

MATTHEW D. MANAHAN

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Admitted in: MA, ME, NH

May 17, 2019

James R. Beyer Maine Dept. of Environmental Protection 106 Hogan Road, Suite 6 Bangor, ME 04401

Bill Hinkel Land Use Planning Commission 22 State House Station Augusta, ME 04333-0022

RE: NECEC - CMP's Response to MDEP May 9, 2019 Additional Information Request

Dear Jim and Bill:

Enclosed is the additional information the DEP requested from CMP at the May 9, 2019 hearing, as further described by Presiding Officer Miller and by Jim on May 10, 2019.

Sincerely,

Matthew D. Manahan

Enclosure cc: Service Lists



May 17, 2019

Mr. James R. Beyer Maine Department of Environmental Protection Division of Land Resources Regulation 106 Hogan Road Bangor, ME 04401

RE: New England Clean Energy Connect Project Response to MDEP May 9, 2019 Additional Information Request

Dear Mr. Beyer:

Central Maine Power Company (CMP) is providing the enclosed materials for the New England Clean Energy Connect (NECEC) Project, as requested by the Maine Department of Environmental Protection (DEP) at the May 9, 2019 hearing and as further described by Presiding Officer Miller and by you on May 10, 2019.

On May 10, 2019, in an email to the service list, DEP Presiding Officer Suzanne Miller stated that the record is closed except that three sets of documents and information will be allowed to be submitted by specific parties by May 17, 2019 as follows:

- Existing maps to be submitted by Dr. Simons-Legaard / Intervenor Group 6 in response to questions from the DEP.
- Cost breakdown to be submitted by CMP in response to questions from Mr. Bergeron. Mr. Bergeron requested costs, dollars, or a numerical backup sheet for CMP Exhibits 11-B through 11-G of Mr. Bardwell's pre-filed rebuttal testimony dated March 25, 2019.
- Engineering information pertaining to pole heights and possible tree heights, to be submitted by CMP in response to questions from you.

Also on May 10, 2019, in an email to the service list, you circulated the five maps and additional direction that the Presiding Officer noted in her third bullet point above. You explained:

Attached are the files I used to produce the maps for my questions of the Engineering Panel. I produced these from the Google Earth map on our web site. The point of this line of questioning was to determine whether based on the topographic change between the proposed structure locations and the streams being crossed would allow CMP to leave existing vegetation; or if the current design would require the removal of the capable species, how much taller would the structures need to be in order to maintain a 35 foot canopy height.

Enclosed with this letter are the two document requests made of CMP. CMP reserves the right to respond to the first document request (existing maps to be submitted by Dr. Simons-Legaard) by the deadline of May 24, 2019.



Attachment A: Cost Breakdown of Exhibits CMP-11-B through CMP-11-G

CMP attaches hereto Exhibits CMP-11-B.1 through CMP-11-G.1, which are the cost breakdowns of Exhibits CMP-11-B through CMP-11-G.

Attachment B: Pole and Tree Height Information

CMP attaches hereto: (1) a table summarizing the structure height changes required and comments on the impacts of the height changes; (2) red-lined markups from the screenshots you provided to correctly reflect the NECEC permit application structure numbers; and (3) an illustrative cross-section for a typical wildlife travel corridor in your five crossing locations. This information is responsive to your May 9 hearing questions and your May 10 email and attachments. All five crossing locations you suggested can accommodate 35' tall vegetation with limited impact to currently proposed structure heights. Three of the five crossings (Moxie Stream, South Branch Moose River, and Tomhegan Stream) require no structure height increases to accommodate 35' tall vegetation along the entire span, one span requires only one structure to increase in height by 10.5' (area near Wilson Hill Pond and Tobey Pond), and the remaining span requires only one structure to increase in height by 5.5' (area near Spencer Road). The two spans where the 35' tall vegetation is not possible for short distances along the span can accommodate up to 25' tall vegetation in those locations.

If you have any questions regarding this submittal, please give me a call at (207) 629-9717 or email me at <u>gerry.mirabile@cmpco.com</u>.

Sincerely,

Gerry ! Miable

Gerry J. Mirabile Manager – Environmental Projects Environmental Permitting AVANGRID Networks, Inc.

Enclosures cc: MDEP Service List; LUPC Service List

ATTACHMENT A Cost Breakdown of Exhibits CMP-11-B.1 through CMP-11-G.1

Black & Veatch							
Owner	Avangrid					Computed By	N. Thomas
Project	NECEC						
B&V File No.	. 400319.42.3	000 I Cast Esti	mate Deserved D			Checked By	J. Bardwell
Fstimate Overall Route Length	146.88	i Cost Esti Miles	mate, Proposed R	oute		1 DC Circuits	
Estimate Overan Route Eengin	775,504	Feet	390	Splices per Circuit		2 Cables per Pole	
				.		•	
	_		Material		Labor		
Item	Qty	Unit	T	Total	T T 14	Total	TOTAL
			Cost	Cost	Cost	Cost	0031
CABLE SYSTEM INSTALATION	-						
2201/27 DC 2500 sec mm. Cy Cable	2 152 676	0					£441 514 640 00
S20K V DC, 2500 sq. mm. Cu Cable	5,155,070	11 A					\$441,314,640.00
Cable Installation Duct	78	ii sea					\$8 580 000 00
Cable Laving Direct Buried	3 127 520	ere fi					\$31,275,200,00
Cable Terminations-AIS	10	ea					\$800,000,00
Spare Cable Term-AIS	2	ea		PROPR	IETARY		\$90,000.00
Cable Joints	2.340	ea					\$163,800,000,00
Spare Cable Joints	12	ea					\$420.000.00
Surge Arresters, 209 MCOV	0	ea					\$0.00
Field Testing	1	lot					\$105,000.00
Mobilization/Demobilize (Cable)	1	lot					\$250,000.00
CABLE SYSTE	EM FURNISH	I & INSTA	LL SUBTOTAL	\$637,198,300.00		\$120,015,200.00	\$757,213,500.00
	1.500.000						* 10 5 10 5 10 0 1
Fiber Optic Cable (48 Fiber)	1,590,308	ft					\$10,543,742.04
Splice Enclosure	160	ea		PROPF	RIETARY	/	\$192,000.00
Splicing Fiber ontio Bull Dovos	160	ea					\$480,000.00
riber-optier un Boxes	COMU	u NICATIO	NS SUBTOTAL	\$6 944 924 00		\$8 170 818 04	\$15,115,742.04
	come	menno	NO DODIOTAL	\$0,744,724.00		\$0,170,010.04	\$13,113,742.04
DISTRIBUTED TEMPERATURE SENSING (DTS)							
	-	Γ	TS SUBTOTAL	\$0.00		\$0.00	\$0.00
ONW WORK							
CIVIL WORK	-						
GENERAL	2					,	¢750.000.00
Mobilization/Demobilize (Prime)	3	lot		PROPF	RIETARY		\$750,000.00
Construction Surveying & Staking	140.00	GENER	AL SUBTOTAL	\$300,000.00		\$2,285,946.97	\$2,585,946.97
				,		, ,	· · ·
OVERHEAD TO UNDERGROUND TRANSITIONS							
	ST	RUCTUF	ES SUBTOTAL	\$0.00		\$0.00	\$0.00
Totation Totation							
Jointing Locations	1.050						\$24.275.000.00
Splice Enclosures, 12'x4'x3'	1,950	ea					\$24,375,000.00
Site work for joint bays	390	ea					\$7,800,000.00
Leinting logation restantion	390	ea		PROPR			\$9,750,000.00
Splice Grounding	1 050	ed ed					\$3,120,000.00 \$1,462,500.00
oprice Orounding	1,950 SDI ICING EN	JCI OSUE	ES SUBTOTAL	\$20,182,500,00		\$26 325 000 00	\$46 507 500.00
×.	N LICHNO EI	10000r	CO SUDIUIAL	φ20,102,000.00		\$20,525,000.00	970,207,200.00

Owner	Avangrid					Computed By	N. Thomas
Project B&V File No. Title	NECEC 400319.42.3	3000 Id Cost Estir	nate Pronosed F	Poute		Checked By	J. Bardwell
Estimate Overall Route Length	146.88 775,504	Miles Feet	390 390	Splices per Circuit		1 DC Circuits 2 Cables per Pole	
			Material		Labor		
Item	Qty	Unit	Unit Cost	Total Mat'l Cost	Unit Cost	Total Labor Cost	TOTAL COST
TRENCHING DIRECT BURIED	625504	FEET					
Clearing and Grubbing (Light clearing) Access Road (3/4" Gravel over Geotextile) Soil Erosion and Sediment Control Silt Fence Excavation Cable Bedding Concrete Cap Backfill, Native Vegetation Restoration (Grass/Shrub Mix) Dewater (50%) Shoring (0%) (Sloping)	1077 1042507 118.47 1251008 1135174 173751 86876 648671 1,077 312,752 0 TRI	acres sq. yd Mi Ift Cu. Yd. Cu. Yd. Cu. Yd. Cu. Yd. acres Ift sqft ENCH WOF	RK SUBTOTAL	PROP \$47,278,179.92	RIETARY	\$239,802,869.48 Per route foot	\$13,462,500.00 \$40,042,681.07 \$5,331,000.00 \$120,896,023.11 \$19,981,377.78 \$23,456,400.00 \$42,163,602.96 \$3,607,848.48 \$9,382,560.00 \$0.00 \$287,081,049.40 \$458.96
JACK AND BORE INSTALLATION	0		250	Feet Each		00.03	00.03
	JACI	AND BUI	KE SUBIUIAL	\$0.00		Per foot	#DIV/0!
HDD INSTALLATION (NO CASING : Land to Land) Mobilization/Demobilize (HDD) Site Preparation for HDD Horiz. Directional Drill Conduit for Cables, 10" DR 9 HDPE Conduit for Comm., 6" DR 9 HPDE HDPE Innerduct, 1 1/4"	150 1 150 300,000 900,000 300,000 900,000	Sets of 2 @ lot sets lft lft lft lft	3 1,000	Feet Each	RIETARY		\$50,000.00 \$6,000,000.00 \$148,500,000.00 \$45,000,000.00 \$9,000,000.00 \$3,150,000.00
	HDD INS	STALLATIO	ON SUBTOTAL	\$42,600,000.00		\$169,100,000.00 Per route foot	\$211,700,000.00 \$1,411.33

Owner	Avangrid					Computed By	N. Thomas
B&V File No.	. 400319.42.	3000 nd Cost Estin	mate Proposed I	Pouto		Checked By	J. Bardwell
Estimate Overall Route Length	146.88 775,504	Miles Feet	390	Splices per Circuit		1 DC Circuits 2 Cables per Pole	
Item	Qty	Unit	Material Unit Cost	Total Mat'l Cost	Labor Unit Cost	Total Labor Cost	TOTAL COST
CABLE SYSTEM FURNISH AND INSTALL UG CABLE AND ACCESSORIES SUBTOTAI	5			\$637,198,300		\$120,015,200	\$757,213,500
COMMUNICATIONS CABLE SYSTEM COMMUNICATIONS (FO)	SUBTOTA	L		\$6,944,924		\$8,170,818	\$15,115,742
CIVIL WORK GENERAL SUBTOTAL	-			\$300,000		\$2,285,947	\$2,585,947
OVERHEAD TO UNDERGROUND SUBTOTA	AL			\$0		\$0	\$0
SPLICING VAULT SUBTOTAL				\$20,182,500		\$26,325,000	\$46,507,500
DIRECT BURIED Direct Buried cost per route foot	\$458.96			\$47,278,180		\$239,802,869	\$287,081,049
HDD INSTALLATION SUBTOTAL HDD Ductbank cost per route foot(1 Bores))	\$1,411.33			\$42,600,000		\$169,100,000	\$211,700,000
ESCALATION	3	3 Years @	2.50%	\$754,503,904 \$56,588,000		\$565,699,834 \$42,427,000	\$1,320,203,738 \$99,015,000
ESCALATED CONSTRUCTION COST	-			\$811,091,904		\$608,126,834	\$1,419,218,738
Mark-Up	10.0%	of Est. La	bor & Mat.	\$81,109,000		\$60,813,000	\$141,922,000
ESTIMATED PROJ COST	-			\$892,200,904		\$668,939,834	\$1,561,140,738
STATE SALES TAX	5.5%	of Materia	als	\$49,071,000			\$49,071,000
ROW ACQUISITION	\$0) per Mile					\$0
MITIGATION							\$0
TOPOGRAPHIC SURVEYING/SOIL EXPLO	RATION @) 40,000/mi					\$5,875,030
ENGINEERING AND CONSTRUCTION MAN	NAGEMEN	Т					\$31,222,815
CONTINGENCY	14.46%	of project	t cost				\$231,105,299
ESTIMATED TOTAL PROJ COST	=					=	\$1,878,414,883
	UNDERG	ROUND PR	ROJECT TOTA	L		(rounded)	\$1,878,400,000

Owner Avangrid

Project NECEC B&V File No. 400319.42.3000

Assumptions - Underground Cost Estimate, Proposed Route

<u>General</u>

1 The estimate is based on a 320 kV DC Cable installation 146.88 miles long.

- 2 ROW acquisition costs are not included in the estimate.
- 3 Environmental mitigation costs are not included in the estimate.
- 4 The estimate does not include costs related to contaminated or hazardous soils or water.
- 5 The estimate does not include allowances for existing facility relocations.
- 6 The estimate does not include allowances for work hour/location restrictions.
- 7 The estimate is in 2019 dollars and includes 3 years of escallation at 2.5%
- 8 The estimate includes a 10% allowance for prime contractor mark-up.
- 9 The estimate includes a 14.46% contingency.
- 10 The estimate includes sales tax of 5.5% on materials only.

Cable & Accessories

- 11 The estimate assumes a single +/-320kV DC circuit with 2 cables per pole.
- 12 The cables are estimated as 320kV DC, 2500 sq. mm Cu Cable.
- 13 The estimate includes an installed spare cable the full length of the line.
- 14 The estimate includes (10) AIS cable terminations, and 2 spare terminations.
- 15 The estimate includes (2,340) single-phase cable joints, with 4 spare joints.
- 16 The estimate does not include surge arrestors.
- 17 The estimate does not include optical fiber cable inside the power cable for temperature monitoring.

Communications

- 18 The estimate includes two fiber optic cable systems.
- 19 Fiber-optic cables are estimated as 48 fiber, single mode, loose tube outdoor cable.
- 20 Fiber-optic cables are installed into 1 1/4" HDPE innerducts installed in 4" PVC conduit.
- 21 Separate pull/splicing boxes are included for the fiber-optics.

Temperature Monitoring

22 The estimate does not include cable temperature monitoring equipment.

Overhead to Underground Transition

- 23 The estimate does not include termination supports or stands.
- 24 The estimate does not include provisions for overhead transmission connections
- 25 The estimate does not include concrete encased sweeps for the cable

Splice Housings

- 26 The estimate includes (390) jointing locations with (5) 12'x4'x3' precast concrete splice housings at each location.
- Each splice housing is assumed to hold (1) splice.

Duct Bank Installation

28 The estimate does not include duct bank.

Direct Buried Installation

- 29 The estimate does not include conduits in the direct buried sections.
- 30 The estimate includes soil erosion and sediment control measures for green spaces.
- 31 The cables are installed in a single 5' wide trench averaging 7' deep.
- 32 The cables are installed in a thermal sand cable bedding material
- 33 The estimate includes a 9" thick concrete cap installed 18" below grade
- 34 The estimate assumes backfilling direct buried sections with native soils.
- 35 The estimate includes vegetation clearing and restoration 50' wide for construction not in roadways.
- 36 The estimate includes allowance for dewatering for 50% of the trench in uplands, and 100% in wetlands.
- 37 The estimate does not include shoring for the trenches.

HDD Installation

- 38 The estimate includes (150) sets of HDD installations in soil, 1000 feet long each.
- 39 Each HDD installation consists of the bundled FPVC or HDPE conduits pulled directly into the boreholes.
- 40 The HDD installations do not include a casing.
- 41 The HDD installations do not include grouting of the bore hole.

- 42 The estimate includes surveying, and soil exploration.
- 43 The estimate includes approximate engineering costs.
- 44 The estimate includes construction management based on a 15 month construction duration.

Black & Veatch							
Owne	r Avangrid					Computed By	J. Bardwell
Projec	t NECEC	000					
B&V File No	6. 400319.42.3	000 d Cast Esti		Checked By			
Estimate Overall Poute Lengt	b 52.50	u Cost Estil Milec	mate, new corridor	r portion of Propose	d Roule	1 DC Circuite	
Estimate Overan Route Lengt	282 480	Feet	143 S	nlices per Circuit		2 Cables per Pole	
	202,100	1 001	115 5	phees per eneur		2 Cubics per 1 tile	
			Material		Labor		
Item	Oty	Unit		Total		Total	TOTAL
			Unit	Mat'l	Unit	Labor	COST
			Cost	Cost	Cost	Cost	
CABLE SYSTEM INSTALATION	_						
UNDERGROUND CABLE AND ACCESSORIES							
320kV DC, 2500 sq. mm. Cu Cable	1,148,976	ft					\$160,856,640.00
Installed Spare	287,244	ft					\$40,214,160.00
Cable Installation, Duct	0	seg					\$0.00
Cable Laying, Direct Buried	912,400	ft					\$9,124,000.00
Cable Terminations-AIS	10	ea			FTARY		\$800,000.00
Spare Cable Term-AIS	2	ea					\$90,000.00
Cable Joints	858	ea					\$60,060,000.00
Spare Cable Joints	10	ea					\$350,000.00
Surge Arresters, 209 MCOV	0	ea					\$0.00
Field Testing	1	lot					\$105,000.00
Mobilization/Demobilize (Cable)	1	lot		****		*** ***	\$250,000.00
CABLE SYST	EM FURNISF	1 & INSTA	LL SUBTOTAL	\$232,095,800.00		\$39,754,000.00	\$271,849,800.00
COMMUNICATIONS	_						
Fiber Optic Cable (48 Fiber)	579,560	ft					\$3,842,482.80
Splice Enclosure	59	ea			TARY		\$70,800.00
Splicing	59	ea					\$177,000.00
Fiber-optic Pull Boxes	286	ea					\$1,430,000.00
	COMU	INICATIO	NS SUBTOTAL	\$2,536,280.00		\$2,984,002.80	\$5,520,282.80
DISTRIBUTED TEMPERATURE SENSING (DTS)							
DISTRIBUTED TEMPERATURE SENSING (DTS)	-	Л	TS SUBTOTAL	\$0.00		\$0.00	\$0.00
		D	15 SOBIOTAL	\$0.00		\$0.00	\$0.00
CIVIL WORK	_						
GENERAL							A
Mobilization/Demobilize (Prime)	52.50	lot		PROPR	IETAR'	Y	\$750,000.00
Construction Surveying & Staking	53.50	MI		#200.000.00		¢1 110 770 00	\$668,750.00
		GENER	AL SUBIOTAL	\$300,000.00		\$1,118,750.00	\$1,418,750.00
OVERHEAD TO UNDERGROUND TRANSITIONS	1						
Substation Termination Structure, Single Cable	5	ea					\$125,000.00
Termination Structure Fdn	5	ea					\$39,090.00
Overhead Line Dead End Structure	1	ea					\$175,000.00
Dead End Structure Fdn	1	ea					\$51,265.00
Silt Fence	600	ft					\$4,140.00
Clearing/Grading/Cut& Fill	22,500	Sq Ft				<i>x</i>	\$11,700.00
Rock Surfacing (6" Crushed Rock)	2,025	Cu. Yd		FRUFR		T	\$130,340.14
Fence, Galv. Chainlink	540	ft					\$12,420.00
Drive Gates	2	ea					\$4,600.00
Access Road, Permanent	1,000	ft					\$43,370.00
Site Grounding	18,225	Sq Ft					\$64,261.35
Ductbank Transitions (Concrete Encased Bends)	5	ea			. , ,		\$108,340.75
	S	TRUCTUR	ES SUBTOTAL	\$272,717.89		\$496,809.35	\$769,527.24
Jointing Locations							
Splice Enclosures, 12'x4'x3'	715	ea					\$8,937,500.00
Site work for joint bays	143	ea					\$4,290,000.00
Temporary joint bays	143	ea		PROP	RIETAF	RY I	\$3,575,000.00
Jointing location restoration	143	ea					\$1,144,000.00
Splice Grounding	715	ea					\$536,250.00
	SPLICING E	NCLOSUR	ES SUBTOTAL	\$7,400,250.00		\$11,082,500.00	\$18,482,750.00

Owner	Avangrid					Computed By	J. Bardwell
Project B&V File No. Title Estimate Overall Route Length	NECEC 400319.42.3 Undergroun 53.50 282,480	3000 ad Cost Estin Miles Feet	mate, New corrido	r portion of Pro	oposed Route	Checked By 1 DC Circuits 2 Cables per Pole	
Item	Qty	Unit	Material Unit Cost	Total Mat'l Cost	Labor Unit Cost	Total Labor Cost	TOTAL COST
TRENCHING DIRECT BURIED Clearing and Grubbing Access Road (3/4" Gravel over Geotextile) Soil Erosion and Sediment Control Silt Fence Excavation Cable Bedding Concrete Cap Backfill, Native Vegetation Restoration (Grass/Shrub Mix) Dewater (50%) Shoring (0%) (Sloping)	182480 FEET 314 acres 304133 sq. yd 34.56 Mi 364960 lft 331167 Cu. Yd. 50689 Cu. Yd. 25344 Cu. Yd. 189239 Cu. Yd. 314 acres 91,240 lft 0 sqft TRENCH WORK		RK SUBTOTAL	P \$13,792,593	ROPRIETA	ARY \$69,955,897.68 Per route foot	\$3,925,000.00 \$11,681,761.33 \$1,555,227.27 \$2,554,720.00 \$35,269,328.89 \$5,829,222.22 \$6,843,000.00 \$12,300,503.70 \$1,052,527.55 \$2,737,200.000 \$83,748,490.97 \$458.95
JACK AND BORE INSTALLATION	0 JACI	(@) K AND BO	250 I RE SUBTOTAL	Feet Each \$0).00	\$0.00 Per foot	\$0.00 #DIV/0!
HDD INSTALLATION (NO CASING : Land to Land) Mobilization/Demobilize (HDD) Site Preparation for HDD Horiz. Directional Drill Conduit for Cables, 10" DR 9 HDPE Conduit for Comm., 6" DR 9 HPDE HDPE Innerduct, 1 1/4"	100 3 100 200,000 600,000 200,000 600,000 HDD INS	Sets of 2 @ lot sets lft lft lft STALLATIO) 1,000 I	Feet Each P \$28,400,000		ARY \$112,850,000.00 Per route foot	\$150,000.00 \$4,000,000.00 \$99,000,000.00 \$30,000,000.00 \$6,000,000.00 \$2,100,000.00 \$141,250,000.00 \$1,412.50

Owner	Avangrid					Computed By	J. Bardwell
Project B&V File No.	: NECEC . 400319.42.	3000				Checked By	
Title Estimate Overall Route Length	e Undergroun 53.50 282,480	nd Cost Estin) Miles Feet	mate, New corri	dor portion of Proposed Splices per Circuit	d Route	1 DC Circuits 2 Cables per Pole	
			Matarial		Labor		
Item	Qty	Unit	Unit Cost	Total Mat'l Cost	Unit Cost	Total Labor Cost	TOTAL COST
CABLE SYSTEM FURNISH AND INSTALL							
UG CABLE AND ACCESSORIES SUBTOTAL	5			\$232,095,800		\$39,754,000	\$271,849,800
COMMUNICATIONS	_						
CABLE SYSTEM COMMUNICATIONS (FO)	SUBTOTA	L		\$2,536,280		\$2,984,003	\$5,520,283
CIVIL WORK							
GENERAL SUBTOTAL	-			\$300,000		\$1,118,750	\$1,418,750
OVERHEAD TO UNDERGROUND SUBTOT	AL			\$272,718		\$496,809	\$769,527
SPLICING VAULT SUBTOTAL				\$7,400,250		\$11,082,500	\$18,482,750
DIRECT BURIED				\$13,792,593		\$69,955,898	\$83,748,491
HDD INSTALLATION SUBTOTAL HDD Ductbank cost per route foot(2 Bores))	\$458.95 \$1,412.50			\$28,400,000		\$112,850,000	\$141,250,000
ESTIMATED LABOR & MATERIAL COST	-			\$284,797,641		\$238,241,960	\$523,039,601
ESCALATION	3	3 Years @	2.50%	\$21,360,000		\$17,868,000	\$39,228,000
ESCALATED CONSTRUCTION COST	-			\$306,157,641		\$256,109,960	\$562,267,601
Mark-Up	10.0%	of Est. La	bor & Mat.	\$30,616,000		\$25,611,000	\$56,227,000
ESTIMATED PROJ COST	-			\$336,773,641		\$281,720,960	\$618,494,601
STATE SALES TAX	5.5%	of Materia	als	\$18,523,000			\$18,523,000
ROW ACQUISITION	\$0) per Mile					\$0
MITIGATION							\$0
TOPOGRAPHIC SURVEYING/SOIL EXPLO	RATION @) 40,000/mi					\$2,140,000
ENGINEERING AND CONSTRUCTION MAN	NAGEMEN	Т					\$18,554,838
CONTINGENCY	14.46%	of project	cost				\$92,426,793
ESTIMATED TOTAL PROJ COST	=					_	\$750,139,232
	UNDERG	ROUND PR	ROJECT TOTA	L		(rounded)	\$750,000,000

Owner Avangrid

Project NECEC B&V File No. 400319.42.3000

Assumptions - Underground Cost Estimate, New corridor portion of Proposed Route

General

- 1 The estimate is based on a 320 kV DC Cable installation 53.8 miles long.
- 2 ROW acquisition costs are not included in the estimate.
- 3 Environmental mitigation costs are not included in the estimate.
- 4 The estimate does not include costs related to contaminated or hazardous soils or water.
- 5 The estimate does not include allowances for existing facility relocations.
- 6 The estimate does not include allowances for work hour/location restrictions.
- 7 The estimate is in 2019 dollars and includes 3 years of escallation at 2.5%
- 8 The estimate includes a 10% allowance for prime contractor mark-up.
- 9 The estimate includes a 14.46% contingency
- 10 The estimate includes sales tax of 5.5% on materials only.

Cable & Accessories

- 11 The estimate assumes a single +/-320kV DC circuit with 2 cables per pole.
- 12 The cables are estimated as 320kV DC, 2500 sq. mm Cu Cable.
- 13 The estimate includes an installed spare cable the full length of the line.
- 14 The estimate includes (10) AIS cable terminations, and 2 spare terminations.
- 15 The estimate includes (864) single-phase cable joints, with 10 spare joints.
- 16 The estimate does not include surge arrestors.
- 17 The estimate does not include optical fiber cable inside the power cable for temperature monitoring.

Communications

- 18 The estimate includes two fiber optic cable systems.
- 19 Fiber-optic cables are estimated as 48 fiber, single mode, loose tube outdoor cable.
- 20 Fiber-optic cables are installed into 1 1/4" HDPE innerducts installed in 4" PVC conduit.
- 21 Separate pull/splicing boxes are included for the fiber-optics.

Temperature Monitoring

22 The estimate does not include cable temperature monitoring equipment.

Overhead to Underground Transition

- Includes terminations stands, surge arrestor stands and dead-ends for one transition.
- 24 The estimate includes site work and foundations for a 135' square termination station
- 25 The estimate includes ground grid and fencing for a 135' square terminations station.

Splice Housings

23

- 26 The estimate includes (144) jointing locations with (5) 12'x4'x3' precast concrete splice housings at each location.
- 27 Each splice housing is assumed to hold (1) splice.

Duct Bank Installation

28 The estimate does not include duct bank.

Direct Buried Installation

- 29 The estimate does not include conduits in the direct buried sections.
- 30 The estimate includes soil erosion and sediment control measures for green spaces.
- 31 The cables are installed in a single 5' wide trench averaging 7' deep.
- 32 The cables are installed in a thermal sand cable bedding material
- 33 The estimate includes a 9" thick concrete cap installed 18" below grade
- 34 The estimate assumes backfilling direct buried sections with native soils.
- 35 The estimate includes vegetation clearing and restoration 50' wide for construction not in roadways.
- 36 The estimate includes allowance for dewatering for 50% of the trench in uplands, and 100% in wetlands.
- 37 The estimate does not include shoring for the trenches.

HDD Installation

- 38 The estimate includes (100) sets of HDD installations in soil, 1000 feet long each.
- 39 Each HDD installation consists of the bundled FPVC or HDPE conduits pulled directly into the boreholes.
- 40 The HDD installations do not include a casing.
- 41 The HDD installations do not include grouting of the bore hole.

- 42 The estimate includes surveying, and soil exploration.
- 43 The estimate includes approximate engineering costs.
- 44 The estimate includes approximately construction management costs.

Owner	Avangrid					Computed By	N. Thomas
B&V File No.	NECEC 400319.42.3	000				Checked By	J. Bardwell
Title Estimate Overall Route Length	Underground 146.88 775,504	l Cost Esti Miles Feet	mate, Undergrou	nd Alternate Route Splices per Circuit		1 DC Circuits 2 Cables per Pole	
Item	Qty	Unit	Material Unit Cost	Total Mat'l Cost	Labor Unit Cost	Total Labor Cost	TOTAL COST
CABLE SYSTEM INSTALATION							
320kV DC, 2500 sq. mm. Cu Cable Installed Spare Cable Installation, Duct Bank Cable Laying, Direct Buried Cable Terminations-AIS Spare Cable Joints Spare Cable Joints Field Testing Mobilization/Demobilize (Cable) CABLE SYSTE	3,153,676 788,419 232 317,680 10 2,340 12 1 1 M FURNISH	ft seg ft ea ea ea lot lot I & INSTA	LL SUBTOTAL	PROP \$641,818,300.00		\$104,236,800.00	\$441,514,640.00 \$110,378,660.00 \$25,520,000.00 \$30,176,800.00 \$90,000.00 \$163,800,000.00 \$163,800,000.00 \$105,000.00 \$250,000.00 \$746,055,100.00
COMMUNICATIONS							
Fiber Optic Cable (48 Fiber) Splice Enclosure Splicing Fiber-optic Pull Boxes	1,590,308 160 160 780	ft ea ea ea		PROP	RIETARY		\$10,543,742.04 \$192,000.00 \$480,000.00 \$3,900,000.00
	COMU	NICATIO	NS SUBTOTAL	\$6,944,924.00)	\$8,170,818.04	\$15,115,742.04
CIVIL WORK GENERAL							
Mobilization/Demobilize (Prime) Construction Surveying & Staking	3 146.88	lot MI GENER	AL SUBTOTAL	PROP \$300,000.00		\$2,285,946.97	\$750,000.00 \$1,835,946.97 \$2,585,946.97
Splicing Vaults Splicing Vaults, 30'x8'x8' Duct Bank Connections	780 1,560	ea ea		PROPF			\$89,700,000.00 \$31,200,000.00
Manhole covers Splicing Vault Grounding S	1,560 780 PLICING E1	ea ea NCLOSUR	ES SUBTOTAL	\$40,755,000.00	<u>,</u>	\$92,430,000.00	\$9,360,000.00 \$2,925,000.00 \$133,185,000.00

Owner . Project	Avangrid					Computed By	N. Thomas
B&V File No. 4	400319.42.30	000				Checked By	J. Bardwell
Estimate Overall Route Length	Underground 146.88] 775,504	l Cost Estu Miles Feet	mate, Undergrour 390	nd Alternate Route Splices per Circuit		1 DC Circuits 2 Cables per Pole	
			Material		Labor		
Item	Qty	Unit	Unit Cost	Total Mat'l Cost	Unit Cost	Total Labor Cost	TOTAL COST
DUCTBANK INSTALLATION - Roadway	307824	FEET					
Utilility Locates 15/Mile	875	-a					\$787 500 00
Traffic Control	2052	tavs					\$8,619,072,00
Soil Erosion and Sediment Control	58.30	Mi					\$5.830.000.00
Excavation	359128	Cu. Yd.					\$31,244,136,00
Concrete Encasement	68405	Cu. Yd.					\$16,417,280.00
Backfill, FTB	142511	Cu. Yd.					\$27,789,666,67
Backfill, Native	85507	Cu. Yd.					\$6,413,000.00
Road Bed Restoration, 9" 3/4" Crushed Rock	25.652	Cu. Yd.					\$897.820.00
Pavement Saw Cutting, Concrete	615648	ff		PROF		2Y	\$8.311.248.00
Pavement Removal, 15 feet wide	4.617.360	saft					\$9.234.720.00
Pavement Restoration, Gravel, 30 feet wide	9.234.720	saft					\$13,852,080,00
8" SCH, 40 PVC Conduit	1846944	ft					\$29,920,492.80
4" SCH. 40 PVC Conduit	615648	ft					\$5,756,308.80
1.25" HDPE Conduit	923472	ft					\$3,232,152.00
8" Conduit Spacers	369389	ea					\$8,495,947.00
4" Conduit Spacers	123130	ea					\$1,600,690.00
Landscaping Repair/Restoration	212 ;	acre					\$710,200.00
Dewater (50%)	153,912	lft					\$6,156,480.00
Shoring (50%)	2,770,416 :	sqft					\$13,852,080.00
D	UCTBANK-	ROADW	AY SUBTOTAL	\$70,799,626.93		\$128,321,246.33 Per route foot	\$199,120,873.27 \$646.87
TRENGUNG DIRECT DURIED	217(00)	CEET					
IRENCHING DIRECT BURIED	317680	FEET					¢ (927 500 00
Clearing and Grubbing	520467	acres					\$0,837,500.00
Access Road (3/4 Gravel over Geolexille)	529407 8	sq. ya Mi					\$20,330,814.07
Soli Elosion and Sediment Control	625260	NII I A					\$2,707,300.00
Shit Felice	576520	m Cu Vd				,	\$4,447,320.00
Cable Bodding	88244	Cu. Tu. Cu. Vd		PROPE	KIETARY	r l	\$10,400,484.44
Concrete Can	44122	Cu. Yd.					\$11,913,000,00
Backfill Native	329446	Cu. Yd.					\$21 413 985 19
Vegetation Restoration (Grass/Shruh Mix)	547	acres					\$1 832 348 48
Dewater (50%)	158 840	lft					\$4 765 200 00
Denater (5070)	TRE	NCH WOI	RK SUBTOTAL	\$24.011.568.59		\$121 790 895 31	\$145 802 463 89
	III.			φ <u>μ</u> 1,011,500.59		Per route foot	\$458.96
HDD INSTALLATION (NO CASING - Land to Land)	150	Sets of 2 %	0 1000	Feet Each		_ !	
Mobilization/Demobilize (HDD)	1 1	ot		. eet Daen			\$50,000,00
Site Preparation for HDD	150	sets					\$6,000,000,00
Horiz, Directional Drill	300 000 1	lft					\$148,500,000,00
Conduit for Cables, 10" DR 9 HDPF	900,000 1	lft		PROPRI	ETARY		\$45,000,000,00
Conduit for Comm., 6" DR 9 HPDE	300,000 1	lft					\$9,000,000,00
HDPE Innerduct. 1 1/4"	900.000	ft					\$3,150,000.00
	HDD INS	FALLATI	ON SUBTOTAL	\$42,600,000.00		\$169,100,000.00 Per route foot	\$211,700,000.00 \$1,411.33

Owner	Avangrid				Computed By	N. Thomas
Project B&V File No	. 400319.42.3000				Checked By	J. Bardwell
Title	Underground Cost E	stimate, Undergrou	ind Alternate Route			
Estimate Overall Route Length	146.88 Miles	200	Spliggs por Circuit		1 DC Circuits	
	775,504 Feel	390	spices per Circuit		2 Cables per Pole	
		Material		Labor		
Item	Qty Unit	t	Total		Total	TOTAL
		Unit	Mat'l	Unit	Labor	COST
		Cost	Cost	Cost	Cost	
CABLE SYSTEM FURNISH AND INSTALL	-		\$6/1 818 300		\$104 236 800	\$746.055.100
UG CABLE AND ACCESSORIES SUBTOTAL			5041,818,500		\$104,230,800	\$740,055,100
COMMUNICATIONS	-					
CABLE SYSTEM COMMUNICATIONS (FO)	SUBTOTAL		\$6,944,924		\$8,170,818	\$15,115,742
CIVIL WORK						
GENERAL SUBTOTAL	-		\$300,000		\$2,285,947	\$2,585,947
OVERHEAD TO UNDERGROUND SUBTOT	AL .		\$20,036		\$109,973	\$130,009
SPLICING VAULT SUBTOTAL			\$40,755,000		\$92,430,000	\$133,185,000
			\$50 500 (3 5		£138 331 34C	\$100 1 <u>20 8</u> 72
Ductbank INSTALLATION - ROADWAY	\$646.87		\$70,799,627		\$128,321,246	\$199,120,873
DIRECT BURIED	\$040.07		\$24.011.569		\$121,790,895	\$145.802.464
Direct Buried cost per route foot	\$458.96		φ= 1,011,e 05		\$1 1 1,150,050	¢110,002,101
HDD INSTALLATION SUBTOTAL			\$42,600,000		\$169,100,000	\$211,700,000
HDD Ductbank cost per route foot(1 Bores))	\$1,411.33					
ESTIMATED LABOR & MATERIAL COST			\$827,249,455		\$626,445,680	\$1,453,695,135
ESCALATION	2 Voore G	2 2 509/	\$67.044.000		\$46 092 000	\$100.027.000
ESCALATION	5 Years (<i>u</i> 2.50%	502,044,000		\$40,985,000	\$109,027,000
ESCALATED CONSTRUCTION COST	-		\$889,293,455		\$673,428,680	\$1,562,722,135
N	10.00/ - CE-4	I h 9. M 4	£99 0 20 000		¢(7.242.000	£156 252 000
магк-ор	10.0% OI ESt.	Labor & Mat.	\$88,929,000		\$67,343,000	\$156,272,000
ESTIMATED PROJ COST	-		\$978,222,455		\$740,771,680	\$1,718,994,135
STATE SALES TAX	5.5% of Mate	erials	\$53,802,000			\$53,802,000
ROW ACQUISITION	\$0 per Mil	e				\$0
MITIGATION						\$0
TOPOGRAPHIC SURVEVING/SOIL EXPLO	RATION @ 40 000/r	ni				\$5 875 030
						\$3,075,050
ENGINEERING AND CONSTRUCTION MAN	NAGEMENT					\$34,579,883
CONTINGENCY	14.46% of proj	ect cost				\$254,387,412
ESTIMATED TOTAL PROJ COST	•				-	\$2,067,438,460
	UNDERGROUND	PROJECT TOTA	L		(rounded)	\$2,067,400,000

Owner Avangrid Project NECEC

B&V File No. 400319.42.3000

Assumptions - Underground Cost Estimate, Underground Alternate Route

General

- The estimate is based on a 320 kV DC Cable installation 146.88 miles long.
- 2 ROW acquisition costs are not included in the estimate.
- 3 Environmental mitigation costs are not included in the estimate.
- 4 The estimate does not include costs related to contaminated or hazardous soils or water.
- 5 The estimate does not include allowances for existing facility relocations.
- 6 The estimate does not include allowances for work hour/location restrictions.
- 7 The estimate is in 2019 dollars and includes escallation at 2.5% for 3 years.
- The estimate includes a 10% mark-up for a prime contractor 8
- 9 The estimate includes a 14.46% contingency
- 9 The estimate includes sales tax of 5.5% on materials only.

Cable & Aco essories

- The estimate assumes a single +/-320kV DC circuit with 2 cables per pole. 10
- 11 The cables are estimated as 320kV DC, 2500 sq. mm Cu Cable.
- The estimate includes an installed spare cable the full length of the project. 12
- 13 The estimate includes (10) AIS cable terminations, including 2 spare terminations.
- The estimate includes (2,340) single-phase cable joints, with 12 spare joints. 14
- 15 The estimate does not include surge arrestors.

The estimate does not include optical fiber cable inside the power cable for temperature monitoring. 16

Communications

- 17 The estimate includes two fiber optic cables for communications and monitoring.
- 18 Fiber-optic cables are estimated as 48 fiber, single mode, loose tube outdoor cable.
- Fiber-optic cables are installed into 1 1/4" HDPE innerducts installed in 4" PVC conduit. 19
- 20 Separate pull/splicing boxes are included for the fiber-optics.

Temperature Monitoring

The estimate does not include cable temperature monitoring equipment. 21

Overhead to **Jnderground Transition**

- The estimate does not include termination stations or supports. 22
- 23 The estimate does not include provisions for overhead transmission connections
- 24 The estimate does not include concrete encased sweeps for the cable
- Splice Housings
 - 25 The estimate includes (780) 33'x8'x10' precast concrete splice vaults.
 - 26 Each splice housing is assumed to hold (3) splices

Duct Bank Installation

- The estimate includes 53.8 miles of duct bank. 27
- 28 The estimate includes (6)8" SCH 40 PVC Conduits for high voltage cable include one spare conduits.
- The estimate includes (2) 4" SCH 40 PVC Conduits for communications. 29
- 30 The conduits are installed in a common duct bank, 3' wide and 2' high
- 31 The estimate assumes ductbank installation will be under payement.
- 32 The estimate includes traffic control at 200ft/day.
- 33 The estimate includes soil erosion and sediment control measures for rural streets.
- 34 The estimate assumes a 3' wide trench, averaging 6' deep.
- 35 The estimate assumes the ductbank will be backfilled with FTB to 2' below grade.
- 36 The estimate includes pavement removal and restoration for the entire route length.
- 37 The estimate includes allowance for dewatering for 50% of the trench.
- 38 The estimate includes sheeting and shoring of the trench for 25% of the route length.

Direct Buried Installation

- The estimate includes 60.2 miles of direct buried installation. 39
- The estimate does not include conduits in the direct buried sections. 40
- 41 The estimate includes soil erosion and sediment control measures for green spaces.
- 42 The cables are installed in a single 5' wide trench averaging 7' deep.
- 43 The cables are installed in a thermal sand cable bedding material
- 44 The estimate includes a 9" thick concrete cap installed 18" below grade
- 45 The estimate assumes backfilling direct buried sections with native soils.
- 46 The estimate includes vegetation clearing and restoration 50' wide for construction not in roadways.
- The estimate includes allowance for dewatering for 50% of the trench in uplands, and 100% in wetlands. 47
- 48
- The estimate does not include shoring for the trenches.

HDD Installation

- The estimate includes (150) sets of HDD installations in soil, 1000 feet long each. 49
- 50 Each HDD installation consists of the bundled FPVC or HDPE conduits pulled directly into the boreholes.
- The HDD installations do not include a casing. 51
- 52 The HDD installations do not include grouting of the bore hole.

& Construction Management Engineering

- The estimate includes surveying, and soil exploration. 53
- 54 The estimate includes approximate engineering costs.
- 55 The estimate includes approximately construction management costs.

Diack & Vealch							
Owner A	vangrid					Computed By	J. Bardwell
Project N		000				CI 1 1 D	
B&V File No. 4	00319.42.3	000			Checked By		
Little U	ndergroun	d Cost Estii	mate, Appalachian	Irail		DC Circuite	
Estimate Overall Route Length	5 280	Foot	2 9	uliaca non Cinovit	1		
	5,280	reel	2.5	plices per Circuit	2	Cables per Pole	
			Matarial		Labor		
Item	Otv	Unit	wateria	Total	Labor	Total	ΤΟΤΑΙ
nem	Qıy	Oint	Unit	Mat'l	Unit	Labor	COST
			Cost	Cost	Cost	Cost	0001
			COSt	0051	0051	0051	
CABLE SYSTEM INSTALATION							
UNDERGROUND CABLE AND ACCESSORIES							
320kV DC, 2500 sq. mm. Cu Cable	21,564	ft					\$3,018,960.00
Installed Spare	5,391	ft					\$754,740.00
Cable Installation, Duct	6	seg					\$660,000.00
Cable Laying, Direct Buried	0	ft					\$0.00
Cable Terminations-AIS	10	ea		PROPRI	FTARY		\$800,000.00
Spare Cable Term-AIS	2	ea					\$90,000.00
Cable Joints	10	ea					\$700,000.00
Spare Cable Joints	2	ea					\$70,000.00
Surge Arresters, 209 MCOV	0	ea					\$0.00
Field Testing	1	lot					\$105,000.00
Mobilization/Demobilize (Cable)	1	lot					\$250,000.00
CABLE SYSTEM	I FURNISH	H & INSTA	LL SUBTOTAL	\$5,018,700.00		\$1,430,000.00	\$6,448,700.00
COMMUNICATIONS							
Fiber Optic Cable (48 Fiber)	11,060	ft					\$73,327.80
Splice Enclosure	2	ea		PROPRI	FTARY		\$2,400.00
Splicing	2	ea					\$6,000.00
Fiber-optic Pull Boxes	4	ea					\$20,000.00
	COMU	JNICATIO	NS SUBTOTAL	\$45,980.00		\$55,747.80	\$101,727.80
DISTRIBUTED TEMPERATURE SENSING (DTS)		_					
		D	TS SUBTOTAL	\$0.00		\$0.00	\$0.00
CIVIL WORK							
CIVIL WORK							
GENERAL Mahilipatian (Damahilipa (Driver))	1	1.4					\$250,000,00
Construction Surgering & Staling	1 00	IOU		PROPRI	ETARY		\$250,000.00
Construction Surveying & Staking	1.00	CENED		\$100,000,00		\$162,500,00	\$12,500.00
		UENEK	AL SUBIUIAL	\$100,000.00		\$102,500.00	\$202,500.00
OVERHEAD TO UNDER CROUND TRANSITIONS	2						
System Termination Structure Single Cable	10						\$250,000,00
Termination Structure Edn	10	ca ea					\$78 190.00
Overhead Line Dead End Structure	10	ea					\$210,000,00
Dead End Structure Edn	2	00					\$102 530 00
Silt Fance	1 200	ft ft					\$8,280,00
Clearing/Grading/Cut& Fill	45 000	Sa Et					\$23,200.00
Rock Surfacing (6" Crushed Rock)	4 050	Cu Vd		PROPRI	ETARY		\$260,680,28
Fence Galy Chainlink	1.080	fu. Tu					\$200,080.28
Drive Gates	1,000	n ea					\$9,200,00
Access Road Permanent		ft					\$0.00
Site Grounding	36 450	Sa Et					\$128 522 70
Ducthank Transitions (Concrete Encased Bends)	0	ea					\$0.00
International (Control of Director Director Dorida)	S'	TRUCTUR	ES SUBTOTAL	\$433 122 78	,	\$662.510.20	\$1.095 632 98
	5		LE SEBTOTAL	ψ155,122.70		<i>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</i>	\$1,075,052.70
Jointing Locations							
Splicing Vaults, 30'x8'x8'	4	ea					\$460.000.00
Duct Bank Connections	. 8	ea					\$160.000.00
Manhole covers	8	ea		PROPR			\$48,000.00
Splicing Vault Grounding	4	ea					\$15,000.00
SP	LICING E	NCLOSUR	ES SUBTOTAL	\$209,000.00		\$474,000.00	\$683,000.00

Owner	Avangrid					Computed By	J. Bardwell
B&V File No.	NECEC 400319.42.3	000				Checked By	
Title	Undergroun	d Cost Esti	mate, Appalachia	an Trail		1 5 6 61 1	
Estimate Overall Route Length	1.00	Miles	2			1 DC Circuits	
	5,280	Feet	2	Splices per Circuit		2 Cables per Pole	
Item	Qty	Unit	Material Unit Cost	Total Mat'l Cost	Labor Unit Cost	Total Labor Cost	TOTAL COST
DUCTBANK INSTALLATION - Roadway	1780	FEET					
Utilility Locates 15/Mile	5	ea					\$4,500.00
Traffic Control	12	davs					\$49.840.00
Soil Erosion and Sediment Control	0.34	Mi					\$33,712,12
Access Road (3/4" Gravel over Geotextile)	0	sa. vd.					\$0.00
Excavation	2077	Cu. Yd.					\$180.670.00
Concrete Encasement	396	Cu. Yd.					\$94,933,33
Concrete Reinforcement, Rebar (0 Long)	0	ft					\$0.00
Backfill, FTB	0	Cu. Yd.					\$0.00
Backfill, Native	989	Cu. Yd.					\$74,166.67
Road Bed Restoration, 9" 3/4" Crushed Rock	0	Cu. Yd.					\$0.00
Pavement Saw Cutting, Concrete	0	lft		PROF	PRIETAR	RY	\$0.00
Pavement Removal, 15 feet wide	0	sqft					\$0.00
Pavement Restoration, Gravel, 30 feet wide	53,400	sqft					\$80,100.00
8" SCH. 40 PVC Conduit	3560	lft					\$57,672.00
2" SCH. 40 PVC Conduit	0	lft					\$0.00
4" SCH. 40 PVC Conduit	1780	lft					\$16,643.00
1.25" HDPE Conduit	5340	lft					\$18,690.00
8" Conduit Spacers	712	ea					\$16,376.00
4" Conduit Spacers	356	ea					\$4,628.00
Landscaping Repair/Restoration	1	acre					\$4,112.41
Dewater (50%)	890	lft					\$35,600.00
Shoring (50%)	14,543	sqft					\$72,713.00
D	UCTBANK	-ROADW	AY SUBTOTAL	\$192,175.08		\$552,181.46	\$744,356.54
						Per route foot	\$418.18
TRENCHING DIRECT BURIED	0	FEET					
	TRE	ENCH WO	RK SUBTOTAL	\$0.00		\$0.00	\$0.00
		i.	1			Per route foot	#DIV/0!
		_					
JACK AND BORE INSTALLATION	0	<u>a</u>	250	Feet Each		#0.00	* 0.00
	JACK	AND BO	RE SUBIOTAL	\$0.00		\$0.00	\$0.00
						Per foot	#DIV/0!
		a	2 500				
HDD INSTALLATION (NO CASING : Land to Land)	1	Sets of 2 (<i>y</i> 3,500	Feet Each			1 ¢50 000 00
Site Preparation for LIDD	1	lot					\$50,000.00
Noise Perriers	1	sets					\$05,000.00
Noise Darriers	7 000	10					\$2,50,000.00
Conduit for Cobles 10" DP 0 HDPE	/,000	111 1 0		PROPF	RIETARY	(\$3,813,000.00
Conduit for Comm. 10" DR 9 HDPE	42,000	111 1 0					\$2,100,000.00
Conduit for CCC 2" DP 14 FDVC	14,000	10 10					\$700,000.00
HDPE Innerduct 1 1/4"	42 000	lft					\$0.00
TET E Inforduct, 1 1/4	יען ערד איז עעד	TALLATI	ON SUBTOTAL	\$1 803 000 00		\$5 234 000 00	\$7 127 000.00
			OI, BOBIOIAL	φ1,075,000.00		Per route foot	\$2,036.29

Owner	Avangrid					Computed By	J. Bardwell
B&V File No.	400319.42.	3000				Checked By	
Title	Undergrour	nd Cost Estin	nate, Appala	chian Trail			
Estimate Overall Route Length	1.00 5 280	Miles Feet		2 Splices per Circuit		2 Cables per Pole	
	5,200	1001		2 opnees per circuit			
			Material		Labor		
Item	Qty	Unit		Total		Total	TOTAL
			Unit	Mat'l	Unit	Labor	COST
			Cost	Cost	Cost	Cost	
CABLE SYSTEM FURNISH AND INSTALL							
UG CABLE AND ACCESSORIES SUBTOTAL				\$5,018,700		\$1,430,000	\$6,448,700
COMMUNICATIONS							
CABLE SYSTEM COMMUNICATIONS (FO)	SUBTOTA	L		\$45,980		\$55,748	\$101,728
CIVIL WORK							
GENERAL SUBTOTAL				\$100.000		\$162.500	\$262.500
				,))
OVERHEAD TO UNDERGROUND SUBTOT	AL.			\$433,123		\$662,510	\$1,095,633
SPLICING VAULT SUBTOTAL				\$209,000		\$474,000	\$683,000
DUCTBANK INSTALLATION				\$192,175		\$552,181	\$744,357
Ductbank cost per route foot	\$418.18			£1 902 000		EE 224 000	67 127 000
HDD INSTALLATION SUBJOTAL HDD Ductbank cost per route foot(1 Bores))	\$2.036.29			\$1,893,000		\$5,234,000	\$7,127,000
ESTIMATED LABOR & MATERIAL COST				\$7,891,978		\$8,570,939	\$16,462,917
ESCALATION	3	Vears @	2 50%	\$592.000		\$643.000	\$1 235 000
ESCALATION		i tais w	2.30 /0	\$572,000		\$043,000	\$1,235,000
ESCALATED CONSTRUCTION COST				\$8,483,978		\$9,213,939	\$17,697,917
Mark-Up	10.0%	of Est. La	bor & Mat.	\$848,000		\$921,000	\$1,769,000
ESTIMATED PROJ COST				\$9,331,978		\$10,134,939	\$19,466,917
STATE SALES TAX	5.5%	of Materia	ls	\$513,000			\$513,000
ROW ACQUISITION	\$0) per Mile					\$0
MITIGATION							\$0
TOPOGRAPHIC SURVEYING/SOIL EXPLOI	RATION @	, 40,000/mi					\$40,000
ENGINEERING AND CONSTRUCTION MAN	AGEMEN	Т					\$2,920,038
CONTINGENCY	30.00%	of project	cost				\$6,881,986
ESTIMATED TOTAL PROJ COST	•					_	\$29,821,941
	UNDERCI	ROUND PP	OFFCT TO	TAL		(rounded)	\$29 800 000
	UNDERGI		OFFCI IO	1711		(i Junucu)	\$27,000,000

Owner Avangrid

Project NECEC B&V File No. 400319.42.3000

Assumptions - Underground Cost Estimate, Appalachian Trail

General

- 1 The estimate is based on a 320 kV DC Cable installation 1 mile long.
- 2 ROW acquisition costs are not included in the estimate.
- 3 Environmental mitigation costs are not included in the estimate.
- 4 The estimate does not include costs related to contaminated or hazardous soils or water.
- 5 The estimate does not include allowances for existing facility relocations.
- 6 The estimate does not include allowances for work hour/location restrictions.
- 7 The estimate is in 2019 dollars and includes 3 years of escallation at 2.5%
- 8 The estimate includes a 10% allowance for prime contractor mark-up.
- 9 The estimate includes a 30% contingency to account for potential rock variation.
- 9 The estimate includes sales tax of 5.5% on materials only.

Cable & Accessories

- 10 The estimate assumes a single +/-320kV DC circuit with 1 cable per pole.
- 11 The cables are estimated as 320kV DC, 2500 sq. mm Cu Cable.
- 12 The estimate includes an installed spare cable the full length of the line.
- 13 The estimate includes (6) AIS cable terminations, and 2 spare terminations.
- 14 The estimate includes (9) single-phase cable joints, with $\hat{2}$ spare joints.
- 15 The estimate does not include surge arrestors.
- 16 The estimate does not include optical fiber cable inside the power cable for temperature monitoring.

Communications

- 17 The estimate includes two fiber optic cable systems.
- 18 Fiber-optic cables are estimated as 48 fiber, single mode, loose tube outdoor cable.
- 19 Fiber-optic cables are installed into 1 1/4" HDPE innerducts installed in 4" PVC conduit.
- 20 Separate pull/splicing boxes are included for the fiber-optics.

Temperature Monitoring

21 The estimate does not include cable temperature monitoring equipment.

Overhead to Underground Transition

- 22 Includes terminations stands, surge arrestor stands and dead-ends for the overhead lines
- 23 The estimate includes site work and foundations for two 135' square termination station
- 24 The estimate includes ground grid and fencing for two 135' square terminations station.

Splice Housings

- 25 The estimate includes (3) jointing locations with (3) 12'x4'x3' precast concrete splice housings at each location.
- 26 Each splice housing is assumed to hold (1) splice.

Duct Bank Installation

- 27 The estimate includes 1,700 feet of duct bank.
- 28 The estimate includes (6)8" SCH 40 PVC Conduits for high voltage cable include one spare conduits.
- 29 The estimate includes (2) 4" SCH 40 PVC Conduits for communications.
- 30 The conduits are installed in a common duct bank, 3' wide and 2' high
- 31 The estimate assumes ductbank installation will be under pavement.
- 32 The estimate includes traffic control at 200ft/day.
- 33 The estimate includes soil erosion and sediment control measures for rural streets.
- 34 The estimate assumes a 3' wide trench, averaging 6' deep.
- 35 The estimate assumes the ductbank will be backfilled with FTB to 2' below grade.
- 36 The estimate includes pavement removal and restoration for the entire route length.
- 37 The estimate includes allowance for dewatering for 50% of the trench.
- 38 The estimate includes sheeting and shoring of the trench for 25% of the route length.

HDD Installation

- 39 The estimate includes (1) HDD installation in mixed soil and rock, 3500 feet long.
- 40 Each HDD installation consists of the bundled FPVC or HDPE conduits pulled directly into the boreholes.
- 41 The estimate includes errection of noise barriers around the HDD sites.
- 42 The HDD installations do not include a casing.

43 The HDD installations do not include grouting of the bore hole.

- 44 The estimate includes surveying, and soil exploration.
- 45 The estimate includes approximate engineering costs.
- 46 The estimate includes approximate construction management costs.

Black	&	Veatch
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Black & Vealch						Commuted Dr.	I. Danderrall
Project	NECEC					Computed By	J. Bardwell
B&V File No.	400319.42.3	3000				Checked By	
Title	Undergroun	d Cost Estir	nate, Beattie Pond				
Estimate Overall Route Length	1 1.20 6.336	Miles Feet	3 Sr	lices per Circuit	1	DC Circuits Cables per Pole	
	.,		r				
	0	T T T T	Material	T . 1	Labor	T - 1	TOTAL
Item	Qty	Unit	Unit	l otal Mat'l	Unit	Total	COST
			Cost	Cost	Cost	Cost	0001
CABLE SYSTEM INSTALATION							
UNDERGROUND CABLE AND ACCESSORIES	-						
320kV DC, 2500 sq. mm. Cu Cable	12,960	ft					\$1,814,400.00
Installed Spare	6,480	ft					\$907,200.00
Cable Installation, Duct	0	seg					\$0.00
Cable Laying, Direct Buried	21,680	ft					\$216,800.00
Cable Terminations-AIS	6	ea					\$480,000.00
Spare Cable Term-AIS	2	ea		FROFR			\$90,000.00
Cable Joints	9	ea					\$630,000.00
Spare Cable Joints	2	ea					\$70,000.00
Surge Arresters, 209 MCOV	0	ea					\$0.00
Field Testing	1	lot					\$105,000.00
Mobilization/Demobilize (Cable)	I M FURNISI	IOU H & INSTA		\$3 571 600 00		\$991 800 00	\$250,000.00
CONSTRUCTIONS		11 00 11/0 17/	LE SOBIOINE	\$5,571,000.00		\$771,000.00	\$4,505,400.00
COMMUNICATIONS	12.070	۵					697.002.27
Selice Enclosure	15,272	п					\$87,993.30
Splicing	2	ea		FRUFI			\$2,400.00
Fiber-optic Pull Boxes	6	ea					\$30,000.00
	COM	JNICATIO	NS SUBTOTAL	\$57,616.00		\$68,777.36	\$126,393.36
DISTRIBUTED TEMPERATURE SENSING (DTS)	-	D		0.00		00.03	00.03
		D	IS SUBIUIAL	\$0.00		\$0.00	\$0.00
CIVIL WORK	-						
GENERAL							** **
Mobilization/Demobilize (Prime)	1 20	lot		PROPF	RIETARY		\$250,000.00
Construction Surveying & Staking	1.20	GENER		\$100,000,00		\$165,000,00	\$15,000.00
		GENERA	AL SUBIUIAL	\$100,000.00		\$105,000.00	\$205,000.00
OVERHEAD TO UNDERGROUND TRANSITIONS	2						
Substation Termination Structure, Single Cable	6	ea					\$150,000.00
Termination Structure Fdn	6	ea					\$46,908.00
Overhead Line Dead End Structure	2	ea					\$210,000.00
Dead End Structure Fdn	2	ea					\$102,530.00
Silt Fence	1,200	ft					\$8,280.00
Clearing/Grading/Cut& Fill	45,000	Sq Ft					\$23,400.00
Rock Surfacing (6" Crushed Rock)	4,050	Cu. Yd		PROP	RIETARY		\$260,680.28
Fence, Galv. Chainlink	1,080	ft					\$24,840.00
Drive Gates	4	ea					\$9,200.00
Access Road, Permanent	26.450	II Co Et					\$0.00
Sile Orounding Ductbank Transitions (Concrete Encased Bends)	30,430	SULL					\$128,322.70
Ductoank Transmons (Concrete Encased Bends)	S	TRUCTUR	ES SUBTOTAL	\$386,698.78		\$577,662.20	\$964,360.98
Jointing Locations							
Splice Enclosures, 12'x4'x3'	9	ea					\$112,500.00
Site work for joint bays	3	ea				,	\$60,000.00
Temporary joint bays	3	ea		TNUE			\$75,000.00
Jointing location restoration	3	ea					\$24,000.00
Splice Grounding	9	ea					\$6,750.00
2	SPLICING E	NCLOSUR	ES SUBTOTAL	\$108,750.00		\$169,500.00	\$278,250.00

Owner Project B & V File No		Computed By J. Bardw							
Estimate Overall Route Length	Undergrour 1.20 6,336	nd Cost Esti Miles Feet	imate, Beattie Por 3	d Splices per Circuit	1	DC Circuits Cables per Pole			
Item	Qty	Unit	Material Unit Cost	Total Mat'l Cost	Labor Unit Cost	Total Labor Cost	TOTAL COST		
TRENCHING DIRECT BURIED Clearing and Grubbing Access Road (3/4" Gravel over Geotextile)	4336 7 7227	FEET acres					\$87,500.00 \$277 576 27		
Soil Erosion and Sediment Control Silt Fence Excavation Cable Bedding	0.82 8672 5621 723	Mi Ift Cu. Yd. Cu. Yd.		PROPRIETARY					
Concrete Cap Backfill, Native Vegetation Restoration (Grass/Shrub Mix) Dewater (50%)	361 3212 7 2.168	Cu. Yd. Cu. Yd. acres							
Shoring (0%) (Sloping)	2,100 0 TRI	sqft ENCH WO	RK SUBTOTAL	\$252,575.48		\$1,288,254.90 Per route foot	\$00,000 \$0.00 \$1,540,830.38 \$355.36		
LACK AND BODE INSTALLATION	0		250	Foot Foob					
JACK AND BOKE INSTALLATION	JAC	K AND BC	DRE SUBTOTAL	\$0.00	-	\$0.00	\$0.00		
				+		Per foot	#DIV/0!		
HDD INSTALLATION (NO CASING : Land to Land) Mobilization/Demobilize (HDD) Site Preparation for HDD Horiz. Directional Drill Conduit for Cables, 10" DR 9 HDPE Conduit for Comm., 6" DR 9 HPDE Conduit for GCC, 2" DR 14 FPVC	INSTALLATION (NO CASING : Land to Land) bilization/Demobilize (HDD) e Preparation for HDD criz. Directional Drill nduit for Cables, 10" DR 9 HDPE nduit for Comm., 6" DR 9 HPDE nduit for GCC, 2" DR 14 FPVC 0 Ift		a <u>1,000</u>	\$50,000.00 \$80,000.00 \$840,000.00 \$300,000.00 \$60,000.00 \$0.00					
HDPE Innerduct, 1 1/4"	6,000 HDD INS	lft STALLATI	ON SUBTOTAL	\$289,000.00		\$1,062,000.00 Per route foot	\$21,000.00 \$1,351,000.00 \$675.50		

Owner	Avangrid					Computed By	J. Bardwell
Project B&V File No.	NECEC 400319.42.	3000				Checked By	
Title	Undergrou	nd Cost Estin	nate, Beattie	Pond			
Estimate Overall Route Length	6,336	Feet		3 Splices per Circuit		1 DC Circuits 1 Cables per Pole	
				<u> </u>		•	
Item	Otv	Unit	Material	Total	Labor	Total	τοται
iciii	Qty	Onit	Unit	Mat'l	Unit	Labor	COST
			Cost	Cost	Cost	Cost	
CABLE SYSTEM FURNISH AND INSTALL							
UG CABLE AND ACCESSORIES SUBTOTAL	i de la companya de l			\$3,571,600		\$991,800	\$4,563,400
COMMUNICATIONS							
CABLE SYSTEM COMMUNICATIONS (FO)	SUBTOTA	L		\$57,616		\$68,777	\$126,393
CIVIL WORK							
GENERAL SUBTOTAL				\$100,000		\$165,000	\$265,000
OVERHEAD TO UNDERGROUND SUBTOTA	L			\$386,699		\$577,662	\$964,361
SPLICING VAULT SUBTOTAL				\$108,750		\$169,500	\$278,250
DIRECT BURIED				\$252,575		\$1,288,255	\$1,540,830
Direct Buried cost per route foot HDD INSTALLATION SUBTOTAL	\$355.36			\$289.000		\$1.062.000	\$1,351,000
HDD Ductbank cost per route foot(1 Bores))	\$675.50			,			
ESTIMATED LABOR & MATERIAL COST				\$4,766,240		\$4,322,994	\$9,089,235
ESCALATION	3	3 Years @	2.50%	\$357,000		\$324,000	\$681,000
ESCALATED CONSTRUCTION COST				\$5,123,240		\$4,646,994	\$9,770,235
Mark-Up	10.0%	of Est. Lal	bor & Mat.	\$512,000		\$465,000	\$977,000
ESTIMATED PROJ COST				\$5,635,240		\$5,111,994	\$10,747,235
STATE SALES TAX	5.5%	of Materia	ls	\$310,000			\$310,000
ROW ACQUISITION	\$0) per Mile					\$0
MITIGATION							\$0
TOPOGRAPHIC SURVEYING/SOIL EXPLOI	RATION @) 40,000/mi					\$48,000
ENGINEERING AND CONSTRUCTION MAN	AGEMEN	Т					\$1,612,085
CONTINGENCY	20.0%	of project o	cost				\$2,543,464
ESTIMATED TOTAL PROJ COST						_	\$15,260,784
	UNDERG	ROUND PR	ОЈЕСТ ТО	TAL		(rounded)	\$15,300,000

Owner Avangrid

Project NECEC B&V File No. 400319.42.3000

Assumptions - Underground Cost Estimate, Beattie Pond

<u>General</u>

- 1 The estimate is based on a 320 kV DC Cable installation 1.2 miles long.
- 2 ROW acquisition costs are not included in the estimate.
- 3 Environmental mitigation costs are not included in the estimate.
- 4 The estimate does not include costs related to contaminated or hazardous soils or water.
- 5 The estimate does not include allowances for existing facility relocations.
- 6 The estimate does not include allowances for work hour/location restrictions.
- 7 The estimate is in 2019 dollars and includes 3 years of escallation at 2.5%
- 8 The estimate includes a 10% allowance for prime contractor mark-up.
- 9 The estimate includes a 20% contingency.
- 9 The estimate includes sales tax of 5.5% on materials only.

Cable & Accessories

- 10 The estimate assumes a single +/-320kV DC circuit with 1 cable per pole.
- 11 The cables are estimated as 320kV DC, 2500 sq. mm Cu Cable.
- 12 The estimate includes an installed spare cable the full length of the line.
- 13 The estimate includes (6) AIS cable terminations, and 2 spare terminations.
- 14 The estimate includes (9) single-phase cable joints, with 2 spare joints.
- 15 The estimate does not include surge arrestors.
- 16 The estimate does not include optical fiber cable inside the power cable for temperature monitoring.

Communications

- 17 The estimate includes two fiber optic cable systems.
- 18 Fiber-optic cables are estimated as 48 fiber, single mode, loose tube outdoor cable.
- 19 Fiber-optic cables are installed into 1 1/4" HDPE innerducts installed in 4" PVC conduit.
- 20 Separate pull/splicing boxes are included for the fiber-optics.

Temperature Monitoring

21 The estimate does not include cable temperature monitoring equipment.

Overhead to Underground Transition 22 Includes terminations s

- Includes terminations stands, surge arrestor stands and dead-ends for the overhead lines
- 23 The estimate includes site work and foundations for two 135' square termination station
- 24 The estimate includes ground grid and fencing for two 135' square terminations station.

Splice Housings

- 25 The estimate includes (3) jointing locations with (3) 12'x4'x3' precast concrete splice housings at each location.
- Each splice housing is assumed to hold (1) splice.

Duct Bank Installation

27 The estimate does not include duct bank.

Direct Buried Installation

- 28 The estimate does not include conduits in the direct buried sections.
- 29 The estimate includes soil erosion and sediment control measures for green spaces.
- 30 The cables are installed in a single 5' wide trench averaging 7' deep.
- 31 The cables are installed in a thermal sand cable bedding material
- 32 The estimate includes a 9" thick concrete cap installed 18" below grade
- 33 The estimate assumes backfilling direct buried sections with native soils.
- 34 The estimate includes vegetation clearing and restoration 75' wide for construction not in roadways.
- 35 The estimate includes allowance for dewatering for 50% of the trench in uplands, and 100% in wetlands.
- 36 The estimate does not include shoring for the trenches.

HDD Installation

- 37 The estimate includes (2) sets of HDD installations in soil, 1000 feet long each.
- 38 Each HDD installation consists of the bundled FPVC or HDPE conduits pulled directly into the boreholes.
- 39 The HDD installations do not include a casing.
- 40 The HDD installations do not include grouting of the bore hole.

- 41 The estimate includes surveying, and soil exploration.
- 42 The estimate includes approximate engineering costs.
- 43 The estimate includes approximate construction management costs.

Black &	& Veatch	
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Black & Veatch							
Owner	Avangrid					Computed By	J. Bardwell
Project	NECEC	000				Charles I D	
B&V Flie No. Title	400319.42.3	000 d Cost Esti	mate, Gold Brook			Спескей Ву	
Estimate Overall Route Length	1.15	Miles	mate, Gold Brook		1 D(⁷ Circuits	
	6,072	Feet	3 5	Splices per Circuit	2 Ca	bles per Pole	
T .	0.	T T T .	Material	T . 1	Labor	T + 1	TOTAL
Item	Qty	Unit	11.4	Total	T.T., 14	Total	TOTAL
			Cost	Cost	Cost	Labor	COST
			Cost	Cost	Cost	Cost	
CABLE SYSTEM INSTALATION	•						
320kV DC 2500 sq. mm. Cu Cable	24 864	Ĥ					\$3,480,960,00
Installed Spare	6 216	ft ft					\$870 240 00
Cable Installation Duct	0,210	sea					\$0.00
Cable Laving Direct Buried	0	ft ft					\$0.00
Cable Terminations-AIS	10	n ea					\$800,000,00
Spare Cable Term-AIS	2	ea					\$90,000.00
Cable Joints	15	ea		FRUER	IETART		\$1,050,000,00
Spare Cable Joints	2	ea					\$70,000.00
Surge Arresters 209 MCOV	0	ea					\$70,000.00
Field Testing	1	lot					\$105,000,00
Mobilization/Demobilize (Cable)	î	lot					\$250,000,00
CABLE SYSTE	M FURNISH	I & INSTA	ALL SUBTOTAL	\$5,591,200.00		\$1,125,000.00	\$6,716,200.00
COMMUNICATIONS							
Eiher Ontie Cable (48 Eiher)	12 744	۵				1	PP4 402 72
Selice Enclosure	12,744	11					\$2,400,00
Splicing	2	ea		PROPF	RIETARY		\$2,400.00
Sphering Fiber optic Pull Boxes	2	ea					\$30,000.00
Ther optic I un boxes	COM	u NICATIO	NS SUBTOTAL	\$56,032.00		\$66,860.72	\$122,892.72
DISTRIBUTED TEMPERATURE SENSING (DTS)			_				
		D	TS SUBTOTAL	\$0.00		\$0.00	\$0.00
CHUL WODY							
GENERAL							# 2 5 0 0 0 0 0 0
Mobilization/Demobilize (Prime)	1 16	lot		PROF	RIETARY		\$250,000.00
Construction Surveying & Staking	1.15		AL SUDTOTAL	¢100.000.00	\$100,000,00 \$164,375,00		
		GENER	AL SUBIUTAL	\$100,000.00		\$104,373.00	\$264,373.00
OVERHEAD TO UNDERGROUND TRANSITIONS	2						
Substation Termination Structure, Single Cable	10	ea					\$250,000.00
Termination Structure Fdn	10	ea					\$78,180.00
Overhead Line Dead End Structure	2	ea					\$210,000.00
Dead End Structure Fdn	2	ea					\$102,530.00
Silt Fence	1,200	ft					\$8,280.00
Clearing/Grading/Cut& Fill	45,000	Sq Ft		PROP	RIETARY		\$23,400.00
Rock Surfacing (6" Crushed Rock)	4,050	Cu. Yd					\$260,680.28
Fence, Galv. Chainlink	1,080	ft					\$24,840.00
Drive Gates	4	ea					\$9,200.00
Access Road, Permanent	2,000	ft					\$86,740.00
Site Grounding	36,450	Sq Ft					\$128,522.70
Ductbank Transitions (Concrete Encased Bends)	10	ea					\$216,681.50
	S	FRUCTUR	ES SUBTOTAL	\$495,435.78		\$903,618.70	\$1,399,054.48
Jointing Locations							
Access Road and Bridge	1	ea					\$70.000.00
Splice Enclosures, 12'x4'x3'	9	ea					\$112.500.00
Site work for joint bays	3	ea					\$60.000.00
Temporary joint bays	3	ea		FINUE			\$75.000.00
Jointing location restoration	3	ea					\$24.000.00
Splice Grounding	9	ea					\$6.750.00
	SPLICING E	NCLOSU	RES SUBTOTAL	\$128,750.00		\$219,500.00	\$348,250.00
						2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	· · · · · · · ·

Owner	Avangrid					Computed By	J. Bardwell
Project B&V File No	NECEC 400319.42.3	3000				Checked By	
Title	Undergroun	d Cost Esti	mate, Gold Brook			,	
Estimate Overall Route Length	1.15 6,072	Miles Feet	3 S	plices per Circuit		1 DC Circuits 2 Cables per Pole	
Itom	Otv	Unit	Material	Total	Labor	Total	TOTAL
Item	Qıy	Ullit	Unit	Mat'l	Unit	Labor	COST
			Cost	Cost	Cost	Cost	0001
DUCTRANK INSTALLATION Reading	272	FFFT					
Utilility Locates 15/Mile	272	PEE1 ea					\$0.00
Traffic Control	0	davs					\$0.00
Soil Erosion and Sediment Control	0.05	Mi					\$5,151.52
Access Road (3/4" Gravel over Geotextile)	0	sq. yd.					\$0.00
Excavation	453	Cu. Yd.					\$39,440.00
Concrete Encasement	101	Cu. Yd.					\$24,177.78
Concrete Reinforcement, Rebar (0 Long)	0	ft					\$0.00
Backfill, FTB	0	Cu. Yd.					\$0.00
Backfill, Native	151	Cu. Yd.					\$11,333.33
Road Bed Restoration, 9" 3/4" Crushed Rock	0	Cu. Yd.					\$0.00
Pavement Saw Cutting, Concrete	0	lft		PROP	KIETAR	ίΥ.	\$0.00
Pavement Removal, 15 feet wide	0	sqft					\$0.00
Pavement Restoration, Gravel, 30 feet wide	8,160	sqft					\$12,240.00
8" SCH. 40 PVC Conduit	544	lft					\$8,812.80
2" SCH. 40 PVC Conduit	0	lft					\$0.00
4" SCH. 40 PVC Conduit	2/2	lft					\$2,543.20
1.25" HDPE Conduit	810						\$2,850.00
4" Conduit Spacers	54	Ca					\$2,507.00
Landscaping Renair/Restoration	0	acre					\$628.41
Dewater (50%)	136	lft					\$5 440 00
Shoring (50%)	2.222	saft					\$11.111.20
	UCTBANK	-ROADW	AY SUBTOTAL	\$34.866.52		\$92.076.72	\$126,943,24
						Per route foot	\$466.70
TRENCHING DIRECT BURIED	0	FEET	_				
	TRI	ENCH WO	RK SUBTOTAL	\$0.00		\$0.00	\$0.00
			1			Per route foot	#DIV/0!
JACK AND BORE INSTALLATION	0	<u>a</u>	250 F	eet Each			
	JAC	AND BO	RE SUBTOTAL	\$0.00		\$0.00	\$0.00
						Per foot	#DIV/0!
	2					1 1	
HDD INSTALLATION (NO CASING : Land to Land)	2	Sets of 2 (<i>x</i> 2,900 F	eet Each			£50.000.00
Site Propagation for HDD	1	iot					\$20,000.00 \$80,000.00
Horiz Directional Drill	11 600	sets 1 0					\$80,000.00
Conduit for Cables 10" DR 9 HDPF	34 800	10				v	\$1,740,000,00
Conduit for Comm 6" DR 9 HPDE	11 600	10		FNUF		1	\$348,000,00
Conduit for GCC, 2" DR 14 FPVC	0	1ft					\$0.00
HDPE Innerduct, 1 1/4"	34,800	lft					\$121,800.00
,	HDD INS	TALLATI	ON SUBTOTAL	\$1,628,200.00		\$8,773,600.00	\$10,401,800.00
						Per route foot	\$1,793.41

Owner	Avangrid					Computed By	J. Bardwell
Project B&V File No.	400319.42.	3000				Checked By	
Title	Undergrou	nd Cost Estin	nate, Gold B	rook			
Estimate Overall Route Length	6,072	Feet		3 Splices per Circuit		2 Cables per Pole	
			N				
Item	Otv	Unit	Material	Total	Labor	Total	TOTAL
			Unit	Mat'l	Unit	Labor	COST
			Cost	Cost	Cost	Cost	
CABLE SYSTEM FURNISH AND INSTALL							
UG CABLE AND ACCESSORIES SUBTOTAL				\$5,591,200		\$1,125,000	\$6,716,200
COMMUNICATIONS							
CABLE SYSTEM COMMUNICATIONS (FO)	SUBTOTA	L		\$56,032		\$66,861	\$122,893
CIVIL WORK							
GENERAL SUBTOTAL				\$100,000		\$164,375	\$264,375
OVERHEAD TO UNDERGROUND SUBTOTA	L			\$495,436		\$903,619	\$1,399,054
SPLICING VAULT SUBTOTAL				\$128,750		\$219,500	\$348,250
DUCTBANK INSTALLATION - ROADWAY				\$34,867		\$92,077	\$126,943
Ductbank cost per route foot HDD INSTALLATION SUBTOTAL	\$466.70			\$1,628,200		\$8,773,600	\$10,401,800
HDD Ductbank cost per route foot(1 Bores))	\$1,793.41						
ESTIMATED LABOR & MATERIAL COST				\$8,034,484		\$11,345,031	\$19,379,515
ESCALATION	3	3 Years @	2.50%	\$603,000		\$851,000	\$1,454,000
ESCALATED CONSTRUCTION COST				\$8,637,484		\$12,196,031	\$20,833,515
Mark-Up	10.0%	of Est. Lai	bor & Mat.	\$864,000		\$1,220,000	\$2,084,000
ESTIMATED PROJ COST				\$9,501,484		\$13,416,031	\$22,917,515
STATE SALES TAX	5.5%	of Materia	ls	\$523,000			\$523,000
ROW ACQUISITION	\$0) per Mile					\$0
MITIGATION							\$0
TOPOGRAPHIC SURVEYING/SOIL EXPLOR	RATION @	40,000/mi					\$46,000
ENGINEERING AND CONSTRUCTION MAN	AGEMEN	Т					\$2,291,752
CONTINGENCY	30.0%	of project o	cost				\$7,733,480
ESTIMATED TOTAL PROJ COST						=	\$33,511,747
	UNDERG	ROUND PR	ојест то	TAL		(rounded)	\$33,500,000

Owner Avangrid

Project NECEC B&V File No. 400319.42.3000

Assumptions - Underground Cost Estimate, Gold Brook

General

- 1 The estimate is based on a 320 kV DC Cable installation 1.15 miles long.
- 2 ROW acquisition costs are not included in the estimate.
- 3 Environmental mitigation costs are not included in the estimate.
- 4 The estimate does not include costs related to contaminated or hazardous soils or water.
- 5 The estimate does not include allowances for existing facility relocations.
- 6 The estimate does not include allowances for work hour/location restrictions.
- 7 The estimate is in 2019 dollars and includes 3 years of escallation at 2.5%
- 8 The estimate includes a 10% allowance for prime contractor mark-up.
- 9 The estimate includes a 30% contingency to account for the potential rock in the area.
- 9 The estimate includes sales tax of 5.5% on materials only.

Cable & Accessories

- 10 The estimate assumes a single +/-320kV DC circuit with 2 cables per pole.
- 11 The cables are estimated as 320kV DC, 2500 sq. mm Cu Cable.
- 12 The estimate includes an installed spare cable the full length of the line.
- 13 The estimate includes (10) AIS cable terminations, and 2 spare terminations.
- 14 The estimate includes (15) single-phase cable joints, with 2 spare joints.
- 15 The estimate does not include surge arrestors.
- 16 The estimate does not include optical fiber cable inside the power cable for temperature monitoring.

Communications

- 17 The estimate includes two fiber optic cable systems.
- 18 Fiber-optic cables are estimated as 48 fiber, single mode, loose tube outdoor cable.
- 19 Fiber-optic cables are installed into 1 1/4" HDPE innerducts installed in 4" PVC conduit.
- 20 Separate pull/splicing boxes are included for the fiber-optics.

Temperature Monitoring

21 The estimate does not include cable temperature monitoring equipment.

Overhead to Underground Transition

- 22 Includes terminations stands, surge arrestor stands and dead-ends for the overhead lines
- 23 The estimate includes site work and foundations for two 135' square termination station
- 24 The estimate includes ground grid and fencing for two 135' square terminations station.

Splice Housings

- 25 The estimate includes (3) jointing locations with (3) 12'x4'x3' precast concrete splice housings at each location.
- 26 Each splice housing is assumed to hold (1) splice.

Duct Bank Installation

- 27 The estimate includes 300 feet of duct bank.
- 28 The estimate includes (6) 8" SCH 40 PVC Conduits for high voltage cable include one spare conduits.
- 29 The estimate includes (2) 4" SCH 40 PVC Conduits for communications.
- 30 The conduits are installed in a common duct bank, 3' wide and 2' high
- 31 The estimate assumes ductbank installation will be under pavement.
- 32 The estimate includes traffic control at 200ft/day.
- 33 The estimate includes soil erosion and sediment control measures for rural streets.
- 34 The estimate assumes a 3' wide trench, averaging 6' deep.
- 35 The estimate assumes the ductbank will be backfilled with FTB to 2' below grade.
- 36 The estimate includes pavement removal and restoration for the entire route length.
- 37 The estimate includes allowance for dewatering for 50% of the trench.
- 38 The estimate includes sheeting and shoring of the trench for 25% of the route length.

HDD Installation

- 39 The estimate includes (2) sets of HDD installations in soil, with a combined length of 5,800 feet.
- 40 Each HDD installation consists of the bundled FPVC or HDPE conduits pulled directly into the boreholes.
- 41 The HDD installations do not include a casing.
- 42 The HDD installations do not include grouting of the bore hole.

- 43 The estimate includes surveying, and soil exploration.
- 44 The estimate includes approximate engineering costs.
- 45 The estimate includes approximate construction management costs.

ATTACHMENT B Pole and Tree Height Information

Crossing	From	То	Current D	esign (10'	Revised D	esign (35'	Req'd Ht	Increase	Comment
#	Structure	Structure	Veg H	eight)	Veg H	eight)	For 35	o' Veg	
	#	#	A.G.H.	A.G.H.	A.G.H.	A.G.H.	(ft.)	(ft.)	
			(ft.)	(ft.)	(ft.)	(ft.)			
1	541	542	120	127	120	127	0	0	Moxie Stream (rated as Scenic River). Based on the current design, a person on Moxie Stream (east of the crossing) would see the structures. Taller structures would be more visible and would create more visual impact. Based on the current design, the entire span can accommodate 35' height of vegetation.
2	767	768	97.5, 102	134	97.5, 102	134	0	0	South Branch Moose River. The structures allowing 35' vegetation will not be visible if at least 25' vegetation is preserved on the river. Due to the topography, it is likely the vegetation will be at least 25'. Entire span can accommodate 35' height of vegetation based on current design.
3	588	589	115.5	98	126	98	10.5	0	Area near Wilson Hill Pond and Tobey Pond in Johnson Mtn Twp. Structures heights allowing 35' vegetation will most likely be screened by 60' vegetation surrounding the ponds. 35' tall vegetation can be accommodated along most of the span, 25' tall vegetation can be accommodated elsewhere.
4	741	742	120.5	93.5	120.5	99	0	5.5	Not visible from No 5 Mtn or Rock Pond. The structures as currently designed will be visible from Spencer Road (private haul road) looking south and other haul roads adjacent. Taller structures will be as visible and taller structures may be more visible above regenerating forest along haul roads. 35' tall vegetation can be accommodated along most of the span, 25' tall vegetation can be accommodated elsewhere.
5	575	576	113.5	113.5	113.5	113.5	0	0	Tomhegan Stream. Structure 576 is not likely visible from Wilson Hill Road. Structure 575 may be visible. However, need to keep context in mind because the Project will parallel Wilson Hill Road in this entire area and be highly visible based on current design. Entire span can accommodate 35' height of vegetation based on current design.



Structure # 542 per permitting application.

cture 3006-12

Moxie Stream

Structure # 541 per permitting application.

Structure 3006-11

Legend 1-NEW HVDC 3. 2-CO-LOCATED HVDC 3. Clearing Limit 0.0 FEET Feature 1 Feature 2 30 NULL PFO 2. Segment Structure Wyman

South Branch Moose River

Structure 238





Structure 237

Structure # 767 per permitting application.

Google earth

900 ft

N





Structure 59

....

Structure 3006-60

Structure # 588 per permitting application.

Structure # 589 per permitting application.

Google earth

@ 2018 Google

800 ft

N

Area between structures 212 and 211

Structure # 742 per permitting application.

Structure 212

Structure # 741 per permitting application.

Structure 211



N

Legend

Seatur

0

Feature 1
Feature 2
Feature 3
Feature 4
NULL
Segment
Structure

Wyman

1-NEW HVDC

2-CO-LOCATED HVDC Clearing Limit



Structure # 576 per permitting application.

Structure 3006-47



Braided Channel on Tomhegan Stream

Structure # 575 per permitting application.

Structure 3006-46

500 ft

Google earth

@ 2018 Google



Cross Section Typical Wildlife Travel Corridor MDEP Areas of Interest

Notes:

Drawing not to scale.

The area around the base of each transmission line structure will be maintained as scrub-shrub vegetation to allow for future operation and maintenance activities. The area maintained in this manner will vary by structure type as depicted on Figure 7-1 of CMP's Natural Resources Protection Act Application.