STATE OF NEW HAMPSHIRE

Inter-Department Communication

DATE: February 27, 2017 **AT (OFFICE):** NHPUC

FROM: Randy Knepper

Director - Safety Division

SUBJECT: Docket No. DE 15-460, DE 15-461, DE 15-462 and DE 15-463

Northern Pass Transmission Project

Northern Pass Transmission, LLC (NPT) and

Public Service Company of New Hampshire d/b/a Eversource Energy (ESE)

Staff Recommendation #1 regarding

20 Licenses to Cross Public Waters and Lands

TO: Debra Howland, Executive Director

Thomas Frantz, Director, Electric Division

Leszek Stachow, Assistant Director, Electric Division

Suzanne Amidon, Staff Attorney

cc: Robert Wyatt, Assistant Director, Safety Division

Public waters and lands crossings included in this recommendation

Table 1 Zone 1 - List of NPT and ESE Crossings

Staff	Water/	DE 15-460	DE 15-461	DE 15-462	DE 15-463	Totals
Zone-	Land	NPT Water	NPT Land	ESE Water	ESE Land	
Map	Name	Crossing/	Crossing/	Crossing/	Crossing/	
#		License	License	License	License	
1-1	Halls Stream	Pittsburg				1
1-2	Connecticut River	Pittsburg		-		1
1-3	Nash Stream Forest		Stark		Stark	2
1-4	Percy State Forest		Stark		Stark	2
1-5	Upper Ammonoosuc	Stark		Stark		2
1-6	Cape Horn Forest		Northumberland		Northumberland	2
1-7	Otter Brook	Lancaster		Lancaster		2
1-7	Israel River	Lancaster		Lancaster		2
1-7	NHDOT RR		Lancaster		Lancaster	2
1-8	NHDOT RR		Dalton		Dalton	2
1-8	Johns River	Dalton		Dalton		2
Zone 1	Sub-Total Licenses	6 NPT Water	5 NPT Land	4 ESE Water	5 ESE Land	20

DE 15-460, DE 15-461, DE 15-462, DE 15-463 Northern Pass Transmission Project Public Waters and Lands Crossings

Staff Recommendation #1 for Zone 1 crossings

NPT filed petitions pursuant to RSA 371:17 in docket no. DE 15-460, DE 15-461, DE 15-462 and DE 15-463, for licenses to construct and maintain electric lines over, under and across public waters, lands and rails at 20 locations along the proposed path between Pittsburg and Dalton, New Hampshire (Zone 1). The proposed 320kV direct current high-voltage electric transmission line is referenced in the petitions as the DC Line. Other existing Eversource circuits along the project path that will require licenses to cross public waters or lands are identified by their assigned circuit numbers and operate at alternating current (AC).

The methodology used by Staff to determine how the analysis was performed is presented in the Overall Recommendation memorandum.

This Recommendation #1 is to provide the details examined that apply to Zone 1.

Within Zone 1 there is a single underground proposed installation of the public water crossing of the Connecticut River in Pittsburg. All 19 remaining crossings are overhead for land, public waters, and rails. The 20 crossings are sequentially labeled from, north to south. All mapping and data collection tables are presented in and follow the same sequence.

Table 2 gives pertinent information tables provided in this Staff Recommendation regarding overhead crossing information that has been reviewed or otherwise analyzed as appropriate.

	TABLE 2 ZONE 1 AERIAL CROSSINGS											
Staff			Type Crossing				Staff	Clearance		Required		
Zone- Map	Wate r/Land Name	Town	Land	Voltage/Type	NPT/ESE	Circuit	Calculated Clearance	Shown on Petition	Calculated Difference	Clearance	Span ft	Verification
#	- 11222		Rail Water				SAG 10	Profile		NESC		
1-1	Halls Stream	Pittsburg	Water	320kV/DC	NPT	3270 3271	54	53	1	35.7	812.48	Excellent
1-3	Nash Stream Forest	Stark	Land	320kV/DC	NPT	3270 3271	43	33	10	21.7	712.08	Adequate
1-3	Nash Stream Forest	Stark	Land	115kV/AC	ESE	O154	30	24	6	16.1	506.73	Good
1-4	Percy State Forest	Stark	Land	320kV/DC	NPT	3270 3271	34	33	1	21.7	591.52	Excellent
1-4	Percy State Forest	Stark	Land	115kV/AC	ESE	O154	37	27	10	16.1	607.97	Adequate
1-5	Upper Ammonoosuc	Stark	Water	320kV/DC	NPT	3270 3271	41	39	2	35.7	548.00	Excellent
1-5	Upper Ammonoosuc	Stark	Water	115kV/AC	ESE	O154	38	37	1	30.1	537.83	Excellent
1-6	Cape Horn Forest	Northumberland	Land	320kV/DC	NPT	3270 3271	30	30	0	21.7	442.57	Excellent
1-6	Cape Horn Forest	Northumberland	Land	115kV/AC	ESE	D142	27	24	3	16.1	481.43	Excellent
1-7	Otter Brook	Lancaster	Water	320kV/DC	NPT	3270 3271	41	38	3	35.7	833.52	Excellent
1-7	Otter Brook	Lancaster	Water	115kV/AC	ESE	D142	39	35	4	30.1	824.05	Good
1-7	Israel River	Lancaster	Water	320kV/DC	NPT	3270 3271	41	38	3	35.7	833.52	Excellent
1-7	Israel River	Lancaster	Water	115kV/AC	ESE	D142	39	35	4	30.1	824.05	Good
1-7	NHDOT RR Groveton Branch	Lancaster	Rail	320kV/DC	NPT	3270 3271	45	44	1	33.7	559.75	Excellent
1-7	NHDOT RR Groveton Branch	Lancaster	Rail	115kV/AC	ESE	D142	47	46	1	28.1	537.04	Excellent
1-8	NHDOT RR Mountain Div Rail Line	Dalton	Rail	320kV/DC	NPT	3270 3271	59	57	2	33.7	605.02	Excellent
1-8	NHDOT RR Mountain Div Rail Line	Dalton	Rail	34.5kV/AC	ESE	348X	42	42	0	23.5	183.01	Excellent
1-8	Johns River	Dalton	Water	320kV/DC	NPT	3270 3271	52	51	1	35.7	700.57	Excellent
1-8	Johns River	Dalton	Water	34.5kV/AC	ESE	348X	31	30	1	25.5	213.33	Excellent

Refer to 8 detailed PUC generated single-page maps using its GIS mapping software specific to each crossing location. Each detailed map depicted all circuits, (proposed and existing including those that will be relocated and those that will remain in place). Support structures, Support structure identifications, support structure heights, ROW widths, proper orientation of circuits, dimensions of spans, parcel information known as line lists (which emanated from NPT and ESE's petitions) are all depicted. Typical elevation views within the Right of Way are shown including cross sections within the ROW are taken from Forward NH Plans located at www.northernpass.us/towns.htm. In addition to the above geographical information was also depicted such as roads, buildings, rivers, trees, neighborhoods, bridges, and town lines.

Refer to Appendix A for single-page tables of information specific to each crossing, with a comments, conclusions, conditions and recommendations. Staff designated Zone 1 has identified 20 public waters and lands crossings that will require licenses. Specific technical and information relevant to the crossing are identified in each Appendix A table.

Existing license(s) and permissions previously granted by the PUC for these locations

See Attachments A1, A2 or A3 of the Overall Recommendation for licenses previously granted. NPT and ESE petitions were for the new DC transmission line and only for relocated ESE transmission lines. ESE did not include licenses for those existing transmission lines that were not being altered.

Existing Circuits where ESE does not have a license.

In examining the eight locations Staff found 2 locations where existing licenses were never issued:

- 1. Johns River, Dalton Q195 Circuit 115kV PUC detailed map 8
- 2. Johns River, Dalton X178 Circuit 115kV PUC detailed map 8

Staff recommends ESE be required to submit petitions for granting of these licenses.

Safety Division Specific Recommendations with any applicable conditions:

See individual crossing details listed within Tables A.1.1.1, A.1.2.1, A.1.3.1, A.1.3.2, A.1.4.1, A.1.4.2, A.1.5.1, A.1.6.1, A.1.6.2, A.1.7a.1, A.1.7a.2, A.1.7b.1, A.1.7b.2, A.1.7c.1, A.1.7c.2 A1.8a.1, A.8.1a.2, A.1.8b.1, and A.1.8b.2 located in Appendix A of Recommendation #1.

Table A.1.1.1 Appendix A

Public Water/Land Crossing Name:

Halls Stream, Pittsburg, NH for NPT

General Information			Technical Information		
PUC Docket Number		DE 15-460	Voltage	320 kV, DC	
PUC Zone		1	Circuit	3720/3731	
PUC Map Number		1	Conductor Type	AAAC	
Petitioner (NPT, ESE)		NPT	Code Name	None	
Petitioner Line List # (for Pa	arcels traversed)	TBD	Conductor Size	2933 kcmil	
Crossing Circuit Configurati	ion	Overhead	Stranding	91	
Public Crossing Type (Wate	er/Land)	Water	Conductor Horizontal Separation	36	
Previous Public Crossing Lic	cense Issued by PUC (Yes/No)	No	Conductor Vertical Separation	NA	
Relocated ESE Crossing (Ye	s/No/NA)	NA	Cable Weight (Lbs/Ft)	2.769	
Right of Way Width		120 feet	Back Pole Number	HQ-1	
Number of Circuits within F	ROW	1 new (DC)	Back Structure Height	120	
Foreign Utilities within ROV	N	None	Back Ground Elevation (Ft)	1081.36	
Total Structures/Poles/Mar	nholes this circuit crossing	2	Back Conductor Height	95.5	
First Structure Identificatio	n	DC-HQ-1	Back Conductor Elev. at Pole	1176.86	
State Listed Public Waters	(Yes/No/Not Applicable)	Yes	Forward Pole Number	DC-1	
Last Structure Identification	n	DC-1	Forward Structure Height	90	
PUC Approximate Length o	f crossing for License (Land only)	Net Applicable	Forward Ground Elevation	1076.5	
[Does Not apply to Water of		Not Applicable	Forward Conductor Height	65.5	
	-		Forward Conductor Elev. at Pole	1142	
			Span (Feet)	812.48	
			Max Tension NESC Heavy lbs.	20,000	
			Max Operating Temp (°F)	130	
			Calc'd Horiz.Tension@MaxTemp	8,964	
			Calc'd. Clearance (SAG 10)	54	
			Clearance Shown on Profile	53	
			Reg'd Clearance (NESC)	35.7	
			rioq a cicarana (rizac)		
Comments	that are based on information cor elevation for this portion of the riv The design incorporates NESC min	itained in flood insurance ver. iimum required clearance	the water, the engineering design incorporate maps provided by FEMA. The design of above the water for these open supply correquirement (7.19 feet) brings the minimu	uses the 100-year flood nductors, using 100-year	
Conclusions	The proposed public water crossir substantially affect the fuctional u	-	ect the public rights in these waters, nor wolic waters.	vill the proposed crossing	
	The the proposed design for this overhead crossing across public waters meets or exceeds NESC requirements for the expected recreational use by the public.				
Staff Recommendation	That the Commission grant the lick waters identified in the petition.	ense to construct, maintai	n and operate the electric and communica	tion lines over the public	
	The license for this public water confrom the SEC.	ossing is contingent upon	the Northern Pass Project receiving a Cert	ificate of Site and Facility	
Staff Reccommended Conditions applied to License					

Table A.1.2.1 Appendix A

Public Water/Land Crossing Name: Connecticut Ri

Connecticut	Divor	Dittchurg	NH for NDT
Connecticut	River.	PILLSDUIE.	ו אור וטו וארו

General Information				Technical Information	
PUC Docket Number		DE 15-460		Voltage	320 kV, DC
PUC Zone		DE 13-460 1		Circuit	3720/3731
PUC Map Number		2		Conductor diameter (cross sect)	2.25 in
		NPT		Manufacturer	ABB
Petitioner (NPT, ESE) Petitioner Line List # (for Page 1)					
,	•	161		Conductor Size	2500 sq mm XLPE
Crossing Circuit Configuration		Underground		Insulation	
Public Crossing Type (Water	· '	Water		Conduit Diameter	8" HDPE
	cense Issued by PUC (Yes/No)	No		Conductor Dia with Insulation	4.72 in
Relocated ESE Crossing (Ye	S/NO/NA)	NA 120 for the		Cable Weight (Lbs/Ft)	20.900
Right of Way Width	2011	120 feet		Back Structure Receiver	HDD 03 Exit Points (a +b)
Number of Circuits within I		1 new (DC)		Estimated Depth Max	75 feet at max arc
Foreign Utilities within RON		None		Radius of Directional Drill	1200 ft
Total Structures/Poles/Mai	•	2		Back Conductor Height	NA
First Structure Identificatio		HDD 03 Entry Points (a +b)		Back Conductor Elev. at Pole	NA
State Listed Public Waters		Yes		First Structure Receiver	HDD 03 Entry Points (a +b)
Last Structure Identification		HDD 03 Exit Points (a +b)		Estimated Depth Arc	varies
	f crossing for License (Land only)	Not Applicable (but 1003		Forward Ground Elevation	NA
[Does Not apply to Water of	or Rail]	feet including DOT ROW)		Forward Conductor Height	NA
				Forward Conductor Elev. at Pole	NA
				Span (Feet)	1003
				Max Tension NESC Heavy lbs.	NA
				Max Operating Temp (°F)	130
				Calc'd Horiz.Tension@MaxTemp	NA
				Calc'd. Clearance (SAG 10)	NA
				Clearance Shown on Profile	55 feet
				Req'd Clearance (NESC)	No Engineering Standard
Crossing Comments, Concl	usions, Conditions, and Staff Reco	mmendation			
Conclusions	underground path of greater leng There isa town water main(12 inc Each cable will have approximatel 3 inch diameter HDPE will be attac	th. th diameter) within this NH DC y the same radius and will be ched to each positive and nego or may be exercised without s	sepa sepative	arated by approximately 5 ft to 20 ft. charge cable. antially affecting the public rights in the	Communication cables that have
	comments received by the NH DO	T during the design review pro	oces		
Staff Recommendation	That the Commission grant the license to construct, maintain and operate the electric lines, communication cable, and heat sensing cable under or across the public waters identified in the petition.				
	The license for this public water consecutive sections.	rossing is contingent upon the	Nor	thern Pass Project receiving a Certifica	ite of Site and Facility from the
Staff Reccommended Conditions applied to License	Staff recommends HDPE as the co calibration requirements and align	•	and	many commercially available standard	ds for tool requirements, heating

Table A.1.3.1 Appendix A

Public Water/Land Crossing Name:

Nash Stream Forest, Stark, NH for NPT

General Information			Technical Information		
PUC Docket Number		DE 15-461	Voltage	320 kV, DC	
PUC Zone		1	Circuit	3720/3731	
PUC Map Number		3	Conductor Type	AAAC	
Petitioner (NPT, ESE)		NPT	Code Name	None	
Petitioner Line List # (for P	arcels traversed)	12519	Conductor Size	2933 kcmil	
Crossing Circuit Configurat	ion	Overhead	Stranding	91	
Public Crossing Type (Wate		Land	Conductor Horizontal Separation	28	
Previous Public Crossing Li	cense Issued by PUC (Yes/No)	No	Conductor Vertical Separation	NA	
Relocated ESE Crossing (Ye	es/No/NA)	NA	Cable Weight (Lbs/Ft)	2.769	
Right of Way Width		150 feet	Back Pole Number	DC-396	
Number of Circuits within		2	Back Structure Height	85	
Foreign Utilities within RO		Yes, PNGTS	Back Ground Elevation (Ft)	1087.8	
	nholes this circuit crossing	8	Back Conductor Height	61	
First Structure Identification State Listed Public Waters		DC-402 NA	Back Conductor Elev. at Pole Forward Pole Number	1148.8 DC-397	
Last Structure Identificatio		DC-395	Forward Structure Height	90	
	of crossing for License (Land only)	DC-393	Forward Ground Elevation	1072.6	
* * *	- : : : : : : : : : : : : : : : : : : :	4,335 ft	Forward Conductor Height	66	
[Does Not apply to Water	OI Kalij		Forward Conductor Elev. at Pole	1138.6	
				712	
			Span (Feet) Max Tension NESC Heavy lbs.	20,000	
			Max Operating Temp (°F)	130	
			Calc'd Horiz.Tension@MaxTemp	8,500	
			Calc'd. Clearance (SAG 10)		
			Clearance Shown on Profile	43	
			Req'd Clearance (NESC)	21.7	
			Req d Clearance (NESC)	21.7	
Comments	recreationally for a variety of pub Comments from DRED related to t impact to the public use of the lan project.	olic uses including snowm the project's impact on the d would be potential res rticular parcel. Staff note	ransmission System (PNGTS) ROW across the obiling, ATV use, hiking, etc his State-owned land were generally favorable tricted access to popular trails during constitute the property is likely used for receational	ole. A possible negative ruction related to the	
Conclusions	substantially affecting the public r and safety in these public lands. The petition, appendices and other	Based on the comments received from DRED, Staff believes the proposed license petitioned for may be exercised without substantially affecting the public rights in these public lands, nor will the proposed crossing substantially affect the fuctional use			
Staff Recommendation Staff Reccommended Conditions applied to License	across the public land identified in NPT shall coordinate with DRED to transmission lines. NPT shall coordinate with PNGTS t used for corrosion control of the p	n the petition. o minimize concerns of put to minimize the effects of pipeline.	in and operate the electric lines and commulation and operate the electric lines and commulation belong the overhead DC attentuation between the overhead DC the Northern Pass Project receiving a Certif	onstruction of the	

Table A.1.3.2 Appendix A

Public Water/Land Crossing Name:

Nash Stream Forest, Stark, NH for ESE

General Information			Technical Information	
PUC Docket Number		DE 15-463	Voltage	115 kV, AC
PUC Zone		1	Circuit	0154
PUC Map Number		3	Conductor Type	ACSR
Petitioner (NPT, ESE)		ESE	Code Name	Drake
Petitioner Line List # (for P	Parcels traversed)	12519	Conductor Size	795 kcmil
Crossing Circuit Configurat	tion	Overhead	Stranding	26/7
Public Crossing Type (Wat	er/Land)	Land	Conductor Horizontal Separation	12
Previous Public Crossing Li	icense Issued by PUC (Yes/No)	No	Conductor Vertical Separation	0
Relocated ESE Crossing (Ye	es/No/NA)	Yes	Cable Weight (Lbs/Ft)	1.094
Right of Way Width		150 feet	Back Pole Number	0154-48
Number of Circuits within		2	Back Structure Height	92.5
Foreign Utilities within RO		Yes, PNGTS	Back Ground Elevation (Ft)	1037.52
	anholes this circuit crossing	8	Back Conductor Height	55.01
First Structure Identification		0154-49	Back Conductor Elev. at Pole	1092.53 O154-49
State Listed Public Waters Last Structure Identification		NA	Forward Structure Height	80
		0154-42	Forward Structure Height Forward Ground Elevation	1066.12
	of crossing for License (Land only)	4335 ft		42.74
[Does Not apply to Water	or Railj		Forward Conductor Height Forward Conductor Elev. at Pole	1108.86
				506.73
			Span (Feet)	9,000
			Max Tension NESC Heavy lbs. Max Operating Temp (°F)	285
			Calc'd Horiz.Tension@MaxTemp	2,391
				-
			Clarate as Shaver as Brafile	30
			Clearance Shown on Profile Req'd Clearance (NESC)	24 16.1
			Req a clearance (NESC)	16.1
Comments	impact to the public use of the lan	he project's impact on the	iobiling, ATV use, niking, etc nis State-owned land were generally favorab tricted access to popular trails during constr	
	project.			
	DRED did not comment on this pa meets or exceeds NESC requireme	•	es the property is likely used for receational	purposes and the design
Conclusions	substantially affecting the public r and safety in these public lands.	ights in these public land	s the proposed license petitioned for may be ls, nor will the proposed crossing substantia Company provide sufficient support showin	lly affect the fuctional use
			Fety Code (NESC) C2-2012, consistent with Pt	
Staff Recommendation	That the Commission grant the license to construct, maintain and operate the electric lines and communication lines over and across the public land identified in the petition. ESE shall coordinate with DRED to minimize concerns of public access and use of public lands during construction of the transmission lines. ESE shall coordinate with PNGTS to minimize the effects of AC attentuation between the overhead AC circuit and DC ground beds used for corrosion control of the pipeline.			
Staff Reccommended Conditions applied to License	The license for this public land cro from the SEC.	ssing is contingent upon	the Northern Pass Project receiving a Certifi	cate of Site and Facility

Table A.1.4.1 Appendix A

Public Water/Land Crossing Name: Percy State Forest, Stark for NPT

General Information	1		Technical Information	
PUC Docket Number		DE 15-461	Voltage	320 kV, DC
PUC Zone		1	Circuit	3720/3731
PUC Map Number		4	Conductor Type	AAAC
Petitioner (NPT, ESE)		NPT	Code Name	Custom
Petitioner Line List # (for P	arcels traversed)	12547	Conductor Size	2933 kcmil
Crossing Circuit Configurat	tion	Overhead	Stranding	91
Public Crossing Type (Water		Land	Conductor Horizontal Separation	28
Previous Public Crossing Li	icense Issued by PUC (Yes/No)	No	Conductor Vertical Separation	NA
Relocated ESE Crossing (Ye		No	Cable Weight (Lbs/Ft)	2.769
Right of Way Width		150 feet	Back Pole Number	DC-419
Number of Circuits within	ROW	2	Back Structure Height	115
Foreign Utilities within RO	W .	Yes, PNGTS	Back Ground Elevation (Ft)	1256.51
	anholes this circuit crossing	4	Back Conductor Height	63.86
First Structure Identification	on	DC-419	Back Conductor Elev. at Pole	1320.37
State Listed Public Waters		NA	Forward Pole Number	DC-420
Last Structure Identification		DC-416	Forward Structure Height	110
	of crossing for License (Land only)	1892 ft	Forward Ground Elevation	1278.54
[Does Not apply to Water	or Rail]	1002 10	Forward Conductor Height	58.87
			Forward Conductor Elev. at Pole	1337.41
			Span (Feet)	591.52
			Max Tension NESC Heavy lbs.	20,000
			Max Operating Temp (°F)	130
			Calc'd Horiz.Tension@MaxTemp	7,800
			Calc'd. Clearance (SAG 10)	34
			Clearance Shown on Profile	33
			Req'd Clearance (NESC)	21.7
Comments	recreationally for a variety of pub Comments from DRED related to t impact to the public use of the lan project.	lic uses including snowm the project's impact on the d would be potential res	ransmission System (PNGTS) ROW across thi obiling, ATV use, hiking, etc his State-owned land were generally favorabl tricted access to popular trails during construes the property is likely used for receational p	e. A possible negative uction related to the
Conclusions	substantially affecting the public rand safety in these public lands.	ights in these public land	s the proposed license petitioned for may be s, nor will the proposed crossing substantial Company provide sufficient support showing	ly affect the fuctional use
	exceeds the requirements of the 2	2012 National Electric Saf	ety Code (NESC) C2-2012, consistent with Pu	c 306.01(b)(1).
Staff Recommendation	across the public land identified in NPT shall coordinate with DRED to transmission lines. NPT shall coordinate with PNGTS t used for corrosion control of the p	the petition. o minimize concerns of put to minimize the effects of oipeline.	ain and operate the electric lines and commu sublic access and use of public lands during co f DC attentuation between the overhead DC of the Northern Pass Project receiving a Certific	nstruction of the
Staff Reccommended Conditions applied to	from the SEC.		a de la composición dela composición de la composición dela composición de la composición de la composición de la composición dela composición dela composición de la composic	

Table A.1.4.2 Appendix A

Public Water/Land Crossing Name: Percy State Forest, Stark for ESE

General Information			Technical Information	
PUC Docket Number		DE 15-463	Voltage	115 kV, AC
PUC Zone		1	Circuit	0154
PUC Map Number		4	Conductor Type	ACSR
Petitioner (NPT, ESE)		ESE	Code Name	Drake
Petitioner Line List # (for P	arcels traversed)	12547	Conductor Size	795 kcmil
Crossing Circuit Configurat	ion	Overhead	Stranding	26/7
Public Crossing Type (Wate	er/Land)	Land	Conductor Horizontal Separation	12
	cense Issued by PUC (Yes/No)	No	Conductor Vertical Separation	0
Relocated ESE Crossing (Ye	es/No/NA)	Yes	Cable Weight (Lbs/Ft)	1,094
Right of Way Width		150 feet	Back Pole Number	0154-66
Number of Circuits within		2	Back Structure Height	88
Foreign Utilities within RO		Yes, PNGTS	Back Ground Elevation (Ft)	1249
	nholes this circuit crossing	4	Back Conductor Height	50.73
First Structure Identification		0154-66	Back Conductor Elev. at Pole	1299.73
State Listed Public Waters		NA O154.63	Forward Pole Number	0154-67
Last Structure Identification		0154-63	Forward Structure Height	97
	of crossing for License (Land only)	2631 ft	Forward Ground Elevation	1282
[Does Not apply to Water	or Kallj		Forward Conductor Height	59.54
			Forward Conductor Elev. at Pole	1341.54
			Span (Feet)	607.97
			Max Tension NESC Heavy lbs.	9,000
			Max Operating Temp (°F)	285
			Calc'd Horiz.Tension@MaxTemp	2,616
			Calc'd. Clearance (SAG 10)	37
			Clearance Shown on Profile	27
			Req'd Clearance (NESC)	16.1
Comments		he project's impact on th	obiling, ATV use, hiking, etc nis State-owned land were generally favorab tricted access to popular trails during constr	
	DRED did not comment on this pa meets or exceeds NESC requireme	•	es the property is likely used for receational	purposes and the design
Conclusions	substantially affecting the public r and safety in these public lands. The petition, appendices and othe	ights in these public land r documents filed by the	s the proposed license petitioned for may be s, nor will the proposed crossing substantia Company provide sufficient support showing the Code (NESC) C3 2013, appreciate the base of the Code (NESC) C3 2013, appreciate the base of the Code (NESC) C3 2013, appreciate the base of the Code (NESC) C3 2013, appreciate the base of the Code (NESC) C3 2013, appreciate the base of the Code (NESC) C3 2013, appreciate the base of the Code (NESC) C3 2013, appreciate the base of the Code (NESC) C3 2013, appreciate the base of the Code (NESC) C3 2013, appreciate the base of the Code (NESC) C3 2013, appreciate the base of the Code (NESC) C3 2013, appreciate the base of the Code (NESC) C3 2013, appreciate the base of the Code (NESC) C3 2013, appreciate the base of the Code (NESC) C3 2013, appreciate the base of the Code (NESC) C3 2013, appreciate the base of the Code (NESC) C3 2013, appreciate the base of the Cade (NESC) C3 2013, appreciate the Cade (NESC) C3 2013, app	lly affect the fuctional use
	·		ety Code (NESC) C2-2012, consistent with Po	. , , ,
Staff Recommendation	That the Commission grant the license to construct, maintain and operate the electric lines and communication lines over and across the public land identified in the petition. ESE shall coordinate with DRED to minimize concerns of public access and use of public lands during construction of the transmission lines. ESE shall coordinate with PNGTS to minimize the effects of AC attentuation between the overhead AC circuit and DC ground beds used for corrosion control of the pipeline.			
Staff Reccommended Conditions applied to License	The license for this public land cro from the SEC.	ssing is contingent upon	the Northern Pass Project receiving a Certifi	cate of Site and Facility

Table A.1.5.1 Appendix A

Public Water/Land Crossing Name:

Upper Ammonoosuc River, Stark NH for NPT

General Information				Technical Information	
PUC Docket Number		DE 15-460		Voltage	320 kV, DC
PUC Zone		1		Circuit	3720/3731
PUC Map Number		5		Conductor Type	AAAC
Petitioner (NPT, ESE)		NPT		Code Name	None
Petitioner Line List # (for F	Parcels traversed)	12556		Conductor Size	2933 kcmil
Crossing Circuit Configura	tion	Overhead		Stranding	91
Public Crossing Type (Wat	er/Land)	Water		Conductor Horizontal Separation	26
Previous Public Crossing L	icense Issued by PUC (Yes/No)	No		Conductor Vertical Separation	NA
Relocated ESE Crossing (Yo	es/No/NA)	No		Cable Weight (Lbs/Ft)	2.769
Right of Way Width		150 feet		Back Pole Number	DC-434
Number of Circuits within		2		Back Structure Height	100
Foreign Utilities within RO		Yes, PNGTS		Back Ground Elevation (Ft)	934
	anholes this circuit crossing	2		Back Conductor Height	49.5
First Structure Identification		DC-435		Back Conductor Elev. at Pole	983.63
State Listed Public Waters Last Structure Identification		Yes DC-434		Forward Pole Number	DC-435 100
		DC-454		Forward Structure Height	
[Does Not apply to Water	of crossing for License (Land only)	548 ft		Forward Ground Elevation Forward Conductor Height	946.49 49.5
Looes Not apply to water	ui naiij			Forward Conductor Height Forward Conductor Elev. at Pole	995.99
				Span (Feet)	548
				Max Tension NESC Heavy lbs.	20,000
				Max Operating Temp (°F)	130
				Calc'd Horiz.Tension@MaxTemp	130
				Calc'd. Clearance (SAG 10)	41
				Caic d. Clearance (SAG 10) Clearance Shown on Profile	41 39
				Reg'd Clearance (NESC)	35.7
				Req a clearance (NESC)	55.7
Comments	elevations that are based on infor year flood elevation for this portion The design incorporates NESC mir	mation contained in floo on of the river. nimum required clearance	d insu	vater, the engineering design incorporate and the maps provided by FEMA. ve the water for these open supply of the water for these open supply of the minimum of the minim	The design uses the 100- onductors, using 100-year
Conclusions	The proposed public water crossing crossing substantially affect the fu	uctional use and safety in	these	the public rights in these waters, nor e public waters. c waters meets or exceeds NESC requ	
	expected recreational use by the	public.			
Staff Recommendation	That the Commission grant the lic and across the public waters iden		ain ar	nd operate the electric lines and comi	nunication cables over
	The license for this public water c Facility from the SEC.	rossing is contingent upo	n the	Northern Pass Project receiving a Ce	rtificate of Site and
Staff Reccommended Conditions applied to License					

Table A.1.5.2 Appendix A

Public Water/Land Crossing Name:

Upper Ammonoosuc River, Stark NH for ESE

General Information				Technical Information	
PUC Docket Number		DE 15-462		Voltage	115 kV, AC
PUC Zone		1		Circuit	0154
PUC Map Number		5		Conductor Type	ACSR
Petitioner (NPT, ESE)		ESE		Code Name	Drake
Petitioner Line List # (for F	Parcels traversed)	12556		Conductor Size	795 kcmil
Crossing Circuit Configura	tion	Overhead		Stranding	26/7
Public Crossing Type (Wat	er/Land)	Water		Conductor Horizontal Separation	12
Previous Public Crossing L	icense Issued by PUC (Yes/No)	No		Conductor Vertical Separation	0
Relocated ESE Crossing (Ye	es/No/NA)	Yes		Cable Weight (Lbs/Ft)	1.094
Right of Way Width		150 feet		Back Pole Number	0154-81
Number of Circuits within		2		Back Structure Height	88
Foreign Utilities within RO		Yes, PNGTS		Back Ground Elevation (Ft)	934.2
	anholes this circuit crossing	2		Back Conductor Height	50.5
First Structure Identification		0154-82		Back Conductor Elev. at Pole	984.7
State Listed Public Waters				Forward Pole Number	0154-82
Last Structure Identification		0154-81		Forward Structure Height	92.5
	of crossing for License (Land only)	538 ft		Forward Ground Elevation	936.92
[Does Not apply to Water	or Rail]			Forward Conductor Height	55
				Forward Conductor Elev. at Pole	991.92
				Span (Feet)	537.83
				Max Tension NESC Heavy lbs.	9,000
				Max Operating Temp (°F)	285
				Calc'd Horiz.Tension@MaxTemp	2,465
				Calc'd. Clearance (SAG 10)	38
				Clearance Shown on Profile	37
				Req'd Clearance (NESC)	30.1
	enthusiasts. In order to determine the minimu	ım NESC clearance above	the v	s used recreationally for fishing, as wo	rates flood water
Comments	year flood elevation for this portion. The design incorporates NESC mir flood data (28.5 feet) plus the address.	on of the river. nimum required clearance ditional NESC Rule 232.C.:	e abo 1 req	urance rate maps provided by FEMA. ve the water for these open supply our or the water for these open supply our or the water for these open supply our or the water for	onductors, using 100-year num clearance to 30.1
Conclusions	crossing substantially affect the fu	uctional use and safety in	these	the public rights in these waters, nor e public waters. c waters meets or exceeds NESC requ	
	expected recreational use by the	public.			
Staff Recommendation	across the public waters identified		ain ar	nd operate the electric and communio	ation lines over and
	The license for this public water c Facility from the SEC.	rossing is contingent upo	n the	Northern Pass Project receiving a Ce	rtificate of Site and
Staff Reccommended Conditions applied to License					

Table A.1.6.1 Appendix A

Public Water/Land Crossing Name:

Cape Horn State Forest, Northumberland for NPT

General Information			Technical Information		
PUC Docket Number		DE 15-461	Voltage	320 kV, DC	
PUC Zone		1	Circuit	3720/3731	
PUC Map Number		6	Conductor Type	AAAC	
Petitioner (NPT, ESE)		NPT	Code Name	Custom	
Petitioner Line List # (for P	arcels traversed)	2030, 2034, 2037	Conductor Size	2933 kcmil	
Crossing Circuit Configurat		Overhead	Stranding	91	
Public Crossing Type (Wate		Land	Conductor Horizontal Separation	28	
Previous Public Crossing Lie	cense Issued by PUC (Yes/No)	No	Conductor Vertical Separation	0	
Relocated ESE Crossing (Ye	s/No/NA)	No	Cable Weight (Lbs/Ft)	2.769	
Right of Way Width		150 feet	Back Pole Number	DC-486	
Number of Circuits within	ROW	2	Back Structure Height	80	
Foreign Utilities within RO	W	None	Back Ground Elevation (Ft)	1384.31	
Total Structures/Poles/Ma	ū	20	Back Conductor Height	56	
First Structure Identification		DC-486	Back Conductor Elev. at Pole	1440.31	
State Listed Public Waters		NA	Forward Pole Number	DC-487	
Last Structure Identificatio		DC-505	Forward Structure Height	80	
PUC Approximate Length o	of crossing for License (Land only)	12,609 ft	Forward Ground Elevation	1072.6	
[Does Not apply to Water of	or Rail]	12,005 10	Forward Conductor Height	303.27	
			Forward Conductor Elev. at Pole	1375.87	
			Span (Feet)	442.57	
			Max Tension NESC Heavy lbs.	20,000	
			Max Operating Temp (°F)	130	
			Calc'd Horiz.Tension@MaxTemp	6,642	
			Calc'd. Clearance (SAG 10)	30	
			Clearance Shown on Profile	30	
			Req'd Clearance (NESC)	21.7	
Comments	public land crossing follows existir recreationally for a variety of pub Comments from DRED related to t impact to the public use of the lan project. DRED did not comment on this pa meets or exceeds NESC requirements.	ng Portland Natural Gas Tr lic uses including snowmo the project's impact on thi id would be potential restr rticular parcel. Staff notes ents for that type of use.	s State-owned land were generally favorab ricted access to popular trails during constr s the property is likely used for receational	is parcel. This land is used le. A possible negative uction related to the purposes and the design	
Conclusions	substantially affecting the public r and safety in these public lands. The petition, appendices and other	Based on the comments received from DRED, Staff believes the proposed license petitioned for may be exercised without substantially affecting the public rights in these public lands, nor will the proposed crossing substantially affect the fuctional use and safety in these public lands. The petition, appendices and other documents filed by the Company provide sufficient support showing that the design meets or exceeds the requirements of the 2012 National Electric Safety Code (NESC) C2-2012, consistent with Puc 306.01(b)(1).			
Staff Recommendation	across the public land identified in NPT shall coordinate with DRED to transmission lines. NPT shall coordinate with PNGTS t used for corrosion control of the c The license for this public land cro	the petition. o minimize concerns of pul to minimize the effects of pipeline.	n and operate the electric lines and commu blic access and use of public lands during co DC attentuation between the overhead DC he Northern Pass Project receiving a Certifi	onstruction of the circuit and ground beds	
Staff Reccommended Conditions applied to License	from the SEC.				

Table A.1.6.2 Appendix A

Public Water/Land Crossing Name:

Cape Horn State Forest, Northumberland for ESE

General Information			Technical Information	
PUC Docket Number		DE 15-463	Voltage	115 kV, AC
PUC Zone		1	Circuit	D142
PUC Map Number		6	Conductor Type	ACSR
Petitioner (NPT, ESE)		ESE	Code Name	Drake
Petitioner Line List # (for P	arcels traversed)	2030, 2034, 2037	Conductor Size	795 kcmil
Crossing Circuit Configurat	ion	Overhead	Stranding	26/7
Public Crossing Type (Wate		Land	Conductor Horizontal Separation	12
Previous Public Crossing Li	cense Issued by PUC (Yes/No)	No	Conductor Vertical Separation	0
Relocated ESE Crossing (Ye	es/No/NA)	Yes	Cable Weight (Lbs/Ft)	1.094
Right of Way Width		150 feet	Back Pole Number	D142-322
Number of Circuits within		2	Back Structure Height	88
Foreign Utilities within RO		None	Back Ground Elevation (Ft)	1383.82
	nholes this circuit crossing	22	Back Conductor Height	50.5
First Structure Identification		DC-142-323	Back Conductor Elev. at Pole	1434.32
State Listed Public Waters Last Structure Identification		DC-142-343	Forward Pole Number Forward Structure Height	D-142-323 97
	of crossing for License (Land only)	DC-142-343	Forward Ground Elevation	1320.44
[Does Not apply to Water	- : : :	12,561 ft	Forward Conductor Height	59.5
Looes Not apply to water	or Kalij		Forward Conductor Fley. at Pole	1379.94
			Span (Feet)	481.43
			Max Tension NESC Heavy lbs.	9,000
			Max Operating Temp (°F)	285
			Calc'd Horiz.Tension@MaxTemp	2,384
			Calc'd. Clearance (SAG 10)	27
			Clearance Shown on Profile	24
			Reg'd Clearance (NESC)	16.1
			neq a clearance (NESC)	10.1
Crossing Comments Cons	lusions, Conditions, and Staff Reco	mmondation		
Comments	public land crossing follows existir recreationally for a variety of pub Comments from DRED related to timpact to the public use of the lan project.	ng Portland Natural Gas Ti lic uses including snowmo the project's impact on th Id would be potential rest	Department of Resources and Economic De ansmission System (PNGTS) ROW across the abiling, ATV use, hiking, etc Is State-owned land were generally favorab- ricted access to popular trails during constructed access to popular trails acc	nis parcel. This land is used ble. A possible negative ruction related to the
	meets or exceeds NESC requireme	ents for that type of use.		
Conclusions	Based on the comments received from DRED, Staff believes the proposed license petitioned for may be exercised without substantially affecting the public rights in these public lands, nor will the proposed crossing substantially affect the fuctional use and safety in these public lands. The petition, appendices and other documents filed by the Company provide sufficient support showing that the design meets or exceeds the requirements of the 2012 National Electric Safety Code (NESC) C2-2012, consistent with Puc 306.01(b)(1).			
Staff Recommendation	That the Commission grant the license to construct, maintain and operate the electric lines and communication lines over and across the public land identified in the petition. ESE shall coordinate with DRED to minimize concerns of public access and use of public lands during construction of the transmission lines. ESE shall coordinate with PNGTS to minimize the effects of AC attentuation between the overhead AC circuit and DC ground bediused for corrosion control of the pipeline. The license for this public land crossing is contingent upon the Northern Pass Project receiving a Certificate of Site and Facility from the SEC.			
Staff Reccommended Conditions applied to License				
	1			

Table A.1.7a.1 Appendix A

Public Water/Land Crossing Name: Otter Brook, Lancaster, NH for NPT

General Information			Technical Information	
PUC Docket Number		DE 15-460	Voltage	320 kV, DC
PUC Zone	PUC Zone		Circuit	3720/3731
PUC Map Number		7	Conductor Type	AAAC
Petitioner (NPT, ESE)		NPT	Code Name	None
Petitioner Line List # (for I	Parcels traversed)	2233, 2234	Conductor Size	2933 kcmil
Crossing Circuit Configuration		Overhead	Stranding	91
Public Crossing Type (Water/Land)		Water	Conductor Horizontal Separation	28
Previous Public Crossing L	icense Issued by PUC (Yes/No)	No	Conductor Vertical Separation	NA
Relocated ESE Crossing (Y	es/No/NA)	NA	Cable Weight (Lbs/Ft)	2,769
Right of Way Width		150	Back Pole Number	DC-538
Number of Circuits within	ROW	1 new (DC), 1 existing	Back Structure Height	95
Foreign Utilities within RC)W	None	Back Ground Elevation (Ft)	920
Total Structures/Poles/Ma	anholes this circuit crossing	2	Back Conductor Height	60.5
First Structure Identificati		DC-536	Back Conductor Elev. at Pole	990.5
State Listed Public Waters	s (Yes/No/Not Applicable)	Yes	Forward Pole Number	DC-539
Last Structure Identification	on	DC-537	Forward Structure Height	90
PUC Approximate Length	of crossing for License (Land only)	Not Applicable	Forward Ground Elevation	931.23
[Does Not apply to Water	or Rail]	Not Applicable	Forward Conductor Height	65.5
			Forward Conductor Elev. at Pole	996.73
			Span (Feet)	833.52
			Max Tension NESC Heavy lbs.	20,000
			Max Operating Temp (°F)	130
			Calc'd Horiz.Tension@MaxTemp	
			Calc'd. Clearance (SAG 10)	41
			Clearance Shown on Profile	38
			Reg'd Clearance (NESC)	35.7
			ned a cicarance (itzse)	55.7
Comments	In order to determine the minimum NESC clearance above the water, the engineering design incorporates flood water elevations that are based on information contained in flood insurance rate maps provided by FEMA. The design uses the 100 year flood elevation for this portion of the river. The design incorporates NESC minimum required clearance above the water for these open supply conductors, using 100-year flood data (28.5 feet) plus the additional NESC Rule 232.C.1 requirement (7.19 feet) brings the minumum clearance to 35.7			The design uses the 100- onductors, using 100-year
Conclusions	crossing substantially affect the form	uctional use and safety in t overhead crossing across p	fect the public rights in these waters, nor these public waters. Sublic waters meets or exceeds NESC requ	
Staff Recommendation	expected recreational use by the That the Commission grant the lic across the public waters identified	cense to construct, mainta	in and operate the electric and communic	ation lines over and
Staff Reccommended Conditions applied to License	The license for this public water c Facility from the SEC.	rossing is contingent upon	the Northern Pass Project receiving a Ce	rtificate of Site and

Table A.1.7a.2 Appendix A

Public Water/Land Crossing Name: Otter Brook, Lancaster, NH for ESE

General Information			Technical Information	
PUC Docket Number		DE 15-462	Voltage	115 kV, AC
PUC Zone		1	Circuit	D142
PUC Map Number		7	Conductor Type	ACSR
Petitioner (NPT, ESE)		ESE	Code Name	Drake
Petitioner Line List # (for F	Parcels traversed)	2233, 2234	Conductor Size	795 kcmil
Crossing Circuit Configura	tion	Overhead	Stranding	26/7
Public Crossing Type (Water/Land)		Water	Conductor Horizontal Separation	12
	icense Issued by PUC (Yes/No)	No	Conductor Vertical Separation	NA
Relocated ESE Crossing (Yo		Yes	Cable Weight (Lbs/Ft)	1.094
Right of Way Width	,	150	Back Pole Number	D142-376
Number of Circuits within	ROW	1 new (DC), 1 existing	Back Structure Height	110.5
Foreign Utilities within RO	W .	None	Back Ground Elevation (Ft)	923.83
Total Structures/Poles/Ma	anholes this circuit crossing	2	Back Conductor Height	73
First Structure Identification	_	D142-375	Back Conductor Elev. at Pole	996.83
State Listed Public Waters	(Yes/No/Not Applicable)	Yes	Forward Pole Number	D-142-377
Last Structure Identification	on	D142-376	Forward Structure Height	80
PUC Approximate Length	of crossing for License (Land only)	Not Applicable	Forward Ground Elevation	972.18
[Does Not apply to Water	or Rail]	Not Applicable	Forward Conductor Height	42.5
			Forward Conductor Elev. at Pole	1014.68
			Span (Feet)	537.04
			Max Tension NESC Heavy lbs.	9,000
			Max Operating Temp (°F)	285
			Calc'd Horiz.Tension@MaxTemp	2,971
			Calc'd. Clearance (SAG 10)	39
			Clearance Shown on Profile	35
			Reg'd Clearance (NESC)	30.1
			ned a cicarance (17250)	30.1
Comments	Otter Brook is used recreationally for fishing. In order to determine the minimum NESC clearance above the water, the engineering design incorporates flood water elevations that are based on information contained in flood insurance rate maps provided by FEMA. The design uses the 100 year flood elevation for this portion of the river. The design incorporates NESC minimum required clearance above the water for these open supply conductors, using 100-ye. flood data (28.5 feet) plus the additional NESC Rule 232.C.1 requirement (1.59 feet) brings the minimum clearance to 30.1			The design uses the 100- onductors, using 100-year
Conclusions	feet. The proposed public water crossing will not substantially affect the public rights in these waters, nor will the proposed crossing substantially affect the fuctional use and safety in these public waters. The the proposed design for this overhead crossing across public waters meets or exceeds NESC requirements for the expected recreational use by the public.			
Staff Recommendation	That the Commission grant the lic across the public waters identified	·	in and operate the electric and communic	ation lines over and
Staff Reccommended Conditions applied to License	The license for this public water c Facility from the SEC.	rossing is contingent upon	the Northern Pass Project receiving a Cer	tificate of Site and

Table A.1.7b.1 Appendix A

Public Water/Land Crossing Name: Israel River, Lancaster, NH for NPT

General Information			Technical Information	
PUC Docket Number		DE 15-460	Voltage	320 kV, DC
PUC Zone		1	Circuit	3720/3731
PUC Map Number		7	Conductor Type	AAAC
Petitioner (NPT, ESE)		NPT	Code Name	None
, , ,	Petitioner Line List # (for Parcels traversed)		Conductor Size	2933 kcmil
Crossing Circuit Configura	,	Overhead	Stranding	91
	Public Crossing Type (Water/Land)		Conductor Horizontal Separation	28
	icense Issued by PUC (Yes/No)	No	Conductor Vertical Separation	NA
Relocated ESE Crossing (Y		NA	Cable Weight (Lbs/Ft)	2.769
Right of Way Width	,	150	Back Pole Number	DC-538
Number of Circuits within	ROW	1 new (DC), 1 existing	Back Structure Height	95
Foreign Utilities within RC	W	None	Back Ground Elevation (Ft)	920
Total Structures/Poles/Ma	nholes this circuit crossing	2	Back Conductor Height	60.5
First Structure Identification	on	DC-538	Back Conductor Elev. at Pole	990.5
State Listed Public Waters	(Yes/No/Not Applicable)	Yes	Forward Pole Number	DC-539
Last Structure Identification	on	DC-539	Forward Structure Height	90
PUC Approximate Length	of crossing for License (Land only)	Not Applicable	Forward Ground Elevation	931.23
[Does Not apply to Water	or Rail]	Not Applicable	Forward Conductor Height	65.5
,	-		Forward Conductor Elev. at Pole	996.73
			Span (Feet)	833.52
			Max Tension NESC Heavy lbs.	20,000
			Max Operating Temp (°F)	130
			Calc'd Horiz.Tension@MaxTemp	
			Calc'd. Clearance (SAG 10)	41
			Clearance Shown on Profile	38
			Reg'd Clearance (NESC)	35.7
			ned a cicarance (NESC)	55.7
Comments	Israel River is used recreationally for fishing, as well as for kayak and canoe enthuiasts. In order to determine the minimum NESC clearance above the water, the engineering design incorporates flood water elevations that are based on information contained in flood insurance rate maps provided by FEMA. The design uses the 10ty year flood elevation for this portion of the river. The design incorporates NESC minimum required clearance above the water for these open supply conductors, using 100-year flood.			The design uses the 100-
	feet.			
Conclusions	crossing substantially affect the function	uctional use and safety in to	fect the public rights in these waters, nor these public waters. Sublic waters meets or exceeds NESC requ	
	expected recreational use by the		in and operate the electric and communic	ation lines over and
Staff Recommendation	across the public waters identifie		22 Speciale and electric and communic	25
Staff Reccommended	The license for this public water of Facility from the SEC.	rossing is contingent upon	the Northern Pass Project receiving a Cer	tificate of Site and
Conditions applied to License				

Table A.1.7b.2 Appendix A

Public Water/Land Crossing Name: Israel River, Lancaster, NH for ESE

General Information			Technical Information	
PUC Docket Number		DE 15-462	Voltage	115 kV, AC
PUC Zone		1	Circuit	D142
PUC Map Number		7	Conductor Type	ACSR
Petitioner (NPT, ESE)		ESE	Code Name	Drake
Petitioner Line List # (for F	Parcels traversed)	2236	Conductor Size	795 kcmil
Crossing Circuit Configura	<u>'</u>	Overhead	Stranding	26/7
Public Crossing Type (Water/Land)		Water	Conductor Horizontal Separation	12
	icense Issued by PUC (Yes/No)	No.	Conductor Vertical Separation	NA NA
Relocated ESE Crossing (Y		Yes	Cable Weight (Lbs/Ft)	1.094
Right of Way Width	25, 110, 1111,	150	Back Pole Number	D142-375
Number of Circuits within	ROW	1 new (DC), 1 existing	Back Structure Height	115
Foreign Utilities within RC		None	Back Ground Elevation (Ft)	919.26
Total Structures/Poles/Ma	anholes this circuit crossing	2	Back Conductor Height	77.5
First Structure Identificati	on	D142-375	Back Conductor Elev. at Pole	996.76
State Listed Public Waters	(Yes/No/Not Applicable)	Yes	Forward Pole Number	D-142-376
Last Structure Identification	on	D142-376	Forward Structure Height	110.5
PUC Approximate Length	of crossing for License (Land only)	Not Amelias III	Forward Ground Elevation	923.83
[Does Not apply to Water		Not Applicable	Forward Conductor Height	73
	-		Forward Conductor Elev. at Pole	996.83
			Span (Feet)	824.05
			Max Tension NESC Heavy lbs.	9,000
			Max Operating Temp (°F)	285
			Calc'd Horiz.Tension@MaxTemp	2,971
			Calc'd. Clearance (SAG 10)	39
			Clearance Shown on Profile	35
			Reg'd Clearance (NESC)	30.1
			· · · · · · · · · · · · · · · · · · ·	
Comments	Israel River is used recreationally for fishing, as well as for kayak and canoe enthuiasts. In order to determine the minimum NESC clearance above the water, the engineering design incorporates flood water elevations that are based on information contained in flood insurance rate maps provided by FEMA. The design uses the 10ty year flood elevation for this portion of the river. The design incorporates NESC minimum required clearance above the water for these open supply conductors, using 100-yee flood data (28.5 feet) plus the additional NESC Rule 232.C.1 requirement (1.59 feet) brings the minimum clearance to 30.1			The design uses the 100- onductors, using 100-year
Conclusions	crossing substantially affect the fu	uctional use and safety in t		
	expected recreational use by the	public.	public waters meets or exceeds NESC requ	
Staff Recommendation	That the Commission grant the lic across the public waters identified		in and operate the electric and communio	ation lines over and
Staff Reccommended	The license for this public water c Facility from the SEC.	crossing is contingent upon	the Northern Pass Project receiving a Ce	rtificate of Site and
Conditions applied to License				

Table A.1.7c.1 Appendix A

Public Water/Land Crossing Name:

NH Central Rail-Groveton Railroad, Lancaster, NH for NPT

General Information			Technical Information	
PUC Docket Number		DE 15-461	Voltage	320 kV, DC
PUC Zone		1	Circuit	3720/3731
PUC Map Number		7	Conductor Type	AAAC
Petitioner (NPT, ESE)		NPT	Code Name	None
Petitioner Line List # (for F	Parcels traversed)	2235	Conductor Size	2933 kcmil
Crossing Circuit Configura	,	Overhead	Stranding	91
	Public Crossing Type (Water/Land)		Conductor Horizontal Separation	28
	icense Issued by PUC (Yes/No)	No	Conductor Vertical Separation	NA
Relocated ESE Crossing (Y		NA	Cable Weight (Lbs/Ft)	2.769
Right of Way Width		150	Back Pole Number	DC-539
Number of Circuits within	ROW	1 new (DC), 1 existing	Back Structure Height	90
Foreign Utilities within RC)W	None	Back Ground Elevation (Ft)	931.23
Total Structures/Poles/Ma	anholes this circuit crossing	2	Back Conductor Height	65.5
First Structure Identificati		DC-539	Back Conductor Elev. at Pole	996.73
State Listed Public Waters	(Yes/No/Not Applicable)	Yes	Forward Pole Number	DC-540
Last Structure Identification	on	DC-540	Forward Structure Height	70
PUC Approximate Length	of crossing for License (Land only)	Not Applicable	Forward Ground Elevation	977.89
[Does Not apply to Water	or Rail]	Not Applicable	Forward Conductor Height	45.5
			Forward Conductor Elev. at Pole	1023.39
			Span (Feet)	559.75
			Max Tension NESC Heavy lbs.	20,000
			Max Operating Temp (°F)	130
			Calc'd Horiz.Tension@MaxTemp	
			Calc'd. Clearance (SAG 10)	45
			Clearance Shown on Profile	44
			Reg'd Clearance (NESC)	33.7
			ned a cicarance (NESC)	33.7
Comments	NH Central Rail-Groveton Branch is a State-owned railroad parcel managed by the NH Department of Transportation (NH DOT). This public land crossing will require a license from the NH PUC for the utility rights to cross the parcel. The NH DOT describes this railroad as an active, year-round freight line. NH DOT does not anticipate any negative impact from the proposed NPT project, notes a positive relationship with Eversource maintenance practices, and has no concerns with the relocation of the existing Eversource circuit within the ROW. NH DOT does not foresee any negative impacts of this project on the rights to the public in using this land. The NH DOT does not foresee any negative impact to the NH Central Rail-Groveton Branch related to the proposed NPT project.			e parcel. any negative impact from has no concerns with the land. The NH DOT does
Conclusions	without substantially affecting the fuctional use and safety in these partition, appendices and other or exceeds the requirements of the function of the func	e public rights in these pul public lands. er documents filed by the ne 2012 National Electric S	elieves the proposed license petitioned for olic lands, nor will the proposed crossing : Company provide sufficient support show afety Code (NESC) C2-2012, consistent wi	substantially affect the ring that the design meets th Puc 306.01(b)(1).
Staff Recommendation	across the public land identified in		in and operate the electric and communic	auon inies over and
Staff Reccommended Conditions applied to	The license for this public land croffrom the SEC.	ossing is contingent upon t	he Northern Pass Project receiving a Cert	ificate of Site and Facility
License				

Table A.1.7c.2 Appendix A

Public Water/Land Crossing Name:

NH Central Rail-Groveton Branch, Lancaster, NH for ESE

General Information			Technical Information	
PUC Docket Number		DE 15-463	Voltage	115 kV, AC
PUC Zone		1	Circuit	D142
PUC Map Number		7	Conductor Type	ACSR
Petitioner (NPT, ESE)		ESE	Code Name	Drake
, , ,	Petitioner Line List # (for Parcels traversed)		Conductor Size	795 kcmil
Crossing Circuit Configura	,	Overhead	Stranding	26/7
	Public Crossing Type (Water/Land)		Conductor Horizontal Separation	12
	icense Issued by PUC (Yes/No)	No	Conductor Vertical Separation	NA
Relocated ESE Crossing (Y		Yes	Cable Weight (Lbs/Ft)	1.094
Right of Way Width	,	150	Back Pole Number	D142-376
Number of Circuits within	ROW	1 new (DC), 1 existing	Back Structure Height	110.5
Foreign Utilities within RC	W .	None	Back Ground Elevation (Ft)	923.83
Total Structures/Poles/Ma	anholes this circuit crossing	2	Back Conductor Height	73
First Structure Identification	on	D142-376	Back Conductor Elev. at Pole	996.83
State Listed Public Waters	(Yes/No/Not Applicable)	Yes	Forward Pole Number	D-142-377
Last Structure Identification	on	D142-377	Forward Structure Height	80
PUC Approximate Length	of crossing for License (Land only)	Not Applicable	Forward Ground Elevation	972.18
[Does Not apply to Water	or Rail]	Not Applicable	Forward Conductor Height	42.5
			Forward Conductor Elev. at Pole	1014.68
			Span (Feet)	537.04
			Max Tension NESC Heavy lbs.	9,000
			Max Operating Temp (°F)	285
			Calc'd Horiz.Tension@MaxTemp	
			Calc'd. Clearance (SAG 10)	47
			Clearance Shown on Profile	46
			Reg'd Clearance (NESC)	28.1
			neq a cicarance (NESC)	20.1
Comments	NH Central Rail-Groveton Branch is a State-owned railroad parcel managed by the NH Department of Transportation (NH DOT). This public land crossing will require a license from the NH PUC for the utility rights to cross the parcel. The NH DOT describes this railroad as an active, year-round freight line. NH DOT does not anticipate any negative impact from the proposed NPT project, notes a positive relationship with Eversource maintenance practices, and has no concerns with the relocation of the existing Eversource circuit within the ROW. NH DOT does not foresee any negative impacts of this project on the rights to the public in using this land. The NH DOT does not foresee any negative impact to the NH Central Rail-Groveton Branch related to the proposed NPT project.			e parcel. any negative impact from has no concerns with the land. The NH DOT does
Conclusions	without substantially affecting the fuctional use and safety in these partition, appendices and other or exceeds the requirements of the same of the s	e public rights in these pul public lands. er documents filed by the ne 2012 National Electric S	elieves the proposed license petitioned for olic lands, nor will the proposed crossing Company provide sufficient support show afety Code (NESC) C2-2012, consistent wi	substantially affect the ring that the design meets th Puc 306.01(b)(1).
Staff Recommendation	That the Commission grant the lic and across the public land identifi		in and operate the electric lines and comr	nunication cables over
Staff Reccommended Conditions applied to	The license for this public land croffrom the SEC.	ossing is contingent upon t	he Northern Pass Project receiving a Cert	ificate of Site and Facility
License				

Table A.1.8a.1 Appendix A

Public Water/Land Crossing Name:

Mountain Division Rail Line , Dalton, NH for NPT

General Information			Technical Information	
PUC Docket Number		DE 15-461	Voltage	320 kV, DC
PUC Zone		1	Circuit	3720/3731
PUC Map Number		8	Conductor Type	AAAC
Petitioner (NPT, ESE)		NPT	Code Name	None
Petitioner Line List # (for I	Parcels traversed)	2819	Conductor Size	2933 kcmil
Crossing Circuit Configuration		Overhead	Stranding	91
Public Crossing Type (Water/Land)		Land	Conductor Horizontal Separation	28
Previous Public Crossing L	icense Issued by PUC (Yes/No)	No	Conductor Vertical Separation	NA
Relocated ESE Crossing (Y	es/No/NA)	NA	Cable Weight (Lbs/Ft)	2.769
Right of Way Width		150	Back Pole Number	DC-620
Number of Circuits within		1 new (DC), 1 existing	Back Structure Height	90
Foreign Utilities within RC		None	Back Ground Elevation (Ft)	974.8
	anholes this circuit crossing	2	Back Conductor Height	65.5
First Structure Identificati		DC-620	Back Conductor Elev. at Pole	1040.3
State Listed Public Waters		NA	Forward Pole Number	DC-621
Last Structure Identification		DC-621	Forward Structure Height	100
''	of crossing for License (Land only)	Not Applicable	Forward Ground Elevation	905.84
[Does Not apply to Water	or Rail]	• • • • • • • • • • • • • • • • • • • •	Forward Conductor Height	75.5
			Forward Conductor Elev. at Pole	981.34
			Span (Feet)	605.02
			Max Tension NESC Heavy lbs.	20,000
			Max Operating Temp (°F)	130
			Calc'd Horiz.Tension@MaxTemp	
			Calc'd. Clearance (SAG 10)	59
			Clearance Shown on Profile	57
			Req'd Clearance (NESC)	33.7
Comments	parcel. The NH DOT describes this railroad as an active, year-round freight line. NH DOT does not anticipate any negative impact from the proposed NPT project, notes a positive relationship with Eversource maintenance practices, and has no concerns with the relocation of the existing Eversource circuit within the ROW. NH DOT does not foresee any negative impacts of this project on the rights to the public in using this land. The NH DOT does			nas no concerns with the
Conclusions	Based on the comments received	from the NH DOT, Staff be	on Branch related to the proposed NPT pr	r may be exercised
	fuctional use and safety in these	public lands.	olic lands, nor will the proposed crossing s	•
			Company provide sufficient support show afety Code (NESC) C2-2012, consistent wi	
Staff Recommendation	That the Commission grant the lic across the public land identified in	•	in and operate the electric and communic	ationlines over and
Staff Reccommended	The license for this public land croffrom the SEC.	ossing is contingent upon t	he Northern Pass Project receiving a Certi	ficate of Site and Facility
Conditions applied to License				

Table A.1.8a.2 Appendix A

Public Water/Land Crossing Name:

Mountain Division Rail Line , Dalton, NH for ESE

General Information				Technical Information			
PUC Docket Number		DE 15-463		Voltage	34.5 kV, AC		
PUC Zone		1		Circuit	348X		
PUC Map Number		8		Conductor Type	ACSR		
Petitioner (NPT, ESE)		ESE		Code Name	Penguin		
Petitioner Line List # (for F	Parcels traversed)	2825, 2826		Conductor Size	4/0 AWG		
Crossing Circuit Configura	tion	Overhead		Stranding	6/1		
Public Crossing Type (Wat	er/Land)	Land		Conductor Horizontal Separation	5		
Previous Public Crossing L	icense Issued by PUC (Yes/No)	No		Conductor Vertical Separation	1.5		
Relocated ESE Crossing (Yo		Yes		Cable Weight (Lbs/Ft)	0.2911		
Right of Way Width		150		Back Pole Number	348X-11		
Number of Circuits within	ROW	1 new (DC), 1 existing		Back Structure Height	56.5		
Foreign Utilities within RO	W	None		Back Ground Elevation (Ft)	928.5		
Total Structures/Poles/Ma	anholes this circuit crossing	2		Back Conductor Height	49		
First Structure Identification	on	348X-13		Back Conductor Elev. at Pole	977.5		
State Listed Public Waters	(Yes/No/Not Applicable)	Yes		Forward Pole Number	348X-12		
Last Structure Identification	on	348X-17		Forward Structure Height	61		
PUC Approximate Length	of crossing for License (Land only)			Forward Ground Elevation	909.87		
[Does Not apply to Water		Not Applicable		Forward Conductor Height	53.5		
,	-			Forward Conductor Elev. at Pole	963.37		
				Span (Feet)	183.01		
				Max Tension NESC Heavy lbs.	3,000		
				Max Operating Temp (°F)	120		
				Calc'd Horiz.Tension@MaxTemp	512		
				Calc'd. Clearance (SAG 10)	42		
				Clearance Shown on Profile	42		
				Reg'd Clearance (NESC)	23.5		
					20.0		
Crossing Comments, Cond	clusions, Conditions, and Staff Rec	ommendation					
	The Mountain Division Rail Line D	alton Branch is a State-ov	vned	railroad parcel managed by the NH D	epartment of		
	Transportation (NH DOT). This pu	ublic land crossing will req	uire	a license from the NH PUC for the util	ity rights to cross the		
	parcel.						
	The NH DOT describes this railroa	d as an active, year-round	l frei	ght line. NH DOT does not anticipate	any negative impact from		
Comments	the proposed NPT project, notes	a positive relationship wit	h Eve	ersource maintenance practices, and	nas no concerns with the		
	relocation of the existing Eversou	rce circuit within the ROV	٧.				
	NH DOT does not foresee any neg	gative impacts of this proj	ect o	n the rights to the public in using this	land. The NH DOT does		
	not foresee any negative impact t	NH DOT does not foresee any negative impacts of this project on the rights to the public in using this land. The NH DOT does not foresee any negative impact to the NH Central Rail-Dalton Branch related to the proposed NPT project.					
Conclusions		•		es the proposed license petitioned fo	•		
	without substantially affecting the	e public rights in these pu	blic l	ands, nor will the proposed crossing	substantially affect the		
	fuctional use and safety in these p	oublic lands.					
	· · · ·	•		pany provide sufficient support show	•		
	or exceeds the requirements of the	ne 2012 National Electric S	Safet	y Code (NESC) C2-2012, consistent wi	th Puc 306.01(b)(1).		
	That the Commission grant the list	conce to construct mainta	in a	nd operate the electric and communic	ation lines over and		
	across the public land identified in	•	ıııı di	ia operate the electric and communit	ation inies over allu		
Staff Recommendation	across the public land identified if	n are pennon.					
Stan Recommendation							
	The license for this public land cro	ossing is contingent upon	the N	Northern Pass Project receiving a Cert	ificate of Site and Facility		
	from the SEC.	is continuent about					
Staff Reccommended							
Conditions applied to							
License							

Table A.1.8b.1 Appendix A

Public Water/Land Crossing Name: Johns River, Dalton, NH for NPT

General Information			Technical Information	
PUC Docket Number		DE 15-460	Voltage	320 kV, DC
PUC Zone		1	Circuit	3720/3731
PUC Map Number		8	Conductor Type	AAAC
Petitioner (NPT, ESE)		NPT	Code Name	None
Petitioner Line List # (for P	arcels traversed)	2825, 2826	Conductor Size	2933 kcmil
Crossing Circuit Configurat	'	Overhead	Stranding	91
Public Crossing Type (Wate		Water	Conductor Horizontal Separation	28
	cense Issued by PUC (Yes/No)	No	Conductor Vertical Separation	NA
Relocated ESE Crossing (Ye	es/No/NA)	NA	Cable Weight (Lbs/Ft)	2.769
Right of Way Width		150	Back Pole Number	DC-621
Number of Circuits within	ROW	1 new (DC), 1 existing	Back Structure Height	100
Foreign Utilities within RO	W	None	Back Ground Elevation (Ft)	905.95
Total Structures/Poles/Ma	nholes this circuit crossing	2	Back Conductor Height	75.5
First Structure Identification		DC-622A	Back Conductor Elev. at Pole	981.45
State Listed Public Waters	(Yes/No/Not Applicable)	Yes	Forward Pole Number	DC-622
Last Structure Identificatio		DC-621	Forward Structure Height	110
PUC Approximate Length of	of crossing for License (Land only)		Forward Ground Elevation	868.75
Does Not apply to Water	, ,,	Not Applicable	Forward Conductor Height	56
1 1 pp / 10 11 2001	•		Forward Conductor Elev. at Pole	924.75
			Span (Feet)	700.57
			Max Tension NESC Heavy lbs.	20,000
			Max Operating Temp (°F)	130
			Calc'd Horiz.Tension@MaxTemp	100
			Calc'd. Clearance (SAG 10)	52
			Clearance Shown on Profile	51
			Req'd Clearance (NESC)	35.7
			ned a clearance (NESC)	33.7
Crossing Comments, Conc	Johns River is used recreationally			
Comments	In order to determine the minimu elevations that are based on infor year flood elevation for this portion The design incorporates NESC min	Im NESC clearance above to rmation contained in flood on of the river. nimum required clearance	he water, the engineering design incorpoi insurance rate maps provided by FEMA. a above the water for these open supply co requirement (7.19 feet) brings the minim	The design uses the 100- inductors, using 100-year
Conclusions	crossing substantially affect the fu	uctional use and safety in t		
	The the proposed design for this overhead crossing across public waters meets or exceeds NESC requirements for the expected recreational use by the public.			
Staff Recommendation	That the Commission grant the lic across the public waters identified	•	n and operate the electric and communic	ation lines over and
Staff Reccommended	The license for this public water c Facility from the SEC.	rossing is contingent upon	the Northern Pass Project receiving a Cer	tificate of Site and
Conditions applied to License				

Table A.1.8b.2 Appendix A

Public Water/Land Crossing Name: Johns River, Dalton, NH for ESE

General Information			Technical Information	
PUC Docket Number		DE 15-462	Voltage	34.5 kV, AC
PUC Zone		1	Circuit	348X
PUC Map Number		8	Conductor Type	ACSR
Petitioner (NPT, ESE)		ESE	Code Name	Penguin
Petitioner Line List # (for F	Parcels traversed)	2825, 2826	Conductor Size	4/0 AWG
Crossing Circuit Configura	tion	Overhead	Stranding	6/1
Public Crossing Type (Wat		Water	Conductor Horizontal Separation	5
	icense Issued by PUC (Yes/No)	No	Conductor Vertical Separation	1.5
Relocated ESE Crossing (Y	<u> </u>	Yes	Cable Weight (Lbs/Ft)	0.2911
Right of Way Width	, -,	150	Back Pole Number	348X-16
Number of Circuits within	ROW	1 new (DC), 1 existing	Back Structure Height	43
Foreign Utilities within RO	DW	None	Back Ground Elevation (Ft)	869.62
	anholes this circuit crossing	2	Back Conductor Height	35.5
First Structure Identification		348X-13	Back Conductor Elev. at Pole	905.12
State Listed Public Waters		Yes	Forward Pole Number	348X-17
Last Structure Identification		348X-17	Forward Structure Height	43
	of crossing for License (Land only)	3 10X 17	Forward Ground Elevation	869.52
Does Not apply to Water	• , , , , , , , , , , , , , , , , , , ,	Not Applicable	Forward Conductor Height	35.5
LDGC3 NOT apply to water	or nanj		Forward Conductor Fley, at Pole	905.02
			Span (Feet)	213.33
			Max Tension NESC Heavy lbs.	3,000
			Max Operating Temp (°F)	120
			Calc'd Horiz.Tension@MaxTemp	529
			Calc'd. Clearance (SAG 10)	31
			Clearance Shown on Profile	30
			Req'd Clearance (NESC)	25.5
Crossing Comments, Cond	clusions, Conditions, and Staff Rec	ommendation		
Conclusions	elevations that are based on infor year flood elevation for this porti The design incorporates NESC min (25.5 feet). In this configuration,	rmation contained in flood on of the river. nimum required clearance the neutral wires are locat	the water, the engineering design incorport insurance rate maps provided by FEMA. above the water for the neutral wires, used approximately 6 feet below the phase fect the public rights in these waters, nor	The design uses the 100- sing 100-year flood data e conductors.
Conclusions	crossing substantially affect the fo	uctional use and safety in t	hese public waters.	
	The the proposed design for this expected recreational use by the		public waters meets or exceeds NESC requ	uirements for the
Staff Recommendation	That the Commission grant the license to construct, maintain and operate the electric and communication lines over and across the public waters identified in the petition. Staff reccommends ESE submit a petition for Johns River in Dalton for the Q195 and X178 115 kV circuits			
Staff Reccommended Conditions applied to	The license for this public water of Facility from the SEC.	rossing is contingent upor	the Northern Pass Project receiving a Ce	rtificate of Site and
License				