Appendix C
I-135N – Ashuelot River, Surry, NH

1. As currently constructed, this line crosses over the Ashuelot River in a cross country location approximately ½ mile north of the Ashuelot River Inlet to Surry Mountain Lake. The location of the existing crossing of the Ashuelot River and the proposed construction is shown on attached location map, marked as Exhibit 1-3.

2. In order to accommodate the reconductoring, the existing 4/0 conductors in the current crossing of the I135N Line, a 115 kV circuit, will be replaced with new 795 kcmil ACSR conductors, and the existing 7/16 inch high strength galvanized steel shieldwire will be replaced with a new shieldwire containing fiber optics (OPGW), equivalent to 3/8 inch extra high strength galvanized steel. The existing steel lattice towers will be reused.

3. The design and proposed construction of the crossing is shown on the attached New England Power Company Plan and Profile Drawing entitled "Plan Showing Location of I135N Transmission Line Over and Across Ashuelot River, Surry, New Hampshire", marked as Exhibit 1-3.

4. The required technical information provided in this petition is based on the 2007 National Electrical Safety Code (NESC) C2-2007.

5. The proposed crossing occurs between two existing lattice towers, located approximately 897 feet apart. The tower on the north side of the Ashuelot River, Tower 64-1, is a 70-foot high suspension tower, Type H-70. The tower on the south side of the river, Tower 65-1, is a 46-foot high deadend tower, Type M-46. The three phase wires will be 795 kcmil ACSR, 26/7, and the shieldwire will be OPGW, equivalent to 3/8 inch extra high strength galvanized steel.

   The three new phase conductors and the new shieldwire will be located at the same elevation on the towers, but will have different sags and greater clearances over the river than the existing 4/0 conductors. A copy of suspension tower and deadend tower, Types H-70 and M-46, respectively, is attached, marked as Exhibit 2-3.

   Both the phase wire and the shieldwire will be sagged using the NESC Heavy Loading condition (0°F, 4 pounds wind, ½" radial ice). The phase wires will be sagged using a maximum tension of 8,500 pounds. The shieldwire will be sagged using a maximum tension of 4,500 pounds.

6. Flood water elevations for the Ashuelot River, located north of the north end of Surry Mountain Lake, are controlled by the operating practices of the Corps of

Engineers, because the Ashuelot River becomes part on the impoundment behind the Surrey Mountain Dam during flood events. See Exhibit 1-3.

Flood water elevations for the impoundment were based on information from the US Army Corps of Engineers stationed at Surry Mountain Lake, Town of Surry, New Hampshire. The Design-HighWater elevation for the impoundment at this location is 560 feet based on the National Geodetic Vertical Datum of 1929 (NGVD 29) construed from the Relocation Agreement with the US Army Corps of Engineers. To reach Elevation 560, a 70-year frequency storm reaching Elevation 550 feet would need to be sequentially followed by a 500-year frequency storm.

7. The nature of the water surface underneath the conductors crossing the Ashuelot River is not suitable for sailboating. See Site Review of the Connecticut River Crossing, the Cold River Crossing, and the Ashuelot River Crossing; Identification of Clearance Issues, Dated September, 2008, Prepared by Vanderweil Engineers.

The applicable vertical clearance is found in NESC Table 232-1, Row 6.

8. Using the above design criteria, and the maximum sags of the phase wire and the shieldwire, the minimum clearance for the crossing over the impoundment have been determined and designed as follows:

Condition	Maximum Sag under this condition	Minimum clearance to Land	Minimum clearance to the Design High-Water
	Feet	Feet	Feet
A. NESC Heavy, Phase Wires	26.6	38.1	21.5
B. Minus 20° F, Phase Wires	23.1	39.8	25.0
C. 105° F, Phase Wires	27.5	37.2	19.5
D. 284° F, Phase Wires	31.5	34.8	14.6*
E. NESC Heavy, Shieldwire	23.5	50.0	37.2
F Minus 20° F, Shieldwire	14.9	53.4	44.3
G. 105° F, Shieldwire	19.9	50.6	38.4

* At water Elevation 556, the clearance is 18.6 feet

H. Minimum Clearance, Phase Wires

Maximum Operating Condition at 284 ° F (Item D above) results in minimum clearance
Minimum Clearance to land under those conditions is 34.8 feet, next to Tower 65-1

- Required minimum clearance to land based on NESC Table 232-1.2 is 20.1 feet

Minimum Clearance to the Design-High Water level under those conditions is 14.6 feet

- Required minimum clearance to water surface based on NESC Table 232-1.6 is 18.6 feet

The crossing clearances as proposed

- Do not meet the NESC Requirements at Design-High Water
- NEP undertakes to maintain 18.6 feet of clearance up to Elevation 560

- This will be accomplished by initiating Operating Restrictions between Elevation 556 (clearance of 18.6) and Elevation 560 to provide the necessary 18.6 feet of clearance
- A specific protocol to accomplish this will be in place prior to reconductoring the associated span.

I. Minimum Clearance, Shieldwire

Maximum Temperature Condition at 105° F (Item G above) results in minimum clearance
Minimum Clearance to land under those conditions is 50.5, next to Tower 65-1

- Required minimum clearance to land based on NESC Table 232-1.2 is 15.5 feet

Minimum Clearance to the Design High-Water Elevation is 48.4 feet

- Required minimum clearance to water surface based on NESC Table 232-1.6 is 14.0 feet

The crossing clearances as proposed exceeds the NESC Requirements

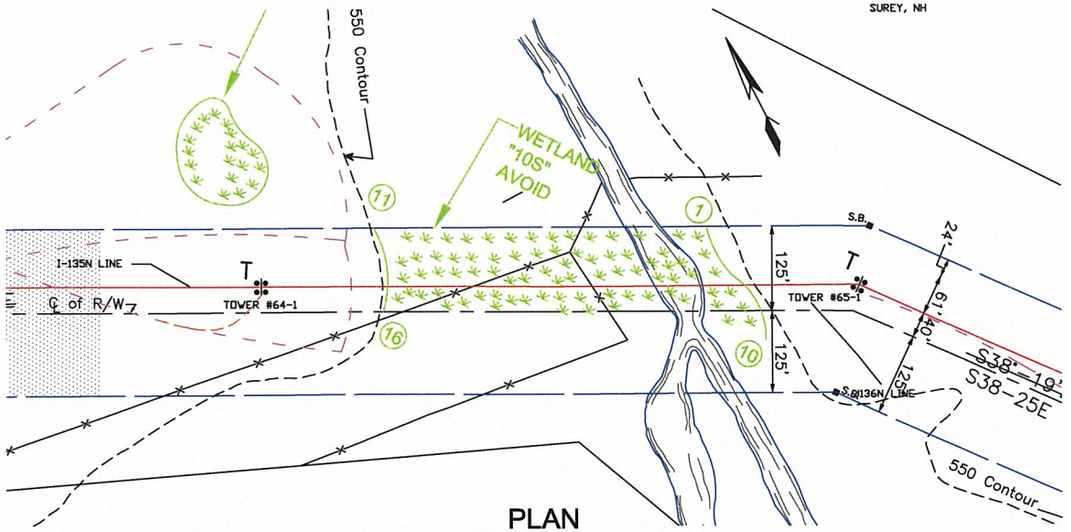
J. Minimum Shieldwire to Phase Wire Clearance

	Shieldwire Sag, feet	Conductor Sag, feet	Minimum separation between shieldwire and conductor
1	30 °F, ½" ice – 22.0	30 °F, Bare – 25.5	9.9 feet, next to Tower 65
2	NESC Heavy – 23.5	NESC Heavy – 26.6	9.9 feet, next to Tower 65
3	30 °F, 3/4" ice, 4 psf wind – 24.0	30 °F, Bare – 25.5	9.3 feet, 75' from Tower 65

The minimum separations are based on the output of PLS-CADD, which searched for the minimum distance between the shieldwire and conductor along the entire span for conditions 1, 2, and 3.
Condition 3 results in the minimum clearance between these wires
Minimum Clearance shieldwire to phase under those conditions is 9.3 feet

- Required minimum clearance shieldwire to phase based on NESC Table 235-6, Section 2 is 4.8 feet

The shieldwire to phase wire clearances as proposed exceeds the NESC Requirements

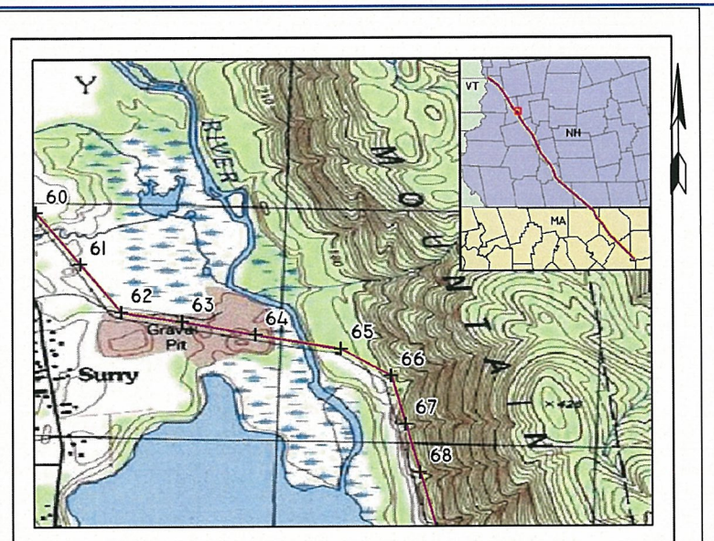


PLAN

SCALE: 1"=200'

SCALE OF FEET

200 100 0 200

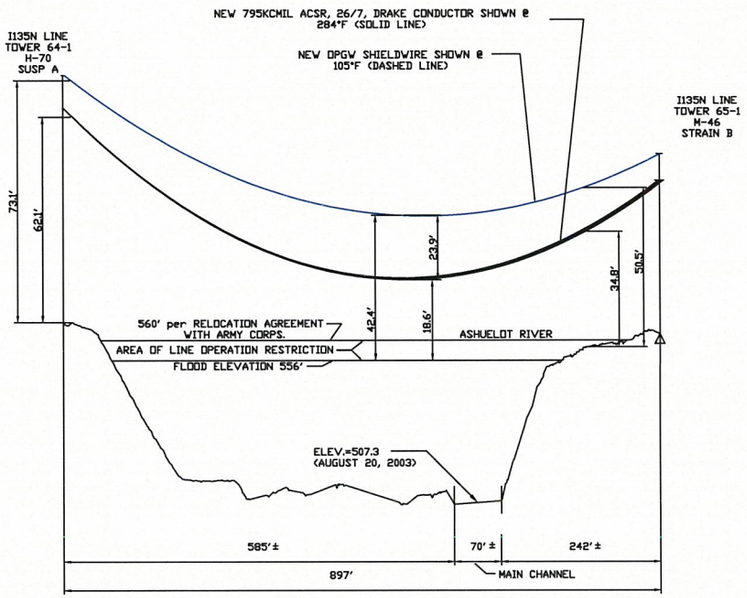


KEY MAP

MAP SOURCE - USGS TOPOGRAPHIC IMAGE

SCALE - 1:24,000

0 0.125 0.25 0.5 0.75 1 MILES



PROFILE

HORIZONTAL:1"=200'

VERTICAL:1"=40'

PHOTO

RIVER UNDER I135N & J136N LINES

LEGEND

Tower Location

Existing Conductor to be Replaced

EXHIBIT 1-3

New England Power Company
Plan Showing Location of
I-135N Transmission Line
Over and Across
Ashuelot River
Surry, New Hampshire

Scale: As Shown Date: February 2009

115KV LINE
LINE CROSSING OF ASHUELOT RIVER
IN SURRY, NH
PLAN & PROFILE
SCALE : 1:50

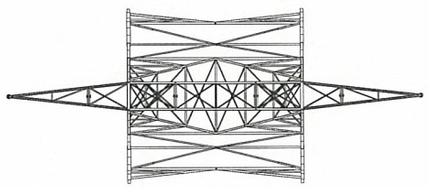
ORIGINAL NAME DATE
DRAWN BY 3/25/08
CHKD BY
NSPTD BY
APPR BY

REV 1 2 3 4 5 6 7
DATE
REVISION DESCRIPTION
DRWN CHKD APPVD
REVISION

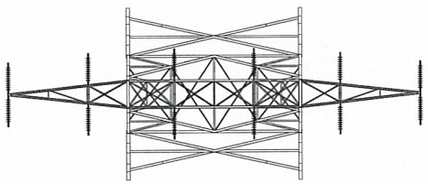
nationalgrid

INCHES ON ORIGINAL

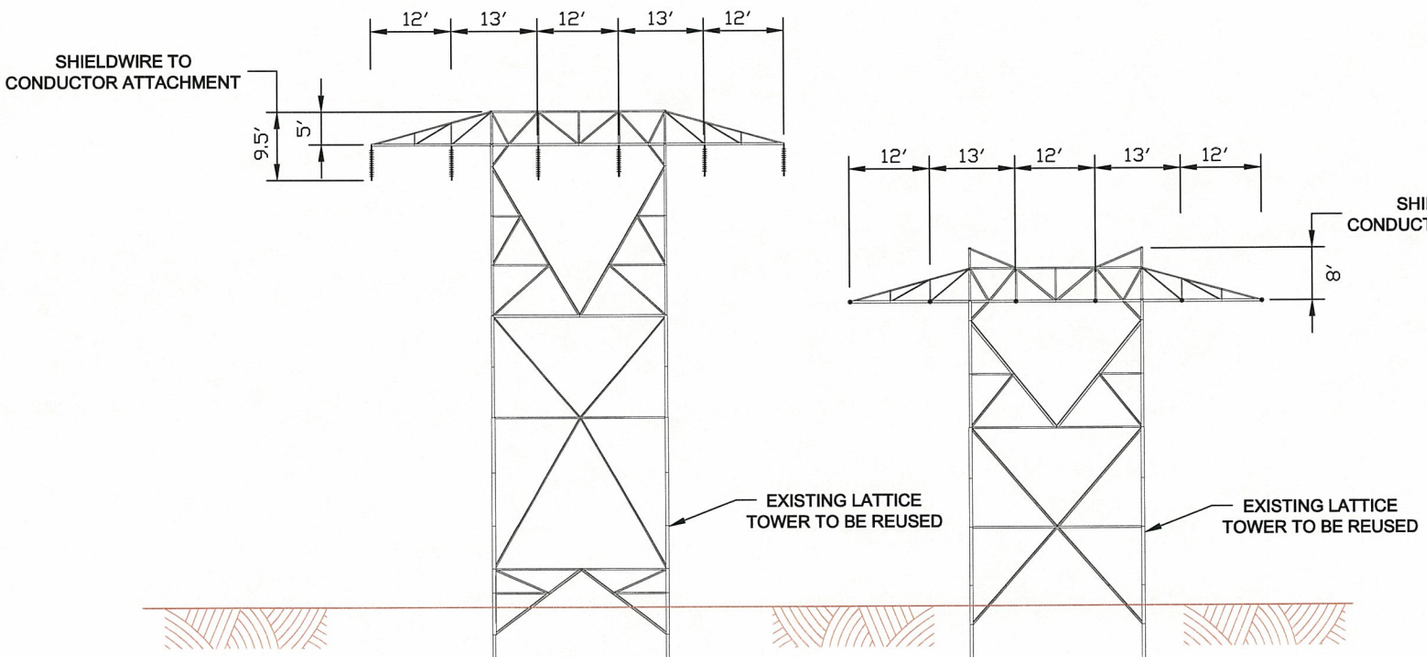
INCHES ON ORIGINAL



TYPE H-70
SUSPENSION



TYPE M-46
STRAIN



ELEVATION
SCALE:1"=20'

ELEVATION
SCALE:1"=20'

EXHIBIT 2-3

New England Power Company
Tower Types H-70 & M-46
I135N Transmission Line
Over and Across the
Ashuelot River
Surry, New Hampshire

Scale: As Shown Date: October 2008

INCHES ON ORIGINAL

REV	DATE	REVISION DESCRIPTION	DRWN	CHKD	APPVD
1					
2					
3					
4					
5					
6					

nationalgrid

ORIGINAL	NAME	DATE
DRAWN BY		1/7/07
CHKD BY		
RSPD BY		
APPRV BY		

115KV LINE
LINE CROSSING OF COLD RIVER
IN SURRY, NH
DEADEND & SUSPENSION TOWER
SCALE : As Shown

INCHES ON ORIGINAL

INCHES ON ORIGINAL