

Eversource Laminated Structure Replacement Projects

Planning Advisory Committee Meeting

December, 2017

Agenda

- Project Scope Summary
- Project Background and Drivers
 - Reliability and Safety
- Scope Details
 - Line Characteristics, Asset Condition
- Summary and Conclusions

Project Driver -Reliability and Safety

- Structure Inspections have identified asset conditions (degradation of structures and/or components) that necessitated repair or replacement to ensure safety of line workers and public.
- Laminated Arm Failures
 - 1675 – October 10, 2013
 - 1835 – July 14, 2015
 - 1620/1975 #1 – March 25, 2016
 - 1620/1975 #2 – July 11, 2016
 - 1211 – September, 2016
- In many cases during arm repair, significant pole column rot/degradation was noted.

Structure Condition

- Recent projects (structure and arm replacements) have revealed additional concerns over integrity of poles (rot, woodpecker damage, pole top rot).
- In the Eversource system, failures of aged laminate wood arms have been recognized as a significant threat to system reliability. The integrity of the laminated wood cannot be measured by conventional visual inspection and the remaining strength cannot be estimated because most of the wood is rotting from within or under mounting brackets: not visible during an aerial or ground inspection.
- Industry Survey reveals other U.S. utilities have experienced similar issues.

Condition Summary Davit Arm Deterioration



1211/1161 Line “close call” – Sept. 2016



Engineering Analysis

- Full extent of rot/degradation cannot be readily or reliably measured
- Immediate and proactive measures have been taken to repair and avoid abrupt failures. However, given the age and extent of degradation of the structures, the next location or time of failure is unpredictable.
 - For these types of structures, replacing based on structure condition at specific locations (based on visual inspections) is insufficient.
 - This, coupled with associated project costs for contractor mobilization, permitting, customer impact, etc., makes it more cost effective to include a broader scope of adjacent structures.
- These structures are at the end of their useful life and are in critical need of replacement. This approach provides a more dependable, long-lasting solution to avoid unexpected outages and ensure safety.

Typical Wood Degradation

(ground line or aerial inspections will miss extent of internal deterioration)



Schedule

- Eversource is proposing a multi-year program to replace the 1970s Laminated Wood Structures.
- Anticipated completion date for all lines is December 2020.

Summary and Conclusions

Summary of Project Costs

Primary Circuit	Other Circuit	Original Install	Total Structures on Line	Replacements Required	Estimate (\$M)
1505	1607	1973	337	213	\$52.50
1675	1080	1972	76	74	\$17.80
1921	-	1971	54	52	\$10.80
1512	-	1972	218	88	\$14.50
1211	1161	1972	87	53	\$12.50
TOTALS				480	\$108.10

- Structures to be replaced with tubular steel pole structures
- Replacement schedules to be determined – anticipated ISD for completion of all lines is December 2020.
- All estimated costs are (-25%/+50%)

Questions



Appendix – Line Characteristics

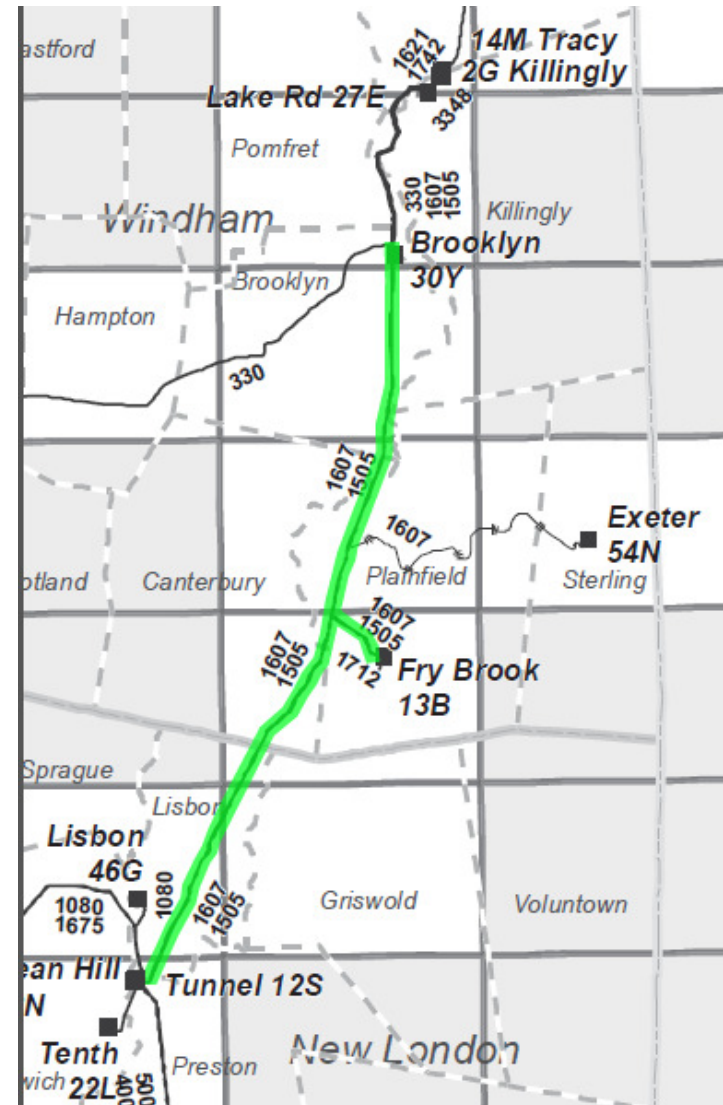
- 1505 / 1607 Line
- 1675 / 1080 Line
- 1921 Line
- 1512 Line
- 1211 / 1161 Line

Line Characteristics-1505/1607

- Line 1505/1607 are 115-kV circuits with multiple terminals that mainly runs from Tunnel 12S to Plainfield Jct. to Killingly 2G and Plainfield Jct. to Frybrook 13B.
- The Laminate section is 21.8 miles long, has 213 structures in scope, and was placed in service in 1973.
- The majority of structures are Double Circuit Laminated Wood Poles with Laminated Wood Arms.
 - Note: The section of line from Brooklyn 30Y to Killingly 2G is separated onto respective Single Circuit Wood H-frames
- The conductor is 1272 kcmil ACSR, and the shield wire is 3/8” Alumoweld.

1505/1607 Line Tunnel 12S to Frybrook 13B to Brooklyn 30Y

- Replace all wood structures
- Re-use existing conductor and shield wire
- Majority of structures to be replaced with Direct Embedded Engineered Steel Poles and Light Duty Tubular Steel Poles
- Cost = \$52.5 Million



Condition Summary Davit Arm Deterioration



Condition Summary

Pole Deterioration

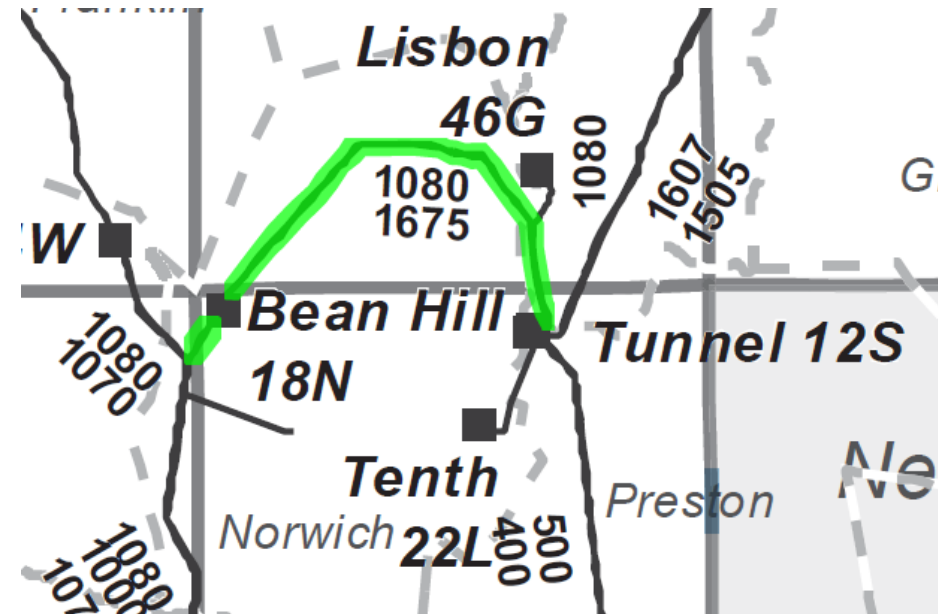


Line Characteristics-1675/1080

- Line 1675/1080 are 115-kV circuits with multiple terminals including a Laminate section from Wawecus Jct. (Norwich, CT) to Tunnel 12S (Preston, CT).
- The Laminate section is 7.62 miles long, has 74 structures in scope, and was placed in service in 1972.
- The majority of structures are Double Circuit Laminated Wood Poles with Laminated Wood Arms.
- The conductor is 1272 kcmil ACSR, and the shield wire is 3/8" Alumoweld.
- Will be coordinated with a separate project to pull OPGW in this section.

1675/1080 Wawecus Jct. to Bean Hill 18N to Tunnel 12S

- Replace all wood structures
- Re-use existing Conductor and Shield Wire/OPGW
- Majority of structures to be replaced with Direct Embedded Engineered Steel Poles and Light Duty Tubular Steel Poles.
- Cost = \$17.8 Million



Condition Summary

Davit Arm Deterioration



Condition Summary

Pole Deterioration

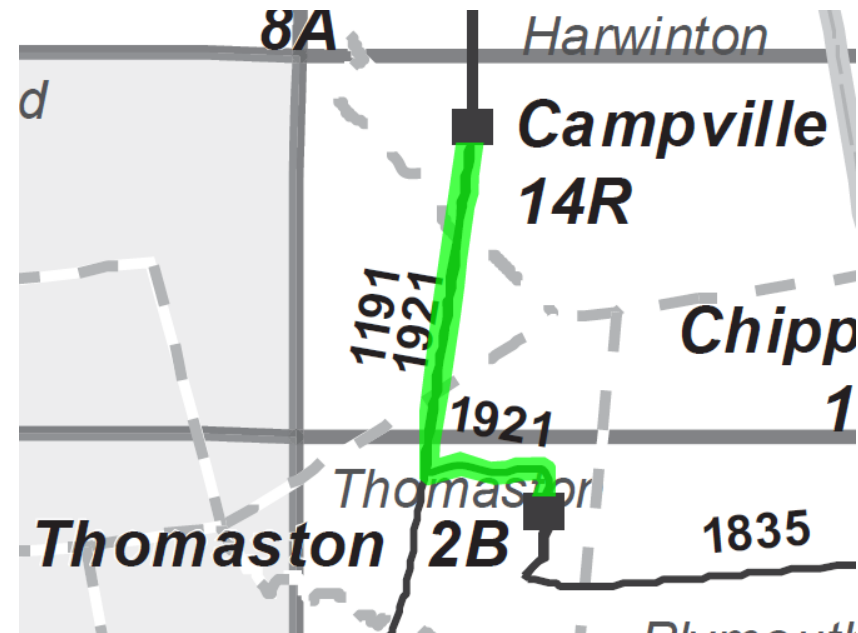


Line Characteristics- 1921

- Line 1921 is 115-kV circuit that runs between Campville 14R (Harwington, CT) to Thomaston 2B (Thomaston, CT)
- It is 5.67 miles long, has 52 structures in scope, and was placed in service in 1971.
- The majority of structures are Single Circuit Wood Pole with Laminated Wood Arms.
- The conductor is 795 kcmil ACSR, and the shield wire is Optical Ground Wire

1921 Campville 14R to Walnut Hill Jct. to Thomaston 2B

- Replace all wood structures
- Re-use existing Conductor and Shield Wire
- Majority of structures to be replaced with Direct Embedded Light Duty Tubular Steel Poles.
- Cost = \$10.9 Million



Condition Summary

Davit Arm Deterioration



Condition Summary

Pole Deterioration

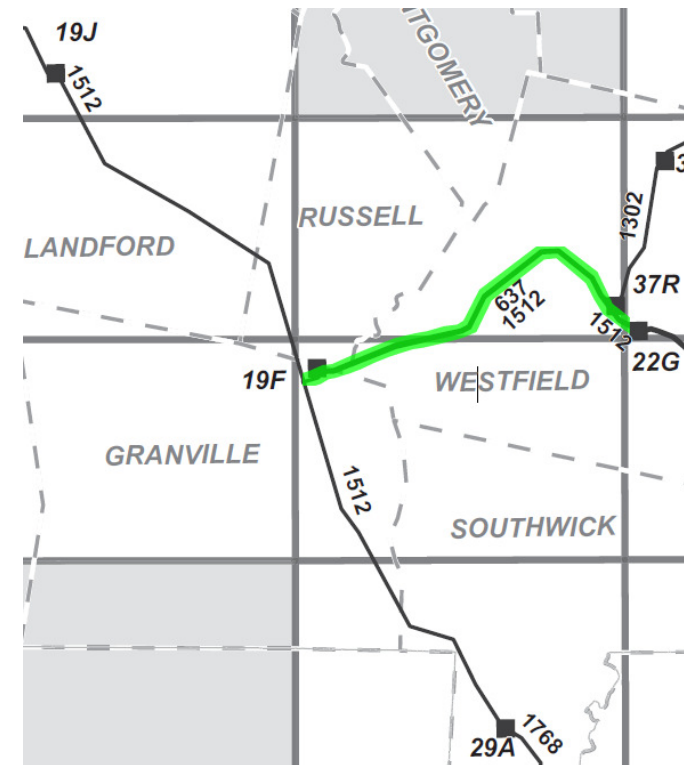


Line Characteristics- 1512

- Line 1512 is 115-kV three-terminal circuit that runs between Blandford 19J, Southwick 29A, Elm 22G.
- The laminate section is 8.1 miles long from Elm 22G (Westfield, MA) to Granville Jct. (Granville, MA), has 88 structures in scope, and was placed in service in 1972.
- The majority of structures are Single Circuit Wood Poles with Laminated Wood Arms.
- The conductor is 556 kcmil ACSR, and the shield wire is 3/8" Alumoweld.

1512 Elm 22G to Granville Jct.

- Replace all wood structures
- Re-use existing Conductor and Shield Wire
- Majority of structures to be replaced with Direct Embedded Light Duty Tubular Steel Poles.
- Cost = \$14.5 Million



Condition Summary Davit Arm Deterioration



Condition Summary

Pole Deterioration

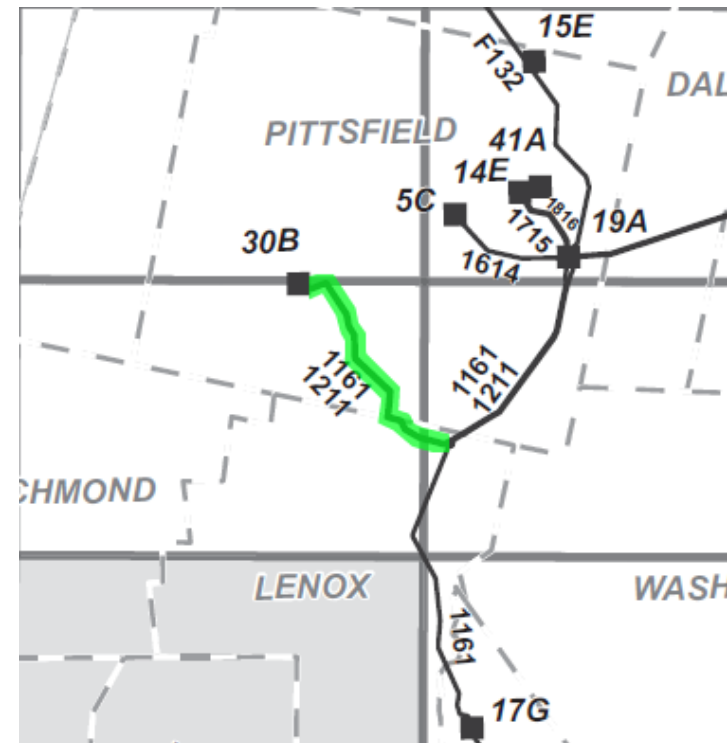


Line Characteristics-1211/1161

- Line 1211/1161 are 115-kV circuits that run between Oswald 30B, Doreen 19A, & Woodland 17G
- The Laminate section is 4.1 miles long from Oswald 30B (Pittsfield, MA) to Oswald Jct. (Lenox, MA), has 53 structures in scope, and was placed in service in 1972.
- The majority of structures are Double Circuit Laminated Wood Poles with Laminated Wood Arms.
- The conductor is 1272 kcmil ACSR, and the shield wire is Optical Ground Wire

1211/1161 Oswald 30B to Oswald Jct.

- Replace all wood structures
- Re-use existing Conductor and Shield Wire
- Majority of structures to be replaced with Direct Embedded Engineered Steel Poles and Light Duty Tubular Steel Poles.
- Cost = \$12.5 Million



Condition Summary Davit Arm Deterioration



Condition Summary

Pole Deterioration

