

Eversource 115-kV Structure Replacement Projects

Planning Advisory Committee Meeting

October 17, 2018

Agenda

- Project Scope Summary
 - Transmission Inventory Data
- Project Background and Drivers
 - Inspections, Criteria, Results
- Scope Summary
 - Lines, Structures
- Conclusions

Project Scope Summary

- Eversource Manages ~4,000 Circuit Miles of Transmission Voltage OH lines, including ~3400 structure miles
 - Nearly 40% of all transmission in New England
 - Eversource maintains over 20,000 115-kV structures
- Wood poles are showing significant signs of age-related degradation and a program is underway to address those structures on our transmission system
- This presentation covers the 2018-2019 replacement program for Eversource 115-kV, wood transmission poles requiring replacement due to degradation.
 - Larger single projects that involve larger scope or replacement of conductor or lattice towers will be brought to PAC on an individual basis.
 - The 345-kV structures program was previously presented for 2017-2018

Project Scope Summary

Eversource Transmission System Inventory

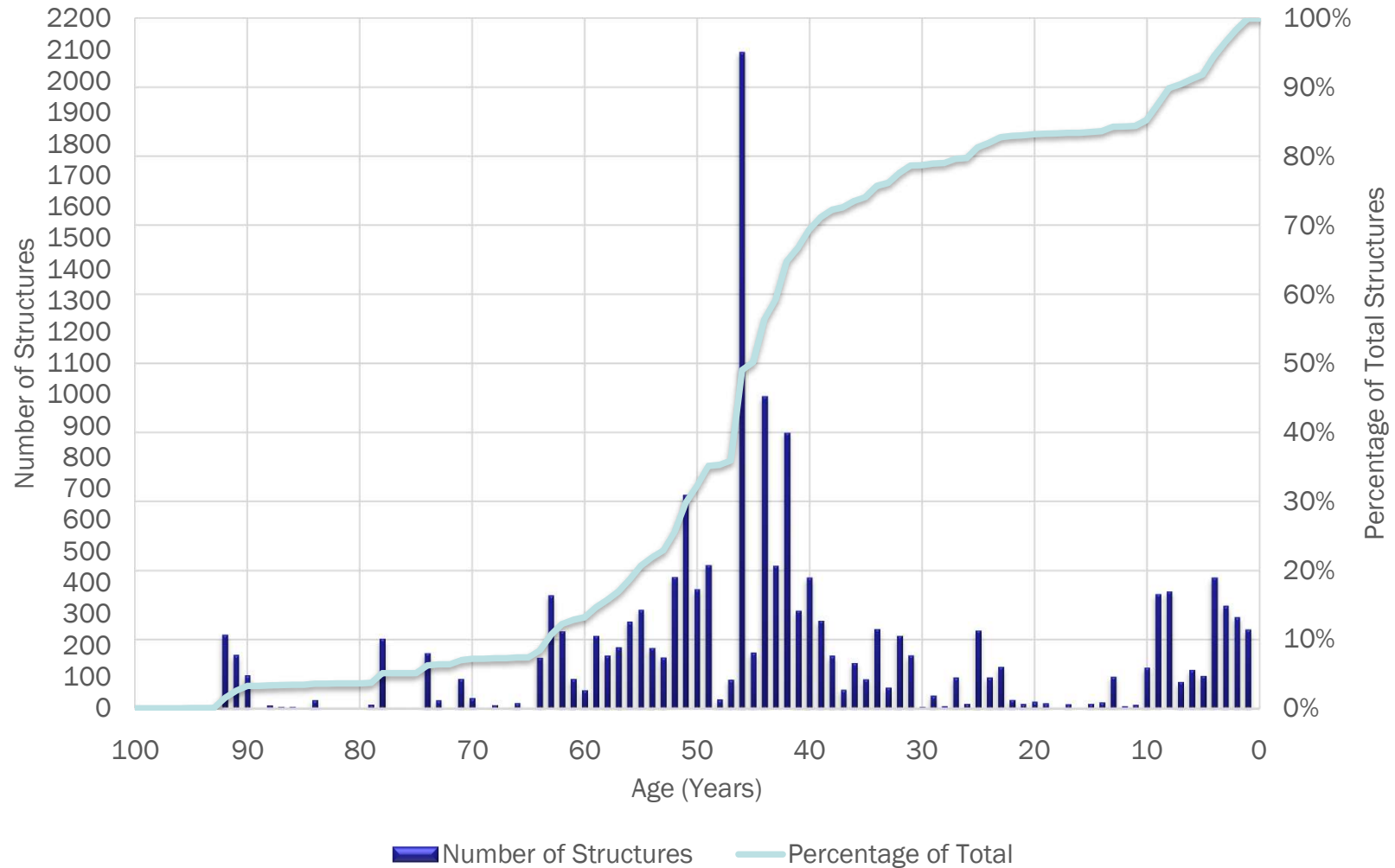
Transmission Line kV	ES Total Structure Miles	CT Structure Miles	WMA Structure Miles	EMA Structure Miles	NH Structure Miles
345	1086	492	129	202	263
230	28	0	0	19	9
115	2203	779	237	416	771
69	72	66	6	0	0
Totals by Company	3,389	1,337	372	637	1,043

Includes wood and steel structures

Totals are Structure miles, not circuit miles

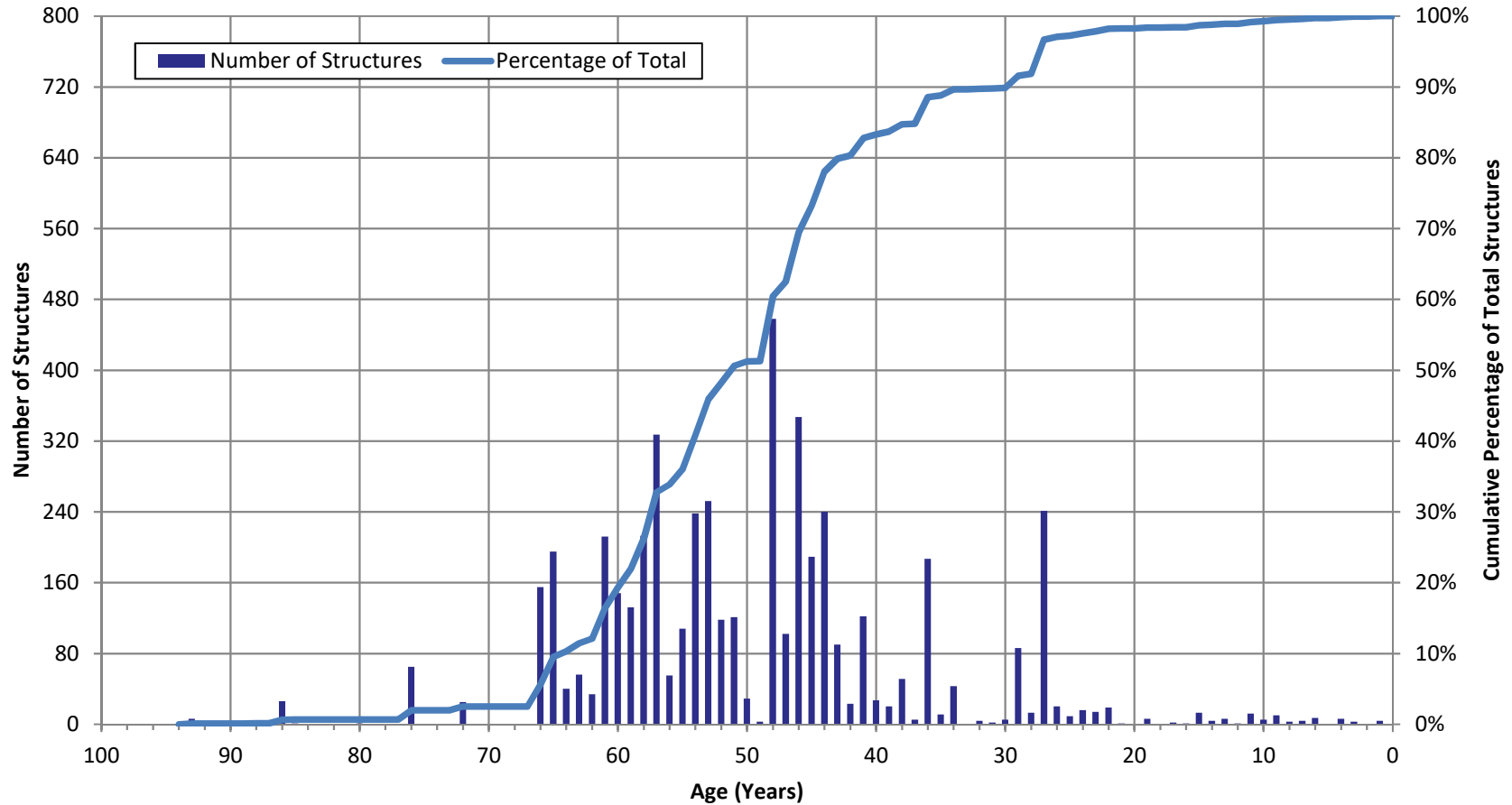
Project Scope Summary

Age of Structures (total 115-kV str) – CT/WMA

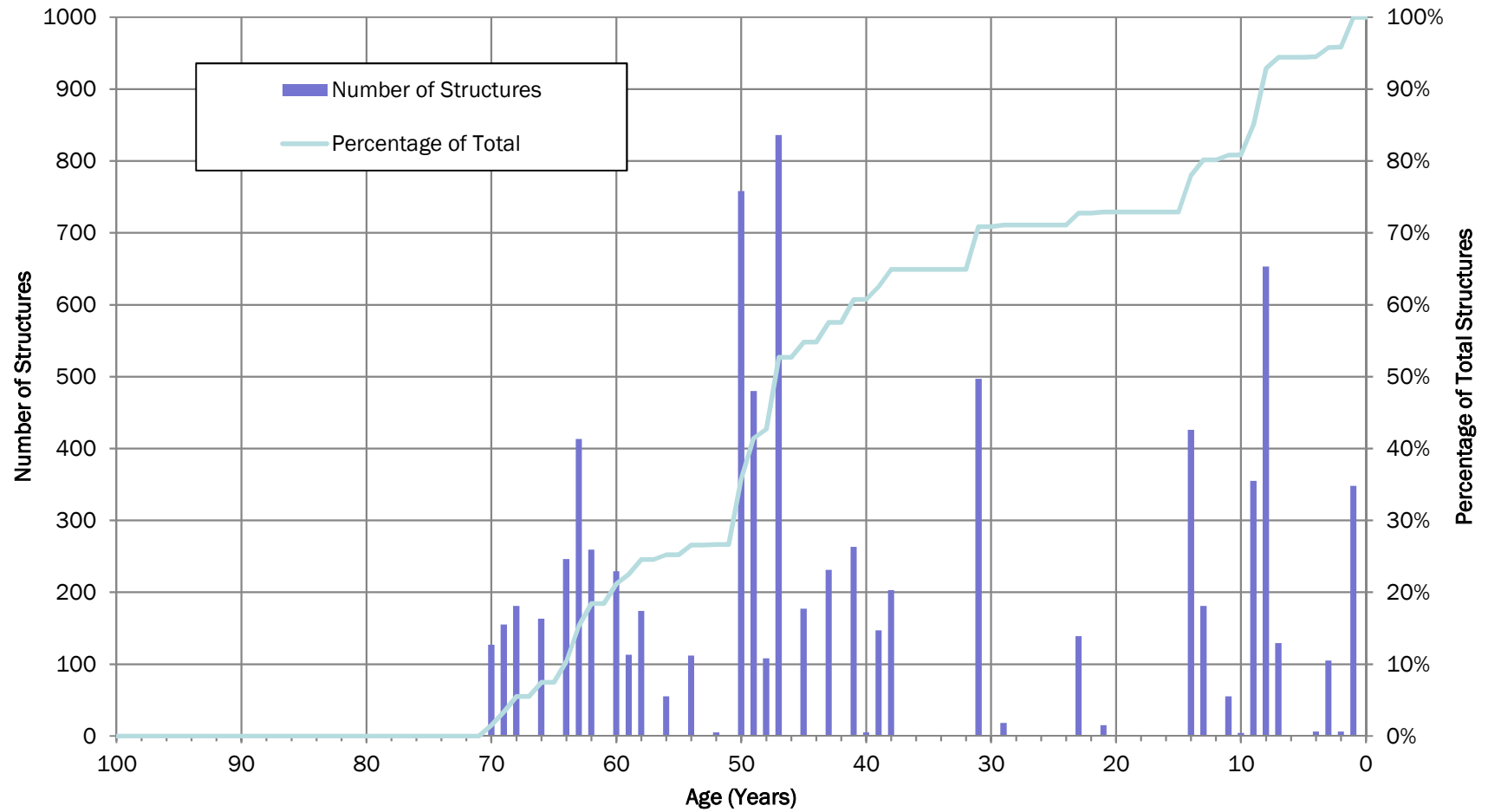


Project Scope Summary

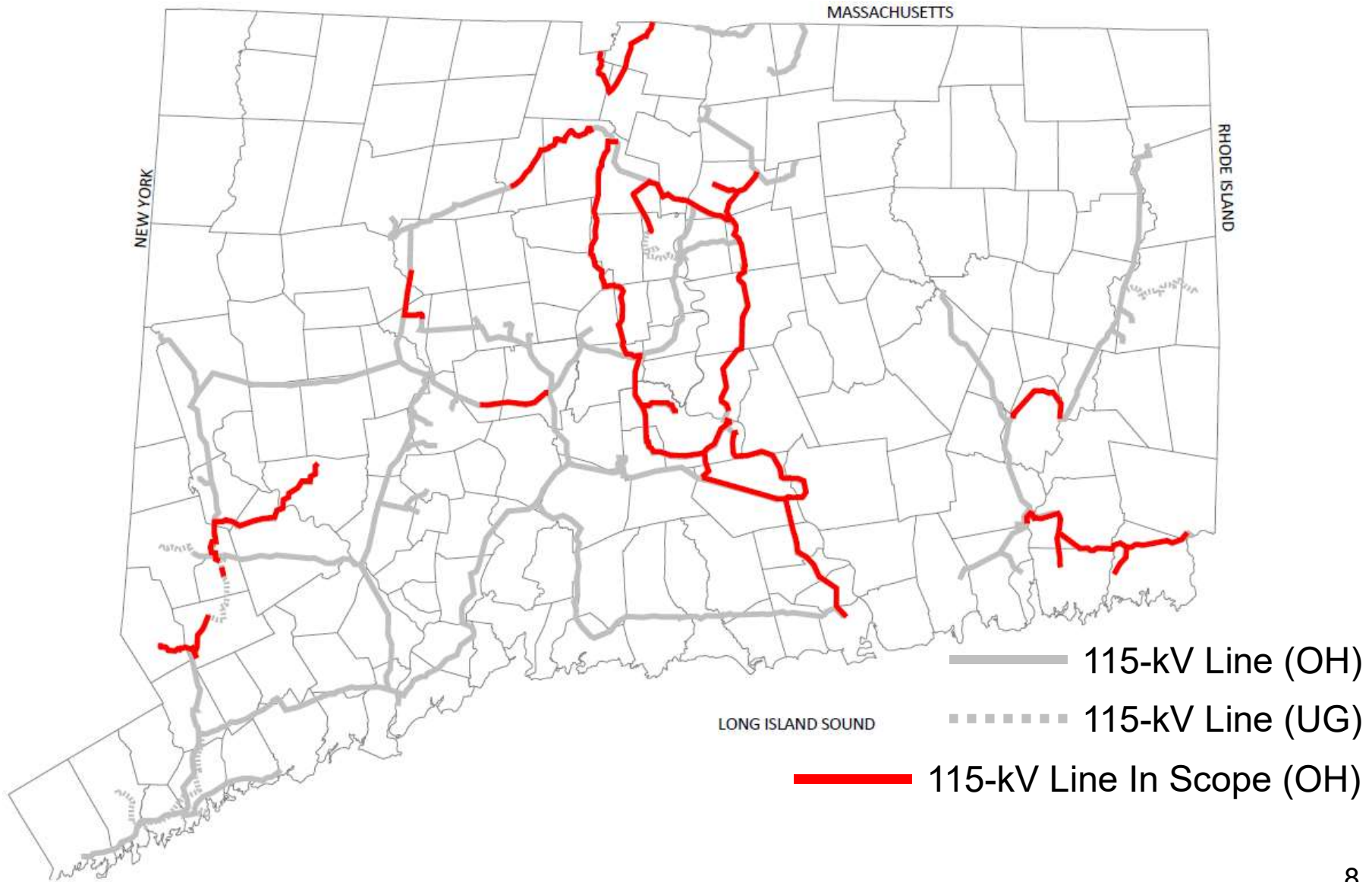
Age of CT/WMA 115kV Wood Structures



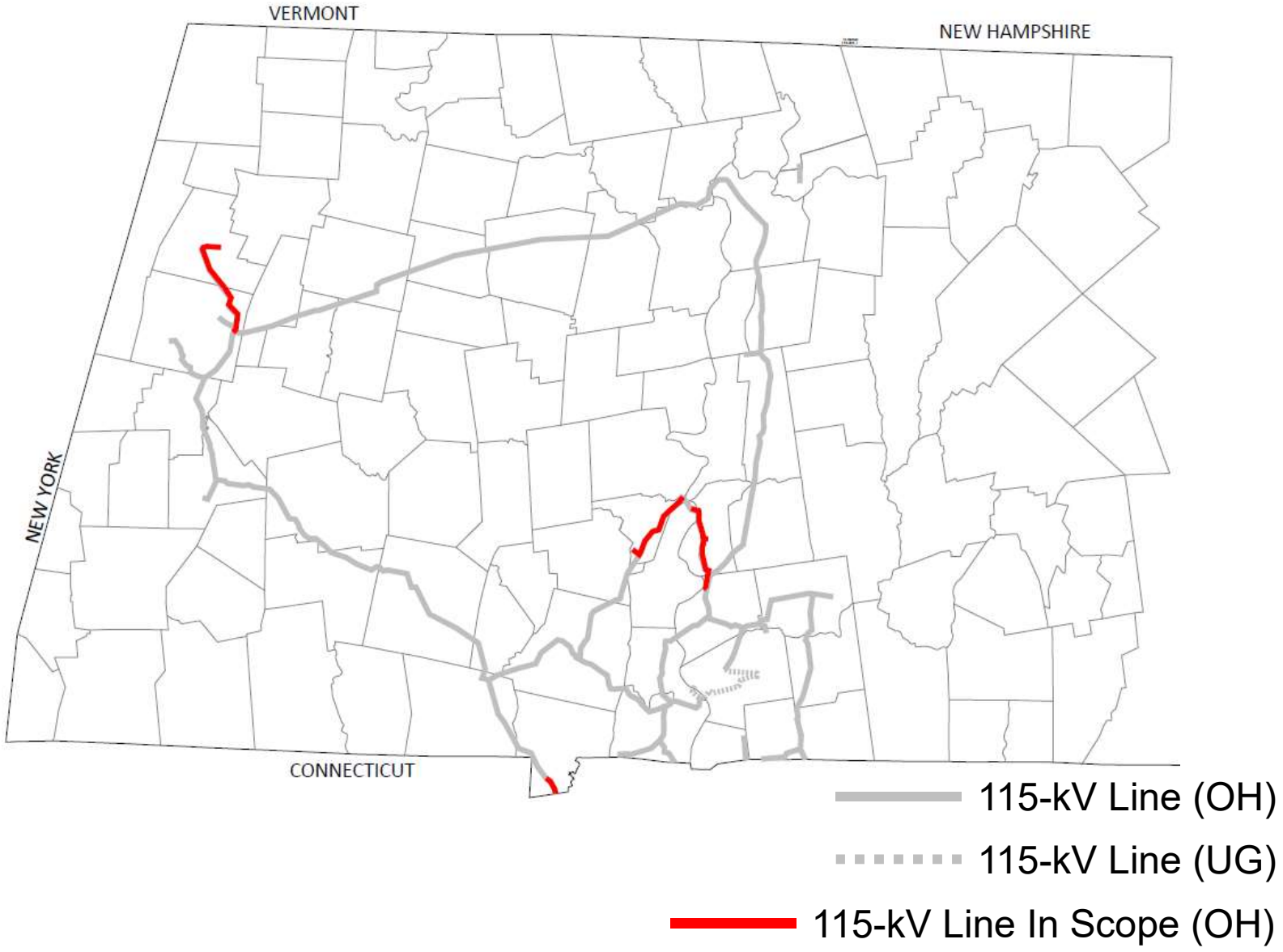
Age of All NH Structures



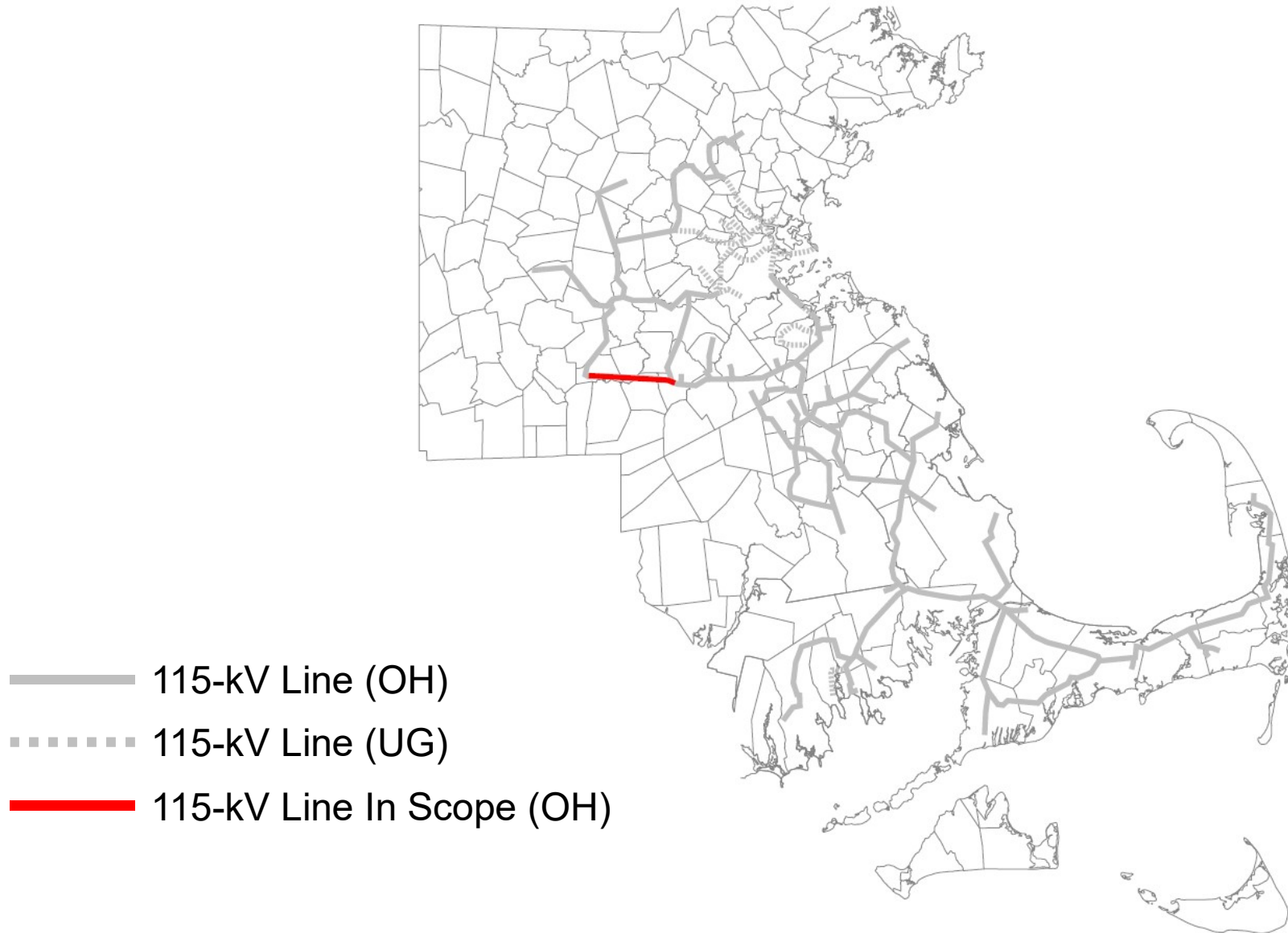
CT 115-kV Geographic Locations



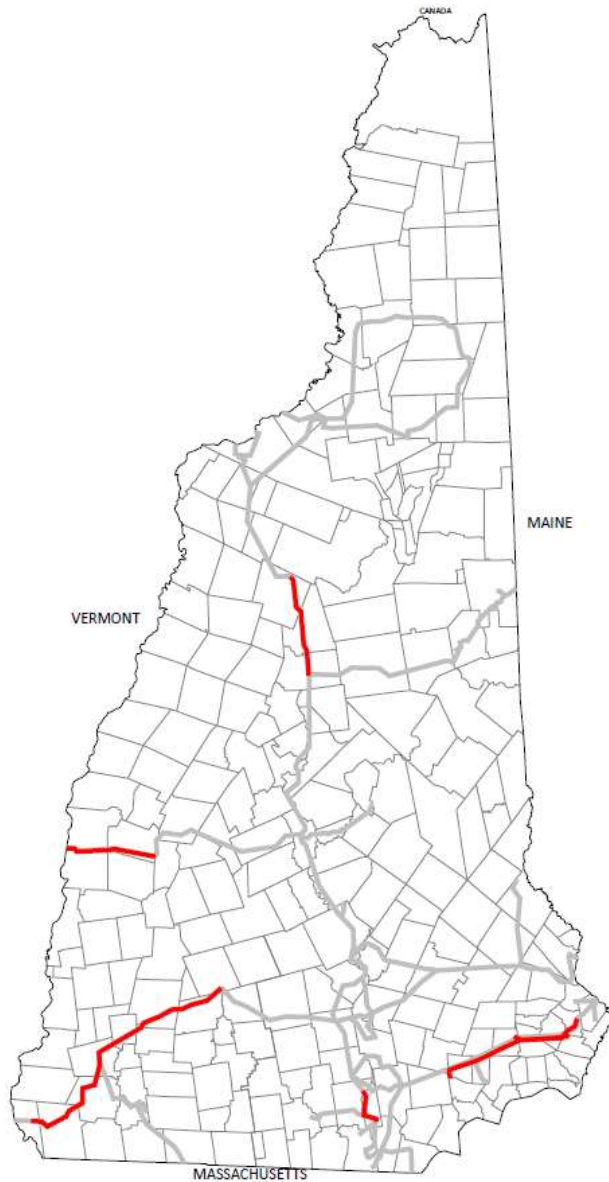
WMA 115-kV Geographic Locations



EMA 115-kV Geographic Locations



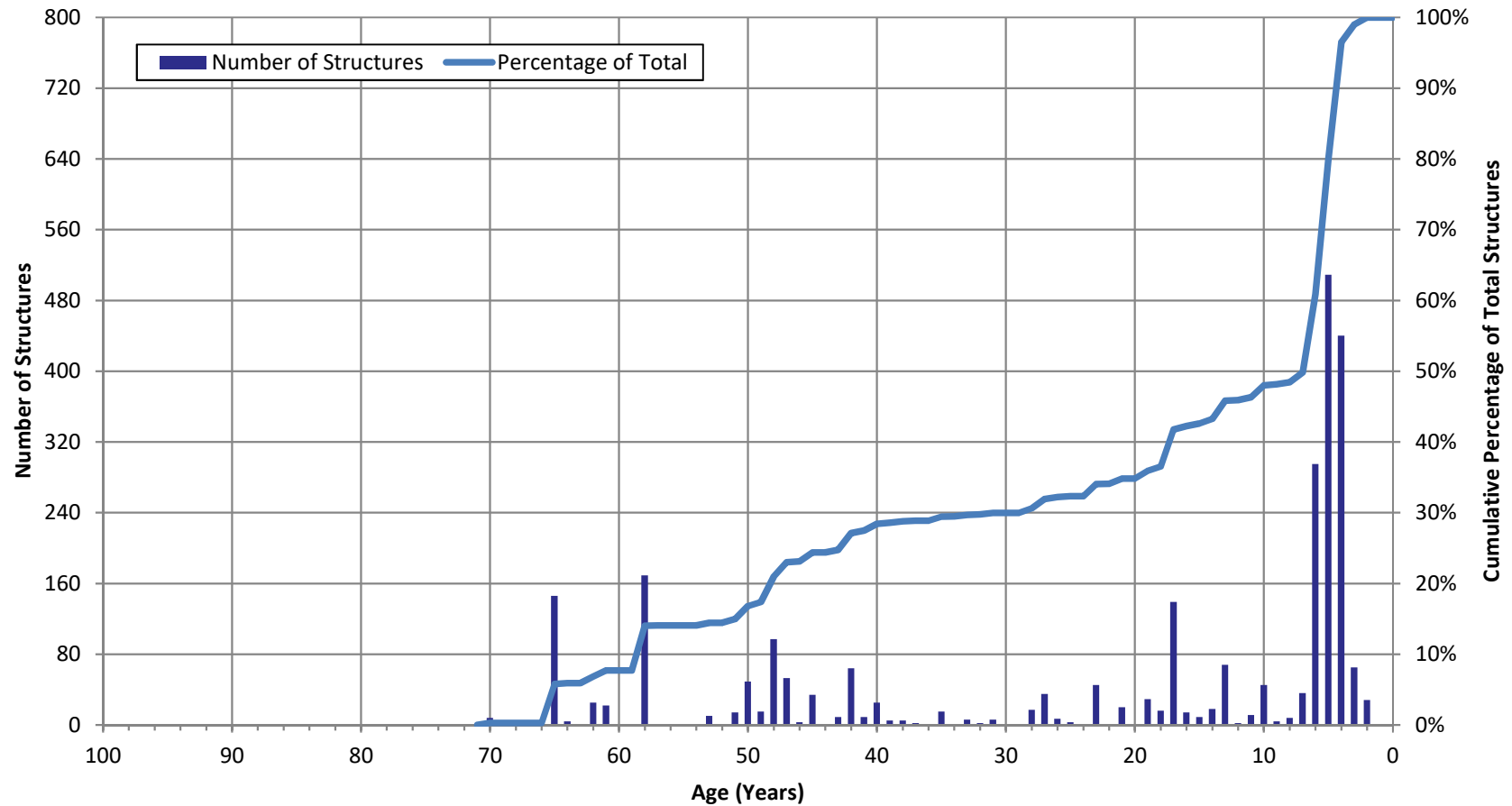
NH 115-kV Geographic Locations



- 115-kV Line (OH)
- 115-kV Line In Scope (OH)

Project Scope Summary

Age of EMA 115kV Wood Structures



Structure Inspections

- Foot Patrol –
 - Line crews walk/drive line to observe general condition of structures (ground level up) and general condition of ROW (access, vegetation, encroachments)
- Structure Ground Line –
 - Specialized crews excavate at each structure (~18”) to determine subsurface integrity of pole and apply treatment as necessary
- High Resolution Aerial –
 - Entire system flown, and with detail hover review at most structures, accompanied by high-resolution photos
- Thermography -
 - Infra-red camera (typically on helicopter) observes line for hot-spots
- Comprehensive Drone - Started in 2017
 - Combines foot and High Res Aerial. Plan to inspect whole system in 3 years
- Items Reviewed - Wood Structures
 - Significant Woodpecker Damage
 - Severe Checking/Splits/Cracking
 - Insect Damage
 - Structure with Rot or Decay
 - Severe Fracturing, Buckling, Leaning
 - Compression Breaks
 - Fire Damage
 - Damage / Vandalism
 - Hardware / Insulator damage

Structure Inspections

- Structures are Graded in Accordance with EPRI Guidelines
 - A: Nominal Defect - No action required.
 - B: Minimal Defect - Monitor degradation
 - C: Moderate Defect - Repair or replace under next maintenance.
 - D: Severe Defect - Repair, reinforce, or replace immediately
- Replace C and D structures in one mobilization
 - Other structures (A/B) may be replaced during scope in order to minimize costs and impacts to environment.
 - For example, where significant effort associated with access road construction is required for C/D structures, other adjacent structures of similar age may be replaced during the same construction effort
- Engineering provides training to inspectors on appropriate grading criteria - Field Inspectors provide structure grade while in field, and observe entire structure. Results reviewed by team
- New Structures are typically Light-Duty Steel (wood pole equivalent std) /Direct Embed poles, and comply with most recent strength and clearance requirements

Pole Degradation – Woodpeckers/Age



CT – 1726 Line Str. # 8056:



MA – 65-508 Line



MA – 1768 Line Str. # 18107:

Pole Degradation – Woodpeckers/Age

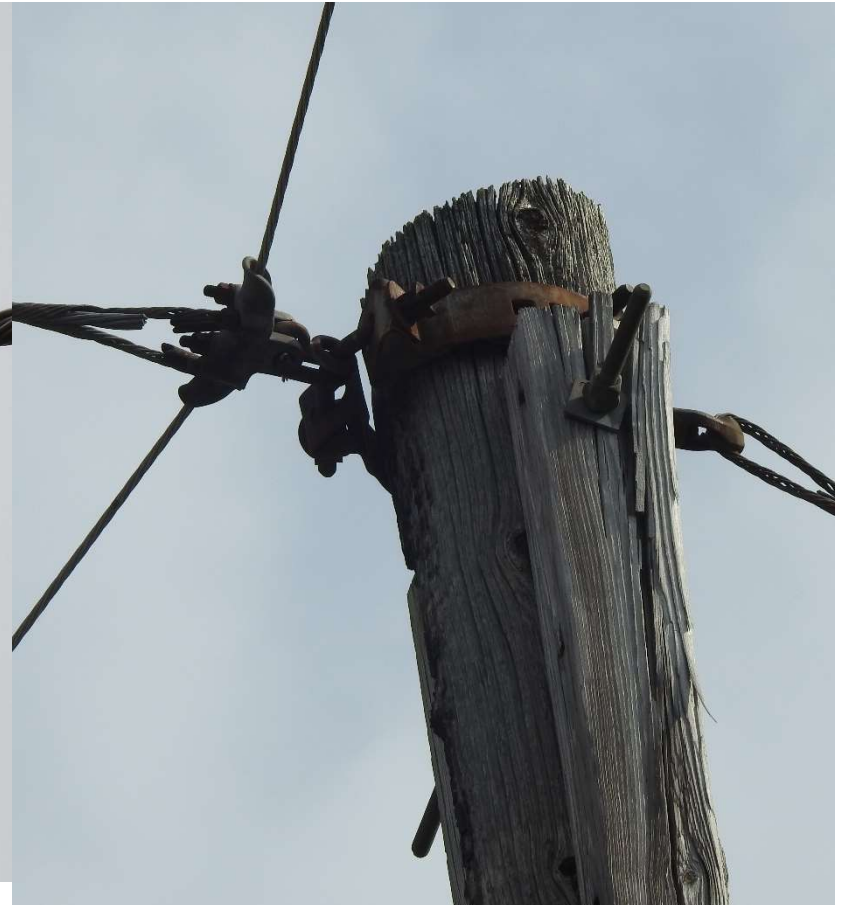


NH K174 – Str 182

Pole Top Rot



CT 1448 Line Str 10130



CT 1769 Line Str 16022

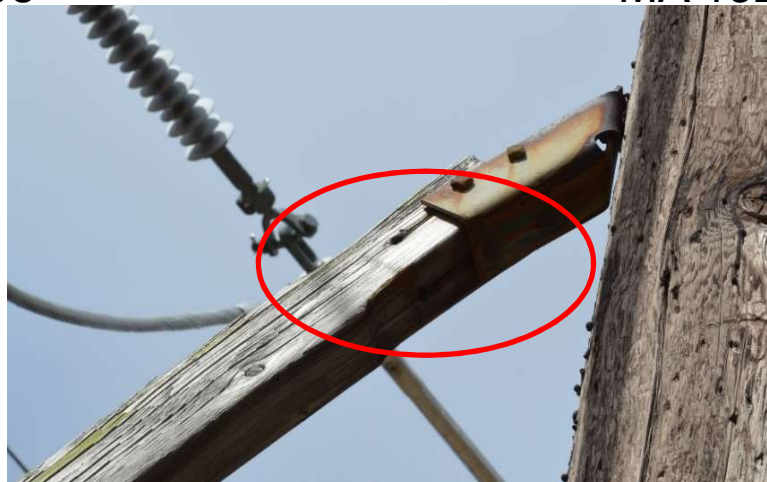
Damaged Structural Members



MA F132 – Str 15008



MA 1327 Line – Str 18006



MA 65-508 Line: Brace failure

115-kV Lines Summary - CT

Line	Proposed Replace (2018-2019)	Est. Replace Cost (\$M)		Line	Proposed Replace (2018-2019)	Est. Replace Cost (\$M)
1050	27	\$7.3		1751	50	\$12.5
1191	33	\$8.3		1756	28	\$7.0
1256	54	\$12.2		1759	29	\$7.3
1261	81	\$18.3		1765	46	\$12.3
1280	30	\$7.5		1766	23	\$5.8
1310	29	\$8.3		1767	24	\$5.4
1410	23	\$5.8		1769	35	\$8.2
1448	26	\$6.9		1770	65	\$16.3
1565	38	\$11.5		1772	39	\$10.0
1620	41	\$10.0		1783	35	\$8.2
1635	18	\$5.7		1785	38	\$9.0
1675	29	\$7.3		1768-CT	21	\$5.2
1726	62	\$16.3		1910	23	\$5.8
1465	28	\$7.0				
				CT Total	975	\$245.4

- Wood structures typically replaced with light-duty, wood pole equivalent steel
- Replacement schedules to be determined – anticipated ISD for completion of all lines is December 2019
- All estimated costs are (-25%/+50%)

115-kV Lines Summary – MA, NH

Line	Proposed Replace (2018-2019)	Est. Replace Cost (\$M)		Line	Proposed Replace (2018-2019)	Est. Replace Cost (\$M)
65-508	102	\$19.5		A126	49	\$8.3
1327	22	\$7.8		H123	29	\$6.0
1428	44	\$12.1		H141	44	\$7.7
1447	24	\$6.6		K174	43	\$8.7
1962	54	\$20.3		L163	64	\$14.0
1768-MA	10	\$3.0		A152	29	\$6.1
F132	40	\$11.0		X178	56	\$11.2
MA Total	296	\$80.3		NH Total	314	\$62.0

- Wood structures typically replaced with light-duty, wood pole equivalent steel
- Replacement schedules to be determined – anticipated ISD for completion of all lines is December 2019
- All estimated costs are (-25%/+50%)

Conclusion

- Inspections have indicated significant degradation and decreased load carrying capacity of wood 115-kV structures. Replacing the structures resolves multiple structural/hardware issues and supports safe and reliable operation.
- Replace 1585 wood 115-kV structures with steel pole structures based on identified deficiencies found during inspections.
 - Hardware, insulators, and guys to be replaced with structures.
- All new structures will be designed to meet current design criteria

The current proposed scope for 115-kV structure replacement is estimated at \$387.6 M (-25%, +50%).

State	Proposed Replace (2018-2019)	Est. Replace Cost (\$M)
CT Total	975	\$245.4
MA Total	296	\$80.3
NH Total	314	\$62.0
Eversource Tot	1585	\$387.6