

Eversource Laminated Wood Structure Replacement Program Phase III

Planning Advisory Committee Meeting

June 15th, 2023

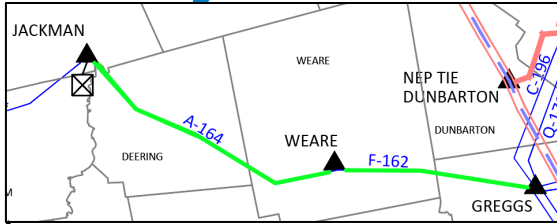
Agenda

- Project Background
- Project Locations
- Project Drivers
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 - Recent Structure Replacements
 - Optical Ground Wire
 - Other Structure Replacements
 - Pole Cracking
 - Other Asset Condition Issues
- Project Scope
 - Structure Replacements
 - Optical Ground Wire
- Summary

Project Background

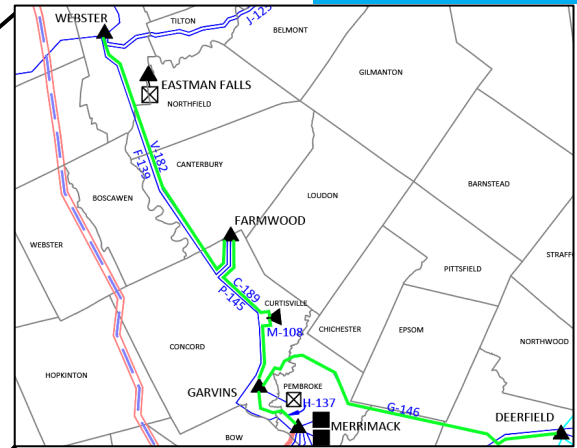
- Laminated wood structures are made with untreated southern yellow pine and placed into a pressurized tube to force chemical treatments into wood pores
 - This treatment only penetrates about $\frac{3}{4}$ " into the pole's surface
- In 2017, Eversource began replacing deteriorating laminated wood structures that were installed in the 1970s
- Recent structure replacements have revealed additional concerns about the integrity of laminated wood structures installed between 2000 and 2014
 - Poles are susceptible to cracking along their length and rot damage in locations where the surface pressure treatment of wood is penetrated
 - Cracks create points of entry for insects and water which causes the centers to become soft with rot
 - Insects and woodpeckers target rotten locations and cause further damage
- [Phase I](#) of the Laminated Wood Structure Replacement Program was presented in March 2021 for five 115 kV lines and [Phase II](#) was presented in October 2021 for five 115 kV lines and one 345 kV line
 - Most projects presented to date are located in NH

Project Locations

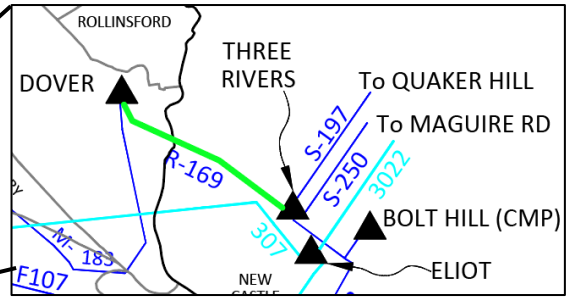


Lines A164 & F162

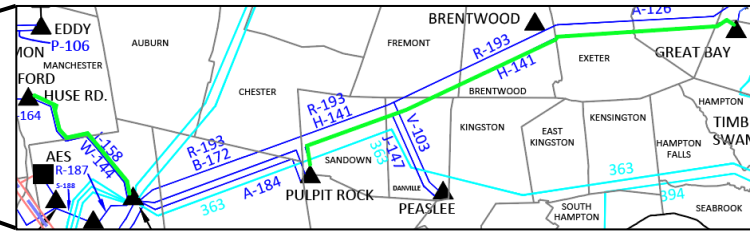
 Lines in scope



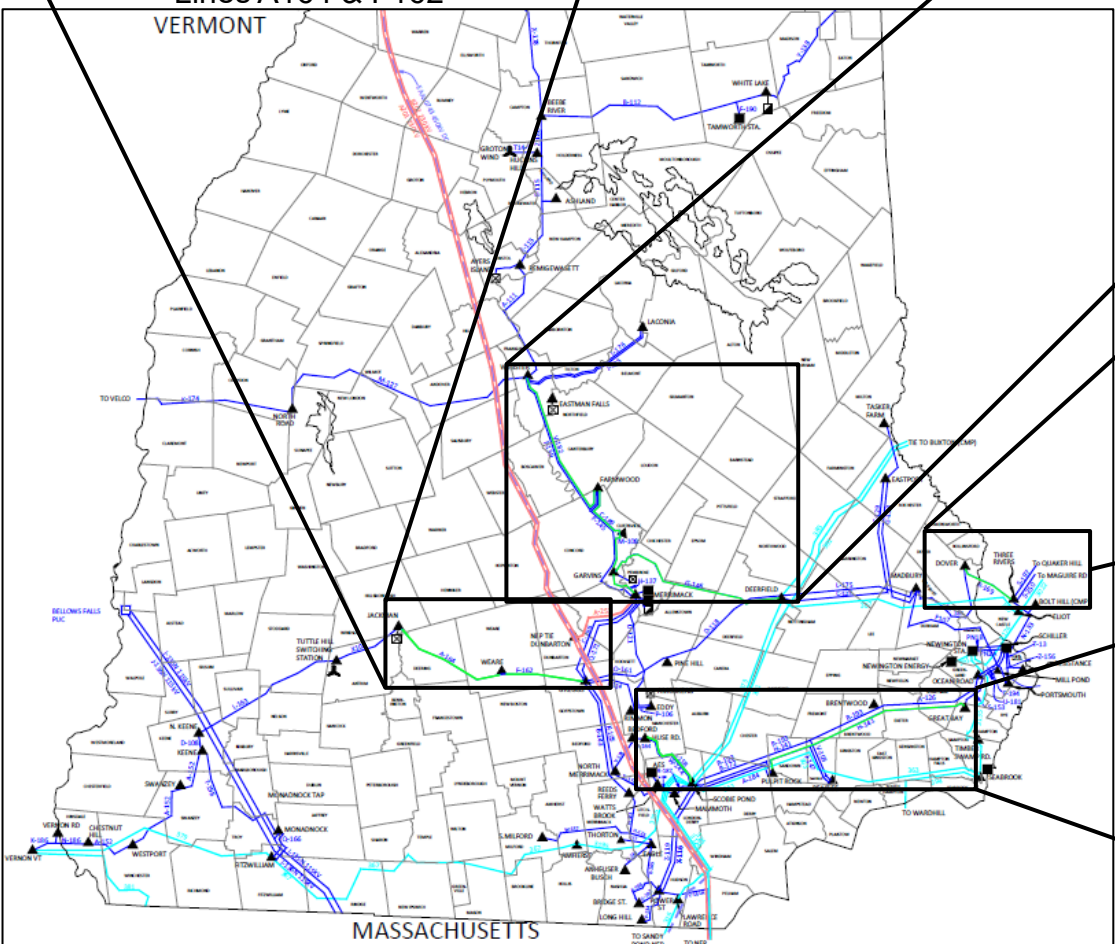
Lines V182, C189,
M108, H137, & G146



Line R169



Lines H141 & I158



Project Drivers – Inspection Results

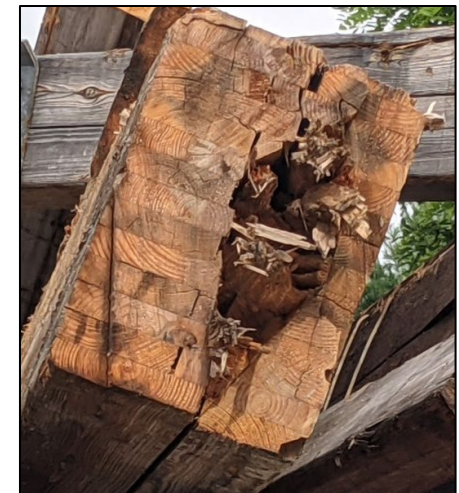
- Eversource periodically replaces structures as part of regular maintenance projects and system upgrades
- While Eversource typically uses Electric Power Research Institute (EPRI) Guidelines to grade structures and assess the need for replacements, EPRI does not have specific guidelines to assess the internal damage or rot during ground inspection
- Extent of internal damage did not become visible until structures' cross sections were examined after removal
 - Internal damage was not visible during aerial inspections
 - Woodpecker damage and pole-top cracks accelerated internal deterioration
- Integrity of laminated wood structures cannot be measured by conventional visual inspection
 - Most structures are rotting from within or under mounting brackets

Project Drivers – Recent Structure Replacements

- Cross-sectional inspections of recently-removed laminated wood structures have uncovered significant internal structural damage, including:
 - Rotting through the length of structures following the voids between joints
 - Open joints at the top of structures which allow for free entry of water
 - Damp wood at the center of structures soft with rot
 - Woodpecker damage and pole-top cracks that accelerated internal deterioration
 - Voids between layers that are not consistent in size or location throughout structures but present in each cross-sectional cut
 - Splitting behind surface cracks (2-4 layers in) throughout the length of the structure



Phase I: Line G128 internal rot & insect damage



Phase I: Line L175 internal rot & insect damage

Project Drivers – Optical Ground Wire

- OPGW will be installed on Lines A164, R169, F162, G146, and I158 in conjunction with structure replacements
- OPGW installation expands a private Eversource OPGW / Synchronous Optical Networking (SONET) loop
- Critical Infrastructure Protection: Fiber provides the necessary bandwidth for physical security monitoring and triaging of alarms for BES Cyber Systems at medium and low impact substations
- The DOE and EPRI recommend fiber as a means of strengthening the security and resilience of critical communication infrastructure to protect against the consequences of electromagnetic pulse attacks
- Fiber optic cable is a non-propagating media for electric and magnetic fields and therefore is generally immune to the effects of geomagnetic disturbances

Project Drivers – Other Structure Replacements

- Eversource completed inspections and graded the condition of all non-laminated wood structures 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*
- Grade C wood structures showed age-related degradations, leading to decreased load-carrying capability (weathered tops, top rot/erosion, large cracks, etc.)
- Additional grade B structures were identified for replacement based on:
 - Access and permitting efficiencies in affected rights-of-way to perform an expanded scope
 - Concerns associated with clearance and uplift
- Recent structure inspections identified a significant number of deficient natural wood structures on Line H141
- A limited number of natural wood structures will be replaced on other lines



*Line H141 Structure 290
Rusty insulator bells, large
hole and top rot*

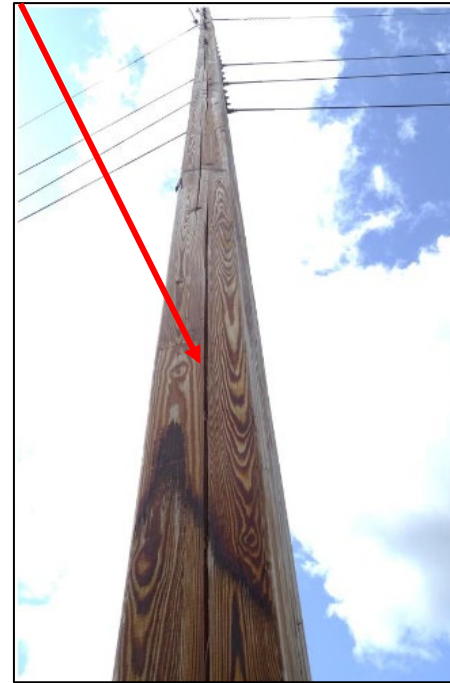
Project Drivers – Pole Cracking



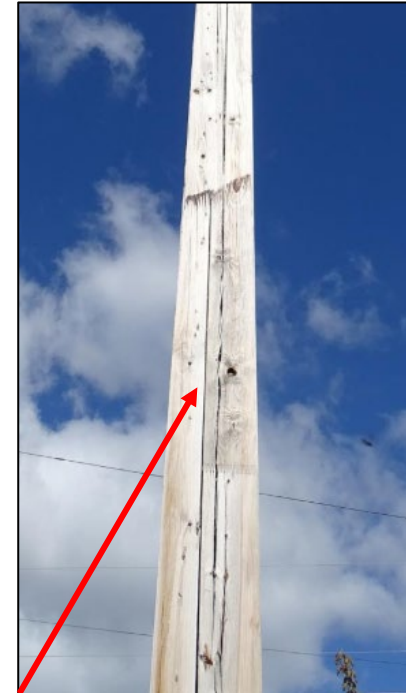
Line C189
Structure 67



Line V182
Structure 134



Line H137
Structure 28

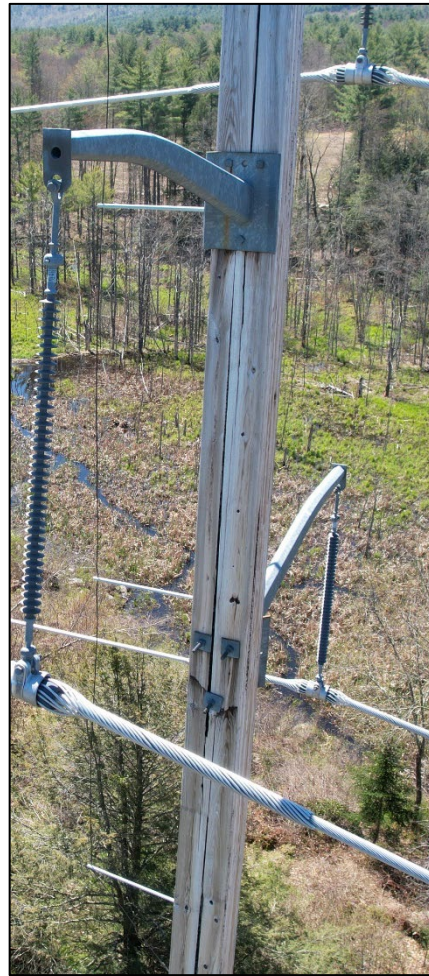


Line M108
Structure 6

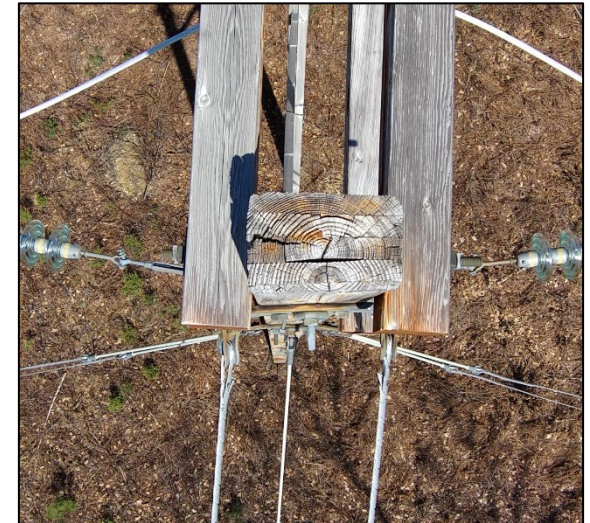
Project Drivers – Pole Cracking (Cont'd)



Line F162 Structure 17



Line F162 Structure 23



Line I158 Structure 40



Line F162 Structure 23

Project Drivers – Other Asset Condition Issues



Line I158 Structure 73: Leaning and Bowing



Line F162
Structure 18:
Delamination

Line H141 Structure
160: Shell Rot on
Pole Top Impacting
Shieldwire Bracket



Project Scope – Structure Replacements

Line	Length (Miles)	Replacement Natural Wood Structures	Replacement Laminated Wood Structures	Total Existing Structures	Estimated Cost (\$M) (-25% / +50%)	In-Service Date
C189	4.28	1	44	53	12.81	Q1 2024
H137	2.70	0	28	32	7.79	Q1 2024
M108	5.51	0	44*	64	13.40	Q1 2024
V182	14.45	2	145	162	32.92	Q4 2024
H141	19.20	57	26	215	18.75	Q1 2024
Totals	46.14	60	287	526	85.67	–

*Includes one permanent structure removal

Project Scope – Structure Replacements and OPGW Installation

Line	Length (Miles)	OPGW Installation Length (Miles)	Replacement Natural Wood Structures	Replacement Laminated Wood Structures	Total Existing Structures	Estimated Cost (\$M) (-25% / +50%)	In-Service Date
A164	15.52	15.52	0	173*	187	66.96	Q3 2025
R169	3.00	3.00	2	18	30	8.40	Q3 2024
F162	5.10	5.10	0	56	64	21.84	Q4 2024
G146	18.10	1.25	1	164**	185	58.38	Q1 2025
I158	6.20	6.20	1	73	81	28.63	Q3 2024
Totals	47.92	31.07	4	484	547	184.21	–

*Includes one permanent structure removal

**Includes two (2) permanent laminated wood structure removals

ADSS Scope

- Spans of ADSS will be utilized to tie OPGW into substations

Summary

- Replace 771 laminated wood structures and 64 natural wood structures with weathering steel structures across ten New Hampshire 115 kV transmission lines
 - Replacement of both laminated and natural wood structures takes advantage of access and permitting efficiencies
- Light duty weathering steel structures provide multiple benefits, including:
 - Compliance with current clearance and strength code requirements
 - Improved reliability and storm resilience
 - Increased strength to support larger conductor sizes if needed in the future
- Install 31.07 circuit miles of OPGW on Lines A164, R169, F162, G146 & I158
- Install lightning arrestors
- This is the final phase of the Laminated Wood Structure Replacement Program coming to PAC

Total Estimated PTF Costs: \$269.88M (-25% / +50%)

Questions

