D-156 115kV Line Asset Condition Refurbishment

Rafael Panos
National Grid
March 19, 2025

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Project Summary

Project Drivers

- Physical deterioration of wood pole structures due to woodpecker damage and decay
- Insulation is degraded. Frequent flashovers and exposure have damaged existing insulators leading to poor circuit performance. New insulation is required.
- Shieldwire is damaged, showing broken strands and deteriorated attachment hardware

Alternatives Considered

Alternative	*Description*	*Cost Estimate*
Base Alternative	Replace wood pole structures with steel structures, replace insulation at remaining structures, replace existing shieldwire	$17.650M (+200%, -50%)
Alternative 2	Replace wood pole structures with steel structures, replace insulation at remaining structures, replace existing ACSR conductor in-kind, replace existing shieldwire with OPGW	$19.005M (+50%, -25%)

Project Summary

Preferred Alternative		
Alternative	***Reason for Recommendation***	***Cost Estimate***
Alternative 2	• Removes deteriorated wood poles with decay and woodpecker damage • Replaces damaged insulation and adds additional insulation to prevent flashover which degrades insulators and results in poor circuit performance. There have been 17 operations on the D-156 circuit in the past ten years with three outages each in two of the past three years. • Replaces damaged shieldwire to improve lightning performance and adds communication interconnection with adjacent utilities through use of OPGW • Minimizes potential future projects, duplicated permitting, and additional impacts to asset owner, communities, and environment by replacing original vintage conductor • Matches recently installed conductor beyond demarcation point	$19.005M (+50%, -25%)

Outline

- Background Information
- Project Needs and Drivers
- Solution Alternatives
- Selection of Preferred Solution
- Schedule and Contact Information

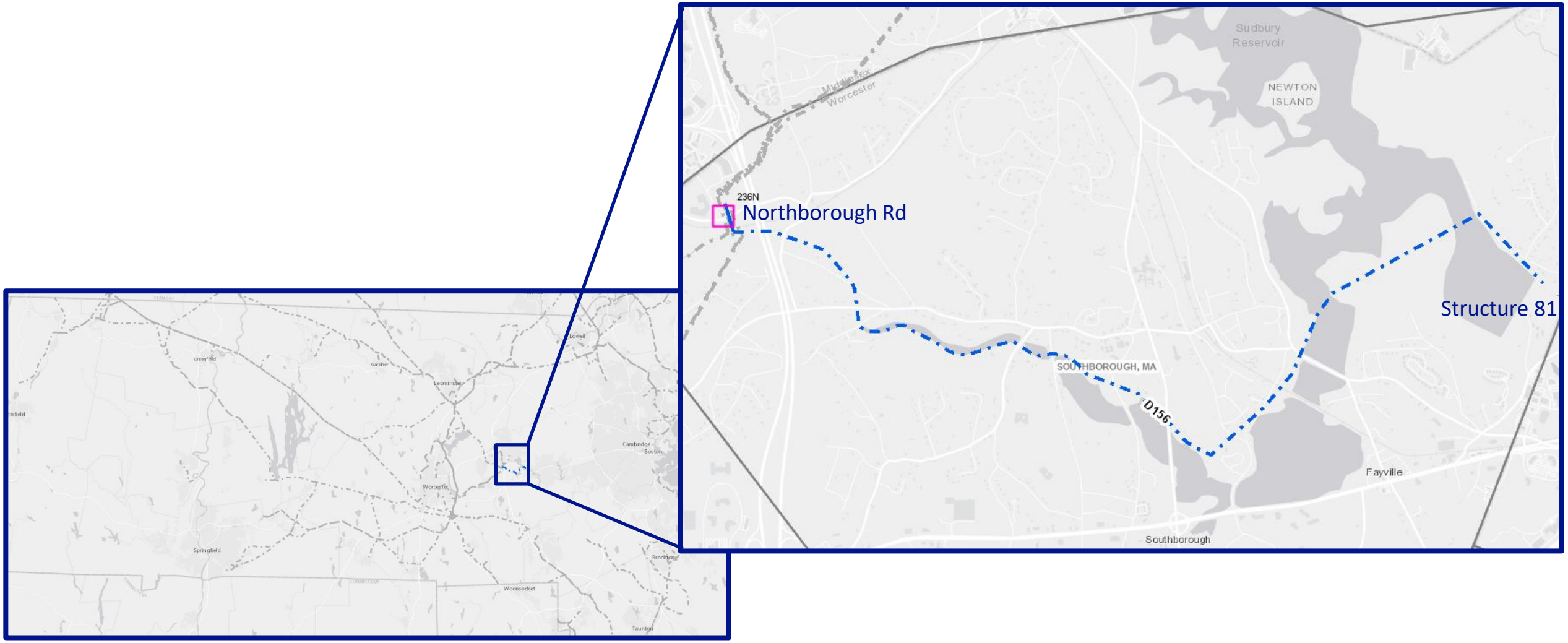
Background Information – D-156 115kV Line

Key Details	
Location	From: Northborough Rd To: West Framingham (owned by Eversource)
Line length	5.5 miles
Operating Voltage	115 kV
Age and upgrade history	• Originally constructed in 1972 • New England Power (NEP) owns structures #1 and #2, 669ft of conductor. • Mass Department of Conservation and Recreation (DCR) owns conductor and structures #3 - #81, managed by NEP • Eversource owns beyond structure #81 to West Framingham • Crosses Wachusett Aqueduct, Sudbury Reservoir, underground Hultman Aqueduct • This line is 100% PTF
Prior PAC presentations	• None

Existing structures			
Material	*Configuration*	*Number*	*Avg. age*
Line Section 1			
Wood	Single Circuit	39	30 years
Steel	Single Circuit	42	53 years

Existing conductor		
Type	*Length*	*Avg. age*
Line		
795 ACSR Condor	5.5 miles	53 years
(2) 7#9 Alumoweld Shieldwire	1.0 miles	53 years
7#9 Alumoweld Shieldwire	4.5 miles	53 years

Background Information – Maps and Diagrams



Project Needs and Drivers

Asset Concerns	
Primary Concerns (must be addressed)	
Woodpecker Damage	• Significant woodpecker damage across all wood structures
Insulation Deterioration	• Insulators experiencing flashover and damage • Insulation quantity insufficient leading to poor performance
Shieldwire Damage	• Broken strands and discoloration as well as damage to mounting hardware
Pole Top Decay	• Wood poles experiencing rot at pole tops from moisture
Secondary concerns (may be addressed)	
Telecommunication Needs	• Fiber desired to strengthen communication interconnection with Eversource

Summary of Current Structure Grades

Category	Recommended Action	Number of structures
A	No replacement required due to deterioration	42
B	Consider replacement in conjunction with other structure replacements	0
C	Initiate planned structure replacement project or Replace as part of upcoming structure replacement project	39
D	Replace immediately (emergency replacement)	0
Total		81

Project Needs and Drivers – Woodpecker Damage

D-156 Str 42

D-156 Str 69

D-156 Str 70

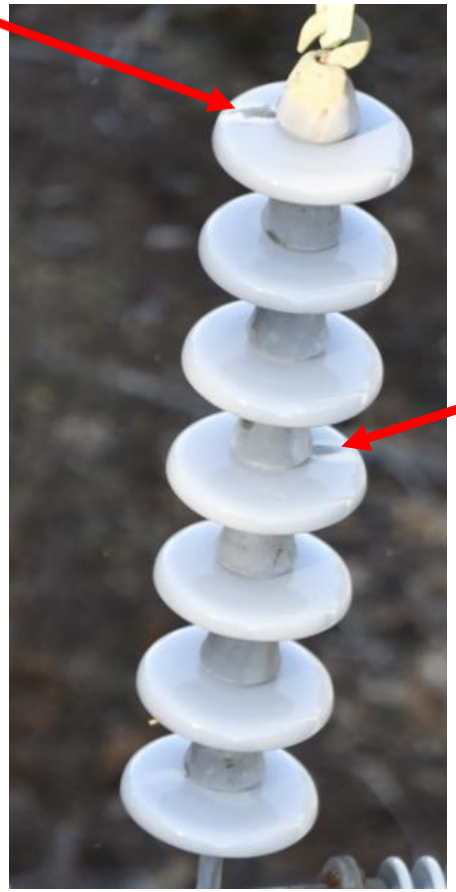
D-156 Str 73

D-156 Str 77

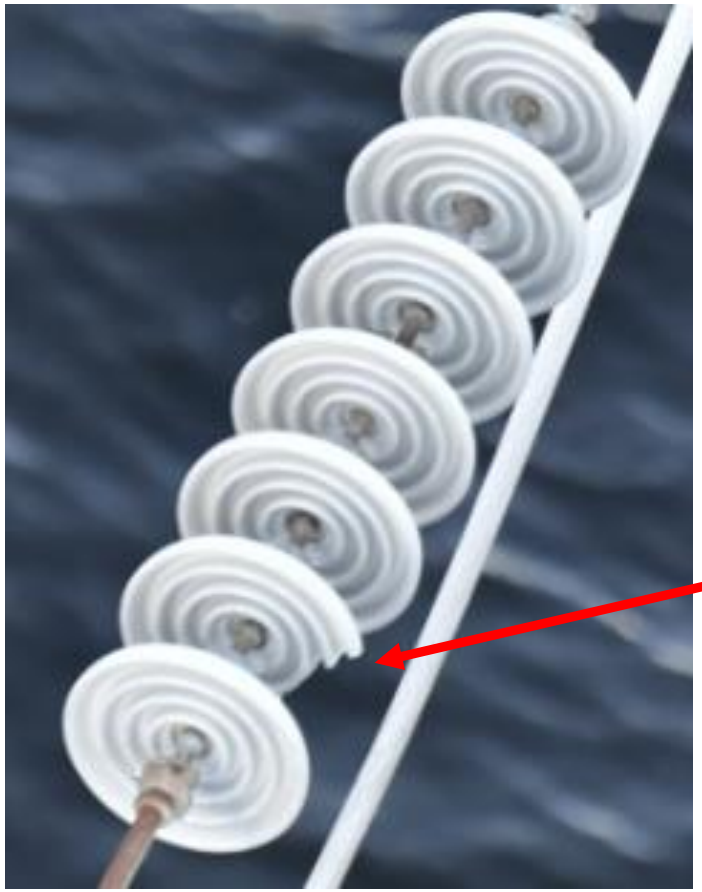
*Multiple instances on most structures including signs of prior repairs at Str 77 which have been ineffective

Project Needs and Drivers – Deteriorated Insulation

D-156 Str 15



D-156 Str 59



D-156 Str 74

*Damaged insulation due to combination of exposure and insufficient quantity of insulators. Insulation exhibiting burns and chipping. As degradation progresses, the performance of the circuit suffers at an increasing rate. There have been 17 operations in the last ten years, with three events each in two of the last 3 years

Project Needs and Drivers – Shieldwire Concerns

D-156 Str 29

*Improperly installed and now damaged shieldwire attachment

D-156 Str 30

*Broken strands in shieldwire

Project Needs and Drivers – Pole Top Decay

D-156 Str 53

D-156 Str 58

Review of Relevant Transmission Studies

Transmission Study Status
Was this line overloaded in recent Attachment K studies (Reliability Needs Assessments, Longer-Term Transmission Studies, etc.) or other recent studies?
• No
Have modifications or upgrades to this line been identified as potential solutions in any of those studies?
No

Evaluated Solution Alternatives

Base Alternative

Replace Wood Structures, Reinsulate Remaining Structures, and Replace Shieldwire	
Description	• Replace 39 wood pole suspension structures with steel suspension structures • Replace insulation on remaining 42 steel structures with 10-bell strings to increase insulation factor • Remove one (1) mile of (2) 7#9 shieldwire and 4.5 miles of 7#9 shieldwire and replace with 5.5 miles of 3/8” EHS shieldwire
Primary Needs Addressed	Structure, Shieldwire, Insulators
Secondary Needs Addressed	N/A
Advanced transmission technologies to be considered	N/A
Cost Estimate and Accuracy	$17.650M PTF (+200% / -50%)
Longer-term transmission needs addressed	N/A

Evaluated Solution Alternatives
Alternative 2

Replace Wood Structures, Reinsulate Remaining Structures, Reconductor with ACSR, and Install OPGW	
Description	• Replace 39 wood pole suspension structures with steel suspension structures • Replace insulation on remaining 42 steel structures with 10-bell strings to increase insulation factor • Replace 5.5 miles of 795 ACSR “Condor” conductor with 5.5 miles of 795 ACSR “Drake” conductor • Remove one (1) mile of (2) 7#9 shieldwire and 4.5 miles of 7#9 shieldwire and replace with 5.5 miles of OPGW
Primary Needs Addressed	Structure, Shieldwire, Insulators
Secondary Needs Addressed	Telecommunications
Advanced transmission technologies to be considered	N/A
Cost Estimate and Accuracy	$19.005 M PTF (+50% / -25%)
Longer-term transmission needs addressed	N/A

Comparative Analysis of Alternatives

Comparison		
Key Criteria	**Base Alternative**	**Alternative 2**
Addresses Primary Need(s)	• Yes	• Yes
Secondary Needs Addressed	• No	• Yes
Cost	• $17.650 M PTF (+200% / -50%)	• $19.005 M PTF (+50% / -25%)
Constructability concerns or advantages	• N/A	• Addresses secondary concern for minimal increase in cost of OPGW over shieldwire
Siting, Environmental and Regulatory issues	• Same for both options	• Same for both options
Governmental or Community Goals addressed	• N/A	• Minimizes impacts to community by avoiding the need to replace conductor with a separate project
Future-Proofing	• Same for both options	• Same for both options
Schedule and Outage Coordination	• Same for both options	• Same for both options

Schedule

Planned Schedule	
Comment Deadline	April 2nd, 2025
Start of Major Construction	Q1 2026
Project in Service	Q2 2026

Please submit any comments to pacmatters@iso-ne.com and:

Transmission Owner Contact	
Contact Name	Rafael Panos
Contact Email Address	rafael.panos@nationalgrid.com

Questions

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This document has been reviewed and does not contain Critical Energy/Electric Infrastructure Information (CEII).

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