



Rhode Island Energy™

a PPL company

S-171, S-171S, & T-172S 115 kV Structure Replacements and Lightning Mitigation

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ISO-NE Planning Advisory Committee Meeting

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Business Use

Project Summary

Project Drivers

- The S-171, S-171S and T-172S lines were built in 1974, 1955, and 1964, respectively. There are few wood poles structures that remain among the three lines and deterioration of those structures was identified during recent inspections. Additionally, S-171S and T-172S have experienced (9) lightning caused operations since 2011, two of which resulted in long-duration outages. 53% of structures fall in the top quartile for lightning risk.

Alternatives Considered

Alternative	Description	Cost Estimate
Alternative 1	Wood Pole Replacements and Lightning Mitigation and OPGW Installation	\$15.2 M
Alternative 2	Wood Pole Replacements and Lightning Arrester Installation	\$15.3 M

Preferred Alternative

Alternative	Reason for Recommendation	Cost Estimate
Alternative 1	Most cost-effective solution that resolves structural concerns as well as increase line reliability during lightning storms.	\$15.2 M +200%/-50%

Outline

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

Background Information

Line S-171, S-171S, T-172S

Key Details	
Location	From: Hartford Avenue, RI To: Drumrock, RI
Line length	S-171 – 4.69 miles S-171S – 8.89 miles T-172S - 12.8 miles
Operating Voltage	115 kV
Age and upgrade history	<ul style="list-style-type: none">• S-171 originally constructed in 1974• S-171S originally constructed in 1955• T-172S originally constructed in 1964
Prior PAC presentations	<ul style="list-style-type: none">• None

Existing Structures			
Material	Configuration	Number	Avg. age
S-171			
Wood	Monopole Structures	2	51 years
Steel	H-frame & Monopole Structures	24	12 years
S-171S			
Wood	H-frame & Monopole Structures	6	44 years
Steel	H-frame & Monopole Structures	94	12 years
T-172S			
Wood	H-frame & Monopole Structures	8	38 years
Steel	H-frame & Monopole Structures	116	12 years

Existing Conductor		
Type	Length	Avg. age
S-171		
1590 ACSR “Falcon”	3.58 miles	12 years
1590 ACSS “Falcon”	1.11 miles	13 years
S-171S		
1590 ACSR “Falcon”	8.89 miles	12 years
T-172S		
1590 ACSR “Falcon”	11.69 miles	12 years
1590 ACSS “Falcon”	1.11 miles	13 years

Background Information

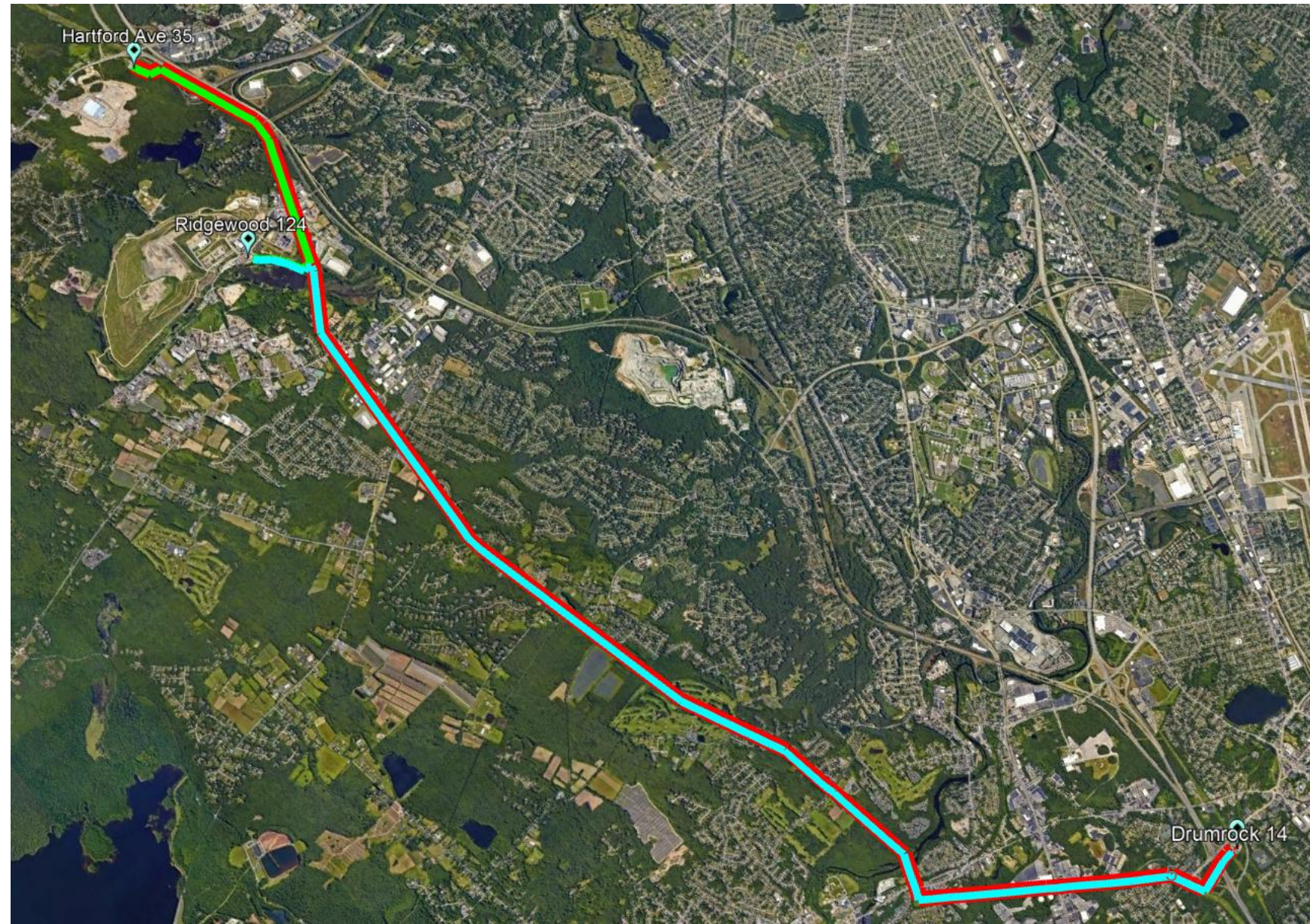
Maps and Diagrams

Legend:

Green - S-171

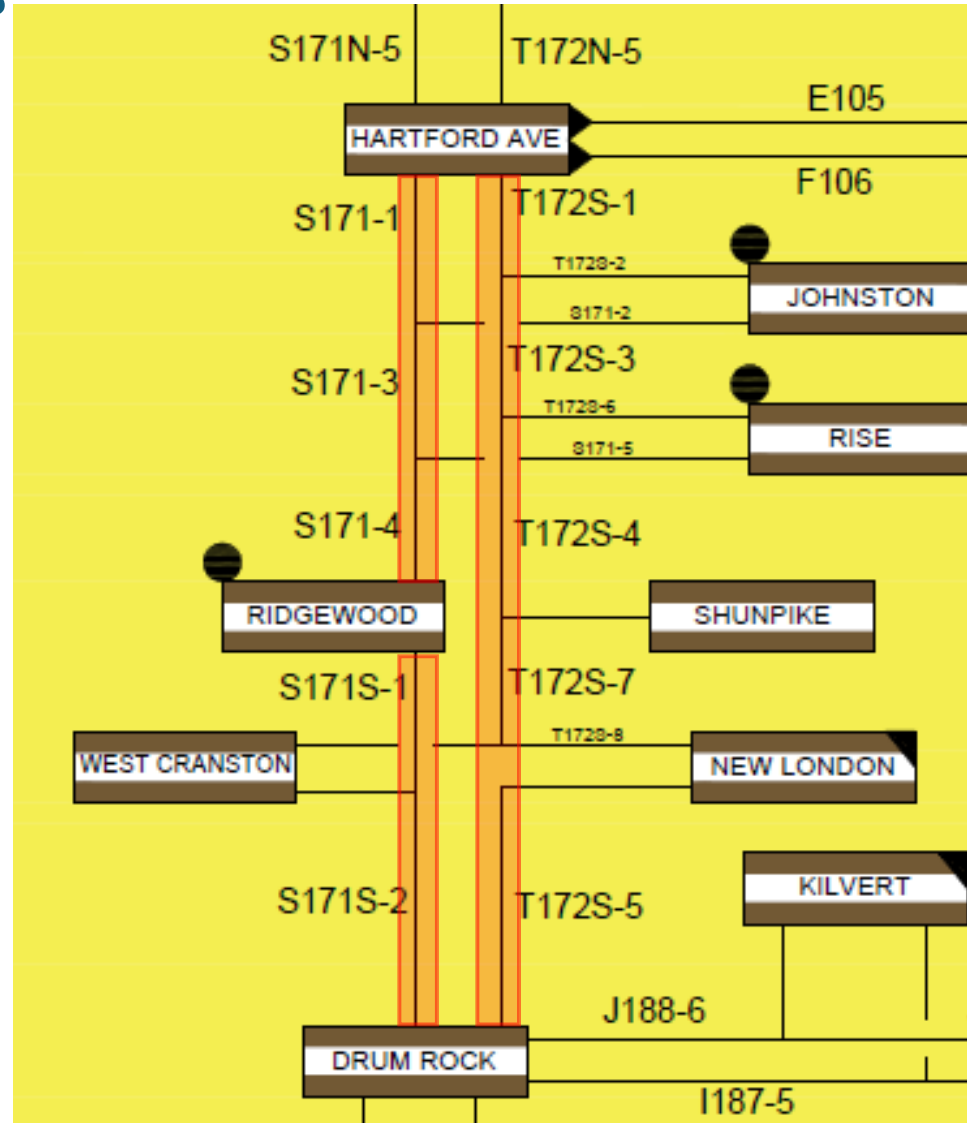
Blue - S-171S

Red - T-172S



Background Information

Maps and Diagrams



Project Needs and Drivers

Structure Concerns

Structure Concerns	
Primary Concerns	
Wood structure rot and decay	<ul style="list-style-type: none"> 2023 inspections identified wood structures with woodpecker damage, pole top rot, cracked crossarms, splitting poles, and other forms of decay Affected structures are reaching end of useful life
Line Performance	<ul style="list-style-type: none"> 39 overall operations on S-171 (7 operations), S-171S (12 operations) and T-172S (20 operations) since 2011 <ul style="list-style-type: none"> 9 of these operations were caused by lightning Repeat operations degrade equipment over time As recently as 2023, a lightning operation on T172S affected ~20,000 RIE customers Existing single shield wire fails to meet current RIE lightning performance standards
Secondary Concerns	
Insulators	<ul style="list-style-type: none"> Existing porcelain insulators on wood poles showing hairline cracks, which can hold moisture and reduce resistance

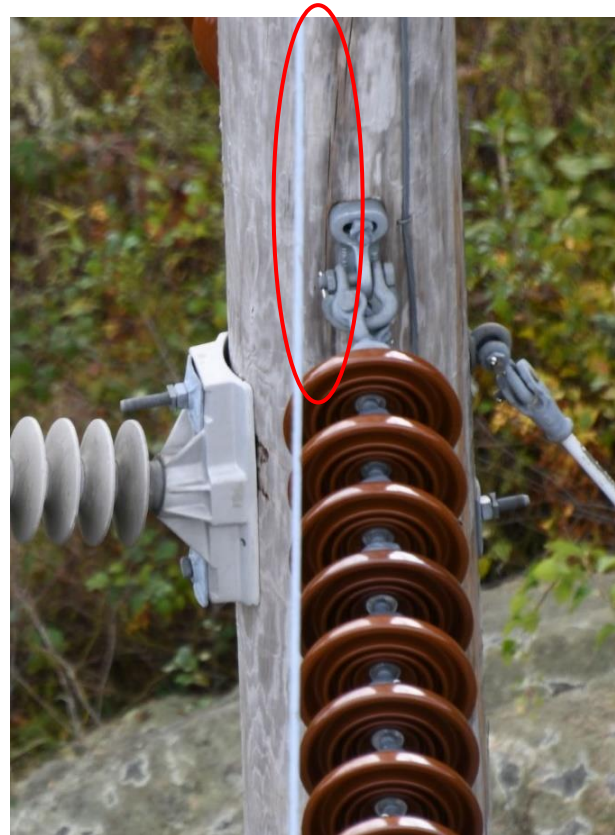
Summary of Current Structure Grades		
Category	Recommended Action	Number of Structures
A	No replacement required due to deterioration	234
B	Consider replacement in conjunction with other structure replacements	0
C	Initiate planned structure replacement project or Replace as part of upcoming structure replacement project	16
D	Replace immediately (emergency replacement)	0
Total		250

Project Needs and Drivers

Structure Concerns



S-171S Structure 224
Pole Top Rot



S-171 Structure 133
Pole Cracks



S171S Structure 263
Pole Cracks and Pole Base Deterioration



Project Needs and Drivers

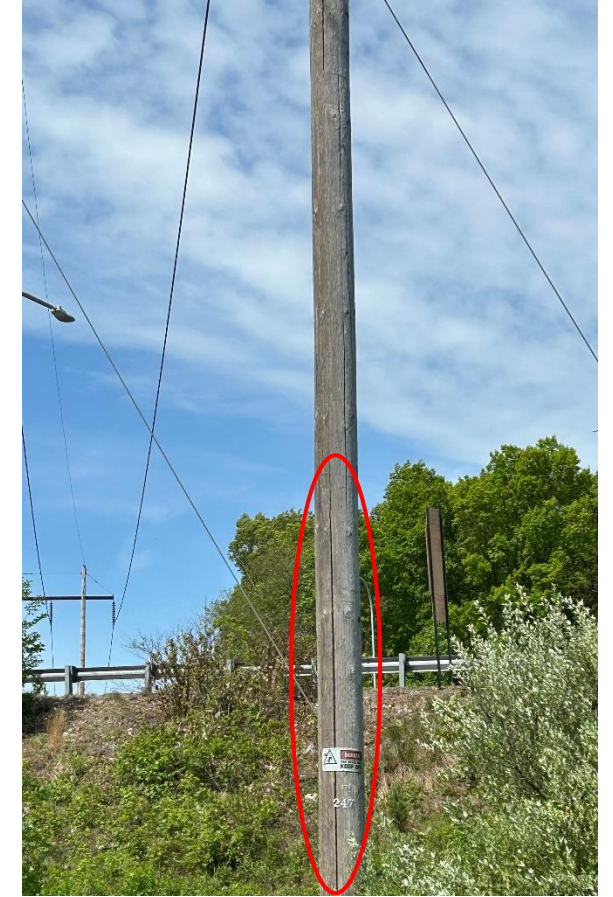
Structure Concerns



S-171S Structure 263 - Back
Pole Cracks



S-171S Structure 263 - Front
Pole Cracks



T-172S Structure 247
Pole Cracks

Project Needs and Drivers

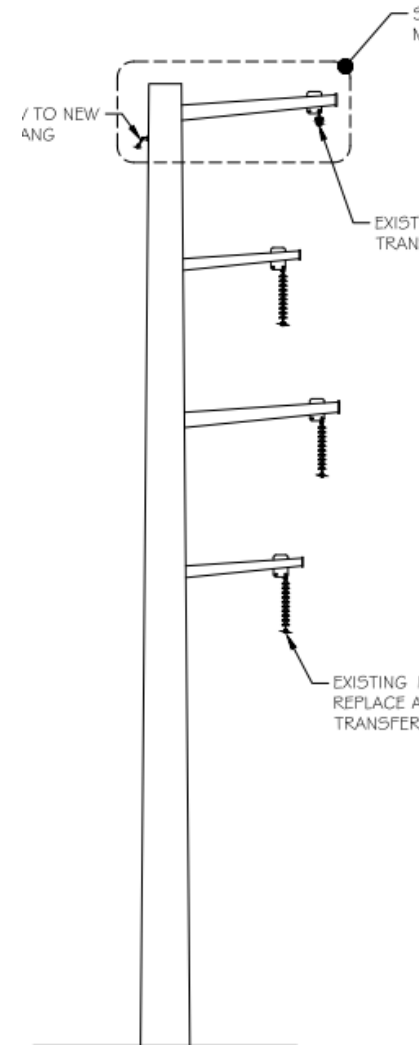
Shield Wire Concerns	
Primary Concerns	
Line Performance	<ul style="list-style-type: none">• Lines fail to meet current RIE lightning performance criteria<ul style="list-style-type: none">• Inadequate lightning protection can increase flashover on structures, resulting in momentary or permanent outages• ~20,000 customers impacted in a single outage in 2023 on T172S• Dual shield wire will provide better shielding angle from lightning strikes<ul style="list-style-type: none">• Will result in fewer outages• Better grounding using ground rods or ground drills to limit equipment damage, create safe working conditions
Secondary Concerns	
Line Performance	<ul style="list-style-type: none">• OPGW installation allows for direct protective relaying between the substations via fiber, the implementation of our new communication network, and the ability to communicate with Motor Operated Load Break Air Break Switch
Insulators	<ul style="list-style-type: none">• Existing porcelain insulators on wood poles showing hairline cracks, which can hold moisture and reduce resistance

Project Needs and Drivers

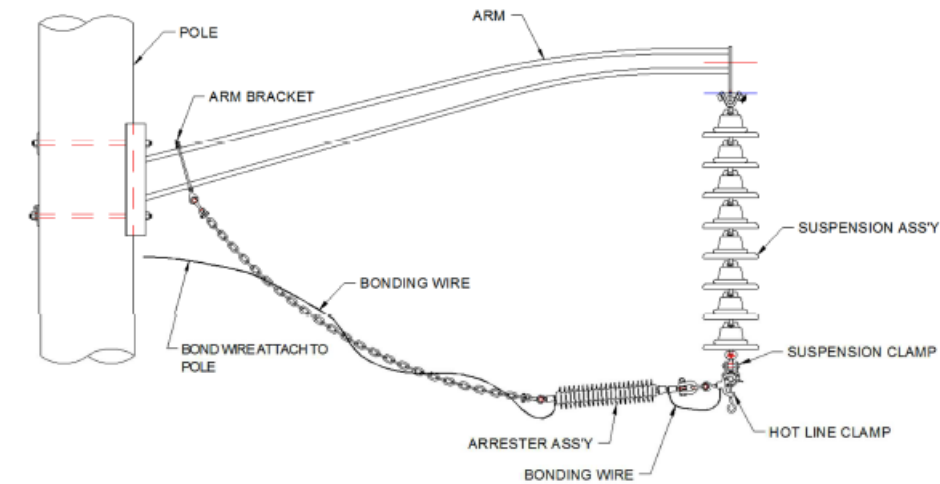
Lightning Protection



T-172S Str 162 and S-171S
Str 180 Current Layout



Alternative 1 Future Layout



Alternative 2 Layout

Review of Relevant Transmission Studies

Recent Transmission Studies

Was this line overloaded in recent Attachment K studies (Reliability Needs Assessments, Longer-Term Transmission Studies, etc.) or other recent studies?

S-171

N-1 overload from RISE Tap to Johnston Tap (S171-3) in both the 2040 Summer and Winter Peak cases. Same line section is also overloaded in both 2050 Winter Peak cases, with the line reaching 146.47% of its LTE rating in the 2050 Winter Peak 57 GW load case.

N-1-1 overload from RISE Tap to Johnston Tap (S171-3) in all 2040 cases. Same line section is also overloaded in both 2050 Winter Peak cases, with the line reaching 148.6% of its LTE rating in the 2050 Winter Peak 57 GW load case.

T-172S

N-1 overload from RISE Tap to Johnston Tap (T172S-3) in the 2040 Winter Peak case. Same line section is also overloaded in the 2050 Winter Peak 57 GW load case, with the line reaching 137.99% of its LTE rating.

N-1-1 overload from RISE Tap to Johnston Tap (T172S-3) in the 2040 Winter Peak case. Same line section is also overloaded in both 2050 Winter Peak cases, with the line section reaching 140.6% of its LTE rating in the 2050 Winter Peak 57 GW load case.

Have modifications or upgrades to this line been identified as potential solutions in any of those studies?

No

Evaluated Solution Alternatives

Alternative 1

Wood Pole Replacement and Lightning Mitigation	
Description	<p>S-171, S-171S, T-172S 115kV Wood Pole Replacement and Lightning Mitigation</p> <ul style="list-style-type: none">• Replace four (4) wood H-frames and twelve (12) 3-pole wood structures along S-171, S-171S, and T-172S with steel monopoles, install 10.3 miles of OPGW, replace all insulators and hardware where OPGW is installed, improve grounding at any structure that does not meet the minimum ground impedance requirement of 25 ohms or less
Primary Needs Addressed	<p>Structures</p> <ul style="list-style-type: none">• The identified wood structures with woodpecker damage, pole top rot, cracked crossarms, splitting poles, and other forms of decay will be removed and replaced with steel monopoles <p>Shield wire</p> <ul style="list-style-type: none">• Dual shield wire will provide improved shielding angle<ul style="list-style-type: none">• This will allow customers to see less outages due to lightning strikes• Better grounding using ground rods or ground drills to limit equipment damage, create safe working conditions
Secondary Needs Addressed	<ul style="list-style-type: none">• Direct communication between substations for protective relaying and communication with remotely operated switches• Replacing existing insulators and hardware on T172S
Advanced transmission technologies to be considered	N/A
Cost Estimate and Accuracy	\$15.2 M (+200% / -50%)
Impact on transmission needs or concerns from recent studies	N/A
Key standards or criteria affecting design if different than current design	N/A

Evaluated Solution Alternatives

Alternative 2

Targeted Wood Pole Replacements and Lightning Arrester Installation	
Description	Wood Pole Replacements on S-171, S-171S, T-172S and Lightning Arrester Installation <ul style="list-style-type: none">Replace four (4) wood H-frames and twelve (12) 3-pole wood structures with steel monopoles and install lightning arresters on all phases of 250 structures
Primary Needs Addressed	Structures <ul style="list-style-type: none">The identified wood structures with woodpecker damage, pole top rot, cracked crossarms, splitting poles, and other forms of decay will be removed and replaced with steel monopolesImproved lightning performance
Secondary Needs Addressed	No
Advanced transmission technologies to be considered	N/A
Cost Estimate and Accuracy	\$15.3 M (+200% / -50%)
Impact on transmission needs or concerns from recent studies	N/A
Key standards or criteria affecting design if different than current design	N/A

Comparative Analysis of Alternatives

Comparison		
Key Criteria	Alternative 1	Alternative 2
Addresses Primary Need(s)	Yes	Yes
Secondary Needs Addressed	Yes	No
Cost	\$15.2 M	\$15.3 M
Constructability concerns or advantages	• No	• No
Siting, Environmental and regulatory issues		

Conclusions

- Alternative 1 is the preferred alternative because this will address all primary and secondary needs identified by recent inspections, increase reliability of lines during lightning storms, and expand RIE fiber communications network
- Alternative 2 addresses the primary needs that are associated with the project. However, this Alternative has a higher upfront cost and increased risk of emergency repairs due to arrester failures and lightning operations will likely result in higher long-term costs

Schedule

Planned Schedule	
Comment Deadline	September 4, 2025
Follow-up PAC Presentation	
Start of Major Construction	Q4 2025
Project in Service	Q4 2026

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

Transmission Owner Contact	
Contact Name	Kyra Lagunilla
Contact Email Address	klagunilla@pplweb.com