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# S-171N & T-172N 115kV Line Rebuild

ISO NE PAC Meeting October 18, 2023

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# Agenda



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**Purpose: Discuss S-171N Woonsocket – Hartford Ave 115kV line and T-172N Woonsocket – Hartford Ave 115kV line needs and proposed solution.**

- Project Background
- Maps/Diagrams
- Project Drivers
- Solution Alternatives
- Summary
- Feedback and Next Steps



# Project Background

- Rhode Island Energy (RIE) manages approximately 400 miles of overhead and underground transmission lines exclusively within the state of RI and applies a proactive asset management strategy to upgrade or rebuild aging transmission facilities to improve reliability and longevity of the system while reducing maintenance costs.
- System needs are identified through a combination of data collection activities including desktop review, ground inspections, aerial inspections, 3<sup>rd</sup> party condition assessments, etc.
- The S-171N and T-172N 115kV lines from Woonsocket to Hartford Avenue are 11.8-mile three terminal lines connecting to Woonsocket, West Farnum, and Hartford Ave substations that run on parallel single circuit structures in the same ROW.
- The lines each have 3 taps to Farnum Pike, Wolf Hill, and Putnam Pike totaling 0.2 miles (non-PTF).

# Project Background, cont.



- The S-171N line was originally constructed in 1962 (61 years old) and contains a combination of 1590 ACSR, 795 AAC, and 477 AAC conductor, 3/8” Extra High Strength Steel (EHS) Overhead Ground Wire (OHGW) and Optical Ground Wire (OPGW), and 138 structures.
- The T-172N line was originally constructed in 1962 (61 years old) and contains a combination of 1590 ACSR, 795 AAC, and 477 AAC conductor, 3/8” EHS OHGW and OPGW, and 132 structures.
- The lines were partially refurbished in 2013. The section from the West Farnum Tap to Hartford Ave is primarily steel davit arm construction while the section between Woonsocket and West Farnum is still primarily wood H-frame construction.

Material	PTF	Non-PTF
Steel	110	4
Wood	23	1
<b>Total</b>	<b>133</b>	<b>5</b>

S-171N Structure Count by Material

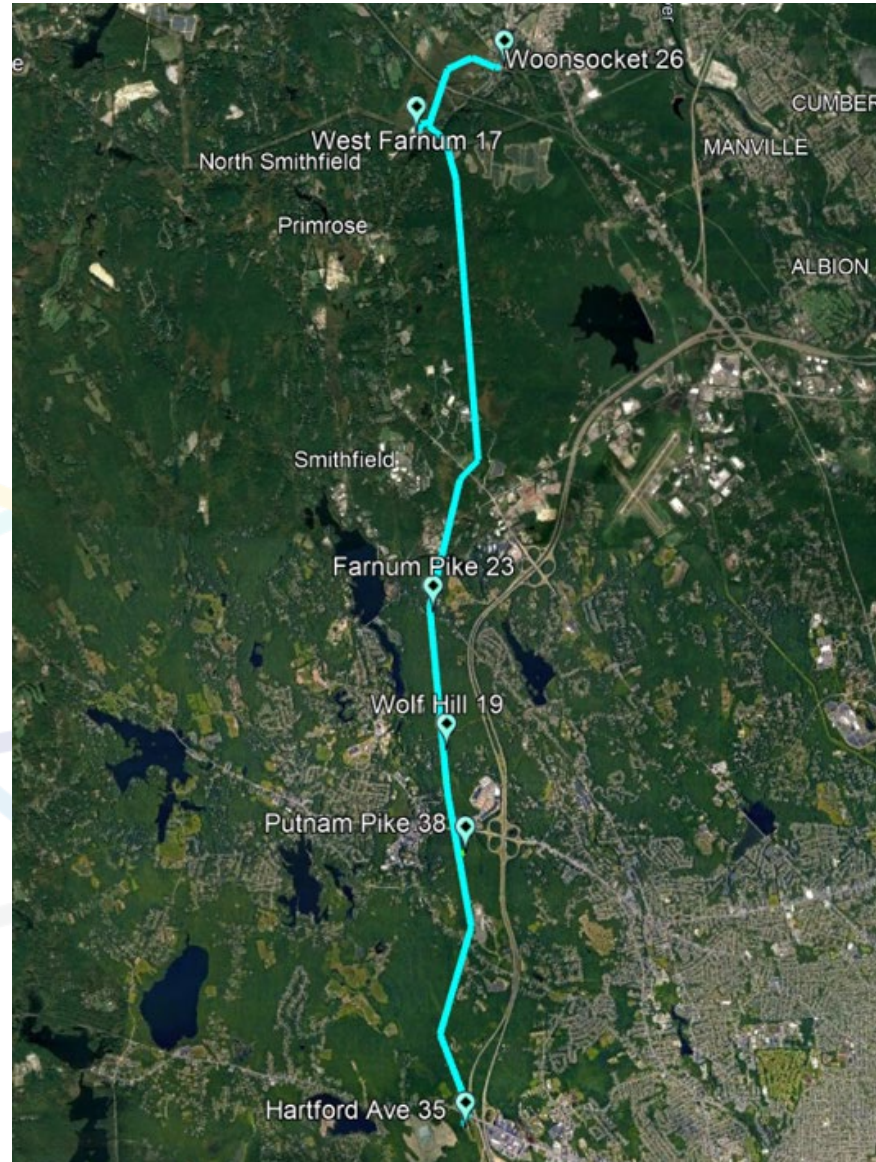
Material	PTF	Non-PTF
Steel	110	0
Wood	22	0
<b>Total</b>	<b>132</b>	<b>0</b>

T-172N Structure Count by Material

# S-171N & T-172N Aerial View



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**S-171N & T-172N Woonsocket – Hartford Ave**

# Project Driver



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- Targeted ground and aerial patrols have identified evidence of deterioration such as rot and woodpecker holes on the wood pole population.
- The lines also fail to meet the current lightning performance design standard which contributes to their poor performance.
  - The S-171N line has experienced 7 outages since 2011.
  - The T-172N line has experienced 20 outages since 2011.
- Sections of conductor between Woonsocket and West Farnum were originally installed in 1973.
  - ACSR conductor loses mechanical strength over its service life due to corrosion and annealing, leading to an increased likelihood of broken strands and eventual conductor failure. Steel core corrosion may not be easily identifiable during visual inspections.
- The taps to West Farnum, Farnum Pike, and Wolf Hill substations do not currently have switches installed, limiting the operational flexibility of these taps.
- Fiber installations along this corridor provide key communication links for a future system wide fiber deployment in support of protection networks, relaying, improving grid automation, and other device communications

# Project Driver, cont.



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**Pole Deterioration on T-172N Str 17**



**Woodpecker Damage on T-172N Str 126**



**Typical Structure Condition on S-171N & T-172N Str 14**

# Solution Alternatives

## Option 1: In-Kind Structure Replacement Only

- Replace 45 wood structures along S-171N and T-172N with steel structures matching existing framing.
- Replace 1 wood structure along S-171N Tap to Putnam Pike with a steel structure matching existing framing (non-PTF).

### Benefits

- Lower initial construction cost
- Shorter outages

### Drawbacks

- Does not increase operational flexibility
- Line would not have standard conductor size
- Transferring conductor increases risk of equipment failure
- Doesn't maximize existing ROW for future growth
- Fails to address lightning performance issues
- Does not reduce vegetation risk
- Eliminates opportunity for optimized design

**Estimated PTF Project Cost (+200%/-50%): \$7.6M**

**Estimated non-PTF Project Cost (+200%/-50%): \$0.2M**





## Solution Alternatives, cont.

### Option 2: Structure Replacement Only

- Replace 45 wood structures along S-171N and T-172N with steel structures.
- Replace 1 wood structure along S-171N Tap to Putnam Pike with a steel structure (non-PTF)

#### Benefits

- Lower initial construction cost
- Shorter outages
- Optimized framing reduces vegetation risk

#### Drawbacks

- Does not increase operational flexibility
- Line would not have standard conductor size
- Transferring conductor increases risk of equipment failure
- Doesn't maximize existing ROW for future growth
- Fails to address lightning performance issues

**Estimated PTF Project Cost (+200%/-50%): \$11.3M**

**Estimated non-PTF Project Cost (+200%/-50%): \$0.25M**

# Solution Alternatives, cont.



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## Option 3: Preferred PTF Solution – Structure, Conductor, and OPGW Replacement

- S-171N
  - Replace 23 wood structures with 23 steel structures (PTF). The structures between Woonsocket and West Farnum shall be designed as a double circuit configuration (DCT) where there will be one PTF circuit initially and a second non-PTF circuit installed in the future (non-PTF).
  - Replace approximately 1.3 miles of existing 1590 ACSR conductor with 1590 ACSS. (Ratings on next slide)
  - Replace approximately 1.3 miles of OHGW and OPGW with dual OPGW from Woonsocket substation to West Farnum substation.
  - Install 5 loadbreaks.
  - Lightning and grounding improvements from West Farnum to Hartford Ave.
- T-172N
  - Replace 22 wood structures with 22 steel structures (PTF). The structures between Woonsocket and West Farnum shall be designed as a double circuit configuration (DCT) where there will be one PTF circuit initially and a second non-PTF circuit installed in the future (non-PTF).
  - Replace approximately 1.3 miles of existing 1590 ACSR conductor with 1590 ACSS. (Ratings on next slide)
  - Replace approximately 1.3 miles of OHGW and OPGW with dual OPGW from Woonsocket substation to West Farnum substation.
  - Install 4 loadbreaks.
  - Lightning and grounding improvements from West Farnum to Hartford Ave.

**Estimated PTF Project Cost (+50%/-25%): \$20.8M**

# Solution Alternatives, cont.



## Option 3: Preferred PTF Solution – Structure, Conductor, and OPGW Replacement

### S-171N

	<b>Normal (MVA)</b>	<b>LTE (MVA)</b>	<b>STE (MVA)</b>
<b>Existing Circuit Ratings (Summer/Winter)</b>	359/446	446/511	524/607
<b>Proposed Conductor Ratings: 1590 ACSS (Summer/Winter)</b>	565/612	565/612	703/783

### T-172N

	<b>Normal (MVA)</b>	<b>LTE (MVA)</b>	<b>STE (MVA)</b>
<b>Existing Circuit Ratings (Summer/Winter)</b>	359/446	446/511	524/607
<b>Proposed Conductor Ratings: 1590 ACSS (Summer/Winter)</b>	565/612	565/612	703/783

# Solution Alternatives, cont.



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## Option 3: Preferred non-PTF Solution – Structure, Conductor, and OPGW Replacement

- Future double circuit design for wood pole replacement between Woonsocket and West Farnum.
  - This solution takes advantage of efficiencies with respect to mobilization, permitting, public disruption, and environmental impacts to perform a more comprehensive scope that would otherwise require additional future efforts to install a new 115kV circuit as an additional source to resolve a load growth need.
- Replace 1 wood structure along S-171N Tap to Putnam Pike with 1 steel structure. Existing conductor to be transferred.

**Estimated non-PTF Project Cost (+50%/-25%): \$1.5M**

# Summary



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- Replace remaining 24 wood structures on the S-171N line with steel monopoles. The structures between Woonsocket and West Farnum shall be designed for initial single future double circuit configuration to accommodate a future 115 kV Woonsocket to Nasonville project. Replace conductor and install dual OPGW between Woonsocket and West Farnum.
- Replace remaining 22 wood structures on the T-172N line with steel monopoles. The structures between Woonsocket and West Farnum shall be designed for initial single future double circuit configuration. Replace conductor and install dual OPGW to be installed between Woonsocket and West Farnum.
- Lightning and grounding improvements on S-171N and T-172N lines from West Farnum to Hartford Ave.
- Install 9 loadbreaks.

**Estimated PTF Project Cost (+50%/-25%): \$20.8M**

**Estimated non-PTF Project Cost (+50%/-25%): \$1.5M**

**Estimated Total Project Cost (+50%/-25%): \$22.3M**

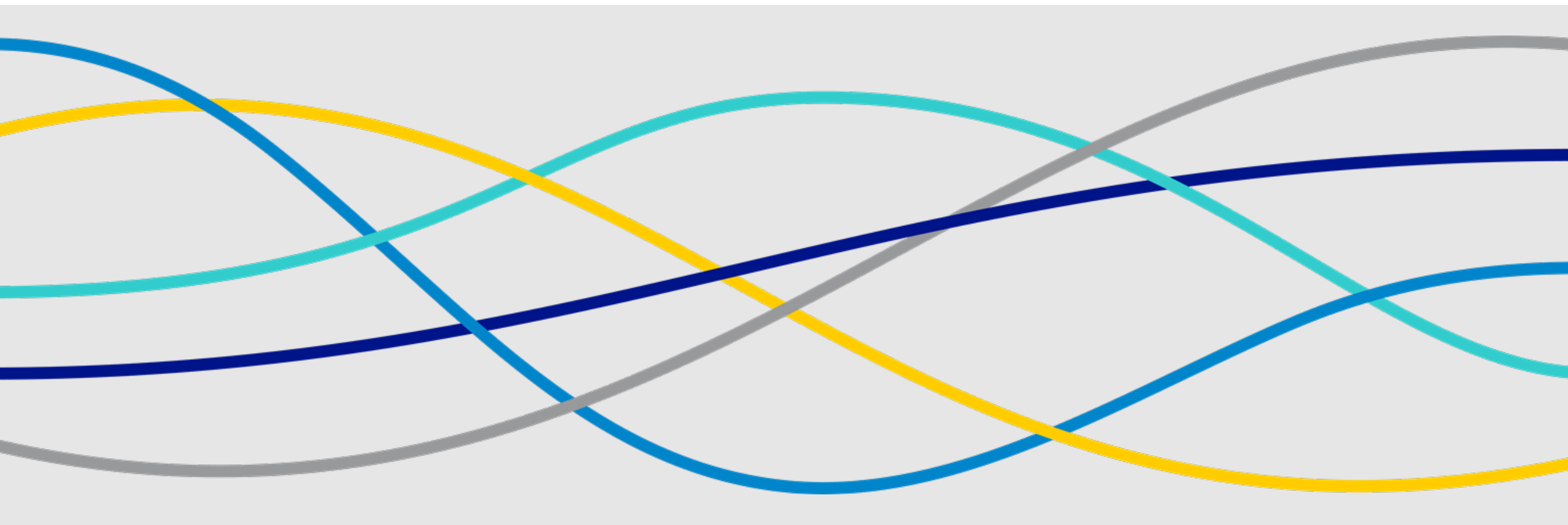
**Estimated Construction Start: Q4 2023**

**Project IS Date: Q3 2026**



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Please submit any written comments or feedback by November 2, 2023