Northern New Hampshire Rebuilds
115 kV Lines B112, Q195, U199

Planning Advisory Committee Meeting

May 18th, 2023

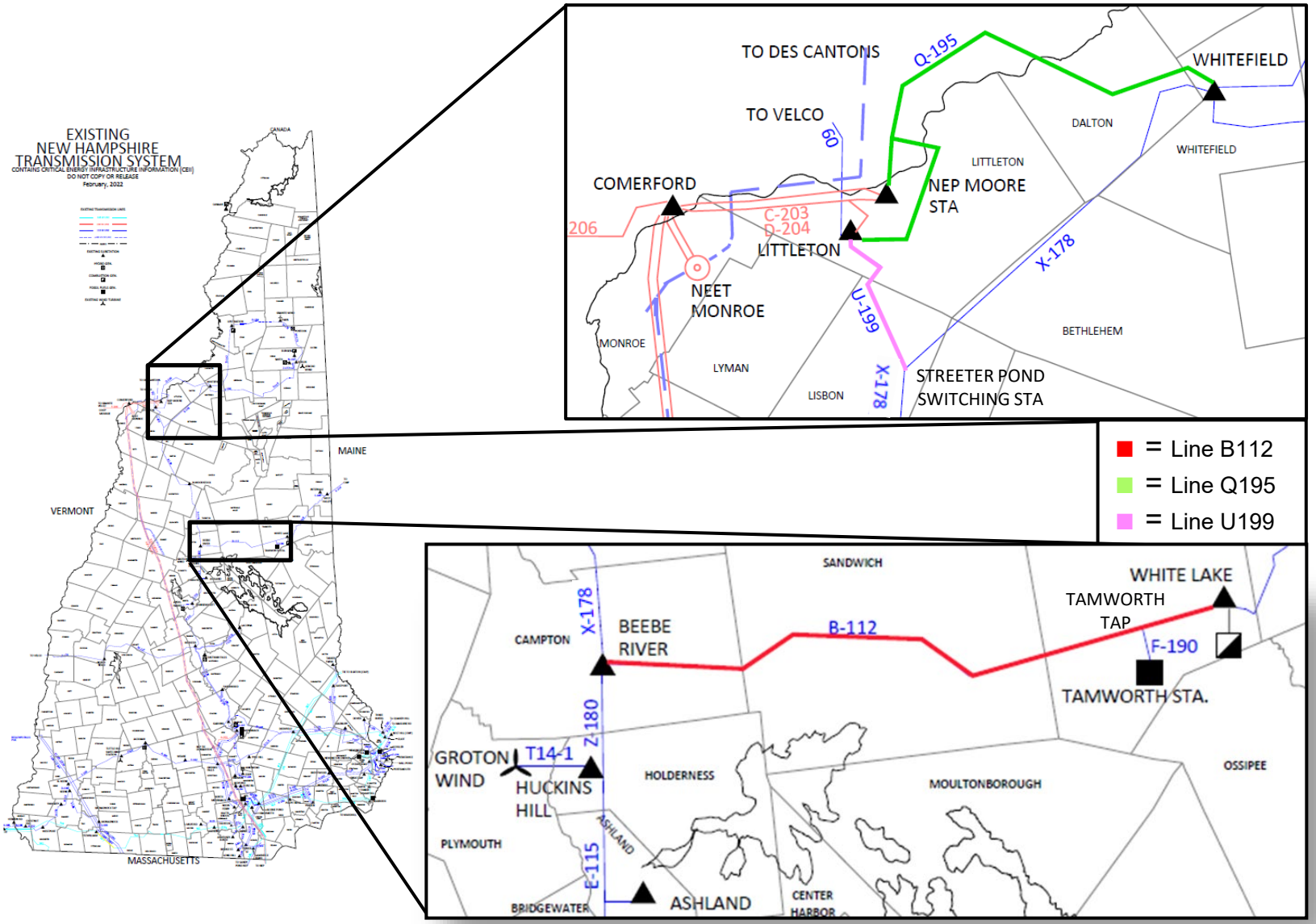
Agenda

- Project Background
- Project Locations
- Project Drivers
  - Wood Structure Asset Condition
  - Shield Wire Asset Condition
  - OPGW
  - Full Line Rebuild
- Project Scopes
- Summary

Project Background

- Line B112 from Beebe River 115kV substation in Campton, NH to White Lake 115 kV substation in Tamworth, NH
  - Total length: 22.9 miles
  - Constructed in 1956 (67 years old)
- Line Q195 from Whitefield 115 kV substation in Whitefield, NH to Moore 115kV substation in Littleton, NH with a tap to Littleton substation in Littleton, NH
  - Total length: 17.5 miles
  - Constructed in 1958 (65 years old)
- Line U199 from Littleton 115kV substation in Littleton, NH to Streeter Pond Tap switching towers in Sugar Hill, NH.
  - Total length: 9.75 miles
  - Constructed in 1971 (52 years old)

Project Locations

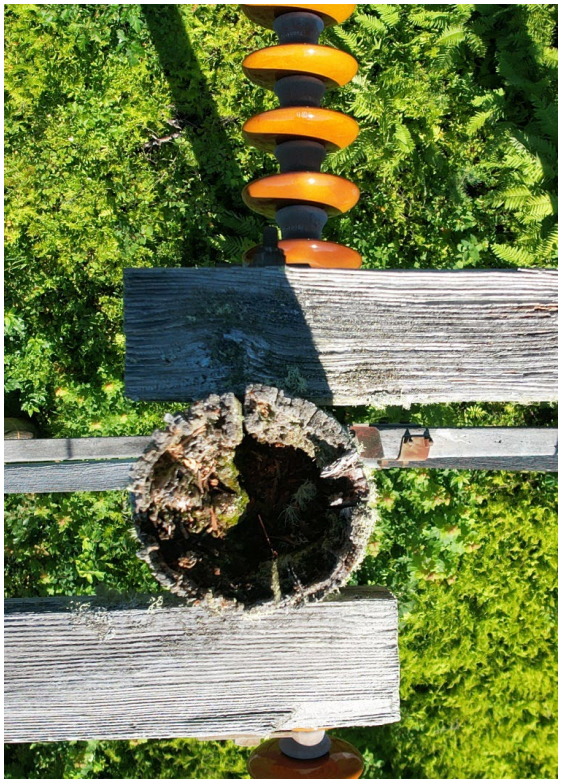


Wood Structure Asset Condition

- Recently completed inspections of these lines graded condition of all structures in accordance with Electric Power Research Institute (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*
- Inspection results showed all wood structures are rated B or C
- Many existing wood structures have one or more of the following deficiencies:
  - Pole top rot
  - Split pole top
  - Decay
  - Broken or rusting hardware
  - Checking
- Other structures do not meet current Eversource design standards for structural capacity, uplift and clearance

Wood Structure Asset Condition

Line B112 Structure 138
Split Pole Top

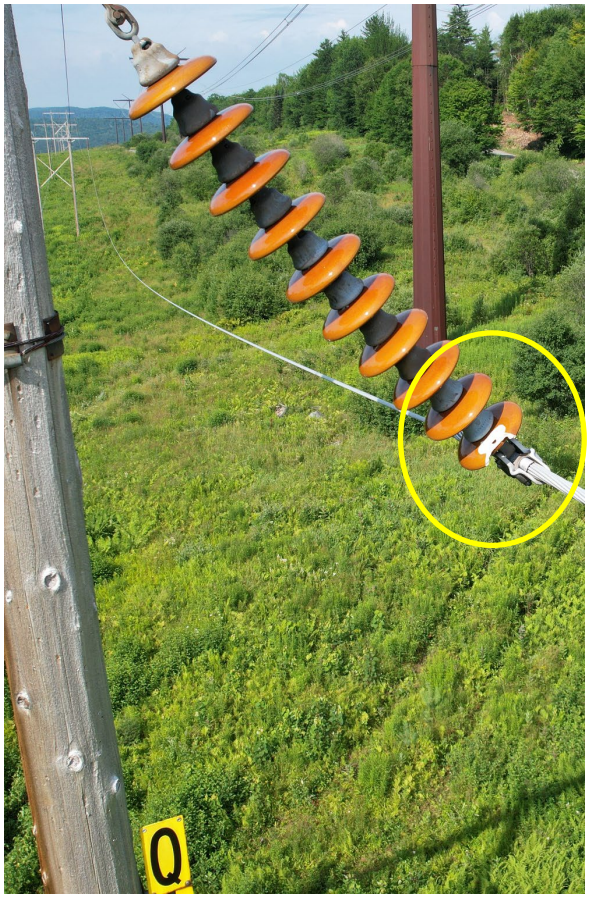


Line Q195 Structure 99
Significant Pole Top Rot

Line U199 Structure 15
Pole Top Split and Rotting

Wood Structure Asset Condition

Line B112 – Structure 99
Significant Decay



Line Q195 – Structure 200
Broken Insulator

Line U199 – Structure 17
Significant Pole Top Rot

Wood Structure Asset Condition

Line B112 – Structure 30
Pole Top Rot

Line Q195 – Structure 193
Pole Top Split, Rot

Line U199 – Structure 50
Pole Top Split, Checking

Project Drivers – Shield Wire Asset Condition

- Copper shield wire is susceptible to thermal degradation as well as degradation due to environmental factors
- Eversource periodically tests samples of conductor and shield wire obtained from existing lines during repairs and maintenance
- Recent test results indicate loss of strength in copper conductor and shield wire
  - Damaged areas and loose strands
  - Outer copper conductor strands have visible verdigris and black oxide
  - Excessive elongation in some strands, potentially due to overheating
  - Conductor and shield wire failed to exceed 95% of the rated breaking strength by American Society for Testing and Materials (ASTM) standards for hard drawn copper wire (84.2-91.1% depending on sample)
  - Severe corrosion of shield wire
- Failure of copper shield wire presents a safety hazard and creates risks to the reliable operation of the transmission system

Project Drivers – OPGW

- OPGW installation expands a private Eversource OPGW / Synchronous Optical Networking (SONET) loop
  - Provides a controlled, alternate fiber communication path supporting the long-term buildout of the fiber optic network
  - Greatly reduces the reliance on leased services for protection, SCADA, and Phasor Measurement Unit (PMU) and Dynamic Disturbance Recorder (DDR) installations (ISO-NE OP-22)
  - A private network is segregated from third-party telecom services, improving the overall reliability and security of communications paths
- 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 to strengthen 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 considered generally immune to the effects of geomagnetic disturbances

Project Drivers - Full Line Rebuild

- Based on recent inspections in accordance with EPRI guidelines, all remaining wood structures on the B112, Q195 and U199 lines need to be replaced
  - Existing wood structures, conductor, and shield wires installed between 1956 and 1971
  - Industry-accepted life expectancy of ACSR is approximately 65 years
- Addressing numerous asset condition structure issues along these lines presents an opportunity to carry out a more comprehensive rebuild to current engineering standards and growing transmission needs
  - Robust, long-term solution for system reliability
  - Allows for more efficient procurement and utilization of resources, as well as more efficient siting and permitting
  - Reduces the occurrence of unplanned outages which may require the need for emergency structure replacement
  - Utilizes Eversource standard structures, conductor, and OPGW
  - Increased conductor size will drastically raise thermal capability of lines to meet future needs

Project Scope – B112

- Replace 254 H-frame wood structures with steel H-frame structures
  - All structures will be steel after completion of project
- Replacement of a 3-pole dead-end switch structure, including new 115 kV 2,000 Amp manual disconnect switch and mounting hardware
  - Located On Beebe River side of B112 at the Tamworth Tap
- Reconductor existing 22.9 circuit miles of 336.4 ACSR conductor with Eversource standard 1272 ACSS
- Replace two existing 22.9-mile-long runs of 3#6 Copperweld shield wires with OPGW
  - No Copperweld shield wire will remain after completion of project
- Install 1700’ of ADSS into Beebe River and White Lake substations to tie in OPGW
- B112 line upgrade previously proposed and PPA-approved (ES-20-T27) to support interconnection of QP 639
  - ES-20-T27 scope was to upgrade the existing conductor splices with higher temperature splices to achieve a LTE rating required as part of QP 639
  - Scope of asset condition rebuild will also achieve required thermal ratings for QP 639
  - ISO-NE recommendation is to proceed with asset condition project (with separate PPA) and withdraw previous QP 639-related PPA when asset condition project goes in service

Project Scope – Q195

- Replace 224 wood structures with 223 new steel H-frame structures
  - All structures will be steel after completion of project
- Reconductor existing 15 circuit miles of 477 ACSR, 1.4 circuit miles of 336.4 ACSR and 1.1 miles of 795 ACSR conductor with 17.5 circuit miles of Eversource standard 1272 ACSS
- Replace two existing 17.5-mile-long runs of 3#6 Copperweld and 7#8 Alumoweld shield wires with OPGW
  - No Copperweld shield wire will remain after completion of project
- Install 1000’ of ADSS into Littleton, Moore, and Whitefield substations to tie in OPGW

Project Scope – U199

- Replace 104 wood and 1 steel H-frame wood structures with new steel H-frame structures
  - All structures will be steel after completion of project
- Reconductor existing 9.75 circuit miles of 795 ACSR conductor with Eversource standard 1272 ACSS
- Replace two existing 9.75-mile-long runs of 7#8 Alumoweld shield wires with OPGW
- Install 1000’ of ADSS into Littleton substation to tie in OPGW

Summary

- B112
  - Replace 254 wood structures with new steel structures
  - Reconductor 22.9 mi of 336 ACSR with 1272 ACSS
  - Install 45.8 mi of OPGW (2 x 22.9 mi)
  - Estimated PTF Cost: **$105.43M** (-25% / +50%) Projected In-service Date: **Q4 2024**
- Q195
  - Replace 224 wood with 223 new steel structures
  - Reconductor 17.5 mi of 336/477/795 ACSR with 1272 ACSS
  - Install 35 mi of OPGW (2 x 17.5 mi)
  - Estimated PTF Cost: **$100.00M** (-25% / +50%) Projected In-service Date: **Q4 2026**
- U199
  - Replace 104 wood and 1 steel structures with new steel structures
  - Reconductor 9.75 mi of 795 ACSR with 1272 ACSS
  - Install 19.5 mi of OPGW (2 x 9.75 mi)
  - Estimated PTF Cost: **$51.18M** (-25% / +50%) Projected In-service Date: **Q2 2026**

Questions