Eversource 345-kV Structure Replacement Projects

Planning Advisory Committee Meeting

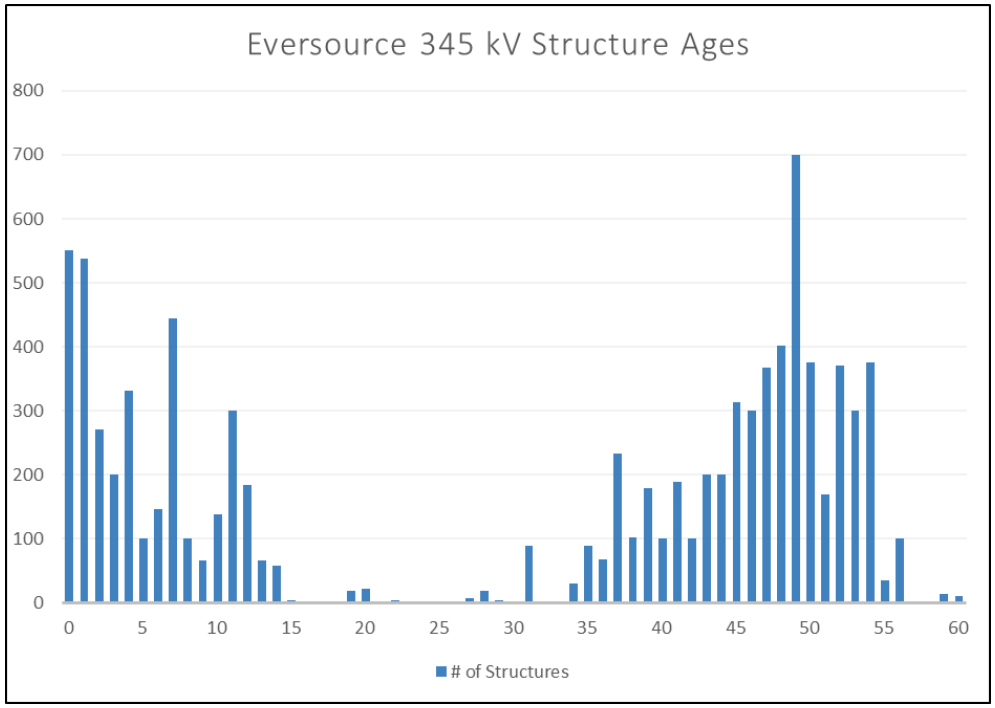
August 8, 2019

Agenda

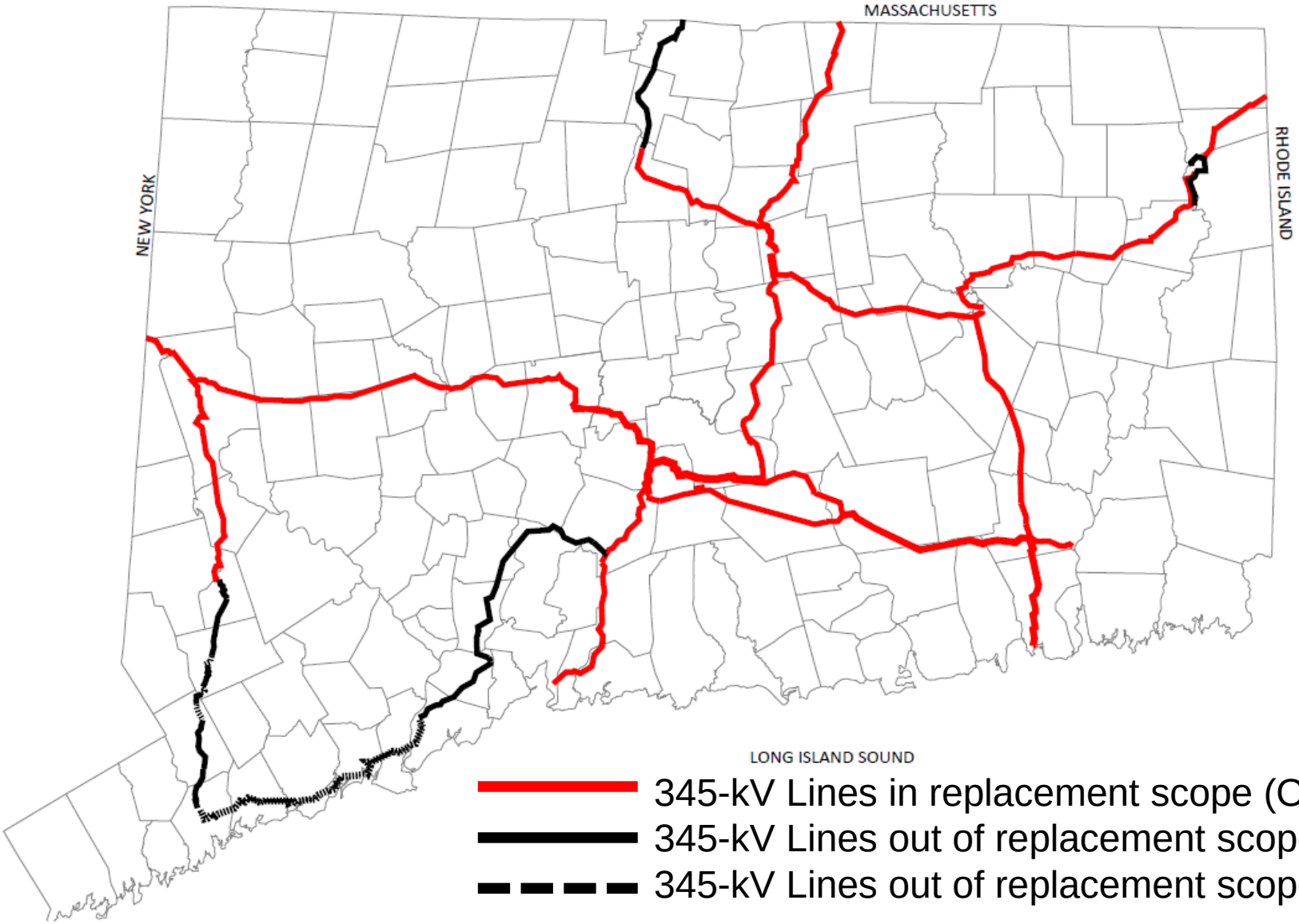
- Eversource 345-kV Program Summary
- Project Background and Drivers
  - Reliability and Safety
    - Inspections, Criteria, Results
- Scope Details – phase 2
  - Line Characteristics, Asset Condition
- Summary and Conclusions

Eversource 345-kV Program Summary

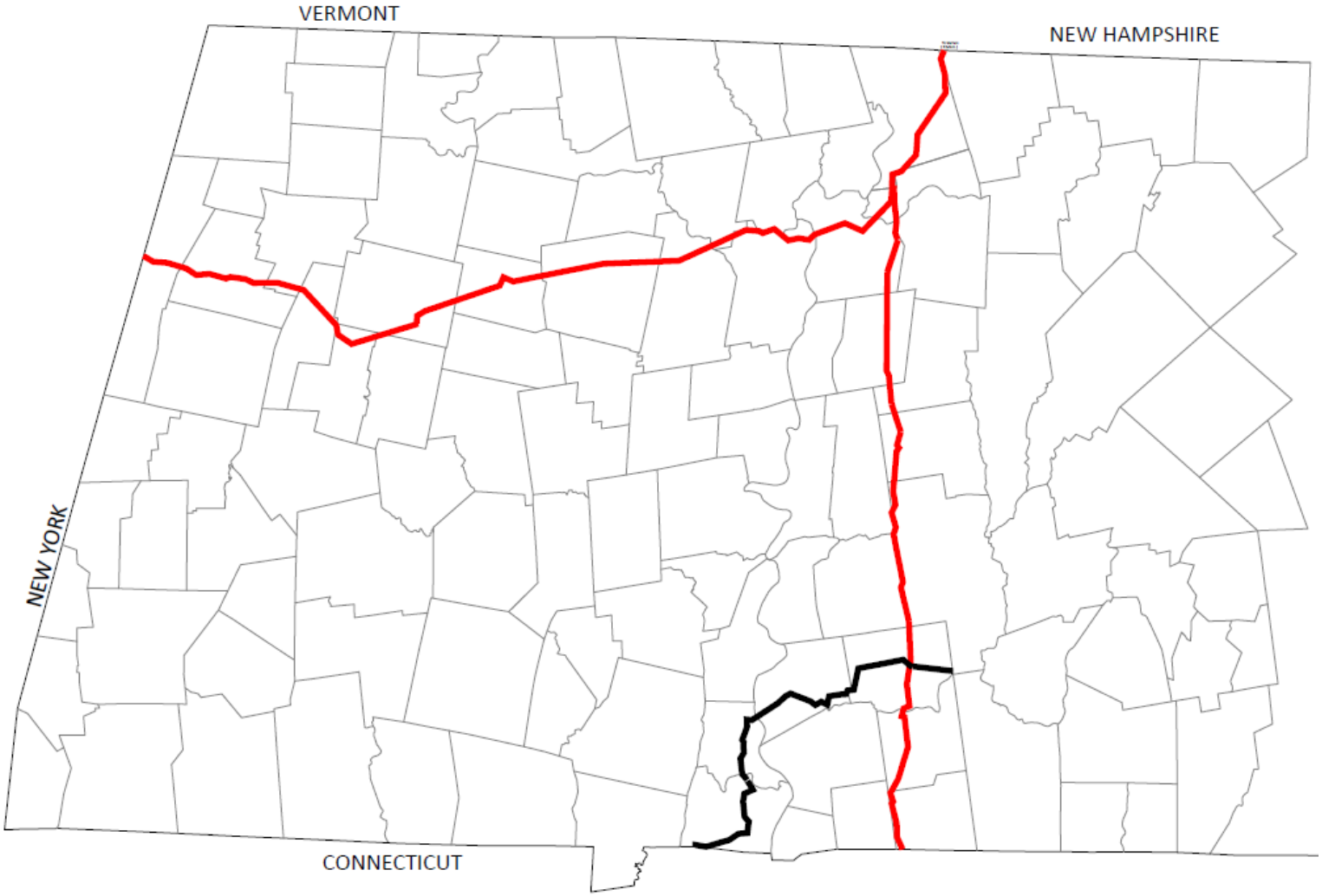
- Eversource manages ~1,250 miles of 345-kV OH lines
  - Over 40% of all New England 345-kV PTF
  - Eversource has over 9,000 345-kV structures
- The majority of NE 345-kV system was constructed in 1960s and 1970s
  - 345-kV structures targeted by the program are typically wood, single circuit structures in an H-Frame configuration



CT 345-kV Geographic Locations



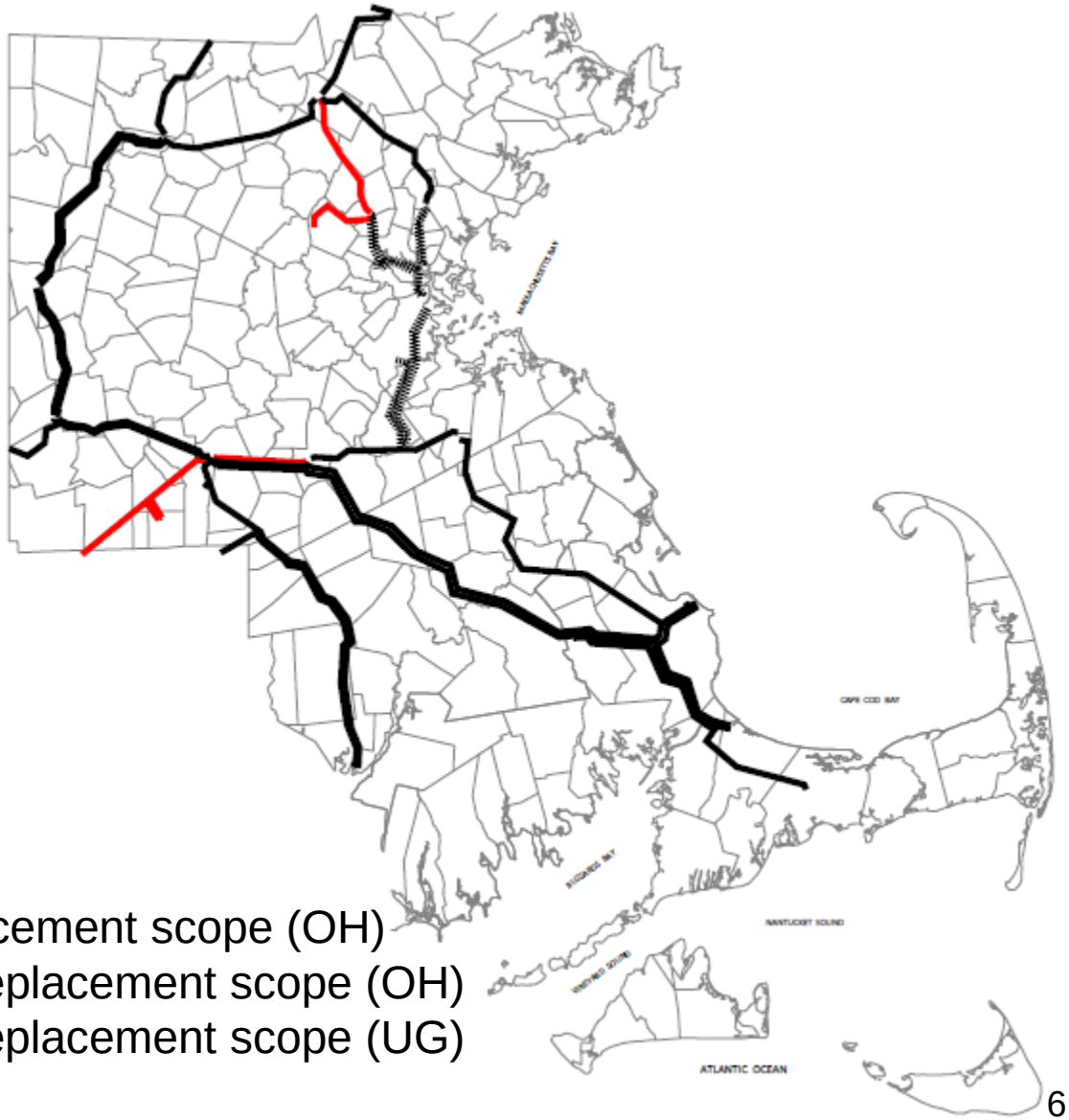
WMA 345-kV Geographic Locations



345-kV Lines in replacement scope

345-kV Lines out of replacement scope

EMA 345-kV Geographic Locations

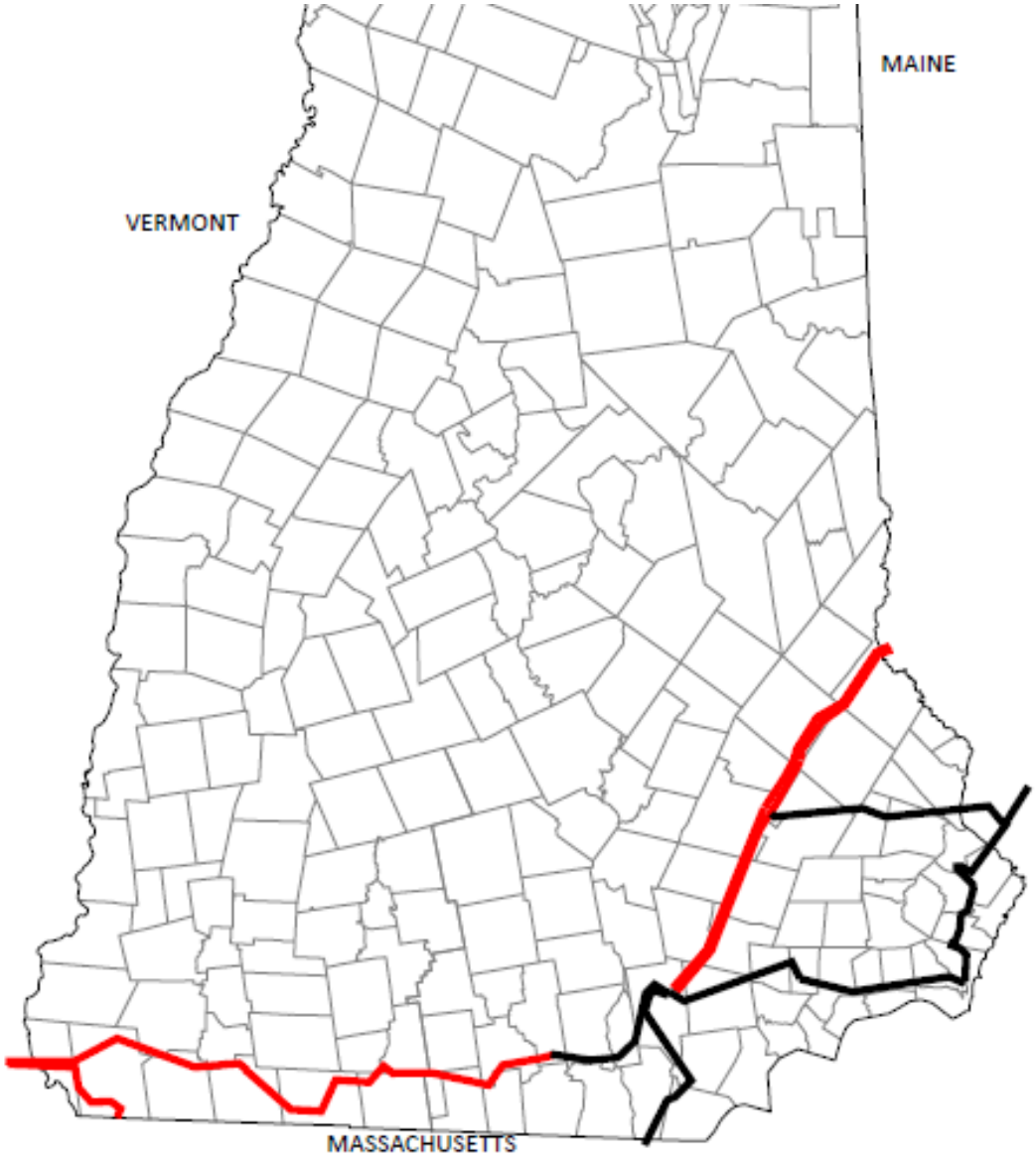


345-kV Lines in replacement scope (OH)

345-kV Lines out of replacement scope (OH)

345-kV Lines out of replacement scope (UG)

NH 345-kV Geographic Locations



345-kV Lines in replacement scope

345-kV Lines out of replacement scope

Project Drivers – Reliability/Safety

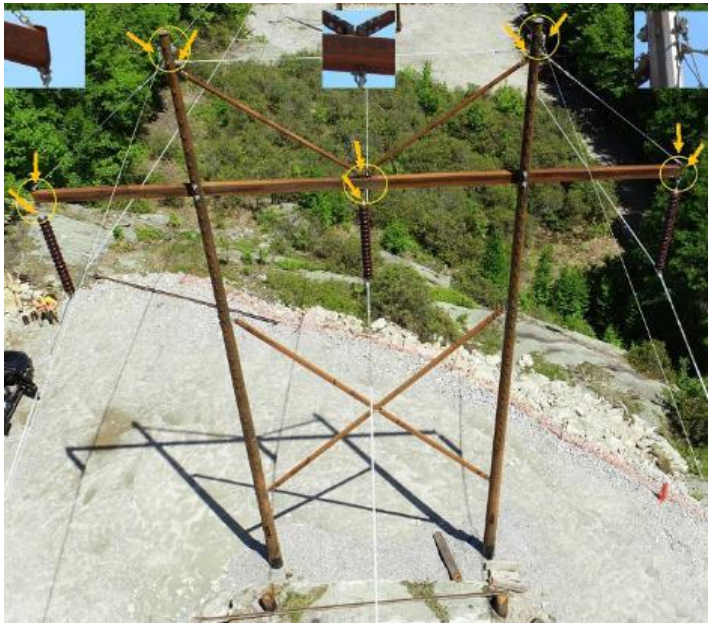
- Eversource is focused on safe and reliable operation of the transmission system, and frequent inspections are performed in accordance with the Eversource Maintenance Program.
- Inspection results are reviewed by Maintenance and Engineering personnel.
- Factors such as cost of structure components vs. cost of future access, environmental impact, and abutter impact will be assessed.
  - Where there is significant cost and/or impacts associated with access to the structure in need of replacement (matting, etc.), the adjacent structure will be reviewed for consideration of replacement at the same time.
- Structures that are being replaced will be reviewed for storm hardening and compliance with the most recent NESC and MA DPU loading and clearance criteria.
  - New structures are typically light-duty steel (wood pole equivalent std) direct embed poles

Structure Inspections

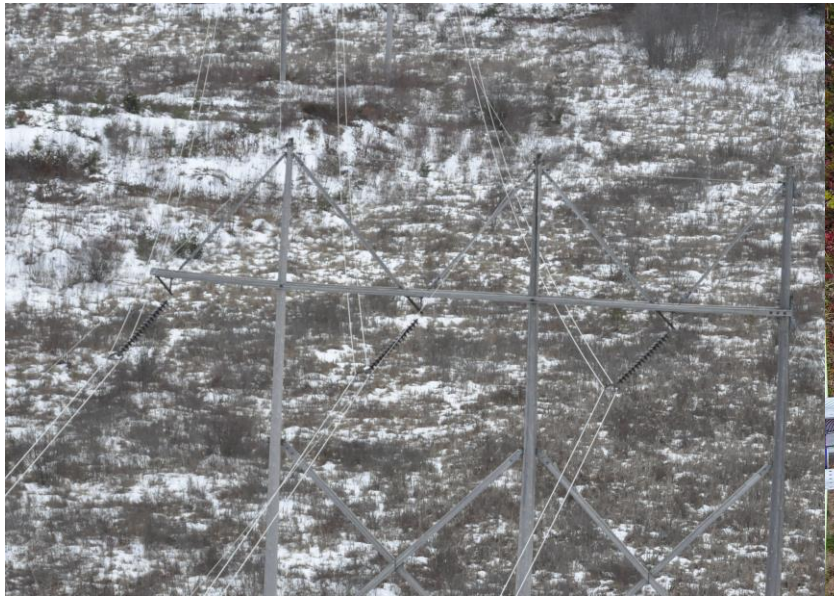
- Current Inspection Standard utilizes ***Comprehensive Drone Inspection*** as Primary Means of Inspection
  - Combines foot patrol and aerial inspection details in one inspection
  - 2-in-1 inspection is more efficient when considering overall duration and frequency of inspectors in row easements during two separate inspections
  - High-definition cameras on drones allow for inspectors to see possible damage from all angles and take better photos
  - Plan is to have the entire system inspected by 2021

- <u>Items Reviewed – Wood Structures</u>
  - Significant woodpecker damage
  - Severe checking/splits/cracking
  - Insect damage
  - Rot or Decay
  - Severe fracturing, buckling, leaning
  - Compression breaks
  - Fire damage
  - Damage/Vandalism
  - Hardware/Insulator damage

UAV Inspections



UAV Inspections



373 Line – NH – Str 182
CVI – Feb-2017

373 Line – NH – Str 182
UAS – Dec. 2018

Inspection Grading & Project Scoping

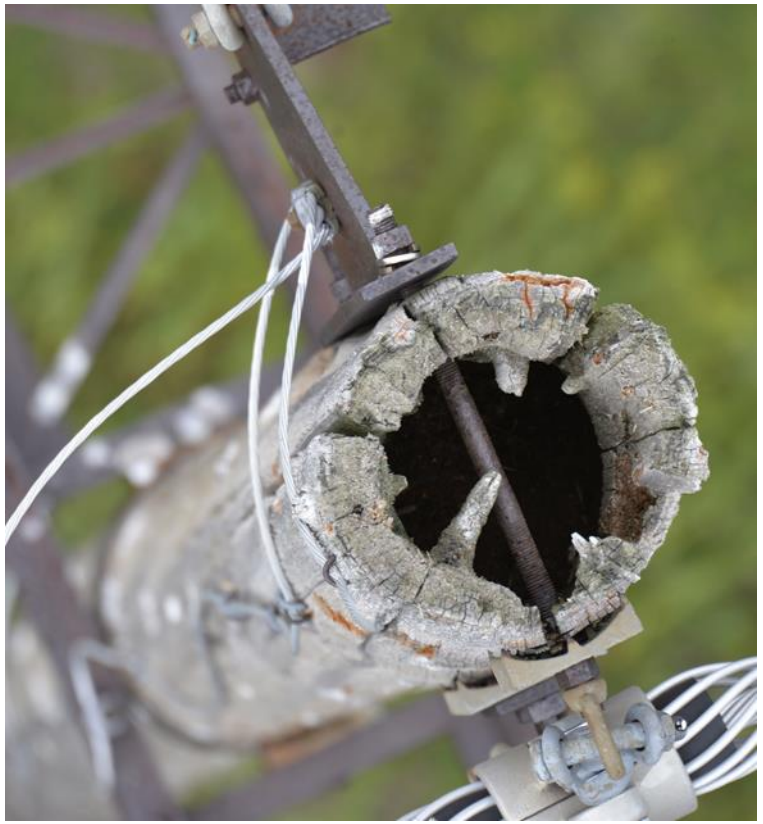
- Structures are graded in accordance with EPRI Guidelines
  - *A: Nominal Defect – No Action Required*
  - *B: Minimal Defect – Monitor Degradation*
  - *C: Moderate Defect – Repair or Replace under next maintenance*
  - *D: Severe Defect – Repair, Reinforce, or Replace immediately*
- Replace C and D structure in one mobilization
  - Other structures (A/B) may be replaced during scope due to engineering requirements and to minimize costs and environmental impacts.
- Engineering provides training to inspectors on appropriate grading criteria
  - Field inspectors provide structure grade while in field and observe the entire structures. Results are reviewed by engineering team and field operations.

Inspection Results

- Utilization of Drones has resulted in significant increase in identified defects.
- Inspections have indicated significant degradation and decreased load carrying capacity of 345-kV wood structures.
- Issues can be detected by visual inspection, but there are also many which are not apparent until the structure is replaced or more detailed inspections are performed.
- Proactively replacing the structures resolves multiple structural/hardware issues and supports safe and reliable operation.

Pole Top Rot

321 Line – CT



381 Line – WMA

Pole Top Rot

348 Line – CT

330 Line – CT

Pole Top Rot

3041 Line – CT

367 Line - NH

Pole Splits

393 Line – WMA

391 Line – NH

Pole Splits

381 Line – NH

364 Lin – CT

Cross Arm Damage

Bowed Cross Arm
336 Line – EMA

Longitudinal Split along Arm
3361 Line – EMA

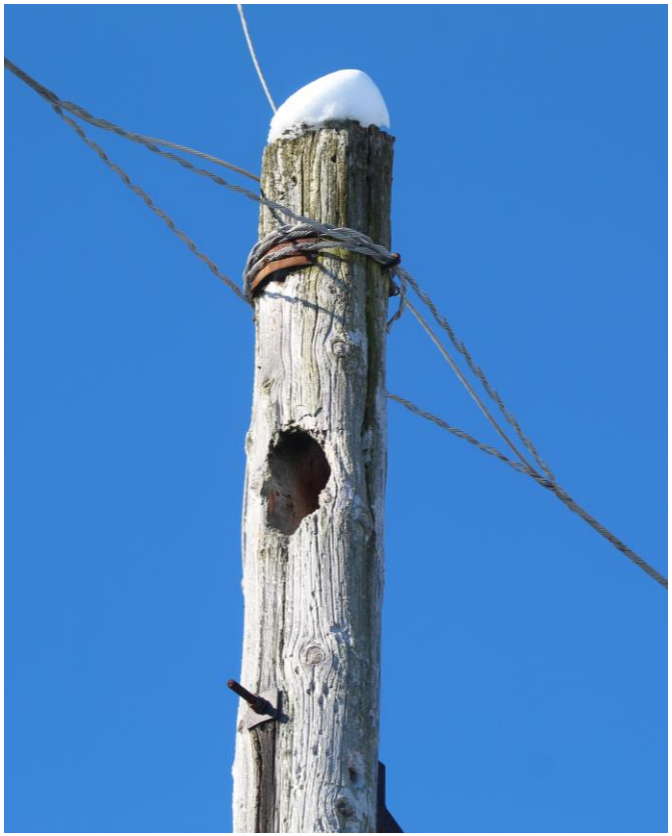
Woodpecker Damage

326 Line – NH

3419 Line – WMA

Woodpecker Damage contd.

354 Line – WMA



3424 Line – CT

Woodpecker Damage contd.

3041 Line - CT

367 Line – NH

Summary of Work

CONNECTICUT			
Line	*Replacement Structures*	*Total Line Structures*	*Estimated Cost ($M)*
310*	85	410	$19.9
321*	24	64	$6.5
330*	59	264	$17.2
348*	83	363	$19.4
352	48	160	$12.5
362	19	139	$5.2
364*	73	199	$17.3
368	31	168	$7.3
383*	97	277	$22.2
387*	59	230	$18.2
3041*	33	161	$10.0
3252	40	128	$8.9
3419	41	106	$11.9
3424	28	135	$7.9
3754	29	106	$8.2

* scope is exclusive of any prior presented work

MASSACHUSETTS			
Line	*Replacement Structures*	*Total Line Structures*	*Estimated Cost ($M)*
336	24	69	$6.6
3361	23	83	$6.3
312	134	318	$41.3
354	86	260	$29.6
381	36	81	$12.5
393*	37	127	$11.0
3419	76	103	$26.0

NEW HAMPSHIRE			
Line	*Replacement Structures*	*Total Line Structures*	*Estimated Cost ($M)*
326*	21	166	$5.2
367*	55	281	$14.1
373	42	179	$10.3
379*	42	169	$9.7
381*	33	89	$8.3
385	57	169	$14.0
391*	68	335	$16.4

Conclusion

- The scope of 345-kV replacement structures is for 1483 structures at estimated cost of $403.9M (-25%/+50%).
  - Structures to be replaced with light-duty tubular steel pole structures. New structures will comply with current clearance and strength Code requirements
  - Replacement schedules to be determined – anticipated ISD for completion of all lines in 2021
- This Phase is expected to be the final major program for 345-kV structure replacements. Any future 345-kV lines that require PAC approvals will be brought forth on a line-by-line basis.

EVERSOURCE TOTALS		
State	***Replacement Structures***	***Estimated Cost ($M)***
CT	749	$192.6
MA	416	$133.3
NH	318	$78.0
Total	1483	$403.9

Questions