RELIABILTY ENHANCEMENT PROGRAM

2019 Report to the NH Public Utilities Commission

EVERSOURCE

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2019 Report to the NH Public Utilities Commission
April 30, 2019

Eversource

Reliability Enhancement Program

Executive Summary

Executive Summary
Eversource Reliability Enhancement Program

This report provides program-specific details for Eversource's Reliability Enhancement Program (REP). This includes Operation and Maintenance (O&M) expenditures from the initial REP program (Base REP) and the 2019 extension of REP for the period January 1, 2019 through December 31, 2019. Results for 2019 are presented for the entire year, even though the REP program effectively ended when temporary distribution rates went into effect on July 1, 2019 and all O&M expenses became part of base distribution rates. This will be the final report for Eversource's Reliability Enhancement Program.

The initial REP was established under the settlement agreement approved by the Commission in Order No. 24,750 in Docket No. DE 06-028 and became effective July 1, 2007. The results of the reliability work under the initial REP were documented in the report submitted by Eversource on February 18, 2011.

As part of the Settlement Agreement on Permanent Distribution Rates approved by the Commission in Order No. 25,123 issued in Docket No. DE 09-035, the settling parties agreed that Eversource should continue its existing REP expenditures from the initial REP and incorporate the revenue requirement for the O&M portion into base distribution rates. Additionally, the Settlement Agreement provided for an additional $4 million per year of revenue for the duration of the Settlement to support enhanced O&M and capital spending under a so-called "REP II" initiative. The REP II initiative ended in 2015 and the final results of that program were included in the report submitted by Eversource on September 30, 2016.

The "REP 3" initiative was a two year extension of REP and was included in the Generation Divestiture settlement agreement of Docket No. DE 14-238. It became effective July 1, 2015, and continued for two years through June 30, 2017. The final results of that program were included in the report submitted by Eversource on May 15, 2017.

A further extension was agreed to as part of Docket No. 17-076 (REP 4). It became effective July 1, 2017 and continued for six months, ending December 31, 2017. The final results of that program were included in the report submitted by Eversource on May 15, 2017.

REP was extended for calendar year 2018 under Docket No. 17-196 and again for calendar year 2019 under Docket No. 18-177. This report covers calendar year 2019 expenditures and results for base REP and the 2019 extension.

O&M

Actual O&M spending for the twelve months ended December 31, 2019 for projects initiated under the Base REP program was $8.98 million. See Section 2 *Base REP O&M Summary January 1, 2019 – December 31, 2019* for details on individual activity cost and unit count.

Actual O&M spending for the twelve months ended December 31, 2019 under 2019 REP program was $16.36 million. See Section 4 *REP O&M Summary January 1, 2019 – December 31, 2019* for details on individual activity cost.

Capital

Capital expenditures for the twelve months ended December 31, 2019 for project initiated under the Base REP program was $3.53 million. See Section 3 *Base REP Capital Summary January 1, 2019 – December 31, 2019* for details on budget item/project descriptions and expenditures by item or project.

There was no Capital component to the 2019 extension of the REP program.

Reliability

Eversource's SAIDI performance improved in 2019, on a weather normalized basis. In 2019 the company experienced fewer storms than in 2018. See Section 1 *NHPUC Reliability Graphs*.

Executive Summary
Eversource Reliability Enhancement Program

Since the REP was implemented, the trend from 2006 onward has been improved reliability on a weather normalized basis. Eversource's customers continue to see benefits from the REP activities. REP programs are preventing problems from occurring (improving SAIFI) and reducing outage times (improving SAIDI) and reducing the number of customers impacted by outages which do occur. The REP activities have proven to be a critical component to improving reliability and have been important in concert with Eversource's continued efforts to maintain and improve the system in the normal course of business.

Section 1

NHPUC Reliability Graphs

NHPUC SAIDI Graphs Summary
Reliability Enhancement Program

The following is a brief description of the SAIDI Graphs contained in this section and the related REP activities for them. All graphs represent data through the end of 2019. Note that for consistency over the entirety of REP reports since the inception of the program, all graphs are based on the NHPUC criteria in effect at the time REP was implemented on July 1, 2007. The change to NHPUC criteria which took place in 2015 is intentionally not reflected in these graphs in order to provide consistency as described. Quarterly reports filed with the NHPUC reflect IEEE criteria, adopted by the NH PUC in the second quarter of 2015.

1. Graphs 1 and 2 depict the Eversource SAIDI – NHPUC Criteria. The Company SAIDI improved in 2019 compared to 2018. 2019 SAIDI of 82.8 is comparable to 1991 and 1992 which have been the best years since at least 1989 and is the first time since 1993 that SAIDI has been under 100. The pre-REP trend lines shown are based on data for 1989 through 2005 and are intended to show where SAIDI might have been without the REP program. The second chart shows a trend line for SAIDI for the period since the implementation of REP and clearly demonstrates the value of the REP program since its inception. Even though there was some significant variation in SAIDI in the early years of REP, the trend over time shows significant improvement resulting from the cumulative efforts of the various aspects of the program.

2. Graphs 3 and 4 depict the Eversource SAIDI – NHPUC Criteria With and Without Storms. NHPUC SAIDI (pink line) does not include emergency events which are classified as PUC Major Storms. A Major Storm is defined as an event that results in either: a) 10% or more of Eversource's retail customers being without power in conjunction with more than 200 reported troubles; or b) more than 300 reported troubles during the event. See *Order No. 25,465* at 1. Eversource experienced a total of four major storms in 2019 compared to 9 in 2018, 4 in 2017, and one in 2016. These larger events are shown on this chart over and above the NHPUC reported SAIDI as the dark blue line. Off-scale impacts are shown for the December Ice Storm in 2008, the February wind storm in 2010, Tropical Storm Irene in August 2011, a major snowstorm in October 2011, Hurricane Sandy in 2012, the Thanksgiving weekend storm in 2014, and the October windstorm in 2017.

   Eversource also tracks minor storms when 100 or more primary power outages occur within a storm timeframe and not deemed a NHPUC major storm. Eversource experienced a total of 17 minor storm days in 2019 compared to 21 in 2018, 25 in 2017, and 20 in 2016(1). These storms contributed 25 minutes to Eversource's SAIDI performance in 2019, compared to 33 minutes in 2018, 50 minutes in 2017, and 53 minutes in 2016.

   Subtracting major and minor storm impacts from NHPUC reported SAIDI leaves a Weather normalized SAIDI, which is the yellow line on the graph. As shown, that component continues to be below levels present when REP was initiated in July 2007 and continues to be on a downward trend since that time, with 2019 results the best since 2002.

3. Eversource Tree Related SAIDI (graph 5). The largest cause group for SAIDI is trees and limbs, primarily from outside of the clearance area. Tree related SAIDI and the NHPUC reported SAIDI trend very closely and are sensitive to weather. Both metrics improved in 2019, with tree related SAIDI reaching the lowest level since at least 2002 and Weather Normalized Tree SAIDI reaching its lowest level since 2003. The overall trend for Weather Normalized SAIDI is essentially flat since 2002, showing that tree trimming efforts coupled with other mitigating factors such as covered conductor, appear to be keeping pace with tree growth. Eversource's trimming cycle based on 2019 results stands at approximately 4.9 years, which is below the maximum five year cycle required by Puc 307.10 Tree-Pruning Standards. REP activities relating to this are Enhanced Tree Trimming specifications for establishing larger clearance zones, Hazard Tree Removals for trees outside the trim zone identified as having the potential to fall into line, and clearing rights-of-way to full width. All of these activities were O&M work in 2019.

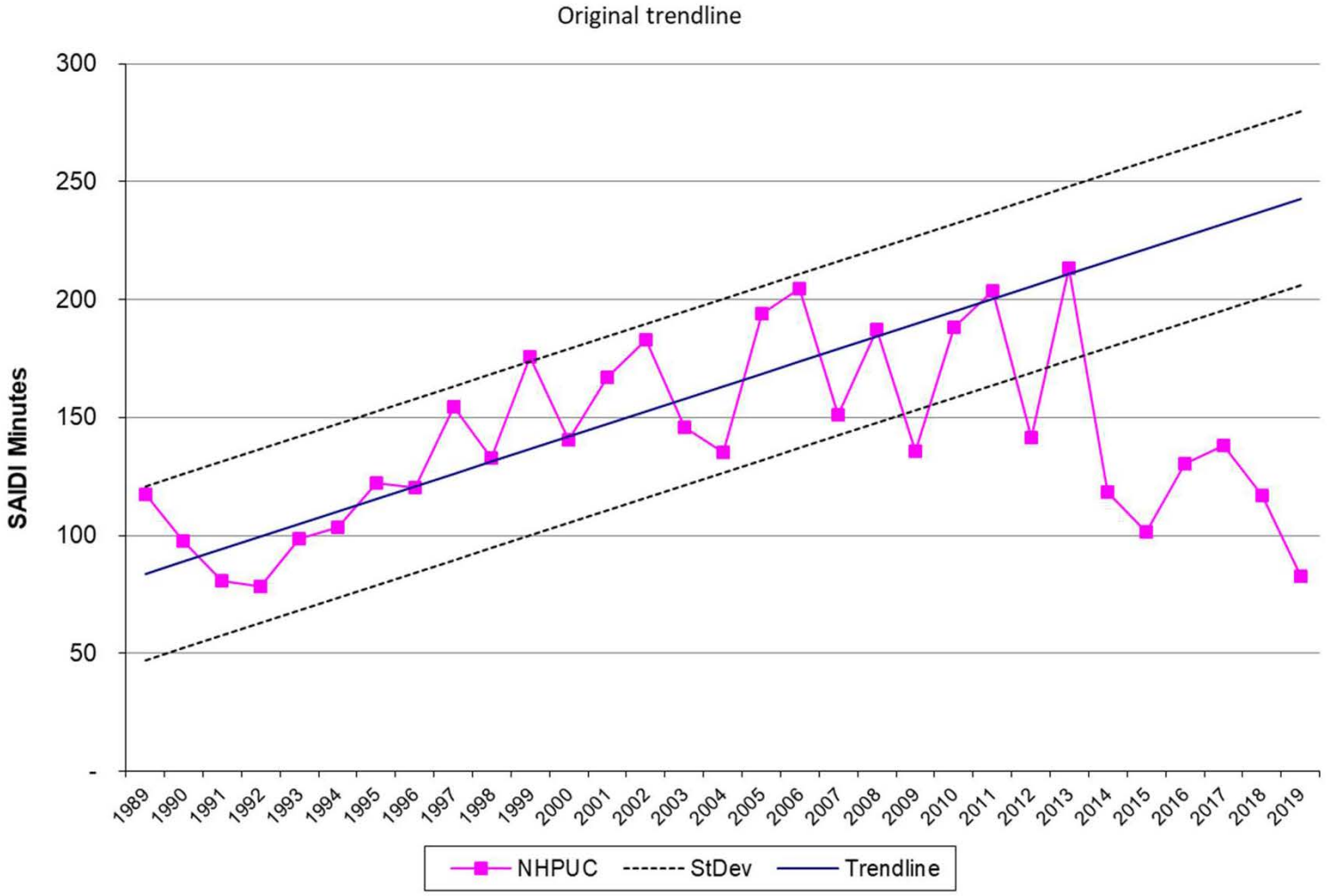
(1) For internal reporting purposes, these are referred to as "minor" and "work order" storm days. There were 13 minor storm days plus 4 work order storm days in 2019. These storms are included in reliability reporting statistics.

4. Eversource Equipment Related SAIDI (graph 6). The second largest cause group for SAIDI is equipment failures in substations and on distribution lines. These outages have very low correlation to weather so the difference between NHPUC criteria performance and weather normalized performance is small. Results in this area showed a decrease in SAIDI in 2019, a continuation of a declining trend since the start of REP in 2007.

5. Eversource SAIDI – NHPUC Criteria Substation Reliability (graph 7). Power outages caused by actions or problems inside substations are typically large and widespread. The amount of SAIDI minutes relating to these events is generally declining and there is essentially no correlation to weather. Substation SAIDI improved in 2019 versus 2018 and remains well below the levels before inception of the REP. There were five substation events in 2019, three of which were equipment failures and two were animal related.

6. Top 50 Hit List SAIDI Contribution from Year to Year (graph 8). Each year Eversource reviews SAIDI by circuit and determines which circuits have contributed the most minutes according to the NHPUC Criteria. Shown on this graphic are the total SAIDI minutes for the top 50 circuits in a year, the amount of SAIDI minutes for those circuits remaining on the top 50 list from the previous year, and the percentage of SAIDI these carry forward circuits represent compared to the Top 50 total. The Top 50 contributed less than 39 minutes to company SAIDI in 2019 (yellow bar). This compares to just over 63 minutes in 2018, 57 minutes in 2017, and almost 68 minutes in 2015. Approximately 57% of these minutes (pink line) or 22 minutes, were due to circuits which were also on the 2018 Top 50 list (purple bar).

PSNH SAIDI - NHPUC Criteria

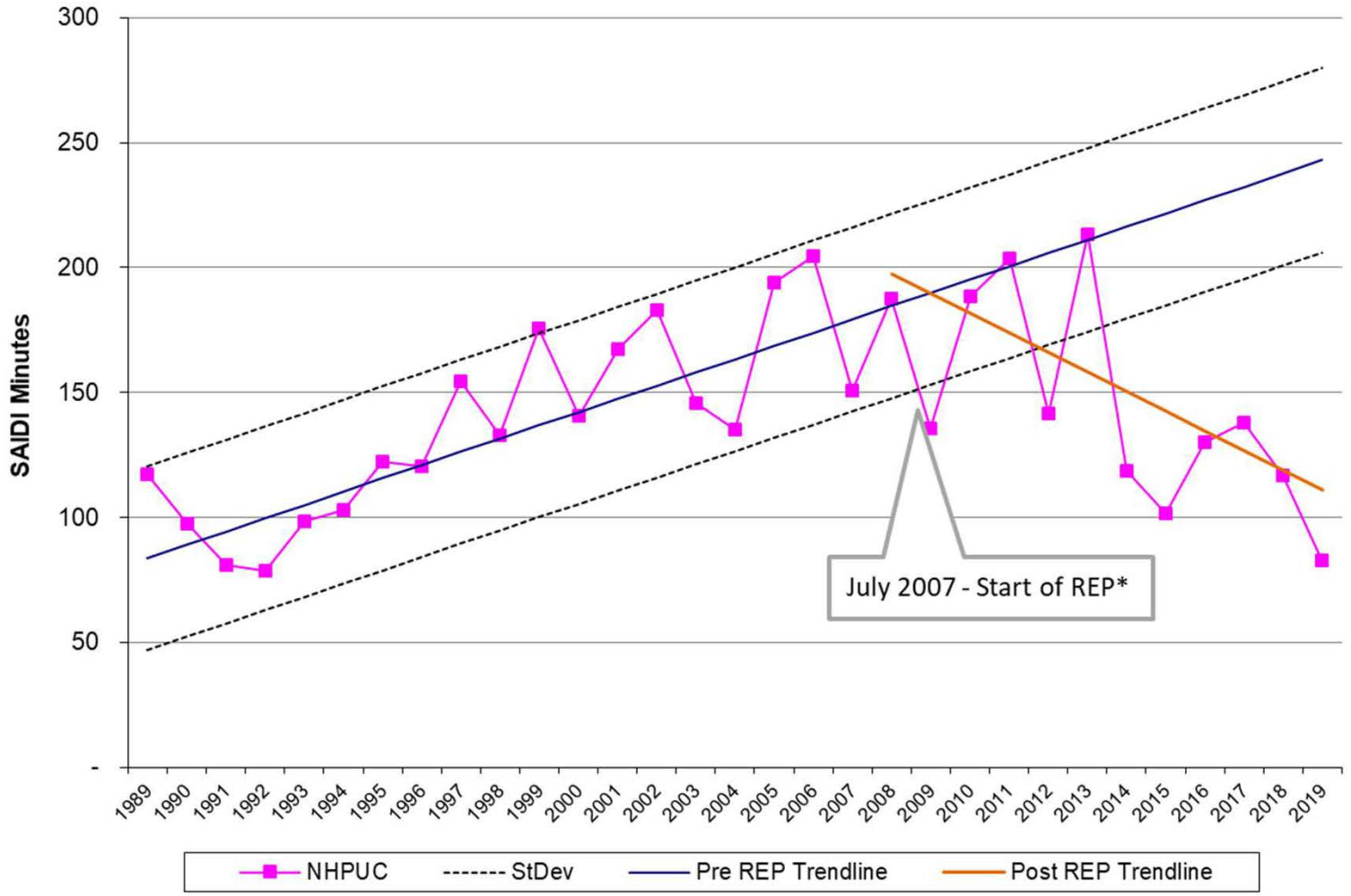


Trend Lines are based upon 1989 - 2005 data and are intended to depict where SAIDI might have tracked without the REP Program

600000

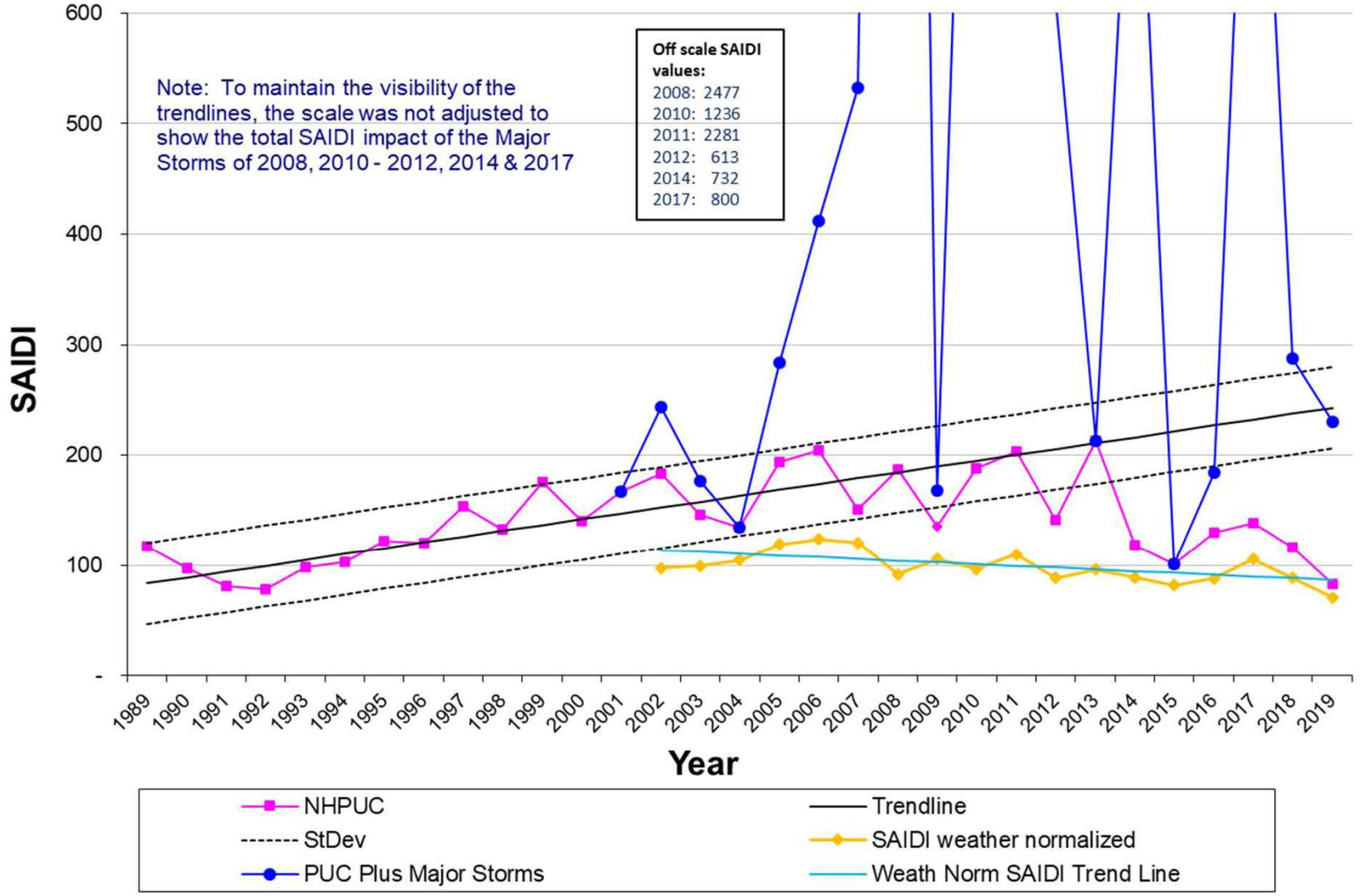
Eversource SAIDI - NHPUC Criteria

Post REP Trendline

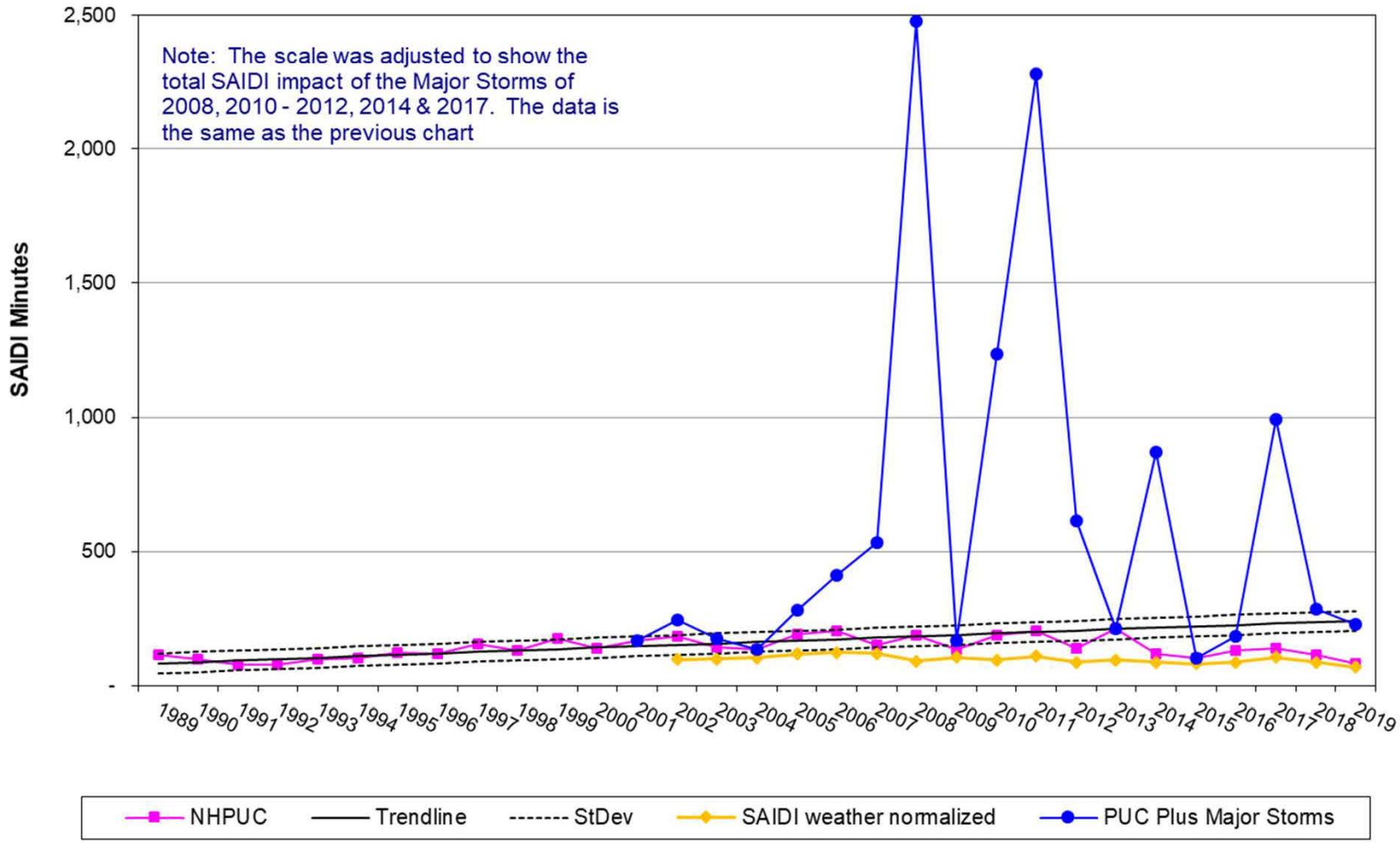


Eversource SAIDI - NHPUC Criteria

With and Without Storms



Eversource SAIDI - NHPUC Criteria
With and Without Storms



Eversource Tree Related SAIDI

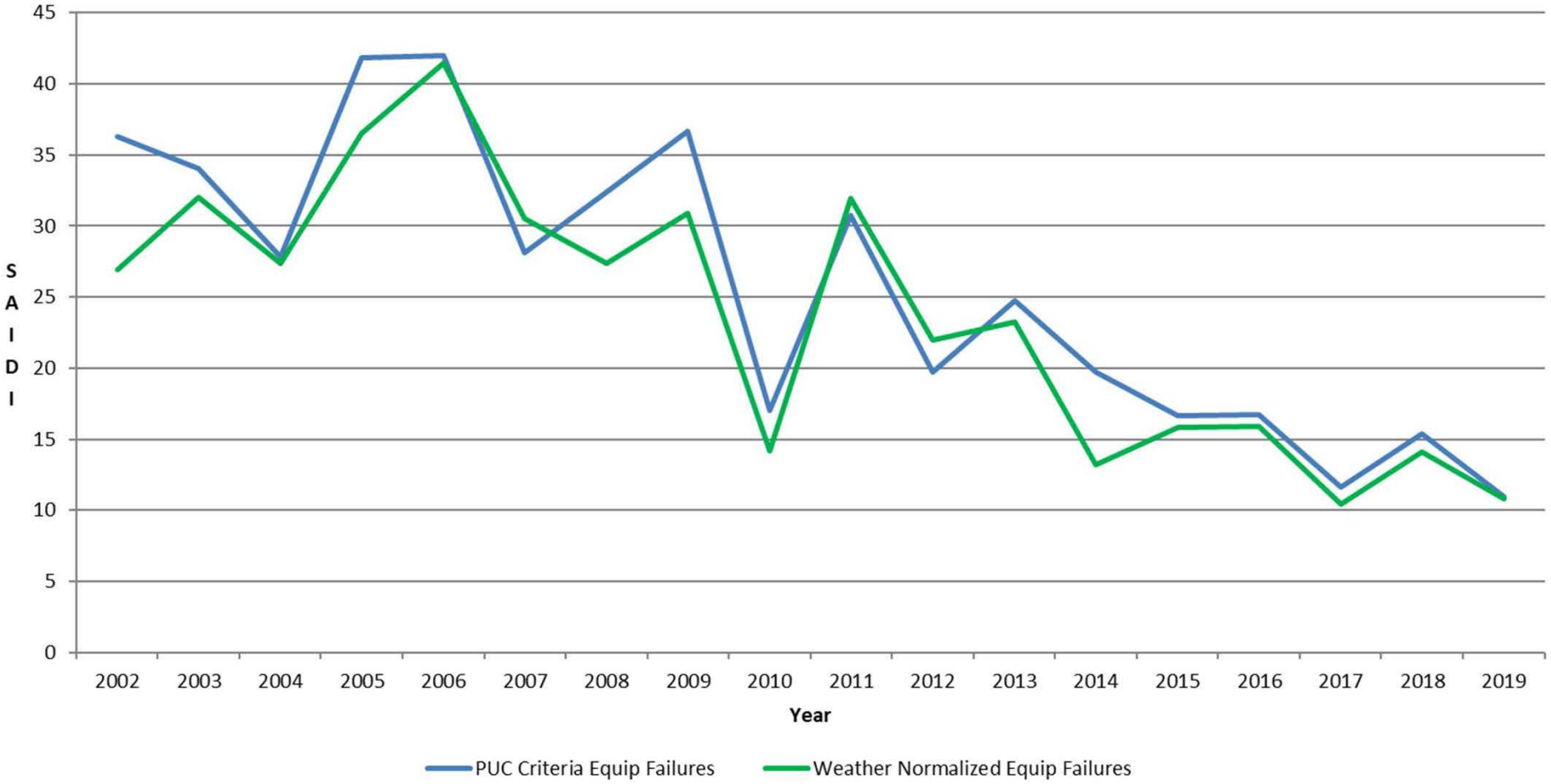
NHPUC Criteria

100% of Trees/Limbs, 50% of Snow/Ice Loading, 40% of Patrolled Nothing Found related troubles)

Eversource Equipment Failure Related SAIDI

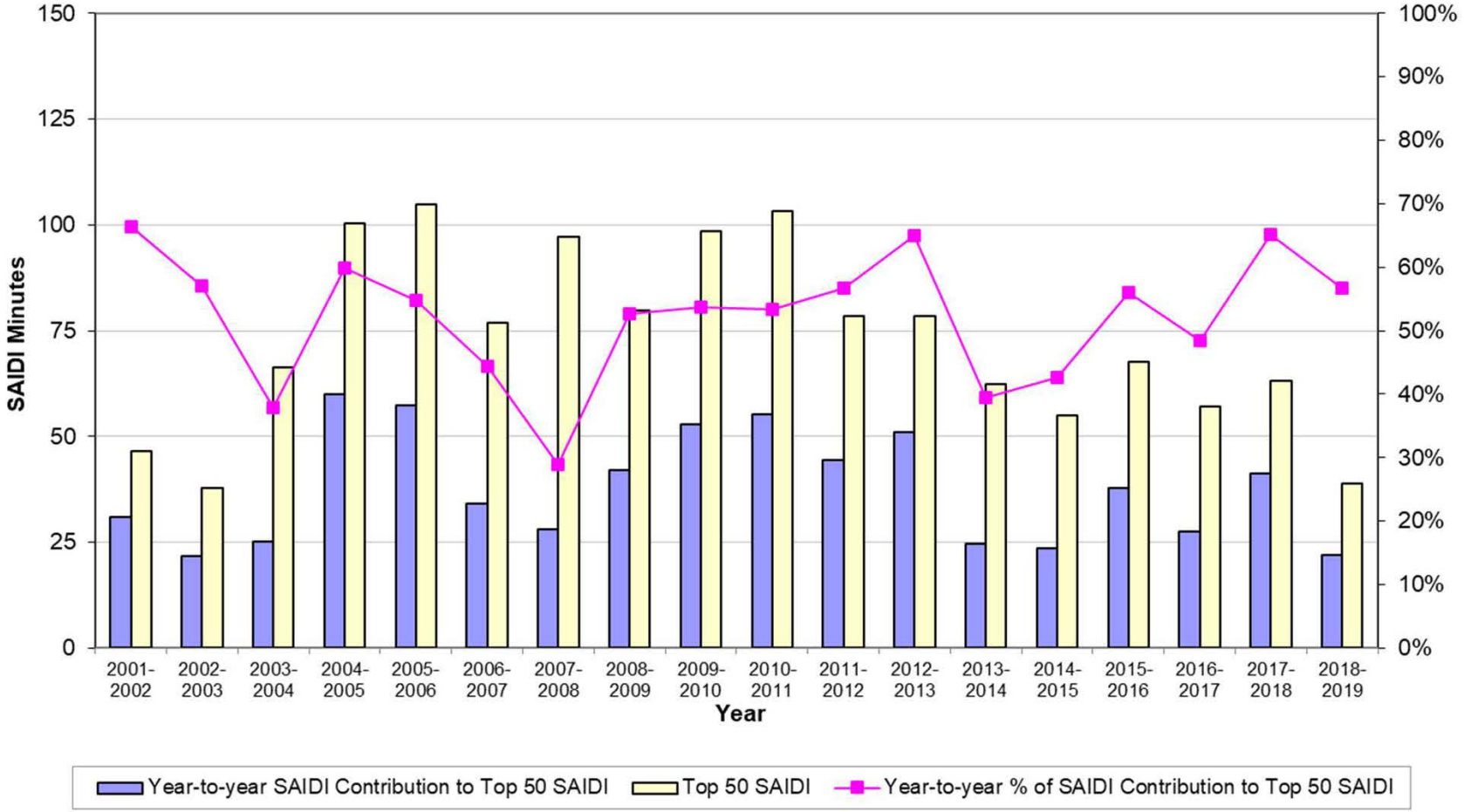
NHPUC Criteria

100% Equipment Failure and Overload Events

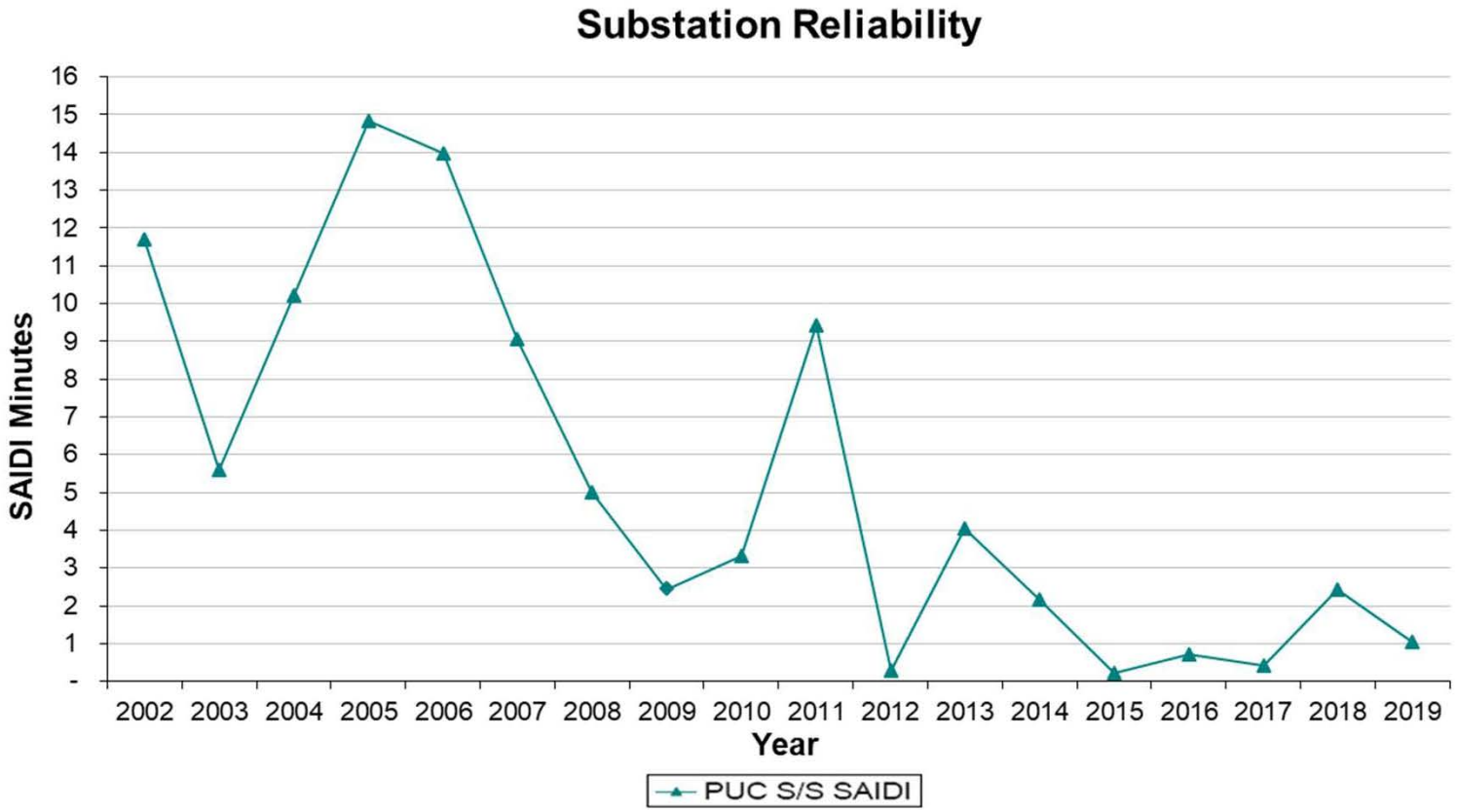


Top 50 Hit List SAIDI Contribution from year to year

NHPUC Criteria



Eversource SAIDI - NHPUC Criteria



Section 2

Base REP O&M Summary

January 1, 2019 – December 31, 2019

Year End 2019 - Base REP
Summary of Eversource Reliability Enhancement Program – O&M

EVERSOURCE

Jan 1 2019 - Dec 31 2019

TRIMRC - VEGETATION MANAGEMENT (O&M)						
	Units	**$ Planned**	**$ Expended**	**Units Planned**	**Units Completed**	**Cost Per Unit**
Reduce Scheduled Maintenance Trim Cycle	Miles	$7,489,500	$8,019,324	1,307	1,067	$7,516
Hot Spot Trimming	Locations	N/A	$0	N/A	0	N/A
Mid Cycle Trimming	Miles	0	0	0	0	N/A
Inspect Contractor	Miles	N/A (2)	N/A (2)		N/A (2)	N/A
Distribution Rights-of-Way Maintenance Cycle	Acres	$250,000	$209,043	687	612	$342
Total TRIMRC		**$ 7,739,500**	**$8,228,367**	**1,994**	**1,679**	

NESCRC - National Electrical Safety Code (O&M)						
	Units	**$ Planned**	**$ Expended**	**Units Planned**	**Units Completed**	**Cost Per Unit**
Full Circuit Patrol	Poles	N/A (1)	$158,675	0	28,850	$6
Inspect and Repair Underground Systems	Maps	N/A (1)	$312,583	297	320	$977
Inspect Manholes	Manholes	N/A (1)	N/A (2)	N/A (2)	N/A (2)	N/A
Pole Inspection and Treatment	Poles	N/A (1)	$315,837	22,600	16,867	$19
Overhead Repair Activity	Repair Orders	N/A (1)	$303	N/A	68	$4
Foot Patrol ROW	Miles	N/A (1)	$192	0	0	$2,379
Total NESCRC		N/A (1)	**$787,590**	**22,897**	**46,105**	

RELIOM - RELIABILITY (O&M)						
	Units	**$ Planned**	**$ Expended**	**Units Planned**	**Units Completed**	**Cost Per Unit**
Overhead Switch Maintenance	Switches	N/A (1)	$1,980	54	54	$37
Recloser Maintenance	Reclosers	N/A (1)	($45,539)	0	0	N/A
Fault Indicators	Units	N/A (1)	$5,083	16	16	$318
Test & Repair Direct Buried Unjacketed Cable	Runs	N/A (1)	$0	0	0	N/A
Total RELIOM		N/A (1)	**($38,476)**	**70**	**70**	

TOTAL O&M ONGOING FROM BASE REP		**$ 8,977,481**	**24,961**	**47,854**

(1) O&M budgets are no longer developed at this level of detail

(2) Data is embedded in another category as specified in O&M Briefing Sections.

O&M – BASE REP - 2019

REDUCE SCHEDULED MAINTENANCE TRIM CYCLE (BASE REP):

Program Description: Eversource is responsible for trimming approximately 11,000 miles of overhead distribution lines. Reduce the schedule maintenance trimming (SMT) cycle to a system average of less than 4.5 years.

Maintenance Cycle: For 2019, the trim cycle is 4.9 years – 2,062 miles of regular maintenance, 72 miles of ETT Maintenance (METT) and 106 miles of ETT.

Results: 1,067 miles were trimmed under this program in 2019

$ Plan	$ Actual	$ Variance
$7,489,500	$8,019,324	$529,824

HOT SPOT TRIMMING (BASE REP)

Program Description: Trim locations identified outside normal maintenance cycle that have been identified during reliability improvement inspections.

Maintenance Cycle: None.

Results: No hot spot trimming was performed in 2019.

$ Plan	$ Actual	$ Variance
$0	$0	$0

MID CYCLE TRIMMING (BASE REP):

Program Description: Perform mid-cycle trimming in areas where vegetation problems develop between maintenance cycles.

Maintenance Cycle: Prior to 2010, the maintenance trimming program did not identify areas that could benefit from trimming between cycles. The Reliability Enhancement Program targeted a limited mid-cycle program of approximately 50 miles in 2010 and 100 miles annually thereafter. By reducing the maintenance trimming cycle to less than four years, mid-cycle trimming needs have been significantly reduced.

Results: With a trim cycle of under five years, no mid-cycle trimming was required.

$ Plan	$ Actual	$ Variance
$0	$0	$0

INSPECT ALL CONTRACTOR WORK (BASE REP):

Program Description: Inspect 100% scheduled maintenance trimming to ensure that the contractor is trimming to specification within the bounds of owner permissions.

Inspection Cycle: The quality assurance program currently targets inspections on approximately 80% of the circuit miles. The Reliability Enhancement Program will target inspecting 100% of the circuit miles trimmed annually. The cost of this program is included within the maintenance trimming budget

$ Plan	$ Actual	$ Variance
$0	$0	$0

REDUCE DISTRIBUTION RIGHTS-OF-WAY (ROW) MOWING CYCLE (BASE REP):

Program Description: Reduce the average maintenance mowing cycle of 34.5 kV rights-of-way to an average of 4 years.

Total Unit Population: Eversource is responsible for mowing approximately 7,930 acres of 34.5 kV rights-of-way.

Inspection Cycle: ROW mowing averages 1,660 acres per year, which results in a four year cycle.

Results: In 2019, 612 acres were completed under this program, plus 612 acres under base budget.

$ Plan	$ Actual	$ Variance
$250,000	$209,043	($40,957)

FULL CIRCUIT PATROL (BASE REP):

Program Description: Establish a full circuit patrol cycle for distribution lines to inspect for adherence to the National Electrical Safety Code including primary distribution lines, secondaries and services. This provides proactive identification of potential problems related to safety, grounding, clearance, attachments, asset maintenance and replacement. Starting in 2017 NESC circuit patrols are performed by the contractors performing pole inspections, so every pole will be inspected every 10 years, including poles maintained by Eversource and poles maintained by joint owners.

Total Unit Population: Eversource is responsible for approximately 11,000 circuit miles of distribution lines.

Maintenance Cycle: A full circuit patrol of the 11,000 miles was completed in four years. Beyond the initial cycle, perform full circuit patrols on a cycle similar to scheduled maintenance trimming (SMT).

Results: In 2019, 28,850 poles were inspected for overhead deficiencies. Note that O&M budgets are no longer developed at this level of detail.

$ Plan	$ Actual	$ Variance
N/A	$158,675	N/A

INSPECT & REPAIR UNDERGROUND SYSTEMS (BASE REP):

Program Description: Establish an inspection cycle for underground systems to identify and repair any issues and to install fault indicators.

Total Unit Population: Eversource is responsible for approximately 2,142 underground development system maps in addition to underground facilities providing service from the company's overhead system.

Maintenance Cycle: A complete cycle of the underground system maps was completed in 2014. Eversource Maintenance requirements were revised in 2013 incorporating a 10-year inspection cycle.

Results: Two hundred ninety seven (297) inspections and 23 repairs were completed in 2019. Note that O&M budgets are no longer developed at this level of detail.

$ Plan	$ Actual	$ Variance
N/A	$312,583	N/A

INSPECT MANHOLES (BASE REP):

Program Description: Establish a cycle program to inspect manholes. A rating is given to each manhole to indicate the structural condition. A program has been established to replace the structurally deficient manholes.

Total Unit Population: Eversource has approximately 634 manholes.

Maintenance Cycle: Inspect on a cycle not to exceed ten years per NU Maintenance Manual, except those requiring inspection more frequently. This program is now part of Inspect and Repair Underground Systems.

POLE INSPECT AND TREAT (BASE REP):

Program Description: Establish a long-term preventive maintenance cycle for roadside distribution poles to inspect, treat, reinforce or replace decayed or damaged poles to ensure reliable and safe use of this asset.

Total Unit Population: Eversource is responsible for approximately 276,000 poles to inspect and treat. Eversource performs pole inspect and treatment in Eversource set areas only.

Maintenance Cycle: 10 years at 27,600 poles annually to inspect and treat (276,000 divided by 10).

Results: In 2019, 16,867 poles were inspected with 403 found to be defective and requiring replacement (2.4 % defective rate). Due to the change in standard pole from a Class 4 to a Class 2, deficient poles are replaced rather than treated in an effort to harden the system. Note that O&M budgets are no longer developed at this level of detail.

$ Plan	$ Actual	$ Variance
N/A	$315,837	N/A

OVERHEAD REPAIR ACTIVITY (BASE REP):

Program Description: Complete O&M maintenance orders generated from National Electrical Safety Code (NESC) inspection including work associated with animal guards. This provides proactive identification of potential problems related to safety, grounding, clearance, attachments, asset maintenance and replacement. Items are prioritized from 1 (correct immediately) to 5 (low priority work to be scheduled in conjunction with other work).

Total Unit Population: Dependent on program inspection results.

Maintenance Cycle: Complete maintenance orders within a reasonable period of time from initial identification.

Results: Sixty eight corrective items in the priority 1-3 category were completed in 2019. Note that O&M budgets are no longer developed at this level of detail.

$ Plan	$ Actual	$ Variance
N/A	$303	N/A

FOOT PATROL RIGHT-OF-WAY (BASE REP):

Program Description: Inspect from the ground the 862 miles of overhead line in ROW. Identify for correction all NESC code violations and reliability issues.

Total Unit Population: 862 miles (171 lines)

Maintenance Cycle: Starting in 2015, the Eversource Maintenance Manual recommends an annual helicopter patrol or foot patrol.

Results: All 862 miles were patrolled by helicopter in 2019 (171 lines). No distribution ROW lines were foot patrolled under this program. Note that O&M budgets are no longer developed at this level of detail.

$ Plan	$ Actual	$ Variance
N/A	$192	N/A

OVERHEAD LINE SWITCH MAINTENANCE (BASE REP):

Program Description: Establish program to maintain and exercise overhead switches to ensure reliable operation when needed. Bypass switching will be installed as needed to facilitate this program going forward.

Total Unit Population: Eversource has approximately 279 switches remaining on the distribution system included in this program. Switches are being replaced with Distribution Automation devices as part of the Distribution Automation program, so the population of switches decreases every year.

Maintenance Cycle: Eversource Maintenance Manual specifies a six year maintenance cycle.

Results: In 2019, 54 switches were maintained. Note that O&M budgets are no longer developed at this level of detail.

$ Plan	$ Actual	$ Variance
N/A	$1,980	N/A

OVERHEAD RECLOSER MAINTENANCE (BASE REP):

Program Description: Reclosers are scheduled to be maintained on a time and fault operation based frequency or based on remaining contact life.

Total Unit Population: Eversource has 1,755 reclosers installed, including 469 with interruption under oil and 1,286 with vacuum interruption.

Maintenance Cycle: Starting in 2013, Eversource Maintenance Manual specifies 12 years for oil type reclosers and ≤ 5% contact life or duty cycle for reclosers with contacts under vacuum and modern electronic controls.

Results: No reclosers were maintained in 2019. There was a Material credit to this account because reclosers previously maintained were damaged due to external events and returned to maintenance facility. Replacement units were issued out under repair work orders. Note that O&M budgets are no longer developed at this level of detail.

$ Plan	$ Actual	$ Variance
N/A	$(45,539)	N/A

INSTALL FAULT INDICATORS (BASE REP):

Program Description: Install fault indicators on equipment and at locations which will facilitate identifying the locations of faults on the distribution system. Installation will reduce the outage duration.

Total Unit Population: Underground - 1:1 ratio with single phase padmount transformers, overhead to be determined.

Maintenance Cycle: Battery life is in excess of 20 years. Fault indicators will be replaced before the end of their useful lives. Underground fault indicator battery replacement will be performed during underground inspections, within an appropriate timeframe. Overhead fault indicator locations will be entered into CASCADE maintenance data base with an appropriate trigger for replacement.

Results: Sixteen fault indicators required replacement in 2019 and these were completed. Note that O&M budgets are no longer developed at this level of detail.

$ Plan	$ Actual	$ Variance
N/A	$5,083	N/A

TEST & REPAIR DIRECT BURIED UNJACKETED CABLE - CONCENTRIC NEUTRALS (BASE REP):

Program Description: Testing of direct buried unjacketed cable concentric neutral to determine if there is a sufficient neutral path. If the neutral has degraded to an inadequate level, the cable will be replaced.

Total Unit Population: Eversource has approximately 2,000,000 feet or 5,764 runs of direct buried cable.

Maintenance Cycle: Once.

Results: No cable was tested in 2019. Note that O&M budgets are no longer developed at this level of detail.

$ Plan	$ Actual	$ Variance
N/A	$0	$0

Section 3

Base REP Capital Summary

January 1, 2019 – December 31, 2019

Year End 2019 - Base REP
Summary of Eversource Reliability Enhancement Program – CAPITAL

EVERSOURCE

Jan 1 2019 - Dec 30 2019

CAPITAL - DUE TO BASE REP			
	$ PLAN	**$ ACTUAL**	**$ VARIANCE**
Reject Pole Replacement	$2,494,700	$3,019,500	$524,800
Pole Reinforcement	$0	$0	$0
NESC Capital Work	$0	($15,200)	($15,200)
Airbreak Switch Replacement	$0	$0	$0
Direct Buried Cable Replacement	$700,000	$531,900	($168,100)
Direct Buried Cable Injection	$0	($1,800)	($1,800)
TOTAL BASE REP CAPITAL	**$3,194,700**	**$3,534,400**	**$339,700**

CAPITAL - BASE REP - 2019

REJECT POLE REPLACEMENT (BASE REP):

Program Description: The preventive maintenance cycle for distribution poles to inspect, treat, reinforce or replace decayed or damaged poles to ensure reliable and safe use of this asset will generate approximately 2% of the poles inspected for replacement.

Eversource maintains 276,000 poles on its system. These are inspected every 10 years or an average of 27,600 poles per year

Total Unit Population: Dependent upon inspection results, estimate 480 poles to replace each year.

Results: In 2019, 16,867 poles were inspected with 403 found to be defective and requiring replacement (2.4 % defective rate).

$ Plan	$ Actual	$ Variance
$2,494,700	$3,019,500	$524,800

POLE REINFORCEMENT (BASE REP):

Program Description: Inspection of poles generates approximately 0.6% of poles that require being made safe or replaced within five working days, approximately 0.8% of poles must be replaced within one year and approximately 0.5% are eligible for reinforcement. Each of the poles eligible for reinforcement are reviewed in the field to determine if they will be reinforced.

Total Unit Population: Dependent upon inspection results.

Results: Due to the change in standard pole from a Class 4 to a Class 2 to improve system hardness, the decision was made to replace rather than reinforce the smaller poles. Therefore, no poles were reinforced in 2019.

$ Plan	$ Actual	$ Variance
$0	$0	$0

NATIONAL ELECTRICAL SAFETY CODE (NESC) GENERATED CAPITAL WORK (BASE REP):

Program Description: Replace distribution plant units with deficiencies identified during NESC inspections which are required to conform to the National Electrical Safety Code (NESC). Correct NESC violations by installing plant units. Most often, the installation of poles and conductors are required to meet clearance problems to buildings, communications conductors, or over streets and roadways.

Total Unit Population: The backlog of NESC capital maintenance orders is 34. Additional units are identified during the Overhead Plant inspections.

Results: The most common requirement is to replace poles to gain additional height to meet clearance to communications conductors or clearance to buildings or structures. Starting in 2019, this work completed under the "Repairs and Obsolescence" annual project. A small credit appears in the category due to accounting adjustments from prior year activities.

$ Plan	$ Actual	$ Variance
$0	$(15,200)	$(15,200)

AIRBREAK SWITCH REPLACEMENT (BASE REP):

Program Description: Air break switches are being replaced with Distribution Automation devices. Of the 725 airbreak switches on the system at the beginning of the REP program, only 41 remain on distribution lines. This project accounts for the replacement of distribution line switches that are not suitable to be maintained and are not being changed to DA devices.

Total Unit Population: 41

Maintenance Cycle: Airbreak Switches are maintained on a six year cycle with inspection every year.

Results: No switches were replaced under this program in 2019.

$ Plan	$ Actual	$ Variance
$0	$0	$0

DIRECT BURIED CABLE REPLACEMENT (BASE REP):

Program Description: Replace direct buried cable with cable in conduit.

2,000,000 feet of direct buried cable was installed at Eversource until 1985 with earliest vintages from 1970. Cable insulation is subject to age failure and bare concentric neutral conductors are subject to corrosion. Testing has indicated that in many locations the concentric neutral is no longer sufficient to provide a path to ground for the electric system. This project is to replace unjacketed direct buried cable in specific developments which have experienced a high failure rate or where cable has been rejected as a candidate for cable injection. Live front transformers and/or pre-1987 elbows are replaced along with the cable.

Total Unit Population: 2,000,000 feet

Results: Approximately 4,900 feet of direct buried cable was replaced with new cable in conduit as part of this project in 2019.

$ Plan	$ Actual	$ Variance
$700,000	$531,900	$(168,100)

DIRECT BURIED CABLE INJECTION (BASE REP):

Program Description:

2,000,000 feet of direct buried cable was installed at Eversource until 1985 with earliest vintages from 1970. The cable insulation is subject to age failure and the bare concentric neutral is subject to corrosion. This project is to inject unjacketed direct buried cable if it has shown by test that the concentric neutral has the majority of its integrity remaining.

Total Unit Population:

2,000,000 feet of direct buried cable. The actual amount eligible for injection is determined after concentric neutral testing.

Results:

No cable was injected in 2019. The small credit here was due to accounting adjustments on prior year activities.

$ Plan	$ Actual	$ Variance
$0	$(1,800)	$(1,800)

Section 4

REP O&M Summary

January 1 2019 – December 31 2019

Summary of Eversource Reliability Enhancement Program – O&M

EVERSOURCE

January 1 2019 - December 31 2019

2019 REP O&M			
	$ Planned	**$ Expended**	**Variance**
Vegetation Management	$16,800,000	$15,403,876	($1,396,124)
Enhanced Tree Trimming	$5,000,000	$3,681,707	($1,318,293)
Hazard Tree Removal	$10,000,000	$9,983,639	($16,361)
Full Width ROW Clearing	$1,800,000	$1,738,530	($61,470)
Troubleshooter Organization	$1,000,000	$957,669	($42,331)

TOTAL O&M	**$ 17,800,000**	**$ 16,361,545**	**$ (1,438,455)**

VEGETATION MANAGEMENT:

Enhanced Tree Trimming (ETT):

Program Description: Trim main lines for reliability using an enhanced tree trimming (ETT) specification to create ground to sky clearance versus the standard maintenance trim zone. Expanded clearance is obtained by performing greater off zone takedowns and clearing and higher than normal vertical clearing. Approximately 11,000 miles of overhead line exists with the project targeted at up to 115 miles per year on circuits with worst tree related reliability (top 50 list).

Total Unit Population: Eversource is responsible for trimming approximately 11,000 miles of overhead distribution line. A portion of these miles are candidates for ETT to improve reliability on main lines.

Reliability Benefit: Increasing the trim zone at targeted main line locations significantly reduces the risk of tree outages associated with significant SAIDI (customer) impact.

Results: 105.29 miles of ETT was performed in 2019 at an average cost of $34,967 per mile. Eversource was able to surpass its annual goal of 100 miles. The introduction of another NH based competitive specialized removal contractor (Northern Tree) has diversified Eversource's ability to complete SMT and ETT work plans effectively. Introduction of competition has also brought the average cost per mile down compared to historical 5-year average. This decrease in cost allowed the Company to exceed its goal of 100 miles while spending approximately 27% less than budget. The additional contractors bidding on the work has also proven helpful to Eversource customers as it increases the number of tree crews available for storm duty in New Hampshire. Actual work completed and the associated costs are as follows:

CIRCUIT	TOWN	MILES	COST
53H2	Dublin	3.27	$153,672
360X5	Bedford	0.86	$31,182
314X26	Milford	1.92	$67,848
11W2	Laconia	1.64	$95,218
70W1	Laconia	5.1	$85,529
39H2	Franklin	3.95	$39,855
35W1	Peterborough	5.38	$206,494
15H6	Nashua	1.41	$41,447
16H3	Nashua	2.59	$68,624
17H2	Nashua	2.25	$13,077
18H1	Nashua	2.72	$97,474
28H1	Rochester	1.63	$39,139
41H2	Dover	2.0	$27,020
43H1	Rochester	2.82	$64,733
73W2	Wakefield	6.98	$205,965
32X3	Dover/Somersworth	2.5	$96,485
3177X	Nashua	4.0	$117,581
37H2	Northfield	1.43	$71,576
37X4	Northfield	1.65	$65,818
377X1	Durham	1.82	$66,765
32W1	Londonderry	2.5	$44,725
3120	Troy	1.7	$49,972
3615X1	Candia	2.39	$46,185
324	Londonderry	0.5	$12,500
3445X	Nashua	0.8	$27,691
3173X3	Northwood	2.98	$137,565

Results continued:

CIRCUIT	TOWN	MILES	COST
348X2	Sugar Hill	0.55	$42,000
3197X	Merrimack	0.95	$33,990
3137X6	Northwood	3.31	$121,473
21W1	Manchester	3.35	$125,692
75W2	Claremont	3.1	$61,424
345X5	Laconia	2.79	$109,926
20W2	Hebron	7.53	$518,586
382X3	Jaffrey	13.61	$574,448
	Total	**105.29**	**$3,681,707**

$ Plan	$ Actual	$ Variance
$5,000,000	$3,681,707	($1,318,293)

Hazard Tree Removal:

Program Description: Remove trees greater than 16 inches in diameter within the trim zone and others outside the trim zone that are identified as a hazard to falling onto primary conductors.

Total Unit Population: Population is unknown. Candidates are identified during maintenance trimming and by employees during reliability investigations.

Reliability Benefit: Identifying and removing trees that have a high likelihood of contacting primary conductors significantly reduces the risk of tree outages associated with significant SAIDI (customer) impact.

Results: 23,982 trees were removed in 2019. The major focus for the company was to utilize historical storm and tree trouble data to plot where the company has experienced poor reliability attributed to tree related outages. The 316X1 circuit in Grantham, NH has historically been a poor reliability circuit for Eversource. Utilizing Power Bi Eversource was able to target the removal of 1,466 hazard tree removals and during a recent 2020 ice storm event the circuit saw zero tree related outages. Power Bi is a business analytic platform that Eversource has adapted to assist with planning hazard tree removal work to target areas where tree outages have been trending upward.

$ Plan	$ Actual	$ Variance
$10,000,000	$9,983,639	($16,361)

Full Width ROW Clearing:

Program Description: Research easements, determine the easement boundaries and clear ROWs to the full extent of the easements.

Total Unit Population: Distribution in ROW is approximately 841 miles. ROWs are prioritized based upon outage histories.

Reliability Benefit: Clearing ROWs to the full width of the easements will reduce the risk of tree outages associated with significant SAIDI (customer) impact.

Results: 22.91 miles of ROW were cleared to their full width under the program in 2019.

Town	Circuit	Miles
Sugar Hill	348x2	3.2
Tilton/Northfield	3216	2.4
Dublin/Marlborough	W15	2.0
Durham	3229 (Newmarket Tap)	1.0
Newfields	3191 (Newfields Tap)	0.4
Manchester	324	1.0
Wilton/Milford	314	5.25
Tuftonboro	390	2.96
Laconia	368/3222X	0.4
Rumney	343	2.8
Pembroke	334G	1.5
	Total Miles	**22.91**

$ Plan	$ Actual	$ Variance
$1,800,000	$1,738,530	($61,470)

TROUBLESHOOTER ORGANIZATION:

Program Description: Similar to prior years, the REP provides approximately half of the funding for the original group of two supervisors and 18 Troubleshooter positions, broken up into three six-person teams working twelve hour shifts providing coverage 24 hours a day, 365 days a year to the primary coverage area. The primary coverage area consists of the Bedford, Derry, Hooksett, Milford, and Nashua Area Work Centers (AWCs). This coverage area includes 235,704 customers across 1,052 square miles. When available, the Troubleshooters also provide coverage to a secondary coverage area consisting of the Epping, Keene, Newport, Portsmouth, Rochester and Tilton AWCs. This secondary coverage area includes 229,341 customers across 2,642 square miles.

Results: Eversource has utilized this organization to provide improved response times to emergency situations for both customers and municipal partners. Actual charges to REP activities were 4% lower than estimated. Note that REP funding for the Troubleshooter organization ended August 1, 2019 when temporary rates under Order No. 26,265 took effect so the figures below were from January 1, 2019 to June 30, 2019.

$ Plan	$ Actual	$ Variance
$1,000,000	$957,669	($42,331)