THE STATE OF NEW HAMPSHIRE
BEFORE THE
PUBLIC UTILITIES COMMISSION

Unitil Energy Systems, Inc.

RELIABILITY PROGRAM AND VEGETATION MANAGEMENT PROGRAM PLAN – FISCAL YEAR 2021

1. Introduction

Pursuant to the Settlement Agreement approved by the New Hampshire Public Utilities Commission ("Commission") in Docket No. DE 10-055 (Order 25,214 dated April 26, 2011) Unitil Energy Systems, Inc. ("UES" or "Company") is required to provide an annual report to the Commission showing actual Reliability Enhancement Plan ("REP") and Vegetation Management Plan ("VMP") activites for the previous calendar year and its planned acivities for the current calendar year. Pursuant to this requirement, the Company filed its most recent report on March 5, 2020, which was designated as docket DE 20-027.

Subsequent to that filing, in Order No. 26,388 in DE 20-098, the annual reconciliation of UES's External Delivery Charge ("EDC") (which included reconciliation of the VMP and REP expenditures), the Commission revised the filing deadlines for a portion of the VMP and REP plans, requiring that the Company file its *planned* activities for the upcoming period by November 15 "to allow sufficient time for Staff and others to review Unitil's proposed projects prior to the start of the next calendar year." (Order 26,388 at 5.) *Actual* REP and VMP costs for the previous calendar year will continue to be reconciled along with the EDC. Accordingly, this report includes the following information:

(A) A description of Unitil's VMP;
(B) Detail on the O&M spending related to the FY2021 VMP estimated expenditures and work to be completed;
(C) Detail on the Vegetation Management Storm Hardening Program FY2021 estimated expeditures; and
(D) Detail on the O&M spending related to FY2021 Enhanced Tree Trimming estimated expenditures.
(E) Reliability projects recommended by Distribution Engineering as part of the 2020 annual reliability studies for the UES system which have been proposed in the 2021 Capital Budget.

2. Vegetation Management Plan

The VMP is based upon the recommended program provided in the report of Unitil's consultant Environmental Consultants, Inc. ("ECI"),[1] modified to incorporate a 5-year prune cycle with 10-foot side and 15-foot top prune zones.

2.1. Plan Description

Unitil's VMP is comprised of five components; 1) circuit pruning; 2) hazard tree mitigation; 3) mid-cycle review; 4) forestry reliability assessment; and 5) storm resiliency work. This program is designed to support favorable reliability performance, reduce damage to lines and equipment, as well as provide a measure of public safety. The main benefits and risks addressed by these programs are reliability, regulatory, efficiency, safety and customer satisfaction.

2.1.1. Circuit Pruning

Vegetation maintenance pruning is done on a cyclical schedule by circuit. The optimal cycle length was calculated by balancing five important aspects: 1) clearance to be created at time of pruning; 2) growth rates of predominant species; 3) risk to system performance; 4) aesthetics / public acceptance of pruning; and 5) cost to implement. For New Hampshire, this optimal cycle length was calculated as 5 years for all lines.

2.1.2. Hazard Tree Mitigation

The Hazard Tree Mitigation program ("HTM") consolidates tree removal activities into a formalized program with risk tree assessment. This program is aimed at developing a more resistant electrical system that is more resilient under the impacts of typical wind, rain and snow events. The intention is to accomplish this through minimizing the incidence and resulting damage of large tree and limb failures from above and alongside the conductors through removal of biologically unhealthy or structurally unstable trees and limbs.

[1] A copy of the ECI reliability report, originally provided in response to data request Staff 1-29 (Confidential), was made part of the record in DE 10-055, UES's 2010 base rate case, as a Confidential Exhibit, accompanied by a public redacted version, during the hearing before the Commission.

HTM circuits are identified and prioritized through reliability assessment risk ranking, identification as a worst performing circuit, field problem identification, and time since last worked. Once circuits are identified they are scheduled in two ways: 1) while the circuit is undergoing cycle pruning; or 2) scheduled independently of cycle pruning. In New Hampshire, HTM circuit selection corresponds closely with cycle pruning, as both pruning and HTM are on a 5 year cycle.

2.1.3. Mid-Cycle Review

The mid-cycle review program targets circuits for inspection and pruning based on time since last circuit pruning and forecasted next circuit pruning. The aim of this program is to address the fastest growing tree species that will grow into the conductors prior to the next cyclic pruning, potentially causing reliability, restoration and safety issues. As the first full circuit pruning cycle is underway, mid-cycle review will be used to address only 13.8kV and above, three-phase portions of selected circuits. Circuit selection is based on number of years since last prune and field assessment.

2.1.4. Forestry Reliability Assessment

The Forestry Reliability Assessment program targets circuits for inspection, pruning, and hazard tree removal based on recent historic reliability performance. The goal of this program is to allow reactive flexibly to address immediate reliability issues not addressed by the scheduled maintenance programs. Using recent historic interruption data, poor performing circuits are selected for analysis of tree related interruptions. Circuits or portions of circuits showing a high number of tree related events per mile, customers interrupted per event, and/or customer minutes interrupted per event are selected for field assessment. After field assessment, suitable circuits are scheduled and a forestry work prescription is written for selected circuits or areas.

2.1.5. Storm Resiliency Work

The Storm Resiliency Program (SRP) targets critical sections of circuits for tree exposure reduction by removing all overhanging vegetation or pruning “ground to sky,” as well as performing intensive hazard tree review and removal along these critical sections and the remaining three phase of the circuit. The goal of this program is to reduce tree related incidents and resulting customers interrupted along these portions in minor and major weather events. In turn, the aim is to reduce the overall cost of storm preparation and response, and improve restoration.

2.2. 2021 VMP Estimated Expenditures and Work To Be Completed

Table 1 depicts the 2021 VMP expenditures by activity and the estimated proposed VMP activity details. Unitil proposes to spend $4,262,446 on VMP activities and another $1,465,690 on vegetation storm resiliency, explained in more detail below, for a total of $5,728,136.[2] This amount includes the required work to complete the known minor sub-transmission carry over from 2020, discussed further in this document. The major cost drivers when comparing 2020 proposed cost to 2021 are a 5% increase in cycle pruning and hazard tree mitigation, and a 3% increase in all other activities, driven largely by cost of labor increases due to rising costs of employment and workforce retention.

Table 1

2021 VMP O&M Activities Cost Proposal		
VM Activity		**2021 Cost Proposal**
Cycle Prune	$	1,564,500
Hazard Tree Mitigation	$	840,000
Forestry Reliability Work	$	25,603
Mid-Cycle Review	$	115,360
Brush Control	$	-
Police / Flagger	$	545,385
Core Work	$	154,500
Distribution Total	**$**	**3,245,348**
Sub-T	$	616,584
Substation Spraying	$	11,352
VM Staff	$	389,162
Program Total	**$**	**4,262,446**
Storm Resiliency Program (SRP)	$	1,465,690
Grand Total	**$**	**5,728,136**

Tables 2 through 6 provide more detail on each of the VMP activities planned for 2021. The activities include 223 miles of cycle pruning (Table 2), 85.8 miles of hazard tree mitigation (Table 3), 3.7 miles of forestry reliability work (Table 4), 36.4 miles of mid-cycle pruning (Table 5), and 18.3 miles of sub-transmission clearing (Table 6). The sub-transmission clearing includes $72,744 of carry-over work

[2] This figure is as of November 1, 2020 and is a best estimate which does not include final pricing for 2021 work, as work is out to bid and contracts are not yet finalized. This amount includes the indentified minor carryover of work from 2020 to 2021 known as of this date and does not include any carryover that could arise from a distruptive storm event, loss of workforce due to pandemic, or other work interruption before the end of the year.

consisting of only the Low Volume Foliar (LVF) herbicide application to the scheduled 2020 lines. Due to the COVID-19 pandemic, the usual work force encountered federal and state paperwork delays and the window of application closed before the work force was approved to work. This work will instead be done in the spring of 2021 immediately after leaf-out.

Table 2

2021 VMP Planned Cycle Pruning Details			
District	**Feeder**	**Overhead Miles**	**Scheduled Miles**
Capital	C4W3	18.6	18.6
Capital	C13X4	1.7	1.7
Capital	C37X1	6.7	6.7
Capital	C16H1	3.2	1.1
Capital	C16H3	4.5	2.7
Capital	C16X4	6.6	2.8
Capital	C16X5	0.5	0.5
Capital	C16X6	0.1	0.1
Capital	C375X1	0.1	0.1
Capital	C15H3	1.3	1.3
Capital	C35X1	0.4	0.4
Capital	C35X2	0.03	0.03
Capital	C35X3	0.03	0.03
Capital	C35X4	0.04	0.04
Capital	C374X1	0.5	0.5
Capital	C6X3	14.9	14.9
Capital	C21W1P	1.8	1.8
Capital	C2H1	3.2	3.2
Capital	C2H2	8.7	8.7
Capital	C2H4	1.8	1.8
Capital	C34X1	0.2	0.2
Capital	C34X2	0.4	0.4
Capital	C34X3	0.04	0.04
Capital	C18W2	33.7	33.7
Seacoast	E19X3	37.9	37.9
Seacoast	E43X1	30.7	30.7
Seacoast	E51X1	29.5	29.5
Seacoast	E3W4	5.6	5.6
Seacoast	E7W1	7.4	7.4
Seacoast	E59X1	15.4	15.4
Total			**223**

Table 3

2021 VMP Planned Hazard Tree Mitigation Details			
District	**Feeder**	**Overhead Miles**	**Scheduled Miles**
Capital	C13W2	18.1	5.0
Capital	C13W3	83.4	18.1
Capital	C18W2	33.7	3.4
Capital	C4W3	18.6	7.5
Capital	C6X3	14.9	4.4
Capital	C37X1	6.7	1.2
Seacoast	E13W2	29.1	10.7
Seacoast	E58X1	31.2	12.9
Seacoast	E27X1	19.9	7.1
Seacoast	E19X3	39.1	15.5
Seacoast	E43X1	29.9	7.2
Seacoast	E59X1	15.7	7.4
Seacoast	E51X1	30.1	10.3
Total			**85.8**

***does not include possible carry-over from 2020**

Table 4

2021 VMP Planned Reliability Analysis Details			
District	**Feeder**	**Overhead Miles**	**Scheduled Miles**
Capital	C8X3	106.0	1.2
Seacoast	C13W1	18.8	2.5
Total			**3.7**

*** additional work may be added pending review of 2020 year end reliability results**

Table 5

2021 VMP Planned Mid-Cycle Review Details			
District	**Feeder**	**Overhead Miles**	**Scheduled Miles**
Capital	C13W2	18.1	5.0
Capital	C24H1	1.9	0.7
Capital	C24H2	1.9	1.5
Capital	C33X4	2.0	0.1
Capital	C34X4	0.2	0.2
Seacoast	E13X3	3.9	2.5
Seacoast	E56X2	2.5	2.1
Seacoast	E58X1	31.2	12.9
Seacoast	E5X3	9.0	5.2
Seacoast	E15X1	9.6	6.1
Seacoast	E17W1	9.9	4.1
Seacoast	E17W2	4.6	1.8
Seacoast	E2H1	2.3	1.4
Total			**36.4**

Table 6

2021 Sub Transmission Planned Clearing Details		
District	**Feeder**	**Scheduled Miles**
Capital	2020 LVF	0*
Capital	33	3.2
Capital	33	4.8
Seacoast	2020 LVF	0*
Seacoast	3341/3352	3.2
Seacoast	3347	2.1
Seacoast	3351/3362	4.3
Seacoast	E51X1 ROW	0.6
Total		**18.3**

*** includes only LVF herbicide treatment carry-over from 2020**

2.3. 2021 Vegetation Management Storm Resiliency Program Planned

For 2021, storm resiliency work on 37.6 miles of line in the Capital service area is proposed, at a total cost of $1,465,690.

Table 7

2021 SRP Planned Work Details		
Circuit	**Overhead Miles**	**Scheduled Miles**
E23X1	13.7	7.2
E21W1	29.8	8.7
E2X2	19.7	12.9
E11X2	11.9	6.6
E20H1	4.5	2.2
Total		**37.6**

3. Reliability O&M Expenditures

The Company has allocated $300,000 to Reliability O&M expenditures for enhanced tree trimming. The Enhanced Tree Trimming funding is intended to target "problem" areas identified through engineering analysis.

3.1. Enhanced Tree Trimming

Each year, the Company completes reliability analysis on the distribution and subtransmission system. The reliability analysis identifies areas of the system which have experienced an abnormal or increasing amount of tree related outages in the previous year. Distribution Engineering provides the System Arborist a prioritized list of recommended subtransmission lines and/or distribution circuits which would benefit the most from enhanced tree trimming.

For 2021, once the reliability analysis information is completed for 2020, Distribution Engineering will recommend the areas of line to be worked. The work is budgeted not to exceed $300,000.

4. Reliability Planning and Performance

The Reliability Program covers capital and O&M activities and projects intended to maintain or improve the reliability of the electric system including: (1) system hardening measures, i.e., equipment upgrades; installation of additional fuses, sectionalizers and reclosers; SCADA and automation projects; improvements to lightning protection; installation of animal guards; and other activities to mitigate the

specific causes of outages; and (2) reliability-based inspections and maintenance, which will include inspections of tree growth and health and enhanced trimming in targeted areas on the system.

4.1. Annual Studies

Each year the Company completes an annual distribution planning study and reliability study in each of the operation areas. Both of these studies incorporate analysis to improved system reliability.

4.1.1. Distribution Planning Study

The Company conducts distribution planning studies on an annual basis. The purpose of this study is to identify when system load growth is likely to cause main elements of the distribution system to reach their operating limits, and to recommend plans for the most cost-effective system improvements.

Circuit analysis provides the basis for the distribution planning study. Circuit analysis is completed on a three year rotating cycle with the objective to perform a detailed review on one-third of the entire system each year. The Milsoft Windmil software application is used to perform circuit analysis to identify potential problem areas and to evaluate available alternatives for system improvements. Circuit analysis includes the following: 1) update of circuit model from GIS; 2) circuit diagnostics; 3) load allocation; 4) voltage drop and loading analysis; 5) fault current and protection device coordination analysis. Engineering work requests are initiated for any apparent miscoordination identified during this analysis. Projects are entered into the capital budget for projects that require replacement or installation of equipment.

In addition to the fuse coordination completed as part of circuit analysis, the Company reviews trouble interruption reliability reports on a daily basis. Any outage in which the fuse did not appear to operate correctly is further analyzed to determine the cause. Engineering Work Requests are issued to implement upgrades or changes on the system identified by the circuit analysis or an evaluation of an outage.

4.1.2. Reliability Studies

Each year, Unitil completes annual reliability studies for each of its operating areas. The purpose of these studies is to report on the overall reliability performance of the electric systems from January 1 through December 31 of the previous year (12 months total). The scope of this report also evaluates substation, subtransmission (34.5kV system generally off road and serving one or more substations or circuit taps) and individual circuit reliability performance over the same time period. The analysis also

identifies common trends or themes based upon type of outage (i.e. tree, equipment failure, etc.). The Annual Reliability Analysis and Recommendations report for the UES Capital Operating Area and UES Seacoast Operating Area are attached to this report as Attachment 1 and Attachment 2 respectively.

The recommendations provided in the study are focused on improving the worst performing circuits as well as the overall system reliability. These recommendations are provided for budget consideration and will be further developed with the intention of incorporation into the capital budget development process.

There are several common solutions which can improve reliability depending upon the circumstance: 1) installation of reclosers or sectionalizers; 2) addition of fusing locations; 3) tree trimming; 4) installation of tree wire or spacer cable; and 5) implementation of automatic restoration schemes. These solutions are recommended most commonly; however, other solutions are also recommended for specific situations.

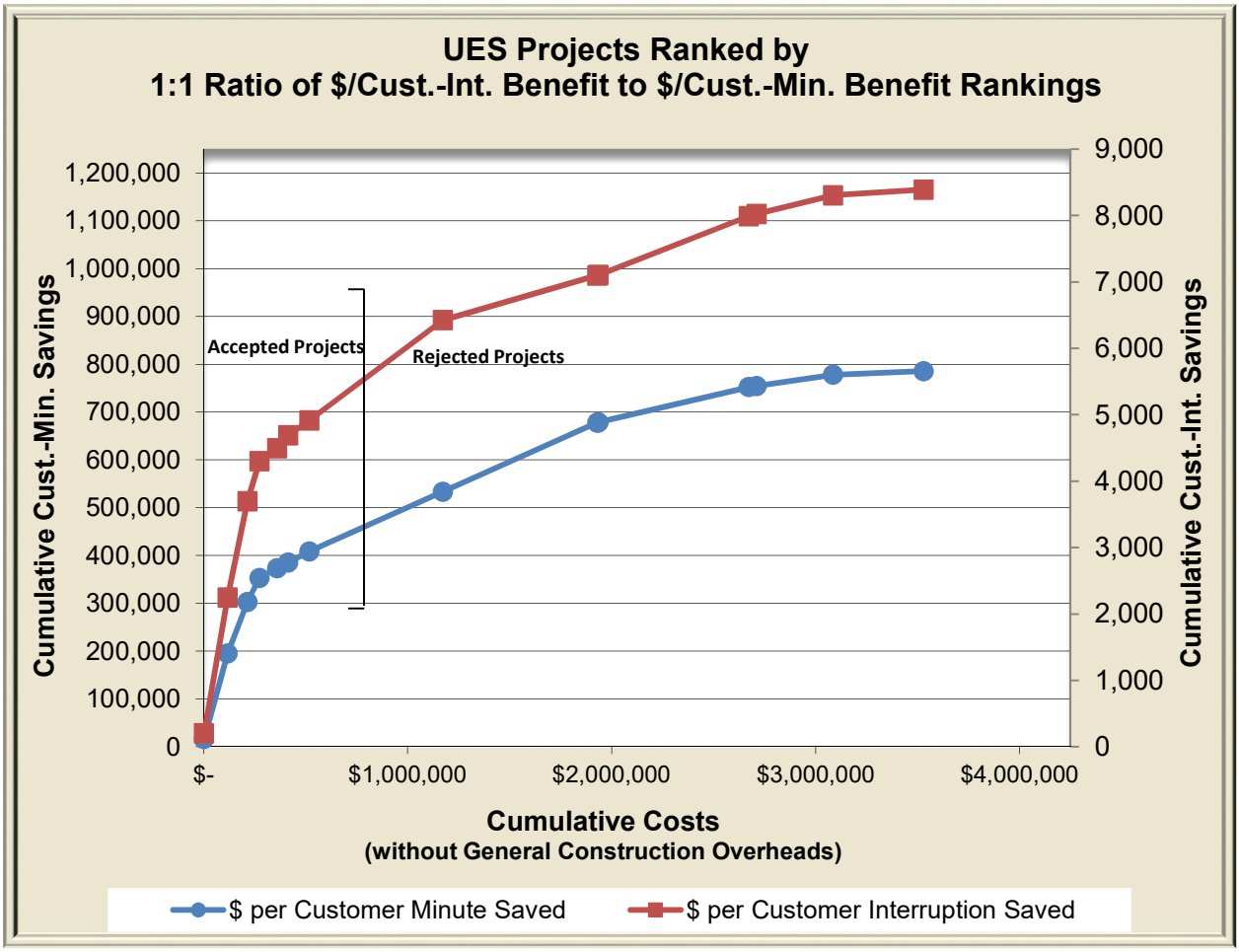
4.2. Reliability Capital Expenditures

As described above, in addition to the annual pole inspection and replacement program, each year Unitil completes annual reliability studies for each of its operating areas. The recommendations provided in the study are focused on improving the worst performing circuits, as well as the overall system reliability. These reliability projects count for the majority or all of the "System Hardening/Reliability" spending for each year.

The reliability projects recommended for the budget include a project scope, construction cost estimate and estimated reliability improvements (annualized saved customer minutes and saved customer interruptions). All of the recommended projects are ranked against each other based upon two cost benefit comparisons (cost per saved customer minute and cost per saved customer interruption).

An overall project rank is derived from the sum of these two cost benefit rankings. In general, projects with low construction cost and high saved customer minutes or high saved customer interruptions are ranked highest on the list while those projects with high construction cost and low saved customer minutes or saved customer interruptions are ranked low on the list. Another way these projects are analyzed by Distribution Engineering is shown in Chart 1 below. This chart displays the cumulative project cost compared to the anticipated reliability benefits of all projects. Each data point pair represents a specific project and its associated reliability benefits (saved customer minutes and saved customer interruptions). This chart is used to compare the relative return of reliability benefits associated with project cost between all projects. The projects to the left of the cutoff line are those that are entered into the annual Capital Budget for approval. Those to the right have been rejected.

Chart 1



The reliability projects for 2021 presented in Table 15 below provide an illustration of the process used to identify reliability projects. This table is a listing of reliability projects recommended by Distribution Engineering as part of the 2020 annual reliability studies for the UES system which have been proposed in the 2021 Capital Budget. This project-listing details the overall project ranking, scope, cost, and anticipated reliability benefits.

Table 15

Project Ranking	Budget No.	Descrption	Project Cost	Cumulative Cost	Customer Interruptions Saved Annually	Customer Minutes Saved Annually
1	DRBE03	Circuit 21W1 - Install Sectionalizer on Sawmill Rd	$3,062	$3,062	204	16,477
2	DRBE02	Circuit 22X1 - Install Reclosers and Implement DA	$115,045	$118,107	2,042	178,588
3	DRBC06	Install Recloser and Switches, Fisherville Rd - 4W4	$97,419	$215,526	1,452	108,069
4	DRBC09	Install Recloser Dover Rd - 8X3	$59,252	$274,778	602	50,025
5	DRBC10	FuseSaver Installations	$86,115	$360,893	198	20,443
6	DRBC08	Install Recloser on Pleasant St - 6X3	$54,439	$415,332	192	11,563
7	DRBE01	Circuit 6W1 - Install Two Reclosers	$103,931	$519,263	226	23,573

Recommended 2021 Reliability Based Projects

Note the project list in the table above has been sorted by project rank in ascending order beginning with the project having the best composite cost benefit ranking. This list is used by Distribution Engineering as a guide for recommending projects to be included in the Capital Budget as reliability projects. The projects listed above are those projects that were accepted into the 2021 capital budget. However, it should be noted other projects were identified in the annual reliability analysis and were not accepted in the Capital Budget as providing adequate reliability compared to the cost. The Capital Budget process approves the amount of spending for reliability projects and allows for changes of projects, if it is later determined that there are better or more practical projects. At of the time of this report, the 2021 Capital Budget had not yet received final approval.