Unitil Energy Systems, Inc.
May 1, 2013 Step Adjustment

Explanation of Filing

REP and VMP Annual Report 2012
Pursuant to Section 7 of the Settlement Agreement, UES shall file an annual report showing actual REP and VMP activities and costs for the previous calendar year and its planned activities and costs for the current calendar year. Actual and planned REP and VMP costs shown in the report will be reconciled with the revenue requirements associated with the actual planned capital additions and expenses. UES' report for 2012 is attached hereto. The report also includes fuse and re-closer studies and reviews which the Company completed in accordance with the Settlement Agreement.

Changes in Non-REP Net Plant in Service
Pursuant to Section 6 of the Settlement Agreement, UES shall file financial documentation showing the actual changes to Net Plant in Service, which is included in the Step Adjustment as described below. Schedule 1 shows the calculation of the change in Non-REP Net Plant in Service. Page 1 shows the actual net book value by plant account at December 31, 2012 while page 2 provides the same information at December 31, 2011. Page 3 provides the change between periods, less the net book cost of 2012 REP projects. Page 4 provides additional supporting detail for the 2012 REP projects.

Step Adjustment Revenue Requirement
The Company has calculated a total revenue requirement of $2,843,351 for the May 1, 2013 Step Adjustment as shown in Schedule 2. The 2013 Step Adjustment reflects 75 percent of the actual change to Non-REP net plant in service between December 31, 2011 and December 31, 2012, adjustments for the change in REP net plant in service, VMP and REP reconciliation, the storm resiliency program, and an increase in the Major Storm Cost Reserve.

Non-REP Net Plant in Service: As provided for in Section 6 of the Settlement Agreement, the 2013 Step Adjustment reflects the revenue requirement associated with 75% of the actual change in non-REP net plant in service during 2012. The actual change in non-REP net plant in service during 2012 was $7,834,633, and 75% of that amount is $5,875,974. In Attachment 1 of the Settlement Agreement, the Company forecasted the change in non-REP net plant in service to be $9,016,336 during 2012. The difference between the forecasted and actual change in non-REP net plant in service primarily results from the difference in the long-term capital spending forecast model that used at the time to prepare Attachment 1 and the final approved Capital Budget for 2012, which is prepared with more detail and specificity using current information and data at the start of each budget year. The revenue requirement reflected in the 2013 Step Adjustment is $1,334,460 which was calculated based on 75% of the change in non-REP net plant in service of $5,875,974 during 2012. The amount $5,875,974, or 75% of the change in non-REP net plant in service during 2012, is below the recoverable limits established in Section 6.5 of the Settlement Agreement which specifies an annual maximum change for 75% of non-REP net plant in service of $8 million and a cumulative change of $20 million.

REP Net Plant in Service: As provided for in Sections 2 of the Settlement Agreement, the 2013 Step Adjustment also reflects a revenue requirement of $384,854 associated with $1,985,913 of REP net plant in service additions during 2012.

VMP & REP Reconciliation: As required by Section 7 of the Settlement Agreement, UES has reconciled its VMP and REP program Costs. From December 31, 2011 through December 31, 2012, the Company has collected $3,175,739 in VMP revenue, and will collect an additional $178,333 for the remaining four months of the Storm Hardening Pilot, for a total of $3,354,072 in VMP revenue (Table 1, Page 5). Additionally the Company has collected $133,333 in REP revenue related to VMP (Table 15, Page 26) and $130,772 in revenue from Fairpoint, for a grand total of $3,618,177. During that same period, the Company spent $3,427,506 in VMP expense (Table 1, Page 5) and $46,947 of REP expenses related to VMP (Section 3.2.1., Page 26) for a total of $3,474,453, leading to an over-collection of $143,724.

The Company also collected $66,667 in REP revenue related to reliability inspection and maintenance (Table 15, Page 26) from December 31, 2011 to December 31, 2012. During that same period, the Company spent $56,205 (Section 3.2.2.1, Page 27), for an over-collection of $10,462.

In the step effective May 1, 2012, the Company had an under-collection balance of $9,776. Since this will have been collected over the 12 months from May 1, 2012 to May 1, 2013, this amount has been removed from the reconciliation calculation. These three components result in a negative reconciliation amount of $163,962 as shown on Schedule 2.

Storm Resiliency Program: As explained in the REP and VMP Annual Report, Unitil requests funding to undertake a storm resiliency program for an annual cost of $1,423,000. In the May 1, 2012 Step Adjustment, the Company incorporated $535,000 for the storm hardening pilot program. Thus, the 2013 adjustment for the storm resiliency program is for an additional $888,000 which reflects the difference between the total storm resiliency program cost of $1,423,000 and the $535,000 already reflected in rates.

Major Storm Cost Reserve: Section 8 of the Settlement Agreement provides for $400,000 annually for the Major Storm Cost Reserve ("MSCR") to be used to recover costs associated with responding to and recovering from qualifying major storms. Excluding the Hurricane Sandy costs of $2.3 million, which the Company will propose to recover through the Storm Recovery Adjustment Factor in an upcoming filing with the Commission, the MSCR fund balance is a deficit of ($0.7) million at December 31, 2012. In addition, the Company has incurred significant costs for storm events since December 31, 2012, such as the February blizzard, and the Company projects the MSCR fund deficit will exceed ($1.2) million at March 31, 2013. To address the projected deficit balance in the MSCR, the Company proposes to increase the annual MSCR funding level from $0.4 million to $0.8 million with the implementation of this step adjustment. The step adjustment increases the Major Storm Cost Reserve to $800,000 annually in order to reduce the deficit in the reserve fund and fund future storm recovery efforts.

The total revenue requirement for all of the above components of the 2013 Step Adjustment is $2,843,351.

Rate Design

Schedule 3 shows the rate design from current rates to the rates proposed in this filing. Columns 1-3 demonstrate the May 1, 2011 effective rates which included the rate case expense of $0.00034/kWh for all rate classes. Columns 4-6 show the removal of the rate case expense from rates, the resulting revenue and percent change in revenue. Columns 7-9 demonstrate the rate design for the May 1, 2012 Step Adjustment of $1,469,304 following the methodology approved in Section 9 of the Settlement Agreement. Columns 10-12 demonstrate the rate design for the May 1, 2013 Step Adjustment of $2,843,351 following the methodology approved in Section 9 of the Settlement Agreement. The overall percentage increase due to the May 1, 2013 Step Adjustment is 6.20%. Pursuant to the Settlement Agreement, the residential class will receive 115% of this increase, or 7.13% with residential customer charges to remain unchanged and the block difference remaining at $0.00500 per kWh. The remaining revenue requirement is to be collected from other rate classes on a uniform percentage basis through customer, kWh, demand, and luminaire charges as appropriate. This is a 5.24% increase for non-residential rate classes.

Bill Impacts

Bill impacts are computed and shown in Schedule 4. These reflect rates as proposed in this filing versus currently effective rates. As a result of this filing, a typical 600 kWh residential customer on default service will see a monthly bill increase of $2.07 or 2.4%. Impacts to other rate classes will be similar, but may vary based on size and consumption pattern.

Earnings Sharing

In accordance with Section 5 of the Settlement Agreement, UES has calculated its earned return on equity on Form F-1 for the calendar year ending December 31, 2012. Schedule 5 contains UES's Form F-1 for the year ending December 31, 2012 which shows an earned return on equity of 7.9%. Since its return on equity is not greater than 10 percent, UES is not subject to a sharing of earnings for the 2012 calendar year reporting period.

Exogenous Events

In accordance with Section 11 of the Settlement Agreement, UES certifies that no exogenous events occurred during calendar year 2012 which caused changes in excess of the Exogenous Events Rate Adjustment Threshold.

Report and Schedules:

REP and VMP Annual Report 2012
Schedule 1: Changes in Non-REP Net Plant in Service
Schedule 2: Step Adjustment Revenue Requirement
Schedule 3: Rate Design
Schedule 4: Bill Impacts
Schedule 5: Earnings Sharing Calculation

THE STATE OF NEW HAMPSHIRE
BEFORE THE
PUBLIC UTILITIES COMMISSION

Unitil Energy Systems, Inc.

RELIABILITY ENHANCEMENT PROGRAM AND VEGETATION MANAGEMENT PROGRAM ANNUAL REPORT 2012

1. Introduction

Pursuant to the Settlement Agreement approved by the New Hampshire Public Utilities Commission ("Commission") in Docket No. DE 10-055[1] , Unitil Energy Systems, Inc. ("UES" or "Company") is submitting the results of the Reliability Enhancement Plan ("REP") and Vegetation Management Plan ("VMP") for Fiscal Year 2012 ("FY 2012"), representing the period, January 1, 2012 – December 31, 2012.

The Settlement Agreement provides that Unitil should implement a REP beginning in calendar year 2011 and allowed Unitil to spend a target amount of $1,750,000 annually and is subject to a cap of $2,000,000 on REP capital spending in any given year. Unitil is also to increase its annual REP operation and maintenance expense by $300,000 effective May 1, 2012. The Settlement Agreement also provides that Unitil implement an augmented VMP. The revenue requirement for the permanent rates effective May 1, 2011 included $200,000 of augmented VMP spending above the test year amount and the Step Adjustment effective May 1, 2011 provided for an additional increase of $1,250,000 for annual VMP spending. The Step Adjustment effective May 1, 2012 provided for a further increase of $950,000.

The Settlement Agreement also provides that on or before the last day of February of each year following approval, Unitil will provide an annual report to the Commission, Staff and OCA showing actual REP and VMP activities and costs for the previous calendar year, and its planned activities and costs for the current calendar year. Actual and planned REP and VMP costs shown in the report will be reconciled along with the revenue requirements associated with the actual and planned capital additions and expenses. This report includes the following information:

(A) A description of Unitil's VMP;
(B) A comparison of FY2012 actual to budgeted spending on O&M activities related to the VMP

[1] Order 25,214 dated April 26, 2011

(C) Detail on the O&M spending related to the FY2013 VMP estimated expenditures and work to be completed;

(D) A summary of the Vegetation Management Storm Hardening Pilot Program results;

(E) A proposal and recommendation for a Vegetation Management Storm Resiliency Program component; and

(F) A summary of the reliability performance tracking for pruning, hazard tree and storm pilot program components.

2. Vegetation Management Plan

The Settlement Agreement provides that Unitil will implement an augmented Vegetation Management Program (VMP). The VMP shall be based upon the recommended program provided in the report of Unitil's consultant Environmental Consultants, Inc. ("ECI")[2], modified to incorporate a 5-year multi-phase and 5-year single phase trim cycle with 10-foot side and 15-foot top trim zones. In addition, the VMP will be conducted in a manner that addresses fast growing species, and will provide that deadwood will be removed above the primary, and that deadwood outside the trim zone will be removed if service could be impacted. The VMP shall also comply with the requirements of NESC Rule 218.B regarding overhanging vegetation at railroad and limited access highway crossings[3].

2.1. Plan Description

Unitil's Vegetation Management Program ("VMP") is comprised of six components; 1) circuit pruning; 2) hazard tree mitigation; 3) mid-cycle review; 4) forestry reliability assessment; 5) brush removal; and 6) 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] A copy of the ECI report, originally provided in response to data request Staff 1-29 (Confidential), was made part of the record in DE 10-055 as a Confidential Exhibit, accompanied by a public redacted version, during the hearing before the Commission.

[3] Reference Settlement Agreement Section 7.3 Page 14 of 26

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.

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.

In order to produce the greatest reliability impact quickly and cost effectively, HTM circuit hazard tree assessment and removal is focused primarily on the three phase only, with most emphasis on the portion of the circuit from the substation to the first protection device.

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. Brush Removal

The Brush Removal program targets removal of healthy trees growing under or directly adjacent to conductors to realize benefits of avoided cost of future pruning and future hazard limb or tree removal. Tree removal will be paired with a selective stump treatment program to inhibit sprouting and re-growth and provide short and long-term benefits. The program targets small diameter trees to maximize cost effectiveness.

Due to program prioritization in relation to the VMP ramp up of funding, this program was not selected for implementation in 2013.

2.1.6. Storm Resiliency Work

The Storm Resiliency program 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. 2012 Actual Expenditures and Work Completed

Table 1 depicts the 2012 VMP expenditures by activity in relation to the anticipated budget expenditures. As the program progressed in 2012 there were some deviations in the anticipated expenditures. The Hazard Tree Mitigation and the Core Work activity required the most deviation in spending relative to anticipated costs. Core work cost was above the anticipated level. Increases were driven by customer requests and emergency work. An additional cost for VMP Planning was also incurred for software to more efficiently and effectively schedule, manage, implement and monitor the VM program components. Due to these unanticipated costs, Hazard Tree Mitigation spending was below the level anticipated. As shown in the table below, total spending was above the budget by $173,871.

Table 1

2012 VMP O&M Activities			
VM Activity	**2012 Cost Proposal**	**2012 Actual Cost**	**2012 Revised Cost***
Cycle Prune	$ 1,156,000	$ 1,076,920	$ 1,156,440
Hazard Tree Mitigation	$ 630,400	$ 414,317	$ 420,489
Forestry Reliability Work	$ 112,000	$ 51,250	$ 51,250
Mid-Cycle Review	$ 77,645	$ 92,035	$ 92,035
Brush Control	$ -	$ 260	$ 260
Police / Flagger	$ 483,227	$ 494,044	$ 504,667
Core Work	$ 40,000	$ 210,615	$ 214,737
VMP Planning	$ -	$ 148,148	$ 148,148
Distribution Total	**$ 2,499,272**	**$ 2,487,589**	**$ 2,588,026**
Sub-T	$ 100,000	$ 95,274	$ 95,274
VM Staff	$ 219,800	$ 271,991	$ 271,991
Program Total	**$ 2,819,072**	**$ 2,854,854**	**$ 2,955,291**
Storm Pilot Program	$ 535,000	$ 572,652	$ 572,652
Grand Total	**$ 3,354,072**[4]	**$ 3,427,506**	**$ 3,527,943**

*Added invoices processed after Dec. 2012 cut-off date for work completed in 2012

The following tables detail the 2012 VMP work completed by activity. Table 2 details the cycle pruning work. All circuits were completed as planned. A total of 253.6 miles of cycle pruning was completed in 2012.

[4] Test year amount of $735,739 + $200,000 augmented VMP spending in permanent rates + $1,250,000 included in step adjustments + 8/12 of $950,000 increase to step adjustment effective May 1, 2012.

Table 2

2012 VMP Planned Cycle Pruning Details				
District	**Feeder**	**Overhead Miles**	**Scheduled Miles**	**Completed Miles**
Capital	C8X3	104.62	96.1	96.1
Capital	C4W3	18.30	18.3	18.3
Seacoast	E59X1	15.75	12	12
Seacoast	E2X3	13.60	13.6	13.6
Seacoast	E28X1	10.30	10.3	10.3
Seacoast	E2X2	20.20	20.2	20.2
Seacoast	E46X1	3.90	3.9	3.9
Seacoast	E20H1	4.50	4.5	4.5
Seacoast	E19X2	2.80	2.8	2.8
Seacoast	E11X2	12.10	12.1	12.1
Seacoast	E11W1	12.10	12.1	12.1
Seacoast	E54X1	30.70	30.7	30.7
Seacoast	E56X1	17.00	17.0	17.0
Total			**253.6**	**253.6**

Table 3 details the hazard tree mitigation work. A total of 145.9 miles of line across 13 circuits were mitigated for hazard tree risk. Unitil had estimated approximately 1,050 hazard tree removals in the budget. The actual results indicate 1,004 total hazard trees were removed on these circuits and various other circuits as found through the course of work over the year.

Table 3

2012 VMP Planned Hazard Tree Mitigation Details					
District	Feeder	Overhead Miles	Scheduled Miles	Completed Miles	# of Removals
Capital	C13W2	73.20	13.7	13.7	220
Capital	C7W3	23.30	14.2	14.2	39
Capital	C8X3	104.62	26.9	26.9	183
Capital	C4W3	18.30	7.5	7.5	68
Capital	Various				97
Seacoast	E19X3	42.10	18.2	18.2	63
Seacoast	E22X1	53.70	14.9	14.9	118
Seacoast	E59X1	15.80	7.4	7.4	52
Seacoast	E2X3	13.60	7.3	7.3	17
Seacoast	E28X1	10.30	4.4	4.4	20
Seacoast	E2X2	20.20	13.0	13.0	4*
Seacoast	E46X1	3.90	2.0	0	0*
Seacoast	E19X2	2.80	1.7	0	0*
Seacoast	E11X2	12.10	6.8	6.8	4*
Seacoast	E54X1	30.70	7.9	7.9	1*
Seacoast	E56X1	17.00	3.7	3.7	5*
Seacoast	Various				
Total			**149.6**	**145.9**	**1004**

* All hazard trees identified, marked, and approved for removal but not yet completed in the field – removals to carry over to 2013

Tables 4 and 5 detail the forestry reliability work and mid-cycle work respectively. A total of 11.6 miles of line underwent forestry reliability work and 20.2 miles of line were completed for mid-cycle work.

Table 4

2012 VMP Planned Reliability Analysis Details				
District	Feeder	Overhead Miles	Scheduled Miles	Completed Miles
Capital	C4W4	14.2	4.0	4.0
Capital	C37X1	7.9	1.1	1.1
Seacoast	E15X1	10.1	6.4	0
Seacoast	E47X1	16.0	6.5	6.5
Total			**18**	**11.6**

Table 5

2012 VMP Planned Mid-Cycle Review Details				
District	**Feeder**	**Overhead Miles**	**Scheduled Miles**	**Completed Miles**
Capital	C13W2	73.20	13.7	13.7
Capital	C7W3	23.30	14.2	0
Capital	C1H3	2.80	1.6	0
Seacoast	E13W1	18.60	4.7	4.7
Seacoast	E17W2	4.80	1.8	1.8
Seacoast	E46X1	3.91	2.0	0
Seacoast	E13X3	4.20	2.9	0
Total			**40.9**	**20.2**

Table 6 details the sub-transmission right-of-way clearing work. A total of 165.2 acres were cleared.

Table 6

2012 Sub Transmission Planned Clearing Details				
District	**Feeder**	**Scheduled Miles**	**Scheduled Acres**	**Completed Acres**
Capital	396	4.35	29.0	29.0
Capital	375	4.12	29.5	29.5
Capital	374	4.04	18.0	18.0
Seacoast	3358	1.08	5.6	5.6
Seacoast	3345/3356	3.96	21.4	15.1*
Seacoast	3343/3354	12.61	68.0	68.0
Total		**30.16**	**171.5**	**165.2**

* Section along RR in Plaistow not done to scheduling constraint with RR – will carry over to 2013

2.3. 2013 VMP Estimated Expenditures and Work To Be Completed

Table 7 depicts the 2013 VMP expenditures by activity and the proposed VMP activity details. Unitil proposes to spend $3,135,739[5] on VMP activities and another $1,423,000 on vegetation storm resiliency, explained in more detail below, for a total of $4,558,739.

[5] Test year amount of $735,739 + $200,000 augmented VMP spending in permanent rates + $1,250,000 included in step adjustments + $950,000 increase to step adjustment effective May 1, 2012.

Table 7

2013 VMP O&M Activities Cost Proposal		
VM Activity		**2013 Cost Proposal**
Cycle Prune	$	1,156,000
Hazard Tree Mitigation	$	880,000
Forestry Reliability Work	$	112,000
Mid-Cycle Review	$	81,845
Brush Control	$	-
Police / Flagger	$	546,094
Core Work	$	40,000
Distribution Total	**$**	**2,815,939**
Sub-T	$	100,000
VM Staff	$	219,800
Program Total	**$**	**3,135,739**
Storm Resiliency Work	$	1,423,000
Grand Total	**$**	**4,558,739**

Tables 8 through 12 provide more detail on each of the VMP activities planned for 2013. The activities include 238.7 miles of cycle pruning (Table 8), 101 miles of hazard tree mitigation (Table 9) which estimates 1,760 hazard tree removals, 36.7 miles of forestry reliability work (Table 10), 33.6 miles of mid-cycle pruning (Table 11), and 189 acres of sub-transmission clearing.

Table 8

2013 VMP Planned Cycle Pruning Details			
District	Feeder	Overhead Miles	Scheduled Miles
Capital	C13W2	72.9	72.9
Capital	C34X4	0.2	0.2
Capital	C33X4	2.0	2.0
Capital	C2H1	3.2	3.2
Capital	C2H2	8.6	8.6
Capital	C2H4	1.8	1.8
Capital	C24H1	1.9	1.9
Capital	C24H2	1.9	1.9
Capital	C16H1	3.8	3.8
Capital	C16H3	4.4	4.4
Capital	C16X4	6.5	6.5
Capital	C16X5	0.5	0.5
Capital	C16X6	0.1	0.1
Seacoast	E51X1	30.0	30.0
Seacoast	E17W2	4.8	4.8
Seacoast	E2H1	2.3	2.3
Seacoast	E15X1	9.8	9.8
Seacoast	E27X1	17.4	17.4
Seacoast	E13W2	29.4	24.4
Seacoast	E56X2	2.4	2.4
Seacoast	E13X3	4.0	4.0
Seacoast	E5H1	3.3	3.3
Seacoast	E5H2	6.9	6.9
Seacoast	E58X1	31.5	25.6
Total			**238.7**

Table 9

2013 VMP Planned Hazard Tree Mitigation Details			
District	**Feeder**	**Overhead Miles**	**Scheduled Miles**
Capital	C4X1	34.3	7.7
Capital	C18W2	33.6	5.0
Capital	C13W3	15.4	8.2
Capital	C2H2	8.6	5.2
Capital	C16X4	6.5	3.7
Seacoast	E2X2	20.20	13.0
Seacoast	E46X1	3.90	2.0
Seacoast	E19X2	2.80	1.7
Seacoast	E11X2	12.10	6.8
Seacoast	E54X1	30.70	7.9
Seacoast	E56X1	17.00	3.7
Seacoast	E18X1	18.1	8.5
Seacoast	E23X1	27.5	10.6
Seacoast	E15X1	9.8	6.2
Seacoast	E27X1	17.4	4.6
Seacoast	E47X1	15.3	6.2
Total			**101.0**

Table 10

2013 VMP Planned Reliability Analysis Details			
District	**Feeder**	**Overhead Miles**	**Scheduled Miles**
Capital	C13W1	33.5	6.2
Capital	C3H1	2.8	1.9
Seacoast	E22X1	53.5	11.4
Seacoast	E21W1	28.5	8.7
Seacoast	E21W2	21.9	8.5
Total			**36.7**

Table 11

2013 VMP Planned Mid-Cycle Review Details			
District	**Feeder**	**Overhead Miles**	**Scheduled Miles**
Capital	C15W2	5.8	4.4
Capital	C22W3	4.5	3.2
Capital	E19X3	37.8	15.4
Seacoast	E6W1	26.8	5.7
Seacoast	E6W2	18.9	4.9
Total			**33.6**

Table 12

2013 Sub Transmission Planned Clearing Details			
District	**Feeder**	**Scheduled Miles**	**Scheduled Acres**
Capital	35	3.6	44
Capital	34	3.5	44
Seacoast	3343/3354	7.9	101
Total		**15.0**	**189**

2.4. Vegetation Management Storm Hardening Pilot Program Results

In 2012, Unitil embarked on a pilot project that targeted specific circuits (shown in Table 13) in communities in the Seacoast area which underwent extensive tree exposure reduction. These circuits were selected through analysis of tree related reliability performance. 14.7 miles of critical three phase line had all overhanging vegetation removed (pruned "ground-to-sky") and 1,685 hazard trees were removed along this portion as well as 9.9 additional miles of three phase.

Table 13

2012 Storm Pilot Planned Work Details			
Circuit	**Scheduled Miles**	**Completed Miles**	**# of Removals**
E13W2	4.65	4.65	614
E58X1	5.42	5.42	408
E21W2	4.66	4.66	663
Total	**14.73**	**14.73**	**1685**

This program was met with huge success. All pilot program work was completed within 7% of the estimated budget, with final expenditures (excluding spring tree replanting costs) totaling $572,652. The planned pruning and removals were obtained with very limited customer opposition or complaints. In fact, Unitil received the opposite response and was praised by many customers for the pilot initiative.

During the course of the pilot pruning and removal work, Unitil was faced with a unique situation to test the work's response to a storm event. On October 29, 2012 Hurricane or "Super Storm" Sandy came up the east coast and affected Unitil's New Hampshire service territory. At this time, one of the two storm pilot circuits, E58X1, was in the final stages of completion. Only a few customer tree removal negotiations and pruning spots remained. The E21W2 circuit pruning and removal was just beginning, however, and work had not started on the E13W2. This left the unique opportunity to study the effects on the worked and unworked circuits during one event. As rain and wind from Hurricane Sandy pelted the Seacoast area, the E58X1 circuit held up remarkably well. The main line of the circuit experienced no events and many of the customers fed off this circuit did not experience a single interruption. A customer communication to the company after the storm event, shown below, is representative of many emails, phone calls and Twitter "tweets" Unitil received:

> *Just wanted to let you know how wonderful it was not to lose power during the hurricane. I believe it was directly attributable to all the tree cutting and trimming Unitil did especially in the Pollard Road and Westville Road area. My husband and I had our home built here thirty seven years ago....this is the **first** big storm that I can remember that power remained on!! I know there is no assurance this will be the norm but I think you all are striving hard to make it that way. Thanks so much!!Plaistow NH*

There was one tree related event in the storm pilot area along the E58X1 where a desired tree removal, still in discussion with an unsure homeowner, failed and contacted the phases. The tree was removed and those customers affected were restored quickly. Following the event, the property owner gave consent for additional tree removal.

The other two Storm Pilot circuits faced more tree related incidents and the main line of both of these circuits experience tree related troubles which led to substation lock-outs. A field review by the System Arborist directly after the storm event showed multiple tree failures along the Storm Pilot designated area. Two sideline tree failures on the E13W2 on East Rd, Plaistow and East Rd, Atkinson had been marked and approved for removal prior to the storm.

In other analysis, studying the number of tree related events on the portions of the E58X1 which had not been included in the storm pilot, compared to the number of tree related events on the main line, where the storm pilot was conducted also demonstrate convincing results. There was one event on the main line versus 18 events on the remaining portions of the circuit. For a visual map of the incidents, see Attachment 1: *Hurricane Sandy Tree Related Outages E58X1.*

The Unitil Seacoast service territory was also hit with other wind and snow events over the November 2012 to January 2013 time frame. Again, in each event, the Storm Pilot circuits performed well with no major events.

From this pilot, it is apparent that the Storm Hardening Pilot work has the ability to prevent tree related failures and subsequent electric incidents. This reduction in incidents reduces damage to the electric infrastructure and the need for crews to respond, in turn reducing overall storm costs.

There are also a number of other benefits associated with a tree exposure reducing Storm Hardening program, including:

- Preserving municipal critical infrastructure
- Minimizing the dependence on mutual aid and off system resources
- Minimizing the total number of resources required to restore service
- Shortening the duration of major events
- Minimizing the overall cost of restoration
- Reducing economic loss to municipals, businesses, and customers
- Most cost effective solution vs. other alternatives
- Minimal bill impact on a per-customer basis

The next section briefly describes each of these benefits.

Because of the design of the Storm hardening program, much of a municipality's critical infrastructure is included in the targeted circuitry. These facilities include police stations, fire stations, emergency shelters, and schools. These areas are also most often the business centers for the municipality, and therefore include gas stations, restaurants and hotels. Preserving power during multiple day events to both municipal infrastructure and business districts ensures functioning emergency services, and a place where residents can seek temporary warmth and shelter.

As many states and regulatory jurisdictions have established standards for restoring power during major events, the competition for securing outside line resources has increased significantly, and as a result, resources have become both scarce and very expensive. Often, in order to secure an adequate amount of resources for a particular event, Unitil has been required to reach outside of the New England area, adding travel time and additional cost. Unfortunately, there does not appear to be aready solution for this problem One way, however, to manage these escalating costs is to prevent the damage from occurring in the first place. Less damage translates into a reduced need for outside crews, which in turn lowers overall costs and shortens the duration of an event.

As electric utilities review various options to improve overall storm performance, the undergrounding of utility infrastructure is often mentioned, but quickly dismissed due to significant cost and impracticality. The results of the pilot suggest that the implementation of a Storm Hardening program may achieve similar performance to that of undergrounding at a fraction of the cost.

Municipalities and businesses have described the significant economic impact of losing power for multiple days. These natural disasters are very disruptive, result in a loss of business income and tax revenue, personal income loss, and increased costs to municipalities due to the requirements of providing emergency services, debris removal, and requiring overtime work for multiple departments. Any actions that help to minimize this disruption will provide some measure of economic relief.

Finally, customers have expressed concern with losing power for multiple days. Although it is impossible to prevent storm damage across the entire system, preserving power and minimizing damage for each municipality along its main business corridor as well as protecting its emergency critical infrastructure appears to offer significant promise as a means to assure safety and provide some measure of security during and after these extreme weather events.

Unitil submits that the cost of this program is very reasonable. The Company estimates that the rate impact of implementing the proposal (as described in section 2.5 below) is $1.03 per month for a 600 kWh residential customer. The incremental cost over the pilot program implemented in 2012 is $0.64 per month for a 600 kWh residential customer.

2.5. Vegetation Management Storm Resiliency Program Recommendation

After reviewing the results of the Storm Hardening Pilot program, Unitil found that the reliability effects, the avoided interruptions and costs, and the positive public acceptance more than offsets the cost to implement. For this reason, Unitil is proposing to add a Vegetation Management Storm Resiliency program component as part of the overall Vegetation Management Program.

This program builds on the pilot and proposes to perform VM Resiliency work on 331 miles of line in the New Hampshire service territory over a 10 year period for an annual cost of $1.423 million. This work will mirror the pilot program in specifications where critical sections of the circuit, from the substation out to the first protection device, will have tree exposure reduced by removing all overhanging vegetation or pruning "ground to sky." Intensive hazard tree review and removal will also be conducted on these critical sections. In cases where the customer count is either over 500 customers or over 1/3 the total customers served at the first protection device (if less than 500), overhang and hazard tree removal will continue to the second protection device. From that point, hazard tree inspection and removal will be conducted out to the third protection device or along remaining three phase lines.

For 2013, resiliency work on 33.1 miles of line in the Capital service area is proposed, at a total cost of $1,423,000 (an increase of $888,000 from the $535,000 approved for last year's pilot program). These circuits, shown in Table 14, were chosen for their recent historic reliability performance, number of customers served, field conditions, and location.

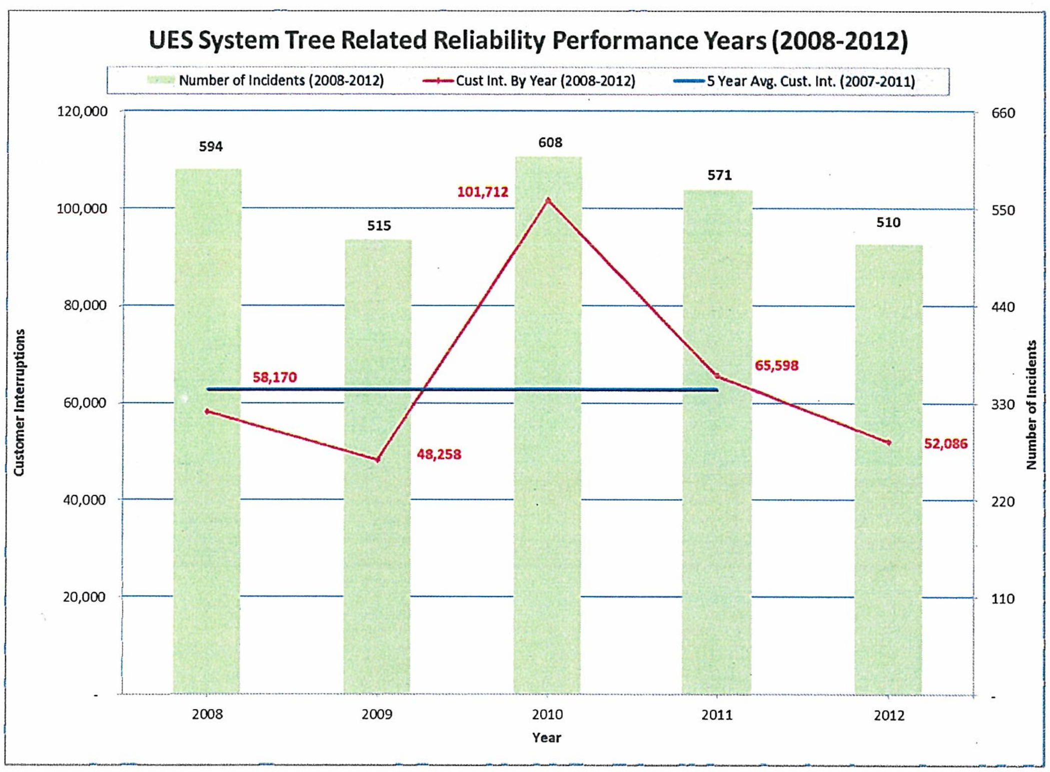
Table 14

2013 Storm Pilot Planned Work Details		
Circuit	**Overhead Miles**	**Scheduled Miles**
C13W1	33.5	6.2
C18W2	33.6	5.0
C4X1	34.3	7.7
C7W3	23.2	14.2
Total		**33.1**

2.6. Vegetation Management Reliability Performance Tracking

As the Vegetation Management Program progresses through its first five year prune and hazard tree cycles, the effects of these programs on reliability have begun to emerge. In order to study the results of these programs and the combination of VM components that have the largest reliability effect, the Company has developed VM Program reliability analysis. Overall New Hampshire system tree related reliability performance was reviewed, as well as the individual circuits and program components that were undertaken. Chart 1, shown below, displays the number of customers interrupted per year from tree related incidents from 2008 to 2012 against the 5 year average of tree related incidents from 2007 to 2011.

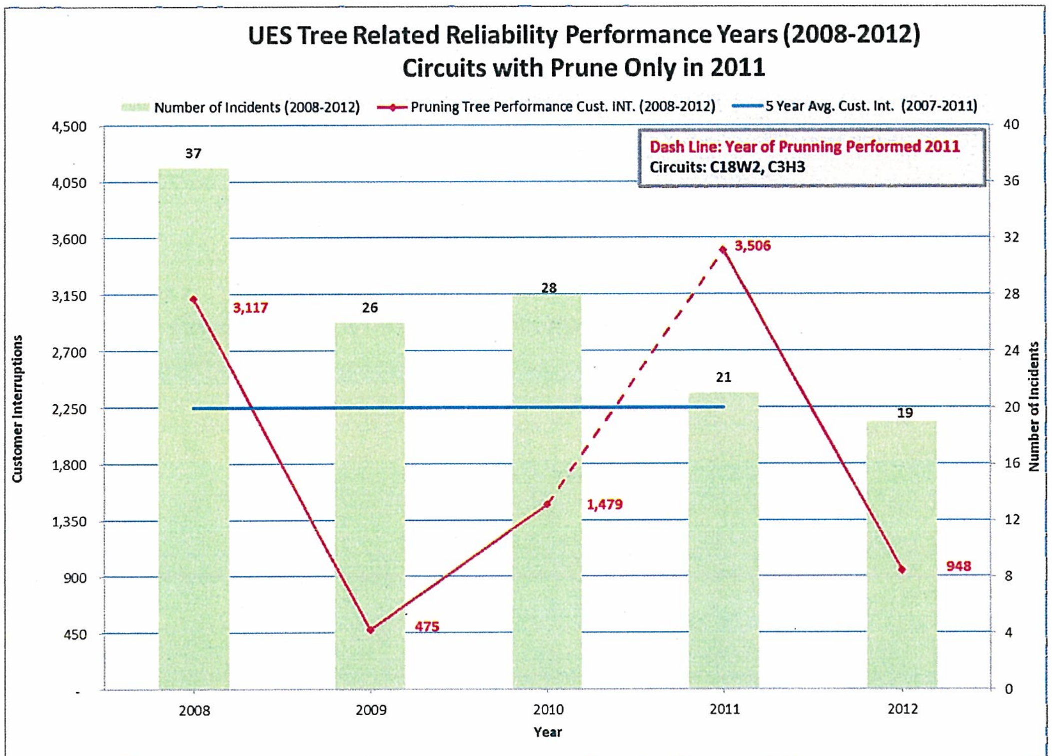
Chart 1



The chart shows a decline in customers interrupted as well as a decline in tree related incidents from 2010 through 2012. It also shows the number of customers interrupted in 2012 is below the historic 5 year average. Although the VM program is still in its infancy, the Company believes this trend is indicative of overall positive program results.

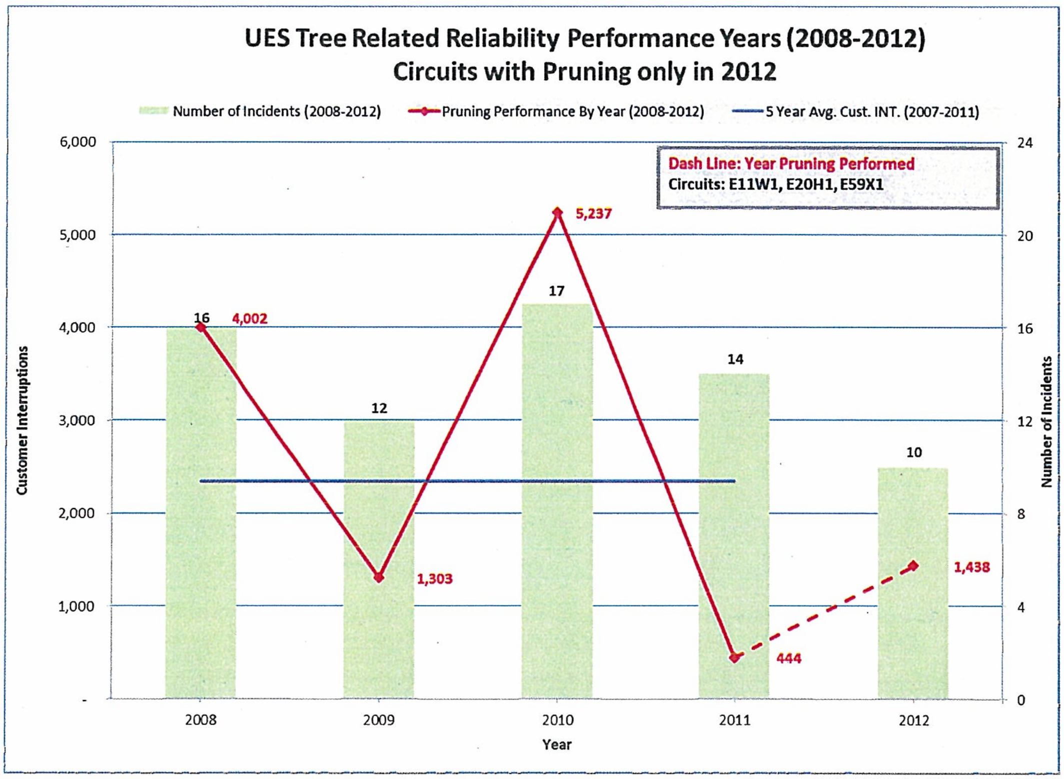
Chart 2 and Chart 3, shown below, display the tree related reliability performance of the individual circuits that underwent pruning only in 2011 and 2012 respectively. The dashed line represents the year pruning occurred.

Chart 2



5 Year Avg. Cust. INT. (2007-2011)	5 Year Avg. # of Incidents (2007-2011)	Year After Trimming Cust. INT. (2012)	Year After Trimming # of Incidents (2012)	Cust. INT. Percentage Difference from Avg.	# of Incidents Percentage Difference from Avg.
2,247	29.4	948	19	58%	35%

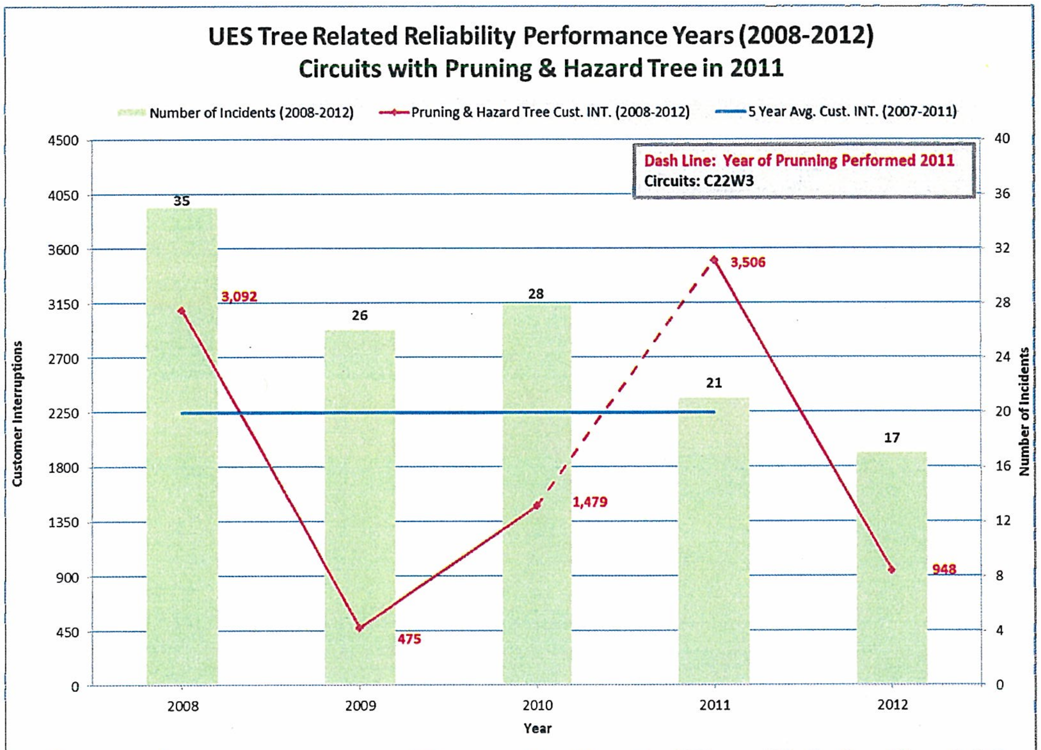
Chart 3



Both Charts show a decrease in incidents, but an increase in customers interrupted during the year of pruning. It is important to note that pruning could have occurred at any point during that year from January through December, and includes a combination of before and after pruning results. Chart 2 shows a decrease in incidents and a decrease in customers interrupted in the first full year following pruning.

Chart 4 and Chart 5, shown below, display the tree related reliability performance of the individual circuit(s) that underwent pruning and hazard tree together in 2011 and 2012 respectively. The dashed line represents the year work occurred.

Chart 4



5 Year Avg. Cust. INT. (2007-2011)	5 Year Avg. # of Incidents (2007-2011)	Year After Trimming Cust. INT. (2012)	Year After Trimming # of Incidents (2012)	Cust. INT. Percentage Difference from Avg.	# of Incidents Percentage Difference from Avg.
2,242	28.8	948	17	58%	41%

Chart 5

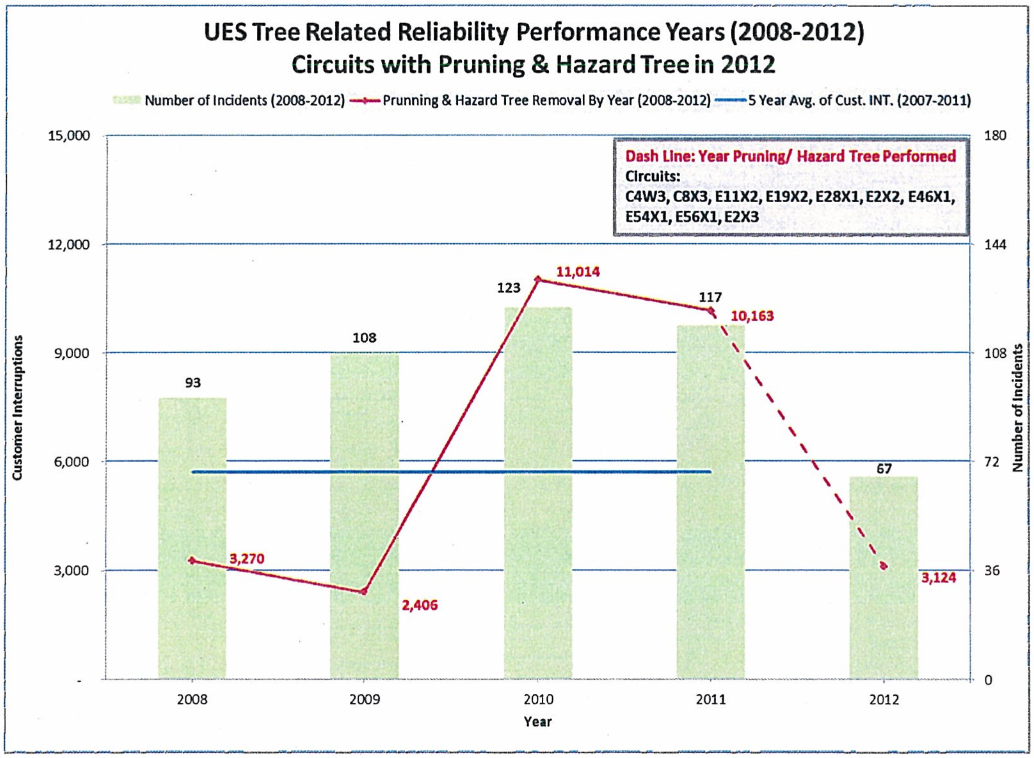


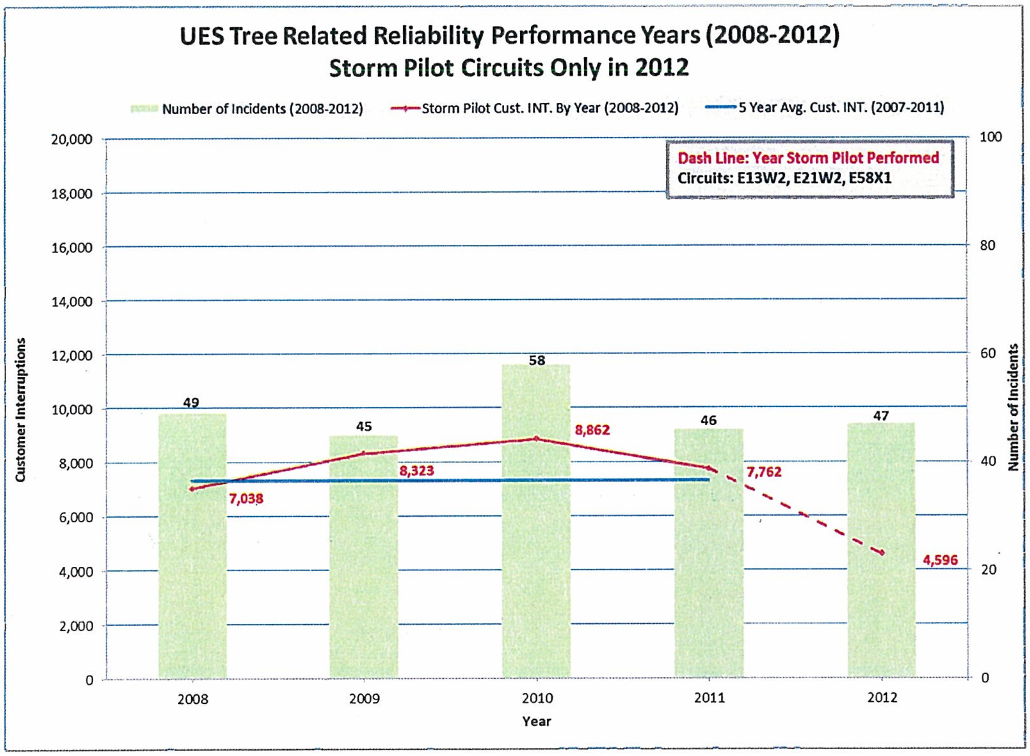
Chart 4 shows a decrease in incidents, but an increase in customers interrupted during the year of pruning and hazard tree. It is important to note that 1) only one circuit underwent both pruning and hazard tree in 2011 and 2) pruning could have occurred at any point during that year from January through December, and includes a combination of before and after pruning results.

Chart 5, unlike Chart 4, shows a decrease in incidents as well as a decrease in customers interrupted in the year of pruning and hazard tree removal. It is important to note that 1) many more circuits; ten (10), underwent both pruning and hazard tree in 2012 and 2) work could have occurred at any point during that year.

For the first year following pruning, Chart 4, like the 2011 pruning only Chart 2, shows favorable reliability results with a decrease in incidents and a decrease in customers interrupted.

Chart 6, shown below, displays the tree related reliability performance of the individual circuits that underwent Storm Hardening Pilot work in 2012. The dashed line represents the year work occurred.

Chart 6



The Storm Pilot work, show in Chart 6, indicates a very slight increase in incidents and a decrease in customers interrupted during the year work was done. It is important to note that due to work planning and implementation need, most of the work occurred in the last quarter of 2012 and includes a combination of reliability results from before and after work was completed.

The Company will continue to monitor those circuits which have undergone Pruning, Hazard Tree and Storm Resiliency work, and barring any unforeseen items such as weather or pest infestations, expect to see a continuing trend in reliability improvement.

3. Reliability Enhancement Plan

The Settlement Agreement provides that Unitil should implement a Reliability Enhancement Program. Pursuant to the Agreement and beginning in 2011, the Company has planned to spend a target amount of $1,750,000 annually and is subject to a cap of $2,000,000 in REP capital expenditures in a given year and $300,000 in operation and maintenance expense effective May 1, 2012.[6]

As described in Mr. Meissner's Direct Testimony in Docket DE 10-055[7], the REP 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; (2) enhanced tree trimming, i.e., aggressive trimming and clearing involving an expanded trim zone or more aggressive removal beyond what is normally included in maintenance trimming, typically in localized areas of poor reliability; (3) asset replacement, which targets aging electrical components at increased risk of failure, including porcelain cutouts and insulators, transformers, circuit breakers, underground cable, wood poles and other equipment, and includes conductor replacement and reconductoring of select mainlines with spacer cable; and (4) reliability-based inspections and maintenance, which will include enhanced inspection methods to detect and mitigate outage causes before they occur, including surveys using new or improved technology such as thermography (IR) and radiofrequency (RF) sensor technology to identify and mitigate failing electrical equipment, as well as software applications to better manage inspection, maintenance, and reliability programs and data.

3.1. Reliability Studies

The Settlement Agreement provides that the Company will complete the following fuse and recloser studies and reviews: 1) Un-fused Lateral Study; 2) Fuse Coordination Studies; and 3) Recloser Studies[8]. Each of these studies is described below.

[6] Reference Settlement Agreement Section 7.1 Page 14 of 26
[7] Direct Testimony of Thomas P. Meissner, Jr., DE 10-055, pages 20-29.
[8] Reference Settlement Agreement Section 7.6.1 Page 15 of 26

3.1.1. Un-fused Lateral Study

The Settlement Agreement provides that the Company would complete a review of un-fused lateral on distribution circuits.

In 2011, the Company completed a review of all distribution circuits in order to identify laterals tapped directly to the main line of distribution circuits without fusing or some other type of protective device. [9]The study was provided as part of the Reliability Enhancement Program and Vegetation Management Program Annual Report 2011.

Distribution Engineering developed a prioritized list of unprotected laterals based upon number of customers which could be affected by an outage event. As identified in the 2011 Annual Report, the Company plans to issue Engineering Work Requests (EWRs) to address all the identified locations over a three year period or as other work is performed on these circuits as part of planned system upgrades or modifications. In 2012, EWR's were issued to install fusing at over forty locations on nineteen circuits.

3.1.2. Fuse Coordination Studies

The Settlement Agreement provides that the Company complete fuse coordination studies on distribution circuits where they are out of date and ensure that fuses are coordinated and of the proper size.

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 prepare 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 review 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 and overload analysis; 4) voltage drop analysis; 5) fault current and coordination analysis. Engineering work requests are initiated for any apparent miscoordination identified during this analysis. Protection device

[9] Reference Unitil Energy Systems Unprotected Lateral Study, November 29, 2011.

coordination analysis is an automated function within the WindMil application. This function is included each year as part of the circuit analysis performed on the circuits evaluated.

In addition to the fuse coordination completed as part of circuit analysis, the Company reviews trouble interruption 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. In 2012, twenty-four Engineering Work Requests were initiated specific to fuse installation or fuse size changes due to the coordination analysis performed.

3.1.3. Recloser Studies

The Settlement Agreement provides that the Company would complete a review of locations on distribution circuits where reclosers could be applied in an economic manner to improve reliability.

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 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 2 and Attachment 3 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. In response to these studies, projects have been approved for 2013 construction to install reclosers and/or breakers in five locations.

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; and 4) installation of tree wire or spacer cable. These solutions are recommended quite regularly. For instance, in 2012, there were five projects implemented to add reclosers or sectionalizers to improve fault isolation and a project to replace spacer cable to improve the circuit reliability. In addition, projects have been approved to install reclosers or breakers in five locations and to upgrade over a mile of spacer cable.

3.2. REP O&M Expenditures

The Settlement Agreement provides that Unitil will increase its annual REP O&M expense by $300,000 effective May 1, 2012.[10] The order does not specify, however, the allocation of the expense. The Company is allocating: 1) $200,000 for Enhanced Tree Trimming and 2) $100,000 for Reliability Inspections and Maintenance. The Enhanced Tree Trimming funding is intended to target "problem" areas identified through engineering analysis.

The annual budget year increases over the test year amounts for the Company are shown in Table 15 below:

Table 15

REP O&M Category	**Spending Above Test Year Amounts**		
	2011	**2012**[11]	**2013**
Enhanced Tree Trimming	-	$133,333	$200,000
Reliability Inspection and Maintenance	-	$ 66,667	$100,000
Totals	-	$200,000	$300,000

3.2.1. Enhanced Tree Trimming

Each year, the Company completes reliability analysis on the distribution and subtransmission system. The reliability analysis (as shown in Attachments 2 and 3) identifies areas of the system which have experienced an abnormal or increasing amount of tree related outages in 2012. 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.

In 2012, Distribution Engineering recommended three subtransmission lines to receive enhanced tree trimming: 1) Line 3346 in Hampton; 2) Line 37 in Boscawen; and 3) Line 3359 in Hampton, Hampton Falls and Seabrook. In total, $46,946.75 was spent on Enhanced Tree Trimming on the 3346 line in Hampton and the 37 line in Boscawen. The entire 3346 line underwent enhanced risk tree assessment, and 66 hazard tree removals were completed along with sideline clearing on selected portions. The northern portion of the 37 line underwent enhanced risk tree assessment and 35 hazard tree

[10] Reference Settlement Agreement Section 7.1 Page 14 of 26
[11] Prorated annual amounts assuming May 1, 2012 increase

removals were completed along with sideline clearing and incompatible small tree species and brush removal around the substation.

For 2013, Distribution Engineering is recommending two sub-transmission lines to receive enhanced tree trimming: 1) Line 375 in Concord and 2) Line 37 in Penacook. Tree related outages on these two lines have accounted for 24% of the customer minutes of outage time and 18% of the customer interruptions for UES from January, 2010 through October 2011. The trimming on these two subtransmission lines will be prioritized as listed and are budgeted not to exceed $200,000 in 2013.

3.2.2. Reliability Inspection and Maintenance

3.2.2.1. Program Description

In 2012 $56,205 was expended conducting an infrared (IR) inspection of UES's complete overhead distribution system, encompassing a total of approximately 1,200 miles of line. The total expended includes subsequent repairs of the identified "hot spots."

A formal Request for Proposal (RFP) was developed and seven (7) vendors were invited to submit proposals. An initial review of the proposals reduced the qualified vendors to a total of three (3). A committee consisting of personnel for Operations, Engineering, and Purchasing was formed to evaluate the three proposals and ultimately the bid was awarded to OSMOSE.

3.2.2.2. IR Survey Results

OSMOSE conducted the survey in the fall of 2012. A total of seven (7) primary voltage and forty-seven (47) secondary voltage "hot spot" locations were identified, prioritized and scheduled for repair. If the identified primary locations would have failed, UES would have incurred approximately 546,750 customer minutes or 7.2 additional SAIDI minutes. Furthermore, preventing these failures reduces expenditures for unscheduled deployment of line crews, and contributes to improved customer satisfaction.

Other notable benefits of the IR program include other, physical findings of the OSMOSE inspection, including items such as vines, leaning poles, and slack guys. These items are also prioritized and investigated by UES personnel for mitigation and repair.

Given these results, the company believes that utilizing IR is only marginally beneficial, and we are unconvinced that it is necessary to perform these inspections on an annual basis given the small number of problems identified. The Company is evaluating another inspection technology (described below) that may yield better results, and plans to perform a pilot of this technology in 2013.

3.2.2.3. 2013 Plan Proposal

In 2013, a total of $100,000 is approved and allocated to Reliability Inspections and Maintenance. Given the minimal success of the IR program in 2012, the Company is proposing to discontinue distribution IR inspections and instead perform a pilot program utilizing EXACTER technology. Unitil has been in discussions with a vendor that has been successful in the deployment of a device that utilizes radio frequencies (RF) to detect electrical equipment that may be close or nearly close to failure.

Unitil will use field diagnostics to determine whether specific assets should remain in service past their predicted life. These field diagnostics will provide the detection of deterioration measurement of electro-magnetic interference (EMI) utilizing EXACTER Technology. EXACTER technology is currently used by electric utilities to augment overhead line preventive maintenance programs. The technology will allow Unitil to perform high-speed, condition-assessments on all electrical equipment that is energized, and will identify failures regardless of circuit loading or ambient conditions.

The functionality of the technology is the detection and identification of specific radio frequency (RF) failure signatures that provide a reliable method to detect failing utility equipment, while not being affected by other ambient Radio Frequency Interference (RFI). The failure signatures discriminate RF generated and emitted from energized equipment as a result of leakage, tracking, and arcing. As normal wear and tear degrade insulating materials, or equipment is damaged by lightning strikes or transients, characteristic failure signatures are emitted. This technology may provide an additional step for Unitil to proactively improve reliability, with a sustained reliable approach to predictive facility maintenance.

3.2.2.4. Predictive Analytics for Preventive Maintenance

Unitil intends to contract with Davey Reliability Solutions to perform an initial deployment of the EXACTER technology that will allow us to inspect our facilities for signatures that identify equipment that is likely to fail. Proactive use of this technology is intended to reduce interruptions to customers, as well as to improve the reliability and resiliency of the Unitil distribution system. The use of this technology, in conjunction with our GIS and OMS systems will provide a targeted and effective tool to prioritize critical maintenance. The EXACTER Technology and the locations of deteriorated equipment will be combined with our GIS and OMS data to identify the number of customers that would be affected if equipment failure occurred.

This multiple step process provides cross checks prior to equipment replacement. This methodology has provided consistent reliability improvement for other utilities when implemented on a 3-5 year cycle. Unitil will use 2013 to refine internal processes for anticipated rollout in 2014 should results prove satisfactory.

The pilot cost of $100,000 includes an analysis of UES' three phase backbone, and repair/replacement of equipment identified as priorities based upon saved customer minutes. In addition to identifying degraded equipment, the pilot will also test the product's ability to integrate with our GIS/OMS systems.

3.3. REP Capital Expenditures

As described above, beginning in 2011 the Company planned on spending a target amount of $1,750,000, subject to a cap of $2,000,000 in REP capital expenditures in a given year annually. The breakdown of the spending by category is shown in Table 16 below:

Table 16

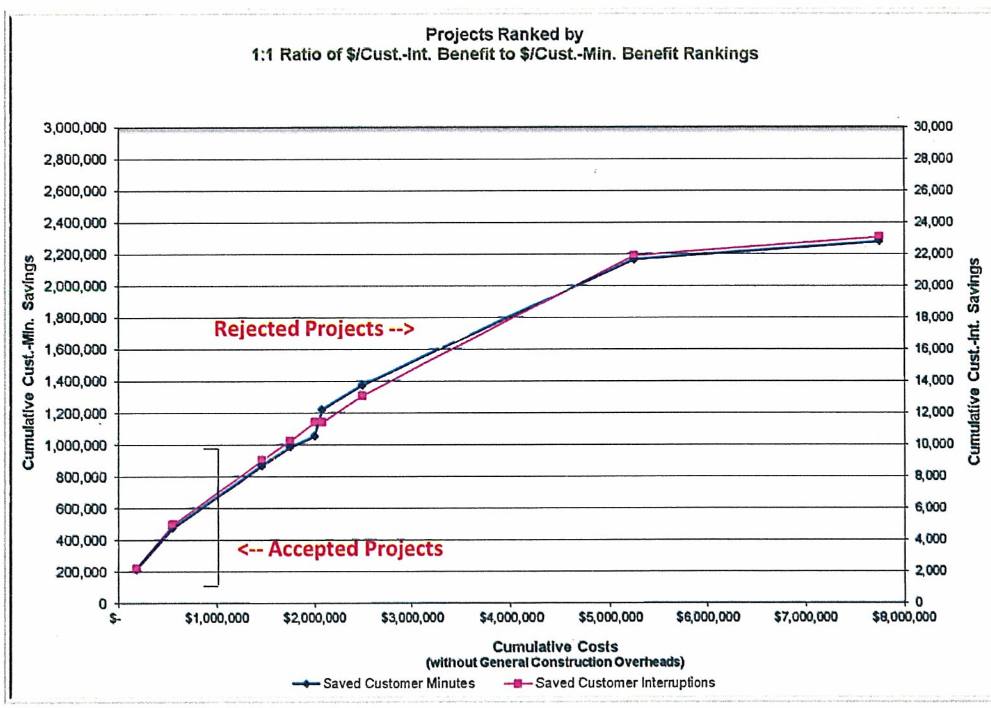
REP Capital Category	Target Spending Above Test Year Amounts		
	2011	2012	2013
System Hardening/Reliability	$ 750,000	$ 750,000	$ 750,000
Asset Replacement	$1,000,000	$1,000,000	$1,000,000
Totals	$1,750,000	$1,750,000	$1,750,000

As described above, 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 REP projects count for the majority or all of the "System Hardening/Reliability" spending for each year.

The REP 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 the 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 7 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 determine when there is a diminishing return of reliability benefits associated with project cost as indicated by the "knee" of the curve. Proposed projects to the left of the cutoff line are accepted in the 2012 Capital Budget and those to the right have been rejected.

Chart 7



The REP projects for 2013 presented in Table 17 below provide an illustration of the process used to identify REP projects. Table 17 is a listing of REP projects recommended by Distribution Engineering as part of the 2012 annual reliability studies for the UES system which have been accepted into the 2013 Capital Budget. This project listing details the overall project ranking, scope, cost, and anticipated reliability benefits.

Table 17

Project Ranking	DOC / Budget No.	Description	Project Cost	Cumulative Cost	Customer Interruptions Saved Annually	Customer Minutes Saved Annually
1	DRBE07	Portsmouth Ave S/S - Install Reclosers	$ 303,200	$ 303,200	2,193	210,481
2	DRBE02	Hampton S/S - Install Breakers 3342, 3353 and 3348	$ 612,160	$ 915,360	2,739	262,957
3	DRBC05	4W4 Recloser on Lakeview	$ 10,600	$ 925,960	48	4,350
PROPOSED NH REP PROJECTS				**$ 925,960**	**4,980**	**477,788**

Note the project list 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 REP projects. However, it should be noted that not all projects identified in the annual reliability analysis are accepted in the Capital Budget.

3.3.1. 2012 Actual REP Expenditures

The 2012 capital expenditures for the Company total $1,994,219, or $244,219 greater than the targeted amount of $1,750,000 but below the $2,000,000 cap in REP spending[12]. The spending beyond the targeted amount was mainly due to projects that were originally budgeted in 2011, but were not completed due to delays in materials deliveries which delayed project construction (see Table 18). In

[12] Reference Attachment 4 for schedule of 2012 REP project spending

addition there was a project not originally budgeted that was implemented to install cut-outs and fuses per the unfused lateral study. Table 19 is a list of projects completed in the field and closed to plant as of December 31, 2012 and the final expenditures.

Table 18 - Projects Carried over from 2011

Project	**Description/Comment**	**Total Expenditures**
Replace 1H3 Breaker – Replacement of substation breaker	Replace failed substation breaker	$ 41,611
Replace 13X4 Recloser – Replacement circuit recloser	Install three-phase recloser with Single-Phase tripping	$ 33,202
Replace 7X2 Recloser – Replacement circuit recloser	Install three-phase recloser with Single-Phase tripping	$ 89,46
Replace 13X3 Recloser – Replacement circuit recloser	Install three-phase recloser with Single-Phase tripping	$ 50,853
Total		**$215,511**

Table 19 - Projects initiated in 2012

Project	**Description/Comment**	**Total Expenditures**
Distribution Pole Replacement	Replacement of distribution poles which were identified during pole inspections completed in 2011.	$968,181
Circuit 19X3 – Install Sectionalizers	Install sectionalizers to increase isolation points	$ 20,223
Circuit 3H2/3H3 – Increase Phase Spacing	Reconstruct circuit spacing to reduce chance of phase-to-phase faults	$ 36,536
Circuits 13W2 and 13W3 Rebuild Substation Getaway	Rebuild circuits 13W2 and 13W3 leaving substation with Spacer Cable	$379,872
Circuit 13W2 install reclosers Main St Newton	This project consists of installing a new recloser on the distribution circuit to add isolation	$ 34,065
Circuit 4X1/37 Line Automation*	This project is a change of scope to the project originally Titled 37 Line Install Underground Cable.	$299,956
Install cutouts/fuses on Unprotected main line	This project was not originally budgeted, but was initiated to install additional fuses on circuits per the Unfused Lateral Study completed in 2011.	$ 39,875
Total		**$1,778,708**

*The scope of the project, originally titled 37 Line Install Underground Cable, was changed to installing two reclosers and implementing an automation scheme. These changes will allow automatic restoration of the 37 Line by opening the circuit recloser and closing the circuit tie recloser, thereby supplying the unfaulted portion of the 37 Line from the 4X1 circuit and restoring all customers on the 37 Line. These reclosers will also be used to remotely re-energize the 4X1 circuit from the 37 Line upon loss of the 4X1 supply. It was determined that this new scope should provide a much greater reliability benefit per cost than the original project to construct an underground portion of the 37 Line. The original scope protected faults occurring on approximately 1,000 feet of the circuit, where the new scope covers faults along more than 1.5 miles of the 37 Line as well as added benefit to the 4X1 circuit.

In addition to the 2012 expenditures, there is one project that was not completed in 2012 and will be carried over to 2013. This project *Exeter S/S Replace LTC Controls,* consists of replacing a Load Tap

Changer control on a substation transformer. The estimated cost for this project is $58,600;the amount expended to date is $42,900.

3.3.2. 2013 REP Estimated Capital Expenditures and Work To Be Completed

As stated above, the 2013 REP capital spending plan was developed from the recommendations identified in the annual reliability planning studies. The projects shown below provide the best cost benefit ratio based upon project cost and estimated reliability improvement. The proposed 2013 REP capital spending is $ 1,776,019 which is $26,019 more than the targeted $1,750,000 but below the $2,000,000 cap in REP capital spending. The proposed projects are identified below.

The Asset Replacement projects identified for 2013 include distribution pole replacement of $850,059. Distribution pole replacements are based upon field inspections and are defined as poles that are not expected to last until the next inspection cycle. Distribution pole replacements are prioritized based upon their condition. Other smaller projects may be identified throughout the year such as insulator or cutout replacements identified during normal inspections. At this time, the cost of those replacements is unknown.

The 2013 System Hardening/Reliability projects are shown below in order of the ranking described in section 3.3 and total $925,960. Other System Hardening/Reliability projects may be identified throughout the year which may provide a better cost benefit than the projects presently identified. If such projects are identified, the Company generally attempts to maintain flexibility and complete the project with the better cost benefit ratio.

(1) *Portsmouth Ave Substation Install Reclosers* – This project consists of installing two new reclosers at Portsmouth Ave. substation. One recloser will supply 11X1 (11W1) load and the other will supply 11X2 load. This project is estimated to save 210,481 customer minutes and 2,193 customer interruptions on an annual basis.

(2) *Hampton S/S - Install Breakers 3342, 3353 and 3348* - This project will consist of installing 1200 amp (minimum) breakers on the 3342 and 3353 lines and an 800 amp (minimum) breaker on the 3348 line at Hampton. This project is estimated to save 262,957 customer minutes and 2,739 customer interruptions on an annual basis.

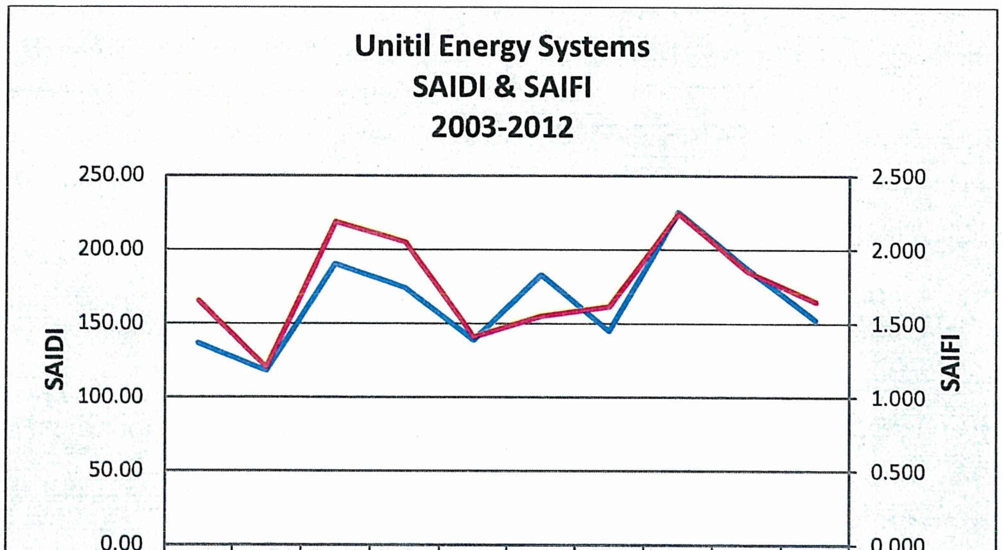
(3) *4W4 Recloser on Lakeview* – This project consists of Installing a 100A V4L Recloser at P.1 on Lake View Drive. This project is estimated to save 4,350 customer minutes and 48 customer interruptions on an annual basis.

4. 2012 Reliability Performance

4.1. Historical Performance (2003-2012)

The historical reliability performance for the UES system for the time period from 2003-2012 is outlined in Chart 8 below. This chart displays annual SAIDI and SAIFI for the combined UES systems consisting of the UES-Capital and UES-Seacoast service territories.

Chart 8



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
SAIDI	136.1	117.4	189.7	173.6	138.2	182.2	144.4	224.6	186.9	151.9
SAIFI	1.651	1.200	2.187	2.047	1.406	1.548	1.614	2.241	1.852	1.645

NOTE: Only those events causing an outage to 1 or more customers and lasting more than 5 minutes in duration are included in the calculation of these indices. In addition, events meeting any of the following criteria have also been excluded from these calculations:

- PUC Major Storm: Any event where the number of customers interrupted exceeds 15 % of customers served with 16 concurrent outage events or 22 concurrent outage events regardless of the number of customers interrupted.
- Scheduled Outages
- Off system power supply interruptions

4.2. Summary of 2012 Performance

The reported reliability performance of the UES systems in 2012 (after taking PUC exclusions) is better than the 10 year average. The 2012 SAIDI of 151.90 is 7.5% better than the 10 year average of 164.65 and the 2012 SAIFI of 1.645 is 5.5% better than the 10 year average of 1.741. The total number of troubles recorded in 2012, not including exclusionary events, was 1,008. This is lower than any year since 2004 and almost 7.5% below the 10 year average of 1,087.

Hurricane/Tropical Storm Sandy was the only major storm event that impacted the UES system during 2012. However, this storm ranks among the worst storms in Unitil history in terms of the resulting widespread damage to Unitil facilities and the number of customers impacted. In addition to Sandy, there was one other event that was excluded from the calculation of UES SAIDI and SAIFI based on the exclusionary criteria described in Section 4.1. The excluded events are listed below:

- October 29 – November 1 – Hurricane Sandy
- December 13 – Loss of Kingston Supply (Due to PSNH R193 Line Outage)

Table 20 below shows the reliability performance of the total UES system by individual cause codes.

Table 20

Cause	No of Troubles	Customer Hours	Customer Interruptions	SAIDI	% of Total	SAIFI	% of Total
Broken Tree/Limb	326	59,329.87	41,752	47.31	31.1%	0.555	33.7%
Vehicle Accident	43	40,062.75	17,416	31.95	21.0%	0.231	14.1%
Equipment Failure - Company	127	39,433.68	28,001	31.45	20.7%	0.372	22.6%
Tree/Limb Contact - Growth into Line	120	14,146.13	9,865	11.28	7.4%	0.131	8.0%
Patrolled, Nothing Found	97	16,809.77	11,698	13.40	8.8%	0.155	9.5%
Squirrel	127	3,791.53	3,214	3.02	2.0%	0.043	2.6%
Lightning Strike	23	5,889.60	2,241	4.70	3.1%	0.030	1.8%
Loose/Failed Connection	38	1,409.90	812	1.12	0.7%	0.011	0.7%
Action by Others	22	4,431.10	2,517	3.53	2.3%	0.033	2.0%
Other	28	2,095.65	3,063	1.67	1.1%	0.041	2.5%
Improper Installation	2	59.62	38	0.05	0.0%	0.001	0.0%
Overload	17	588.97	326	0.47	0.3%	0.004	0.3%
Bird	17	1,699.30	1,582	1.36	0.9%	0.021	1.3%
Animal - Other	4	183.10	63	0.15	0.1%	0.001	0.1%
Operating Error/System Malfunction	1	336.33	1,009	0.27	0.2%	0.013	0.8%
Corrosion/Contamination/Decay	9	42.87	48	0.03	0.0%	0.001	0.0%
Equipment Failure - Customer	6	49.70	27	0.04	0.0%	0.000	0.0%
Civil Emergency (fire, etc.)	1	128.80	84	0.10	0.1%	0.001	0.1%
Total:	**1,008**	**190,488.67**	**123,756**	**384.19**	**100%**	**4.16**	**100%**

As observed from the preceding table, tree related outages had the greatest impact on UES system SAIDI and SAIFI performance in 2012. However the percentage in SAIDI and SAIFI measurement of tree related troubles to the total reduced noticeably compared to the last few years. Table 21 below is a comparison of the top three causes over the last three years.

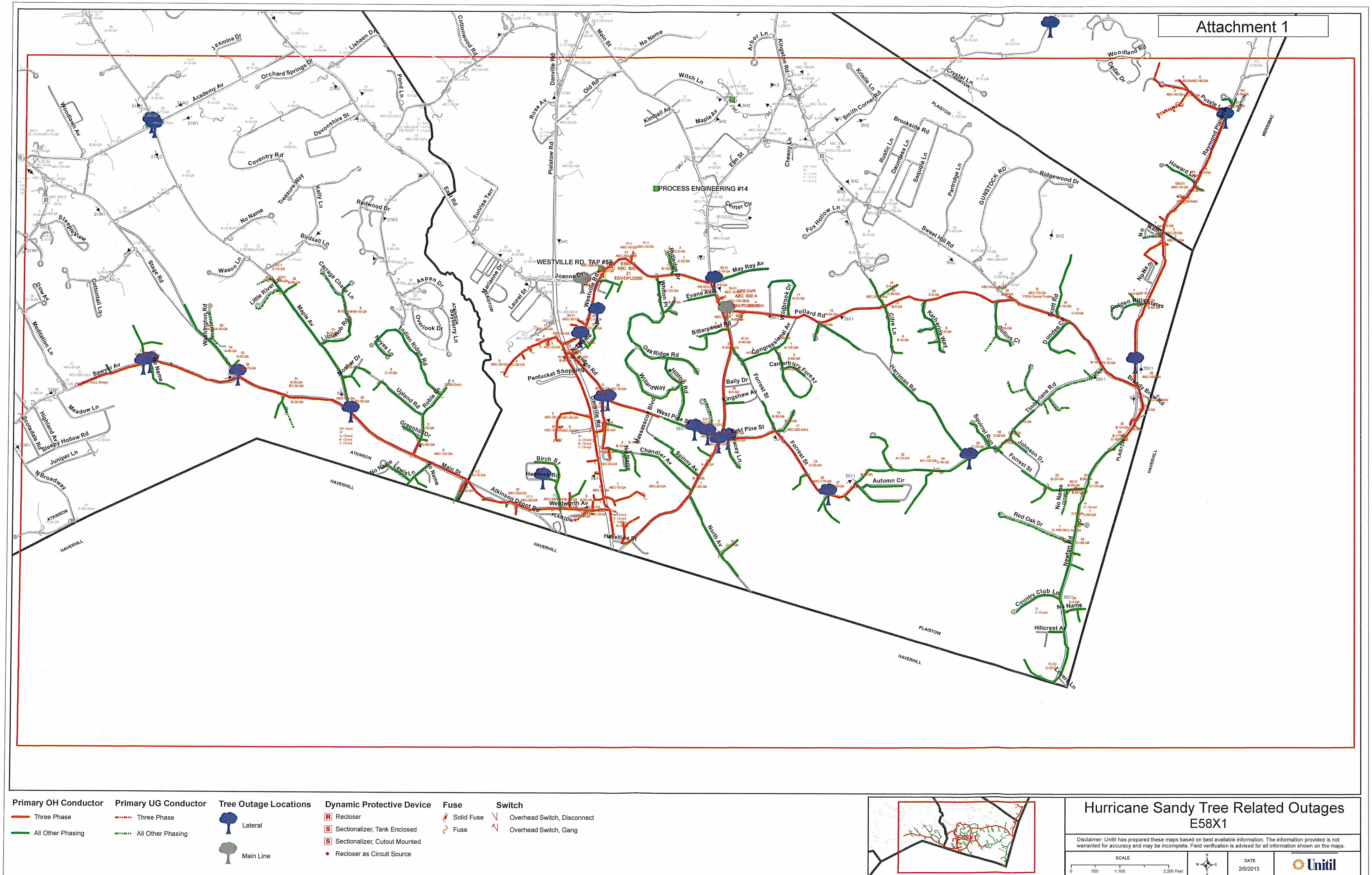
Table 21

	SAIDI (% Total)				**SAIFI (% Total)**		
Cause	**2012**	**2011**	**2010**		**2012**	**2011**	**2010**
Tree Related	39%	48%	61%		42%	47%	61%
Equipment Failure	21%	21%	10%		14%	23%	14%
Motor Vehicle Accident	21%	7%	13%		14%	5%	7%

Attachment 1

Hurricane Sandy

Tree Related Outages E58X1



Hurricane Sandy Tree Related Outages
E58X1

Disclaimer: Unitil has prepared these maps based on best available information. The information provided is not warranted for accuracy and may be incomplete. Field verification is advised for all information shown on the maps.

SCALE 0 550 1,100 2,200 Feet

DATE 2/5/2013

Unitil

00039

Attachment 2

UES – Capital

Reliability Analysis and Recommendations 2012

Unitil Service Corp.

Unitil Electric System - Capital

Reliability Study 2012

Prepared By:
Cyrus Esmaeili
Unitil Service Corp.
September 27, 2012

UES - Capital Reliability Analysis and Recommendations 2012

September 27, 2012

UES - Capital Reliability Analysis and Recommendations 2012

September 27,2012

1. Executive Summary

The purpose of this document is to report on the overall reliability performance of the UES-Capital system January 1, 2011 through December 31, 2011. The scope of this report will also evaluate individual circuit reliability performance over the same time period. The reliability data presented in this report does not include Hurricane Irene (8/28/11 3:25 to 8/30/11 18:40) or the October Nor'easter (10/29/11 17:35 to 11/2/11 9:24).

The following projects are proposed from the results of this study and are focused on improving the worst performing circuits as well as the overall UES-Capital system reliability. These recommendations are provided for consideration and will be further developed with the intention to be incorporated into the 2013 budget development process.

Circuit/Line/ Substation	Proposed Project	Cost
13W2/13W3	REBUILD SPACER CABLE ON HIGH STREET & KING STREET	417,860
3H3	RECLOSER REPLACEMENT AT GULF ST S/S	19,307
18W2	UPGRADE AND SPLIT 22W3, CREATING 18W2 TIE	247,729
8X3	CREATE ALTERNATE MAINLINE	2,750,592
4W4	HYDRAULIC RECLOSER INSTALLATION ON LAKE VIEW DR	7,238

2. Reliability Goals

The annual corporate system reliability goals for 2012 have been set at 191-156-121 SAIDI minutes. These were developed through benchmarking Unitil system performance with surrounding utilities.

Individual circuits will be analyzed based upon circuit SAIDI, SAIFI, and CAIDI. Analysis of individual circuits along with analysis of the entire Capital system is used to identify future capital improvement projects and/or operational enhancements which may be required in order to achieve and maintain these goals.

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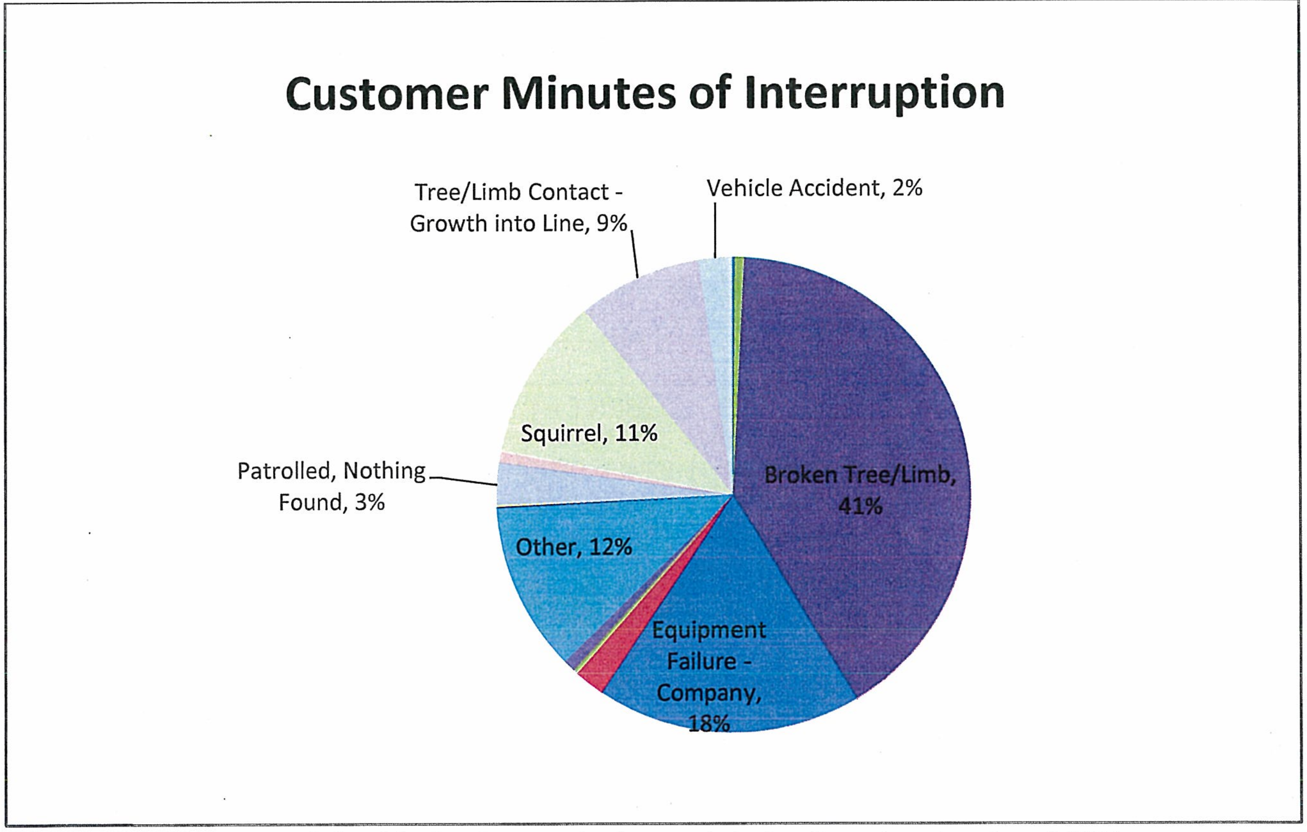
3. Outages by Cause

The following chart provides a breakdown of outage by cause and the corresponding percentage of customer-minutes of interruption from January 1, 2011 to December 31, 2011.

Chart 1
Percent of Customer-Minutes of Interruption by Cause



Note: 98% of the cause “other” is due to one single event during the micro-burst on 9/5/11.

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4. 10 Worst Distribution Outages

The ten worst distribution outages ranked by customer-minutes of interruption during the time period from January 1, 2011 through December 31, 2011 are summarized in Table 1 below.

Table 1

Worst Ten Distribution Outages

Circuit	Description Date/Cause	No. of Customers Affected	No. of Customer Minutes	Effect on UES-Capital SAIDI	Effect on UES-Capital SAIFI
7W3	9/5/11 Other (Wind Microburst)	1,838	424,779	14.24	.062
13W3	3/20/11 Equipment Failure – Company (Insulator)	2,197	197,040	6.61	.073
13W2	7/11/11 Equipment Failure – Company (Tie wire)	1,297	182,440	6.11	.043
17X1	6/20/11 Equipment Failure – Customer (lightning arrester)	1,023	156,551	5.25	.034
13W2	12/8/11 Broken Tree/Limb	563	142,275	4.77	.019
3H1	6/14/2011 Tree/Limb Contact – Growth into Line	600	117,000	3.92	.020
13W2	7/21/2011 Tree/Limb Contact – Growth into Line	1,287	106,784	3.58	.043
4W4	1/15/2011 Equipment Failure – Company (Cutout)	2,156	105,920	3.55	.072
21W1A	9/23/2011 Equipment Failure – Company (Cable)	714	101,633	3.41	.024
22W3	2/25/2011 Broken Tree/Limb	837	99,603	3.34	.028

Note: This table does not include substation, sub-transmission or scheduled planned work outages.

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5. Contribution of Sub-transmission Line Outages

This section describes the contribution of sub-transmission line and substation outages on the UES-Capital system from January 1, 2011 through December 31, 2011.

All substation and sub-transmission outages ranked by customer-minutes of interruption during the time period from January 1, 2011 through December 31, 2011 are summarized in Table 2 below.

Table 3 shows the circuits that have been affected by sub-transmission line outages. The table illustrates the contribution of customer minutes of interruption for each circuit affected by a sub-transmission outage. In aggregate, sub-transmission line and substation outages accounted for 31% of the total customer-minutes for UES-Capital, excluding Hurricane Irene and the October Nor'easter.

Table 2
Sub-transmission and Substation Outages

Trouble Location	Description (Date/Cause)	No. of Customers Affected	No. of Customer Minutes	UES Capital SAIDI (min.)	UES Capital SAIFI
37 Line	8/21/2011 Broken Tree/Limb	3,088	413,792	13.88	.104
396X1 Line	9/5/2011 Other – Microburst Storm	1,056	409,728	13.72	.035
34 Line	3/9/2011 Equipment Failure – Company (Insulator)	2,675	358,517	12.02	.090
Ironworks S/S	7/11/2011 Squirrel	2,069	267,525	8.97	.069
West Portsmouth S/S	11/10/2011 Squirrel	1,315	231,166	7.75	.044
37 Line	6/3/2011 Broken Tree/Limb	3,173	120,574	4.04	.106
37 Line	7/6/2011 Broken Tree/Limb	3,171	117,327	3.93	.106
0375 Line	2/25/2011 Broken Tree/Limb	1,498	49,778	1.66	.050
[1]Terrill Park S/S	3/30/2011 Equipment Failure – Company (Insulator)	300	45,600	1.53	.010
Gulf St S/S	6/22/2011 Equipment Failure – Company (Insulator)	604	42,280	1.42	.020

[1] Unscheduled outage to replace insulator before it failed.

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Table 3
Contribution of Sub-transmission and Substation Outages

Circuit	Subtransmission Line Or Substation Location	Circuit SAIDI Contribution	Customer-Minutes of Interruption	% of Total Circuit Outage Minutes	Number of Events
16H1	Line 0375	29.00	8,758	88.91%	1
16H3	Line 0375	96.33	19,343	96.03%	2
16X4	Line 0375	41.06	21,648	49.75%	1
16X5	Line 0375	6.44	29	100.00%	1
6X3	Line 34	134.41	131,186	61.81%	1
34X2	Line 34	22.33	201	100.00%	1
33X3	Line 34	134.00	134	100.00%	1
33X4	Line 34	140.62	11,390	100.00%	1
33X5	Line 34	44.67	134	100.00%	1
33X6	Line 34	134.00	134	100.00%	1
2H1	Line 34	135.73	62,042	99.55%	1
2H2	Line 34	133.97	140,700	56.96%	1
2H4	Line 34	134.00	12,596	90.20%	1
37X1	Line 37	206.61	40,353	25.92%	3
13W1	Line 37	180.66	80,618	20.37%	3
13W2	Line 37	209.15	270,377	25.03%	3
13W3	Line 37	233.64	260,136	35.40%	3
13X4	Line 37	209.00	209	56.64%	3
17X1	Line 396X1	388.00	776	100.00%	1
18W2	Line 396X1	393.82	408952	66.33%	1
22W1	Iron Works	121.40	59,901	68.90%	1
22W2	Iron Works	16.02	5,177	4.47%	1
22W3	Iron Works	126.69	202,447	30.03%	1
3H1	Gulf	70.50	42,280	23.14%	1
15W2	West Portsmouth	177.83	61,766	62.80%	1
15W1	West Portsmouth	173.12	169,400	71.37%	1

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6. Worst Performing Circuits

This section compares the reliability of the worst performing circuits using various performance measures. Circuits having one outage contributing more than 75% of the customer-minutes of interruption were excluded from this analysis.

6.1. Worst Performing Circuits in Past Year

A summary of the worst performing circuits during the year of 2011 is included in the tables below. *Table 4* shows the ten worst circuits ranked by the total number of Customer-Minutes of interruption. The SAIFI and CAIDI for each circuit are also listed in this table.

Table 5 provides detail on the major causes of the outages on each of these circuits. Customer-minutes of interruption are given for the six most prevalent causes.

Table 4
Worst Performing Circuits by Customer-Minutes

Circuit	No. of Customers Interruptions	Worst Event (% of Total Cust Int.)	Customer-Minutes of Interruption	Worst Event (% of Total Minutes)	Circuit SAIDI	Circuit SAIFI	Circuit CAIDI
13W2	11,560	11.17%	1,080,312	16.89%	835.67	8.94	93.45
13W3	11,556	19.07%	734,938	26.81%	660.07	10.38	63.60
22W3	10,291	13.28%	674,182	30.03%	421.91	6.44	65.51
18W2	2,597	40.59%	616,579	66.33%	593.77	2.50	237.42
4X1	6,170	32.24%	452,801	39.53%	227.51	3.10	73.39
13W1	3,347	13.33%	395,864	20.05%	887.09	7.50	118.27
8X3	3,253	2.15%	380,731	10.76%	137.70	1.18	117.04
4W4	5,092	42.34%	303,149	34.94%	138.88	2.33	59.53
2H2	2,486	42.24%	247,020	56.96%	235.20	2.37	99.36
4W3	2,149	6.14%	243,951	13.58%	185.69	1.64	113.52

Table 5
Circuit Interruption Analysis by Cause

Circuit	Customer – Minutes of Interruption					
	Broken Tree Limb	[1]Animal	Patrolled, Nothing Found	Vehicle Accident	Company Equipment Failure	Tree Growth into Line
13W2	674,148	28,574	24,380	3,989	214,769	128,948
13W3	337,777	9,844	33,248	544	300,766	52,759
22W3	259,533	337,380	11,800	340	1,131	13,068
18W2	28,318	14,518	7,230	378	439	0
4X1	373,142	33,618	6,840	3,036	4,934	0
13W1	373,142	3,537	0	64,105	63,400	15,148
8X3	143,583	51,000	27,777	13,694	2,097	108,179
4W4	141,757	16,136	3,545	12,348	106,002	20,828
2H2	4,165	0	38,850	62,225	141,750	0
4W3	152,376	31,889	0	0	0	58,267
Total	2,487,941	526,496	153,670	160,659	835,288	397,197

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[1]This category includes bird, squirrel and other animals combined

6.2. Worst Performing Circuits of the Past Five Years (2007 – 2011)

The annual performance of the ten worst circuits for the past five years has been ranked in the tables below. *Table 6* lists the ten worst circuits ranked by SAIDI performance. *Table 7* lists the ten worst performing circuits ranked by SAIFI.

Table 6
Circuit SAIDI

Circuit Ranking	2011		2010		2009		2008		2007	
	Circuit	SAIDI	Circuit	SAIDI	Circuit	SAIDI	Circuit	SAIDI	Circuit	SAIDI
1	13W1	887.09	8X3	1,037.0	13W1	797.86	211A	1,655.4	13W2	1,116.9
2	13W2	835.67	211A	650.29	13X4	444.00	13W2	1,071.9	13W1	1,108.9
3	37X1	797.25	13W1	648.23	13W2	443.03	13W1	575.6	13W3	988.0
4	13W3	660.07	13W2	487.15	18W2	369.36	22W3	434.3	15W2	949.0
5	18W2	593.77	13W3	417.67	13W3	349.28	4W3	396.1	22W3	777.4
6	22W3	421.91	2H4	414.01	211A	330.29	1H3	351.1	7W3	764.3
7	17X1	388.00	2H2	353.25	37A	269.61	22W2	291.3	4W3	744.3
8	13X4	369.00	37X1	304.57	22W3	246.30	15W1	288.9	22W1	674.9
9	21W1A	361.90	3H2	298.00	4W3	245.64	13W3	233.1	15W1	642.4
10	38W	359.61	18W2	293.13	15W1	210.10	1H4	194.0	13X4	572.0

Table 7
Circuit SAIFI

Circuit Ranking	2011		2010		2009		2008		2007	
	Circuit	SAIFI	Circuit	SAIFI	Circuit	SAIFI	Circuit	SAIFI	Circuit	SAIFI
1	13W3	10.379	13W1	5.956	211A	8.614	13W2	9.98	7W3	7.38
2	13W2	8.942	8X3	5.847	13W1	6.091	211A	7.01	16X4	6.75
3	37X1	7.660	13W3	5.561	13W2	3.881	13W1	6.28	13W2	6.49
4	13W1	7.500	13W2	4.638	22W1	3.240	22W2	5.04	22W3	6.37
5	22W3	6.440	37X1	4.391	4W3	3.051	14X3	5.00	22W1	6.08
6	38W	5.428	211A	4.365	13W3	2.748	22W3	4.58	13W1	4.90
7	13X4	5.000	1H5	4.235	22W2	2.720	15W1	3.08	1H4	4.83
8	22W2	4.881	1H3	4.135	15W1	2.277	1H3	3.00	2H2	4.51
9	3H1	3.245	1H4	4.127	18W2	2.004	4W3	2.88	6X3	4.50
10	4X1	3.100	3H2	4.000	37A	1.702	22W1	2.36	16H3	4.33

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7. Animal Related outages in the Past Year (1/1/11-12/31/11)

This section summarizes the worst performing circuit and street by animal related outages during 2011.

Table 8 shows these roads with >2 animal related outages. This table identifies roads that should be reviewed for existing wildlife guards. This work would be in addition to Unitil's current practice of installing Wildlife guards when responding to outages caused by animal contact, or doing other work, at existing service transformers where no animal guard is presently installed.

Table 8
Animal Related Outages by Street

Circuit	Road	# of Animal Outages
8X3	Lane Rd	3
8X3	Horse Corner Rd	3
22W3	Fernwood Place	3

8. Tree Related Outages in the Past Year (1/1/11-12/31/11)

This section summarizes the worst ten performing circuits by tree related outages during 2011. This section is used by the forestry department to help come up with future tree trimming plans.

Table 9 shows the ten worst circuits ranked by the total number of Customer-Minutes of interruption. The number of customer-interruptions and number of outages are also listed in this table. Circuits having less than 3 outages were excluded from this table.

All streets on the Capital System with 4 or more tree related outages are shown in Table 10 below. The table is sorted by number of outages and customer-minutes of interruption.

Table 9
Worst Performing Circuits – Tree Related Outages

Circuit	Customer Minutes of Interruption	Customer Interruptions	No. of interruptions
[1]13W2	803,096.00	8,304.00	72
13W3	390,536.00	5,620.00	20
4X1	373,142.00	3,418.00	15
22W3	272,601.00	3,931.00	21
13W1	264,722.00	2,340.00	36
8X3	251,762.00	1,605.00	68
4W3	210,643.00	1,688.00	17
4W4	162,585.00	2,529.00	9
37X1	124,466.00	1,214.00	16
7W3	93,512.00	1,521.00	11

[1]13W2 has hazard tree mitigation planned in 2012 and full trimming in 2013

Table 10

UES - Capital Reliability Analysis and Recommendations 2012

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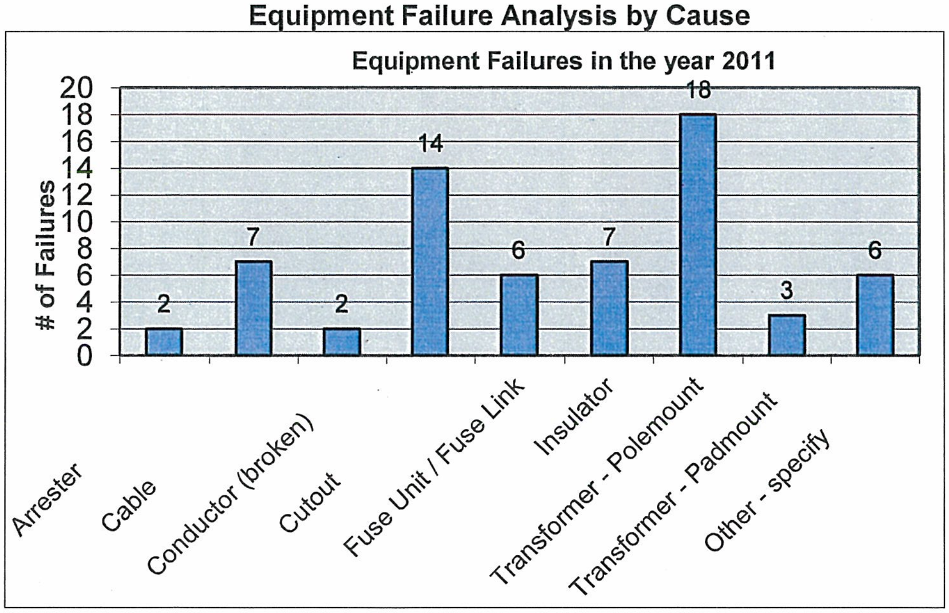
Tree Related Outages by Street

Circuit	Street	# of Outages	Customer Interruptions	Customer Mins of Interruptions
8X3	Mountain Rd	6	232	39380
13W2	West Salisbury Rd	6	310	32096
37X1	South West Rd	6	171	30813
13W2	Old Turnpike Rd	6	354	23404
4W4	Lakeview Dr	5	219	34278
13W1	Morrill Rd	5	59	17189
13W2	Warner Rd	5	150	15502
13W1	West Rd	4	522	89747
4W3	Sewalls Falls Rd	4	633	63235
8X3	Horse Corner Rd	4	210	52368
13W2	Pleasant St	4	233	40681
13W2	Franklin Rd	4	127	18282
15W1	Shaker Rd	4	283	17197
13W2	Little Hill Rd	4	75	14973
6X3	Hopkinton Rd	4	114	13453
8X3	Center Rd	4	22	2050
8X3	Wing Rd	4	30	1992
8X3	Monroe Rd	4	4	324

9. Failed Equipment

This section is intended to clearly show all equipment failures throughout the study period from January 2011 through December 2011. It is important to track these failures so that trends, if any exist, can be observed and corrected in an effort to reduce failures of a specific type of equipment in the future. *Figure 2*, shown below, shows all equipment failures throughout the study period. In addition, *Figure 3* shows each equipment failure as a percentage of the total failures within this same study period. Finally, *Figure 4* shows the top three types of failed equipment within the study period.

Chart 2
Equipment Failure Analysis by Cause



Note: Other is composed mostly of tie wire failures, and Jumper wire failures

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Chart 3
Equipment Failure Analysis by Percentage of Total Failures

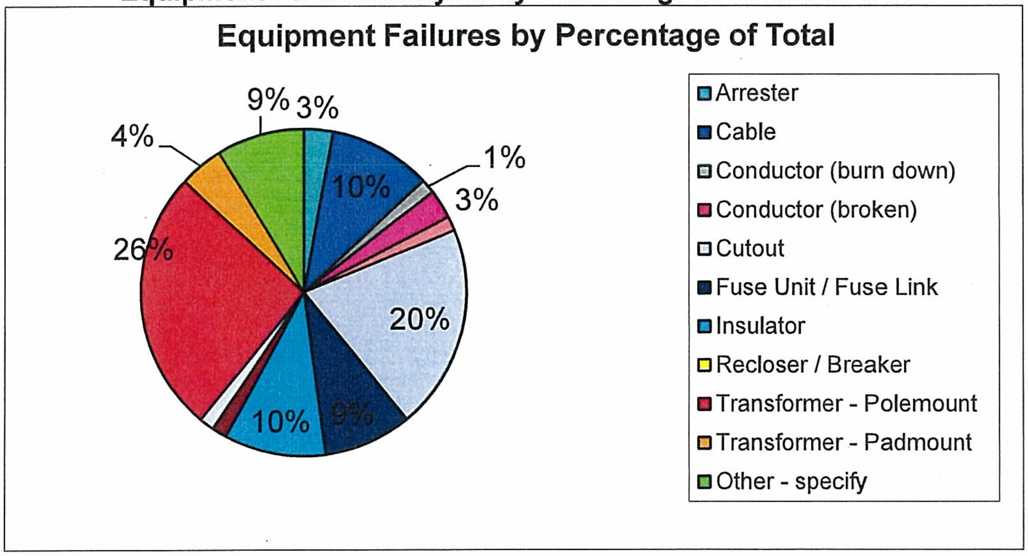
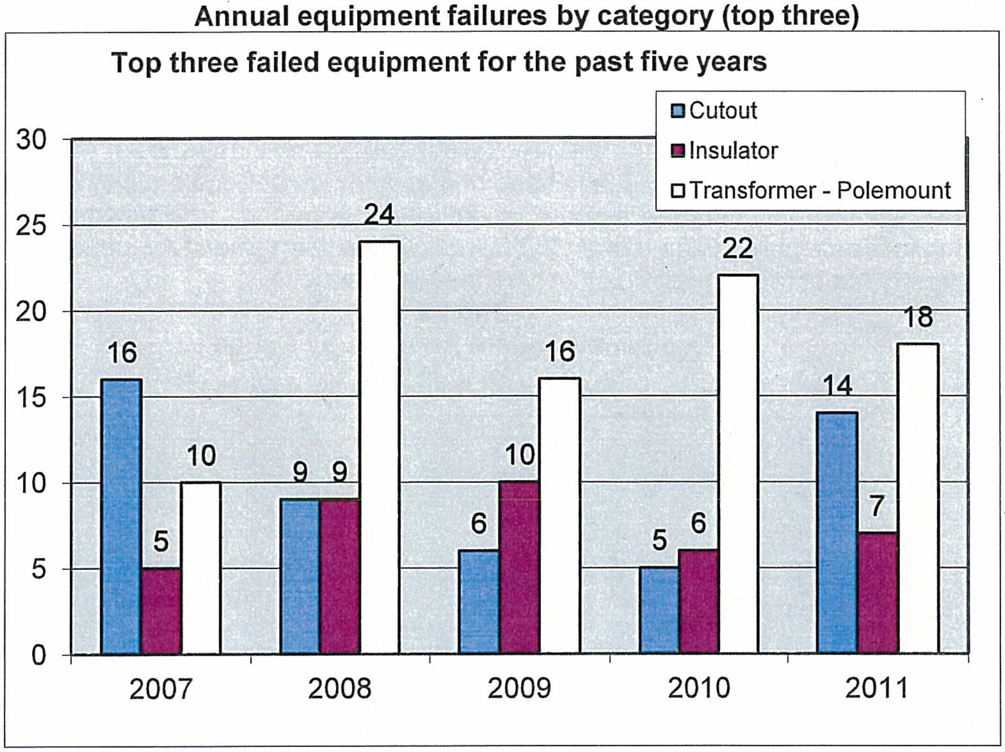


Chart 4
Annual equipment failures by category (top three)



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10. Multiple Device Operations in the Past Year (1/1/11-12/31/11)

Table 11 below is a summary of the devices that have operated four or more times in 2011.

Table11
Multiple Device Operations

Circuit	Number of Operations	Device	Customer-Minutes	Customer-Interruptions
13W2	8	Fuse, Pole 1, West Salisbury Rd	53,680	479
4W4	6	Fuse, Pole 1, Lakeview Dr	34,558	256
37X1	6	Fuse, Pole 11, South West Rd	19,765	223
8X3	6	Fuse, Pole 118, Dover Rd	10,304	143
13W2	5	Fuse, Pole 33, Winnepocket Lake Rd	7,949	54
4W3	4	Fuse, Pole 40, Hoit Rd	44,084	373
8X3	4	Fuse, Pole 1, Mountain Rd	37,968	224
13W2	4	Fuse, Pole 2, Franklin Rd	14,824	127
13W2	4	Fuse, Pole 69, Battle St	15,301	135
13W2	4	Fuse, Pole 1, Warner Rd	16,845	182

11. Other Concerns

11.1. Grey Spacer Cable Insulation

Grey spacer cable and spacers on the Unitil System manufactured prior to1975 have been identified by the manufacturer to have reached the end of its useful life. Samples of failed sections of this cable show significant "ringing" due to the dielectric breakdown of the insulation. This is an industry known problem recognized by the manufacturer due to the UV inhibitor compound in this vintage cable. This problem raises concerns with the insulations' effectiveness, increased probability of conductor burn down, and mechanical strength of the spacers. Locations where this type of cable is installed have been identified and a replacement schedule is planned to be budgeted over the next 5 years.

11.2. Recloser Replacement

Through power factor testing it appears that the solid dielectric material used for the poles on a specific type/vintage recloser degrades over time leading to premature failure. The manufacturer has confirmed this concern. Unitil has experienced two (UES-Seacoast and FG&E) failures of type/vintage of recloser in 2011 and removed a third from service due to the appearance of tracking.

11.3. 13.8kV Underground Electric System Degradation

The 13.8kV underground electric system has been experiencing connector and conductor failures at an average rate of 2 per year for the last 10 years. (This does not include scheduled replacement of hot terminations identified by inspection) This could be due to the age of the underground system, the amount of non-continuous conductor, and/or the number of tee connectors stringed together in some locations. A study will be done next year to identify the best strategy for dealing with these concerns.

12. Recommended Reliability Improvement Projects

This following section describes recommendations on circuits, sub-transmission lines and substations to improve overall system reliability. The recommendations listed below will be compared to the other proposed reliability projects on a system-wide basis. A cost benefit analysis will determine the priority ranking of projects for the 2013 capital budget. All project costs are shown without general construction overheads

12.1. Circuits 13W2 & 13W3: Rebuild Spacer Cable on High Street & King Street

12.1.1. Identified Concerns

One outage on King Street in Boscawen within the study period has resulted in a total of 182,440 customer minutes and 1,291 customer interruptions on circuit 13W2. The existing spacer cable on 13W2 and 13W3 was manufactured in the early 1970's with the ineffective grey cable UV inhibitor. This spacer cable exposes 1,300 customers to a possible fault.

12.1.2. Recommendations

Replace the existing spacer cable on King Street and High Street with new construction. Circuits 13W2 and 13W3 shall be combined in the vicinity of pole 169 King Street. The existing spacer cable currently serving circuit 13W3 shall be removed.

- Reconductor from pole 135 to pole 169 on King Street and from pole 1 to pole 37 on High Street in Boscawen (approximately 8,000 feet) with 336 AAC spacer cable.
- Install a Gang Operated Switches on Goodue Rd P.10 and on High St P. 26.

Estimated Project Cost: $417,860
Estimated Annual Savings - Customer Minutes: 153,013, Customer Interruptions: 1,700
Customer Exposure: 1,300

12.2. Circuit 3H3: Recloser replacement at Gulf St S/S

12.2.1. Identified Concerns

Unitil has experienced premature failures of a specific type/vintage of reclosers due to insulation breakdown of the poles.

12.2.2. Recommendations

Replace this recloser.

Estimated Project Cost: $19,307
Estimated Annual Savings - Customer Minutes: 1,249, Customer Interruptions: 14
Customer Exposure: 111

12.3. Circuit 18W2: Upgrade and Split 22W3, Creating 18W2 Tie

12.3.1. Identified Concerns

There have been 7 outages affecting all of 18W2 in the last 8 years that have an average duration of over 1 1/2 hours (not including the microburst for this average). There have been 4 outages affecting all of 22W3 in the last 8 years. Also, 22W3 exposure will be reduced from 1,538 to 619 (load towards Logging Hill Road) customers. This project was analyzed considering the 18W2 load transfer to 7W3 distribution loading project had been completed, which reduces loading on 18W2 and reduces customer exposure to 773 customers.

12.3.2. Recommendations

Split and upgrade circuit 22W3 to allow circuit 18W2 to be carried by Iron Works S/S and install Gang Operated Switches strategically.

- Add a three phase circuit, built double circuited with existing infrastructure, from P.32 on Iron Works Rd to P.55 on Lewis Lane (3000ft). Install 336 AAC spacer cable using existing neutral. This will cross over I-89 highway. The 22W2 position will feed the original circuit line and the Clinton Street load. The 22W3 position will feed the new circuit line and the load towards Logging Hill Road.
- Move the existing reclosers at P.52 and P.49
- Remove fuses at P.44 Logging Hill Road.
- Install (3) Regulators in the vicinity of P.1, Albin Rd
- Install Gang Operated Switches at P. 79 Bow Center Rd, P.1 Bow Bog Rd, and P.32 Iron Works Rd

Estimated Project Cost: $247,728
Estimated Annual Savings – Customer Minutes of Interruption: 69,015, Customer Interruptions: 1,150
Customer Exposure: 773(18W2), 1547(22W3)

12.4. Circuit 8X3: Create Alternate Mainline

12.4.1. Identified Concerns

Circuit 8X3 has the largest customer exposure on the capital system at 2,764 customers. This circuit has no alternative feeds to restore customers during mainline outages. Horse Corner Rd has had 4 outages in 2011 making up 13% of the customer minutes of interruption on 8X3.

12.4.2. Recommendations

Build an alternate mainline that can be used to divert some customer exposure permanently and allow an alternate circuit feed during contingency scenarios. Three alternatives where looked at one involved crossing over PSNH territory, one involved double circuiting, and the final involved rebuilding Horse Corner Rd. The Horse Corner Road was selected because it will have the added benefit of improving reliability on this road and does not involve PSNH.

- Rebuilding 18,000ft of Horse Corner Rd from single phase 13.8kV to three phase 34.5kV spacer construction.
- Installing three 201A, 19.9kV, regulators on Horse Corner Rd in the vicinity of Dover Rd.
- Installing 19 step down transformers, metering would be needed on 1 of these stepdowns.
- Rebuilding 5,000ft of Old Loudon Rd from 13.8kV to 34.5kV open wire construction.
- Cross I-393 and double circuit mainline for 2000ft.

Estimated Project Cost: $2,750,592
Estimated Annual Savings – Customer Minutes of Interruption: 791,000, Customer Interruptions: 8,788
Customer Exposure: 2800

12.5. Circuit 4W4: Hydraulic Recloser Installation on Lakeview Dr.

12.5.1. Identified Concerns

Six outages caused the fuses on P.1 Lakeview Drive to operate which has resulted in a total of 34,558 customer minutes and 256 customer interruptions on circuit 4W4. These outages break down into the following cause categories: four broken tree limbs, one action by other and one patrolled, nothing found.

12.5.2. Recommendations

Install a 100A V4L Recloser at P.1 on Lake View Dr. with Curves A/B Trips 2/2

Estimated Project Cost: $7,238
Estimated Annual Savings – Customer Minutes of Interruption: 4,350, Customer Interruptions: 48
Customer Exposure: 36

13. Conclusion

During 2011, the Capital System has been greatly affected by interruptions involving tree contact. Enhanced tree trimming efforts are beginning to be implemented, due to increased funding. These efforts will be monitored and evaluated to assure the most effective mitigation of tree related concerns. Projects developed from this study focused on areas of tree related outages as well as other types of outages and ways to prevent or minimize the reliability impact of these outages. In addition, new ideas and solutions to reliability problems are always being explored in an attempt to provide the most reliable service possible.

Although the Boscawen area circuits have been identified as worst performing circuits multiple years running, several significant reliability improvement projects are currently under construction. These projects include: 2011 – Extensive squirrel guard installation effort on 13W3, 2012 – 37X1 load transfer, 2012 – 37 Line auto transfer scheme, 2012 – 13W2 re-coordination and installation of additional protection devices, 2012 – Transfer 13W3 load to 4X1, 2012 – Boscawen Getaway Rebuild and 2012 – Hazard Tree Mitigation. Unitil is investing over 1 million dollars in reliability enhancements for this area.

Attachment 3

UES - Seacoast

Reliability Analysis and Recommendations 2012

Unitil Service Corp.

Unitil Energy Systems – Seacoast

Reliability Study
2012

Prepared By:

Jake Dusling
Unitil Service Corp.
September 18, 2012

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1 Executive Summary

The purpose of this document is to report on the overall reliability performance of the UES-Seacoast system from January 1, 2011 through December 31, 2011. The scope of this report will also evaluate individual circuit reliability performance over the same time period. The reliability data presented in this report does not include Hurricane Irene (8/28/11 03:25 to 8/30/11 18:40) or the October Snow Storm (10/29/11 17:35 to 11/2/11 9:24).

The following projects are proposed from the results of this study and are focused on improving the worst performing circuits as well as the overall UES-Seacoast system reliability. These recommendations are provided for consideration and will be further developed with the intention to be incorporated into the 2013 budget development process.

Circuit / Line / Substation	Proposed Project	Cost ($)
22X1	Relocate Main Line to Route 111	$600,000
13W2	Transfer Portion to 5W2	$125,000[1]
Hampton S/S	Install Breakers on 3342, 3353 and 3348 Lines	$365,000
3348 / 3359	Recloser Installation and Distribution Automation Scheme	$295,000
3359	Install Wireless Fault Indicators	$168,000
3348 / 3350	Rebuild Line off the Salt Marsh	$3,000,000
Portsmouth Ave S/S	Install Reclosers	$160,000
Various	Recloser Replacements	$90,000[2]
6W1 / 6W2	Install Animal Guards Pole 48 Depot Road and Pole 94 Main Street Laterals	Minimal
Plaistow S/S	Rebuild to 15 kV	$1,250,000
Hampton Beach S/S	Add 15 kV Circuit Positions and Remove 4 kV Equipment	$1,400,000

[1] Price does not include the reconstruction of Plaistow substation and Smith Corner Road (reference 2013-2017 Distribution Planning Study for additional information).
[2] Price Assumes manufacturer discounted pricing and that the existing relays will remain.

2 Reliability Goals

The annual corporate system reliability goals for 2012 have been set at 191-156-121 SAIDI minutes. These were developed through benchmarking Unitil system performance with surrounding utilities.

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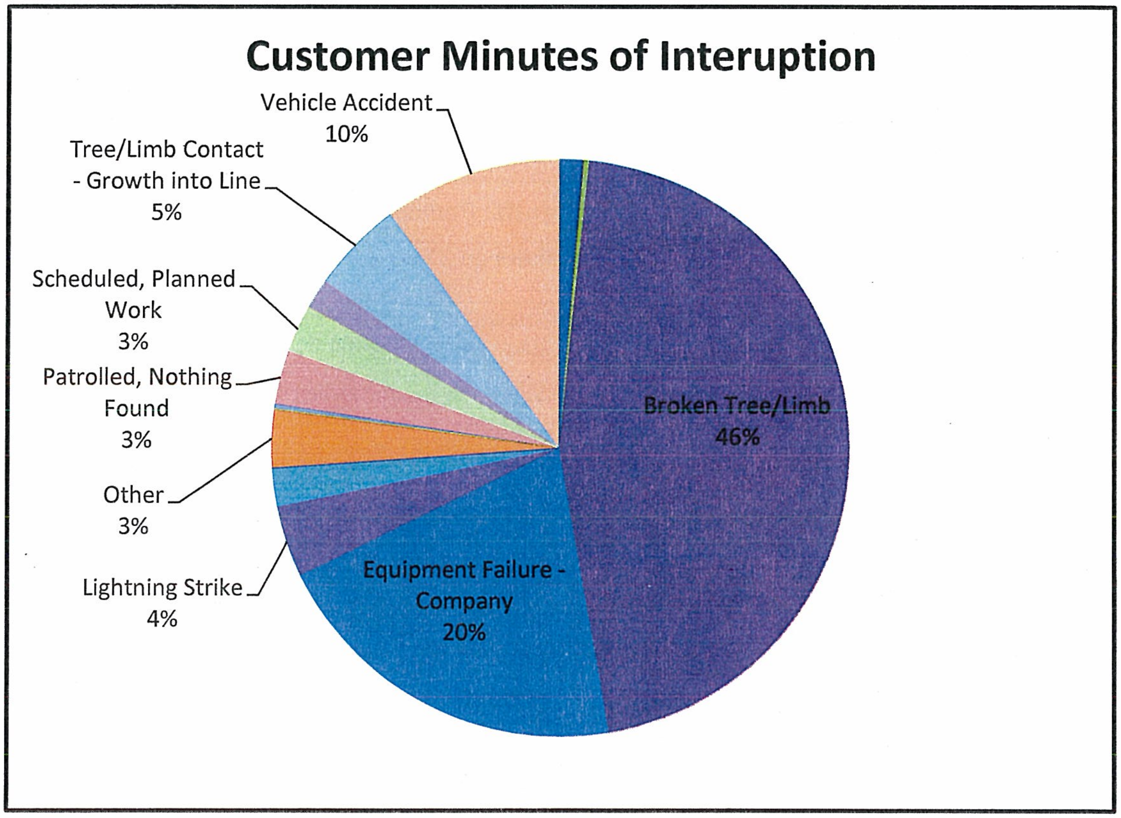
Individual circuits will be analyzed based upon circuit SAIDI, SAIFI, and CAIDI. Analysis of individual circuits along with analysis of the entire Seacoast system is used to identify future capital improvement projects and/or operational enhancements which may be required in order to achieve and maintain these goals.

3 Outages by Cause

The following chart provides a breakdown of outages by cause and the corresponding percentage of customer-minutes of interruption from January 1, 2011 to December 31, 2011.

Chart 1
Percent of Customer-Minutes of Interruption by Cause



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4 10 Worst Distribution Outages

The ten worst distribution outages ranked by customer-minutes of interruption during the time period from January 1, 2011 through December 31, 2011 are summarized in Table 1 below.

Table 1
Worst Ten Distribution Outages

Trouble Location	Description (Date/Cause)	No. of Customers Affected	No. of Customer Minutes	UES Seacoast SAIDI (min.)	UES Seacoast SAIFI
7X2	6/16/11 Vehicle Accident	1,720	269,384	5.96	0.038
54X1	10/27/11 Broken Tree / Limb	1,403	252,540	5.59	0.031
22X1	2/18/11 Broken Tree / Limb	2,008	228,912	5.06	0.044
43X1	7/7/11 Vehicle Accident	1,035	224,255	4.96	0.023
7W1	1/26/11 Equipment Failure-Company (Guy / Anchor)	1,223	220,140	4.87	0.027
54X1	9/24/11 Tree/Limb Contact - Growth into Line	1,406	208,088	4.60	0.031
18X1	4/9/11 Equipment Failure-Company (Insulator)	2,611	180,159	3.99	0.058
22X1	1/27/11 Vehicle Accident	1,225	158,185	3.50	0.027
22X1	4/13/11 Equipment Failure-Company (Insulator)	2,007	148,455	3.28	0.076
19X3	6/23/11 Equipment Failure-Company (Insulator)	875	128,280	2.84	0.019

Note: This table does not include substation, sub-transmission or scheduled planned work outages.

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5 Sub-transmission and Substation Outages

This section describes the contribution of sub-transmission line and substation outages on the UES-Seacoast system from January 1, 2011 through December 31, 2011.

All substation and subtransmission outages ranked by customer-minutes of interruption during the time period from January 1, 2011 through December 31, 2011 are summarized in Table 2 below.

Table 3 shows the circuits that have been affected by sub-transmission line and substation outages. The table illustrates the contribution of customer minutes of interruption for each circuit affected.

In aggregate, sub-transmission line and substation outages accounted for 29% of the total customer-minutes of interruption for UES-Seacoast, excluding Hurricane Irene and the October Nor'easter.

Table 2
Sub-transmission and Substation Outages

Trouble Location	Description (Date/Cause)	No. of Customers Affected	No. of Customer Minutes	UES Seacoast SAIDI (min.)	UES Seacoast SAIFI
3346 Line	10/13/11 Broken Tree / Limb	5,830	1,398,900	30.94	0.129
Timberlane S/S	5/16/11 Equipment Failure-Company (Insulator)	2,532	644,822	14.26	0.056
3354 Line	2/25/11 Equipment Failure-Company (Insulator)	3,122	189,040	5.96	0.038
3347 Line	6/30/11 Power Supply Interruption / Disturbance	3,015	96,480	2.13	0.067

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Table 3
Contribution of Sub-transmission and Substation Outages

Circuit	Transmission Line Outage	Customer-Minutes of Interruption	% of Total Circuit Minutes	Circuit SAIDI Contribution	Number of events
47X1	Line 3347	46,240	23.62%	32.21	1
11X2	Line 3347	31,264	43.97%	31.92	1
11W1	Line 3347	18,976	14.15%	32.10	1
17W1	Line 3346	661,044	97.47%	371.56	1
17W2	Line 3346	226,920	86.95%	373.38	1
46X1	Line 3346	410,316	99.95%	378.20	1
2X2	Line 3346	33,884	69.79%	18.90	1
3W4	Line 3346	66,736	59.33%	43.32	1
54X1	Line 3354	84.120	10.74%	59.91	1
6W1	Line 3354	104.920	45.96%	60.90	1
13W1	Timberlane S/S	104,275	35.02%	96.48	1
13W2	Timberlane S/S	540,547	52.96%	396.96	1

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6 Worst Performing Circuits

This section compares the reliability of the worst performing circuits using various performance measures.

6.1 Worst Performing Circuits in Past Year (1/1/11 – 12/31/11)

A summary of the worst performing circuits during the time period between January 1, 2011 and December 31, 2011 is included in the tables below.

Table 4 shows the ten worst circuits ranked by the total number of Customer-Minutes of interruption. The SAIFI and CAIDI for each circuit are also listed in this table.

Table 5 provides detail on the major causes of the outages on each of these circuits. Customer-minutes of interruption are given for the six most prevalent causes.

Circuits having one outage contributing more than 75% of the customer-minutes of interruption were excluded from this analysis.

Table 4
Worst Performing Circuits Ranked by Customer-Minutes

Circuit	No. of Customers Interruptions	Worst Event (% of Total Cust. Int.)	Customer-Minutes of Interruption	Worst Event (% of Total Minutes)	Circuit SAIDI	Circuit SAIFI	Circuit CAIDI
13W2	6,620	22%	1,020,734	53%	698.61	4.53	154.19
22X1	9,949	20%	822,506	28%	407.92	4.93	82.67
54X1	7,372	19%	783,332	32%	557.90	5.25	106.26
19X3	4,877	18%	501,316	26%	152.894	1.49	102.79
18X1	4,638	56%	387,204	47%	161.74	1.94	83.49
21W2	2,631	35%	326,939	31%	239.71	1.93	124.26
13W1	3,034	36%	297,720	36%	275.45	2.81	98.13
6W1	3,043	57%	228,280	46%	132.50	1.77	75.02
51X1	1,884	30%	197,367	28%	106.12	1.01	104.76
47X1	2,859	51%	195,806	24%	136.41	1.99	68.49

Circuits 19X3 and 22X1 are scheduled for hazard tree mitigation and circuit 13W1 is scheduled for mid-cycle review in 2012. Additionally, circuits 13W2, 21W2 and 58X1 are being trimmed as part of a storm resiliency pilot (ground to sky and hazard tree removal) in 2012. Reliability projects completed in

2012 include the installation of reclosers on circuit 13W2 and sectionalizers on circuit 19X3.

Table 5
Circuit Interruption Analysis by Cause

Circuit	Customer – Minutes of Interruption					
	Broken Tree Limb	Animal	Lightning Strike	Vehicle Accident	Company Equipment Failure	Tree Growth into Line
13W2	428,517	1,940	27,999	1,600	542,080	4,535
22X1	356,429	198	38,090	240,186	149,310	809
54X1	368,070	85,467	6,504	0	89,264	228,555
19X3[3]	38,929	6,028	28,781	390	179,162	8,501
18X1[4]	40,210	1,575	4,700	0	191,716	1,683
21W2	195,053	4,194	6,716	10,310	22,921	6,940
13W1	132,845	315	0	291	104,275	29,820
6W1	24,123	13,286	32,137	920	112,765	24,763
51X1	147,944	28,960	1,119	0	519	8,450
47X1	54,137	910	79,533	0	11,113	0
Total	**2,231,899**	**106,297**	**112,790**	**542,017**	**1,281,877**	**280,963**

[3] Loose/failed connection accounted for 126,795 customer-minutes of interruption on circuit 19X3.
[4] Scheduled planned work accounted for 141,755 customer-minutes of interruption on circuit 18X1.

6.2 Worst Performing Circuits of the Past Five Years (2007 – 2011)

The annual performance of the ten worst circuits for the past five years have been ranked in the tables below. Table 6 lists the ten worst circuits ranked by SAIDI performance. Table 7 lists the ten worst performing circuits ranked by SAIFI.

Outages accounting for more than 75% of the customer-interruptions, sub-transmission line outages and substation outages were included when calculating the indices below.

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Table 6
Circuit SAIDI

Circuit Ranking (1 = worst)	2011		2010		2009		2008		2007	
	Circuit	SAIDI	Circuit	SAIDI	Circuit	SAIDI	Circuit	SAIDI	Circuit	SAIDI
1	13W2	698.61	51X1	582.06	15X1	526.90	6W1	1033.5	21W1	1082.1
2	54X1	557.90	3H2	575.51	22X1	526.47	21W1	580.27	13W2	1031.4
3	17W2	429.40	22X1	518.07	5H2	444.34	5H2	442.97	27X1	974.02
4	22X1	407.92	59X1	509.53	56X2	430.31	51X1	438.66	22X1	697.94
5	17W1	381.20	15X1	387.88	13W2	414.30	20H1	360.47	13W1	613.90
6	46X1	372.37	23X1	378.56	13W1	365.14	21W2	350.88	11W1	592.79
7	13W1	275.45	17W2	361.53	23X1	339.98	7X2	347.68	18X1	521.24
8	21W2	239.71	58X1	308.72	18X1	323.54	56X2	323.79	47X1	517.21
9	11W1	226.92	46X1	306.30	3H1	260.91	58X1	308.38	6W1	480.12
10	7X2	213.44	21W1	291.33	21W2	260.71	23X1	284.28	7W1	465.33

Circuit 22X1 is the only circuit that has been on the worst performing SAIDI circuits list for four of the last five years and circuits 13W1, 13W2, 21W1, 21W2 and 23X1 have been on the list for three of the past five years. Circuit 17W2 and 46X1 have been on the worst performing SAIDI circuits list the past two years, primarily due to subtransmission line outages.

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Table 7
Circuit SAIFI

Circuit Ranking (1 = worst)	2011		2010		2009		2008		2007	
	Circuit	SAIFI	Circuit	SAIFI	Circuit	SAIFI	Circuit	SAIFI	Circuit	SAIFI
1	54X1	5.25	51X1	6.65	22X1	6.10	21W1	5.35	27X1	9.573
2	22X1	4.93	3H2	6.01	18X1	5.23	51X1	4.41	13W2	9.565
3	13W2	4.53	22X1	5.21	5H2	5.06	6W1	2.83	21W1	8.570
4	13W1	2.81	15X1	4.38	15X1	4.96	20H1	2.46	22X1	7.889
5	7X2	2.48	23X1	3.77	13W2	4.70	56X2	2.33	18X1	5.156
6	11W1	2.42	59X1	3.43	56X2	4.52	21W2	2.33	13W1	4.673
7	47X1	1.99	11W1	3.29	3H1	4.06	23X1	2.31	47X1	4.639
8	18X1	1.94	13W2	3.21	13W1	3.91	7X2	2.17	11W1	4.615
9	21W2	1.93	28X1	3.07	21W2	3.91	59X1	2.14	6W1	4.235
10	6W1	1.77	20H1	3.01	21W1	3.89	5H2	1.94	43X1	4.057

Circuit 22X1 and circuit 13W2 have been on the worst performing SAIFI circuits list for four of the last five years and circuits 11W1, 18X1, 21W1 and have been on the list for three of the past five years.

Circuit 6W1 has also been on the worst performing SAIFI worst performer circuit list three of the past five years. This circuit was split into two distribution circuits, circuit 6W1 and circuit 6W2, in September of 2011.

7 Tree Related Outages in Past Year (1/1/11 – 12/31/11)

This section summarizes the worst performing circuits by tree related outage during the time period between January 1, 2011 and December 31, 2011.

Table 8 shows these circuits ranked by the total number of Customer-Minutes of interruption. The number of customer-interruptions and number of outages are also listed in this table. Circuits having two or less tree related outages were excluded from this table.

All streets on the Seacoast system with two or more tree related outage are shown in table 9 below. The table is sorted by number of outages and customer-minutes of interruption.

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Table 8
Worst Performing Circuits – Tree Related Outages

Circuit	Customer-Minutes of Interruption	Number of Customers Interrupted	No. of Interruptions
54X1	487,191.00	3,137.00	13
13W2	433,052.00	4,753.00	18
22X1	357,238.00	3,129.00	15
21W2	201,993.00	1,731.00	13
13W1	162,665.00	1,555.00	11
51X1	156,394.00	1,447.00	21
58X1	137,990.00	1,311.00	16
23X1	110,197.00	1,460.00	15
56X1	83,261.00	623.00	11
19X3	47,342.00	563.00	22

Circuits 54X1 and 56X1 are scheduled for cycle pruning in 2012.

Circuits 19X3 and 22X1 are scheduled for hazard tree mitigation and circuit 13W1 is scheduled for mid-cycle review in 2012. Additionally, circuits 13W2, 21W2 and 58X1 are being trimmed as part of a storm resiliency pilot (ground to sky and hazard tree removal) in 2012.

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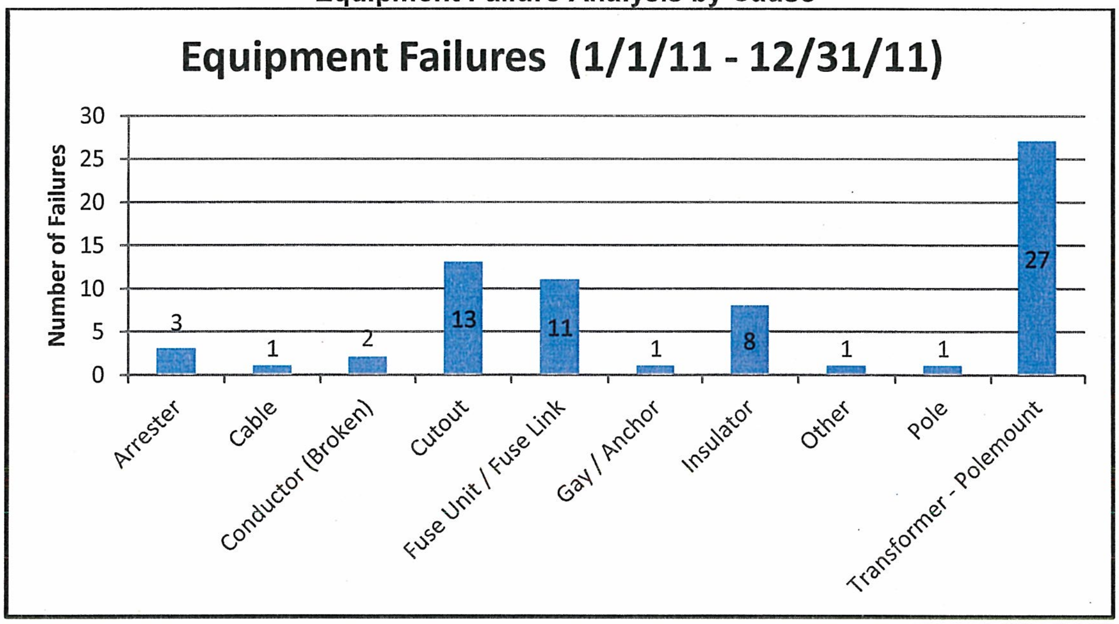
Table 9
Tree Related Outages by Street

Circuit	Street	# Outages	Customer-Minutes of Interruption	No. of Customer Interruptions
21W2	Main St	5	187251	1650
51X1	Winnicut Rd	5	60957	576
56X1	Hunt Rd	5	28534	354
13W2	Whittier St	4	114195	783
13W1	North Main St	4	38047	313
22X1	Main St	3	86504	674
58X1	Forest St	3	32854	326
58X1	Sawyer Ave	3	19856	127
19X3	Brentwood Rd	3	1175	4
13W1	Main St	2	111455	1130
13W2	Main St	2	70842	650
51X1	Portsmouth Ave	2	65577	639
23X1	Wild Pasture Rd	2	41140	88
13W2	Thornell Rd	2	30277	151
43X1	Exeter Rd	2	25842	217
58X1	Main St	2	17046	191
23X1	South Rd / Rt 107	2	13131	111
23X1	Highland St / Old Rt 150	2	12819	72
13W2	Smith's Corner Rd	2	11405	115
58X1	Harriman Rd	2	11350	92
22X1	Sandown Rd	2	11240	43
59X1	Crank Rd	2	9527	139
19X3	Beech Hill Rd	2	9312	112
23X1	Woodman Rd	2	8342	66
43X1	Heritage Way	2	8177	74
19H1	Drinkwater Rd	2	7982	41
2X2	Dearborn Ave	2	6200	124
51X1	Union Rd	2	5655	35
19X3	Newfields Rd	2	4574	21
6W1	Stumpfield Rd	2	3198	35
51X1	Squamscott Rd	2	1905	32
51X1	Birnum Woods Rd	2	1421	28
11W1	Doe Run Ln	2	766	12
51X1	Spring Creek Ln	2	622	4
23X1	Pevear Ln	2	534	4
28X1	Exeter Rd	2	460	2
54X1	New Boston Rd	2	324	4
19X3	Lary Ln	2	238	4
43X1	Willow Rd	2	229	2
21W2	Bittersweet Ln	2	114	2

8 Failed Equipment

This section is intended to clearly show all equipment failures throughout the study period from January 1, 2011 through December 31, 2011. Chart 2 shows all equipment failures throughout the study period. Chart 3 shows each equipment failure as a percentage of the total failures within this same study period. The number of equipment failures in each of the top three categories of failed equipment for the past five years are shown below in Chart 4.

Chart 2
Equipment Failure Analysis by Cause



UES – Seacoast 2012 Reliability Study

Reliability Analysis and Recommendations

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Chart 3

Equipment Failure Analysis by Percentage of Total Failures

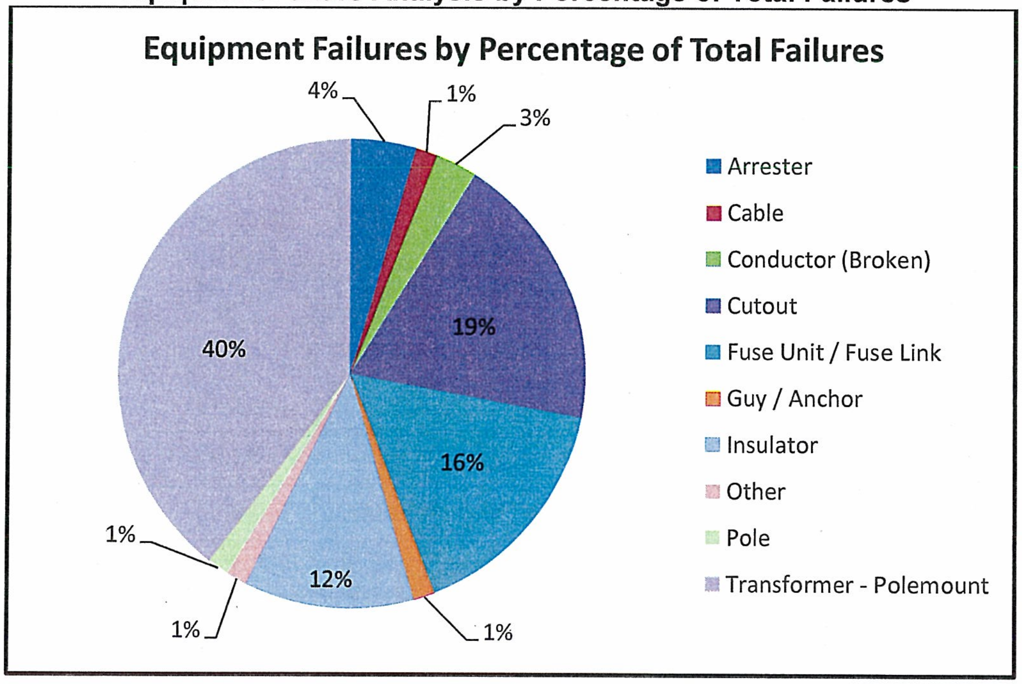
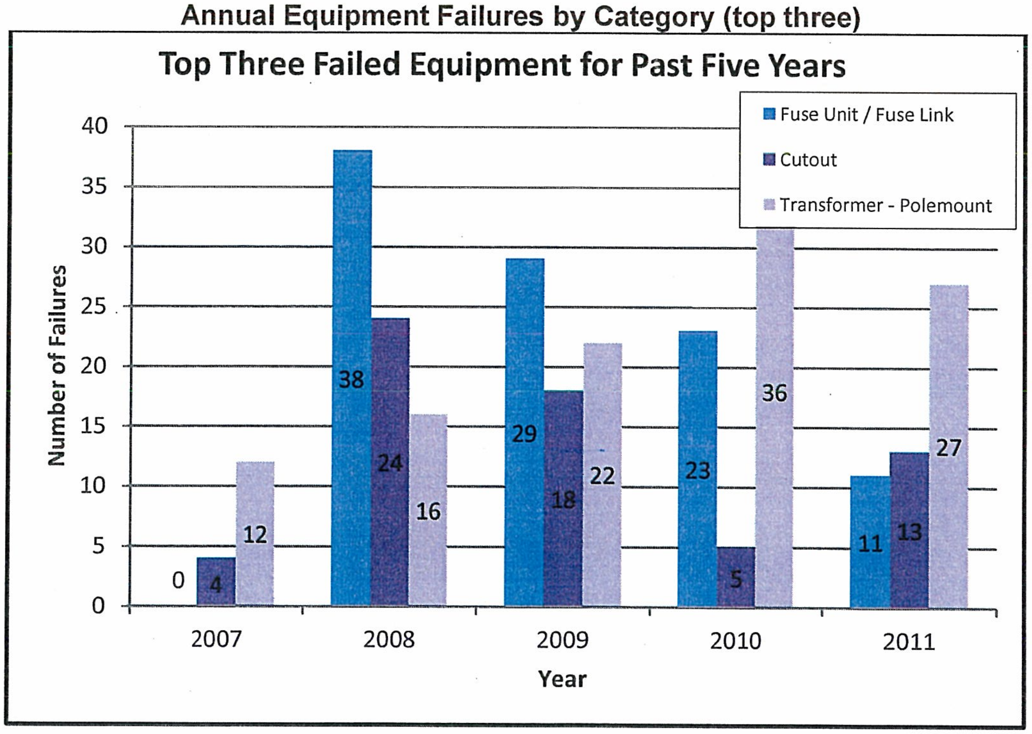


Chart 4

Annual Equipment Failures by Category (top three)



9 Multiple Device Operations in Past Year (1/1/11 – 12/31/11)

A summary of the devices that have operated three or more times from January 1, 2011 to December 31, 2011 is included in table 10 below.

Table 10
Multiple Device Operations

Circuit	Number of Operations	Device	Customer-Minutes	Customer-Interruptions
22X1	4	Fuse Pole 9 Kingston Road	286,937	3,109
6W1	4	Fuse Pole 48 Depot Road	272	4
6W1	4	Fuse Pole 94 Main Street	4,042	36
21W2	3	Recloser Pole 107 Main Street	187,011	1,648
15X1	3	Fuse Pole 74 Lafayette Road	8,556	90
3H1	3	Fuse Pole 8 Kentville Terrace	7,774	78

10 Other Concerns

This section is intended to identify other reliability concerns that would not be identified from the analyses above.

10.1 Recloser Replacements

Through power factor testing it appears that the solid dielectric material used for the poles on a specific type/vintage recloser degrades over time leading to premature failure. The manufacturer has confirmed this concern. Unitil has experienced two (UES-Seacoast and FG&E) failures of type/vintage of recloser in 2011 and removed a third from service due to the appearance of tracking.

There are currently five of these reclosers in service in UES-Seacoast, two at Wolf Hill tap, two at the 3347 line tap and one at Stard Road tap.

10.2 Subtransmission Lines Across Salt Marsh

The 3348 line has been damaged several times during major events over the last four years, causing outages to the customers on all the distribution circuits supplied by the 3348, 3350 and 3353 lines. The 3348 line is constructed through salt marsh, making it very difficult to access and repair.

The 3350 line and portions of the 3342 and 3353 lines are also constructed through salt marsh. These lines have the same access concerns, but have been far more reliable than the 3348 line in the past. The 3350 line is radial line that supplies Seabrook substation, if damaged load may need to be left out of service until repairs are made.

10.3 3347 Line

The 3347 line has been damaged by trees during major events over the past four years, causing outages to customers at Guinea Road Tap and Portsmouth Ave substation until load is restored.

10.4 Hampton Beach Substation

The existing 4 kV equipment, structures and control cabinets at Hampton Beach substation are experiencing significant rusting and the foundations are cracked and crumbling. In 2009 the 3T2 transformer was removed from service and scrapped due to rusting. Additionally, a majority of the 4 kV insulators are of the brown porcelain variety that are historically prone to failure and the existing switch braids are in need of replacement.

10.5 Plaistow Substation 4 kV Foundation

The existing 5T1 transformer and switchgear foundation at Plaistow substation is in varying stages of failure. A 2005 evaluation by SW&C suggests the cause of the deterioration appears to be a chemical breakdown between the aggregate and the cement which cannot be halted by repairs or reinforcement.

The foundation failure is making it more difficult each year to rack out the breakers for maintenance, creating a concern that the breaker may no longer be able to be maintained in the future.

The breaker arc chutes are reaching the end of their useful lives and replacement units are becoming ever more difficult to purchase.

11 Recommendations

This following section describes recommendations on circuits, sub-transmission lines and substations to improve overall system reliability. The recommendations listed below will be compared to the other proposed reliability projects on a system-wide basis. A cost benefit analysis will determine the priority ranking of projects for the 2013 capital budget. All project costs are shown without general construction overheads.

11.1 Circuit 22X1 – Relocate Main Line to Route 111

11.1.1 Identified Concerns

Circuit 22X1 has been one of UES-Seacoast's worst performing circuits (top 5) four of the last five years. The fuses at pole 9

Kingston Road, feeding Route 111A have operated four times over the same period, two of which were potentially temporary in nature.

Additionally, the existing main line along Kingston Road and Pleasant Street typically sustains significant damage during major storms, requiring significant repairs to energize the mainline of 22X1.

11.1.2 Recommendation

This project will consist of building approximately 2.25 miles of new three-phase open wire construction along Route 111 from Mill Road to Danville Tie. Route 111 is a major state road-way with very little tree exposure.

Additionally, 2,500' of Route 111A will be rebuilt to three-phase construction and a new recloser will be installed along Route 111A to prevent sustained outages for potentially momentary faults.

Once complete, the new main line of 22X1 will run along Route 111 and Route 111A and Kingston/Danville Road will become protected laterals off the new mainline.

This project is expected to save approximately 1,900 customer interruptions per event for faults on Danville Road and Pleasant Street. This will also reduce damage to the mainline of 22X1 during major events.

- Estimated annual customer-minutes savings = 388,867
- Estimated annual customer-interruption savings = 4,051

Estimated Project Cost: $600,000

11.2 Hampton S/S – Install Breakers on the 3342, 3353 and 3348 Lines

11.2.1 Identified Concerns

In the present configuration, the Guinea 3353 breaker will operate for faults on the 3353 line from Hampton to Hampton Beach, the 3348 line, the 3350 line and a portion of the 3359 line causing interruptions to circuits 2H1, 2X3, 3H1, 3H2, 3H3, 7W1, 7X2 and a portion of the 3359 line, totaling approximately 5,300 customers.

For faults on the 3342 line from Hampton to Hampton Beach and the 3346 line, the Guinea 3342 breaker will operate causing interruptions to circuits 2X2, 46X1, 17W1, 17W2 and 3W4 totaling approximately 7,600 customers.

Historically, there has been at least one (1) permanent fault on one of the lines described above each year over the past five years and several momentary interruptions that could be from temporary faults on the same lines.

11.2.2 Recommendation

This project will consist of installing 1200 amp (minimum) breakers on the 3342 and 3353 lines and an 800 amp (minimum) breaker on the 3348 line at Hampton. SCADA communications and control will be installed for the new breakers.

The addition of these breakers will remove approximately 10 pole-miles of fault exposure from the 3342 and 3353 lines. This will save approximately 2,300 customer interruptions for faults on the 3348 line and a portion of the 3359 line, 4,000 customer interruptions for faults on the 3353 line from Hampton to Hampton and 2,500 customer interruptions for faults on the 3346 line and the 3342 from Hampton to Hampton Beach.

- Estimated annual customer-minutes savings = 262,957
- Estimated annual customer-interruption savings = 2,739

Estimated Project Cost: $365,000

11.3 3348/3359 Line – Distribution Automation Scheme

11.3.1 Identified Concerns

The 50J59 and 48J50 switches are located on Seabrook Station property requiring crews to pass through a security check-point to performing system switching, which adds significant time to the restoration of Seabrook substation for faults on the 3348.

11.3.2 Recommendation

This project will consist of installing two reclosers at the Seabrook Station Marsh tap, replacing the 50J59 and the 48J50 switches. The new reclosers will communicate with Hampton substation via radio.

With the addition of the new reclosers the normally open point on the 3348/59 line would be moved the 50J59 recloser. An automation scheme would be implemented to automatically restore Seabrook substation for loss of the 3348 line.

The intent is to select a scheme that is expandable to include Cemetery Lane substation, Stard Road tap and Mill Lane tap in the future.

The addition of the new reclosers and the automation scheme will allow for the automatic restoration of Seabrook substation load (approximately 3,000 customers) for the loss of the 3348 line. Additionally, the new reclosers will be set to operate for faults on the 3350 line.

- Estimated annual customer-minutes savings = 116,452
- Estimated annual customer-interruption savings = 1,213

Estimated Project Cost: $295,000

11.4 3359 Line – Wireless Fault Indicators

11.4.1 Identified Concerns

Due to the nature of the 3359 and 3348 lines, the 3359 line must be patrolled prior to performing restoration switching.

The 3359 has experience three outages since the beginning of 2010 totaling 952,013 customer-minutes of interruption and the 3359 typically sustains damage during major storm events.

11.4.2 Recommendation

This project will consist of installing six wireless fault indicators, two each at Cemetery Lane substation, Stard Road Tap and Mill Lane Tap. The indicators will be integrated into the existing RTU's at these locations to provide status via SCADA.

Prior to installation it will need to be confirmed that SCADA and communications will be able to provide status after the loss of station service.

The addition of the fault indicators will provide immediate indication of the fault location to allow crews to be dispatched to the appropriate locations for patrolling and/or restoration switching. This is expected to save approximately 275,000 customer-minutes of interruption per event for faults on the 3359 line

- Estimated annual customer-minutes savings = 167,3912
- Estimated annual customer-interruption savings = 0

Estimated Project Cost: $75,000

11.5 3348 and 3350 Line – Rebuild off the Salt Marsh

11.5.1 Identified Concerns

The 3348 line and 3350 line are constructed entirely through the salt marsh in Hampton, Hampton Falls and Seabrook, which makes them difficult to patrol and repair.

The 3350 line is a radial line to Seabrook substation. Load will remain out of service for faults on the 3350 line until the line is repaired.

These lines are concerns during all major wind events. During the 2010 wind storm several structures on the 3348 line were damaged causing the line to be out of service for several months. The line was also damaged in March of 2012 due to a failed insulator which required the line to remain out of service for a few weeks.

11.5.2 Recommendation

This project will consist of building a new 34.5 kV subtransmission line from Hampton substation to Seabrook substation. Once complete the 3348 and 3350 line will be removed from the marsh. There are several possible routes for the new line, including Route 1, the 3359 line right-of-way or along the railroad right-of-way from Hampton to Seabrook.

This project would most likely need to be a multi-year project to allow sufficient time for design and construction.

This project removes approximately 4.5 miles and 3,000 customers of exposure from lines on the salt marsh.

- Estimated annual customer-minutes savings = 112,696
- Estimated annual customer-interruption savings = 1,174

Estimated Project Cost: $3,000,000

11.6 Portsmouth Ave Substation – Install Reclosers

11.6.1 Identified Concerns

When circuit 11W1 was converted to 34.5 kV, circuit 11X2 more than doubled in size. In the new configuration faults along the Exeter portion of Portsmouth Ave will affect 11W1 customers and faults on Portsmouth Ave in Stratham will affect 11X2 customers.

This added load on the 11X2 recloser prevents 11X2 from backing up circuit 19X2 under peak conditions.

Additionally, Portsmouth Ave is supplied from the 3347 line, which is a radial line that typically experiences damage during major events.

11.6.2 Recommendation

This project will consist of installing two new reclosers at Portsmouth Ave. substation. One recloser will supply 11X1 (11W1) load and the other will supply 11X2 load. The new reclosers will be installed in locations to allow regulators to be installed on 11X1 at Portsmouth Ave substation in the future.

The recloser settings for circuit 19X2 will be modified to allow circuit 19X2 to supply circuit 11X2 and 11X1. This will require the 11X1 and 11X2 reclosers to have alternate settings while in this configuration.

Once complete circuit 11X1 will supply approximately 600 customers with 1.25 miles of main line exposure and 11X2 will supply approximately 1,000 customers with 1.25 miles of customer exposure opposed to one circuit supplying 1,600 customers with 2.5 miles of main line exposure. For loss of the 3347 line this will save roughly 200,000 customer-minutes of interruption to the customers served from Portsmouth Ave substation.

- Estimated annual customer-minutes savings = 210,481
- Estimated annual customer-interruption savings = 2,193

Estimated Project Cost: $160,000

11.7 Recloser Replacements

11.7.1 Identified Concerns

Unitil has experienced premature failures of a specific type/vintage of reclosers due to insulation breakdown of the poles.

11.7.2 Recommendation

This project will consist of replacing the remaining of these reclosers on the UES-Seacoast system. The existing relays will be re-used.

- Two (2) at Wolf Hill Tap
- Two (2) at 3347 Line Tap
- One (1) at Stard Road Tap

Below is a summary of the reliability benefit for this project:

Recloser	Customers of Exposure
03341	15,250[5]
3352	18,000[5]
3347A	5,350
3347B	7,900
59X1	3,050

[5] Assumes summer normal configuration at peak load conditions.

- Estimated annual customer-minutes savings = 120,000
- Estimated annual customer-interruption savings = 1,250

Estimated Project Cost: $90,000 (assumes special pricing from the manufacturer)

11.8 Circuit 6W1 and 6W2 – Install Animal Guards Pole 48 Depot Road and Pole 94 Main Street Laterals

11.8.1 Identified Concerns

The laterals supplied from pole 94 Main Street and pole 48 Depot Road, Kingston have each experienced four animal contact outages during 2011.

11.8.2 Recommendation

Install cone-type animal guards on all transformers (approximately 6) on the laterals supplied by pole 94 Main Street and pole 48 Depot Road, Kingston.

Once complete this mitigates animal contacts on these two laterals (approximately 15 customers).

- Estimated annual customer-minutes savings = 4,314
- Estimated annual customer-interruption savings = 40

Estimated Project Cost: Minimal

11.9 Plaistow S/S – Rebuild and Transfer Portion of 13W2 to 5W2

11.9.1 Identified Concerns

Circuit 13W2 was the worst performing circuit in 2011 and has been on UES-Seacoast's worst performing circuits three of the last five years. One substation outage at Timberlane substation resulted in approximately 540,000 customer-minutes of interruption during 2011.

The Plaistow power transformer and switchgear foundation is degrading and beyond repair causing switchgear maintenance concerns. Additionally the breaker arc chutes are reaching the end of their useful lives.

11.9.2 Recommendation

This project will consist of rebuilding Plaistow substation and converting circuits 5H1 and 5H2 to 13.8 kV operation. A portion of Smith Corner Road will be rebuilt three-phase and approximately 650 customers from circuit 13W2 will be transferred to circuit 5W2, saving interruptions to those customers for faults at Timberlane substation and along the main line of circuit 13W2.

This will also create a circuit tie between circuits 13W2 and 5W2 that will allow circuit 13W2 to be transferred to circuit 5W2 for faults at Timberlane substation and along Crane's Crossing Road, which will save approximately 90 minutes of interruption to approximately 650 customers on circuit 13W2.

Reference the UES-Seacoast 2013-2017 Distribution Planning Study for additional justification and associated costs.

11.10 Hampton Beach S/S – Add 15 kV Circuit Positions and Remove 4 kV

11.10.1 Identified Concerns

The 4 kV portion of Hampton Beach substation has several condition concerns, including the following:

- Rusting of 3T1 transformer
- Significant wear on the braids of all 4 kV switches
- Brown porcelain insulators that are prone to failure
- Significant rusting of control cabinets and structures
- Degradation of concrete foundations

11.10.2 Recommendation

This project will consist of populating the 3W5 circuit position, upgrading the existing 3W4 circuit position and installing two new 15 kV circuit positions.

Construction will include the installation of a new dual ratio power transformer and new circuit regulators and reclosers on all circuit positions.

Circuit 3H2 will be converted to 13.8 kV to accommodate this project. Circuits 3H1 and 3H3 will continue to operate at 4 kV.

Once complete this will eliminate condition concerns associated with 4 kV portion of Hampton Beach substation, which serves roughly 1,400 customers.

Estimated Project Cost: $1,400,000

12 Conclusion

The UES-Seacoast system has experienced a large number of outages caused by tree contact as well as outages affecting a large number of customers. A more aggressive tree trimming program began in 2011 and should start to reduce the number of tree related outages experienced in the future. In 2012 three circuits on the UES-Seacoast will benefit from a storm resiliency pilot, which will consist of ground to sky trimming and hazard tree removal.

The recommendations made for capital improvement projects within this report are aimed at reducing the duration and customer impact of outages, improving the reliability of the subtransmission system and mitigating damage to distribution mainlines and subtransmission lines during major events.

Attachment 4

REP Project Listing

2012 Actual Expenditures

REP Project Spending 2011
All projects closed to Plant In Service

Attachment 4

Budget Number	Auth #	Description	Budget	Installation Costs	Cost of Removal	Salvage	Total Project Spending
System Hardening Reliability							
DPBE01	C-2211	Condemned Poles	$411,100	$375,138	$24,189	($136)	$399,192
DPBE01	E-2110	Condemned Poles	$519,000	$505,117	$65,261	($1,388)	$568,990
		Subtotal	$930,100	$880,255	$89,450	($1,524)	$968,181
Asset Replacement							
SPCC03	C-8073	Replace 1H3 Breaker	$53,310	$41,611	$0	$0	$41,611
SPOC04	C-1028	Replace 13X4 Recloser	$68,400	$33,202	$0	$0	$33,202
DROE04	E-0259	Replace 7X2 Recloser	$100,000	$80,713	$9,133	$0	$89,846
SPOE06	E-1086	Replace 13X3 Recloser	$70,000	$45,767	$5,085	$0	$50,853
DRBE08	E-2145	Circuit 19X3 - Install Sectionalizers	$21,200	$17,986	$2,237	$0	$20,223
DRBE09	E-2146	Circuit 3H2/3H3 - Increase Phase Spacing	$31,700	$31,319	$5,217	$0	$36,536
DRBE00	C-2267	Circuits 13W2 and 13W3 Rebuild Substation Getaway	$603,000	$379,808	$208	($144)	$379,872
DRBE12	E-2154	Circuit 13W2 Install Reclosers Main St Newton	$36,321	$25,889	$8,176	$0	$34,065
DRBE13	E-2172	Install cutouts/fuses on Unprotected main line (circuits 1H4, 6W1, 6W2, 19H1, and 19X2)	$52,586	$39,422	$453	$0	$39,875
DRBC05	C-2264	Circuit 4X1/37 Line Automation	$247,189	$292,846	$7,265	($155)	$299,956
		Subtotal	$1,283,706	$988,562	$37,774	($299)	$1,026,038
		Totals	**$2,213,806**	**$1,868,818**	**$127,224**	**($1,823)**	**$1,994,219**
Carry Over to 2013							
SPOE01	E-1039	Exeter S/ Replace LTC Controls	$58,600	$42,898	$0	$0	$42,898
		Total Carryover Expenditures	**$58,600**	**$42,898**	**$0**	**$0**	**$42,898**