Unitil Energy Systems, Inc.

Major Storm Cost Reserve Fund Report

2019

Prepared By: Business Resiliency & Compliance and Accounting

February 28, 2020

Introduction

Unitil Energy Systems, Inc. ("UES" or the "Company") submits this annual Major Storm Cost Reserve ("MSCR") Fund Report for the 12 month period ending December 31, 2019. This filing complies with the New Hampshire Public Utilities Commission ("Commission") requirements set forth in the Company's Rate Plan Settlement Docket No. DE 10-055 and as ordered in the Commission's Order in DE 11-277 Order No. 25,351 *Order Granting Increase to Storm Recovery Adjustment Factor* ("SRAF") issued April 24, 2012 (requiring UES "to file annual reports on the Storm Reserve Fund and storm recovery updates for those storms where costs are recovered through the SRAF"). The rate levels resulting from the distribution revenue changes specified in Section 2 of the Settlement Agreement approved in docket DE 10-055 and revised in Docket No. DE 13-065 (Order No. 25,502 issued April 29, 2013) include $0.8 million annually for the MSCR, which will be used to recover costs associated with preparing for, responding to and recovering from, qualifying major storms. The MSCR Fund Balance at December 31, 2019 is in a deficit position of ($3,406,149).

Please refer to the *UES MSCR Fund Reconciliation as of December 31, 2019* on page 3 for a summary of the costs.

Please refer to the Storm Recovery Adjustment Factor Reconciliation which provides the reconciliation of the SRAF through December 31, 2019 on page 4. Beginning May 1, 2019, the SRAF decreased by $0.00096 per kWh due to the completion of the recovery of the costs of two extraordinary storms: the December 2008 ice storm and the February 2010 wind storm. In accordance with its tariff, Schedule SRAF, the costs associated with these extraordinary storms were to be recovered at a rate of $0.00096 per kWh over 8 years ending April 30, 2019. UES filed the final disposition of the balance for this cost piece on June 26, 2019. The net change to the SRAF effective May 1, 2019 was a decrease of $0.00049 per kWh, factoring in the addition of Winter Storm Quinn which occurred on March 7, 2018. Quinn has a recovery rate of $0.00047 per kWh over 3 years.

Section 8 of the Settlement Agreement approved by the Commission in DE 10-055 provides, in part, that:

> 8.1 The rate levels resulting from the distribution revenue changes specified in Section 2 include $800,000 annually for the Major Storm Cost Reserve, which will be used to recover costs associated with responding to and recovering from qualifying major storms. Qualifying major storms shall include severe weather events causing 16 concurrent troubles (interruption events occurring on either primary or secondary lines) and 15 percent of customers interrupted, or 22 concurrent troubles, in either the Capital or Seacoast regions of Unitil, as well as costs associated with planning and preparation activities in advance of severe weather if a qualifying major storm is likely occur.
>
> Planning and preparation activities will include pre-staging of crews, standby arrangements with external contractors, incremental compensation of employees, and other costs that may be incurred to prepare for a qualifying major storm. A qualifying major storm will be considered likely to occur if the Energy Event Index ("EEI") from the Company's professional weather forecaster reaches an EEI level of 3 or greater with a "high" (greater than 60 percent) level of confidence.
>
> 8.2 The parties recognize that certain weather events may result in extraordinary expenditures to prepare for, or recover from, storms or natural disasters that do not meet the defined criteria for a qualifying major storm. The Company may petition the Commission to recover the extraordinary costs of such events from the Major Storm Cost Reserve and has the burden to demonstrate the reasonableness of its expenditures.

Unitil Energy Systems, Inc.

Major Storm Cost Reserve Fund – Reconciliation
As of December 31, 2019

Section #	Date	Description	Surplus (Deficit)
	12/31/2018	**MSCR BALANCE (As Filed on 2/28/2019)**	**$ (4,992,050)**
	Adjustments to 2018 Report as Filed		
	3/14/2017[1]	Nor'easter Event – Calypso Adjustment	12,316
	3/31/2017[2]	Snow Event - Calypso Adjustment	5,567
	10/30/2017[3]	October Windstorm Calypso Adjustment	14,626
	3/7/2018[4]	Snow Event - Calypso Adjustment	25,990
	3/7/2018[5]	Snow Event – Re-Classed to SRAF	1,591,597
		Adjusted Opening Balance 1/1/2019	**$(3,341,954)**
	2019 Deferred Charges		
1.0	01/20/2019	Winter Storm Harper	(50,241)
2.0	02/25/2019	Winter Storm Liam	(162,242)
3.0	10/17/2019	Winter Storm Riley	(457,442)
	2019 Recovery		
	2019	**Current Annual Recovery Rate**	**800,000**
	2019	**Interest Rate**	**5.20%**
	2019 Carrying Charges		**(194,270)**
	12/31/2019	**MSCR BALANCE**	**$ $(3,406,149)**

[1] The Company's 2017 MSCR Report reported costs for the 3/14/2017 Nor'easter Event totaling $677,974. A reduction of $12,316 in costs were identified subsequent to that report, bringing the total costs to $665,658.
[2] The Company's 2017 MSCR Report reported costs for the 3/31/2017 Snow Event totaling $191,611 A reduction of $5,567 in costs were identified subsequent to that report, bringing the total costs to $186,044.
[3] The Company's 2018 MSCR Report reported updated costs for the 10/30/2017 Windstorm Event totaling $1,265,848. A reduction of $14,626 in costs was identified subsequent to that report, bringing the total costs to $1,251,222.
[4] The Final Audit Report on the Company's 2018 MSCR was filed on February 12, 2020 and included the Company's agreement to Audit Issue #1, which removed $25,990 of communication service costs.
[5] Per order No. 26,236 the Company moved $1,591,597 in costs related to the 3/7/2018 Winter Storm Event (costs reported in the 2018 MSCR Report, plus associated carrying charges, less NHPUC Staff Audit Issue amount) to the SRAF

Unitil Energy Systems, Inc.

Storm Recovery Adjustment Factor Reconciliation

	(a) Beginning Balance	(b) Total Costs	(c) Total Revenue	(d) Ending Balance Before Interest (a + b - c)	(e) Average Monthly Balance ((a+d) / 2)	(f) Interest Rate	(g) Computed Interest	(h) Ending Balance with Interest (d + g)
Jan-19	$1,246,437[1]	$0	$141,120	$1,105,317	$1,175,877	5.20%	$5,193	$1,110,510
Feb-19	$1,110,511	$0	$134,961	$975,550	$1,043,030	5.20%	$4,161	$979,710
Mar-19	$979,710	$0	$128,202	$851,508	$915,610	5.20%	$4,044	$855,552
Apr-19	$855,552	$0	$120,613	$734,939	$795,245	5.20%	$3,399	$738,338
May-19	$738,338	$1,591,597[2]	$91,503	$2,238,432	$1,488,385	5.20%	$6,573	$2,245,005
Jun-19	$2,245,005	$0	$71,418	$2,173,587	$2,209,296	5.20%	$9,443	$2,183,030
Jul-19	$2,183,030	$0	$96,039	$2,086,991	$2,135,010	5.20%	$9,429	$2,096,420
Aug-19	$2,096,420	$0	$99,638	$1,996,782	$2,046,601	5.20%	$9,038	$2,005,820
Sep-19	$2,005,820	$0	$76,445	$1,929,375	$1,967,598	5.20%	$8,410	$1,937,785
Oct-19	$1,937,785	$0	$77,927	$1,859,858	$1,898,821	5.20%	$8,386	$1,868,244
Nov-19	$1,868,244	$0	$70,467	$1,797,777	$1,833,010	5.20%	$7,834	$1,805,611
Dec-19	$1,805,611	$0	$81,040	$1,724,571	$1,765,091	5.20%	$7,795	$1,732,366

(1) As filed in Unitil Energy Systems, Inc.'s Major Storm Cost Reserve Fund Report, February 27, 2019.

(2) Pursuant to Order No. 26,236 in DE 19-043, the costs associated with the March 2018 Winter Storm Quinn plus carrying charges less the accepted NHPUC Staff Audit Issue amount, have been moved to the SRAF for recovery.

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Attachments

1. January 20th, 2019 (Winter Storm Harper)

1.1. Description of the Storm

Figure 1 – Winter Storm Harper
(provided by the Weather Channel)

Beginning around Monday January 14th, Unitil's weather service provider and other weather services began forecasting a major winter storm (Winter Storm Harper) expected to arrive over the weekend (Jan 19th - 20th) with heavy, wet snow and freezing rain expected across all of southern New England. Snow accumulations of 16 to 20 inches were predicted with icing and sleet up to a quarter inch expected. Although winds were not expected to be hazardous, common gusts of 15 to 25 mph and peak gusts up to 45 mph were also associate with the system. Snow began to fall across the region on Saturday evening (the 19th) continuing through Sunday morning before transitioning to a wintery mix of rain, freezing rain and sleet across the territory. Most areas within Unitil service territory ultimately received between 10 and 12 inches of snow with minor to trace icing accumulations.

1.2. Summary of the Extent of the Storm Damage

Unitil Energy Systems experienced no impacts resulting from this event in either Region.

UES Region	Total # Outages	Peak # Outages	Total Customers Interrupted	Peak Customers Interrupted	Percentage Affected (Peak)
Seacoast	0	**0**	0	0	**0**
Capital	0	**0**	0	0	**0**

1.3. Preparations

Unitil began communicating internally on Monday, January 14th to coordinate initiation of preparation activities, including public notifications (via press releases) and outreach to life support customers, municipal, regulatory and elected officials, and state emergency management agencies (via email). Additional preparation activities such as contractor availability outreach and checking inventory, stock levels and fleet vehicles were also completed prior to the event. The Company held several internal coordination calls leading up to the event and activated key response employees to staff the Seacoast, Capital and System emergency operating centers throughout the event to respond to any interruptions and communicate with affected stakeholders.

1.4. Restoration

No outages were caused as a result of this event and Unitil reverted back to normal operations at approximately 2 PM Sunday (the 20th). Unitil had its normal contingent of internal line crews (10) on system line contractors (7), and tree crews (13).

1.5. Exclusionary Criteria

This event qualified for recovery of preparation costs due to the EEI of 4 for hazardous snow totals with a high confidence level (see attached forecast). The actual experience of this event did not meet the concurrent trouble requirement in either the Seacoast or Capital Regions; therefore

restoration costs do not qualify for recovery. Preparation only costs recovered through the MSCR are summarized in Section 1.6.

Energy Event Index for UNITIL Your forecast administrator: murphyt@unitil.com
Valid Time: January 18, 2019 6:00 AM EST Forecaster: justin.wegwerth

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Capital	1	1	1
	Fitchburg	1	1	1
	Portland	1	1	1
	Seacoast	1	1	1
Wind/Gust	Capital	1	1	1
	Fitchburg	1	1	1
	Portland	1	1	1
	Seacoast	1	1	1
Snow	Capital	1	4	4
	Fitchburg	1	4	4
	Portland	1	4	4
	Seacoast	1	4	4
Ice	Capital	1	1	1
	Fitchburg	1	1	1
	Portland	1	1	1
	Seacoast	1	1	1
Confidence Level	Capital	High	High	High
	Fitchburg	High	High	High
	Portland	High	High	High
	Seacoast	High	High	High

Energy Event Index Definition

No Leaves (Nov 17 - Apr 30)

EEI	Wind Speed	Wind/Gust	Snow	Ice
1	< 40 mph	< 45 mph	< 6 in.	< 1/10 in.
2	>= 40 mph	>= 45 mph	>= 6 in.	>= 1/10 in.
3	>= 50 mph	>= 55 mph	>= 8 in.	>= 3/8 in.
4	>= 60 mph	>= 70 mph	>= 12 in.	>= 1/2 in.
5	>= 70 mph	>= 85 mph	>= 24 in.	>= 1 in.

Confidence Level	
Low	<30% chance the most likely index level remains at that level through the event
Medium	30-60% chance the most likely index level remains at that level through the event
High	>=60% chance the most likely index level remains at that level through the event

*Note: Confidence is NOT a measure of probability of an event occurring; if you have an accompanying forecast discussion, that information can be found there. Confidence is a measure of how likely the forecasted index level will stay at that level from now through the event, or a way to measure the potential for variability in the forecast. So for example, if it is Monday and there are level 2 gusts forecasted on Wednesday with high confidence, and if your customizable threshold for high confidence is set at 60%, it means the following: There is a >=60% chance the most likely forecasted gusts will remain at level 2 with all updates from now through Wednesday.

Date: January 18, 2019
Time: 6:00 AM EST
Forecaster: Justin Wegwerth

Zones	SEACOAST	CAPITAL	FITCHBURG	PORTLAND
Event Starting in 30hrs	NONE	NONE	NONE	NONE
Event Begin Time				
Event End Time				
Event Confidence				
TSTM Wind Gusts				
Ltng Intensity				
Storm Mvmt Dir				
Rain Amount				
Snow Accumulation				
Snow Character				
Ice Amount				
Sustained Wind				
Wind Gust				
Temp. Extremes	35/17	33/14	36/18	35/15

UNITIL SERVICE AREA 48 HOUR OUTLOOK:

CAPITAL: Light snow possible into Friday late morning/early afternoon, then dry and hazard-free through Saturday afternoon. Snowfall: Tr-1/2". Snow character: Normal-wet. Later Saturday into Sunday, a major winter storm will impact the region. Snow will develop 6-8pm Sat. Heavy

snowfall rates will occur Saturday night through Sunday morning. Snow will wind down 5-7pm Sun. Snowfall: 14-22". Winds could gust 20-30 mph late Saturday night/Sunday morning. Winds will become widespread behind this system Sunday afternoon-night with gusts of 25-35 mph likely and isolated peak gust of 35-40 mph possible, strongest Sunday afternoon to mid-evening.

Confidence: Confidence is high that no hazards will occur today into Saturday afternoon. Confidence is high in hazard snowfall occurring Saturday evening-Sunday. EEI-2/3/4 chances: 100%/90%/70%.

SEACOAST: Light snow possible into Friday late morning/early afternoon, then dry and hazard-free through Saturday afternoon. Snowfall: Tr-1/2". Snow character: Normal-wet. Later Saturday into Sunday, a major winter storm will impact the region. Snow will develop 7-9pm Sat. Heavy snowfall rates will occur Saturday night through Sunday morning. However, snow could mix with sleet for a period Sunday morning. Snow will wind down 6-8pm Sun. Snowfall: 10-18". Winds could gust 20-30 mph late Saturday night, increasing to 25-35 mph, peak gusts 35-40 mph Sunday morning. Winds will become widespread behind this system Sunday afternoon-night with gusts of 25-35 mph likely and isolated peak gust of 35-40 mph possible, strongest Sunday afternoon to mid-evening.

Confidence: Confidence is high that no hazards will occur today into Saturday afternoon. Confidence is high in hazard snowfall occurring Saturday evening-Sunday. EEI-2/3/4 chances: 100%/80%/60%.

1.6. Qualifying Costs Charged to the Storm Reserve

The total amount charged to the storm reserve for this event was $50,241 with a breakdown of charges in the following table:

Payroll	$7,991
Materials & Supplies	$0
Transportation	$0
Contractor Invoices & Other	$42,250
Less Amount Capitalized	$0
Total To Storm Reserve	$50,241

2. February 25th, 2019 (Winter Storm Ryan)

2.1. Description of the Storm

Beginning on Thursday, February 21st, Unitil's weather service provider and other weather services began forecasting a strong storm system (Winter Storm Ryan) expected to arrive overnight Sunday into Monday (Feb 24th - 25th) consisting of a mixture of snow and rain with hazardous winds gusts. As the system tracked across Upstate New York and Canada, widespread snow and damaging winds developed causing near blizzard conditions. Weather forecasters predicted sustained wind speeds between 15 and 35 mph and gusts across Unitil's service area up to 55 mph with even higher amounts expected in elevated terrains and near the coast. Unitil experienced an extended period (over 12 hours) of hazardous wind speeds with gusts up to 55 mph reported in the Capital Region and up to 61 mph reported in the Seacoast Region.

2.2. Summary of the Extent of the Storm Damage

Unitil Energy Systems experienced the following impact as detailed in the table below.

UES Region	Total # Outages	Peak # Outages	Total Customers Interrupted	Peak Customers Interrupted	Percentage Affected (Peak)
Seacoast	22	**8**	1,487	773	**1.6%**
Capital	20	**9**	1,475	611	**2.0%**

Figure 2 – Hampton Falls, NH Damage

Figure 3 – E. Kingston, NH Damage

Figure 4 - Kingston, NH Damage

2.3. Preparations

Unitil began communicating internally on Thursday, February 21st to coordinate initiation of preparation activities, including public notifications (via press releases) and outreach to life support customers, municipal, regulatory and elected officials, and state emergency management agencies (via email). Additional preparation activities such as contractor availability outreach and checking inventory, stock levels and fleet vehicles were also completed prior to the event. The Company held several internal coordination calls leading up to the event and activated key response employees to staff the Seacoast, Capital and System emergency operating centers throughout the event to respond to any interruptions and communicate with affected stakeholders.

2.4. Restoration

Scattered outages occurred (listed in Section 2.2) in both the Seacoast and Capital Regions mostly attributed to broken limbs and tree damage resulting in several broken poles and downed wires. Unitil had its normal contingent of internal crews (10), on system contractors (14), and tree crews (18) and secured an additional 8 contractor line crews and 8 wires down personnel for the NH territory. The majority of customers in the Capital Region were restored within 16 hours while the Seacoast Region which experienced more damage was mostly restored within 34 hours. Restoration was slightly hindered by a long duration of elevated wind gusts (over 35 mph) which created hazardous conditions posing safety risks for overhead crews.

2.5. Exclusionary Criteria

This event qualified for recovery of preparation costs due to the EEI of 3 for hazardous wind speeds with a high confidence level (see attached forecast). The actual experience of this event did not meet the concurrent trouble requirement in either the Seacoast or Capital Regions; therefore restoration costs do not qualify for recovery. Preparation only costs recovered through the MSCR are summarized in Section 2.6.

Energy Event Index for UNITIL Your forecast administrator: ulbanj@unitil.com
Valid Time: February 24, 2019 1:00 PM EST Forecaster: jim.murphy

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Capital	1	1	1
	Fitchburg	1	1	1
	Portland	1	1	1
	Seacoast	1	1	1
Wind/Gust	Capital	1	3	1
	Fitchburg	1	3	1
	Portland	1	3	1
	Seacoast	1	3	1
Snow	Capital	1	1	1
	Fitchburg	1	1	1
	Portland	1	1	1
	Seacoast	1	1	1
Ice	Capital	1	1	1
	Fitchburg	1	1	1
	Portland	1	1	1
	Seacoast	1	1	1
Confidence Level	Capital	High	High	High
	Fitchburg	High	High	High
	Portland	High	High	High
	Seacoast	High	High	High

Energy Event Index Definition

No Leaves (Nov 17 - Apr 30)

EEI	Wind Speed	Wind/Gust	Snow	Ice
1	< 40 mph	< 45 mph	< 6 in.	< 1/10 in.
2	>= 40 mph	>= 45 mph	>= 6 in.	>= 1/10 in.
3	>= 50 mph	>= 55 mph	>= 8 in.	>= 3/8 in.
4	>= 60 mph	>= 70 mph	>= 12 in.	>= 1/2 in.
5	>= 70 mph	>= 85 mph	>= 24 in.	>= 1 in.

Confidence Level	
Low	<30% chance the most likely index level remains at that level through the event
Medium	30-60% chance the most likely index level remains at that level through the event
High	>=60% chance the most likely index level remains at that level through the event

*Note: Confidence is NOT a measure of probability of an event occurring; if you have an accompanying forecast discussion, that information can be found there. Confidence is a measure of how likely the forecasted index level will stay at that level from now through the event, or a way to measure the potential for variability in the forecast. So for example, if it is Monday and there are level 2 gusts forecasted on Wednesday with high confidence, and if your customizable threshold for high confidence is set at 60%, it means the following: There is a >=60% chance the most likely forecasted gusts will remain at level 2 with all updates from now through Wednesday.

Date: February 24, 2019
Time: 1:00 PM EST
Forecaster: Jim Murphy

Zones	SEACOAST	CAPITAL	FITCHBURG	PORTLAND
Event Starting in 30hrs	GUSTS	GUSTS	GUSTS	GUSTS
Event Begin Time	3AM MON	3AM MON	3AM MON	4AM MON
Event End Time	3AM TUE	3AM TUE	3AM TUE	3AM TUE
Event Confidence	HIGH	HIGH	HIGH	HIGH
Tstrm Wind Gusts				
Ltng Intensity				
Storm Mvmt Dir				
Rain Amount				
Snow Amount				
Snow Character				
Ice Amount				
Sustained Wind	20-35	20-35	20-35	20-35
Wind Gust	45-58	45-58	45-58	45-58
Temp. Extremes	41/24	38/22	40/24	42/22

UNITIL SERVICE AREA 48 HOUR OUTLOOK:

CAPITAL: Rain this afternoon will end by 9-10pm this evening. A few snow showers may then occur through 2am Monday. Snowfall: Trace. Strong winds develop this evening and continue into Monday, with EEI-2/3 gusts likely. Winds gradually subside Monday night. Timing of peak gusts (50-58 mph): 9am-8pm Monday. See tables for further wind details.

Confidence: Confidence is high that EEI-2/3 gusts will occur tonight into Monday. Chances for EEI-2/3 gusts: 100%/50%

SEACOAST: Rain this afternoon will end by 9-10pm this evening. A few snow showers may then occur through 2am Monday. Snowfall: Trace. Strong winds develop this evening and continue into Monday, with EEI-2/3 gusts likely. Winds gradually subside Monday night. Timing of peak gusts (50-58 mph): 9am-8pm Monday. See tables for further wind details.

Confidence: Confidence is high that EEI-2/3 gusts will occur tonight into Monday. Chances for EEI-2/3 gusts: 100%/50%.

2.6. Qualifying Costs Charged to the Storm Reserve

The total amount charged to the storm reserve for this event was $162,242 with a breakdown of charges in the following table:

Payroll	$15.217
Materials	$0
Transportation	$15,009
Contractor Invoices & Other	$132,016
Less Amount Capitalized	$0
Total To Storm Reserve	$ 162,242

3. October 17th, 2019 (Wind Event "Bomb Cyclone")

3.1. Description of the Storm

Beginning early Sunday, (Oct 13th) forecasters started to predict a strong system moving across the northeast with a threat for hazardous wind speeds. Strong gusty winds of 35 to 40 mph were predicted overnight on Wednesday (Oct 16th) lasting into Thursday (Oct 17th) morning. A "bomb cyclone" was predicted indicating a significant drop in air pressure over a short amount of time which would result in a severe wind event across the northeast. Starting in the early afternoon Wednesday (approximately 1 PM) wind speeds began to increase across Unitil's service area with sustained winds between 15 and 25 mph and peak gusts of 53 mph reported in the Seacoast Region and 49 mph in the Capital Region. Wind speeds continued to remain hazardous throughout the entire day on Thursday (Oct 17th) into Friday morning (Oct 18th).

3.2. Summary of the Extent of the Storm Damage

Unitil Energy Systems experienced the following impact as detailed in the table below

Region	Total # Outages	Peak # Outages	Total Customers Interrupted	Peak Customers Interrupted	Percentage Affected (Peak)
Seacoast	147	90	13,338	10,065	21%
Capital	75	44	4,923	4,000	13%

Figure 6: Atkinson Pole Damage

Figure 8: Seabrook Pole Damage

Figure 7: Concord Pole Damage

Figure 5: Exeter Fallen Tree

3.3. Preparations

Unitil began communicating internally on Wednesday (Oct 16th) to coordinate initiation of preparation activities, including public notifications (via press releases) and outreach to life support customers, municipal, regulatory and elected officials, and state emergency management agencies (via email). Additional preparation activities such as contractor availability outreach and checking inventory, stock levels and fleet vehicles were also completed prior to the event. The Company held several internal coordination calls leading up to the event and activated key response employees to staff the Seacoast, Capital and System emergency operating centers throughout the event to respond to any interruptions and communicate with affected stakeholders.

3.4. Restoration

Scattered outages (listed in Section 3.2) occurred throughout the day Thursday (Oct 17th) mainly attributed to broken limbs and tree damage; at least 14 poles were damaged and needed to be replaced. Outages began around 2 AM on Oct 17th (Thursday) and were responded to and restored by crews throughout the evening and next day with all affected customers being restored by 3 AM on Saturday (Oct 19th). Unitil had its normal contingent of internal crews (10) and on system

line (8) and tree (13) contractors, and secured an additional (11) contractor line and (18) tree crews to support operations.

3.5. Exclusionary Criteria

This event qualified for recovery of preparation costs due to the EEI of 3 for wind gusts with a high confidence level for the Seacoast Region (see attached forecast). The actual experience of this event met the restoration cost recovery criteria for both Seacoast and Capital Regions with more than 22 concurrent troubles occurring in each region. Preparation and restoration costs recovered through the MSCR are summarized in Section 3.6.

Energy Event Index for UNITIL Your forecast administrator: ulbanj@unitil.com
Valid Time: October 16, 2019 6:00 AM EDT Forecaster: john.baranick

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Capital	1	1	1
	Fitchburg	1	1	1
	Portland	1	2	1
	Seacoast	1	2	1
Wind/Gust	Capital	1	2	1
	Fitchburg	1	2	1
	Portland	1	3	1
	Seacoast	1	3	1
Confidence Level	Capital	High	High	High
	Fitchburg	High	High	High
	Portland	High	High	High
	Seacoast	High	High	High

Energy Event Index Definition
With Leaves (Apr 1 - Nov 16)

EEI	Wind Speed	Wind/Gust
1	< 30 mph	< 35 mph
2	>= 30 mph	>= 35 mph
3	>= 45 mph	>= 50 mph
4	>= 60 mph	>= 65 mph
5	>= 70 mph	>= 75 mph

Confidence Level	
Low	<30% chance the most likely index level remains at that level through the event
Medium	30-60% chance the most likely index level remains at that level through the event
High	>=60% chance the most likely index level remains at that level through the event

*Note: Confidence is NOT a measure of probability of an event occurring; if you have an accompanying forecast discussion, that information can be found there. Confidence is a measure of how likely the forecasted index level will stay at that level from now through the event, or a way to measure the potential for variability in the forecast. So for example, if it is Monday and there are level 2 gusts forecasted on Wednesday with high confidence, and if your customizable threshold for high confidence is set at 60%, it means the following: There is a >=60% chance the most likely forecasted gusts will remain at level 2 with all updates from now through Wednesday.

Date: October 16, 2019
Time: 6:00 AM EDT
Forecaster: John Baranick

Zones (Forecast for next 30 hrs)	SEACOAST	CAPITAL	FITCHBURG	PORTLAND
Event	WIND, GUSTS	GUSTS	GUSTS	WIND, GUSTS
Event Begin Time	12am Thu	1am Thu	12am Thu	3am Thu
Event End Time	10pm Thu	10pm Thu	10pm Thu	2pm Thu
Event Confidence	High	High	High	High
Thunderstorm Wind Gusts				
Lightning Intensity				
Storm Direction				
Rain Amount	1-3"	1-3"	1-3"	1-3"
Max Sustained Winds	20-35	15-30	15-30	20-34
Wind Gust	45-60	40-50	40-55	45-60
Temp. Extremes	60/38	60/30	63/36	60/37

UNITIL SERVICE AREA 48 HOUR OUTLOOK:

CAPITAL: Today, dry through the afternoon, with a strong system bringing a swath of moderate to heavy rains and EEI-2 wind gusts overnight into early Thursday. EEI-2 gust timing: 1am-10pm Thu. There may be a brief lull in the morning hours as a low pressure center moves through. Common gusts: 25-35 mph. Peak gusts: 40-50 mph. strongest gusts will occur between 2-7am Thu. Peak gusts should be up to 40 mph after 7am Thu. Sustained winds will be in the 20-30 mph range during the 2-7am time frame as well. Rain showers become isolated to scattered Thursday mid-morning, ending Thursday evening. Total rainfall: 1.00-2.00", with isolated totals near 3.00" possible.

Confidence: Confidence is high that hazard gusts will occur tonight into early Thursday, and medium through the rest of Thursday. EEI-2 Wind Gust Chance: 70%. Confidence is high that hazard sustained winds will not occur. EEI-2 Sustained Wind Chance: 10%.

SEACOAST: Today, dry through the afternoon, with a strong system bringing a swath of moderate to heavy rains and EEI-2 wind gusts overnight into early Thursday. EEI-2 gust timing: 12am-10pm Thu. There may be a lull in the morning hours as a low pressure center moves through. Common gusts: 35-45 mph. Peak gusts: 45-60 mph. Strongest gusts will occur between 2-8am Thu. Peak gusts should be up to 40 mph after 8am Thu. Sustained winds will be in the 20-35 mph range during the 2-8am time frame as well. Rain showers become isolated to scattered late Thursday morning, ending Thursday evening. Total rainfall: 1.00-2.00", with isolated totals near 3.00" possible.

Confidence: Confidence is high that hazard gusts will occur tonight into early Thursday, and medium through the rest of Thursday. EEI-2/3 Wind Gust Chance: 90%/50%. Confidence is medium that hazard sustained winds will occur. EEI-2 Sustained Wind Chance: 50%.

3.6. Qualifying Costs Charged to the Storm Reserve

The amount charged to the storm reserve for this event to date is $457,442 with a breakdown of charges in the following table:

Payroll	$82,510
Materials & Supplies	$41,388
Transportation	$50,347
Contractor Invoices & Other	$528,251
Less Amount Capitalized	$(245,054)
Total To Storm Reserve	$457,442

4. December 2nd, 2019 (Winter Storm Event)

4.1. Description of the Storm

Beginning on November 27th, weather services began forecasting a winter storm bringing between 7 to 14 inches of wet to normal snow and breezy conditions (winds 20 to 30 mph) across the New England area from Sunday (Dec 1st) through Tuesday (Dec 3rd). Winter Storm Warnings were issued across the region for this long duration nor'easter event. The snow began across Unitil's service territory Sunday evening (approximately 6pm) and continued through noon on Tuesday, though there was a lull for the afternoon and evening of Monday (Dec 2nd). Snow totals ranged between 7 and 18 inches across the service area with the Seacoast Region experiencing a wet snow mixing however winds remained under 30 mph for the entirety of the event.

Figure 9 - Snowfall Map (courtesy of WMUR)

4.2. Summary of the Extent of the Storm Damage

Unitil Energy Systems experienced the following impact as detailed in the table below

Region	Total # Outages	Peak # Outages	Total Customers Interrupted	Peak Customers Interrupted	Percentage Affected (Peak)
Seacoast	26	**5**	1,555	984	2%
Capital	0	**0**	0	0	0%

4.3. Preparations

Unitil began communicating internally on Friday (Nov 29th) to coordinate initiation of preparation activities, including public notifications (via press releases) and outreach to life support customers, municipal, regulatory and elected officials, and state emergency management agencies (via email). Additional preparation activities such as contractor availability outreach and checking inventory, stock levels and fleet vehicles were also completed prior to the event. The Company held several internal coordination calls leading up to the event and activated key response employees to staff the Seacoast, Capital and System emergency operating centers throughout the event to respond to any interruptions and communicate with affected stakeholders.

4.4. Restoration

As noted in Section 4.2 our Capital region did not experience any outages while the Seacoast Region experienced 26 outages during this event. Unitil had internal crews (10), on system contractors (10) and tree crews (16) and secured an additional (15) contractor line crews to respond to any interruptions. Seacoast began experiencing outages early on Dec 2nd and ultimately restored most impacted customers within 12 hours however smaller, isolated outages continued throughout the day on the 2nd and were promptly responded to.

4.5. Exclusionary Criteria

This event qualified for recovery of preparation costs due to the EEI of 3 for snow with a high confidence level (EEI 4 of medium confidence) for both Seacoast and Capital Regions (see attached forecast). The actual experience of this event did not meet the concurrent trouble requirement in either the Seacoast or Capital Regions; therefore restoration costs do not qualify for recovery. Preparation only costs recovered through the MSCR are summarized in Section 4.6.

Energy Event Index for UNITIL Your forecast administrator: ulbanj@unitil.com
Valid Time: December 1, 2019 6:00 AM EST Forecaster: jimmy.cayer

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Capital	1	1	1
	Fitchburg	1	1	1
	Portland	1	1	1
	Seacoast	1	1	1
Wind/Gust	Capital	1	1	1
	Fitchburg	1	1	1
	Portland	1	1	1
	Seacoast	1	1	1
Snow	Capital	4	4	4
	Fitchburg	4	4	4
	Portland	2	2	2
	Seacoast	3	3	3
Ice	Capital	1	1	1
	Fitchburg	1	1	1
	Portland	1	1	1
	Seacoast	1	1	1
Confidence Level	Capital	High	High	High
	Fitchburg	High	High	High
	Portland	Medium	Medium	Medium
	Seacoast	High	High	High

Energy Event Index Definition
No Leaves (Nov 17 - Mar 31)

EEI	Wind Speed	Wind/Gust	Snow	Ice
1	< 40 mph	< 45 mph	< 6 in.	< 1/10 in.
2	>= 40 mph	>= 45 mph	>= 6 in.	>= 1/10 in.
3	>= 50 mph	>= 55 mph	>= 8 in.	>= 3/8 in.
4	>= 60 mph	>= 70 mph	>= 12 in.	>= 1/2 in.
5	>= 70 mph	>= 85 mph	>= 24 in.	>= 1 in.

Confidence Level	
Low	<30% chance the most likely index level remains at that level through the event
Medium	30-60% chance the most likely index level remains at that level through the event
High	>=60% chance the most likely index level remains at that level through the event

*Note: Confidence is NOT a measure of probability of an event occurring; if you have an accompanying forecast discussion, that information can be found there. Confidence is a measure of how likely the forecasted index level will stay at that level from now through the event, or a way to measure the potential for variability in the forecast. So for example, if it is Monday and there are level 2 gusts forecasted on Wednesday with high confidence, and if your customizable threshold for high confidence is set at 60%, it means the following: There is a >=60% chance the most likely forecasted gusts will remain at level 2 with all updates from now through Wednesday.

Date: December 1, 2019
Time: 6:00 AM EST
Forecaster: J Cayer

Zones (Forecast for next 30 hrs.)	SEACOAST	CAPITAL	FITCHBURG	PORTLAND
Event	SNOW	SNOW	SNOW	SNOW
Event Begin Time	5PM SUN	4PM SUN	3PM SUN	10PM SUN
Event End Time	4PM TUE	2PM TUE	2PM TUE	7PM TUE
Event Confidence	HIGH	HIGH	HIGH	MEDIUM
Thunderstorm Wind Gusts				
Lightning Intensity				
Storm Direction				
Rain Amount				
Snow Amount	7-14"	9-16"	8-15"	6-12"
Snow Character	Wet	Normal/Wet	Normal/Wet	Wet
Ice Amount				
Max Sustained Winds				
Wind Gust				
Temp. Extremes	35/22	35/18	34/22	33/20

UNITIL SERVICE AREA 48 HOUR OUTLOOK:

CAPITAL: Dry and hazard-free through Sunday morning. A storm system will develop across the area Sunday afternoon and last through early Tuesday afternoon, with likely chances for a long duration heavy snow event. See table above for details. Winds will be breezy Sunday night into Monday as well, with gusts of 20-30 mph possible.

Confidence: Confidence is high that no hazards will occur through Sunday morning. Confidence is high that hazard level snow will occur Sunday afternoon into Tuesday. EEI-2/3/4 snow chance: 100%/90%/50%.

SEACOAST: Dry and hazard-free through early Sunday early afternoon. A storm system will develop across the area late Sunday afternoon and last through Tuesday afternoon, with likely chances for a long duration snow event. See table above for details. Winds will be breezy Sunday night into Monday as well, with gusts of 20-30 mph possible.

Confidence: Confidence is high that no hazards will occur through early Sunday early afternoon. Confidence is medium in the evolution of the storm system Sunday into Monday. While snow is expected to be the dominant precipitation type, some sleet could mix in at times, cutting into overall storm totals. Confidence is high that hazard level snow will occur. EEI-2/3/4 snow chance: 100%/80%/30%.

4.6. Qualifying Costs Charged to the Storm Reserve

The amount charged to the storm reserve for this event to date is $465,000. Final costs for this event were not available at the time of this report and will be included in the 2020 MSCR Report.

Attachment A

To: NH PUC

Topic: Change in Weather Provider Services at Unitil Service Corp

During the technical sessions of UES' most recent rate case, the Company asserted that it had worked with its weather provider, Weather Systems Inc. (WSI), to develop a Power Disruption Index (PDI) that better reflects the potential impact of adverse weather conditions. As an outcome of that discussion and for conditions with a PDI of 2 with a high confidence level, the Company may recover its preparation cost.

Following this, WSI abruptly notified its electric utility clients that it would no longer offer weather services as of April 1, 2011. As a result, the Company reviewed several, alternate weather providers and selected Telvent DTN (DTN).

Unitil worked with DTN to perfect a methodology for delivering the same level of service we enjoyed with WSI. DTN has created an Energy Event Index (EEI) similar to the PDI (see Attachment B for the criteria composing the EEI). The Company worked closely to ensure the same criteria discussed at the technical sessions continue to apply to the DTN equivalent.

Below are the specific levels associated with the EEI; however, to better align the EEI levels with the operational levels in Unitil's Emergency Response Plan (ERP), we began the EEI at Level 1, which differs from the former PDI that began at Level 0. Therefore, an EEI Level 3 is equivalent to the PDI Level 2.

The Estimated Impact Indices or EEI is summarized by day as a table within a typical daily weather forecast (see Attachment C).

- Five levels starting at 1. Estimates the impact for forecasted Wind Speeds, Wind Gusts, Ice Accretions, and Snow Amounts and the forecast's Confidence Level (Low, Medium, or High) to calculate the EEI:
  - Level 1 (Normal Operations/Blue Sky Day, None or Few Outages)
  - Level 2 (Moderate Weather, Isolated Outages)
  - Level 3 (Moderate-Severe Weather, Scattered Outages)
  - Level 4 (Moderate-Severe Weather, Widespread Outages)
  - Level 5 (Severe Weather, Extensive Outages)

Attachment B

Event Energy Index (EEI) Criteria

Forecasted Wind Speed/Wind Gusts

For "With Leaves" Period (May 1 – Nov 16)			For "No Leaves" Period (Nov 17 – Apr 30)		
Level	**Wind Speed**	**Wind Gusts**	**Level**	**Wind Speed**	**Wind Gusts**
EEI = 1	< 30 mph	< 35 mph	EEI = 1	< 40 mph	< 45 mph
EEI = 2	> = 30 mph	> = 35 mph	EEI = 2	> = 40 mph	> = 45 mph
EEI = 3	> = 45 mph	> = 50 mph	EEI = 3	> = 50 mph	> = 55 mph
EEI = 4	> = 60 mph	> = 65 mph	EEI = 4	> = 60 mph	> = 70 mph
EEI = 5	> = 70 mph	> = 75 mph	EEI = 5	> = 70 mph	> = 85 mph

Forecasted Ice Accretion (assumes "normal" wind speed)

Level	Ice Accretion
EEI = 1	< 1/10 inch
EEI = 2	> = 1/10 inch
EEI = 3	> = 3/8 inch
EEI = 4	> = 1/2 inch
EEI = 5	> = 1 inch

Forecasted Snow Amounts (*assumes dry snow consistency*). These amounts are factored with wind speed more so than actual accumulation.

Level	Snow
EEI = 1	< 6 inches
EEI = 2	> = 12 inches
EEI = 3	> = 18 inches
EEI = 4	> = 24 inches
EEI = 5	< 24 inches

Forecasted Snow Amounts (*assumes wet snow consistency*). Season will modify amount within level – A fall storm (with leaves) will have a significantly increased impact.

Level	Snow (Without Leaves)	Snow (With Leaves)
EEI = 1	< 6 inches	< 4 inches
EEI = 2	> = 6 inches	> = 4 inches
EEI = 3	> = 8 inches	> = 6 inches
EEI = 4	> = 12 inches	> = 12 inches
EEI = 5	> = 24 inches	> = 24 inches

Forecast Confidence Levels

Low	Medium	High
< 30% Chance	≥ 30 ≤ 60% Chance	> 60% Chance

Attachment C

Sample Weather Forecast with EEI Table

Energy Event Index for UNITIL Your forecast administrator: ulbanj@unitil.com
Valid Time: March 1, 2019 1:00 PM EST Forecaster: jim.murphy

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Capital	1	1	1
	Fitchburg	1	1	1
	Portland	1	1	1
	Seacoast	1	1	1
Wind/Gust	Capital	1	1	1
	Fitchburg	1	1	1
	Portland	1	1	1
	Seacoast	1	1	1
Snow	Capital	1	1	3
	Fitchburg	1	1	2
	Portland	1	1	3
	Seacoast	1	1	2
Ice	Capital	1	1	1
	Fitchburg	1	1	1
	Portland	1	1	1
	Seacoast	1	1	1
Confidence Level	Capital	High	High	Medium
	Fitchburg	High	High	Medium
	Portland	High	High	Medium
	Seacoast	High	High	Medium

Energy Event Index Definition

No Leaves (Nov 17 - Apr 30)

EEI	Wind Speed	Wind/Gust	Snow	Ice
1	< 40 mph	< 45 mph	< 6 in.	< 1/10 in.
2	>= 40 mph	>= 45 mph	>= 6 in.	>= 1/10 in.
3	>= 50 mph	>= 55 mph	>= 8 in.	>= 3/8 in.
4	>= 60 mph	>= 70 mph	>= 12 in.	>= 1/2 in.
5	>= 70 mph	>= 85 mph	>= 24 in.	>= 1 in.

Confidence Level	
Low	<30% chance the most likely index level remains at that level through the event
Medium	30-60% chance the most likely index level remains at that level through the event
High	>=60% chance the most likely index level remains at that level through the event

*Note: Confidence is NOT a measure of probability of an event occurring; if you have an accompanying forecast discussion, that information can be found there. Confidence is a measure of how likely the forecasted index level will stay at that level from now through the event, or a way to measure the potential for variability in the forecast. So for example, if it is Monday and there are level 2 gusts forecasted on Wednesday with high confidence, and if your customizable threshold for high confidence is set at 60%, it means the following: There is a >=60% chance the most likely forecasted gusts will remain at level 2 with all updates from now through Wednesday.

Date: March 1, 2019
Time: 1:00 PM EST
Forecaster: J Murphy

Zones	SEACOAST	CAPITAL	FITCHBURG	PORTLAND
Event Starting in 30hrs				
Event Begin Time				
Event End Time				
Event Confidence				
Tstrm Wind Gusts				
Ltng Intensity				
Storm Mvmt Dir				
Rain Amount				
Snow Amount				
Snow Character				
Ice Amount				
Sustained Wind				
Wind Gust				
Temp. Extremes	36/23	35/17	35/20	35/19

UNITIL SERVICE AREA 48 HOUR OUTLOOK:

CAPITAL: This afternoon and tonight will be dry and hazard-free. A storm system will spread snow showers over the area after 7am Saturday morning and end by 11pm Saturday. Snowfall: 2-3". Snow character: Normal-wet.

Confidence: High confidence that no hazards will occur in the next 48 hours.

FITCHBURG: This afternoon and evening will be dry and hazard-free. A storm system will spread snow over the area after 3am Saturday morning and end by 11pm Saturday. Snowfall: 2-4". Snow character: Normal-wet.

Confidence: High confidence that no hazards will occur in the next 48 hours.

SEACOAST: This afternoon and evening will be dry and hazard-free. A storm system will spread snow over the area after 3am Saturday morning and end by 11pm Saturday. Snowfall: 3-5". Snow character: Normal-wet.

Confidence: High confidence that no hazards will occur in the next 48 hours. Chance of EEI-2 snow: 10%.

PORTLAND: Today and tonight will be dry and hazard-free. A storm system will spread snow showers over the area after 8am Saturday morning and end by 12am Sunday. Snowfall: 2-4". Snow character: Normal-wet.

Confidence: High confidence that no hazards will occur in the next 48 hours.

UNITIL SERVICE AREA 3-5 DAY OUTLOOK: Another stronger storm system could bring anywhere from 6-15" of additional Normal-wet snow Sunday evening into Monday, but confidence is only medium at this point due to significant model differences in track and strength. The higher snow amounts will be across Capital and Portland where up to 10-15" will be possible with 6-10" expected across Seacoast and Fitchburg. Winds will be breezy Sunday night into Monday with gusts of 30-40 mph possible. Dry and hazard-free conditions are expected on Tuesday.

Confidence: Confidence is medium on Sunday and Monday. Chance for EEI-2/3/4 snow for Sunday night into Monday: 80%/60%/30% Capital and Portland; 70%/40%/- Seacoast and Fitchburg. Confidence is high that no hazards will occur on Tuesday