



Unitil Energy Systems, Inc.  
Major Storm Cost Reserve Fund Report  
2016

Prepared By: Business Continuity & Compliance and Accounting

February 27, 2017

## **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, 2016. 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, 2016 is in a deficit position of (\$2,759,544). The Company is not proposing an adjustment to the level of annual MSCR recovery or seeking cost recovery through its SRAF at this time, but will continue to review the recovery level on a going forward basis as we continue to incur costs for future storm events.

The MSCR includes restoration costs for qualifying major storms, 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 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. Qualifying major storms are those 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. A qualifying major storm will be considered likely to occur if the Estimate Impact Indices (“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. The Commission recognizes 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 an actual or likely qualifying major storm. The Company may petition the Commission to recover the extraordinary costs of such events from the MSCR and has the burden to demonstrate the reasonableness of its expenditures.

All costs included in the MSCR through December 31, 2016 have been reviewed for accuracy, completeness, and proper classification by Unitil’s Internal Audit group. Please refer to the *UES MSCR Fund Reconciliation as of December 31, 2016* on page 3 for a summary of the costs.

Please refer to the Storm Recovery Adjustment Factor Reconciliation on page 4 which provides the reconciliation of the SRAF through December 31, 2016. Beginning May 1, 2017, the SRAF will decrease by \$0.00082 per kWh due to the termination of the recovery of the costs of two extraordinary storms: Tropical Storm Irene, which occurred in August 2011, and the Snow Storm, which occurred in October 2011. In accordance with its tariff, Schedule SRAF, the costs associated with these two extraordinary storms were to be recovered at a rate of \$0.00082 per kWh over 5 years ending April 30, 2017. UES will file the final disposition of the balance for this cost piece by June 30, 2017.

**Unitil Energy Systems, Inc.**

**Major Storm Cost Reserve Fund – Reconciliation  
As of December 31, 2016**

<b>Section #</b>	<b>Date</b>	<b>Description</b>	<b>Surplus (Deficit)</b>
	<b>12/31/2015</b>	<b>MSCR BALANCE (As Filed on 2/28/2016)</b>	<b>\$ (2,862,336)</b>
<b>Prior Year Adjustments</b>			
	07/2/2014	Remittance – Tree Trimming	256
<b>Adjusted Opening Balance 1/1/2016</b>			<b>\$ (2,862,080)</b>
<b>2016 Deferred Charges</b>			
1.0	02/05/2016	Snow Storm	(62,648)
2.0	03/28/2016	Wind Event	(93,209)
3.0	04/1/2016	Wind Event	(47,009)
4.0	7/18/2016	Storm Event (Microburst)	(172,355)
5.0	7/23/2016	Storm Event (Thunder/Lightning)	(197,744)
6.0	12/29/2016	Nor'easter Event <sup>1</sup>	---
<b>2016 Recovery</b>			
<b>2016</b>	<b>Current Recovery Rate</b>		<b>800,000</b>
<b>2016 Carrying Charges</b>			<b>(124,499)</b>
<b>12/31/2016</b>	<b>MSCR BALANCE</b>		<b>\$ (2,759,544)</b>

<sup>1</sup>Costs related to the December 29, 2016 Nor'easter Event, preliminarily estimated at \$200 thousand, were not available at the time this filing was prepared. This event will be included in the 2017 MSCR Report; however, an overview of the event has been provided with this filing.

**Unitil Energy Systems, Inc.**

**Storm Recovery Adjustment Factor Reconciliation**

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
	Beginning Balance	Total Costs	Total Revenue	Ending Balance Before Interest (a + b - c)	Average Monthly Balance ((a+d) / 2)	Interest Rate	Computed Interest	Ending Balance with Interest (d + g)
Jan-16	\$5,951,309 (1)	\$0	\$228,803	\$5,722,506	\$5,836,907	4.52%	\$22,346	\$5,744,852
Feb-16	\$5,744,852	\$0	\$229,538	\$5,515,314	\$5,630,083	4.52%	\$20,164	\$5,535,478
Mar-16	\$5,535,478	\$0	\$214,925	\$5,320,553	\$5,428,015	4.52%	\$20,781	\$5,341,333
Apr-16	\$5,341,333	\$0	\$203,604	\$5,137,730	\$5,239,532	4.52%	\$19,412	\$5,157,142
May-16	\$5,157,142	\$0	\$185,448	\$4,971,694	\$5,064,418	4.52%	\$19,389	\$4,991,083
Jun-16	\$4,991,083	\$0	\$212,549	\$4,778,533	\$4,884,808	4.52%	\$18,098	\$4,796,631
Jul-16	\$4,796,631	\$0	\$245,058	\$4,551,573	\$4,674,102	4.52%	\$17,894	\$4,569,467
Aug-16	\$4,569,467	\$0	\$284,285	\$4,285,182	\$4,427,325	4.52%	\$16,950	\$4,302,132
Sep-16	\$4,302,132	\$0	\$234,138	\$4,067,994	\$4,185,063	4.52%	\$15,505	\$4,083,499
Oct-16	\$4,083,499	\$0	\$193,366	\$3,890,134	\$3,986,816	4.52%	\$15,263	\$3,905,397
Nov-16	\$3,905,397	\$0	\$190,266	\$3,715,131	\$3,810,264	4.52%	\$14,117	\$3,729,248
Dec-16	\$3,729,248	\$0	\$210,874	\$3,518,374	\$3,623,811	4.52%	\$13,873	\$3,532,248

(1) As filed in Unitil Energy Systems, Inc.'s Major Storm Cost Reserve Fund Report, February 26, 2016.

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Attachments

[Attachment A - Notification of Change to Weather Provider Services](#)

[Attachment B - Weather Estimated Impact Indices \(EII\)](#)

[Attachment C - Sample Telvent DTN Weather Forecast](#)

**1. February 5<sup>th</sup>, 2016 (Snow Event)**

**1.1. Description of the Storm**

On the afternoon of February 5<sup>th</sup>, a significant snowstorm impacted the Northeast and northern Mid-Atlantic states. The event brought moderate amounts of heavy wet snow into Unitil’s service territory accompanied by wind gusts exceeding 45MPH along the coast. Although Unitil’s predicted weather conditions did not meet the exclusionary weather criteria, actual conditions caused scattered, numerous outages mainly along the Seacoast throughout the later afternoon, peaking around 4:45 PM. The winter weather caused many broken tree limbs and greatly impacted transportation in the area with a significant number of reported accidents and road closures.



Figure 1 - Radar (Feb 5th 2016)

**1.2. Summary of the Extent of the Storm Damage**

Unitil Energy Systems experienced significant impact to its Seacoast region specifically in the towns of Kingston, Atkinson and Plaistow, as the system moved through the area as detailed in the table below.

Region	Total # Outages	Peak # Outages	Total Customers Interrupted	Peak Customers Interrupted	Percentage Affected (Peak)
Seacoast	46	17	8,631	6,420	20%

**1.3. Preparations**

Once notified of the incoming weather system, Unitil made appropriate internal communications to ensure its staff was in place to monitor the event. With normal staffing in place throughout the day, additional resources were brought in throughout the afternoon once the amount of outages began to escalate and overwhelm local resources. The Seacoast EOC was staffed on a limited basis to manage response activities throughout the evening which included 9 internal line crews, 8 external line crews, 4 tree crews, 4 wires down personnel and 1 crew guide.

**1.4. Restoration**

Nearly all outages that occurred were due to broken tree limbs contacting or breaking wires and damaging electrical equipment. Although most were small, scattered interruptions there was a major interruption which occurred when a large pine outside of the trim zone in a right of way uprooted and toppled onto a sub-transmission line (3356) in Kingston, NH (pictured below).

This outage caused an interruption to over 200 customers, at which point the Company notified the NH PUC in accordance with NH PUC Rule 306.06.



Figure 2 - Uprooted Pine Tree



Figure 3 - Right of Way

1.5. Exclusionary Criteria

Although the weather criteria did not reach the exclusionary criteria, the actual experience of this event met the concurrent trouble requirement for the Seacoast Region (as stated in Section 1.2); therefore all related costs qualify for recovery. Costs recovered through the MSCR are summarized in Section 1.6

1.6. Qualifying Costs Charged to the Storm Reserve

The total amount charged to the storm reserve for this event was \$62,648.

Payroll	\$ 26,778
Materials & Supplies	1,889
Transportation	4,674
Contractor Invoices & Other	39,177
Less Amount Capitalized	(9,870)
<hr/> Total To Storm Reserve	<hr/> \$ 62,648

**2. March 29<sup>th</sup>, 2016 (Wind Event)**

**2.1. Description of the Storm**

On Sunday, March 27<sup>th</sup> Unitil’s weather service provider began forecasting a moderate rain system moving across the region with increasing wind speeds predicted to occur on Tuesday the 29<sup>th</sup>. By the afternoon of the following day (Monday, 28<sup>th</sup>) confidence in the forecast increased with forecasted hazardous wind gusts up to 50 mph along the coastal areas throughout the early morning and afternoon of Tuesday, March 29<sup>th</sup>. Sustained winds varied between 15 and 24 mph, while gusts up to 43 mph were felt across the Seacoast Region before diminishing throughout the evening. The windy conditions caused only minor interruptions across the service territories which were attributed to limb and tree damage.

**2.2. Summary of the Extent of the Storm Damage**

Unitil Energy Systems experienced minimal impact to its service territories as the storm system passed as detailed in the table below.

Region	Total # Outages	Peak # Outages	Total Customers Interrupted	Peak Customers Interrupted	Percentage Affected (Peak)
Seacoast	5	2	343	282	.6%
Capital	2	1	91	54	.1%

**2.3. Preparations**

Once confidence in the forecasted winds increased, the Company initiated a system wide conference call on the 28<sup>th</sup> to coordinate internal preparations based on the most recent forecast. In addition to other preparatory activities, Unitil decentralized its operations with approximately 10 internal line crews, 19 external line crews, 12 tree crews and additional wires down and support personnel available at the EOCs to respond, if needed.

**2.4. Restoration**

With the additional resources secured, the Company was able to swiftly respond and restore the small, scattered outages throughout the morning and afternoon. All outages were restored and each EOC was demobilized by noon the same day (Tuesday, March 29<sup>th</sup>).

**2.5. Exclusionary Criteria**

This event qualified for recovery of preparation costs due to the EEI of 3 for hazardous winds 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**

Valid Time: March 28, 2016 1:00 PM EDT Forecaster: brad.nelson

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	2	1
	Fitchburg	1	2	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 1 - Mar 31)

EEI	Wind Speed	Wind/Gust	Snow	Ice	Confidence Level
1	< 26 mph	< 40 mph	< 18 in.	< 1/10 in.	Low < 30% chance
2	>= 26 mph	>= 40 mph	>= 18 in.	>= 1/10 in.	Medium >= 30% to < 60% chance
3	>= 30 mph	>= 45 mph	>= 24 in.	>= 3/8 in.	High >= 60% chance
4	>= 40 mph	>= 50 mph	>= 36 in.	>= 1/2 in.	
5	>= 45 mph	>= 60 mph	>= 48 in.	>= 1 in.	

Definition of WET snow (T>=30F)

EEI Value	Wet Snow
EEI 1	<5"
EEI 2	>5"
EEI 3	>6"
EEI 4	>12"
EEI 5	>18"

Date: March 28, 2016

Time: 1:00 PM EDT

Forecaster: B NELSON

Zones	SEACOAST	CAPITAL	FITCHBURG	PORTLAND
Event Starting in 30hrs	GUSTS	GUSTS	GUSTS	GUSTS/RAIN
Event Begin Time	8AM TUE	7AM TUE	7AM TUE	10AM TUE
Event End Time	6PM TUE	5PM TUE	5PM TUE	8PM TUE
Tstrm Wind Gusts				
Ltng				
Storm Mvmt Dir				
Rain Amount				0.75-1.25"
Snow Amount				
Snow Character				
Ice Amount				
Sustained Wind	15-25	15-25	15-25	15-25
Wind Gust	35-50	35-45	35-45	35-50
Temp. Extremes	44/35	41/34	42/35	43/32

**UNITIL SERVICE AREA 48 HOUR OUTLOOK:**

**CAPITAL:** Rain looks to continue through 8-9pm this evening before ending. Total rainfall: 0.60-1.00". Thereafter, a few spotty rain and snow showers may occur overnight, but generally dry weather is expected after 9pm. Dry conditions are expected on Tuesday. Winds will increase tonight through Tuesday, becoming west to northwest sustained: 15-25 mph. Common gusts: 35-45 mph. Isolated peak gusts: 45-50 mph. Hazard wind timing: 7am-5pm Tue.

**Confidence:** High that hazard gusts will occur on Tuesday. Chance of EEI-2 gusts: 70%. Chance of EEI-3 gusts: 30%. High confidence that rainfall will stay below hazard levels of 1". Chance of rainfall exceeding 1": 30%. High confidence that no other hazards will occur over the next 48 hours.

FITCHBURG: Rain looks to continue through 8-9pm this evening before ending. Total rainfall: 0.60-1.00". Thereafter, dry weather is expected overnight. Dry conditions are expected on Tuesday. Winds will increase tonight through Tuesday, becoming west to northwest sustained: 15-25 mph. Common gusts: 35-45 mph. Isolated peak gusts: 45-50 mph. Hazard wind timing: 7am-5pm Tue.

Confidence: High that hazard gusts will occur on Tuesday. Chance of EEI-2 gusts: 70%. Chance of EEI-3 gusts: 30%. High confidence that rainfall will stay below hazard levels of 1". Chance of rainfall exceeding 1": 20%. Confidence is high that no other hazards will occur over the next 48 hours.

SEACOAST: Rain looks to continue through 9-10pm this evening before ending. Total rainfall: 0.60-1.00". Thereafter, dry weather is expected overnight. Dry conditions are expected on Tuesday. Winds will increase tonight through Tuesday, becoming west to northwest sustained: 15-25 mph. Common gusts: 35-45 mph. Isolated peak gusts: 45-50 mph. Hazard wind timing: 8am-6pm Tue.

Confidence: High that hazard gusts will occur on Tuesday. Chance of EEI-2 gusts: 80%. Chance of EEI-3 gusts: 50%. High confidence that rainfall will stay below hazard levels of 1". Chance of rainfall exceeding 1": 30%. Confidence is high that no other hazards will occur over the next 48 hours.

PORTLAND: Rain looks to continue through 2-4am tonight before ending. Total rainfall: 0.75-1.25". Thereafter, a few spotty rain and snow showers may occur into early Tuesday morning, but generally dry weather is expected after 4am. Dry conditions are expected the remainder of Tuesday. Winds will increase tonight through Tuesday, becoming west to northwest sustained: 15-25 mph. Common gusts: 35-45 mph. Isolated peak gusts: 45-50 mph. Hazard wind timing: 10am-8pm Tue.

Confidence: High that hazard gusts will occur tonight through Tuesday. Chance of EEI-2 gusts: 80%. Chance of EEI-3 gusts: 50%. High confidence that rainfall will exceed 1" across portions of the service area, especially near Lewiston. Chance of rainfall exceeding 1": 50%. Confidence is high that no other hazards will occur over the next 48 hours.

UNITIL SERVICE AREA 3-5 DAY OUTLOOK: Dry conditions and lighter winds are expected Wednesday. On Thursday, spotty light rain showers will be possible during the morning. Dry conditions are expected for the afternoon hours. Thursday evening and night, rain showers will move back in. Isolated embedded thunderstorms will be possible Thursday night. Lightning amounts: Low. Winds will increase on Thursday morning and remain elevated throughout the day, with near hazard gusts possible. On Friday, light to moderate rain will remain possible through the day. Dry conditions are expected for the evening and overnight.

Confidence: Medium that hazard gusts will occur on Thursday. Chance of EEI-2 gusts: 50%. Chance of EEI-3 gusts: 30%. Low confidence in thunderstorms occurring on Thursday night. Lightning chance: 20%. Confidence is high that no other hazards will occur over the 3-5 day period.

## 2.6. Qualifying Costs Charged to the Storm Reserve

The total amount charged to the storm reserve for this event was \$93,209.

Contractor Invoices & Other	\$ 93,209
<hr/>	
Total To Storm Reserve	\$ 93,209

### **3. April 3<sup>rd</sup>, 2016 (Wind Event)**

#### **3.1. Description of the Storm**

The Region had already experienced a period of wind and thunderstorm activity when forecasters began predicting another round of hazardous winds moving into the Region on Sunday April 3<sup>rd</sup>. By the afternoon of April 1<sup>st</sup> gusts up to 50 mph were being predicted throughout the service territory. Sustained winds varied between 9 and 30 mph while gusts up to 41 mph were felt across the Seacoast Region before diminishing throughout the evening. The windy conditions caused only minor interruptions in the service territories mostly attributed to limb and tree damage.

#### **3.2. Summary of the Extent of the Storm Damage**

Unitil Energy Systems experienced minimal impact to its service territories as the storm system passed with only 4 outages (2 in each Region) occurring throughout the early morning impacting only 30 customers.

#### **3.3. Preparations**

Once confidence in the forecasted winds increased, the Company initiated a system wide conference call to coordinate internal preparations based on the most recent forecast. In addition to other preparatory activities, Unitil had approximately 9.5 internal line crews, 20 external line crews, 13 tree crews and additional wires down and support personnel available to respond to outages in the state, if needed.

#### **3.4. Restoration**

With the additional resources in place, the Company was able to quickly respond to the reported outages and restore the 30 impacted customers.

#### **3.5. Exclusionary Criteria**

This event qualified for recovery of preparation costs due to the EEI of 3 for hazardous winds 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 3.6.

**Energy Event Index for UNITIL**

Valid Time: April 2, 2016 6:00 AM EDT Forecaster: nathan.hamblin

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Capital	1	3	1
	Fitchburg	1	3	1
	Portland	1	3	1
	Seacoast	1	3	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	Medium
	Seacoast	High	High	Medium

**Energy Event Index Definition**

With Leaves (Apr 1 - Oct 31) (summer override)

EEI	Wind Speed	Wind/Gust	Snow	Ice	Confidence Level
1	< 20 mph	< 30 mph	< 4 in.	< 1/10 in.	Low < 30% chance
2	>= 20 mph	>= 30 mph	>= 4 in.	>= 1/10 in.	Medium >= 30% to < 60% chance
3	>= 25 mph	>= 40 mph	>= 5 in.	>= 3/8 in.	High >= 60% chance
4	>= 40 mph	>= 50 mph	>= 10 in.	>= 1/2 in.	
5	>= 45 mph	>= 60 mph	>= 16 in.	>= 1 in.	

Definition of WET snow (T>=30F)

EEI Value	Wet Snow
EEI 1	<4"
EEI 2	>4"
EEI 3	>5"
EEI 4	>10"
EEI 5	>16"

Date: April 2, 2016

Time: 6:00 AM EDT

Forecaster: N Hamblin

Zones	SEACOAST	CAPITAL	FITCHBURG	PORTLAND
Event Starting in 30hrs	WIND/GUST	WIND/GUST	WIND/GUST	WIND/GUST
Event Begin Time	9AM SUN	9AM SUN	9AM SUN	9AM SUN
Event End Time	8PM SUN	8PM SUN	8PM SUN	8PM SUN
Tstrm Wind Gusts				
Ltng				
Storm Mvmt Dir				
Rain Amount				
Snow Amount				
Snow Character				
Ice Amount				
Sustained Wind	22-30	22-30	22-30	22-30
Wind Gust	40-50	40-50	40-50	40-50
Temp. Extremes	51/33	53/32	52/33	50/33

**UNITIL SERVICE AREA 48 HOUR OUTLOOK:**

**CAPITAL:** Light rain showers will be possible later this morning through this evening. Rainfall amounts: 0.10-0.20". Winds could gust to 20-25 mph this afternoon. Dry conditions will take over through most of tonight. Snow will be possible from 4am-9am Sunday. Snow accumulation: Tr-1". Snow character: Wet. Hazard winds are expected. Hazard wind timing: 9am-7pm Sunday. Northwest winds sustained: 22-30 mph. Frequent gusts: 35-45 mph. Peak gusts: 45-50 mph. Wind chances: EEI-2 100%, EEI-3 90%, EEI-4 40%. Dry weather and decreasing winds are expected on Sunday night.

**Confidence:** Confidence is high that winds will reach hazard levels on Sunday. Wind chances: EEI-2 100%, EEI-3 90%, EEI-4 40%. Otherwise, confidence is high that no hazard conditions will occur through the next 48 hours.

FITCHBURG: Light rain showers will be possible later this morning through this evening. Rainfall amounts: 0.10-0.20". Winds could gust to 20-25 mph this afternoon. Dry conditions will take over through most of tonight. Snow will be possible from 4am-10am Sunday. Snow accumulation: Tr-2". Snow character: Wet. Hazard winds are expected. Hazard wind timing: 9am-8pm Sunday. Northwest winds sustained: 22-30 mph. Frequent gusts: 35-45 mph. Peak gusts: 45-50 mph. Wind chances: EEI-2 100%, EEI-3 90%, EEI-4 40%. Dry weather and decreasing winds are expected on Sunday night.

Confidence: Confidence is high that winds will reach hazard levels on Sunday. Wind chances: EEI-2 100%, EEI-3 90%, EEI-4 40%. Otherwise, confidence is high that no hazard conditions will occur through the next 48 hours.

CAPITAL: Light rain showers will be possible later this morning through this evening. Rainfall amounts: 0.10-0.20". Winds could gust to 20-25 mph this afternoon. Dry conditions will take over through most of tonight. Snow will be possible from 5am-10am Sunday. Snow accumulation: Tr-1". Snow character: Wet. Hazard winds are expected. Hazard wind timing: 9am-8pm Sunday. Northwest winds sustained: 22-30 mph. Frequent gusts: 35-45 mph. Peak gusts: 45-50 mph. Wind chances: EEI-2 100%, EEI-3 90%, EEI-4 40%. Dry weather and decreasing winds are expected on Sunday night.

Confidence: Confidence is high that winds will reach hazard levels on Sunday. Wind chances: EEI-2 100%, EEI-3 90%, EEI-4 40%. Otherwise, confidence is high that no hazard conditions will occur through the next 48 hours.

PORTLAND: Light rain showers will be possible later this morning through this evening. Rainfall amounts: 0.10-0.20". Winds could gust to 20-25 mph this afternoon. Dry conditions will take over through most of tonight. Snow will be possible from 6am-10am Sunday. Snow accumulation: Half inch or less. Snow character: Wet. Hazard winds are expected. Hazard wind timing: 9am-8pm Sunday. Northwest winds sustained: 22-30 mph. Frequent gusts: 35-45 mph. Peak gusts: 45-50 mph. Wind chances: EEI-2 100%, EEI-3 90%, EEI-4 40%. Dry weather and decreasing winds are expected on Sunday night.

Confidence: Confidence is high that winds will reach hazard levels on Sunday. Wind chances: EEI-2 100%, EEI-3 90%, EEI-4 40%. Otherwise, confidence is high that no hazard conditions will occur through the next 48 hours.

UNITIL SERVICE AREA 3-5 DAY OUTLOOK: The next system will bring a risk of accumulating snow from 8-9am through 3-4pm Monday. Snow accumulation: 1-2" for most and 1" or less for Portland. The event has trended faster and further south. Snow chance: EEI-2 10%. Wind gusts should be less than 20 mph through this event. Dry conditions are expected on Monday night and Tuesday. Breezy winds will be possible on Monday night and Tuesday with gusts of 20-25 mph. Peak gusts: 25-30 mph for Seacoast and Portland. Wind chance: EEI-2 30%. Dry weather and light winds are expected on Wednesday. Light rain/snow showers are possible on Wednesday night. Little accumulation is expected.

Confidence: Confidence is medium that hazard winds will occur across Seacoast and Portland on Monday night and Tuesday. Wind chance: EEI-2 30%. Otherwise, confidence is high that no hazard conditions will occur through the day 3-5 period.

### 3.6. Qualifying Costs Charged to the Storm Reserve

The total amount charged to the storm reserve for this event was \$47,009.

Payroll	\$ 1,181
Transportation	280
Contractor Invoices & Other	45,548
<u>Total To Storm Reserve</u>	<u>\$ 47,009</u>

**4. July 18<sup>th</sup>, 2016 (T-Storm/Microburst)**

**4.1. Description of the Storm**

Isolated showers and thunderstorms were forecasted to be possible throughout the evening of Sunday, July 17<sup>th</sup> with another system spreading across the Region the following day (Monday July, 18<sup>th</sup>). By noontime on Monday, a severe thunderstorm watch was in effect throughout the region from 2-9 PM with predicted wind gusts up to 55 mph, hail and moderate amount of lightning. At approximately 3:18 PM, a microburst with winds estimated between 80 and 90 mph, developed in the area southern area in the town of Plaistow, NH. Although brief, the microburst snapped and uprooted hundreds of trees and caused major damage in the area including numerous wires down and broken poles resulting in customer interruptions, travel hazards and several homes and business damaged.



Figure 4 - Radar (Jul 18 2016)

**4.2. Summary of the Extent of the Storm Damage**

The microburst produced large hail and wind speeds up to 90 mph which swept through the southern area of Plaistow taking down large trees and utility poles while damaging property and littering roads with debris. The Company began to receive reports of the damage and impacted customers, immediately following the microbursts departure at approximately 3:20 PM which were nearly all attributed to tree contact. Travel was nearly impossible in certain areas of Plaistow with roads blocked by large trees and debris. Many of Unitil’s (and other utility assets) were damaged as a result including several broken poles, crossarms, transformers, and several areas of downed wires.

Region	Total # Outages	Peak # Outages	Total Customers Interrupted	Peak Customers Interrupted	Percentage Affected (Peak)
Seacoast	14	13	2,750	2,723	6%
Capital	2	2	5	5	.01%



Figures 5 - Microburst Damage (Plaistow)

#### 4.3. Preparations

The State of New Hampshire did not activate its EOC, however, it did create an event in NH's WebEOC to monitor the storms progression across the region due to the hazardous hail, lightning and high winds being predicted. Unitil personnel were on hand to monitor the storm as it moved across the region and promptly decentralized its operations. Additional resources were acquired once the Company was notified of the significant damage made in the Plaistow area with the Seacoast EOC being activated. The Company had access to 8 internal line crews, 14 external line crews, 7 tree crews and support personnel who worked throughout the evening and overnight hours until all customers were restored.

#### 4.4. Restoration

Immediately following the event Unitil crews were dispatched to various locations as they were notified of damage. A Unitil crew supervisor also reported to the Plaistow EOC, which was opened in response to the significant damage to coordinate public safety efforts between responders. The Company worked closely with public safety and highway personnel to coordinate road clearings and the removal of downed power line equipment posing public safety risks.

Once additional line resources arrived, the Company was able to restore impacted customers throughout the evening and overnight hours. Though most customers were restored by 5:00 AM, there remained significant damage to equipment in certain areas that required the crews to continue working throughout the morning hours to restore isolated customer house services.

Unitil coordinated with FairPoint and others responders to repair 15 utility poles, 21 crossarms, 50 insulators, over 950 feet of primary and secondary wires as well as approximately 1000 feet of service cable wire and a number of transformers.

#### 4.5. Exclusionary Criteria

The EII's predicted for the winds associated with the passing storms did not reach exclusionary criteria (3 with medium confidence in Capital; 2 with high confidence in Seacoast) however the storm produced an unexpected microburst with winds between 80-90 mph which heavily damaged certain areas. Although most customers were restored within 14 hours and the event did not reach outage exclusionary criteria, restoration and repairs were ongoing as many temporary repairs were made during the event. The Company views this restoration as an exogenous event and seeks recovery of its cost as discussed in DE 10-055 Section 8.2.



National Weather Service National Headquarters  
**National Weather Service**

**Public Information Statement**

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Public Information Statement  
National Weather Service **Gray** ME  
240 PM EDT TUE JUL 19 2016

...**Microburst** Confirmed in the Town of **Plaistow** in Rockingham County New Hampshire...

Location...**Plaistow** in Rockingham County New Hampshire  
Date...July 18 2016  
Estimated Time...3:18 PM EDT  
Estimated Maximum Wind Speed...80 to 90 mph  
Maximum Path Width...2.0 miles  
Path Length...1.6 miles  
Beginning Lat/Lon...42.815557N / 71.094660W  
Ending Lat/Lon...42.823663N / 71.058942W  
\* Fatalities...0  
\* Injuries...0

\* The information in this statement is preliminary and subject to change pending final review of the event(s) and publication in **NWS** Storm Data.

...Summary...  
The National Weather Service in **Gray** ME has confirmed **microburst** damage in the Town of **Plaistow** in Rockingham County New Hampshire on July 18 2016.

Winds estimated at 80 to 90 mph snapped or uprooted hundreds of trees in the southern section of the town. Numerous structures were damaged by falling trees. Dozens of utility poles and wires were also downed.

**Energy Event Index for UNITIL**

Valid Time: July 18, 2016 12:00 PM EDT Forecaster: jeremy.rossow

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	3	1	1
	Fitchburg	2	1	1
	Portland	2	1	1
	Seacoast	2	1	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 - Oct 31)

EEI	Wind Speed	Wind/Gust	Confidence Level
1	< 20 mph	< 30 mph	Low
2	>= 20 mph	>= 30 mph	Medium
3	>= 25 mph	>= 40 mph	High
4	>= 40 mph	>= 50 mph	
5	>= 45 mph	>= 60 mph	

Zones	SEACOAST	CAPITAL	FITCHBURG	PORTLAND
Event Starting in 30hrs	TSTORMS	TSTORMS	TSTORMS	TSTORMS
Event Begin Time	3pm Mon	3pm Mon	3pm Mon	4pm Mon
Event End Time	9pm Mon	8pm Mon	8pm Mon	10pm Mon
Tstrm Wind Gusts	35-50	45-55	35-50	30-45
Ltng	MED	HIGH	MED-HIGH	MED
Storm Mvmt Dir	ESE	ESE	ESE	ESE
Rain Amount				
Snow Amount				
Snow Character				
Ice Amount				
Sustained Wind				
Wind Gust				
Temp. Extremes	93/68	92/67	95/72	87/66

**UNITIL SERVICE AREA 48 HOUR OUTLOOK:**

**SEVERE THUNDERSTORM WATCH IN EFFECT FOR ALL ZONES THROUGH 8PM.**

**CAPITAL:** A broken line of rain and thunderstorms is anticipated from 2-9pm today. Main threats: Wind gusts to 55 mph, hail to 1" in diameter, and medium amounts of lightning. Rainfall: 0.20-0.40" on average, peak totals 1.00-1.25". Severe threat should end by 5pm. Dry and non-hazard after 9pm Mon through 6am Wed.

**Confidence:** Confidence is high in thunderstorms occurring. Thunderstorm gust chance: 20% EEI-4; 50% EEI-3; 60% EEI-2. Storms may take 1-2 more hours to vacate the region. High confidence in non-hazard conditions after today's event.

**FITCHBURG:** A broken line of rain and thunderstorms is anticipated from 2-8pm today. Main threats: Wind gusts to 50 mph, hail to 0.75" in diameter, and medium amounts of lightning. Rainfall: 0.20-0.40" on average, peak totals to 0.65". Severe threat should end by 5pm. Dry and non-hazard after 8pm Mon through 6am Wed.

**Confidence:** Confidence is high in thunderstorms occurring. Thunderstorm gust chance: 20% EEI-4; 40% EEI-3; 70% EEI-2. Storms may take 1-2 more hours to vacate the region. High confidence in non-hazard conditions after today's event.

**SEACOAST:** A broken and decaying line of rain and thunderstorms is anticipated from 3-9pm today. Main threats: Wind gusts to 45 mph, hail to 0.50" in diameter, and medium amounts of lightning. Rainfall: 0.20-0.40" on average, peak totals to 0.75". Dry and non-hazard after 9pm Mon through 6am Wed.

**Confidence:** Confidence is high in thunderstorms occurring. Thunderstorm gust chance: 15% EEI-3; 50% EEI-2. Storms may take 1-2 more hours to vacate the region. High confidence in non-hazard conditions after today's event.

**PORTLAND:** A decaying area of rain and thunderstorms is anticipated to move through the area between 4-10pm tonight. Main threats: Wind gusts to 35 mph and low amounts of lightning. Rainfall totals: 0.15-0.30". Dry from 10pm through 6am Wed.

**Confidence:** Overall confidence is high. Thunderstorm gust chance: 5% EEI-3; 50% EEI-2. Storms may take 1-2 more hours to vacate the region. High confidence in non-hazard conditions after today's event.

**UNITIL SERVICE AREA 3-5 DAY OUTLOOK:** Isolated showers and thundershowers possible Thursday evening into Thursday night. EEI-2 gusts look possible. Friday holds a better chance for thunderstorms.

**Confidence:** Confidence is high that no hazards will occur on Tuesday through Thursday evening. Confidence is medium that storms would occur Thursday evening through Thursday night. Thunderstorm chance: 30%. Confidence is low for Friday, with wide model disagreements

**TODAY**

A frontal boundary will drag scattered showers and thunderstorms thru the region this afternoon. Some strong to severe storms will be possible over central and eastern New York, Vermont, western and northern New Hampshire, northern and western Maine, western Massachusetts, and western Connecticut. Storms in New York will be strong to severe from the early afternoon through the late

afternoon, with storms in New England strong to severe from the late afternoon through the early evening hours. Main threats will come from wind gusts to 60 mph, hail to 1 inch in diameter, and heavy rains. Storms will likely be dissipating during the late evening hours, with just showers and a few rumbles of thunder along the Atlantic coast. The post-midnight hours look fairly quiet across the region. Temperatures will be well above normal, with departures of 10-20 degrees anticipated.

**TODAY'S Forecast Confidence: Medium**

*The primary concern will be from major hourly trend issues during the afternoon and evening hours as storms impact reporting locales. Highs should be able to be reached before storm development, although if clouds can get going a bit sooner, some stations may come in 2-4 cooler. Overnight lows look okay on the whole, but may be 2-5 cooler in areas hit hard by rain late in the evening.*

**TOMORROW**

A few pop-up showers or thundershowers will be possible in the higher terrain of Upstate New York, Vermont, New Hampshire, and northern Maine during the afternoon hours. No strong or severe storms are anticipated. Overnight hours will be quiet. Temperatures will take quite the tumble for all but Southern New York and southern Coastal New England. Readings away from those places will be near to slightly below normal, while those mentioned places will remain above normal by 5-10 degrees.

**TOMORROW'S Forecast Confidence: Medium - High**

*No significant temperature concerns are anticipated.*

**3-5 DAY EXTENDED OUTLOOK**

Wednesday looks dry. A weak front will bring some scattered showers and thunderstorms to northern New England and Upstate New York late Thursday. Friday will see scattered to widespread showers and thunderstorms for the bulk of the region. Temperatures will be warming through the late week period. Readings Wednesday will be near to slightly above normal, and by Friday we're calling for readings 10-25 above normal.

4.6. Qualifying Costs Charged to the Storm Reserve

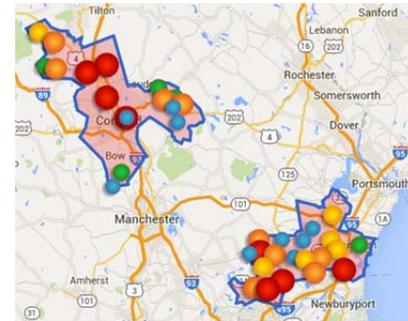
The total amount charged to the storm reserve for this event was \$172,355.

Payroll	\$ 44,252
Materials & Supplies	9,831
Transportation	11,443
Contractor Invoices & Other	178,353
Less Amount Capitalized	(71,524)
<hr/> Total To Storm Reserve	<hr/> \$ 172,355

**5. July 23<sup>rd</sup>, 2016 (T-Storms/Lightning)**

**5.1. Description of the Storm**

A period of scattered thunderstorms was forecasted to be possible across the service territory throughout the evening of Saturday July 23<sup>rd</sup> with moderate gusts (35-55 mph) and medium amounts of lightning expected however low confidence was predicted that hazardous levels (EEI-3) would develop. As the storm moved across the Region, strong wind gusts (up to 50 mph) and high amounts of lightning caused a large amount of scattered outages across Unitil’s service territories.



**Figure 6 - Unitil Outage Map  
Jul 23 2016 8 PM**

**5.2. Summary of the Extent of the Storm Damage**

Customer interruptions began around 6:00 PM and had a peak customer impact of about 14,000 customers at approximately 8:00 PM on Saturday July 23<sup>rd</sup>. UES experienced a total of 70 cases of troubles across both regions (Seacoast experienced the most customer impacts) with most of the outages being attributed to downed branches or tree limb contact.

Region	Total # Outages	Peak # Outages	Total Customers Interrupted	Peak Customers Interrupted	Percentage Affected (Peak)
Seacoast	29	21	9,856	9,423	20%
Capital	41	33	4,925	4,770	16%

**5.3. Preparations**

Unitil personnel were on hand to monitor the storm as it moved across the region and promptly decentralized its operations and requested additional resources once outages began to overwhelm the normal on-call resources. Once the Seacoast and Capital EOCs were staffed, crews worked throughout the overnight hours to restore customers. Outage updates and communications to municipal officials and the public was consistently provided throughout the event. Multiple internal conference calls were also held with key response personnel throughout the evening of the 23<sup>rd</sup> and again on the morning of the 24<sup>th</sup> to ensure all support activities were in place and restoration progress was proceeding smoothly and documented. The Company had access to 8 internal line crews, 11 external line crews, 12 tree crews and wires down and support personnel to respond with additional resources arriving the following day, if needed.

**5.4. Restoration**

Immediately following the event Unitil crews were dispatched to various locations as they were notified of damage. The Company coordinated with Municipal Officials on public safety risks while responding to outages. The Company was able to restore many of the impacted customers overnight with only a small number of impacted customers being restored by 2 PM the following day (Jul 24<sup>th</sup>). Due to the regional impact of the storm, additional crews retained for restoration that were not needed (due to the progress made overnight) and were sent to a neighboring utility.

5.5. Exclusionary Criteria

This met the outage criteria to qualify for recovery of costs, (see Section 5.2); therefore all restoration costs qualify for recovery. Restoration costs recovered through the MSCR are summarized in Section 5.6.

5.6. Qualifying Costs Charged to the Storm Reserve

The total amount charged to the storm reserve for this event was \$197,744.

Payroll	\$ 68,553
Materials & Supplies	9,815
Transportation	10,436
Contractor Invoices & Other	147,590
Less Amount Capitalized	(38,649)
<u>Total To Storm Reserve</u>	<u>\$ 197,744</u>

**6. December 29<sup>th</sup>, 2016 (Nor'Easter)**

6.1. Description of the Storm

Beginning on Tuesday, December 27<sup>th</sup>, Unitil's weather provider began forecasting a high impact nor'easter to impact the region during the early morning hours of Friday the 29<sup>th</sup> with a mix of heavy precipitation (rain/snow) and strong winds along the coast. Several winter storm warnings were issued for the event overnight on Thursday with snow expected to fall at rates up to 1-2" an hour and frequent wind gusts up to 45 mph. Up to a foot of wet snow was forecasted to fall across the service territories however this amount was dependent on the current temperatures in the area which were favorable (warmer) resulting in more rain than snow in most areas and lower snow totals.

6.2. Summary of the Extent of the Storm Damage

Unitil Energy Systems a limited impact to its service territories as the storm system passed overnight on the 29<sup>th</sup> as detailed in the table below.

Region	Total # Outages	Peak # Outages	Total Customers Interrupted	Peak Customers Interrupted	Percentage Affected (Peak)
Seacoast	10	6	2,213	2,025	4%
Capital	3	2	195	167	.01%

6.3. Preparations

Once aware of a potential weather event, Unitil began its preparations by holding a series of storm conference calls beginning on Tuesday to coordinate preparation activities. Based on the forecasted weather and potential for outages, the Company issued a PSA and initiated contact with life support customers, regulators, emergency response, and municipal officials. Both the Seacoast and Capital EOC's were staffed throughout the night of the 29<sup>th</sup> to monitor the event with additional staff and crews reporting in at 6:00 AM the following morning.

6.4. Restoration

Although the storm was predicted to bring up to 14 inches of wet snow in certain areas of the region, the warmer temperatures diminished these amounts. In the end about 4-6 inches was reported in most areas. Unitil had secured resources in advance of the event based on the predicted weather conditions and had 9 internal line crews, 31 external line crews, 28 tree crews, 8 damage assessors, 20 wires down personnel and additional support staff. Crews were able to quickly restore all affected customer overnight

6.5. Exclusionary Criteria

This event qualified for recovery of preparation costs due to the EEI of 4 for hazardous winds 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 6.6.

**Energy Event Index for UNITIL**

Your forecast administrator: [murphyt@unitil.com](mailto:murphyt@unitil.com)

Valid Time: December 28, 2016 6:00 AM EST

Forecaster: cody.fishman

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	3
	Fitchburg	1	1	3
	Portland	1	1	4
	Seacoast	1	1	4
Snow	Capital	1	4	1
	Fitchburg	1	4	1
	Portland	1	3	1
	Seacoast	1	3	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	Medium	High
	Seacoast	High	Medium	High

**Energy Event Index Definition**

No Leaves (Nov 15 - Mar 31)

EEI	Wind Speed	Wind/Gust	Snow	Ice
1	< 26 mph	< 40 mph	< 18 in.	< 1/10 in.
2	>= 26 mph	>= 40 mph	>= 18 in.	>= 1/10 in.
3	>= 30 mph	>= 45 mph	>= 24 in.	>= 3/8 in.
4	>= 40 mph	>= 50 mph	>= 36 in.	>= 1/2 in.
5	>= 45 mph	>= 60 mph	>= 48 in.	>= 1 in.

Confidence Level	
Low	< 30% chance
Medium	>= 30% to < 60% chance
High	>= 60% chance

Definition of WET snow(T>=30F)

EEI Value	Wet Snow
EEI 1	<5"
EEI 2	>5"
EEI 3	>6"
EEI 4	>12"
EEI 5	>18"

Date: December 28, 2016

Time: 6:00 AM EST

Forecaster: C Fishman

Zones	SEACOAST	CAPITAL	FITCHBURG	PORTLAND
Event Starting in 30hrs	SNOW	SNOW	SNOW	SNOW
Event Begin Time	10am Thurs	10am Thurs	10am Thurs	11am Thurs
Event End Time	8am Fri	7am Fri	6am Fri	8am Fri
Tstrm Wind Gusts				
Ltng				
Storm Mvmt Dir				
Rain Amount				
Snow Amount	3-10"	6-13"	5-12"	5-10"
Snow Character	WET	NRM-WET	NRM-WET	WET
Ice Amount				
Sustained Wind				
Wind Gust				
Temp. Extremes	39/19	39/19	40/21	39/19

**UNITIL SERVICE AREA 48 HOUR OUTLOOK:**

**CAPITAL:** Dry, non-hazard conditions expected through tonight. Thursday morning a storm system enters the region with hazard snow expected. Snow showers will likely continue into Friday morning. Snow accumulation: see table. Chance of EEI-3 snow: 70%; Chance of EEI-4 snow: 40%. Sustained winds today: 3-15 mph; Gusts: 18-25 mph. Winds will increase late Thursday night through Friday out of the west-northwest. Sustained: 15-30 mph; Common gusts: 30-40 mph; Peak gusts: 40-45 mph. EEI-2 gust chance Thursday night: 60%; EEI-3 gust chance Thursday night: 30%.

Confidence: High that hazard snow will occur over the next 48 hours. Confidence is also high that hazard winds/gusts will occur Thursday night through Friday.

**FITCHBURG:** Dry, non-hazard conditions expected through tonight. Thursday morning a storm system enters the region with hazard snow expected. Snow showers will likely continue into Friday morning. Snow accumulation: see table. Chance of EEI-3 snow: 70%; Chance of EEI-4 snow: 30% Sustained winds today: 3-12 mph; Gusts: 15-25 mph. Winds will increase late Thursday night through Friday out of the

west-northwest. Sustained: 15-30 mph. Common gusts: 30-40 mph. Peak gusts: 40-45 mph. EEI-2 gust chance Thursday night: 60%; EEI-3 gust chance Thursday night: 30%.

Confidence: High that hazard snow will occur over the next 48 hours. Confidence is also high that hazard winds/gusts will occur Thursday night through Friday.

SEACOAST: Dry, non-hazard conditions expected through tonight. Thursday morning a storm system enters the region with hazard snow possible. Snow showers will likely continue into Friday morning. The event will likely begin as rain and hazard snow will be possible if a transition to snow occurs earlier than anticipated. Snow accumulation: see table. Chance of EEI-3 snow: 70%. Sustained winds today: 3-15 mph; Gusts: 18-28 mph. Winds will increase late Thursday night through Friday out of the west-northwest. Sustained: 15-30 mph; Common gusts: 30-40 mph; Peak gusts: 45-50. EEI-2 gust chance Thursday night: 70%; EEI-3 gust chance Thursday night: 40%; EEI-4 gust chance Thursday night: 20%

Confidence: High that hazard snow will occur over the next 48 hours. Confidence is also high that hazard winds/gusts will occur Thursday night through Friday.

PORTLAND: Dry, non-hazard conditions expected through tonight. Thursday morning a storm system enters the region with hazard snow possible. Snow showers will likely continue into Friday morning. The event will likely begin as snow and transition to rain briefly Thursday night before returning to snow overnight. Hazard snow will be possible if a transition to snow occurs earlier than anticipated. Snow accumulation: see table. Chance of EEI-3 snow: 60%; Chance of EEI-4 snow: 30%. Sustained winds today: 3-15 mph; Gusts: 18-25 mph. Winds will increase late Thursday night through Friday out of the west-northwest. Sustained: 15-30 mph; Common gusts: 30-40 mph; Peak gusts: 45-50. EEI-2 gust chance Thursday night: 70%; EEI-3 gust chance Thursday night: 40%; EEI-4 gust chance Thursday night: 20%

Confidence: High that hazard snow will occur over the next 48 hours. Confidence is also high that hazard winds/gusts will occur Thursday night through Friday.

UNITIL SERVICE AREA 3-5 DAY OUTLOOK: Moderate to heavy snow continues into Friday morning, mainly in Portland. Elsewhere, light snow showers/flurries will be possible for the remainder of the day and night. Additional accumulations: 1-4". Dry, non-hazard conditions expected during the day Saturday with light snow showers becoming possible Saturday evening and night. Additional accumulations: Trace-2". Non-hazard winds are expected Saturday with gusts to 20-30 mph. Isolated flurries are possible Sunday morning, however mainly dry and non-hazard conditions are expected Sunday.

Confidence: High that hazard snow event will continue from Thursday through Friday morning. Confidence is also high that hazard wind gusts will continue from Thursday night through Friday. EEI-2 gust chance: 60% Capital/Fitchburg; 70% Seacoast/Portland. EEI-3 gust chance: 30% Capital/Fitchburg; 40% Seacoast/Portland. EEI-4 gust chance: 20% Seacoast/Portland. Confidence is high that no other hazards will occur during the 3-5 day period.

#### 6.6. Qualifying Costs Charged to the Storm Reserve

Costs related to this event, preliminarily estimated at \$200 thousand, were not available at the time this filing was prepared. Costs for this event will be included in the 2017 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 Estimated Impact Indices (EII) similar to the PDI (see Attachment A for the criteria composing the EII). 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 EII; however, to better align the EII levels with the operational levels in Unitil's Emergency Response Plan (ERP), we began the EII at Level 1, which differs from the former PDI that began at Level 0. Therefore, an EII Level 3 is equivalent to the PDI Level 2.

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

- 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

**Estimated Impact Indices (EII)**

Forecasted Wind Speed/Wind Gusts **\*WITH LEAVES\*** (April 1 - November 14)

<b>Level</b>	<b>Wind Speed</b>	<b>Wind Gusts</b>
EII = 2	> 20 mph	> 30 mph
EII = 3	> 25 mph	> 40 mph
EII = 4	> 40 mph	> 50 mph
EII = 5	> 45 mph	> 60 mph

Forecasted Wind Speed/Wind Gusts **\*WITHOUT LEAVES\*** (November 15 - March 31)

<b>Level</b>	<b>Wind Speed</b>	<b>Wind Gusts</b>
EII = 2	> 26 mph	> 40 mph
EII = 3	> 30 mph	> 45 mph
EII = 4	> 40 mph	> 50 mph
EII = 5	> 45 mph	> 60 mph

Forecasted Ice Accretion (assumes “normal” wind speed)

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

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

<b>Level</b>	<b>Snow</b>
EII = 1	> 6 inches
EII = 1	> 12 inches
EII = 2	> 18 inches
EII = 3-5	> 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.

<b>Level</b>	<b>Snow (Without Leaves)</b>
EII = 2	> 5 inches
EII = 3	> 6 inches
EII = 4	> 12 inches
EII = 5	> 18 inches

Forecast Confidence Levels

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

Attachment C

**Sample Weather Forecast with EII Table**

**Energy Event Index for UNITIL**

Your forecast administrator: [murphyt@unitil.com](mailto:murphyt@unitil.com)

Valid Time: January 17, 2017 6:00 AM EST

Forecaster: kyle.koval

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	2	2	1
	Fitchburg	2	2	1
	Portland	2	2	1
	Seacoast	2	2	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	Medium	Medium	High
	Portland	High	High	High
	Seacoast	High	High	High

**Energy Event Index Definition**

No Leaves (Nov 15 - Mar 31)

EII	Wind Speed	Wind/Gust	Snow	Ice
1	< 26 mph	< 40 mph	< 18 in.	< 1/10 in.
2	>= 26 mph	>= 40 mph	>= 18 in.	>= 1/10 in.
3	>= 30 mph	>= 45 mph	>= 24 in.	>= 3/8 in.
4	>= 40 mph	>= 50 mph	>= 36 in.	>= 1/2 in.
5	>= 45 mph	>= 60 mph	>= 48 in.	>= 1 in.

Confidence Level	
Low	< 30% chance
Medium	>= 30% to < 60% chance
High	>= 60% chance

Definition of WET snow(T>=30F)

EII Value	Wet Snow
EEI 1	<5"
EEI 2	>5"
EEI 3	>6"
EEI 4	>12"
EEI 5	>18"

Date: January 17, 2017

Time: 6:00 AM EST

Forecaster: K Koval

Zones	SEACOAST	CAPITAL	FITCHBURG	PORTLAND
Event Starting in 30hrs	SNOW	SNOW	SNOW/ICE	SNOW
Event Begin Time	7PM Tue	6PM Tue	6PM Tue	7PM Tue
Event End Time	6PM Wed	6PM Wed	6PM Wed	6PM Wed
Tstrm Wind Gusts				
Ltng				
Storm Mvmt Dir				
Rain Amount				
Snow Amount	1-6"(SEE TEXT)	4-7"	2-5"	4-7"
Snow Character	WET	WET	WET	WET
Ice Amount			0.02-0.05"	
Sustained Wind				
Wind Gust				
Temp. Extremes	41/29	41/15	44/31	39/22

UNITIL SERVICE AREA 48 HOUR OUTLOOK:

**CAPITAL:** Snow developing after 6-8pm this evening and continuing through the overnight hours. Snow character: Wet, could be briefly normal overnight as temps fall to near 30F. Most of the snow will fall prior to 7am Wednesday; however spotty light snow showers will be possible through Wednesday afternoon. Snow accumulation: 4-7". Sleet may mix in at times Tuesday night and keep snow totals down a bit. Little to no additional accumulation is expected after 7am Wednesday. A few light snow showers could work into the area after midnight Thursday, otherwise dry and hazard free conditions are expected Wednesday night. Winds will be below hazard levels through the event, easterly and averaging 8-14 mph.

Confidence: High that hazard snow will occur tonight. Snow chance: EEI-2 80%, EEI-3 50%. Otherwise, confidence is high that no hazards will occur over the next 48 hours.

**FITCHBURG:** Snow developing after 6-8pm this evening and continuing through the overnight hours. Sleet and freezing rain could mix in at times, especially after 11pm. Most of the snow will fall prior to 7am Wednesday; however spotty rain/snow showers will be possible through Wednesday afternoon. Snow character: Wet. Snow accumulation: 2-5". Ice accretion: Up to 0.05". Little to no additional accumulation is expected after 7am Wednesday. The temperature profile will be marginal, so confidence is not as high on precipitation type overnight. Dry and hazard free conditions are expected Wednesday night. Winds will be below hazard levels through the event, east-southeast at 8-14 mph.

Confidence: Medium that hazard snow will occur tonight. The forecast is leaning towards a colder/snowier scenario, however a slightly deviation in storm track could easily bring in warmer air and a greater potential for freezing rain and sleet. This would cut back on snow amounts. Snow chance: EEI-2 40%. Otherwise, confidence is high that no hazards will occur over the next 48 hours.

**SEACOAST:** Snow developing after 7-9pm this evening. Snow should change to rain east of I-95 after 11pm-1am with the rain/snow line possibly reaching Highway 125 by 3-4am Wednesday. Most of the snow will fall prior to 7am Wednesday; however spotty rain/snow showers will be possible through Wednesday afternoon. Snow character: Wet. Snow accumulation: 1-3" east of I-95 and 3-6" inland. Sleet may mix in tonight west of I-95 and could cut into totals slightly. Higher snow amounts could reach the coast if a colder solution unfolds. Little to no additional accumulation is expected after 7am Wednesday. Dry and hazard free conditions are expected Wednesday night. Winds will be below hazard levels through the event, averaging east-southeast at 9-15 mph with gusts near 20 mph along the coast.

Confidence: High that hazard snow will occur tonight west of I-95. Snow chance: EEI-2 60%, EEI-3 30%. Low confidence in hazard snow east of I-95. Given marginal temperatures, a slight deviation in storm track could allow places near the immediate coast to remain snow. Snow chance east of I-95: EEI-2 20%. Otherwise, confidence is high that no hazards will occur over the next 48 hours.

**PORTLAND:** Snow developing after 7-9pm this evening. Snow could change to rain/sleet east of I-95 after 2-3am Wednesday. Most of the snow will fall prior to 8am Wednesday; however spotty rain/snow showers will be possible through Wednesday afternoon. Snow character: Wet. Snow accumulation: 4-7", lowest amounts east of I-95. Higher snow amounts could reach the coast if a colder solution unfolds. Little to no additional accumulation is expected after 8am Wednesday. Dry and hazard free conditions are expected Wednesday night. Winds will be below hazard levels through the event, averaging east-southeast at 9-15 mph with gusts near 20 mph along the coast.

Confidence: High that hazard snow will occur tonight west of I-95. Snow chance: EEI-2 70%, EEI-3 40%. Medium confidence in hazard snow east of I-95. Given marginal temperatures, a slight deviation in storm track could allow places near the immediate coast to remain snow. Snow chance east of I-95: EEI-2 50%, EEI-3 30%. Otherwise, confidence is high that no hazards will occur over the next 48 hours.

**UNITIL SERVICE AREA 3-5 DAY OUTLOOK:** Light rain showers could brush the Fitchburg area Friday night, otherwise dry and no hazard conditions are expected through the period.

Confidence: High that no hazards will occur through the day 3-5 period.

NORTHEAST U.S. REGIONAL SUMMARY:

Today's Weather Highlights:

- Precipitation will overspread Upstate New York today before spreading into Downstate New York and New England late this afternoon into tonight.

--- A brief wintry mix will quickly change to rain across western and central New York with very minor ice accretions.

--- A wintry mix of snow, sleet, freezing rain, and rain will impact eastern sections of Upstate New York through interior southern New England. Ice accretions will be highest over the Adirondacks and the Berkshires.

--- Snow will be more likely at night across northern New England with a few inches of snow accumulation likely. Heavy, wet snow, in excess of 6 inches will be possible over southern New Hampshire.

--- Rain will be likely across Downstate New York and the south coast of New England.

- Temperatures: Highs will be 4-12 degrees above normal. Lows will be 8-22 degrees above normal for most but more seasonable in northern Maine.

TODAY'S Forecast Confidence: Medium

Highs could end up 1-4 degrees cooler across eastern New York and western New England if thicker clouds and precipitation advance faster than expected. Otherwise, highs look okay. Lows and spot temperatures could be 1-3 degrees cooler here and there across eastern sections of Upstate New York and away from coastal New England late in the day and at night in spots that see consistent precipitation and a stubborn north or northeast wind.

Tomorrow's Weather Highlights:

- Steady precipitation will taper to scattered light areas across eastern New York and New England on Tuesday before tapering off at night.

--- Mainly snow is expected across northern New England with a little wintry mix for southern sections. Light additional accumulations should occur. Ice accretions will be minor.

--- A wintry mix is expected across eastern sections of Upstate New York and portions of interior southern New England, mostly in the morning. Rain will take over eventually. Light additional ice accretions are possible.

---Otherwise, rain will be possible.

- Light snow showers will be possible close to the Canadian Border sometime Wednesday night with minor accumulations.

- Temperatures: Highs will be near to 10 degrees above normal. Lows will be 12-24 degrees above normal.

TOMORROW'S Forecast Confidence: Medium

Lingering light precipitation and thick cloud cover could keep highs 1-4 degrees cooler in spots. Otherwise, highs should verify well. With light winds in place, if pockets of clearing can occur overnight, lows could end up 2-4 degrees cooler for some. Areas with fresh snow would be most susceptible to temperature issues.