

May 1, 2019

VIA HAND DELIVERY & ELECTRONIC MAIL

Luly E. Massaro, Commission Clerk
Rhode Island Public Utilities Commission
89 Jefferson Boulevard
Warwick, RI 02888

RE: Docket 3628 - 2018 Annual Service Quality Report, Electric Operations

Dear Ms. Massaro:

I have enclosed ten (10) copies of National Grid's¹ performance results for calendar year 2018 under its 2016 Amended Electric Service Quality Plan (Plan), as established in Docket 3628. Based on actual performance results, the Company does not have any penalties for calendar year 2018.

The Company's Plan is described in Attachment 1 of the Company's Settlement Agreement with the Rhode Island Division of Public Utilities and Carriers dated January 4, 2016, filed with the Rhode Island Public Utilities Commission (PUC) on January 8, 2016, and approved by the PUC in Docket 3628. The Plan provides for penalties and offsets relating to performance standards in the areas of reliability and customer service. The service quality standards under the Plan became effective as of January 1, 2016.

This report is organized as follows:

- Section 1: This section provides a summary of each performance standard in the areas of reliability and customer service. Specifically, Section 1 includes descriptions of each of the performance standards, the targeted performance levels for 2018 with their related dollar values, and the actual 2018 results with the applicable annual penalty or offset.
- Section 2: This section provides a summary calculation of the Company's annual penalty or offset for each of the performance standards for 2018. As shown in Column (i), there is no annual penalty for calendar year 2018.
- Section 3: The Plan requires the Company to report on additional aspects of service quality, including: (1) worst performing circuits; (2) trouble, non-outage calls received; (3) annual meter reading performance; and (4) information on Major Event Days. Section 3 summarizes the results of these reporting requirements.

¹ The Narragansett Electric Company d/b/a National Grid (the Company or National Grid).

Luly E. Massaro, Commission Clerk
Docket 3628 - 2018 Service Quality Report
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Thank you for your attention to this filing. If you have any questions concerning this report, please call me at 401-784-7288.

Very truly yours,

A handwritten signature in blue ink, appearing to read "Jennifer Brooks Hutchinson", with a long horizontal flourish extending to the right.

Jennifer Brooks Hutchinson

Enclosures

cc: Docket 3628 Service List
Leo Wold, Esq.
John Bell, Division

Certificate of Service

I hereby certify that a copy of the cover letter and any materials accompanying this certificate was electronically transmitted to the individuals listed below.

The paper copies of this filing are being hand delivered to the Rhode Island Public Utilities Commission and to the Rhode Island Division of Public Utilities and Carriers.



Joanne M. Scanlon

May 1, 2019
Date

**National Grid – Electric Service Quality Plan – Compliance - Docket 3628
Service List Updated 4/9/2019**

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The Narragansett Electric Company
d/b/a National Grid

2018 Service Quality Report

May 1, 2019

Submitted to:
Rhode Island Public Utilities Commission
RIPUC Docket No. 3628

Submitted by:

nationalgrid

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RELIABILITY PERFORMANCE STANDARDS

Interruption Frequency and Duration

Under the Service Quality Plan, an interruption is defined as the loss of electric service to more than one customer for more than one minute. The interruption duration is defined as the period of time, measured in minutes, from the initial notification of the interruption event to the time when service has been restored to the customers. Interruptions are tracked using System Average Interruption Frequency Index (SAIFI) and System Average Interruption Duration Index (SAIDI). SAIFI is calculated by dividing the total number of customers interrupted by the total number of customers served. SAIFI measures the number of times per year the average customer experienced an interruption. This is an average, so in any given year some customers will experience no interruptions, and some will experience several interruptions. SAIDI measures the length of interruption time that the average customer experienced for the year. It is calculated by dividing the total customer minutes of interruption by the total number of customers served.

Certain events are defined as Major Event Days and are excluded from the calculation of reliability performance standards for the purpose of penalty and offset assessment. There were six Major Event Days that occurred during 2018.

The Major Event Days are March 2, 2018, March 3, 2018, March 7, 2018, March 8, 2018, March 13, 2018, and August 18, 2018.

<u>2018 Frequency (SAIFI) Standard</u>		<u>2018 Frequency (SAIFI) Results</u>	
<u>Frequency of Interruptions per Customer</u>	<u>(Penalty) Offset</u>	<u>Frequency of Interruptions per Customer</u>	<u>Annual (Penalty) Offset</u>
Greater than 1.18	(\$916,000)		
1.06-1.18	linear interpolation		
0.84-1.05	\$0	1.001	\$0
0.75-0.83	linear interpolation		
Less than 0.75	\$229,000		

<u>2018 Duration (SAIDI) Standard</u>		<u>2018 Duration (SAIDI) Results</u>	
<u>Duration of Interruptions (minutes)</u>	<u>(Penalty) Offset</u>	<u>Duration of Interruptions (minutes)</u>	<u>Annual (Penalty) Offset</u>
Greater than 89.9	(\$916,000)		
72.0-89.9	linear interpolation		
45.9-71.9	\$0	65.11	\$0
36.7-45.8	linear interpolation		
Less than 36.7	\$229,000		

CUSTOMER SERVICE PERFORMANCE STANDARDS

Customer Contact Survey

The customer contact survey results are based on responses from National Grid’s Rhode Island customers from a survey performed by an independent third-party consultant, Praxis Research Partners. Praxis surveys a random sample of customers who have contacted National Grid recently in order to determine their level of satisfaction with their most recent contact with the Company regarding any call reason. Overall survey results are based on a composite measure of two questions from National Grid’s internal contactor survey: (1) Overall, on a scale from 1 to 10, where 1 means “dissatisfied”, and 10 means “satisfied”, how satisfied are you with the services provided by National Grid? (2) Overall on a scale from 1 to 10, where 1 means “dissatisfied”, and 10 means “satisfied”, how satisfied are you with the quality of service provided by the telephone representative? The individual score for each question is the percentage of respondents who provided a rating of “8”, “9”, or “10” on a 10-point scale, where 1 means “dissatisfied”, and 10 means “satisfied”. The “percent satisfied” composite score is a simple arithmetic average of the satisfaction score from each question.

2018 Customer Contact Standard

<u>Percent Satisfied</u>	<u>(Penalty) Offset</u>
Less than 74.4%	(\$184,000)
74.4%-78.7%	linear interpolation
78.8%-87.6%	\$0
87.7%-92.0%	linear interpolation
More than 92.0%	\$46,000

2018 Customer Contact Results

<u>Percent Satisfied</u>	<u>Annual (Penalty) Offset</u>
79.9%	\$0

Telephone Calls Answered Within 20 Seconds

The calls answered performance standard reflects the annual percentage of calls answered within 20 seconds. “Calls answered” include calls answered by a customer service representative (CSR) and calls completed within the Voice Response Unit (VRU). The time to answer is measured once the customer makes a selection to either speak with a CSR or use the VRU.

2018 Calls Answered Standard

<u>% Answered Within 20 Seconds</u>	<u>(Penalty) Offset</u>
Less than 53.5%	(\$184,000)
53.5%-65.7%	linear interpolation
65.8%-90.4%	\$0
90.5%-100.0%	linear interpolation, to a maximum of \$46,000

2018 Calls Answered Results

<u>% Answered Within 20 Seconds</u>	<u>Annual (Penalty) Offset</u>
79.07%	\$0

ADDITIONAL REPORTING CRITERIA

Under the Company's Service Quality Plan, the following additional reporting criteria are required to be filed with the PUC.

1. **Reporting Requirement:** Each quarter, the Company will file a report of 5% of all circuits designated as worst performing on the basis of customer frequency.

Included in the report will be:

1. The circuit id and location.
2. The number of customers served.
3. The towns served.
4. The number of events.
5. The average duration.
6. The total customer minutes.
7. A discussion of the cause or causes of events.
8. A discussion of the action plan for improvements including timing.

Results:

The Company filed its first quarter 2018 feeder ranking results on November 26, 2018, the second and third quarter results on March 15, 2019 and fourth quarter results on April 9, 2019.

2. **Reporting Requirement:** The Company will track and report monthly the number of calls it receives in the category of Trouble, Non-Outage. This includes inquiries about dim lights, low voltage, half-power, flickering lights, reduced TV picture size, high voltage, frequently burned-out bulbs, motor running problems, damaged appliances and equipment, computer operation problems, and other non-interruptions related inquiries.

Results: The Company filed the required Trouble, Non-Outage reports during 2018, with the final report for the 13 months ended December 2018 filed on April 9, 2019.

3. **Reporting Requirement:** The Company will report its annual meter reading performance as an average of monthly percentage of meters read.

Results: During 2018, the Company’s annual meter reading performance (as an average of monthly percentage of meters read) was 99.06%, compared to 97.43% during 2017, and 98.48% during 2016. The following table details the percentage of meters read per month for 2018, 2017, and 2016.

**The Narragansett Electric Company
Monthly Percentage of Meters Read**

	2018	2017	2016
January	98.93%	98.50%	98.57%
February	99.01%	98.34%	98.63%
March	98.19%	98.32%	98.68%
April	99.11%	98.60%	98.74%
May	99.13%	98.92%	98.56%
June	99.19%	98.94%	98.43%
July	99.11%	98.96%	98.27%
August	99.16%	98.96%	98.41%
September	99.24%	98.95%	98.36%
October	99.21%	98.92%	98.38%
November	99.19%	82.62%	98.29%
December	99.20%	98.94%	98.39%
YTD Average	99.06%	97.43%	98.48%

4. **Reporting Requirement:** For each event defined as a Major Event Day, the Company will prepare a report, which will be filed annually as part of the annual SQ filing, detailing the following information:
1. Start date/Time of event.
 2. Number/Location of crews on duty (both internal and external crews).
 3. Number of crews assigned to restoration efforts.
 4. The first instance of mutual aid coordination.
 5. First contact with material suppliers.
 6. Inventory levels: pre-event/daily/post-event.
 7. Date/Time of request for external crews.
 8. Date/Time of external crew assignment.
 9. # of customers out of service by hour.
 10. Impacted area.
 11. Cause.
 12. Weather impact on restoration.
 13. Analysis of protective device operation.
 14. Summary of customers impacted.

Results:

Major Event Days:

IEEE Std. 1366-2003 identifies reliability performance during both day-to-day operations and Major Event Days. Major Event Days represent those few days during the year on which the energy delivery system experienced stresses beyond that normally expected, such as severe weather. A day is considered a Major Event Day if the daily SAIDI exceeds a threshold value, calculated using the IEEE methodology. For 2018 the T_{MED} value was 4.49 minutes of SAIDI (using IEEE Std. 1366-2003 methodology). There were six days during four separate storms that exceeded this threshold in 2018. These four storms, which occurred on March 2 - March 6, March 7- March 11, March 13 - March 14 and August 18 are described below.

March Winter Storm Riley

1. Start Date and Time of event:

The storm began in the late morning on Thursday, March 2, 2018 with scattered interruptions starting at approximately 8:00 a.m. and peaked around 7:37 p.m. on March 2. The peak reached 113,148 customers interrupted.

2. Number/Location of crews on duty (both internal and external crews):

The Company had initially secured 263.5 internal and external field crews to restore power to customers in Rhode Island, with an additional 75 external overhead line crews to support the State if needed. By March 1, at 8:00 a.m., the Company had increased the number of available field crews to approximately 396.5 field crews to restore power to customers in Rhode Island, consisting of approximately 204 external crews and 192.5 internal crews, including Damage Assessment crews. The external number of crews would ultimately increase to approximately 368 crews on Monday, March 5, at 4:00 p.m., at which point the Company had a total of approximately 570 crews available to support restoration. The internal and external field crew numbers included transmission and distribution overhead line, forestry, wires down, substation, underground, and damage assessment personnel.

3. Number of crews assigned to restoration efforts:

At peak, the Company had the following crews performing restoration activities throughout the impacted areas in the state.

<u>Location</u>	<u>Crew Type</u>	<u># Crews</u>
Rhode Island	Internal Overhead Line	62.5 crews total
	External Overhead Line	134 crews total
	Internal Wire Down	23.5 crews total
	Internal Transmission	5 crews total
	Internal Underground	7 crews total
	Internal Substation	20.5 crews total
	Contractor Forestry	70 crews total
	Company Damage Assessment	30 crews total

4. The first instance of mutual aid coordination:

The Company did not call for mutual aid coordination for this event

5. The first contact with material suppliers:

The first contact with material suppliers was March 1, 2018.

6. Inventory levels: pre-event/daily/post-event

Inventory levels and issues are summarized in the table below. Balances represent actual day-end totals. The balances do not include "no cost", pre-capitalized items, such as transformers; these items are not reported as inventory on the balance sheet.

The inventory positions indicate those inventories held in Rhode Island and those allocated to Rhode Island stored in National Grid's Central Warehouse located in Whitinsville, MA.

<u>Date</u>	<u>RI Inventory Locations</u>	<u>NEDC Total</u>	<u>RIELEC %</u>	<u>Allocated NEDC Inventory</u>	<u>Total Narragansett Electric Inventory</u>
3/2/2018	\$1,239,471.08	\$36,720,143.13	18.92%	\$6,947,162.76	\$8,186,633.84
3/3/2018	\$1,239,471.08	\$36,720,143.13	18.92%	\$6,947,162.76	\$8,186,633.84

7. Date/Time of request for external Crews:

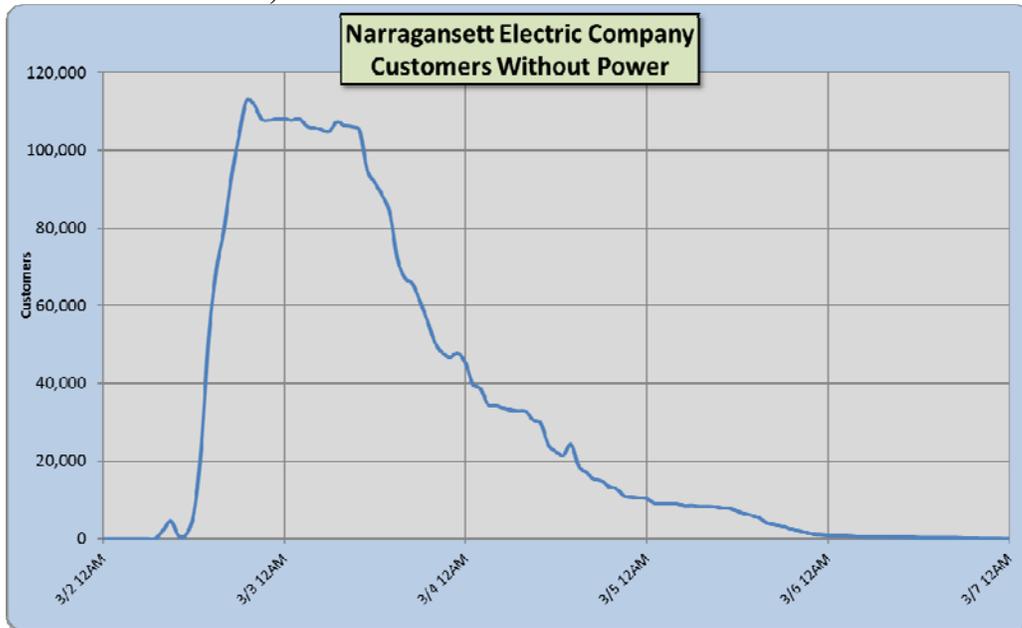
Given the potential magnitude of Winter Storm Riley and forecast of hazardous winds and heavy precipitation, the Company secured crews in advance from its contractors of choice and other outside contractors to support restoration efforts for all of New England as part of its regional preparation for the Storm. As of February 28, 2018, at 5:00 p.m., the Company has 57 external overhead line crews and 70 external forestry crews available for storm restoration. By March 1, 8:00 a.m., The Company had secured a total of 134 external overhead line crews and 70 external forestry crew for Rhode Island.

8. Date/Time of external Crews assignment:

External distribution line crews were first assigned and began working on outages on March 2, 2018 at approximately 5:00 a.m.

9. # of customers out graph (graphs following):

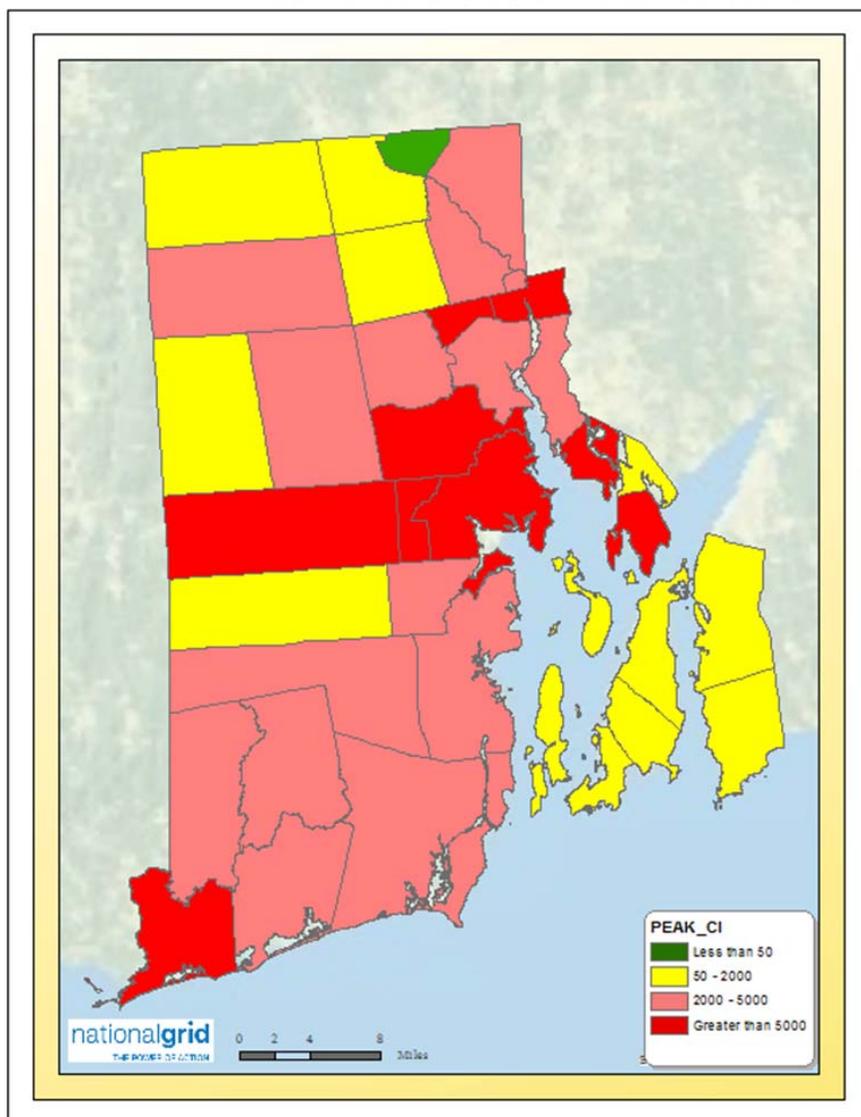
March 2 – March 6, 2018



10. Impacted area:

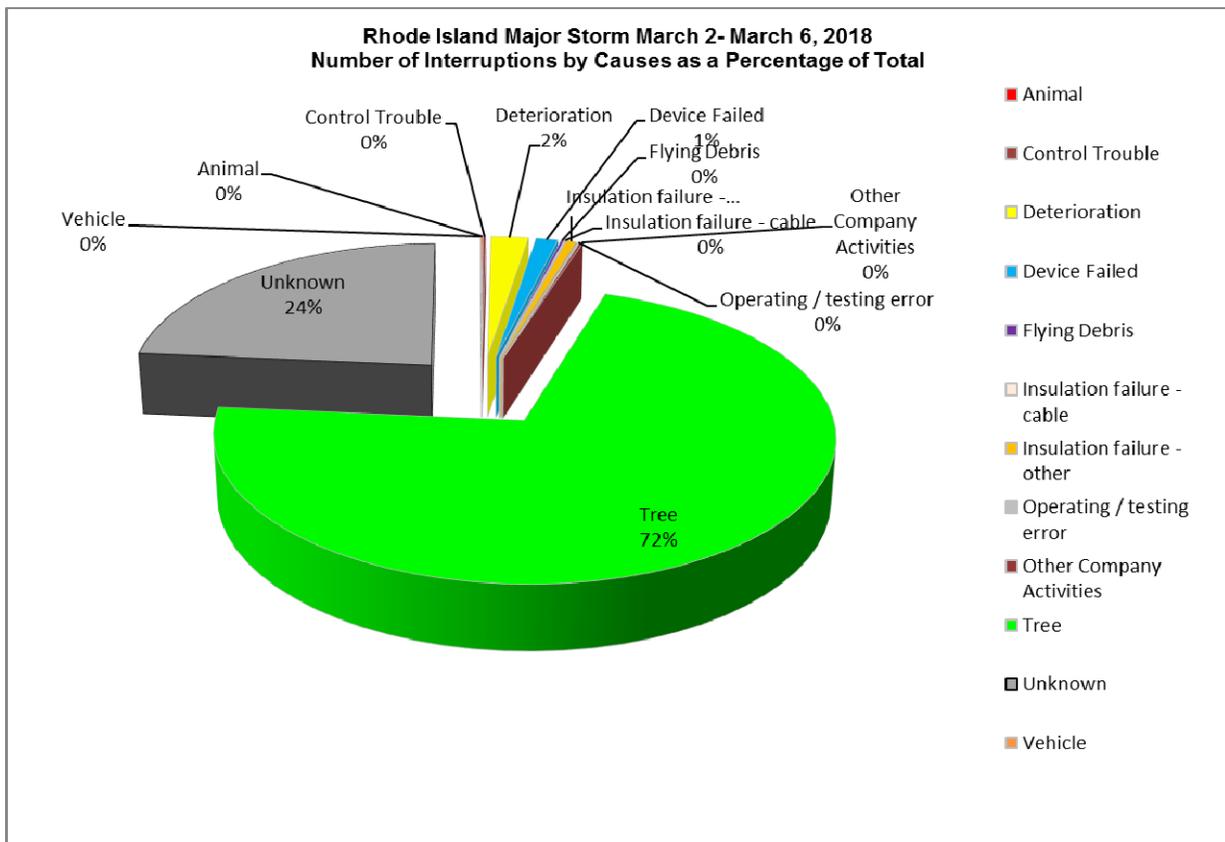
The following map shows the towns that were impacted by the storm and the customers interrupted during the storm.

**Customer Interrupted by Town at Company Peak
RI 03/02/2018 - 03/06/2018**



11. Cause:

Winter Storm Riley caused widespread destruction to Rhode Island’s electric infrastructure resulting in interruptions to customers. The causes of interruptions are shown in the table below.



12. Weather impact on restoration:

Winter Storm Riley was a severe weather event that resulted in significant damage to the Company’s electrical system. The Storm brought widespread winter storm conditions to southern New England inland to New York and nearby states. Rhode Island experienced wind gusts of 50 mph or greater across the State, with peak gusts of 83 mph in Little Compton, 71 mph on Block Island, and 70 mph in Charlestown. Providence experienced peak wind gusts of 64 mph. While Rhode Island did not experience the snowfall

experienced by other areas in the Northeast, much of the State received rainfall greater than two inches, with Westerly receiving almost five inches of rain. The number of trees that came down, resulting in widespread power outages, was likely exacerbated by saturated ground from the heavy rainfall. The rainfall was so significant that one of the Company's substations in Westerly experienced minor flooding, although it did not impact any equipment at the substation.

13. Analysis of Protective Device Operation:

National Grid maintains a wide array of protection and interrupting devices designed to separate faulted components from the electrical system while containing outages to the smallest area practicable. On the distribution system, those devices include fuse cutouts, reclosers, and circuit breakers of various designs. On the transmission system, interrupting devices include circuit breakers, air-break switches, and circuit switchers. Protection relays are used to detect the faults and operate the interrupting device(s) to isolate a faulted component(s).

For the distribution system, design standards exist that indicate how protection devices are to be deployed and coordinated with other devices. Distribution engineers evaluate such devices under normal and fault conditions. Where recent performance may indicate a need for improvement, National Grid performs engineering studies and makes improvements. During a major storm like this event, outages in the distribution system may be far too extensive to assess the function and coordination of individual protection devices in detail, as the focus of storm response is on service restoration. A meaningful analysis would be difficult to perform unless there were specific indications of protection equipment mis-operation.

Protection standards, guides and practices also exist and are followed in the design of the National Grid's transmission system. Post event analysis of all interruptions in the National Grid Bulk Electric System (BES) is performed to confirm proper operation of protection systems. If an improper operation is identified, further analysis is conducted to identify the cause, propose and implement a solution. In addition, National Grid undertakes analysis of transmission and substation protection devices and coordination where there is evidence of a mis-operation. The Company had no mis-operations at the Transmission and substation level in Rhode Island during this event.

14. Summary of Customers Impacted:

March 2, 2018

During this storm, on March 2, 2018 Rhode Island experienced a total of 699 interruptions that affected 148,051 customers and 220,403,136 customer minutes of interruption. On average these interruptions resulted in 0.301 SAIFI, 446.78 minutes of SAIDI, and 1488 minutes of interruption of customers affected. Since a SAIDI value of 446.78 minutes exceeded the threshold value of 4.49 minutes, March 2, 2018 qualified as a Major Event Day under the IEEE methodology.

March 3, 2018

On March 3, 2018 Rhode Island experienced a total of 477 interruptions that affected 12,731 customers and 5,318,831 customer minutes of interruption. On average these interruptions resulted in 0.026 SAIFI, 10.78 minutes of SAIDI, and 418 minutes of interruption of customers affected. Since a SAIDI value of 10.78 minutes exceeded the threshold value of 4.49 minutes, March 3, 2018 qualified as a Major Event Day under the IEEE methodology.

March 4-6, 2018

The restoration efforts still went on from March 4 to March 6, 2018. But the daily SAIDI of March 4, March 5 and March 6 are all less than 4.49 minutes, and they are not qualified as Major Event Day under IEEE methodology.

March Winter Storm Quinn

1. Start Date and Time of event:

The storm began on Wednesday, March 7 at round 12:00 p.m. with scattered customers interruptions. The Storm reached peak at 4:49 a.m. on Thursday, March 8. It impacted approximately 17,936 customers at its peak.

2. Number/Location of crews on duty (both internal and external crews):

The Company dispatched new outages caused by Winter Storm Quinn from the Providence Storm Room beginning on Wednesday, March 7, 2018 at approximately 8:00 p.m. through the end of Winter Storm Quinn. Consistent with the Emergency Response Plan, the Company activated Police and Fire Coordinators for Winter Storm Quinn. These employees reported to the Storm Room Leads and were responsible for communicating the estimated times for restoration on all police and fire calls, with a standby condition noted. The Company also activated and coordinated six Task Force teams in accordance with the Emergency Response Plan, consisting of Company and municipal personnel utilized to clear roads during emergencies. On March 7 at 7:00 p.m., the Company also mobilized the Providence wires down room with approximately 56 internal resources available, including wires down appraisers, cut and clear restoration resources, and standby resources.

3. Number of crews assigned to restoration efforts:

At peak the Company had the following crews performing restoration activities throughout the impacted areas in the State.

<u>Location</u>	<u>Crew Type</u>	<u># Crews</u>
Rhode Island	Internal Overhead Line	62.5 crews total
	External Overhead Line	130 crews total
	Internal Wire Down	28 crews total
	Internal Transmission	4 crews total
	Internal Underground	7 crews total
	Internal Substation	20.5 crews total
	Contractor Forestry	72 crews total
	Company Damage Assessment	30 crews total

4. The first instance of mutual aid coordination:

The Company did not call for mutual aid coordination for this event

5. The first contact with material suppliers:

The first contact with material suppliers was March 6, 2018.

6. Inventory levels: pre-event/daily/post-event

Inventory levels and issues are summarized in the table below. Balances represent actual day-end totals. The balances do not include "no cost", pre-capitalized items, such as transformers; these items are not reported as inventory on the balance sheet.

The inventory positions indicate those inventories held in Rhode Island and those allocated to RI stored in National Grid' Central Warehouse located in Whitinsville, MA.

<u>Date</u>	<u>RI Inventory Locations</u>	<u>NEDC Total</u>	<u>RIELEC %</u>	<u>Allocated NEDC Inventory</u>	<u>Total Narragansett Electric Inventory</u>
3/7/2018	\$1,239,471.08	\$36,720,143.13	18.92%	\$6,947,162.76	\$8,186,633.84
3/8/2018	\$1,239,471.08	\$36,720,143.13	18.92%	\$6,947,162.76	\$8,186,633.84

7. Date/Time of request for external Crews:

Given the potential magnitude of Winter Storm Quinn and forecast of winds and heavy precipitation, the Company secured crews in advance from its contractors of choice and other outside contractors to support restoration efforts for all of New England as part of its regional preparation for Winter Storm Quinn, consistent with its Emergency Response Plan. Many of these external resources were already secured for the Company's response to Winter Storm Riley – with final restoration from Winter Storm Riley occurring the evening of March 6, 2018 – so such resources were already in Rhode Island and at staging sites.

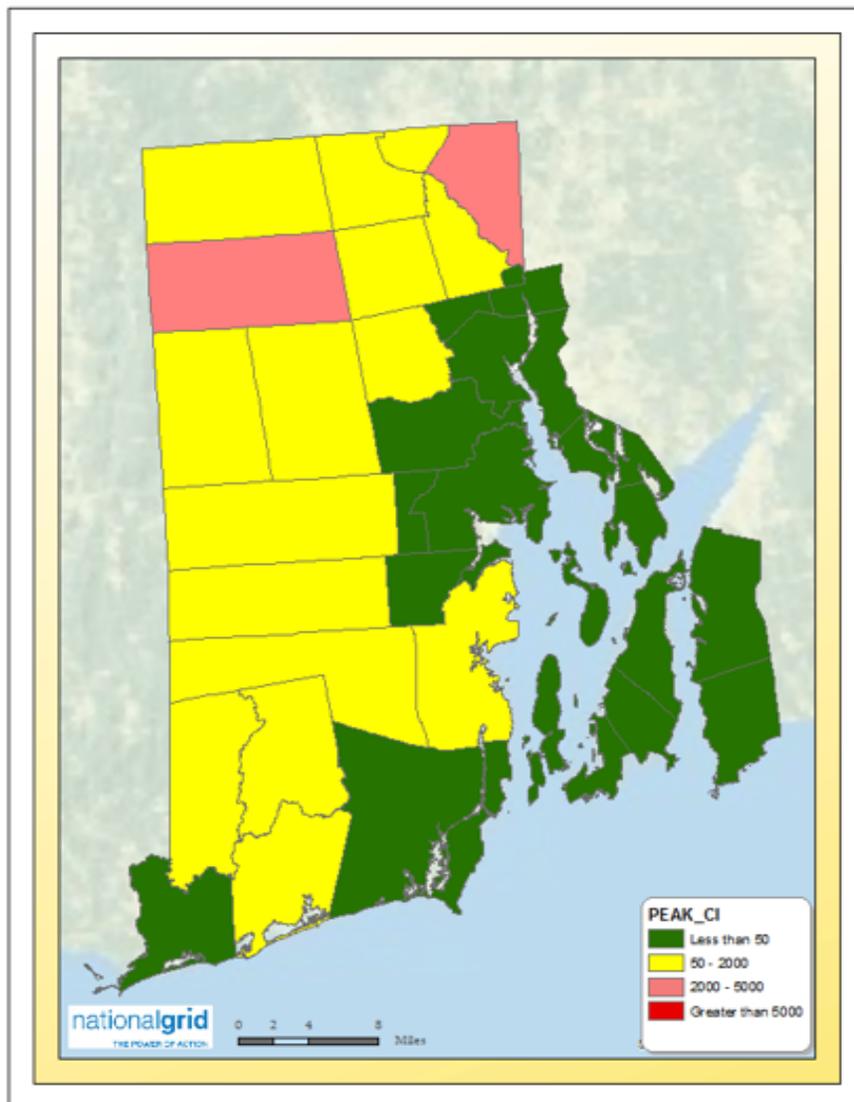
8. Date/Time of external Crews assignment:

External crews were assigned and began working at 8:00 pm on March 7, 2018.

10. Impacted area:

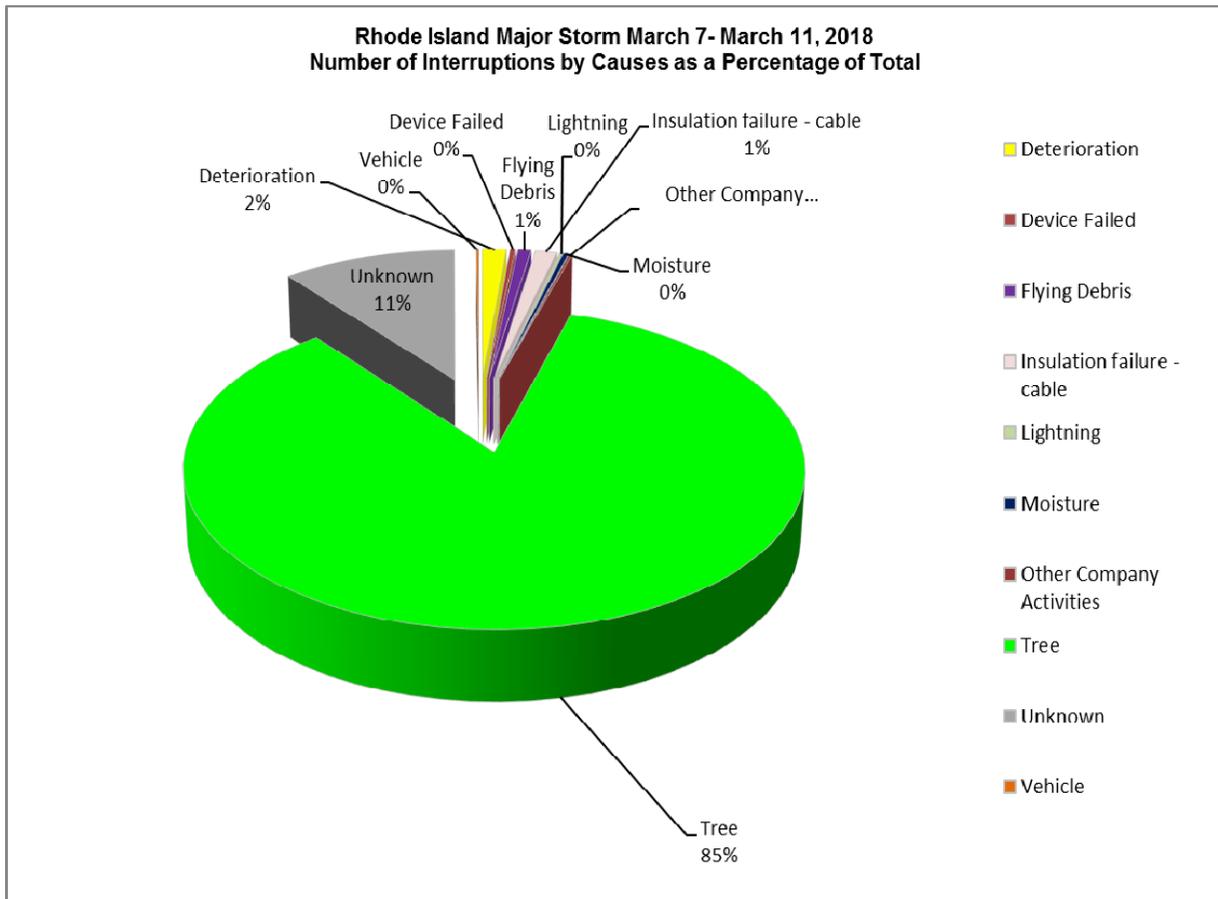
The following map shows the towns that were impacted by the storm and the customers interrupted during the storm.

**Customer Interrupted by Town at Company Peak
RI 03/07/2018 - 03/11/2018**



11. Cause:

Winter Storm Quinn caused widespread destruction to Rhode Island’s electric infrastructure resulting in interruptions to customers. The causes of interruptions are shown in the table below.



12. Weather impact on restoration:

Winter Storm Quinn was a severe weather event that had strong potential to cause significant damage to the Company's electrical system. Beginning the evening of March 7, 2018, Winter Storm Quinn brought widespread winter storm conditions to Southern New England inland to New York and nearby states, up through Maine. Rhode Island experienced wind gusts of 40 mph across the state, with peak gusts of 43 mph in Providence. While Rhode Island did not experience the snowfall experienced by other areas in the Northeast, parts of the state received more than 12 inches of wet, heavy snow, causing many tree limbs to break and fall into energized lines and equipment.

13. Analysis of Protective Device Operation:

National Grid maintains a wide array of protection and interrupting devices designed to separate faulted components from the electrical system while containing outages to the smallest area practicable. On the distribution system, those devices include fuse cutouts, reclosers, and circuit breakers of various designs. On the transmission system, interrupting devices include circuit breakers, air-break switches, and circuit switchers. Protection relays are used to detect the faults and operate the interrupting device(s) to isolate a faulted component(s).

For the distribution system, design standards exist that indicate how protection devices are to be deployed and coordinated with other devices. Distribution engineers evaluate such devices under normal and fault conditions. Where recent performance may indicate a need for improvement, National Grid performs engineering studies and makes improvements. During a major storm like this event, outages in the distribution system may be far too extensive to assess the function and coordination of individual protection devices in detail, as the focus of storm response is on service restoration. A meaningful analysis would be difficult to perform unless there were specific indications of protection equipment mis-operation.

Protection standards, guides and practices also exist and are followed in the design of the National Grid's transmission system. Post event analysis of all interruptions in the National Grid Bulk Electric System (BES) is performed to confirm proper operation of protection systems. If an improper operation is identified, further analysis is conducted to identify the cause, propose and implement a solution. In addition, National Grid undertakes analysis of transmission and substation protection devices and coordination where there is evidence of a mis-operation. The Company had no mis-operations at the Transmission and substation level in Rhode Island during this event.

14. Summary of Customers Impacted:

March 7, 2018

During this storm, on March 7, 2018 Rhode Island experienced a total of 156 interruptions that affected 12,960 customers and 9,942,242 customer minutes of interruption. On average these interruptions resulted in 0.026 SAIFI, 20.15 minutes of SAIDI, and 767 minutes of interruption of customers affected. Since a SAIDI value of 20.15 minutes exceeded the threshold value of 4.49 minutes, March 7, 2018 qualified as a Major Event Day under the IEEE methodology.

March 8, 2018

On March 8, 2018 restoration activity in Rhode Island associated with the storm continued. Customers experienced a total of 242 interruptions that affected 17,531 customers and 6,540,091 customer minutes of interruption. On average these interruptions resulted in 0.035 SAIFI, 13.26 minutes of SAIDI, and 373 minutes of interruption of customers affected. Since a SAIDI value of 13.26 minutes exceeded the threshold value of 4.49 minutes, March 8, 2018 qualified as a Major Event Day under the IEEE methodology.

March 9, 10, 11, 2018

On March 9, 2018 restoration activity in Rhode Island associated with the storm continued. Customers experienced a total of 90 interruptions that affected 3,608 customers and 218,020 customer minutes of interruption. On average these interruptions resulted in 0.007 SAIFI, 0.44 minutes of SAIDI, and 60 minutes of interruption of customers affected. As reported in Docket No. 2509 QUINN Report filed, restoration activity continued through March 11. However, Major Event Day exemptions were not requested after March 8, 2018.

March Winter Storm Skylar

1. Start Date and Time of event:

The storm began on Tuesday, March 13 at round 6:00 a.m. with scattered customers interruptions. The Storm reached peak at 1:12p.m. on Wednesday, March 14. It impacted approximately 26,849 customers at its peak.

2. Number/Location of crews on duty (both internal and external crews):

Given the potential magnitude of Winter Storm Skylar and forecast of hazardous winds and heavy snowfall, the Company secured crews in advance from its contractors of choice and other outside contractors to support restoration efforts for all of New England as part of its regional preparation for the Storm, consistent with our Emergency Response Plan. These external resources had been secured previously to respond to winter Storms Riley and Quinn and were already on Company property or at staging sites.

3. Number of crews assigned to restoration efforts:

At peak the Company had the following crews performing restoration activities throughout the impacted areas in the state.

<u>Location</u>	<u>Crew Type</u>	<u># Crews</u>
Rhode Island	Internal Overhead Line	61.5 crews total
	External Overhead Line	174 crews total
	Internal Wire Down	33 crews total
	Internal Transmission	5 crews total
	Internal Underground	18.5 crews total
	Contractor Forestry	80 crews total
	Company Damage Assessment	10 crews total

4. The first instance of mutual aid coordination:

The Company did not call for mutual aid coordination for this event

5. The first contact with material suppliers:

The first contact with material suppliers was March 12, 2018.

6. Inventory levels: pre-event/daily/post-event

Inventory levels and issues are summarized in the table below. Balances represent actual day-end totals. The balances do not include "no cost", pre-capitalized items, such as transformers; these items are not reported as inventory on the balance sheet.

The inventory positions indicate those inventories held in Rhode Island and those allocated to RI stored in National Grid' Central Warehouse located in Whitinsville, MA.

<u>Date</u>	<u>RI Inventory Locations</u>	<u>NEDC Total</u>	<u>RIELEC %</u>	<u>Allocated NEDC Inventory</u>	<u>Total Narragansett Electric Inventory</u>
3/13/2018	\$1,239,471.08	\$36,720,143.13	18.92%	\$6,947,162.76	\$8,186,633.84

7. Date/Time of request for external Crews:

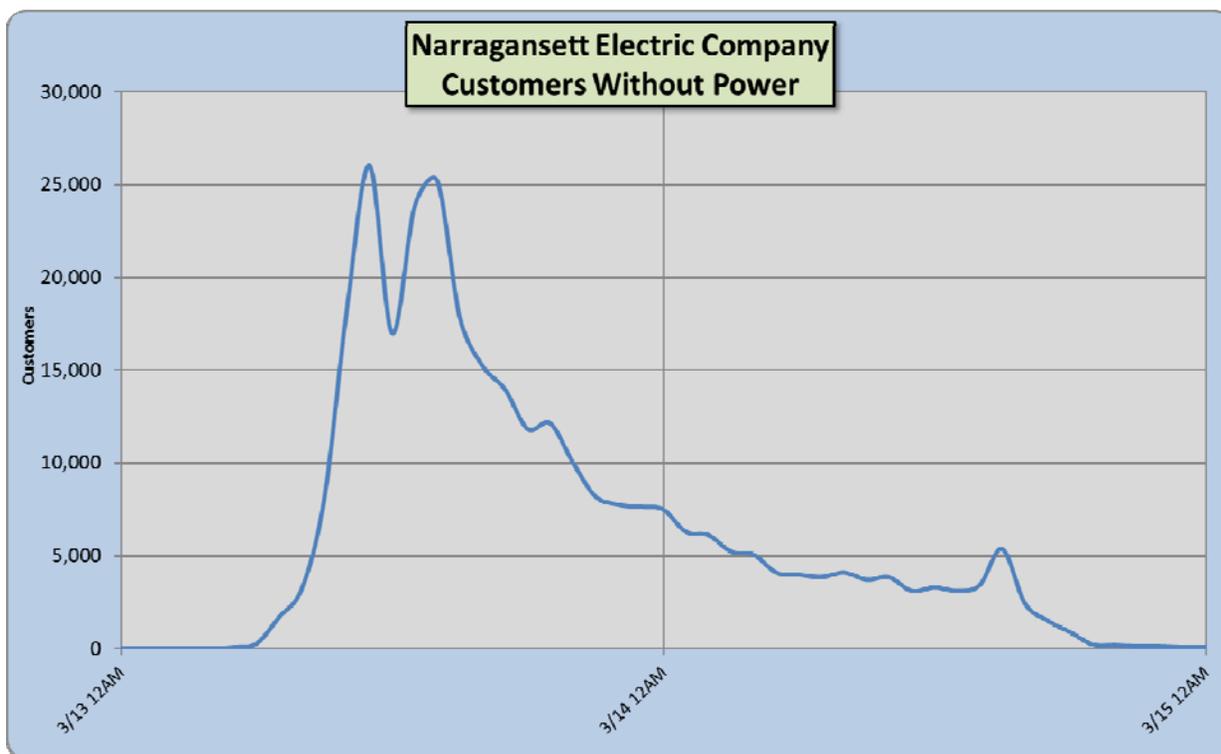
Given the potential magnitude of Winter Storm Skylar and forecast of hazardous winds and heavy snowfall, the Company secured crews in advance from its contractors of choice and other outside contractors to support restoration efforts for all of New England as part of its regional preparation for the Storm, consistent with our Emergency Response Plan. These external resources had been secured previously to respond to Winter Storms Riley and Quinn and were already on Company property or at staging sites.

8. Date/Time of external Crews assignment:

External crews were assigned and began working at 9:00 p.m. on March 12, 2018.

9. # of customers out graph (graphs following):

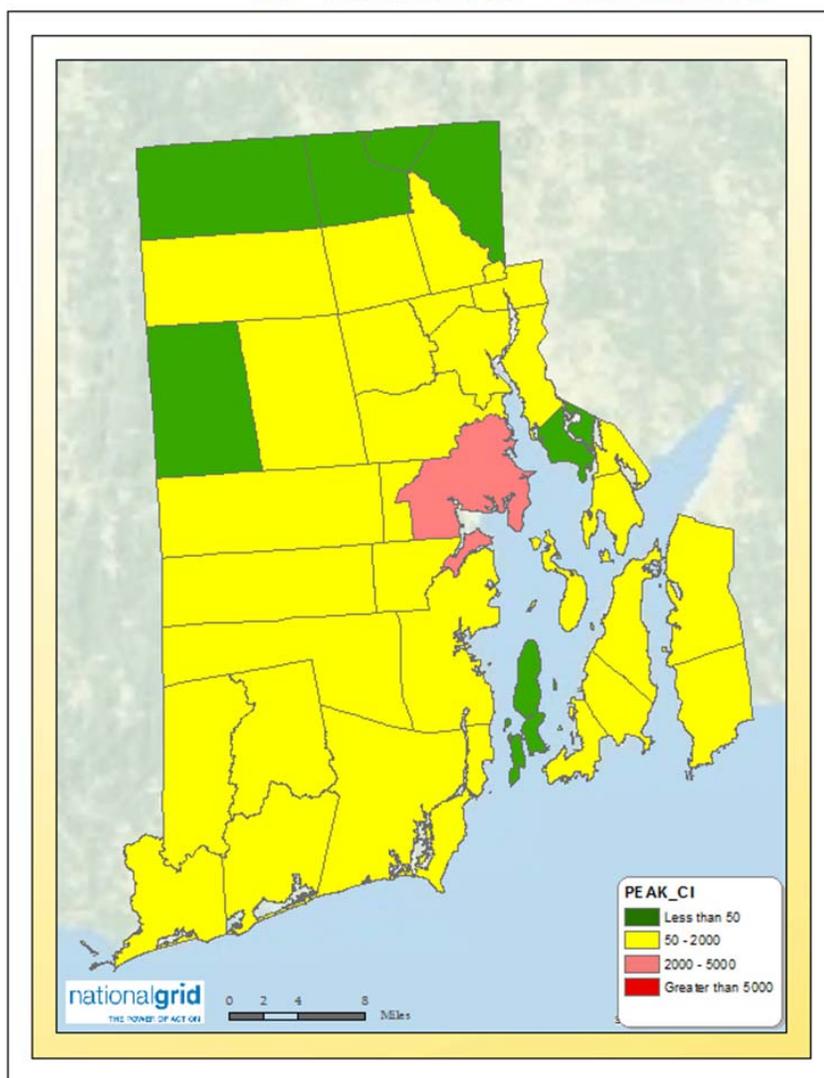
March 13, 2018 – March 14, 2018



10. Impacted area:

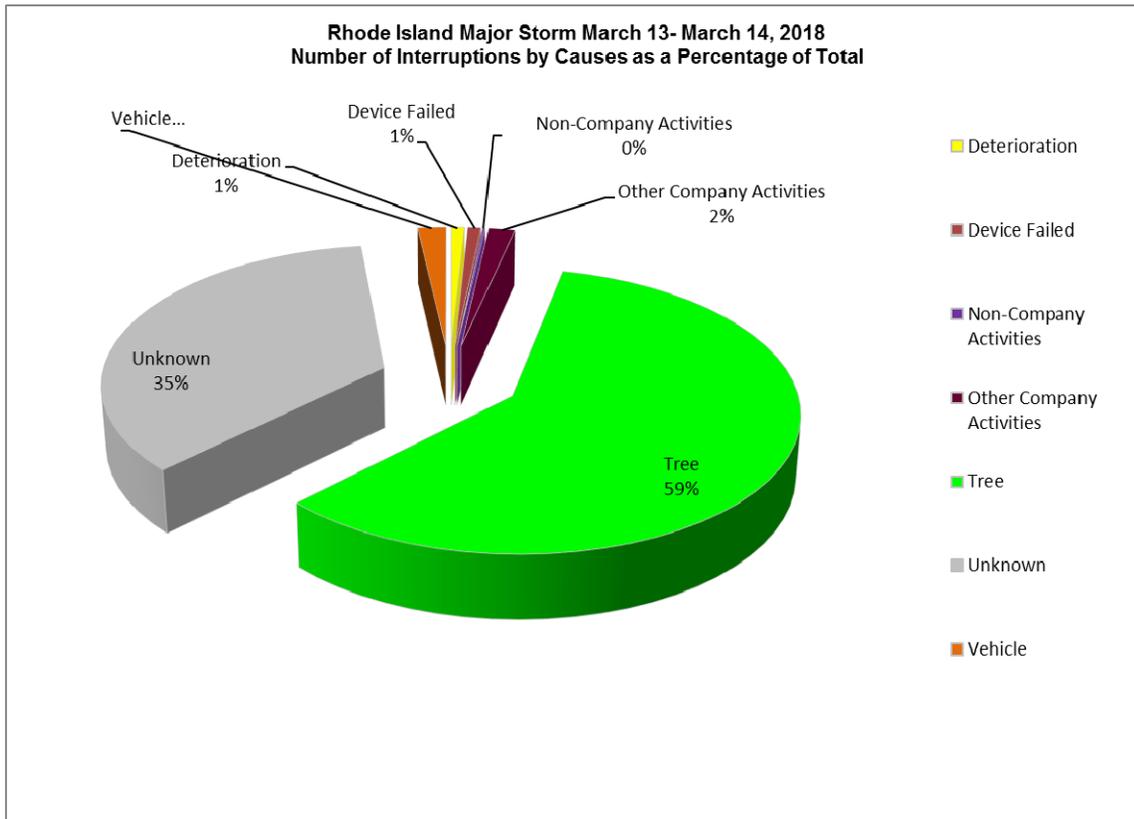
The following map shows the towns that were impacted by the storm and the customers interrupted during the storm.

**Customer Interrupted by Town at Company Peak
RI 03/13/2018 - 03/14/2018**



11. Cause:

Winter Storm Skylar caused widespread destruction to Rhode Island’s electric infrastructure resulting in interruptions to customers. The causes of interruptions are shown in the table below.



12. Weather impact on restoration:

Winter Storm Skylar was a severe weather event that resulted in significant damage to the Company’s electrical system. The Storm brought widespread winter storm conditions from southern New England inland to New York. Rhode Island experienced wind gusts greater than 50 mph along the coast, with peak gusts of 64 mph in Newport and 52 mph at Rose Island. There was heavy snowfall in Rhode Island ranging from 12 – 25 inches across much of the state. The changeover from sticky, wet, snow to snow of a more normal consistency occurred somewhat later than was forecasted, bringing down tree limbs and power lines.

13. Analysis of Protective Device Operation:

National Grid maintains a wide array of protection and interrupting devices designed to separate faulted components from the electrical system while containing outages to the smallest area practicable. On the distribution system, those devices include fuse cutouts, reclosers, and circuit breakers of various designs. On the transmission system, interrupting devices include circuit breakers, air-break switches, and circuit switchers. Protection relays are used to detect the faults and operate the interrupting device(s) to isolate a faulted component(s).

For the distribution system, design standards exist that indicate how protection devices are to be deployed and coordinated with other devices. Distribution engineers evaluate such devices under normal and fault conditions. Where recent performance may indicate a need for improvement, National Grid performs engineering studies and makes improvements. During a major storm like this event, outages in the distribution system may be far too extensive to assess the function and coordination of individual protection devices in detail, as the focus of storm response is on service restoration. A meaningful analysis would be difficult to perform unless there were specific indications of protection equipment mis-operation.

Protection standards, guides and practices also exist and are followed in the design of the National Grid's transmission system. Post event analysis of all interruptions in the National Grid Bulk Electric System (BES) is performed to confirm proper operation of protection systems. If an improper operation is identified, further analysis is conducted to identify the cause, propose and implement a solution. In addition, National Grid undertakes analysis of transmission and substation protection devices and coordination where there is evidence of a mis-operation. The Company had no mis-operations at the Transmission and substation level in Rhode Island during this event.

14. Summary of Customers Impacted:

March 13, 2018

During this storm, on March 13, 2018 Rhode Island experienced a total of 509 interruptions that affected 59,725 customers and 17,726,592 customer minutes of interruption. On average these interruptions resulted in 0.12 SAIFI, 35.93 minutes of SAIDI, and 297 minutes of interruption of customers affected. Since a SAIDI value of 35.93 minutes exceeded the threshold value of 4.49 minutes, March 13, 2018 qualified as a Major Event Day under the IEEE methodology.

March 14, 2018

On March 14, 2018 restoration activity in Rhode Island associated with the storm continued. Customers experienced a total of 70 interruptions that affected 7,853 customers and 558,806 customer minutes of interruption. On average these interruptions resulted in 0.016 SAIFI, 1.13 minutes of SAIDI, and 71 minutes of interruption of customers affected. Since a SAIDI value of 1.13 minutes is less than the threshold value of 4.49 minutes, March 14, 2018 is not qualified as a Major Event Day under the IEEE methodology.

August 18, 2018, lightning Storm

1. Start Date and Time of event:

The storm began on Sunday, August 18 at round 2:00 a.m. with scattered customers interruptions. The Storm reached peak at 6:00 p.m. on August 18. It impacted approximately 10,572 customers at its peak.

2. Number/Location of crews on duty (both internal and external crews):

Based on the weather forecast, the Company determined that it only needed to use its own Rhode Island distribution line and substation crews, a small number of the distribution line contactor crews, and some on-property contractor tree crews to restore service to customers in Rhode Island.

3. Number of crews assigned to restoration efforts:

<u>Location</u>	<u>Crew Type</u>	<u># Crews</u>
Rhode Island	Internal RI Overhead Line	24 crews total
	Internal MA Overhead Line	19 crews total
	Internal RI OH Trouble (single workers)	21 crews total
	Internal RI Substation (single workers)	20 crews total
	Contractor Forestry	3 crews total
	Contractor Overhead Lines	4 crews total

4. The first instance of mutual aid coordination:

The Company did not call for mutual aid coordination for this event.

5. The first contact with material suppliers:

Contact with material suppliers was not required during this storm event.

6. Inventory levels: pre-event/daily/post-event

Inventory levels and issues are summarized in the table below. Balances represent actual day-end totals. The balances do not include "no cost", pre-capitalized items, such as transformers; these items are not reported as inventory on the balance sheet.

The inventory positions indicate those inventories held in Rhode Island and those allocated to Rhode Island stored in National Grid' Central Warehouse located in Whitinsville, MA.

<u>Date</u>	<u>RI Inventory Locations</u>	<u>NEDC Total</u>	<u>RIELEC %</u>	<u>Allocated NEDC Inventory</u>	<u>Total Narragansett Electric Inventory</u>
8/18/2018	\$1,216,657.13	\$35,244,800.78	20.57%	\$7,249,533.97	\$8,466,191.10

7. Date/Time of request for external Crews:

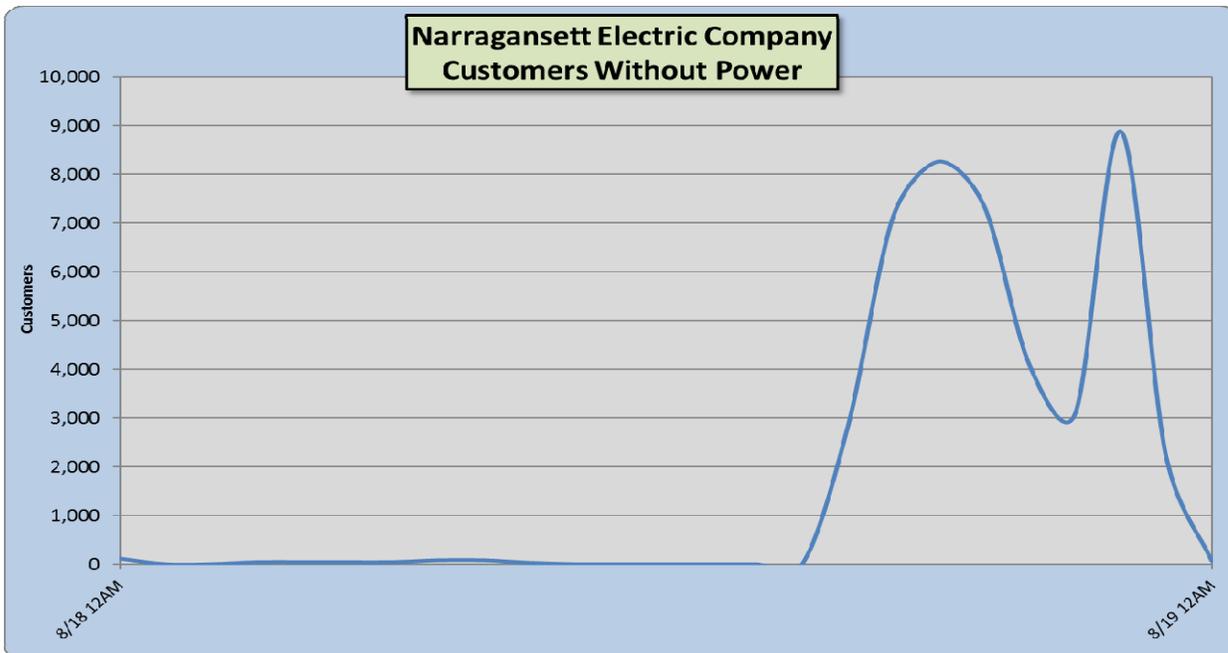
A request for National Grid Massachusetts crews from the South Shore and South East Districts, as well as contractor crews went out at approximately 6:30 p.m. on Saturday, August 18, 2018. The request for National Grid Massachusetts crews from the Central and West Districts went out at approximately 7:30 p.m. on Saturday, August 18, 2018.

8. Date/Time of external Crews assignment:

External distribution line crews were first assigned and began working on outages on August 18, 2018 at approximately 9:00 p.m.

9. # of customers out graph (graphs following):

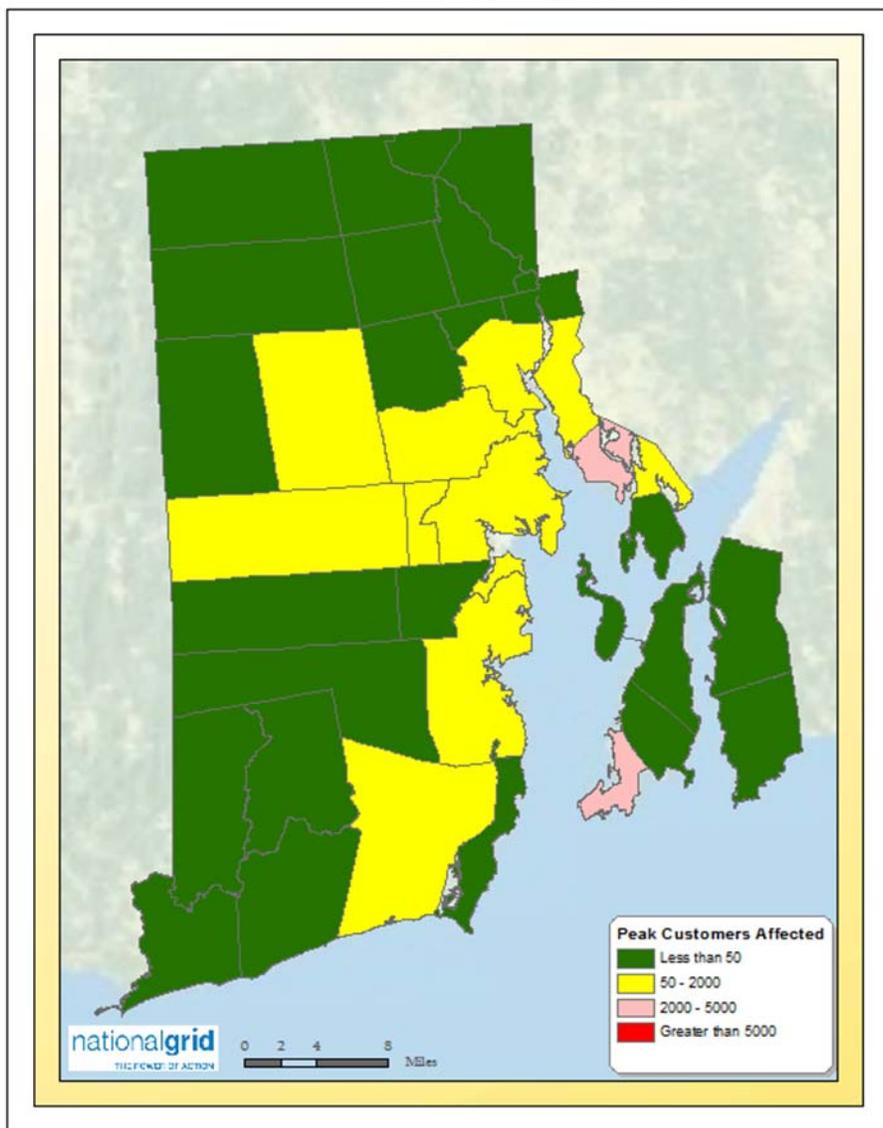
August 18, 2018 – August 19, 2018



10. Impacted area:

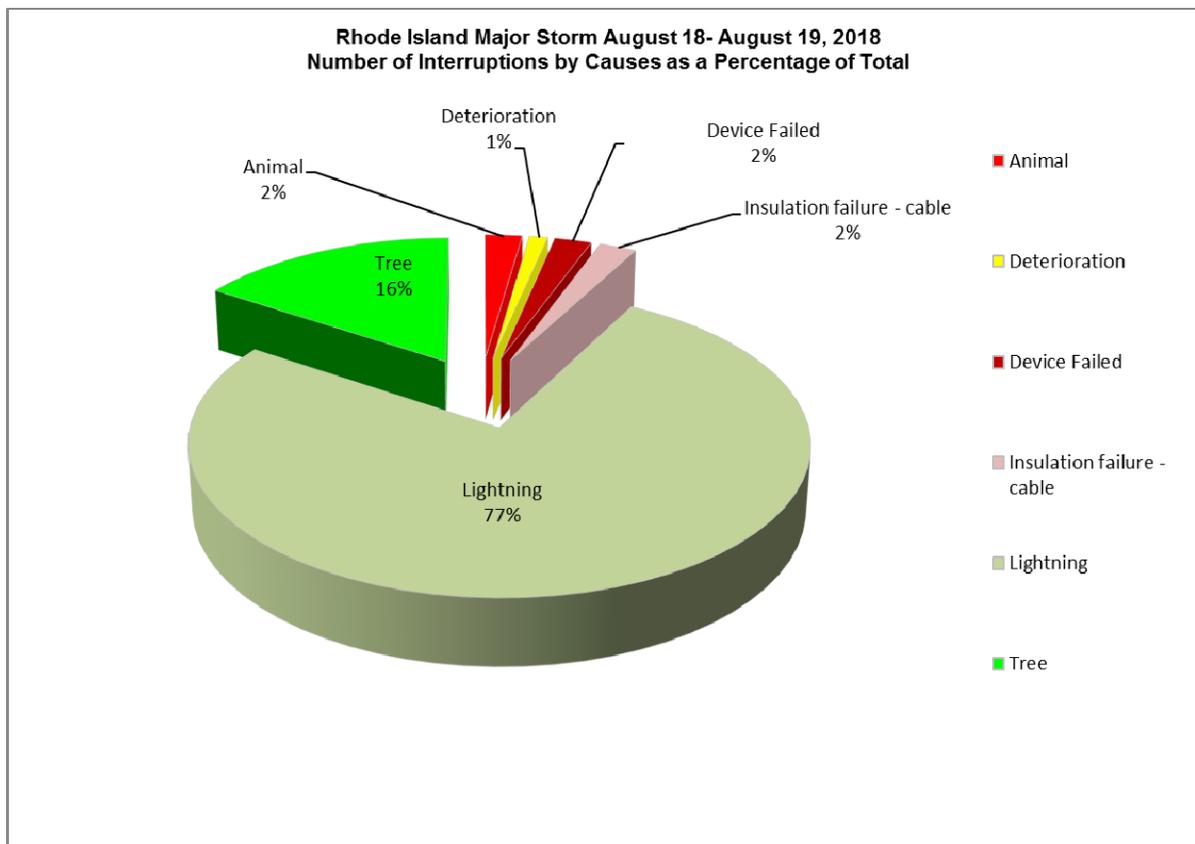
The following map shows the towns that were impacted by the storm and the customers interrupted during the storm.

**Customer Interrupted by Town at Company Peak
RI 08 18 2018**



11. Cause:

The causes of interruptions are shown in the table below:



12. Weather impact on restoration:

Showers and thunderstorms moved through in the afternoon on Saturday, August 18. The most damaging weather occurred between 4:00 p.m. and 11:00 p.m. For Rhode Island, the highest total reported precipitation was approximately 0.5 inches of rain. Lightning and fallen trees caused the most outages in Rhode Island.

13. Analysis of Protective Device Operation:

National Grid maintains a wide array of protection and interrupting devices designed to separate faulted components from the electrical system while containing outages to the smallest area practicable. On the distribution system, those devices include fuse cutouts, reclosers, and circuit breakers of various designs. On the transmission system, interrupting devices include circuit breakers, air-break switches, and circuit switchers. Protection relays are used to detect the faults and operate the interrupting device(s) to isolate a faulted component(s).

For the distribution system, design standards exist that indicate how protection devices are to be deployed and coordinated with other devices. Distribution engineers evaluate such devices under normal and fault conditions. Where recent performance may indicate a need for improvement, National Grid performs engineering studies and makes improvements. During a major storm like this event, outages in the distribution system may be far too extensive to assess the function and coordination of individual protection devices in detail, as the focus of storm response is on service restoration. A meaningful analysis would be difficult to perform unless there were specific indications of protection equipment mis-operation.

Protection standards, guides and practices also exist and are followed in the design of the National Grid's transmission system. Post event analysis of all interruptions in the National Grid Bulk Electric System (BES) is performed to confirm proper operation of protection systems. If an improper operation is identified, further analysis is conducted to identify the cause, propose and implement a solution. In addition, National Grid undertakes analysis of transmission and substation protection devices and coordination where there is evidence of a mis-operation. The Company had no mis-operations at the Transmission and substation level in Rhode Island during this event.

14. Summary of Customers Impacted:

August 18, 2018

During this storm on August 2018, Rhode Island experienced a total of 56 interruptions that affected 27,507 customers and 2,835,866 customer minutes of interruption. On average these interruptions resulted in 0.056 SAIFI, 5.74 minutes of SAIDI, and 103 minutes of interruption of customers affected. Since a SAIDI value of 5.74 minutes exceeded the threshold value of 4.49 minutes, August 18, 2018 qualified as a Major Event Day under the IEEE methodology.