

May 1, 2017

**VIA HAND DELIVERY & ELECTRONIC MAIL**

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

**RE: Docket 3628 - 2016 Annual Service Quality Report, Electric Operations**

Dear Ms. Massaro:

I have enclosed 10 copies of National Grid's<sup>1</sup> performance results for calendar year 2016 under its 2016 Amended Electric Service Quality Plan (2016 Amended Plan), as established in Docket 3628. Based on actual performance results, the Company does not have any penalties for calendar year 2016.

The Company's 2016 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 (2016 Settlement Agreement). The Company filed 2016 Settlement Agreement with the Rhode Island Public Utilities Commission (PUC) on January 8, 2016, and the PUC approved the 2016 Settlement Agreement at an Open Meeting on February 10, 2016 in Docket 3628.<sup>2</sup> The 2016 Amended Plan provides for penalties and offsets relating to performance standards in the areas of reliability and customer service. The service quality standards under the 2016 Amended 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 2016 with their related dollar values, and the actual 2016 results with the applicable annual penalty or offset.

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

<sup>2</sup> The Company's Electric Service Quality Plan was initially approved by written Order No. 18294 in Docket 3628 for effect January 1, 2005, and was subsequently amended pursuant to an Agreement to Modify Performance Benchmarks, which the PUC approved on July 13, 2007 by written Order No. 19020 (2007 Plan). The 2016 Settlement Agreement modified the Customer Contact standard from the 2007 Plan. The 2016 Amended Plan is the currently effective service quality plan and supersedes all prior service quality plans, including the 2007 Plan.

Luly E. Massaro, Commission Clerk  
Docket 3628 - 2016 Service Quality Report  
May 1, 2017  
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- Section 2: This section provides a summary calculation of the Company's annual penalty or offset for each of the performance standards for 2016. As shown in Column (i), there is no annual penalty for calendar year 2016.
- 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.

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,



Jennifer Brooks Hutchinson

Enclosures

cc: Docket 3628 Service List  
Leo Wold, Esq.  
Steve Scialabba, 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, 2017  
Date

**National Grid – Electric Service Quality Plan – Compliance - Docket 3628  
Service List Updated 4/29/16**

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The Narragansett Electric Company  
d/b/a National Grid

## **2016 Service Quality Report**

October 3, 2017

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. Section 3 discusses the Major Event Days that occurred during 2016.

<u>2016 Frequency (SAIFI) Standard</u>		<u>2016 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>
More than 1.18	(\$916,000)		
1.06-1.18	linear interpolation		
0.84-1.05	\$0	0.973	\$0
0.75-0.83	linear interpolation		
Less than 0.75	\$229,000		

<u>2016 Duration (SAIDI) Standard</u>		<u>2016 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>
More than 89.9	(\$916,000)		
72.0-89.9	linear interpolation		
45.9-71.9	\$0	69.13	\$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.

2016 Customer Contact Standard

2016 Customer Contact Results

<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

<u>Percent Satisfied</u>	<u>Annual (Penalty) Offset</u>
80.5%	\$0

**Telephone Calls Answered Within 20 Seconds**

The calls answered performance standard reflects the annual average 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.

2016 Calls Answered Standard

2016 Calls Answered Results

<u>% Answered Within 20 Seconds</u>	<u>(Penalty) Offset</u>	<u>% Answered Within 20 Seconds</u>	<u>Annual (Penalty) Offset</u>
Less than 53.5%	(\$184,000)		
53.5%-65.7%	linear interpolation		
65.8%-90.4%	\$0	76.05%	\$0
90.5%-100.0%	linear interpolation, to a maximum of \$46,000		

**National Grid**  
2016 Results of Service Quality Plan  
Calculation of Penalty/Offset

<u>Performance Standard</u>	<u>Potential Penalty</u> (a)	<u>Potential Offset</u> (b)	<u>2016 Results</u> (c)	<u>Maximum Penalty</u> (d)	<u>One Std Dev. Worse Than Mean</u> (e)	<u>Mean</u> (f)	<u>One Std Dev. Better Than Mean</u> (g)	<u>Maximum Offset</u> (h)	<u>Annual (Penalty)/Offset</u> (i)
Reliability - Frequency	\$ 916,000	\$ 229,000	0.97	1.18	1.05	0.94	0.84	0.75	\$0
Reliability - Duration	\$ 916,000	\$ 229,000	69.1	89.9	71.9	57.5	45.9	36.7	\$0
Customer Service - Customer Contact Survey	\$ 184,000	\$ 46,000	80.1%	74.4%	78.8%	83.2%	87.6%	92.0%	\$0
Customer Service - Telephone Calls Answered	\$ 184,000	\$ 46,000	76.1%	53.5%	65.8%	78.1%	90.4%	100.0%	\$0
Total Penalty/Offset	\$ 2,200,000	\$ 550,000							\$0

**Notes:**

Columns (a), (b), and (d)-(h) are per the Amended Electric Service Quality Plan, RIPUC Docket No. 3628.

Column (c) represents the actual 2016 annual results for the performance standards listed in the first column.

Column (i) is calculated as follows:

- For Reliability Standards:
  - If Column (c) is between Column (g) and Column (e): \$0
  - If Column (c) is between Column (h) and Column (g):  $[\text{Column (g) - Column (c)}] \div [\text{Column (g) - Column (h)}] \times \text{Column (b)}$
  - If Column (c) is between Column (e) and Column (d):  $[\text{Column (c) - Column (e)}] \div [\text{Column (d) - Column (e)}] \times \text{Column (a)}$
  - If Column (c) is greater than Column (d): 100% of Column (a)
  - If Column (c) is less than Column (h): 100% of Column (b)
- For Customer Service Standards:
  - If Column (c) is between Column (e) and Column (g): \$0
  - If Column (c) is between Column (g) and Column (h):  $[\text{Column (c) - Column (g)}] \div [\text{Column (e) - Column (d)}] \times \text{Column (b)}$
  - If Column (c) is between Column (d) and Column (e):  $[\text{Column (e) - Column (c)}] \div [\text{Column (e) - Column (d)}] \times \text{Column (a)}$
  - If Column (c) is less than Column (d): 100% of Column (a)
  - If Column (c) is greater than Column (h): 100% of Column (b)

### **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 2016 feeder ranking results on July 8, 2016, the second and third quarter results on January 31, 2017, and the fourth quarter results on April 5, 2017.

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 2016, with the final report for the 13 months ended December 2016 filed on January 11, 2017.

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

**Results:** During 2016, the Company’s annual meter reading performance (as an average of monthly percentage of meters read) was 98.48%, compared to 98.6% during 2015, and 98.9% during 2014. The following table details the percentage of meters read per month for 2016, 2015, and 2014.

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

	<b>2016</b>	<b>2015</b>	<b>2014</b>
January	98.57%	98.40%	99.00%
February	98.63%	98.20%	98.80%
March	98.68%	98.50%	99.00%
April	98.74%	98.90%	98.90%
May	98.56%	98.90%	98.90%
June	98.43%	98.90%	98.90%
July	98.27%	98.80%	99.00%
August	98.41%	98.60%	98.90%
September	98.36%	98.70%	98.90%
October	98.38%	98.30%	98.90%
November	98.29%	98.60%	98.90%
December	98.39%	98.60%	98.90%
YTD Average	98.48%	98.60%	98.90%

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:** 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 2016 the  $T_{MED}$  value was 5.26 minutes of SAIDI (using IEEE Std. 1366-2003 methodology). During 2016, there were four storms that exceeded 5.26 minutes of SAIDI and thus qualified as Major Event Days. These four storms, which occurred on February 5, 2016, February 25, 2016, July 22, 2016, and September 5-6, 2016, are described below.

#### **February 5, 2016 Winter Storm (Storm Lexi)**

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

The storm began in the very early morning on Friday, February 5, 2016 with scattered interruptions starting at approximately 10:00 a.m. and peaked around 3:00 p.m. The peak reached 45,000 customers interrupted.

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

In total, the Company ultimately had more than 227 line crews, 95 tree and cut and clear crews, and 81 wires down crews working in Rhode Island to restore service to customers throughout the event. Additionally, the Company had two Transmission crews on standby ready to respond to any potential damage to transmission lines.

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	Company Line	227 crews total
	Company Wire Down	81 crews total
	Company Substation/Transmission	2 crews total
	Contractor Tree	95 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

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", precapitalized 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>
2/5/2016	\$1,264,434.29	\$ 39,247,689.22	18.470%	\$ 7,249,048.20	\$ 8,513,482.49

7. Date/Time of request for external Crews:

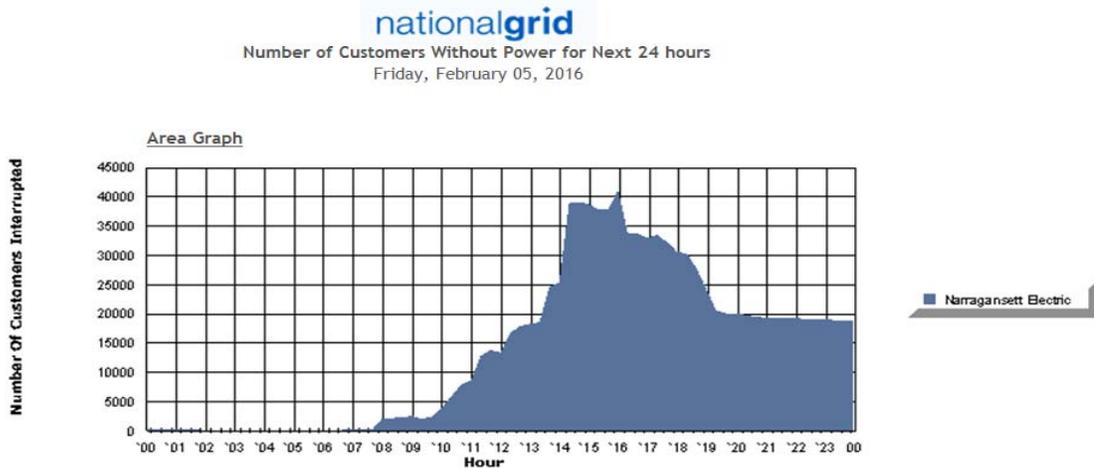
No external crews were required and restoration event was managed by internal crews.

8. Date/Time of external Crews assignment:

No external crews were required and restoration event was managed by internal crews.

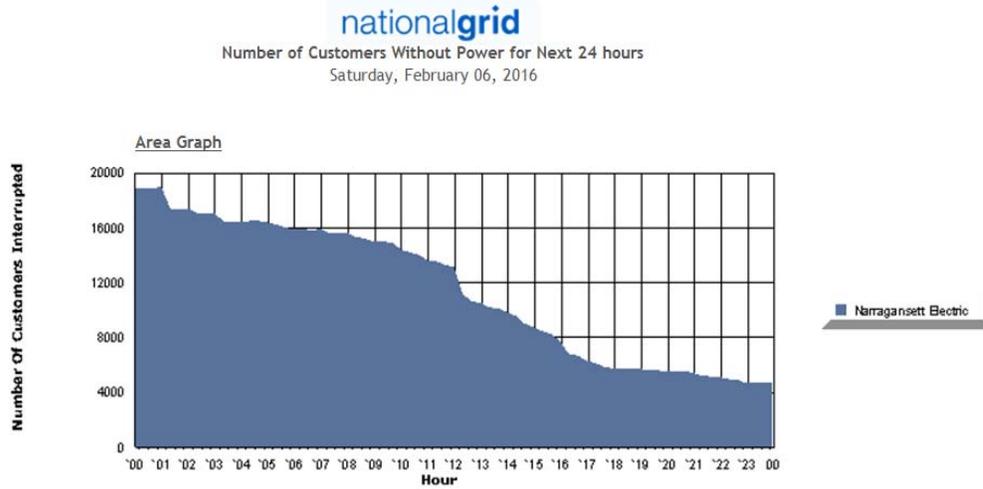
9. # of customers out by hour (graphs following):

**February 5, 2016 (Friday)**



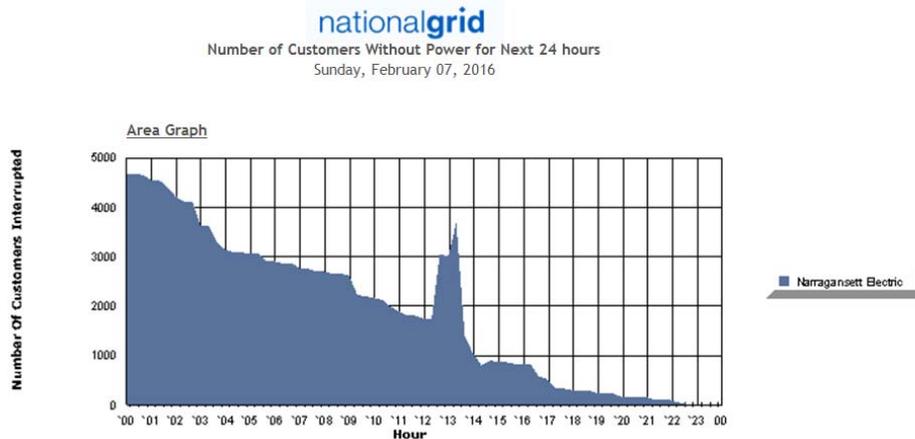
Interruptions Found for: Narragansett Electric

**February 6, 2016 (Saturday)**



Interruptions Found for: Narragansett Electric

**February 7, 2016 (Sunday)**

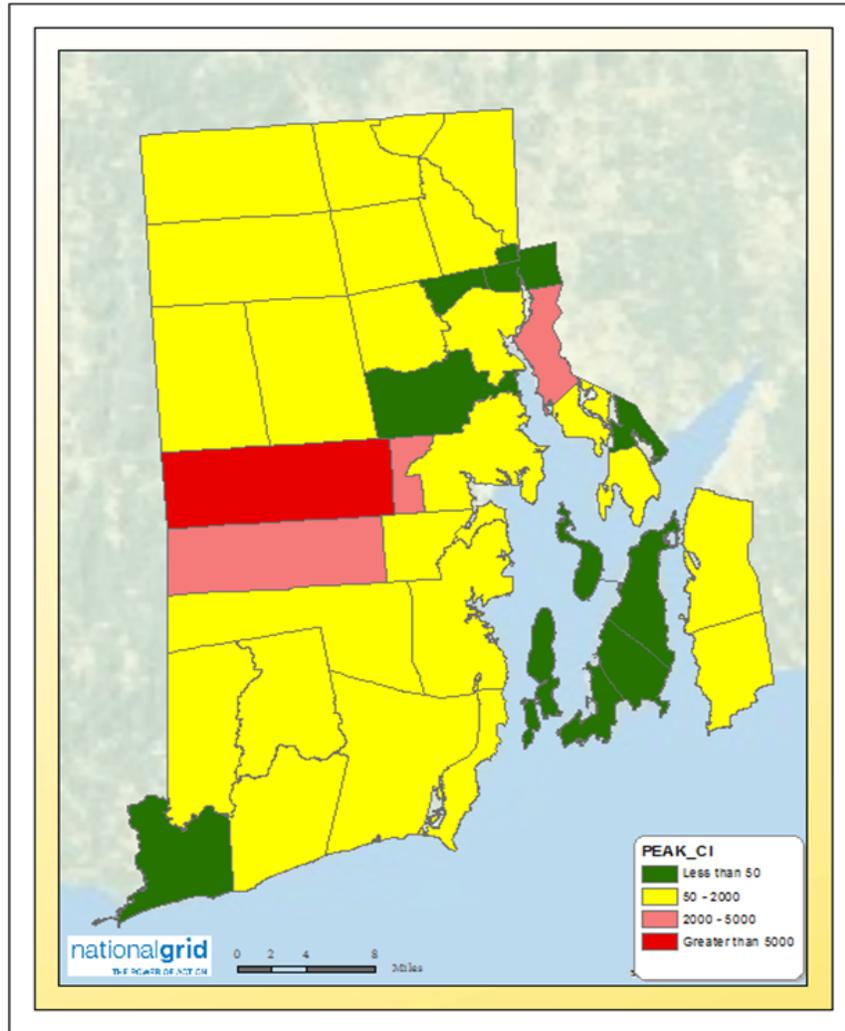


Interruptions Found for: Narragansett Electric

10. Impacted area:

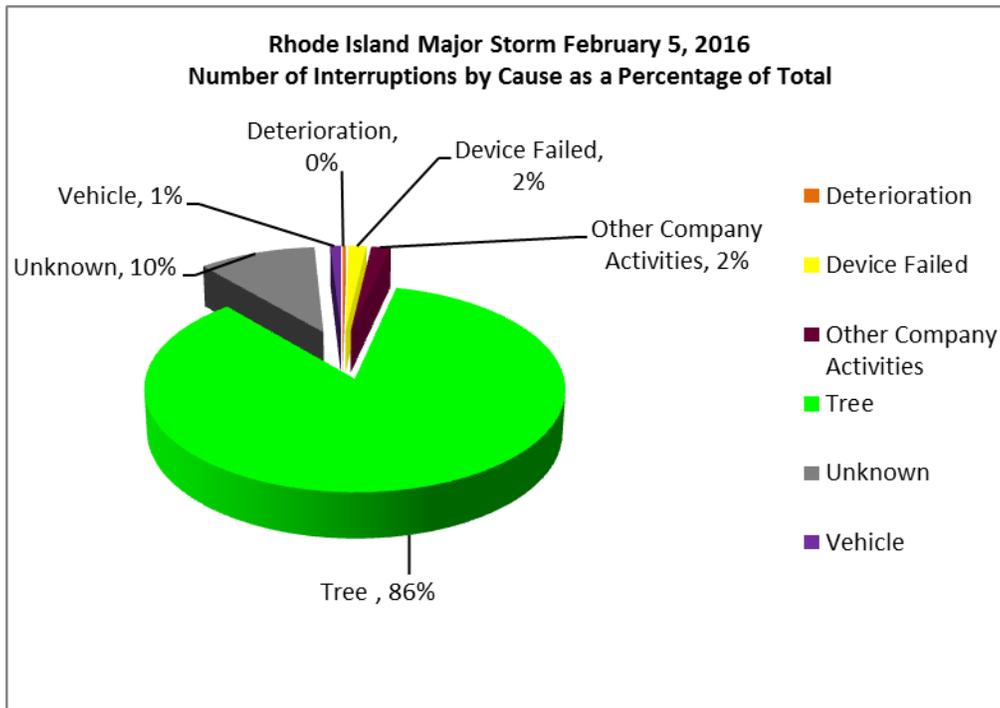
The following map shows the towns that were impacted by the storm and the customers interrupted during the storm.

**Customer Interrupted by Town at Company Peak  
02/05/2016**



11. Cause:

Winter storm Lexi brought heavy, wet snow that blanketed much of Rhode Island bringing down trees, branches and power lines, which in turn, caused many customers to lose power. The causes of interruptions are shown in the table below.



12. Weather impact on restoration:

The powerful intensity and impact of the storm caused significant damage to the Company's electric infrastructure. The power outages impacted approximately 62,200 (approximately 45,000 at peak) of the Company's customers. Overall, approximately 13 percent of the Company's customers in Rhode Island experienced outages. Using its own crews and contractor resources, the Company restored power to 70 percent of its Rhode Island customers by approximately 8:00 a.m., on Sunday, February 7, 2016. Over 90 percent of the Company's customers had their power restored by approximately 6:30 p.m. on Sunday, February 7, 2016. The final customer was restored at approximately 11:45 p.m., on Sunday, February 7, 2016.

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:

**February 5, 2016**

During this storm, on February 5, 2016 Rhode Island experienced a total of 300 interruptions that affected 58,233 customers and 36,800,103 customer minutes of interruption. On average these interruptions resulted in 0.200 SAIFI, 75.597 minutes of SAIDI, and 632 minutes of interruption of customers affected. Since a SAIDI value of 75.597 minutes exceeded the threshold value of 5.26 minutes, February 5, 2016 qualified as a Major Event Day under the IEEE methodology.

**February 6-7, 2016**

Restoration activity continued through February 7, 2016; however, a Major Event Day exemption was not requested.

**February 25, 2016 Wind and Thunderstorm**

1. Start Date and Time of event:

The storm began in the very early morning on Thursday, February 25, 2016 with scattered interruptions starting at approximately 1:00 a.m. and peaked around 5:00 a.m. The peak reached 15,953 customers interrupted.

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

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	Company Line	43 crews total
	Company troubleshooters	21 individual total
	Contractor	23 crews total

3. The first instance of mutual aid coordination:

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

4. The first contact with material suppliers:

Contact with material suppliers was not required during this storm.

5. 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", precapitalized 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>
2/25/2016	\$1,264,434.29	\$ 39,409,734.04	18.471%	\$ 7,279,382.22	\$ 8,543,816.51

6. Date/Time of request for external Crews:

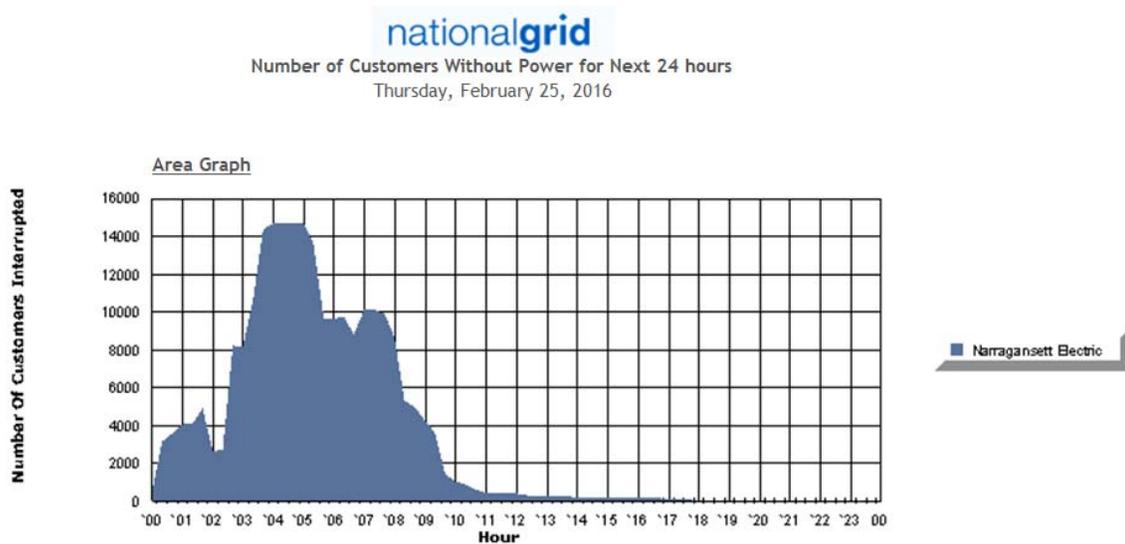
No external crews were required and restoration event was managed by internal crews.

7. Date/Time of external Crews assignment:

No external crews were required and restoration event was managed by internal crews.

8. # of customers out by hour (graphs following):

**February 25, 2016 (Thursday)**

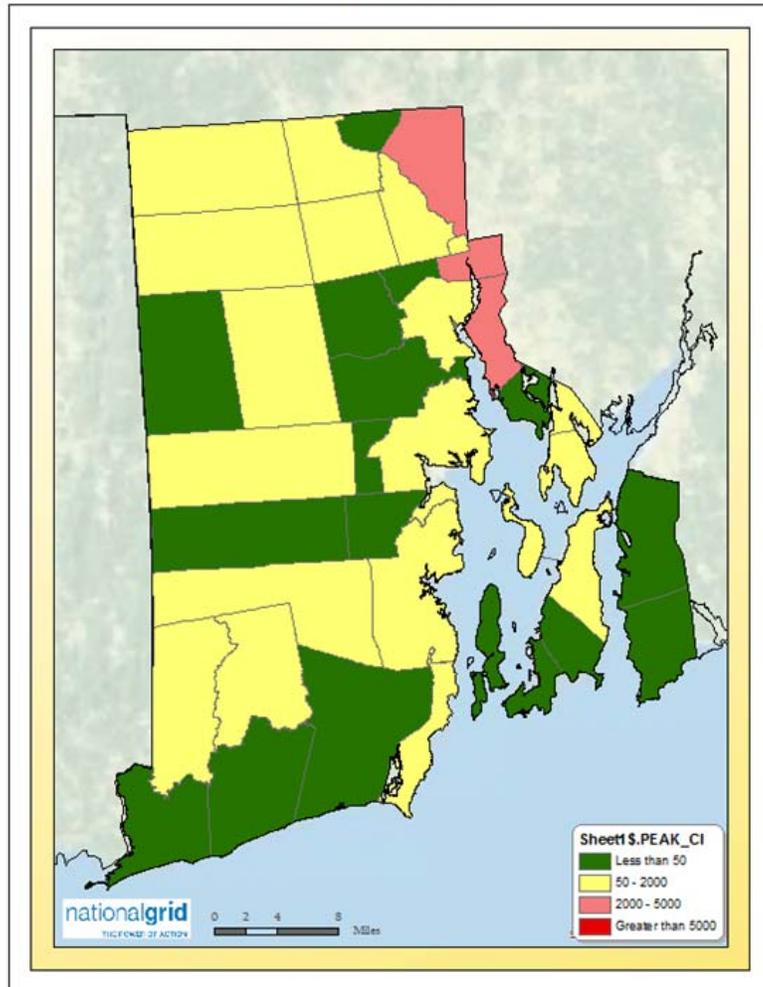


Interruptions Found for: Narragansett Electric

9. Impacted area:

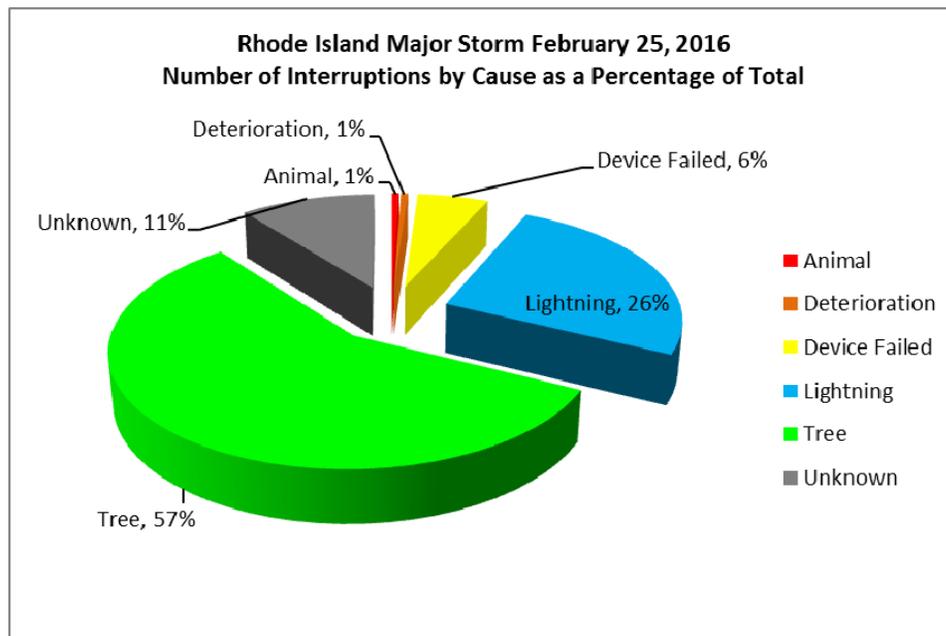
The following map shows the towns that were impacted by the storm and the customers interrupted during the storm.

**Customer Interrupted by Town at Company Peak  
02/25/2016**



10. Cause:

The following chart shows the breakdown of the number of interruptions by cause as a percentage of total interruptions during the storm.



11. Weather impact on restoration:

High winds, bringing down trees and branches, and thunderstorm with lightning resulted in multiple power outages in Rhode Island. Sustained winds of 20 mph with gusts up to 49 mph were reported in the area. These strong winds translated to wide spread wind damage in the form of numerous downed trees and broken limbs.

12. 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.

13. Summary of Customers Impacted:

**February 25, 2016**

During this storm, on February 25, 2016 Rhode Island experienced a total of 107 interruptions that affected 19,683 customers and 4,491,595 customer minutes of interruption. On average these interruptions resulted in 0.040 SAIFI, 9.230 minutes of SAIDI, and 228 minutes of interruption of customers affected. Since a SAIDI value of 79.230 minutes exceeded the threshold value of 5.26 minutes, February 25, 2016 qualified as a Major Event Day under the IEEE methodology.

**July 22, 2016 Thunderstorm**

1. Start Date and Time of event:

The thunderstorm began in the evening of Friday, July 22, 2016 at approximately 8:00 p.m. and peaked around 2:00 a.m. on July 23, 2016. The peak reached 12,919 customers interrupted.

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

The crew number was not reported in the storm.

3. The first instance of mutual aid coordination:

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

4. The first contact with material suppliers:

Contact with material suppliers was not required during this storm

5. 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", precapitalized 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 Narrangansett Electric Inventory</u>
7/22/2016	\$1,597,138.97	\$ 37,180,743.52	20.060%	\$ 7,458,577.24	\$ 9,055,716.21

6. Date/Time of request for external Crews:

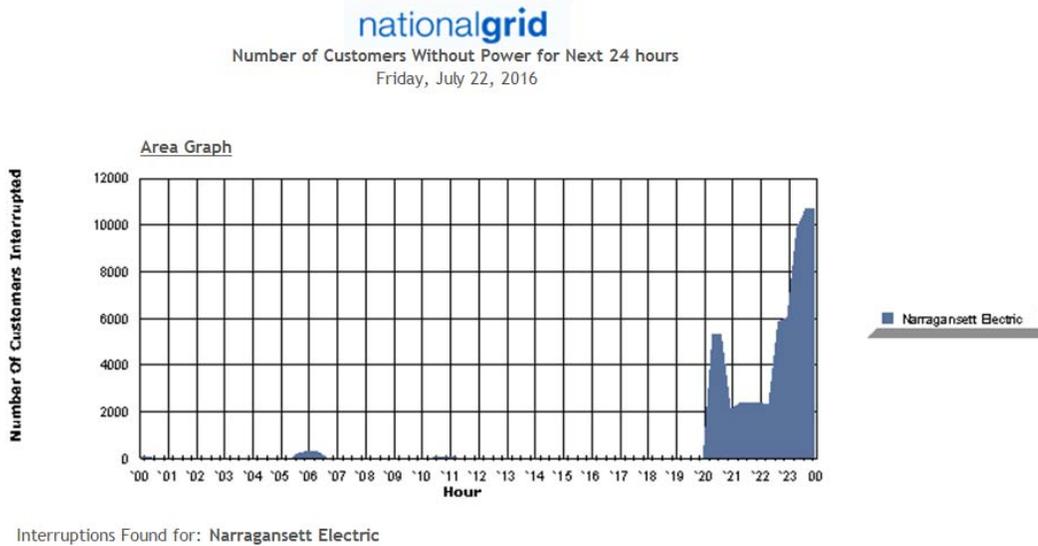
No external crews were required and restoration event was managed by internal crews.

7. Date/Time of external Crews assignment:

No external crews were required and restoration event was managed by internal crews.

8. # of customers out by hour (graphs following):

**July 22, 2016 (Friday)**



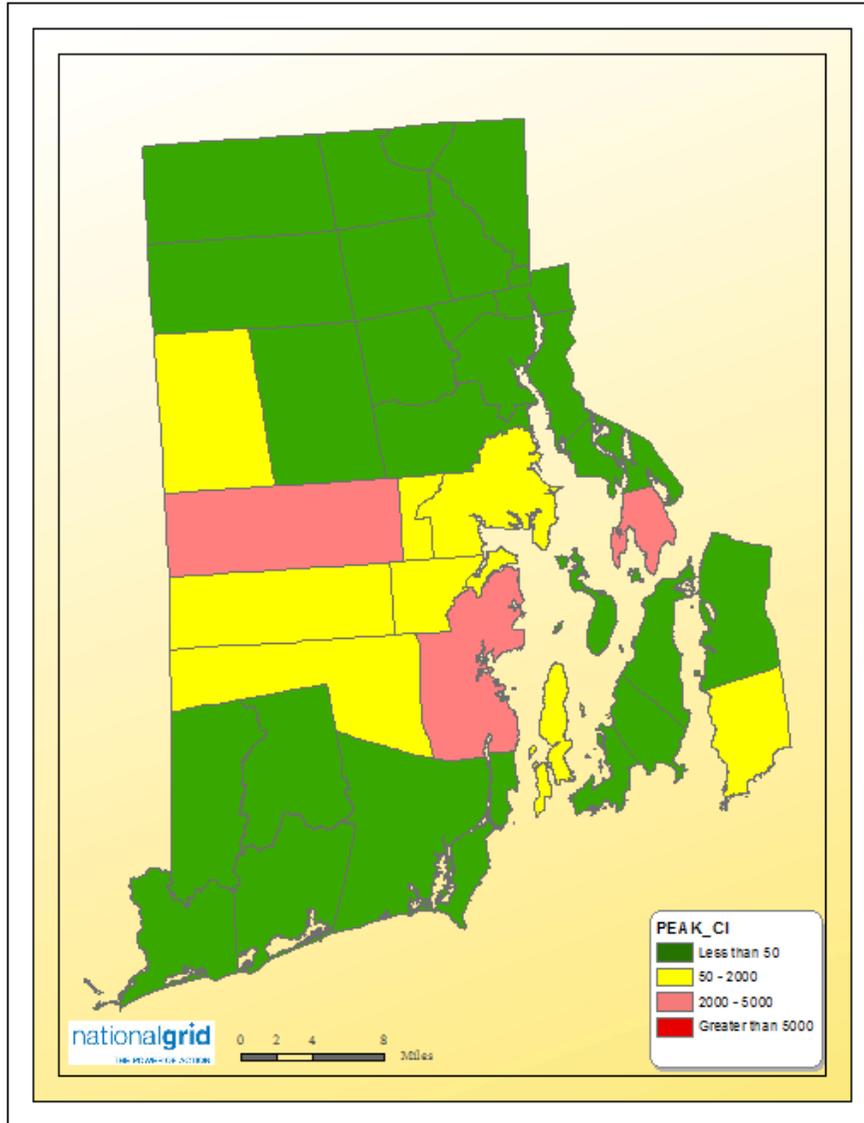
**July 23, 2016 (Saturday)**



9. Impacted area:

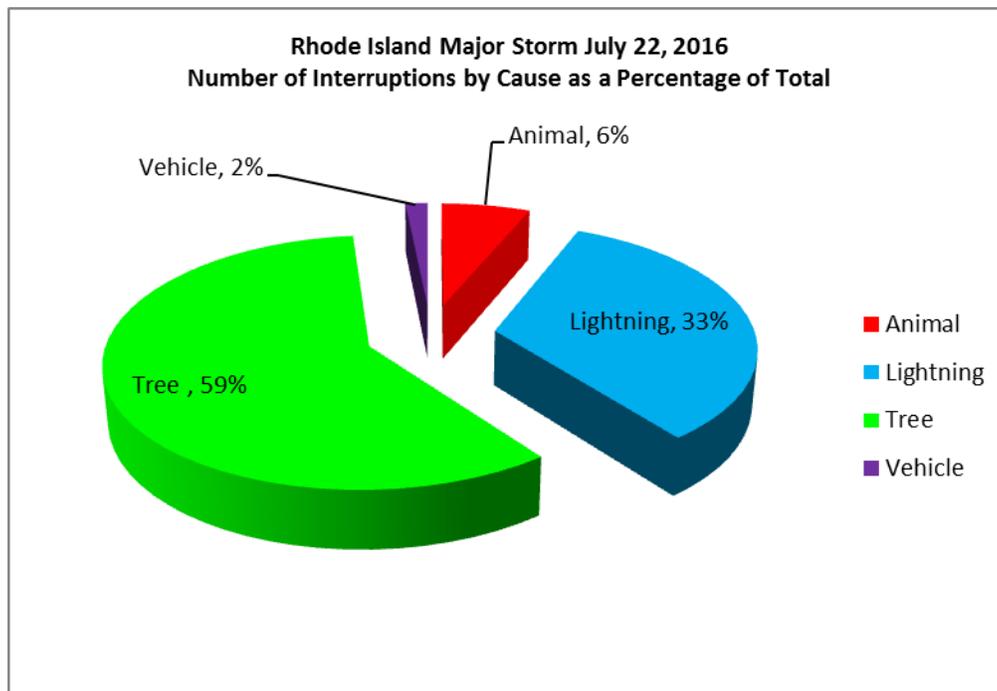
The following map shows the towns that were impacted by the storm and the customers interrupted during the storm.

**Customer Interrupted by Town at Company Peak  
RI 07/22/2016**



10. Cause:

The following chart shows the breakdown of the number of interruptions by cause as a percentage of total interruptions during the storm.



11. Weather impact on restoration:

Rain, thunderstorm with lightning and high winds, brought down trees and branches and resulted in multiple power outages in Rhode Island. Sustained winds of 20 mph with gusts up to 46 mph were reported in the area. These strong winds translated to wide spread wind damage in the form of numerous downed trees and broken limbs.

12. 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.

13. Summary of Customers Impacted:

**July 22, 2016**

During this storm, on July 22, 2016 Rhode Island experienced a total of 33 interruptions that affected 15,917 customers and 4,640,232 customer minutes of interruption. On average these interruptions resulted in 0.033 SAIFI, 9.509 minutes of SAIDI, and 291 minutes of interruption of customers affected. Since a SAIDI value of 90.509 minutes exceeded the threshold value of 5.26 minutes, July 22, 2016 qualified as a Major Event Day under the IEEE methodology.

**July 23, 2016**

Restoration activity continued through July 23, 2016,2016; however Major Event Day exemption was not requested.

**September 5-6, 2016 Storm**

1. Start Date and Time of the event:

The storm began in the middle of the day on Monday, September 5, 2016 at approximately 12:00 p.m and peaked around 6:00 a.m on September 6, 2016. The peak reached 5,901 customers interrupted.

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

The Providence Storm Room was opened and staffed Sunday afternoon, including 40 internal OH Line plus Trouble Shooters, and 50 Forestry crews. Additionally, 42 OH Line contractor crews were available Monday morning.

3. The first instance of mutual aid coordination:

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

4. The first contact with material suppliers:

Contact with material suppliers was not required during this storm

5. 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", precapitalized 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>
9/5/2016	\$1,587,098.77	\$ 36,567,632.51	19.750%	\$ 7,222,045.00	\$ 8,809,143.77
9/6/2016	\$1,584,903.77	\$ 36,514,934.65	19.750%	\$ 7,211,637.26	\$ 8,796,541.03

6. Date/Time of request for external Crews:

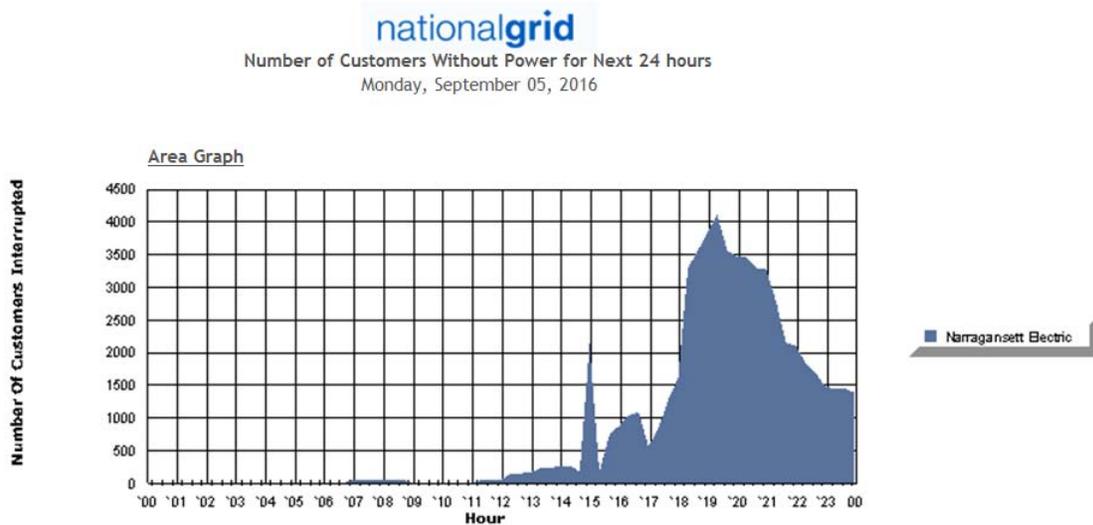
External line contractors were ready to work starting on the morning of September 5, 2016.

7. Date/Time of external Crews assignment:

External line contractors were ready to work starting on the morning of September 5, 2016.

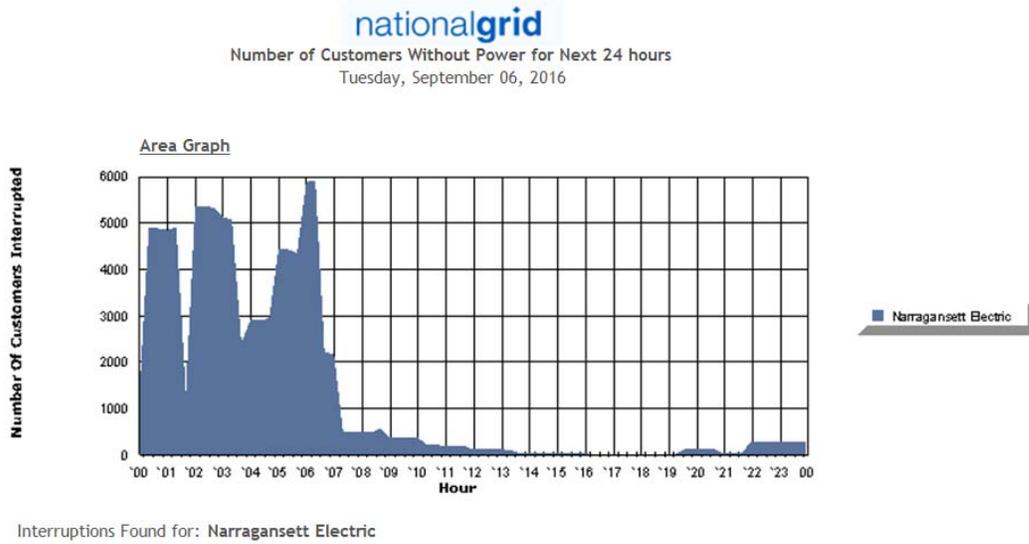
8. # of customers out by hour (graphs following):

**September 5, 2016 (Monday)**



Interruptions Found for: Narragansett Electric

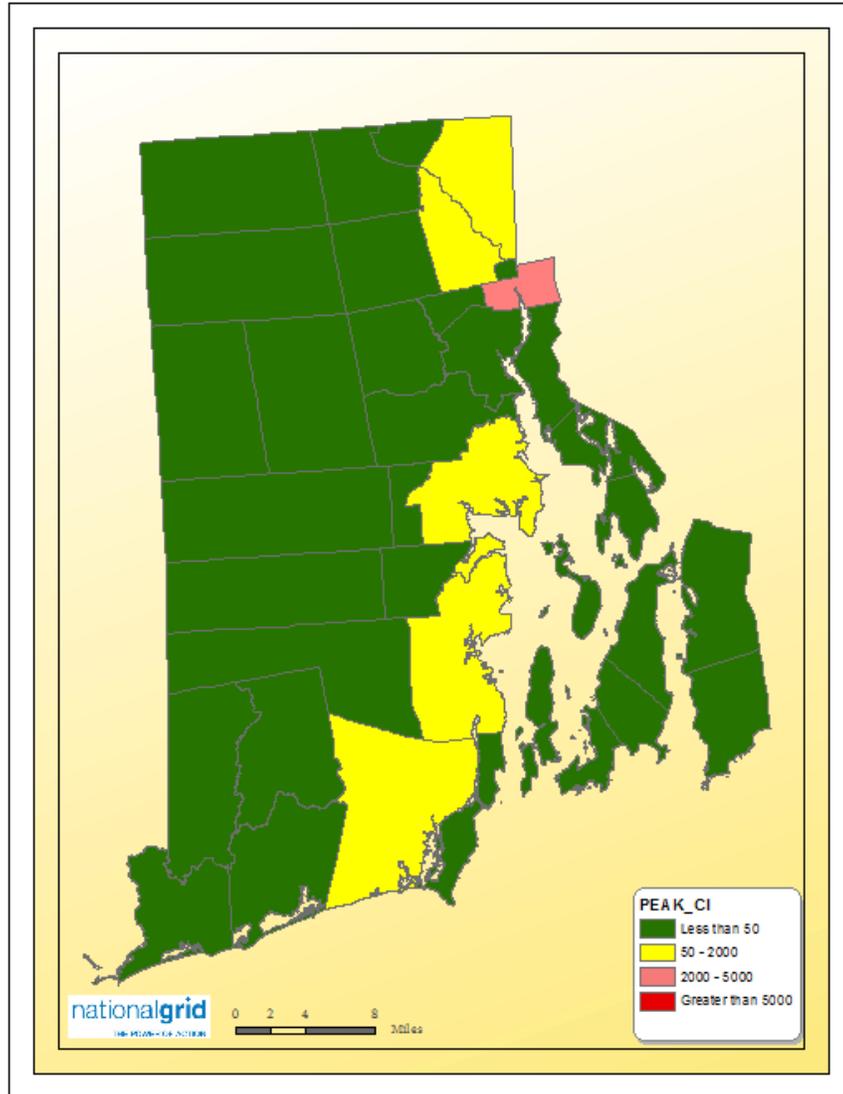
**September 6, 2016 (Tuesday)**



9. Impacted area:

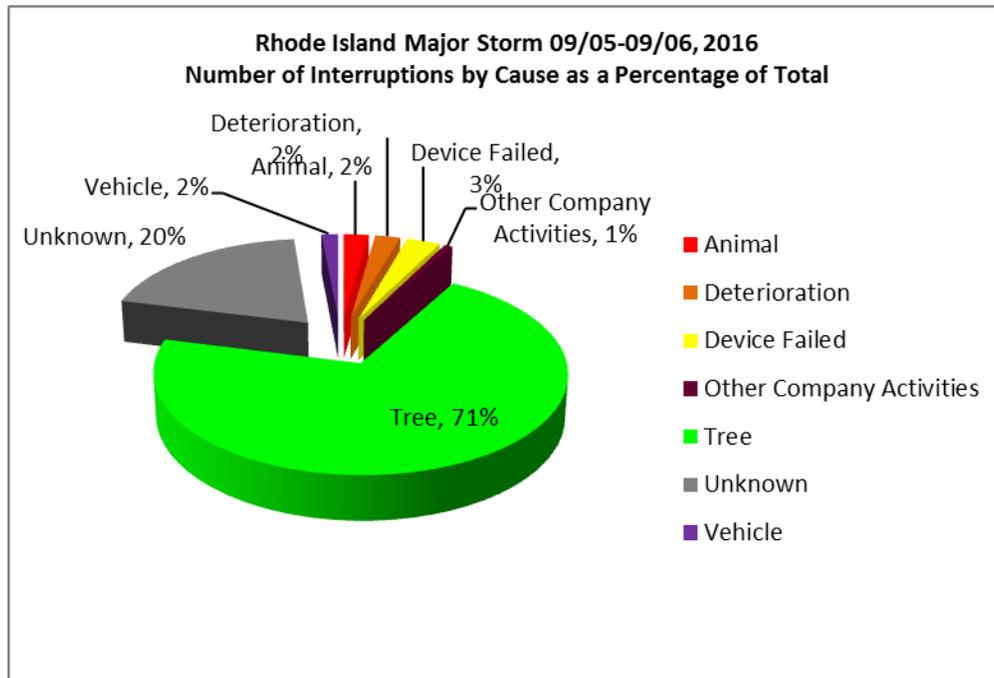
The following map shows the towns that were impacted by the storm and the customers interrupted during the storm.

**Customer Interrupted by Town at Company Peak  
RI 09/05/2016 to 09/06/2016**



10. Cause:

The following chart shows the breakdown of the number of interruptions by cause as a percentage of total interruptions during the storm.



11. Weather impact on restoration:

Rain and high winds brought down trees and branches and resulted in multiple power outages in Rhode Island. Sustained winds of 20 mph with gusts up to 37 mph were reported in the area. These strong winds translated to wide spread wind damage in the form of numerous downed trees and broken limbs.

12. 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.

13. Summary of Customers Impacted:

**September 5- 6, 2016**

During this storm, from mid-day September 5, 2016 to mid-day September 6, 2016 Rhode Island experienced a total of 121 interruptions that affected 19,551 customers and 2,678,680 customer minutes of interruption. On average these interruptions resulted in 0.040 SAIFI, 5.49 minutes of SAIDI, and 137 minutes of interruption of customers affected. A Major Event Day is typically interpreted to mean a calendar day, but since the Labor Day Weekend storm started mid-day on September 5<sup>th</sup>, the events on the following day were also considered when determining the storm's impact. Since the SAIDI value of 5.49 minutes for September 5-6, 2016 exceeded the threshold value of 5.26 minutes, the September 5-6, 2016 Labor Day Weekend storm qualified as a Major Event Day.