Request:

Provide an overall summary of the October 29th/30th storm that impacted National Grid's service territory including information relied on to forecast potential impacts, National Grid's expected impacts prior to the storm, storm preparation actions, actual impacts, and restoration efforts.

Response:

The October 29-30 storm was a Type 3 emergency event that affected the state of Rhode Island as well as numerous other states along the Eastern Seaboard and Canada. The storm brought damaging winds and heavy rain, causing significant damage to the Company's electric infrastructure and interrupting power to 176,247 of the Company's customers in all of the Company's 38 communities in Rhode Island. The storm impacted more customers that Hurricane Sandy did in 2012, and produced more physical damage to the Comapany's poles than Tropical Storm Irene did in 2011. Despite the extensive damage from this storm, the Company successfully restored power to 90% of its peak customers impacted (144,144) in two-and-a-half days.

Information Relied on to Forecast Potential Impacts

The Company monitors the weather forecast obtained from its weather provider, DTN, three times daily. The Company also monitors the forecast from various weather websites. On Thursday, October 26, the weather models indicated a possible hazard wind gust event for the Northeast. However, the various weather models did not agree regarding the timing and position of the low pressure system that was expected to develop as a result of the two weather systems combining, as discussed in more detail in the Company's response to Data Request R-I-7. If the low pressure system developed along the Eastern Coast of the United States, then a shorter duration and lessened wind gust impact would occur. However, if the low pressure system developed in the Hudson River Valley of New York, as some models indicated, then a longer duration and much higher wind gust impact would affect a much broader area of the Northeast. At this time, DTN reflected a possible hazard wind gusts event of an Energy Event Index (EEI) Type 3 (>=45 mph wind speed and >=50 mph wind gusts), both inside and outside of thunderstorm activity, on Sunday, October 29 into Sunday night; and another period of gusty winds through the day on Monday, all reflecting a medium confidence level (30-60% chance the most likely index level remains at that level through the event) in the forecast accuracy. Please

see the Company's response to Data Request R-I-4 for a more detailed description of the confidence levels and index rating definitions under the EEI.

Moving into Friday, October 27, the weather models started to come into better agreement of a low pressure system developing in the Hudson Valley of New York, which increased DTN's confidence that this would be a longer duration and more widespread hazard wind event for the Northeast, yet a medium confidence level was still being offered and no increase in the EEI Type 3 rating for wind speeds. There was also a slight shift in timing with the models showing the peak wind event occurring Sunday night into early Monday morning; and then another round of winds spiking during the daytime hours Monday. Subsequently, the forecast predicted increased wind gusts Sunday night into Monday morning across New England.

By Saturday, October 28 and Sunday, October 29, the models were in agreement regarding the timing, strength, and the Hudson River Valley position of the developing low pressure system. The strongest winds were expected Sunday night into early Monday morning, with the highest gusts expected to remain off the coast. The DTN forecast on Saturday, October 28 at 6:00 a.m. offered a 5% chance that the EEI wind speed level in Rhode Island would raise to a EEI Type 4 (>=60 mph wind speed / >=65 mph wind gusts), and a 20% chance that the thunderstorm activity could cause EEI Type 4 damaging winds in isolated areas.

Lastly, on Sunday, October 29, the 7:00 p.m. DTN forecast continued with a medium confidence rating, and only a 5% and 20% chance for the Capital and Coastal areas of Rhode Island, respectively, to experience EEI Type 4 wind gusts. Ultimately, by the morning of Monday, October 30, parts of the Rhode Island service territory would have experienced actual wind speeds over 70 mph, which would be closer to a EEI Type 5 wind speed rating (>=70 mph wind speed / >=75 mph wind gusts). The forecast offered no percent chance of this possibility.

On Friday, October 27 at 10:00 am, the Company held a planning call during which the Company reviewed the weather forecast and began planning efforts for the possibility that the October 29 storm would impact the Company's electric distribution system in New England. The Company held subsequent pre-event calls on Saturday, October 28 and Sunday, October 29, both at 1:00 p.m. The State Incident Commander had primary responsibility for establishing the projected and actual event classification level for the October 29 storm.

Factors considered in initially establishing or revising the expected incident classification level included the following:

- Expected number of customers without service;
- Expected duration of the restoration event;
- Recommendations of the State Planning Section Chief, Transmission and Distribution Control Centers, and other key staff;
- Current operational situation (such as number of outages, resources, supplies);
- Current weather conditions;
- Damage appraisals;
- Forecasted weather conditions;
- Restoration priorities;
- Forecasted resource requirements; and
- Forecasted scheduling and pace of restoration work crews.

The Company used the weather forecasts, along with operational knowledge of the electrical system and past weather events, to estimate the predicted percentage of customers that would be without distribution service because of the event's impact.

The Company's Expected Impacts Prior to the Storm and Storm Preparation Actions

The Company began preparing for the October 29 storm on Friday, October 27. AAs mentioned above, the Company held a planning call during which the Company reviewed the weather forecast and began planning efforts for the possibility that the October 29 storm would impact the Company's electric distribution system in New England. The Company's Customer Contact Center and Logistics groups were also notified of the upcoming event. The Company followed its Emergency Response Plan for a National Grid Type 4 event, expecting that the event would impact up to 3% of the Company's customers and that restorations would be accomplished in approximately 24 hours. This plan remained consistent throughout the pre-event calls on Saturday, October 28 and Sunday, October 29, both held at 1:00 p.m. As a result of these calls, the Company contacted its employees with storm assignments or operational responsibilities and apprised them of the need to report for storm assignments.

The Company utilizes the Incident Command System, a component of the National Incident Management System, which is a comprehensive national approach to incident management applicable at all levels of the Company's Emergency Response Organization, and addresses the operation of Company Emergency Operation Centers. In accordance with the Emergency Response Plan and anticipated a National Grid Type 4 event, the Company

activated the Branch Level Emergency Response Organization prior to the first Pre-Event Stage Briefing Call on Saturday, October 28 at 1:00 p.m. At that time, the Company planned to staff its Rhode Island branch in Providence on Sunday, October 30 at 6:00 p.m., and began appointing a branch level Emergency Response Organization structure for that location.

The Company uses its own transmission and distribution operations employees, contractors of choice,[1] other outside contractors, and, in some circumstances, mutual assistance restoration crews, to restore service during emergency events. The Company had 30.5 overhead line crews, 11 forestry crews, and 9 underground and substation resources at its disposal at 6:00 p.m. on the evening of October 29, with additional resources scheduled later that evening. The Company planned for contractors of choice crews and external contractor crews to be on property the next day at 6:00 a.m. to assist with restoration. By Monday morning at 7:00 a.m., October 30, resources available to respond to the event had increased to 66 overhead line crews, 17 contractor crews, 24 forestry crews, and 42 underground and substation resources.

On Friday, October 27, the Director New England Regulatory Affairs notified the Division of Public Utilities and Carriers and Office of Energy Resources to inform of the Company's planning efforts for the October 29 storm. The Director of New England Regulatory Affairs provided subsequent updates on Saturday, October 28 and Sunday October 29. Also on Friday, the Company's Director of Community and Customer Management contacted the Rhode Island Emergency Management Agency (RIEMA) to inform of the Company's planning efforts for the October 29 storm. RIEMA did not request the Company to staff the facility nor did it open in advance of the event.

To prepare for the upcoming event, after the Pre-Event Stage Briefing Call #1 on Saturday, October 28 at 1:00 p.m., the State Logistics Section Chief notified the Meals and Lodging Lead to secure hotel rooms and procure food arrangements for incoming contractor crews. Also on Saturday, October 28, the Contact Center took the following steps to facilitate communications with the Company's customers:

- Added additional staffing for Sunday, October 29 through Saturday, November 4;
- Established and created 12- to 16-hour shifts for representatives in New England;
- Assigned support to assist with Life Support customer monitoring and outreach;

[1] Contractors of choice are contractors who, after a competitive bid process, are awarded all or almost all of the Company's contracted work within an area or within groups of areas based on their successful multi-year bid. The contractors of choice typically have resources working daily on National Grid property and make those workers readily available for emergency work.

- Scheduled management personnel for 12- to 16-hour rotating shifts; and
- Contacted the Company's third-party vendor to provide additional support for incoming calls.

The Contact Center initiated automated calls to Life Support customers on Saturday, October 28 at 2:00 p.m. to notify them of the upcoming weather and to recommend taking necessary precautions and preparations to ensure their wellbeing in the event of an outage. The message also advised Life Support customers to contact 911 or their local public safety officials in the event of an emergency.

The Company provided information to customers prior to the event through the Company's website, social media, and interviews with the media. This included, but was not limited to, communications in the following subject areas: information about how the Company prepares for a storm; information how to report and check on outages; safety tips; and information for customers about how to receive text message alerts and updates from the Company. National Grid's media relations staff fielded one call from reporters in Rhode Island about the Company's storm preparations on Saturday, October 28.

Actual Impacts

Strong, hazardous wind gusts affected the majority of the Northeast during the night on Sunday, October 29 through Monday, October 30. The strongest wind gusts recorded occurred between 8:00 p.m. October 29 and 5:00 a.m. October 30, with gusts of 55 to 70 mph experienced along the Eastern Atlantic Seaboard from Long Island, New York and coastal Connecticut and up through coastal Maine, including in Rhode Island. The rest of the Northeast experienced wind gusts of 35 to 50 mph. A second period of wind gusts continued throughout the day on Monday, making this a prolonged hazardous wind event that downed trees and branches and caused numerous power outages. Early Monday morning, Rhode Island experienced actual sustained winds of approximately 60 mph and gusts of 72 mph in Warwick.[2]

On Monday, October 30 at approximately 1:00 a.m., as the Company monitored the impacts of the event, the State Incident Commander elevated the response to a National Grid Type 3 event. A Type 3 event is classified as one where restoration activities are generally accomplished within a 72 hour period and typically results in up to 9% of customer interrupted. The State Incident Commander then requested additional staff to be activated and increased the request for additional external contractor resources. Also at this time, the Company initiated a

[2] Source: https://weather.com.

mutual assistance request for 500 line crews and 210 forestry crews for all of the Company's New England response. The New England State Emergency Response Organization was activated prior to the New England State Restoration Stage Briefing Call #1 at 8:00 a.m. that day. On that 8:00 a.m. call, the Company communicated the change to a Type 3 response.

As a result of the storm, the storm affected two transmission circuits and a total of 204 distribution feeders. The Company experienced interruptions in all of the 38 communities it serves in Rhode Island. At peak, nine towns experienced greater than 5,000 customers interrupted (see Figure 1 below). In six of the Company's communities in Rhode Island, more than 70% of customers lost power at peak; and in 11 of the Company's communities in Rhode Island, more than 50% of customers lost power at peak (see Figure 2 below).

Figure 1. Rhode Island Customers Interrupted by Town, at Peak

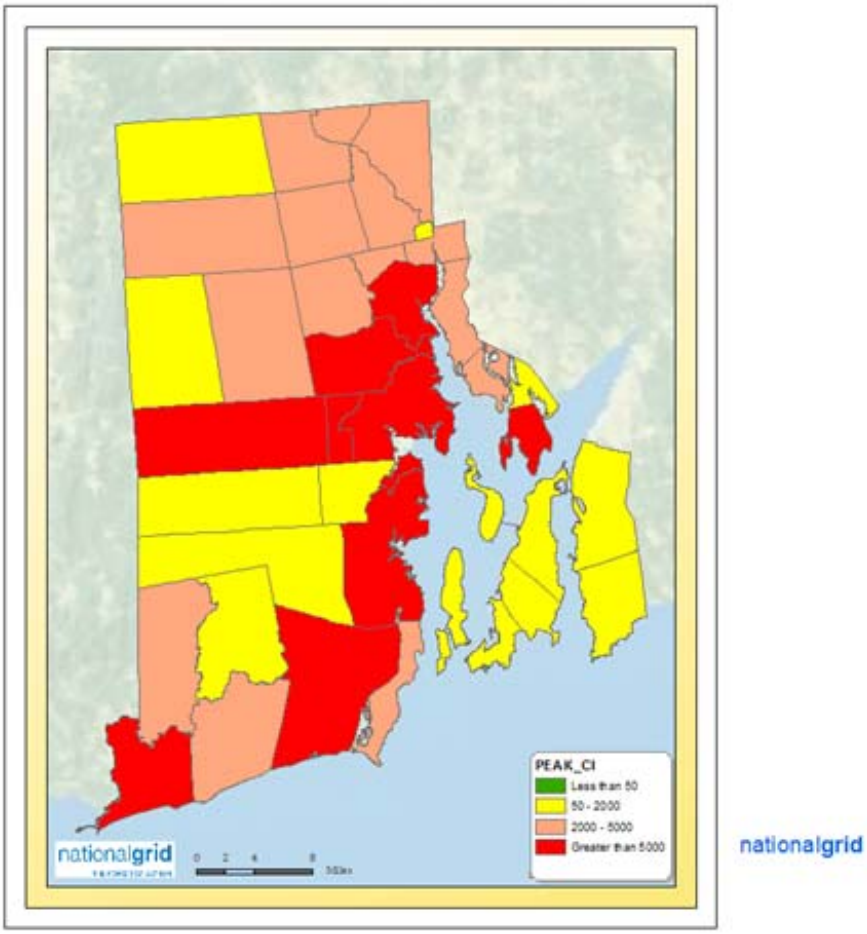
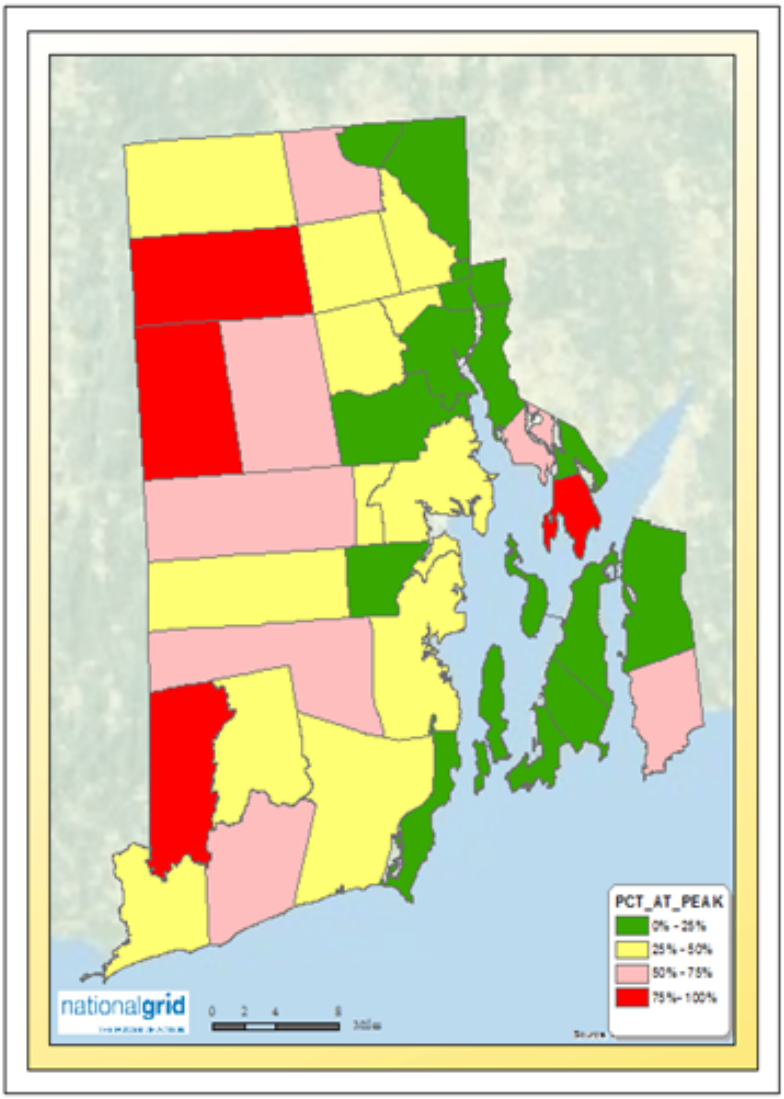


Figure 2. Percent of Rhode Island Customers Interrupted by Town, at Peak



national grid

The Company's preliminary assessment of replaced equipment for the October 29-30 storm shows that the Company replaced approximately 172 poles, 45 transformers, and 15,000 feet of electric wire during the restoration effort.

Prepared by or under the supervision of: Daniel Bunszell

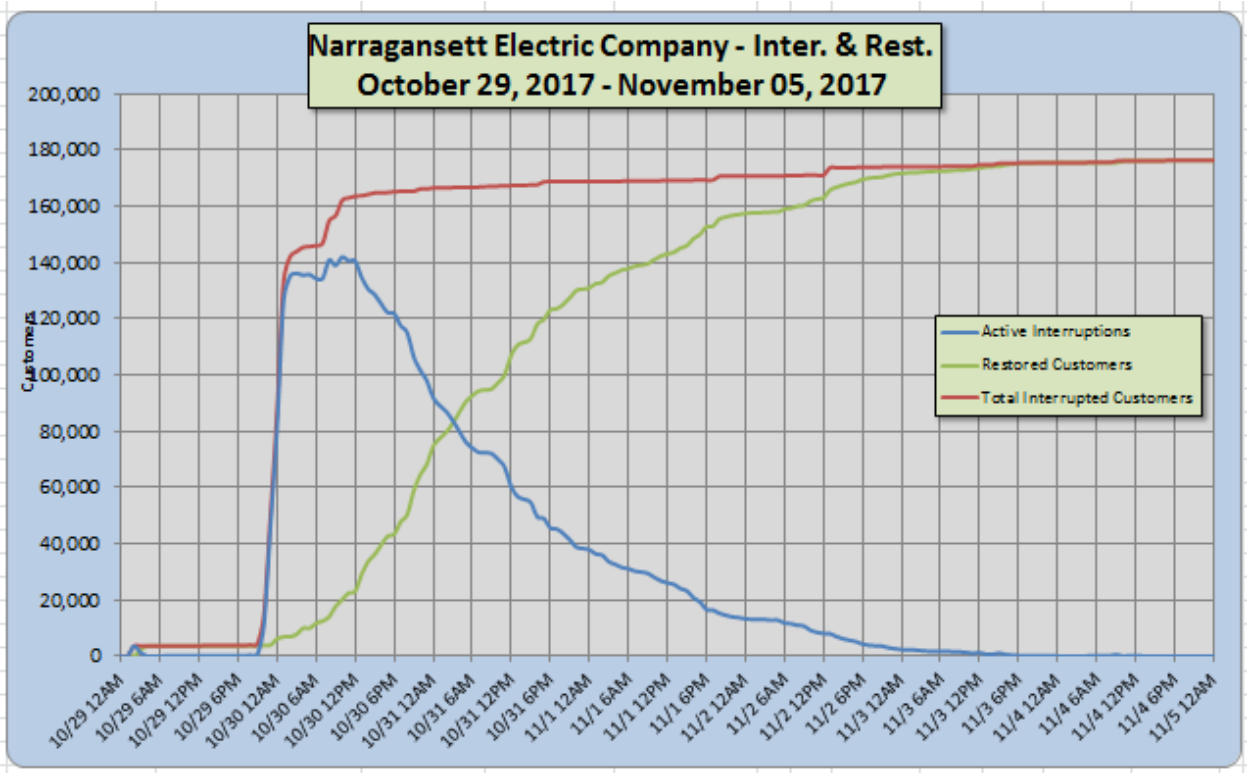
Restoration Efforts

The Company followed the system of prioritization for restoration found in its Emergency Response Plan, focusing first on public safety and then on the overall goal of maximizing customer restoration when lines became energized. The Company prioritized its workforce to focus on repairing transmission lines, substations, sub-transmission, and initial mainline distribution work, balancing resources between areas with the most damage to provide electricity sources to the largest areas without power. Alternate or backup supplies received a lower priority if the area already had a supply line in service. Therefore, affected areas that lacked a source of supply due to transmission or substation interruptions were not initially assigned distribution restoration crews until transmission/substation work could be completed. Instead, as a means of prioritized restoration, the Company sent crews into distribution areas initially only where transmission had not been interrupted and where the ensuing repairs to the distribution system restored aggregate customers to service. The Company next prioritized restoration of service to distribution lines, and by the end, repaired service lines that may have only fed a single customer. The Company gave priority and consideration to critical facilities, and made efforts to restore service to its Life Support customers as quickly as conditions warranted, which is set forth in its Emergency Response Plan.

The storm began in the late evening hours on Sunday, October 29, with 51,000 customers out of service in Rhode Island by approximately 11:00 p.m. and 87,000 customers out of service by approximately midnight that night. At approximately 9:20 a.m. on Monday, October 30, the peak customer outages totaled 144,144. As restoration efforts began, the Company followed its restoration prioritization process, using all available resources. The Company made continued progress in restoring power during the course of the week.

Figure 3 below shows the number of customers interrupted and restored, by hour, from Sunday, October 29 through Sunday, November 5, 2017.

Figure 3 – Rhode Island Customer Interruption & Restoration Graph



R-I-2

Request:

Provide the latest edition of National Grid's storm response plan and policy procedures.

Response:

Please see Attachment R-I-2 for National Grid's Rhode Island Electric Emergency Response Plan effective May 15, 2017.

Prepared by or under the supervision of: Michael G. McCallan

R-I-3

Request:

Provide an organizational chart with the names of all National Grid personnel responsible for all preplanning, organization, and restoration associated with storm response. Include the title and role served for personnel in the Strategic, Tactical, or Operational Level.

Response:

Please see Attachment R-I-3 for the Tactical Level and Operational Level Incident Command System Organization Charts for the October 29-30, 2017 storm event. The titles and roles served for the personnel listed in the organization charts are provided below (Format: name, title, storm role).

Strategic Level

The Crisis Management Team (CMT) was not activated for this event, but key CMT members were provided situational awareness via daily briefings.

Tactical Level

Alejandro Mango – VP US Audit, State Liaison Officer
Brad Newman – Lead Specialist, Security NE, State Security Officer
Brian Schuster – Director NES Performance and Strategy, State Logistics Section Chief
Daniel Bunszell – VP New England Electric Operations, State Incident Commander
Danielle Williamson – Director Strategic Communications, State PIO
Deborah Drew – Director Strategic Communications, State PIO
Edward Lombardi – Principal Program Manager, Dist. Field Engineer NE, Branch Director
Jeff Faber – Director Construction & Maintenance, New England, Branch Director
John Gavin – VP Electric Process and Engineering Projects, State Planning Section Chief
John Isberg – VP Marketing Development, State Liaison Officer
Kate Hearns – Executive Advisor, Operations and Engineering, State Logistics Officer
Kevin Peltier – Director Construction & Maintenance, New England, Branch Director
Maria Marotta – Dir Labor & Employee Relations, State HR Section Chief
Mary Fuller – Director Investment Planning, Branch Director
Mike Nickl – Manager, NE Safety Electric, State Safety & Health Officer
Parker Capwell - Manager Electric Operations Management RI, Branch Director
Paul Brochu – Director Construction & Maintenance, New England, State Incident Commander
Paul Sibley – Manager Electric Operations Management NE, Branch Director

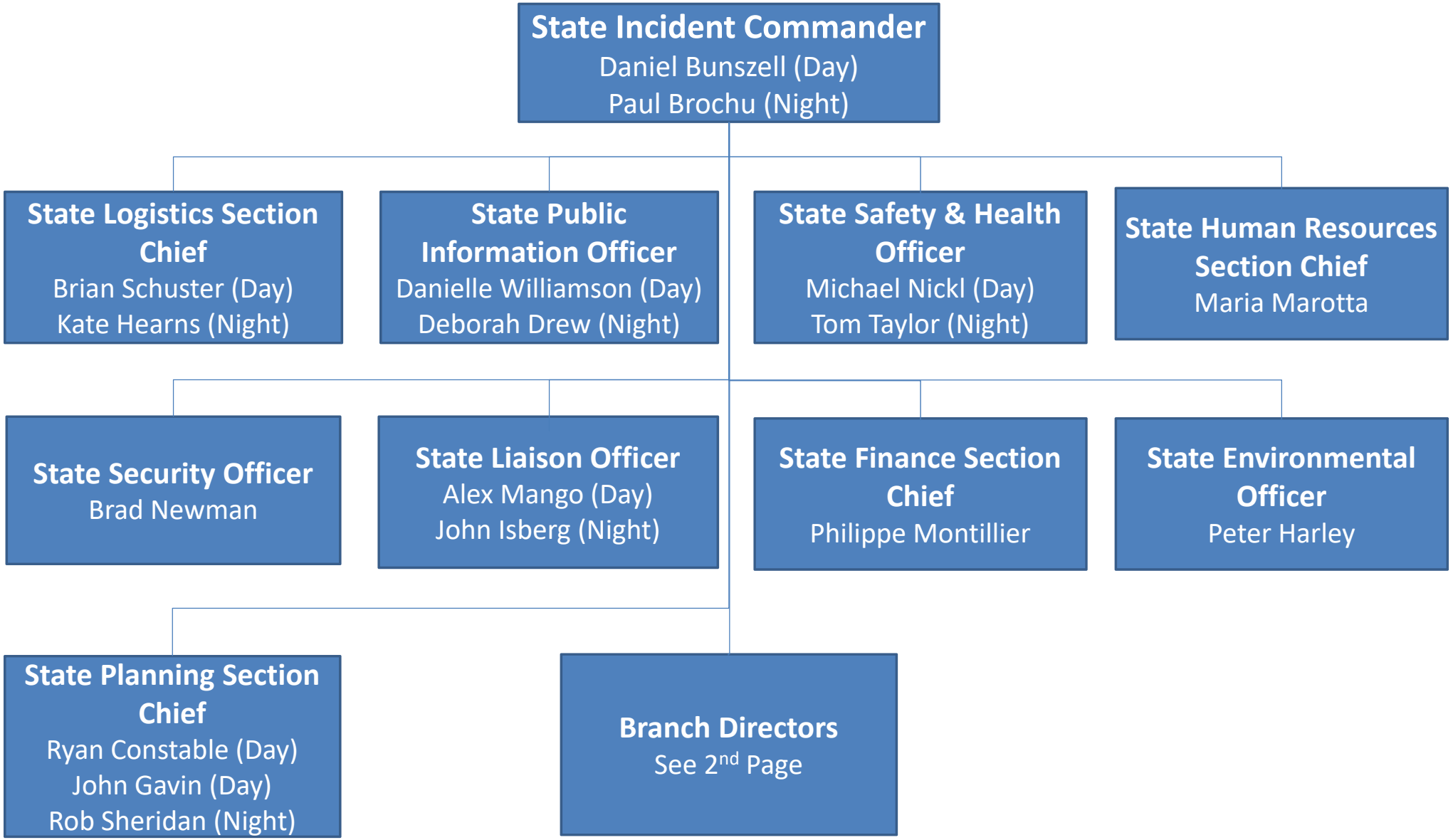
Prepared by or under the supervision of: Daniel Bunszell

Peter Harley – Engineer Manager, Environmental NE, State Environmental Officer
Philippe Montillier – Manager Financial Performance & Reporting, State Finance Section Chief
Robert Pendrake – Principal Engineer, Asset Management Distribution, Branch Director
Robert Schneller – Acting Director, Project Management, Branch Director
Robert Sheridan – Director, Network Solutions, NES Grid Modernization, State Planning Section Chief
Ryan Constable – Acting Director, Asset Management Distribution, State Planning Section Chief
Tom Mulligan – Director Construction & Maintenance, New England, Branch Director
Tom O'Leary – Director Process & Performance, E2E Electric, Branch Director
Tom Taylor – Director Safety Management, State Safety & Health Officer
Walter McDonald - Manager Electric Operations Management RI, Branch Director

Operational Level

David Cardoza – Director Process & Performance, NE Electric, Branch Planning Coordinator
Gary Bourque – Lead Supervisor, Operations Overhead Providence, Branch Operations Coordinator
Jennifer Casey – Sr. Field Coordinator, NE Safety Electric, Branch Safety & Health Coordinator
Joaquim Saraiva – Lead Program Manager, Resource Planning NE, Branch Planning Coordinator
Keith Burgoyne – Lead Supervisor, Operations Underground Providence, Branch Operations Coordinator
Parker Capwell - Manager Elect. Operations Management RI, Branch Director, Branch Director
Rebecca Golding – Lead Analyst, Energy Efficiency Program Execution, Branch Logistics Coordinator
Ted Kresse – Director Strategic Communications, RI, Branch PIO
Walter McDonald – Manager Electric Operations Management RI, Branch Director
William Flaherty – Director Community & Customer Management RI, Branch Liaison Coordinator
William Howard – Manager, Environmental NE, Branch Environmental Coordinator

Tactical Level
Incident Command System – Organization Chart
10/29/17 Wind/Rain Storm


State Incident Commander
Daniel Bunszell (Day)
Paul Brochu (Night)
State Logistics Section Chief
Brian Schuster (Day)
Kate Hearns (Night)
State Public Information Officer
Danielle Williamson (Day)
Deborah Drew (Night)
State Safety & Health Officer
Michael Nickl (Day)
Tom Taylor (Night)
State Human Resources Section Chief
Maria Marotta
State Security Officer
Brad Newman
State Liaison Officer
Alex Mango (Day)
John Isberg (Night)
State Finance Section Chief
Philippe Montillier
State Environmental Officer
Peter Harley
State Planning Section Chief
Ryan Constable (Day)
John Gavin (Day)
Rob Sheridan (Night)
Branch Directors
See 2nd Page

Branch Director
Brockton
Jeff Faber (Day)
Edward Lombardi (Night)

Branch Director
Hopedale
Mary Fuller (Day)
Tim O'Leary (Night)

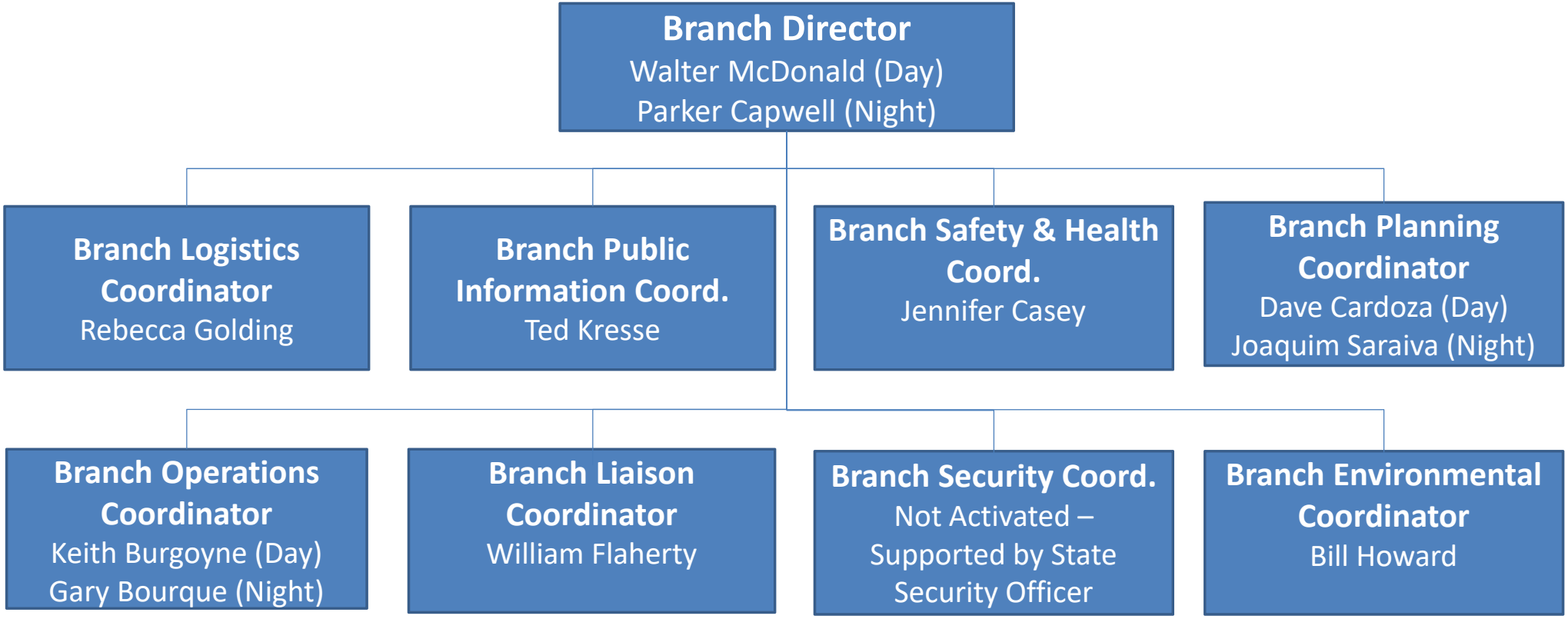
Branch Director
North Andover
Bob Pendrake (Day)
Tom Mulligan (Night)

Branch Director
Malden / Lynn
Andrew Schneller (Day)
Paul Sibley (Night)

Branch Director
Providence
Walter McDonald (Day)
Parker Capwell (Night)

Branch Director
Worcester
Kevin Peltier (Day)

Operational Level
Incident Command System – Organization Chart
Providence Branch 10/29/17 Wind/Rain Storm



R-I-4

Request:

Provide detailed information relied upon to predict the weather impact and storm track, including information provided by any weather service contracted by National Grid.

Response:

Please see Attachment R-I-4-1 for the forecast information from DTN, the Company's primary weather forecasting source. The forecast information in Attachment R-I-4-1 is in chronological order beginning on October 27, 2017 at 6:00 a.m. through October 31, 2017 at 7:00 p.m. In addition, please see Attachment R-I-4-2 for additional information provided by DTN to National Grid on October 29, 2017.

RI-Q 4 Materials

Energy Event Index for NATIONAL GRID (New England)

Your forecast administrator: theresa.leib@nationalgrid.com

Valid Time: October 27, 2017 6:00 AM EDT

Forecaster: justin.wegwerth

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Central Massachusetts	1	1	1
	Eastern Massachusetts	1	1	2
	Nantucket	1	1	2
	Rhode Island	1	1	2
	Western Massachusetts	1	1	1
Wind/Gust	Central Massachusetts	1	1	2
	Eastern Massachusetts	1	1	3
	Nantucket	1	1	3
	Rhode Island	1	1	3
	Western Massachusetts	1	1	2
Confidence Level	Central Massachusetts	High	High	Medium
	Eastern Massachusetts	High	High	Medium
	Nantucket	High	High	Medium
	Rhode Island	High	High	Medium
	Western Massachusetts	High	High	Medium

Forecast for NEW ENGLAND from DTN for National Grid

Date: October 27, 2017
Time: 6:00 AM EDT
Forecaster: J Wegwerth

CURRENT CONDITIONS: Skies are clear, except cloudy in/west of the Berkshires. Winds: Southwest at 5-12 mph. Temperatures: Lower 40s to near 50.

SYNOPSIS: Dry and hazard-free today through Saturday. Showers possible Saturday evening and night. On Sunday, a strong system will impact the service area, especially from Sunday afternoon into Monday. Hazardous sustained winds, gusts, and rainfall will be likely. Embedded thunderstorms will be possible, but any thunderstorms will produce hazard gusts. The strongest winds will focus along the coasts, in the higher terrain, and in any thunderstorms that occur. Damaging wind gusts could occur. Heavy rainfall will increase the risk for downed trees and power lines. Confidence is high that this next system will bring hazard level impacts to much of the service territory, but confidence remains medium regarding the specifics of intensity and timing.

WIND IMPACT: None.

THUNDERSTORM IMPACT: None.

PRECIPITATION IMPACT: None.

TEMPERATURE IMPACT: None.

SNOW IMPACT: None.

ICE IMPACT: None.

FLOOD IMPACT: None.

TODAY: Dry. Winds: West at 5-15 mph, gusting 18-25 mph early. Highs: Middle 50s to middle 60s.

TONIGHT: Dry. Winds: Southwest at 3-8 mph. Lows: Lower 30s to lower 50s.

TOMORROW: Dry. Winds: South at 5-15 mph, gusting 18-25 mph at times. Highs: Lower 60s to near 70.

TOMORROW NIGHT: Rain showers possible in Western after 11pm, Central after 12am Sat, and Charlestown and Lebanon after 2am Sat. Rainfall: Tr-0.15", isolated 0.20" in Western. Winds: South at 8-18 mph, gusting around 20-25 mph at times. Lows: Upper 40s to middle 50s.

DAYS 3-5: On Sunday, rain will increase in coverage/intensity in the late morning/afternoon and evening from west to east. A few rumbles of thunder possible between 6am-12pm Sun in western MA. T-storm chance: 20%. Lightning amounts: Low. Periods of moderate/heavy rain likely from the late morning/afternoon into the night in interior areas and from the late afternoon/evening into the night in eastern/coastal areas. Rainfall: 1-3", isolated 4" possible. Chance for rainfall: 90% > 1.00"; 70% > 2.00"; 55% > 3.00". Embedded t-storms possible 12pm Sun-2am Mon interior areas; 11pm Sun-5am Mon eastern areas. T-storm chance: 20% interior areas; 30% eastern areas. Lightning amounts: Low. Hazard t-storm gust chance western areas: 55% EEI-2; 20% EEI-3. Hazard t-storm gust chance eastern areas: 80% EEI-2; 55% EEI-3; 30% EEI-4. Gusty winds possible outside of storms during the evening and night. Hazard gust chance eastern areas: 80% EEI-2; 55% EEI-3; 10% EEI-4. Hazard gust chance inland: 60% EEI-2; 15% EEI-3. On Monday, periods of showers possible in the morning and early afternoon, then mostly dry. Additional rainfall: 0.20-0.50". Wind gusts: 35-45 mph; peak gusts 45-50 mph in the morning and afternoon, then decreasing to 25-35 mph by the evening and night. Hazard gust chance: 60% EEI-2. Confidence is high in an impactful system occurring on Sunday and Monday, but confidence is medium on the timing and intensity of rainfall, winds, and t-storms. On Tuesday, dry and hazard-free. Winds could gust 25-35 mph, strongest in the morning. Temperatures will be 5-12 degrees above normal on Sunday, within 6 degrees of normal on Monday, and near to 6 degrees below normal on Tuesday.

Energy Event Index Definition

With Leaves (Apr 1 - Oct 31)

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

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

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

Go to WeatherSentry® Online for a complete view of the forecast and other business critical weather information.

Energy Event Index for NATIONAL GRID (New England)

Your forecast administrator: theresa.leib@nationalgrid.com

Valid Time: October 27, 2017 1:00 PM EDT

Forecaster: john.baranick

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Central Massachusetts	1	1	1
	Eastern Massachusetts	1	1	2
	Nantucket	1	1	2
	Rhode Island	1	1	2
	Western Massachusetts	1	1	1
Wind/Gust	Central Massachusetts	1	1	2
	Eastern Massachusetts	1	1	3
	Nantucket	1	1	3
	Rhode Island	1	1	3
	Western Massachusetts	1	1	2
Confidence Level	Central Massachusetts	High	High	Medium
	Eastern Massachusetts	High	High	Medium
	Nantucket	High	High	Medium
	Rhode Island	High	High	Medium
	Western Massachusetts	High	High	Medium

Forecast for NEW ENGLAND from DTN for National Grid

Date: October 27, 2017
Time: 1:00 PM EDT
Forecaster: J Baranick

CURRENT CONDITIONS: Dry. Winds: West at 5-12 mph. Temperatures: Lower 50s to lower 60s.

SYNOPSIS: Dry and hazard-free conditions will continue through Saturday afternoon. Showers will move into Western MA/NH Saturday evening, being slow to spread eastward during the day Sunday. Periods of heavy rain are expected Sunday evening into Sunday night. Winds will be on the increase Sunday afternoon and especially overnight into Monday. The strongest winds will be near the coasts and any thunderstorms that happen to occur. Heavy rainfall will increase the risk for downed trees and power lines. Confidence is high that this system will bring hazard level impacts to much of the service territory, but confidence remains medium regarding the specifics of intensity and timing. Dry weather is expected for Tuesday, but winds may continue to be strong, especially for Nantucket.

WIND IMPACT: None.

THUNDERSTORM IMPACT: None.

PRECIPITATION IMPACT: None.

TEMPERATURE IMPACT: None.

SNOW IMPACT: None.

ICE IMPACT: None.

FLOOD IMPACT: None.

THIS AFTERNOON: Dry. Winds: West-southwest at 5-12 mph. Highs: Middle 50s to middle 60s.

TONIGHT: Dry. Winds: Southwest at 3-8 mph. Lows: Lower 30s to lower 50s.

TOMORROW: Dry. Winds: South at 5-12 mph. Highs: Lower 60s to near 70.

TOMORROW NIGHT: Rain showers possible in Western after 10pm, Central after 2am Sat, and Charlestown and Lebanon after 4am Sat. Rainfall: Tr-0.15", isolated 0.20" in Western. Winds: Southeast at 8-18 mph, gusting to 20-25 mph at times. Lows: Upper 40s to middle 50s.

DAYS 3-5: On Sunday, rain will increase in coverage/intensity in the afternoon and evening from west to east. Periods of moderate/heavy rain likely from the late morning/afternoon into the night in interior areas and from the evening into the night in eastern/coastal areas. Rainfall: 2-4" possible. Chance for rainfall: 90% > 1.00"; 70% > 2.00"; 50% > 3.00". Embedded t-storms possible 8pm Sun-2am Mon for eastern areas. T-storm chance: 20%. Lightning amounts: Low. Winds will increase Sunday, becoming strong overnight. Gusts of 40-50 mph are likely. We cannot rule out higher gusts of 55-65 mph as a band of rain and embedded thunderstorms moves across southeastern MA/RI overnight. Hazard gust chance eastern areas: 80% EEI-2; 60% EEI-3; 10% EEI-4. Hazard gust chance inland: 80% EEI-2; 10% EEI-3. On Monday, periods of showers possible in the morning and early afternoon, then mostly dry. Additional rainfall: 0.20-0.50". Wind gusts: 35-45 mph; peak gusts 40-50 mph in the morning and afternoon, then decreasing to 25-35 mph by the evening and night. Hazard gust chance: 80% EEI-2, 10% EEI-3. Confidence is high in an impactful system occurring on Sunday and Monday, but confidence is medium on the timing and intensity of rainfall, winds, and t-storms. On Tuesday, dry. Winds could gust 30-40 mph for Nantucket. Temperatures will be 5-12 degrees above normal on Sunday, within 6 degrees of normal on Monday, and near to 6 degrees below normal on Tuesday.

Energy Event Index Definition

With Leaves (Apr 1 - Oct 31)

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

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

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

Go to WeatherSentry® Online for a complete view of the forecast and other business critical weather information.

Energy Event Index for NATIONAL GRID (New England)

Your forecast administrator: theresa.leib@nationalgrid.com

Valid Time: October 27, 2017 7:00 PM EDT

Forecaster: john.baranick

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Central Massachusetts	1	1	1
	Eastern Massachusetts	1	1	2
	Nantucket	1	1	2
	Rhode Island	1	1	2
	Western Massachusetts	1	1	1
Wind/Gust	Central Massachusetts	1	1	2
	Eastern Massachusetts	1	1	3
	Nantucket	1	1	3
	Rhode Island	1	1	3
	Western Massachusetts	1	1	2
Confidence Level	Central Massachusetts	High	High	Medium
	Eastern Massachusetts	High	High	Medium
	Nantucket	High	High	Medium
	Rhode Island	High	High	Medium
	Western Massachusetts	High	High	Medium

Forecast for NEW ENGLAND from DTN for National Grid

Date: October 27, 2017
Time: 7:00 PM EDT
Forecaster: J Baranick

CURRENT CONDITIONS: Dry. Winds: Southwest at 5-12 mph. Temperatures: Upper 40s to middle 50s.

SYNOPSIS: Dry and hazard-free conditions will continue through Saturday afternoon. Showers will move into Western MA/NH Saturday evening, being slow to spread eastward during the day Sunday. Periods of heavy rain are expected Sunday afternoon into Sunday night. Winds will be on the increase Sunday afternoon and especially overnight into Monday. The strongest winds will be near the coasts and any thunderstorms that happen to occur. Heavy rainfall will increase the risk for downed trees and power lines. Confidence is high that this system will bring hazard level impacts to much of the service territory, but confidence remains medium regarding the specifics of intensity and timing. Dry weather is expected for Tuesday, but winds may continue to be strong, especially for Nantucket.

WIND IMPACT: None.

THUNDERSTORM IMPACT: None.

PRECIPITATION IMPACT: None.

TEMPERATURE IMPACT: None.

SNOW IMPACT: None.

ICE IMPACT: None.

FLOOD IMPACT: None.

TONIGHT: Dry. Winds: Southwest at 3-8 mph. Lows: Lower 30s to lower 50s.

TOMORROW: Dry. Winds: South at 5-12 mph. Highs: Lower 60s to near 70.

TOMORROW NIGHT: Rain showers possible in Western after 10pm, Central after 2am Sat, and Charlestown and Lebanon after 4am Sat. Rainfall: Tr-0.15", isolated 0.20" in Western. Winds: Southeast at 8-18 mph, gusting to 20-25 mph at times. Lows: Upper 40s to middle 50s.

DAYS 3-5: On Sunday, rain will increase in coverage/intensity in the afternoon and evening from west to east. Periods of moderate/heavy rain likely from the afternoon into the night in interior areas and from the evening into the night in eastern/coastal areas. Rainfall: 2-4" possible. Chance for rainfall: 90% > 1.00"; 70% > 2.00"; 50% > 3.00". Embedded t-storms possible 8pm Sun-3am Mon for eastern areas. T-storm chance: 20%. Lightning amounts: Low. Winds will increase Sunday, becoming strong overnight. Gusts of 40-50 mph are likely. We cannot rule out higher gusts of 55-65 mph as a band of rain and embedded thunderstorms moves across southeastern MA/RI overnight. Hazard gust chance eastern areas: 80% EEI-2; 60% EEI-3; 10% EEI-4. Hazard gust chance inland: 80% EEI-2; 10% EEI-3. On Monday, periods of showers possible in the morning and early afternoon, then mostly dry. Additional rainfall: 0.20-0.50". Wind gusts: 35-45 mph; peak gusts 40-50 mph in the morning and afternoon, then decreasing to 25-35 mph by the evening and night. Hazard gust chance: 80% EEI-2, 10% EEI-3. Confidence is high in an impactful system occurring on Sunday and Monday, but confidence is medium on the timing and intensity of rainfall, winds, and t-storms. On Tuesday, dry. Winds could gust 30-40 mph for Nantucket. Temperatures will be 5-12 degrees above normal on Sunday, within 6 degrees of normal on Monday, and near to 6 degrees below normal on Tuesday.

Energy Event Index Definition

With Leaves (Apr 1 - Oct 31)

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

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

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

Go to WeatherSentry® Online for a complete view of the forecast and other business critical weather information.

Please do not respond to this email.

Energy Event Index for NATIONAL GRID (New England)

Your forecast administrator: theresa.leib@nationalgrid.com

Valid Time: October 28, 2017 6:00 AM EDT

Forecaster: eric.jenks2

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Central Massachusetts	1	1	1
	Eastern Massachusetts	1	2	2
	Nantucket	1	2	2
	Rhode Island	1	2	2
	Western Massachusetts	1	1	1
Wind/Gust	Central Massachusetts	1	2	2
	Eastern Massachusetts	1	3	3
	Nantucket	1	3	3
	Rhode Island	1	3	3
	Western Massachusetts	1	2	2
Confidence Level	Central Massachusetts	High	Medium	Medium
	Eastern Massachusetts	High	Medium	Medium
	Nantucket	High	Medium	Medium
	Rhode Island	High	Medium	Medium
	Western Massachusetts	High	Medium	Medium

Energy Event Index Definition

With Leaves (Apr 1 - Oct 31)

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

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

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

Forecast for NEW ENGLAND from DTN for National Grid

Date: October 28, 2017
Time: 6:00 AM EDT
Forecaster: J Wegwerth

CURRENT CONDITIONS: Skies are clear, but patchy fog is developing. Winds: Calm to light and variable. Temperatures: Middle 30s to upper 40s.

SYNOPSIS: Dry and hazard-free today. Scattered showers will develop tonight. Showers will increase during the day Sunday with a few rumbles of thunder possible in western areas. Sunday evening/night and into Monday, moderate to heavy rain will be likely. Embedded thunderstorms possible. Flooding will be concern. Strong wind gusts will also develop Sunday evening and will continue into Monday. The heavy rain mixed with strong winds will create greater risks for downed trees and power lines. Confidence is high that this system will impact the region and medium-high in impact details. Rain will wind down Monday late morning and afternoon and winds will gradually weaken Monday evening. On Tuesday, breezy winds will remain. On Wednesday, rain chances will arrive late.

WIND IMPACT: Wind gusts will exceed 35 mph from Sunday evening into/through Monday afternoon. Some locations may see a brief break before southeast winds turn southerly and then westerly on Monday. The strongest winds will occur in coastal areas between 10pm Sun to early Monday morning.

Sustained winds of 15-25 mph with wind gusts of 35-45 mph with peak gusts around 45-50 mph will be possible for most locations Monday morning and afternoon before dropping to 25-35 mph Monday evening and night.

REGION	TIMING	SUSTAINED	GUSTS	PEAK GUSTS	EEI CHANCE (2/3/4)
Western/Central	10pm Sun-5pm Mon	15-25 mph	35-45 mph	45-50 mph	70%/30%
Lebanon/Charlestown	12am Mon-8pm Mon	15-25 mph	35-45 mph	45-50 mph	70%/30%
Coastal/Capital/Southeast	8pm Sun-6pm Mon	25-35 mph	40-50 mph	50-60 mph	80%/60%/5%
North/South Shore	10pm Sun-6pm Mon	20-30 mph	40-50 mph	50-55 mph	70%/55%
Merrimack Valley/Salem	11pm Sun-6pm Mon	20-30 mph	35-45 mph	45-55 mph	70%/45%
Nantucket	8pm Sun-6pm Mon	30-40 mph	45-55 mph	55-65 mph	80%/60%/20%

THUNDERSTORM IMPACT SUNDAY: A low chance for thunderstorms will exist during the day. More organized embedded storms could occur in the evening and night. These could produce damaging wind gusts.

REGION	TIMING	LIGHTNING CHANCE/AMOUNTS	GUSTS	EEI CHANCE (2/3/4)
Western	8am-10pm Sun	20% - Low	30-40 mph	20%
Charlestown/Lebanon	11am-12am Mon	20% - Low	30-40 mph	20%
Coastal/Capital	10pm Sun-5am Mon	40% - Low	55-65 mph	70%/60%/20%
Western/Central	10pm Sun-4am Mon	30% - Low	50-60 mph	70%/55%/10%
Southeast	10pm Sun-5am Mon	30% - Low	55-65 mph	70%/60%/20%
North/South Shore	11pm Sun-5am Mon	30% - Low	55-65 mph	70%/60%/20%
Merrimack Valley/Salem	12am Mon-5am Mon	30% - Low	55-65 mph	70%/60%/20%
Nantucket	11pm Sun-5am Mon	40% - Low	55-65 mph	70%/60%/20%

PRECIPITATION IMPACT: Rainfall amounts of 2-4" will be possible Sunday and Monday morning into the early afternoon across the service area. The heaviest rain will fall between 8pm Sun-6am Mon.

TEMPERATURE IMPACT: None.

SNOW IMPACT: None.

ICE IMPACT: None.

FLOOD IMPACT: Areas of flash flooding will be possible across the service area. Urban and poor drainage flooding and small stream flooding will also be possible Sunday and Monday.

TODAY: Dry. Winds: South at 5-12 mph. Highs: Lower to upper 60s.

TONIGHT: Rain showers possible after 12am Sun in Western and after 3am Sun in Charlestown/Lebanon. Rainfall: Tr-0.15", isolated 0.25", heaviest in Western. Winds: Southeast at 8-18 mph, gusting 20-25 mph at times. Lows: Upper 40s to middle 50s.

TOMORROW: Rain will increase in coverage and intensity through the morning and afternoon. T-storms possible after 8am in Western and 11am in Charlestown and Lebanon. See THUNDERSTORM IMPACT. Rainfall: 0.10-0.50", isolated 1.00" possible in Western. See PRECIPITATION/FLOOD IMPACT. Winds: Southeast at 12-20 mph, gusting 25-35 mph. Highs: Lower to upper 60s.

TOMORROW NIGHT: Rain will increase in coverage and intensity with heavy rain likely. Embedded thunderstorms possible in spots. See THUNDERSTORM IMPACT. Rainfall: See PRECIPITATION/FLOOD IMPACT. Winds: See WIND IMPACT. Lows: Lower 40s to near 50, except lower to middle 50s in Nantucket.

DAYS 3-5: On Monday, showers will continue Monday morning and will wind down Monday late morning/early afternoon. See PRECIPITATION/FLOOD IMPACT. Strong winds will be likely. See WIND IMPACT. On Tuesday, dry and hazard-free. Winds could gust 25-35 mph during the day. On Wednesday, dry and hazard-free during the day and evening. Rain showers possible after 11/02 0000 and through the night. No hazards. Temperatures will be 3-8 degrees above normal on Monday and near to 8 degrees below normal on Tuesday and Wednesday.

Go to WeatherSentry® Online for a complete view of the forecast and other business critical weather information.

Energy Event Index for NATIONAL GRID (New England)

Your forecast administrator: theresa.leib@nationalgrid.com

Valid Time: October 28, 2017 1:00 PM EDT

Forecaster: jon.chrzanowski

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Central Massachusetts	1	1	1
	Eastern Massachusetts	1	2	2
	Nantucket	1	2	2
	Rhode Island	1	2	2
	Western Massachusetts	1	1	1
Wind/Gust	Central Massachusetts	1	2	2
	Eastern Massachusetts	1	3	3
	Nantucket	1	3	3
	Rhode Island	1	3	3
	Western Massachusetts	1	2	2
Confidence Level	Central Massachusetts	High	Medium	Medium
	Eastern Massachusetts	High	Medium	Medium
	Nantucket	High	Medium	Medium
	Rhode Island	High	Medium	Medium
	Western Massachusetts	High	Medium	Medium

Energy Event Index Definition

With Leaves (Apr 1 - Oct 31)

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

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

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

Forecast for NEW ENGLAND from DTN for National Grid

Date: October 28, 2017
Time: 1:00 PM EDT
Forecaster: J Chrzanowski

CURRENT CONDITIONS: The weather is dry across New England early this afternoon. Winds: Generally from the south at 8-14 mph. Temperatures: In the upper 50s to middle 60s.

SYNOPSIS: The weather will be dry and hazard-free this afternoon into this evening. Scattered rain showers will develop from southwest to northeast later tonight into Sunday morning. Showers will increase during the day Sunday with a few rumbles of thunder possible in western areas. Sunday evening/night and into Monday, moderate to heavy rain is likely to occur. A few embedded thunderstorms are also possible. The intensity of the rain will increase later Sunday and Sunday night, with standing water and flooding becoming a concern. Strong wind gusts will also develop Sunday evening and will continue into Monday. The heavy rain mixed with strong winds will create greater risks for downed trees and power lines. Confidence is high that this system will impact the region and medium to high with respect to the impact details. Rain will diminish later Monday morning and afternoon and the winds will gradually weaken on Monday evening. On Tuesday, breezy winds ware possible, but they will not be as strong as the wind on Monday. On Wednesday, the daytime will likely be dry with the chance for rain again at night.

WIND IMPACT: Wind gusts will exceed 35 mph from Sunday evening through Monday afternoon. Some locations may have a brief break before southeast winds turn southerly and then westerly on Monday. The strongest winds will occur in coastal areas between about 10pm Sunday and early Monday morning. Sustained winds of 15-25 mph with wind gusts of 35-45 mph with peak gusts around 45-50 mph are possible for most locations Monday morning and afternoon, before dropping to 25-35 mph Monday evening and night.

REGION	TIMING	SUSTAINED	GUSTS	PEAK GUSTS	EEI CHANCE (2/3/4)
Western/Central	10pm Sun-5pm Mon	15-25 mph	35-45 mph	45-50 mph	70%/30%
Lebanon/Charlestown	12am Mon-8pm Mon	15-25 mph	35-45 mph	45-50 mph	70%/30%
Coastal/Capital/Southeast	8pm Sun-6pm Mon	25-35 mph	40-50 mph	50-60 mph	80%/60%/5%
North/South Shore	10pm Sun-6pm Mon	20-30 mph	40-50 mph	50-55 mph	70%/55%
Merrimack Valley/Salem	11pm Sun-6pm Mon	20-30 mph	35-45 mph	45-55 mph	70%/45%
Nantucket	8pm Sun-6pm Mon	30-40 mph	45-55 mph	55-65 mph	80%/60%/20%

THUNDERSTORM IMPACT - SUNDAY: A low chance for thunderstorms will exist during the day. More organized embedded storms could occur in the evening and night. These could produce damaging wind gusts.

REGION	TIMING	LIGHTNING CHANCE/AMOUNTS	GUSTS	EEI CHANCE (2/3/4)
Western	8am-10pm Sun	20% - Low	30-40 mph	20%
Charlestown/Lebanon	11am-12am Mon	20% - Low	30-40 mph	20%
Coastal/Capital	10pm Sun-5am Mon	40% - Low	55-65 mph	70%/60%/20%
Western/Central	10pm Sun-4am Mon	30% - Low	50-60 mph	70%/55%/10%
Southeast	10pm Sun-5am Mon	30% - Low	55-65 mph	70%/60%/20%
North/South Shore	11pm Sun-5am Mon	30% - Low	55-65 mph	70%/60%/20%
Merrimack Valley/Salem	12am Mon-5am Mon	30% - Low	55-65 mph	70%/60%/20%
Nantucket	11pm Sun-5am Mon	40% - Low	55-65 mph	70%/60%/20%

PRECIPITATION IMPACT: Rainfall amounts of 2-4" are possible Sunday and Monday morning into the early afternoon across the service area. The heaviest rain will fall between about 8pm Sunday and 6am Monday.

TEMPERATURE IMPACT: None.

SNOW IMPACT: None.

ICE IMPACT: None.

FLOOD IMPACT: Areas of flash flooding may develop across the service area on Sunday night and Monday. Urban and poor drainage flooding and small stream flooding will also be possible Sunday and Monday.

THIS AFTERNOON: Dry. Winds: South at 8-14 mph. Highs: Lower 60s to upper 60s.

TONIGHT: Rain showers possible after Midnight in Western and after 3am in Charlestown/Lebanon. Rainfall amounts: Trace-0.15", isolated 0.25", heaviest in Western. Winds: Southeast at 8-18 mph, gusting 20-25 mph at times. Lows: Upper 40s to middle 50s, mildest along the coasts.

TOMORROW: Rain will increase in coverage and intensity through the morning and afternoon. A few thunderstorms are possible after 8am in Western and 11am in Charlestown and Lebanon. See THUNDERSTORM IMPACT for details. Rainfall amounts: 0.10-0.50", isolated 1.00" possible in Western. See PRECIPITATION/FLOOD IMPACT for details. Winds: Southeast at 12-20 mph, gusting 25-35 mph.

Highs: Lower 60s to upper 60s.

TOMORROW NIGHT: Rain will increase in coverage and intensity with heavy rain likely. Embedded thunderstorms possible in spots. See THUNDERSTORM IMPACT for details. Rainfall: See PRECIPITATION/FLOOD IMPACT for details. Winds: See WIND IMPACT for details. Lows: Upper 40s upper 50s, except near 60 degrees Nantucket.

DAYS 3-5: On Monday, showers will continue Monday morning but they will diminish later Monday morning/early afternoon. See PRECIPITATION/FLOOD IMPACT. Strong winds will be likely. See WIND IMPACT. On Tuesday, dry and hazard-free weather is expected. Winds may gust to 25-35 mph during the day but winds will be much lighter on Tuesday night. On Wednesday, dry and hazard-free weather is expected during the day and evening. Rain showers are possible after about Midnight and through the night. No hazards. Temperatures will be 3-8 degrees above normal on Monday and near to 8 degrees below normal on Tuesday and Wednesday.

Go to WeatherSentry® Online for a complete view of the forecast and other business critical weather information.

Energy Event Index for NATIONAL GRID (New England)

Your forecast administrator: theresa.leib@nationalgrid.com

Valid Time: October 28, 2017 6:00 PM EDT

Forecaster: tony.dello

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Central Massachusetts	1	1	1
	Eastern Massachusetts	1	2	2
	Nantucket	1	2	2
	Rhode Island	1	2	2
	Western Massachusetts	1	1	1
Wind/Gust	Central Massachusetts	1	2	2
	Eastern Massachusetts	1	3	3
	Nantucket	1	3	3
	Rhode Island	1	3	3
	Western Massachusetts	1	2	2
Confidence Level	Central Massachusetts	High	Medium	High
	Eastern Massachusetts	High	Medium	Medium
	Nantucket	High	Medium	Medium
	Rhode Island	High	Medium	Medium
	Western Massachusetts	High	Medium	Medium

Energy Event Index Definition

With Leaves (Apr 1 - Oct 31)

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

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

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

Forecast for NEW ENGLAND from DTN for National Grid

Date: October 28, 2017
Time: 7:00 PM EDT
Forecaster: J Chrzanowski

CURRENT CONDITIONS: The weather is dry across New England. Winds: Generally from the south at 5-12 mph. Temperatures: Middle 50s to lower 60s.

SYNOPSIS: The weather will be dry and hazard-free this evening. Scattered rain showers will develop from southwest to northeast later tonight into Sunday morning. Showers will increase during the day Sunday with a few rumbles of thunder possible in western areas. Sunday evening/night and into Monday, moderate to heavy rain is likely to occur. A few embedded thunderstorms are also possible. The intensity of the rain will increase later Sunday and Sunday night, with standing water and flooding becoming a concern, and it may become aggravated by leaves clogging storm drains. Strong wind gusts will also develop Sunday evening and will continue into Monday. The heavy rain mixed with strong winds will create greater risks for downed trees and power lines. Confidence is high that this system will impact the region and medium to high with respect to the impact details. Rain will diminish later Monday morning and afternoon and the winds will gradually weaken on Monday evening. On Tuesday, breezy winds ware possible, but they will not be as strong as the wind on Monday. On Wednesday, the daytime will likely be dry with the chance for rain again at night.

WIND IMPACT: Wind gusts will exceed 35 mph from Sunday evening through Monday afternoon. Some locations may have a brief break before southeast winds turn southerly and then westerly on Monday. The strongest winds will occur in coastal areas between about 10pm Sunday and early Monday morning. Sustained winds of 15-25 mph with wind gusts of 35-45 mph with peak gusts around 45-50 mph are possible for most locations Monday morning and afternoon, before dropping to 25-35 mph Monday evening and night.

REGION	TIMING	SUSTAINED	GUSTS	PEAK GUSTS	EEI CHANCE (2/3/4)
Western/Central	10pm Sun-5pm Mon	15-25 mph	35-45 mph	45-50 mph	70%/30%
Lebanon/Charlestown	12am Mon-8pm Mon	15-25 mph	35-45 mph	45-50 mph	70%/30%
Coastal/Capital/Southeast	8pm Sun-6pm Mon	25-35 mph	40-50 mph	50-60 mph	80%/60%/5%
North/South Shore	10pm Sun-6pm Mon	20-30 mph	40-50 mph	50-55 mph	70%/55%
Merrimack Valley/Salem	11pm Sun-6pm Mon	20-30 mph	35-45 mph	45-55 mph	70%/45%
Nantucket	8pm Sun-6pm Mon	30-40 mph	45-55 mph	55-65 mph	80%/60%/20%

THUNDERSTORM IMPACT - SUNDAY: A low chance for thunderstorms will exist during the day. More organized embedded storms could occur in the evening and night. These could produce damaging wind gusts.

REGION	TIMING	LIGHTNING CHANCE/AMOUNTS	GUSTS	EEI CHANCE (2/3/4)
Western	8am-10pm Sun	20% - Low	30-40 mph	20%
Charlestown/Lebanon	11am-12am Mon	20% - Low	30-40 mph	20%
Coastal/Capital	10pm Sun-5am Mon	40% - Low	55-65 mph	70%/60%/20%
Western/Central	10pm Sun-4am Mon	30% - Low	50-60 mph	70%/55%/10%
Southeast	10pm Sun-5am Mon	30% - Low	55-65 mph	70%/60%/20%
North/South Shore	11pm Sun-5am Mon	30% - Low	55-65 mph	70%/60%/20%
Merrimack Valley/Salem	12am Mon-5am Mon	30% - Low	55-65 mph	70%/60%/20%
Nantucket	11pm Sun-5am Mon	40% - Low	55-65 mph	70%/60%/20%

PRECIPITATION IMPACT: Rainfall amounts of 2-4" are likely from Sunday through Monday across the service area. Isolated heavier amounts are possible. The heaviest rain will fall between about 8pm Sunday and 8am Monday.

TEMPERATURE IMPACT: None.

SNOW IMPACT: None.

ICE IMPACT: None.

FLOOD IMPACT: Areas of standing water and flash flooding may develop across the service area on Sunday night and Monday. Urban and poor drainage flooding and small stream flooding will also be possible Sunday and Monday. The condition may be aggravated by leaves clogging storm drains.

TONIGHT: Rain showers possible after 1am in Western and after 4am in Charlestown/Lebanon. Rainfall amounts: 0.05-0.15". Winds: Southeast to south at 8-18 mph, gusting 20-25 mph at times. Lows: Upper 40s to middle 50s, mildest along the coasts.

TOMORROW: Rain will increase in coverage and intensity through the morning and afternoon. A few thunderstorms are possible after 8am in Western and 11am in Charlestown and Lebanon. See THUNDERSTORM IMPACT for details. Rainfall amounts: 0.10-0.50", isolated 1.00" possible in Western. See PRECIPITATION/FLOOD IMPACT for details. Winds: Southeast at 12-20 mph, gusting 25-35 mph. Highs: Lower 60s to upper 60s.

TOMORROW NIGHT: Rain will increase in coverage and intensity with heavy rain likely. Embedded thunderstorms possible in spots. See THUNDERSTORM IMPACT for details. Rainfall: See PRECIPITATION/FLOOD IMPACT for details. Winds: See WIND IMPACT for details. Lows: Upper 40s upper 50s, except near 60 degrees Nantucket.

DAYS 3-5: On Monday, showers will continue Monday morning but they will diminish later Monday morning/early afternoon. See PRECIPITATION/FLOOD IMPACT. Strong winds will be likely. See WIND IMPACT. On Tuesday, dry and hazard-free weather is expected. Winds may gust to 25-35 mph during the day but winds will be much lighter on Tuesday night. On Wednesday, dry and hazard-free weather is expected during the day and evening. Rain showers are possible after about Midnight and through the night. No hazards. Temperatures will be 3-8 degrees above normal on Monday and near to 4 degrees below normal on Tuesday and Wednesday.

Go to WeatherSentry® Online for a complete view of the forecast and other business critical weather information.

Energy Event Index for NATIONAL GRID (New England)

Your forecast administrator: theresa.leib@nationalgrid.com

Valid Time: October 29, 2017 6:00 AM EDT

Forecaster: cody.fishman

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Central Massachusetts	1	1	1
	Eastern Massachusetts	2	2	1
	Nantucket	2	2	1
	Rhode Island	2	2	1
	Western Massachusetts	1	1	1
Wind/Gust	Central Massachusetts	2	2	1
	Eastern Massachusetts	3	3	1
	Nantucket	3	3	1
	Rhode Island	3	3	1
	Western Massachusetts	2	2	1
Confidence Level	Central Massachusetts	Medium	High	High
	Eastern Massachusetts	Medium	Medium	High
	Nantucket	Medium	Medium	High
	Rhode Island	Medium	Medium	High
	Western Massachusetts	Medium	Medium	High

Energy Event Index Definition

With Leaves (Apr 1 - Oct 31)

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

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

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

Forecast for NEW ENGLAND from DTN for National Grid

Date: October 29, 2017
Time: 6:00 AM EDT
Forecaster: M Alberico

CURRENT CONDITIONS: Isolated showers in western CT and Western Mass this morning. Winds: Generally from the south-southeast at 5-10 mph. Temperatures: Middle 40s to lower 60s.

SYNOPSIS: Scattered rain showers will move across the region from southwest to northeast today. Showers will increase throughout the day with some embedded thunderstorms possible, mainly in western areas. Moderate to heavy rainfall is expected tonight into Monday. Flooding will be possible tonight through early Monday. Strong wind gusts will also develop tonight and continue into Monday. The heavy rain mixed with strong winds will create greater risks for downed trees and power lines. Confidence is high that this system will impact the region and medium to high with respect to the impact details. Rain will diminish later Monday morning and afternoon and the winds will gradually weaken on Monday evening. On Tuesday, breezy winds ware possible, but they will not be as strong as the wind on Monday. On Wednesday, the daytime will likely be dry with the chance for rain again at night.

Tropical Storm Philippe: Tropical Storm Philippe is currently located just east of Florida. Philippe will track north-northeastward just east of the main system expected to track into the Northeast Sunday night.

Philippe is expected to track into or just east of the Cape and Islands of Massachusetts as a post-tropical cyclone late Sunday night/early Monday morning. Though this will not change the impacts already listed in the forecast, it will play a role in the strong winds and heavy rainfall expected Sunday and Monday.

WIND IMPACT: Wind gusts will exceed 35 mph from Sunday evening through Monday afternoon. Some locations may have a brief break before southeast winds turn southerly and then westerly on Monday. The strongest winds will occur in coastal areas between about 10pm Sunday and early Monday morning. Sustained winds of 15-25 mph with wind gusts of 35-45 mph with peak gusts around 45-50 mph are possible for most locations Monday morning and afternoon, before dropping to 25-35 mph Monday evening and night.

REGION	TIMING	SUSTAINED	GUSTS	PEAK GUSTS	EEI CHANCE (2/3/4)
Western/Central	10pm Sun-5pm Mon	15-25 mph	35-45 mph	45-50 mph	70%/30%
Lebanon/Charlestown	12am Mon-8pm Mon	15-25 mph	35-45 mph	45-50 mph	70%/30%
Coastal/Capital/Southeast	8pm Sun-6pm Mon	25-35 mph	40-50 mph	50-60 mph	80%/60%/5%
North/South Shore	10pm Sun-6pm Mon	20-30 mph	40-50 mph	50-55 mph	70%/55%
Merrimack Valley/Salem	11pm Sun-6pm Mon	20-30 mph	35-45 mph	45-55 mph	70%/45%
Nantucket	8pm Sun-6pm Mon	30-40 mph	45-55 mph	55-65 mph	80%/60%/20%

THUNDERSTORM IMPACT - SUNDAY/MONDAY MORNING: A low chance for thunderstorms will exist during the day. More organized embedded storms could occur in the evening and night. These could produce damaging wind gusts.

REGION	TIMING	LIGHTNING CHANCE/AMOUNTS	GUSTS	EEI CHANCE (2/3/4)
Western	8am-10pm Sun	20% - Low	30-40 mph	20%
Charlestown/Lebanon	11am-12am Mon	20% - Low	30-40 mph	20%
Coastal/Capital	10pm Sun-5am Mon	40% - Low	55-65 mph	70%/60%/20%
Western/Central	10pm Sun-4am Mon	30% - Low	50-60 mph	70%/55%/10%
Southeast	10pm Sun-5am Mon	30% - Low	55-65 mph	70%/60%/20%
North/South Shore	11pm Sun-5am Mon	30% - Low	55-65 mph	70%/60%/20%
Merrimack Valley/Salem	12am Mon-5am Mon	30% - Low	55-65 mph	70%/60%/20%
Nantucket	11pm Sun-5am Mon	40% - Low	55-65 mph	70%/60%/20%

PRECIPITATION IMPACT: Rainfall amounts of 2-4" are likely from Sunday through Monday across the service area. Isolated heavier amounts are possible. The heaviest rain will fall between about 8pm Sunday and 8am Monday.

TEMPERATURE IMPACT: None.

SNOW IMPACT: None.

ICE IMPACT: None.

FLOOD IMPACT: Areas of standing water and flash flooding may develop across the service area on Sunday night and Monday. Urban and poor drainage flooding and small stream flooding will also be possible Sunday and Monday. The condition may be aggravated by leaves clogging storm drains.

TODAY: Rain will increase in coverage and intensity through the morning and afternoon. A few thunderstorms are possible after 8am in Western and 11am in Charlestown and Lebanon. See THUNDERSTORM IMPACT for details. Rainfall amounts: 0.10-0.50", isolated 1.00" possible in Western. See PRECIPITATION/FLOOD IMPACT for details. Winds: Southeast at 12-20 mph, gusting 25-35 mph. Highs: Lower 60s to upper 60s.

TONIGHT: Rain will increase in coverage and intensity with heavy rain likely. Embedded thunderstorms

possible in spots. See THUNDERSTORM IMPACT for details. Rainfall: See PRECIPITATION/FLOOD IMPACT for details. Winds: See WIND IMPACT for details. Lows: Upper 40s upper 50s, except near 60 degrees Nantucket.

TOMORROW: Showers and a few storms could linger early morning, drying out in the afternoon. See THUNDERSTORM IMPACT for details. Rainfall amounts: 0.10-0.50", isolated 1.00" possible in Western. See PRECIPITATION/FLOOD IMPACT for details. Winds: See WIND IMPACT for details. Highs: Lower 50s to upper 50s.

TOMORROW NIGHT: Dry but breezy. Winds: See WIND IMPACT for details. Lows: Upper 40s upper 50s, except near 60 degrees Nantucket.

DAYS 3-5: On Tuesday, dry and hazard-free weather is expected. Winds may gust to 25-35 mph during the day but winds will be much lighter on Tuesday night. On Wednesday, dry and hazard-free weather is expected during the day and evening. Rain showers are possible after about Midnight and through the night. No hazards. Rain showers linger Thursday morning and early afternoon. Temperatures will be near to 4 degrees below normal on Tuesday and Wednesday and near to 5 degrees above normal on Thursday.

Go to WeatherSentry® Online for a complete view of the forecast and other business critical weather information.

Energy Event Index for NATIONAL GRID (New England)

Your forecast administrator: theresa.leib@nationalgrid.com

Valid Time: October 29, 2017 1:00 PM EDT

Forecaster: jon.chrzanowski

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Central Massachusetts	1	1	1
	Eastern Massachusetts	2	2	1
	Nantucket	2	2	1
	Rhode Island	2	2	1
	Western Massachusetts	1	1	1
Wind/Gust	Central Massachusetts	2	2	1
	Eastern Massachusetts	3	3	1
	Nantucket	3	3	1
	Rhode Island	3	3	1
	Western Massachusetts	2	2	1
Confidence Level	Central Massachusetts	Medium	High	High
	Eastern Massachusetts	Medium	Medium	High
	Nantucket	Medium	Medium	High
	Rhode Island	Medium	Medium	High
	Western Massachusetts	Medium	Medium	High

Energy Event Index Definition

With Leaves (Apr 1 - Oct 31)

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

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

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

Forecast for NEW ENGLAND from DTN for National Grid

Date: October 29, 2017
Time: 1:00 PM EDT
Forecaster: J Chrzanowski

CURRENT CONDITIONS: Showers are in progress across many areas early this afternoon but so far southeast Massachusetts remains dry. Winds: From the southeast at 10-15 mph with a few gusts to 25 mph across southeast Massachusetts and Rhode Island. Temperatures: Upper 50s to middle 60s.

Video briefing detailing high impact weather next 24-36 hours:

SYNOPSIS: Rain showers will move across the region from southwest to northeast this afternoon. The showers will increase later this afternoon with perhaps an isolated thunderstorm mixing in late. The most favored area for a thunderstorm is across the western areas. Moderate to heavy rainfall is expected tonight into Monday. Flooding may develop tonight through early Monday. Strong wind gusts will also develop tonight and continue into Monday. The heavy rain combined with strong winds will create greater risks for downed trees and power lines. Confidence is high that this system will impact the region and medium to high with respect to the impact details. Rain will diminish later Monday morning and afternoon. The winds will gradually weaken later Monday evening and Monday night. On Tuesday, breezy winds ware possible, but they will not be as strong as the wind on Monday. On Wednesday, the daytime will

likely be dry with the chance for rain again at night.

Tropical Storm Philippe: Tropical Storm Philippe was located east of Florida. Philippe will track to the north-northeastward just east of the main system expected to track into the Northeast Sunday night. Philippe is expected to race to or just east of the Cape and Islands of Massachusetts as a post-tropical cyclone late Sunday night/early Monday morning. Though this will not change the impacts already listed in the forecast, it will play a role in the strong winds and heavy rainfall expected Sunday and Monday.

WIND IMPACT: Wind gusts will exceed 35 mph from Sunday evening through Monday afternoon. Some locations may have a brief break before southeast winds turn southerly and then westerly on Monday. The strongest winds will occur in coastal areas between about 10pm Sunday and early Monday morning. Sustained winds of 15-25 mph with wind gusts of 35-45 mph with peak gusts around 45-50 mph are possible for most locations Monday morning and afternoon, before dropping to 25-35 mph later Monday evening and Monday night.

REGION	TIMING	SUSTAINED	GUSTS	PEAK GUSTS	EEI CHANCE (2/3/4)
Western/Central	10pm Sun-5pm Mon	15-25 mph	35-45 mph	45-50 mph	70%/30%
Lebanon/Charlestown	12am Mon-8pm Mon	15-25 mph	35-45 mph	45-50 mph	70%/30%
Coastal/Capital/Southeast	8pm Sun-6pm Mon	25-35 mph	40-50 mph	50-60 mph	80%/60%/5%
North/South Shore	10pm Sun-6pm Mon	20-30 mph	40-50 mph	50-55 mph	70%/55%
Merrimack Valley/Salem	11pm Sun-6pm Mon	20-30 mph	35-45 mph	45-55 mph	70%/45%
Nantucket	8pm Sun-6pm Mon	30-40 mph	45-55 mph	55-65 mph	80%/60%/20%

THUNDERSTORM IMPACT - THIS PM INTO MONDAY MORNING: A low chance for thunderstorms will exist this evening and tonight. These could produce damaging wind gusts.

REGION	TIMING	LIGHTNING CHANCE/AMOUNTS	GUSTS	EEI CHANCE (2/3/4)
Western	4pm-10pm Sun	10% - Low	30-40 mph	20%
Charlestown/Lebanon	4pm Sun-12am Mon	20% - Low	30-40 mph	20%
Coastal/Capital	10pm Sun-5am Mon	30% - Low	55-65 mph	70%/60%/20%
Western/Central	10pm Sun-4am Mon	30% - Low	50-60 mph	70%/55%/10%
Southeast	10pm Sun-5am Mon	30% - Low	55-65 mph	70%/60%/20%
North/South Shore	11pm Sun-5am Mon	30% - Low	55-65 mph	70%/60%/20%
Merrimack Valley/Salem	12am Mon-5am Mon	30% - Low	55-65 mph	70%/60%/20%
Nantucket	11pm Sun-4am Mon	40% - Low	55-65 mph	70%/60%/20%

PRECIPITATION IMPACT: Total rainfall amounts of 2-4" are likely through Monday across the service area. Isolated heavier amounts are possible. The heaviest rain will fall between about 8pm Sunday and 8am Monday.

TEMPERATURE IMPACT: None.

SNOW IMPACT: None.

ICE IMPACT: None.

FLOOD IMPACT: Areas of standing water and flash flooding may develop across the service area tonight through midday Monday. Urban and poor drainage flooding and small stream flooding is also possible tonight through midday Monday. The condition may be aggravated by leaves clogging storm drains.

THIS AFTERNOON: Rain will increase in coverage and intensity. An isolated thunderstorm cannot be ruled out for Western as well as Charlestown and Lebanon. See THUNDERSTORM IMPACT for details. Rainfall amounts: 0.10-0.50", isolated 1.00" possible in Western. See PRECIPITATION/FLOOD IMPACT for details. Winds: Southeast at 12-20 mph, gusting 25-35 mph. Highs: Lower 60s to upper 60s.

TONIGHT: Windy with periods of rain. Rain will be heavy at times. Embedded thunderstorms possible in spots. See THUNDERSTORM IMPACT for details. Rainfall amounts: See PRECIPITATION/FLOOD IMPACT for details. Winds: See WIND IMPACT for details. Lows: Lower 50s to upper 50s, except near 60 degrees Nantucket.

TOMORROW: Rain and perhaps a few isolated thunderstorms will linger in the morning but a drying trend will overspread the area from south to north during the afternoon. See THUNDERSTORM IMPACT for details. Rainfall amounts: 0.10-0.50", isolated 1.00" possible in Western. See PRECIPITATION/FLOOD IMPACT for details. Winds: See WIND IMPACT for details. Highs: Lower 50s to upper 50s.

TOMORROW NIGHT: Dry but breezy. Winds: See WIND IMPACT for details. Lows: Middle 30s to middle 40s, except near 50 degrees Nantucket.

DAYS 3-5: On Tuesday, dry and hazard-free weather is expected. Winds may gust to 25-35 mph during the day but winds will be much lighter on Tuesday night. On Wednesday, dry and hazard-free weather is expected during the day and evening. Rain showers are possible after about Midnight and through the night. No hazards are expected. Rain showers linger Thursday morning and early afternoon. Temperatures will be near to 4 degrees below normal on Tuesday and Wednesday and near to 3 degrees above normal on Thursday.

Go to WeatherSentry® Online for a complete view of the forecast and other business critical weather information.

Energy Event Index for NATIONAL GRID (New England)

Your forecast administrator: theresa.leib@nationalgrid.com

Valid Time: October 29, 2017 7:00 PM EDT

Forecaster: jon.chrzanowski

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Central Massachusetts	1	1	1
	Eastern Massachusetts	2	2	1
	Nantucket	2	2	1
	Rhode Island	2	2	1
	Western Massachusetts	1	1	1
Wind/Gust	Central Massachusetts	2	3	1
	Eastern Massachusetts	3	3	1
	Nantucket	3	3	1
	Rhode Island	3	3	1
	Western Massachusetts	2	2	1
Confidence Level	Central Massachusetts	Medium	High	High
	Eastern Massachusetts	Medium	Medium	High
	Nantucket	Medium	Medium	High
	Rhode Island	Medium	Medium	High
	Western Massachusetts	Medium	Medium	High

Energy Event Index Definition

With Leaves (Apr 1 - Oct 31)

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

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

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

Forecast for NEW ENGLAND from DTN for National Grid

Date: October 29, 2017
Time: 7:00 PM EDT
Forecaster: J Chrzanowski

CURRENT CONDITIONS: Rain is widespread across New England at this time. Winds: From the east/southeast at 12-18 mph with gusts to 25 mph across southeast Massachusetts and Rhode Island. Temperatures: Middle 50s to middle 60s.

SYNOPSIS: On this update, wind gusts have been increased a bit along the coast for later tonight and Monday morning. Widespread rain and perhaps a few isolated thunderstorms will occur tonight into Monday. The rain will be heavy at times. Flooding may develop tonight through early Monday. Strong wind gusts will also develop tonight and continue into Monday. The heavy rain combined with widespread strong winds will create greater risks for downed trees and power lines. Confidence is high that this system will impact the region and medium to high with respect to the impact details. Rain will diminish later Monday morning and afternoon. The winds will gradually weaken later Monday evening and Monday night. On Tuesday, breezy winds are possible, but they will not be as strong as the wind on Monday. On Wednesday, the daytime will likely be dry with the chance for rain again on Wednesday night.

Tropical Storm Philippe: Tropical Storm Philippe was located east of Florida. Philippe will track to the

north-northeastward just east of the main system expected to track into the Northeast tonight/early Monday. Philippe is expected to race to or just east of the Cape and Islands of Massachusetts as a post-tropical cyclone late Sunday night/early Monday morning. Though this will not change the impacts already listed in the forecast, it will play a role in the strong winds and heavy rainfall expected tonight and Monday.

WIND IMPACT - UPDATED: Wind gusts will easily exceed 35 mph from tonight through Monday afternoon. Some locations may have a brief break before southeast winds turn southerly and then westerly on Monday. The strongest winds will occur in coastal areas between about 1am Monday and 3pm Monday. Sustained winds of 20-30 mph with wind gusts of 45-55 mph with peak gusts to 55-65 mph are possible for most locations from early Monday morning through most of Monday afternoon. The strongest gusts of all, perhaps 70-75 mph, are expected to remain off the coast. The winds will gradually diminish to 25-35 mph later Monday evening and Monday night.

REGION	TIMING	SUSTAINED	GUSTS	PEAK GUSTS	EEI CHANCE (2/3/4)
Western/Central	2am Mon-5pm Mon	20-25 mph	35-45 mph	50-55 mph	80%/30%
Lebanon/Charlestown	2am Mon-8pm Mon	20-25 mph	40-45 mph	50-55 mph	80%/30%
Coastal/Capital/Southeast	12am Mon-6pm Mon	25-35 mph	50-55 mph	60-65 mph	100%/70%/5%
North/South Shore	1am Mon-6pm Mon	25-35 mph	50-55 mph	60-65 mph	100%/70%/10%
Merrimack Valley/Salem	1am Mon-6pm Mon	25-30 mph	35-45 mph	50-55 mph	90%/50%/10%
Nantucket	11pm Sun-6pm Mon	30-40 mph	45-55 mph	60-65 mph	100%/70%/20%

THUNDERSTORM IMPACT - THIS PM INTO MONDAY MORNING: A low chance for thunderstorms will exist this evening and tonight. These could produce damaging wind gusts.

REGION	TIMING	LIGHTNING CHANCE/AMOUNTS	GUSTS	EEI CHANCE (2/3/4)
Western	7pm Sun-1am Mon	10% - Low	30-40 mph	20%
Charlestown/Lebanon	7pm Sun-1am Mon	20% - Low	30-40 mph	20%
Coastal/Capital	10pm Sun-5am Mon	30% - Low	55-65 mph	90%/60%/20%
Western/Central	10pm Sun-4am Mon	30% - Low	50-60 mph	90%/55%/10%
Southeast	10pm Sun-5am Mon	30% - Low	55-65 mph	90%/60%/20%
North/South Shore	11pm Sun-5am Mon	30% - Low	55-65 mph	90%/60%/20%
Merrimack Valley/Salem	12am Mon-5am Mon	30% - Low	55-65 mph	90%/60%/20%
Nantucket	11pm Sun-4am Mon	40% - Low	55-65 mph	90%/60%/20%

PRECIPITATION IMPACT: Total rainfall amounts of 2-4" are likely through Monday across the service area. Isolated heavier amounts are possible. The heaviest rain will fall between about 8pm Sunday and 8am Monday.

TEMPERATURE IMPACT: None.

SNOW IMPACT: None.

ICE IMPACT: None.

FLOOD IMPACT: Areas of standing water and flash flooding may develop across the service area tonight through midday Monday. Urban and poor drainage flooding and small stream flooding is also possible tonight through midday Monday. The condition may be aggravated by leaves clogging storm drains.

TONIGHT: Becoming very windy with periods of rain. Rain will be heavy at times. Embedded thunderstorms possible in spots. See THUNDERSTORM IMPACT for updated details. Rainfall amounts: See PRECIPITATION/FLOOD IMPACT for details. Winds: See WIND IMPACT for details. Lows: Lower 50s to upper 50s, except near 60 degrees Nantucket.

TOMORROW: Very windy. Rain and perhaps an isolated thunderstorm will linger in the morning but a drying trend will overspread the area from south to north during the afternoon. See THUNDERSTORM IMPACT for details. Rainfall amounts: 0.20-0.60", isolated 1.00" possible in Western. See PRECIPITATION/FLOOD IMPACT for details. Winds: See WIND IMPACT for details. Highs: Lower 50s to upper 50s.

TOMORROW NIGHT: Dry but breezy. Winds: See WIND IMPACT for details. Lows: Middle 30s to middle 40s, except near 50 degrees Nantucket.

DAYS 3-5: On Tuesday, dry and hazard-free weather is expected. Winds may gust to 25-35 mph during the day but winds will be much lighter on Tuesday night. On Wednesday, dry and hazard-free weather is expected during the day and evening. Rain showers are possible after about Midnight and through the night. No hazards are expected. Rain showers linger Thursday morning and early afternoon. Temperatures will be near to 4 degrees below normal on Tuesday and Wednesday and near to 3 degrees above normal on Thursday.

Go to WeatherSentry® Online for a complete view of the forecast and other business critical weather information.

Energy Event Index for NATIONAL GRID (New England)

Your forecast administrator: theresa.leib@nationalgrid.com

Valid Time: October 30, 2017 6:00 AM EDT

Forecaster: nathan.hamblin

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Central Massachusetts	1	1	1
	Eastern Massachusetts	2	1	1
	Nantucket	2	1	1
	Rhode Island	2	1	1
	Western Massachusetts	1	1	1
Wind/Gust	Central Massachusetts	2	1	1
	Eastern Massachusetts	2	1	1
	Nantucket	3	1	1
	Rhode Island	2	1	1
	Western Massachusetts	2	1	1
Confidence Level	Central Massachusetts	High	High	High
	Eastern Massachusetts	High	High	High
	Nantucket	Medium	High	High
	Rhode Island	High	High	High
	Western Massachusetts	Medium	High	High

Energy Event Index Definition

With Leaves (Apr 1 - Oct 31)

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

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

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

Forecast for NEW ENGLAND from DTN for National Grid

Date: October 30, 2017
Time: 6:00 AM EDT
Forecaster: Nate Hamblin

CURRENT CONDITIONS: Isolated rain showers remain. Winds: South-southwest at 15-20 mph, with gusts of 20-30 mph in Nantucket. Elsewhere: South at 8-15 mph. Temperatures: Upper 50s to middle 60s.

SYNOPSIS: Hazard winds are expected across the region today. The impacts from the hazard level winds will be increased in areas that still have leaves on the trees. Breezy winds will continue tonight and Tuesday, but sub-hazard winds are expected. The next chance of rain showers will come Wednesday night and Thursday. More rain should come Friday with breezy non-hazard winds.

WIND IMPACT: Detailed below. Strongest wind period: Late Monday morning/early Monday afternoon. Wind direction: South-southwest. Western Mass: Any peak gusts over 45 mph will be across higher terrain along the eastern slopes of the Berkshires. Lower elevations should see peak gusts of 40-45 mph.

REGION	TIMING	SUSTAINED	GUSTS	PEAK GUSTS	EEI CHANCE (2/3)
Western/Central	9am-6pm Mon	18-28 mph	30-40 mph	40-55 mph	90%/40%
Lebanon/Charlestown	10am-5pm Mon	17-24 mph	25-35 mph	35-40 mph	60%/0%

Coastal/Capital/Southeast	9am-7pm Mon	20-30 mph	32-42 mph	42-50 mph	100%/10%
South Shore	8am-7pm Mon	18-28 mph	30-40 mph	40-45 mph	90%/0%
Merrimack Valley/Salem/North Shore	8am Mon-6pm Mon	20-30 mph	32-42 mph	42-50 mph	100%/10%
Nantucket	6am-6pm Mon	28-38 mph	45-55 mph	55-60 mph	100%/80%
Nantucket	6pm Tue-7am Tue	17-25 mph	25-35 mph	35-50 mph	70%/0%

THUNDERSTORM IMPACT: None.

PRECIPITATION IMPACT: None.

TEMPERATURE IMPACT: None.

SNOW IMPACT: None.

ICE IMPACT: None.

FLOOD IMPACT: Localized flooding could linger across poor urban drainage areas and near streams through 12pm today.

TODAY: Light rain showers are expected this morning, which could linger very early this afternoon in NH. Rainfall: 0.10-0.25"; locally up to 0.50" in Western Mass. Dry weather will return later today. Winds: See WIND IMPACT. Highs: 60s early, dropping into the upper 40s and 50s this afternoon.

TONIGHT: Dry but breezy. Winds: See WIND IMPACT for Nantucket winds. Elsewhere: Southwest at 8-18 mph, with gusts of 20-25 mph. Peak gusts: 25-30 mph near the coast. Lows: Middle 30s to middle 40s, except lower 50s in Nantucket.

TOMORROW: Dry. Winds: Southwest at 10-20 mph, with gusts of 20-30 mph. Peak gusts: 30-35 mph near the coast. Highs: Lower 50s to lower 60s.

TOMORROW NIGHT: Dry. Winds: Becoming light and variable. Lows: Upper 20s to upper 30s for most and middle 40s for Nantucket.

DAYS 3-5: Dry weather is expected Wednesday. Light rain showers can't be ruled later Wednesday night and Thursday. Scattered rain showers are expected Friday, with the best chance during the afternoon/night. Winds could gust to 20-30 mph during the day Friday. No hazards. Temperatures will be slightly below normal Wednesday, slightly above normal Thursday, and 5-10 degrees above normal Friday.

Go to WeatherSentry® Online for a complete view of the forecast and other business critical weather information.

Energy Event Index for NATIONAL GRID (New England)

Your forecast administrator: theresa.leib@nationalgrid.com

Valid Time: October 30, 2017 1:00 PM EDT

Forecaster: jon.chrzanowski

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Central Massachusetts	1	1	1
	Eastern Massachusetts	2	1	1
	Nantucket	2	1	1
	Rhode Island	2	1	1
	Western Massachusetts	1	1	1
Wind/Gust	Central Massachusetts	2	1	1
	Eastern Massachusetts	2	1	1
	Nantucket	3	1	1
	Rhode Island	2	1	1
	Western Massachusetts	2	1	1
Confidence Level	Central Massachusetts	High	High	High
	Eastern Massachusetts	High	High	High
	Nantucket	High	High	High
	Rhode Island	High	High	High
	Western Massachusetts	Medium	High	High

Energy Event Index Definition

With Leaves (Apr 1 - Oct 31)

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

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

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

Forecast for NEW ENGLAND from DTN for National Grid

Date: October 30, 2017
Time: 1:00 PM EDT
Forecaster: J Chrzanowski

CURRENT CONDITIONS: Areas of rain showers continue across portions of New England early this afternoon. Winds: From the west in many areas at 20-25 mph with gusts to 40 mph. Winds along the immediate coastal sections are from the southwest at 20-25 mph with frequent gusts to 45 mph. Temperatures: In the 40s for many areas with a few 50s along the immediate coast.

SYNOPSIS: Hazard-level wind gusts will continue across the service territory through this afternoon into early this evening. The impacts from the hazard level winds will be increased in areas where leaves are still on the trees. Lingering rain showers will end by mid to late afternoon. Breezy winds will continue tonight and Tuesday, but sub-hazard winds are expected. The next chance of rain showers will occur on Wednesday night and Thursday. More rain should come Friday with breezy non-hazard winds.

WIND IMPACT THIS AFTERNOON/EVENING: Strongest wind period: Into late afternoon. Wind direction: West. Western Mass: Any peak gusts over 45 mph will be across higher terrain along the eastern slopes of the Berkshires. Lower elevations should see peak gusts of 40-45 mph.

REGION	TIMING	SUSTAINED	GUSTS	PEAK GUSTS	EEI CHANCE (2/3)

Western/Central	Through 6pm Mon	18-28 mph	30-40 mph	40-55 mph	90%/40%
Lebanon/Charlestown	Through 5pm Mon	17-24 mph	25-38 mph	38-43 mph	60%/0%
Coastal/Capital/Southeast	Through 7pm Mon	20-30 mph	35-43 mph	45-50 mph	100%/10%
South Shore	Through 7pm Mon	22-28 mph	35-43 mph	43-46 mph	90%/0%
Merrimack Valley/Salem/North Shore	Through 6pm Mon	22-30 mph	35-45 mph	45-50 mph	100%/10%
Nantucket	Through 6pm Mon	26-36 mph	45-55 mph	55-60 mph	100%/80%
Nantucket	6pm Mon-7am Tue	17-25 mph	28-35 mph	35-45 mph	70%/0%

THUNDERSTORM IMPACT: None.

PRECIPITATION IMPACT: None.

TEMPERATURE IMPACT: None.

SNOW IMPACT: None.

ICE IMPACT: None.

FLOOD IMPACT: None additional. High water levels from recent heavy rain will continue to subside this afternoon.

THIS AFTERNOON: Very windy and much cooler. A few lingering rain showers are possible through mid afternoon. Rainfall amounts: 0.10-0.15". Winds: See WIND IMPACT for details. Temperatures: Steady to slowly falling in the middle 40s to middle 50s; mildest along the coasts.

TONIGHT: Dry but breezy. Winds: See WIND IMPACT for Nantucket winds. Elsewhere: Southwest at 10-18 mph, with gusts of 20-25 mph. Peak gusts: 25-30 mph near the coast. Lows: Middle 30s to middle 40s, except lower 50s across Nantucket.

TOMORROW: Dry. Winds: Southwest at 10-20 mph, with gusts of 20-30 mph. Peak gusts: 30-35 mph near the coast. Highs: Lower 50s to lower 60s; mildest near Nantucket.

TOMORROW NIGHT: Dry with less wind. Winds: Becoming light and variable. Lows: Upper 20s to upper 30s for most; middle 40s for Nantucket.

DAYS 3-5: Dry weather is expected during the daylight hours Wednesday. There is a chance for rain showers later Wednesday night and Thursday, but rainfall amounts will be light. Scattered rain showers are expected Friday, with the best chance during the afternoon/night. Winds could gust to 20-30 mph during the day Friday. No hazards. Temperatures will be slightly below normal Wednesday, slightly above normal Thursday, and 5-10 degrees above normal Friday.

Go to WeatherSentry® Online for a complete view of the forecast and other business critical weather information.

Energy Event Index for NATIONAL GRID (New England)

Your forecast administrator: theresa.leib@nationalgrid.com

Valid Time: October 30, 2017 7:00 PM EDT

Forecaster: tony.dello

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Central Massachusetts	1	1	1
	Eastern Massachusetts	1	1	1
	Nantucket	1	1	1
	Rhode Island	1	1	1
	Western Massachusetts	1	1	1
Wind/Gust	Central Massachusetts	1	1	1
	Eastern Massachusetts	1	1	1
	Nantucket	1	1	1
	Rhode Island	1	1	1
	Western Massachusetts	1	1	1
Confidence Level	Central Massachusetts	High	High	High
	Eastern Massachusetts	High	High	High
	Nantucket	High	High	High
	Rhode Island	High	High	High
	Western Massachusetts	High	High	High

Energy Event Index Definition

With Leaves (Apr 1 - Oct 31)

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

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

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

Forecast for NEW ENGLAND from DTN for National Grid

Date: October 30, 2017
Time: 7:00 PM EDT
Forecaster: J Chrzanowski

CURRENT CONDITIONS: Dry. Winds: West-southwest at 10-22 mph with some isolated gusts of 25-35 mph, mainly into NH and coastal MA. Temperatures: Middle 40s to middle 50s.

SYNOPSIS: The strongest wind gusts continue to diminish across the area this evening. Breezy winds will continue tonight and Tuesday, but sub-hazard winds are expected. Dry weather is expected across the service territory from tonight through Tuesday night and Wednesday. The next chance of rain showers will occur on Wednesday night and Thursday. More rain should come Friday with breezy non-hazard winds.

WIND IMPACT - THIS EVENING: Gusty winds going forward this evening and tonight will be confined to Nantucket. Elsewhere, gusts are not indicated to exceed 35 mph.

REGION	TIMING	SUSTAINED	GUSTS	PEAK GUSTS	EEI-2 CHANCE
Nantucket	7pm Mon-5pm Tue	12-22 mph	25-30 mph	30-35 mph	20%

THUNDERSTORM IMPACT: None.

PRECIPITATION IMPACT: None.

TEMPERATURE IMPACT: None.

SNOW IMPACT: None.

ICE IMPACT: None.

FLOOD IMPACT: None.

TONIGHT: Dry but breezy. Winds: See WIND IMPACT for Nantucket winds. Elsewhere: West/southwest at 8-16 mph, with gusts of 20-25 mph for most, higher over Nantucket Island. Lows: Middle 30s to middle 40s, except lower 50s across Nantucket.

TOMORROW: Dry. Winds: Southwest at 10-20 mph, with gusts of 20-30 mph. Peak gusts: 30-35 mph near the coast. Highs: Lower 50s to lower 60s; mildest near Nantucket.

TOMORROW NIGHT: Dry with less wind. Winds: Becoming light and variable. Lows: Upper 20s to upper 30s for most; middle 40s for Nantucket.

DAYS 3-5: Dry weather is expected during the daylight hours Wednesday. There is a chance for rain showers later Wednesday night and Thursday, but rainfall amounts will be light. Scattered rain showers are expected Friday, with the best chance during the afternoon/night. Winds could gust to 20-30 mph during the day Friday. No hazards. Temperatures will be slightly below normal Wednesday, slightly above normal Thursday, and 5-10 degrees above normal Friday.

Go to WeatherSentry® Online for a complete view of the forecast and other business critical weather information.

Energy Event Index for NATIONAL GRID (New England)

Your forecast administrator: theresa.leib@nationalgrid.com

Valid Time: October 31, 2017 6:00 AM EDT

Forecaster: eric.jenks2

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Central Massachusetts	1	1	1
	Eastern Massachusetts	1	1	1
	Nantucket	1	1	1
	Rhode Island	1	1	1
	Western Massachusetts	1	1	1
Wind/Gust	Central Massachusetts	1	1	1
	Eastern Massachusetts	1	1	1
	Nantucket	1	1	1
	Rhode Island	1	1	1
	Western Massachusetts	1	1	1
Confidence Level	Central Massachusetts	High	High	High
	Eastern Massachusetts	High	High	High
	Nantucket	High	High	High
	Rhode Island	High	High	High
	Western Massachusetts	High	High	High

Forecast for NEW ENGLAND from DTN for National Grid

Date: October 31, 2017
Time: 6:00 AM EDT
Forecaster: Eric Jenks

CURRENT CONDITIONS: Dry. Winds: West-southwest at 7-16 mph, with isolated gusts of 20-30 mph, mainly in coastal Southeast MA. Temperatures: Upper 30s to upper 40s for most; lower 50s in Nantucket.

SYNOPSIS: Dry weather will continue today through most of Wednesday. Breezy but non-hazard winds are expected during the day today. A few light rain showers will be possible Wednesday night into Thursday. Additional chances of widely scattered showers should develop on Friday, along with breezy but non-hazard winds. Generally dry and hazard-free conditions are expected Saturday, although there is a chance for a few spotty showers to move into western MA and western NH overnight.

WIND IMPACT: None.

THUNDERSTORM IMPACT: None.

PRECIPITATION IMPACT: None.

TEMPERATURE IMPACT: None.

SNOW IMPACT: None.

ICE IMPACT: None.

FLOOD IMPACT: None.

TODAY: Dry. Winds: West-southwest at 8-20 mph, with gusts of 20-30 mph and isolated peak gusts of 30-35 mph in Nantucket and along the coast of RI and southeast MA. Highs: Lower 50s to lower 60s.

TONIGHT: Dry. Winds: Becoming light and variable for most; West-northwest at 5-12 mph in Nantucket. Lows: Upper 20s to upper 30s for most; middle 40s for Nantucket.

TOMORROW: Dry. Winds: South at 6-12 mph. Highs: Upper 40s to upper 50s.

TOMORROW NIGHT: A few light showers possible overnight in Western/Central MA and western NH; dry elsewhere. Rainfall: Less than 0.10", highest totals in western NH. Winds: South-southeast at 4-10 mph. Lows: Upper 30s to middle 40s for most; upper 40s in Nantucket.

DAYS 3-5: Chances for a few light rain showers continue during the day on Thursday, turning dry by Thursday evening. Rainfall amounts will be light. Isolated to widely scattered rain showers should develop Friday during the afternoon and evening, with greatest coverage in western NH and gradually diminishing from northwest to southeast. Winds could gust to 20-30 mph during the day Friday. Dry and hazard-free conditions are expected for most of Saturday, but a few spotty showers may extend into Western MA and western NH overnight hours, with rainfall amounts remaining light. Temperatures will be 5-10 degrees above normal Thursday, 8-14 degrees above normal Friday, and near to slightly above normal Saturday.

Energy Event Index Definition

With Leaves (Apr 1 - Oct 31)

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

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

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

Go to WeatherSentry® Online for a complete view of the forecast and other business critical weather information.

Energy Event Index for NATIONAL GRID (New England)

Your forecast administrator: theresa.leib@nationalgrid.com

Valid Time: October 31, 2017 1:00 PM EDT

Forecaster: john.baranick

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Central Massachusetts	1	1	1
	Eastern Massachusetts	1	1	1
	Nantucket	1	1	1
	Rhode Island	1	1	1
	Western Massachusetts	1	1	1
Wind/Gust	Central Massachusetts	1	1	1
	Eastern Massachusetts	1	1	1
	Nantucket	1	1	1
	Rhode Island	1	1	1
	Western Massachusetts	1	1	1
Confidence Level	Central Massachusetts	High	High	High
	Eastern Massachusetts	High	High	High
	Nantucket	High	High	High
	Rhode Island	High	High	High
	Western Massachusetts	High	High	High

Forecast for NEW ENGLAND from DTN for National Grid

Date: October 31, 2017
Time: 1:00 PM EDT
Forecaster: J Baranick

CURRENT CONDITIONS: Dry. Winds: West-southwest at 10-20 mph. Temperatures: Lower 50s to lower 60s.

SYNOPSIS: Dry weather will continue today through most of Wednesday. Breezy winds are expected through this afternoon, approaching hazard level at times on Nantucket. A few light rain showers will be possible Wednesday night into Thursday. A cold front will move through on Friday with some light showers and possibly gusty winds near the coasts. Gusts may continue into Saturday for coastal areas, but will be dry.

WIND IMPACT: Wind gusts on Nantucket may be gusty through 7pm. Peak wind gusts: 30-35 mph. EEI-2 chance: 20%.

THUNDERSTORM IMPACT: None.

PRECIPITATION IMPACT: None.

TEMPERATURE IMPACT: None.

SNOW IMPACT: None.

ICE IMPACT: None.

FLOOD IMPACT: None.

THIS AFTERNOON: Dry. Winds: West-southwest at 8-18 mph, with gusts of 20-30 mph and isolated peak gusts of 30-35 mph for Nantucket. See WIND IMPACT. Highs: Lower 50s to lower 60s.

TONIGHT: Dry. Winds: Becoming light and variable for most; West-northwest at 5-12 mph for Nantucket.

Lows: Upper 20s to middle 30s for most; middle 40s for Nantucket.

TOMORROW: Dry. Winds: South at 6-12 mph. Highs: Upper 40s to upper 50s.

TOMORROW NIGHT: A few light showers possible overnight in Western/Central MA and western NH; dry elsewhere. Rainfall: Less than 0.10". Winds: South-southeast at 4-12 mph. Lows: Upper 30s to upper 40s.

DAYS 3-5: Chances for a few light rain showers continue during the day on Thursday, turning dry by Thursday evening. Rainfall amounts will be light. Isolated rain showers should develop along the cold from as it swings through on Friday with the best chances and better rainfall totals in western NH. Winds may be breezy just behind the front for Eastern MA and RI, especially near the coasts and Nantucket, but should stay just below hazard-level. Dry weather is expected for Saturday, with some gusty winds possible near the coasts. Again, this is expected to be just shy of hazard-level. Temperatures will be 5-10 degrees above normal Thursday, 8-14 degrees above normal Friday, and near to slightly above normal Saturday.

Energy Event Index Definition

With Leaves (Apr 1 - Oct 31)

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

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

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

Go to WeatherSentry® Online for a complete view of the forecast and other business critical weather information.

Please do not respond to this email.

Energy Event Index for NATIONAL GRID (New England)

Your forecast administrator: theresa.leib@nationalgrid.com

Valid Time: October 31, 2017 7:00 PM EDT

Forecaster: tony.dello

Parameter	Region	Day 1	Day 2	Day 3
Wind Speed	Central Massachusetts	1	1	1
	Eastern Massachusetts	1	1	1
	Nantucket	1	1	1
	Rhode Island	1	1	1
	Western Massachusetts	1	1	1
Wind/Gust	Central Massachusetts	1	1	1
	Eastern Massachusetts	1	1	1
	Nantucket	1	1	1
	Rhode Island	1	1	1
	Western Massachusetts	1	1	1
Confidence Level	Central Massachusetts	High	High	High
	Eastern Massachusetts	High	High	High
	Nantucket	High	High	High
	Rhode Island	High	High	High
	Western Massachusetts	High	High	High

Forecast for NEW ENGLAND from DTN for National Grid

Date: October 31, 2017
Time: 7:00 PM EDT
Forecaster: J Baranick

CURRENT CONDITIONS: Dry. Winds: West-southwest at 5-15 mph, a few coastal gusts of 20-25 mph. Temperatures: Lower 40s to lower 50s.

SYNOPSIS: Dry weather will continue through most of Wednesday. A few light rain showers will be possible Wednesday night into Thursday. A cold front will move through on Friday with some light showers and possibly gusty winds near the coasts. Gusts may continue into Saturday for coastal areas, but will be dry.

WIND IMPACT: None.

THUNDERSTORM IMPACT: None.

PRECIPITATION IMPACT: None.

TEMPERATURE IMPACT: None.

SNOW IMPACT: None.

ICE IMPACT: None.

FLOOD IMPACT: None.

TONIGHT: Dry. Winds: Becoming light and variable for most; West-northwest at 5-12 mph for Nantucket. Lows: Upper 20s to middle 30s for most; middle 40s for Nantucket.

TOMORROW: Dry. Winds: South at 6-12 mph. Highs: Upper 40s to upper 50s.

TOMORROW NIGHT: A few light showers possible overnight in Western/Central MA and western NH; dry

elsewhere. Rainfall: Less than 0.10". Winds: South-southeast at 4-12 mph. Lows: Upper 30s to upper 40s.

DAYS 3-5: Chances for a few light rain showers continue during the day on Thursday, turning dry by Thursday evening. Rainfall amounts will be light. Isolated rain showers should develop along the cold front as it swings through on Friday with the best chances and better rainfall totals in western NH. Winds may be breezy just behind the front for Eastern MA and RI, especially near the coasts and Nantucket, but should stay just below hazard-level. Dry weather is expected for Saturday, with some gusty winds possible near the coasts. Again, this is expected to be shy of hazard-level. Temperatures will be 5-10 degrees above normal Thursday, 8-14 degrees above normal Friday, and near to slightly above normal Saturday.

Energy Event Index Definition

With Leaves (Apr 1 - Oct 31)

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

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

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

Go to WeatherSentry® Online for a complete view of the forecast and other business critical weather information.

RI Q4 Materials

Email Sunday evening 10/29/2017 from DTN to National Grid

From: Kach, Kurt J.
Sent: Sunday, October 29, 2017 2:40 PM
To: Bunszell, Daniel
Subject: DTN Forecast Check In

Hi Dan,

This is the latest thinking from DTN based on the question of Philippe interacting with our weather system.

NATIONAL GRID: Good afternoon and thanks for your inquiry. According to our forecasts, Philippe will only loosely interact with the storm impacting your service territory. It will not really alter the forecast from our current expectations all that much of widespread heavy rain and strong winds tonight into Monday. Widespread 2-4 inches of rain are likely to occur through about Noon or so on Monday. The winds will be increasing later this evening and overnight, lasting through Monday morning. For many areas, frequent wind gusts to 50 mph will be common, along with a risk of peak gusts to 55 mph. Based on what we see at this time, we may increase a few gusts by 5 mph or so, but that should be about it. That being said, the strongest winds of all will occur off the coast and out into the ocean, where gusts could reach or exceed 70 mph.

Kurt Kach
Lead Process Manager – NE South
Nationalgrid
280 Melrose St
Providence, RI 02907
Office E3.317
Cell: (774)-991-0439
Office: (401)-784-7477

R-I-5

Request:

Provide copies of all internal and external correspondence, including emails between members of the storm assessment team, which occurred in advance of the storms arrival.

Response:

Please see Attachment R-I-5 for copies of internal and external correspondence to and from members of the Company's Tactical Level and Operational Level Incident Command System Organization regarding the October 29-30 storm in Rhode Island that occurred in advance of the storm's arrival.

Prepared by or under the supervision of: Daniel Bunszell

CONFIDENTIAL ATTACHMENT R-I-5

Attachment R-I-5 contains email correspondence which consists of approximately 750 pages. The Company has requested protective treatment of this document and will supplement this response with a redacted version of the document.

R-I-7

Request:

Provide all actual weather and storm track information you currently have and plan on using as part of any storm report produced internally or to the Division or PUC.

Response:

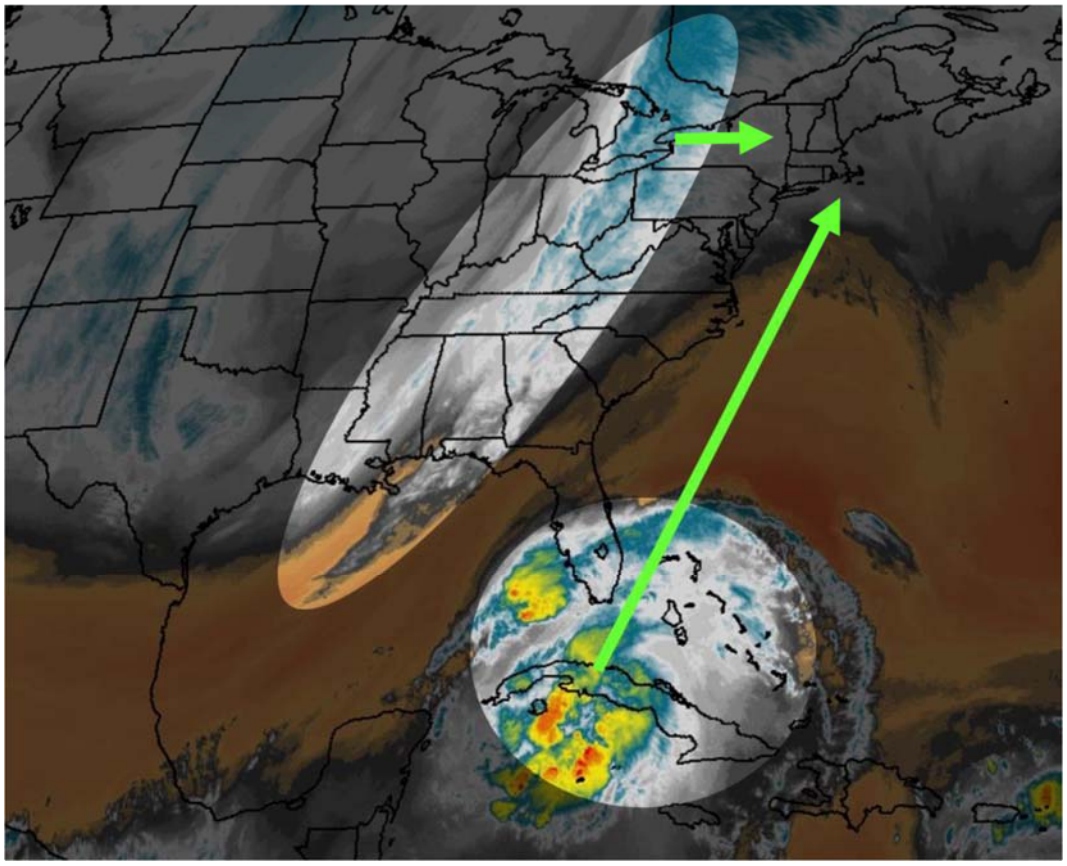
Please see Attachment R-I-7 for all actual weather and storm track information the Company currently has and plans on using as part of any storm report. For forecast-related information, please see the Company's response to Data Request R-I-4.

Prepared by or under the supervision of: Daniel Bunszell

THE STORM AND ITS IMPACT

On October 29th and 30th, 2017 a strong low pressure system moving in from the Great Lakes region, along with the remnants of Tropical Storm Philippe, combined to produce a long duration event of strong wind gusts, significant rain, and thunderstorms. See Figure 1 for satellite imagery from DTN (the Company's weather forecasting service company). There were two periods of significant wind gusts. The first occurred between 8:00 pm October 29th through 5:00 am October 30th, in which wind gusts of 45-70 mph were reported. The second period of wind occurred between 9:00 am - 6:00 pm October 30th, where wind gusts of 40-55 mph were reported. Periods of moderate to heavy rain, along with embedded thunderstorms, also occurred from the morning of October 29th through midday of October 30th. Rainfall amounts of 1.50-5.00" were recorded. As a result, many whole trees fell down onto Company equipment, and this was the leading cause of outages experienced,

Figure 1 - Infrared satellite image from October 29, 2017, DTN



On Thursday, October 26th, the weather models indicated a possible hazard wind gust event for the Northeast. However, there was disagreement regarding the timing and position of the low pressure system that was expected to develop as a result of the two weather systems

combining. If the low pressure system developed along the Eastern Coast of the United States, then a shorter duration and lessened wind gust impact would occur. However, if the low pressure system developed in the Hudson Valley of New York, as some models indicated, then a longer duration and much higher wind gust impact would affect a much broader area of the Northeast. At this time, DTN reflected a possible hazard wind gusts event, both inside and outside of thunderstorm activity, Sunday, October 29th into Sunday night; and another period of gusty winds through the day on Monday.

Moving into Friday, October 27th, the weather models started to come into better agreement of a low pressure system developing in the Hudson Valley of New York, which increased DTN's confidence that this would be a longer duration and more widespread hazard wind event for the Northeast. There was also a slight shift in timing with the models showing the peak wind event occurring Sunday night into early Monday morning; and then another round of winds spiking during the daytime hours Monday. Subsequently, the forecast predicted increased wind gusts Sunday night into Monday morning across New England,

By Saturday October 28th and Sunday October 29th, the models were in agreement on the timing, strength, and the Hudson Valley position of the developing low pressure system. The strongest winds were expected Sunday night into early Monday morning, but the highest gusts were expected to remain off the coast, out to sea, not reaching inland.

Please see Figure 2 for the definition of DTN's Energy Event Index ("EEI"). Each forecast provided by DTN includes the likelihood that the Company's service territory will experience each possible EEI level, using this index.

Figure 2 – Energy Event Index - DTN

Energy Event Index Definition

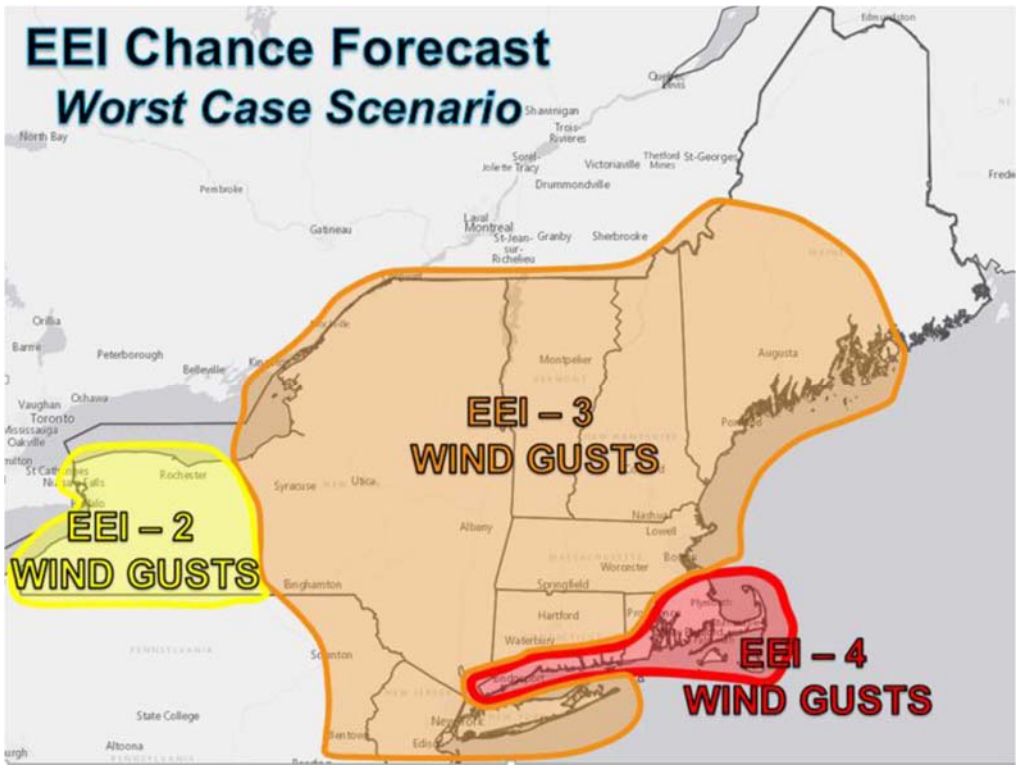
With Leaves (Apr 1 - Oct 31)

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

Figure 3 shows the Energy Event Index forecast wind gust impacts and Figure 4 shows the EEI chance worst case scenario. These figures were provided by DTN after the event as a visual illustration of the forecast.

Figure 3 EEI Forecast Wind Gusts - DTN

Figure 4 EEI Chance Worst Case Scenario – DTN



Strong, hazardous wind gusts affected the majority of the Northeast during the night on Sunday, October 29th through Monday, October 30th. The strongest wind gusts recorded occurred between 8:00 pm October 29th and 5:00 am October 30th, with gusts of 55-70 mph experienced along the Eastern Atlantic Seaboard from Long Island, New York and coastal Connecticut and up through coastal Maine. The rest of the Northeast experienced wind gusts of 35-50. A second period of wind gusts continued throughout the day on Monday, making this a prolonged hazardous wind event that downed whole trees and branches caused numerous power outages. Figure 5 demonstrates that Rhode Island experienced greater wind gusts than was predicted by the worst case forecast.

Figure 5 Peak Wind Gusts Recorded in the Northeast Region - DTN

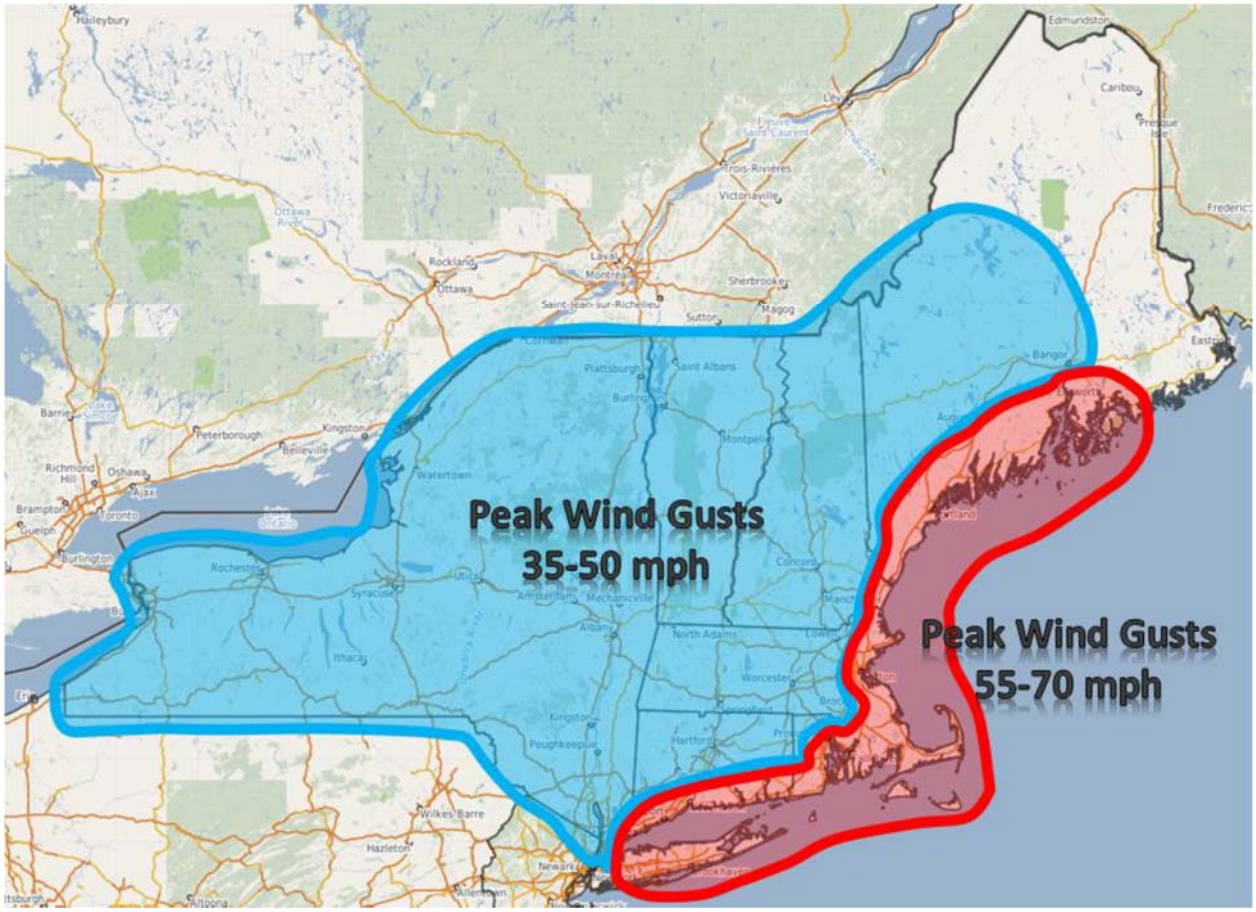


Figure 6 compares peak wind gusts across New England.

Figure 6 Recorded Peak Wind Gusts by New England States - DTN

CONNECTICUT	PEAK GUST	TIME (Oct. 30)
Groton	66 mph	11:31 PM (Oct. 29)
Stamford	65 mph	1:36 AM
Bridgeport	58 mph	11:30 PM (Oct. 29)
Meriden	56 mph	1:06 AM
New Haven	54 mph	11:02 PM (Oct. 29)
New London	47 mph	12:36 AM

RHODE ISLAND	PEAK GUST	TIME (Oct. 29)
Block Island	71 mph	12:00 AM (Oct. 30)
Warwick	63 mph	11:29 PM
Barrington	62 mph	11:40 PM
Providence	61 mph	12:06 AM (Oct. 30)
Bristol	59 mph	10:00 PM
Newport	55 mph	10:35 PM

NEW HAMPSHIRE	PEAK GUST	TIME (Oct. 30)
Meredith	68 mph	2:03 AM
Manchester	59 mph	1:45 AM
Mt. Washington Airport	58 mph	2:56 AM
Portsmouth	56 mph	5:48 AM
Skyhaven Airport	56 mph	5:08 AM
Berlin	51 mph	2:41 AM
Concord	51 mph	12:39 AM
Laconia	43 mph	12:37 AM
Lebanon	39 mph	3:44 AM

MASSACHUSETTS	PEAK GUST	TIME (Oct. 30)
Mashpee	93 mph	3:49 AM
Fairhaven	76 mph	2:50 AM
Wellfleet	72 mph	3:39 AM
Nantucket	70 mph	3:34 AM
Plymouth	68 mph	2:48 AM
Chatham	67 mph	3:29 AM
Taunton	67 mph	11:50 AM (Oct. 29)
Milford	67 mph	6:17 AM
East Falmouth	65 mph	1:29 AM
Barnstable	64 mph	3:12 AM
Milton	63 mph	12:38 AM
Boston	53 mph	12:43 AM
Hyannis	52 mph	3:46 AM
New Bedford	51 mph	12:05 AM
Williamstown	42 mph	4:52 AM
Pittsfield	41 mph	4:29 AM

MAINE	PEAK GUST	TIME (Oct. 30)
South Bristol	71 mph	6:00 AM
Augusta	70 mph	8:05 AM
Portland	69 mph	6:09 AM
Denmark	64 mph	6:02 AM
Camden	54 mph	7:20 AM
Wells	54 mph	6:06 AM
Rangeley	51 mph	6:40 AM
Jackman	50 mph	7:46 AM
Auburn	47 mph	5:56 AM
Sanford	47 mph	4:53 AM
Knox Co. Airport	44 mph	5:53 AM
Eastern Slopes Airport	40 mph	2:25 AM
Waterville	39 mph	6:08 AM

Lastly, from Weather.com, actual peak wind gusts were reported, along with other examples of the widespread and extreme damage the event caused along the Northeast states.

https://weather.com/forecast/regional/news/2017-10-30-northeast-storm-damaging-winds-flooding

Storm Reports - Peak Wind Gusts:

93 mph at Mashpee, Massachusetts
78 mph at Wells, Vermont
76 mph at Fairhaven, Massachusetts
75 mph at Barnstable, Massachusetts
73 mph near Mystic, Connecticut
72 mph near Penobscot, Maine
72 mph at Warwick, Rhode Island
70 mph at Augusta, Maine
70 mph at Nantucket, Massachusetts
69 mph at Portland, Maine
67 mph at Montauk, New York
66 mph at Groton, Connecticut
66 mph at Bangor, Maine
63 mph at Burlington, Vermont
63 mph at Providence, Rhode Island
55 mph at Boston-Logan Airport
49 mph at LaGuardia Airport
47 mph gust at Washington-Reagan National Airport
A sustained wind of 51 mph was reported near Beacon Hills, Connecticut.

A wind gust of 131 mph was also recorded at the top of Mt. Washington, New Hampshire at an elevation of more than 6,000 feet and 115 mph atop Mt. Mansfield, Vermont, at an elevation of almost 4,400 feet.

R-I-8

Request:

Provide copies of the most recent right-away-clearing and vegetation management guidelines for transmission, sub-transmission and distribution.

Response:

Please refer to the following attachments detailing the Distribution Line Clearance Specifications, Sub-transmission Line Clearance Specifications, Transmission Line Clearance Specifications, and the Right-of-Way Integrated Vegetation Management Specifications:

- Attachment R-I-8-1 – RI Distribution Line Clearance Specifications
- Attachment R-I-8-2 – Sub-Transmission Line Clearance Specification
- Attachment R-I-8-3 – Sideline Specification
- Attachment R-I-8-4 – Right-of-Way Integrated Vegetation Management (Floor) Specification

Prepared by or under the supervision of: Daniel Bunszell

nationalgrid

RI DISTRIBUTION LINE CLEARANCE SPECIFICATIONS **Updated 06/22/2017**

I. Scope/Intent

1.1 These specifications cover the cutting, clearing, pruning, tree removal and herbicide treatment of vegetation along overhead electric distribution lines and the corresponding substations. The intent is to define the minimum clearances to be obtained between the overhead conductors and vegetation that will be acceptable to National Grid. These specifications are strictly for use on overhead line maintenance pruning projects. This is not a specification to be used for enhanced hazard tree removal, new construction clearing or rebuild construction clearing.

II. Program Objectives:

2.1 The goals and objectives of the NGRID Distribution Line Clearance program are to provide safe, reliable, electric service through a cost effective, integrated vegetation management program. NGRID acknowledges differences in the manner in which various landowners respond to the need for routine line clearance activities, together with occasional differences in easement rights. Therefore, these specifications are designed to address:

- the minimum clearance requirements necessary to sustain safe, reliable electric service while striving to satisfy the concerns of sensitive customers,
- and the optimum clearance requirements necessary to sustain an appropriate level of safety and reliability.

III. Definitions:

Maintained Area: Generally defined as an area where the landowner or occupant is mowing the lawn and/or caring for gardens, ornamental shrubs or trees in the area under and immediately adjacent to the distribution poles. It includes commercial land uses such as business areas, parking lot edges and the tree lawn areas along urban and suburban streets. Un-maintained areas, of course, hold the opposite of these characteristics. It should be noted that within residential (maintained) areas there may be small sections of un-maintained property between yards or along the roadside of residential front lawns, etc. These small sections shall be treated as maintained areas for the purposes of this specification.

Mature Tree Line: A generally straight and contiguous line of trees nine (9) inches d.b.h. or greater, that mark the boundary between the forested edge and the maintenance corridor. In the case of an existing mature tree line, there may be individual mature trees that are rooted closer to the pole centerline than the common mature tree line. In these instances the mature tree line continues behind those individual trees.

Maintenance Corridor: The area physically located under and alongside the overhead distribution feeder bounded by the mature tree line when one exists. In the absence of a mature tree line the maintenance corridor is defined as the area that is at least ten (10)

feet either side of the pole centerline or equal to the previously maintained dimensions if greater than ten (10) feet.

Service Drop or Service Line: The last span of triplex or open three wire extending to the building or meter pole or a multi-span run of either triplex or open three wire that serves a single customer. This does not include street light services.

Secondary: The conductor, either triplex or open wire, which extends from the transformer to the Service Drop. Secondary spans may run along under primary spans or separately.

Street Light Secondary: The conductor, either triplex or open wire, which leaves the primary pole to pole configuration and extends out to service a street light or lights.

IV. Scope of Work:

4.1 Pruning Standards: All pruning shall be performed in accordance with ANSI A300 standards as well as the Best Management Practices – Tree Pruning publication. All cuts shall be made at a parent branch or limb, so that no stub shall remain. In cutting back a branch, the cut shall be made at a crotch or node where the branch being removed is at least one-third the diameter of the parent limb. All pruning cuts shall be made in accordance with proper collar cutting methods, utilizing drop crotch principles to minimize the number of pruning cuts, promote natural growth patterns, and maintain tree health and vigor (ANSI A300). Climbing irons or spurs shall not be used in pruning a shade/ornamental tree to be saved. Tree wound dressings shall not be applied.

4.2 Line Clearance within Maintained Areas: All overhead primary lines shall be pruned to provide a minimum of ten (10) feet of overhead clearance, a minimum of six (6) feet of side clearance from the outermost phase and a minimum of ten (10) feet of clearance below the wires. The contractor shall recognize that the use of ANSI A300 standards and techniques will result in clearances beyond the dimensions noted above.

4.2.1 The main trunk of the tree or major leads which are structurally sound and healthy may be left growing within these distances as long as none of the smaller diameter end branches are within the clearance dimensions. In that case the lead must be removed.

4.2.2 Where greater clearances have been achieved in previous cycles, the pruning shall be completed so as to re-establish the clearances in a manner that equals or exceeds the previous clearance conditions.

4.2.3 The contractor shall ground cut any new volunteer growth capable of growing into the wires from around poles, guys, fences, etc. within the maintained yard areas after notifying the property owner.

4.2.4 It is an objective of National Grid's program to continually strive to reduce the number of under-wire tree and branch growth that will continually require pruning, by removing as many stems and growth as possible on each cycle. The Contractor is expected to emphasize this type of removal through the landowner contacts made by their customer contact personnel.

4.2.5 Contractor shall exercise extreme care when pruning ornamental plantings. Species, growth rates and growth characteristics should be taken into account and may require differing clearances.

4.2.6 All slash from pruning in maintained areas shall be disposed of through chipping. Large diameter wood may remain on site provided it is cut into manageable lengths and piled neatly. Smaller debris shall be raked up and removed so as to leave the property in a condition equal to the start of work.

4.3 Line Clearance Outside of Maintained Areas: All overhead lines shall be pruned to provide a minimum of fifteen (15) feet of overhead clearance and six (6) feet of side clearance from the outermost phase.

4.3.1 Along off-road sections the contractor shall completely remove all side branches that extend into the maintenance corridor from below and beside the lines in order to "box out" the maintenance corridor. This practice will minimize future pruning efforts as well as improve storm restoration and line inspection efficiencies.

4.3.2 Where greater clearances have been achieved in previous cycles, the pruning shall be completed so as to re-establish the clearances in a manner that equals or exceeds the previous clearance conditions.

4.3.3 The contractor shall ground cut all trees and shrubs which have the ability to interfere with the conductor out to the limits of the existing maintenance corridor. Where a maintenance corridor does not already exist, ground cutting shall be performed for a minimum distance of ten (10) feet either side of centerline. Ground cutting shall include stems of eight (8) inches d.b.h. or less, all as part of the fixed price bid. Along individual spans that have been previously maintained using National Grid's past eight (8) foot targeted ground cutting specification (trimming and removal) the same approach shall be utilized.

4.3.4 Where trees beyond the limits of the maintenance corridor are extending into the corridor, the contractor shall either prune those limbs back or have the option to remove the tree as part of the fixed price bid. For trees, eight (8) inches d.b.h. or less, where the top of the tree is leaning out into the corridor so that topping would be the only possible correction, the contractor shall ground cut that tree as part of the fixed price bid.

4.3.5 Stumps shall be cut flat and as close to grade as possible.

4.3.6 All slash along the roadway or near residences shall be disposed of by chipping or mowing/mulching. Where practical, chips may be blown back onto the site without creating large chip piles. On off-road, un-maintained sites, slash shall be mowed/mulched or neatly windrowed to the edge of the maintenance corridor and cut to lie close to the ground, away from sensitive locations. No debris shall be left anywhere that will potentially block access, significantly alter any drainage or water resource, or create any unsafe condition for the public. Alternatives to these practices must be approved by National Grid's Forestry representative and by the current landowner.

4.4 All dead or damaged overhead limbs, branches or leads that are capable of falling onto overhead primary wires from above or along side the right-of-way and potentially causing a tree outage, shall be removed at the time of pruning, and included in the fixed price bid.

4.5 For all pine species growing above the overhead clearance limits with boughs overhanging primary conductor - the contractor shall shorten all overhanging boughs so to reduce the length of the branch by approximately 1/3 without removing all needle growth from the entire branch. This shall be done in a progressive manner beginning at the upper clearance dimension (10 or 15 feet) and working upwards generally two (2) whorls in the tree as necessary to reduce the likelihood of a long pine bough loaded with ice or wet snow, drooping down or breaking onto the conductors.

4.6 Pruning Clearance for Secondary and Service Lines:

4.6.1 All secondary wire (triplex and open wire), other than that serving street lights only, shall be pruned to provide a minimum of eighteen inches of clearance from wire to vegetation.

4.6.2 All service wires (triplex or open wire) and street light secondary on the circuit shall be inspected during the pruning process. For branches that are either making hard contact with the service wire, pushing on or creating tension enough to force the wire out of a natural arc, or redirecting the wire out of a straight line run, the vendor shall do whatever pruning is necessary to correct that situation. The entire service drop need not be pruned, only the point of conflict.

4.6.3 For open wire services, pruning is required for all the situations noted in 4.6.2 as well as anytime vegetative growth is forcing the three wires out of their normal configuration. The vendor must take extra care when pruning around open wire services so not to cause a service interruption to our customers.

4.7 Multiple Circuits and Under-builds: The contractor shall prune all distribution circuits on a pole unless otherwise called out on the bid documents. Where a distribution circuit is under-built below a sub-transmission the contactor is responsible for the pruning of both the distribution circuit as well as the over-built circuit utilizing the specification of the higher voltage circuit unless otherwise directed in the bid documents. The contractor is also responsible for work on any primary, secondary or service tap running off the sub-transmission line along that specific distribution circuit. Any exceptions to the above will be explained at the time of bidding. Reference the appropriate sections of either National Grid's Sub-T IVM and/or Sideline specifications depending on the under-built situation.

4.8 Circuits along Transmission Rights-of-Way: The contractor shall employ this specification on all sections of distribution circuits that run along segments of transmission rights-of-way except for areas where the distribution circuit is actually under-built on the same pole. In those cases the above section will apply. Any exceptions to the above will be explained at the time of bidding.

4.9 Substation Clearances: All vegetation within 10' of the substation fence shall be pruned, from ground to sky, removed and chipped and no overhanging branches shall be allowed to remain. Where shrubs and trees have been planted for screening purposes and are rooted within the 10' distance, only the fence side branches shall be removed. Any volunteer growth (natural regeneration) rooted within the 10' distance shall be removed.

4.10 Vine Control: All vines growing on poles, guy wires, stub poles or towers shall be cut so as to create a "growth gap" of 4 feet and treated (where appropriate) with a herbicide approved by the company.. Contactors should not attempt to remove vines from any structure.

4.11 Hazard Tree Inspection and Removal: Other than work required in previous sections, the removal of any tree over 8 inches d.b.h. within the maintenance corridor or outside the maintenance corridor shall be considered a hazard tree removal and is outside the fixed price bid.

4.11.1 While pruning the circuit, the contractor's personnel shall perform a visual inspection of each tree along the circuit in order to identify potential defects and determine the potential risk for the tree to cause an interruption over the length of the pruning cycle. The crew shall work closely with National Grid Forestry representative to determine potential hazard trees, preparing a list of trees in accordance with National Grid's Hazard Tree Reporting Form. The completed lists of potential hazard trees shall be regularly provided to the Forestry representative for review and approval prior to removing any of those specific trees. Exceptions to this procedure may be approved to enable removals of trees that have been pre-identified as hazard trees by National Grid representatives, trees that pose an imminent risk, or to authorize hazard tree removals in off-road areas where a skidder bucket is already on site.

4.11.2 Once a crew completes the removals on an approved list they shall note the completion details on the Hazard Tree Reporting Form. This form shall be submitted to the Forestry representative on a timely basis. Once the list is audited the contractor may submit an invoice for that specific work.

V. Contractor Requirements

5.1 The Contractor shall do all work and furnish all labor including supervision, tools, machinery and transportation necessary for the pruning, removal and herbicide treatment of trees to provide acceptable vegetation clearance for overhead lines of National Grid. Work at the fixed price rates will be designated on the distribution circuit maps, and identified in the pre-bid documents. Work at the fixed price is based on overhead primary miles of line, and includes pruning, tree and lead removal and herbicide treatment to all primary, secondary, service drops, and substation fence areas as clarified in the Work Scope section of this specification. Work at unit prices and/or hourly rates as also defined in the Work Scope section will be designated at the pre-bid meeting or by a National Grid Forestry representative as required.

VI. Contractor's Responsibility

6.1 The Contractor shall provide all necessary supervision, labor, material, tools and equipment for the safe execution of all work covered by these specifications.

6.2 The Contractor shall employ a competent field supervisor and customer contact person(s) acceptable to the Corporation, in addition to the crew Foreman and senior Company management. Notification personnel shall be qualified in tree identification including identification of "proper under powerline trees". The supervisor shall be available to the Corporation at all reasonable times during the entire extent of the project and/or contract. In addition, at least one member of each stand-alone crew or unit of crews shall be fluent in the English language and on-site.

6.3 The Contractor shall comply with all building and sanitary laws and all Federal, State, County, Town and Municipal laws, ordinances and regulations pertaining to the work. The contractor shall be responsible for obtaining all permits necessary to perform the work unless otherwise provided by National Grid.

6.4 The Contractor shall notify each landowner and inform them of the clearing, removal, pruning and herbicide work to be done, and where appropriate, agree on access point(s), before crossing the property and then abide by the same. The Contractor shall designate a Customer Contact Person(s) for each project they are awarded and communicate that name and phone contact information for that person to the National Grid forestry representative for that project.

6.5 In the event that the Contractor cannot locate the landowner after using all reasonable measures, or upon locating them is aware of an objection to the work to be performed, the Contractor shall document the landowners concern and then notify the National Grid's forestry representative within 24 hours in order to obtain specific instructions and/or their permission prior to commencing work on that property.

6.6 In addition to the above notifications, where herbicide applications will be made, the Contractor must follow any and all current notification requirements of any applicable regulations.

6.7 The Contractor shall be held solely liable and indemnify National Grid fully for any and all claims and legal expenses for damage to crops, land, trees or otherwise resulting from such violations, failure or damages arising out of the Contractor's negligence. The Contractor shall not be liable for claims or suits for damage to property if the work causing such damage is done under specific direction from NGRID.

6.8 The Contractor shall replace or make necessary repairs to all property destroyed or damaged in the course of the work and exercise due care and diligence in adequately protecting all properties, both real and personal, from damage of whatsoever nature whenever crossed over, on, or in the vicinity of the work. If the contractor neglects or fails to promptly make said repairs or make good of said destruction, the Corporation may make any and all necessary repairs to the satisfaction of the property owner and the Contractor agrees to promptly reimburse the Corporation the amount of its incurred cost and expenses.

6.9 The contractor shall inform the National Grid Forestry representative of their intent to start work at least two weeks prior to the start of any action on a feeder.

6.10 The Contractor shall implement and provide the required training and certification programs necessary to provide fully qualified Line Clearance Tree Trimmers or Line Clearance Tree Trimmer Trainees. A single Foreman may supervise multiple bucket trucks on the same project. In that case however, the minimum qualifications for the "lead" person on each of the other trucks shall be a certified qualified Line Clearance Tree Trimmer. At least one other employee on the truck shall be at least a qualifying Line Clearance Tree Trimmer Trainee, in accordance with all applicable OSHA requirements.

6.11 The Contractor shall submit a weekly time report to the National Grid Forestry representative, indicating the labor and equipment assigned to the project, amount of work accomplished, quantities and location of herbicide applications and location of the work.

6.12 The Contractor shall provide a monthly summary report to Distribution Forestry, identifying crew staffing and equipment by area as of the first of each month, to be submitted by the 5th of each month or the following Monday should the 5th fall on the weekend. The report shall also identify work type (e.g., such as hourly, new construction, danger trees, mowing; lump sum or unit price) by project, percentage complete for all fixed price projects, and anticipated completion dates.

6.13 The Contractor shall provide a monthly OSHA injury summary report in a format supplied by National Grid for the previous month, no later that the 10th of the month or the following Monday should the 10th fall on the weekend. The data in the report shall be separated by state as well as reported for the overall Contractor Company for any and all United States operations.

6.14 By April 10th of each year, the contractor shall provide a list of employees and Aerial lifts that could reasonably be expected to work on National Grid's property to Distribution Forestry. This listing shall include:

Employees:

- identify the current pay classification of each employee, together with their union certification level,
- the date of their progression to their current pay level,
- the dates each employee completed their required OSHA safety and other training, or retraining, including any annual refreshers,
- the date each employee last demonstrated their tree rescue and climbing proficiency
- the date each employee completed first aid and CPR training,
- identify each certified pesticide applicator and their certification number.

Aerial Lifts:

- The truck number and date of dielectric testing
- The next scheduled dielectric test date

6.15 The contractor shall provide a unit cost per tree for the removal of potential hazard trees from the three phase portions of the circuit, as well as "high risk target" hazard trees from the single-phase portions. See the attached Addendum # 1, Hazard Tree Tree Removal, Unit Price Schedule to be bid separately from the fixed price project. National Grid reserves the right to award**,** in whole or in part, the removal of hazard trees for each bid package on the basis of these unit price costs, or to do the work at the contractor's current hourly rates.

VII. Acceptance of Work

7.1 At appropriate intervals, the Contractor shall report and review the work completed to date with National Grid's Forestry representative. The Contractor may then invoice for the percentage of the work completed and approved by National Grid.

7.2 Near completion of the work, the Contractor shall notify the National Grid Forestry representative that the entire project has been reviewed by the contractor's supervision and is now ready for inspection. Upon review and acceptance of all required work including the resolution of any and all required corrective actions as well as any outstanding damage claims, the NGRID Forestry representative will give the Contractor permission to submit a final invoice for payment.

7.2.1 Traffic detail costs associated with re-work or corrective action shall be borne by the Contractor.

7.2.2 Police detail costs for any work not completed by the end of the fiscal year (March 31st) shall be borne by the Contractor. National Grid has the discretion to make allowances for circumstances outside of the Contractor's control. (Storms, requested outages, etc.)

7.3 The contractor shall understand, per their signed Master Purchase order with NGRID that time is of the essence with respect to the performance of this work. The contractor shall take all appropriate actions necessary to complete the work on schedule. Those actions shall include among other things, the use of overtime, the use of supplemental labor crew resources from outside areas, and the use of subcontractors, not withstanding the NGRID requirement for advanced approval of all subcontractors. All actions employed by the contractor to meet schedules are at their cost and shall not affect the lump sum contract amount. In the event of extenuating circumstances defined by NGRID, the company reserves the right to extend project completion dates.

FOREWORD

This specification documents the objectives, practices and procedures for vegetation management on National Grid companies' sub-transmission electric roadsides and rights-of-way in **New England only**, and specifically addresses sideline and hazard tree pruning and removal. The specification also defines the responsibilities of National Grid vegetation management personnel and contractors, identifies procedures to be followed by contractors performing all work and defines the requirements to maintain vegetation acceptable to the Company.

Questions or inquiries regarding information provided in this document should be referred to the National Grid's Manager of Vegetation Strategy.

Bert Stewart III
Bert H Stewart III
Manager
Vegetation Strategy

Anne Marie Moran
Anne Marie Moran
Manager
T&D Forestry, New England

Date: 5/9/2017

Date of Review/Revision:

Revision	Date	Description
0	August 9, 2013	Original Specification
1	July 16, 2014	Updates for 2015 Procurement Event
2	April 21, 2015	Updates for 2016 Procurement Event
3	June 16, 2016	Date Updates for FY18 Procurement Event
4	May 9, 2017	Updates for FY19 Procurement Event

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1.0 Introduction

1.1 Purpose

The purpose of this specification is to document the requirements for sideline pruning, hazard tree removal and IVM on sub-transmission electric roadsides and rights-of-way for National Grid in New England. This specification defines:

- Objectives, strategies and approved practices and procedures for sideline pruning and hazard tree removal on sub-transmission electric roadsides and rights-of-way;
- Clearance requirements between conductors and vegetation acceptable to National Grid for maintaining reliable electric sub-transmission service;
- Responsibilities of National Grid Forestry personnel and contractors;
- Procedures to be followed by contractors performing all work within the scope of this specification.

The Vegetation Strategy group is responsible for preparation of this specification. Company Foresters will manage the work performed by the contractor.

1.2 Scope

The requirements of the specification apply to all National Grid companies sub-transmission electric roadsides and rights-of-way in New England.

2.0 Definitions

Buffer – Areas of vegetation preserved on the right-of-way, on both sides of selected improved road crossings, yards, for the purpose of minimizing the visual impacts and linear views of the right-of-way for motorists.

Capable – Tree, shrub, and vine species that have the ability to grow into within 1 foot of conductor.

Danger Tree – A tree on or off the right-of-way that if were cut or failed could contact electric lines.

Hand Cutting – Vegetation management method in which woody vegetation is felled through the use of hand tools, including chainsaws and brush saws.

Hazard Tree – Danger trees which due to species and/or structural defect are likely to fail and fall into the electric facility.

IVM – IVM is an adaptation of Integrated Pest Management (IPM) where the pest is tall growing, capable vegetation. IPM/IVM is a system of controlling pests in which pests are identified, action thresholds considered, all possible control options evaluated, and selective physical, biological controls are considered. When chemical controls become necessary to control and prevent the growth of capable, tall-growing woody species, The Company is committed to employing selective, targeted applications. These treatments shall use approved herbicide products and mixtures that target specific plants or plant communities in a manner calculated to control and eliminate the tall-growing, capable

woody species, while preserving as much of the small, compatible woody shrub and herbaceous vegetation as is practical.

Pruning – the cutting and removal of tree branches to provide specified clearance distance between vegetation and the conductors. See ANSI A300 for additional detail.

Roadside – The area physically located under and alongside the sub-transmission line bounded by the mature tree line on the field phase side when one exists. In the absence of a mature tree line the maintenance corridor is defined as the area that is at least fifteen (16) feet either side of the pole centerline or equal to the previously maintained dimensions if greater than fifteen (16) feet.
Roadside may include areas: 1. where the landowner or occupant is mowing the lawn and/or caring for gardens, ornamental shrubs or trees in the area under and immediately adjacent to the sub-transmission line/poles; 2. commercial land uses such as business areas, parking lot edges and the tree lawn areas along urban and suburban streets.

Right-of-Way (ROW) (Off-Road definition) - For this VM Spec (Sub-Transmission) a ROW is a cleared corridor of land over which electric lines are located. The companies may own the land in fee, own an easement, or have certain franchise or license rights to construct and maintain electric facilities. This definition does not address the specific width of any ROW. Specific widths will be supplied by the Company where necessary.

Sensitive Area – Areas on rights-of-ways where legal, visual, or environmental impacts/concerns require compromises to the general Vegetation Management Program.

Slash – All branches, tops, small diameter main stems and debris resulting from any cutting operation.

Sub-transmission – Can include electric lines 13kV – 46kV in New EnglandIdentified in the sub-transmssion work plan..

Tree Removal – The cutting and felling of trees, including wood and brush disposal.
Water – Standing or running water, existing at the time of maintenance operations, which has impact outside the right-of-way.

Wire Zone/Border Zone – the wire zone is defined as that portion of the right-of-way floor that is situated directly beneath the conductor for a distance extending approximately ten (10) feet to either side of the conductor. The border zone is that portion of the right-of-way floor situated to the outside of the wire zone extending to the right-of-way edge. It is sometimes referred to as a transition zone between the wire zone and the adjacent forest edge. The wire zone mid-span is the portion of the span where the conductor is at or near its lowest ground clearance distance, generally 60-70% of the span length.

3.0 General Policy/Requirements

- All work will be completed in accordance with the Request for Proposal document, this specification and the maps provided for each sub-transmission line.

- The contractor shall furnish all materials, vehicles, equipment, supervision and labor necessary for the completion of the work described within the timeframe and within the conditions herein set forth.

- Both sides of a right-of-way shall be worked unless instructed otherwise by National Grid Forestry staff, or noted on the maps for the project. If there is a lower voltage circuit on one side of the right-of-way it must meet the minimum side clearance for the lower voltage unless otherwise noted on the maps for the project.

- If the sub transmission circuit is located on the same structure or within the same right of way as a transmission circuit , clearances must be obtained to at least the sub transmission specification. (These areas are not to be skipped, unless specified by National Grid Forestry Staff).

- All vegetation management operations shall be conducted in a safe, effective manner in conformity with Federal and State laws, regulations and permit conditions.

- All vegetation management operations shall be conducted in conformance with national and regional standards including but not limited to ISO 14001.

- All state permits necessary for any vegetation management operations shall be obtained.

- All applicable state notification procedures shall be followed.

- National Grid Forestry staff, in consultation with vegetation management contractors, shall establish procedures for notifying nearby residents of all vegetation management activities conducted within a right-of-way.

- National Grid Forestry staff and/or contractors shall respond quickly to any questions or complaints relating to vegetation management from the public and/or government agencies.

- Appropriately licensed, certified and qualified contractors shall be retained to implement National Grid's vegetation management programs. Contractors shall conduct all vegetation management operations consistent with National Grid safety requirements and the ANSI Z-133 safety standard.

- National Grid Forestry shall provide local supervision, coordination and enforcement of this specification for contractors.

The document control process for this specification is as follows: The document is generally updated annually and distributed as hard copy. The applicable hard copy cover date shall be for the current fiscal year.

4.0 Safety

As a contractual term, National Grid requires all contractors to comply with all appropriate state and federal safety laws and regulations. This includes applicable sections of the Occupational Safety and Health Act (OSHA) and all worker safety-related statements.

It shall be understood and agreed to by the Contractor that vegetation management activities conducted near existing sub-transmission lines shall be undertaken while lines are presumed to be energized and operating at voltages up to and including 46kV. The Contractor shall provide competent, trained personnel to perform the work.

In order to ensure the safety of their employees, the general public and continuity of service in the energized lines, the Contractor shall exercise extraordinary precautions when conducting vegetation management activities in close proximity to structures, poles, guy wires, and anchors on roadsides and rights-of-way.

5.0 National Grid Roles and Responsibilities

5.1 Sub-Transmission Owner

National Grid companies own and are responsible for ensuring proper clearance of their sub-transmission electric facilities on roadsides and rights-of-way.

5.2 Forestry Department

The Forestry Department is responsible for system-wide design, planning, coordination and supervision of all vegetation management operations conducted near electric lines on roadsides and rights-of-way.

5.3 Location of Work

The location of work sites will be provided by the Company Forester**.**

6.0 Contractor Duties and Responsibilities

Vegetation management operations must be conducted according to this specification and according to the written directives of the Company's on-site representative or other contract documents.

6.1 Environmental and Safety Compliance

The Contractor shall comply with all applicable Federal, State and local laws and regulations and with the requirements of all permits and approvals obtained by National Grid.

National Grid is committed to minimizing its impacts to the environment and requires contractors to demonstrate the same level of commitment as National Grid in the management of the environment. National Grid's commitment to the environment is communicated in the National Grid – Environmental Policy (Appendix 2).

The contractor shall immediately notify the Company of any release of any quantity of oil or hazardous material. The contractor is responsible to make all required notifications of releases to appropriate regulatory agencies and to ensure that the response to the release is prompt and done in a proper manner.

National Grid Contractor Safety Requirements establish safety requirements for contractors. This document has been provided during the contractor qualification and bidding process.

All safety incidents shall be reported to the Company. The first call should be to the Company Forester. All inquires will be entered into the National Grid Incident Management System.

6.2 Qualifications

Contractor shall utilize only experienced and/or trained workers who are appropriately licensed or certified. Workers must conduct themselves professionally at all times.

Contractor shall utilize appropriately licensed or certified supervisors who are knowledgeable with regard to all aspects of vegetation mowing, and who are responsive to the guidance of the Company Foresters. Each supervisor must be able to effectively communicate with the public. They must also effectively supervise contractor crews in order to insure the satisfactory completion of the treatment operation.

6.3 Training

Contractor shall provide their employees with training that includes, but is not limited to, recognition of electrical hazards, working in proximity to energized facilities, identification of operating voltages, minimum approach distances, and other applicable rules and regulations associated with worker safety.

6.4 Commencement of Operations

Contractor may not initiate activities without a Purchase Order. Contractor shall contact Company Forestry staff if a Purchase Order has not been received by the time vegetation management activities are scheduled to commence. The contractor must return the signed acknowledgement copy of the Purchase Order to the Procurement Department before any work is done.

6.6 Notifications to National Grid

At least one (1) week prior to the initiation of vegetation management activities, the contractor must specify to Company Forestry staff the date work will begin. The contractor will notify Company Forestry staff of the approximate work schedule the contractor's crew will follow during the project. The contractor must keep Company Forestry staff informed about; crew location, conditions encountered and problems that arise as work progresses. Work shall be completed on each sub-transmission line with as few work interruptions as possible.

At least one (1) week prior to the completion of vegetation management activities, the contractor must specify to National Grid Forestry staff the date work on that sub-transmission line will end.

When working on a sub-transmission right-of-way, the contractor must supply crew work locations on a daily basis by notifying the local forestry supervisor. The location information will include the sub-transmission line name, the contractor company and foreman name, the number of crew members, and the nearest sub-transmission line structure number. Each crew shall call the appropriate National Grid Forester at the completion of the workday and when relocating to another right-of-way.

Should a contractor cause an event on a sub-transmission line, the contractor must immediately notify the appropriate Control Center. Refer to Appendix 1 for a listing of National Grid Forestry staff and Control Center contact information.

The contractor must supply completed weekly time sheet(s) with information for all time and materials worked as per direction of National Grid Forestry staff.

The contractor shall notify and provide copies of any records/reports of any regulatory inspection by federal, state or municipal officials.

6.6 Notifications to Customers/Landowners

The Contractor shall make every reasonable effort to notify nearby residents of all vegetation management activities. They shall also notify any property owner where a yard tree requires pruning or removal. The property owner shall also be notified prior to extensive widening or danger tree removal, unless National Grid has provided prior notification or otherwise specified by the Company Forester. Refer to Appendix 3 for examples of notification materials. Documentation of notification shall be maintained by the contractor and provided to National Grid Forestry staff upon request and at the completion of the project.

6.7 Documentation

The Contractor shall provide supplemental or new information regarding site conditions that affect current or future treatment operations, such as new construction, encroachments, At Time of Vegetation Management (ATVM) clearance deficiencies, hazardous conditions, significantly eroded access or right-of-way, sensitive areas and landowner concerns/requirements to the Company Forester on a timely basis.

6.8 Interaction with Public

The Company strives in every way possible to maintain good relations with the property owner and general public. The actions of the Contractor reflect on the Company; therefore, the Contractor shall give diligent consideration to the interests of property owners, tenants, and the general public, whenever involved, and shall carry out the work in such a manner as to cause a minimum inconvenience.

The contractor, or his representative, will only respond to inquiries regarding what work they are performing, where they are working, and when they will be working.

Copies of appropriate plans or permits may be shown as well. Refer all other inquiries to National Grid Forestry Staff.

Landowner complaints must be forwarded immediately by telephone to Company Forestry staff. The contractor must provide the name, address and telephone number of the major people involved, as well as the complaint or question.

6.9 Demands to Cease Operations

Handle demands to cease operations as follows:

- Immediately make the work area safe to the public, then move all personnel, equipment and materials to another property and continue work.
- Notify National Grid Forestry staff as soon as practical, if not immediately, of a demand that operations cease. Upon contacting National Grid Forestry staff, relate the chain of events and current status of the situation.
- Do not return to that site until National Grid Forestry staff has notified the contractor when and under what circumstances the crew may return.

6.10 Access to a Right-of-Way

Enter a site through the right-of-way on established roadways whenever possible. Permission to enter by any other means must be obtained from the landowner by the contractor.

Access to the right-of-way shall be limited to public road crossings. Where this is not possible, the Contractor shall obtain permission for the use of private roads, driveways, and other access to the right-of-way from the property owners involved and shall be responsible for any damage thereto. When permission for off right-of-way access cannot be obtained from the property owners involved, and other ingress/egress is unavailable, the Contractor shall notify the Company Forester or their designee.

In general, vehicular traffic shall be restricted to a twenty (20) foot wide roadway into and along the right-of-way. When present, existing roads into and along the right-of-way shall be used as the primary access, and maintained in as good or better condition for the duration of the Contractor's use. Access to the overall right-of-way is allowed only for vehicles performing selective vegetation maintenance activities. Other vehicles must remain on the designated access roads. Appropriate efforts to minimize unnecessary or excessive environmental or vegetation damage are required. Repair or replacement of excessive or unnecessary damage shall be the responsibility of the Contractor.

6.11 Site Conditions

Unreasonable site damage or destruction during any phase of the vegetation management operation by the contractor, his agents or employees, must be repaired immediately to the satisfaction of Company Forestry staff at no cost to National Grid companies. Company Forestry staff will determine what constitutes unreasonable site damage. Contractor shall make reasonable efforts to complete work during favorable site conditions so as to prevent unnecessary damage.

The Contractor shall leave all culverts, stream fords, fences, gates, walls and roads in the same or better condition as when they commenced their work. Any trees to be removed that have fence wire attached, or that are part of a permanent functional fence, shall be cut off above the top strand of wire. Care shall be taken that all fences and gates are closed or left in such condition that livestock cannot escape. If fences or gates of an active pasture along the right-of-way are in a state of disrepair prior to the start of clearing and could allow livestock to escape, the contractor shall attempt to notify both the property owner and the Company Forester of this condition. Where movement of the Contractor's equipment is required through existing fences, the Contractor shall make appropriate openings and adequate facilities for closing these openings during and after their use.

6.12 Railroads

Where the Company's right-of-way parallels or crosses railroad property, and the Contractor elects to gain access to the right-of-way from railroad property, they shall be responsible for all applicable rules, regulations and fees pertaining thereto. All associated costs will be a pass-through to National Grid.

The contractor must:

- Coordinate with National Grid to obtain a permit, if required, from the railroad near whose tracks he or she will be executing vegetation maintenance.
- Check with each railroad near whose tracks he will be treating to ensure that the contractor carries all insurance which the railroad may require. Contact National Grid Forestry staff if any problems arise.
- Provide qualified railroad trained personnel.
- Refrain from beginning vegetation work whenever a railroad has failed to provide a flagman or remove the railroad from service. Contact National Grid Forestry staff immediately so that he or she can contact the railroad.

6.13 Native American Lands

Where required to complete work upon reservations, the contractor shall employ the designated Native American personnel for the successful completion of the project.

6.14 Chainsaw Bar Lubricants

When working within a sensitive area, chainsaw bar lubricants must be biodegradable products.

6.16 Equipment

The contractor crew supervisor or foreman must be equipped with a cellular telephone.

Clearing crews should carry with them at all times a shovel, a broom, heavy-duty plastic bags or other leak-proof container, absorptive clay and activated charcoal (Chemical Spill Kit or Universal Kit).

Contractor's equipment must be sufficient to maintain the highest practical level of efficiency and effectiveness. Equipment must be maintained in good visual and working condition.

6.16 Site Restoration

Work shall also include grading, mulching, and reseeding of rutted or scarified soils caused by the Contractor's operations when directed by the Company Forester. This shall include repair of all environmental damage, maintenance of stream crossings, wetlands, crop fields, fence lines, etc. which are adversely impacted by the Contractor so as to leave the right-of-way in as good or better condition than found.

Inclusion of the repair of any previously existing environmental damage, including grading, seeding, mulching, stream, culvert and ditch repair, etc. shall be specified at the time of bidding or completed on a Time and Material basis if required.

7.0 Sub-Transmission Scope of Work

7.1 Pruning Standards

All pruning shall be performed in accordance with ANSI A300 standards as well as the Best Management Practices – Tree Pruning publication. All cuts shall be made at a parent branch or limb, so that no stub shall remain. In cutting back a branch, the cut shall be made at a crotch or node where the branch being removed is at least one-third the diameter of the parent limb. All pruning cuts shall be made in accordance with proper collar cutting methods, utilizing drop crotch principles to minimize the number of pruning cuts, promote natural growth patterns, and maintain tree health and vigor (ANSI A300). Climbing irons or spurs shall not be used in pruning a shade/ornamental tree in a maintained area. Tree wound dressings shall not be applied.

7.2 Hazard Tree Inspection and Removal

Other than work required in previous sections, the removal of any tree 9 inches dbh and above, within a maintained, roadside or unmaintained area, shall be considered a hazard tree removal.

7.2.1 While pruning the circuit, the contractor shall perform a visual inspection of each tree along the circuit in order to identify potential defects and determine the potential risk for the tree to cause an interruption over the length of the pruning cycle. The National Grid Forester will work closely with the contractor to determine potential hazard trees, preparing a list of trees in accordance with National Grid's Hazard Tree Removal Form (Appendix 4). The contractor shall also submit, for approval by National Grid, an additional list of potential hazard trees found while performing the work.

7.2.2 Once a crew completes the removals on an approved list they shall note the completion details on the Hazard Tree Removal Form. This form shall be submitted to the Forestry representative on a timely basis.

7.3 Management of Wood and Brush (Slash)

Wood and brush slash may be generated during vegetation management activities. In general, where tree removal or pruning is required, the brush that has been cut may be left where it falls after being cut (diced) so as to lie close to the ground. Length of diced stems or branches should not exceed 10 feet; height of diced slash should not exceed two (2) feet. Stumps shall be cut flat and as close to grade as possible. (Contractor may choose to mow the floor, this is an option and should be discussed with the Company Forester before proceeding.)

Near public or private roads, residential or commercial areas, parks, streams, on access roads, in any sensitive area or otherwise managed properties, the brush shall be disposed of by either chipping or removal to a suitable location within the right-of-way and neatly piled, windrowed or dispersed.

When chipping is required, the chips may be disposed of by dispersing on site in non-sensitive areas. Chips shall be removed from areas of more intense landscape management such as lawns.

Where trees and limbs larger than four (4) inches in diameter at the small end are removed and the designated slash disposal is a windrow, the wood shall be neatly piled on the site, taking care not to block any access roads used by either the property owner or the Company. When the authorized slash disposal method is chipping, it may be necessary to remove the larger wood from the site to another approved area of the right-of-way and piled neatly, or moved to an approved off right-of-way disposal site.

No burning of wood or brush will be permitted unless specifically authorized by the National Grid Forester.

All species of wild cherry (Prunus serotina, P. virginiana, P. pennsylvanica) that are cut or treated during the growing season can become toxic to livestock during the wilting stage of the leaves. In addition, several species of Maple (Acer) have been identified as toxic to horses in the wilting stage. Therefore, Maple and Cherry stems, which are cut or treated in active pastures, shall be immediately removed from the pasture following clearing, or arrangements made with the farmer to utilize alternate pastures until the wilting stage and hazard has passed.

Contractors shall comply with all applicable laws and guidelines pertinent to invasive species and their management, as set forth by Government and National Grid.

7.4 Overhead Dead or Damaged Vegetation

All dead or damaged overhead limbs, branches or leads that are capable of falling onto overhead sub-transmission lines from above or along side the right-of-way and potentially causing a tree interruption, shall be removed at the time of pruning.

7.5 Pine Species

For all road-side pine species growing above the overhead clearance limits with boughs overhanging primary conductor, the contractor shall shorten all overhanging boughs so to reduce the length of the branch by approximately 1/3 without removing all needle growth from the entire branch. This shall be done in a progressive manner beginning at the upper clearance dimension (20 feet) and working upwards generally two whorls in the tree as necessary to reduce the likelihood of a long pine bough loaded with ice or wet snow, drooping down or breaking onto the conductors.

7.6 Vine Control

All vines growing on poles, guy wires, stub poles or towers shall be cut so as to create a “growth gap” of four feet and treated (where appropriate) with a herbicide approved by the company. Contactors should not attempt to remove vines from any structure.

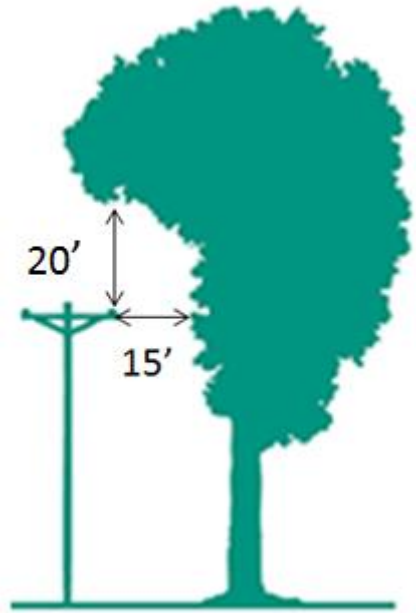
Sub-transmission work shall be carried out in a two-step process:

Step 1: Sideline pruning and floor cutting/mowing
Step 2: Follow-up herbicide treatments on off-road sections

7.7 Step 1: Sideline Pruning and Floor Cutting/Mowing

7.7.1 Vegetation Clearance - Road-side

All overhead sub-transmission lines shall be pruned to provide a minimum of 20 feet of overhead clearance, a minimum of 15 feet of side clearance from the outermost phase, or to the mature tree line and removal of capable species below the wires and within the clearance dimensions. The contractor shall recognize that the use of ANSI A300 standards and techniques will result in clearances beyond the dimensions noted above.



Where greater clearances have been achieved in previous cycles, the pruning shall be completed so as to re-establish the clearances in a manner that equals or exceeds the previous clearance conditions.

It is an objective of National Grid's vegetation program to continually strive to reduce the number of under-wire tree and branch growth that will continually require pruning, by removing as many stems and growth as possible on each cycle. The Contractor is expected to emphasize this type of removal through the landowner contacts made by their customer contact personnel unless they have signed documentation of refusal. National Grid must be notified upon refusal within 24 hours.

All slash from pruning in maintained areas shall be disposed of through chipping. The brush shall be disposed of by either chipping or removal to a suitable location within the right-of-way and neatly piled, windrowed or dispersed. Large diameter wood may remain on site provided it is cut into manageable lengths and piled neatly. Smaller debris shall be raked up and removed so as to leave the property in a condition equal to the start of work.

Herbicide treatments may be applied to road-side vegetation. This will be defined during the bidding process. **All herbicide applications MUST follow local state pesticide regulations.**

7.7.2 Vegetation Clearance - Off-Road

Prior to commencing vegetation maintenance activities in a right-of-way, the contractor MUST contact a National Grid Forester to discuss any sensitive areas within the right-of-way, which can include endangered species, wetlands, and drinking water wells. The presence of sensitive areas might

alter the type and timing of vegetation maintenance activities that will be conducted. A site specific work plan may be provided to the contractor by the National Grid Forester.

There should be no overhang above a sub-transmission line, unless there is an easement restriction or otherwise noted on the map, in which case follow Section 7.4 Overhead Dead or Damaged Vegetation. All sub-transmission lines shall be pruned to provide the maximum clearance allowed by easement. Where no easement has been obtained, prune to the established tree-line **unless an alternative clearance is approved by National Grid**.

Where greater clearances have been achieved in previous cycles, the pruning shall be completed so as to re-establish the clearances in a manner that equals or exceeds the previous clearance conditions.

Slash shall be mowed/mulched or neatly windrowed to the edge of the maintenance corridor and cut to lie close to the ground, away from sensitive locations. All slash near residences shall be disposed of by chipping or mowing/mulching. Where practical, chips may be blown back onto the site without creating large chip piles. No debris shall be left anywhere that will potentially block access, significantly alter any drainage or water resource, or create any unsafe conditions for the public. Stumps shall be cut flat and as close to grade as possible. (Contractor may choose to mow the floor, this is an option and should be discussed with the Company Forester before proceeding.) All mowing will be done in accordance with National Grid's Mowing Specification.

Alternatives to these practices must be approved by a National Grid Forester and by the current landowner.

As stated above, the contractor shall practice ANSI A300 pruning in choosing the pruning points within the tree which will often mean clearances greater than vertical/horizontal clearance distances will actually be obtained. Trees shall be directionally pruned to encourage growth away from the sub-transmission line. Pruning shall not leave any overhang over the right-of-way.

Prune or remove high risk hazard trees. Hazard trees found beyond the right-of-way and/or vertical/horizontal clearance distances that are judged to be an imminent threat to the conductors shall be brought to the attention of a National Grid Forester for approval prior to removing (see Section 6.7). Desirable species shall be retained along the edge of the right-of-way.

Any tree in the border zone that is within vertical/horizontal clearance distances shall be removed, not pruned.

Contractors shall comply with all applicable laws and guidelines pertinent to invasive species and their management, as set forth by Government and National Grid.

7.8 Step 2: Herbicide Treatments

Herbicide treatments will mainly be conducted in the off-road sections on the sub-transmission corridors. If a sub-transmission line shares a ROW with a Transmission line, then that corridor will be treated when the Transmission line is treated. This will be defined during the bidding process. All herbicide applications MUST follow local state pesticide regulations.

All treatment operations must be applied to the full specified width of the ROW. Vegetation Operations staff will determine whether the full specified width of the ROW has been treated. The contractor must, at his own expense, re-treat the site upon notification by Vegetation Operations staff that a treatment was not applied to the full specified width of the ROW. Re-treatment must be accomplished by using the application method and materials prescribed by Vegetation Operations staff. Refer to the National Grid ROW floor specification for additional details.

8.0 Management of Sensitive Areas & Wetlands

8.1 Sensitive Areas

Sensitive Areas are defined as areas on rights-of-way where legal, visual or environmental impacts/concerns require compromises to the general vegetation management program. Sensitive Areas include: public surface, public well and private well drinking water supplies; lakes, ponds, rivers, streams, and any other surface waters; wetlands; endangered species sites; agricultural areas including croplands, orchards, tree plantations and animal pastures; buffers at road crossings; buffers at residential and/or commercial yards; and easement restrictions and/or landowner agreements.

These sensitive areas have varying legal definitions in each of the states in which National Grid companies have sub-transmission facilities. Permits for vegetation management activities in these states vary as well. For purposes of this document, sensitive areas and vegetation management within them are discussed in a general way.

8.2 Wetlands

In wetlands, tall growing trees generally only occur in wooded swamps or areas that are dry for long enough periods each year to support tree growth. Generally equipment may not enter a wetland area. All tree felling in wetlands must be done by hand. Exceptions must be reviewed with the National Grid Forester prior to entering a wetland with equipment.

In remote areas, including remote wetlands, and with the National Grid Forester's approval, trees to be removed may be topped below conductor level to provide wildlife habitat and to reduce ground disturbance and clutter.

9.0 Mitigation of Impacts

If, during their operations, the Contractor causes any damage to occur to the land such as deep ruts or scarified areas, which in the opinion of the National Grid Forester could cause future erosion or interfere with access for line maintenance, the Contractor shall re-grade the site to original contours, and seed and mulch as required. Areas that do become rutted or where erosion occurs during sideline program operations will be restored per National Grid companies' policies.

The Contractor shall take reasonable precautions not to remove or damage existing low-growing vegetation, either natural or planted, which are to be preserved on the right-of-way. Where road crossing buffer vegetation, either natural or planted, has been damaged beyond reasonable repair because of the Contractor's negligence, this vegetation will be replaced at the Contractor's expense.

The Contractor shall take care not to rut or scarify the right-of-way for the duration of their operation. All environmental damage resulting from the Contractor's operation shall be permanently repaired at the Contractor's sole expense.

Mobile equipment shall not intrude into road crossing buffers, stream buffer zones or pruning and topping areas, except on designated access routes. When a tree that has been cut must be removed from such an area, it must first be limbed and the brush hand carried to the chipping location or pile site. The trunk wood may be removed by means of a winch line taking adequate care to avoid damaging residual vegetation.

In certain areas, where feasible and advantageous, the Forester may authorize the use of aerial lifts and other specialized equipment, in road crossing buffers for the purpose of pruning trees, and disposal. In no case, however, will any vegetation be cleared or any new road be authorized, other than the approved access road through the screen to facilitate the use of this equipment.

The Contractor shall take adequate precautions to protect the watercourses and wetlands from pollution and shall avoid disturbing streambeds and banks and the low-growing vegetation protecting them. Felling vegetation in or across a watercourse (such as a river, stream, or brook), should be avoided. Vegetation that is felled into a watercourse shall be removed as soon as possible and placed on high ground. Brush chipping shall be performed in such a manner that the chipped material shall not enter any watercourse or wetland area, nor accumulate in excess of four (4) inches in depth at any location.

Appendix 1
Contact Information

Vegetation Operations Staff, Control Center and Security Contact Information

SYSTEM WIDE		
Contact	**Location**	**Telephone Number**
Injury Hotline	System	866-322-5594

NEW ENGLAND		
Contact	**Location**	**Telephone Number**
NE Distribution Control Center	New England North New England South	(508)421-7879 (508)421-7885
Security	Northboro, MA	(508) 421-7970
Anne Marie Moran (Manager)	Worcester, MA	(508) 860-6925
Jason Magoon	Worcester, MA	(508) 860-6212
Eric Gemborys	Leominster, MA	(508) 614-0404
Jonathan Duval	Somerset, RI	(508) 730-4007
Seth Bernatchez	Leominster, MA	(978) 604-5308
Chris Rooney	Lincoln, RI	(401) 255-4439

Appendix 2
National Grid Environmental Policy

nationalgrid

Environment Policy

Our strategy is to be a recognised leader in the development and operation of safe, reliable and sustainable energy systems to meet the needs of our customers and communities and to generate value for our investors.

One of the ways we will achieve this is to protect and enhance the environment, always seeking new and innovative ways to lighten the environmental impact of our past, present and future activities.

J. Pettigrew.

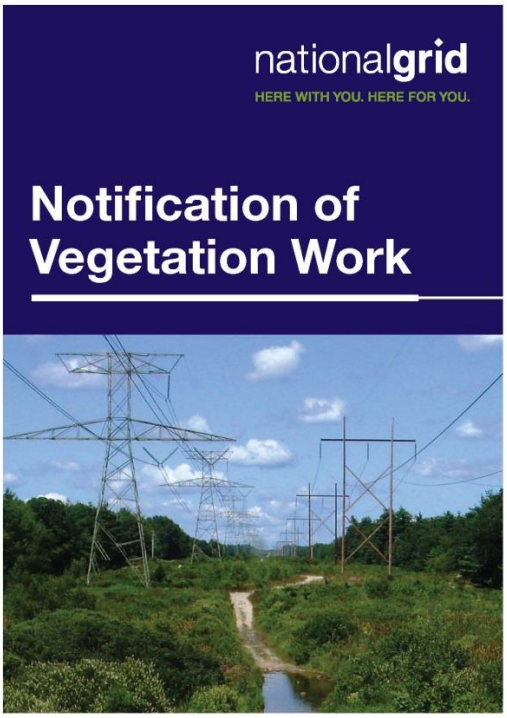
John Pettigrew
Chief Executive

We commit to:

- Ensuring environmental sustainability is considered in our decision making and creating a sustainable thinking culture.
- Using resources more efficiently through good design, using sustainable materials, responsibly refurbishing existing assets, recovery and recycling.
- Ensuring our operations that have an impact on natural habitats are conducted in a manner to protect biodiversity and seeking ways to enhance the natural value of the area for the benefit of local communities and/or environment.
- Reducing greenhouse gas emissions: 45% by 2020 and 80% by 2050.
- Looking at ways to reduce the impact of climate change by implementing mitigation and adaptation measures.
- Openly reporting on our environmental and sustainability performance with employees, members of the public and other stakeholders.
- Actively working to prevent pollution which may result from our activities.
- Continually improving our environmental management system to protect the environment, reduce the risk of environmental incidents.
- Satisfying our compliance obligations.
- Actively managing the risks associated with sites where we have responsibility for dealing with contamination associated with past operations.
- Insuring our employees have the training, skills, knowledge and resources necessary to meet our environmental commitments.
- Working with governments and regulators to help them develop and deliver more effective environmental policies and targets.
- Helping consumers reduce their dependency on fossil fuels by providing them with access to more sustainable energy and through innovative energy efficiency programmes.
- Ensuring those working on our behalf demonstrate the same commitment to the environment as we do.

For more details on this policy, visit the SSR Infonet homepage or nationalgrid.com

Appendix 3
Notification Materials



On behalf of National Grid's Vegetation Management department, _____ will soon conduct scheduled maintenance on the electric transmission right-of-way on or adjacent to your property.

The type of work to be done is indicated below:

❒ **Integrated Vegetation Management** (floor work—see back for details)

❒ **Sideline Maintenance** (see back for details)

Description of work:

_____

_____

_____

_____

If you have questions regarding this work, or a private water supply well on or within 100 feet of the right-of-way, please contact:

Name

_____

Company

_____

Phone

_____

❒ **If this box is checked, a call back is needed**

Date: ROW #:

nationalgrid
HERE WITH YOU. HERE FOR YOU.

Program Descriptions

Integrated Vegetation Management (IVM)
IVM focuses on the removal of tall-growing trees and shrubs to encourage the establishment of a low-growing shrub population on the right-of-way.

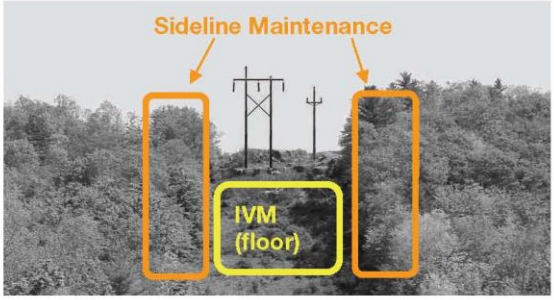
Methods used include:

- Hand cutting with chain saws
- Mowing
- Selective herbicide application (applied to foliage or cut stump surface)

Herbicide use is regulated by federal and state statutes and regulations, which protect sensitive areas, such as:

- Surface Water Supplies
- Wetlands
- Public & Private Wells

Sideline Maintenance
This work consists of removing or pruning danger trees along the sides or edges of transmission line corridors.



Methods used include:

- Skidder bucket or street bucket
- Climbers (for areas inaccessible by equipment)

For more information about our programs and work scheduled for the current year, click on "Operations Documentation" in the following link:

www.nationalgridus.com/transmission/index.asp

FOREWARD

This Vegetation Management Specification (VMSpec) documents the objectives, practices and procedure for vegetation management on National Grid companies' electric rights-of-way. The VMSpec is primarily aimed at the transmission system, 115kV and higher in New York and 69kV and higher in New England, it also will be utilized for sub-transmission and distribution off-road rights-of-way and it specifically addresses sideline and hazard tree pruning and removal. This specification also defines the responsibilities of the National Grid Forestry personnel and contractors, identifies procedures to be followed by contractors performing all work and defines the clearance requirements between conductors and vegetation acceptable to National Grid for maintaining reliable electric transmission service.

Questions or inquiries regarding information provided in this document should be referred to the Manager of Vegetation Strategy.

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1.0 Introduction

1.1 Purpose

The purpose of this Sideline Specification is to document the requirements for sideline pruning and hazard tree removal on transmission, sub-transmission and distribution rights-of-way for National Grid. This specification defines:

- Objectives and approved practices and procedures for sideline pruning and hazard tree removal on electric rights-of-way;
- Clearance requirements between conductors and vegetation acceptable to National Grid for maintaining reliable electric transmission service;
- Responsibilities of National Grid Forestry personnel and contractors;
- Procedures to be followed by contractors performing all work within the scope of this specification.

1.2 Scope

The requirements of this specification apply to all National Grid electric rights-of-way unless otherwise specified.

2.0 Definitions

Annual Work Plan – Identifies the vegetation management field work that will be carried out in a specified year.

Article VII ROW – a ROW approved for construction and maintenance under the Article VII regulations of the N.Y.S. Public Service Commission. These lines generally have additional environmental protections and restrictions associated with access, vegetative screening, integrated management, etc.

Capable Species – – Tree and shrub species that have the ability to grow into the National Grid Clearance Distance (NGMVCD) from conductors.

Clearance Distances – 1) the At Time of Vegetation Management (ATVM) Clearance Distance from vegetation, in a radius around the conductor, to be achieved at the time of vegetation management and 2) National Grid Minimum Vegetation Clearance Distance (NGMVCD) from vegetation, in a radius around the conductor, between conductors and vegetation to be maintained under all rated electrical operating conditions. 3) Minimum Vegetation Clearance Distance (MVCD) from vegetation, in a radius around the conductor derived from the Gallet Equations as defined by FAC 003-4 applying to those lines associated with that standard.

Danger Tree – A tree on or off the ROW that if were cut or failed could contact electric lines.

Hand Cutting – Vegetation management method in which woody vegetation is felled through the use of hand tools, including chainsaws and brush saws.

Hazard Tree – Danger trees which due to species and/or structural defect are likely to fail and fall into the electric facility.

Herbicide – Chemical used to control, suppress or kill plants or severely interrupt their normal growth processes.

I**mminent threat –** An imminent threat is vegetation condition that poses an increased risk to the reliable operation of a particular transmission circuit and therefore requires 1) mitigation and vegetation condition typically within 24 hours, and 2) notifying the system operator.

Integrated Vegetation Management (IVM) – IVM is an adaptation of Integrated Pest Management (IPM) where the pest is tall growing, undesirable vegetation. IPM/IVM is a system of controlling pests in which pests are identified, action thresholds considered, all possible control options evaluated and selective, physical, biological and chemical controls are considered. When chemical controls become necessary to control and prevent the growth of undesirable, tall growing woody species, the Company is committed to employing selective, targeted applications. These treatments shall use approved herbicide products and mixtures that target specific plants or plant communities in a manner calculated to control and eliminate the tall-growing, undesirable woody species, while preserving as much of the small, compatible woody shrub and herbaceous vegetation as is practical.

IROL - Interconnection Reliability Operating Limit

ISO – Independent System Operator

Mowing – the use of mechanical equipment such as a tractor with mounted rotary or reel type mower to cut vegetation at a uniform height above the surface of the soil. Common equipment types are Brush Hogs or Hydro-ax.

MVCD – Minimum Vegetation Management Distance

NERC – North American Electric Reliability Council

NERC Regulated Circuits – Circuits regulated by FAC 003-4 are all circuits operated at above 200 kV and voltages below 200kV that are designated as IROL by the ISO.

NGMVCD – National Grid Minimum Vegetation Clearance Distance

NPCC – Northeast Power Coordinating Council

NY DPS – New York Department of Public Service

Pasture – Fenced area used for grazing livestock.

Pruning – the cutting and removal of tree branches to provide specified clearance distance between vegetation and the conductors. See ANSI A300 for additional detail.

Right-of-Way (ROW) - The corridor of land under a transmission line(s) needed to operate the line(s). The width of the corridor is established by engineering or construction guidance as documented in either construction documents, pre-2007 vegetation maintenance records, or by the blowout standard in effect when the line was built. The ROW width in no case exceeds the applicable Transmission Owner's or applicable Generator Owner's legal rights but may be less based on the aforementioned criteria (FAC 003-4).

Sensitive Area – Areas on ROWs where legal, visual, or environmental impacts/concerns require compromises to the general IVM program.

Slash – All branches, tops, small diameter main stems and debris resulting from any cutting operation.

System Operator – Transmission Control Center's personnel assigned for decision making during the need to operate transmission lines.

"T" Sheet – Strip map of a ROW showing line features (Sometimes referred to as "Q" Sheets or "plan and profile")

Transmission – includes all electric lines 115kV and higher in New York and 69kV and higher in New England, used to transport electricity between various generation, switching, and distribution substations.

Tree Removal – the cutting and felling of trees, including wood and brush disposal. Removal may include, where specified, the use of approved herbicides to enable the chemical removal of the target plant(s) from the ROW.

- **Removal - Maintained Area –** Normally within city, town or village settings in areas where lawn and ornamental tree and shrub care is evident. The contractor will safely fell the tree, limb and chip all brush and flush the stump as low as is practical. The wood will be cut to manageable lengths and yard cleanup performed.
- **Removal – Roadside Area –** Normally outside of any maintained areas as described above. The contractor will safely fell the tree, limb and chip all brush, flush the stump as low as is practical, and leave the wood in a position that does not interfere with public safety and/or conflicts with highway requirements. Minimal cutting should be required other than to allow the wood to lie flat against the ground.
- **Removal – Unmaintained Area –** Outside of any maintained area along a wooded roadside or off-road section of line. The contractor will safely fell the tree and make the necessary cuts on the tree to have the wood and brush lie relatively flat against the ground (drop and lop).

Utility Forest – the forested areas within or adjacent to ROW that contain trees that are tall enough or may grow tall enough to impact the reliability of the transmission facility.

Vegetation Inspection – The systematic examination of vegetation conditions on a ROW and those vegetation conditions under the Transmission Owner's or applicable Generator

Owner's control that are likely to pose a hazard to the line(s) prior to the next planned maintenance or inspection. This may be combined with a general line inspection (FAC 003-4).

VMSpec –Vegetation Management Specification

VMP –Vegetation Management Procedure

VMS –Vegetation Management Strategy

VIPER - (**V**egetation **I**nspection **P**lanning **E**valuation and **R**eporting) - National Grid's vegetation management system; a combination of databases. GIS and mobile applications.

Visual Buffer – areas of vegetation preserved on the ROW, on both sides of selected improved road crossings, yards, for the purpose of minimizing the visual impacts and linear view of the ROW for motorists.

Water – standing or running water, existing at the time of maintenance operations, which has impact outside the ROW.

Wire Zone/Border Zone – the wire zone is defined as that portion of the ROW floor that is situated either directly beneath the conductor area or for a distance extending approximately ten (10) feet to either side of the conductor. The border zone is that portion of the ROW floor situated to the outside of the wire zone extending to the ROW edge. It is sometimes referred to as a transition zone between the wire zone and the adjacent forest edge. The wire zone mid-span is the portion of the span where the conductor is at or near its lowest ground clearance distance, generally 60-70% of the span length.

YOP – Yearly Operational Plan, Massachusetts

3.0 General Policy/Requirements

3.1 All work will be completed in accordance with the Request for Proposal document, this specification and the maps provided for each transmission line.

3.2 The contractor shall furnish all materials, vehicles, equipment, supervision and labor necessary for the completion of the work described within the timeframe and within the conditions herein set forth.

3.3 Both sides of a right-of-way shall be worked unless otherwise noted on the maps for the project. If there is a lower voltage circuit on one side of the right-of-way it must meet the minimum side clearance for that voltage unless otherwise noted on the maps for that project.

3.4 The maintenance cycle for all rights-of-way shall be: Right-of-Way Floor Program, three to eight years, and off right-of-way Sideline Program, three to sixteen years.

3.5 All vegetation management operations shall be conducted in a safe, effective manner in conformity with Federal and State laws, regulations and permit conditions.

3.6 All vegetation management operations shall be conducted in conformance with national and regional standards including but not limited to NERC FAC 003-4 and ISO 14001.

3.7 All state permits necessary for any vegetation management operations shall be obtained.

3.8 All applicable state notification procedures shall be followed.

3.9 National Grid Forestry staff, in consultation with vegetation management contractors, shall establish procedures for notifying nearby residents of all vegetation management activities.

3.10 National Grid Forestry staff and/or contractors shall respond quickly to any questions or complaints relating to right-of-way vegetation management from the public and/or government agencies.

3.11 Appropriately licensed, certified and qualified contractors shall be retained to implement National Grid's vegetation management programs. Contractors shall conduct all vegetation management operations consistent with National Grid safety requirements and the ANSI Z-133 safety standard.

3.12 National Grid Forestry shall provide local supervision, coordination and enforcement of National Grid's Vegetation Management Procedure (VMP) and this VMSpec for contractors.

3.13 The document control process for the VMP and this VMSpec are as follows: Both documents are generally updated annually and distributed as hard copy. The applicable hard copy cover date shall be for the current year.

4.0 Sideline Pruning and Hazard Tree Removal Practices and Procedures

4.1 Objectives

The primary objective of this portion of National Grid's Vegetation Management Program, Sideline Pruning and Danger Tree/Hazard Tree Removal, is to minimize interruptions due to vegetation along and within the right-of-way edge.

4.2 Strategy

National Grid's strategic approach to manage vegetation adjacent to the right-of-way (utility forest) is to prune and/or remove danger trees and/or hazard trees where property rights allow vegetation management work.

Rights-of-way that are largely clear of capable vegetation present a very low risk of vegetation-caused interruptions. Vegetation adjacent to rights-of-way (danger and hazard trees) presents a greater risk of interruptions. The risk from danger trees is primarily related to two (2) non-biotic variables: 1) distance from conductor to the adjacent tree line, and 2) conductor distance above the ground; and three (3) biotic factors: 1) height of trees, 2) tree species, and 3) tree health and condition. National Grid seeks to mitigate risk of interruptions from trees adjacent to the right-of-way through site specific management of these variables.

4.3 Clearance Standards

National Grid specifies clearance distances to be achieved at the time of vegetation management work and minimum clearances to be maintained at all times. Clearance standards established by National Grid below conform to the following regulatory standards and industry guidelines:

- North American Electrical Reliability Counsel (NERC) Vegetation Management Standard FAC-003-4;
- National Electric Safety Code (NESC) Rule 218; and
- Applicable State vegetation management standards or regulations.
- FAC 003-4

The clearances in Appendix 8 presented represent distances vegetation must be from all operating conductors (including static wire).

4.4 Exceptions to ATVM Clearances

Legal restrictions and environmental and social concerns may prevent National Grid from achieving ATVM Clearance Distances at various sites across the transmission system. National Grid tracks these sites within the Forestry GIS system. All such sites will be inspected and mitigation procedures taken to assure compliance with NGMVCD.

4.5 Imminent Threats of Interruption

Contractor personnel shall report any observed vegetation-related imminent threats that may cause interruptions to the appropriate National Grid Division Forester, who will determine the need to notify

If the line is 230 kV or higher, or a lower voltage that is IROL and the National Grid Division Forester or his/her assigned representative is not available the contractor shall report any observed vegetation-related imminent threats that may cause interruptions to the appropriate Company Regional Control Center as outlined in Appendix 9. The Regional Control Center shall take appropriate action per National Grid Control Center operating procedures. The following describes the reporting process.

4.5.1 Description:

An imminent threat is vegetation condition that poses an increased risk to the reliable operation of a particular transmission circuit and therefore requires:

- mitigating the vegetation condition typically within 24 hours, and
- notifying the system operator.

The characteristics of an imminent threat condition usually are:

- vegetation that is approaching or threatens to approach the MVCD,or
- one or more danger trees that appear very likely to contact a transmission line.

4.5.2 Steps for Reporting (See also Appendix 9)

<u>Declaration of Imminent Threat</u>
All vegetation management personnel are required to report an imminent threat to the operation of transmission and sub transmission circuits. Imminent threats to NERC regulated circuits must be reported without delay to the regional control center and the Vegetation Operations Staff.

<u>Communication</u>
All initial communications between vegetation management personnel and the regional control centers are to be spoken (email, voice or text messaging are not acceptable for initial reporting). Enough information about the imminent vegetation risk must be provided for the system operator to decide what action needs to be taken to remove the vegetation without jeopardizing the reliability of the transmission system. Up to date contact lists must be on hand by all vegetation management staff and contractors.

Mitigation Measures

While the system operator monitors the system and reviews options, the vegetation management personnel continues to investigate the threat, notifies National Grid Vegetation Operations staff and reviews options for removal of vegetation. No action to remove vegetation will be performed until directed by the system operator.

Documentation

All communication must be documented and retained by the Vegetation Operations staff. Appendix 9 provides an outline for documentation. Vegetation Operations staff will provide the details to the Vegetation Strategist for determination of required updates to the workplan.

5.0 Contractor Duties and Responsibilities

Vegetation management operations must be conducted according to this specification and according to the written directives of the National Grid's Forestry staff. Failure to do so is grounds for removal of the crew from the work site by National Grid companies' Forestry staff and possible termination of the contractor's contract.

5.1 Environmental and Safety Compliance

The Contractor shall comply with all applicable Federal, State and local laws and regulations and with the requirements of all permits and approvals obtained by National Grid.

National Grid is committed to minimizing its impacts to the environment and requires contractors to demonstrate the same level of commitment as National Grid in the management of the environment. National Grid's commitment to the environment is communicated in the National Grid – Environmental Policy (see Appendix 2).

The contractor shall immediately notify the Company of any release of any quantity of oil or hazardous material. The contractor is responsible to make all required notifications of releases to appropriate regulatory agencies and to ensure that the response to the release is prompt and done in a proper manner.

National Grid Contractor Safety Requirements establish safety requirements for contractors. Documentation is provided during the contractor qualification and bidding process.

All safety incidents must be reported to a National Grid Forester immediately after the incident occurs, as soon as it is safe to make the notification, on the day of the incident. The initial call should be to a National Grid Forester. All incidents are required to be entered in the National Grid Incident Management System.

5.2 Qualifications

Contractor shall utilize only experienced and/or trained workers who are appropriately licensed or certified. Workers must conduct themselves professionally at all times.

Contractor shall utilize appropriately trained supervisors who are knowledgeable with regard to all aspects of the contracted operation and who are responsive to the guidance of National Grid Foresters. Each supervisor must be able to effectively communicate with the public. They must also effectively supervise contractor crews in order to insure the satisfactory completion of the operation.

5.3 Training

Contractor shall provide their employees with training that includes, but is not limited to, recognition of electrical hazards, working in proximity to energized facilities, identification of operating voltages, minimum approach distances, and other applicable rules and regulations associated with worker safety.

5.4 Commencement of Operations

Contractor may not initiate activities without a Purchase Order, with Terms and Conditions attached, from the National Grid Procurement Department. Contractor shall contact National Grid Forestry staff if a Purchase Order has not been received by the time the rights-of-way are scheduled for treatment. The contractor must return the signed acknowledgement copy of the Purchase Order to the Procurement Department before any work is done.

5.5 Permits/Plans/Approvals

Contractor shall follow all conditions of state permits/plans/approvals obtained by the Companies.

5.5.1 Invasive Species Best Management Practices (New York Only)

In an effort to limit the introduction and spread of invasive plant species, National Grid adopted a group of Best Management Practices (BMP) from the Environmental Energy Alliance of New York (EEANY). These BMPs were accepted by the NYS Department of Environmental Conservation as a means to meet permit requirements for maintenance work, including vegetation maintenance.

A copy of this BMP is located in Appendix 3 of this document and is a requirement for all contractors that work on a National Grid right-of-way.

5.5.2 Threatened and Endangered Species (New York Only)

In 2012, the U.S. Fish and Wildlife Service issued National Grid an incidental take permit for impacts to the federally endangered Karner blue butterfly and state protected frosted elfin butterfly during its gas and electric operations in New York. The terms of this permit and the associated Habitat Management Plan is attached as Appendix 4 of this document. The plan covers operations, maintenance and

construction activities on rights-of-way in the Eastern and Central Divisions. Contact the National Grid Forester for locations of protected sites on assigned projects.

5.6 Notifications

5.6.1. To National Grid

At least one (1) week prior to the initiation of vegetation management operations on a specific ROW, the contractor must specify to Vegetation Operations staff the date work on that ROW will begin.

At least one (1) week prior to the completion of vegetation management operations on specific ROW, the contractor must specify to Vegetation Operations staff the date work on that ROW will end.

The contractor will notify Vegetation Operations staff of the approximate work schedule the contractor's crew will follow for the treatment year. The contractor shall complete treatment on each ROW segment with as few work interruptions as possible.

The contractor must supply crew work locations on a daily basis by calling the Transmission Call-in system, and/or other parties specified by the Vegetation Operations staff, before the beginning of the workday. The location information will include the ROW segment number, the contractor company and foreman name, the number of crew members, and the nearest transmission/distribution line structure number. Each crew shall call off the system at the completion of the workday and when relocating to another ROW.

The contractor must keep Vegetation Operations staff informed about crew location, conditions encountered, and problems that arise as work progresses. Should a contractor cause an event on a transmission or distribution line, the contractor must immediately notify the appropriate New England or New York Control Center. Refer to Appendix 1 for a listing of Vegetation Operations staff and Control Center contact information.

The contractor must supply completed daily or weekly time sheet(s) with information regarding all time and materials work as per direction of Vegetation Operations staff.

The contractor shall notify and provide copies of any records/reports of any regulatory inspection by federal, state or municipal officials.

5.6.2 Notifications to Customers/Landowners

The Contractor shall make every reasonable effort to notify nearby residents of all vegetation management activities. They shall also notify any property owner where a yard tree requires pruning or removal. The property owner shall also be notified prior to extensive widening or danger tree removal, unless the Company

has provided prior notification or otherwise specified by the National Grid Vegetation Operations Supervisor.

Certain statutes and regulations in New York, Massachusetts (Mass. Notification Law), Vermont, New Hampshire and Rhode Island require notification to residents/occupants of nearby homes/dwellings prior to use of herbicides or other vegetation management. The contractor shall comply with the appropriate state notification statutes and regulations. Documentation of notification shall be maintained by the contractor and provided to Vegetation Operations staff upon request and at the completion of the project.

Notification materials are presented in Appendix 5.

5.7 Documentation

The Contractor shall provide supplemental or new information regarding site conditions that affect current or future treatment operations, such as new construction, encroachments, ATVM clearance deficiencies, hazardous conditions, significantly eroded access or right-of-way, sensitive areas and landowner concerns/requirements to the National Grid Forester on a timely basis.

5.8 Interaction with Public

The Company strives in every way possible to maintain good relations with the property owner and general public. The actions of the Contractor reflect on the Company; therefore, the Contractor shall give diligent consideration to the interests of property owners, tenants, and the general public, whenever involved, and shall carry out the work in such a manner as to cause a minimum inconvenience.

The contractor, or his representative, will only respond to inquiries regarding what work they are performing, where they are working, and when they will be working. Copies of appropriate plans or permits may be shown as well. Refer all other inquiries to National Grid Forestry Staff.

Landowner complaints must be forwarded immediately by telephone to National Grid Forestry staff. The contractor must provide the name, address and telephone number of the major people involved, as well as a detailed description of the complaint or question.

5.9 Demands to Cease Operations

Handle demands to cease operations as follows:

- Immediately make the work area safe to the public, then move all personnel, equipment and materials to another property and continue work.
- Notify National Grid Forestry staff as soon as practical, if not immediately, of a demand that operations cease. Upon contacting National Grid Forestry staff, relate the chain of events and current status of the situation.
- Do not return to that site until National Grid Forestry staff has notified the contractor when and under what circumstances the crew may return.

5.10 Access

Access to the right-of-way shall be limited to public road crossings. Where this is not possible, the Contractor shall obtain permission for the use of private roads, driveways, and other access to the right-of-way from the property owners involved and shall be responsible for any damage thereto. When permission for off right-of-way access cannot be obtained from the property owners involved, and other ingress/egress is unavailable, the Contractor shall notify the National Grid Forester or their designee.

In general, vehicular traffic shall be restricted to a fifteen (15) foot wide roadway into and along the right-of-way. When present, existing roads into and along the right-of-way shall be used as the primary access, and maintained in as good or better condition for the duration of the Contractor's use. Additionally, primary ingress and egress on Article VII (NY only) rights-of-way are restricted to designated access routes. Access to the overall right-of-way is allowed only for vehicles performing selective vegetation maintenance with all-terrain spray units, skidder buckets for danger tree removal, and similar right-of-way maintenance activities. Other vehicles must remain on the designated access roads. Appropriate efforts to minimize unnecessary or excessive environmental or vegetation damage are required. Repair or replacement of excessive or unnecessary damage shall be the responsibility of the Contractor.

5.11 Site Conditions

Unreasonable site damage or destruction during any phase of the operation by the contractor, his agents or employees, must be repaired immediately to the satisfaction of National Grid Forestry staff at no cost to National Grid companies. National Grid Forestry staff will determine what constitutes unreasonable site damage. Contractor shall make reasonable efforts to complete work during favorable site conditions so as to prevent unnecessary damage.

The Contractor shall leave all culverts, stream fords, fences, gates, walls and roads in the same or better condition as when they commenced their work. Any trees to be removed that have fence wire attached, or that are part of a permanent functional fence, shall be cut off above the top strand of wire. Care shall be taken that all fences and gates are closed or left in such condition that livestock cannot escape. If fences or gates of an active pasture along the right-of-way are in a state of disrepair prior to the start of clearing and could allow livestock to escape, the contract shall attempt to notify both the property owner and the National Grid Forester of this condition. Where movement of the Contractor's equipment is required through existing fences, the Contractor shall make appropriate openings and adequate facilities for closing these openings during and after their use.

5.12 Railroads

Where the Company's right-of-way parallels or crosses railroad property, and the Contractor elects to gain access to the right-of-way from railroad property, they shall be responsible for all applicable rules, regulations and fees pertaining thereto.

The contractor must:

- Obtain a permit, and/or coordinate work with National Grid to obtain a permit, if required, from the railroad near whose tracks he or she will be treating.
- Check with each railroad near whose tracks he will be treating to ensure that the contractor carries all insurance which the railroad may require. Contact National Grid Forestry staff if any problems arise.
- Refrain from beginning a treatment whenever a railroad has failed to provide a flagman or remove the railroad from service. Contact National Grid Forestry staff immediately so that he or she can contact the railroad.

5.13 Native American Lands

Where required to complete work upon reservations, the contractor shall employ the designated Native American personnel for the successful completion of the project.

5.14 Chainsaw Bar Lubricants

When working within a sensitive area, chainsaw bar lubricants must be biodegradable products.

5.15 Equipment

The contractor crew supervisor or foreman must be equipped with a cellular telephone. The cellular telephone number must be provided to the division control center.

Crews should carry with them at all times a shovel, a broom, heavy-duty plastic bags or other leak-proof container, absorptive clay and activated charcoal. (Chemical or Universal Spill Kit)

Contractor's equipment, including backup equipment, must be sufficient to maintain the highest practical level of efficiency and effectiveness. Equipment must be maintained in good visual and working condition.

5.16 Site Restoration

Work shall also include grading, mulching, and reseeding of rutted or scarified soils caused by the Contractor's operations when directed by the National Grid Forester. This shall include repair of all environmental damage, maintenance of stream crossings, wetlands, crop fields, fence lines, etc. which are adversely impacted by the Contractor so as to leave the right-of-way in as good or better condition than found.

Inclusion of the repair of any previously existing environmental damage, including grading, seeding, mulching, stream, culvert and ditch repair, etc. shall be specified at the time of bidding or completed on a Time and Material basis if required.

6.0 Sideline Pruning and Danger Tree/Hazard Tree Removal

6.1 Practices and Procedures

6.1.1 Risk to Transmission Lines

Danger trees falling into the lines present the greatest risk of tree-caused interruptions on transmission circuits. The risk is primarily related to two (2) non-biotic variables: 1) distance from conductor to the adjacent tree line (clear width), and 2) conductor distance above the ground; and three (3) biotic factors: 1) height of trees, 2) tree species, and 3) tree health and condition. National Grid seeks to mitigate risk of interruptions from danger trees through site specific management of these variables.

Risk can be quantified using the Optimal Width Calculator (OWC) software licensed to National Grid by Ecological Solutions, Inc. The OWC calculates a Risk Factor based on the variables discussed above. Data has been collected across National Grid's 69kV (New England only), 115kV, 230kV and 345kV transmission system to calculate average Risk Factor by voltage class.

6.1.2 Sideline Pruning and Danger Tree Removal Levels

Danger Tree work will be specified by level for each right-of-way segment and for each edge dependent on voltage class, line importance and vegetation management rights. Work is defined as Level 1, Level 2, etc. These are presented as a hierarchy. Work specified as Level 1 requires work per definition of Level 1. Work specified as Level 2 requires work per Level 2 and Level 1. Level 3 includes Level 2 and Level 1, etc.

- Level 1: Prune (see Section 6.1.3) or remove danger trees to achieve At Time of Vegetation Management Clearance distances (see Section 4.3.1). Remove danger trees within the cleared right-of-way (encroachment). Dead or damaged branches and leaders on off right-of-way danger trees that are capable of falling onto the conductors shall be pruned.

- Level 2: Prune or remove high risk hazard trees plus Level 1 work.

- Level 3: Prune or remove all hazard trees plus Level 1 & 2 work.

- Level 4: Prune or remove danger trees emergent above the general canopy height. Pruning is the preferred method. Includes Level 1, 2 & 3 work.

- Level 5: Prune or remove danger trees to specified Risk Factor. Data for Risk Factor calculation shall be measured and document at least once per five (5) spans. Includes Level 1, 2, 3 and 4 work.

- Level 6: Remove all trees to a new cleared width (widening) including Level 1, 2, 3, 4, or 5 work along the newly created edge.

6.1.3 Pruning

All pruning shall be performed in accordance with the ANSI A-300 standard. The detailed specifics for the pruning dimensions on each right-of-way or right-of-way segment are included as a separate cover document for each project. The project cover document will include specific project details including the breakdown of the right-of-way into individual segments whenever required.

Description of Sideline/Danger Tree Work – Type A

Prune to the existing treed edge unless otherwise called out on the project details or maps. Prune or remove danger trees to achieve at least the ATVM Clearance Distances (Section 4.3.1). Pruning shall be ground-to-sky, including pruning back the upper canopy of edge trees leaving no overhang over the right-of-way.

Type A sideline work scope includes the removal of small trees up to nine (9) inches diameter breast height that have sprouted from stumps or encroached within the cleared right-of-way edge.

Dead or damaged branches and leaders on off right-of-way danger trees that are capable of falling onto the conductor shall be pruned. Prune or remove high risk hazard trees. Hazard trees found beyond the right-of-way and/or ATVM clearance distances that are judged to be an imminent threat to the conductors shall be brought to the attention of a National Grid Forester for approval prior to removing (see Section 6.1.4). Desirable species shall be retained along the edge of the right-of-way.

In addition, if the contracted tree crew sees a tree within the wire zone that is approaching or within the NGMCD (formerly Clearance 2), they either must cut the tree or contact a National Grid Forester immediately.

Description of Sideline/Danger Tree Work – Type B

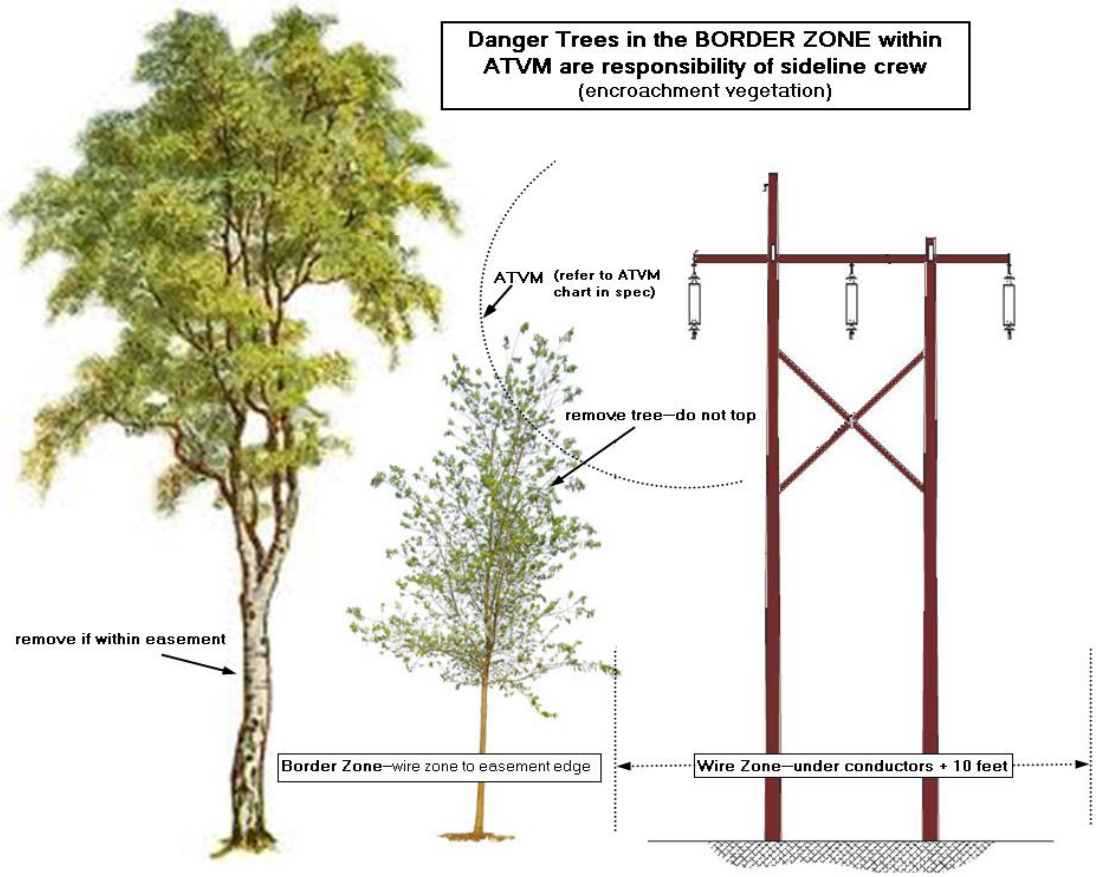
Prune or remove danger trees to achieve the ATVM Clearance Distances (Section 4.3.1) unless otherwise called out on the project details or maps. The contractor shall practice ANSI A300 pruning in choosing the pruning points within the tree which will often mean clearances greater than ATVM will actually be obtained. Trees shall be directionally pruned to encourage growth away from the transmission line. Where there is already sufficient clearance the contractor shall not prune trees to achieve a "boxed" look or wall of tree canopies along the right-of-way. Exceptions to this are those narrower rights-of-way where pruning to this specification will result in a “boxed” look.

Dead or damaged branches and leaders on off right-of-way danger trees that are capable of falling onto the conductors shall be pruned. Prune or remove high risk hazard trees. Hazard trees found beyond the right-of-way and/or ATVM clearance distances that are judged to be an imminent threat to the conductors shall be brought to the attention of the National Grid Forester for

approval prior to removing (see Section 6.1.4). Desirable species shall be retained along the edge of the right-of-way.

Any tree in the border zone that is within ATVM shall be removed, not pruned (see diagram below).

In addition, if the contracted tree crew sees a tree within the wire zone that is approaching or within the NGMCD (formerly Clearance 2), they either must cut the tree or contact a National Grid Forester immediately.



6.1.4 Hazard Trees

Hazard trees identified by the contractor or National Grid for removal shall be paid for by unit price. The removal of any tree nine (9) inches dbh and above, within a maintained, roadside or unmaintained area, shall be considered a hazard tree removal (see definitions). The contractor's notification person shall mark identified hazard trees with ribbon during the notification process.

Tree removals are recorded on a Transmission Sideline Tree Removals Weekly Tracking Form (Appendix 6) and submitted to a National Grid Forester on a weekly basis.

6.2 Contractor Inspection of Completed Work

New England Contractors Only

Upon completion of performing sideline pruning and danger tree/hazard tree removals along a right-of-way, the contractor must inspect the entire right-of-way to ensure the work was performed in accordance with this specification. The contractor must complete a "New England Transmission Forestry Contractor Final Inspection Form" (Appendix 7) and submit the completed and signed form to a National Grid Forester. Submittal of this form is required for final payment; therefore, prior to final payment, the Company will require receipt of a completed "New England Transmission Forestry Contractor Final Inspection Form".

6.3 Management of Wood and Brush (Slash)

Wood and brush slash may be generated during vegetation management activities. In general, where tree removal or pruning is required, the brush that has been cut may be left where it falls after being cut (diced) so as to lie close to the ground. Length of diced stems or branches should not exceed ten (10) feet; height of diced slash should not exceed two (2) feet.

Near public or private roads, residential or commercial areas, parks, streams, on access roads, in any sensitive area or otherwise managed properties, the brush shall be disposed of by either chipping or removal to a suitable location within the right-of-way and neatly piled, windrowed or dispersed.

When chipping is required, the chips may be disposed of by dispersing on site in non-sensitive areas. Chips shall be removed from areas of more intense landscape management such as lawns.

Where trees and limbs larger than four (4) inches in diameter at the small end are removed and the designated slash disposal is a windrow, the wood shall be neatly piled on the site, taking care not to block any access roads used by either the property owner or the Company. When the authorized slash disposal method is chipping, it may be necessary to remove the larger wood from the site to another approved area of the right-of-way and piled neatly, or moved to an approved off right-of-way disposal site.

No burning of wood or brush will be permitted unless specifically authorized by the National Grid Forester.

All species of wild cherry (Prunus serotina, P. virginiana, P. pennsylvanica) that are cut or treated during the growing season can become toxic to livestock during the wilting stage of the leaves. In addition, several species of Maple (Acer) have been identified as toxic to horses in the wilting stage. Therefore, Maple and Cherry stems, which are cut or treated in active pastures, shall be immediately removed from the pasture following clearing, or arrangements made with the farmer to utilize alternate pastures until the wilting stage and hazard has passed.

Contractors shall comply with all applicable laws and guidelines pertinent to invasive species and their management, as set forth by Government entities and National Grid.

6.4 Mitigation of Impacts

If, during their operations, the Contractor causes any damage to occur to the land such as deep ruts or scarified areas, which in the opinion of the National Grid Forester could cause future erosion or interfere with access for line maintenance, the Contractor shall re-grade the site to original contours, and seed and mulch as required. Areas where erosion occurs during sideline program operations will be restored per National Grid companies' policies.

The Contractor shall take reasonable precautions not to remove or damage existing low-growing vegetation, either natural or planted, which are to be preserved on the right-of-way. Where road crossing buffer vegetation, either natural or planted, has been damaged beyond reasonable repair because of the Contractor's negligence, this vegetation will be replaced at the Contractor's expense.

The Contractor shall take care not to rut or scarify the right-of-way for the duration of their operation. All environmental damage resulting from the Contractor's operation shall be permanently repaired at the Contractor's sole expense.

Mobile equipment shall not intrude into road crossing buffers, stream buffer zones or pruning and topping areas, except on designated access routes. When a tree that has been cut must be removed from such an area, it must first be limbed and the brush hand carried to the chipping location or pile site. The trunk wood may be removed by means of a winch line taking adequate care to avoid damaging residual vegetation.

In certain areas, where feasible and advantageous, the Forester may authorize the use of aerial lifts and other specialized equipment, in road crossing buffers for the purpose of pruning trees, and disposal. In no case, however, will any vegetation be cleared or any new road be authorized, other than the approved access road through the screen to facilitate the use of this equipment.

The Contractor shall take adequate precautions to protect the watercourses and wetlands from pollution and shall avoid disturbing streambeds and banks and the low-growing vegetation protecting them. Felling vegetation in or across a watercourse (such as a river, stream, or brook), should be avoided. Vegetation that is felled into a watercourse shall be removed as soon as possible and placed on high ground. Brush chipping shall be performed in such a manner that the chipped material shall not enter any watercourse or wetland area, nor accumulate in excess of four (4) inches in depth at any location.

7.0 Work Precautions

7.1 Safety

As a contractual term, National Grid requires all contractors to comply with all appropriate state and federal safety laws and regulations. This includes applicable sections of the Occupational Safety and Health Act (OSHA) and all worker safety-related statements and instructions on the herbicide label.

It shall be understood and agreed to by the Contractor that herbicide application, hand cutting, pruning and clearing near existing transmission and distribution lines shall be undertaken while lines are presumed to be energized and operating at voltages up to and including 345kV AC and 450kV DC. The Contractor shall provide competent, trained personnel to complete the work.

In order to insure the safety of their employees, the general public and continuity of service in the energized lines, the Contractor shall exercise extraordinary precautions in removing trees and tree limbs that are in such close proximity to the conductors as to constitute a hazard. Such trees shall be pruned, removed with the aid of ropes, or taken down one (1) section at a time.

In addition, all vegetation management work shall be carried out in compliance with ANSI Z133.1, American National Standards Institute, Standard for Arboricultural Operations – Safety Requirements.

7.2 Sensitive Areas

Sensitive areas are defined as areas on a right-of-way where legal, visual or environmental impacts/concerns require compromises to the project. Sensitive areas include: public surface, public well and private well drinking water supplies; lakes, ponds, rivers, streams, and any other surface waters; wetlands; endangered species sites; agricultural areas including croplands, orchards, tree plantations and animal pastures; buffers at road crossings; buffers at residential and/or commercial yards; and easement restrictions and/or landowner agreements.

These sensitive areas have varying legal definitions in each of the states in which National Grid companies have transmission and distribution facilities. Permits for vegetation management activities in these states vary as well. For purposes of this document, sensitive areas and vegetation management within them are discussed in a general way.

When utilizing chainsaws in a sensitive area, chainsaw bar lubricants must be biodegradable products.

7.3 Visual and Protective Buffers

Visual buffers, consisting of trees and/or shrubs, screen the general public from potentially objectionable views of structures and substations. They may be maintained at road crossings, recreational areas, residential or commercial yards.

Specific dimensions for visual buffers may be set by State regulations and/or permit conditions and/or National Grid company policy.

Use shrub buffers on most road crossings or on vantage points where a visual screen is determined to be desirable. Utilize tree/shrub buffers only when legally required or where sites are extremely sensitive visually and shrub growth is inadequate for screening.

7.4 Wetlands

In wetlands, tall growing trees generally only occur in wooded swamps or areas that are dry for long enough periods each year to support tree growth. Equipment may not enter a wetland area without notification through the company's General Permit. Check with the Division Forester prior to working in a wetland.

In remote areas, including remote wetlands, and with the National Grid Forester's approval, trees to be removed may be topped below conductor level to provide wildlife habitat and to reduce ground disturbance and clutter.

FOREWARD

This Vegetation Management Specification (VMSpec) documents the objectives, practices and procedure for vegetation management on National Grid companies' electric rights-of-way. The VMSpec is primarily aimed at the transmission system, 115kV and higher in New York (NY) and 69kV and higher in New England (NE), but addresses vegetation management on all electric rights-of-way. The VMSpec also defines the responsibilities of the Company personnel and contractors, identifies procedures to be followed by contractors performing all work and defines the clearance requirements between conductors and vegetation acceptable to the Company for maintaining reliable electric transmission service.

Questions or inquiries regarding information provided in this document should be referred to the Manager of Vegetation Strategy.

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Date: 5/15/2016

Record of Change		
Revision	**Date**	**Description**
1	December 20, 2001	Updates
2	December 9, 2002	Updates
3	April 22, 2004	Updates
4	November 1, 2005	Complete review and total rewrite to integrate NE and NY operations info.
5	March 1, 2007	Updates and conformance with NERC FAC-003-1
6	March 1, 2008	Updates
7	October 21, 2009	Updates
8	January 28, 2011	Updates
9	September 28, 2011	Updates for 2011 Procurement Event.
10	October 6, 2011	Updates for 2012 Procurement Event.
11	August 21, 2012	Updates for 2013 Procurement Event.
12	July 31, 2013	Updated to Meet Requirements of FAC-003-2. Updates for 2014 Procurement Event.
13	July 1, 2014	Updated to Meet Requirements of FAC-003-3. Updates for 2015 Procurement Event.

14	June 15, 2016	Updated to Meet Requirements of FAC-003-4. Updates for 2017 Procurement Event.

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1.0 Introduction

1.1 Purpose

The purpose of this Right-of-Way (ROW) Vegetation Management Specification (VMSpec) is to document the requirements for vegetation management on transmission and distribution ROW for National Grid. This VMSpec defines:

- Objectives, strategies and approved practices and procedures for all phases of vegetation management on electric ROW;
- Clearance requirements between conductors and vegetation acceptable to National Grid for maintaining reliable electric transmission service;
- Responsibilities of Company personnel and contractors;
- Procedures to be followed by contractors performing all work within the scope of this VMSpec.

1.2 Scope

The requirements of the VMSpec apply to all National Grid electric ROWs.

2.0 Definitions

Annual Work Plan – Identifies the vegetation management field work that will be carried out in a specified year.

Article VII ROW – a ROW approved for construction and maintenance under the Article VII regulations of the N.Y.S. Public Service Commission. These lines generally have additional environmental protections and restrictions associated with access, vegetative screening, integrated management, etc.

Basal Application – Herbicide application method in which the lower portion of the capable species stems and root collar is completely covered by the herbicide solution.

Capable Species – – Tree and shrub species that have the ability to grow into the National Grid Clearance Distance (NGMVCD) from conductors.

Clearance Distances – 1) the At Time of Vegetation Management (ATVM) Clearance Distance from vegetation, in a radius around the conductor, to be achieved at the time of vegetation management and 2) National Grid Minimum Vegetation Clearance Distance (NGMVCD) from vegetation, in a radius around the conductor, between conductors and vegetation to be maintained under all rated electrical operating conditions. 3) Minimum Vegetation Clearance Distance (MVCD) from vegetation, in a radius around the conductor derived from the Gallet Equations as defined by FAC 003-4 applying to those lines associated with that standard.

Danger Tree – A tree on or off the ROW that if were cut or failed could contact electric lines.

Forestry GIS Forestry Geographic Information System

Hand Cutting – Vegetation management method in which woody vegetation is felled through the use of hand tools, including chainsaws and brush saws.

Hazard Tree – Danger trees which due to species and/or structural defect are likely to fail and fall into the electric facility.

Herbicide – Chemical used to control, suppress or kill plants or severely interrupt their normal growth processes.

I**mminent threat –** An imminent threat is vegetation condition that poses an increased risk to the reliable operation of a particular transmission circuit and therefore requires 1) mitigation and vegetation condition typically within 24 hours, and 2) notifying the system operator.

Integrated Vegetation Management (IVM) – IVM is an adaptation of Integrated Pest Management (IPM) where the pest is tall growing, undesirable vegetation. IPM/IVM is a system of controlling pests in which pests are identified, action thresholds considered, all possible control options evaluated and selective, physical, biological and chemical controls are considered. When chemical controls become necessary to control and prevent the growth of undesirable, tall growing woody species, the Company is committed to employing selective, targeted applications. These treatments shall use approved herbicide products and mixtures that target specific plants or plant communities in a manner calculated to control and eliminate the tall-growing, undesirable woody species, while preserving as much of the small, compatible woody shrub and herbaceous vegetation as is practical.

IROL - Interconnection Reliability Operating Limit

ISO – Independent System Operator

MA DAR – Massachusetts Department of Agricultural Resources

Mowing – the use of mechanical equipment such as a tractor with mounted rotary or reel type mower to cut vegetation at a uniform height above the surface of the soil. Common equipment types are Brush Hogs or Hydro-ax.

MVCD – Minimum Vegetation Management Distance
NERC – North American Electric Reliability Council

NERC Regulated Circuits – Circuits regulated by FAC 003-4 are all circuits operated at above 200 kV and voltages below 200kV that are designated as IROL by the ISO.

NGMVCD – National Grid Minimum Vegetation Clearance Distance

NH PES – New Hampshire Pesticide Bureau

NPCC – Northeast Power Coordinating Council

NY DPS – New York Department of Public Service

NY Part 84 – The New York Long-Range Transmission ROW Management Program required by the NY Public Service Commission

Non-Selective Treatment – the broadcast application of approved herbicide products and mixtures to all woody vegetation

Pasture – Fenced area used for grazing livestock.

Pruning – the cutting and removal of tree branches to provide specified clearance distance between vegetation and the conductors. See ANSI A300 for additional detail.

RI DEM – Rhode Island Department of Environmental Management

Right-of-Way (ROW) - The corridor of land under a transmission line(s) needed to operate the line(s). The width of the corridor is established by engineering or construction guidance as documented in either construction documents, pre-2007 vegetation maintenance records, or by the blowout standard in effect when the line was built. The ROW width in no case exceeds the applicable Transmission Owner's or applicable Generator Owner's legal rights but may be less based on the aforementioned criteria (FAC 003-4).

Selective Mowing – Mowing small areas of high-density capable species, or dense woody vegetation encroaching upon roadways or trails to structures or adjacent to structures.

Selective Treatments – Removal of individual undesirable woody plant species through the use of a controlled vegetation management method.

Sensitive Area – Areas on ROWs where legal, visual, or environmental impacts/concerns require compromises to the general IVM program.

Slash – All branches, tops, small diameter main stems and debris resulting from any cutting operation.

Stump Application – Herbicide application method in which the herbicide is applied only to the freshly cut surface of the stump of the capable tree.

System Operator – Transmission Control Center's personnel assigned for decision making during the need to operate transmission lines.

"T" Sheet – Strip map of a ROW showing line features (Sometimes referred to as "Q-Sheets" or "Plan & Profile")

Transmission – includes all electric lines 115kV and higher in New York and 69kV and higher in New England, used to transport electricity between various generation, switching, and distribution substations.

Tree Removal – the cutting and felling of trees, including wood and brush disposal. Removal may include, where specified, the use of approved herbicides to enable the chemical removal of the target plant(s) from the ROW.

Utility Forest – the forested areas within or adjacent to ROW that contain trees that are tall enough or may grow tall enough to impact the reliability of the transmission facility.

Vegetation Inspection – The systematic examination of vegetation conditions on a ROW and those vegetation conditions under the Transmission Owner's or applicable Generator Owner's control that are likely to pose a hazard to the line(s) prior to the next planned maintenance or inspection. This may be combined with a general line inspection (FAC 003-4).

VMSpec –Vegetation Management Specification

VMP –Vegetation Management Procedure

VMS –Vegetation Management Strategy

VAAFM – Vermont Agency of Agriculture, Food and Markets

VIPER - (**V**egetation **I**nspection **P**lanning **E**valuation and **R**eporting) - National Grid's vegetation management system; a combination of databases. GIS and mobile applications.

Visual Buffer – areas of vegetation preserved on the ROW, on both sides of selected improved road crossings, yards, for the purpose of minimizing the visual impacts and linear view of the ROW for motorists.

Water – standing or running water, existing at the time of maintenance operations, which has impact outside the ROW.

Wire Zone/Border Zone – the wire zone is defined as that portion of the ROW floor that is situated either directly beneath the conductor area or for a distance extending approximately ten (10) feet to either side of the conductor. The border zone is that portion of the ROW floor situated to the outside of the wire zone extending to the ROW edge. It is sometimes referred to as a transition zone between the wire zone and the adjacent forest edge. The wire zone mid-span is the portion of the span where the conductor is at or near its lowest ground clearance distance, generally 60-70% of the span length.

YOP – Yearly Operational Plan, Massachusetts

3.0 General Policy/Requirements

3.1 The maintenance cycle for all ROWs shall be: ROW Floor Program, three to eight years and off ROW Sideline Program, three to sixteen years.

3.2 Herbicide treatments within the context of an Integrated Vegetation Management (IVM) strategy, shall be the preferred method of vegetation management.

3.3 Hand cutting or mowing shall be used where herbicide use is prohibited.

3.4 All vegetation management operations shall be conducted in a safe, effective manner in conformity with Federal and State laws, regulations and permit conditions.

3.5 All vegetation management operations shall be conducted in conformance with national and regional standards including but not limited to NERC FAC-003-4 and ISO 14001.

3.6 All state permits necessary for any vegetation management operations shall be obtained.

3.7 All applicable state notification procedures shall be followed.

3.8 National Grid Forestry staff, in consultation with vegetation management contractors, shall establish procedures for notifying nearby residents of all vegetation management activities.

3.9 National Grid Forestry staff and/or contractors shall respond quickly to any questions or complaints relating to ROW vegetation management from the public and/or government agencies.

3.10 Appropriately licensed, certified and qualified contractors shall be retained to implement National Grid's vegetation management programs. Contractors shall conduct all vegetation management operations consistent with National Grid safety requirements and the ANSI Z-133 safety standard.

3.11 National Grid Forestry staff shall provide local supervision, coordination and enforcement of National Grid's Vegetation Management Procedures (VMP) and this Vegetation Management Specification (VMSpec) for contractors.

3.12 The document control process for the VMSpec is as follows: This document is generally updated annually and distributed as hard copy. The applicable hard copy cover date shall be for the current year.

4.0 Vegetation Management Program

4.1 Objectives

The primary objective of National Grid's Vegetation Management Program is to minimize interruptions due to vegetation. Other objectives include providing a clear and safe work space and access for maintenance activities.

4.2 Strategy

National Grid's strategic approach to vegetation management within the ROW is to establish and maintain ROWs that are largely clear of all capable vegetation while maintaining a stable low-growing plant community that is pleasing to the eye and beneficial to wildlife. National Grid's strategic approach to managing vegetation adjacent to the ROW is to prune and/or remove danger trees and/or hazard trees where property rights allow vegetation management work.

ROWs that are largely clear of capable vegetation present a very low risk of vegetation-caused interruptions. Vegetation adjacent to ROWs (danger and hazard trees) presents a greater risk of interruptions. The risk from danger trees is primarily related to two non-biotic variables: 1) distance from conductor to the adjacent tree line, and 2) conductor distance above the ground; and three biotic factors: 1) height of trees, 2) tree species, and 3) tree health and condition. National Grid seeks to mitigate risk of interruptions from trees adjacent to the ROW through site specific management of these variables.

Vegetation management work on transmission and distribution ROW is organized into two programs:

- ROW Floor Program – management of vegetation within the ROW corridor, and
- Sideline Tree Program – management of vegetation adjacent to the ROW corridor.

4.2.1 Contractors

Appropriately certified and qualified contractors are retained to carry out nearly all hands-on vegetation management work on National Grid ROWs.

4.2.2 Inquiries and Complaints from Landowners and/or Public

Vegetation Operations staff and/or contractors shall respond quickly to any questions or complaints relating to ROW vegetation management from the public and/or government agencies. Inquiries and/or complaints from external parties will be documented and reported to the National Grid Vegetation Operations Supervisor.

4.3 Clearance Standards

National Grid specifies clearance distances to be achieved at the time of vegetation management work and minimum clearances to be maintained at all times. Clearance standards established by National Grid below conform to the following regulatory standards and industry guidelines:

- North American Electrical Reliability Counsel (NERC) Vegetation Management Standard FAC-003-4;
- National Electric Safety Code (NESC) Rule 218; and
- Applicable State vegetation management standards or regulations.
- FAC 003-4

The clearances in Appendix 10 presented represent distances vegetation must be from all operating conductors (including static wire).

4.4 Exceptions to ATVM Clearances

Legal restrictions and environmental and social concerns may prevent National Grid from achieving ATVM Clearance Distances at various sites across the transmission system. National Grid tracks these sites within the Forestry GIS system. All such sites will be inspected and mitigation procedures taken to assure compliance with NGMVCD

4.5 Imminent Threats of Interruption

Contractor personnel shall report any observed vegetation-related imminent threats that may cause interruptions to the appropriate National Grid Division Forester, who will determine the need to notify

If the line is 230 kV or higher, or a lower voltage that is IROL and the National Grid Division Forester or his/her assigned representative is not available the contractor shall report any observed vegetation-related imminent threats that may cause interruptions to the appropriate Company Regional Control Center as outlined in Appendix 11. The Regional Control Center shall take appropriate action per National Grid Control Center operating procedures. The following describes the reporting process.

4.5.1 Description:

An imminent threat is vegetation condition that poses an increased risk to the reliable operation of a particular transmission circuit and therefore requires:

- mitigating the vegetation condition typically within 24 hours, and
- notifying the system operator.

The characteristics of an imminent threat condition usually are:

- vegetation that is approaching or threatens to approach the MVCD,or

- one or more danger trees that appear very likely to contact a transmission line.

4.5.2 Steps for Reporting (See also Appendix 11)

Declaration of Imminent Threat
All vegetation management personnel are required to report an imminent threat to the operation of transmission and sub transmission circuits. Imminent threats to NERC regulated circuits must be reported without delay to the regional control center and the Vegetation Operations Staff.

Communication
All initial communications between vegetation management personnel and the regional control centers are to be spoken (email, voice or text messaging are not acceptable for initial reporting). Enough information about the imminent vegetation risk must be provided for the system operator to decide what action needs to be taken to remove the vegetation without jeopardizing the reliability of the transmission system. Up to date contact lists must be on hand by all vegetation management staff and contractors.

Mitigation Measures
While the system operator monitors the system and reviews options, the vegetation management personnel continues to investigate the threat, notifies National Grid Vegetation Operations staff and reviews options for removal of vegetation. No action to remove vegetation will be performed until directed by the system operator.

Documentation
All communication must be documented and retained by the Vegetation Operations staff. Appendix 11 provides an outline for documentation. Vegetation Operations staff will provide the details to the Vegetation Strategist for determination of required updates to the workplan.

5.0 Contractor Duties and Responsibilities

Vegetation management operations must be conducted according to this ROW VMSpec and according to the written directives of the National Grid Forestry staff. Failure to do so is grounds for removal of the crew from the treatment site by National Grid Forestry staff and possible termination of the contractor's contract.

5.1 Environmental and Safety Compliance

The Contractor shall comply with all applicable Federal, State and local laws and regulations and with the requirements of all permits and approvals obtained by National Grid

National Grid is committed to minimizing its impacts to the environment and requires contractors to demonstrate the same level of commitment as National Grid in the management of the environment. National Grid's commitment to the environment is communicated in the National Grid – Environmental Policy, see Appendix 2.

The contractor shall immediately notify the Company of any release of any quantity of oil or hazardous material. The contractor is responsible to make all required notifications of releases to appropriate regulatory agencies and to ensure that the response to the release is prompt and done in a proper manner.

National Grid Contractor Safety Requirements establish safety requirements for contractors. This documentation is provided during the contractor qualification and bidding process.

All safety incidents shall be reported to the Company. The initial call should be to a National Grid Vegetation Operations Supervisor. All injuries will be entered in the National Grid Incident Management System.

5.2 Qualifications

Contractor shall utilize only experienced and/or trained workers who are appropriately licensed or certified. Workers must conduct themselves professionally at all times. Each herbicide applicator shall hold, at minimum, a pesticide applicators license or equivalent from any state within National Grid service territory and comply with license requirements for the state within which applications are taking place.

Contractor shall utilize appropriately licensed or certified supervisors who are knowledgeable with regard to all aspects of the contracted treatment, and who are responsive to the guidance of National Grid Vegetation Operations Supervisors. Each supervisor must be able to effectively communicate with the public. They must also effectively supervise contractor crews in order to insure the satisfactory completion of the treatment operation. Supervisors of herbicide applications must hold, at minimum, a commercial certification license or equivalent from any state within National Grid service territory and comply with license requirements of the state within which applications are taking place.

5.3 Training

Contractor shall provide their employees with training that includes, but is not limited to, recognition of electrical hazards, working in proximity to energized facilities, identification of operating voltages, minimum approach distances, and other applicable rules and regulations associated with worker safety.

Additionally, National Grid trains vegetation management contractors annually on the contents of this Specification.

5.4 Commencement of Operations

Contractor may not initiate activities without a Purchase Order, with Terms and Conditions attached, from the National Grid Procurement Department. Contractor

shall contact Vegetation Operations staff if a Purchase Order has not been received by the time the ROWs are scheduled for treatment. The contractor must return the signed acknowledgement copy of the Purchase Order to the Procurement Department before any work is done.

5.5 Permits/Plans/Approvals

Contractor shall follow all conditions of state permits/plans/approvals obtained by the Company.

5.5.1 Invasive Species Best Management Practices (NY Only)

In an effort to limit the introduction and spread of invasive plant species, National Grid adopted a group of Best Management Practices (BMP) from the Environmental Energy Alliance of New York (EEANY). These BMPs were accepted by the NYS Department of Environmental Conservation as a means to meet permit requirements for maintenance work, including vegetation maintenance.

A copy of this BMP is located in Appendix 3 of this document and is a requirement for all contractors that work on a National Grid ROW.

5.5.2 Threatened and Endangered Species (New York Only)

In 2012, the U.S. Fish and Wildlife Service issued National Grid an incidental take permit for impacts to the federally endangered Karner blue butterfly and state protected frosted elfin butterfly during its gas and electric operations in New York. The terms of this permit and the associated Habitat Management Plan are attached as Appendix 4 of this document. The plan covers operations, maintenance and construction activities on ROWs in the Eastern and Central Divisions. Contractors shall contact the National Grid Vegetation Operations Supervisor for locations of protected sites on assigned projects.

5.6 Notifications

5.6.1. To National Grid

At least one (1) week prior to the initiation of vegetation management operations on a specific ROW, the contractor must specify to Vegetation Operations staff the date work on that ROW will begin.

At least one (1) week prior to the completion of vegetation management operations on specific ROW, the contractor must specify to Vegetation Operations staff the date work on that ROW will end.

The contractor will notify Vegetation Operations staff of the approximate work schedule the contractor's crew will follow for the treatment year. The contractor shall complete treatment on each ROW segment with as few work interruptions as possible.

The contractor must supply crew work locations on a daily basis by calling the Transmission Call-in system, and/or other parties specified by the Vegetation Operations staff, before the beginning of the workday. The location information

will include the ROW segment number, the contractor company and foreman name, the number of crew members, and the nearest transmission/distribution line structure number. Each crew shall call off the system at the completion of the workday and when relocating to another ROW.

The contractor must keep Vegetation Operations staff informed about crew location, conditions encountered, and problems that arise as work progresses. Should a contractor cause an event on a transmission or distribution line, the contractor must immediately notify the appropriate New England or New York Control Center. Refer to Appendix 1 for a listing of Vegetation Operations staff and Control Center contact information.

The contractor must supply completed daily or weekly time sheet(s) with information regarding all time and materials work as per direction of Vegetation Operations staff.

The contractor shall notify and provide copies of any records/reports of any regulatory inspection by federal, state or municipal officials.

5.6.2 Notifications to Customers/Landowners

The Contractor shall make every reasonable effort to notify nearby residents of all vegetation management activities. They shall also notify any property owner where a yard tree requires pruning or removal. The property owner shall also be notified prior to extensive widening or danger tree removal, unless the Company has provided prior notification or otherwise specified by the National Grid Vegetation Operations Supervisor.

Certain statutes and regulations in New York, Massachusetts (Mass. Notification Law), Vermont, New Hampshire and Rhode Island require notification to residents/occupants of nearby homes/dwellings prior to use of herbicides or other vegetation management. The contractor shall comply with the appropriate state notification statutes and regulations. Documentation of notification shall be maintained by the contractor and provided to Vegetation Operations staff upon request and at the completion of the project. .

Notification materials are presented in Appendix 5.

5.7 Documentation

The Contractor shall provide the following documents:

On a timely basis, the Contractor shall provide supplemental or new information regarding site conditions that affect current or future treatment operations, such as new construction, encroachments, ATVM clearance deficiencies, hazardous conditions, significantly eroded access or ROW, sensitive areas and landowner concerns/requirements to the National Grid Vegetation Operations Supervisor.

The Contractor shall complete and return a completed copy of the Field Inventory or weekly time sheets (as appropriate for NE or NY) to include the treatment date, the type and amount of herbicide used, any approved changes in site density,

treatment method, etc. to the National Grid Vegetation Operations Supervisor, who will then enter the completed work in the Forestry GIS. Submittal of these treatment records is required for final payment; therefore, prior to final payment, the Company will require receipt of a complete treatment record/inventory.

5.8 Interaction with Public

The Company strives in every way possible to maintain good relations with the property owner and general public. The actions of the Contractor reflect on the Company; therefore, the Contractor shall give diligent consideration to the interests of property owners, tenants, and the general public, whenever involved, and shall carry out the work in such a manner as to cause a minimum inconvenience.

The contractor, or his representative, will only respond to inquiries regarding what they are doing, where they are treating, and when they are treating. Copies of appropriate plans or permits may be shown as well. Refer all other inquiries to Vegetation Operations staff.

Landowner complaints must be forwarded immediately by telephone to Vegetation Operations staff. The contractor must provide the name, address and telephone number of the major people involved, as well as a detailed description of the complaint or question.

5.9 Demands that a Treatment Operation Cease

Handle demands that a treatment operation cease as follows:

- Immediately make the work area safe to the public, then move all personnel, equipment and materials to another property and continue work.
- Notify Vegetation Operations staff as soon as practical, if not immediately, of a demand that treatment cease. Upon contacting National Grid Vegetation Operations, relate the chain of events and current status of the situation.
- Do not return to that site until Vegetation Operations staff has notified the contractor when and under what circumstances the crew may return.

5.10 Access

Access to the ROW shall be limited to public road crossings. Where this is not possible, the Contractor shall obtain permission for the use of private roads, driveways, and other access to the ROW from the property owners involved and shall be responsible for any damage thereto. When permission for off ROW access cannot be obtained from the property owners involved, and other ingress/egress is unavailable, the Contractor shall notify the National Grid Vegetation Operations Supervisor or their designee.

In general, vehicular traffic shall be restricted to a 15-foot wide roadway into and along the ROW. When present, existing roads into and along the ROW shall be used as the primary access, and maintained in as good or better condition for the duration of the Contractor's use. Additionally, primary ingress and egress on Article VII ROWs (NY Only) are restricted to designated access routes. Access to

the overall ROW is allowed only for selective vegetation maintenance with all terrain spray units, skidder buckets for danger tree removal, and similar ROW maintenance activities. Other vehicles must remain on the designated access roads. Appropriate efforts to minimize unnecessary or excessive environmental or vegetation damage are required. Repair or replacement of excessive or unnecessary damage shall be the responsibility of the Contractor.

5.11 Site Conditions

Unreasonable site damage or destruction during any phase of the vegetation management operation by the contractor, his agents or employees, must be repaired immediately to the satisfaction of Vegetation Operations staff at no cost to National Grid companies. Vegetation Operations staff will determine what constitutes unreasonable site damage.

The Contractor shall leave all culverts, stream fords, fences, gates, walls and roads in the same or better condition as when they commenced their work. Any trees to be removed that have fence wire attached, or that are part of a permanent functional fence, shall be cut off above the top strand of wire. Care shall be taken that all fences and gates are closed or left in such condition that livestock cannot escape. If fences or gates of an active pasture along the ROW are in a state of disrepair prior to the start of clearing and could allow livestock to escape, the contractor shall attempt to notify both the property owner and the National Grid Vegetation Operations Supervisor of this condition. Where movement of the Contractor's equipment is required through existing fences, the Contractor shall make appropriate openings and adequate facilities for closing these openings during and after their use.

5.12 Herbicides

Application of herbicides by the Contractor shall conform to the following:

The contractor shall utilize only herbicides, mixture rates and solutions prescribed by Vegetation Operations staff (Reference Herbicide Mixes listed in the Appendix 6). Herbicides, adjuvants, carriers and additives are hereinafter collectively referred to as "materials."

5.12.1 Handling, Mixing, Loading and Labeling Herbicide Concentrates

All containers (tanks, gerry jugs, etc.) containing herbicide mixes shall be labeled with the trade name and concentration of each herbicide in the mix.

The majority of the Contractor's handling, mixing and loading of herbicide concentrates is to be done at the contractor's base location. If it is necessary to handle, mix, or load herbicide concentrates at any other location, the contractor is required to comply with herbicide label directions and existing regulations regarding setbacks from sensitive areas and safety precautions.

No handling, mixing, or loading of herbicide concentrates will be done within the buffer zones adjacent to any drinking water supplies or surface waters, or within 100 feet of any other sensitive area. All water to be used to mix herbicide solutions will be secured from a faucet or open bodies of water, which

are not drinking water supplies. If pumps are used, they must be equipped with anti-siphoning devices. Pumps and hoses used for water will not be used to pump or mix herbicides. If separate tank trucks are used for supplying water for mixing, the tanks shall never contain any material other than water.

5.12.2 Treatment Width

All treatment operations must be applied to the full specified width of the ROW. Vegetation Operations staff will determine whether the full specified width of the ROW has been treated. The contractor must, at his own expense, re-treat the site upon notification by Vegetation Operations staff that a treatment was not applied to the full specified width of the ROW. Re-treatment must be accomplished by using the application method and materials prescribed by Vegetation Operations staff.

For 69 kV and above, Vegetation Operations staff will provide the specified width of the ROW to the contractor. Prior to treatment, the width of the ROW must be measured by the contractor, and the contractor must mark the measured ROW edge with surveyor ribbon. A line of sight must be established along the edge of the ROW, or at least every third structure.

The Contractor shall confine their activities within the limits of the ROW, except for danger tree removals and authorized off ROW access. All ROW restrictions, noted in the inventory and/or on the drawings, shall be strictly adhered to.

5.12.3 Treatment Effectiveness

Treatments must result in 100% control or removal of all target species greater than or equal to six (6) feet in height. The contractor shall also provide a minimum of 95% control or removal of all target species less than six feet in height. Treatment effectiveness extends over the full three (3) to eight (8) year treatment cycle. Any target species identified as a hazard to the line and shown to have been six (6) feet or taller at the time of treatment shall be subject to this provision. Vegetation Operations staff will determine whether a treatment has been effective.

The contractor must, at his own expense, re-treat the site(s) upon notification by Vegetation Operations staff that a treatment was ineffective. Re-treatment must be accomplished by using the application method and materials prescribed by Vegetation Operations. Exceptions to this treatment effectiveness standard are limited to trees in yards, special road crossings, landowner treatment sites and must be noted in ROW Field Inventory.

<u>New England Contractors Only</u>

Upon completion of treatment of a ROW, the contractor must inspect the entire ROW to ensure the work was performed in accordance with this specification. The contractor must complete a “New England Vegetation Management Contractor Final Inspection Form” (Appendix 7) and submit the completed and signed form to a National Grid Vegetation Operations Supervisor. Submittal of this form is required for final payment; therefore, prior to final payment, the Company will require receipt of a completed “New England Vegetation Management Contractor Final Inspection Form”.

5.13 Danger Trees

IVM treatment crews shall routinely check for Danger Trees adjacent to the ROW to assess and identify any Hazard Tree conditions. Hazard Tree conditions, or Danger Tree growth approaching NGMVCD shall be reported to the National Grid Vegetation Operations Supervisor.

5.14. Wetlands and Sensitive Areas

The IVM treatment crew will deploy a cutting crew or point person in advance of the main herbicide application operation to locate and flag the boundaries of these Sensitive Areas and/or the appropriate buffer zones.

5.15 Railroads

Where the Company's ROW parallels or crosses railroad property, and the Contractor elects to gain access to the ROW from railroad property, they shall be responsible for all applicable rules and regulations pertaining thereto.

The contractor must:

- Obtain a permit and/or coordinate work with National Grid to obtain a permit if required, from the railroad near whose tracks he or she will be treating.
- Check with each railroad near whose tracks he or she will be treating to ensure that the contractor carries all insurance which the railroad may require. Contact Vegetation Operations staff if any problems arise.
- Refrain from beginning a treatment whenever a railroad has failed to provide a flagman or has removed the railroad from service. Contact Vegetation Operations staff immediately so that he or she can contact the railroad.

5.16 Native American Lands

The Contractor shall not use herbicides to manage vegetation on Native American reservations without prior, express approval of the National Grid Vegetation Operations Supervisor. Where required to complete work upon reservations, the contractor shall employ the designated Native American personnel for the successful completion of the project. The only reservation with a tentative agreement allowing the use of herbicides in New York is the Seneca Reservation in southwest New York.

5.17. Chainsaw Bar Lubricants

When working within a sensitive area, chainsaw bar lubricants must be a biodegradable product.

5.18 Equipment

The contractor crew supervisor or foreman must be equipped with a cellular telephone. The cellular telephone number must be provided to the division control center.

Applicator crews should carry with them at all times a shovel, a broom, heavy-duty plastic bags or other leak-proof container, absorptive clay and activated charcoal. (Chemical or Universal Spill Kit)

Contractor's equipment, including backup equipment, must be sufficient to maintain the highest practical level of efficiency and effectiveness. Equipment must be maintained in good visual and working condition.

5.19 Site Restoration

Work shall also include grading, mulching, and reseeding of rutted or scarified soils caused by the Contractor's operations when directed by the National Grid Vegetation Operations Supervisor. This shall include repair of all environmental damage, maintenance of stream crossings, wetlands, crop fields, fence lines, etc. which are adversely impacted by the Contractor so as to leave the ROW in as good or better condition than found.

Inclusion of the repair of any previously existing environmental damage, including grading, seeding, mulching, stream, culvert and ditch repair, etc. shall be specified at the time of bidding or completed on a Time and Material basis if required.

6.0 Vegetation Management Practices and Procedures

6.1 Practices and Procedures – Maintenance

6.1.1 ROW Floor Program

A treatment operation generally includes most of the vegetation management methods described in this section. Herbicide treatments, employing herbicides and treatment methods consistent with the sensitivity of the site, shall be the preferred method of vegetation management. Four (4) methods of herbicide treatments are utilized: basal application, cut stump application, cut stubble, and low-volume/high-volume foliar applications.

Treatment is generally carried out in two (2) phases: Preparatory Treatment and Foliar Treatment. These two (2) phases may be carried out separately or simultaneously depending on vegetative conditions or permit requirements for each ROW segment.

National Grid Foresters identify ROW segments to be treated each year in the Annual Work Plan. Field inventories of each ROW segment to be treated are completed by Company Transmission Foresters and provided to the Contractor. Inventory codes used by the New York Transmission Foresters are presented in Appendix 8. If the inventory shows a ROW segment as being maintained by the landowner, the Contractor should still review the property to ensure vegetation maintenance does not need to be performed.

The contractor shall perform an end-to-end inspection at the ROW segment and preparatory treat all vegetation approaching the NGMVCD (Clearance 2) prior to June 1 of a treatment year to assure reliability of the line. Foliar treatment shall be completed prior to October 1 of each year. Certain sites requiring hand cutting, mowing and/or cut stump treatment may be carried out after October 1.

6.1.1.1 Selective Vegetation Management

The Contractor shall treat all capable vegetation listed in Appendix 9, Exhibit A (tall growing trees) within the wire zone and border zone of the ROW.

The contractor shall treat all capable vegetation listed in Appendix 9, Exhibit B (small trees) within the mid-span of the wire zone of the ROW, except where the mature height would not approach the ATVM clearance distance.

Vegetation listed in Appendix 9, Exhibit B will be retained in the border zone of wider ROWs.

Small-medium trees shall also be removed from the wire zone and border zone on narrow ROWs such as sub-transmission.

A height limit of 12 feet is applicable for low-volume backpack foliar treatments. A height limit of 16 feet is applicable for high volume or low volume hydraulic foliar treatments (New York only). Capable hardwood vegetation greater than the heights specified above shall be hand cut and stump treated. Capable hardwood vegetation less than the heights specified above shall be foliar or basal treated.

In sites, due to terrain, conductor height, or other ROW variables, where a normally capable tree will never reach the ATVM clearance distances, such tree may be retained on the ROW during routine maintenance as long as there is no undesirable affect or risk to access, construction, reliability or public safety. These areas must be approved by the National Grid Forester and noted on the inventories. Such locations will be determined through a combination of field measurements, profile mapping or other technology and will also be routinely reviewed and verified during each inventory cycle.

Conifers are generally not treated with herbicides since most species do not resprout. One exception to this general guideline is pine species that do resprout, particularly Pitch Pine, which shall be stump treated. Capable conifers over two (2) feet tall (knee-height) shall be hand cut. Conifer species less than two (2) feet tall may be foliar treated. If there is low stem density of capable conifers, or a large area of capable conifers, speak with a National Grid Forester to see if foliar treatment can be used. Herbicides cannot be applied to any conifer species within and ten (10) feet from wetlands.

6.1.1.2 Non-Selective Vegetation Management

All vines growing on gates, guys, poles and towers shall be treated.

For guys, poles and towers:

New England: All woody vegetation species growing within **ten (10) feet** of guys, poles and towers shall be cut and stump treated where site conditions permit. All herbaceous species, except for grasses, growing within ten (10) feet of guys, poles and towers shall be foliar treated where site conditions permit. Wherever practicable, grape vines shall be treated with low-volume basal or low-volume foliar method.

New York:..... All woody vegetation species growing within **ten (10) feet** of guys, poles and towers shall be cleared and treated, using the treatment technique being applied to the surrounding site. Wherever practicable, grape vines shall be treated with low-volume basal or low-volume foliar method.

All trees and shrubs growing within the established or designated access road(s) along the ROW shall be treated to provide an access route **15 feet** in width. This includes the access way to all gates. Where there is no established access road, a route shall be designated and/or approved by the National Grid Forester, and the Contractor shall clear the same, unless property rights or environmental concerns prevail. Where multiple improved access roads exist within the ROW, the Contractor shall maintain all roads.

Treatments will also extend around the perimeter of any substations within **five (5) feet** of fence line and along short side taps associated with the ROW segment.

6.1.1.3 Vegetation Management in Visual Buffers

Where capable vegetation, listed in Appendix 9 Exhibits A and B, cannot be removed, generally trees that are visual buffers, in yards and road crossings, said vegetation shall be pruned to the ATVM clearance distances shown in Appendix 10. The specific maintenance technique is specified in the Field Inventory.

6.1.1.4 Vegetation Management in Protective Buffers

The size/dimensions of protective buffers are generally specified in state level plans/permits. Capable vegetation in protective buffers is hand cut or mowed as specified in the Field Inventory.

6.2 Vegetation Management Techniques

6.2.1 Herbicides

6.2.1.1 Stump Application (Cut Surface)

After the stem of the capable species is cut, apply herbicide with a squirt bottle or backpack sprayer. When treatments are interrupted by rain, resume the treatment only after the rain ends. Resume treatment at the point where it was interrupted.

This method includes the application of an approved herbicide product to the cut surface and/or stump of a recently cut stem. This method is utilized within sites of environmental, aesthetic or public sensitivity.

6.2.1.2 Basal Application

Apply basal treatments with basal wands. Keep pump pressures at the minimum required to adequately cover the capable species. When treatments are interrupted by rain, resume the treatment only after the rain ends. Resume treatment at the point where it was interrupted once it is observed that the lower stem of the capable species is predominantly dry.

This method includes the application of an approved herbicide product to the base of the capable stem for a distance of up to 18 inches. This method is utilized within sites of higher environmental, aesthetic or public sensitivity where cut and stump treatment would not be as effective in controlling capable species.

6.2.1.3 Foliar Application

When applying foliar treatments on the edge of the treatment area, (forest edge, site borders) spray herbicide toward the center of the ROW in order to prevent off-site drift.

Keep pump pressures at the minimum required to adequately cover the capable species. When herbicide treatments are interrupted by rain, resume the treatment only after the rain ends. Resume treatments after active leaf runoff has ended and then re-treat those portions of the site that were treated within approximately four (4) hours before the rain started.

Do not apply foliar treatments during windy periods when spray material has a high propensity to drift or if standing water is present under the capable species (Operations in adverse weather conditions is detailed in section 7.3).

High Volume and Low Volume Hydraulic Application (NY only)
This method includes treatments of water-borne herbicide mixtures, using hydraulic spray tanks, mounted on all-terrain units such as pickup trucks, skidders, tracked units, four-wheel all terrain vehicles (ATVs), etc. The applicator should be within ten (10) feet of the capable species in order to maximize the accuracy of the application and minimize off-target damage.

Low Volume Backpack Applications
This method includes light and very light applications of more concentrated herbicide mixtures, using hand-operated backpacks, to selectively deliver the herbicide mixture to the capable species.

This method is especially preferred for its highly selective control in areas that are suitable for foliar treatments but not accessible to or appropriate for treatment with hydraulic units.

6.2.2 Mechanical

6.2.2.1 Hand Cutting

Hand cutting is generally the method of choice where herbicides cannot be applied or where capable vegetation exceeds certain specified heights (see Section 6.1.1.1).

Cut stems parallel to slope as close to the ground as practical. Do not leave stumps that exceed three (3) inches in height.

6.2.2.2 Mowing

Use extreme care in order to provide for the safety of workers and the general public. Crews need to mark all obstructions including poles and guy wires with flagging and hand cut all woody growth from around the area within 15 feet. Provide a mechanism, such as a buffer to shield operations that are carried out close to residences or high public use areas. Cut stumps as close to the ground as practical, making sure that stumps do not exceed three (3) inches in height unless otherwise directed by National Grid Forestry staff.

6.2.2.3 Selective Mowing

Selective mowing shall mean mowing small areas of high-density capable species such as extensive Sumac, Buckthorn or Multi-flora Rose, particularly in wire zone mid-spans, or dense woody vegetation encroaching upon roadways or trails to structures.

6.2.2.4 Pruning

Pruning may be required in order to achieve ATVM clearances between the line conductors and vegetation. Sites requiring pruning could include:

- At designated road crossings, or designated portions of lines along high use public roads.
- Along the edge of the cleared ROW where, in order to obtain required conductor clearances specified in Section 4.3, side pruning or removal of danger trees is required. The pruning and/or removal of danger trees located beyond the limits of the ROW may be specified on the Field Inventory or in a separate document.
- On designated portions of lines passing through natural preserves, or public or private parks.
- On designated portions of lines passing over ridges or other exposed views of the ROW in areas of high aesthetic value.
- In general, along all or part of the route of the line when removal of vegetation is to be minimized consistent with reliable line operation.

Pruning shall be carried on in accordance with the ANSI A-300 standard.

6.3 Management of Wood and Brush (Slash)

Wood and brush slash may be generated during vegetation management activities. In general, where tree removal or pruning, or mechanized clearing is required, the brush that has been cut (diced) may be left where it falls after being cut so as to lie close to the ground. Length of diced stems or branches should not exceed ten (10) feet; height of diced slash should not exceed two (2) feet.

Near public roads or private roads, residential or commercial areas, parks, streams, on access roads, or in any sensitive areas indicated in the Field Inventory, the brush shall be disposed of by either chipping or removal to a suitable location within the ROW and neatly piled, windrowed or dispersed. The site-specific slash disposal method is identified in the Field Inventory.

When chipping is required, the chips may be disposed of by dispersing on site in non-sensitive areas. Chips shall be removed from areas of more intense landscape management such as lawns.

Where trees and limbs larger than four (4) inches in diameter at the small end are removed and the designated slash disposal is a windrow, the wood shall be neatly piled on the site, taking care not to block any access roads used by either the property owner or the Company. When the authorized slash disposal method is chipping, it may be necessary to remove the larger wood from the site to another approved area of the ROW and piled neatly, or moved to an approved off ROW disposal site.

No burning of wood or brush will be permitted unless specifically authorized by the National Grid Forestry Staff.

All species of wild cherry (Prunus serotina, P. virginiana, P. pennsylvanica) that are cut or treated during the growing season can become toxic to livestock during the wilting stage of the leaves. In addition, several species of Maple (Acer) have been identified as toxic to horses in the wilting stage. Therefore, Maple and Cherry stems, which are cut or treated in active pastures, shall be immediately removed from the pasture following clearing, or arrangements made with the farmer to utilize alternate pastures until the wilting stage and hazard has passed.

Contractors shall comply with all applicable laws and guidelines pertinent to invasive species and their management, as set forth by government entities and National Grid.

6.4 Mitigation of Impacts

If, during their operations, the Contractor causes any damage to occur to the land such as deep ruts or scarified areas, which in the opinion of the National Grid Forester could cause future erosion or interfere with access for line maintenance, the Contractor shall re-grade the site to original contours, and seed and mulch as required. Areas where erosion occurs during vegetation management operations will be restored per National Grid companies' policies.

The Contractor shall take reasonable precautions not to remove or damage existing low-growing vegetation, either natural or planted, which are to be preserved on the ROW. Where road crossing buffer vegetation, either natural or planted, has been damaged beyond reasonable repair because of the Contractor's negligence, this vegetation will be replaced at the Contractor's expense.

The Contractor shall take care not to rut or scarify the ROW for the duration of their operation. All environmental damage resulting from the Contractor's operation shall be permanently repaired at the Contractor's sole expense.

Mobile equipment shall not intrude into road crossing buffers, stream buffer zones or pruning areas, except on designated access routes. When a tree that has been cut must be removed from such an area, it must first be limbed and the brush hand carried to the chipping location or pile site. The trunk wood may be removed by means of a winch line taking adequate care to avoid damaging residual vegetation.

In certain areas, where feasible and advantageous, the National Grid Forester may authorize the use of aerial lifts and other specialized equipment, in road crossing buffers for the purpose of pruning trees, and disposal. In no case, however, will any vegetation be cleared or any new road be authorized, other than the approved access road through the screen to facilitate the use of this equipment.

The Contractor shall take adequate precautions to protect the watercourses and wetlands from pollution and shall avoid disturbing streambeds and banks and the low-growing vegetation protecting them. Felling vegetation in or across a watercourse (such as a river, stream, or brook), should be avoided. Vegetation that is felled into a watercourse shall be removed as soon as possible and placed on high ground. Brush chipping shall be performed in such a manner that the

chipped material shall not enter any watercourse or wetland area, nor accumulate in excess of four (4) inches in depth at any location.

7.0 Work Precautions

7.1 Safety

As a contractual term, National Grid requires all contractors to comply with all appropriate state and federal safety laws and regulations. This includes applicable sections of the Occupational Safety and Health Act (OSHA) and all worker safety-related statements and instructions on the herbicide label.

It shall be understood and agreed to by the Contractor that herbicide application, hand cutting, pruning and clearing near existing transmission and distribution lines shall be undertaken while lines are presumed to be energized and operating at voltages up to and including 345kV AC and 450kV DC. The Contractor shall provide competent, trained personnel to complete the work.

In order to insure the safety of their employees, the general public and continuity of service in the energized lines, the Contractor shall exercise extraordinary precautions in removing trees and tree limbs that are in such close proximity to the conductors as to constitute a hazard. Such trees shall be pruned, removed with the aid of ropes, or taken down one (1) section at a time.

National Grid's safety requirements are included in service procurement documentation and contracts with selected contractors.

In addition, all vegetation management work shall be carried out in compliance with ANSI Z133.1, American National Standards Institute, Standard for Arboricultural Operations – Safety Requirements.

7.2 Sensitive Areas

Sensitive areas are defined as areas on a ROW where legal, visual or environmental impacts/concerns require compromises to the general vegetation maintenance activities. Sensitive areas include: public surface, public well and private well drinking water supplies; lakes, ponds, rivers, streams, and any other surface waters; wetlands; endangered species sites; agricultural areas including croplands, orchards, tree plantations and animal pastures; buffers at road crossings; buffers at residential and/or commercial yards; and easement restrictions and/or landowner agreements.

These sensitive areas have varying legal definitions in each of the states in which National Grid companies have transmission and distribution facilities. Permits for IVM activities in these states vary as well. For purposes of this document, sensitive areas and vegetation management within them are discussed in a general way.

In some sensitive areas restrictions for use of herbicides may exist including in wetlands; endangered species sites; agricultural areas including croplands,

orchards, tree plantations and animal pastures. Hand cutting and limited herbicide applications may be required in these areas.

The IVM treatment crew will deploy a cutting crew or point person in advance of the main herbicide application operation to visually locate the boundaries of these sensitive areas and/or the appropriate buffer zones.

7.3 Weather

Herbicide application will be restricted during certain adverse weather conditions such as rain, wind or deep snow.

Herbicide applications will not be made during periods of moderate or heavy rainfall.

Foliar applications are effective in light mist situations; however, any measurable rainfall that creates leaf runoff will wash the herbicide off the capable species. If foliar applications are interrupted by unexpected rainfall, the treatment will not resume until the rain ends and active leaf runoff has ceased.

Basal applications are ineffective during measurable rainfall. Basal applications that are interrupted by rainfall will not be resumed until the lower stem of the capable species is predominately dry.

Excessive wind can create drift during foliar applications. Significant herbicide drift can cause damage to desirable vegetation on or off the ROW. Basal or cut-stump treatments are much less affected by wind because they are applied in such close proximity to the ground.

To prevent any significant off-target drift of herbicides, the applicator will comply with the following restrictions:

a. During periods of wind, which are strong enough to bend the tops of the main stems of tree species on the ROW, the contractor crew supervisor will periodically observe the application of the foliar treatment to insure that there is no significant movement of the herbicide solution. If the supervisor can see the solution moving off the capable species, applications will immediately stop until the wind has subsided enough to permit further applications.

b. All herbicide solutions to be used for a foliar application will contain low-drift agents. Low-drift agents will be added to the foliar herbicide solution as per the low-drift agent label. In moderate wind conditions, as per label recommendations, more low-drift agent may be added at the discretion of the contractor supervisor to control significant drift.

7.4 Wetlands

IVM methods using herbicides on ROWs in wetlands have come to be accepted in several states. Tall growing trees generally only occur in wooded swamps; or areas that are dry for long enough periods each year to support tree growth. Emergent wetlands including: wet meadows, cattail swamps, shrub swamps and

bogs, generally do not support tree growth and; therefore, do not require management of vegetation. Occasional high ground or hummocks within emergent wetlands may support tree growth and are hand cut. In addition, herbicide use within wetlands is always limited by the presence of surface water including: lakes, ponds, rivers, streams, seasonal ponds and streams, and flood storage following heavy rainfall. These buffer zones clearly prevent use of herbicides within or in close proximity to surface water unless labeled for and permitted.

R-I-9

Request:

Provide a specific list of all circuits impacted, in executable format, including:

a. Region
b. Substation
c. Circuit number
d. Voltage
e. Initial outage time and date
f. Time and date of field assessment and any subsequent assessments
g. Time and date that crews were dispatched to restore service
h. Description of required crews (tree and/or line), and whether crews were National Grid employees or contractors.
i. Time and date that crews commenced restoration work
j. Time and date that restoration was completed
k. Total time required to complete restoration
l. Description of restoration work
m. Total outage duration
n. Number of customers impacted at peak of the outage
o. Total number of customers served
p. Detailed cause of outage
q. Most recent date (month/year) that National Grid cleared the right-of-way
r. Most recent date (month/year) that Enhanced Hazard Tree Mitigation (EHTM) was performed
s. Number of poles replaced due to storm impacts
t. Number of transformers replaced due to storm impacts
u. Miles of downed conductor replaced or reinstalled
v. Number of downed trees

Response:

Please see Attachment R-I-9 for the requested information. On Attachment R-I-9, the tab entitled "Outage Data" responds to parts (a)-(r) and (v); and the tab entitled "Asset Replacement" responds to parts (s)-(u). The remaining tabs on Attachment R-I-9 provide additional information, specifically forestry information, in response to parts (g) and (h).

Please note the following about the attachments:

R-I-9

Some of the outages listed do not have all of the data fields populated, as such data points are not typically tracked at the outage level within the Company's Outage Management System.

The response to part (v) has been intentionally left blank because the Company does not track that data.

For the parts specified below, the Company has responded with the best estimate from data within the Outage Management System.

- Part (g) – in some cases, multiple crews were assigned to an outage. This field shows the time the earliest crew was assigned or dispatched.
- Part (h) – this field shows all types of crews assigned to the outage order. The Company does not track every crew that may have worked on the outage.
- Part (i) – this field is populated if the control room issued switching orders to the field crews during restoration. No restoration start times are available for work off the feeder mainline where crews can perform work without switching orders.
- Part (k) – this field is calculated against the restoration commencement time if there were switching orders, or against the dispatch time if there were no switching orders. The field is blank if there is no record of a dispatch time or switching orders.
- Parts (s)-(u) – the Company tracks this data at the town level, not at the feeder level.

Prepared by or under the supervision of: Daniel Bunszell

R-I-10

Request:

For each individual impacted circuit and for the total system, provide a chronological outage restoration assessment to include the hour by hour number of customers out. This should show the outage restoration progress.

Response:

Please see Attachment R-I-10 for a chronology of (1) customer outages for the Company's Capital and Coastal regions and for the total system; and (2) customer outages for each feeder affected.

Prepared by or under the supervision of: Michael G. McCallan

	Hour 0	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	Hour 9	Hour 10
	10/29/2017 0:00	10/29/2017 1:00	10/29/2017 2:00	10/29/2017 3:00	10/29/2017 4:00	10/29/2017 5:00	10/29/2017 6:00	10/29/2017 7:00	10/29/2017 8:00	10/29/2017 9:00	10/29/2017 10:00
Capital	0	0	3,573	1,318	0	0	0	0	0	0	0
Coastal	0	0	0	0	0	0	0	73	84	85	85
ALL company	0	0	3573	1318	0	0	0	73	84	85	85

Hour 11	Hour 12	Hour 13	Hour 14	Hour 15	Hour 16	Hour 17	Hour 18	Hour 19	Hour 20	Hour 21
10/29/2017 11:00	10/29/2017 12:00	10/29/2017 13:00	10/29/2017 14:00	10/29/2017 15:00	10/29/2017 16:00	10/29/2017 17:00	10/29/2017 18:00	10/29/2017 19:00	10/29/2017 20:00	10/29/2017 21:00
0	0	0	0	0	11	0	5	0	70	289
74	73	156	156	156	156	156	156	192	195	440
74	73	156	156	156	167	156	161	192	265	729

Hour 22	Hour 23	Hour 24	Hour 25	Hour 26	Hour 27	Hour 28	Hour 29	Hour 30	Hour 31	Hour 32	Hour 33
10/29/2017 22:00	10/29/2017 23:00	10/30/2017 0:00	10/30/2017 1:00	10/30/2017 2:00	10/30/2017 3:00	10/30/2017 4:00	10/30/2017 5:00	10/30/2017 6:00	10/30/2017 7:00	10/30/2017 8:00	10/30/2017 9:00
1,257	10,358	27,535	64,811	70,850	71,762	73,198	73,269	72,884	72,271	77,882	76,870
10289	36515	53835	61814	64237	64345	62196	62389	61351	62032	62847	62005
11546	46873	81370	126625	135087	136107	135394	135658	134235	134303	140729	138875

Hour 34	Hour 35	Hour 36	Hour 37	Hour 38	Hour 39	Hour 40	Hour 41	Hour 42	Hour 43	Hour 44
10/30/2017 10:00	10/30/2017 11:00	10/30/2017 12:00	10/30/2017 13:00	10/30/2017 14:00	10/30/2017 15:00	10/30/2017 16:00	10/30/2017 17:00	10/30/2017 18:00	10/30/2017 19:00	10/30/2017 20:00
82,104	81,390	81,420	77,347	77,029	76,010	75,078	74,665	74,542	70,395	67,941
59798	59097	59068	56888	53508	52567	49906	47538	47210	47069	46912
141902	140487	140488	134235	130537	128577	124984	122203	121752	117464	114853

Hour 45	Hour 46	Hour 47	Hour 48	Hour 49	Hour 50	Hour 51	Hour 52	Hour 53	Hour 54	Hour 55
10/30/2017 21:00	10/30/2017 22:00	10/30/2017 23:00	10/31/2017 0:00	10/31/2017 1:00	10/31/2017 2:00	10/31/2017 3:00	10/31/2017 4:00	10/31/2017 5:00	10/31/2017 6:00	10/31/2017 7:00
59,955	59,337	55,908	53,429	50,580	48,730	45,590	43,393	41,662	40,560	39,534
46508	42266	41870	38482	38218	38220	38177	36546	34506	33467	32907
106463	101603	97778	91911	88798	86950	83767	79939	76168	74027	72441

Hour 56	Hour 57	Hour 58	Hour 59	Hour 60	Hour 61	Hour 62	Hour 63	Hour 64	Hour 65	Hour 66
10/31/2017 8:00	10/31/2017 9:00	10/31/2017 10:00	10/31/2017 11:00	10/31/2017 12:00	10/31/2017 13:00	10/31/2017 14:00	10/31/2017 15:00	10/31/2017 16:00	10/31/2017 17:00	10/31/2017 18:00
39,309	39,324	37,827	35,685	30,840	28,511	28,171	27,781	24,695	24,400	22,602
32959	32562	31997	31418	29269	28172	27574	26599	24771	24523	22876
72268	71886	69824	67103	60109	56683	55745	54380	49466	48923	45478

Hour 67	Hour 68	Hour 69	Hour 70	Hour 71	Hour 72	Hour 73	Hour 74	Hour 75	Hour 76	Hour 77	Hour 78
10/31/2017 19:00	10/31/2017 20:00	10/31/2017 21:00	10/31/2017 22:00	10/31/2017 23:00	11/1/2017 0:00	11/1/2017 1:00	11/1/2017 2:00	11/1/2017 3:00	11/1/2017 4:00	11/1/2017 5:00	11/1/2017 6:00
22,376	21,182	19,156	17,015	16,559	16,564	15,000	14,483	14,083	13,387	13,393	12,952
22643	22372	22098	21578	21329	21331	21324	21325	19471	19233	18138	18122
45019	43554	41254	38593	37888	37895	36324	35808	33554	32620	31531	31074

Hour 79	Hour 80	Hour 81	Hour 82	Hour 83	Hour 84	Hour 85	Hour 86	Hour 87	Hour 88	Hour 89	Hour 90
11/1/2017 7:00	11/1/2017 8:00	11/1/2017 9:00	11/1/2017 10:00	11/1/2017 11:00	11/1/2017 12:00	11/1/2017 13:00	11/1/2017 14:00	11/1/2017 15:00	11/1/2017 16:00	11/1/2017 17:00	11/1/2017 18:00
12,583	12,290	12,168	10,847	10,044	9,618	9,593	9,006	8,572	6,945	6,609	6,122
17594	17601	17257	16916	16599	16402	15937	14950	14634	13734	12661	10275
30177	29891	29425	27763	26643	26020	25530	23956	23206	20679	19270	16397

Hour 91	Hour 92	Hour 93	Hour 94	Hour 95	Hour 96	Hour 97	Hour 98	Hour 99	Hour 100	Hour 101	Hour 102
11/1/2017 19:00	11/1/2017 20:00	11/1/2017 21:00	11/1/2017 22:00	11/1/2017 23:00	11/2/2017 0:00	11/2/2017 1:00	11/2/2017 2:00	11/2/2017 3:00	11/2/2017 4:00	11/2/2017 5:00	11/2/2017 6:00
5,886	5,441	5,227	4,918	4,836	4,837	4,719	4,676	4,638	4,638	4,638	4,516
10272	9570	9032	8866	8494	8423	8368	8366	8334	8135	8134	7271
16158	15011	14259	13784	13330	13260	13087	13042	12972	12773	12772	11787

Hour 103	Hour 104	Hour 105	Hour 106	Hour 107	Hour 108	Hour 109	Hour 110	Hour 111	Hour 112	Hour 113	Hour 114
11/2/2017 7:00	11/2/2017 8:00	11/2/2017 9:00	11/2/2017 10:00	11/2/2017 11:00	11/2/2017 12:00	11/2/2017 13:00	11/2/2017 14:00	11/2/2017 15:00	11/2/2017 16:00	11/2/2017 17:00	11/2/2017 18:00
4,321	4,015	3,958	3,481	3,189	2,945	2,749	2,680	2,328	2,167	2,081	1,575
7222	6754	6638	5668	5249	5064	5164	4257	3772	3473	2924	2515
11543	10769	10596	9149	8438	8009	7913	6937	6100	5640	5005	4090

Hour 115	Hour 116	Hour 117	Hour 118	Hour 119	Hour 120	Hour 121	Hour 122	Hour 123	Hour 124	Hour 125	Hour 126
11/2/2017 19:00	11/2/2017 20:00	11/2/2017 21:00	11/2/2017 22:00	11/2/2017 23:00	11/3/2017 0:00	11/3/2017 1:00	11/3/2017 2:00	11/3/2017 3:00	11/3/2017 4:00	11/3/2017 5:00	11/3/2017 6:00
1,542	1,487	1,460	1,085	1,043	888	777	779	557	475	472	469
2255	2078	2092	1865	1564	1466	1399	1388	1387	1331	1234	1239
3797	3565	3552	2950	2607	2354	2176	2167	1944	1806	1706	1708

Hour 127	Hour 128	Hour 129	Hour 130	Hour 131	Hour 132	Hour 133	Hour 134	Hour 135	Hour 136	Hour 137	Hour 138
11/3/2017 7:00	11/3/2017 8:00	11/3/2017 9:00	11/3/2017 10:00	11/3/2017 11:00	11/3/2017 12:00	11/3/2017 13:00	11/3/2017 14:00	11/3/2017 15:00	11/3/2017 16:00	11/3/2017 17:00	11/3/2017 18:00
567	367	370	303	279	244	240	225	219	130	89	114
1169	1158	1118	890	703	982	450	393	877	427	284	103
1736	1525	1488	1193	982	1226	690	618	1096	557	373	217

Hour 139	Hour 140	Hour 141	Hour 142	Hour 143	Hour 144	Hour 145	Hour 146	Hour 147	Hour 148	Hour 149	Hour 150
11/3/2017 19:00	11/3/2017 20:00	11/3/2017 21:00	11/3/2017 22:00	11/3/2017 23:00	11/4/2017 0:00	11/4/2017 1:00	11/4/2017 2:00	11/4/2017 3:00	11/4/2017 4:00	11/4/2017 5:00	11/4/2017 6:00
39	133	33	29	10	8	8	7	7	7	5	5
50	29	19	55	54	54	13	10	9	9	72	72
89	162	52	84	64	62	21	17	16	16	77	77

Hour 151	Hour 152	Hour 153	Hour 154	Hour 155	Hour 156	Hour 157	Hour 158	Hour 159	Hour 160	Hour 161	Hour 162
11/4/2017 7:00	11/4/2017 8:00	11/4/2017 9:00	11/4/2017 10:00	11/4/2017 11:00	11/4/2017 12:00	11/4/2017 13:00	11/4/2017 14:00	11/4/2017 15:00	11/4/2017 16:00	11/4/2017 17:00	11/4/2017 18:00
5	2	4	3	71	2	3	2	2	1	3	3
72	72	557	10	27	28	23	20	2	1	0	0
77	74	561	13	98	30	26	22	4	2	3	3

Hour 163	Hour 164	Hour 165	Hour 166	Hour 167
11/4/2017 19:00	11/4/2017 20:00	11/4/2017 21:00	11/4/2017 22:00	11/4/2017 23:00
2	2	3	3	1
0	1	1	1	0
2	3	4	4	1

Region	Feeder	Hour 0	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	Hour 9
		10/29/2017 0:00	10/29/2017 1:00	10/29/2017 2:00	10/29/2017 3:00	10/29/2017 4:00	10/29/2017 5:00	10/29/2017 6:00	10/29/2017 7:00	10/29/2017 8:00	10/29/2017 9:00
Capital	53-102W44	0	0	0	0	0	0	0	0	0	0
Capital	53-102W51	0	0	0	0	0	0	0	0	0	0
Capital	53-102W52	0	0	0	0	0	0	0	0	0	0
Capital	53-102W54	0	0	0	0	0	0	0	0	0	0
Capital	53-104J1	0	0	0	0	0	0	0	0	0	0
Capital	53-104J7	0	0	0	0	0	0	0	0	0	0
Capital	53-105K1	0	0	0	0	0	0	0	0	0	0
Capital	53-106J3	0	0	0	0	0	0	0	0	0	0
Capital	53-107W51	0	0	0	0	0	0	0	0	0	0
Capital	53-107W60	0	0	0	0	0	0	0	0	0	0
Capital	53-107W61	0	0	0	0	0	0	0	0	0	0
Capital	53-107W63	0	0	0	0	0	0	0	0	0	0
Capital	53-107W65	0	0	0	0	0	0	0	0	0	0
Capital	53-107W80	0	0	0	0	0	0	0	0	0	0
Capital	53-107W81	0	0	0	0	0	0	0	0	0	0
Capital	53-107W83	0	0	0	0	0	0	0	0	0	0
Capital	53-107W84	0	0	0	0	0	0	0	0	0	0
Capital	53-108W62	0	0	7	7	0	0	0	0	0	0
Capital	53-108W63	0	0	0	0	0	0	0	0	0	0
Capital	53-108W65	0	0	3,566	1,311	0	0	0	0	0	0
Capital	53-109J3	0	0	0	0	0	0	0	0	0	0
Capital	53-111J3	0	0	0	0	0	0	0	0	0	0
Capital	53-112W41	0	0	0	0	0	0	0	0	0	0
Capital	53-112W42	0	0	0	0	0	0	0	0	0	0
Capital	53-112W43	0	0	0	0	0	0	0	0	0	0
Capital	53-112W44	0	0	0	0	0	0	0	0	0	0
Capital	53-126W40	0	0	0	0	0	0	0	0	0	0
Capital	53-126W41	0	0	0	0	0	0	0	0	0	0
Capital	53-126W42	0	0	0	0	0	0	0	0	0	0
Capital	53-126W50	0	0	0	0	0	0	0	0	0	0
Capital	53-126W51	0	0	0	0	0	0	0	0	0	0
Capital	53-126W54	0	0	0	0	0	0	0	0	0	0
Capital	53-127W40	0	0	0	0	0	0	0	0	0	0

Capital	53-127W41	0	0	0	0	0	0	0	0	0	0
Capital	53-127W42	0	0	0	0	0	0	0	0	0	0
Capital	53-12J4	0	0	0	0	0	0	0	0	0	0
Capital	53-13F10	0	0	0	0	0	0	0	0	0	0
Capital	53-13F3	0	0	0	0	0	0	0	0	0	0
Capital	53-13F4	0	0	0	0	0	0	0	0	0	0
Capital	53-13F5	0	0	0	0	0	0	0	0	0	0
Capital	53-148J1	0	0	0	0	0	0	0	0	0	0
Capital	53-148J7	0	0	0	0	0	0	0	0	0	0
Capital	53-15F1	0	0	0	0	0	0	0	0	0	0
Capital	53-15F2	0	0	0	0	0	0	0	0	0	0
Capital	53-18F10	0	0	0	0	0	0	0	0	0	0
Capital	53-18F11	0	0	0	0	0	0	0	0	0	0
Capital	53-18F13	0	0	0	0	0	0	0	0	0	0
Capital	53-18F5	0	0	0	0	0	0	0	0	0	0
Capital	53-18F6	0	0	0	0	0	0	0	0	0	0
Capital	53-18F7	0	0	0	0	0	0	0	0	0	0
Capital	53-18F8	0	0	0	0	0	0	0	0	0	0
Capital	53-18F9	0	0	0	0	0	0	0	0	0	0
Capital	53-20F1	0	0	0	0	0	0	0	0	0	0
Capital	53-20F2	0	0	0	0	0	0	0	0	0	0
Capital	53-21F1	0	0	0	0	0	0	0	0	0	0
Capital	53-21F2	0	0	0	0	0	0	0	0	0	0
Capital	53-21F4	0	0	0	0	0	0	0	0	0	0
Capital	53-2211	0	0	0	0	0	0	0	0	0	0
Capital	53-2227	0	0	0	0	0	0	0	0	0	0
Capital	53-2228	0	0	0	0	0	0	0	0	0	0
Capital	53-2228_ELM	0	0	0	0	0	0	0	0	0	0
Capital	53-2229	0	0	0	0	0	0	0	0	0	0
Capital	53-2242	0	0	0	0	0	0	0	0	0	0
Capital	53-2243	0	0	0	0	0	0	0	0	0	0
Capital	53-23F1	0	0	0	0	0	0	0	0	0	0
Capital	53-23F2	0	0	0	0	0	0	0	0	0	0
Capital	53-23F3	0	0	0	0	0	0	0	0	0	0
Capital	53-23F4	0	0	0	0	0	0	0	0	0	0
Capital	53-23F6	0	0	0	0	0	0	0	0	0	0
Capital	53-26W1	0	0	0	0	0	0	0	0	0	0

Capital	53-26W3	0	0	0	0	0	0	0	0	0	0
Capital	53-26W5	0	0	0	0	0	0	0	0	0	0
Capital	53-26W7	0	0	0	0	0	0	0	0	0	0
Capital	53-27F1	0	0	0	0	0	0	0	0	0	0
Capital	53-27F2	0	0	0	0	0	0	0	0	0	0
Capital	53-27F5	0	0	0	0	0	0	0	0	0	0
Capital	53-2J7	0	0	0	0	0	0	0	0	0	0
Capital	53-34F1	0	0	0	0	0	0	0	0	0	0
Capital	53-34F2	0	0	0	0	0	0	0	0	0	0
Capital	53-34F3	0	0	0	0	0	0	0	0	0	0
Capital	53-36J1	0	0	0	0	0	0	0	0	0	0
Capital	53-36J2	0	0	0	0	0	0	0	0	0	0
Capital	53-36J4	0	0	0	0	0	0	0	0	0	0
Capital	53-36J5	0	0	0	0	0	0	0	0	0	0
Capital	53-37J1	0	0	0	0	0	0	0	0	0	0
Capital	53-37J2	0	0	0	0	0	0	0	0	0	0
Capital	53-37J4	0	0	0	0	0	0	0	0	0	0
Capital	53-37J5	0	0	0	0	0	0	0	0	0	0
Capital	53-38F1	0	0	0	0	0	0	0	0	0	0
Capital	53-38F2	0	0	0	0	0	0	0	0	0	0
Capital	53-38F3	0	0	0	0	0	0	0	0	0	0
Capital	53-38F4	0	0	0	0	0	0	0	0	0	0
Capital	53-38F5	0	0	0	0	0	0	0	0	0	0
Capital	53-38F6	0	0	0	0	0	0	0	0	0	0
Capital	53-45F2	0	0	0	0	0	0	0	0	0	0
Capital	53-47J2	0	0	0	0	0	0	0	0	0	0
Capital	53-47J4	0	0	0	0	0	0	0	0	0	0
Capital	53-48F1	0	0	0	0	0	0	0	0	0	0
Capital	53-48F3	0	0	0	0	0	0	0	0	0	0
Capital	53-48F4	0	0	0	0	0	0	0	0	0	0
Capital	53-48F6	0	0	0	0	0	0	0	0	0	0
Capital	53-4F1	0	0	0	0	0	0	0	0	0	0
Capital	53-4F2	0	0	0	0	0	0	0	0	0	0
Capital	53-50F2	0	0	0	0	0	0	0	0	0	0
Capital	53-50J1	0	0	0	0	0	0	0	0	0	0
Capital	53-50J2	0	0	0	0	0	0	0	0	0	0
Capital	53-50J3	0	0	0	0	0	0	0	0	0	0

Capital	53-51F1	0	0	0	0	0	0	0	0	0	0
Capital	53-51F2	0	0	0	0	0	0	0	0	0	0
Capital	53-51F3	0	0	0	0	0	0	0	0	0	0
Capital	53-5F1	0	0	0	0	0	0	0	0	0	0
Capital	53-5F2	0	0	0	0	0	0	0	0	0	0
Capital	53-5F3	0	0	0	0	0	0	0	0	0	0
Capital	53-5F4	0	0	0	0	0	0	0	0	0	0
Capital	53-66J3	0	0	0	0	0	0	0	0	0	0
Capital	53-66J4	0	0	0	0	0	0	0	0	0	0
Capital	53-66J5	0	0	0	0	0	0	0	0	0	0
Capital	53-67J1	0	0	0	0	0	0	0	0	0	0
Capital	53-69F1	0	0	0	0	0	0	0	0	0	0
Capital	53-69F3	0	0	0	0	0	0	0	0	0	0
Capital	53-6J8	0	0	0	0	0	0	0	0	0	0
Capital	53-71J1	0	0	0	0	0	0	0	0	0	0
Capital	53-71J5	0	0	0	0	0	0	0	0	0	0
Capital	53-73J1	0	0	0	0	0	0	0	0	0	0
Capital	53-76F1	0	0	0	0	0	0	0	0	0	0
Capital	53-76F2	0	0	0	0	0	0	0	0	0	0
Capital	53-76F5	0	0	0	0	0	0	0	0	0	0
Capital	53-76F7	0	0	0	0	0	0	0	0	0	0
Capital	53-76F8	0	0	0	0	0	0	0	0	0	0
Capital	53-77J2	0	0	0	0	0	0	0	0	0	0
Capital	53-77J3	0	0	0	0	0	0	0	0	0	0
Capital	53-77J4	0	0	0	0	0	0	0	0	0	0
Capital	53-78F3	0	0	0	0	0	0	0	0	0	0
Capital	53-78F4	0	0	0	0	0	0	0	0	0	0
Capital	53-79F2	0	0	0	0	0	0	0	0	0	0
Capital	53-7F1	0	0	0	0	0	0	0	0	0	0
Capital	53-7F2	0	0	0	0	0	0	0	0	0	0
Capital	53-7F4	0	0	0	0	0	0	0	0	0	0
Coastal	56-100F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-122J4	0	0	0	0	0	0	0	0	0	0
Coastal	56-131J2	0	0	0	0	0	0	0	0	0	0
Coastal	56-14F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-14F2	0	0	0	0	0	0	0	0	0	0
Coastal	56-14F3	0	0	0	0	0	0	0	0	0	0

Coastal	56-154J14	0	0	0	0	0	0	0	0	0	0
Coastal	56-16F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-16F2	0	0	0	0	0	0	0	0	0	0
Coastal	56-16F3	0	0	0	0	0	0	0	0	0	0
Coastal	56-16F4	0	0	0	0	0	0	0	0	0	0
Coastal	56-17F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-17F2	0	0	0	0	0	0	0	0	0	0
Coastal	56-17F3	0	0	0	0	0	0	0	0	0	0
Coastal	56-19J2	0	0	0	0	0	0	0	0	0	0
Coastal	56-21J4	0	0	0	0	0	0	0	0	0	0
Coastal	56-21J6	0	0	0	0	0	0	0	0	0	0
Coastal	56-2222	0	0	0	0	0	0	0	0	0	0
Coastal	56-2224	0	0	0	0	0	0	0	0	0	0
Coastal	56-2230	0	0	0	0	0	0	0	0	0	0
Coastal	56-2262	0	0	0	0	0	0	0	0	0	0
Coastal	56-22F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-22F2	0	0	0	0	0	0	0	0	0	0
Coastal	56-22F3	0	0	0	0	0	0	0	0	11	11
Coastal	56-22F6	0	0	0	0	0	0	0	0	0	0
Coastal	56-23J14	0	0	0	0	0	0	0	0	0	0
Coastal	56-23J2	0	0	0	0	0	0	0	0	0	0
Coastal	56-23J4	0	0	0	0	0	0	0	0	0	0
Coastal	56-29F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-30F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-30F2	0	0	0	0	0	0	0	0	0	0
Coastal	56-32J12	0	0	0	0	0	0	0	0	0	0
Coastal	56-33F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-33F2	0	0	0	0	0	0	0	0	0	0
Coastal	56-33F3	0	0	0	0	0	0	0	0	0	0
Coastal	56-33F4	0	0	0	0	0	0	0	0	0	0
Coastal	56-36W41	0	0	0	0	0	0	0	0	0	0
Coastal	56-36W42	0	0	0	0	0	0	0	0	0	0
Coastal	56-36W43	0	0	0	0	0	0	0	0	0	0
Coastal	56-36W44	0	0	0	0	0	0	0	0	0	0
Coastal	56-37J4	0	0	0	0	0	0	0	0	0	0
Coastal	56-37W41	0	0	0	0	0	0	0	0	0	0
Coastal	56-37W42	0	0	0	0	0	0	0	0	0	0

Coastal	56-37W43	0	0	0	0	0	0	0	0	0	0
Coastal	56-38W2	0	0	0	0	0	0	0	0	0	0
Coastal	56-3F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-3F2	0	0	0	0	0	0	0	0	0	0
Coastal	56-41F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-42F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-43F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-45J3	0	0	0	0	0	0	0	0	0	0
Coastal	56-45J4	0	0	0	0	0	0	0	0	0	0
Coastal	56-46F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-46F2	0	0	0	0	0	0	0	0	0	0
Coastal	56-46F3	0	0	0	0	0	0	0	0	0	0
Coastal	56-46F4	0	0	0	0	0	0	0	0	0	0
Coastal	56-49J1	0	0	0	0	0	0	0	0	0	0
Coastal	56-49J2	0	0	0	0	0	0	0	0	0	0
Coastal	56-49J3	0	0	0	0	0	0	0	0	0	0
Coastal	56-49J4	0	0	0	0	0	0	0	0	0	0
Coastal	56-52F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-52F2	0	0	0	0	0	0	0	0	0	0
Coastal	56-52F3	0	0	0	0	0	0	0	0	0	0
Coastal	56-54F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-57J1	0	0	0	0	0	0	0	0	0	0
Coastal	56-57J2	0	0	0	0	0	0	0	0	0	0
Coastal	56-57J3	0	0	0	0	0	0	0	0	0	0
Coastal	56-57J5	0	0	0	0	0	0	0	0	0	0
Coastal	56-59F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-59F2	0	0	0	0	0	0	0	0	0	0
Coastal	56-59F3	0	0	0	0	0	0	0	73	73	73
Coastal	56-59F4	0	0	0	0	0	0	0	0	0	0
Coastal	56-61F2	0	0	0	0	0	0	0	0	0	0
Coastal	56-61F3	0	0	0	0	0	0	0	0	0	0
Coastal	56-61F4	0	0	0	0	0	0	0	0	0	0
Coastal	56-63F2	0	0	0	0	0	0	0	0	0	0
Coastal	56-63F3	0	0	0	0	0	0	0	0	0	0
Coastal	56-63F4	0	0	0	0	0	0	0	0	0	0
Coastal	56-63F5	0	0	0	0	0	0	0	0	0	0
Coastal	56-63F6	0	0	0	0	0	0	0	0	0	1

Coastal	56-64F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-64F2	0	0	0	0	0	0	0	0	0	0
Coastal	56-65J12	0	0	0	0	0	0	0	0	0	0
Coastal	56-65J2	0	0	0	0	0	0	0	0	0	0
Coastal	56-68F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-68F2	0	0	0	0	0	0	0	0	0	0
Coastal	56-68F3	0	0	0	0	0	0	0	0	0	0
Coastal	56-68F4	0	0	0	0	0	0	0	0	0	0
Coastal	56-72F2	0	0	0	0	0	0	0	0	0	0
Coastal	56-72F3	0	0	0	0	0	0	0	0	0	0
Coastal	56-72F4	0	0	0	0	0	0	0	0	0	0
Coastal	56-72F5	0	0	0	0	0	0	0	0	0	0
Coastal	56-72F6	0	0	0	0	0	0	0	0	0	0
Coastal	56-83F2	0	0	0	0	0	0	0	0	0	0
Coastal	56-84T1	0	0	0	0	0	0	0	0	0	0
Coastal	56-84T3	0	0	0	0	0	0	0	0	0	0
Coastal	56-85T1	0	0	0	0	0	0	0	0	0	0
Coastal	56-85T3	0	0	0	0	0	0	0	0	0	0
Coastal	56-86F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-87F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-87F3	0	0	0	0	0	0	0	0	0	0
Coastal	56-87F4	0	0	0	0	0	0	0	0	0	0
Coastal	56-87F5	0	0	0	0	0	0	0	0	0	0
Coastal	56-87F6	0	0	0	0	0	0	0	0	0	0
Coastal	56-88F1	0	0	0	0	0	0	0	0	0	0
Coastal	56-88F3	0	0	0	0	0	0	0	0	0	0
Coastal	56-88F5	0	0	0	0	0	0	0	0	0	0
Coastal	56-88F7	0	0	0	0	0	0	0	0	0	0

Hour 10	Hour 11	Hour 12	Hour 13	Hour 14	Hour 15	Hour 16	Hour 17	Hour 18	Hour 19
10/29/2017 10:00	10/29/2017 11:00	10/29/2017 12:00	10/29/2017 13:00	10/29/2017 14:00	10/29/2017 15:00	10/29/2017 16:00	10/29/2017 17:00	10/29/2017 18:00	10/29/2017 19:00
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0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	36
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	83	83	83	83	83	83	83
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
73	73	73	73	73	73	73	73	73	73
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0

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0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

Hour 20	Hour 21	Hour 22	Hour 23	Hour 24	Hour 25	Hour 26	Hour 27	Hour 28	Hour 29	Hour 30
10/29/2017 20:00	10/29/2017 21:00	10/29/2017 22:00	10/29/2017 23:00	10/30/2017 0:00	10/30/2017 1:00	10/30/2017 2:00	10/30/2017 3:00	10/30/2017 4:00	10/30/2017 5:00	10/30/2017 6:00
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	15	15	15	15	15	15	15
0	0	0	0	0	952	952	952	952	952	952
0	0	0	0	0	0	132	132	132	132	132
0	0	0	0	0	885	885	885	885	885	885
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	8	8	8	8	8	8
0	0	0	42	72	72	72	72	72	72	72
0	0	0	0	0	55	55	55	55	55	55
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	62	62	62	62	62	62
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	12	12	12	12	12
0	0	0	0	0	2,249	2,249	2,249	2,249	2,249	2,109
0	0	0	0	52	52	95	95	95	95	141
0	0	0	0	1,852	1,871	1,871	1,871	1,871	1,871	1,424
0	0	0	0	0	1,486	1,486	1,486	1,486	1,486	1,486
0	0	0	0	0	0	0	35	35	35	35
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	33	127	127	127	127	127	127
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	1	1	1	1	1	1
0	0	152	308	336	1,228	1,270	1,270	1,270	1,270	1,273
0	0	0	0	0	150	150	150	150	150	150
0	0	237	237	237	2,586	2,586	2,586	2,586	2,586	2,586
0	0	0	0	0	415	415	415	415	415	415
0	0	0	420	1,598	1,598	1,598	1,598	1,598	1,598	1,598
0	0	0	0	0	2,448	2,448	2,448	2,448	2,448	2,448
0	0	0	0	117	117	226	226	226	226	226
0	0	96	320	320	825	2,817	2,817	2,817	2,822	2,824

0	0	0	0	0	336	336	336	336	336	336
0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	10	10	27	27	27	27
0	0	0	0	8	276	276	276	276	307	401
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	2,486	2,486	2,486	2,486	2,486	2,486
0	0	0	185	675	2,462	2,462	2,462	2,462	2,462	2,462
0	0	0	0	2,480	2,480	2,480	2,480	2,480	2,480	2,480
0	0	0	0	0	29	29	29	29	29	29
0	0	0	0	55	55	55	55	55	55	55
0	0	0	0	0	0	0	0	0	0	0
0	0	0	1,047	1,047	1,047	1,047	1,047	1,047	1,047	1,047
0	0	0	2,992	2,992	2,992	2,992	2,992	2,992	2,992	2,992
0	0	0	0	196	196	196	196	196	196	196
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	753	753	753	753	753	753
0	0	0	0	1	31	31	31	31	31	31
0	0	0	736	859	918	936	936	936	971	986
0	0	0	0	3	113	113	113	113	113	113
0	0	0	0	37	37	37	62	62	62	62
0	0	0	0	38	38	38	38	38	38	38
0	0	0	0	0	0	0	0	1	1	1
0	0	0	0	0	2	2	2	2	2	2
0	0	0	0	0	23	23	23	23	23	23
0	0	0	0	0	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	4	4	4	4	4
0	0	0	52	52	125	125	125	1,501	1,501	1,501
0	0	0	1	388	388	388	388	388	388	388
0	0	0	20	45	45	45	45	45	45	45
0	0	0	0	0	0	15	15	22	22	22
0	0	0	124	197	293	293	293	293	293	293
0	0	0	0	404	587	587	587	587	587	587

0	62	62	62	62	2,154	2,154	2,154	2,154	2,154	2,154
0	0	0	42	42	42	2,798	2,798	2,798	2,798	2,798
0	0	0	0	0	89	9	9	9	9	9
0	0	0	0	7	8	8	8	8	8	8
0	0	0	0	1	21	21	21	21	21	21
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	103	361	634	834	3,310	3,310	3,310	3,310	3,310	3,310
58	58	0	710	1,298	2,515	2,515	2,515	2,515	2,515	2,515
0	0	0	258	258	846	846	846	846	846	846
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	159	159	159	159	159	159	159
0	0	0	0	0	0	26	26	26	26	26
0	0	0	0	0	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	53	53	53	53	53	53
0	54	54	265	390	1,311	1,311	1,311	1,311	1,311	1,311
0	0	0	0	0	0	0	0	52	52	52
0	0	0	0	43	43	56	56	56	56	56
0	0	0	0	19	50	73	73	73	73	73
0	0	0	73	73	2,496	2,496	2,496	2,496	2,496	2,496
0	0	0	0	0	1,160	1,506	1,506	1,506	1,506	1,507
0	0	0	17	17	407	407	407	407	407	407
0	0	0	0	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	33	33	33	33	33	33	33
0	0	0	0	26	173	173	807	807	807	807
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
4	4	0	39	83	83	137	326	326	326	326
0	0	13	13	0	3,012	3,012	3,012	3,012	3,012	3,012
0	0	0	0	4	4	4	4	4	4	4
0	0	0	0	0	0	102	102	102	102	102
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	31	204	204	204	204	204

0	0	263	585	585	585	585	585	585	585	585
0	0	0	0	0	83	83	83	83	83	84
0	0	0	1,011	1,011	2,173	2,173	2,173	2,173	2,173	2,173
0	0	0	0	0	448	448	448	448	448	448
8	8	0	0	0	391	391	391	391	391	391
0	0	19	25	25	37	38	38	38	38	38
0	0	0	0	295	295	295	295	295	295	295
0	0	0	0	0	0	90	90	90	90	90
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	147	147	147	147	147	147
0	0	0	0	3,519	3,519	3,519	3,519	3,519	3,519	3,519
0	0	0	0	4,491	4,491	4,491	4,491	4,491	4,491	4,491
0	0	0	121	121	121	121	121	121	121	121
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	11	11	11	50
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	18	18	18	18	18	18	18	18
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1,566	1,566	1,566	1,566	1,566	1,566
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	1	1	2	2	2	2
0	0	0	0	0	0	168	168	168	168	168
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	585	585	586	586	624	624	624	624
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	501	1,015	1,355	1,355	1,355	1,355	1,355	1,356
0	0	0	0	17	36	36	36	37	37	38
0	0	0	163	163	1,720	1,720	1,720	1,720	1,702	520

0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	2	2	2	2
0	0	0	150	150	461	461	461	461	461	461
0	0	0	16	16	16	17	17	17	17	17
0	0	0	32	32	46	46	46	46	46	46
0	0	0	0	0	0	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	981	982	982	982	986	987	988
0	0	0	37	37	37	37	37	37	37	37
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	2	2	2	2
0	0	0	0	0	0	0	4	4	4	4
0	0	0	0	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0
0	0	10	10	506	506	506	506	516	516	516
0	0	0	0	2,610	2,610	2,610	2,610	2,610	2,610	2,610
0	0	0	898	898	898	898	898	898	898	898
0	0	0	5	177	177	209	209	209	209	209
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	285	285	285	285	285
0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	1	1	12	12	12	12
0	0	0	0	231	243	300	300	300	300	300
0	0	81	81	1,308	1,308	1,308	1,308	1,308	1,308	1,308
0	0	0	0	0	0	0	0	0	0	0
0	0	0	14	14	20	20	20	20	20	20
0	0	0	0	37	37	37	37	37	37	86
0	0	102	650	650	621	636	636	232	263	265
0	0	212	2,045	2,047	1,352	1,351	1,353	851	852	861
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	2	4	4	4	156	157
0	0	0	11	11	12	12	12	12	12	12
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	3	3	3	3	3	3	3
0	0	0	0	0	0	0	0	0	0	0

0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	46	46	46	46	46	46	46
0	0	0	0	1,845	1,845	1,845	1,845	1,845	1,845	1,845
0	0	47	124	257	257	257	257	257	257	257
36	0	294	744	744	744	964	964	964	964	964
0	0	0	0	1	15	15	15	15	15	15
0	0	2,152	2,152	2,152	2,152	2,152	2,152	2,152	2,152	2,152
0	0	62	62	62	1,157	1,157	1,157	62	62	62
0	0	0	0	0	413	413	413	233	233	233
83	83	83	165	166	166	166	168	168	168	168
0	0	868	868	758	759	759	759	759	759	764
0	0	1,952	1,896	60	60	60	60	60	60	61
0	0	0	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355
0	0	0	0	629	629	629	629	629	629	629
0	0	0	0	341	341	341	341	341	341	341
0	0	0	0	806	806	806	806	806	806	806
0	0	0	0	598	598	598	598	598	598	598
0	0	0	0	697	697	697	697	697	697	697
0	0	0	0	0	1	1	1	1	1	1
0	0	0	1,410	1,773	1,773	1,773	1,773	1,773	1,794	1,794
0	277	277	2,663	2,663	2,663	2,663	2,663	2,663	2,663	2,663
0	0	0	0	0	589	589	589	589	589	594
0	0	0	0	12	23	23	23	34	34	34
0	0	0	0	503	503	504	504	504	504	504
0	0	0	0	0	0	1	1	1	2	2
0	0	0	676	676	1,139	1,139	1,139	1,139	1,139	1,139
0	0	0	0	1,420	1,420	1,420	1,420	1,420	1,420	1,420
76	80	240	1,315	1,315	1,315	1,315	1,315	1,315	1,315	1,330
0	0	0	0	0	0	0	0	0	1	2
0	0	0	16	116	116	116	116	116	116	116
0	0	838	838	838	838	838	838	838	838	838
0	0	0	0	0	0	0	0	0	0	0
0	0	0	142	142	142	142	142	142	142	142
0	0	0	167	263	286	321	321	322	322	322
0	0	0	0	40	40	40	40	40	40	40
0	0	0	259	282	474	474	474	474	474	474
0	0	400	2,579	2,579	2,579	2,579	2,579	2,579	2,581	2,581

0	0	0	0	1,266	1,266	1,266	1,266	1,266	1,266	1,266
0	0	0	0	2,584	2,584	2,584	2,584	2,584	2,584	2,584
0	0	0	0	0	0	0	0	0	0	0
0	0	17	17	17	17	17	17	17	17	17
0	0	591	706	706	706	1,120	1,120	1,120	1,120	1,167
0	0	6	524	662	662	662	662	662	662	662
0	0	0	3,159	3,159	3,159	3,159	3,159	3,159	3,159	3,159
0	0	177	177	177	177	177	224	224	224	224
0	0	0	0	1	23	23	23	23	23	23
0	0	0	0	58	3,168	3,168	3,168	3,168	3,168	3,168
0	0	0	94	261	275	275	275	275	275	275
0	0	0	0	0	1	1	1	2	3	3
0	0	0	0	123	123	123	123	123	123	124
0	0	0	152	152	152	152	152	152	152	152
0	0	0	3	3	3	3	3	3	3	3
0	0	0	0	1	1	1	1	1	1	1
0	0	0	213	213	213	213	213	213	213	214
0	0	0	2,697	2,697	2,697	2,697	2,697	2,697	2,697	2,697
0	0	1,538	3,561	3,561	3,561	3,561	3,561	3,561	3,561	3,561
0	0	0	0	71	71	71	71	71	71	71
0	0	0	0	0	0	7	7	7	7	7
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	1	1	1	2	2	2
0	0	58	58	19	509	595	595	595	595	595
0	0	97	170	170	170	170	170	170	170	170
0	0	187	333	951	951	2,218	2,218	2,219	2,219	2,219
0	0	0	20	353	353	353	353	355	355	359

Hour 31	Hour 32	Hour 33	Hour 34	Hour 35	Hour 36	Hour 37	Hour 38	Hour 39	Hour 40
10/30/2017 7:00	10/30/2017 8:00	10/30/2017 9:00	10/30/2017 10:00	10/30/2017 11:00	10/30/2017 12:00	10/30/2017 13:00	10/30/2017 14:00	10/30/2017 15:00	10/30/2017 16:00
0	0	1	1	1	1	1	1	1	1
15	15	16	19	19	20	20	20	20	27
952	952	952	952	952	952	952	952	952	952
132	132	132	132	132	132	132	132	132	132
885	885	885	885	885	885	885	885	885	885
0	0	0	1	42	42	42	42	42	42
8	8	8	8	8	8	8	8	8	8
72	72	72	72	72	72	72	72	72	72
55	55	55	55	55	55	63	63	63	63
0	0	0	0	0	0	0	0	0	0
62	62	62	62	62	62	62	62	62	62
0	0	0	1	1	2	2	2	2	2
0	0	316	316	316	316	316	316	316	316
12	12	12	12	12	12	12	12	12	12
2,109	2,109	2,109	2,109	2,109	2,109	2,109	2,109	2,109	2,109
141	141	141	141	141	141	141	141	141	141
1,424	1,424	1,424	1,424	1,424	1,424	1,424	1,424	1,424	1,424
1,486	1,486	1,486	1,486	1,486	1,486	1,486	1,486	1,486	1,486
35	35	35	35	35	35	35	35	35	35
0	0	1	1	1	1	1	1	1	1
0	0	0	0	0	15	15	15	15	15
0	0	0	0	0	0	0	0	0	0
127	127	127	127	127	127	127	127	127	127
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
1,273	1,273	1,273	1,273	1,273	1,273	1,121	1,121	1,121	1,121
150	150	150	150	150	150	150	150	150	150
2,586	2,586	2,586	2,586	1,937	1,937	2,010	1,644	617	626
415	415	415	415	415	415	415	415	415	415
1,598	1,598	1,598	1,598	1,598	1,598	1,598	1,598	1,598	1,598
2,448	2,448	2,448	2,448	2,321	2,321	949	954	957	958
226	226	226	226	226	226	226	226	226	226
2,824	2,824	2,824	2,842	2,842	2,842	2,842	2,842	2,842	2,842

336	336	336	336	336	336	336	336	336	336
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
27	27	27	27	27	27	27	27	27	27
401	401	402	402	402	402	427	427	427	427
0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	1	1	1	1	1
0	0	0	0	1	1	1	1	2	3
2,486	2,486	2,486	2,486	2,486	2,486	2,486	2,486	2,486	2,486
2,462	2,462	2,462	2,462	2,462	2,462	2,462	2,462	2,462	2,462
2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480
29	29	29	29	29	29	29	29	29	29
55	55	55	55	55	55	55	55	55	55
0	0	1	1	1	1	1	1	1	1
1,047	1,047	1,047	1,047	1,047	1,047	1,047	1,047	1,048	1,048
2,992	2,992	2,992	2,992	2,992	2,992	2,992	2,992	2,992	2,992
213	213	213	213	213	213	213	213	213	213
0	0	0	0	0	0	0	0	0	0
753	753	753	753	753	753	753	753	753	753
31	34	34	34	34	34	34	34	34	34
250	252	253	253	253	253	254	254	254	254
113	115	118	118	118	118	118	118	118	119
78	78	251	251	265	265	265	265	265	265
38	38	38	38	38	38	38	38	38	38
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
23	23	23	23	23	23	23	23	23	23
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
4	4	4	4	4	4	4	4	4	4
1,501	1,501	1,501	1,501	1,501	1,501	1,501	1,501	1,501	1,501
426	426	426	426	426	426	426	426	426	426
45	45	45	45	45	45	45	46	46	46
22	22	22	22	22	22	22	22	22	22
293	293	293	293	293	293	293	293	293	293
587	587	587	587	587	587	587	587	587	587

2,154	2,004	479	479	479	480	480	480	480	480
2,798	2,798	2,798	2,798	2,798	2,798	374	374	374	374
9	9	9	9	9	9	9	9	9	9
8	8	9	9	9	21	21	21	21	21
34	34	34	34	34	34	34	34	34	34
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
3,310	3,310	3,310	3,310	3,310	3,310	3,310	3,310	3,310	3,310
2,515	2,515	2,515	2,515	2,515	2,515	2,515	2,515	2,515	2,515
846	846	846	846	846	846	846	846	846	846
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
159	159	159	159	159	159	159	159	159	159
26	26	26	26	26	26	26	26	26	26
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
53	53	53	53	53	53	53	53	53	53
1,311	1,311	1,311	1,311	1,311	1,311	1,076	1,076	1,076	861
52	52	52	52	52	52	52	52	52	52
57	66	66	66	66	66	66	66	66	66
73	74	74	74	74	74	74	74	74	74
2,496	2,496	2,496	2,496	2,496	2,496	2,496	2,496	2,497	2,497
1,507	1,507	1,507	1,507	1,507	1,507	1,507	1,507	1,507	1,161
407	407	407	407	407	407	407	407	407	407
9	9	9	9	9	9	9	9	10	10
0	0	0	0	0	0	0	0	0	0
33	33	33	33	33	33	33	33	33	33
807	3,566	3,566	3,566	3,566	3,566	3,566	3,566	3,566	3,566
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
327	327	327	327	328	328	328	329	329	330
3,012	3,012	3,012	3,012	3,012	3,012	3,012	3,012	3,012	3,012
4	4	4	4	4	4	4	4	4	4
102	102	102	102	102	102	102	102	102	102
0	0	0	0	0	0	0	0	0	0
204	204	204	204	204	204	204	204	204	204

585	585	585	2,059	2,059	2,059	2,059	2,059	2,059	2,059
84	84	84	3,749	3,749	3,749	3,749	3,749	3,749	3,749
2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173
448	448	448	448	448	448	448	448	448	448
391	392	393	393	393	393	393	393	393	2
60	60	61	132	137	137	138	138	139	139
295	3,279	3,279	3,279	3,279	3,279	3,279	3,279	3,279	3,279
103	103	103	103	103	103	103	103	103	103
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
147	147	147	147	147	147	147	147	147	147
3,519	3,519	3,519	3,519	3,519	3,519	3,519	3,519	3,519	3,519
4,491	4,491	4,491	4,491	4,491	4,491	4,491	4,491	4,491	4,491
121	121	121	121	121	121	121	121	121	121
0	0	0	0	0	0	0	41	41	41
1	1	1	1	1	1	2	2	2	2
1	1	1	1	1	1	1	1	1	1
50	50	51	51	51	51	51	51	51	51
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	1	1	1
18	18	18	18	18	18	18	18	18	18
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
2	2	2	2	2	2	2	2	2	2
168	168	168	168	168	168	168	168	168	168
0	0	11	11	11	11	11	11	11	11
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
624	624	624	624	624	624	624	624	624	624
0	0	0	0	0	0	0	0	11	11
0	0	0	0	1	1	1	1	1	1
1,370	1,370	1,370	1,370	1,370	1,370	1,370	1,370	1,370	1,371
38	38	38	53	62	62	62	62	62	62
520	520	521	521	521	521	521	521	522	522

0	0	0	0	0	0	0	0	0	0
2	10	10	10	10	10	10	10	10	10
461	461	461	461	462	462	463	464	464	464
17	17	17	17	18	18	19	19	19	19
46	46	46	46	46	46	46	46	46	46
1	1	44	44	44	44	44	44	44	44
0	0	0	0	0	0	0	0	0	0
988	988	988	988	988	988	988	988	988	989
37	37	37	37	37	37	37	37	37	37
0	0	0	0	0	0	0	0	0	0
0	0	65	65	65	65	80	0	0	0
2	2	2	2	2	2	2	2	2	2
4	4	4	4	4	4	4	4	4	4
1	1	1	1	1	1	1	1	1	1
0	0	0	1	1	1	1	1	1	1
517	517	517	517	517	45	45	45	45	45
2,610	2,610	2,610	2,610	2,610	2,610	1,451	532	533	533
898	898	898	898	898	898	898	898	898	898
209	211	230	230	231	231	231	232	233	233
0	0	0	0	0	0	0	0	0	0
285	285	285	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
12	12	12	12	82	82	82	82	82	82
300	300	300	300	300	300	300	300	300	300
1,308	1,308	1,308	1,308	1,308	1,829	1,639	1,640	1,644	1,645
0	0	0	0	0	0	0	0	0	0
20	20	20	20	20	20	20	20	20	21
86	37	37	37	37	37	37	58	58	58
278	409	813	813	813	813	813	821	822	822
867	867	1,223	1,234	1,261	1,261	1,261	1,276	1,276	1,276
0	1	1	1	1	2	2	3	3	9
762	762	762	762	764	764	764	764	764	765
13	13	13	23	23	23	23	23	23	23
0	10	11	12	12	12	12	12	12	12
0	0	0	0	0	0	0	0	0	0
3	3	3	3	4	4	11	11	11	11
0	0	0	0	0	0	0	0	0	0

0	0	0	0	0	0	0	0	0	0
46	94	94	94	94	94	94	94	94	94
1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,851	1,851	1,851
257	276	276	276	276	276	276	276	276	276
964	964	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294
15	17	17	17	17	17	17	17	25	26
2,152	2,152	2,152	2,152	2,152	2,152	2,152	2,152	2,152	2,152
62	62	62	62	62	62	62	62	62	62
233	239	239	239	239	239	239	239	239	239
168	1,435	173	173	173	181	181	181	181	98
784	785	785	786	786	787	787	787	788	788
61	61	62	62	62	62	62	63	63	63
3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	925
629	629	629	629	629	629	629	629	629	629
341	341	341	341	341	341	341	341	341	341
806	806	806	806	806	806	806	806	806	806
598	598	598	598	598	598	598	598	598	598
697	1,136	1,139	1,139	1,139	1,139	1,139	1,139	1,139	1,139
1	1	1	1	1	1	2	2	2	2
1,794	1,794	1,794	1,795	1,795	1,795	1,795	1,795	1,795	1,795
2,663	2,663	2,663	2,663	2,663	2,663	2,663	2,663	2,663	2,663
594	594	594	594	5	5	5	5	5	5
34	34	34	34	34	34	34	34	34	34
504	504	504	520	520	520	520	520	521	521
2	2	2	2	44	44	44	44	44	44
1,139	1,139	1,139	1,139	1,139	1,139	1,139	1,139	166	166
1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420
1,330	1,330	1,360	1,360	1,467	1,467	1,467	1,468	1,468	1,468
2	226	227	227	227	227	227	227	227	227
116	116	116	116	117	117	117	117	117	118
838	838	838	838	671	672	672	672	672	672
0	0	0	0	0	0	0	0	0	0
142	142	143	143	143	145	146	146	147	147
322	322	322	322	322	326	326	326	326	326
40	41	41	41	41	41	46	46	46	46
475	475	475	475	476	476	89	89	89	89
2,581	2,581	2,581	2,581	2,581	2,581	2,581	2,581	2,581	2,581

1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266
2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584
1	1	1	1	1	1	1	1	2	2
17	26	26	26	26	26	26	26	26	26
1,168	1,168	1,169	1,174	1,174	1,175	1,175	1,176	1,176	1,177
662	662	697	697	698	698	698	698	698	698
3,159	1,787	1,787	1,787	1,787	1,787	1,787	1,787	1,787	1,787
225	225	225	225	227	228	228	228	228	229
23	24	25	26	26	26	27	27	27	27
3,168	3,168	2,294	184	190	190	190	190	190	190
275	276	276	276	277	277	277	277	277	278
20	20	20	20	21	22	22	22	22	22
124	125	125	125	125	125	125	125	125	125
152	152	152	152	152	152	152	50	50	50
3	3	3	3	3	3	3	3	3	3
1	1	1	1	1	1	1	1	1	1
214	251	252	252	252	252	252	252	252	252
2,697	2,697	2,697	2,697	2,697	2,697	2,697	258	258	258
3,561	3,561	3,561	3,561	3,561	3,561	3,561	3,561	3,561	3,561
71	96	96	96	96	97	97	97	98	98
7	7	8	133	133	133	133	133	133	133
0	0	0	0	1	1	1	1	1	1
0	1	1	2	2	2	3	3	3	3
2	2	2	2	3	3	3	3	3	3
595	597	597	597	597	597	597	597	597	598
170	170	170	170	170	170	170	578	578	578
2,219	2,219	2,219	2,219	2,148	2,034	1,557	1,252	1,252	1,252
359	359	359	359	208	223	223	223	223	58

Hour 41	Hour 42	Hour 43	Hour 44	Hour 45	Hour 46	Hour 47	Hour 48	Hour 49	Hour 50	Hour 51
10/30/2017 17:00	10/30/2017 18:00	10/30/2017 19:00	10/30/2017 20:00	10/30/2017 21:00	10/30/2017 22:00	10/30/2017 23:00	10/31/2017 0:00	10/31/2017 1:00	10/31/2017 2:00	10/31/2017 3:00
1	1	1	1	1	1	1	1	1	1	1
27	27	27	27	27	27	27	27	27	27	27
952	952	952	952	20	20	20	20	20	20	20
132	132	132	132	132	132	132	132	132	132	132
885	885	885	885	885	885	885	885	0	0	0
42	42	42	42	42	42	42	42	42	42	42
8	8	8	8	8	8	8	8	8	8	8
72	72	72	72	72	72	72	72	72	72	72
63	63	63	63	63	63	63	63	63	63	63
0	0	0	0	0	0	0	0	0	0	0
62	62	62	62	62	62	62	62	62	62	62
2	2	2	2	2	2	3	3	3	3	3
316	316	316	316	316	316	316	316	316	316	316
12	12	12	12	12	12	12	12	12	12	12
2,109	2,109	2,109	2,109	2,109	2,109	2,109	2,109	2,109	2,109	2,109
141	159	159	159	159	159	159	159	159	159	159
1,424	1,424	1,424	1,424	1,424	1,424	1,424	1,424	1,424	1,424	1,424
1,486	1,486	1,486	1,486	1,486	1,486	1,486	1,486	1,486	1,486	1,486
35	35	35	35	35	35	35	35	35	35	35
1	1	1	1	1	1	1	1	1	1	1
15	15	15	15	15	15	15	15	15	15	15
0	0	0	0	0	0	0	0	0	0	0
127	127	127	127	127	127	127	127	127	129	130
1	1	1	1	1	1	1	1	1	1	1
1	1	7	7	7	7	7	7	7	7	7
1,121	1,121	1,121	1,121	1,121	1,121	1,121	1,121	1,121	1,121	1,121
150	150	150	150	150	150	150	150	150	150	150
626	626	626	626	626	627	627	627	627	627	627
0	0	0	0	0	0	0	0	0	0	0
1,598	1,598	1,406	1,406	1,406	1,406	1,021	1,117	1,117	565	565
958	959	959	959	959	959	959	959	959	959	959
226	226	226	226	226	226	226	226	226	226	226
2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842

336	336	336	336	336	336	336	336	336	336	336
1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
27	27	27	27	27	27	27	27	27	27	27
427	427	427	427	427	427	427	427	427	427	427
0	0	16	16	16	16	16	16	16	16	16
1	1	1	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3
2,486	2,486	2,486	2,486	2,486	2,486	2,486	2,486	2,486	2,486	2,486
2,462	2,462	2,462	2,462	2,462	2,462	2,462	2,462	2,462	2,462	2,462
2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480	818	195	195
29	29	29	29	29	29	29	29	29	29	29
55	55	55	55	55	55	55	55	55	55	55
1	1	1	1	1	1	1	1	1	1	1
1,048	1,048	1,048	1,048	1,048	1,048	1,048	150	151	151	152
2,992	2,992	2,992	2,992	2,992	2,992	0	0	2	2	2
213	213	213	213	213	213	213	213	213	213	213
0	0	0	0	0	0	0	0	0	0	0
753	753	753	753	753	753	753	1	1	2	2
34	34	34	34	34	34	34	34	34	34	34
254	254	254	254	257	257	257	257	257	257	257
119	119	120	120	120	120	120	120	120	120	120
265	265	265	265	265	265	265	265	265	265	265
38	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2
23	23	23	23	23	23	23	23	23	23	23
1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	3	0	0	0	0	0
4	4	4	4	4	1	1	1	1	1	1
1,501	1,501	1,501	1,501	1,501	1,501	1,449	1,449	1,449	1,449	1,449
426	426	426	426	426	426	426	426	426	426	426
46	46	46	46	46	46	46	46	46	46	46
22	22	22	22	22	22	22	22	22	22	22
293	293	293	293	293	293	293	293	293	293	294
587	587	587	587	587	587	587	587	587	587	587

480	480	480	480	480	480	480	480	480	480	480
374	374	374	374	374	374	374	374	374	374	374
9	9	9	9	9	9	9	9	9	9	9
21	21	21	21	21	21	21	21	21	21	21
34	34	34	34	34	34	34	34	34	34	34
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
3,310	3,310	3,310	3,310	3,310	3,310	3,310	3,310	3,310	3,147	3,147
2,515	2,515	2,515	2,515	2,515	2,515	2,515	2,515	2,515	2,515	2,515
846	846	846	846	846	846	846	846	846	846	846
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
159	159	159	159	159	159	159	159	159	159	159
26	26	26	26	26	26	26	26	26	26	26
1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0
53	53	53	53	53	53	53	53	53	53	53
861	861	861	861	791	791	791	791	791	791	794
52	52	52	52	52	52	52	52	52	52	52
66	66	66	66	66	66	66	66	66	66	66
74	74	74	74	74	74	74	74	74	74	74
2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497
1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161
407	407	407	407	407	407	407	407	407	407	407
11	11	12	12	12	12	12	12	12	12	12
0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0
3,566	3,566	3,566	3,566	809	190	191	191	191	191	191
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
330	330	259	260	260	260	260	260	260	260	260
3,012	3,012	417	417	419	419	419	419	419	419	419
4	4	5	5	5	5	5	5	5	5	5
102	102	102	102	102	102	102	102	102	102	102
0	0	0	0	0	0	0	0	0	0	0
204	204	204	204	204	204	204	204	204	204	204

2,059	2,059	2,059	2,059	2,059	2,059	2,059	857	536	536	537
3,749	3,749	3,749	3,749	3,749	3,749	3,749	3,749	3,749	3,233	84
2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173
448	448	448	448	448	448	448	725	725	726	728
2	2	2	2	2	2	2	2	2	2	2
139	68	68	68	68	68	68	68	68	68	68
3,279	3,279	3,279	3,279	3,279	3,279	3,279	3,279	3,279	3,279	3,279
103	103	103	103	103	103	103	103	103	103	103
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
147	147	147	147	147	147	147	147	147	147	147
3,519	3,519	2,198	2,198	0	0	0	0	16	16	16
4,491	4,491	4,491	2,034	0	0	1	1	1	1	1
121	121	121	121	121	121	121	121	121	121	121
41	41	41	41	41	41	41	41	41	41	41
2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	1	1
51	51	51	51	51	51	51	51	51	51	51
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
18	18	18	18	18	18	18	18	18	18	18
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566
0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2
168	168	168	168	168	168	168	168	168	168	168
11	11	11	11	11	11	11	11	11	11	11
0	0	0	0	0	0	0	0	0	0	0
0	0	7	7	7	7	7	7	7	7	7
624	624	624	624	624	624	624	624	624	624	624
11	11	11	11	11	11	11	11	11	11	11
1	1	1	1	1	1	1	1	1	1	1
1,371	1,371	1,371	1,371	1,371	1,371	1,371	1,371	1,371	1,371	1,371
63	63	63	63	63	63	63	63	63	63	63
522	522	522	522	522	522	522	522	522	522	522

0	0	0	0	0	0	0	0	0	0	0
10	10	10	10	10	10	10	10	10	10	10
464	464	464	464	464	464	464	464	153	153	153
19	19	19	20	20	20	20	20	20	20	20
46	46	46	46	46	46	46	46	46	46	46
44	44	44	44	44	44	44	44	44	44	44
0	0	0	0	0	0	0	0	0	0	0
989	989	989	989	989	989	989	989	989	989	989
37	37	37	37	37	37	37	37	37	37	37
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
2	2	2	2	2	2	2	2	2	2	2
4	4	4	4	4	4	4	4	4	4	4
1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1
45	45	45	45	45	45	45	45	45	45	45
533	534	534	534	534	534	534	534	534	534	534
898	898	898	898	898	898	898	898	898	898	898
233	233	233	233	233	234	234	234	234	234	234
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
82	82	82	82	82	82	82	82	82	82	82
300	300	300	300	300	300	300	300	300	300	300
1,645	1,645	1,645	1,645	1,314	1,314	1,314	1,314	1,314	1,314	1,314
1	1	1	1	1	1	1	1	1	1	1
21	21	21	21	21	21	21	21	21	21	21
58	58	58	58	21	21	21	21	21	21	21
143	143	142	128	133	144	144	144	144	144	144
753	731	731	712	662	662	606	607	641	642	642
10	10	10	10	10	10	10	10	10	10	10
765	765	765	765	765	14	14	14	14	14	14
23	23	23	23	23	23	23	23	23	23	23
12	12	12	12	12	12	12	12	12	12	12
0	0	0	0	0	0	0	0	0	0	0
11	11	11	11	11	11	11	11	11	11	11
0	0	0	0	0	0	0	0	0	0	0

0	0	0	0	0	0	0	0	0	0	0
94	94	94	94	94	94	94	94	94	94	94
1,851	1,851	1,851	1,851	1,851	1,851	1,851	1,851	1,851	1,851	1,851
276	276	276	229	229	229	229	229	229	229	229
1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294
26	26	26	26	26	26	26	26	26	26	26
2,152	2,152	2,152	2,152	2,152	2,152	2,152	2,152	2,152	2,152	2,152
62	62	62	62	62	62	62	62	62	62	62
239	239	239	239	239	239	24	24	24	24	24
98	98	102	20	20	20	20	20	20	20	20
31	333	333	335	335	335	335	335	335	335	335
64	64	64	64	64	64	64	64	64	64	64
940	951	960	961	962	962	962	962	962	962	962
629	629	629	629	629	629	629	629	629	629	629
341	341	341	341	341	341	341	341	341	341	341
806	806	806	806	806	806	806	806	806	806	806
598	598	598	598	598	598	598	598	598	598	598
1,139	1,139	1,139	1,139	1,139	1,139	1,139	1,139	1,139	1,139	1,139
2	2	2	2	2	2	2	2	2	2	2
1,795	1,795	1,795	1,795	1,795	1,795	1,795	1,795	1,795	1,795	1,795
2,663	2,663	2,663	2,663	2,663	2,663	2,663	2,663	2,663	2,663	2,663
5	5	5	5	5	5	5	5	5	5	5
34	34	34	34	34	34	34	34	34	34	34
521	521	521	521	521	521	521	521	521	521	521
44	44	44	44	44	44	44	44	44	44	44
168	168	168	168	168	168	168	168	168	168	168
1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420
1,468	1,468	1,468	1,468	1,468	1,468	1,468	1,468	1,468	1,468	1,468
228	228	228	228	228	228	228	228	228	228	228
118	118	118	118	118	118	118	118	118	118	118
672	672	672	672	672	672	672	672	672	672	630
0	0	0	0	0	0	0	0	0	0	0
148	148	148	148	148	148	148	148	148	148	148
326	331	331	331	331	331	331	331	331	331	331
46	46	46	47	47	47	47	47	47	47	47
89	89	89	89	97	97	97	97	97	97	97
2,581	2,581	2,581	2,581	2,581	2,581	2,581	2,581	2,581	2,581	2,581

1,266	1,266	1,266	1,266	1,266	1,266	1,266	459	459	459	459
2,584	2,584	2,584	2,584	2,584	2,584	2,584	1	14	15	15
2	2	2	2	2	2	2	2	2	2	2
26	26	26	26	26	26	26	26	26	26	26
1,177	1,177	1,177	1,177	1,177	1,177	1,177	1,177	1,177	1,177	1,177
698	698	698	698	698	698	698	698	698	698	698
1,787	1,787	1,787	1,787	1,787	1,787	1,787	1,787	1,787	1,787	1,787
229	229	229	229	229	229	229	229	229	229	229
27	27	27	27	27	27	27	27	27	27	27
215	215	216	216	216	216	216	216	216	216	216
278	278	278	278	278	184	184	184	184	184	184
22	22	22	22	22	22	22	22	22	22	22
125	125	125	125	125	125	125	125	125	125	125
0	0	0	0	0	0	0	0	0	0	0
3	3	3	3	3	3	3	3	3	3	3
1	1	1	1	1	1	1	1	1	1	1
252	252	252	252	252	252	252	252	252	252	252
258	258	258	258	258	258	258	258	258	258	258
3,561	3,561	3,561	3,561	3,561	152	152	153	153	153	153
98	98	131	131	131	131	131	131	131	131	131
133	133	133	133	133	133	8	8	8	8	8
1	1	1	1	1	1	1	1	1	1	1
3	3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3	2
598	598	598	598	598	598	598	598	598	598	598
171	171	171	171	171	171	171	171	171	171	171
1,252	627	440	440	440	440	440	440	440	440	440
58	58	58	58	58	58	58	58	58	58	58

Hour 52	Hour 53	Hour 54	Hour 55	Hour 56	Hour 57	Hour 58	Hour 59	Hour 60	Hour 61	Hour 62
10/31/2017 4:00	10/31/2017 5:00	10/31/2017 6:00	10/31/2017 7:00	10/31/2017 8:00	10/31/2017 9:00	10/31/2017 10:00	10/31/2017 11:00	10/31/2017 12:00	10/31/2017 13:00	10/31/2017 14:00
1	1	1	1	1	1	1	1	1	1	1
27	27	27	27	27	27	27	27	27	27	27
20	20	20	20	20	20	20	20	20	20	20
132	132	132	132	132	132	132	132	132	132	132
0	0	0	0	0	0	0	0	0	0	0
42	42	42	42	42	42	42	42	42	42	42
8	8	8	8	8	8	8	8	8	8	8
72	72	72	72	72	72	72	72	72	72	72
63	63	63	63	63	63	63	63	63	63	63
0	0	0	0	0	0	0	0	0	0	0
62	62	62	62	62	62	62	0	0	0	0
3	3	3	3	3	3	3	3	3	3	3
316	316	316	316	316	316	316	316	316	316	316
12	12	12	12	12	12	12	12	12	12	12
2,109	2,109	2,109	2,109	2,109	2,109	2,109	2,109	125	125	125
159	159	159	159	159	159	159	159	159	159	159
1,424	1,424	1,424	1,424	1,424	1,424	1,424	1,424	19	19	19
1,486	1,486	1,486	1,486	1,486	1,486	1,486	1,486	0	0	0
35	35	35	35	35	35	35	35	35	35	35
1	1	1	1	1	1	1	1	1	5	5
15	15	15	15	15	15	15	15	15	15	15
0	0	0	0	0	0	0	0	0	0	0
131	131	131	131	131	131	131	131	131	131	131
1	1	1	1	1	1	1	1	1	1	1
7	7	7	7	7	7	7	7	7	7	7
1,121	1,121	1,121	1,121	1,121	1,121	1,124	1,125	1,125	1,126	1,126
150	150	150	150	150	150	150	150	150	0	0
627	627	627	627	627	555	557	557	557	557	557
0	0	0	0	0	0	0	0	1	1	1
565	565	565	565	565	565	565	565	565	566	566
959	959	959	959	959	959	959	961	961	962	963
226	226	226	226	226	226	226	226	226	226	227
2,842	2,842	2,842	2,842	2,842	2,842	1,340	862	875	631	625

336	336	336	336	336	336	336	336	336	336	336
1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	1	1	1
0	0	0	0	0	0	0	0	0	0	0
27	27	27	27	27	27	27	27	27	27	27
427	427	427	427	427	428	429	429	429	429	429
16	16	16	16	16	16	16	16	16	16	16
2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3
2,486	2,486	2,486	2,486	2,486	2,486	2,486	2,486	2,486	2,486	2,486
2,462	2,462	2,462	2,462	2,462	2,462	2,462	2,462	2,462	2,462	2,462
195	195	195	195	195	195	195	196	196	196	197
29	29	29	29	29	29	29	29	29	29	29
55	55	55	55	55	66	66	66	66	66	66
1	1	1	1	1	1	1	1	1	1	1
152	153	154	155	158	158	158	166	166	167	168
2	2	2	2	2	2	2	2	2	2	12
213	213	213	213	213	213	213	213	213	213	213
0	0	0	0	0	0	0	0	0	0	0
2	2	2	3	3	3	3	3	4	4	4
34	34	34	34	34	34	34	35	35	35	35
257	257	257	257	258	258	243	243	243	243	243
120	120	120	120	120	120	120	120	120	120	120
265	265	265	265	265	265	265	266	266	266	266
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	0	0
23	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
426	426	426	426	426	426	426	426	426	426	426
46	46	46	46	46	46	46	46	46	46	46
22	22	22	22	22	22	22	22	22	22	22
294	294	295	295	296	298	298	311	311	311	313
587	587	588	588	588	588	588	599	599	599	599

480	480	480	480	480	480	480	480	480	480	480
374	374	374	374	374	374	374	375	376	377	24
9	9	9	9	9	9	9	9	9	9	9
21	21	21	21	21	21	21	21	21	21	21
34	34	34	34	34	34	34	34	34	34	34
0	0	0	0	0	1	1	1	1	1	1
0	0	0	0	0	1	1	1	1	1	1
2,340	2,340	1,431	767	783	792	796	808	814	821	822
2,515	2,515	2,457	2,457	2,457	2,457	2,457	2,457	2,457	2,457	2,457
846	846	846	846	846	846	846	846	846	846	846
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
159	159	159	159	159	159	159	159	159	159	159
26	26	26	26	26	26	26	26	26	26	26
1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0
53	53	53	53	53	53	53	54	54	54	54
795	795	795	795	901	904	913	913	913	914	914
52	52	52	52	52	52	52	52	52	52	52
66	66	66	66	66	66	66	66	66	66	66
74	74	74	74	74	74	74	74	74	74	74
2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497
1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161	188	188
407	407	407	407	407	407	407	313	313	313	313
12	12	12	12	12	12	12	12	12	12	12
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
191	191	191	191	191	191	191	193	193	194	194
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
260	260	260	260	261	261	261	261	261	261	261
419	419	419	419	419	419	419	419	419	420	420
5	5	5	5	5	5	5	5	5	5	5
102	102	102	102	102	102	102	102	102	102	102
0	0	0	0	0	0	0	0	0	0	0
204	204	204	204	204	204	204	204	204	204	204

537	537	537	537	537	537	537	537	537	537	537
85	85	85	87	88	88	89	89	89	89	89
2,173	1,011	1,013	1,013	1,015	1,015	1,015	1,015	1,015	149	149
728	729	736	744	744	744	744	745	745	750	749
2	2	2	2	2	2	2	2	2	2	2
68	68	68	69	69	69	69	69	69	69	69
1,886	1,336	1,336	961	605	605	605	605	605	605	605
103	103	103	103	103	103	103	103	103	103	103
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
147	147	0	0	0	0	0	0	0	0	0
16	16	16	16	16	16	16	16	16	16	16
1	1	1	1	1	1	1	1	1	1	1
121	121	121	121	121	121	121	121	121	0	0
41	41	41	41	41	41	41	41	41	41	41
2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	1	1
51	51	51	51	51	51	51	51	51	51	51
0	0	0	0	0	59	59	59	59	59	59
1	1	1	1	1	1	1	1	1	1	1
18	18	18	18	18	18	18	18	18	19	19
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
1,566	1,566	1,566	1,566	1,566	1,566	1,566	3	9	11	14
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	2	2	2
2	2	2	2	2	2	2	2	2	2	2
168	168	168	168	168	168	168	168	168	168	168
11	11	11	11	11	11	11	11	11	11	11
0	0	0	0	0	0	0	0	0	0	0
7	7	7	7	7	7	7	7	7	7	7
624	624	624	624	624	624	624	624	624	624	624
11	11	11	11	11	11	11	11	11	11	11
1	1	1	1	0	0	0	0	0	0	0
1,371	1,371	1,371	1,371	1,371	1,303	1,304	1,305	1,305	1,305	1,305
63	63	63	63	63	63	63	63	63	63	63
522	522	522	522	522	523	523	523	524	524	524

0	0	0	0	0	0	0	0	0	0	0
10	10	10	16	16	16	16	16	16	16	16
153	153	153	153	153	153	153	153	153	153	153
20	20	20	20	20	21	21	21	21	21	21
46	46	46	46	46	47	47	48	48	48	48
1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0
989	118	103	103	103	102	103	104	104	104	104
37	37	37	37	37	37	37	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
2	2	2	2	2	2	2	2	2	2	2
4	4	4	4	4	4	4	4	4	4	4
1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1
45	45	45	45	45	45	45	45	45	45	45
534	534	534	534	534	534	534	534	452	452	452
898	898	898	898	898	898	340	340	340	340	340
234	234	234	234	234	234	234	234	234	234	234
0	0	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
82	82	82	82	82	82	82	82	82	82	82
300	300	300	300	300	300	300	300	117	117	117
1,314	1,314	1,314	1,314	1,314	1,314	1,314	802	808	808	808
1	1	1	1	1	1	1	1	1	1	1
21	21	21	21	21	21	21	21	21	21	21
21	21	21	21	21	21	21	21	21	21	21
144	144	71	144	144	144	144	145	145	145	145
642	642	688	676	685	690	692	692	694	695	695
10	10	10	10	10	9	9	9	9	9	9
14	14	14	14	14	14	14	14	14	14	14
0	0	0	0	0	0	0	0	0	1	1
12	12	12	12	12	13	13	13	13	13	13
0	0	0	0	0	0	0	0	0	0	0
11	11	11	11	11	11	11	11	11	11	11
0	0	0	0	0	0	0	0	0	0	0

0	0	0	0	0	0	0	0	0	0	0
94	94	94	94	94	94	46	46	46	46	46
1,851	1,851	1,851	1,851	1,851	1,851	1,851	1,851	1,851	1,851	1,851
229	229	229	230	248	248	248	248	248	171	171
1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294
26	26	26	26	26	26	26	26	26	26	26
1,927	1,927	1,927	1,927	1,927	1,927	1,927	1,927	1,546	1,548	1,550
62	62	0	0	0	0	0	0	0	0	0
24	24	24	24	24	33	35	35	35	35	35
20	20	20	20	20	20	20	20	20	20	20
335	335	335	335	335	335	336	339	339	339	339
64	64	64	64	65	65	65	65	65	15	15
962	962	962	962	964	966	966	966	917	917	917
629	629	629	0	3	4	4	5	5	5	5
341	341	0	0	0	0	0	0	0	0	0
806	0	0	0	0	1	1	2	2	2	3
598	598	1	1	2	2	2	3	3	4	4
1,139	1,139	1,139	1,139	1,139	1,139	1,139	1,139	1,139	1,139	1,139
2	2	2	2	2	2	3	3	3	3	3
1,795	1,795	1,795	1,795	1,795	1,795	1,795	1,795	1,795	1,795	1,795
1,742	1,742	1,742	1,743	1,743	1,743	1,743	1,743	1,744	757	713
5	5	5	5	5	5	5	5	5	5	5
34	34	34	34	34	34	34	34	34	34	34
521	521	521	521	521	521	521	521	521	521	521
44	44	44	44	44	44	44	2	2	2	3
168	168	168	168	168	168	169	169	169	169	170
1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	8	8	11
1,468	1,468	1,468	1,468	1,468	1,468	1,468	1,468	1,468	1,468	1,468
228	228	228	228	228	228	228	228	228	228	228
118	118	118	118	118	118	118	118	118	118	118
630	630	630	630	630	630	630	630	630	630	331
0	0	0	0	0	0	0	0	0	0	0
148	148	148	148	148	148	148	148	148	148	148
331	331	331	331	331	331	331	331	331	332	332
47	47	47	47	47	47	47	47	47	47	47
97	97	97	97	97	97	97	97	97	97	97
2,187	1,823	1,823	1,823	1,823	1,823	1,823	1,823	1,823	1,824	1,557

459	459	459	459	459	459	460	461	461	462	462
15	16	18	18	18	18	18	18	39	39	39
2	2	2	2	2	2	2	2	2	2	2
26	26	26	26	26	26	26	26	26	27	27
1,177	1,177	1,177	1,177	1,177	1,177	1,177	1,177	1,177	1,177	1,177
698	698	698	698	698	698	698	698	698	698	698
1,787	1,787	1,787	1,787	1,787	1,787	1,787	1,787	1,787	1,787	1,787
229	229	229	229	229	229	229	229	229	229	229
27	27	27	27	28	28	29	29	29	29	29
216	216	216	216	216	216	223	223	165	165	165
184	184	184	184	184	184	184	184	184	184	184
22	22	22	22	22	22	22	22	22	22	23
125	125	125	125	125	125	125	125	125	125	125
0	0	0	0	0	0	0	0	0	0	0
3	3	3	3	3	3	3	3	3	3	3
1	1	1	1	1	1	1	1	1	1	1
252	252	252	252	252	252	252	252	252	252	252
258	258	258	258	267	271	273	274	274	282	282
153	153	153	153	162	165	165	165	167	167	167
106	106	106	106	106	106	106	106	106	106	106
8	8	8	8	8	8	8	8	8	8	8
1	1	1	1	1	1	1	1	1	1	1
3	3	3	3	3	3	3	3	3	3	3
2	2	2	2	2	2	2	2	2	2	2
598	598	598	598	598	242	242	242	242	242	245
171	171	171	171	171	171	171	171	171	171	171
440	440	440	440	440	440	440	440	440	440	440
58	58	58	58	58	58	79	79	62	62	62

Hour 63	Hour 64	Hour 65	Hour 66	Hour 67	Hour 68	Hour 69	Hour 70	Hour 71	Hour 72	Hour 73
10/31/2017 15:00	10/31/2017 16:00	10/31/2017 17:00	10/31/2017 18:00	10/31/2017 19:00	10/31/2017 20:00	10/31/2017 21:00	10/31/2017 22:00	10/31/2017 23:00	11/1/2017 0:00	11/1/2017 1:00
1	1	1	1	1	1	1	1	1	1	1
27	27	27	27	27	27	27	27	27	27	27
20	20	20	20	20	20	20	0	0	0	0
132	132	132	132	132	132	132	132	132	132	132
0	0	0	0	0	0	0	0	0	0	0
42	42	42	42	42	42	42	42	42	42	42
8	8	0	0	0	0	0	0	0	0	0
72	72	72	72	72	72	72	72	72	72	72
63	63	63	63	63	63	63	63	63	63	63
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
3	3	3	3	3	3	3	3	3	3	3
316	316	316	316	316	316	316	316	316	316	316
12	12	12	12	12	12	12	12	12	12	12
125	125	125	125	125	125	125	125	125	125	125
159	159	159	159	159	159	159	159	159	159	159
19	19	19	19	19	19	19	19	19	19	19
130	130	1,108	130	0	0	0	0	0	0	0
35	35	35	35	35	35	35	35	35	35	35
5	5	5	5	5	5	5	5	5	5	5
15	15	15	15	15	15	15	15	15	15	15
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
7	7	7	7	7	7	7	7	7	7	7
1,126	1,126	1,126	1,127	1,127	1,127	1,127	290	291	292	292
0	0	0	0	0	0	0	0	0	0	0
557	557	557	557	557	557	557	557	557	558	558
1	1	1	1	1	1	1	1	1	1	1
566	566	566	517	517	517	517	517	517	517	517
963	963	963	963	963	963	132	132	60	61	61
227	227	227	227	227	227	227	227	227	227	227
348	287	287	162	162	162	162	162	162	162	162

336	336	336	336	336	336	336	336	336	336	336
1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0
27	27	27	27	27	27	27	27	27	27	27
429	429	429	429	429	429	429	429	429	429	429
16	16	16	16	16	16	16	16	16	16	16
2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3
2,486	0	0	0	3	3	4	4	4	4	4
2,462	2,462	1,382	1,251	1,264	1,270	1,271	1,271	1,271	1,271	1,271
197	197	197	197	197	197	197	197	197	197	197
29	29	29	29	29	29	29	29	29	29	29
67	67	67	67	67	67	67	67	67	67	67
1	1	1	1	1	1	1	1	1	1	1
168	169	169	169	132	132	146	146	147	147	147
12	12	12	12	12	12	12	12	12	12	12
213	213	213	213	213	213	213	213	17	17	17
0	0	0	0	0	0	0	0	0	0	0
4	4	4	4	4	4	4	4	4	4	4
35	35	35	35	35	35	35	35	35	35	35
243	243	243	243	243	243	243	243	243	243	243
120	120	120	120	120	120	120	120	120	120	120
266	266	266	266	266	266	266	266	266	266	266
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
1,449	1,449	1,449	1,449	1,449	1,449	333	118	118	118	119
296	296	296	296	296	296	296	296	296	296	296
46	46	46	46	46	46	46	46	46	46	46
22	22	22	22	22	22	22	22	22	22	22
313	313	313	313	313	313	313	240	240	240	240
599	599	599	533	533	533	533	533	533	533	533

480	480	480	480	480	480	480	480	480	480	480
24	25	26	26	26	26	26	26	26	26	26
9	9	0	0	0	0	0	0	0	0	0
21	21	21	21	21	21	21	21	21	21	21
34	34	34	34	34	34	34	34	34	34	34
1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1
828	829	829	833	834	838	839	840	705	705	705
2,457	1,911	1,912	1,912	1,913	887	889	889	890	890	890
846	846	846	846	846	729	731	669	671	672	372
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
159	159	159	159	159	159	159	159	159	159	159
26	26	26	26	26	26	26	26	26	26	26
1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0
54	54	54	54	54	54	66	66	66	66	66
914	915	915	915	915	916	801	638	638	638	638
52	52	52	52	52	52	52	52	52	52	52
66	66	66	66	66	66	66	66	66	66	66
74	74	74	74	74	74	74	74	74	74	74
2,497	2,497	2,497	2,497	2,418	2,418	2,419	1,932	1,935	1,936	828
188	188	188	188	188	188	188	188	188	188	188
313	313	96	96	96	96	96	96	96	96	96
12	12	12	12	12	12	12	12	12	12	12
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
194	194	194	194	195	195	195	195	195	195	195
1	1	1	1	1	1	1	1	1	1	1
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261	261	261	261	261	261	261	143	143	143	143
420	420	420	420	420	420	420	420	420	420	420
5	5	5	5	5	5	5	5	5	5	5
102	102	102	102	102	102	102	102	102	102	102
0	0	0	0	0	0	0	0	0	0	0
204	204	204	204	204	204	204	204	204	204	204

537	537	537	537	537	537	538	369	369	369	212
89	89	89	89	89	89	89	89	89	89	89
149	149	149	149	149	149	149	149	149	149	149
759	759	760	306	306	304	304	305	305	305	305
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69	69	69	69	70	70	70	70	70	70	70
605	605	605	605	605	605	605	605	544	544	544
103	103	103	103	103	103	103	103	103	103	103
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
16	16	16	16	16	16	16	16	16	16	16
1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0
41	41	41	41	41	41	41	41	41	41	41
2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	1	1
51	51	51	51	51	51	51	51	51	51	51
59	59	59	59	59	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
19	19	19	19	19	19	19	19	19	19	19
0	0	0	0	0	0	0	0	0	0	0
0	0	38	38	38	38	38	38	38	38	38
14	17	17	17	17	17	18	19	19	19	19
0	0	0	0	0	0	0	0	0	0	0
2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2	2
168	168	168	168	168	168	168	168	168	168	168
11	11	11	11	11	11	11	11	11	11	11
0	0	0	0	0	0	0	0	0	0	0
7	7	7	7	7	7	7	7	7	7	7
624	624	624	624	624	624	624	624	624	624	624
11	11	11	11	11	11	11	11	11	11	11
0	0	0	0	0	0	0	0	0	0	0
1,108	1,109	1,107	1,107	1,107	1,107	1,107	1,107	1,107	1,107	1,107
63	63	63	63	63	63	63	63	63	63	63
524	524	524	524	524	524	524	524	524	524	524

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16	16	24	25	25	25	25	25	25	25	25
153	153	153	153	153	153	3	3	3	3	3
21	32	32	32	32	32	32	32	32	32	32
48	48	48	48	48	48	48	48	48	48	48
1	1	1	1	1	1	1	1	1	1	1
0	2	2	2	2	2	2	2	2	2	2
104	104	104	104	104	104	104	104	104	104	104
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
2	2	2	2	2	2	2	2	2	2	0
4	4	4	4	4	4	4	4	4	4	0
1	1	1	1	1	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
45	45	45	45	45	45	45	45	45	45	45
452	452	452	394	394	394	394	394	394	394	394
340	340	340	340	340	340	340	340	340	340	340
234	234	234	234	234	234	234	234	234	234	234
1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
82	81	81	81	81	81	81	81	81	81	81
117	118	118	118	118	118	118	118	118	118	118
806	806	806	807	726	726	727	727	727	732	732
1	1	1	1	1	1	1	1	1	1	1
21	21	21	21	21	21	21	21	21	21	21
21	21	21	21	21	21	21	21	21	21	21
145	146	115	115	42	42	42	42	42	42	42
679	98	97	97	97	97	96	96	96	96	93
9	9	9	9	9	8	8	8	8	8	8
14	14	14	14	14	14	14	14	14	14	14
1	1	1	1	1	1	1	0	0	0	0
13	13	13	13	13	13	13	13	13	13	13
1	1	1	1	1	1	1	1	1	1	1
11	11	11	11	11	11	11	11	11	11	11
0	0	0	0	0	0	0	0	0	0	0

0	0	0	0	0	0	0	0	0	0	0
46	46	47	47	47	1	1	1	1	1	1
1,851	1,851	1,851	614	614	614	614	614	615	615	615
173	173	173	173	173	173	173	173	173	173	173
1,294	1,056	1,056	1,056	1,056	1,056	1,056	1,056	1,056	1,056	1,056
26	26	26	26	26	26	26	26	26	26	26
1,550	1,550	1,550	1,554	1,555	1,555	1,555	1,026	1,028	1,028	1,028
0	0	0	0	0	0	0	0	0	0	0
35	35	35	35	35	35	35	35	35	35	35
21	21	27	27	27	27	27	27	27	27	27
339	339	339	339	339	340	341	341	341	341	341
15	15	15	15	15	15	15	15	15	15	15
144	145	95	75	75	75	75	75	75	75	75
5	5	14	14	14	14	14	14	14	14	14
0	0	0	0	0	0	0	0	0	0	0
3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	5	5	5
1,139	1,139	1,139	1,139	1,139	1,139	1,139	1,139	1,139	1,139	1,139
3	3	3	3	3	3	3	3	3	3	3
1,796	744	744	406	406	406	406	406	406	406	406
714	714	714	714	714	714	714	714	719	719	721
5	5	5	5	5	5	5	5	5	5	5
34	34	34	34	34	34	34	34	34	34	34
521	521	521	521	521	521	521	521	521	521	521
3	3	3	3	3	3	3	3	3	3	3
170	170	170	170	170	170	170	170	170	170	170
11	11	11	11	11	11	11	11	11	11	11
1,468	1,468	1,468	1,468	1,468	1,469	1,469	1,469	1,469	1,469	1,469
228	228	228	228	228	228	228	228	228	228	228
118	118	118	118	118	118	118	118	118	118	118
334	335	335	335	271	271	271	271	9	9	9
0	0	0	0	0	0	0	0	0	0	0
148	148	148	148	148	148	148	148	148	148	148
332	358	358	358	358	358	358	358	358	358	358
47	47	47	47	47	47	47	47	47	47	47
97	97	97	97	97	97	97	97	97	97	97
1,557	1,557	1,367	1,367	1,367	1,141	1,141	1,141	1,142	1,142	1,142

462	462	462	462	462	462	462	462	462	462	462
39	39	40	40	40	40	40	40	40	40	40
2	2	2	2	2	2	2	2	2	2	2
27	27	27	27	10	10	10	10	10	10	10
1,177	1,177	1,178	1,178	1,178	1,178	1,178	1,178	1,178	1,178	1,178
698	698	698	698	698	698	698	698	698	698	698
1,787	1,787	1,787	1,787	1,787	1,787	1,787	1,787	1,787	1,787	1,787
229	229	229	229	229	230	231	232	232	232	232
29	29	29	29	29	29	29	29	29	29	29
165	165	165	165	165	165	39	39	39	39	39
185	185	185	185	185	185	185	185	185	185	185
23	23	23	23	23	23	23	23	24	24	24
125	125	125	125	125	125	125	125	125	125	125
0	0	0	0	0	0	0	0	0	0	0
3	3	3	3	3	3	3	3	3	0	0
1	1	1	1	1	1	1	1	1	1	1
252	252	252	252	252	252	252	252	252	252	252
283	283	283	283	283	283	283	283	283	283	283
168	168	168	168	169	169	169	169	169	169	169
106	106	106	106	106	106	106	106	106	106	106
8	8	8	8	8	8	8	8	8	8	8
1	1	1	1	1	1	1	1	1	1	1
3	3	3	3	3	3	3	3	3	3	3
2	2	2	2	2	2	2	2	2	2	2
245	245	245	245	245	245	245	245	245	245	245
171	171	171	171	171	171	171	171	173	173	173
440	440	440	440	440	440	440	449	449	449	449
62	62	62	62	62	62	62	62	62	62	62

Hour 74	Hour 75	Hour 76	Hour 77	Hour 78	Hour 79	Hour 80	Hour 81	Hour 82	Hour 83	Hour 84	Hour 85
11/1/2017 2:00	11/1/2017 3:00	11/1/2017 4:00	11/1/2017 5:00	11/1/2017 6:00	11/1/2017 7:00	11/1/2017 8:00	11/1/2017 9:00	11/1/2017 10:00	11/1/2017 11:00	11/1/2017 12:00	11/1/2017 13:00
1	1	1	1	1	1	1	1	1	1	1	1
27	27	27	27	27	27	27	27	27	27	27	27
0	0	0	0	0	0	0	0	0	0	0	0
132	132	132	132	132	132	132	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
42	42	42	42	42	42	42	42	42	42	42	42
0	0	0	0	0	0	0	0	0	0	0	0
72	72	72	72	72	72	32	32	32	32	32	32
63	63	63	63	63	63	63	63	8	8	8	8
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
3	3	3	3	3	3	3	3	4	4	4	4
316	316	316	316	316	316	316	316	316	15	15	15
12	12	12	12	12	12	12	12	12	12	12	12
125	125	125	125	125	125	125	125	89	25	25	25
159	159	159	159	159	159	159	159	159	159	0	0
19	19	19	19	19	19	19	19	19	19	19	19
0	0	0	0	0	0	0	0	0	0	7	7
35	35	35	35	35	35	35	35	35	35	35	35
5	5	5	5	5	5	5	5	5	5	5	5
15	15	15	15	15	15	15	15	15	15	15	15
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	1
1	1	1	1	1	1	1	1	1	1	1	1
7	7	7	7	7	7	7	7	7	7	7	8
292	292	292	292	292	293	294	294	294	294	294	294
0	0	0	0	0	0	0	0	0	0	1	1
558	558	558	557	557	321	321	321	321	321	321	321
1	1	1	1	1	1	1	1	1	1	1	1
517	517	517	517	517	517	517	517	517	194	194	194
61	61	61	61	61	61	61	61	40	40	40	40
227	227	227	227	227	227	227	227	227	227	227	228
162	162	162	162	20	20	20	21	22	22	30	30

336	336	336	336	336	336	336	336	336	336	336	336
1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0
27	27	27	27	27	27	27	27	27	27	27	27
429	174	174	174	174	175	175	175	175	175	175	175
16	16	16	16	16	16	16	16	16	16	16	16
2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	5	5	5
1,271	1,271	1,271	1,271	1,073	1,032	1,033	1,035	874	875	698	701
197	197	197	197	197	197	197	197	197	197	195	195
29	29	29	29	29	29	29	29	29	29	29	29
67	67	67	67	67	67	67	67	67	67	67	67
1	1	1	1	1	1	1	1	1	1	1	1
147	147	147	147	147	147	147	149	150	150	150	150
12	12	0	0	0	0	0	0	0	0	0	0
17	17	17	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
4	4	4	4	4	4	4	4	4	4	4	4
35	35	35	35	35	35	35	35	35	35	35	35
243	243	243	243	243	243	243	243	123	123	123	123
120	120	120	120	120	120	120	120	30	31	32	32
266	266	93	93	77	63	63	63	63	63	64	64
0	0	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1
119	119	119	119	119	126	131	132	132	132	132	132
296	296	296	296	296	296	296	296	297	297	297	297
46	46	46	46	46	46	46	46	46	46	46	46
22	22	22	22	22	22	22	22	22	22	22	22
240	240	240	240	240	240	240	240	240	116	20	19
533	533	533	533	533	533	533	533	533	533	533	533

480	480	480	480	480	480	480	480	480	480	480	480
26	26	26	26	26	26	26	26	6	6	6	7
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21	21	21	21	21	21	21	21	21	21	21	21
34	34	34	34	34	34	34	34	34	34	34	34
1	1	1	1	1	1	11	11	11	11	11	11
1	1	1	1	1	1	1	1	1	1	1	1
632	632	632	632	632	632	632	627	617	617	617	617
890	890	890	890	890	890	890	890	895	896	896	896
372	227	227	228	228	229	231	235	235	236	236	236
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1	1	1	1	1	1	1	1	1	1	1	1
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66	66	66	66	13	13	13	13	13	13	13	13
638	638	638	659	659	659	659	660	648	649	650	651
52	52	52	52	52	52	52	52	52	52	52	52
66	66	66	66	66	66	66	66	66	66	66	66
74	74	74	74	74	74	74	74	74	74	74	43
543	543	195	197	197	198	199	202	204	205	208	208
188	188	188	188	188	188	188	188	188	188	187	187
96	96	96	96	96	96	96	96	96	96	96	96
12	12	12	12	12	12	12	12	12	12	12	12
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0	0	0	0	0	0	0	0	0	0	0	0
195	195	195	195	195	195	195	195	195	195	181	181
1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1
143	143	143	143	144	145	145	145	145	145	145	145
420	420	420	420	387	387	388	388	175	176	176	176
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102	102	102	102	102	102	102	102	102	102	102	102
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204	204	204	204	204	204	204	204	204	204	204	204

212	212	144	144	144	144	144	144	144	144	144	144
89	89	89	89	89	89	89	89	89	89	89	89
149	149	149	149	149	149	149	149	149	149	149	149
305	305	305	305	305	294	17	18	10	11	12	12
2	2	2	2	2	2	2	2	2	2	2	2
70	70	70	70	70	70	70	70	70	70	70	70
544	544	544	544	544	544	544	544	31	31	31	31
103	103	103	103	103	103	103	103	103	103	103	103
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
16	16	16	16	16	16	16	16	16	16	16	16
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41	41	41	41	41	0	0	0	0	0	0	0
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51	51	51	51	51	12	12	12	12	12	12	12
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19	19	19	19	19	19	20	20	20	20	20	20
0	0	0	0	0	0	0	0	0	0	0	0
38	38	38	38	38	38	38	38	38	38	38	38
19	19	19	19	19	19	19	19	19	19	19	19
0	0	0	0	0	0	0	0	0	0	0	0
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2	2	2	2	2	2	2	2	2	2	2	2
168	168	73	73	73	73	73	73	0	0	0	0
11	11	11	11	11	11	11	11	11	11	11	11
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7	7	7	7	7	8	8	8	8	8	8	8
624	624	624	624	624	624	624	624	624	307	308	311
11	11	11	11	11	11	11	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
1,107	1,107	1,107	1,107	1,107	1,107	1,107	767	767	767	767	767
63	63	63	63	63	63	63	63	63	63	63	63
524	524	524	524	524	524	524	524	524	524	524	524

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25	25	25	25	25	25	25	25	17	17	17	17
3	3	3	3	3	3	4	4	4	4	4	4
32	32	32	32	32	32	32	32	32	32	32	32
48	48	48	48	48	48	48	48	48	48	48	16
1	1	1	1	1	1	1	1	1	1	1	1
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104	104	104	104	104	104	104	104	104	104	104	104
0	0	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1
45	45	45	45	45	45	45	45	45	45	45	45
394	394	394	394	394	394	394	394	394	394	394	394
340	340	340	340	340	340	340	340	340	340	340	340
234	234	234	234	234	234	234	234	234	234	234	234
1	1	1	1	1	1	1	1	1	1	1	1
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0	0	0	0	0	0	0	0	0	0	0	0
81	81	81	81	81	81	81	81	81	81	81	81
118	118	118	118	118	118	118	118	118	119	119	119
732	732	732	732	732	732	732	732	732	732	732	732
1	1	1	1	1	1	1	1	1	1	1	1
21	21	21	21	21	21	21	21	21	21	21	21
21	21	21	21	21	21	21	0	0	0	0	0
42	42	42	35	35	35	35	35	35	35	22	22
93	93	93	93	93	71	71	71	71	56	31	31
8	8	8	8	8	8	8	8	8	8	8	8
14	14	14	14	14	14	14	14	14	14	14	14
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13	13	13	13	13	13	13	13	13	14	14	14
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11	11	11	11	11	11	11	11	11	11	11	11
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1	1	1	1	1	1	1	1	1	1	1	1
615	616	616	616	616	616	616	616	616	616	616	616
173	173	173	173	173	173	173	173	173	173	174	174
1,056	489	249	249	249	249	250	260	262	263	264	267
26	26	26	26	26	26	26	26	27	27	27	27
1,028	1,028	1,028	1,028	1,028	1,029	1,029	1,029	700	700	700	426
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35	35	35	35	17	17	17	17	17	15	15	9
27	27	27	27	27	27	27	27	27	27	27	27
341	341	341	341	341	341	342	342	342	342	342	342
15	15	15	15	15	15	15	15	15	15	15	15
75	75	75	75	75	75	75	75	67	67	68	68
14	14	14	14	14	14	14	14	14	14	14	14
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3	3	3	3	3	3	3	3	3	3	3	3
5	5	5	5	5	5	5	5	5	5	5	5
1,139	1,139	1,139	1,139	1,139	625	625	626	625	625	625	625
3	3	3	3	3	3	3	3	3	3	3	4
406	406	406	406	407	407	407	407	406	407	407	387
721	721	721	722	723	726	732	739	739	743	570	421
5	5	5	5	5	5	5	5	5	5	5	5
34	34	34	34	34	34	34	34	34	34	34	34
521	521	521	521	521	521	521	521	521	521	521	521
3	3	3	3	3	3	3	3	3	3	3	3
170	170	170	170	170	170	170	171	171	171	171	171
11	11	11	11	11	11	11	11	11	11	11	12
1,469	1,469	1,469	376	376	376	376	377	378	378	383	384
228	228	228	228	228	228	228	228	228	228	228	228
118	118	118	118	118	118	118	118	118	115	115	115
9	9	9	9	9	9	9	9	4	4	4	4
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148	148	148	148	148	148	148	148	148	148	148	148
358	358	358	358	358	358	358	358	358	358	358	358
47	47	47	47	47	47	47	47	47	47	47	47
97	97	98	98	98	98	98	98	98	98	99	100
1,142	877	878	882	882	885	887	887	892	900	902	908

462	462	462	462	462	462	462	462	462	462	462	461
40	40	40	40	40	40	40	40	40	40	40	40
2	2	2	2	2	2	2	2	2	2	2	2
10	10	10	10	10	10	10	10	10	10	10	10
1,178	1,179	1,179	1,179	1,179	1,179	1,179	1,179	1,179	1,179	1,179	1,179
698	698	698	698	698	698	698	698	698	698	698	698
1,787	763	763	763	763	763	763	763	763	763	763	763
232	232	232	232	232	232	232	232	232	235	235	235
29	29	29	29	29	29	29	29	29	29	29	30
39	39	39	39	39	39	39	39	39	39	39	39
185	185	185	185	185	185	185	185	184	185	185	185
24	24	24	24	24	24	24	24	23	23	23	23
125	125	125	125	125	125	125	125	125	125	125	125
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0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1
252	252	252	252	252	252	252	252	252	252	252	252
283	283	283	283	283	283	283	283	283	283	283	283
169	169	169	169	169	169	169	169	169	169	169	169
106	106	106	106	106	106	106	106	106	106	107	107
8	8	8	8	8	8	8	8	8	8	8	8
1	1	1	1	1	1	1	1	1	1	1	1
3	3	3	3	3	3	3	3	3	3	3	3
2	2	2	2	2	2	2	2	2	2	2	2
245	245	245	245	245	246	246	246	246	246	246	246
173	173	173	173	173	173	173	173	176	176	177	177
450	450	450	450	450	450	450	458	459	459	459	459
62	62	62	62	62	62	58	58	58	58	58	58

Hour 86	Hour 87	Hour 88	Hour 89	Hour 90	Hour 91	Hour 92	Hour 93	Hour 94	Hour 95	Hour 96
11/1/2017 14:00	11/1/2017 15:00	11/1/2017 16:00	11/1/2017 17:00	11/1/2017 18:00	11/1/2017 19:00	11/1/2017 20:00	11/1/2017 21:00	11/1/2017 22:00	11/1/2017 23:00	11/2/2017 0:00
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27	25	18	16	16	16	16	0	0	0	0
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42	42	0	0	0	0	0	0	0	0	0
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12	12	12	12	12	12	12	12	12	12	12
25	25	25	25	0	0	0	0	0	0	0
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19	19	19	19	0	0	0	0	0	0	0
7	7	7	7	7	0	0	0	0	0	0
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81	78	7	6	4	4	4	4	4	4	4
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194	194	1	1	1	1	1	1	1	1	1
40	40	41	41	41	41	41	41	41	41	41
228	228	111	111	111	111	111	111	111	111	111
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336	336	263	264	264	264	264	264	264	264	264
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27	27	27	27	27	27	27	27	27	27	27
175	175	175	175	188	188	188	188	188	188	188
16	16	16	16	16	16	16	16	16	16	16
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3	3	3	3	3	3	3	3	3	3	3
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695	696	697	471	473	473	473	473	403	404	404
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29	29	29	29	29	29	29	29	29	29	29
67	12	1	1	0	0	0	0	0	0	0
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150	89	94	94	94	94	95	95	95	95	95
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35	35	35	35	35	35	35	5	5	4	4
55	55	55	55	41	30	29	26	26	26	26
32	32	32	32	32	32	32	32	32	32	32
64	27	27	2	2	2	2	1	1	1	1
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46	46	46	46	47	47	47	47	47	47	47
22	22	22	22	22	22	22	22	22	22	22
16	16	14	14	14	14	14	14	14	14	14
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418	402	320	258	216	195	63	63	63	63	63
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11	11	11	11	11	11	11	11	11	11	11
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617	617	620	621	630	430	430	430	430	430	430
896	896	203	204	204	205	205	205	206	206	206
236	208	209	211	212	213	213	213	213	213	213
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654	655	659	660	661	661	662	523	524	468	469
52	52	52	52	52	52	52	52	52	52	52
66	66	66	66	66	66	66	67	67	67	67
43	43	43	43	43	43	43	43	43	43	43
209	209	210	210	210	210	210	210	210	210	210
187	187	187	187	187	187	187	187	38	38	38
96	96	96	96	96	95	95	95	95	95	95
12	12	12	12	12	12	12	12	12	12	12
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181	181	181	181	48	48	48	48	48	48	48
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145	145	145	145	145	145	145	145	145	145	145
176	176	176	176	176	176	176	176	176	176	176
5	5	5	5	5	5	5	5	5	5	5
102	102	102	102	102	102	0	0	0	0	0
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204	204	204	204	204	204	31	1	2	2	2

144	144	144	144	144	144	144	144	51	51	51
89	89	89	89	6	6	6	6	6	6	6
149	149	149	149	149	149	149	149	149	149	149
22	22	22	22	22	22	22	22	22	22	22
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31	31	31	0	0	0	0	0	0	0	0
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11	11	11	11	11	11	11	11	11	11	11
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312	317	318	318	131	131	132	133	133	133	133
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767	767	767	768	768	768	768	768	768	768	768
63	63	63	63	63	63	63	63	63	63	63
168	168	168	168	168	168	168	168	168	168	168

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4	4	4	4	4	4	4	4	4	4	4
32	32	32	32	32	32	32	32	32	32	32
15	15	16	16	16	16	15	15	15	15	15
1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2
104	104	104	104	104	104	104	104	104	104	104
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45	45	45	45	45	45	35	35	35	25	25
394	394	394	394	394	394	393	0	0	0	0
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234	234	234	234	234	234	234	234	234	62	62
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81	81	81	81	82	82	1	1	1	1	1
119	119	62	62	40	40	40	40	40	40	40
732	734	734	734	734	734	335	335	335	335	335
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22	21	21	21	21	19	19	18	18	18	18
32	32	32	32	25	25	25	25	25	25	25
8	8	8	8	8	8	8	8	8	8	8
14	14	14	14	14	14	14	14	14	14	14
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14	15	15	15	15	15	15	16	16	16	16
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11	10	10	10	10	3	3	3	3	3	3
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616	616	616	616	599	599	599	484	484	484	484
174	174	173	0	0	0	0	0	0	0	0
268	268	268	268	270	270	270	270	272	272	272
27	27	27	27	27	27	27	27	27	27	27
426	426	426	426	426	426	426	426	426	427	401
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9	9	9	9	9	9	0	0	0	0	0
27	27	27	27	27	27	27	27	27	27	27
342	356	356	356	191	191	191	191	191	191	191
15	15	15	15	15	15	15	15	15	15	15
68	68	68	68	68	68	41	41	41	41	41
14	14	14	14	14	18	18	18	18	18	18
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5	5	5	5	5	5	5	5	5	5	5
186	186	186	185	183	183	183	183	172	172	172
4	4	4	4	4	4	4	4	4	4	4
368	368	368	4	4	4	4	4	4	4	4
421	422	425	426	427	429	429	430	430	430	430
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34	34	34	34	34	34	34	34	34	34	34
521	521	0	0	1	1	1	1	1	1	1
3	3	3	3	3	3	3	3	3	3	3
171	171	171	7	7	7	7	8	8	8	8
12	12	12	12	12	12	12	12	12	12	12
384	384	384	384	384	384	384	384	384	384	384
228	228	210	210	210	210	210	210	210	210	210
115	115	115	115	115	115	115	115	115	115	115
5	5	5	5	5	5	5	5	5	5	5
0	0	0	0	0	0	0	0	0	0	0
148	148	148	148	148	148	148	148	148	148	148
358	358	358	353	266	266	266	266	172	172	172
47	47	47	47	47	47	47	47	47	47	47
100	100	100	100	100	100	100	100	100	100	100
913	715	660	663	663	663	663	651	596	596	596

381	380	287	45	45	45	45	45	45	45	45
40	40	40	40	40	40	40	40	40	40	40
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1,179	1,180	1,180	1,089	1,053	1,053	1,053	1,053	1,053	1,053	1,053
698	698	698	698	180	180	4	4	5	5	5
763	763	763	763	0	1	1	2	3	5	6
235	235	235	234	233	231	232	224	224	177	177
30	30	30	30	30	30	30	30	30	30	30
39	39	15	15	15	15	15	15	15	15	15
185	185	185	185	185	185	185	185	185	186	186
23	23	23	23	23	23	23	23	23	23	23
125	125	125	125	125	125	125	125	125	125	125
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1	1	0	0	0	0	0	0	0	0	0
252	253	253	253	253	253	253	253	253	253	253
182	182	46	12	12	12	12	12	11	11	11
169	169	169	169	169	169	169	169	169	169	169
107	107	107	107	107	107	107	107	107	107	107
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1	1	1	1	1	1	1	1	1	1	1
3	3	3	3	3	3	3	3	3	3	3
2	2	2	2	2	2	2	2	2	2	2
246	246	246	242	2	3	3	3	3	3	3
177	177	177	177	177	177	177	177	177	177	177
459	319	319	319	319	319	319	319	319	173	127
58	58	58	58	58	58	58	58	58	58	58

Hour 97	Hour 98	Hour 99	Hour 100	Hour 101	Hour 102	Hour 103	Hour 104	Hour 105	Hour 106	Hour 107	Hour 108
11/2/2017 1:00	11/2/2017 2:00	11/2/2017 3:00	11/2/2017 4:00	11/2/2017 5:00	11/2/2017 6:00	11/2/2017 7:00	11/2/2017 8:00	11/2/2017 9:00	11/2/2017 10:00	11/2/2017 11:00	11/2/2017 12:00
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0	0	0	0	0	0	0	0	0	0	0	0
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8	8	8	8	8	8	8	8	8	8	8	8
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12	12	12	12	12	12	12	12	12	12	12	12
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41	41	41	41	41	41	41	41	41	41	41	41
111	111	111	111	111	111	111	111	111	111	2	0
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264	264	264	264	264	264	264	264	264	264	264	264
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27	27	27	27	27	27	27	27	27	27	27	27
95	95	95	95	95	95	95	95	95	95	95	95
16	16	16	16	16	16	16	16	16	16	16	16
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3	3	3	3	3	3	3	3	3	3	3	0
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404	404	404	404	404	404	404	404	405	78	78	78
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29	29	29	29	29	29	29	0	0	0	0	0
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32	32	32	32	32	32	32	32	32	31	28	27
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98	98	98	98	98	98	98	98	85	61	54	28
42	42	42	42	42	42	42	42	42	42	42	42
47	47	47	47	47	47	47	47	47	47	47	47
22	22	22	22	22	22	22	22	22	22	22	22
14	14	14	14	14	14	14	14	14	14	14	14
377	377	377	377	377	377	377	224	224	225	225	225

63	63	63	63	63	63	63	63	63	63	63	63
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34	34	34	34	34	34	34	34	34	14	14	14
11	11	11	11	11	11	11	11	11	11	11	11
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430	430	430	430	430	430	430	430	430	430	431	431
206	206	206	206	206	206	206	206	207	207	149	149
213	213	213	213	213	139	139	140	137	119	119	119
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13	13	13	13	13	13	1	1	1	1	1	1
469	469	469	469	469	469	469	469	434	379	378	375
52	52	52	52	52	52	52	52	52	53	53	53
67	67	67	67	67	67	67	67	67	67	66	53
43	43	43	43	43	43	43	43	43	43	43	43
210	210	210	210	210	210	97	128	128	128	128	52
38	38	38	38	38	38	38	38	38	38	16	0
95	95	95	95	95	95	25	26	26	26	26	26
12	12	12	12	12	12	12	12	12	12	12	12
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176	176	176	176	176	176	176	113	113	113	20	20
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149	149	149	149	149	101	101	6	6	6	6	6
22	22	22	22	22	22	22	22	22	22	22	22
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168	168	168	168	168	168	168	168	168	168	0	0

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484	484	484	376	376	376	376	136	136	136	116	116
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272	272	272	272	272	272	272	272	272	272	263	263
27	27	27	27	27	27	27	27	27	27	27	27
401	401	401	401	401	401	349	349	357	357	356	351
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27	27	27	27	27	27	27	27	27	27	27	27
191	191	191	191	191	191	191	191	191	189	17	17
15	15	15	15	15	15	15	15	15	15	15	15
41	41	41	41	41	41	41	41	41	20	0	1
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172	172	172	172	172	172	172	172	172	172	172	172
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430	430	430	430	430	430	430	431	431	432	432	432
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34	34	34	34	34	34	34	34	34	34	34	34
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384	384	384	384	384	384	384	384	384	384	384	384
210	210	210	210	210	210	210	17	17	17	17	17
115	115	115	115	115	115	115	115	115	115	115	115
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172	172	172	172	172	172	172	172	172	172	176	176
47	47	47	47	47	47	47	47	47	47	47	47
100	100	100	100	100	100	100	100	100	100	100	100
596	596	596	596	595	563	563	564	567	567	544	555

45	45	45	45	45	45	45	45	0	0	0	0
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1,053	1,053	1,053	1,053	1,053	187	188	196	203	170	170	170
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6	6	6	6	6	65	65	65	65	6	7	7
177	177	177	177	177	177	177	177	177	177	177	177
30	30	30	30	30	30	30	13	13	13	13	13
15	15	15	15	15	15	15	15	15	15	15	15
186	186	186	186	186	186	186	186	186	19	17	2
23	23	23	23	23	22	22	22	22	22	22	22
125	125	125	125	125	125	125	125	125	125	125	125
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11	11	11	11	11	11	11	11	11	11	11	11
169	169	169	169	169	169	169	169	169	169	169	169
107	106	106	106	106	106	106	106	106	106	106	106
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2	2	2	2	2	2	2	2	2	2	2	2
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177	177	177	177	177	177	177	177	177	177	177	177
77	77	77	77	77	33	33	33	33	33	33	33
58	58	58	58	58	58	58	58	58	58	58	58

Hour 109	Hour 110	Hour 111	Hour 112	Hour 113	Hour 114	Hour 115	Hour 116	Hour 117	Hour 118	Hour 119
11/2/2017 13:00	11/2/2017 14:00	11/2/2017 15:00	11/2/2017 16:00	11/2/2017 17:00	11/2/2017 18:00	11/2/2017 19:00	11/2/2017 20:00	11/2/2017 21:00	11/2/2017 22:00	11/2/2017 23:00
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41	26	21	0	0	0	0	0	0	0	1
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264	264	264	264	264	264	264	264	264	264	264
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27	27	27	27	27	17	17	17	17	0	0
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16	16	16	16	16	16	16	16	16	16	16
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79	78	1	11	18	18	18	18	18	18	18
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42	41	40	40	40	1	1	1	0	0	0
47	47	47	47	48	28	28	28	28	28	1
22	22	22	22	15	0	0	0	0	0	0
14	14	0	0	0	0	0	0	0	0	0
225	225	225	225	225	225	143	143	143	143	143

63	63	63	0	0	0	0	0	0	0	0
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22	21	21	21	21	21	21	21	21	21	21
14	14	14	14	14	0	0	0	0	0	0
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431	432	432	432	433	414	412	412	410	142	117
151	152	152	152	152	150	137	136	129	129	113
119	119	33	30	18	2	2	2	3	4	4
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53	53	53	53	53	53	53	53	53	53	53
53	52	51	50	51	8	8	8	1	1	1
43	43	43	43	43	43	43	20	19	19	19
47	43	38	36	35	33	33	2	2	3	3
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145	145	145	144	141	12	3	3	3	3	3
20	20	20	20	20	21	3	3	3	3	3
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22	22	22	23	0	0	0	0	0	0	0
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70	70	70	69	69	47	47	47	47	47	47
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32	32	32	32	28	0	0	0	1	1	1
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1	1	1	1	0	0	0	0	0	0	0
40	40	28	0	0	0	0	0	0	0	0
305	247	152	150	150	151	72	72	72	72	72
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0	0	0	0	0	0	0	0	0	0	0
18	18	18	18	18	6	6	6	5	5	5
8	7	4	2	1	1	1	1	1	0	0
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17	17	17	17	17	0	0	0	0	0	0
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3	3	3	3	3	3	3	3	3	3	3
0	0	0	0	0	0	0	0	44	0	0

0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
116	116	116	115	73	6	6	6	6	6	6
0	0	0	0	0	0	0	0	0	0	0
263	263	263	263	263	94	94	94	81	78	78
27	28	28	27	25	25	25	25	25	11	11
349	190	190	190	190	191	191	191	191	197	197
1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1
27	27	26	26	26	17	17	17	17	18	14
1	1	1	0	0	0	0	0	0	0	0
15	15	16	16	15	16	15	15	15	15	15
1	2	2	3	3	3	3	3	3	3	3
18	18	18	18	14	4	4	4	4	4	4
0	0	0	0	0	0	0	0	0	0	0
3	3	2	2	0	0	0	0	0	0	0
5	5	4	3	3	0	0	0	0	0	0
172	172	172	172	172	172	172	172	172	0	0
3	3	2	2	2	1	1	0	0	0	0
4	4	4	2	2	2	2	1	1	1	1
586	405	343	240	241	241	165	53	53	53	52
5	5	5	5	5	5	5	5	5	5	5
34	34	34	34	34	34	34	34	34	34	34
1	1	1	1	1	1	1	1	1	1	1
3	3	3	3	3	1	1	1	1	1	1
8	8	7	6	5	5	4	4	4	4	4
12	12	12	12	12	12	12	12	12	12	12
384	384	383	383	206	206	206	206	207	202	125
18	18	18	18	12	12	12	12	4	4	4
115	115	115	115	115	115	115	115	115	115	99
6	6	6	6	3	3	3	3	3	3	3
0	0	0	1	1	1	1	1	1	1	1
6	5	5	6	3	3	3	3	3	3	4
176	176	176	175	110	110	110	110	110	110	110
47	47	47	46	40	40	40	40	40	40	40
100	100	100	100	35	31	8	8	8	8	8
541	541	541	541	364	310	310	254	253	259	98

0	0	0	0	0	0	0	0	0	0	0
40	1	1	1	1	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3
1	1	1	1	1	1	1	1	1	1	1
170	171	124	124	147	120	52	52	52	52	52
5	5	5	5	5	5	5	5	5	5	5
2	3	3	3	3	3	3	3	3	3	3
177	0	2	2	2	2	2	2	2	2	2
13	13	13	12	11	10	10	10	10	10	10
15	15	15	15	15	15	15	15	15	15	15
2	2	2	2	2	2	2	1	1	1	1
22	22	22	21	20	18	17	17	17	37	67
125	125	125	2	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
253	102	104	105	104	104	104	104	104	104	104
11	11	11	11	11	11	11	11	11	11	11
169	169	169	169	169	168	158	157	157	136	136
106	106	0	0	0	0	0	0	0	0	0
8	8	8	8	8	8	8	8	8	8	8
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3	3	3	3	0	0	0	0	0	0	0
2	2	2	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
177	177	80	80	80	80	80	80	80	80	7
33	33	33	33	33	31	31	31	31	31	31
58	56	35	21	21	21	21	21	21	21	21

Hour 120	Hour 121	Hour 122	Hour 123	Hour 124	Hour 125	Hour 126	Hour 127	Hour 128	Hour 129	Hour 130	Hour 131
11/3/2017 0:00	11/3/2017 1:00	11/3/2017 2:00	11/3/2017 3:00	11/3/2017 4:00	11/3/2017 5:00	11/3/2017 6:00	11/3/2017 7:00	11/3/2017 8:00	11/3/2017 9:00	11/3/2017 10:00	11/3/2017 11:00
1	1	1	1	1	1	1	0	0	0	1	1
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0	0	0	0	0	0	0	0	0	0	0	0
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8	8	8	8	8	8	8	8	8	8	8	8
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0	0	0	0	0	0	0	0	0	0	0	0
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1	1	1	1	1	1	1	1	1	1	1	1
3	3	3	3	2	2	2	0	0	0	0	0
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264	264	264	59	1	1	1	1	1	1	1	3
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18	18	18	18	18	18	18	148	9	10	10	9
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3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	1	1	1	1	1
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3	3	3	3	3	3	3	3	3	3	3	3
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0	0	0	0	0	0	0	0	0	0	0	0
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75	75	75	75	75	75	76	77	77	77	77	78

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0	0	0	0	0	0	0	0	0	0	0	0
13	13	13	13	13	13	12	12	0	0	0	0
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38	38	39	39	39	39	37	42	43	43	43	15
112	7	7	7	7	7	7	7	7	7	6	6
4	4	4	4	4	4	4	4	4	1	1	0
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44	44	44	44	44	44	44	9	9	10	8	10
53	53	53	53	53	53	53	53	53	53	1	1
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19	19	19	19	19	19	19	19	0	0	0	0
3	3	3	3	3	3	3	3	3	4	4	4
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3	3	3	3	3	3	3	3	3	4	4	4
1	1	1	1	1	1	1	1	1	1	1	1
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3	3	3	3	3	3	3	3	3	3	3	3
5	5	5	1	1	1	1	1	1	1	1	1
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8	1	1	1	1	1	1	1	1	1	1	1
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7	7	7	7	7	4	4	4	2	2	1	1
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3	3	3	3	3	3	3	3	3	3	2	2
47	47	47	47	28	28	28	28	16	15	14	14
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15	15	15	15	15	15	15	15	15	15	15	15
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0	0	0	0	0	0	0	0	0	0	0	1
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17	17	17	17	17	17	16	16	0	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2
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2	2	2	2	2	2	2	2	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2
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2	2	2	2	2	2	2	2	2	2	2	1
1	1	1	1	1	1	1	1	1	1	0	0
16	16	16	16	16	16	16	16	16	16	14	14
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2	2	2	2	2	2	2	2	2	2	2	2
4	4	4	4	4	4	4	4	4	4	4	4
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0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1
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6	6	6	6	6	6	6	1	1	1	1	2
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0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0
72	72	72	72	72	72	72	72	72	72	72	72
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0	0	0	0	0	0	0	0	0	0	0	0
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6	6	6	6	6	6	6	6	6	6	6	6
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78	78	78	78	78	78	78	78	78	78	58	50
11	11	11	11	9	9	9	9	9	8	8	8
197	197	197	197	197	197	197	197	197	197	197	55
1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1
14	14	14	14	14	14	10	10	10	8	8	8
0	0	0	0	0	0	0	0	0	0	1	1
15	15	15	15	15	15	15	15	15	15	6	5
3	3	3	3	3	3	3	3	3	3	3	3
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0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	0	0	0
28	28	28	28	30	10	11	13	16	19	19	15
5	5	5	5	5	5	5	5	5	5	5	5
34	34	23	23	23	23	23	23	23	24	24	24
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4	4	4	4	4	4	4	4	4	4	4	4
4	4	4	4	4	4	4	4	4	4	4	3
96	96	96	96	81	81	81	81	81	81	9	6
4	4	4	4	4	4	4	4	4	4	4	3
92	92	92	92	92	20	20	20	20	22	2	2
3	3	3	3	3	3	3	3	3	3	3	3
1	1	1	1	1	1	1	1	1	1	1	1
4	4	4	4	4	4	4	4	4	6	6	6
110	66	67	67	21	21	21	21	21	21	21	22
40	40	40	40	40	40	40	40	40	40	40	40
9	9	9	9	9	9	9	9	9	9	9	10
98	98	98	98	98	98	100	100	100	100	55	55

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2	2	2	2	2	2	2	2	2	2	2	1
3	3	3	3	3	3	3	3	3	3	2	1
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52	52	52	52	52	52	52	52	54	54	52	50
5	5	5	5	5	5	5	5	5	5	5	5
3	3	3	3	3	3	3	3	3	3	3	3
2	2	2	2	2	2	2	2	2	2	2	2
10	10	10	10	10	11	11	11	11	12	12	12
15	15	15	15	15	9	9	9	2	2	2	2
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67	48	48	48	48	48	48	48	48	47	21	6
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104	104	104	104	104	104	104	104	104	66	58	58
11	11	11	11	11	11	11	11	11	10	10	10
136	136	136	136	141	141	146	79	70	70	70	68
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7	7	7	7	7	7	7	7	7	7	7	7
31	32	31	31	31	31	32	32	32	32	32	33
21	21	21	21	21	21	21	21	21	21	0	0

Hour 132	Hour 133	Hour 134	Hour 135	Hour 136	Hour 137	Hour 138	Hour 139	Hour 140	Hour 141	Hour 142
11/3/2017 12:00	11/3/2017 13:00	11/3/2017 14:00	11/3/2017 15:00	11/3/2017 16:00	11/3/2017 17:00	11/3/2017 18:00	11/3/2017 19:00	11/3/2017 20:00	11/3/2017 21:00	11/3/2017 22:00
1	1	1	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
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7	7	7	408	0	0	0	0	0	0	0
33	33	33	33	33	4	2	1	0	0	0
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Hour 143	Hour 144	Hour 145	Hour 146	Hour 147	Hour 148	Hour 149	Hour 150	Hour 151	Hour 152	Hour 153	Hour 154
11/3/2017 23:00	11/4/2017 0:00	11/4/2017 1:00	11/4/2017 2:00	11/4/2017 3:00	11/4/2017 4:00	11/4/2017 5:00	11/4/2017 6:00	11/4/2017 7:00	11/4/2017 8:00	11/4/2017 9:00	11/4/2017 10:00
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Hour 155	Hour 156	Hour 157	Hour 158	Hour 159	Hour 160	Hour 161	Hour 162	Hour 163	Hour 164	Hour 165
11/4/2017 11:00	11/4/2017 12:00	11/4/2017 13:00	11/4/2017 14:00	11/4/2017 15:00	11/4/2017 16:00	11/4/2017 17:00	11/4/2017 18:00	11/4/2017 19:00	11/4/2017 20:00	11/4/2017 21:00
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R-I-11

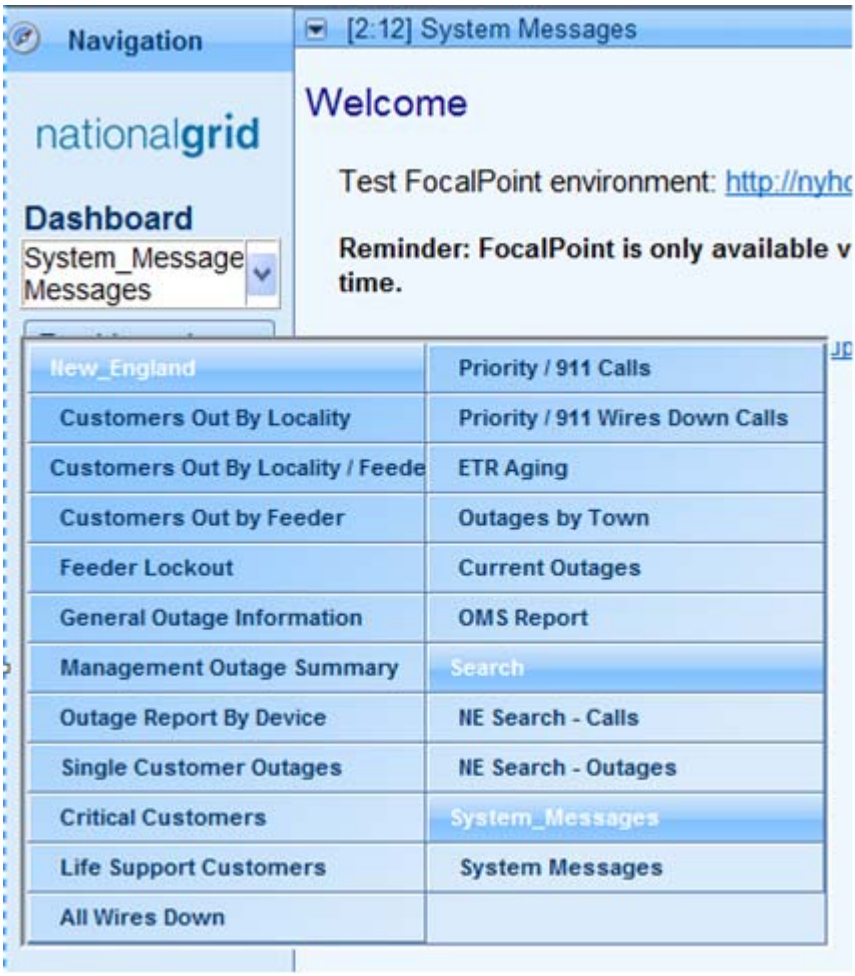
Request:

Provide copies of any reports, databases, and logs utilized in the outage management and restoration process for each day of the storm recovery.

Response:

National Grid does not have any reports, databases, or logs available because it utilizes its Outage Management System and Focal Point during the restoration process, which provide real-time and near real-time information, respectively. National Grid uses these applications to collect outage data and dispatch crews to respond to outages. FocalPoint uses the information from National Grid's Outage Management System to provide electronic reporting, such as those listed below.

R-I-11
Page 2 of 2



Prepared by or under the supervision of: Daniel Bunszell

R-I-12

Request:

What was the total quantity of substations that were out of service as a result of the storm and the number of customers affected by each substation? List the reason for each substation and a detailed accounting of the steps taken in the restoration process. Also, if any substations were flooded during this event was there an interruption of service as a result of that flooding?

Response:

Ten substations were out of service as a result of the storm. The table below lists the substation, number of customers affected, and a detailed account of restoration.

No substations were flooded during this event.

Substation	Customers de-energized when supply was lost	Restoration Summary:
Eldred 45	1,508	Radial 23kV supply line lockout - patrolled, repaired, restored 23kV line to substation, then 4kV feeders.
Manton 69	8,010	Radial 23kV supply line lockout - patrolled, sectionalized 23kV line, restored 23kV line to substation, then 12kV feeders.
Coventry 54	2,272	23kV tie line supply lockout - patrolled, repaired, restored 23kV line from one source to substation, then 12kV feeder.
Arctic 49	2,374	Double 23kV tie line lockout - patrolled, repaired single 23kV line from one source to substation, then 4kV feeders.
Anthony 64	3,850	Double 23kV tie line lockout - patrolled, repaired single 23kV line from one source to substation, then 12kV feeders.
Chopmist 34	4,281	Double 23kV supply line lockout - patrolled, repaired single 23kV line from one source to substation, then 12kV feeders.
Bristol 51	5,139	Station lost both its 115kV supply and 23kV supply - 115kV was patrolled and repaired to substation, then 12kV feeders.
Hope 15	4,274	Triple 23kV tie line lockout - patrolled, repaired single 23kV line from one source to substation, then 12kV feeders.
Ashaway 43	2,152	Radial 34kV supply line lockout - distribution feeder was picked up with 12kV field tie and a 34kV backfeed from another supply line.
Centerdale 50	783	1 of 3 substation transformer fuses found blown due to multiple distribution feeder trip/reclose cycles - De-energized transformer, replaced fuse, patrolled and re-energized distribution feeders.

Prepared by or under the supervision of: Daniel Bunszell

R-I-13

Request:

For any transmission line outage, state the specific line location and section and the reason for the outage. Were any transmission or distribution facilities de-energized by National Grid for any period of time in order to mitigate potential equipment damage due to high winds? Did the wind speeds and wind gusts at any time exceed the design rating of any particular transmission line? If so, specifically state which line and its location.

Response:

Two transmission line outages affected Rhode Island. Please see Attachment R-I-13 for a summary of the outages and activities.

Wind speeds did not exceed the design rating of any transmission line. No transmission or distribution facilities were de-energized to mitigate potential damage from high winds.

Prepared by or under the supervision of: Daniel Bunszell

R-I-14

Request:

Provide a summary of number of customer outages at peak and customer outage minutes, by cause, for each region.

Response:

Please see Attachment R-I-14 for the requested information.

Prepared by or under the supervision of: Daniel Bunszell

Region	ALL	Coastal	Capital
Peak Customer Outages	144,144	65,098	82,119
Total Customer Outage	176,247	79,598	96,649
Total Customer Outage Minutes	326,913,114	156,226,838	170,686,276

Cause	Total Customer Outage Minutes	Capital Customer Outage Minutes	Coastal Cusomer Outage Minutes
Grand Total	**0**	**0**	**0**
Tree Fell	175810884	87288901	88521983
Tree - Broken Limb	82848294.25	41928916.25	40919378
Unknown	57077092	31690584	25386508
Device Failed	7187200	6225017	962183
Tree Growth	3204103	3203945	158
Vehicle	322215	321020	1195
Deterioration	233231	1059	232172
Insulation failure - cable	159744	0	159744
Other Company Activities	39790	13817	25973
Animal	11077	5483	5594
Control Trouble	5261	5261	0
Moisture	4389	0	4389
Construction by Company Contractor	3880	2056	1824
Operating / testing error	2931	0	2931
Lightning	1522	0	1522
Tree - Vines	1284	0	1284
Non-Company Activities	217	217	0

R-I-15

Request:

For each of National Grid's regions, provide a system map (preferably including major highways and roads) indicating the location of all impacted transmission lines, sub-transmission lines, substations, and distribution circuit.

Response:

Please refer to confidential Attachment R-I-15-1 for a system map of the Company's impacted facilities in the Coastal region, and confidential Attachment R-I-15-2 for a system map of the Company's impacted facilities in the Capital region.

Prepared by or under the supervision of: Daniel Bunszell

CONFIDENTIAL ATTACHMENT R-I-15-1

Attachment R-I-15-1 is a system map of the Company's impacted facilities and consists of 1 page. The Company has requested protective treatment of this document in its entirety.

CONFIDENTIAL ATTACHMENT R-I-15-2

Attachment R-I-15-2 is a system map of the Company's impacted facilities in the Coastal region and consists of 1 page. The Company has requested protective treatment of this document in its entirety.