

The October 2011 Snowstorm

New Hampshire's Regulated Utilities' Preparation and Response



Report Prepared by the New Hampshire Public Utilities Commission

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Glossary of Acronyms

AWC	Area Work Center
EOC	Emergency Operations Center
ERO	Emergency Response Organization
ERP	Emergency Response Plan
ETR	Estimated Time of Restoration
GIS	Geographic Information System
GSEC	Granite State Electric Company
HSEM	New Hampshire Homeland Security & Emergency Management
NEMAG	Northeast Mutual Aid Group
NHEC	New Hampshire Electric Cooperative
NHPUC	New Hampshire Public Utilities Commission
NOAA	National Oceanic and Atmospheric Administration
NU	Northeast Utilities, parent company of PSNH
NWS	National Weather Service
OMS	Outage Management System
PSNH	Public Service Company of New Hampshire
SRC	Strategic Response Committee
TDS	TDS Telecommunications Corporation, parent company of Wilton Telephone Company Inc. d/b/a TDS Telecom
UES	Unitil Energy Systems, subsidiary of Unitil Corporation

I. Overview

New Hampshire utilities have seen a spate of major storms resulting in widespread power outages in the past four years. The Commission conducted an extensive after-action review following the largest of the recent storms, the December 2008 Ice Storm, to assess utility preparedness and emergency response capabilities in New Hampshire. The 2008 Ice Storm report included a number of directives to utilities to implement improvements in their emergency planning and response procedures. This report focuses on the October 2011 Snowstorm and, in particular, whether the utilities were better prepared for the storm as a result of actions taken following the December 2008 Ice Storm. All data contained herein were received from the utilities through their responses to Commission data requests as well as information provided by them to the State Emergency Operations Center (EOC) during the October 2011 Snowstorm event.

In late October 2011, the fourth in a recent string of powerful storms to hit New Hampshire and the region caused widespread damage and prolonged outages as heavy, wet snow, combined with high winds and abundant foliage still on trees, resulted in numerous broken branches and fallen trees that closed roads and downed power lines. With over 300,000 power outages, the October 2011 Snowstorm ranks as the third largest outage event in the State after the December 2008 Ice Storm and the February 2010 Wind Storm.

The New Hampshire Public Utilities Commission (Commission) reviewed electric utility response to the October 2011 Snowstorm, identifying in some instances improved performance as compared to the December 2008 Ice Storm and recommending corrective actions needed where storm preparedness, restoration response and communications remain inadequate. This report recounts and evaluates pre-storm planning and preparedness as well as the power restoration response taken by the state's four electric distribution utilities, which are further described in Appendix A: Public Service Company of New Hampshire (PSNH), Unil Energy Systems (UES),¹ Granite State Electric Company (GSEC)² and the New Hampshire Electric Cooperative (NHEC).³ The Commission also reviewed communications between the electric utilities and state and municipal officials as well as with the public. Finally, the report addresses telecommunication service problems that arose within the Town of Wilton, served by Wilton

¹ UES is a subsidiary of Unil Corporation (Unil). Where Unil is noted rather than UES, it is because the function described is performed by Unil on behalf of UES, either directly or through Unil Service Corp., another subsidiary.

² At the time of the October 2011 Snowstorm, GSEC was owned by parent company, National Grid USA, based in Massachusetts. Since then, GSEC has been acquired by Liberty Energy Utilities (New Hampshire) Corp. This report reviews GSEC's emergency response as a subsidiary of National Grid.

³ NHEC is a public utility, though not fully regulated by the Commission, as it is a member cooperative with a certificate of deregulation on file, pursuant to RSA 362:2, II. The Commission retains jurisdiction over NHEC in limited matters, including the requirement that it provide safe and reliable service.

Telephone Company,⁴ in the wake of the storm. It does not address actions taken by municipal electric utilities, which fall outside the Commission's jurisdiction.

The result of unseasonably cold air moving southward from Canada into New England while a low pressure system moved northward along the East coast, the October 2011 Snowstorm arrived in New Hampshire in the afternoon of Saturday, October 29 and peaked early Sunday morning, October 30, before weakening and moving northeastward into the Canadian Maritimes Sunday afternoon. Snowfall amounts in New Hampshire varied widely depending on location and elevation; the seacoast north to the Lakes Region received 12-24 inches, while some higher elevation locations received more than two feet of heavy, wet snow. Over 22 inches of snow fell in Concord, setting a city record for a single snow storm in the month of October.

The storm resulted in over 300,000 of New Hampshire's approximately 700,000 electric utility customers losing power, which for many customers in the state means losing water and heat, as well as the use of lighting and electric appliances.⁵

Utility crews worked long and difficult hours to restore power. It should be noted as well that no fatalities or significant injuries to restoration crews occurred during the restoration period. That result indicates the high degree of value placed on safety by all four electric utilities, for which they should be commended. The percentage of customers out at the peak of storm damage varied among the electric utilities, as follows:

Electric Utility	Number of Customers Without Power at Peak	Percentage of Customers Without Power at Peak	Time When Nearly All Restorations Complete
UES	51,262	69%	Tuesday evening, November 1
NHEC	18,687	24%	Tuesday evening, November 1
GSEC	15,679	38%	Thursday morning, November 3
PSNH	237,000 ⁶	46%	Saturday afternoon, November 5

As in the case of other major storms that have resulted in widespread power outages, the Commission launched an 'after action review' of the October 2011 Snowstorm soon after power restoration was complete. Part of the Commission's review included a customer questionnaire, to which hundreds of customers responded. A customer feedback table is found at Appendix B. Responses can be viewed on the Commission's website.

⁴ Wilton Telephone Company, Inc. d/b/a TDS Telecom is an incumbent local exchange carrier regulated by the Commission.

⁵ Customers of municipal electric utilities are not included in totals.

⁶ PSNH never reported to the Commission an exact peak number of outages. In a press release issued on October 30, 2011, PSNH reported a peak number of "approximately 237,000" customers out of power. In its post-storm self-assessment report released on November 30, 2011, PSNH reported a peak of 237,000 customers. The November 30, 2011 press release accompanying the self-assessment reported "more than 237,000 PSNH customers without power at the peak of the storm."

On November 8, 2011, Governor John Lynch sent a letter to the Commission expressing his concerns about the length of time it took to restore power to some New Hampshire citizens.⁷ In his letter, the Governor asked whether New Hampshire's utilities were sufficiently prepared for the storm and what steps could have been taken to reduce the number and length of outages.

In conducting its review, the Commission Staff issued data requests to each of the four electric utilities and conducted interviews when necessary to clarify utility responses. The Commission's findings follow in Section III. The Commission conducted a similar review of New Hampshire's electric utilities' response to the December 2008 Ice Storm. Status of completion of recommended action items in the December 2008 Ice Storm review is found at Appendix D of this report.

⁷ The letter from Governor Lynch is found at Appendix C.

II. Purpose and Scope of Review

A. Statutory Authority

The Commission has broad regulatory powers over the provision of safe and reliable service to the public. Public utilities, defined in RSA 362:2, shall “furnish such service and facilities as shall be reasonably safe and adequate and in all other respects just and reasonable” as required under RSA 374:1. Accordingly, the Commission has the purview to review utility emergency planning and response in the event of major power outages, such as occurred in the wake of the October 2011 Snowstorm.

B. Utilities Included in this Review

The October 2011 Snowstorm caused widespread power outages across New Hampshire. All four electric utilities regulated by the Commission were affected by the storm and are included in this review. Further information on the four electric utilities, including a map of their respective service territories, is included at Appendix A. Because the Commission and State officials also heard a number of concerns about phone service in the franchise service territory of Wilton Telephone Company, a subsidiary of TDS Telecommunications, we reviewed those issues as well.

C. Scope of Review

The report focuses on actions taken by New Hampshire’s regulated electric utility companies: 1) prior to the onset of the October 2011 Snowstorm, including weather monitoring and analysis, assessment of resource requirements, in-house and off-system crew⁸ levels, procurement of off-system resources, and the pre-staging of materials and crews and storm practice drills; 2) initial damage assessment and deployment of resources during the storm; 3) post-storm activities, including crew scheduling, restoration of service and the release and reassignment of crews; and 4) communications with municipal officials, as well as with the public at large. The report also evaluates the status of corrective actions that came out of the December 2008 Ice Storm report. Finally, the report addresses phone service outages related to a generator and central office switch failure in the Town of Wilton.

⁸ A crew generally consists of two people with a truck and equipment. Line crews are responsible for switching and repair of equipment and hardware, and the final energizing of the line; digger crews are responsible for replacing utility poles; tree crews are responsible for removing and disposing of downed trees. *See NHPUC December 2008 Ice Storm After Action Review* (Dec. 3, 2009) at II-4.

III. Findings and Corrective Actions

The details on which the following findings and recommendations are based are found in Section IV, Planning and Preparedness, Section V, Restoration Response, Section VI, Customer Expectations and Communications and Section VII, Wilton Telephone Company Switch Outage.

A. General Findings

1. Heavy snow while leaves are still on the trees is unusual but not unprecedented in the region,⁹ and could recur in the future. These conditions will always result in major outages and should be taken into account in utility outage planning.
2. Though the precise scale of the impact of the October 2011 Snowstorm may have been difficult to predict, it was clear by early Friday, October 28 that New Hampshire was going to see at least 4 inches of heavy wet snow that, because of foliage, would result in wide-scale and prolonged power outages.
3. A storm of this magnitude requires extensive preparation and emergency resource acquisition prior to the storm's onset, including procurement of external line, tree, damage assessment, and restoration crews as well as emergency stock for facility repairs and replacement.
4. Early acquisition of contractor crews is crucial to reducing outage duration; the more widespread the storm and the later a utility seeks additional resources, the more difficult it is to obtain the resources needed.
5. Tree trimming was not a significant factor in the extended outages that occurred in the October 2011 Snowstorm. Damage resulted from the weight of heavy snow on trees still laden with leaves, breaking whole trees and large limbs from well beyond the established trim zones, bringing down wires and damaging distribution equipment.

B. Findings and Corrective Actions Regarding Utility Emergency Planning and Preparedness

Findings Regarding Utility Emergency Planning and Preparedness:

1. For the most part, all companies have been meeting current industry practice with regard to drill exercises for major events, but have not fully incorporated the

⁹ See, e.g., "October 2006 Western New York Major Snowstorm - A Report on Utility Performance," NY Public Service Commission (May 2007).

emergency drill structure and scheduling recommendations made by the Commission following the December 2008 Ice Storm.

2. Utilities' in-house crews are the first level of resources for power restoration. Crew levels used for non-emergency operations during the past decade at all electric companies have been maintained within the parameters of good utility practice.
3. NHEC, GSEC and PSNH lack accurate prediction modeling tools and generally rely on past experience when estimating system damage, which in major events can contribute to delay in seeking outside crews and completing system restoration. None of the utilities had historical data to enable them to predict system damage due to the unusual circumstances of the October 2011 Snowstorm.
4. UES is the only company that uses a resource procurement planning method based on damage prediction estimation. UES's estimation approach is superior to solely relying on past experience but can be improved by reviewing actual results and the application of appropriate weighting of various input factors.
5. Damage prediction and estimates of expected outage duration were markedly different among the utilities and, as a result, utility effectiveness in emergency preparation and service restoration varied widely.
6. UES is the only company that incorporates the probability of an event's occurrence into its Emergency Response Plan (ERP) Event Levels. The classification of emergency events by level of impact and severity allows a utility to make a more accurate prediction of damage expected from forecasted weather events. Lack of consistency in the definition and use of event levels can lead to poor communications with State officials, imprecise damage prediction and, as a result, ineffective resource procurement decisions.
7. PSNH typically does not pre-stage external crews prior to the onset of major storm events because 1) its ERP does not provide for pre-staging; 2) management is reluctant to incur pre-staging costs due to a perceived risk of non-recovery or lag in recovery of those costs; and 3) PSNH generally elects to go through its parent company for resource procurement and allocation decisions, thereby handicapping its own ability to pre-stage resources in a timely manner.

Corrective Actions Regarding Utility Emergency Planning and Preparedness:

1. Each utility shall review the data available from the December 2008 Ice Storm, the February 2010 Wind Storm, 2011 Tropical Storm Irene, the October 2011 Snowstorm and Hurricane Sandy, to develop indices that facilitate the prediction of impact of storms of varying magnitudes. Indices to be incorporated into utility ERPs shall be filed with the Commission no later than March 1, 2013.
2. Each utility shall incorporate into its impact indices factors such as snow accumulations, ice thickness, wind speeds, and foliage conditions that will allow utilities to estimate, by event level, the number of troubles¹⁰ and resulting outages that could result from a forecasted weather event.
3. Each utility shall establish clear ERP Event Level tables, including maximum system-wide duration of outages, minimum and maximum percentage of customers without power per event level, and normalized number of troubles. Event Levels should be consistent among all four electric utilities and should include at least five levels of event magnitude.
4. Impact indices and their use in determining resource requirements for wide-scale storm planning and preparedness procedures shall be incorporated within each utility's ERP before the next annual ERP filing.
5. Using the event levels and revised ERPs submitted by the utilities, the Commission will evaluate the need to establish maximum restoration targets based on worst case conditions for large-scale, widespread storms, to be incorporated into utility pre-storm planning.
6. NHEC, GSEC and PSNH shall incorporate forecast confidence levels into pre-storm restoration models in a manner similar to that used by UES.
7. The Puc 300 electric service rules will be revised in Docket DRM 12-271 to consider emergency response.
8. PSNH shall improve its emergency resource planning procedures to ensure that outside resources are obtained in a timelier manner.

¹⁰ Troubles refers to specific damage to the system, such as downed wires, a broken pole or blown fuse; a single "trouble ticket" could result in an outage affecting one customer or multiple customers.

9. PSNH shall include in its ERP specific procedures for pre-staging crews in anticipation of a major storm event.
10. All utilities shall review the emergency drill structure and scheduling recommendations made by the Commission following the December 2008 Ice Storm and implement improvements as needed.

C. Findings and Corrective Actions Regarding Weather Forecasting

Findings Regarding Weather Forecasting:

1. All utilities, except NHEC, received forecast updates regarding the October 2011 Snowstorm through commercial weather forecasting services that include some combination of forecasts for the current day, next day, 48 hours, 2-to-3 day extended outlooks, and 3-to-5 day extended outlooks.
2. PSNH received forecast updates from its forecast provider that reflect only the current day and a 2-to-3 day extended outlook, which do not provide enough detailed information to accurately predict storm damage potential.
3. UES is the only company that obtains forecasts for each of its service territories. Though the other companies serve areas with markedly different weather, they do not contract for individualized weather forecasting.
4. PSNH's forecasting service was insufficient in that it was not frequently updated and was not geographically targeted to its service territories. A comparison of the forecasts contracted for by UES and PSNH, from the same provider, makes this clear: on Thursday October 27 at 1:35 p.m. UES's forecast estimated 8-12 inches of snow for the Capital Region of UES. The outlook PSNH received at 1:55 p.m., just minutes after UES received its forecast, was targeted to New England generally and contained no snowfall estimates specific to New Hampshire. The first estimate of significant snowfall for New Hampshire that PSNH received was not until Friday, October 28 at 6:00 a.m.

Corrective Actions Regarding Weather Forecasting:

1. PSNH should add at least two additional intervals to the weather forecast services it currently receives.
2. Each utility shall evaluate the services it uses for accuracy and service territory detail, and obtain the forecasts most appropriate for its service territories.

D. Findings and Corrective Actions Regarding Emergency Response

Findings Regarding Emergency Response:

1. UES has significantly improved its emergency response since the December 2008 Ice Storm; its storm management is now a model for other New Hampshire companies.
2. PSNH underestimated the magnitude and effects of the October 2011 Snowstorm, and did not obtain sufficient crews early enough, thereby delaying restoration by at least a day, if not several days, in some communities.
3. PSNH’s “After Action” self-assessment of the October 2011 Snowstorm lacked detailed technical analysis of storm outage restoration performance or critique of management decisions, and did not produce specific recommendations that can lead to measurable progress in achieving reductions in the duration of outages.
4. Municipalities are natural partners with utilities, with capabilities of assisting in damage assessment and the conveyance of restoration information to local residents. However, as in past storms, municipalities were not used to the extent they could have been by PSNH and NHEC to help identify damage.
5. Damage assessment crews are not properly equipped to relay information to the office efficiently and effectively. Damage assessment performance can be improved through the utilization of electronic tools, such as digital cameras and smart phones, to relay images and data from the field to regional area work centers and emergency operation centers in real time. The use of such devices is of critical importance for utilities, particularly PSNH and NHEC with their large geographic territories. Relying on paper forms that are submitted at the end of a shift is not efficient and must be replaced by wireless technology.
6. Unlike UES and GSEC, PSNH and NHEC did not hold daily municipal conference calls with town officials that inform the municipalities of daily action plans for restoration, where crews are going to be located, areas of restoration focus and priorities. Nor did PSNH and NHEC’s emergency response efforts incorporate mechanisms to facilitate outreach to municipalities regarding coordination and prioritization of restoration efforts.
7. PSNH does not yet have a functioning Geographic Information System (GIS) that fully geo-locates the company’s electrical equipment and facilities to enable

office and field personnel to identify outage locations with more precision and improve restoration efforts. This is a fundamental component of an Outage Management System (OMS) that would enable PSNH to identify and communicate outage locations to the public with precision. PSNH is not scheduled to fully deploy GIS until December 31, 2014.¹¹

8. PSNH's OMS is inadequate, in that it does not include GIS, cannot portray precise numbers of customers affected, and does not depict outages at the street level or Estimated Times of Restoration (ETRs). PSNH has committed to replacing its existing system with an improved OMS but, other than stating that it will be implemented following full installation of the GIS, PSNH has no specific implementation plan or completion date.

Corrective Actions Regarding Emergency Response:

1. PSNH's GIS schedule should be accelerated. PSNH shall provide the Commission by January 31, 2013, the financial and resource impacts to fully deploy GIS by December 31, 2013.
2. PSNH shall submit a detailed plan by January 31, 2013, for an improved OMS to be implemented no later than July 2014 with fully functional capabilities and integration with all company emergency response processes.

E. Findings and Corrective Actions Regarding Restoration Response

Findings Regarding Restoration Response:

1. PSNH did not maintain records of management decisions regarding procurement and coordination of resources from parent company NU or other response and recovery actions made by its President.
2. PSNH has publicly stated that company management chooses not to pre-stage crews because the company could suffer financial harm if a weather event does not materialize in scope and location as predicted.¹² Such an approach severely hampers the company's ability to secure outside crews where a limited pool of nearby resources are available and, moreover, are in high demand from other

¹¹ See Commission Order No. 25,123 (June 28, 2010) in Docket DE 09-035.

¹² "If PSNH pre-stages crews and is wrong, it's a financial loss to us." PSNH President and COO Gary Long statement in appearance before the Governor and Executive Council (Hearing Transcript, Nov. 30, 2011).

utilities competing for additional restoration crews in the event of a wide-scale storm event.¹³

3. The Commission is not aware of any instance in which a New Hampshire electric utility has been denied recovery of prudent costs for storm preparation, even if a storm proved to be less severe than expected. Proper storm planning may result, in some cases, in a utility being prepared for a level of storm that does not materialize.
4. Early requests for mutual assistance are critical to having additional resources arrive as quickly as possible and in sufficient quantities.
5. For PSNH and UES, who each have affiliates in neighboring states, the potential exists that resources could be allocated in a manner that results in the New Hampshire territories being disadvantaged, particularly given the political pressures exerted on the region's utilities after recent storm restoration problems.
6. PSNH data show that outages peaked approximately 24 hours after the outage peaks reported by the other three companies, suggesting a delay in the logging of damage assessment results into the outage management system (OMS). This reflects inadequacies in PSNH's OMS, including inefficiencies in PSNH's recording and integration of damage assessment results. (*See* Figure V-1 on p. 29.)
7. PSNH did not begin to reduce its outage levels until hours later than the other three companies. This delay grows from its failure to pre-stage crews prior to the onset of the storm and its failure to ensure the immediate availability of crews in New Hampshire at the onset of the storm. (*See* Figure V-1 on p. 29.)
8. UES ramped up early and procured additional resources prior to the onset of the storm. It added a work force of 3 times its normal internal line crews with contractor crews by 8 a.m., Sunday, October 30, and quickly reduced its number of outages by 25%. Within the first 24 hours after storm onset, UES had increased its contractor crews to approximately 6 times its normal number of line crews. Procuring and pre-staging crews before the onset of the storm allowed UES to quickly restore power to its customers. (*See* Figure V-3 on p. 35.)

¹³ PSNH recently petitioned the Commission on October 26, 2012, for implementation of a mechanism that would enable the company to recover pre-staging costs through its Major Storm Reserve. That petition is being reviewed in Docket DE 12-320.

9. GSEC did not receive the level of support from its parent company that it had in previous wide-scale storms. As a result, GSEC took approximately 54 hours to add a work force that equaled its normal internal number of line crews. Once the crews arrived, restoration improved dramatically. (See Figures V-1 on p. 29 and V-4 on p. 36.)
10. PSNH needs to provide consistent information regarding crew levels and availability. Post-storm data provided publicly in its self-assessment report and at a meeting with the Governor and Executive Council did not comport with data supplied by PSNH to the State Emergency Operations Center during the October 2011 Snowstorm.
11. PSNH was slow to deploy its own internal line crews, and, as a result, did not reach its maximum usage of internal crews until approximately 42 hours after the onset of the storm. (See Figure V-5 on p. 36.)
12. PSNH's procurement of additional line crews to assist in power restoration efforts was significantly slower in the initial stages than that of UES and GSEC, as indicated by the number of hours it took to double internal crew levels. (See Figure V-5 on p. 36.)
13. As reported to the Commission during the storm restoration period, PSNH apparently did not cancel line crew vacations. This resulted in the availability of only 41 internal line crews as of 7 a.m. on Sunday morning, October 30. It took PSNH an additional 28 hours to reach its peak level of 84 internal line crews at 11 a.m. on Monday, October 31. During that period, no crews requested by PSNH through its parent company were available to work in New Hampshire.

Corrective Actions Regarding Utility Restoration Response:

1. Utilities that procure and coordinate resources through their parent companies shall document those decisions as well as notes of decisions made by the parent company concerning response and recovery actions.
2. Each utility shall include in its Emergency Response Plan procedures for pre-staging crews in the event of wide-scale emergencies that have the potential of affecting 20% or more of customer base. The Plan should (1) provide a methodology for determining how many crew resources will be needed based on forecasts; (2) pre-establish an available pool of resources; (3) factor in travel times; (4) incorporate its own historical restoration data as well as relevant data from other utilities from detailed reviews of the most recent wide-scale storms;

and (5) provide for the cancellation of employee vacations as needed for major storm events.

3. Each utility shall develop early resource procurement plans and incorporate those plans into their ERPs.
4. The Commission will establish through rulemaking specific reporting data requirements consistent for all utilities during major storms that allow for meaningful Commission review of resource acquisitions and restoration efficiency, including allocation of resources among affiliates in other states.
5. In the event a utility decides to release crews from New Hampshire to an operating affiliate in another state prior to restoration of all New Hampshire customers, it shall notify the Commission within 2 hours of its decision. That decision shall be documented in writing and signed by a senior level management employee. The utility shall further provide the Commission written documentation within 14 days of the decision that includes justification for the release of crews and demonstrates that the release of crews did not unduly delay restoration of power to New Hampshire customers.
6. Given the competition for limited resources within the region, New Hampshire electric utilities shall explore mechanisms for pooling aggregate resource needs, especially field and line crews. Cost sharing and mechanisms regarding resource attainment and allocation are to be explored and developed resulting in a report jointly filed by the four electric utilities describing the feasibility of such an arrangement, filed with the Commission by June 30, 2013.

F. Findings and Corrective Actions Regarding Utility Communications

Findings Regarding Utility Communications:

1. During the October 2011 Snowstorm and resulting restoration efforts, utilities used websites and social media, which is appropriate, but for those customers without internet access they are not helpful. Utility information on the radio is minimal and so generic it provides little assistance.
2. A major concern expressed by customers was the lack of information on ETRs in any channel of communication. This information was critical to customers' planning on how to deal with the power outage.

3. Representatives for each of the electric utilities responded to thousands of calls from customers during the outages but provided little information regarding estimated repair times, adding to customer frustration and inhibiting customer ability to plan for their families and/or businesses.
4. Though they are a natural partner in emergency response, municipalities were not used effectively by PSNH and NHEC during the October 2011 Snowstorm. Based on feedback received by the Commission, municipalities were given little information regarding restoration plans and, therefore, were unable to respond to residents' questions or to plan for their own community's needs, such as whether to open emergency shelters.
5. Utilities should ensure that procedures are in place during emergency events through which municipalities can provide utilities with feedback on restoration priorities.
6. PSNH's communications with municipal officials as well as the public at large were inadequate, because they failed to provide information sufficient to permit officials and customers to properly plan based on the anticipated length of the power outages.
7. PSNH does not provide ETRs for particular neighborhoods; rather, it provides estimates of when all service areas will be restored to a level of 95%, which provides no meaningful assistance to customers who need to make decisions regarding their homes and businesses especially with regard to heat and, for those customers on private wells, water.¹⁴ By the time the 95% ETR is announced, nearly everyone has been restored; the information is thus "old news" to those who have power and no comfort to those without, because there is still no estimate of when the final outage will be repaired.

Corrective Actions Regarding Utility Communications:

1. Utilities shall broaden their communications outreach, by exploring ways to use radio and television to provide more targeted information to customers on a local level, such as a scroll identifying areas of concentration for restoration, road

¹⁴ According to the NH Department of Environmental Services (DES), nearly 40% of New Hampshire residents obtain their water from private wells. See, e.g., DES Press Release "Drinking Water Week Puts Spotlight on Private Wells, Public Infrastructure" (May 3, 2010), available at <http://des.nh.gov/media/pr/2010/20100503-wells.htm>. Private wells generally require electric power to operate.

closures and regularly updating municipal officials so that they can convey restoration estimates to residents.

2. Utilities shall incorporate ETRs into their emergency response and allow their customer representatives to share that information with customers. Websites should provide real-time mapping that shows outage locations with numbers of customers affected at each location, as well as ETRs for each location.
3. Utilities shall coordinate with municipalities, by sharing information through regular outreach in the form of municipal conference calls, providing ETR updates so that municipalities can respond meaningfully to residents' inquiries, and coordinate emergency response actions. The training and use of municipal workers can help in damage assessment reports, with digital photographs, identification of road closures, etc. and should be explored.
4. PSNH shall develop a meaningful ETR protocol, such as that used by Unitil, that provides real information at the start, rather than at the conclusion, of the restoration phase of a major event.

G. Findings and Corrective Actions Regarding Wilton Telephone

Findings Regarding Wilton Telephone Company:

1. TDS was reasonably prepared for the October 2011 Snowstorm, alerting personnel to be ready to respond, conducting generator inspections, positioning portable generators and filling all equipment and storage containers with fuel.
2. Though TDS tested its generators, it did not do so under full load requirements and thus did not recognize that it was using undersized propane fuel tanks that resulted in inadequate vaporization to operate under full load conditions. Following the storm, TDS replaced the smaller propane tanks with a 1000 gallon tank, a new regulator and piping, capable of delivering the required fuel in the future.
3. TDS's communications with Wilton officials, the Commission and customers were not ideal, though it has made significant improvements to its Disaster Recovery Plan in follow up to the storm. TDS acknowledged that it was not aware of any loss of service and did not recognize the need to communicate with customers or officials. A communications liaison serving all TDS territories in New Hampshire should have first-hand knowledge of conditions and ensure that

customers are kept informed through regular communication with local officials, as well as the state's Emergency Operations Center.

4. It is not clear whether TDS was fully aware of the number of customer outages before the Wilton Telephone switch shut down and after power was restored by the portable generator. In this case, where landline and cell service was inoperable, customers could not call to report a trouble. If mechanized testing had been in place, TDS might have become aware sooner that customers served by remote terminals remained without dial tone after power had been restored to the central office.

Corrective Actions Regarding Wilton Telephone:

1. TDS shall perform field tests by operating each of its central offices using the fixed generator at full load, and report the results to the Commission by March 30, 2013. For each central office, the report shall include the load required to operate the central office, the generator rating and the sizing and vaporization rates of the propane fuel supply. TDS shall perform an operations test, at full load, annually.
2. TDS shall analyze its communications plan and determine how it could improve communications with local officials and the Commission in events where landline and cell service are not operational, and report the results to the Commission by March 30, 2013.
3. TDS shall analyze automated testing options to determine when customers are out of service, without relying on customers to report a trouble. TDS shall report its findings to the Commission by March 30, 2013.

IV. Planning and Preparedness

A. Utility Pre-Storm Preparedness Actions

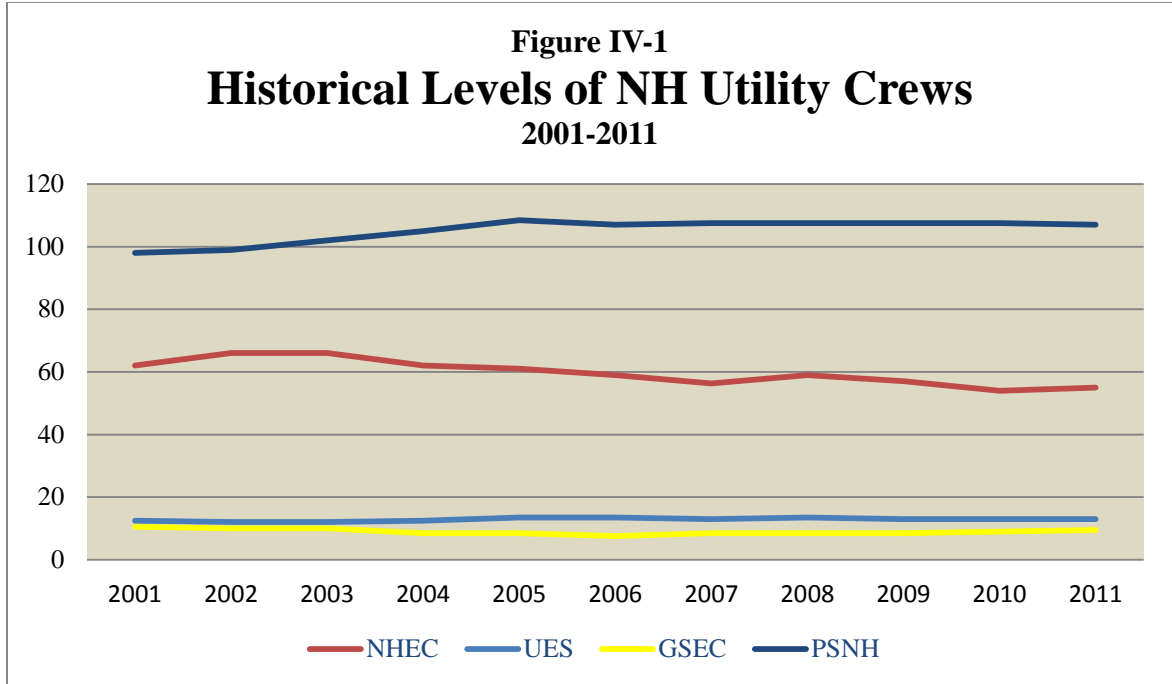
Pre-storm preparedness actions include general preparations that occur prior to any forecasted storm, as well as more targeted planning activities to respond to a storm's particular circumstances, in this case, the October 2011 Snowstorm. Each utility establishes its emergency planning and response procedures in an Emergency Response Plan (ERP) that provides guidelines for effective action in the wake of an emergency event and serves as a manual for personnel involved in emergency response activities. The ERPs set forth an Incident Command Structure, an internal decision-making and operational structure based on the National Incident Management System guidelines established by the U.S. Department of Homeland Security.

1. Annual Emergency Operation Drills

Electric industry practice is to conduct at least one emergency drill per year to maintain proficiency in emergency response skills and to educate and train new participants. The events simulated generally are major system-wide events, with drill activities focused on preparing for total mobilization. NHEC and UES each held two practice drills in 2010 and 2011. PSNH held one practice drill in 2010 and a tabletop exercise in December 2011, following the October 2011 Snowstorm. GSEC held table top exercises in 2010 and again in 2011, prior to both Tropical Storm Irene, which occurred in late August 2011, and the October 2011 Snowstorm. All companies review drill performance and implement changes to their Emergency Response Plans if deficiencies are noted. Only UES currently invites third parties, including state regulators and municipal officials, to participate in drill exercises. No company conducts unannounced drills, due to the costs and inefficiencies involved.

2. Historical Levels of Utility Crews

A review of utility crew levels maintained during the past decade indicates that field staffing levels have remained fairly constant since 2001 (see Figure IV-1 below). The Commission reviewed whether utility management had reduced manpower levels in recent years to such an extent that a deterioration in maintenance could have been a contributing factor in the number and duration of outages resulting from the October 2011 Snowstorm. There is no evidence of any such reduction.



3. Utility Determination of Storm Resource Requirements

Pre-storm restoration prediction models are critical in determining storm resource requirements. Prediction model inputs include utility-specific weather forecasts, as well as estimated system impacts based on utility history and industry experience. Common inputs into restoration prediction models include levels of wet snow, ice thickness, time of year, wind speeds and forecast confidence levels as these factors can influence the extent of damage that occurs to the power system during a major storm event.

Restoration prediction, which takes various forms, enhances utility preparedness by indicating the expected scale of the event for which a utility should plan, based on particular forecasts. Modeling practices vary among the four electric companies.

Each utility categorizes storm events by level of severity in its Emergency Response Plan, but the thresholds used vary by utility, as shown in Table IV-1, making statewide reporting difficult. Event levels are a critical means to categorize forecasted weather events and predict potential impacts and associated resource needs.

Table IV-1			
Company	ERP Event Level	% Customers Out	Outage Duration (Hrs.)
NHEC	1	0	0
	2	2-5	0-24
	3	5	24-48
	4	25	48-144
	5	>25	48-240
UES	1	<2	<12
	2	<10	12-24
	3	10-15	24-48
	4	25-50	36-72
	5	>50	>72
GSEC	1	2	0
	2	2-5	12-24
	3	5-9	24-48
	4	>9	36-72
	5	>9	>72
PSNH	None identified	None identified	None identified

NHEC

NHEC does not use a commercial pre-storm restoration prediction model. Instead, it develops Estimated Times of Restoration (ETRs) only after the onset of a storm based on data obtained from its Outage Management System (OMS) and information drawn from its automated customer call-in system. Such an approach is reactive and therefore precludes effective pre-staging of crews and resources.

NHEC outage predictions and pre-storm planning are based on case-by-case assessments of various forecasted and reported weather data. NHEC has not developed specific outage prediction capabilities and relies only on its own past experience for purposes of outage and associated restoration predictions. According to NHEC, it has generally determined that widespread outages are likely to occur with heavy, wet snow exceeding 6 inches when there are leaves on the trees, or when icing occurs that will bend conifers and break hardwood tree limbs. NHEC further has determined that sustained winds up to 40 miles per hour cause only minor outages, while winds above 40 miles per hour with saturated ground conditions will result in the uprooting of old growth trees. NHEC does not quantify with any precision the number of customer outages predicted in the event of a major storm event.

UES

UES does not use a commercial pre-storm prediction model, but uses an internal prediction matrix based on National Weather Service (NWS) forecast data. UES uses the NWS forecast

data to develop Estimated Impact Indices (EIIs), which characterize the level of utility response required on a scale of 1 to 5, as follows:

- Level 1 - a regular blue sky day that results in few or no outages
- Level 2 - moderate weather impact that results in isolated outages
- Level 3 - moderate to severe weather that results in scattered outages
- Level 4 - moderate to severe weather that results in widespread outages
- Level 5 - severe weather that results in extensive outages.

Three confidence levels of the weather forecasts are factored into determining EIIs: *low* (less than 30% confidence level), *medium* (40% to 60% confidence level), and *high* (greater than 60% confidence level). Other inputs include amount of forecasted ice, snowfall amounts, wind gusts and whether trees have leaves or are bare. UES estimates the number of electrical troubles anticipated and resulting number of outages based on 10 years of the company’s historical data. After the onset of an event, the estimated number of troubles is refined as damage reports come in from the field and the number of man hours required to restore customers is reassessed. Crew arrival times are purposely staggered so they may be received and utilized as efficiently and effectively as possible.

GSEC

GSEC does not use a commercial pre-storm restoration prediction model or conduct formal restoration prediction modeling. GSEC states that local work center supervisors develop pre-storm or post-storm ETRs using historical company data, past experience, and weather forecasts to estimate expected outages and man hours required for restoration efforts. This approach is reactive and precludes effective pre-staging of crews and resources.

PSNH

PSNH does not use any formal pre-storm restoration prediction method, either commercial or internal. Rather, it uses a simple spreadsheet calculation based on the number of crews available and historical company data regarding average numbers of troubles in storm events to estimate the number of crews required to restore power. No weather or event-specific data are input into the spreadsheet calculations, and individual runs conducted in the lead-up to a storm are not saved. Rather, PSNH plugs in the number of troubles reported during the course of a storm event and uses an average restoration time of 4 hours per trouble to estimate the number of crews needed. Calculations are not begun until after the onset of a storm, when damage and outages have occurred. Thus, there appears to be no formal methodology for determining outside resource determinations before a weather event occurs. As noted with NHEC and GSEC, the approach is reactive and precludes effective pre-staging of crews and resources.

B. October 2011 Snowstorm Weather Monitoring and Analysis

Weather forecasts are used to determine a utility’s resource needs to respond to a major storm event, and where resources should be deployed before the storm hits the utility’s service territory. While PSNH does not include event levels, all four electric utilities have Emergency Response Plans that are tied to the severity of the forecasted weather.

1. Utility Weather Monitoring Services Used in Generic Weather Events

PSNH,¹⁵ UES¹⁶ and GSEC¹⁷ all entered into contracts for meteorological services with Telvent DTN in early 2011. Each contract provides for forecasts by region and service territory, including daily operating forecasts delivered via e-mail twice per day. In general, the forecasting provided under each contract covers the following weather events:

- thunderstorms (including probability of occurrence, timing and intensity);
- heavy rain and snow;
- strong winds (including gusts and sustained wind speeds);
- ice accumulation from freezing rain;
- tropical and hurricane events; and
- lightning.

The forecasting service also includes 24 hours a day, 7 days a week availability of updates for the specified utility service area, including impacts that have the potential to disrupt operations, and automatic notification of weather that meets pre-defined threshold conditions contained in the contracts. Not all utilities, however, contract for these more frequent or more targeted forecasts.

NHEC does not subscribe to a commercial weather service, but monitors a number of weather information sources. NHEC’s control center is staffed 24 hours a day 365 days a year and monitors weather through the NWS storm prediction center on the National Oceanic and Atmospheric Agency’s (NOAA’s) website, www.spc.noaa.gov, and the forecasts of Intellicast at www.intellicast.com, as well as several local news and weather stations, including the National Weather Service out of Gray, Maine; New England Cable News out of the Boston area; and WMUR-TV 9 out of Manchester.

Table IV-2 depicts the level of service for commercial weather forecasts for three utilities. All contract with Telvent DTN, a commercial provider of weather forecasting services.

¹⁵ PSNH subscribes to weather forecasts indirectly through its parent company, Northeast Utilities.

¹⁶ UES subscribes to weather forecasts indirectly through its parent company, Unital.

¹⁷ At the time of the October 2011 Snowstorm, GSEC subscribed to weather forecasts indirectly through its parent company National Grid USA.

Table IV-2 Utility Weather Forecasting Type & Updating Frequency			
Company	NH specific?	Description Categories	# of Forecast Categories
UES	Yes	Today; Tomorrow; 3-5 day extended regional outlook (Northeast); 48 hours; 3-5 day extended outlook (UES specific)	5
GSEC	Yes	Today; Tonight; Tomorrow Day; Tomorrow Night; 3 to 5 day extended outlook	5
PSNH	Yes	Today; 2 to 3 day extended outlook	2
NHEC	N/A	N/A	N/A

2. Publicly Available Weather Forecasts

As early as Thursday afternoon, October 27, weather forecasts on the Internet, television and radio were predicting a significant storm for the New England region. Weather forecasts as of 4 p.m. on Friday, October 28 indicated substantial snowfall expected across the Northeast. Shown below is a screen shot from a publicly available and popular weather Internet site that represented the forecasted impact of the October 2011 Snowstorm in the Northeast.



Source: Weather.com October 28, 2011, 3:50 p.m. (Commission-captured screen shot)

3. Utility-Specific Forecasts for the October 2011 Snowstorm

The National Weather Service (NWS) out of Gray, Maine provided the following forecast for the impending storm during a New Hampshire state agency conference call at 11 a.m. on Friday, October 28:

- 1) Winter Storm Watch for much of interior southern New England.
- 2) Risk of extensive tree and power line damage from heavy wet snow accumulations.
- 3) 4 to 8 inches possible many interior areas with locally higher amounts of 8 to 12 inches in higher terrain.
- 4) Strong winds along coast - High Wind Watch may need to be issued later for coastal zones (gusts 50 to 60 mph possible).
- 5) Probability of 1 inch or more of snow for all areas except the coastline of New Hampshire (90%).

UES

By 1:35 p.m. Thursday, October 27, Telvent was forecasting 8-12 inches of snow for the Capital Region starting late afternoon on Saturday, October 29, and tapering off early to mid-morning on Sunday, October 30. Seacoast snowfall amounts were forecasted to be 4-8 inches, although forecast confidence was low for the Seacoast region. Wind speeds were expected to gust 35-45 miles per hour and possibly as high as 50 miles per hour in the Seacoast region and 30-35 miles per hour in the Capital Region. The forecast UES received changed only slightly from Thursday, October 27, through the onset of the storm on Saturday afternoon, October 29.

PSNH

The 2-to-3 day outlooks PSNH obtained from Telvent through NU varied slightly depending on the NU subsidiary and service territory covered. A forecast for a severe snowstorm event in New Hampshire was not issued to NU until 6 a.m. Friday, October 28, stating:

Data has come into better agreement in that there will be a significant storm system Saturday into Sunday morning...snow may linger into eastern/northern New Hampshire into late Sunday morning. At this point, a swath of 6 -10 inches of snow will be possible over the Berkshires up into the higher terrain of western/central New Hampshire, while a general 4 - 8 inches may cover the lower elevations of MA/NH.

On Friday, October 28 at 1:20 p.m., the update for NU changed to 8-12 inches of snow in New Hampshire, as follows:

a “major winter type storm” would affect most of the regions Saturday afternoon, October 29 into Sunday October 30. The potential exist for downed power lines, considerable tree damage from this storm with hazard winds developing for most of the region...Total estimates of snowfall amounts in New Hampshire were 8-12 inches as far north as the Southern Lakes Region and trail off northward to 1 to 2 inches up near the Canadian Border. Locally higher amounts are possible just about anywhere with the best chance through the higher elevations of the Monadnock Region. Snow accumulation confidence is lowest in the Seacoast Region and could go either way by several inches, all depend on the exact of the storm. At this point figure 4 to 8 inch accumulations. The highest accumulations all areas will be over grassy areas, trees and any colder/exposed surfaces. The snow will be wet and heavy for all areas and is likely to cause major problems with tree limbs and power lines. Wind gusts for this storm may gust as high as 40-45 mph through the Seacoast Region...

The forecast provided to NU at 6 a.m. on Saturday, October 29 increased the predicted level of snowfall across the region, with amounts ranging from 5-15 inches in the interior of New England and 8-12 inches across southwest parts of New Hampshire. Snowfall amounts were forecasted to be lower north of the Lakes Region and in the Seacoast region. Wind speeds were forecasted to be within the 25-35 miles per hour range with peak gusts near 40 miles per hour. Telvent increased the forecast for peak wind speeds for PSNH on Saturday morning, October 29, to 50 miles per hour.

GSEC

Telvent forecasts for GSEC were similar to the forecasts supplied to UES and PSNH in terms of snowfall and wind expectations, though they contained less detail with respect to timing and affected locations. The forecast did not differentiate between GSEC’s two service territories, the Salem-Pelham area and the Lebanon-Hanover area.

NHEC

As noted above, NHEC does not subscribe to commercial weather services. Further, it did not retain forecasts that it used to prepare for the October 2011 Snowstorm. It is not possible, therefore, to reconstruct the information NHEC used in its pre-storm actions.

4. Actions Taken by Individual Utilities Prior to the Onset of the October Snowstorm

UES

Unitil and UES began planning for the October 2011 Snowstorm on Thursday, October 27. Due to the increase in predicted snow amounts and forecast confidence levels provided by Telvent, Unitil’s Incident Commander held a call with emergency response personnel on Friday, October

28 at 9:30 a.m. Following the call, Unital’s CEO met with its senior executive-level Strategic Response Committee (SRC) to discuss planning for the storm. Preparations launched at that time included securing outside line and tree crews, setting up two emergency operations centers in New Hampshire and a System Emergency Operations Center, pre-event conferences with municipal officials, and pre-event communications to customers. UES notified the Commission and Homeland Security and Emergency Management (HSEM) of the expected major storm event (Level 3) on Friday, October 28 at 12:39 p.m.; another update was sent at 8:00 p.m. Based on a recommendation from the SRC, all employee vacations were cancelled immediately. UES also notified municipal officials that it would open its emergency operations centers at 6:00 p.m. on Saturday, October 29.

UES participated in the Saturday morning, October 29 Northeast Mutual Assistance Group (NEMAG) call. The emergency operations centers were opened at 6:00 p.m. on Saturday, October 29. At 7:00 p.m. on Saturday, October 29, a municipal conference call was held in the municipal room to update officials of storm preparations and to ensure that the lines of communication were clear.

PSNH

On Friday, October 28 at 8:32 a.m., a weather advisory was issued to PSNH Advisory Level employees to indicate that escalation of emergency conditions may be likely. PSNH also contacted NU’s internal emergency response organization to request the availability of 30 line crews, notify local line contractors on the PSNH system (15 bucket crews and 3 digger crews) that their services would be required for the duration of the emergency event, and request additional resources. PSNH also notified its medical emergency customers through an automated call system of the potential for outages. PSNH continued to modify its request to NU for additional line crews on Friday, requesting 35 line crews at 9:30 a.m. and 100 additional crews at 8:00 p.m. According to information provided to the Commission at the State EOC, PSNH did not have 100% crew availability at the onset of the storm on Saturday, October 29. A 100% level of crew availability was not achieved until 11 a.m. on Monday, October 31.

A Level 1 Advisory¹⁸ was issued at 1:55 p.m. on Friday, October 28 to all PSNH Advisory Level participants. PSNH held a Customer Operations Center conference call at 2:00 p.m. on Friday, October 28 to plan for the storm and assess crew availability and staffing levels. All levels of NU’s emergency response organization were directed to be fully staffed by 6:00 a.m. on Sunday, October 30. A Level II advisory was issued at 8:58 p.m. Friday, October 28. Based on PSNH’s self-assessment report regarding its response to the October 2011 Snowstorm, it never issued a Level III advisory to officially declare an emergency condition under its ERP.

¹⁸ PSNH’s ERP includes three Advisory Levels through which it informs its emergency response organization. Generally, a Level I Advisory indicates the potential for escalating emergency conditions; a Level II Advisory indicates that a significant outage affecting 10,000 or more customers is likely; a Level III Advisory is issued when an emergency condition has been officially declared.

PSNH moved up the opening of its Emergency Operations Center to 8:00 p.m. on Saturday, October 29 instead of Sunday morning, October 30, due to changes in the weather and the resulting forecast for increased snowfall.

GSEC

GSEC participated in an operations planning call with its parent company, National Grid, on Wednesday, October 26 at 5:00 p.m. to discuss the possible storm. A NWS briefing was held Thursday afternoon, October 27. Additional weather service briefings and company-wide storm calls were held on Friday, October 28. GSEC held internal discussions concerning the possible snowstorm and additional resource requirements. On October 29, GSEC notified the Commission of company preparations for the storm and provided information on the resources it had available. GSEC did not cancel employee vacations during the October 2011 Snowstorm because National Grid did not determine that the storm would occur at a level requiring cancellation under its ERP. It should be noted that the National Grid ERP is designed for the company's system-wide operations, and not scaled to its individual state operations. As a result, the number of GSEC customers in its New Hampshire service territories would never trigger the 'catastrophic event' level that National Grid, GSEC's parent at the time of the October 2011 Snowstorm, would require before cancelling employee vacations.¹⁹

NHEC

NHEC began to closely follow the storm on Thursday, October 27 by monitoring weather forecasts available through public sources, including television, radio and Internet. On the morning of Friday, October 28, NHEC sent out an e-mail to all employees, indicating that a winter storm watch was in effect for the region from Saturday afternoon, October 29 through Sunday morning, October 30. At that point on Friday morning, October 28, NHEC went into storm preparation mode. Employee availability lists, including those of outside contractors performing maintenance and construction activities on NHEC's system, were expected to be submitted to management by noon. NHEC notified the Commission by e-mail the same morning, Friday, October 28, that it was launching storm preparations. On Friday, October 28 at 7 a.m., NHEC opened its storm room and activated its Incident Command System. Later that morning, NHEC notified all its line and vegetation contractor crews (outside line and tree crews) of the pending storm and requested their availability. At 6 a.m. on Saturday, October 29, all NHEC's outside line and tree trimming crews were put on standby.

By Saturday morning, October 29, NHEC notified senior management of updated and higher snowfall forecasts and at 8:00 a.m., NHEC participated in the first NEMAG phone conference. NHEC indicated that all utilities participating on the call were holding their crews and not

¹⁹ GSEC's new parent company is responsible for utility service only in New Hampshire; accordingly, GSEC's ERP now includes a definition of event levels with corresponding procedures appropriate for the number of customers GSEC has in New Hampshire.

allowing them to participate in mutual aid. Later that morning, NHEC made calls to cooperatives in Delaware and North Carolina, requesting 20 additional line crews. NHEC confirmed that 17 line crews from Southern Electric Cooperative were available and would be placed on hold for NHEC while travel arrangements were made. NHEC continued to make phone requests for mutual aid throughout the day on Saturday to electric cooperatives and public power companies in Ohio, Indiana, Virginia, North Carolina, Pennsylvania, Delaware, New York, Maine and Connecticut.

V. Restoration Response

The effectiveness of restoration efforts varied among the four utilities due to a number of factors, including geographic differences in service territories and the relative impact of the storm in those territories. Of critical import in any restoration response to a major storm event such as the October 2011 Snowstorm are a utility’s ability to effectively and efficiently procure off-system resources in a timely manner, its management of restoration crews, and, not least, the internal coordination and communication of emergency response decision-making. Poor performance in any one of those areas can contribute to delays in the restoration of power.

Table V-1 and Figure V-1 below display the overall response time per utility for the October 2011 Snowstorm. Notably, UES had the highest percentage of customers without power, yet yielded the fastest pace of restoration times.

Electric Utility	Number of Customers Without Power at Peak	Percentage of Customers Without Power at Peak	Time When Nearly All Restorations Complete (# days)
UES	51,262	69%	Tuesday evening, November 1 (3 days)
NHEC	18,687	24%	Tuesday evening, November 1 (3 days)
GSEC	15,679	38%	Thursday morning, November 3 (5 days)
PSNH	237,000	46%	Saturday afternoon, November 5 (7 days)

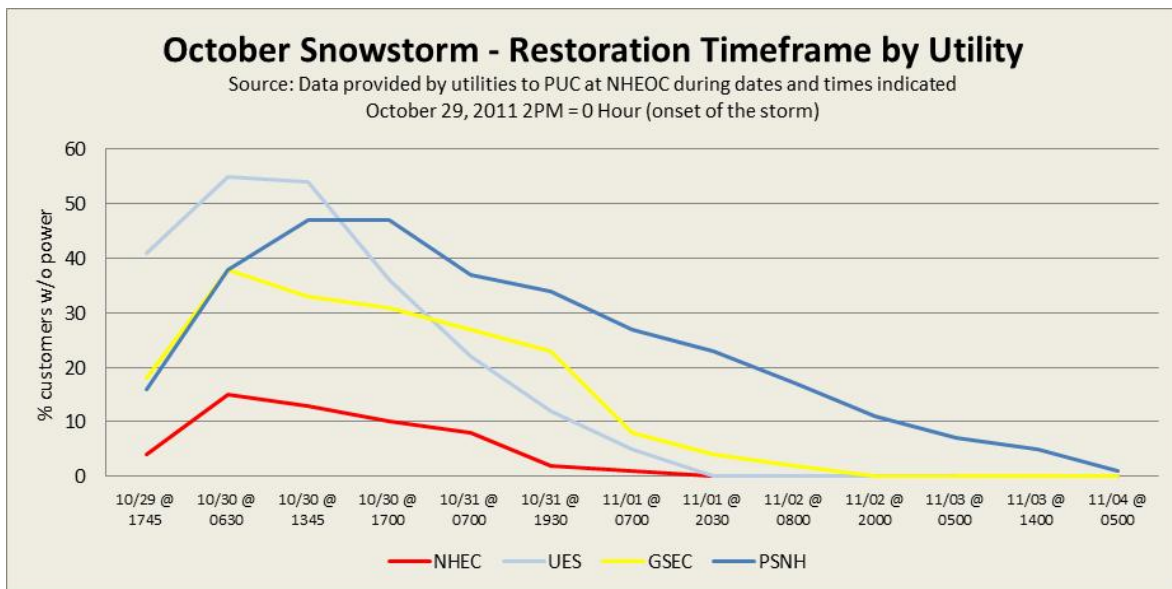
A. Utility Restoration Timeframes

The electric utilities performed at varying levels of efficiency in achieving power restoration. The following chart and narrative details the chronological restoration efforts of each utility. Figure V-1 depicts the overall restoration for each utility and percentage of customers without power at various time intervals during the restoration process. Table V-1 reveals that UES had the greatest percentage (69%)²⁰ of customers out of power in the wake of the October 2011 Snowstorm, yet achieved the quickest restoration times. GSEC’s curve, as

²⁰ The differences in percentages of customers without power shown in Table V-1 versus Figure V-1 reflect different reporting time periods. The trends, however, remain consistent.

depicted in Figure V-1, read in conjunction with Figure V-4 below, shows that GSEC’s most effective restoration occurred only after additional crews were deployed, indicated by a steeper decline in the restoration curve. NHEC’s performance shows that its system was impacted the least of the four utilities, but that it did not achieve a corresponding speed in restoring power to customers because it did not procure any incremental crews beyond the levels in place at the onset of the storm. PSNH’s flatter restoration curve shows that the outages were handled in a relatively steady manner over time, reflecting the fact that the number of crews deployed did not peak until approximately 117 hours after the onset of the storm, as shown in Figure V-5.

Figure V-1



UES

UES’s first outage was reported at 4:00 p.m. on Saturday, October 29; peak outage of 51,262 customers occurred on Sunday, October 30 at 2:00 a.m. Additional outside crews contracted for UES arrived on Saturday, October 29 through Sunday, October 30, allowing restoration efforts to be substantially ahead of the other electric providers in New Hampshire. By 4:00 p.m. on Sunday, October 30, UES’s Capital Region service territory had been 90% restored; the Seacoast region service territory did not achieve 90% restoration until 3:00 p.m. on Tuesday, November 1. The Capital Region restored 99% of its customers by 11:00 p.m. on Sunday, October 30 while the Seacoast region reached the 99% level at 5:00 p.m. on Tuesday, November 1. For UES as a whole, it restored 90% of its customers late Monday, October 31 and 99% by Tuesday evening, November 1.

PSNH

PSNH's large service territory meant that not all areas were affected by the October 2011 Snowstorm to the same degree. On Friday, October 28, PSNH assessed its existing internal line crew availability at the local Area Work Center (AWC) level. PSNH retained on-system contractor crews that were doing maintenance or construction activities, and requested 30 additional crews through its parent company NU, securing commitments although the additional crews did not begin traveling that day. On Friday, October 28, four vegetation management crews were pre-staged at each AWC (68 in total) with an additional 32 to be dispatched as needed. The crews were pre-staged throughout the PSNH system rather than in areas that were most likely to be impacted by the storm because PSNH did not have targeted weather information that would permit more specific allocation of crews according to forecasted needs. On Saturday, October 29 at 9:30 a.m. after the NEMAG call, PSNH requested an additional 35 crews through NU. After the storm had arrived, at 8:00 p.m. on Saturday, October 29, an additional 100 crews were again requested from NU.

A few external crews for PSNH arrived on Sunday, October 30 and Monday, October 31, however the bulk of assistance did not arrive until Tuesday, November 1.

For customers served in areas that were minimally affected by the storm, restoration was 100% complete by early evening on Sunday, October 30. For areas greatly affected by the storm, restoration times varied widely by location. Customers served out of the Bedford Area Work Center (AWC) did not see 90% restoration until noon on Wednesday, November 2. Customers served out of the Nashua AWC saw 90% restoration by the early morning hours of Friday, November 4. For the company as a whole, 90% restoration was achieved in the afternoon of Thursday, November 3 and 99% restoration was achieved in the morning of Friday, November 4, although the Nashua AWC did not hit 99% restoration until early morning on Saturday, November 5, almost seven days after the storm started.

GSEC

Ordinarily, GSEC has only eight crews to cover its two service territory areas. As a result, any significant amount of damage from a storm event can quickly lead to large numbers of customers without power unless additional crews are utilized. Crew acquisition for GSEC at the time was the responsibility of the parent company, National Grid; thus, much information provided in the Commission's review of the storm response was applicable to the total company-wide needs of National Grid rather than New Hampshire in particular.

Late Thursday, October 27, National Grid's service company subsidiary called one of its external contractors to request use of 20 on-system crews for the forecasted storm. On Friday morning, October 28, the service company contacted eight additional local contractors regarding crew availability to work on the National Grid system. Five of the contractors confirmed that

resources would be available and 36 crews were secured. The additional crews that GSEC requested arrived Sunday, October 30 through Tuesday, November 1.

National Grid declared during its storm conference call on Friday, October 28 at noon that it expected a major storm event would occur. On Sunday morning at 5:00 a.m., the EOC in Salem opened in preparation for restoration efforts in Salem, Windham, Pelham and Derry. The Salem EOC remained open daily from 5:00 a.m. to 9:00 p.m. until restoration was 100% complete on Thursday, November 3 at 8:10 a.m. During the hours that the Salem EOC was not open, restoration operations were conducted out of the North Andover, Massachusetts EOC. The EOC in Lebanon, New Hampshire was opened on Sunday, October 30 at 5:00 a.m. and remained open until restoration efforts were completed on Monday afternoon, October 31.

Overall, GSEC had restored power to 90% of its customers by 7:32 p.m. on Tuesday, November 1 and had reached the 95% level late morning on November 2 and the 99% level at 3:06 p.m. on November 3. On Friday, November 4, PSNH requested crews from GSEC and GSEC released four crews to work on the PSNH system. Those 4 crews were released by PSNH on Saturday, November 5.

NHEC

In light of the predicted snowstorm, NHEC requested Friday morning, October 28 that all line and tree contractors working on its system be available for purposes of emergency response. All contract line and tree crews were put on standby at 6:00 a.m. Saturday, October 29. At 8:00 a.m., NHEC participated in the first NEMAG call and shortly thereafter requested crews from electric cooperatives in Delaware and North Carolina. Its request for 20 crews resulted in 17 confirmed line crews available for NHEC. At 2:00 a.m. on Sunday, October 30, NHEC declared a Major Storm event, indicating that it anticipated that the storm would affect up to 20,000 members and result in switching to Operating Level 4 under its ERP. NHEC ultimately handled the storm with local assistance only and then provided mutual aid to other utilities, including sending nine NHEC crews to PSNH on Tuesday, November 1, after restoration was completed on NHEC's system.

NHEC stated that it reached its peak number of members without power (18,687) at 2:40 a.m. on Sunday, October 30. NHEC estimated that it had restored power to 95% of its members by Monday evening, October 31, and to 99% by late morning on Tuesday, November 1.

B. Procuring External Crew Resources After the Onset of the Storm

All four electric companies have arrangements with the Northeast Mutual Aid Group (NEMAG), through which they may request additional crew resources in the event of a major storm and power outage. PSNH also belongs to New York Mutual Aid Group. NHEC also belongs to the Northeast Association of Electric Cooperatives mutual aid group, the Northeast Public Power

Association mutual aid group, and the National Rural Electric Cooperative Association mutual aid group.

Generally, each utility’s ERP assumes that on-system crews (internal crews as well as contract crews working on the utility’s system) can handle outages without outside help for events that are expected to result in outage times of two days or less. ERPs provide for escalated levels of response actions and procurement needs in accordance with event size categories, from local events, such as a tornado, that impact only a small portion of the system, to large, system-wide events, such as a major ice or snow storm. ERP scalability breaks down, however, for high damage level events that are regional in impact, as utilities will not release crews to others until outages on their own systems are restored. In such a case, utility ERPs generally anticipate that outages that are expected to last more than two days will require the procurement of external crews through mutual assistance arrangements with other utilities throughout the Northeast region and, in the case of particularly wide-scale events, throughout the country. As a result, the procurement of restoration crews for a wide-scale event can require several days of travel time for crews to reach New Hampshire, thereby contributing to further delay in the restoration of power.

Decisions to acquire mutual assistance appear to have varied among utilities due to the location of each service territory relative to the anticipated track of the storm. Ultimately, NHEC required no outside help. Until recognized that, due to the wide-scale, regional nature of the storm, early action was required; as a result, it sought mutual assistance by Friday, October 28, one day earlier than GSEC or PSNH, both of which waited until Saturday, October 29 only to recognize at that point that crews would not be available. In addition, as discussed above, PSNH’s crew prediction spreadsheet tends to underestimate crew requirements for major storm events, because trouble correction times are inadequately calculated.

C. Management of Crew Resources for Power Restoration

As discussed above, pre-staging of restoration crews is critical to effective emergency response when a major storm event is anticipated. Once a storm event occurs, timely damage assessment with prompt, if not instantaneous reporting is necessary to determine whether additional mutual assistance is needed and where it should be deployed. For a major region wide event, resources are typically 2 to 3 days distant in terms of travel and logistical timing. Utility preference is for in-region resources to be obtained for a variety of reasons, including the following:

- travel time is less, thus in-region crews are a less expensive source of man power;
- with shorter travel, crews can get started right away, permitting immediate productivity;
- crews have familiarity with local climate conditions, terrains and road locations, permitting greater work efficiency; and

- utilities have greater ability to control the safety of crews, because crews are familiar with infrastructure construction techniques used in the area.

Once additional crews arrive, whether from near or far, the utilities all seem effective at managing and deploying the additional resources. However, the delayed arrival of those additional crews, whether due to the timing of procurement requests, travel distance, crew availability, prolonged damaged assessment, or a combination of factors, can prolong the restoration process.

Damage assessment is a critical element in an effective restoration effort. The assessment of damage caused by a major storm event is time-consuming, which makes the prompt reporting of troubles and system conditions back to command centers and work centers extremely important. Currently, each utility conducts damage assessment largely through a manual, handwritten process that records damage to the system on paper forms and reports information back to command centers, generally at the end of the day. Typically, however, only major system damage is reported immediately from the field. The use of electronic devices to report system damage more expeditiously would enable more efficient management of available crew resources, assuming systems are in place on the receiving end to efficiently accept and organize the incoming damage reports.

D. Decision-making Location as a Factor in Restoration Effectiveness

The incident command process within each corporate entity is structured to coordinate emergency response actions and resource allocation among subsidiaries, including those located in neighboring states. The proximity of decision-makers to territories affected by a major storm event can play a critical role in the timing and effectiveness of restoration response.

Unitil coordinates restoration of its electric utilities in New Hampshire and Massachusetts through a centralized incident commander based in New Hampshire and three regional incident commanders covering the Capital and Seacoast territories in New Hampshire and Fitchburg in Massachusetts. The centralized incident commander has final decision-making authority.

PSNH makes on-the-ground storm restoration decisions from its headquarters in Manchester, NH, but works through its Connecticut-based parent, NU, to procure resources for storm restoration, including mutual assistance resources.

GSEC has relied on the service company of its Massachusetts-based parent company, National Grid, for restoration decisions in the past, including during the October 2011 Snowstorm.²¹ Under the National Grid structure, local input from GSEC was provided by operations personnel to the service company, which held final decision-making authority.

²¹ Under its current corporate structure, GSEC d/b/a Liberty Utilities will be making all storm-related decisions through its Salem, New Hampshire headquarters.

NHEC has no parent company or affiliates, and makes all decisions related to storm restoration within its service territory at the company’s local headquarters.

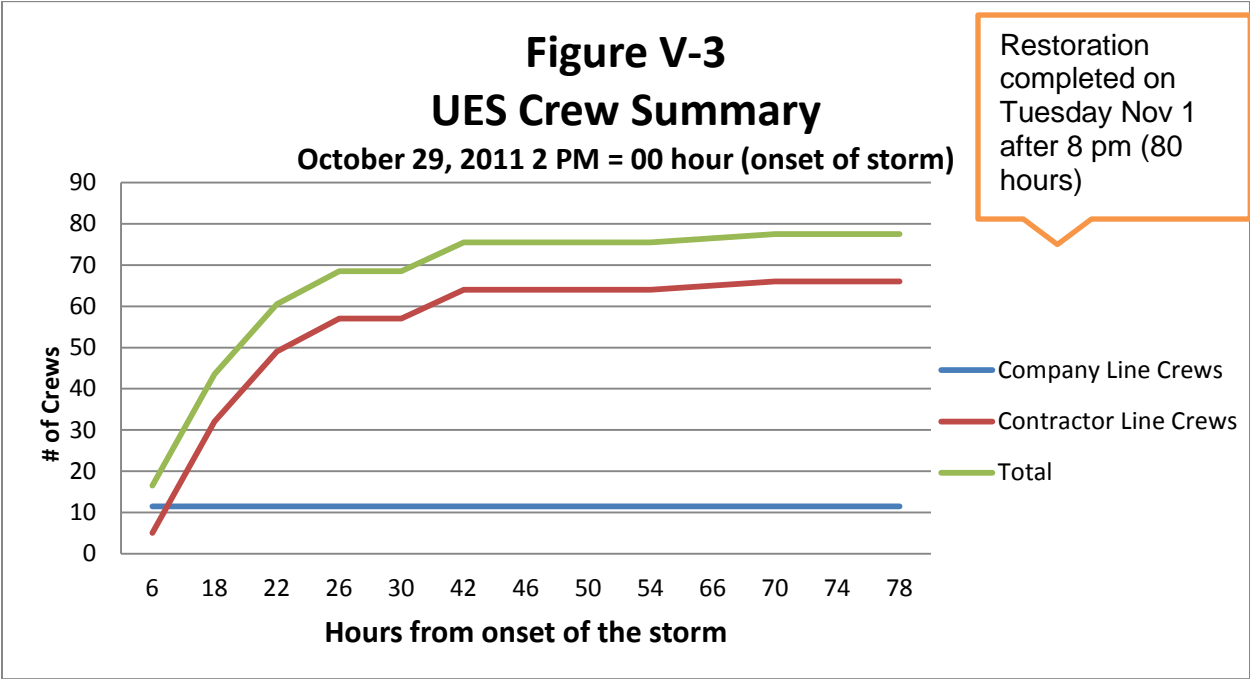
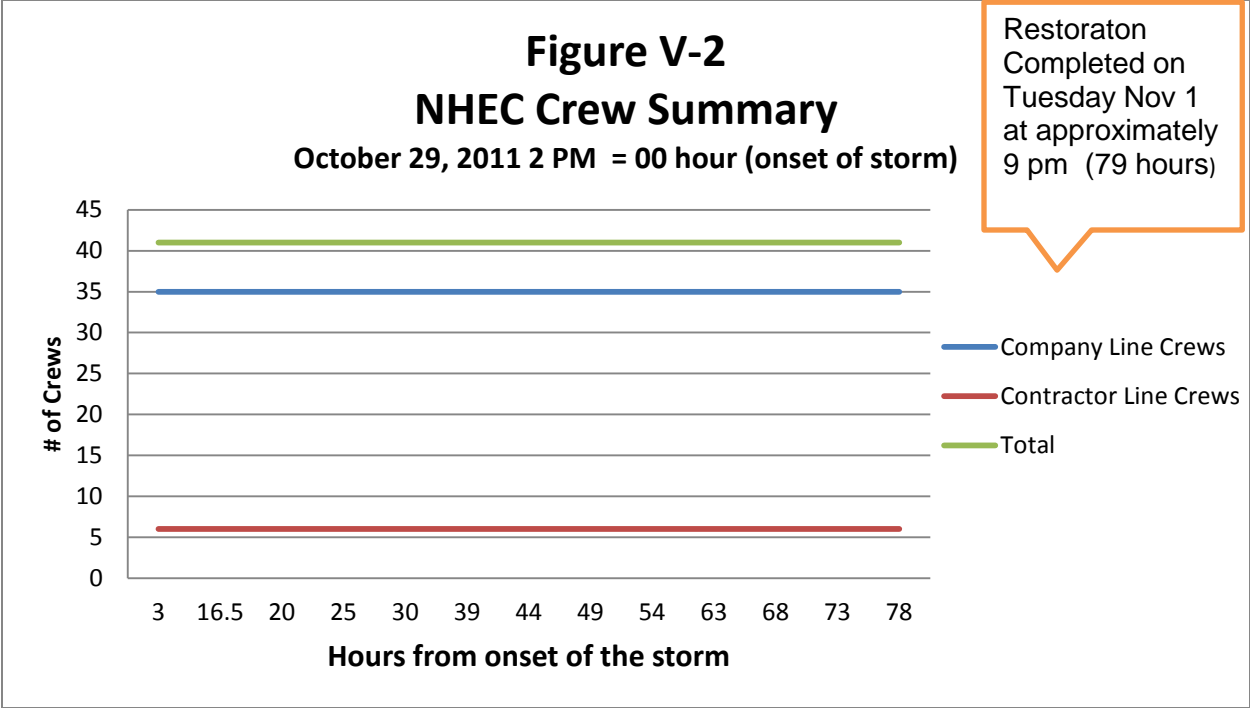
E. Utility Procurement of Line Crews during the October 2011 Snowstorm

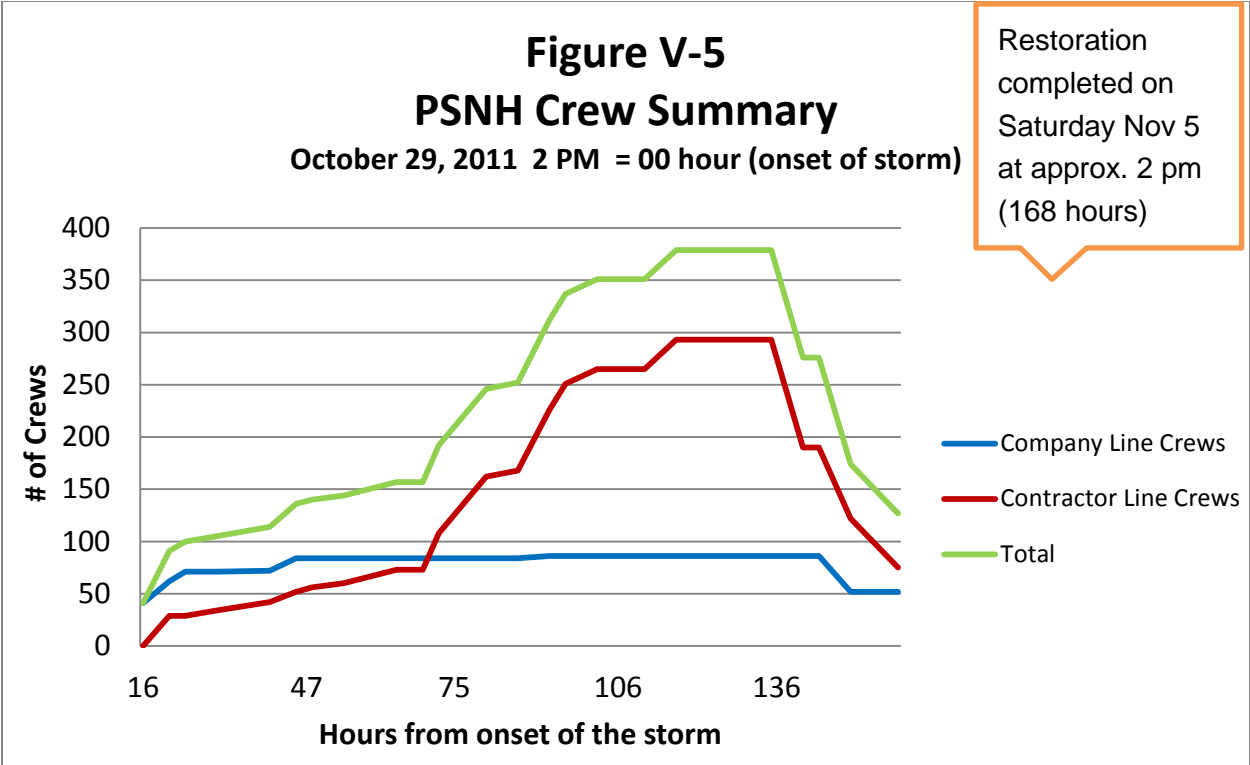
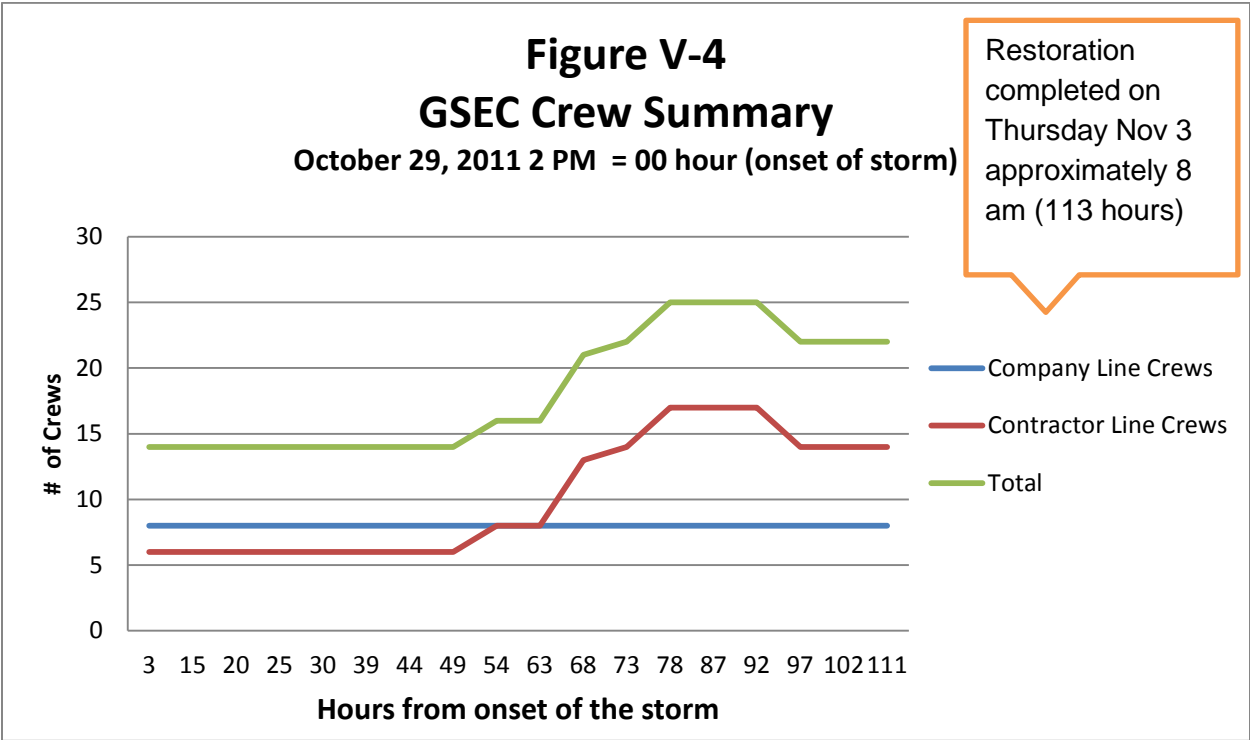
Figures V-2 through V-5 reflect the crew information submitted to the State Emergency Operations Center by each of the utilities. Figure V-2 shows that NHEC deployed all 35 of its internal crews and added six additional contractor crews at the storm’s onset. It added no further crews throughout the storm. By the 79th hour after the onset of the storm, restoration was substantially complete and crews were released or off duty.

Figure V-3 shows that at the onset of the storm UES pre-staged crews by utilizing outside resources at approximately three times the level of its internal line crews so that all were in place prior to the end of the storm on early Sunday morning, October 30, 2011. By bringing on still more resources, UES’ crew levels reached approximately six times its internal level of crews 42 hours from the onset of the storm. By the 80th hour, restoration was substantially complete and crews were released or off duty.

Figure V-4 indicates that GSEC ramped up its crew levels slowly, and it was not until 78 hours after the storm’s onset that the external crews procured through its parent company at the time, National Grid, arrived. These additional crews nearly tripled the number of internal line crews available at the onset, from 8.5 to 25. Once these additional crews arrived, GSEC’s restoration rates began to improve significantly and nearly all GSEC customers were restored within 24 hours after their arrival.

Figure V-5 shows PSNH also increased its crew levels slowly, and its own line crews were not fully deployed until approximately 42 hours from the onset of the storm (*i.e.*, 10 hours after the storm ended). It took approximately 70 hours after the onset of the storm for PSNH to double the number of internal line crews that PSNH maintains in the normal course of business. It was not until approximately 117 hours after the onset of the storm (nearly 5 days) that PSNH reached a peak level of crews on its system, with approximately four times the number of its normal line crews. Within 24 hours of attaining this peak, PSNH began releasing crews, approximately 33 hours prior to the completion of restoration. By the 168th hour, restoration was substantially complete and crews were released or off duty.





VI. Customer Expectations and Communications

A. Customer Feedback and the Need for Improved Communication

The Commission's Consumer Affairs Division reviewed direct feedback from 249 customers received through calls, emails and letters during the storm restoration period and the 10-day period following the completion of storm restoration efforts on Saturday, November 5, 2011. A breakdown of those contacts by utility is provided in Table VI-1. In December 2011, the Commission posted a survey on its website to solicit feedback on customer experiences during the storm and satisfaction with utility communication regarding restoration efforts. Almost 500 customers representing 83 towns responded to the survey, providing valuable information regarding utility communication efforts and customer expectations. A tabulation of survey responders by utility is provided in Table VI-2. A summary of the comments submitted is available on the Commission's website. Although there were a number of positive survey responses regarding utility performance related to the October 2011 Snowstorm, the focus of this report is on areas of utility performance that need improvement; this section, therefore, will highlight those areas.

1. Communication Methods and Content

Many customers expressed dissatisfaction with the communication methods used by the utilities, as well as the information they provided. While utility websites and social media outlets such as Facebook and Twitter can provide information dedicated to outages and restoration, customers without power have no readily available internet access unless they have charged smart phones or other alternative means. Customers expressed a desire to have more regular, more current and more detailed information available by radio as well as by telephone, and suggested that radio and television outlets could run a list identifying towns experiencing outages and providing Estimated Times of Restoration (ETRs). A major concern to customers throughout the storm and the resulting outages was not knowing how long power would be out so that they could plan accordingly. ETRs thus are a critical element of information sought by customers through whatever channels of communication are available.

Customers repeatedly expressed concern regarding the lack of information on ETRs. Based on survey responses, there was a clear demand for ETRs earlier in the process than was provided during the October 2011 Snowstorm. In many cases, ETRs were not provided until the end of the storm. Customers sought more accurate and timely ETRs at the street-level so that they could develop personal action plans and implement appropriate measures for themselves, their families and their businesses. Customers also indicated that the information being provided, whether through websites, social media outlets, radio or television, should be updated more frequently and consistently across all communication channels. Many customers commented

that specific location information indicating where power was available would be more useful than general information on the number of customers without power. Considerable customer frustration was expressed regarding the lack of information on where the utility crews were working. Customers suggested that utilities maintain real-time maps that show the areas where restoration crews are working, as well as outage locations, so that customers would know that their service provider was aware of their specific outage.

2. Utility Preparedness

Customers of PSNH were much more critical of the preparedness of their utility than customers of GSEC, NHEC and UES. The general sentiment among those who contacted the Commission or responded to the survey was that PSNH did not have sufficient crews available in the state in advance of the storm and that it took too long for the crews to get to New Hampshire once the storm was over. As a result, customers perceived outage times to be longer than necessary.

3. Additional Customer Feedback

Customers also expressed frustration with the personal costs incurred as a result of multi-day outages. For residential customers, those costs are driven in part by the purchase of fuel for generators; lodging and meals for those who cannot remain in their homes; lost wages for those who work from home; and spoiled food with the loss of refrigeration. Business customers experienced revenue losses, as well. Without electricity, many customers in New Hampshire lack water, as well as heat. While customers recognized that the utility field crews work long hours under difficult circumstances, they expressed their belief that utility management could do a better job in responding to these events.

Table VI-1 Calls/Letters Received by Commission Regarding Storm and Restoration by Utility			
Electric Service Provider	# of Calls/Letters	% of total Calls/Letters Received	Calls/Letters as Percentage per 1000 Utility Customers Out at Peak
NHEC	1	0%	5.4%
UES	14	6%	27.3%
GSEC	4	1.5%	25.5%
PSNH	223	89.5%	94.1%
No Electric Utility Provided	7	3%	n/a
Total	249	100%	n/a

Electric Service Provider	# Responses Received
NHEC	10
UNITIL	32
GSEC	5
PSNH	450
No Electric Utility Provided	2
Total	499

B. Utility Communications with Municipalities

Based on a review of utility actions taken pursuant to the Commission’s December 2008 Ice Storm After Action Review, as well as their performance during the October 2011 Snowstorm, the four electric utilities have made some progress toward improving communications with municipal officials prior to and during major storm events and associated restoration efforts, but substantial room for improvement remains.

Although utilities used media resources such as Twitter and website updates to communicate information during emergency events, they did not utilize radio and television as effectively as they could have to provide more targeted information to municipal officials or customers on a local level during the October 2011 Snowstorm. To improve information flow and facilitate municipal emergency planning, utilities should coordinate with municipalities through regular outreach in the form of municipal conference calls during outage events. Utilities should ensure that a process is readily available during emergency events through which municipalities can provide utilities with feedback on restoration priorities.

Municipal participation in utility emergency drills could provide another useful means to ensure familiarity of municipalities with their local utility’s emergency practices, and facilitate mutual understanding in emergency response situations. The training and utilization of municipal workers during storm restoration could help substantially in utility damage assessment efforts, as municipal workers could relay digital photographs, identification of road closures, and other localized details to utility EOCs.

UES, for example, held pre-event conferences with municipal officials and notified municipal officials when it would open its emergency operations centers during the October 2011 Snowstorm. GSEC had conducted annual meetings with municipalities but failed to do so in 2011; it should resume its meetings with municipal officials. Unlike UES and GSEC, PSNH and NHEC did not hold daily municipal conference calls with town officials during the October 2011

Snowstorm to inform municipalities of daily action plans for restoration, the location of line crews, and areas of restoration focus and priorities. Both NHEC and PSNH should implement outreach procedures with municipal officials to coordinate emergency response plans and explore means to improve communications during outage events.

VII. Wilton Telephone Company Switch Outage

Wilton Telephone Company Inc. d/b/a TDS Telecom, a wholly owned subsidiary of TDS Telecommunications Corporation (collectively, TDS), experienced an extended switch outage during the October 2011 Snowstorm, causing all of its customers, as well as cellular service in the area, to be out of service from 2:00 p.m. to 11:30 p.m. on Sunday, October 30, 2011. Some Wilton customers lost service earlier and some remained without telephone service through Tuesday, November 1. The switch outage was due to the incapacitation of the company's fixed generator as a result of improperly sized propane fuel supply.

A. Event Preparedness

TDS was aware of the weather forecast for the October 2011 Snowstorm and was reasonably prepared to react. Prior to the storm event, TDS had alerted Field Service personnel and its construction contractor to stand by. All generators were inspected, tested and filled with fuel. Portable generators were loaded on trailers and fuel cans and vehicles were filled. Generator testing, however, was not done under the full load required to operate the central office during a power outage. During the actual power outage, the fuel flow was not adequate due to undersized propane fuel tanks, which caused the vaporization rate to be insufficient to supply the fuel required to run the generator under a full load.

B. Communications

TDS's communications with town officials, the Commission and customers were not ideal. According to TDS, while the generator was operating, it was not aware of any loss of service and did not need to communicate because no problems had been identified. As the event unfolded, field personnel were focused on troubleshooting and correcting problems.

C. Outage Testing

It is not clear whether TDS was fully aware of the number of customer outages before the switch shut down and after power was restored by the portable generator. In this case, where landline and cell service was inoperable, customers could not call to report a trouble. Diagnostics revealed that software connections had been lost as a result of the switch shut-down. If mechanized testing had been in place, TDS might have become aware sooner that customers served by remotes remained without dial tone after power had been restored to the central office.

Appendix A – New Hampshire’s Electric Utilities

The electric utility franchise map shown in Figure A-1, below, indicates the franchised service territory of each electric utility, as follows:

PSNH, shown in blue, serves most of New Hampshire’s larger population areas, including the heavily populated southern tier of New Hampshire, including the cities of Manchester, Nashua, Portsmouth, Merrimack, Londonderry, Portsmouth, Dover, Rochester, and Keene.

UES, shown in light blue, supplies two distinct service territories – the Capital Region centered around Concord and the Seacoast Region centered around Hampton.

GSEC’s territory, shown in yellow, consists of two discrete areas: a densely populated area along the New Hampshire-northeast Massachusetts border, including Salem and Pelham, and a more sparsely populated area along the New Hampshire-Vermont border in the Upper Valley region.

NHEC, shown in red, serves the more rural areas of New Hampshire.

The green areas on the map represent municipal electric service territories.

PSNH is a subsidiary of Northeast Utilities, a large electric and natural gas holding company headquartered in Berlin, Connecticut. It has affiliated electric distribution companies operating in Connecticut and western Massachusetts. In April 2012, Northeast Utilities and NStar, an electric and natural gas holding company headquartered in Boston, completed the merger of their two companies. The Commission continues to exercise its regulatory responsibility over PSNH and its parent, Northeast Utilities.

UES is a subsidiary of Unitol Corporation, a public utility holding company headquartered in Hampton, New Hampshire. Unitol’s main subsidiaries include a natural gas distribution utility, Northern Utilities that operates in New Hampshire and Maine, an electric and natural gas distribution utility in Massachusetts, Fitchburg Gas and Electric Light Company as well as UES, which provides electric distribution service in New Hampshire.

At the time of the October 2011 Snowstorm, Granite State Electric Company (GSEC)²² was a subsidiary of National Grid USA, a large natural gas and electric utility holding company headquartered in Westborough, Massachusetts. GSEC, and EnergyNorth Natural Gas, Inc., a New Hampshire natural gas distribution utility, have since been acquired by Liberty Energy

²² Now GSEC d/b/a Liberty Utilities.

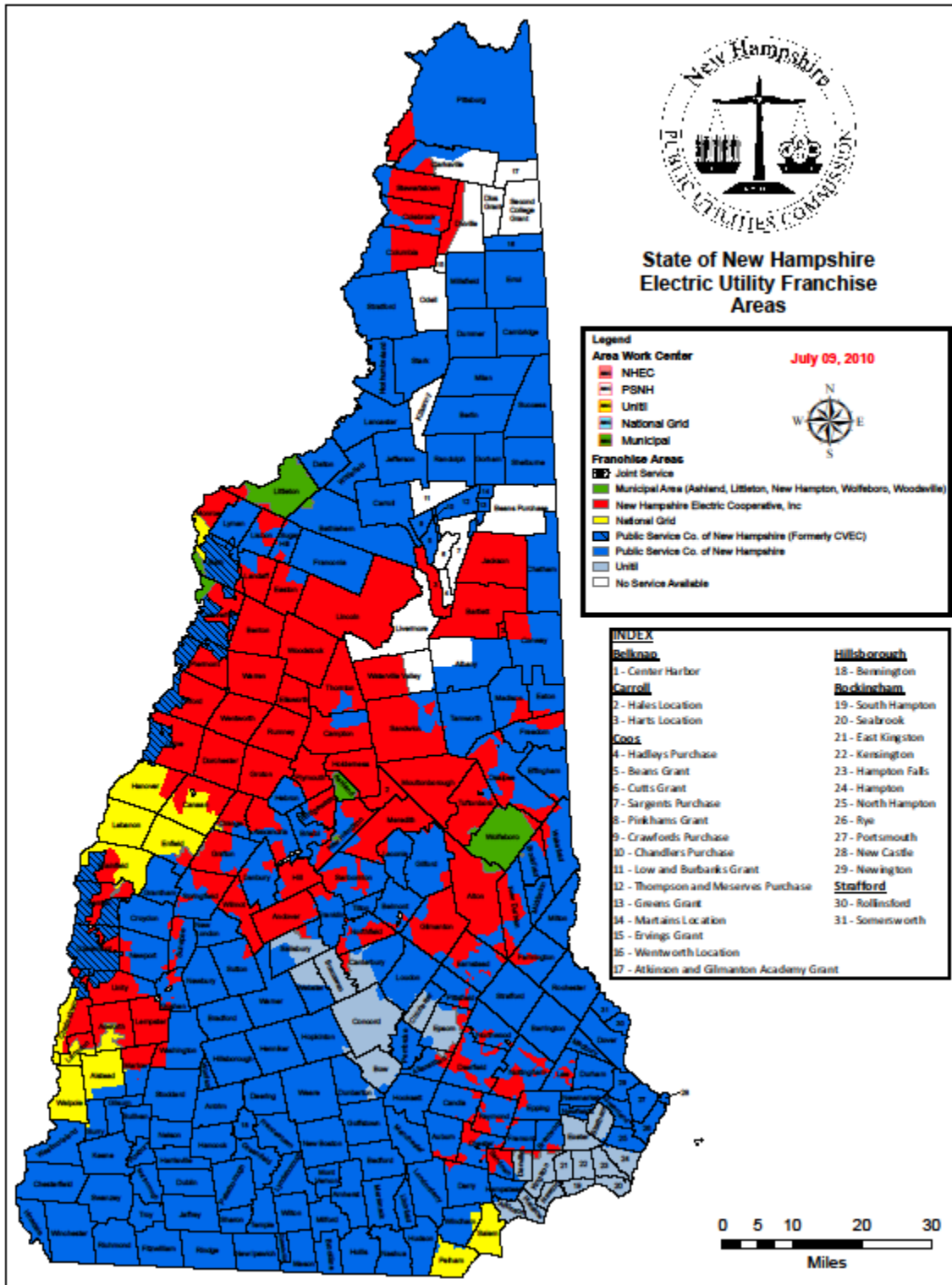
Utilities (New Hampshire) Corp., a transaction approved in May 2012 by the Commission in Docket No. DG 11-040.

Tables A-1 and A-2 provide an overview of the regulated electric utilities in New Hampshire.

Table A-1			
Electric Provider	Number of Customers	Total Square Miles of Service Territory	Total Miles of Transmission and Distribution
New Hampshire Electric Cooperative	78,830	2,419	5,586
Unitil Energy Systems	75,177	408	1,568
Granite State Electric Company	42,050	810	1,768
Public Service of New Hampshire	506,004	5,628	13,804
Total	702,061	9,265	22,726

Table A-2				
Electric Company	Number of Towns Fully Served	No. Customers Within Towns Fully Served	Number of Towns Partially Served	No. Customer Within Towns Partially Served
New Hampshire Electric Cooperative	16	22,396	101	56,434
Unitil Energy Systems	7	24,849	24	50,328
Granite State Electric Company	3	23,585	19	18,465
Public Service of New Hampshire	98	331,796	114	174,208
Total	124	402,626	258	299,435

Figure A-1 – New Hampshire Electric Franchise Territories



Appendix B – Customer Feedback Tables

Survey Responses Tabulated by Town

Amherst	24
Atkinson	2
Auburn	5
Barrington	2
Bedford	41
Belmont	1
Bow	2
Brentwood	1
Brookline	5
Candia	5
Canterbury	1
Chester	3
Chichester	1
Colebrook	1
Concord	4
Deerfield	7
Derry	18
Dover	1
Dunbarton	2
Durham	5
East Kingston	1
East Wakefield	1
Epping	2
Epsom	1
Exeter	7
Farmington	2
Fitzwilliam	1
Francestown	1
Fremont	1
Gilford	1
Goffstown	10
Hampstead	8
Hampton/Hampton Falls	2

Harrisville	1
Henniker	1
Hillsboro	1
Hinsdale	1
Hollis	6
Hooksett	13
Hopkinton	1
Hudson	20
Kensington	3
Kingston	2
Laconia	1
Lee	2
Litchfield	11
Londonderry	27
Loudon	1
Lyndeborough	1
Manchester	65
Merrimack	30
Milford	12
North Hampton	1
Nashua	37
New Boston	9
New Hampton	1
New Ipswich	1
Newfields	1
Newmarket	4
Newton	2
Northwood	6
Nottingham	2
Pelham	2
Plaistow	2
Raymond	4
Richmond	1
Rochester	3

Rye	1
Salem	3
Sanbornton	1
Sandown	5
Seabrook	1
Somersworth	1
Springfield	1
Strafford	1
Stratham	1
Tilton	1
Troy	1
Warner	2
Weare	3
Winchester	1
Windham	14
Wolfeboro	1
No town provided	17
Total Responses	499
Towns Represented	83

Calls/Letters Received By Commission Regarding Storm and Restoration By Town

Amherst	11
Ashuelot	1
Atkinson	2
Auburn	2
Bedford	6
Bow	1
Brentwood	4
Brookline	1
Candia	2
Chester	2
Concord	1
Deerfield	1
Derry	13
Dover	1
Durham	2
East Derry	1
East Hampstead	3
Epping	4
Fremont	3
Hampstead	11
Hampton Falls	2
Hollis	3
Hooksett	3
Hudson	16
Litchfield	6
Londonderry	10
Manchester	16
Merrimack	8
Milford	6
Mont Vernon	1
Nashua	39
New Boston	3
New Ipswich	2
Newfields	2
Newmarket	2
Newton	4

North Hampton	1
Nottingham	1
Pelham	2
Plainfield	1
Plaistow	2
Raymond	1
Rindge	1
Rochester	2
Rye	1
Salem	2
Salisbury	1
Sandown	3
Seabrook	2
Spofford	1
Stoddard	1
Strafford	1
Wilton	1
Windham	11
No Town Given	19
Total	249

Appendix C – Governor Lynch’s Letter to the Commission



JOHN H. LYNCH
Governor

State of New Hampshire
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November 8, 2011

Chairman Thomas Getz
Public Utilities Commission
21 South Fruit Street – Suite 10
Concord, NH 03301

Dear Chairman Getz:

I am pleased that the Public Utilities Commission will undertake an after-action review of the response of New Hampshire’s regulated utilities to the recent snowstorm.

Prolonged power outages are deeply disruptive to the lives of our citizens and the operations of our businesses. Our businesses and citizens suffered tremendous hardship – students were out of school for days, families were displaced from homes or subjected to cold and unsafe conditions within their homes, and our people and businesses suffered economic losses as a result of the outages.

It appears that some utilities worked pro-actively to secure the additional crews they needed to restore power quickly for their customers, and they are to be commended. But I am deeply concerned that it took until Saturday – a week after the storm – to see power restored to all our citizens. Like many New Hampshire citizens, I have questions about whether all New Hampshire utilities were sufficiently prepared, whether utilities could have done anything to shorten the length of the recent outages, or whether there were steps that could have been taken to reduce the number of outages.

As the Public Utilities Commission undertakes its review, I urge you to focus on a number of questions:

- 1) At what point was it known to the utilities that this would be a significant storm, likely requiring the securing of additional repair crews?
- 2) Did the utilities take steps to secure and pre-position private and out-of-state crews ahead of the storm, and were these steps adequate?
- 3) Were crews deployed by the utilities in the most efficient and effective manner?

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Chairman Thomas Getz
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- 4) How did the number of crews responding to outages compare on a per customer basis between the utilities? Do the scope and nature of the outages indicate a lack of maintenance or other reliability measures by the utilities?
- 5) Are there other preparations that the utilities could have made to prepare for the storm that would have shortened the length of the outages or reduced the number of outages?
- 6) Are there policy changes, either on a state or utility level, that would have reduced the number of outages or helped to shorten the restoration time?
- 7) Are utility emergency response agreements operating sufficiently under the demands of increased power outages?
- 8) Were the utilities adequately communicating with customers and municipal officials?

Thank you for your attention to this matter. Please let me know if I can be of assistance.

Sincerely,



John W. Lynch
Governor

Appendix D – Status Report on the December 2008 Ice Storm After Action Review

The December 2008 Ice Storm remains the single worst New Hampshire electric outage event in recent history. Over three-quarters of New Hampshire electric customers were without power at the peak of the storm; many customers remained without power for over a week, while some did not get power restored until Christmas Eve, two weeks after the storm. The Commission hired an independent consulting firm to review the storm response of PSNH, UES, GSEC and NHEC, as well as FairPoint Communications, New Hampshire’s largest telecommunications utility. The consultant’s report and the Commission’s After Action Review provide a comprehensive and detailed review of utility planning and response to an unprecedented widespread outage event.

The Commission’s December 2008 Ice Storm After Action Review contained numerous “action items” for each utility, as well as the Commission and other state agencies. Since then, New Hampshire has experienced other major weather events that have caused significant damage and resulted in widespread power outages. Overall emergency response has varied by utility, and in some cases there has been tremendous improvement in utility response, but all companies, as well as the State, have learned lessons from the December 2008 Ice Storm about emergency planning, resource procurement and deployment, and communications.

This report on the October 2011 Snowstorm provides an opportunity to revisit the recommendations made after the December 2008 Ice Storm, assess the status of each after action item, and identify additional actions that are required, as outlined in the chart below.

**December 2008 Ice Storm
After Action Review Status Report**

AREA OF CONCERN	STATUS	COMMENTS
Emergency Planning Actions		
1.1 GSEC must designate emergency contact, incorporate NH based emergency response decision-making	✓ GSEC	GSEC made the required changes; with transition to Liberty Utilities the NH based decision-making will continue with GSEC.
1.2 Commission should amend PUC 300 to require annual emergency response plans	✓ PUC	Rulemaking underway; should be completed by July 1, 2013.
1.2 (continued) utilities should file annually their emergency response plans and efforts	✓ NHEC ✓ UES ✓ GSEC ✓ PSNH	All 4 utilities have filed as required.
1.3 Utilities work with municipalities to integrate and coordinate emergency response plans and efforts	✓ NHEC ✓ UES ✓ GSEC ✗ PSNH	GSEC had conducted annual meetings with municipalities but failed to do so in 2011; transition to Liberty Utilities is good opportunity to resume meetings. PSNH states it cannot compel municipalities to integrate plans, and thus cannot implement this action. Liberty Utilities and PSNH must promptly schedule meetings with municipal officials and coordinate response plans to the extent possible.
1.4 Utilities expand emergency readiness drills to include in-house and external participants typically involved in emergency response. Drills should be conducted at least annually, preferably twice annually	✓ NHEC ✓ UES ✓ GSEC ✗ PSNH	National Grid conducts drills annually, however, no NH personnel from GSEC participated in 2011; Liberty Utilities must resume drills. PSNH opposes external responders in drills because it cannot compel their participation; opposes twice yearly drills due to cost. PSNH must conduct drills as recommended in 1.4, external responders should be offered opportunity but not compelled to participate.
Vegetation Management Actions		
2.1 Utilities consider standardized trim zones	✓ NHEC ✓ UES ✓ GSEC ✓ PSNH	NHEC believes its trim zones and cycles are appropriate for its service territory. UES, PSNH and GSEC have been standardized through rate case proceedings. Standardized trim zones will be addressed in Puc 300 rulemaking.
2.2 Commission meet with utilities, develop trim cycles and zones, to be included in amended Puc 300 rules	✓ PUC	Meetings held, rulemaking underway for completion July 2013.
2.3 Utilities have arborist or forester unaffiliated with	✓ NHEC	Each utility has inspections conducted by

Appendix D–Status Report on the December 2008 Ice Storm After Action Review

the trimming service provider inspect 100% of circuit miles trimmed and all hazard trees removed	<ul style="list-style-type: none"> ✓ UES ✓ GSEC ✓ PSNH 	arborist or forester.
2.3 (continued) Utilities compile results of inspections, including GIS mapping, and submit annually to Commission	<ul style="list-style-type: none"> ○ NHEC ○ UES ○ GSEC ○ PSNH 	All 4 utilities filed the results of inspections, but without GIS mapping. Future submissions shall include GIS mapping for those utilities with GIS deployment.
2.4 Commission monitor tree trimming on more systematic basis, initiate rulemaking, consider retaining arborist	<ul style="list-style-type: none"> ✓ PUC 	Commission reviews annual vegetation management plans and budgets of UES, PSNH and GSEC. Puc 300 rulemaking now underway, Commission considered and no longer recommends retention of arborist.
2.5 Commission review Unitil’s vegetation management, distribution hardening, report by June 2010	<ul style="list-style-type: none"> ✓ PUC 	Review completed as part of Docket DE 10-055.
2.6 Commission review NHEC’s tree trimming practices, report by April 2010	<ul style="list-style-type: none"> ○ PUC 	Staff to review current practices and file report by April 2013.
2.7 Utilities improve communications with customers re: importance of hazard tree removal, maintenance trimming	<ul style="list-style-type: none"> ✓ NHEC ✓ UES ✓ GSEC ✓ PSNH 	Utilities should continually evaluate effective communications strategies (for example, NHEC now includes trim schedules on its website).
2.8 Utilities document details of discussions when homeowner refuses consent to trim or remove tree, file all such documentation by June 30 each year	<ul style="list-style-type: none"> ✓ NHEC ✓ UES ✓ GSEC ✓ PSNH 	Utilities are keeping record of these instances; Puc 300 rulemaking will develop standard reporting format.
Outage Management System Actions		
3.1 Commission consider, as part of PSNH rate case, adequacy of PSNH’s outage management system	<ul style="list-style-type: none"> ○ PSNH 	Commission approved PSNH’s acquisition of GIS, installation has begun with completion targeted for end of 2014. Questions remain re: timing of GIS installation and adequacy of OMS.
Resource Planning and Procurement Actions		
4.1 Utilities consider lining up outside contracts with rights of first refusal when major storms expected, reduce reliance on mutual aid; continue to pursue arrangements in addition to mutual aid for emergency response	<ul style="list-style-type: none"> ✓ NHEC ✓ UES ✓ GSEC ✓ PSNH 	All 4 utilities considered these recommendations: NHEC institutes a “right of first refusal.” UES also uses “right of first refusal” in its contracts but states they are becoming less of an option due to the increased demand for crews. PSNH has held discussions with its contract crews to explore this option. GSEC has contracts with firms that contain language about “release” before those crews can leave GSEC. Each utility shall file an update to its response to 4.1 by April 1, 2013.
4.2 Utilities consider benefits of contracts with national firms to ensure wider availability of resources in event of emergency	<ul style="list-style-type: none"> ✓ NHEC ✓ UES ✓ GSEC ✓ PSNH 	NHEC uses pool of more than 900 cooperatives nationwide. GSEC has long standing contracts with national companies. PSNH is pursuing the possibility of

Appendix D–Status Report on the December 2008 Ice Storm After Action Review

		contracting with national firms. UES has considered this and believes it could be very expensive without any guarantee of having crews when needed. Each utility shall file with Commission an update to 4.2 by April 1, 2013.
4.3 Utilities file summaries of mutual aid arrangements, external contracts, municipal outreach efforts	<ul style="list-style-type: none"> ○ NHEC ○ UES ○ GSEC ○ PSNH 	UES provides summary in its ERP. PSNH does not support filing external contracts due to competitive nature of acquiring resources. Each utility shall file its summaries in its ERP filed with the Commission.
4.4 Emergency Response Plan should include clear management policy for storm response	<ul style="list-style-type: none"> ✓ NHEC ✓ UES ✓ GSEC ✓ PSNH 	The policy for senior management shall be filed with each utility’s annual ERP.
4.5 Emergency Response Plan should include standard trigger points for resource procurement based on clear benchmarks	<ul style="list-style-type: none"> ✗ NHEC ✓ UES ✗ GSEC ✗ PSNH 	3 utilities shall develop standard trigger points for resource procurement based on clear benchmarks.
4.6 Utilities consider use of trained municipal employees (Fire, Police, Public Works) for damage assessment during large-scale disasters	<ul style="list-style-type: none"> ✓ NHEC ✓ UES ✓ GSEC ✓ PSNH 	UES and Liberty considering ways to supplement its workforce with trained municipal workers; PSNH believes municipal officials have their own roles to play during storms and can’t be relied on for utility damage assessment. Utilities shall continue to explore opportunities to train and utilize municipal workers who want to participate in damage assessment.
4.7 Utilities train local officials in electric distribution system, safety precautions, hazards	<ul style="list-style-type: none"> ✓ NHEC ✓ UES ✓ GSEC ✓ PSNH 	Utilities conduct “Fires and Wires” trainings periodically and should be continued.
4.8 Utilities consider training telephone companies’ workers to assess electric distribution system damage	<ul style="list-style-type: none"> ✓ NHEC ✓ UES ✓ GSEC ✓ PSNH 	All 4 utilities considered and found not practicable, Commission agrees this recommendation does not warrant further action.
Emergency Response Actions		
5.1 Each utility should gather and analyze weather and damage information during and immediately following weather events and develop improved models to predict damage	<ul style="list-style-type: none"> ○ NHEC ✓ UES ○ GSEC ○ PSNH 	UES integrates weather forecasting into damage assessment modeling; remaining 3 utilities shall develop such modeling.
5.2 Each affected utility shall file self-assessments within 60 days following any state-declared emergency event	<ul style="list-style-type: none"> ✓ NHEC ✓ UES ✓ NGid ✓ PSNH 	Self-assessments are intended to result in self-improvement and should contain meaningful analysis of decision-making prior to and during event, and corrective action as needed. PSNH’s Oct 2011 Snowstorm report described challenge and efforts of workers but did not assess

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		effectiveness of management decisions.
5.3 Commission open adjudicative proceeding re: reasonableness of timing of Unutil’s response to December 2008 Ice Storm	✓ PUC	Docket DE 10-001 addressed UES’s response. Order No. 25,148 approved settlement and directed UES to take a number of steps to improve its response to emergencies and large-scale outages.
5.4 Unutil must amend ERP to outline how crews allocated during simultaneous large-scale events in multiple states	✓ UES	Unutil amended ERP as required.
5.5 By February 2010 utilities reassess field crew staffing to ensure adequate resources exist locally	✓ NHEC ✓ UES ✓ GSEC ✓ PSNH	Liberty Utilities has ability to acquire crews from GSEC for transition period, but should address its ability to obtain crews in its 2013 ERP filed with the Commission.
5.6 Utilities communicate with regulators, municipalities and public location of crews deployed, preferably by town or street; use of GIS helpful	○ NHEC ✓ UES ✓ GSEC ○ PSNH	NHEC and PSNH have not been doing municipal outreach as frequently as they should. NHEC exploring new communications strategies with municipalities. PSNH developing web-based system, doesn’t recommend information by street, no crew schedules made available to state or local officials.
5.7 Utilities consider acquiring, sharing off road trucks in their fleets	✓ NHEC ✓ UES ✓ GSEC ✓ PSNH	All utilities utilize existing contractual arrangements for the use of off road trucks and heavy equipment. No further action needed.
Communications Actions		
6.1 HSEM could provide Commission with updated municipal contacts	✓ HSEM	Contacts provided and updated regularly.
6.2 DOT could provide utilities with updated contacts and participate with utilities on municipal calls	✓ DOT	DOT provided contacts. Would be useful for DOT to participate in municipal calls conducted by utilities.
6.3 DOT and municipalities could include local as well as state road closures on WebEOC	✓ DOT	State, local and private road closure information now maintained on WebEOC.
6.4 HSEM, Dept of Fire Safety could consider non-endorsed list of licensed electricians for emergency events	✗ HSEM ✗ Fire Safety	Commission to follow-up with HSEM and Fire Safety.
6.5 Utilities and municipalities could coordinate re: road closures, input updated info on WebEOC to facilitate utility planning, deployment of resources	✓ NHEC ✓ UES ✓ GSEC ✓ PSNH	Staff to convene meeting with utilities and HSEM to develop better coordination and use of WebEOC.
6.6 Electric and telephone utilities should coordinate to improve restoration efforts, including sharing daily work plans, joint conference calls with municipalities	○ NHEC ○ UES ○ GSEC ○ PSNH	All 4 utilities have processes to coordinate with telephone companies; should expand to include all pole attachers, such as cable providers.
6.7 When assigning communications personnel to be embedded with municipalities, PSNH should assign span of control ratio of 5-6 towns per person	○ PSNH	PSNH has communications liaison to increase internal training so more PSNH personnel available to interface with municipalities PSNH shall file in its annual

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		ERP details of training and how additional personnel are meeting need of municipal emergency response personnel, including specific procedures to facilitate handling of calls from municipal officials.
6.8 PSNH should have dedicated municipal room as best practice in emergency response	○ PSNH	PSNH believes this is impractical, and not necessary with new communications liaison. Next steps: PSNH must improve outreach and coordination with municipalities, Commission is willing to consider PSNH’s municipal initiatives that may not include a dedicated municipal room. PSNH shall file in its annual ERP details of its municipal outreach and responses.
6.9 PSNH should implement GIS system with state of the art Outage Management System to facilitate emergency restoration	✓ PSNH	PSNH has begun to install GIS, but not scheduled to be complete until December 31, 2014. PSNH shall file by January 31, 2013 evaluation of cost accelerated deployment of GIS.
6.10 PSNH should reconsider long term viability of existing system, reevaluate feasibility of expedited new OMS	✓ PSNH	PSNH continuing with existing OMS until GIS fully installed. PSNH shall file by January 31, 2013 detailed plan for improved OMS.
6.12 NHEC should consider posting ETRs on front page interface of its website	✓ NHEC	NHEC posts ETRs on its outage map.

- ✓ Denotes action completed
- Denotes action undertaken but not yet completed
- ✗ Denotes action not yet taken

Appendix E – The October 2011 Snowstorm in Historical Perspective

Table E-1 displays the ranking and magnitude of the October 2011 Snowstorm when comparing the largest historical storms and associated power outages to occur in New Hampshire for the four largest electric providers. Overall the October 2011 Snowstorm ranks as the third highest behind the December 2008 Ice Storm in terms of the total number of outages statewide at one time. For UES and GSEC, it was the second largest customer outage ever recorded in New Hampshire on their respective distribution systems. For PSNH the October 2011 Snowstorm ranked as the third largest outage; for NHEC it was the sixth largest recorded.

On October 31, 2011, Governor Lynch requested a declaration of an emergency disaster with an application to the Federal Emergency Management Agency for federal disaster assistance. On November 21, 2011, the Governor requested a major disaster declaration and direct federal assistance to help cover costs resulting from the October Snowstorm. New Hampshire Homeland Security and Emergency Management reported that no fatalities were associated with the October 2011 Snowstorm in New Hampshire. All four electric providers reported that no major injuries to workers occurred during restoration efforts. Approximately 250 municipal roadways and 40 state highways were partially or fully closed as a result of downed trees, limbs and power lines. Twelve shelters and six warming stations were opened by local communities in the state, servicing more than 600 people. Approximately 122 schools were closed during the week-long restoration process. Snowfall totals throughout the southern portion of the state set local records. Concord, NH recorded an historic amount of snowfall for a single day in October with 22 inches, shattering the former record of 2.2 inches. New Ipswich had the highest amount of snowfall recorded for Hillsborough County at 26.2 inches, while Northwood recorded 14.2 inches, the highest amount for Rockingham County.

Electric Provider	Key Parameters	Worst Outage	2nd Worst Outage	3rd Worst Outage
PSNH	Event Name	December 2008 Ice Storm	February 2010 Wind Storm	October 2011 Snowstorm
	# of Customers Affected	322,000	269,000	237,000
	% of Customers Affected	66%	54%	47%
	Duration of Restoration	≈275 hours	157 hours	168 hours
	# of Restoration Crews²³	788	398	494
NHEC	Event Name	December 2008 Ice Storm	February 2010 Wind Storm	April 15, 2007 Nor'easter
	# of Customers Affected	48,200	45,000	35,000
	% of Customers Affected	61%	57%	44%
	Duration of Restoration	142 Hours	128 hours	129 Hours
	# of Restoration Crews	118	90	120
UES	Event Name	February 2010 Wind Storm	October 2011 Snowstorm	December 2008 Ice Storm
	# of Customers Affected	62,054	51,262	41,066
	% of Customers Affected	82%	69%	55%
	Duration of Restoration	100 Hours	80 Hours	240 Hours
	# of Restoration Crews	159	77	64
GSEC	Event Name	December 2008 Ice Storm	October 2011 Snowstorm	August 2011 Tropical Storm Irene
	# of Customers Affected	32,000	13,300	11,400
	% of Customers Affected	81%	32%	27%
	Duration of Restoration	161 Hours	113 Hours	72 Hours
	# of Restoration Crews	70.5	25	32
Combined overall Storm Ranking #1		December 2008 Ice Storm	# of Customers Simultaneously Without Power	432,000
Combined overall Storm Ranking #2		February 2010 Wind Storm		328,600
Combined overall Storm Ranking #3		October 2011 Snowstorm		≈300,000

²³ Restoration Crews in Table E-1 includes all contractor, affiliate, mutual assistance and internal crews (commonly referred to as: line crews, digger crews, service crews, but excludes tree trimming crews).