

CHAPTER I

Introduction

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A. BACKGROUND

Late on Thursday, December 11, 2008, a major ice storm struck New England and Upstate New York. The storm continued into Friday, December 12, wreaking havoc along its path. Figure I-1 displays the geographical footprint of the damage caused by the storm. Thousands of trees were damaged when their branches became laden with ice as shown in Figure I-2, resulting in tree limbs breaking and entire trees uprooting. Many of the damaged trees and limbs fell onto houses, cars, or across roads, and others fell onto telecommunication and power lines. The mechanical shock caused by falling limbs and trees resulted in a tremendous amount of damage to the overhead electric power system infrastructure.

Power outages in New Hampshire began late on Thursday, December 11 (Day 1), and power was not restored to all customers until Wednesday, December 24 (Day 14), a full two weeks after the storm occurred. This ice storm, one of the worst natural disasters to occur in New Hampshire within the last two decades, resulted in over sixty percent of New Hampshire electric customers losing power. As described in Chapter II, the storm caused over \$150 million in reported property damage in New Hampshire alone.

The restoration of power was a long and difficult process due to the record amount of damage to the power system. In addition, ice and tree covered roads, as seen in Figure I-3, made the initial damage assessments difficult and time consuming, and hampered repair crews trying to enter damaged areas. The ice storm was followed by two snow events 4 days and 7 days later during the restoration period that further hampered the restoration of power outages. At the peak of the outage there were nearly a half-million customers without power in New Hampshire.¹ The storm

¹ For a full discussion of outage numbers please refer to Chapter II.

resulted in severe economic loss to the state, made even worse due to its occurrence during the holiday shopping season.

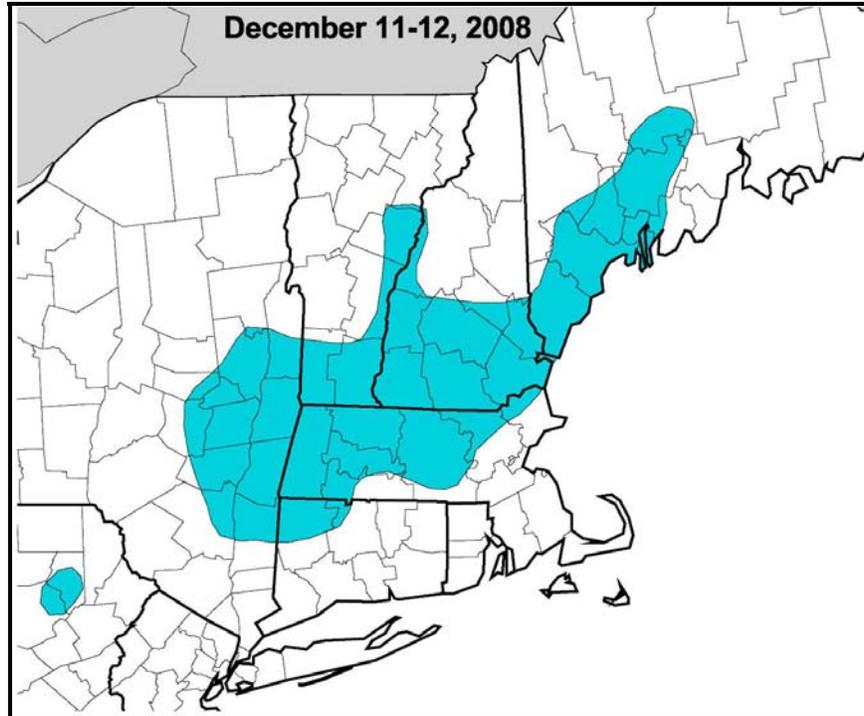


Figure I-1 – Map of the ice storm damage footprint.²

² Jones, K.F. (July 28, 2009). The December 2008 Ice Storm in New Hampshire. U.S. Army Corps of Engineers Cold Regions Research Engineering Laboratory, Hanover, New Hampshire.



Figure I-2 – Damage in PSNH distribution line corridor.
(Photo courtesy of PSNH. Exact location unknown.)



Figure I-3 - Impassable roads due to ice damage in Londonderry, NH
(Photo courtesy of PSNH)

As a result of the storm, the governors of New York, Massachusetts, New Hampshire, and Maine declared states of emergency in their jurisdictions. On December 12, at 9:20 a.m. Governor John Lynch declared a state of emergency. In New Hampshire, 500 National Guardsmen were deployed for 13 days to help with traffic control, delivery of supplies to local emergency centers,

wellness checks of residential properties, support for the state emergency center, and tree clearing efforts. National Guard armories in Concord, Manchester, Peterborough, and a hangar at Pease Air Force Base in Portsmouth were converted into shelters for residents and staging areas for use by electric utilities.³ The State’s Emergency Operations Center (EOC) operated throughout the entire emergency to provide situational information, support in terms of goods and services for local emergency centers, problem solving when needed, and coordination, command, and control of specific tasks related to the ice storm. A record number (81) of local emergency operations centers as well as a record number (51) of shelters were opened during the ice storm. Over 448 schools were closed due to loss of power or because they were serving as shelters for local communities. Over 350 segments of state and local roads were affected by downed wires or fallen trees. Businesses that lost power during the storm remained closed for several days. Some businesses that had power experienced a temporary increase in sales of food, accommodations, supplies, and other items in demand during lengthy power outages.

Many utilities in New Hampshire were criticized for restoring power too slowly and for poor communications with customers. They were also criticized for not communicating the extent of the damage and for being unspecific or inaccurate when estimating restoration times.

The New Hampshire Public Utilities Commission (NHPUC) requested assistance from a consultant in reviewing the efforts of the four electric utilities and the two largest incumbent telecommunications utilities in New Hampshire prior to, during, and after the storm. This review was undertaken by NEI Electric Power Engineering (NEI), resulting in this report. The six utilities reviewed are listed in Table I-1 below.

Table I-1 – New Hampshire utilities included in the December 2008 ice storm assessment.

New Hampshire Utility	Type
Public Service Company of New Hampshire (PSNH)	Electric
Unitil Energy System, Inc. (Unitil)	Electric
Granite State Electric Company d/b/a National Grid (National Grid)	Electric
New Hampshire Electric Cooperative, Inc. (NHEC)	Electric
Northern New England Telephone Operations, LLC d/b/a FairPoint Communications-NNE (FairPoint)	Telecommunications
Hollis Telephone Company, Kearsarge Telephone Company, Merrimack County Telephone Company and Wilton Telephone Company d/b/a TDS Telecom (jointly referenced as TDS Companies)	Telecommunications

³ Champa, H. Program Assistant, Business office of the Adjutant General, New Hampshire National Guard. Interview by Malmedal, K. August 14, 2009.

The four electric utilities are very different in terms of service territory, organizational structure, and numbers of customers they serve in New Hampshire. These differences are important when considering their response to emergencies and the types of emergency organizations they use. The differences were also important in the recommendations reached by this report. The map in Figure I-4, supplied by the NHPUC, shows the areas of New Hampshire served by each of the four electric utilities. Figure I-5 shows the number of customers each of the utilities serves.

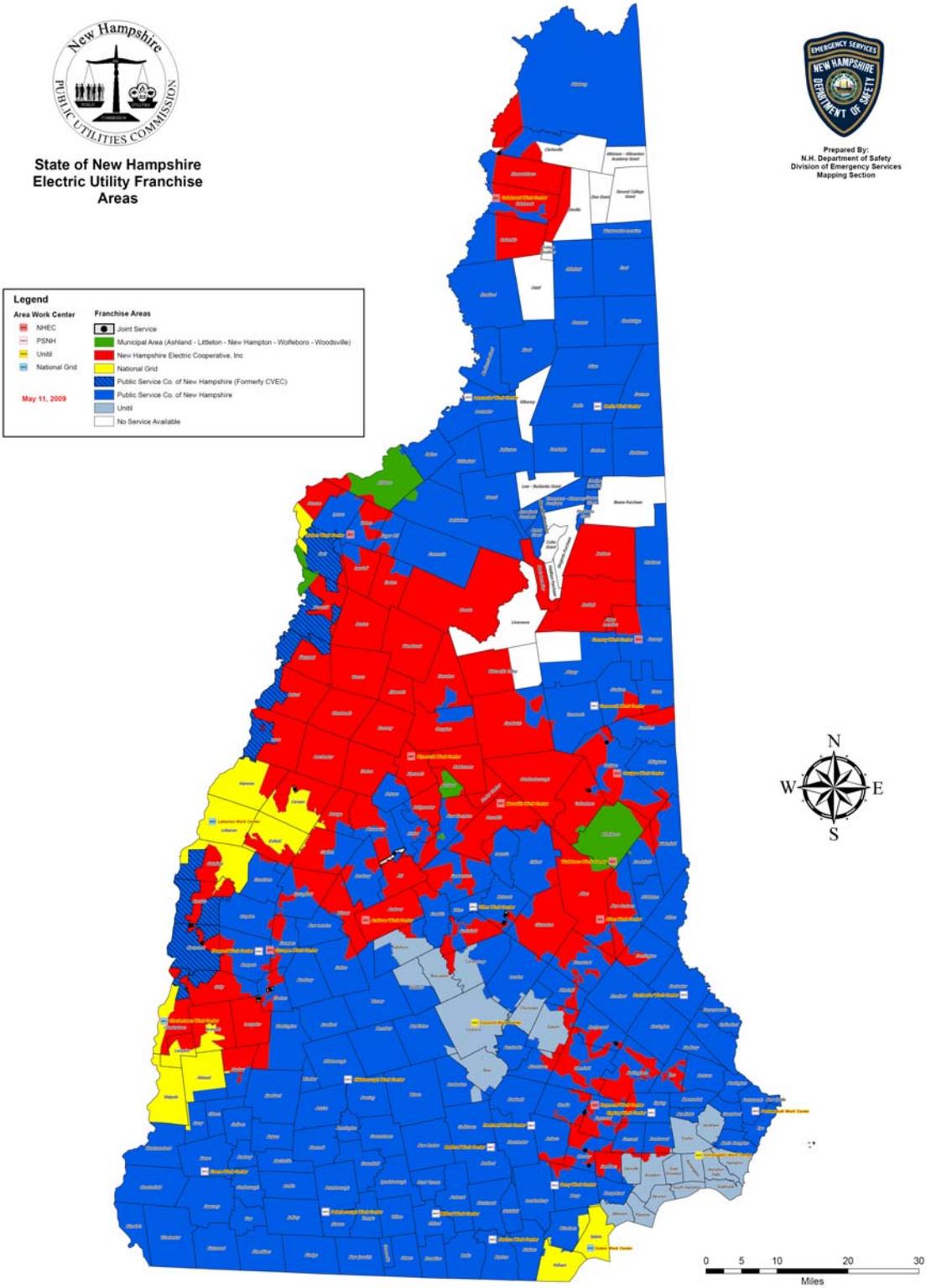


Figure I-4 – Map of New Hampshire electric utility service territories.

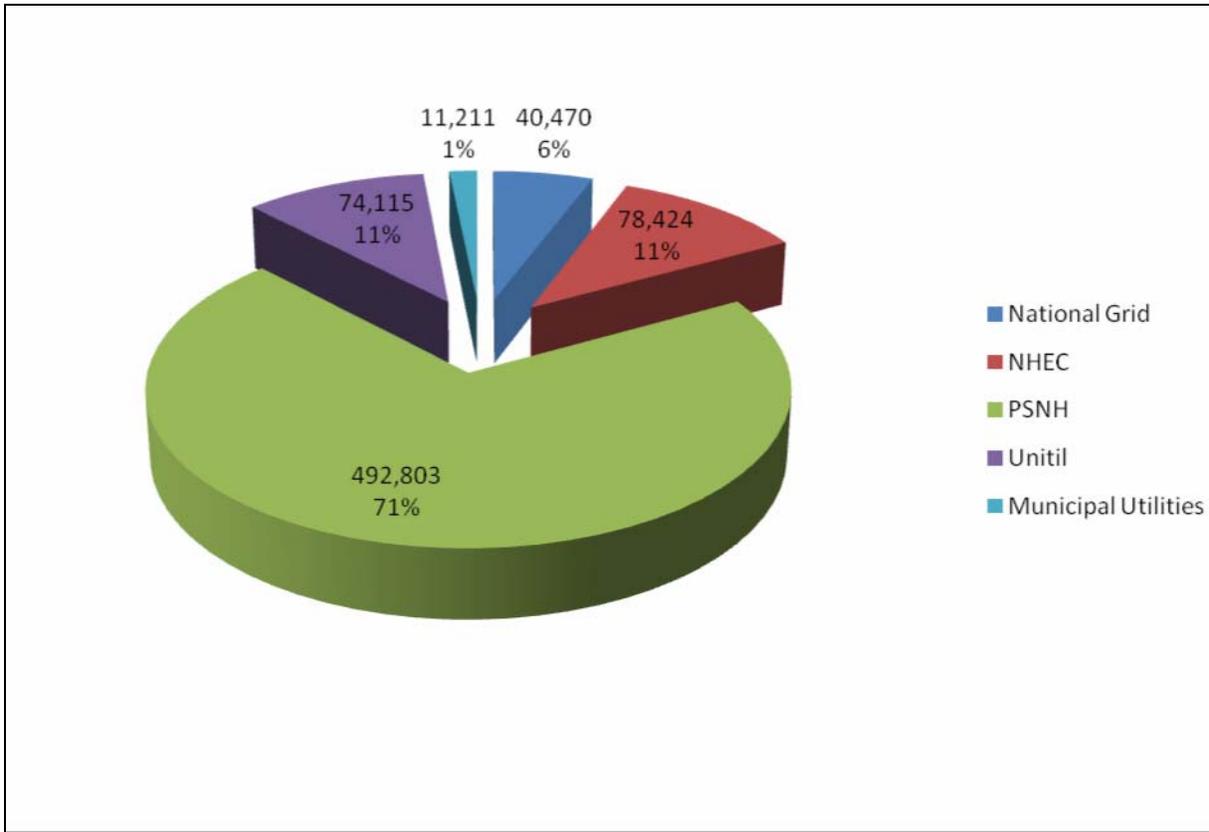


Figure I-5 – Relative sizes of New Hampshire electric utilities based on the number of customer meters. ^{4 5}

PSNH

Public Service Company of New Hampshire (PSNH) is a wholly owned subsidiary of Northeast Utilities, whose other electric utility subsidiaries include Connecticut Light & Power and Western Massachusetts Electric Company. Altogether they serve approximately 1.7 million electric customers in New Hampshire, Massachusetts and Connecticut.

PSNH supplies power to a larger area and to more customers in New Hampshire than any other New Hampshire electric utility. It serves approximately 500,000 customers including 70 percent of the retail customers in the state. Its service area includes 211 communities, 13 of the 15 largest cities in New Hampshire, and rural and urban areas throughout the state. PSNH manages emergencies at the state level and has a corporate level emergency operations organization to provide logistical and managerial support when requested. PSNH has a large contingent of workers in New Hampshire, consistent with the size of its customer base, and can

⁴ Getz, T. Knepper, R. and Frantz, T. (Jan. 14, 2009). Brief Legislative Overview of Dec 2008 Ice Storm Impacts [PowerPoint]. Concord, New Hampshire.

⁵ National Grid Response to Data Request NEI 11-1 – (July 8, 2009 E-mail from P O'Brien to JPN)

draw upon a large contingent of affiliate company workers in Massachusetts and Connecticut in an emergency.

Unitil

Unitil Corporation provides electric distribution services to approximately 74,000 customers in two distinct areas within New Hampshire. The Seacoast area consists of approximately 15 communities and 44,000 customers and the Capital area consists of approximately 13 communities and 29,000 customers. Unitil provides only electric distribution services. It relies on PSNH for transmission and the supply interfaces to its system at 7 transfer (metering) locations. Unitil also provides electric service to customers in Massachusetts and natural gas to customers in Maine, New Hampshire, and Massachusetts. Although its electric territories in New Hampshire and Massachusetts are not contiguous, they are in close proximity to each other. Unitil's two operations centers in New Hampshire — Concord, NH and Kensington, NH — are less than 50 miles from the company's operations center in Fitchburg, Massachusetts. As a result of the December 2008 ice storm, the System Emergency Operations Center for all of Unitil's electric service is located in Hampton, New NH. This center includes both operations and staff support functions.

National Grid

National Grid operates in a relatively small geographic area of New Hampshire and serves approximately 40,000 customers in 21 New Hampshire communities. Its territory consists of two discrete areas: a densely populated area along the northeast New Hampshire-Massachusetts border, and a more sparsely populated area along the New Hampshire-Vermont border in the Upper Valley region. Of significance for emergency response is the fact that National Grid's New Hampshire operations are a very small part of a much larger international organization with correspondingly large resources. In the United States, National Grid serves approximately 3.3 million electric customers in Massachusetts, New Hampshire, New York, and Rhode Island, and manages the electricity network on Long Island under an agreement with the Long Island Power Authority. Due to its relatively large size, National Grid can draw upon extensive contract and support personnel from within the company during emergencies before having to go outside to find additional resources. This supply of personnel and other resources gives National Grid an advantage relative to other New Hampshire electric utilities in an emergency situation.

National Grid has a corporate emergency response organization located in Waltham, Massachusetts⁶. This organization is responsible for emergency plan development and designing drills and exercises, but does not have any operational responsibility for actual storm restoration. Storm restoration is managed entirely within the company's operations organization, which

⁶ National Grid was in the process of moving from Westborough, Massachusetts to Waltham, Massachusetts during this assessment.

transitions into storm response mode during emergency events. This creates a division between personnel dedicated to planning and preparing for emergencies and those who execute the plan.

NHEC

New Hampshire Electric Cooperative (NHEC) serves approximately 78,000 customers in 115 cities and towns scattered throughout 9 of the 10 New Hampshire counties. Typical of cooperatives nationwide, NHEC's service territory varies from low population density to extremely rural. Of particular importance for this review is the fact that the cooperative operates with a very small management staff and is independent of the investor owned utility (IOU) mutual aid agreements (explained in Chapter II). NHEC provides only electric distribution services and relies on PSNH for transmission and supply interfaces for 32 of its 33 incoming electric transfer (metering) locations and on National Grid for 1 of its 33 interfaces.

Telecommunications Companies

The service territories of the telecommunications companies serving New Hampshire residents are shown in Figure I-6. The two largest incumbent companies are FairPoint Communications and TDS, who together constitute just over 60% of the market, as seen in Figure I-7.

FairPoint Communications is new to the state of New Hampshire. After acquiring Verizon's existing infrastructure in March 2008, FairPoint became the primary provider of telecommunications services in New Hampshire. It serves more customers and a larger area than any other telecommunications company in New Hampshire and provides service to 210 towns across the state.⁷ During the December ice storm, FairPoint was still operating under an agreement with Verizon that relied upon Verizon's systems prior to an impending multi-computer systems cut over.

TDS Communications is a wholly owned subsidiary of Telephone and Data Systems, Inc. In the State of New Hampshire, TDS is comprised of Hollis Telephone Company, Kearsarge Telephone Company, Merrimack County Telephone Company, and Wilton Telephone Company. It provides service mainly in the central portion of the state and serves 24 towns in New Hampshire.

⁷ FairPoint Communications FAQ. "What are the basics of the transaction with Verizon?" 2009. <http://www.fairpoint.com/news/faqs.jsp> (Accessed August 17, 2009).

DECEMBER 2008 ICE STORM
Chapter I - Introduction



State of New Hampshire
Telecom Franchise Areas

August 10, 2009



Prepared by:
NH Department of Safety
Division of Emergency Services
Mapping Section

	Tandem Switch
	Primary Central Office
	Secondary Central Office
SERVING TELEPHONE COMPANY	
	FAIRPOINT COMMUNICATIONS
	BRETTON WOODS TELEPHONE
	DIXVILLE PHONE CO
	DUNBARTON TELEPHONE
	FAIRPOINT CLASSIC NORTHLAND
	GRANITE STATE TELEPHONE
	TDS HOLLIS
	TDS KEARSARGE
	TDS MERRIMACK COUNTY
	TDS WILTON
	UNION TELEPHONE
	NO PHONE SERVICE

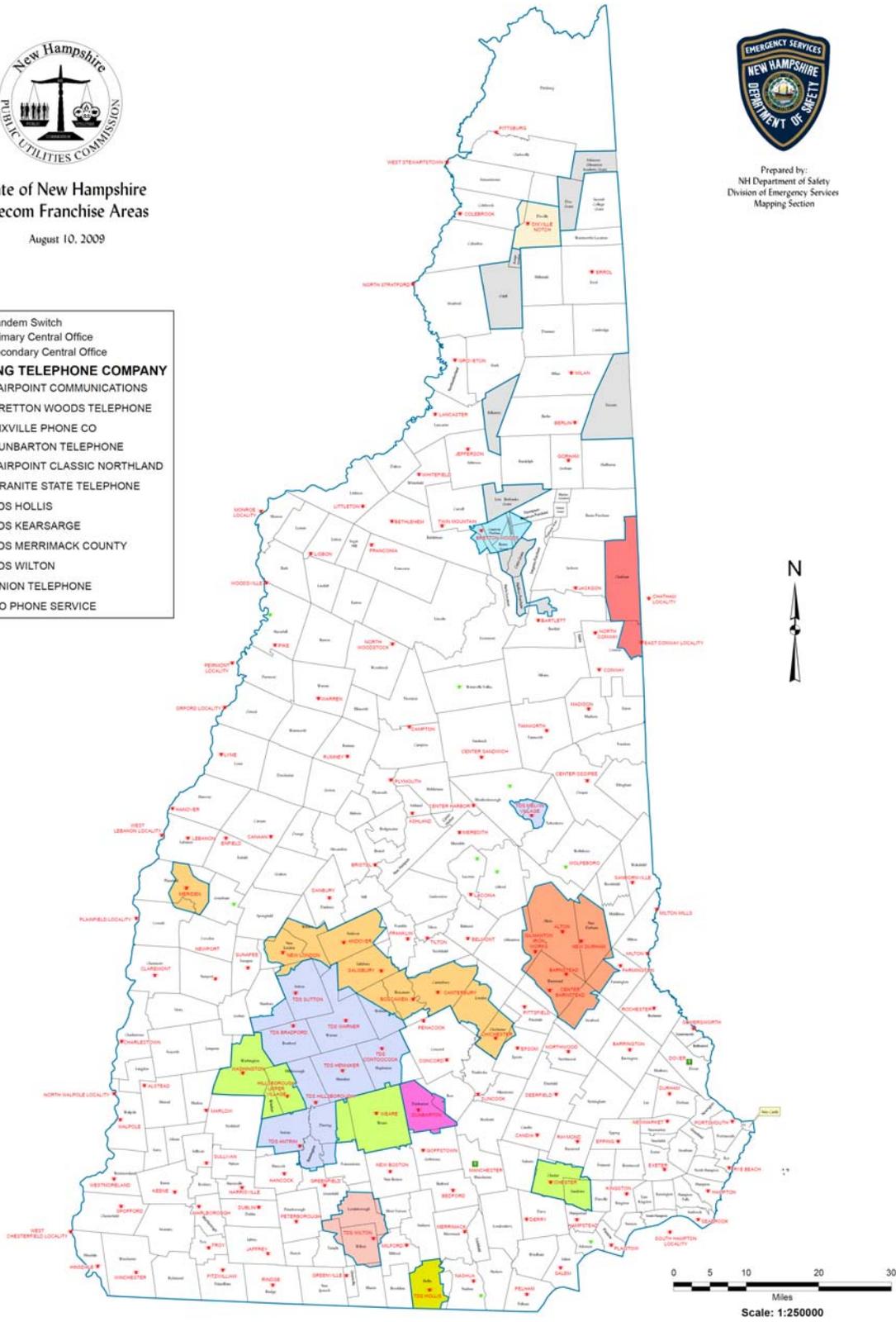


Figure I-6 – Map of New Hampshire incumbent telephone exchanges.

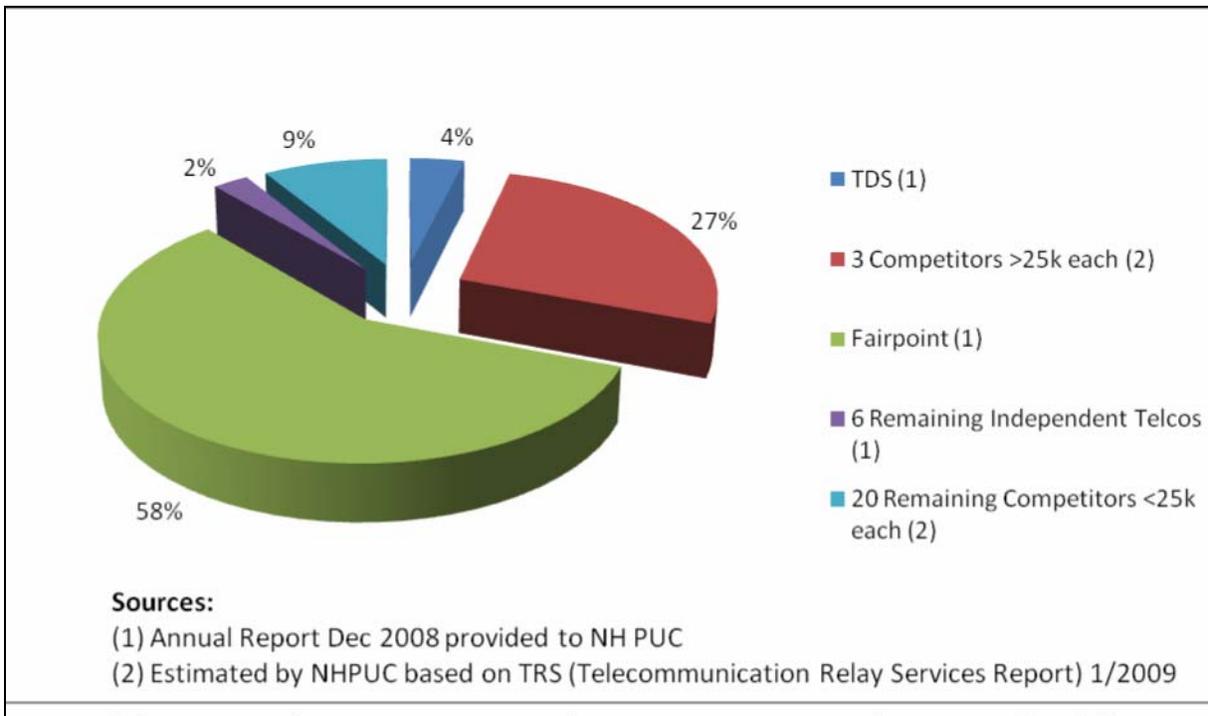


Figure I-7 – Relative sizes of the New Hampshire telecommunications companies based on number of customers as of December 30, 2008.⁸

B. APPROACH

The four electric utilities were evaluated in three general areas: effective preparation for prolonged emergencies, efficient and timely response to outages, and restoration of service. The two telecommunications companies were reviewed under a somewhat different set of criteria than that used to review the electric utilities, due to the differing roles played by telecommunications companies and electric companies in the wake of an emergency. The assessment was conducted in the following steps:

Step One: Orientation and Planning

The objectives of this first step of the investigation were to:

- Review specific NHPUC objectives for this assessment
- Develop a clear understanding of the events surrounding the December 2008 ice storm that resulted in power outages to New Hampshire consumers

⁸ Provided by Knepper R. "RE: Number of customers served by the telecommunications utilities." E-mail to Oertli, C. August 12, 2009.

- Become familiar with each utility's organization, particularly those departments and groups responsible for communications, customer service, operations and maintenance, construction, human resource planning, and emergency preparedness
- Gain an understanding of the requirements for providing service and communicating with customers, the media, regulatory bodies, other governmental agencies, and public officials

The orientation and planning step involved three primary activities:

- Initial interviews and presentations
- Preliminary data gathering and analysis
- Project planning

Based on the information collected in step one, working hypotheses were developed for each of the major areas to be evaluated and a detailed work plan was developed to guide the efforts during the remainder of the investigation.

Step Two: Detailed Analysis and Verification

Step two involved investigation and data collection. Its purpose was to gather the data needed to examine and assess the issues described in the Work Tasks in the NHPUC's Request for Proposal (RFP). The project team integrated and summarized information gained during this step and developed preliminary findings, conclusions, and recommendations. Work tasks included the following:

- Submission of numerous data requests to each of the utilities to obtain detailed information
- Interviews with various utility and public officials with regard to the effects and impact of the ice storm
- Analysis of each utility's activities and performance before, during, and after the storm, including preparation, emergency management, and restoration
- Review of power restoration procedures, specifically those pertaining to each utility's electric retail service territory
- Review of each utility's service related operations manuals, system restoration plans, emergency procedures, and service regulations
- Review of each utility's public information and communication procedures concerning its ability to provide timely and accurate restoration timetable information to:
 - New Hampshire electric retail customers
 - Emergency preparedness entities
 - Other agencies and organizations responsible for public health and safety

- Review of each utility's preventive maintenance program
- Review of the system planning, design, construction, and protection practices and procedures of each utility to determine their effectiveness during the adverse weather conditions witnessed during the storm
- Review of the operations, maintenance, and vegetation management programs of each utility to determine their effectiveness during the adverse weather conditions witnessed during this storm
- Review to determine whether some of the adverse effects of the storm might have been mitigated by an aggressive pole upgrade program, an underground cable installation program, or an accelerated tree trimming program
- Analysis of precipitation totals resulting from the 2008 storm using historical records of past storms
- Development of suggested best practices based on discussions with each New Hampshire utility and NEI team experiences with similar electric and telecommunications utilities in other parts of the country
- Review of public comments regarding the ice storm damage and restoration efforts, including concerns submitted in response to an NHPUC online questionnaire, written statements filed with the NHPUC, and comments voiced in ten public hearings held jointly by the New Hampshire Public Utilities Commission and the New Hampshire Department of Safety, Division of Homeland Security and Emergency Management between March 18 and April 30, 2009.^{9 10}

Step Three: Report Preparation

On July 17, 2009, NEI submitted a draft report to the NHPUC staff for review and comment. After incorporating various comments from the NHPUC staff, this final report was prepared. It provides a detailed analysis for each of the tasks set forth in the Commission's RFP, and contains conclusions and recommendations resulting from the analysis done during this study. This report also contains reasoning and evidence supporting the conclusions reached as a result of the analysis.

There are cases where conflicting data exists for the December 2008 ice storm. This may be due to the sheer magnitude of data involved as well as the varying methods used by each utility for gathering and recording data. Of particular note are the conflicts that occurred in reports of the numbers of customers without power and the number of field crews working at any given instant.

⁹ Public statement hearings were held in Peterborough, Exeter, Raymond, Salem, Plaistow, Milford, Derry, New London, Goffstown, and Rochester.

¹⁰ December 2008 Ice Storm, "Transcripts of Ice Storm Meetings", 2009.
<http://www.puc.state.nh.us/2008IceStorm/December2008IceStorm.htm>. (Accessed August 17, 2009).

Among the utilities studied, there are variations in the ways such numbers are counted, estimated, and recorded. Depending upon how data is chosen, more than one value may exist for a particular variable. When conflicting values for any data point were encountered, the data with the most reasonable results and sampling method was used. This report endeavors to use the most consistent data set possible for the numbers and conclusions presented.

AUDITING STANDARDS AND QUALITY ASSURANCE

The parties involved in the quality assurance process for this audit were NEI consultants, the NEI Project Manager, and the NEI Engagement Director. The approach to project management and preparing an audit trail are essential components of the quality assurance process. The quality review process is designed to assure adherence to generally accepted auditing standards in accordance with "Government Auditing Standards" (2007 Revision GAO-07-731G) issued by the Comptroller General of the United States.

The Project Manager was responsible for day-to-day monitoring of work, reviewing work products for compliance with project goals and objectives, and for anticipating and responding to problems or concerns. He ensured that the consultants were adequately supported, enforced administrative controls, assured consistency among approaches and methods, and scheduled work to ensure that the consultants were efficient in their efforts. He periodically reviewed the work in progress by attending interviews, assessing the processes used in analysis, testing conclusions, and checking the clarity and completeness of all written materials.

The NHPUC staff reviewed the process and analysis used by the consultants, and reviewed the work products prepared by the review team. The NHPUC provided extensive comments and input during the period of July 17th through October 2nd, 2009. There were numerous changes made in all of the chapters based on their comments. The NEI project team was not in agreement with the inclusion of the evaluation criteria matrices which as stated by the utilities are subjective. The NH PUC staff removed the criteria matrices in Chapter 8 due to their disagreement.

The review process ensures that work is factually based, that the observations and comments formed are supported by relevant data, that professional judgment is differentiated from analytical results, and the results of the review are traceable to the sources of information. Prior to issuance of this report, each utility was provided the opportunity to review the facts in this report to ensure their accuracy. NEI reviewed those comments and made factual changes where appropriate.