Internet Sites

The Internet sites for each of the Utilities also proved helpful in communications with customers. In an effort to keep customers updated, each utility's web site included information from its press releases issued before, during, and after the Ice Storm.

In response to inquires from the Public Staff and the Commission in connection with this investigation, Duke reported that its web site recorded 1,267 inquiries related to the Ice Storm, of which "approximately 69% were general in nature, 19% were compliments, and the remaining 12% were complaints and claims."[7]

Progress Energy reported that its Customer Service Center received 368 e-mails related to the December 2002 Ice Storm, 27 of which were complaints, 100 were compliments, one was a claim, 11 related to tree trimming, and 229 related to outages (reporting, requesting information, and the like).[8]

Dominion advised the Public Staff and the Commission that it provided updates to the public by means of an outage map on its web site. Dominion received several complimentary e-mails and does not recall receiving any complaints or restoration inquiries.

VII. Restoration Costs

The costs of restoring power following the Ice Storm were substantial for Duke and Progress Energy, totaling approximately $87 million and approximately $39 million,

[7] Response of February 3, 2003 by Duke Power to Public Staff – NCUC data request, Question No. 40.

[8] E-mail from B. Mitchell Williams, Progress Energy Carolinas, dated March 17, 2003.

respectively. The total restoration cost to Dominion was approximately $2.4 million. These costs are summarized in Table 2.

Table 2: Costs of the Ice Storm

	Dominion	Duke	Progress
Materials	$58,662	$5,400,000	$4,208,439
Company Labor	$1,018,694	$17,700,000	$8,291,911
Outside Labor	$634,965	$56,500,000	$19,994,908
Transportation	$187,164	$700,000	$491,039
Other	$537,819	$6,900,000	$6,013,703
Total	$2,437,304	$87,200,000	$39,000,000

Some storm related costs are expensed on the Utilities' books of account in the period when they are incurred, and others are capitalized and depreciated over the life of the plant. For extraordinary, non-capital costs of the magnitude incurred by Duke and Progress Energy in connection with the December 2002 Ice Storm, a utility may request that the Commission authorize deferral accounting. This allows the utility to amortize such costs over a specified period, typically three years from when the costs are incurred, instead of expensing all of the costs in the current period. If a utility seeks a rate increase during the amortization period, the storm related costs will generally be included in the utility's cost of service in setting rates, a portion in test year expenses and the unamortized balance in rate base. Under N.C. Session Law 2002-4, House Bill 1078, the Clean Smokestacks legislation, the base rates of Duke and Progress Energy are frozen through December 31, 2007. The Commission is authorized, however, to allow adjustments to base rates or cost deferrals during the rate freeze period for "[m]ajor expenditures to restore or replace property damaged or destroyed by force majeure." G.S. 62-133.6(e). Both Duke and Progress Energy stated publicly that they would not seek to recover the costs of the December 2002 Ice Storm through increased rates, and neither has requested deferral accounting for these costs. (Deferral accounting would not permit recovery through increased rates, since the expenses would be fully amortized by the time the rate freeze ends.) Thus, all of the Utilities have recovered their Ice Storm costs through current rates.

VIII. Comparison with Other Major Storms

To place the Ice Storm in some perspective, the Utilities Commission and the Public Staff compiled data regarding several major storms that affected the Utilities in the past. However, this list of storms is not exhaustive, and the geographic areas impacted by particular storms and the characteristics of the storms themselves may vary greatly from one utility to the next, as well as within a utility's service territory. In the discussions below, the number of "customers impacted," for Duke and Progress Energy, represents the maximum number of customers (i.e., electric service accounts) out of service at any one time during a storm. For Dominion, it represents the total number of customers (defined as unique metered service points) interrupted for more than two minutes at any time during the storm. All storm numbers are system-wide numbers, not North Carolina-specific.

Duke

Prior to December 2002, the storms that had the greatest impact on Duke's service area were Hurricane Hugo in 1989, the 1996 Ice Storm, and Hurricane Fran in 1996.

As Table 3 indicates, the December 2002 Ice Storm had a much greater impact on Duke's customers than the other three storms. The number of customers who lost power in this storm was more than twice the number impacted by the 1996 Ice Storm and three times the number affected by Hurricane Fran. However, the time it took Duke to restore service to all customers after the most recent storm was comparable to the 1996 storms and half that of Hurricane Hugo. Additionally, the average number of customers restored per day for the December 2002 Ice Storm far exceeds the same measure for the other three storms.

Table 3: Duke Historical System-Wide Storm Data

Event	Customers Impacted	Restoration Personnel	Outage Duration in Days	Average Rate of Restoration (Customers per Day)	Costs in 2002 Dollars (Millions)
1989 Hurricane Hugo	696,000	Duke Not Available Non-Duke 2500	18	38,667	94
1996 Ice Storm	650,000	Not Available	8	81,250	16
1996 Hurricane Fran	450,000	Duke Not Available Non-Duke 996	9	50,000	17
2002 Ice Storm	1,375,000	Duke 3660 Non-Duke 5087	9	152,777	87

Progress Energy

Prior to December 2002, Progress Energy had experienced greater damage than the other utilities as a result of major storms. Information relating to these storms is shown on Table 4.

In 1996, Hurricane Fran (a Category 3 hurricane with winds of 115 mph, affecting Progress Energy's Raleigh area as well as its Eastern Region) left 790,000 Progress Energy customers, including 98% of its Eastern Region, without power for as much as ten days. In 1999 Hurricane Floyd, another Category 3 hurricane, left much of eastern North Carolina under water and 537,000 Progress Energy customers without power for up to six days.

During the December 2002 Ice Storm, Progress Energy restored power to customers at an average rate of 70,083 customers per day, compared to 34,620 customers per day following the 2000 Snowstorm and 15,250 customers per day following the 1996 Ice Storm. Thus, Progress Energy's average number of customers restored per day has improved for similar types of storms.

Table 4: Progress Energy Historical System-Wide Storm Data

Event	Customers Impacted	Restoration Personnel	Outage Duration in Days	Average Rate of Restoration (Customers per Day)	Costs in 2002 Dollars (Millions)
1996 Ice Storm	61,000	1130	4	15,250	7
1996 Hurricane Fran	790,000	8250	10	79,000	115
1999 Hurricane Floyd	537,000	6300	6	89,500	70
2000 Snowstorm	173,100	2265	5	34,620	28
2002 Ice Storm	560,660	3947	8	70,083	39

Dominion

As Table 5 indicates, Dominion's service territory and electric system sustained less damage during the December 2002 Ice Storm than during previous major storms. It took Dominion three days to restore power to all customers, with an average of 30,333 customers restored each day. This average is not as high as the restoration averages for Duke and Progress Energy, and it also is lower than the averages for previous major storms affecting Dominion. However, Dominion's North Carolina service area is much less densely populated than those of the other Utilities, and the same amount of repair work would have resulted in the restoration of many fewer customers than had the damage occurred in a metropolitan area. With only 91,000 outages, Dominion would have had to complete the restoration process in a single day to attain an average comparable to those of Duke and Progress Energy, or to its own performance in Hurricane Floyd or the 2000 Ice Storm.

Table 5: Dominion Historical System-Wide Storm Data

Event	Customers Impacted	Outage Duration in Days	Average Rate of Restoration (Customers per Day)	Costs in 2002 Dollars (Millions)
1996 Hurricane Fran	415,000	6	69,167	14
1998 Ice Storm	401,000	10	40,100	16
1999 Hurricane Floyd	800,000	5	160,000	18
2000 Ice Storm	285,000	3	95,000	6
2002 Ice Storm	91,000	3	30,333	3

Based on the above data, the Utilities Commission and Public Staff find no discernible increase in outage duration following a major storm. In fact, the data show that restoration rates for Duke and Progress Energy were significantly higher for the December 2002 Ice Storm than for the 1996 Ice Storm. Duke restored an average of 152,777 customers per day after the 2002 storm compared to 81,250 customers per day after the 1996 storm, while Progress Energy restored an average of 70,083 customers per day after the 2002 storm compared to 15,250 customers per day after the 1996 storm. Overall, the variations in the number of customers with service interruptions and the average restoration times associated with the storms suggest that the impact on service depends on the type and severity of the storm, as well as the location of the storm relative to customer density and system infrastructure. Many factors affect a utility's storm response. Localized heavy damage in a densely populated area may be repaired more quickly than similar damage in a rural area, and one circuit in an urban area may serve hundreds of customers, while one circuit in a rural area may serve as few as two customers. Thus, while comparative outage durations and service restoration averages are informative, they should not be used uncritically.

IX. Preparedness for the Storm

The Utilities maintain comprehensive response plans to provide for pre-event preparation and an organizational shift to a structure and operational mode designed to respond safely to major outages when they occur.[9] When a storm threatens to impact a utility's service territory significantly, the utility undertakes measures to prepare for post-storm restoration efforts. Such efforts include the strategic positioning of materials and coordinating with suppliers to ensure timely availability of potential additional material needs; securing line and tree contractor commitments; discussing with neighboring utilities the availability of mutual aid assistance; placing company crews on standby; and advising the public of the potential for extended storm-related power outages. Each utility's storm response plan provides a reasonable organizational structure, general guidelines, and a safety-conscious approach that accommodates the flexibility needed to address such events.

[9] Progress Energy Distribution Storm Plan; Duke Power Region Emergency Manual; and Dominion Electric Distribution Response Plan.

Forecasting and Tracking

The Utilities receive daily reports from local meteorologists or contracted weather forecasting services. Typically they begin assessing potential risks to their electric systems and the magnitude of electric service interruptions several days prior to an expected weather event.[10] Progress Energy has contracted with Weather Services International ("WSI") for weather-forecasting services. WSI provides very detailed forecasts on all aspects of weather that may specifically impact each company's service territory, such as temperature, speed of the weather system, and time that localized impacts might begin occurring in various parts of a company's service area. Duke and Dominion utilize in-house meteorological services to obtain similar weather-related information.

Duke's meteorologists began monitoring weather forecasts the weekend prior to the December 2002 Ice Storm, and at 5:50 p.m. on December 1 they issued their first special weather statement noting a potential for significant icing. From then through the end of the storm, they issued updated forecasts discussing the amount of ice accumulation expected and the probable number of customer outages. Duke's meteorologists consulted with National Weather Service ("NWS") personnel and local media weather forecasters to confirm their predictions. Progress Energy received updates from WSI several times a day and also monitored weather forecasts on local television stations. Progress Energy confirmed that WSI's forecasts were in line with the forecasts of other utilities in the region and local media outlets. Dominion's meteorology staff began monitoring the storm on December 3, relying primarily on their own analysis and NWS postings, and supplementing these with reports from WSI,

[10] Tornadoes, which are localized weather events, often do not provide early warning signs and are an exception to this rule.

AccuWeather, and the Weather Channel, as well as anecdotal information from neighboring utilities.

Pre-positioning

As the magnitude of the impending storm became more apparent, the Utilities implemented internal communication plans to notify company personnel of the severe weather forecast and to pre-position line crews in expected high impact areas in anticipation of widespread electric outages. The Utilities checked critical inventory levels and communicated with suppliers as early as December 2, to ensure that adequate materials were available, including transformers, poles, insulators, fuses, and electrical wire. On December 3, vehicles were fueled and stocked with materials so that restoration efforts could begin as soon as crews could work safely.

On December 3, Duke employee and contractor “travel teams,” consisting of construction crews, tree and line contractors, and support personnel, were identified and instructed to report to work prepared to travel on December 4. The predicted amount of ice accumulation in Progress Energy’s service area was within the range that the company normally expects to be able to handle with its own resources. As previously noted, Progress Energy moved 350 employees and contract personnel to the central part of the state on December 4.

As members of the Southeastern Electric Exchange (the “SEE”), the Utilities participate in a mutual aid agreement to assist other SEE members with service restorations when there is severe system damage due to adverse weather events or other natural disasters. On December 4, the Utilities participated in a 2 p.m. conference call among SEE members, and during this call Duke and Progress Energy requested outside crews to assist with their restoration efforts. Because a relatively smaller portion of its service territory was expected to be affected by the storm, Dominion believed it could handle its restoration effort itself utilizing internal service crews, along with contractor tree crews that normally assist Dominion in its North Carolina and Virginia service territories.

Public Information

During the pre-storm preparation period, the Utilities provided information to local television, radio, and newspaper media. This information typically took the form of press releases containing information on the approaching storm and issues related thereto, including potential storm impact to utility facilities, the utility's mobilization of manpower and equipment in advance of the storm, electrical and health safety tips, how to report a power outage, and an alert for customers with medical concerns or in-home medical equipment regarding the need to make alternative arrangements due to the possibility of power outages. Duke also hosted the media at its Emergency Operating Facility and other sites to deliver this message.

Contact with Customers with Special Needs

Each of the Utilities maintains a list of customers who are handicapped or have serious medical conditions that could make power outages especially hazardous to them. In the past, when adding customers' names to these lists, Duke and Progress Energy have alerted them of the need to take special precautions for their safety in the event of a major storm. Duke and Progress Energy did not call customers on these lists prior to the December 2002 Ice Storm, but did make an effort to provide them with relevant information, such as the location of shelters, if they called the company during the service restoration period. Dominion, on the other hand, did contact customers with medical conditions prior to the Ice Storm to notify them that there was a possibility of lengthy power outages.

After the Ice Storm, both Duke and Progress Energy adopted a policy of making calls to customers on the medical needs list shortly after a major storm and informing these customers of the location of nearby shelters, telephone numbers where help can be obtained, the importance of making appropriate outage plans, the progress of service restoration efforts, and other information relevant to the customer's situation. Progress Energy's policy provides for these calls to be made within 24 to 48 hours after the storm stops. Progress Energy has expressed a strong preference for contacting customers after the storm when more accurate information about the impact of the storm is available. These new policies were in effect during an ice storm that affected North Carolina at the end of February 2003.

The Commission and Public Staff commend the Utilities for increasing their assistance to customers with medical needs. As storms approach, the Utilities should contact medical alert customers at the earliest time the impact and extent of a major storm become known to the Utilities and encourage them to make alternative shelter arrangements. The Utilities should continue to evaluate each storm on its merits, seek customer feedback, and determine the most effective means of contacting medical alert customers.

X. Questions Raised: Condition of Systems

Infrastructure

Questions were raised at the Public Meetings as to whether the Utilities' distribution systems are properly designed and adequately maintained to withstand storms such as the December 2002 Ice Storm.

In addressing this question, it will be helpful to begin with a general discussion of the electric transmission and distribution network. The electric power infrastructure is a complex and highly technical system. Its components must be compatible with the environment and must operate in normal and abnormal weather conditions. The system must be sufficiently hardened to absorb damage in severe storms and return to service without excessive delay; at the same time, it must not be so costly that customers' rates become burdensome. In addition, the system must be maintained as equipment ages, breaks down, and is impacted by growth of trees near overhead power lines.

Transmission lines are the high-voltage lines that deliver electricity from generating facilities to the distribution system. They can be analogized to interstate highways, while distribution lines are comparable to local roads and city streets. Since transmission line outages impact massive numbers of customers, utilities are quite aggressive in the maintenance of transmission ROWs, and they regularly cut down or trim trees that could fall into transmission lines even if the trees are located outside the ROW. In addition, transmission lines are located above the height of most trees. For these reasons, transmission lines are generally not damaged by ice storms; they are vulnerable, however, to damage from the high winds caused by hurricanes and tornadoes.

The distribution system connects to the transmission system at substations, which serve as starting points to route power lines in different directions. Transformers at a substation reduce transmission voltages to distribution level voltages. The substation is equipped with protective devices and switches that allow it to be disconnected completely from the transmission grid or to disconnect individual distribution lines when needed. Typical distribution line voltages are approximately 7.2

kilovolts ("kV"), 12 kV, or 23 kV. The distribution system includes main lines that run through neighborhoods and "tap" lines that take power from these main lines down side streets and roads. Once the wires reach a customer's house, another transformer reduces the voltage to 120/240 volts, which provides the customer with the 240 volts necessary for operating large appliances and the 120 volts required for lighting and electrical outlets.

The distribution system is the most weather-vulnerable portion of the electric system, primarily because trees are much closer to the power lines comprising the distribution system. The December 2002 Ice Storm was primarily a distribution system event; there was little or no damage to transmission facilities.

The National Electrical Safety Code classifies North Carolina as a medium ice load district.[11] In districts within this category, the Utilities must design conductors and poles to withstand ¼ inch of ice loading.[12] As a result, accumulations of ¼ inch of ice or less should not cause significant outages. While the Utilities use this standard as a minimum design criterion, their distribution systems are actually constructed to withstand significantly greater ice buildup, as the December 2002 Ice Storm demonstrated. Lines that were not impacted by falling trees and limbs generally continued to function even in areas that experienced ¾ to 1 inch of ice accumulation.

Typically, the vast majority of outages associated with ¼ inch or less of ice accumulation are widely scattered and are usually caused by evergreen tree limbs and leaning evergreen trees. Once ice accumulation reaches the ½ inch level, the number of outages climbs rapidly due to breaking limbs and trees. Ice accumulation of ¾ to 1

[11] Institute of Electrical and Electronics Engineers, National Electrical Safety Code, 2002 Edition.

[12] Id.

inch or more causes much more structural damage to trees, including breaking tree limbs and damage to hardwood treetops. Trees growing outside of trimmed ROWs fall onto lines. Ice accumulations of one inch or more are also likely to cause some insulated service drops to detach from weak building attachments and some long spans of distribution conductors to break.[13]

Statements by participants at the Public Meetings indicated that some small areas may have experienced damage and subsequent power outages due to the failure of a weakened pole or cross arm during the Ice Storm, and others may have chronic service problems for other reasons that were exacerbated by the storm. However, the Utilities Commission and the Public Staff find no reason to believe that significant outages during the storm were attributable to either the age or the design of the Utilities' electric distribution systems or to pre-existing conditions on the systems.

The System Average Interruption Duration Index ("SAIDI"), a nationally recognized electric system reliability index, is the best overall measure of the condition of a utility's distribution system. It represents the average number of minutes per year that a customer was out of power, excluding major storms, during a given year. A SAIDI can be converted to a system reliability percentage using the following formula: 1.00 minus SAIDI/number of minutes per year, times 100 percent. According to data provided annually to the Public Staff, the North Carolina system reliability for all three of the Utilities consistently exceeds 99.9%. These data indicate that the Utilities' electric distribution systems are not improperly designed or inadequately maintained.

[13] Response of January 15, 2003 by Progress Energy Carolinas to Public Staff – NCUC data request, Question No. 28.

Tree-Trimming Practices

A number of participants at the Public Meetings suggested that the Utilities' tree-trimming and ROW maintenance practices contributed to the outages that resulted from the Ice Storm.

Effective tree-trimming and ROW maintenance programs are the most cost-effective methods to prevent widespread power outages caused by all natural disasters, including ice storms. All of the Utilities have established tree-trimming policies and have increased ROW tree-trimming budgets in recent years to reduce the number of tree-related outages.

ROW clearing and tree-trimming practices vary depending on whether the line in question is a distribution line or transmission line. The standard tree-trimming width for the typical distribution voltages utilized by the Utilities is 30 feet, 15 feet on either side of the distribution centerline. The 15 feet on either side actually amounts to a minimum of 11 feet of clearance from the outermost conductor of the distribution line to the trees. Limitations to the standard 30-foot tree-trimming width have been imposed by a number of municipalities, as discussed below. All the Utilities trim trees within 15 feet of either side of their distribution lines, except that in some circumstances Dominion trims to achieve ten feet of clearance.

Transmission ROWs are generally maintained more aggressively by the Utilities than distribution ROWs, because a failure of these lines will impact more customers. The transmission programs typically integrate tree pruning, cutting danger trees (trees outside the ROW that are in danger of falling onto the lines, including dead, dying, diseased or leaning trees), ROW mowing, and herbicides to control vegetation.

Helicopters are also employed on a regular basis to fly over the transmission lines to identify danger trees or other potential problems.

Progress Energy generally trims trees outside of urban and metro areas on a four-year cycle. Tree trimming in major urban and metro areas is performed on a two-year cycle as municipal or other restrictions contribute to the need for more frequent trimming. In 1996, Progress Energy implemented a significant change to its tree-trimming policy by utilizing mechanized tree-trimming equipment in rural areas, which increased both productivity and safety by reducing the need to climb many trees.

Duke's ROW maintenance cycles vary depending on the lines and location. Rather than using a fixed trimming cycle, Duke monitors reliability reports to determine the tree-trimming schedule that will have the greatest impact on increasing reliability, and some ROWs are maintained on a more frequent basis than others. In 2000, Duke undertook a major initiative to reduce the number of tree-related system outages. Duke is also working with its contractors to use mechanized equipment and herbicides to maintain its ROWs more efficiently and effectively.

Dominion trims trees on a three-year cycle, with supplemental hot spot trimming performed as needed in small areas where trees are causing outages. Dominion has a limited number of lower voltage distribution circuits that use a 20-foot ROW (ten feet on either side of the distribution centerline) because lower voltage circuits typically can effectively operate with a narrower ROW. In addition to routine scheduled trimming, Dominion has initiated a ground to sky trimming policy within the ROW on selected main distribution lines to enhance reliability by removing tree canopy that could fall in ice storms.

Limitations to the 30-foot tree-trimming width of standard utility ROWs have been imposed on Progress Energy by various municipalities in its service area and on Duke by one municipality. Progress Energy has reported to the Public Staff that "restrictions in our right of way pruning width did have a negative impact on the number and severity of certain outages in the recent ice storm."[14] Duke and Progress report that some municipalities have only general ordinances with no specific trimming limitations, while others are very specific and limiting. For example, the city of Durham has placed limitations on Duke's tree-trimming clearances, requiring that trees not be trimmed more than five feet from the side of the outside conductor, five feet under the conductor, or eight feet above the conductor. However, Duke reports that Durham has been working with the company since the Ice Storm to relieve some of the restrictions placed on Duke by the city's tree-trimming limitations.

Duke and Progress Energy report that some municipalities have been fairly lenient in enforcing their ordinances and have recognized that there must be some tradeoff between aesthetics and reliability. However, others have been much more aggressive in interpreting and enforcing tree-trimming practices.

Dominion has no limitations placed on its ability to trim trees in its ROWs.

The Ice Storm outage data supplied by the Utilities reveal that the municipalities with the most restrictive tree-trimming ordinances (Charlotte, Durham, Chapel Hill, and Raleigh) were among the hardest hit areas in terms of damage and customer outages. It is clear that there is a direct correlation between the proximity of overhanging tree limbs and distribution line damage during an ice storm. Thus all municipalities should

[14] Response of January 15, 2003 by Progress Energy Carolinas to Public Staff – NCUC data request, Question No. 4.

reexamine their tree-trimming ordinances, in consultation with utility providers, to make sure that the need to protect trees and foliage is properly balanced against the need for citizens to receive reliable electricity. This reexamination should focus on the municipalities' ordinances and the interpretation as well as enforcement of those ordinances.

A recurring issue at the Public Meetings was whether any of the Utilities were too lax in keeping trees trimmed on transmission and distribution ROWs. The transmission systems were not the cause of system outages following the Ice Storm. Trees that fell from outside the Utilities' ROWs, as well as trees that the Utilities were restricted from cutting within their ROWs, caused a majority of the damage to distribution systems and resulting power outages. Generally, prior to the Ice Storm, the Utilities had trimmed the ROWs on their distribution and transmission systems to the extent allowed by their ROW agreements and the limits set by various municipalities.

System reliability is the best evidence of whether a utility is properly maintaining its ROWs. As previously stated, the data show that the Utilities' system reliability exceeded 99.9% in 2002. These data do not indicate that the Utilities were lax in their ROW maintenance prior to the December 2002 Ice Storm. However, the Utilities Commission and the Public Staff recommend that the Utilities give further attention to ROW maintenance enhancements to determine whether changes can be made to improve system reliability.

Undergrounding

Questions were raised at the Public Meetings as to whether electrical facilities should be placed underground as a means to avoid widespread outages during major storms. Reasonable answers to these questions require a studied comparison of costs to benefits. The Public Staff is currently investigating that issue in detail and will release a separate report later this year.

Use of Alternate Feeds

One method used to reduce the duration of outages caused by electric line failures is to provide for alternate feeds, which are sometimes referred to as interconnections, loop feeds, dual feeds or back-up feeds. These alternate feeds or interconnections are accomplished by building circuits that have a loop-type construction with an open point. Each side of the loop is energized from a source line and ends at the open point. In the event of a failure in one side of the loop, the electric failure point can be isolated and the open point connected to provide electric power to the points on the loop between the failure point and the normal open point. This system of interconnection is normally most beneficial in concentrated areas of electric load where there are multiple source lines delivering electricity from different directions. It is generally more expensive to construct interconnections or alternate feed distribution electric lines (either overhead or underground) than the more traditional single-feed distribution line, also known as a radial feed.

Some individuals suggested at the Public Meetings that the Utilities could reduce the number of outages in ice storms by increasing the use of alternate feeds. However, in a major storm or other natural disaster, the benefits of alternate feeds are greatly limited simply because both feeds and line sources are subjected to the same types of damage. In the areas hardest hit by the December 2002 Ice Storm, almost all the Utilities' distribution lines were damaged. An alternate feed provides no benefit if both the primary power source and the alternate source have been damaged by falling trees and are out of service. For this reason, the Utilities Commission and the Public Staff do not recommend wider use of alternate feeds as a means of reducing ice storm outages.

Distributed Generation

One of the participants in the Public Meetings suggested that the Utilities could reduce the severity of outages due to storms by making greater use of distributed generation. Distributed generation is the use of small-scale generating facilities located close to the places where power is consumed, rather than large centrally located generating facilities. Distributed generation could reduce storm-related outages when a generating facility is built on the site of a large customer (e.g., an industrial plant) that uses the power as it is generated. However, when distributed generation is used to serve small users such as residential customers, distribution lines are still needed to deliver the power from the generating facility to the customers, and those lines are vulnerable to storm damage. Consequently, the reduction in weather-related outages that can be obtained from the use of distributed generation is limited. In addition, extended outages on the utility system may result in distributed generation being operated outside its design capabilities, resulting in outages of these facilities, additional maintenance, or early replacement of the distributed generation.

XI. Questions Raised: Management of Outage

Assignment of Restoration Crews

During and after the Ice Storm, many customers expressed concern as to whether Duke had shown favoritism to certain areas of its service territory with regard to assignment of repair crews. Customers expressed specific concern as to whether Durham and Chapel Hill received unfavorable treatment during Duke's restoration efforts. The Utilities Commission and the Public Staff requested detailed information from Duke to investigate these allegations.

In response to the data requests, Duke provided the number of customer outages and the number of repair workers by city for each day throughout the December 5-13 storm restoration period. This information is shown in Table 6, along with the ratio of customer outages to repair personnel in each city for each day of the restoration period.

Table 6: Duke Power Outages & Restoration Crews By Location

Ratio Values Calculated By NCUC Public Staff Electric Division Using Duke Data

N.C.	5-Dec Field		O/E	6-Dec Field		O/E	7-Dec Field		O/E	8-Dec Field		O/E	9-Dec Field		O/E	10-Dec Field		O/E	11-Dec Field		O/E	12-Dec Field		O/E	13-Dec Field		O/E
Location	Out	Emp	Ratio	Out	Emp	Ratio	Out	Emp	Ratio	Out	Emp	Ratio	Out	Emp	Ratio	Out	Emp	Ratio	Out	Emp	Ratio	Out	Emp	Ratio	Out	Emp	Ratio
Burlington	62,014	118	526	60,226	357	169	47,695	358	133	38,560	438	88	31,196	487	64	22,526	608	37	6,998	663	11	4,488	688	7	1,075	374	3
Chapel Hill	38,786	108	359	38,199	234	163	33,192	234	142	24,250	329	74	21,794	353	62	18,148	393	46	15,588	482	32	6,133	522	12	788	329	2
Charlotte	296,660	617	481	271,026	902	300	220,798	1,184	186	179,038	1,482	121	143,880	1,455	99	94,305	1,503	63	40,144	1,494	27	17,286	1,449	12	5,058	1,542	3
Durham	108,985	138	790	108,238	432	251	92,996	493	189	75,245	600	125	63,089	744	85	50,047	838	60	21,697	967	22	9,600	1,002	10	4,249	640	7
Greensboro	105,816	222	477	88,692	522	170	65,634	543	121	51,307	603	85	45,891	626	73	35,792	669	54	16,018	863	19	8,575	969	9	1,298	625	2
Gastonia	60,451	108	560	58,570	282	208	55,275	331	167	46,870	341	137	37,133	627	59	16,310	662	25	3,423	401	9	153	171	1	63	167	0
Hendersonville	277			935			5			2			4			0			24			1			0		
Hickory	67,386	194	347	63,159	348	181	44,316	459	97	29,071	373	78	14,285	267	54	1,370	202	7	184	132	1	2	119	0	0	113	0
Lenoir	9,903			9,903			4,526			2,750			1,490			0			36			0			0		
Marion	7,045			2,909			2,141			535			0			1			0						0		
High Point	54,465	132	413	50,901	134	380	43,254	156	277	41,407	156	265	36,721	179	205	23,247	282	82	9,606	476	20	5,869	476	12	3,210	331	10
Kannapolis	36,498	87	420	36,497	151	242	26,472	224	118	18,198	323	56	18,017	369	49	11,690	359	33	2,025	359	6	607	451	1	4	70	0
Mooresville	26,331	58	454	26,329	136	194	21,764	140	155	12,793	161	79	8,585	161	53	5,545	161	34	799	161	5	245	112	2	106	119	1
N. Wilkesboro	13,383	198	68	10,061	198	51	6,841	198	35	10	198	0	0	158	0	1	148	0	0	148	0	0	148	0	0	148	0
Elkin	1,885			229			23			1			0			0			0			0			0		
Mt Airy	2,842			1,390			489			1			0			0			0			0			0		
Reidsville/Eden	379	20	19	0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0	
Madison	9			0			0			0			0			0			0			0			0		
Salisbury	57,223	110	520	56,497	319	177	48,937	385	127	43,579	367	119	33,412	415	81	25,908	480	54	11,802	480	25	4,666	625	7	1,149	430	3
Shelby	34,005	73	466	34,004	70	486	19,238	148	130	16,230	177	92	8,107	177	46	4,947	168	29	3,305	168	20	211	182	1	14	71	0
Spindale	18,116	30	604	17,527	40	438	7,996	40	200	3,891	106	37	1,345	96	14	244	96	3	0	30	0	0	30	0	0	30	0
Brevard	531			6			2			0			0			0			0			0			0		
Winston-Salem	36,844	208	177	25,085	220	114	10,039	345	29	5,459	345	16	105	201	1	38	191	0	231	191	1	39	191	0	22	191	0
NC Total	1,039,834	2,421	430	960,383	4,345	221	751,633	5,238	143	589,197	5,999	98	465,054	6,315	74	310,119	6,760	46	131,880	7,015	19	57,875	7,135	8	17,036	5,180	3

S.C.	5-Dec Field		O/E	6-Dec Field		O/E	7-Dec Field		O/E	8-Dec Field		O/E	9-Dec Field		O/E	10-Dec Field		O/E	11-Dec Field		O/E	12-Dec Field		O/E	13-Dec Field		O/E
Location	Out	Emp	Ratio	Out	Emp	Ratio	Out	Emp	Ratio	Out	Emp	Ratio	Out	Emp	Ratio	Out	Emp	Ratio	Out	Emp	Ratio	Out	Emp	Ratio	Out	Emp	Ratio
Anderson	27250	473	58	22692	576	39	3237	576	6	37	258	0	23	258	0	30	258	0	544	258	2	0	258	0	0	328	0
Greenwood	9888			7932			1241			3			3			0			0			0			0		
Clemson	7061			587			0			0			1			0			8			0			0		
Spartanburg	99943	934	107	98671	934	106	48160	934	52	42334	1221	35	29234	1221	24	12216	1197	10	1244	817	2	48	495	0	12	397	0
Greer	25823			25513			14026			6954			600			71			18			0			0		
Greenville	115285	496	232	87810	785	112	51447	1017	51	27998	902	31	8823	636	14	769	442	2	139	418	0	18	395	0	1	395	0
Lancaster	42483	112	379	40592	238	171	20508	268	77	15434	253	61	6441	163	40	2015	143	14	295	114	3	71	89	1	0	96	0
Chester	5253			3146			985			269			1			0			3			960			0		
SC Total	332,986	2,015	165	286,943	2,533	113	139,604	2,795	50	93,029	2,634	35	45,126	2,278	20	15,101	2,040	7	2,251	1,607	1	1,097	1,237	1	13	1,216	0

In Durham (Northern Region), the ratio of 790 on December 5, the first day of storm restoration, was 41% higher than the 560 ratio for Gastonia (Central Region), which was the next highest ratio for a large city on that day. This situation is explained, at least in part, by the fact that the Ice Storm began in Duke's Southern Region on December 4 and did not fully impact the Northern Region until late in the day on December 5. Thus, Duke's restoration crews began working in its Southern Region sooner than in the Central and Northern Regions. Until service had been restored in the Southern Region, the crews working in that area could not be moved to other locations.

By December 6, the ratio for Durham dropped to 251, which was lower than those of four other cities in North Carolina. During the remainder of the restoration period, Durham was never the city with the highest ratio of outages to repair personnel and the Durham ratio remained close to those for other cities in Duke's Central and Northern Regions.

In Chapel Hill (Northern Region), the ratio of 359 on December 5 was below those of eleven other large cities in North Carolina. Throughout the restoration period, the Chapel Hill ratio remained in line with those for other cities in Duke's Central and Northern Regions, exceeding the ratio for all other cities in North Carolina only on December 11.

With the exception of December 5, the first full day of storm restoration work, the ratios for Durham and Chapel Hill were at or below the ratio for Charlotte, the largest city in Duke's service territory, and very close to those of other cities in Duke's Central and Northern Regions. These cities had some of the highest percentages of total customers without power on Duke's entire system – 93% in Durham, 95% in Chapel

Hill, and 94% in Burlington – and Duke had not anticipated that such a large percentage of customers would lose power anywhere in its service area.

As discussed in detail in Section IX, Preparedness for the Storm, Duke undertook measures to prepare for post-storm restoration efforts. With the widespread outages across Duke's entire service territory, decisions about the number of repair crews to place in each area and when to move them were difficult at best. After review of the information provided by Duke, the Utilities Commission and the Public Staff have concluded that Duke acted reasonably and impartially in assigning repair crews during the restoration period.

Restoration Priorities

Questions were raised at the Public Meetings as to whether the Utilities' restoration priorities were appropriate, particularly where customers with special needs are concerned.

Restoration work logically begins at the foundation of each circuit, which is its distribution substation, and then proceeds sequentially towards the end of the circuit. Thus, in general, primary feeders are repaired first, then sub-feeders, tap lines, and finally individual services. Figure 8, the diagram on the next page, entitled "The Steps to Restoring Power," illustrates this process. The North Carolina Association of Electric Cooperatives created this diagram for its members, and it gives a good explanation of how power is restored, not just by the Cooperatives, but also by all electric utilities in North Carolina.

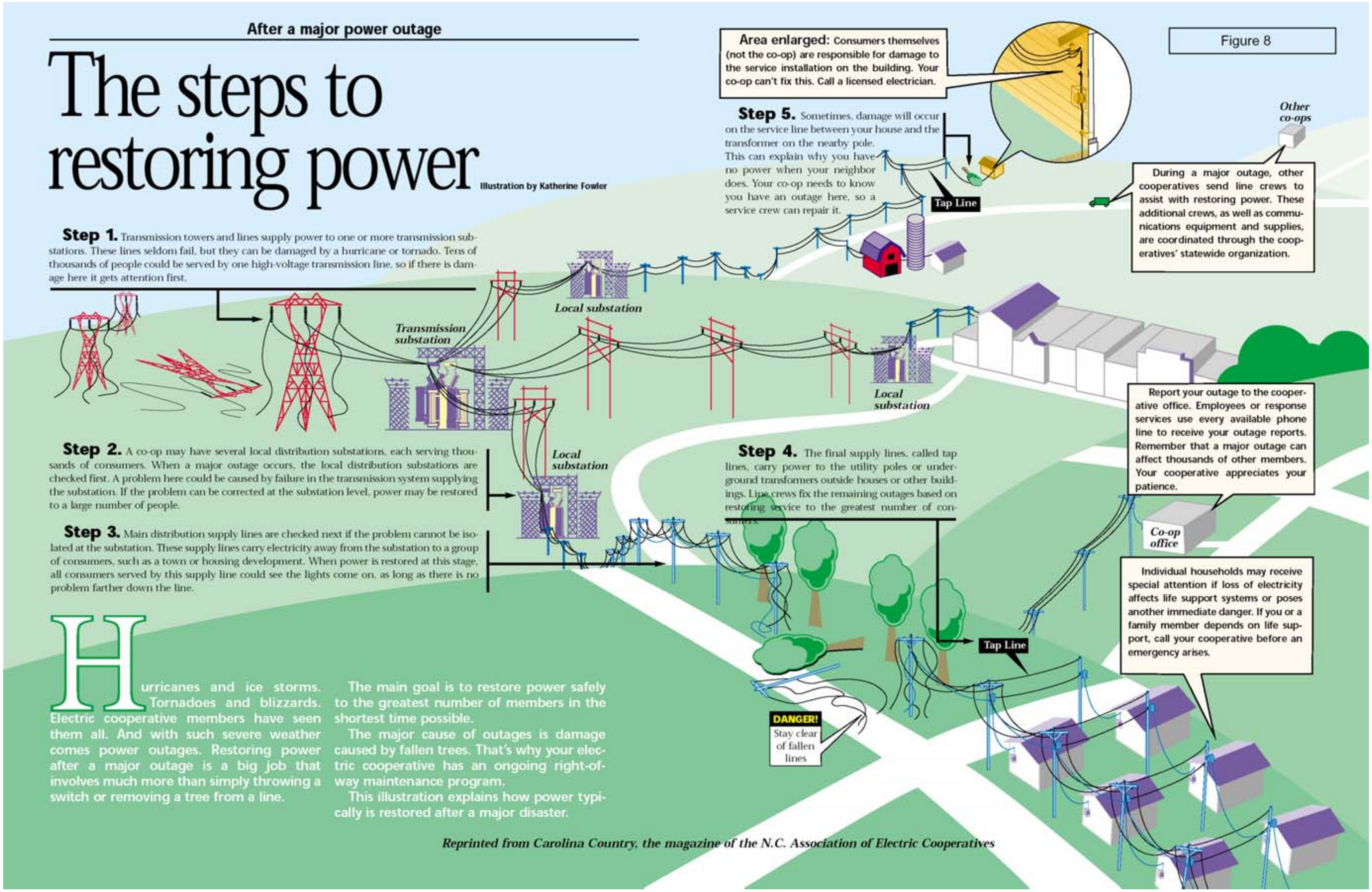

Figure 8

After a major power outage

The steps to restoring power

Illustration by Katherine Fowler

Step 1. Transmission towers and lines supply power to one or more transmission substations. These lines seldom fail, but they can be damaged by a hurricane or tornado. Tens of thousands of people could be served by one high-voltage transmission line, so if there is damage here it gets attention first.

Step 2. A co-op may have several local distribution substations, each serving thousands of consumers. When a major outage occurs, the local distribution substations are checked first. A problem here could be caused by failure in the transmission system supplying the substation. If the problem can be corrected at the substation level, power may be restored to a large number of people.

Step 3. Main distribution supply lines are checked next if the problem cannot be isolated at the substation. These supply lines carry electricity away from the substation to a group of consumers, such as a town or housing development. When power is restored at this stage, all consumers served by this supply line could see the lights come on, as long as there is no problem farther down the line.

Step 4. The final supply lines, called tap lines, carry power to the utility poles or underground transformers outside houses or other buildings. Line crews fix the remaining outages based on restoring service to the greatest number of consumers.

Step 5. Sometimes, damage will occur on the service line between your house and the transformer on the nearby pole. This can explain why you have no power when your neighbor does. Your co-op needs to know you have an outage here, so a service crew can repair it.

Area enlarged: Consumers themselves (not the co-op) are responsible for damage to the service installation on the building. Your co-op can't fix this. Call a licensed electrician.

During a major outage, other cooperatives send line crews to assist with restoring power. These additional crews, as well as communications equipment and supplies, are coordinated through the cooperatives' statewide organization.

Report your outage to the cooperative office. Employees or response services use every available phone line to receive your outage reports. Remember that a major outage can affect thousands of other members. Your cooperative appreciates your patience.

Individual households may receive special attention if loss of electricity affects life support systems or poses another immediate danger. If you or a family member depends on life support, call your cooperative before an emergency arises.

Hurricanes and ice storms. Tornadoes and blizzards. Electric cooperative members have seen them all. And with such severe weather comes power outages. Restoring power after a major outage is a big job that involves much more than simply throwing a switch or removing a tree from a line.

The main goal is to restore power safely to the greatest number of members in the shortest time possible.

The major cause of outages is damage caused by fallen trees. That's why your electric cooperative has an ongoing right-of-way maintenance program.

This illustration explains how power typically is restored after a major disaster.

Reprinted from Carolina Country, the magazine of the N.C. Association of Electric Cooperatives

While the general procedure shown in the diagram is common to all utilities, each company establishes its own specific priorities for service restoration. The Utilities give restoration priority to:

- Public safety-related situations (downed power lines, 911 emergency calls involving power lines or equipment, accidents involving power lines or poles, etc.);
- Emergency services (hospitals, shelters, fire and rescue facilities, police stations, etc.); and
- Critical infrastructure (water and sewer facilities and other services needed for the welfare of the general public, including major traffic and thoroughfare traffic signals).

Beyond this group, priority is determined by an attempt to restore service to the largest number of customers in the shortest period of time, as illustrated in Figure 8. The Utilities maintain lists of special needs customers, and they make every effort to accommodate such customers when possible; however, these lists were created to prevent the disconnection of service for non-payment, not for priority restoration of service. During a widespread outage, it is impossible to focus individually on restoring power to each of the thousands of special needs customers spread throughout each company's system and also to maintain the policy of systematic service restoration, which impacts the greatest number of customers first. Given this reality, it is recommended (as more fully discussed in Section IX above) that the Utilities communicate with customers with special needs, or the caretakers of these customers, and make sure that they understand the imperative need for alternate arrangements in the event of major storms.

Hours Worked by Restoration Crews

At the Public Meetings, questions were raised as to the number of hours worked by restoration crews. There was a widespread perception that while Progress Energy's crews worked 16-hour days, Duke inappropriately limited its crews to 12-hour days.

The Public Staff's investigation indicates that both Duke and Progress Energy worked their crews approximately the same number of hours per day. Duke's line repair employees and off-system workers worked 15- to 16-hour schedules, including travel, briefings, and meal times. Crews typically spent between 12 and 14 hours per day actually restoring service, beginning at approximately 7 a.m. and continuing until after nightfall. These working hours were consistent with the work practices prescribed in Duke's "Region Emergency Manual" for use during service restoration for a regional outage. Similarly, Progress Energy's crews began the workday with breakfast at the staging center between 6 and 7 a.m. and left the staging center several hours after sunset, in some cases as late as 11:15 p.m. The Commission and the Public Staff conclude that the perceived differences in workday length between Duke and Progress Energy were based on mistaken impressions. There are no established industry standards governing the workday length for power restoration crews; but given the expected length of the restoration period and the very cold weather, on the one hand, and the need for rapid restoration of electric service on the other, a workday of 15 to 16 hours appears reasonable.

Effect of Company Layoffs and Closure of Local Offices

Questions were raised at the Public Meetings as to whether some of the delays in service restoration might be attributable to recent layoffs of line maintenance and tree-trimming employees by the Utilities, or to the recent closure of a number of the

Utilities' local offices. Both Duke and Progress Energy have slightly reduced the total number of contractor and company distribution line repair employees from 1998 to 2002. These employees include line technicians, meter technicians, field service representatives and distribution service technicians. Notwithstanding these slight workforce reductions, both Duke and Progress Energy have been able to improve productivity and maintain service restoration capabilities through the use of outage-management systems, work and design management systems, and specialized equipment such as on-board laptop computers and state-of-the-art bucket trucks. Thus, the Utilities Commission and the Public Staff find no reason to believe that Progress Energy or Duke delayed the restoration work because of reductions in their workforces. As for the local offices that have recently been closed by the Utilities, these offices were operated primarily for bill payment and customer service purposes, rather than for line maintenance and tree trimming. Consequently, the decision to close some local offices almost certainly did not have any significant adverse impact on service restoration.

<u>Restoration Estimates</u>

During and after the Ice Storm, several persons questioned the accuracy and timeliness of information provided by the Utilities concerning their restoration efforts. The issue of estimated restoration times given to customers was an area of intense interest, a common complaint being that the Utilities gave overly optimistic estimates as to when a customer's power would be restored.

The Utilities have remotely monitored terminals in place at substations throughout their systems, which automatically report interruption data back to a central computer. The computers use this input, in concert with customer calls, to analyze problems in the distribution system and predict the probable location of problems and the number of customers affected. This information is not only valuable in pinpointing the location and likely causes of outages, but can also be useful in communicating with customers. However, these systems are less useful in determining estimated restoration times following a major storm and resulting widespread damage.

As the December 2002 Ice Storm advanced during the first several hours, the Utilities advised customers that outages would likely last multiple days, and that estimates would be available after the extent of damage was determined. It was the policy of each utility to give estimated restoration times to customers, but not during the first few days of the Ice Storm while damage assessments were still being made. The extensive damage associated with this storm made it difficult for the Utilities to provide accurate restoration estimates during the first few days following the storm.

By December 6, the second full day of restoration, the Utilities had a good estimate of the damage to their facilities, and they were able to begin giving out estimates for restoration times within communities via their customer call centers. The majority of these estimates appear to have been accurate. However, there were still situations where the main circuits were repaired and pockets of customers remained in the dark because of damage below the main circuit level. In a storm of this magnitude, because of the many variables involved in restoring electrical service, it is very difficult to give restoration times, and it is not practical to provide individual customers more detailed information about the restoration of their individual service line than the Utilities currently provide.

Another public criticism was that the Utilities gave customer callbacks that indicated that power had been restored, when in fact it had not. Based on a review of the scripts used by the customer service automated callback systems at all three utilities, the Public Staff has found that each system calls the customer back (using a recorded message) and asks whether or not the power has been restored. The customer is then asked to indicate whether or not this is accurate by pressing the appropriate number. For example, Duke's recorded message was, "This is Duke Power. Based on work completed in your area, we believe power has been restored to your location. If you are using a touch-tone phone and power has been restored, please press 1. If power has not been restored, please press 2 . . . ."[15] Duke indicated it believes that the portion of this message that said, "[W]e believe power had been restored," could have led to some customer confusion, and has, therefore, changed the callback script to "Duke Power crews have been working in your area. We are calling to determine if power has been restored to your location. If your power is on, press 1. If your power has not been restored, press 2."[16]

A related issue discussed at the Public Meetings was whether any of the Utilities were at fault with respect to the accuracy of their restoration information when pockets of customers without service existed within more general areas where power had been restored. The Utilities can remedy this problem, as they did in the Ice Storm, by having the recorded callback message reference their work in the general outage area, with a statement that power is expected to return within a certain period of time. The message should ask the customer to call the utility if power has not returned in that period of time.

Another issue was whether the Utilities should provide customers with maps showing where service is expected to be restored each day. Since the restoration of service due to storm damage is a fluid and dynamic operation, maps given out in

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[15] Response of January 15, 2003 by Duke Power to Public Staff – NCUC data request, Question No. 7.

[16] Id.

morning briefings can be soon rendered inaccurate due to unforeseen circumstances in restoring damaged facilities. The information provided to customers would be viewed as a promise by many of those customers who received it, as opposed to the hopeful, best guess of the utility made sometime the prior evening. This would result in dissatisfaction if the estimated restoration times shown on the maps could not in fact be achieved. Moreover, customers whose areas were not shown to be in a particular day's restoration plan might well complain because of their area's exclusion. The maps would also be very difficult for the Utilities to monitor and maintain, thus consuming large amounts of valuable manpower. For all these reasons, the Utilities Commission and the Public Staff believe that the use of service restoration maps, as proposed at the Public Meetings, would not be practical. Dominion, however, does provide its customers with a service territory map on its web site that identifies broad geographic areas with service outages, but not restoration information.

Secondary Damage

Several customers have complained to the Utilities Commission and the Public Staff about damage to their homes and personal property resulting from excessive electric voltage following the restoration of service by the Utilities. Often during service outages caused by adverse weather, power lines are struck by falling trees or tree limbs, and on occasion one of the three electrical wires that supply electrical service to a customer may be broken. If the wire that is broken happens to be the neutral wire, electric voltage will still be provided to the customer's meter; however, the voltage can vary greatly from the designed 120/240 volts on the typical residential service. This condition is generally referred to as an "open neutral" condition. In a secondary line (the line that leads from the transformer serving a customer to the customer's premises), the neutral wire is largely concealed by the energized wires that wrap around it, and breaks in the neutral wire are difficult to observe. In the other lines that compose the distribution system ("primary lines"), the neutral wire is separated from the energized wires, and open neutral conditions can be detected more easily.

The circuit protection device (panel box and circuit breakers) installed in most customer premises will not detect or protect against an open neutral condition. The most common problem that occurs with an open neutral condition arises when a 120-volt electrical circuit has a stray voltage that can go up to approximately 170 volts. A voltage above the designed 120 volts for the circuit can cause damage to electrical equipment connected to the circuit with an open neutral. In the most severe case, a fire could result. Damage resulting from an open neutral condition may occur either at the time the neutral wire breaks or at the time power is restored after an outage. The higher the voltage above 120 volts on the open neutral circuit, the greater is the possibility that damage will result to electrical equipment connected to the circuit.

The Utilities contend that they cannot devote the time and manpower necessary during a major storm restoration to check the voltage at each customer's meter and ensure that an open neutral condition does not exist, as doing so would significantly extend the restoration period. Although the Utilities' service regulations protect them from liability for damages that are caused by an "act of God," all the Utilities have stated that if the open neutral is caused by negligence on the company's part, they will assume responsibility for the resulting damages.[17]

There is no device currently available on the market that consumers can install to detect and protect against open neutral conditions. When open neutral conditions

[17] The Utilities also point out that open neutrals are rare. In Duke's case, less than 0.02% of the customers affected by the Ice Storm suffered damage caused by open neutral conditions.

occur, appliance and equipment damage almost always results, and fires occasionally start. Although the likelihood that an open neutral condition will occur is relatively low, the severity of the potential damage and the danger of fires merit the Utilities' efforts to detect and eliminate the problem of an open neutral whenever possible. In particular, the Commission and Public Staff recommend that the Utilities inspect primary lines for open neutral conditions as a part of the restoration process. The Commission and the Public Staff will continue to study this issue with the Utilities.

XII. Recommendations and Implemented Changes

This section of the report summarizes the recommendations of the Commission and Public Staff for changes in practice with respect to ice storms and other major storms. It also summarizes the changes in practice that the Utilities have already implemented as a result of the December 2002 Ice Storm.

Recommendations for Change: Utilities

1. As discussed on page 26 of this report, the Commission and Public Staff recommend that Duke take whatever steps are necessary to ensure that elected officials in all areas of its service territory have direct access to information regarding storm preparedness and restoration.

2. As discussed on page 30, in planning for future storms, the Utilities should make every effort to ensure that the number of telephone lines available to customers at their outage-reporting numbers – as well as internal system parameters such as maximum queue size – is sufficient to meet the demands imposed by a major storm. The number of customers is steadily increasing, and the Utilities cannot appropriately assume that the December 2002 Ice Storm is the worst storm they will ever face; thus,

even a telephone system adequate to meet the requirements of the December 2002 Ice Storm may not be sufficient for future planning purposes.

3. As discussed on pages 48 and 63, the Utilities should continue their policy of providing increased assistance to customers with medical needs. As storms approach, the Utilities should contact medical alert customers, or their caretakers, at the earliest time the impact and extent of a major storm become known to the Utilities and encourage them to make alternative shelter arrangements. The Utilities should continue to evaluate each storm on its merits, seek customer feedback, and determine the most effective means of contacting medical alert customers.

4. As discussed on page 55, the Utilities should give further attention to right-of-way maintenance enhancements to determine whether changes can be made to improve system reliability.

5. As discussed on page 70, the Utilities should make an effort to detect and eliminate open neutral conditions whenever practicable during the power restoration process. In particular, the Utilities should inspect primary lines for open neutral conditions as power is restored.

Recommendation for Change: Municipalities

Although the Commission and Public Staff have no jurisdiction over municipalities, they nevertheless recommend, as discussed on pages 54-55 of this report, that all municipalities reexamine their tree-trimming ordinances, in consultation with utility providers, to make sure that the need to protect trees and foliage is properly balanced against the need for citizens to receive reliable electricity. This reexamination should focus on the municipalities' ordinances and the interpretation as well as enforcement of those ordinances.

Changes Implemented by the Utilities

The Utilities have made an intensive effort to identify lessons learned from the December 2002 Ice Storm and have already implemented numerous changes in their storm response procedures. Some of these changes were implemented while recovery from the Ice Storm was still in progress, while others have been put in place in the months since the storm. Unless otherwise indicated, the Commission and Public Staff endorse these changes and recommend that they continue in effect.

1. As discussed on page 26 of this report, the Utilities have made plans to designate specific employees to serve as liaisons with particular counties and emergency operations centers in future storms.

2. As discussed on page 26, Duke is developing a new outage database, which will enable it to determine the number of outages and the number of customer calls received by county, city, and ZIP code. Duke also plans to communicate with key emergency personnel before the winter and summer storm seasons, and it intends to work with county officials to identify critical facilities that are remote from substations or main feeder lines and thus are especially vulnerable to lengthy outages.

3. As discussed on page 27, Progress Energy has made plans to enhance its media communications in adverse weather periods by positioning media spokespersons in affected areas, proactively generating news updates on the restoration process, and adding local radio outlets and towers to its restoration priority lists.

4. As discussed on page 29, Duke increased the Maximum Queue Size parameter for the Voice Response Unit (VRU) at its outage-reporting number from 255

to 2048 during the Ice Storm, so that callers would not be directed back into the VRU while waiting to talk to a live operator.

5. As discussed on page 31, Progress Energy has enhanced the VRU at its outage-reporting number so as to provide the following information to callers: (1) areas most impacted by the storm; (2) a schedule for providing restoration estimates, even while damage assessment is under way; (3) number of customer outages and number of repair crews working in the field; (4) areas for which no restoration estimates are available; (5) an option for customers with meter damage requiring an inspection before system connection can occur; and (6) a full Spanish outage-reporting menu.

6. As discussed on page 31, Progress Energy plans to distribute glow-in-the-dark magnets with outage-reporting numbers.

7. As discussed on page 33, during the Ice Storm Duke added messages to its VRU for Spanish-speaking customers; established a unique toll-free number for these customers, thus enabling them to hear the same storm informational messages that English-speaking customers heard; promoted the new toll-free number on radio stations targeted to Spanish-speaking customers; used Duke employee volunteers who speak Spanish to staff the line after regular Spanish-speaking specialists completed their 12-hour shifts; and utilized two Spanish-speaking Duke employees to provide translations, information, and interviews to major Latino news outlets.

8. As discussed on pages 33-34, Duke has requested PR Newswire to translate its storm restoration news releases into Spanish and distribute them to Spanish-language media outlets. In addition, Duke is designing and building a fully automated Spanish Outage Reporting application, enabling Spanish-speaking customers to report their outages through a special toll-free number.

9. As discussed on pages 34-35, Progress Energy has made enhancements to its automated outage reporting system, enabling Spanish-speaking customers to have the exact outage reporting functionality that is provided to English-speaking callers. In addition, Progress Energy has identified nearly 50 Spanish-language media outlets in its service area, and news releases have been translated into Spanish and distributed directly to these media outlets.

10. As discussed on page 48, Duke and Progress Energy have adopted a policy of making calls to customers on their medical needs lists shortly after a major storm and informing these customers of the location of nearby shelters, telephone numbers where help can be obtained, the importance of making appropriate outage plans, the progress of service restoration efforts, and other information relevant to the customer's situation.

11. As discussed on page 54, Duke has begun working with the city of Durham to relieve some of the restrictions imposed by the city's tree-trimming ordinance.

12. As discussed on page 67, Duke has modified the text of its recorded and automatically dialed telephone messages to customers concerning power restoration, in order to avoid customer misunderstanding.

XIII. Conclusions

The Utilities Commission and the Public Staff conclude that the Utilities were adequately prepared for the December 2002 Ice Storm and that the Utilities' restoration efforts were diligent, effective, and well managed on the whole. Given the extraordinary scope and intensity of the storm, the Utilities' performance, though not flawless, was commendable. The Utilities have recognized the need for improvements and have identified and acted upon twelve primary lessons learned from this storm. Further, the Commission expects the Utilities to adopt three additional recommendations for change which have been made by the Commission and the Public Staff in this report.

The Utilities Commission and the Public Staff also commend the Utilities for their cooperation with this investigation and their assistance in gathering the data that went into this report. While the focus of the investigation was largely retrospective, the findings and conclusions in this report are intended to be forward-looking as well.

Each major storm is a unique event and presents its own challenges to providers of electric service. The type of damage incurred and the density of the affected population can have a significant effect on the number of customers restored per day. Thus, quantitative comparisons of restoration times and ratios between storms, or even between the Utilities, are of limited value in assessing how well a provider responded to a specific event. It is clear, however, that the Utilities incorporated lessons learned from prior storm events into the planning and execution of their responses to the December 2002 Ice Storm and are continuing to refine and enhance aspects of the outage prevention and restoration process.

Finally, the Utilities Commission and the Public Staff believe that the Utilities' line workers and field personnel deserve special recognition for their part in the restoration effort. These men and women spent long hours performing dangerous tasks under difficult conditions in order to restore power to hundreds of thousands of North Carolinians. They can be proud of their achievements and assured of the public's gratitude.