

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington,DC 20554**

In the Matter of )  
Policies and Rules Governing Retirement ) RM-11358  
of Copper Loops by Incumbent Local )  
Exchange Carriers )

**REPLY COMMENTS OF DANIEL J. UDOVIC, P.E.**

The attached paper is being provided to refute Verizon's comment that its FiOS POTS service has higher probability of functioning during times of emergency as compared to its current copper wireline POTS service. To the contrary, the analysis within this paper finds that copper POTS service is far superior in this regard, while Appendix B illustrates why protecting landline emergency communication capability remains important.

The New Jersey Board of Public Utilities has chosen to take a neutral position regarding this matter, indicating that the FCC is the relevant governing body to rule on the matter. As pointed out in my original comments, I have found no mechanism in current FCC's regulations regarding copper loop retirement that acknowledges the validity of maintaining equivalent existing emergency communications capability afforded by copper POTS service during extended power outages, when replaced by fiber POTS service or in new POTS installations.

There is an immediate need to provide such mechanism, as Verizon acknowledges enacting a policy of swapping out existing copper POTS service with FiOS POTS service in New Jersey when installing Cable TV or Internet FiOS services to a customer's premise. Appendix C is a copy of NJBPU letter to me in which Verizon states

”..in the typical FiOS installation scenario, the Optical Network Terminal (ONT) replaces the existing Network Interface Device (NID). The network components of the service, i.e., NID and the drop wire from the pole to the house are removed and the ONT is put in its place, thus enabling reuse of the customer’s existing wiring. In some instances, the existing wiring may need to be replaced if it is not suitable to accommodate Verizon’s FiOS services. Leaving both the NID and ONT on the side of a customer’s house would not be cosmetically appealing. Leaving the loop without a termination point could become a maintenance issue. Verizon indicated to staff that it complies with state and federal regulations regarding network access to other providers. According to Verizon, in the event that a competitor wishes to serve the customer, provisions are made to accommodate the competitor’s request, consistent with applicable rules and regulations.”

On page 22 in its ”Comments of Verizon on Copper Retirement Petitions”, Verizon asserts

”Therefore, any suggestion that Verizon is ripping out copper as it deploys FiOS in order to disadvantage other providers is categorically false.”,

and

”Although Verizon is not currently retiring copper loops in FTTP overbuild situations, in some instances Verizon does remove the copper drop line running to the side of a customer’s home when it installs fiber. If a customer subsequently orders service from another provider that seeks unbundled access to Verizon’s facilities, Verizon replaces the copper drop line at no cost to the customer or provider.”

Herein, lies the problem. According to current FCC regulations, and in Verizon’s eyes, no damage is done when a customer orders FiOS CATV or Internet service and Verizon proceeds to also swap out copper POTS service with FiOS POTS service. This unnecessary swapout policy enables Verizon to remove its copper drop to the customer’s home. Since a CLEC is not providing copper wire-based services to residences where this is occurring, no one suffers from this swapout practice,

per current regulations. In fact, no one needs to be notified that the drop has been "temporarily retired", in such instances. But in real fact, a superior emergency communications infrastructure (copper wireline POTS) has been unnecessarily retired and replaced with an inferior fiber-based version (FiOS POTS), as my memo will show.

The FCC must revise its copper loop retirement regulations to protect copper POTS-based emergency communication infrastructure, until Verizon implements a revised version of its fiber POTS service designed to have equivalent or better critical infrastructure capability than the copper wireline POTS service it is replacing.

Respectfully submitted,

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# Unnecessary FiOS-induced Degradation of Landline Voice Communication Capability during Times of Regional Power Outage

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## **Abstract**

The probability model developed in Appendix A shows that Verizon's ongoing migration from copper POTS to current form of FiOS POTS service produces a proportional degradation in the POTS subscriber base's ability to communicate during regional power outage events lasting longer than eight hours. Although extended power outage events are the exception rather than rule, the probability of these events rises dramatically during times of emergency, such as after severe storms, natural disasters, and following certain acts of terrorism.

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## Discussion

The present FiOS system design of POTS voice communications during power outage events is flawed. Need for wireline emergency communication increases, rather than decreases with time, during such events. Yet, FiOS POTS functionality at the customer's premise becomes unavailable with high probability after eight hours of power outage. It is important to public safety that Verizon provide a fiber-based POTS service that supports subscriber communication during power outage events for two weeks, rather than eight hours, when powered by the 7.5 AH (Amp-Hr) FiOS backup battery which Verizon presently supplies its customers <sup>1</sup>

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<sup>1</sup>A recent FEMA Grant Report[1] did a detailed statistical analysis of 400 electric power outage incidents involving more than 50,000 customers per incident occurring over the interval January, 1990 thru August, 2004 as reported by the North American Reliability Council (NERC) in its Disturbance Analysis Working Group (DAWG) database. The statistical analysis indicates the following:

1. Most power outage events are either storm-related or equipment failure related. Weather related incidents typically take five times as long to clear as equipment failure related incidents.
2. Duration of outages has been increasing, primarily due to the increase in frequency of weather related incidents over equipment failure incidents during the last several years.
3. The mean duration power outage from 1990 thru autumn 2002 was 27.2 hours, while the mean duration from winter 2002 thru summer 2004 was 65.5 hrs.
4. The median duration power outage from 1990 thru autumn 2002 was 3.6 hours, while the median duration from winter 2002 thru summer 2004 was 25.8 hrs.
5. Winter outages are typically 2.25 times longer in duration than outages during the other seasons.
6. Assuming reported outages are equally likely for all seasons, items 3 thru 5 above suggest that the mean and median winter power outage event since winter 2002 is 4.7 days and 6 hrs, respectively.

Appendix B lists power outage incidents during the past three years that involved 50,000 or more customers and lasted significantly longer than eight hours. These incidents demonstrate the need to retain copper POTS phone service that operates throughout a two week regional power outage (assuming that ILEC continues to power its POTS central office and field equipment during the power outage event), while ILECs rework their fiber-based POTS implementations to likewise have high probability of sustaining subscriber communication over similar two week power outage period. The need for this critical landline communication capability is further reinforced by the fact that during the Northeast Blackout of 2003, wireless communication services performed poorly<sup>2</sup>, while POTS landline voice service performed well throughout the blackout period[5].

Converting to a fiber POTS service that features two weeks of emergency voice communication capability would reasonably replace the critical communication capability afforded by original copper POTS service. Converting to a fiber POTS service that features only eight hours of emergency voice communication capability does not.

This situation is unfortunate, as it appears that with modest fiber POTS ONT (optical

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<sup>2</sup>Two reasons listed for the poor performance of wireless service were:

1. Spectrum is a scarce resource and wireless companies build out their networks based on average expected levels. "A spike in demand can blow up the network and most cannot handle an emergency." ..... "It will be years before wireless carriers are at a level where they can handle the type of volume that landlines can."
2. While wireless carriers have ample power backup to protect their switches, that is not the case for all of the cell sites, which house the antennas that transmit the calls across the network. "Wireless is too dependent on the external power supply."

network terminator) redesign, Verizon and other ILECs can provide a fiber-based POTS solution which MAINTAINS or EXCEEDS the critical communication capability of present copper POTS service<sup>3</sup> The revised FiOS POTS offering would focus on providing a 4 Khz wide narrowband analog mode of POTS voice transmission over fiber link that exhibits dramatically reduced operational power requirement. FiOS battery backup power needed to support this analog mode of communication during power outages would be tens of milliwatts, similar to existing copper wireline POTS service, rather than ten to twenty watts, as now required from customer by Verizon's present digital version of fiber POTS communication.

### **Position**

POTS landline voice communication was, and is, a telecommunication service. As such, it must be held to a higher standard of performance and survivability than currently associated with information services. Transitioning POTS telecommunication service from copper plant to fiber plant should not imply that a telecommunication service now becomes an information service, with lower emergency communication requirement. ILECs must recognize this distinction in the system redesign of their fiber-based POTS service.

ILECs can develop and offer fiber-based POTS solutions capable of functioning for two weeks into regional power outage event, when powered solely by 7.5 AH fiber service residential backup battery. Until ILECs provides this solution, the FCC should not allow indiscriminate swap out of copper wireline POTS service with fiber POTS service, regardless of maintenance cost savings

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<sup>3</sup>On March 1, 2007 Attorneys for Verizon telephone companies in their "COMMENTS OF VERIZON ON COPPER RETIREMENT PETITIONS" asserted that "Moreover, after FiOS is in place, future upgrades are possible by changing the terminal equipment in the central office or the equipment at the customer premise to add additional wavelengths or capacity without engaging in expensive upgrades to the distribution network" [2].

that otherwise would occur.

Each conversion of copper wireline POTS service to Verizon's present FiOS POTS service offering degrades existing landline communication capability important to public safety during extended regional power outage events.

## Appendix A.

### Model for Estimating Probability of POTS Voice Communication during Regional Power Outage Events

The probability of POTS service being available at time  $t$  from start of power outage is for copper POTS

$$P_{c\_voice}(t) = P_{c\_integrity}(t) \cdot P_{c\_ILEC\_Auxpower}(t) \cdot P_{wired\_handset} \quad (1)$$

where

$P_{c\_integrity}(t)$  = the probability that the copper line remains intact at time  $t$ ,

$P_{c\_ILEC\_Auxpower}(t)$  = the probability that ILEC provides emergency power to copper POTS office and field equipment at time  $t$ , and

$P_{wired\_handset}$  = the probability that POTS customer has a wired handset available at home for use during power outage,

For fiber POTS a similar equation applies, i.e.

$$P_{f\_voice}(t) = P_{f\_integrity}(t) \cdot P_{f\_ILEC\_Auxpower}(t) \cdot P_{f\_House\_Auxpower}(t) \quad (2)$$

where

$P_{f\_integrity}(t)$  = the probability that the fiber line remains intact at time  $t$ ,

$P_{f\_ILEC\_Auxpower}(t)$  = the probability that the ILEC provides emergency power to fiber POTS office and field equipment at time  $t$ , and

$P_{f\_House\_Auxpower}(t)$  = the probability that POTS customer is capable of providing power to fiber ONT device at time t.

Copper wire and fiber to the same premise will typically travel identical physical routes from central office to that premise<sup>4</sup>

Consequently, probability of either copper or fiber circuit remaining intact at any time after a particular disaster event is approximately the same

$$P_{c\_integrity}(t) = P_{f\_integrity}(t) \quad (3)$$

It seems reasonable to assume that ILEC will provide emergency power to copper and fiber-based POTS central office and field equipment for similar periods. Therefore,

$$P_{c\_ILEC\_Auxpower}(t) = P_{f\_ILEC\_Auxpower}(t) \quad (4)$$

Multiplying each side of equation 3, by its corresponding side of equation 4 yields

$$K(t) = P_{c\_integrity}(t) \cdot P_{c\_ILEC\_Auxpower}(t) = P_{f\_integrity}(t) \cdot P_{f\_ILEC\_Auxpower}(t) \quad (5)$$

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<sup>4</sup>On March 1, 2007 Attorneys for Verizon telephone companies in their "COMMENTS OF VERIZON ON COPPER RETIREMENT PETITIONS" asserted that "new fiber facilities generally run parallel to the existing copper, often even lashed to it. As a result, any instances negatively impacting the fiber network - such as extreme weather conditions, line cuts, etc - are likely to also impact the copper" [3].

Using equation 5, equation 1 can now be rewritten as

$$P_{c\_voice}(t) = K(t) \cdot P_{wired\_handset} \quad (6)$$

while equation 2 can be rewritten as

$$P_{f\_voice}(t) = K(t) \cdot P_{f\_House\_Auxpower}(t) \quad (7)$$

Equations 6 and 7 show that both copper or fiber wireline communication at time t into a power outage depends critically upon the ILEC supplying emergency power at that time to POTS central office and field equipment. For example, if Verizon's power outage contingency plan only commits to powering POTS networks for the first eight hours of a power outage, then

$$K(t) = 0, \quad t > 8 \text{ hrs.}$$

and neither copper nor fiber POTS communications is possible, thereafter. This is true no matter that a subscriber's POTS circuit remains intact after disaster event, and he has wired handset (copper POTS subscriber) or emergency power generator (FiOS POTS subscriber) at his house to fulfill his service obligations to retain communication during power outage.

Dividing the expected value of equation 6 by the expected value of equation 7 produces a useful metric

$$S_{c\_voice/f\_voice}(t) = \bar{P}_{wired\_handset} / \bar{P}_{f\_House\_Auxpower}(t) \quad (8)$$

for quantifying the expected percentage of copper POTS customers retaining copper POTS communication capability versus the expected percentage of FiOS POTS customers retaining fiber POTS communication capability, at time t.

Specifically, during those intervals of  $t$  where

$$S_{c\_voice/f\_voice}(t) > 1, \tag{9}$$

then the devolving copper POTS network is superior as an emergency communication infrastructure to the evolving FiOS POTS network, which is replacing it.

For copper POTS service,  $P_{wired\_handset}$  in equation 6 corresponds to the probability that any given copper POTS customer will have a wired handset available in his house for use during a power outage. A concerned town can increase this probability to near certainty (value of 1), by simply supplying each POTS resident in town not having such a handset, with one purchased for him by the town. One time cost to the town would be \$5/handset needed. By so doing, a town guarantees that all copper POTS subscriber residents with intact wire paths after a disaster event retain POTS communication ability for as long as the ILEC provides emergency power to central office and field POTS equipment.

For fiber POTS service,  $P_{f\_House\_Auxpower}(t)$  in equation 7 corresponds to the probability that power to FiOS ONT device is available at time  $t$  from start of power outage. The emergency backup battery system provided by Verizon as part of FiOS system residential installation, insures that power to the ONT device will be available for the first eight hours of any extended power outage. Thereafter, the customer must have some other source of energy to power the ONT device at his home. In reality, this requires the FiOS POTS customer to purchase an emergency generator to energize the 117 volt outlet supplying 10-15 watts of emergency power to FiOS ONT device. Unfortunately, the cost to FiOS customer for such generator, automatic power source transfer switch, and companion electrician installation service is thousands of dollars. A recent study estimates that only 7 percent of all households have an on-site generator, most of which

are portable units used exclusively during power outages that require manual start and frequent refueling [4].

Using this finding as an optimistic estimate of the probability of any particular FiOS customer deploying an emergency generator to power his FiOS ONT device once backup battery energy is exhausted, indicates that no more than one out of every fourteen FiOS customers will be able to retain fiber POTS communications longer than eight hours into an extended power outage.

In light of the above discussion, those towns which educate POTS subscribers as to the need for having a wired handset to use during power outage, can raise

$$\bar{P}_{wired\_handset} \approx 1 \quad (10)$$

while within the general population of FiOS POTS subscribers,

$$\bar{P}_{f\_House\_Auxpower}(t) \approx 1, \quad t \leq 8 \text{ hrs.} \quad (11)$$

$$\bar{P}_{f\_House\_Auxpower}(t) \approx .07, \quad t > 8 \text{ hrs.} \quad (12)$$

Evaluating equation 8 using the expected mean values stated in equations 10, 11, and 12 yields

$$\bar{S}_{c\_voice/f\_voice}(t) \approx 1, \quad t \leq 8 \text{ hrs.} \quad (13)$$

$$\bar{S}_{c\_voice/f\_voice}(t) \approx 20, \quad 8 \text{ hrs.} < t < t_{ILEC\_noAuxpower} \quad (14)$$

where

$t_{ILEC\_noAuxpower}$  = time into power outage event, when ILEC ceases to provide emergency power to its POTS office and field equipment.

For power outage lasting longer than  $t_{ILEC\_noAuxpower}$ , the above network comparison metric is meaningless - neither copper or fiber POTS communications is possible, once the ILEC stops powering POTS office and field equipment.

## Modeling Results

Applying this probability model to emergency events involving regional power outages predicts that:

1. For the period of power outage prior to FiOS ONT device backup battery exhaustion, both copper and fiber POTS services are fully capable of providing unrestricted voice communication, as needed.
2. At time of FiOS battery exhaustion within the home (typically, eight hours into the power outage event), only one out of every fourteen FiOS POTS customers is expected to retain functional FiOS POTS communication capability.
3. In contrast, all copper POTS subscribers having intact copper lines and wired handset retain ability to communicate throughout power outage events.

These conclusions are based upon four assumptions, the first of which being the most critical:

1. that ILEC has a realistic contingency plan in place with necessary resources to provide emergency power to its copper POTS plant and to that end of the fiber POTS circuit for which it is responsible, for a minimum of two weeks into an extended power outage event. Any ability, whatsoever, to communicate over copper and fiber lines during power outages is predicated upon the assumption that the ILEC continues to provide emergency power

to POTS central office, field equipment, and copper loops. Both copper and fiber POTS communication is no longer possible when the ILEC ceases to emergency power its POTS equipment and loops ( $t = t_{ILEC\_noAuxpower}$ ). This is true, despite a customer having fulfilled his POTS service obligation at home to retain such emergency communication capability.

2. that copper wireline and fiber paths have a near equal probability of remaining intact during and after a disaster event,
3. that most POTS customers have been previously equipped with \$5 wired handsets and educated as to their use during power outage, and
4. that one out of every fourteen POTS customers have purchased and installed an emergency generator to provide needed power to the FiOS ONT device circuitry installed by Verizon on his premises.

## References

- [1] "Electricity Case: Statistical Analysis of Electric Power Outages", Siminoff, J., Zimmerman, R., Restrepo, C., Remington, W., Lave, L., Schuler, R., Report #05-013, Center for Risk and Economic Analysis of Terrorism Events, University of Southern California, Los Angeles, CA, May 31, 2005.
- [2] "Comments of Verizon on Copper Retirement Petitions", (*FCC RM-11358*), Zacharia, Karen & Johnson, William H., Attorneys for Verizon telephone companies, page 15, March 1, 2007.
- [3] "Comments of Verizon on Copper Retirement Petitions", (*FCC RM-11358*), Zacharia, Karen & Johnson, William H., Attorneys for Verizon telephone companies, pp. 23-24, March 1, 2007.

- [4] Energy Insights, <http://www.idc.com//El/getdoc.jsp?containerid=prUS20318806>, Framington, Mass., August 17, 2006.
- [5] , "Wireless Service Performs Poorly in Big Blackout", <http://money.cnn.com/2003/08/15/technology/landlines/index.htm>, La Monica, Paul R., August 16, 2003.

## **Appendix B.**

### **Regional Power Outage Events Involving Greater than 50,000 Customers and Lasting Multiple Days**

When a utility experiences an electric system emergency that it must report to the U.S. Department of Energy (DOE), the utility sends a copy of the report to its Regional Council, which then sends a copy to NERC (North American Electric Reliability Council<sup>5</sup>). NERC has published its findings on bulk electric system disturbances, demand reductions, and unusual occurrences since 1979 in reports entitled System Disturbances.

This Appendix contains a report subset covering the last three years corresponding to power outage events that affected more than 50,000 customers and had durations significantly longer than eight hours.

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<sup>5</sup>Effective January 1, 2007, the North American Electric Reliability Council and the North American Electric Reliability Corporation merged, with NERC Corporation being the surviving entity. NERC Corporation was certified as the electric reliability organization by the Federal Energy Regulatory Commission on July 20, 2006. NERC's mission is to improve the reliability and security of the bulk power system in North America. To achieve that, NERC develops and enforces reliability standards; monitors the bulk power system; assesses future adequacy; audits owners, operators, and users for preparedness; and educates and trains industry personnel. NERC is a self-regulatory organization that relies on the diverse and collective expertise of industry participants. As the Electric Reliability Organization, NERC is subject to audit by the U.S. Federal Energy Regulatory Commission and governmental authorities in Canada.

## 2006 - Disturbance Reports - Public

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**Region:** WECC-CAMX

**Control Area ID:** CISO

**Date - Time:** 12/31/2005 6:00:00 AM PST

**Year:** 2006 **Type:** UO

**Utility:** California Independent System Operator

**Category:** Weather

**Cause:** Weather - High Winds, Rain

### Event Description:

Beginning 12/31/ 2005 a series of strong storms brought torrential rain and winds. The saturated ground and high winds/rains caused extensive and rapid flooding and toppled many trees. The initial storm was quickly followed by a second wave of storms that punished the area on 1/1 to 1/2. The storms brought 7-11 inches of rain along the coast, 4-6 in the central valley, and 5-7 in the foothills, as well as up to 10 feet of snow in the mountains. All this triggered widespread flooding, numerous mudslides, the toppling of trees, and snapping of electricity distribution poles.

There was extensive damage to the distribution and transmission system. Distribution lost about 530 poles, 459 transformers and 1760 spans of wire. Ninety one transmission lines were affected by the storms. Impacts ranged from momentary outages to broken cross-arms to collapsed towers or broken poles. Additionally, one 500 kV transmission line was forced out of service when floodwaters caused its telemetry and relay protection systems to be unreliable. In all, 157 transmission poles (and/or towers) were damaged along with 35 spans of wire. Twenty generating stations (primarily cogenerator units and hydroelectric generators) were either interrupted or rendered unavailable by the outages on the transmission system.

A generating station and associated area were islanded due to transmission failures at 10:34 AM on 1/2. The area load at the time was about 80 MW and was served continuously throughout the islanding event by other generators. Repairs were completed and the island was synchronized to the system at 11:44 AM on 1/2.

Early on, the storms affected significant numbers of customers, by 10:00 AM of 12/31 there were nearly 250,000 customers without power. Customer outages peaked at approximately 310,000 outages at 1 PM on 12/31. Crews worked to restore power to those locations to which access was not impeded by mud or rock slides, flooding or fallen trees. At midnight on 12/31 there were about 120,000 customers without power. However, the next storms arrived before all customers could be restored and the number of customers without power fluctuated between about 60,000 and 175,000 throughout 1/1&2 as crews worked to restore customers even as the storm was causing other customers to lose power.

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## 2006 - Disturbance Reports - Public

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**Region:** MAAC

**Control Area ID:** PJM

**Date - Time:** 1/14/2006 3:45:00 PM EST

**Year:** 2006    **Type:** INT

**Utility:** PJM Interconnection

**Category:** Weather

**Cause:** Weather - High Winds

**Event Description:**

On January 14, 2006 at 1545 EST, high winds, gusting to about 45 MPH, caused widespread electric customer outages within the service area of a utility. An estimated 155,879 electric customers were interrupted during this wind storm. By about 1254 on January 16, 2006 power was restored to all but 2,340 electric customers.

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## 2006 - Disturbance Reports - Public

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**Region:** MAAC

**Control Area ID:** PJM

**Date - Time:** 1/18/2006 3:00:00 AM EST

**Year:** 2006    **Type:** INT

**Utility:** PJM Interconnection

**Category:** Weather

**Cause:** Weather - High Winds

**Event Description:**

On January 18, 2006 at 0300 EST, high winds, gusting to about 50 MPH, caused widespread electric customer outages within the service area of a utility. An estimated 72,535 electric customers were interrupted during this wind storm. By about 1800 on January 18, 2006 power was restored to all but 23,211 electric customers.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-NWPP

**Control Area ID:** PSEI

**Date - Time:** 2/4/2006 4:30:00 AM PST

**Year:** 2006 **Type:** UO

**Utility:** Puget Sound Energy Transmission

**Category:** Weather

**Cause:** Weather - Wind Storm

**Event Description:**

On Feb. 4, 2004 a regional windstorm caused widespread damage to the utilities transmission and distribution systems. The Emergency Response Plan was initiated in anticipation of this damage. The Emergency Operations Center and all storm bases were opened, a storm management team initiated, and 135 crews were deployed to repair expected damage. As of Feb. 6, over 100 crews are still working on the restoration. As of 4 AM about 5,500 customers were without service. Expectations are that the remaining customers will be restored by today or by the morning of Feb. 7.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-CAMX

**Control Area ID:** CISO

**Date - Time:** 2/27/2006 6:25:00 PM PST

**Year:** 2006    **Type:** UO

**Utility:** California Independent System Operator

**Category:** Weather

**Cause:** Weather - High Winds, Rain

**Event Description:**

On Feb 27, 2006, a winter storm with high winds and rain swept across the utilities service area causing the interruption of service to approximately 160,000 customers. Sustained 70 MPH winds were reported, with gusts as high as 98 MPH. The winds died down during the night and restoration continued through March 1. All downed lines were restored by 2:30 PM on 3/1/2006.

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## 2006 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** EES

**Date - Time:** 3/9/2006 2:00:00 PM CST

**Year:** 2006 **Type:** UO

**Utility:** Entergy

**Category:** Weather

**Cause:** Weather - Thunderstorms

**Event Description:**

On March 9, 2006, severe thunderstorms with strong wind gusts, heavy downpours, frequent lightning and isolated tornados moved across the utilities service territory. The system experienced significant outages (10,000-plus customers) by 9:45 AM ad 50,000-plus customers about 12:45 PM. The storms peak was at 1:30 PM with over 72,800 customers out of service. The severe weather knocked out numerous electrical distribution circuits and damaged eighteen transmission lines. No Transmission customers were out of service at 4:30 PM. The majority of remaining customers were restored late March 9. By March 10 AM, 2,800 customers remained without service and all are estimated to be restored by end of March 10.

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## 2006 - Disturbance Reports - Public

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**Region:** MAIN

**Control Area ID:** CWLP

**Date - Time:** 3/12/2006 8:30:00 PM CST

**Year:** 2006    **Type:** UO

**Utility:** City Water Light & Power

**Category:** Weather

**Cause:** Weather - Tornado

**Event Description:**

On March 12, 2006 high winds, storms and two significant tornados interrupted the power to between 64,500 to 69,000 customers. Transmission lines of 38 to 138 kV were disrupted and severing the interconnection to a neighboring utility. Four coal generating units, 249 MW total, were also forced out of service. Restoration work began immediately following the passing of the tornados. The generating units were put into service by the following morning. By noon of March 14th, approximately 80% of the affected customers were restored.

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## 2006 - Disturbance Reports - Public

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**Region:** MAAC

**Control Area ID:** PJM

**Date - Time:** 6/1/2006 6:00:00 PM EDT

**Year:** 2006 **Type:** UO

**Utility:** PJM Interconnection

**Category:** Weather

**Cause:** Weather - Thunderstorms, Lightning

**Event Description:**

At 6:00 PM on June 1 heavy rains, hail and lightening came into the utilities area resulting in outages for approximately 60,000 customers. The estimated restoration time for all customers was estimated at 6:00 PM on June 2.

Less than 24 hours after the initial storm, at 4:00 PM on June 2, a second series of thunderstorms (classified as "Severe" by the National Weather Service) moved through the service territory initially affected and surrounding areas. Heavy rains, winds and lightening continued for several hours resulting in outages of an additional 50,000 customers being out of service. All total, 111,555 customers were affected by the series of storms.

The utilities Emergency Operations Center (EOC) was activated to oversee all response activities including assistance from a neighboring utility, through our pre-established mutual assistance process, and contract support.

The customer response efforts were 9:00 am and normal system operations were enacted at 3:00 PM June 3rd.

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## 2006 - Disturbance Reports - Public

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**Region:** MAAC

**Control Area ID:** PJM

**Date - Time:** 7/18/2006 7:00:00 PM EDT

**Year:** 2006    **Type:** UO

**Utility:** PJM Interconnection

**Category:** Weather

**Cause:** Weather - High Winds, Storms

**Event Description:**

At 7 PM on July 1, 2006, a storm with wind gusts of up to 70 MPH came into the utilities service territory resulting in outages for approximately 380,000 customers. The estimated restoration time for all storm related outages is currently unknown. Due to the amount of customers impacted this will be a multi-day restoration.

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## 2006 - Disturbance Reports - Public

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**Region:** MAIN

**Control Area ID:** AMRN

**Date - Time:** 7/19/2006 7:00:00 PM CDT

**Year:** 2006 **Type:** UO

**Utility:** Ameren Transmission

**Category:** Weather

**Cause:** Weather - Thunderstorms, Lightning

**Event Description:**

Thunderstorms, with wind exceeding 90 MPH ,with high levels of lightning occurred on July 19, 2006. The high winds and falling trees did significant damage to the distribution system. At one point, 600,000 customers in were without service.

By July 26, restoration efforts to the electrical infrastructure continued and was not expected to be completed until July 29. Restoration crews from 11 states are participating in the repair efforts. which caused additional outages. Ameren Corporation is being supported by utility repair crews from 11 other states. As of July 26, a total of 96,353 remain without power.

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## 2006 - Disturbance Reports - Public

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**Region:** MAAC

**Control Area ID:** PJM

**Date - Time:** 7/27/2006 7:00:00 PM EDT

**Year:** 2006    **Type:** UO

**Utility:** PJM Interconnection

**Category:** Weather

**Cause:** Weather - Thunderstorms

**Event Description:**

The utilities service territory experienced several waves of thunderstorms. Beginning Thursday, July 27, 2006; during the overnight hours, about 90,000 customers lost service, primarily due to severe lightning. At 4 PM, Friday, another wave of storms with violent winds and heavy rains hit the service territory resulting in another 85,000 customer outages. The utilities Emergency Operations Center and all Regional Storm Centers were activated to coordinate restoration activities. The utilities crews worked through the weekend to return customers to service. As a result, all storm related customer outages were restored by 11:15 PM on Sunday, July 30.

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## 2006 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** CPLE

**Date - Time:** 9/1/2006 5:30:00 AM EDT

**Year:** 2006 **Type:** UO

**Utility:** Carolina Power & Light Company - CPLE

**Category:** Weather

**Cause:** Weather - Tropical Storm Ernesto

**Event Description:**

On 9/1/2006 Tropical Storm Ernesto caused major distribution system interruptions (outages) in eastern North Carolina and the loss of service to a max of about 61,000 customers ( 7 am on 9/1). By 10 am that same day, there were about 39,000 customer outages. Full customer service restoration is anticipated by 8 am on 9/3.

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## 2006 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** VAP

**Date - Time:** 9/1/2006 6:41:00 AM EDT

**Year:** 2006 **Type:** UO

**Utility:** Dominion Virginia Power

**Category:** Weather

**Cause:** Weather - Tropical Storm Ernesto

**Event Description:**

On 9/1/2006, a Tropical Storm caused minor flooding and major distribution system interruptions and the loss of service to approximately 150,520 customers in the utilities service area. The utilities Storm Center contingency plans has been activated and electric service restorations are in progress. The storm is moving northward and is expected to exit the service territory later today (9/1). Crews continue to restore customers. The Incident ended at 9/3 at 3:25 PM when customer outages dropped below 50,000. By 9/5, crews continue to restore the remaining 6200 customer outages.

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## 2006 - Disturbance Reports - Public

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**Region:** MAIN

**Control Area ID:** CE

**Date - Time:** 10/2/2006 2:00:00 PM EDT

**Year:** 2006 **Type:** UO

**Utility:** Commonwealth Edison

**Category:** Weather

**Cause:** Weather - Thunderstorms

**Event Description:**

On October 2, 2006 sever thunderstoms with high winds and lightning in the Chicago area affected distribution system. Heavy conductor and pole damage from vegetation contributed largely to customer outages. The Storm Restoration Process was initiated. Neighboring utilities and contractors were brought in to supplement the repair forces. Approximately 269,322 customers were affected. By October 4, some 70,000 customers remained without electricity.

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## 2006 - Disturbance Reports - Public

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**Region:** NPCC

**Control Area ID:** ISNE

**Date - Time:** 10/12/2006 5:48:00 PM EDT

**Year:** 2006    **Type:** UO

**Utility:** ISO New England Inc.

**Category:** Weather

**Cause:** Weather - Snow Storm

**Event Description:**

Beginning the evening of October 12 thru the day of October 13, 2006 a large snow storm with 25 mph winds deposited 1-2 feet of heavy wet snow on western NY. The utility immediately implemented its contingency alert and public alert plans. This resulted in structure damage due to downed lines of the sub-transmission (20 - 115 kV lines, 1 230 kV line) and distribution systems. Several generation stations were also affected. A total of 90 MW of generation was tripped as a result of a bus trip.

Complete restoration of service was achieved by noon October 23.

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## 2006 - Disturbance Reports - Public

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**Region:** NONE

**Control Area ID:** NONE

**Date - Time:** 10/15/2006 7:09:00 AM HDT

**Year:** 2006    **Type:** UO

**Utility:** non-NERC Region

**Category:** Earthquake

**Cause:** Earthquake

**Event Description:**

On the morning of October 15, 2006, two earthquakes centered off the coast of the Island of Hawaii affected the entire State of Hawaii. The first was a magnitude 6.7 earthquake at approximately 7:07 a.m., and the second was a magnitude 6.0 earthquake at approximately 7:14 a.m. Many aftershocks followed. The earthquakes were felt throughout the island of Oahu and affected their generating facilities.

Shortly after the initial and second earthquake, three generating units were lost. Automatic load shedding scheme operated as designed to balance loads with available generation. Subsequent system events resulted in the loss of additional generators until eventually, all the local utilities remaining generating units and those by independent power producers tripped offline to prevent damage to the generators.

The restart process was initiated immediately after the earthquake subsided as personnel inspected equipment in the power plants and transmission substations and determined that there was no major damage. The first group of customer loads was picked up by noon while the restoration of the generating units and addition of customer loads continued. The last large area of customers was energized at approximately 2:55 a.m. the following day. Isolated pockets of customers reporting no service or service interruptions were addressed throughout the day on Monday, October 16th.

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## 2006 - Disturbance Reports - Public

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**Region:** MAAC

**Control Area ID:** PJM

**Date - Time:** 10/20/2006 1:00:00 PM EDT

**Year:** 2006    **Type:** UO

**Utility:** PJM Interconnection

**Category:** Weather

**Cause:** Weather - Wind Storm and Rain

**Event Description:**

On October 20, 2006, the utilities service area experienced high winds. Most trouble cases involved fallen trees, downed power lines and damaged electric equipment. By 1 PM, approximately 92,300 customers had lost service, primarily due to the high winds. An Operating Condition (OpCon) Level 3 was declared due to the number of outages.

The Emergency Operations Center (EOC) and all Regional Storm Centers were activated to oversee all response activities. The utilities repair crews along with contract crews worked around the clock from Friday October 20, 2006 to Sunday October 22, 2006. Service outage restoration efforts were completed by 3 PM October 22, 2006 and the system was returned to normal (OpCon level 1).

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-NWPP

**Control Area ID:** PSEI

**Date - Time:** 11/15/2006 1:00:00 PM PST

**Year:** 2006    **Type:** UO

**Utility:** Puget Sound Energy Transmission

**Category:** Weather

**Cause:** Weather - Wind Storm and Rain

**Event Description:**

By 1 pm on November 15, 2006, a windstorm that began during the morning hours and rincreased during the day caused a distribution disturbance resulting in the loss of service to about 50,000 customers in the affected utilities service area. The high winds continued while the damage assessment and repairs were underway.

By noon, November 16, 2006, the weather has stabilized and restoration efforts continued with approximately 17,000 customers without electric service..

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## 2006 - Disturbance Reports - Public

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**Region:** MAIN

**Control Area ID:** AMRN

**Date - Time:** 11/30/2006 10:00:00 PM CST

**Year:** 2006    **Type:** UO

**Utility:** Ameren Transmission

**Category:** Weather

**Cause:** Weather - Snow Storm and Ice Storm

**Event Description:**

On November 30, 2006 the utilities service area was impacted by winds gusting to 25 MPH, a severe ice storm with ice accumulating on power lines and trees nearly 1/2 inch thick, and more than one foot of snow in some areas.

The strong winter storm passing through the Midwest has caused power outages. The bulk electric power system is holding up well and no significant problems have occurred or are anticipated. A few transmission lines have tripped due to icing or high winds but they have returned to service. The outages are being caused by damage to the local distribution systems. By December 9th, after nearly nine days of emergency restoration, the utilities Emergency Operations Center closed its doors at 6 PM. Less than 100 customers remain out of service. The work still being done today is largely clean-up and reconnects of customers who, as a result of damage to their own equipment, had to take maintenance outages.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-NWPP

**Control Area ID:** PSEI

**Date - Time:** 12/13/2006 4:30:00 AM PST

**Year:** 2006    **Type:** UO

**Utility:** Puget Sound Energy Transmission

**Category:** Weather

**Cause:** Weather - Wind Storm and Rain

### Event Description:

In the morning of December 13, 2006, a major low pressure center moved up the west coast causing a large storm to develop. High winds exceeded 100 mph in some areas. Electrical system disturbances resulted in a loss of greater than 700,000 electrical customers throughout the service area. Extensive damage has occurred over the distribution and sub-transmission systems.

December 14 - the high winds continued and the utilities Energy Emergency Operations Center and outlying areas Operating Bases were opened to respond around the clock as needed.

December 15 - the major weather event continued with high winds, up to 90 mph. There has been significant damage to Transmission and Distribution infrastructure. Crews continuing around the clock to restore system to normal.

December 16 - progress in the restoration of service to the over 320,000 customers who were impacted by the gale-force winds. Approximately 420,000 customers are without electric service. 250 repair crews continue to restore service. 150 additional electric crews are being brought in over the next couple of days. So far, we've re-energized 27 of the 80 transmission lines and 95 of the 150-plus substations that lost power from the storm.

December 17 - progress continues, by the end of the night, service will be restored to 500,000 customers. Over 350 crews are working on the restoration efforts, with approximately 50 more arriving over the next two days. There was good progress repairing the transmission system. So far, crews repaired 47 of the 85 transmission lines taken down by the storm, and by re-routing power loads, we've re-energized 129 of the 159 substations that lost power from the storm.

By 9:30 am December 26 - all Customers have been restored. All Operating Bases and the Energy Emergency Operations Center have been closed..

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-NWPP

**Control Area ID:** PACW

**Date - Time:** 12/14/2006 12:07:00 PM PST

**Year:** 2006    **Type:** UO

**Utility:** PacifiCorp-West

**Category:** Weather

**Cause:** Weather - Wind Storm and Rain

**Event Description:**

On December 14, 2006, a major low pressure center moved up the west coast causing a large storm to develop. High winds exceeded 80 to 100 mph in some areas. Electrical system disturbances resulted in a loss of greater than 50-77,500 electrical customers throughout the service area. Extensive damage has occurred over the distribution and sub-transmission systems. The utility is coordinating its restoration with neighboring utilities.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-NWPP

**Control Area ID:** TPWR

**Date - Time:** 12/14/2006 5:00:00 PM PST

**Year:** 2006    **Type:** UO

**Utility:** Tacoma Power

**Category:** Weather

**Cause:** Weather - Wind Storm and Rain

**Event Description:**

From 5 PM on December 14, 2006 through 1 am December 15, high winds (65 mph gusts) accompanied by heavy rains toppled trees in the service area. Much of the distribution system sustained heavy damage from falling trees and other segments of the sub-transmission system. One 230 KV transmission line was affected with minimal damage.

As of midday, December 15, all Transmission is in normal configuration with everything back in service.

As of December 17, 6-8,000 customers are back in service with outages limited to areas with a small number of customers. It may be another 2 to 3 days before all of our remaining affected customers are back in service.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-CAMX

**Control Area ID:** CISO

**Date - Time:** 12/14/2006 7:00:00 PM PST

**Year:** 2006    **Type:** UO

**Utility:** California Independent System Operator

**Category:** Weather

**Cause:** Weather - Wind Storm and Rain

**Event Description:**

In the morning of December 15, 2006, a major low pressure center moved up the coast causing a large storm to develop. High winds exceeded 100 mph in some areas. Electrical system disturbances resulted in a loss of greater than 250,000 electrical customers throughout the service area. Extensive damage has occurred over the distribution and sub-transmission systems. Extensive damage has occurred over several Oregon counties. Restoration efforts will continue into the weekend to restore all customer loads. The utility is coordinating its restoration with neighboring utilities.

At 2:30 PM on December 15, a Level III outage was declared. A Level III outage includes multiple substations and feeders out of service, three or four regions experiencing outages and more than 72 hours being required to restore service. Restoration efforts are in full swing with more than 200 crews working on restoration. This storm resulted in a huge number of downed power lines, so addressing those outages and ensuring our customers' safety remains a top priority. Some roads are still impassable due to downed trees and other storm-related damage, making restoration efforts difficult in some areas.

As of 4:30 PM December 19, restoration efforts substantially completed.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-NWPP

**Control Area ID:** PSEI

**Date - Time:** 12/15/2006 12:01:00 AM PST

**Year:** 2006    **Type:** UO

**Utility:** Puget Sound Energy Transmission

**Category:** Weather

**Cause:** Weather - Wind Storm and Rain

**Event Description:**

On December 15, 2006, a major low pressure center moved up the west coast causing a large storm to develop. High winds exceeded 80 to 100 mph in some areas. Electrical system disturbances resulted in a loss of greater than 170,000 electrical customers throughout the service area. Extensive damage has occurred over the distribution and sub-transmission systems. The utility is coordinating its restoration with neighboring utilities.

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## 2006 - Disturbance Reports - Public

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**Region:** MAPP

**Control Area ID:** NPPD

**Date - Time:** 12/30/2006 10:25:00 PM CST

**Year:** 2006    **Type:** UO

**Utility:** Nebraska Public Power District

**Category:** Weather

**Cause:** Weather - Snow Storm and Ice Storm

### Event Description:

On December 30, 2006 a storm system moved across the state of Nebraska from west to east with heavy precipitation. As temperatures were near the freezing range, it resulted in a leading edge of rainfall, followed by a band of freezing rain and icing conditions. Ice accumulation on power lines and substations caused extensive damage to the transmission and distribution systems of the affected utility and its wholesale distribution suppliers. At one point, over 35 transmission line circuits, those with voltages from 115-345 kV, out of service due to the storm. Of those, three circuits are 230 kV and five circuits are 345 kV. In addition to the transmission system, telecommunications system was damaged because much of the fiber optics cable is carried in the shield wire on the transmission lines which were damaged.

Throughout the storm the utilities Control Center operations personnel, in conjunction with our transmission system planning personnel, ran studies and contingency analyses of the system to ensure that system stability and reliability were maintained.

Storm conditions remained throughout most of the day on December 31, hampering efforts to assess the scope of the damage. The initial focus was placed on public safety and clearing major highways and railroads of fallen conductors. As of 5:00 p.m. on January 1, 31 transmission lines are out of service - over 130 miles of 115 & 230 kV lines supported by wood pole structures are on the ground. Most of the 345 kV circuits that are out of service are constructed on steel lattice towers. Several private transmission construction contractors have been engaged to assist with the restoration efforts.

No official estimated return to service dates are available at this time, but it is certain that it will be at least several months before the entire transmission system is restored. Some circuits, with minimal damage will be returned to service in a matter of days, but there are circuits with many miles of line on the ground that will take much longer. Efforts to restore service to all distribution customers is expected to take a number of days.

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## 2005 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** CPLE

**Date - Time:** 3/8/2005 11:00:00 AM EST

**Year:** 2005    **Type:** INT

**Utility:** Carolina Power & Light Company - CPLE

**Category:** Weather

**Cause:** Weather - Wind Storm - Severe

**Event Description:**

On March 8, 2005 at 1100 EST, a severe wind storm caused widespread outages in Eastern and Central North Carolina. Approximately 51,600 electric customers were interrupted. All customer load was restored by 0600 EST on March 9, 2005.

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## 2005 - Disturbance Reports - Public

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**Region:** ERCOT

**Control Area ID:** ERCO

**Date - Time:** 5/8/2005 3:00:00 PM CDT

**Year:** 2005 **Type:** INT

**Utility:** ERCOT ISO

**Category:** Weather

**Cause:** Weather - Thunderstorm - Severe

**Event Description:**

On May 8, 2005 at about 15:00 CDT, a series of strong thunderstorms moved across a utilities service territory causing widespread distribution outages. At the peak of these storms, about 243,000 customers had their electric services interrupted. By about 1700 on May 10, 2005 CDT, all customer electric service had been restored.

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## 2005 - Disturbance Reports - Public

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**Region:** ERCOT

**Control Area ID:** ERCO

**Date - Time:** 5/29/2005 8:00:00 PM CDT

**Year:** 2004    **Type:** INT

**Utility:** ERCOT ISO

**Category:** Weather

**Cause:** Weather - Thunderstorm - Severe

**Event Description:**

On May 29, 2005 at about 20:00 CDT, a strong thunderstorm caused widespread distribution outages throughout a utilities service area. At the peak of the storm, about 123,000 electric customers were interrupted. By May 31, 2005 at 17:00 CDT, all electric customers had been restored.

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## 2005 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** SOCO

**Date - Time:** 7/10/2005 8:00:00 AM EDT

**Year:** 2005    **Type:** INT

**Utility:** Southern Company Services, Inc.

**Category:** Weather

**Cause:** Weather - Hurricane Denis

**Event Description:**

On July 10, 2005 starting at about 0800, Hurricane Dennis moved through the Florida, Mississippi, Alabama and Georgia areas causing wide-spread electric customer outages. The peak total of electric customers that were without power occurred at 0800 on July 11, 2005 when about 570,899 customers were without power.

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## 2005 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** DUK

**Date - Time:** 7/28/2005 8:30:00 PM EDT

**Year:** 2005    **Type:** INT

**Utility:** Duke Energy Corporation

**Category:** Weather

**Cause:** Weather - Thunderstorm - Severe

**Event Description:**

On July 28, 2005 starting at about 2030 EDT, a series of strong thunderstorms passed through a utilities service area causing widespread distribution outages. About 52,200 electric customers were interrupted. Repairs were completed and all electric customer loads were restored by 1700 on 8/1/2005.

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## 2005 - Disturbance Reports - Public

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**Region:** ECAR

**Control Area ID:** LGEE

**Date - Time:** 8/29/2005 1:10:00 AM CDT

**Year:** 2005    **Type:** INT

**Utility:** LG&E Energy Transmission Services

**Category:** Weather

**Cause:** Weather - Hurricane Katrina

**Event Description:**

On August 29, 2005 at about 0710 CDT, Hurricane Katrina started causing widespread outages throughout the Gulf shore area.

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## 2005 - Disturbance Reports - Public

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**Region:** SPP

**Control Area ID:** CLEC

**Date - Time:** 8/29/2005 6:45:00 AM CDT

**Year:** 2005 **Type:** INT

**Utility:** Cleco Power LLC

**Category:** Weather

**Cause:** Weather - Hurricane Katrina

**Event Description:**

On August 29, 2005 at about 0645, Hurricane Katrina caused widespread damage and electric customer outages. Estimated that 50,800 electric customers were without electricity.

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## 2005 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** SOCO

**Date - Time:** 8/29/2005 7:10:00 AM CDT

**Year:** 2005    **Type:** INT

**Utility:** Southern Company Services, Inc.

**Category:** Weather

**Cause:** Weather - Hurricane Katrina

**Event Description:**

On August 29, 2005 at about 0710 CDT, Hurricane Katrina started causing widespread outages throughout the Gulf shore area.

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## 2005 - Disturbance Reports - Public

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**Region:** MAIN

**Control Area ID:** WEC

**Date - Time:** 9/13/2005 6:30:00 PM CDT

**Year:** 2005    **Type:** INT

**Utility:** Wisconsin Energy Corporation

**Category:** Weather

**Cause:** Weather - Winds - Severe

**Event Description:**

On September 13, 2005 at about 1800 CDT, a strong cold front with high winds moved through the services territory of a utility that caused widespread electric customer outages. The cold front brought sustained winds of over 60 MPH for the duration of the storm. This caused extensive damage to the distribution system. About 110,000 electric customers lost power during the storm. Repairs will take several days to complete.

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## 2005 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** CPLE

**Date - Time:** 9/14/2005 3:00:00 PM EDT

**Year:** 2005    **Type:** INT

**Utility:** Carolina Power & Light Company - CPLE

**Category:** Weather

**Cause:** Weather - Hurricane Ophelia

**Event Description:**

On September 14, 2005 at 15:00 high winds from Hurricane Ophelia caused widespread outages within the distribution system of a utility in eastern North Carolina.

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## 2005 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** LAGN

**Date - Time:** 9/23/2005 1:06:00 PM CDT

**Year:** 2005 **Type:** INT

**Utility:** Louisiana Generating, LLC

**Category:** Weather

**Cause:** Weather - Hurricane Rita

**Event Description:**

On September 23, 2005 at about 1306 CDT, strong winds associated with Hurricane Rita caused widespread distribution interruptions to about 125,000 electric customers in the western and southwestern area of Louisiana.

There was no loss of generation associated with this disturbance. Restoration will take several days to complete.

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## 2005 - Disturbance Reports - Public

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**Region:** ERCOT

**Control Area ID:** ERCO

**Date - Time:** 9/23/2005 5:00:00 PM CDT

**Year:** 2005    **Type:** INT

**Utility:** ERCOT ISO

**Category:** Weather

**Cause:** Weather - Hurricane Rita

**Event Description:**

On September 23, 2005 at 1700 CDT, significant electric customer outages began in Houston area due to strong winds associated with rain bands from the approach of Hurricane Rita toward the upper Texas coast. The winds and storms are causing outages throughout the entire area.

Outages to electric customers peaked to 715,000 by 07:00 on September 24, 2005. Crews entered restoration mode at about 07:30 that morning with the first task being reports of lines down across roads as reported by the Houston Police Department and other local officials. Most of the damage was caused by intense wind, lightning and flying debris caused by toppled trees and large branches falling on power lines. The company has more than 4,000 utility personnel from across the country to assist in restoration work. Although crews have been able to bring on large numbers of customers in a short amount of time, some areas have suffered heavier damage, and repairs in these areas may take longer.

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## 2005 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** EES

**Date - Time:** 9/23/2005 9:00:00 PM CDT

**Year:** 2005    **Type:** INT

**Utility:** Entergy

**Category:** Weather

**Cause:** Weather - Hurricane Rita

**Event Description:**

On September 24, 2005 at about 06:00 CDT, strong winds associated with Hurricane Rita caused widespread damage to the transmission and distribution systems in coastal areas of Arkansas, Louisiana, Mississippi, and Texas. Because of this storm, electric service to about 787,774 customers was interrupted. Facilities affected included about 271 transmission lines of various voltage levels, and about 275 substations. Two area power plants were also affected by this storm. Restoration will take several days.

(Need better start time for this)

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## 2005 - Disturbance Reports - Public

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**Region:** SPP

**Control Area ID:** CLEC

**Date - Time:** 9/24/2005 6:00:00 AM CDT

**Year:** 2005    **Type:** INT

**Utility:** Cleco Power LLC

**Category:** Weather

**Cause:** Weather - Hurricane Rita

**Event Description:**

On September 24, 2005 at about 0600 CDT, strong winds associated with Hurricane Rita caused widespread damage to the transmission and distribution systems in costal area of Louisiana. Because of this storm, electric service to about 80,000 customers was interrupted.

(Need better start time for this)

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## 2005 - Disturbance Reports - Public

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**Region:** ERCOT

**Control Area ID:** ERCO

**Date - Time:** 9/24/2005 6:00:00 AM CDT

**Year:** 2005    **Type:** INT

**Utility:** ERCOT ISO

**Category:** Weather

**Cause:** Weather - Hurricane Rita

**Event Description:**

On September 24, 2005 at 0600 CDT, significant electric customer outages began in Texas coast area due to strong winds associated with rain bands from the approach of Hurricane Rita. The winds and storms are causing outages throughout the entire area. Electric service to about 100,000 customers was interrupted because of the storm. Repairs will take several days.

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## 2005 - Disturbance Reports - Public

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**Region:** FRCC

**Control Area ID:** HST

**Date - Time:** 10/24/2005 4:11:00 AM EDT

**Year:** 2005    **Type:** INT

**Utility:** City of Homestead

**Category:** Weather

**Cause:** Weather - Hurricane Wilma

**Event Description:**

On October 24, 2005 EDT, system protection removed from service two high voltage transmission lines from service due to high winds from Hurricane Wilma. This caused the isolation and shut down of a small single system. The high winds caused extensive damage to the distribution system. A total of 17,000 customers were affected by this incident. By 1545 on October 25, 2005, one of the transmission lines had been restored, which allowed the utility to restore electric power to about 1,000 customers.

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## 2005 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** SOCO

**Date - Time:** 12/15/2005 5:05:00 AM EST

**Year:** 2005    **Type:** INT

**Utility:** Southern Company Services, Inc.

**Category:** Weather

**Cause:** Weather - Ice storm

**Event Description:**

On December 15, 2005 at about 0505 EST, a major ice storm caused widespread electric customer outages in the distribution system in parts of northern Georgia. About 52,659 electric customers were interrupted. All electric service was restored by 1210 EST on December 16, 2005.

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## 2005 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** GSOC

**Date - Time:** 12/15/2005 11:00:00 AM EST

**Year:** 2005    **Type:** INT

**Utility:** Georgia System Operations Corporation

**Category:** Weather

**Cause:** Weather - Ice storm

**Event Description:**

On December 15, 2005 at about 1100 EST, an ice storm hit the northern portion of Georgia causing approximately 52,000 electric customer outages in the distribution system due to ice laden trees falling on distribution lines. In addition, there were several high voltage transmission lines outages during the early morning hours to about 1500 on 12/15/2005. All high transmission lines were restored by 1500 on 12/15/2005. By 1800 on December 16, 2005, electric service had been restored on all customers.

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## 2005 - Disturbance Reports - Public

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**Region:** WECC-CAMX

**Control Area ID:** CISO

**Date - Time:** 12/31/2005 6:00:00 AM PST

**Year:** 2005 **Type:** INT

**Utility:** California Independent System Operator

**Category:** Weather

**Cause:** Weather - Rain and High Winds

### Event Description:

Beginning on December 30, 2005 a series of strong Pacific storms swept through northern and central areas of a utilities service area. These storms had been preceded by an extended period of wet weather that while not severe enough to cause significant customer outages had, nonetheless, left the ground saturated. As the storm beginning on December 30 strengthened, it brought torrential rain and strong gusty winds. On top of the already saturated ground, the additional rainfall and winds caused extensive and rapid flooding and toppled many trees. The storm passed through the area by mid-day on the 31st but was quickly followed by a second wave of storms that punished the area on January 1 and 2 before beginning to clear out on January 3. The storms brought 7-11 inches of rain to communities along the coast, 4-6 inches in the central valley and 5-7 inches in the foothills as well as up to 10 feet of snow in the upper elevations of the mountain areas. The torrential rains triggered widespread flooding and numerous mudslides and rockslides. Strong winds with gusts from 60-80 miles per hour caused further damage as trees toppled and poles were snapped off.

The heavy winds associated with the series of storms caused extensive damage to the distribution and transmission system. On the distribution system, some 530 poles, 459 transformers and 1760 spans of wire were damaged. Ninety one transmission lines were affected by the storms including twenty six 115kV, fifteen 70kV and fifty two 60kV transmission lines. The impacts of the storm ranged from momentary outages to broken cross-arms to collapsed towers or broken poles. Additionally, one 500kV transmission line was forced out of service when floodwaters caused its telemetry and relay protection systems to be unreliable. In all, 157 transmission poles (and/or towers) were damaged along with 35 spans of wire.

Twenty generating stations (primarily cogenerator units and hydroelectric generators) were either interrupted or rendered unavailable by the outages on the transmission system. A total of 1,669 MW of generation was affected.

A small area islanded at 1034 on 01/02/06 when a double circuit of high voltage transmission lines were removed from service by system protection due to trees falling into the lines. The area load at the time was about 80 MW and was served continuously throughout the islanding event by internal generation. At 1126 the high voltage transmission lines were restored and the island was synchronized to the system at 1144 on 01/02/06.

The series of storms began to cause a significant number of retail customer outages at about 0500 on December 31. By 1000 there were nearly 250,000 customers without power. Customer outages peaked at approximately 310,000 outages at 1300. Crews worked to restore power to those locations to which access was not impeded by mud or rock slides, flooding or fallen trees. Mutual aid crews were brought in from Southern California Edison to assist with restoration efforts. At midnight on December 31 there were about 120,000 customers without power. As access to outage locations improved, additional customers were restored. However, the next storms arrived before all customers could be restored and the number of customers without power fluctuated between about 60,000 and 175,000 throughout January 1 and 2 as crews worked to restore customers even as the storm was causing other customers to lose power.

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## 2004 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** SCEG

**Date - Time:** 1/26/2004 10:00:00 AM EST

**Year:** 2004    **Type:** INT

**Utility:** South Carolina Electric & Gas Company

**Category:** Weather

**Cause:** Weather - Ice Storm

**Event Description:**

At about 1000 on January 26, 2004 a severe winter storm caused icing conditions that led to the loss of 500 to 700 MW of electric customer load. Service to approximately 150,000 electric customers was interrupted by this storm. All service to electric customers had been restored by 1200 EST on January 30, 2004.

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## 2004 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** SC

**Date - Time:** 1/26/2004 2:00:00 PM EST

**Year:** 2004 **Type:** INT

**Utility:** Southern Company

**Category:** Weather

**Cause:** Weather - Ice Storm

**Event Description:**

On 1/26/2004 at about 14:00 EST, a winter storm in North and Central Georgia caused severe icing on trees and power lines, which resulted in the loss of about 150 MW of electric customer load. Service to approximately 30,689 electric customers was interrupted by this this storm. (Need final restoration times)

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## 2004 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** SCEG

**Date - Time:** 1/26/2004 4:00:00 PM EST

**Year:** 2004    **Type:** INT

**Utility:** South Carolina Electric & Gas Company

**Category:** Weather

**Cause:** Weather - Ice Storm

**Event Description:**

On 1/26/2004 at about 16:04, a severe winter ice storm, in Central, Southern, and Eastern parts of North and South Carolina, caused the loss of about 475 MW of electric customer load. Service to approximately 92,000 electric customers was interrupted by this this storm. Restoration in the hardest hit areas is expected to take several days. (Need restoration times)

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## 2004 - Disturbance Reports - Public

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**Region:** FRCC

**Control Area ID:** FPL

**Date - Time:** 4/12/2004 5:30:00 AM EDT

**Year:** 2004 **Type:** INT

**Utility:** Florida Power & Light

**Category:** Weather

**Cause:** Weather - Lightning and High Winds

**Event Description:**

At about 0530 EDT on April 12, 2004, a series of thunderstorms with high winds gusting between 50 to 60 mph, caused a large number of distribution interruptions because of tree contacts, wires down and other problems. In addition, there were reports of possible tornado activity associated with the storm front. The storm moved west to east across the utility's service territory. There were approximately 179,000 electric customers affected by this storm, with a maximum of 90,000 customers without power at any one time.

At about 03:00 EDT on April 13, 2004, a second wave of strong thunderstorm activity moved across the utility's service territory, causing additional distribution interruptions. All customer electric service was restored by 2400 on April 13, 2004

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## 2004 - Disturbance Reports - Public

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**Region:** MAPP

**Control Area ID:** NPPD

**Date - Time:** 5/22/2004 6:57:00 PM CDT

**Year:** 2004    **Type:** INT

**Utility:** Nebraska Public Power District

**Category:** Weather

**Cause:** Weather - Thunderstorm and Tornados

**Event Description:**

Between 1857 and 2046 CDT on May 22, 2004, system protection removed from service several high voltage transmission lines due to severe thunderstorms and tornadoes throughout the service area of a public power district. In addition, this event caused the interruption to approximately 40 MW of firm electric customer load and the tripping of about 145 MW of area generation. There was extensive damage to several transmission lines and tower structures throughout the area affected. By 0917 CDT on May 23, 2004, most of the transmission system was normal, service to electric all customers, and all generating units had been restored. There remains out of service some transmission lines because of the extensive damage.

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## 2004 - Disturbance Reports - Public

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**Region:** ERCOT

**Control Area ID:** ERCO

**Date - Time:** 6/1/2004 5:00:00 PM CDT

**Year:** 2004 **Type:** INT

**Utility:** ERCOT ISO

**Category:** Weather

**Cause:** Weather - Lightning and High Winds

**Event Description:**

On June 1, 2004 at about 1700 CDT, a severe storm, with lightning, heavy rain, hail and wind gusts of up to 80 mph, crossed a large metropolitan area in Texas. This storm caused severe damage to the electric system with numerous poles and wires down. This event caused interruption to the electric service of about 500,000 customers. Restoration efforts were assisted by neighboring utilities from as far as 750 miles from affected area.

As of about 1100 CDT on June 2, 2004, some 350,000 electric customers remained without service.

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## 2004 - Disturbance Reports - Public

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**Region:** MAPP

**Control Area ID:** LES

**Date - Time:** 6/12/2004 5:37:00 PM CDT

**Year:** 2004    **Type:** INT

**Utility:** Lincoln Electric System

**Category:** Weather

**Cause:** Weather

**Event Description:**

On June 12, 2004 at about 1712 CDT, a severe storm, with possible tornados, caused extensive damage thought out the service area of a utility in Nebraska. Because of damage from a previous storm, there were widespread electric customer outages because of damage to both the transmission and distribution systems. About 120, 212 electric customers were interrupted because of this storm. Repairs to the transmission and distribution system will take several days to complete.

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## 2004 - Disturbance Reports - Public

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**Region:** MAIN

**Control Area ID:** CE

**Date - Time:** 7/21/2004 5:30:00 PM CDT

**Year:** 2004    **Type:** INT

**Utility:** Commonwealth Edison

**Category:** Weather

**Cause:** Weather - Thunderstorm and High Winds

**Event Description:**

On July 21, 2004 at about 17:30 a severe thunderstorm with high winds, gusting to about 60 mph, moved through the service area causing damage to the distribution system. This storm continued through on July 22, 2004. The electric service to about 200,000 customers was interrupted because of the damage caused by this storm. The majority of the customers interrupted had been restored by 1900 CDT on July 22, 2004.

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## 2004 - Disturbance Reports - Public

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**Region:** FRCC

**Control Area ID:** SEC

**Date - Time:** 8/13/2004 1:30:00 PM EDT

**Year:** 2004    **Type:** INT

**Utility:** Seminole Electric Cooperative

**Category:** Weather

**Cause:** Weather - Hurricane Charley

**Event Description:**

On August 13, 2004 at about 13:30 Hurricane Charley hit much of the western coast of Florida causing severe damage to the transmission and distribution infrastructure. About 200,000 electric customers were interrupted.

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## 2004 - Disturbance Reports - Public

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**Region:** FRCC

**Control Area ID:** FPL

**Date - Time:** 8/13/2004 3:00:00 PM EDT

**Year:** 2004 **Type:** INT

**Utility:** Florida Power & Light

**Category:** Weather

**Cause:** Weather - Hurricane Charley

**Event Description:**

On August 13, 2004 at about 1500 EDT, Hurricane Charley made landfall on the west coast of Florida. The wind speeds were up to 145 mph. This caused major damage to the transmission and distribution infrastructure. By 1530, about 50,000 electric customers were without power. As the storm continued, additional transmission and distribution feeders tripped. By 1630, about 290,000 electric customers were without power. By 1945, the winds started to subside to a level where an assessment of the damage could begin. As a result of this storm a total of about 400,000 electric customers were left without power. Complete restoration is expected to take approximately two to three weeks in the west coast area with most electric services returned by 8/25/04 in the northern area.

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## 2004 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** CPLE

**Date - Time:** 8/14/2004 1:00:00 PM EDT

**Year:** 2004    **Type:** INT

**Utility:** Carolina Power & Light Company - CPLE

**Category:** Weather

**Cause:** Weather - Hurricane Charley

**Event Description:**

On August 14, 2004 at about 13:00 Hurricane Charley hit portions of Central and Eastern North Carolina and Eastern South Carolina causing wide-spread electric customer outages. At the peak of the storm more than 94,000 electric customers were interrupted. On 8/16/04 at about 12:00 all electric customers had been restored.

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## 2004 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** SCEG

**Date - Time:** 8/29/2004 9:52:00 AM EDT

**Year:** 2004 **Type:** INT

**Utility:** South Carolina Electric & Gas Company

**Category:** Weather

**Cause:** Weather - Tropical Storm Gaston

**Event Description:**

On August 29, 2004 at about 09:52 EDT, Tropical storm Gaston passed through South Carolina. Widespread disturbance outages were caused by this tropical storm with an estimate of about 125,000 electric customers being without power. Restoration efforts continued with the last electric customers being restored by 9/1/2004.

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## 2004 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** VAP

**Date - Time:** 8/30/2004 6:58:00 PM EDT

**Year:** 2004    **Type:** INT

**Utility:** Dominion Virginia Power

**Category:** Weather

**Cause:** Weather - Tropical Storm Gaston

**Event Description:**

On August 30, 2004 at about 1858 EDT, Tropical Storm Gaston caused widespread distribution outages within Virginia and North Carolina. Several high voltage transmission lines were removed from service by system protection and manual control of the utility's system operators. The storm had minimal affect in northern and western Virginia. As a result of this storm about 80,000 electric customers lost service.

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## 2004 - Disturbance Reports - Public

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**Region:** FRCC

**Control Area ID:** FPL

**Date - Time:** 9/4/2004 8:00:00 AM EDT

**Year:** 2004 **Type:** INT

**Utility:** Florida Power & Light

**Category:** Weather

**Cause:** Weather - Hurricane Frances

**Event Description:**

On September 4, 2004 at about 0800 EDT, winds from Hurricane Frances started causing widespread outages with damage to the distribution system, and some high voltage transmission line outages. As of 2000 on 9/5/2004, about 1,807,881 electric customers were without power in Florida. Hurricane Francis moved slowly through the area and continued to cause damage for more than 24 hours.

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## 2004 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** SOCO

**Date - Time:** 9/6/2004 1:00:00 PM EDT

**Year:** 2004    **Type:** INT

**Utility:** Southern Company Services, Inc.

**Category:** Weather

**Cause:** Weather - Hurricane Frances

**Event Description:**

On September 6, 2004 at about 1300 EDT, Hurricane Frances caused widespread outages in parts of Georgia. About 556,383 electric customers were affected by this storm.

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## 2004 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** SOCO

**Date - Time:** 9/15/2004 7:00:00 PM EDT

**Year:** 2004 **Type:** INT

**Utility:** Southern Company Services, Inc.

**Category:** Weather

**Cause:** Weather - Hurricane Ivan

**Event Description:**

On September 15, 2004 at about 1900 EDT, Hurricane Ivan caused widespread distribution outages due to damage sustained by high winds. About 1,536,433 electric customers were affected by this storm.

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## 2004 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** AEC

**Date - Time:** 9/16/2004 2:00:00 AM EDT

**Year:** 2004 **Type:** INT

**Utility:** Alabama Electric Cooperative, Inc.

**Category:** Weather

**Cause:** Weather - Hurricane Ivan

**Event Description:**

On September 16, 2004 at 0200 EDT, Hurricane Ivan caused widespread distribution outages. There were approximately 75,000 electric service customers affected by this storm.

As of September 20, 2004 at 14:50 EDT, all electric customer service had been restored.

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## 2004 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** CPLE

**Date - Time:** 9/18/2004 5:30:00 AM EDT

**Year:** 2004    **Type:** INT

**Utility:** Carolina Power & Light Company - CPLE

**Category:** Weather

**Cause:** Weather - Hurricane Ivan

**Event Description:**

On 9/18/2004 at about 0430 EDT, Hurricane Ivan caused widespread distribution outages. About 112,000 electric customers were affected by this storm. All electric customers had been restored by 12:00 EDT on 9/22/2004.

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## 2004 - Disturbance Reports - Public

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**Region:** FRCC

**Control Area ID:** FPL

**Date - Time:** 9/25/2004 7:00:00 PM EDT

**Year:** 2004 **Type:** INT

**Utility:** Florida Power & Light

**Category:** Weather

**Cause:** Weather - Hurricane Jeanne

**Event Description:**

On September 25, 2004 at about 1900 EDT, Hurricane Jeanne came ashore approximately at Stuart, Florida, as a category 3 hurricane with winds of 115 mph. The storm has caused both transmission and distribution outages in an area around West Palm Beach, Florida. Damage assessments will not begin until approximately 1300 EDT, as the area is still experiencing hurricane force winds. As a result of this event, about 1,700,000 electric customers are without power.

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## 2004 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** SOCO

**Date - Time:** 9/27/2004 8:00:00 AM EDT

**Year:** 2004    **Type:** INT

**Utility:** Southern Company Services, Inc.

**Category:** Weather

**Cause:** Weather - Hurricane Jeanne

**Event Description:**

On September 27, 2004 at about 0800 EDT, widespread electric customer outages occurred as a result of Hurricane Jeanne. About 85,455 electric customers were affected.

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## 2004 - Disturbance Reports - Public

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**Region:** ECAR

**Control Area ID:** MECS

**Date - Time:** 10/30/2004 10:00:00 AM EDT

**Year:** 2004    **Type:** INT

**Utility:** Michigan Electric Coordinated System

**Category:** Weather

**Cause:** Weather - High Winds

**Event Description:**

On October 30, 2004 at 1000 EDT, a windstorm with winds gusting to about 55 MPH caused widespread distribution outages. In addition, three high voltage transmission lines were removed from service due to these winds. About 117,842 electric customers were affected by this storm. By 11/1/2004 at 2400 EST, all electric customer electric service had been restored.

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## 2004 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** SOCO

**Date - Time:** 11/24/2004 10:00:00 AM EST

**Year:** 2004    **Type:** INT

**Utility:** Southern Company Services, Inc.

**Category:** Weather

**Cause:** Weather - Thunderstorms

**Event Description:**

Severe thunder storms caused widespread electric customer outages. About 83,450 electric service customers were without power as a result of this storm system.

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**Appendix C.**

**Letter from NJ Board of Public Utilities conveying Verizon's Response to Udovic  
Inquiry Concerning Practice of Removing Copper Drop at Customer's Premise  
when Installing FiOS CATV or Internet Service.**



State of New Jersey  
BOARD OF PUBLIC UTILITIES  
TWO GATEWAY CENTER  
NEWARK, NJ 07102

Jeanne M. Fox  
*President*

Anthony Centrella  
*Director*  
Tel: (973) 648-7865  
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January 10, 2007

Mr. Dan Udovic  
2804 Colonial Drive  
Belmar, NJ 07719

Dear Mr. Udovic:

Thank you for your letter to the Board of Public Utilities concerning FIOS.

Board staff initiated an inquiry with Verizon upon receipt of your correspondence. Thereafter, Verizon informed staff that in the typical FIOS installation scenario, the Optical Network Terminal (ONT) replaces the existing Network Interface Device (NID). The network components of the service, i.e., NID and the drop wire from the pole and house are removed and the ONT is put in its place, thus enabling reuse of the customers existing wiring. In some instances, the existing wiring may need to be replaced if it is not suitable to accommodate Verizon's FIOS services. Leaving both the NID and ONT on the side of a customer's house would not be cosmetically appealing. Leaving the loop without a termination point could become a maintenance issue. Verizon indicated to staff that it complies with state and federal regulations regarding network access to other providers. According to Verizon, in the event that a competitor wishes to serve the customer, provisions are made to accommodate the competitor's request, consistent with applicable rules and regulations.

Verizon also advised staff that after several unsuccessful attempts to speak to you a "Please Call" closure letter was mailed January 5, 2007.

Sincerely,

  
Anthony Centrella  
Director

JD/VH