

# 2006 - Disturbance Index - Public

Date	Region	Utilities	Type	MW	Customers	Cause
31-Dec-05	WECC-CAMX	CISO	UO	800 MW	1,667,316	Weather - High Winds, Rain
14-Jan-06	RFC	PJM	INT	N/A	155,879	Weather - High Winds
18-Jan-06	RFC	PJM	INT	N/A	72,535	Weather - High Winds
28-Jan-06	WECC-CAMX	CISO	INT	N/A	76,000	Equipment Failure - Transformer Failure
04-Feb-06	WECC-RMPA	BPAT	UO	150 MW	1,827 Total Customers Aff	Weather - Wind Storm
04-Feb-06	WECC-RMPA	PSEI	UO	N/A	100 Customers Aff	Weather - Wind Storm
05-Feb-06	SERC-Entergy	EES	UO	N/A	N/A	Cyber - Hard Drive Equipment Failure
15-Feb-06	MRO	WAUE	UO	N/A	N/A	Fuel - RR Delivery Problems
18-Feb-06	WECC-RMPA	PSCO	INT	428 MW	323,000 Customers	Fuel - Natural Gas Supply and Pressure Limitations
27-Feb-06	WECC-CAMX	CISO	UO	N/A	160,000 Customers	Weather - High Winds, Rain
03-Mar-06	WECC-NWPP	BCTC	VR	N/A	N/A	Human Error - Voltage Reduction
09-Mar-06	SERC-Entergy	EES	UO	N/A	73,000	Weather - Thunderstorms
12-Mar-06	RFC	CWLP	UO	200 MW	54,500 to 69,000	Weather - Tornado
17-Mar-06	WECC-NWPP	AESO	UO	650 MW	N/A	Weather - Ice Fog
18-Mar-06	WECC-CAMX	LDWP	UO	N/A	N/A	Equipment Failure - Fire
08-Apr-06	SERC-Southern	SOCO	INT	300 MW	115,589	Weather - Tornadoes, Thunderstorms
17-Apr-06	ERCOT	ERCO	INT	1,000 MW	200,000	Weather - High Temperatures, Limited Resources
17-Apr-06	ERCOT	ERCO	INT	260 MW	Rolling in 15 Min	Weather - High Temperatures, Limited Resources
17-Apr-06	ERCOT	ERCO	INT	380 MW	N/A	Weather - High Temperatures, Limited Resources
17-Apr-06	ERCOT	ERCO	INT	N/A	N/A	Weather - High Temperatures, Limited Resources
17-Apr-06	ERCOT	ERCO	INT	37-40 MW	8-10,000	Weather - High Temperatures, Limited Resources
17-Apr-06	ERCOT	ERCO	INT	58 MW	51,404	Weather - High Temperatures, Limited Resources
02-May-06	WECC-CAMX	BPAT	UO	N/A	N/A	Equipment Failure - Transmission Line Fault
03-May-06	WECC-CAMX	CISO	UO	N/A	55,655	Equipment Failure - Transformer Failure
04-May-06	SERC-Entergy	EES	UO	N/A	N/A	EMS Computer Failure - Hard Drive

Date	Region	Utilities	Type	MW	Customers	Cause
25-May-06	RFC	CIN	UO	N/A	112,000	Weather - High Winds, Storms, Lightning
01-Jun-06	SERC	VAP	UO	N/A	N/A	Cyber - Unknown
01-Jun-06	RFC	PJM	UO	N/A	111,555	Weather - Thunderstorms, Lightning
04-Jun-06	WECC-RMPA	WACM	UO	130 MW	31,076	Equipment Failure - Transmission Line Fault
04-Jun-06	WECC-RMPA	WACM	VR	N/A	N/A	Equipment Failure - Transmission Line Fault
14-Jun-06	WECC-NWPP	AESO	UO	N/A	N/A	Weather - Lightning - Islanding
26-Jun-06	NPCC-ISO-NE	ISNE	UO	N/A	N/A	Equipment Failure - Lightning Arrestor
30-Jun-06	WECC-CAMX	CISO	UO	N/A	N/A	Human Error - Technical Error
02-Jul-06	SERC-Entergy	EES	UO	N/A	N/A	Weather - Lightning
04-Jul-06	WECC-NWPP	AESO	UO	N/A	N/A	Weather - Lightning - Islanding
04-Jul-06	SERC	VAP	UO	335 MW	67,000	Weather - Thunderstorms
05-Jul-06	WECC-NWPP	AESO	UO	N/A	N/A	Weather - Lightning - Islanding
05-Jul-06	WECC-NWPP	BCTC	UO	N/A	N/A	Weather - Lightning - Islanding
18-Jul-06	RFC	PJM	UO	N/A	380,000	Weather - High Winds, Storms
18-Jul-06	NPCC-ISO-NE	ISNE	UO	N/A	N/A	CORRECTION-/NONE INCIDENT
19-Jul-06	SERC-Entergy	EES	PA	40 MW	8,000	Equipment Failure - Transformer Failure
19-Jul-06	SERC	AMRN	UO	N/A	600,000	Weather - Thunderstorms, Lightning
22-Jul-06	WECC-CAMX	CISO	PA	out 200 M	1,271,893	Weather - High Temperatures
24-Jul-06	WECC-CAMX	CISO	PA	855 MW	N/A	Weather - High Temperatures
24-Jul-06	WECC-CAMX	CISO	PA	N/A	variable Tariff (I-6) C	Weather - High Temperatures
24-Jul-06	WECC-NWPP	BCTC	UO	MW at AF	0 at BCTC	Weather - Lightning - Islanding
24-Jul-06	WECC-CAMX	BPAT	UO	N/A	N/A	Equipment Failure - Transmission Line Fault
25-Jul-06	WECC-NWPP	AESO	UO	N/A	N/A	Weather - Lightning - Islanding
27-Jul-06	RFC	PJM	UO	N/A	175,000	Weather - Thunderstorms
01-Aug-06	MRO	MISO	PA	N/A	N/A	PA - Weather, High Temperatures
01-Aug-06	MRO	MISO	PA	N/A	N/A	PA - Weather, High Temperatures
02-Aug-06	MRO	MISO	PA	N/A	N/A	PA - Weather, High Temperatures
02-Aug-06	NPCC-ISO-NE	ISNE	VR	N/A	N/A	Weather - High Temperatures, Humidity

Date	Region	Utilities	Type	MW	Customers	Cause
03-Aug-06	NPCC-ISO-NE	ISNE	UO	40 MW	11,000	Equipment Failure - Transmission, Vegetation
10-Aug-06	WECC-NWPP	AESO	UO	N/A	N/A	Weather - Lightning - Islanding
19-Aug-06	NPCC-Quebec	HQT	UO	N/A	N/A	Human Error - Misoperation
01-Sep-06	SERC-VACAR	CPL	UO	N/A	61,000	Weather - Tropical Storm Ernesto
01-Sep-06	SERC-VACAR	VAP	UO	225 MW	150,520	Weather - Tropical Storm Ernesto
15-Sep-06	FRCC	FPL	UO	81.4 MW	26,894	Weather - Lightning Storm
28-Sep-06	ERCOT	ERCO	INT	N/a	2	Special Protection
02-Oct-06	RFC	CE	UO	N/A	269,322	Weather - Thunderstorms
02-Oct-06	WECC-CAMX	CISO	UO	308 MW	130,000	Equipment Failure - Breaker
03-Oct-06	ERCOT	ERCO	UO	185 MW	100,308	Equipment Failure - CCVT
12-Oct-06	NPCC-ISO-NE	ISNE	UO	400 MW	180,000	Weather - Snow Storm
15-Oct-06	NONE	NONE	UO	1,170 MW	291,000	Earthquake
20-Oct-06	RFC	PJM	UO	N/A	92,300	Weather - Wind Storm and Rain
29-Oct-06	NPCC-Maritimes	NBSC	UO	N/A	N/A	Human Error - Misoperation
15-Nov-06	WECC-RMPA	PSEI	UO	0 Plus MV	50,000 Plus	Weather - Wind Storm and Rain
15-Nov-06	SERC-Southern	SOCO	UO	363 MW	109,000	Weather - Wind Storm and Rain
30-Nov-06	SERC	AMRN	UO	N/A	550,000	Weather - Snow Storm and Ice Storm
13-Dec-06	WECC-RMPA	PSEI	UO	N/A	700,00 at peak	Weather - Wind Storm and Rain
14-Dec-06	WECC-RMPA	BPAT	UO	233 MW	15	Weather - Wind Storm and Rain
14-Dec-06	WECC-NWPP	PACW	UO	N/A	50,000 to 77,500	Weather - Wind Storm and Rain
14-Dec-06	WECC-NWPP	TPWR	UO	280	75,000	Weather - Wind Storm and Rain
14-Dec-06	WECC-CAMX	CISO	UO	N/A	249,500	Weather - Wind Storm and Rain
15-Dec-06	WECC-RMPA	PSEI	UO	N/A	170,000	Weather - Wind Storm and Rain
16-Dec-06	WECC-CAMX	CISO	UO	at Initiat	50,000 Plus	Equipment Failure -Transformer
22-Dec-06	ERCOT	ERCO	UO	plus 1,037	N/A	Equipment Failure - Transformer
26-Dec-06	WECC-CAMX	CISO	UO	0 MW at pe	850,000	Weather - Wind Storm and Rain
30-Dec-06	MRO	NPPD	UO	50-500 MV	15,000	Weather - Snow Storm and Ice Storm

## 2006 - Number of Disturbances by Region - Public

Region	Disturbances
ERCOT	9
FRCC	1
MRO	5
NONE	1
NPCC-ISO-NE	5
NPCC-Maritimes	1
NPCC-Quebec	1
RFC	9
SERC	4
SERC-Entergy	5
SERC-Southern	2
SERC-VACAR	2
WECC-CAMX	15
WECC-NWPP	11
WECC-RMPA	9
<b>Total Number of Disturbances:</b>	<b>80</b>

## 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-CAMX

**Control Area ID:** CISO

**Date - Time:** 1/28/2006 6:13:00 AM PST

**Year:** 2006    **Type:** INT

**Utility:** California Independent System Operator

**Category:** Equipment Failure

**Cause:** Equipment Failure - Transformer Failure

**Event Description:**

On January 28, 2006 at 6:13 am, system protection removed from service a high voltage stepdown transformer. The cause of this failure is unknown. Because of the incident the electric service to about 76,000 customers was interrupted. All electric service was restored by 7:15 am.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-NWPP

**Control Area ID:** BPAT

**Date - Time:** 2/4/2006 1:34:00 AM PST

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

**Utility:** Bonneville Power Administration Transmission

**Category:** Weather

**Cause:** Weather - Wind Storm

**Event Description:**

On Feb 4, 2006, strong winds blew through the utility speeds of 60 mph. Winds caused trees to fall into four 115-kV and numerous 12-kV distribution lines. The utility used all available resources along with line crews from neighboring utilities to restore the damage. There were 83,434 customers out for over one hour and 40,393 customers for less than one hour. Overall, 123,827 customers were impacted during the storm. The storm was declared over at midnight on Feb. 6.

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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:** SERC

**Control Area ID:** EES

**Date - Time:** 2/5/2006 4:19:00 AM CST

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

**Utility:** Entergy

**Category:** Cyber Failure

**Cause:** Cyber - Hard Drive Equipment Failure

**Event Description:**

A hard drive failure on the utilities EMS computer at the transmission operations center caused the EMS system to be lost. As a result, SCADA for the area was lost from approximately 4:19 AM until 5:38 AM. The failure caused the utilities SPS to become inoperable and disabled the automatic load-shedding scheme for the area during that same time period.

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## 2006 - Disturbance Reports - Public

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**Region:** MAPP

**Control Area ID:** WAUE

**Date - Time:** 2/15/2006 9:00:00 AM CST

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

**Utility:** Western Area Power Administration - UGPR

**Category:** Fuel Supply Problems

**Cause:** Fuel - RR Delivery Problems

**Event Description:**

The on hand coal inventory at the generating station has dropped below 50% of the normal operating coal inventory. This situation is caused by the lack of timely coal deliveries by the rail carrier.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-RMPA

**Control Area ID:** PSCO

**Date - Time:** 2/18/2006 8:50:00 AM MST

**Year:** 2006    **Type:** INT

**Utility:** Public Service Company of Colorado

**Category:** Fuel Supply Problems

**Cause:** Fuel - Natural Gas Supply and Pressure Limitations

### Event Description:

On Feb 18, 2006, record low temperatures (-13F) in the metropolitan area occurred when the Utilities system was deficient by 1,000+ MW of generation due to gas supply and pressure limitations. At 0:44 AM, the utility lost a 186 MW generating station. At 1 AM, a 45 MW generating station tripped. About 4:13 AM, a generating unit that was ramping down for an overhall tripped, losing about 350 MW of capacity. At 5:36 and 6:38 AM two units tripped, an additional 75 MW. In conjunction with the utility, the area's Reliability Coordinator (RC) declared an Energy Emergency Alert 1 (EEA) at 7:16 AM due to increased load and declining reserves. All interruptible loads were curtailed (EEA 1) and all non-firm sales were recalled. The utilities media relations initiate public appeals to conserve energy. Neighboring control areas offered assistance but were unable to provide support because of transmission constraints.

At 8:37 AM, a 250 MW of gas turbine was lost and at 8:42 AM an additional 230 MW was lost. At 8:50 AM, due to the last 480 MW of loss, the utility shed approximately 428 MW of firm load to restore reserves and prepare for the next contingency. At 8:51 AM, the utility and the area reliability coordinator declared an EEA 3 requiring rotating shedding of firm load for individual customers every 30 minutes until all systems and normacy were restored at 10:18 AM.

A total of 428 MW of firm load was shed, affecting over 323,000 customers, and approximately 85 MW interruptible customer load. All firm loads were restored at 10:18 AM and the interruptible customer loads were restored at 4:09 AM.

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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:** WECC-NWPP

**Control Area ID:** BCTC

**Date - Time:** 3/3/2006 1:38:00 PM CST

**Year:** 2006    **Type:** VR

**Utility:** British Columbia Transmission Company

**Category:** Human Error

**Cause:** Human Error - Voltage Reduction

**Event Description:**

About 1:38 PM on March 3, 2006, during in-service maintenance on a substation transformer, a protection scheme was inadvertently operated tripping both the transformer and associated protection zones. The action off-loaded the a 500 kV line sending a transfer trip to clear the line. There was no appreciable frequency deviation, however voltage depressed on the southern interior subsystem from 237 kV to 150 kV in one area and from 142 kV to 97kV in another area. A total of 292 MW of load was shed in the parent utility to preserve the bulk transmission system. All transmission lines were returned to service by 2:04 PM, all load by 2:30 PM, and all generation 3:40 PM.

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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:** WECC-NWPP

**Control Area ID:** AESO

**Date - Time:** 3/17/2006 9:08:00 PM MST

**Year:** 2006    **Type:** UO

**Utility:** Alberta Electric System Operator

**Category:** Weather

**Cause:** Weather - Ice Fog

**Event Description:**

At 9:08 PM a 500 kV line relayed to lockout and a 240kV breaker opened. The area was experiencing ice fog at the time, and ice formation on the transmission lines is the suspected cause of the line loss and 650 MW of firm load.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-CAMX

**Control Area ID:** LDWP

**Date - Time:** 3/18/2006 3:29:00 PM PST

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

**Utility:** Los Angeles Department of Water and Power

**Category:** Equipment Failure

**Cause:** Equipment Failure - Fire

### Event Description:

At 3:18 PM, a power plant received a third harmonic alarm on Filter Bank 2. At 3:22 PM, the power plant operator manually tripped the harmonic filter branch of Filter Bank 2 due to equipment fire. At 3:24:02 PM, the power plant operator manually tripped the entire Filter Bank 3 and at 3:24:47 PM manually tripped the entire Filter Bank 1 due to equipment fire. At 3:28 PM, the power plant operator manually tripped the remainder of Filter Bank 2. At 3:28:38 PM the "loss of filter trip timer" that trips the HVDC in 30 seconds was initiated.

At 3:28:49 PM, system protection removed from service a generating unit in an adjacent system by a third harmonic differential scheme. At 3:29:08:943 PM and 3:29:08:947 PM, system protection removed from service HVDC Poles 1 and 2 respectively. At 3:29:09 PM, system protection removed from service generating unit #2 tripped by a remedial action scheme and was left out of service due to a boiler tube leak. This generating unit did not return until 1:32 PM on 3/20/06. The generating unit in the adjacent system was restored by 0:40 am on 3/19/06. The HVDC transmission line was returned to service at 0:35 am on 3/19/06. There were no electric customers interrupted because of this event.

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## 2006 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** SOCO

**Date - Time:** 4/8/2006 4:00:00 AM CDT

**Year:** 2006    **Type:** INT

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

**Category:** Weather

**Cause:** Weather - Tornados, Thunderstorms

**Event Description:**

Severe thunderstorms and tornado in the service area affected 115,589 customers and approximately 300 MW of demand.

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## 2006 - Disturbance Reports - Public

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**Region:** ERCOT

**Control Area ID:** ERCO

**Date - Time:** 4/17/2006 3:25:00 PM CDT

**Year:** 2006    **Type:** INT

**Utility:** ERCOT ISO

**Category:** Weather

**Cause:** Weather - High Temperatures, Limited Resources

### Event Description:

On April 17, unseasonably warm temperatures (90's throughout the area) caused a large increase in electric demand. Due to the time of year, planned transmission and generation outages are underway further stressing system conditions. As the temperatures and loads continued to increase, all available generation was ordered on-line by the area control center (ACC). At 3:25 PM, the ACC implemented step 1 of a predetermined electric emergency curtailment plan (Plan). At 3:34 PM, the Plan was advanced to step 2 and the ACC ordered shedding of Firm and any Interruptible load. At 4:13 PM, as frequency continued to decline, the ACC step 4 of the Plan and ordered the interconnected utilities in the area to shed 1,000 MW's of firm load. At 5:31 PM, after the peak period for the area, the ACC advised the interconnected area utilities that they could begin restoring firm load. By 6:10 PM, all 1,000 MW's of the previously shed firm load was restored.

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## 2006 - Disturbance Reports - Public

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**Region:** ERCOT

**Control Area ID:** ERCO

**Date - Time:** 4/17/2006 4:10:00 PM CDT

**Year:** 2006    **Type:** INT

**Utility:** ERCOT ISO

**Category:** Weather

**Cause:** Weather - High Temperatures, Limited Resources

### Event Description:

Common Description of Incident: On April 17, unseasonably warm temperatures (90's throughout the area) caused a large increase in electric demand. Due to the time of year, planned transmission and generation outages are underway further stressing system conditions. As the temperatures and loads continued to increase, all available generation was ordered on-line by the area control center (ACC). At 3:25 PM, the ACC implemented step 1 of a predetermined electric emergency curtailment plan (Plan). At 3:34 PM, the Plan was advanced to step 2 and the ACC ordered shedding of Firm and any Interruptible load. At 4:13 PM, as frequency continued to decline, the ACC step 4 of the Plan and ordered the interconnected utilities in the area to shed 1,000 MW's of firm load. At 5:31 PM, after the peak period for the area, the ACC advised the interconnected area utilities that they could begin restoring firm load. By 6:10 PM, all 1,000 MW's of the previously shed firm load was restored.

Specific Utility Action: At the request of the ACC, the subject utility shed 260 MW of firm load within its service territory. This was done by a rolling blackout of specific circuits for a period of 15 minutes. A total of thirty-four circuits were removed from service, affecting approximately 68,000 customers. Normal operations and all firm load were resumed by 6:11 PM.

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## 2006 - Disturbance Reports - Public

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**Region:** ERCOT

**Control Area ID:** ERCO

**Date - Time:** 4/17/2006 4:10:01 PM CDT

**Year:** 2006 **Type:** INT

**Utility:** ERCOT ISO

**Category:** Weather

**Cause:** Weather - High Temperatures, Limited Resources

### Event Description:

Common Description of Incident: On April 17, unseasonably warm temperatures (90's throughout the area) caused a large increase in electric demand. Due to the time of year, planned transmission and generation outages are underway further stressing system conditions. As the temperatures and loads continued to increase, all available generation was ordered on-line by the area control center (ACC). At 3:25 PM, the ACC implemented step 1 of a predetermined electric emergency curtailment plan (Plan). At 3:34 PM, the Plan was advanced to step 2 and the ACC ordered shedding of Firm and any Interruptible load. At 4:13 PM, as frequency continued to decline, the ACC step 4 of the Plan and ordered the interconnected utilities in the area to shed 1,000 MW's of firm load. At 5:31 PM, after the peak period for the area, the ACC advised the interconnected area utilities that they could begin restoring firm load. By 6:10 PM, all 1,000 MW's of the previously shed firm load was restored.

Specific Utility Action: At the request of the ACC, the subject utility was requested to shed 380 MW of firm load within its service territory. AT 6:10 PM, the ACC requested that all operations be resumed including all firm load. The utility resumed normal operations at 7:20 PM.

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## 2006 - Disturbance Reports - Public

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**Region:** ERCOT

**Control Area ID:** ERCO

**Date - Time:** 4/17/2006 4:12:00 PM CDT

**Year:** 2006    **Type:** INT

**Utility:** ERCOT ISO

**Category:** Weather

**Cause:** Weather - High Temperatures, Limited Resources

### Event Description:

Common Description of Incident: On April 17, unseasonably warm temperatures (90's throughout the area) caused a large increase in electric demand. Due to the time of year, planned transmission and generation outages are underway further stressing system conditions. As the temperatures and loads continued to increase, all available generation was ordered on-line by the area control center (ACC). At 3:25 PM, the ACC implemented step 1 of a predetermined electric emergency curtailment plan (Plan). At 3:34 PM, the Plan was advanced to step 2 and the ACC ordered shedding of Firm and any Interruptible load. At 4:13 PM, as frequency continued to decline, the ACC step 4 of the Plan and ordered the interconnected utilities in the area to shed 1,000 MW's of firm load. At 5:31 PM, after the peak period for the area, the ACC advised the interconnected area utilities that they could begin restoring firm load. By 6:10 PM, all 1,000 MW's of the previously shed firm load was restored.

Specific Utility Action: At the request of the ACC, the subject utility was requested to shed 49 MW of firm load within its service territory. This was done by a rolling blackout of specific circuits for a period of 15 minutes. The number of customers affected is unknown. At 6:10 PM, the ACC requested that all operations be resumed including all firm load. The utility resumed normal operations at 6:15 PM.

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## 2006 - Disturbance Reports - Public

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**Region:** ERCOT

**Control Area ID:** ERCO

**Date - Time:** 4/17/2006 4:20:00 PM CDT

**Year:** 2006    **Type:** INT

**Utility:** ERCOT ISO

**Category:** Weather

**Cause:** Weather - High Temperatures, Limited Resources

### Event Description:

Common Description of Incident: On April 17, unseasonably warm temperatures (90's throughout the area) caused a large increase in electric demand. Due to the time of year, planned transmission and generation outages are underway further stressing system conditions. As the temperatures and loads continued to increase, all available generation was ordered on-line by the area control center (ACC). At 3:25 PM, the ACC implemented step 1 of a predetermined electric emergency curtailment plan (Plan). At 3:34 PM, the Plan was advanced to step 2 and the ACC ordered shedding of Firm and any Interruptible load. At 4:13 PM, as frequency continued to decline, the ACC step 4 of the Plan and ordered the interconnected utilities in the area to shed 1,000 MW's of firm load. At 5:31 PM, after the peak period for the area, the ACC advised the interconnected area utilities that they could begin restoring firm load. By 6:10 PM, all 1,000 MW's of the previously shed firm load was restored.

Specific Utility Action: At the request of the ACC, the subject utility was requested to shed 37-40 MW of firm load within its service territory. This was done by a rolling blackout of specific circuits for a period of 10 to 15 minutes, affecting a total of approximately 8-10,000 customers. At 6:10 PM, the ACC requested that all operations be resumed including all firm load. The utility resumed normal operations at 6:30 PM.

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## 2006 - Disturbance Reports - Public

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**Region:** ERCOT

**Control Area ID:** ERCO

**Date - Time:** 4/17/2006 4:35:00 PM CDT

**Year:** 2006    **Type:** INT

**Utility:** ERCOT ISO

**Category:** Weather

**Cause:** Weather - High Temperatures, Limited Resources

### Event Description:

Common Description of Incident: On April 17, unseasonably warm temperatures (90's throughout the area) caused a large increase in electric demand. Due to the time of year, planned transmission and generation outages are underway further stressing system conditions. As the temperatures and loads continued to increase, all available generation was ordered on-line by the area control center (ACC). At 3:25 PM, the ACC implemented step 1 of a predetermined electric emergency curtailment plan (Plan). At 3:34 PM, the Plan was advanced to step 2 and the ACC ordered shedding of Firm and any Interruptible load. At 4:13 PM, as frequency continued to decline, the ACC step 4 of the Plan and ordered the interconnected utilities in the area to shed 1,000 MW's of firm load. At 5:31 PM, after the peak period for the area, the ACC advised the interconnected area utilities that they could begin restoring firm load. By 6:10 PM, all 1,000 MW's of the previously shed firm load was restored.

Specific Utility Action: At the request of the ACC, the subject utility was requested to shed 58 MW of firm load within its service territory. This was done by a rolling blackout of specific circuits, affecting a total of approximately 51,404 customers. At 6:10 PM, the ACC requested that all operations be resumed including all firm load. The utility resumed normal operations at 7 PM.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-NWPP

**Control Area ID:** BPAT

**Date - Time:** 5/2/2006 12:31:00 PM PDT

**Year:** 2006    **Type:** UO

**Utility:** Bonneville Power Administration Transmission

**Category:** Equipment Failure

**Cause:** Equipment Failure - Transmission Line Fault

**Event Description:**

Prior to the May 2nd incident, the system was operating normally and there were no unusual or abnormal weather conditions. At approximately 12:31 PM a line fault occurred. Within the total transmission path, the MW's being transmitted were reduced to less than 70%. The fault initiated a Remedial Action Scheme which automatically changed the scheduled flows in the area. Maximum frequency deviation due to this operation was from 59.99 Hz to 59.9455 Hz which recovered to normal at 12:33 PM. A directive was released by the areas Reliability Coordinator to take all necessary actions, up to and including, shedding firm load to unload the affected transmission path and recover ACE. At 12:50 PM, operations along the transmission path were sufficiently unloaded and NO generation and/or Firm load were shed. The frequency returned to normal at 1:01 PM. The reason for the fault continues to be investigated.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-CAMX

**Control Area ID:** CISO

**Date - Time:** 5/3/2006 3:30:00 PM PDT

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

**Utility:** California Independent System Operator

**Category:** Equipment Failure

**Cause:** Equipment Failure - Transformer Failure

**Event Description:**

At 3:30 PM on May 18, a 115 kV bus potential transformer at a power station failed and a fire occurred. Protective relays opened the 115 kV and two 230/115 kV transformer banks connected to the power station. Approximately 300 MW of load demand and 55,655 customers were affected. By 4:54 the two 230/115 kV busses were restored to operations and the 115 KV busses were restored to operation at 4:55 PM. All load was restored by 7:10 PM and final restoration of all affected customers was completed by 9:35 PM.

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## 2006 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** EES

**Date - Time:** 5/4/2006 7:36:00 PM CST

**Year:** 2006    **Type:** UO

**Utility:** Entergy

**Category:** EMS Computer Failure

**Cause:** EMS Computer Failure - Hard Drive

**Event Description:**

The utilities Transmission Operations Center (TOC) experienced an EMS computer system failure of their primary and backup systems at 7:36 CST on May 4, 2006. This outage caused the VShed protection scheme to be inactive until the computer problem was resolved. The cause of the computer outage was an "Unknown Host System Software Lockup". It was not found to be related to any network, host system hardware, database, operator action, SCADA Support action, or any other area other than the core Host System Software.

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## 2006 - Disturbance Reports - Public

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**Region:** ECAR

**Control Area ID:** CIN

**Date - Time:** 5/25/2006 7:50:00 PM EDT

**Year:** 2006    **Type:** UO

**Utility:** Cinergy Corporation

**Category:** Weather

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

**Event Description:**

Major storms including high winds and lightning moved through the service area causing local or regional power outages. The affected utility activates its emergency response and organized its restoration efforts accordingly.

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## 2006 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** VAP

**Date - Time:** 6/1/2006 4:39:00 PM EDT

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

**Utility:** Dominion Virginia Power

**Category:** Cyber Failure

**Cause:** Cyber - Unknown

**Event Description:**

At 4:39 PM of June 1, 2006 the Energy Management System and Distribution Management System networks at the System Operations Center became isolated from the rest of the enterprise network. Preliminary investigations suggest an equipment malfunction resulting in an internal network routing issue or a computer network bridge loop; possibly a network or firewall related problem. Investigations continue on the cause of the problem. Configuration changes have been implemented and the network is stable. Operations were relocated to the Emergency System Operations Center.

Restoration of normal computer network operations was achieved at approximately 8:00 PM on June 1 with normal system operations returning to the primary System Operations Center. There was no effect on power system adequacy.

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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:** WECC-RMPA

**Control Area ID:** WACM

**Date - Time:** 6/4/2006 12:34:00 PM MDT

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

**Utility:** Western Area Power Administration - CM

**Category:** Equipment Failure

**Cause:** Equipment Failure - Transmission Line Fault

**Event Description:**

Prior to the incident, the utility had scheduled and taken a line, 115 kV, out of service to replace several CCVT (Closed Coupling Voltage Transformer) that were leaking oil. A risk analysis was done prior to the equipment repair. The analysis also determined what line outages and voltage reductions would be necessary should an incident occur during the repair.

At 12:34 PM on the day of the scheduled repair, a line in the immediate area of the repair relayed out of service (trip) for an as yet unknown reason. Because of the repair, voltages in the area dropped significantly and shed 26 MW of customer load. The neighboring utility immediately implemented manual load shedding, dropping 50 MW, as predetermined. All total, 130 MW of load was eventually shed. At 1:18 PM the line that experienced the lightning strike was returned to service and voltage in the area returned to above nominal levels. At the utility where the incident initiated, all load was restored by 2:34 PM. Load restoration by neighboring began at 1:27 PM and was completed at 3:55 PM.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-RMPA

**Control Area ID:** WACM

**Date - Time:** 6/4/2006 12:34:28 PM MDT

**Year:** 2006    **Type:** VR

**Utility:** Western Area Power Administration - CM

**Category:** Equipment Failure

**Cause:** Equipment Failure - Transmission Line Fault

**Event Description:**

At the time of the incident, the transmission system was in an abnormal state because of a scheduled line outage. A transmission line equipment failure at 12:34 PM resulted in line loading reconfigurations and temporary voltage reductions. Operations of affected lines, including voltages, were returned to normal at 1:18 PM.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-NWPP

**Control Area ID:** AESO

**Date - Time:** 6/14/2006 9:45:00 PM PDT

**Year:** 2006    **Type:** UO

**Utility:** Alberta Electric System Operator

**Category:** Weather

**Cause:** Weather - Lightning - Islanding

**Event Description:**

Lightning struck a 500 kV line at 9:45 PM on July 4, 2006 causing it to relay and the utility system separate its connections to neighboring utilities. The utility experienced separation (islanding). The islanding resulted in the loss of 80 MW of load: although no customers were affected by the separation. At 10:07 PM, the 500 kV line was synchronized with neighboring utilities and at 10:35 PM all affected transmission lines were in service... Lightning and heavy rains continued in the area but did not affect the transmission system.

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## 2006 - Disturbance Reports - Public

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**Region:** NPCC

**Control Area ID:** ISNE

**Date - Time:** 6/26/2006 7:37:00 PM EDT

**Year:** 2006    **Type:** UO

**Utility:** ISO New England Inc.

**Category:** Equipment Failure

**Cause:** Equipment Failure - Lightning Arrestor

**Event Description:**

At 7:37 PM on June 26th, a lightning arrester at a substation failed and tripped a 115 KV line. The 115 kV alternate service line was out of service for scheduled maintenance at the time of the incident. Approximately 115 MW of load was lost and 30,000 customers lost power. The line, along with the 30,000 customers, was restored to service at 8:40 PM.

NOTE: The initial report was sent out assuming more than 50,000 customers lost power during the transmission outage. Actually, the number of customers that lost power was approximately 30,000 customers. Therefore, the initial report filing was not necessary in accordance with the OE-417 guidelines.

Restoration of normal computer network operations was achieved at approximately 8:00 PM on June 1 with normal system operations returning to the primary System Operations Center. There was no effect on power system adequacy.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-CAMX

**Control Area ID:** CISO

**Date - Time:** 6/30/2006 9:02:00 AM PDT

**Year:** 2006    **Type:** UO

**Utility:** California Independent System Operator

**Category:** Human Error

**Cause:** Human Error - Technical Error

**Event Description:**

A substation technician was testing modifications and technician mistakenly sent incorrect line outage indications to the neighboring 500 kV system, which detected a triple line outage at 9:02 am. No actual line outages occurred. When the line outages were detected, the protection system immediately issued transfer trip signals that resulted in the dropping of the generators feeding the 500 kV line, 1,312 MW. The test error was cleared at 9:03 am.

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## 2006 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** EES

**Date - Time:** 7/2/2006 12:00:00 PM CDT

**Year:** 2006    **Type:** UO

**Utility:** Entergy

**Category:** Weather

**Cause:** Weather - Lightning

**Event Description:**

At noon, a lightning strike caused the loss of the server air conditioner at the transmission operations center. This then resulted in the outage of the EMS computer system and a portion of the voltage shedding protection system. The matter was resolved and all operations returned to normal at 7:05 PM.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-NWPP

**Control Area ID:** AESO

**Date - Time:** 7/4/2006 3:47:00 AM PDT

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

**Utility:** Alberta Electric System Operator

**Category:** Weather

**Cause:** Weather - Lightning - Islanding

**Event Description:**

Lightning struck a 500 kV line at 3:47 PM causing it to relay and the utility system to separate its connections to neighboring utilities. The utility experienced separation (islanding). The islanding resulted in the loss of 150 MW of load: although no customers were affected by the separation. At 3:56 PM, the 500 kV line was synchronized with neighboring utilities. Lightning continued in the area but did not affect the transmission system.

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## 2006 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** VAP

**Date - Time:** 7/4/2006 5:30:00 PM EDT

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

**Utility:** Dominion Virginia Power

**Category:** Weather

**Cause:** Weather - Thunderstorms

**Event Description:**

Severe thunderstorms went across the state Tuesday night, July 4th. Normal storm restoration procedures were applied.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-NWPP

**Control Area ID:** AESO

**Date - Time:** 7/5/2006 11:30:00 PM PDT

**Year:** 2006    **Type:** UO

**Utility:** Alberta Electric System Operator

**Category:** Weather

**Cause:** Weather - Lightning - Islanding

**Event Description:**

Lightning struck a 500 kV line at 11:30 PM on July 5, 2006 causing it to relay and the utility system to separate its connections to neighboring utilities. The RAS (Remedial Action Scheme) tripped the designated related transmission lines. As a result, the utility experienced separation (islanding). The islanding resulted in NO loss of load and NO customers were affected. At 11:39 PM, the 500 kV line was synchronized and by 11:42 PM the last lines were synchronized.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-NWPP

**Control Area ID:** BCTC

**Date - Time:** 7/5/2006 11:30:01 PM PDT

**Year:** 2006    **Type:** UO

**Utility:** British Columbia Transmission Company

**Category:** Weather

**Cause:** Weather - Lightning - Islanding

**Event Description:**

Lightning struck a 500 kV line at 11:30 PM on July 5, 2006 causing it to relay and the utility system to separate its connections to neighboring utilities. The RAS (Remedial Action Scheme) tripped the designated related transmission lines. As a result, the utility experienced separation (islanding). The islanding resulted in NO loss of load and NO customers were affected. At 11:39 PM, the 500 kV line was synchronized and by 11:42 PM the last lines were synchronized.

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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:** NPCC

**Control Area ID:** ISNE

**Date - Time:** 7/18/2006 8:07:00 PM EDT

**Year:** 2006    **Type:** UO

**Utility:** ISO New England Inc.

**Category:** Equipment Failure

**Cause:** CORRECTION-/NONE INCIDENT

**Event Description:**

NONE INCIDENT - This incident does not meet the minimum reporting criteria for OE417 and thus should not have been reported to DOE.

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## 2006 - Disturbance Reports - Public

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**Region:** SERC

**Control Area ID:** EES

**Date - Time:** 7/19/2006 11:00:00 AM CDT

**Year:** 2006    **Type:** PA

**Utility:** Entergy

**Category:** Equipment Failure

**Cause:** Equipment Failure - Transformer Failure

**Event Description:**

On July 19, an unplanned outage of a single phase 500/115 kV A transformer resulted in low voltage and overload. The cause of the transformer trip was a ruptured oil storage tank. Public appeals were made requesting the conservation of energy.

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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:** WECC-CAMX

**Control Area ID:** CISO

**Date - Time:** 7/22/2006 1:09:00 PM PDT

**Year:** 2006 **Type:** PA

**Utility:** California Independent System Operator

**Category:** Weather

**Cause:** Weather - High Temperatures

**Event Description:**

Beginning on Monday July 17 and lasting through Wednesday July 26, the western US experienced a widespread heat wave. Record or near record temperatures spread over the entire service territory except for coastal areas. Many areas set either all-time high record temperatures or exceeded records for consecutive days with temperatures above 100 degrees F.

Although there had been a number of heat-related outages since the beginning of the heat wave, the numbers were small until the extreme peak temperatures hit the area on July 22. Throughout the day on July 22, numerous heat-related distribution problems arose and continued to be a major problem until July 25. More than 1,270,000 customers have had power interrupted at one time or another. The primary cause is due to the overheating of some 1,207 transformers - mostly distribution pole-top and pad-mount transformers.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-CAMX

**Control Area ID:** CISO

**Date - Time:** 7/24/2006 2:33:00 PM PDT

**Year:** 2006 **Type:** PA

**Utility:** California Independent System Operator

**Category:** Weather

**Cause:** Weather - High Temperatures

**Event Description:**

At 10 am the areas Reliability Coordinator declared a Stage 1 alert due to high temperatures and demand. At 1 PM this was increased to Stage 2.. At 2:33 PM, the Reliability Coordinator called for the shedding of 855 MW of non-firm interruptible customers to reduce the load curve and preserve Operating Reserves. Specific loads were identified for selected utilities. Other actions taken included making public appeals and implementing a warning, alert, or contingency plan.

At 5:33 PM, all interrupted loads were restored. At 6:14 PM, the Stage 2 was downgraded to Stage 1. The Stage 1 was terminated at 9 PM.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-CAMX

**Control Area ID:** CISO

**Date - Time:** 7/24/2006 2:33:01 PM PDT

**Year:** 2006 **Type:** PA

**Utility:** California Independent System Operator

**Category:** Weather

**Cause:** Weather - High Temperatures

**Event Description:**

At 10 am on July 24, 2006 the areas Reliability Coordinator declared a Stage 1 alert due to high temperatures and demand. At 1 PM this was increased to Stage 2.. At 2:33 PM, the Reliability Coordinator called for the shedding of 504 MW of Interruptible Tariff Rate load at the subject utility to reduce the load curve and preserve Operating Reserves. The subject utility shed an estimate 414 MW of interruptible load. Other actions taken included making public appeals and implementing a warning, alert, or contingency plan.

At 5:33 PM, all interrupted loads were restored. At 6:14 PM, the Stage 2 was downgraded to Stage 1. The Stage 1 was terminated at 9 PM.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-NWPP

**Control Area ID:** BCTC

**Date - Time:** 7/24/2006 3:28:00 PM PDT

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

**Utility:** British Columbia Transmission Company

**Category:** Weather

**Cause:** Weather - Lightning - Islanding

**Event Description:**

Pre-disturbance, there were reports of lightning and thunderstorms in the area. A neighboring system was in a NERC Energy Emergency Alert Level 2 because of 800 MW of generation outages..

About 3:28 PM, the 500-kV line relayed due to a lightning strike and the control systems tripped a 138-kV line. This separated the adjacent system from the Interconnection. The control system then tripped 525 MW of generation at the initiating utility causing its frequency to decreased to 59.839 Hz from 60.007 Hz. No customer load was interrupted in the utility where the trip was initiated. A neighboring systems frequency dropped to 59.13 Hz, causing the Under-Frequency Load Shedding Scheme of 250 MW of customer load. About 3:33 PM, the neighboring utility declared an EEA Level 2, Alert 3 and issued a verbal directive to shed 400 MW of firm load.

At 3:44 PM, the tripped 500-kV and 138-kV lines were returned to service. Subsequently, at 3:54 PM all loads, including that at the neighboring utility, were restored.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-NWPP

**Control Area ID:** BPAT

**Date - Time:** 7/24/2006 3:28:32 PM PDT

**Year:** 2006    **Type:** UO

**Utility:** Bonneville Power Administration Transmission

**Category:** Equipment Failure

**Cause:** Equipment Failure - Transmission Line Fault

**Event Description:**

On July 24, 2006 at 3:28:32 PM, the line faulted and tripped to lockout. Prior to the incident the utilities transmission system was operating normally and there were no unusual or abnormal weather conditions. The transmission control system's Remedial Action Scheme (RAS) properly issued protective generator dropping 1,661 MW of generation, insertion of other predetermined protection schemes (braking resistors and shunt capacitors). Oscillations were noted on the system and these oscillations were dampened within 30-40 seconds. All generation was restored by 3:46 PM and no customer load was interrupted as a result of the event.

NOTE: A transmission outage that occurred about the same time at a neighboring system was not the cause or result of this event described herein.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-NWPP

**Control Area ID:** AESO

**Date - Time:** 7/25/2006 4:12:00 PM PDT

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

**Utility:** Alberta Electric System Operator

**Category:** Weather

**Cause:** Weather - Lightning - Islanding

**Event Description:**

Predisturbance system operating conditions were normal. The weather conditions included heavy lightning and rain.

Due to lightning strikes in the area, at 4:12 PM the 500 kV Line relayed due to lightning causing the utility to separate from the Interconnection. As a result of the relaying, a secondary 138 kV also relayed out. The frequency then went from 60.014 to 60.024. The Interconnection was delivering 250 MW at time of the line trip. However, no customers were affected and no customer demand was lost. At 4:23 PM, the connection to the Interconnection was synchronized.

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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:** MAIN

**Control Area ID:** MISO

**Date - Time:** 8/1/2006 10:47:00 AM EDT

**Year:** 2006 **Type:** PA

**Utility:** Midwest ISO

**Category:** Public Appeal

**Cause:** PA - Weather, High Temperatures

**Event Description:**

The Reliability Coordinator declared a regional Energy Emergency Alert 2 event effective immediately. The reason for this was the extremely high temperatures, peak loads, generation availability, and system conditions occurring today, Tuesday, August 1, 2006. Specific participants of the region and its sub-region were requested to enact NERC EEA Level 2, this includes:

- Curtailment of non-firm energy curtailments outside the market,
  - Public Appeals to reduce demand,
  - Voltage reduction where applicable,
  - Demand side management,
  - Utility load conservation measures, and
  - Interruption (shedding) of non-firm end use loads in accordance with applicable contracts.
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## 2006 - Disturbance Reports - Public

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**Region:** MAIN

**Control Area ID:** MISO

**Date - Time:** 8/1/2006 12:00:00 PM CDT

**Year:** 2006 **Type:** PA

**Utility:** Midwest ISO

**Category:** Public Appeal

**Cause:** PA - Weather, High Temperatures

**Event Description:**

The utility submitted a Public Appeal to reduce load after the Reliability Coordinator for the area declared an EEA Level 2 at 10:44 am. This EEA Level 2 was downgraded to EEA Level 1 at 5:38 PM, also on August 1.

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## 2006 - Disturbance Reports - Public

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**Region:** MAIN

**Control Area ID:** MISO

**Date - Time:** 8/2/2006 12:00:00 PM EDT

**Year:** 2006    **Type:** PA

**Utility:** Midwest ISO

**Category:** Public Appeal

**Cause:** PA - Weather, High Temperatures

**Event Description:**

The Reliability Coordinator declared a regional Energy Emergency Alert 2 event effective immediately. The reason for this was the extremely high temperatures, peak loads, generation availability, and system conditions occurring today, Tuesday, August 2, 2006. Specific participants of the region and its sub-region were requested to enact NERC EEA Level 2, this includes:

- Curtailment of non-firm energy curtailments outside the market,
  - Public Appeals to reduce demand,
  - Voltage reduction where applicable,
  - Demand side management,
  - Utility load conservation measures, and
  - Interruption (shedding) of non-firm end use loads in accordance with applicable contracts.
-

## 2006 - Disturbance Reports - Public

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**Region:** NPCC

**Control Area ID:** ISNE

**Date - Time:** 8/2/2006 1:00:00 PM EDT

**Year:** 2006 **Type:** VR

**Utility:** ISO New England Inc.

**Category:** Voltage Reduction

**Cause:** Weather - High Temperatures, Humidity

**Event Description:**

A generation capacity deficiency occurred on August 2nd due to a increased demand because of the regions high heat and high dew point. The Reliability Coordinator enacted NPCC OP#4, Level 12 which enacts a 5% region-wide voltage reduction. The OP#4, Action 12 was cancelled at 4:35 PM EST when the ambient temperatures and demand reduced.

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## 2006 - Disturbance Reports - Public

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**Region:** NPCC

**Control Area ID:** ISNE

**Date - Time:** 8/3/2006 1:10:00 AM EDT

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

**Utility:** ISO New England Inc.

**Category:** Equipment Failure

**Cause:** Equipment Failure - Transmission, Vegetation

**Event Description:**

At approximately 01:10 hr of August 3, 2006, a 345 kV transmission circuit tripped. Indications are that the line protection schemes did not properly clear the fault and the remote backup protection had to operate. That remote protection tripped resulting in the interruption of approximately 40 MW of load. The event caused the 115kV inter-area tie line to exceed its 15 minute emergency rating (STE) by 4 MVA for approximately one minute.

The utility operator closed the circuit breaker at approximately one minute after the initial event and the other area breakers at approximately two minutes after the event. The breakers for the 345 kV line closed automatically at approximately twelve minutes after the event. All load was restored within approximately 3 minutes after the event.

An aerial patrol did not reveal the reason for the trip. Fault recorder data suggests that a vegetation related fault developed on the line. The 345 kV transformer experienced a failed lightning arrester during this event and was out of service until approximately 2:00 PM that day.

The 345 kV line was de-rated as a precaution until additional line patrols were completed. This measure is to preclude a vegetation related fault.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-NWPP

**Control Area ID:** AESO

**Date - Time:** 8/10/2006 3:48:00 PM PDT

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

**Utility:** Alberta Electric System Operator

**Category:** Weather

**Cause:** Weather - Lightning - Islanding

### Event Description:

Prior to the disturbance system operating conditions were normal. The weather conditions included heavy lighting and rain.

At approximately 3:48 PM, The 500 kV path was tripped, thus opening and separating the utility system from the Interconnection. The line relayed (tripped) due to lightning strikes. Tripping of the line resulted in the tripping of associated 138-kV lines. The frequency deviated from a predisturbance level of 60.0 Hz to a maximum deviation of 59.79 Hz and recovered to normal in 6 minutes. This occurred due the interruption of a transfer of 210 MW of energy that was being delivered to affected utility.. The 138-kV interconnection was re-established at 4:25 PM. At 6:16 PM the 138-kV interconnection tripped again due to lightning. At 6:25 PM, 290 MW of generation was lost while the utilities system was again separated from the Interconnection. This time the frequency fell to 59.56 Hz and recovered to normal in 4 minutes. No load was lost in the Interconnection or the affected utility during either of the separations. The 138-kV transmission lines were returned to service at 6:39 PM. The Interconnection was returned to service at 6:39 PM.PDT. The 500-kV transmission line was returned to service the next day at 0:22 am.

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## 2006 - Disturbance Reports - Public

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**Region:** NPCC-HQ

**Control Area ID:** HQT

**Date - Time:** 8/19/2006 11:10:08 AM EDT

**Year:** 2006    **Type:** UO

**Utility:** Hydro-Quebec, TransEnergie

**Category:** Human Error

**Cause:** Human Error - Misoperation

**Event Description:**

The operator, while switching generators to follow new schedules on the asynchronous tie, inadvertently synchronized the utilities system with the adjacent , but not synchronized interconnection. The two systems remained synchronized during 57 seconds before the operator opened a breaker. The supervisory control system (ADR) dedicated to minimize the risk of such events was unavailable when these events occurred.

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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:** FRCC

**Control Area ID:** FPL

**Date - Time:** 9/15/2006 5:45:00 PM EST

**Year:** 2006    **Type:** UO

**Utility:** Florida Power & Light

**Category:** Weather

**Cause:** Weather - Lightning Storm

**Event Description:**

On September 15, 2006, an outage occurred during a severe lightning storm. The outage was caused by two lightning strikes. One directly to the system operations center and the other to the internal 138 kV system. System operations lost the UPS and ATS for the emergency generator. The 138 kV system lost two ABB microsheid relays. All damaged equipment has been replaced and tested.

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## 2006 - Disturbance Reports - Public

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**Region:** ERCOT

**Control Area ID:** ERCO

**Date - Time:** 9/28/2006 3:08:42 PM CDT

**Year:** 2006    **Type:** INT

**Utility:** ERCOT ISO

**Category:** Sys. Prot.

**Cause:** Special Protection

**Event Description:**

On September 28, 2006 at about 3:08 PM, a series of events occurred resulting in the activation of the circuits Special Protection Scheme.

Due to a planned clearance of a 345 kV bus, higher than normal flow was observed on the affected circuit. Several generating units in the area were on-line and two steam turbines were in the process of ramping to 300 MW at 1:50 PM. This caused the affected 345 kV circuit to ramp up, reaching the 90% alarm load level at 2:10 PM. The line continued to load up until it exceeded 100%, arming the SPS at 3:06:40 PM. The two steam generating should have begun to ramp down, but this did not happen. At 3:08:43 PM, the 345 kV breaker tripped, by the SPS as intended, disconnecting the affected 345 kV bus. The 345 kV breaker was re-closed at 3:32 PM after clearance from the area control center.

As a result of the incident, the frequency declined at two substation. This frequency dip triggered the shedding of 170 and 22 MW of interruptible load.

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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 severe thunderstorms 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:** WECC-CAMX

**Control Area ID:** CISO

**Date - Time:** 10/2/2006 3:05:00 PM PDT

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

**Utility:** California Independent System Operator

**Category:** Equipment Failure

**Cause:** Equipment Failure - Breaker

**Event Description:**

On October 2, 2006 at 3:05 PM, 308 MW of firm customer load on was interrupted when three substation banks (220/66 kV) each relayed on 66 kV local breaker failure backup protection. The action was the result of a significant fault occurring on the 66 kV subtransmission system. Approximately 130,000 customers were affected. Subsequent investigation determined that an unidentified individual started a small fire which then spread and burned under the 66 kV line, causing a flashover and the line to relay when overhead jumpers blew open as result of the fault. Firm load interrupted as result of system problem and load subsequently restored.

The individual who started the fire was reportedly apprehended by local law enforcement agency.

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## 2006 - Disturbance Reports - Public

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**Region:** ERCOT

**Control Area ID:** ERCO

**Date - Time:** 10/3/2006 5:28:00 PM CDT

**Year:** 2006    **Type:** UO

**Utility:** ERCOT ISO

**Category:** Equipment Failure

**Cause:** Equipment Failure - CCVT

**Event Description:**

On October 3, 2006, at 5:28 PM a CCVT located between breakers A and B at generating facility switchward exploded and debris caused the station to trip. A 345KV bus and several 345/138 Auto Transformers and associated lines were forced out service. Approximately 1,223 MWs was taken out of service and frequency dropped to 59.832.

At 5:35 PM Reliability Coordinator shed interruptable load to restore frequency. At 5:49 PM the local transmission operator shed partial distribution load due to transmission instability and voltage issues. At 5:55 PM additional load was requested off line maintain transmission system voltage. At 5:57 PM, the Reliability Coordinator was informed that the local transmission operator had started shedding load due to voltage instability. Approx. 185 MW of load was shed.

By 9:58 PM, all load was restored.

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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:** NPCC-Maritimes

**Control Area ID:** NBSC

**Date - Time:** 10/29/2006 10:53:00 AM AST

**Year:** 2006    **Type:** UO

**Utility:** New Brunswick - Canada

**Category:** Human Error

**Cause:** Human Error - Misoperation

**Event Description:**

On October 29, 2006, the possible misoperation (at 10:53 am) of a communications tripped three 345 kV and one 115 kV line. Another possible reason for the misoperation may be the fact that the communication line was struck by lightning (7:52 am) earlier that same day. Investigation of the cause of the incident are proceeding.

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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:** SERC

**Control Area ID:** SOCO

**Date - Time:** 11/15/2006 3:00:00 PM CST

**Year:** 2006    **Type:** UO

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

**Category:** Weather

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

**Event Description:**

On November 15, 2006 a major weather front, rain and high winds, moved across the utilities service area causing wide spread distribution system outages. Restoration and repair activities were enacted by the utility.

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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:** BPAT

**Date - Time:** 12/14/2006 9:44:00 AM PST

**Year:** 2006    **Type:** UO

**Utility:** Bonneville Power Administration Transmission

**Category:** Weather

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

**Event Description:**

In the morning of December 14, 2006, a major low pressure center moved up the coast causing a large wind storm to develop. This report summarizes outages to customers who were out of service at least 15 minutes in duration. All customers now have electrical service as of 4:44 PM the same day.

One of the utilities 230 KV transmission line is out of service and crews are working on this outage. This outage is not impacting electric service to customers. A failure of a 500 KV tower caused an outage to a 500 KV line. A stronger steel lattice tower structure is being fabricated. The line is scheduled to be repaired after December 25th.. This outage has been taken into account and the utility is operating in a reliable manner based on established studies and procedures.

During the disturbance, the utility did not exceed the DOE/NERC 300 MW reporting criteria. A review of the actual outages showed a total to this utility of 133 MW and losses of 233 MW to a neighboring utility to which generation is furnished. It is anticipated that the affected utility will submit their own OE417 report. Reacting to a question from DOE, this utility is voluntarily providing this report.

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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:** WECC-CAMX

**Control Area ID:** CISO

**Date - Time:** 12/16/2006 4:30:00 PM PST

**Year:** 2006    **Type:** UO

**Utility:** California Independent System Operator

**Category:** Equipment Failure

**Cause:** Equipment Failure -Transformer

**Event Description:**

On December 16, 2006 at 4:30 PM a 320 MVA - 230/115/13kV bulk transformer at a substation caught on fire. The fire continued to burn through the night under the supervision of local fire officials. The transformer had experienced a close-in low side fault during a major storm approximately 36 hours earlier.

Manual load shedding was initiated to 7 neighboring 115 kV and 12 neighboring 57 kV substations to clear the 230 kV and 115 kV busses at the affected substation. A total of 89 feeders were removed from service during the event.

The load restoration for substation feeders load shed was initiated following isolation of the transformer. All substation feeders opened during the course of this event were restored by 1 am December 17, 2006.

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## 2006 - Disturbance Reports - Public

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**Region:** ERCOT

**Control Area ID:** ERCO

**Date - Time:** 12/22/2006 3:25:00 PM CST

**Year:** 2006    **Type:** UO

**Utility:** ERCOT ISO

**Category:** Equipment Failure

**Cause:** Equipment Failure - Transformer

**Event Description:**

On December 22, 2006, at 2:59:11 am the main power transformer failed utility Generating Station A.. Prior to that the system was recovering from an interconnection disturbance when a switch tripped resulting in a loss of 202 MW import. Shortly after that, a loud bang was heard at Station A and a transient 10 kV drop in the 345 kV voltage was observed by plant operators. Two substations over at Station B tripped on undervoltage due to this transient voltage disturbance. Moments later, Stations C and D tripped on undervoltage. The Reliability Coordinator Load Acting as A Resource (LAAR) Ancillary Service Market for Responsive Reserve procedures. At 3:09:11am, 1,037 MW of LAAR had been deployed. At 3:03 am, Step 1 of the regions Emergency Electric Curtailment Plan (EECP) was declared, as physical responsive reserve was below its required limit. Total MW lost were 2,138 MW. At 3:48 am the Reliability Coordinator requested restoration of LAARs. At 4:07 am, EECP Step 1 was terminated.

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## 2006 - Disturbance Reports - Public

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**Region:** WECC-CAMX

**Control Area ID:** CISO

**Date - Time:** 12/26/2006 12:01:00 AM PST

**Year:** 2006    **Type:** UO

**Utility:** California Independent System Operator

**Category:** Weather

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

**Event Description:**

In the am of December 26, 2006, a strong storm struck the coast and brought heavy rains and strong winds to the coastal areas and significant snowfall and high winds to the mountains, witht lesser rainfall totals and winds to the central valley areas. The coastal areas were particularly hard hit as very strong winds continued long after the precipitation passed through. Approximately 850,000 customers lost power at one time or another, with no more than about 175,000 out at any one time.

The storm damaged 29 tsub-ransmission lines including 6 - 115 kV, 1 - 70 kV and 22 - 60 kV substations. Most of the damage resulted when trees were toppled by the high winds. However, two 115kV transmission lines were lost when three double-circuit towers collapsed in high winds. Temporary repairs have been made to one circuit of the double-circuit 115kV line and reconstruction of the three collapsed towers located within an environmentally sensitive area will be completed on January 31, 2007. Mutual Aide from other utilities was not required.

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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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