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April 1, 2011

**HAND DELIVERED**

Reggie Chaney  
Director of Engineering  
Public Service Commission of Kentucky  
211 Sower Boulevard  
Frankfort, Kentucky 40601

RECEIVED

APR 01 2011

PUBLIC SERVICE  
COMMISSION

Mark R. Overstreet  
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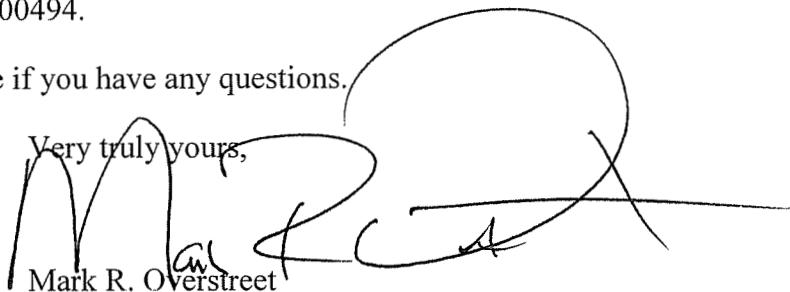
**RE: Kentucky Power Company – Electric Distribution Utility Annual Reliability Report**

Dear Mr. Chaney:

Enclosed please find Kentucky Power Company's filing in response to the Commission's October 26, 2006 Order in Case No. 2006-00494.

Please do not hesitate to contact me if you have any questions.

Very truly yours,



Mark R. Overstreet

cc: L.P. Munsey  
R.K. Wohnhas

**COMMONWEALTH OF KENTUCKY**  
**BEFORE THE**  
**PUBLIC SERVICE COMMISSION OF KENTUCKY**

**IN THE MATTER OF**

**AN INVESTIGATION OF THE RELIABILITY )**  
**MEASURES OF KENTUCKY'S JURISDICTIONAL )**  
**ELECTRIC DISTRIBUTION UTILITIES AND ) CASE NO. 2006-00494**  
**CERTAIN RELIABILITY MAINTENANCE PRACTICES )**

**KENTUCKY POWER COMPANY**

**RESPONSES TO COMMISSION ORDER DATED OCTOBER 26, 2007**

**April 1, 2011**

# KENTUCKY PUBLIC SERVICE COMMISSION

## Electric Distribution Utility Annual Reliability Report

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### SECTION 1: CONTACT INFORMATION

UTILITY NAME	1.1	<u>Kentucky Power Company</u>
REPORT PREPARED BY	1.2	<u>Everett G. Phillips</u>
E-MAIL ADDRESS OF PREPARER	1.3	<u>egphillips@aep.com</u>
PHONE NUMBER OF PREPARER	1.4	<u>606-929-1463</u>

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### SECTION 2: REPORT YEAR

CALENDAR YEAR OF REPORT	2.1	<u>2010</u>
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### SECTION 3: MAJOR EVENT DAYS

$T_{MED}$	3.1	<u>26.855</u>
FIRST DATE USED TO DETERMINE $T_{MED}$	3.2	<u>1-Jan-06</u>
LAST DATE USED TO DETERMINE $T_{MED}$	3.3	<u>31-Dec-10</u>
NUMBER OF MED IN REPORT YEAR	3.4	<u>4 days</u>

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NOTE: Per IEEE 1366  $T_{MED}$  should be calculated using the daily SAIDI values for the five prior years. If five years of data are not available, then utilities should use what is available until five years are accumulated.

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### SECTION 4: SYSTEM RELIABILITY RESULTS

Excluding MED

SAIDI	4.1	<u>418.4</u>
SAIFI	4.2	<u>2.47</u>
CAIDI	4.3	<u>169.4</u>

Including MED (Optional)

SAIDI	4.4	<u>572.5</u>
SAIFI	4.5	<u>2.751</u>
CAIDI	4.6	<u>208.1</u>

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#### Notes:

- 1) All duration indices (SAIDI, CAIDI) are to be reported in units of minutes.
  - 2) Reports are due on the first business day of April of each year
  - 3) Reports cover the calendar year ending in the December before the reports are due.
  - 4) IEEE 1366 (latest version) is used to define SAIDI, SAIFI, CAIDI, and  $T_{MED}$
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# KENTUCKY PUBLIC SERVICE COMMISSION

## Electric Distribution Utility Annual Reliability Report

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### SECTION 5: OUTAGE CAUSE CATEGORIES

Excluding MED

CAUSE CODE DESCRIPTION		SAIDI VALUE	CAUSE CODE DESCRIPTION		SAIFI VALUE
Veg Outside R/W	5.1.1	118.45	Equipment Failure	5.2.1	0.663
Equipment Failure	5.1.2	107.17	Veg Outside R/W	5.2.2	0.522
Veg Inside R/W	5.1.3	70.87	Veg Inside R/W	5.2.3	0.371
Scheduled	5.1.4	27.51	Scheduled	5.2.4	0.339
Vehicle Accident	5.1.5	24.15	Vehicle Accident	5.2.5	0.133
Lightning	5.1.6	15.22	Unknown (Non-Weather)	5.2.6	0.084
Unknown (Non-Weather)	5.1.7	12.67	Lightning	5.2.7	0.082
Weather-Unknown	5.1.8	6.87	Weather-Unknown	5.2.8	0.038
Flood/Slide	5.1.9	6.32	Tree Removal (Non-AEP)	5.2.9	0.033
Tree Removal (Non-AEP)	5.1.10	5.46	Scheduled (Outside Request)	5.2.10	0.028

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### SECTION 6: WORST PERFORMING CIRCUITS

CIRCUIT IDENTIFIER		SAIDI VALUE	MAJOR OUTAGE CATEGORY
3404002	6.1.1	4405.55	Tree Out of ROW
2150105	6.1.2	2346.88	Tree Out of ROW
3400702	6.1.3	2162.82	Weather-Flood/Slide
3303901	6.1.4	2018.57	Tree Out of ROW
3311102	6.1.5	1685.50	Equipment Failure
3409401	6.1.6	1601.40	Equipment Failure
3409402	6.1.7	1589.96	Equipment Failure
3301101	6.1.8	1411.94	Tree Out of ROW
3002101	6.1.9	1294.22	Unknown (Non-weather)
3200204	6.1.10	1149.35	Tree Inside ROW

CIRCUIT IDENTIFIER		SAIFI VALUE	MAJOR OUTAGE CATEGORY
3303901	6.2.1	11.273	Equipment Failure
3200204	6.2.2	9.369	Tree Inside ROW
3303902	6.2.3	8.716	Tree Out of ROW
3002101	6.2.4	6.554	Weather - Unknown
3413402	6.2.5	6.224	Weather -Lightning
3000801	6.2.6	6.156	Relay - Mis-operation
3404002	6.2.7	6.034	Tree Out of ROW
3413401	6.2.8	6.029	Weather - Lightning
3400701	6.2.9	5.803	Tree Out of ROW
3408303	6.2.10	5.786	Equipment Failure

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# KENTUCKY PUBLIC SERVICE COMMISSION

## Electric Distribution Utility Annual Reliability Report

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Additional pages may be attached as necessary

### SECTION 7: VEGETATION MANAGEMENT PLAN REVIEW

See attachments for details of Kentucky Power's Vegetation Management Plan:

- 2011 Kentucky Power Vegetation Management Plan.doc
- 2011 KYPCO Forestry PLAN.xls
- 2010 VM Plan Recap.xls

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### SECTION 8: UTILITY COMMENTS

System Reliability Results for each of the past 5 years is attached separately:

- System Reliability 5-Year Summary - Kentucky Power - 2010.xls

Worst Performing Circuit (WPC) analysis and plans are attached separately:

- 2010 KPCo WPC Analysis and Plans\_Ashland District.doc
- 2010 KPCo WPC Analysis and Plans\_Hazard District.doc
- 2010 KPCo WPC Analysis and Plans\_Pikeville District.doc

## 2011 Kentucky Power Distribution Vegetation Management Plan

The 2011 Vegetation Management Plan will focus on Full-Circuit Reclearing. Reclearing work will be prioritized and scheduled based on past tree-related reliability performance, field inspection of the right-of-way conditions, and the number of customers impacted. Some reclearing will be performed on selected Feeder Breaker Zones and Recloser/Sectionalizer Zones that impact large numbers of customers. Mitigating tree-caused outages in these areas will provide the optimum impact on reducing SAIFI. Some line segments that have experienced repeated tree-caused outages in 2010 will also be included in the 2011 Plan. Approximately \$1,591,670 will be earmarked to address reactive reliability issues that develop throughout the year. This Unscheduled/Reactive funding represents about eight percent of the total Vegetation Management Budget.

Judicious use of herbicides is an important component of Kentucky Power's Vegetation Management Plan. ULV (Ultra Low Volume), high-volume foliar, basal, cut-surface, and aerial application techniques will be utilized depending on the brush conditions. The goal is to treat 2,006 acres of brush in 2011.

The 2011 Kentucky Power Distribution Management Plan projection for the three districts in its service territory is:

### 2011 KENTUCKY POWER DISTRIBUTION VEGETATION MANAGEMENT PLAN

AREA	PLANNED MILES	PLANNED SPRAY ACRES	FORESTRY CAPITAL FUNDING	UNSCHEDULED REACTIVE O&M FUNDING	SCHEDULED O&M FUNDING	TOTAL O&M FUNDING	TOTAL VMP FUNDING
HAZARD	1,022	1,062	\$900,000	\$505,789	\$5,506,366	\$6,012,155	\$6,912,155
PIKEVILLE	833	619	\$1,022,500	\$761,301	\$6,475,797	\$7,237,098	\$8,259,598
ASHLAND	440	325	\$577,500	\$324,581	\$3,626,166	\$3,950,747	\$4,528,247
TOTALS	2,295	2,006	\$2,500,000	\$1,591,670	\$15,608,330	\$17,200,000	\$19,700,000

Kentucky Power Company				
2011				
Distribution Vegetation Management O&M Forestry Plan-Summary				
ACTIVITY	Total O&M	Pikeville	Hazard	Ashland
RECLEARING	\$13,725,570	\$5,893,870	\$4,646,700	\$3,185,000
GROUND SPRAY	\$1,152,500	\$350,000	\$600,000	\$202,500
AERIAL SPRAY	\$30,260	\$1,260	\$29,000	\$0
AERIAL SAW	\$0			
Unscheduled/Reactive Maintenance	\$1,591,670	\$761,301	\$505,789	\$324,581
CONTRACT FORESTERS	\$204,000	\$68,000	\$68,000	\$68,000
STUMP GRINDING PROGRAM	\$8,000			\$8,000
TREE REPLACEMENT PROGRAM	\$24,000	\$8,000	\$8,000	\$8,000
KPI INCENTIVE PROGRAM-Asplundh Field Personnel	\$260,000	\$86,667	\$86,666	\$86,666
INTERNAL-Existing KY Forestry Staff	\$204,000	\$68,000	\$68,000	\$68,000
<b>TOTAL</b>	<b>\$17,200,000</b>	<b>\$7,237,098</b>	<b>\$6,012,155</b>	<b>\$3,950,747</b>
September 30, 2009 O&M Test Year Level	\$7,200,000			
Settlement O&M Incremental Level	\$10,000,000			
Total Annual O&M Distribution Vegetation	\$17,200,000			
Forestry Capital	\$2,500,000	\$1,022,500	\$900,000	\$577,500
Total KYPCO Forestry Budget	\$19,700,000	\$8,259,598	\$6,912,155	\$4,528,247
Reclearing, Aerial Saw and Spray Miles				
Pikeville	833			
Hazard	1,022			
Ashland	440			
<b>Total</b>	<b>2,295</b>			

## 2011 KYPKO DISTRIBUTION VEGETATION MANAGEMENT PLAN

RECLEARING PLAN		STATION NAME		CIRCUIT NAME		CIRCUIT NUMBER		LINE MILES		MILES PLANNED		O&M		DBX Assoc w/ Reclear		PROJECTED O&M COST per MILE		TOTAL COST		COMMENTS	
DISTRICT	STATION NAME	CIRCUIT NAME	CIRCUIT NUMBER	LINE MILES	MILES PLANNED	O&M	DBX Assoc w/ Reclear	PROJECTED O&M COST per MILE	TOTAL COST	COMMENTS											
PKV	Sidney	Coburn Mountain	3404302	49	15	\$240,000	\$40,800	16,000	\$280,800	Finish Full Circuit Reclear											
PKV	Barrenshee	Vulcan	3200202	49	49	\$980,000	\$166,600	20,000	\$1,146,600	Full Circuit Reclear											
PKV	Spigg	Matewan	2150105	1	1	\$15,600	\$2,652	12,000	\$18,252	Station Zone											
PKV	Dewey	Inez	3411401	169	30	\$600,000	\$100,547	20,000	\$700,547	Lower Rockcastle Feeds											
PKV	Draffin	Yellow Hill	3400702	12	6	\$96,000	\$16,320	16,000	\$112,320	Finish Full Circuit Reclear											
PKV	Feds Creek	Feds Creek	3409401	41	10	\$180,000	\$30,600	18,000	\$210,600	Finish Full Circuit Reclear											
PKV	Fishtrap	Distribution	3414901	5	5	\$38,400	\$6,528	8,000	\$44,928	Full Circuit Reclear											
PKV	Fords Branch	Shelby	3411901	39	39	\$507,000	\$86,190	13,000	\$593,190	Full Circuit Reclear											
PKV	Fords Branch	Robinson Creek	3411902	56	40	\$400,000	\$68,000	10,000	\$468,000	Finish Full Circuit Reclear											
PKV	Elwood	Dorton	3401001	44	44	\$209,536	\$42,917		\$252,453	Full Circuit Reclear - BID											
PKV	Elwood	Virgie	3401002	69	69	\$290,119	\$59,421		\$349,540	Full Circuit Reclear - BID											
PKV	Johns Creek	Meta	3411801	158	5	\$60,000	\$10,200	12,000	\$70,200	Hedge Rd. Recloser Zone											
PKV	Burdine	Levisa	3409502	39	39	\$702,000	\$119,340	18,000	\$821,340	Full Circuit Reclear											
PKV	Coleman	Peter Creek	3408303	72	28	\$496,800	\$84,456	18,000	\$581,256	Partial											
PKV	Kenwood	Hagerhill	3409303	51	51	\$612,000	\$104,040	12,000	\$716,040	Full Circuit Reclear											
PKV	Second Fork	Distribution	3403801	2	1	\$8,000	\$1,360	8,000	\$9,360	Feeder Breaker Zone											
PKV	Hurley	Racefork	2970603	6	6	\$120,000	\$20,400	20,000	\$140,400	Paw Paw Creek											
PKV	Elkhorn	Grassy	3400902	6	2	\$17,600	\$2,992	8,000	\$20,592	Station Zone											
PKV	Betsy Layne	Harold	3400303	48	3	\$52,700	\$8,959	17,000	\$61,659	Pennook Conversion Project											
PKV	Betsy Layne	Mud Creek	3400301		8	\$139,400	\$23,698	17,000	\$163,098	Toler Creek Conversion Project											
PKV	Johns Creek	Raccoon	3411802		5	\$59,275	\$10,077	11,855	\$69,352	Grassy Creek Conversion Project											
PKV	South Pikeville	Pikeville	3410501	1	1	\$9,440	\$1,605	8,000	\$11,045	Station Zone											
PKV	Allen	Distribution	3400101	38	5	\$60,000	\$10,200	12,000	\$70,200	Finish Full Circuit Reclear											
HAZ	Stinnett	Redbird	3311101	116	116	\$1,508,000	\$271,440	\$13,000	\$1,779,440	Full Circuit Reclear											
HAZ	Stinnett	Beech Fork	3311102	10	10	\$100,000	\$18,000	\$10,000	\$118,000	Full Circuit Reclear											
HAZ	Hazard	Wendover	3311103	36	0	\$0	\$0	\$12,000	\$0	Full Circuit Reclear - DEFERRED											
HAZ	Reedy	Blackgold	3302701		2.5	\$30,000	\$5,400	\$12,000	\$35,400	finish Full Circuit Reclear											
HAZ	Whitesburg	Deane	3311401		11.0	\$126,000	\$22,680	\$11,455	\$148,679	Quality-of-Service Work											
HAZ	Mayking	Crafts Colley	3309104		15	\$180,000	\$32,400	\$12,000	\$212,400	finish Full Circuit Reclear											
HAZ	Beckham	Millstone	3314401		8	\$96,000	\$17,280	\$12,000	\$113,280	finish Full Circuit Reclear											
HAZ	Combs	Hindman	3308401		75	\$862,500	\$155,119	\$11,500	\$1,017,619	Full Circuit Reclear											
HAZ	Combs	Combs	3301401		9	\$93,000	\$16,740	\$10,000	\$109,740	Full Circuit Reclear											
HAZ	Collier	Airport Gardens	3301402		41	\$492,000	\$88,560	\$12,000	\$580,560	Full Circuit Reclear											
HAZ	Leslie	Lower Rockhouse	3308602		70	\$840,000	\$151,200	\$12,000	\$991,200	Full Circuit Reclear											
HAZ	Bluegrass	Wootton	3303902		4	\$51,600	\$9,288	\$12,000	\$60,888	Recloser Zone, mouth of Cutshin											
HAZ	Softshell	Walkertown	3306601		28	\$36,000	\$6,480	\$10,000	\$42,480	Second Zone											
HAZ	Softshell	Leburn	3420002		49	\$39,600	\$7,128	\$12,000	\$46,728	Recloser Zone, Possum Trof/Wiley Br											
HAZ	Jeff	Viper	3200001		54	\$108,000	\$19,440	\$12,000	\$127,440	Recloser at Mid. Fk/Lft Fk intersection											
ASH	Big Sandy	Fallsburg	3000201		156	\$975,000	\$121,875	13,000	\$1,096,875	Full Circuit Reclear											
ASH	Gray's Branch	Gray's Branch	3000701		66	\$819,000	\$102,375	13,000	\$921,375	Full Circuit Reclear											
ASH	Olive Hill	Globe	3103101		117	\$975,000	\$121,875	13,000	\$1,096,875	Full Circuit Reclear											
ASH	47th Street	39th Street	3008002		13	\$143,000	\$17,875	13,000	\$160,875	Full Circuit Reclear											
ASH	Bellfonte	Westwood	3000302		23	\$273,000	\$27,300	13,000	\$300,300	Full Circuit Reclear											
<b>RECLEARING TOTALS</b>									<b>\$15,690,246</b>												



**DISTRIBUTION VEGETATION MANAGEMENT SPRAY PLAN**

**KYPCO 2011**

<b>DISTRICT</b>	<b>SPRAY MILES</b>	<b>ACRES</b>	<b>O&amp;M BUDGET</b>
PKV	371	619	\$350,000
HAZ	637	1062	\$600,000
ASH	195	325	\$202,500
<b>Totals</b>	<b>1203</b>	<b>2006</b>	<b>\$1,152,500</b>

## 2010 KENTUCKY POWER DISTRIBUTION VEGETATION MANAGEMENT RECAP

AREA	PLANNED MILES	ACTUAL MILES	PLANNED SPRAY ACRES	ACTUAL SPRAY ACRES	FORESTRY CAPITAL FUNDING	FORESTRY CAPITAL EXPENDITURES	UNSCHEDULED REACTIVE O&M FUNDING	UNSCHEDULED REACTIVE O&M EXPENDITURES
HAZARD	703	673	987	1030	\$ 364,726	\$ 295,872	\$ 208,790	\$ 356,870
PIKEVILLE	666	619	707	726	\$ 396,128	\$ 420,304	\$ 225,646	\$ 342,037
ASHLAND	325	277	408	365	\$ 286,246	\$ 377,698	\$ 111,232	\$ 150,398
TOTALS	1694	1569	2102	2121	\$ 1,047,100	\$ 1,093,874	\$ 545,668	\$ 849,305

AREA	SCHEDULED O&M FUNDING	SCHEDULED O&M EXPENDITURES	TOTAL O&M FUNDING	TOTAL O&M EXPENDITURES	TOTAL VMP FUNDING	TOTAL VMP EXPENDITURES
HAZARD	\$ 3,800,831	\$ 3,818,644	\$ 4,009,621	\$ 4,175,514	\$ 4,374,347	\$ 4,471,386
PIKEVILLE	\$ 4,129,632	\$ 4,598,917	\$ 4,355,278	\$ 4,940,954	\$ 4,751,406	\$ 5,361,258
ASHLAND	\$ 3,034,247	\$ 2,951,659	\$ 3,145,479	\$ 3,102,057	\$ 3,431,725	\$ 3,479,755
TOTALS	\$ 10,964,710	\$ 11,369,220	\$ 11,521,900	\$ 12,218,525	\$ 12,557,478	\$ 13,312,399

*Note: Expenditures represent Outside Services & Materials supplied by contractor only. The value is not directly comparable to the \$13,830,897 total O&M and Capital VMP expenditures reported in Case No, 2009-00459, which also includes company labor, fleet, overheads, company purchased materials and employee expenses.*

# Kentucky Power Company

## 5-Year System Performance

(Excluding Major Events as defined by IEEE Std 1366)

Calendar Year	SAIFI	CAIDI	SAIDI
2006	2.756	182.2	502.1
2007	2.276	146.9	334.2
2008	2.904	170.9	496.3
2009	2.556	194.5	497.1
2010	2.470	169.4	418.4

# Kentucky Power Company

## 2010 WORST PERFORMING CIRCUITS

### Analysis of Causes/Corrective Actions

#### Ashland District

##### 10<sup>th</sup> Street – 6<sup>th</sup> Street 12kV Circuit (3002101 – SAIFI #4, SAIDI #9)

Over 96% of the Customers Interrupted (SAIFI) can be accounted for by three breaker outages and two station transformer outages.

On July 12 and July 21, breaker outages were coded as Weather – Unknown. Lines were patrolled and nothing was found on the distribution lines. A few days after the second outage crews were sent to do a pole by pole inspection on the circuit and nothing was found. Two sets of fault indicators were installed to help determine the cause of any future occurrences.

On August 14, the station transformer failed at 10<sup>th</sup> Street and the 6<sup>th</sup> Street Circuit was out for nearly 11 hours. Since this area is summer peaking, load was carefully transferred over to other sources and circuits as the mobile transformer was put into service.

On October 26, while customers were transferred over to Bellefonte station – due to the prior transformer failure, one of the breakers at Bellefonte failed to open during a fault and took out Bellefonte station transformer.

On October 30, Tenth Street mobile transformer locked out as the instantaneous relay on the mobile transformer miscoordinated with one of the distribution breakers at Tenth Street.

#### Corrective Actions

Since the transformer failure, inspections were completed on the enclosed breaker, and it was determined that the 10<sup>th</sup> Street/6<sup>th</sup> Street breaker had taken a lightning strike. Repairs have been made, and additional lightning arresters have been added on the underground circuit exit. At this time no further action is recommended.

##### Hayward Station – Haldeman 12kV Circuit (3000801 -- SAIFI #6)

Over 80% of the Customers Interrupted (SAIFI) can be accounted for by five feeder breaker outages due to station equipment.

## Ashland District

On March 4, 2010 DGA levels on our existing station transformer were at such a high level that a mobile transformer was installed. Due to safety concerns and spacing, the station department requested a station outage to close in the mobile transformer rather than parallel the two transformers.

On March 31, the mobile transformer's secondary service transformer failed and had to be replaced. The load was transferred back over to the station transformer until repairs could be completed.

Later in the afternoon on March 31, customers were interrupted and put back on the mobile transformer.

On May 24, after the manufacturer's recommended maintenance work had been completed on the station transformer, an outage was necessary to remove the mobile transformer and put customers back on the station transformer.

On August 20, there was a relay mis-operation when a tree fell on the Hayward Lawton circuit close to the station and opened up the transrupters, or vacuum circuit switches, on the primary side of the transformers. Relays were replaced in 2005, and this setting was overlooked on the primary side causing the mis-operation.

The other 1.141 of Customers Interrupted (SAIFI) were accounted for by outages on the 110 plus circuit miles of distribution line.

### Corrective Actions

At this time no further action is recommended.

# Kentucky Power Company

## 2010 WORST PERFORMING CIRCUITS

### Analysis of Causes/Corrective Actions

#### Hazard District

#### Leslie Station – Hyden 34.5kV Circuit (3303901 – SAIFI #1, SAIDI #4)

Leslie Hyden appears on both the top 10 worst performing circuits lists by SAIFI and SAIDI in 2010. This circuit had experienced seven station related outages. These outages alone contributed to 39% of the total customer minutes interrupted on the Leslie Hyden circuit.

Below is a table summarizing the seven outages that occurred at the station.

Interruption Start Date	Major-Minor Cause	Clearing Device	Outage Duration (min)	Total Customers Affected	Total Customer Minutes
2/22/2010	EQUIPMENT FAILURE	Station	248	982	123,242
2/22/2010	EQUIPMENT FAILURE	Station	100	982	98,200
3/1/2010	SCHEDULED COMPANY	Station	14	978	13,692
5/16/2010	TREE OUT OF ROW	Station	194	973	188,762
12/16/2010	EQUIPMENT FAILURE	Station	49	967	47,383
12/16/2010	EQUIPMENT FAILURE	Station	413	967	304,958
5/16/2010	TREE OUT OF ROW	Station	10	958	9,580

Of the outages listed above, two were caused by trees taking out the transmission line and two are attributed to a transformer failure in the station itself.

Of the 95 different outages experienced by the Leslie Hyden circuit, 57 outages were caused by tree related issues (including the two transmission line outages). These tree related outages contribute 60% percent of the total customer minutes interrupted. The second largest contributing factor to the customer minutes interrupted (CMI) has been equipment failure which accounts for 16% of the total CMI.

#### Corrective Actions

In order to reduce the tree issues, several problem areas on this circuit have already been patrolled by vegetation management. In the summer of 2010, these problem areas were cleared of many trees that could cause an outage. Also, in December of 2010, a

## Hazard District

large section of line was also taken care of by cutting down several trees that had a potential of falling across the lines.

In the fall of 2010, a large section of line was rebuilt. This line was composed of old copper conductor that was beginning to deteriorate and cause problems. During this line rebuild, several deteriorated poles were also replaced.

In 2011, a larger station transformer will be installed and the station regulators will be replaced with larger ones. This will increase the capacity of the Leslie station and will reduce the likelihood of another transformer failure in the near future.

Also in 2011, an infrared camera will be used to inspect devices within the first breaker zone of the Leslie Hyden circuit. Hot spots will be identified on switches, fuses, and other equipment that may be located within the first breaker zone. The infrared camera will also be used during the recloser, capacitor, and regulator inspections to check for hot spots on such equipment.

### **Leslie Station – Wooton 34.5kV Circuit (3303902 – SAIFI #3)**

Leslie Wooton is a large circuit serving 1,827 customers. The Wooton Circuit, like the Hyden Circuit, has been affected by several station outages. Out of the seven station outages, two were caused by trees taking out the transmission line, one is attributed to a transformer failure in the station itself, one was scheduled by the company in order to place a mobile transformer unit at the station in order to correct out of phase switching, and one was caused by a coordination issue with a recloser and the installed mobile unit at the Leslie Station.

Out of the 131 outages experienced on the Leslie Wooton circuit, 45 outages were caused by trees inside the right of way (about 34%), and 25 were caused by equipment failure (about 19%).

#### Corrective Actions

The station transformer and the station regulators will be replaced with larger units in 2011. This will increase the capacity of the Leslie station and will reduce the likelihood of another transformer failure in the near future.

In 2011, four miles of right of way is planned for reclearing which includes the breaker zone and a targeted trouble area. This right of way maintenance work will reduce the number of outages caused by trees inside the right of way experienced by the Leslie Wooton Circuit.

Also in 2011, an infrared camera will be used to inspect devices within the first breaker zone of the Leslie Wooton circuit. Hot spots will be identified on switches, fuses, and other equipment that may be located within the first breaker zone. The infrared camera will also be used during the recloser, capacitor, and regulator inspections to check for hot spots on such equipment.

Hazard District

**Stinnett Station – Beechfork 34KV Circuit (3311102– SAIDI # 5)**

Stinnett Beechfork is a dedicated circuit serving only a few customers. Any outage involving the station for any significant amount of time will greatly add to the SAIDI.

The table below lists all the outages that occurred on the Stinnett Station.

<b>Minor Cause Name</b>	<b>Occurrences</b>	<b>Total Customer Minutes of Interruption</b>
SCHEDULED COMPANY	1	472
TREE OUT OF ROW	1	680
SCHEDULED COMPANY	1	1,000
EQUIPMENT FAILURE	1	4,590

This circuit made it on the top ten worst performing circuits list because of one outage in particular. Equipment failure occurred in the station which resulted in transmission structure damage. Due to the long repair time, this outage accounts for 4,590 customer minutes of interruption or 68% of the total customer minutes of interruption experienced by the Stinnett Beechfork circuit.

Corrective Actions

Due to the rarity of the outage mentioned above, no corrective action is needed for this circuit.

**Chavies Station – Chavies 12KV Circuit (3301101 – SAIDI # 8)**

A little over 69% of the total customer minutes of interruption on the Chavies Chavies circuit were caused by trees inside or trees outside of the ROW.

The largest outage based on customer minutes interrupted occurred in April when a forest fire ignited one of our power poles. This outage contributed 106,106 minutes (about 10%) of the customer minutes interrupted. An outage of this nature is rare and is unlikely to occur again in the near future.

Corrective Actions

Most of the right of way issues for this circuit were addressed in 2010. In mid 2010, the right of way in the first breaker zone was re-cleared. In November of 2010, a targeted trouble area was also re-cleared. Since this was the source of most tree related outages, the right of way maintenance work on these sections of line should greatly reduce the future tree related outages on the Chavies Chavies circuit.

The Chavies Chavies circuit is also part of Hazard’s distribution automation plan for the Buckhorn area. In this plan the Haddix Canoe circuit will be able to automatically, with the aid of precise electronic devices, pick up load from the Chavies Chavies circuit in the event that power is lost in particular areas (and vice versa). This quick restoration process will help to reduce the customer minutes interrupted and thus will also reduce the SAIDI for this circuit.



# Kentucky Power Company

## 2010 WORST PERFORMING CIRCUITS

### Analysis of Causes/Corrective Actions

#### Pikeville District

##### Spring Fork Station – Single Phase 12kV Circuit (3404002 - SAIDI #1, SAIFI #7)

The Spring Fork Distribution circuit is on both the SAIDI and SAIFI worst performing circuits list. This circuit serves 29 customers. There were only seven outages on this circuit in 2010, each having a different cause. Six of these outages affected all customers on the circuit. Five of the outages involved problems on the transmission line and account for 94% of the CMI and 83% of the total number of customers interrupted.

Due to the nature of the transmission outages (insulator failure, brush fire, trees outside of right-of-way (ROW), scheduled outage to replace deteriorated poles and lightning) very few corrective actions are being recommended.

#### Corrective Actions

1. The LEAD equipment (a tool which detects electromagnetic interference generally associated with arcing or tracking and thereby enables us to find failing equipment) and infrared (FLIR) camera (used to detect components which are heating up and subject to imminent failure) will be used to inspect the distribution circuit and portions of the radial transmission line serving this station.
2. We will work with the transmission organization to ensure that adequate lightning protection is in place on the transmission equipment.

##### Sprigg Station – Matewan 34kV Circuit (2150105 - SAIDI #2)

The major contributor to outages for this circuit is trees outside of ROW. This cause contributed 90% of the total Customer Minutes Interrupted (CMI) related to this circuit during 2010.

#### Corrective Actions

1. In 2011, the Station Zone on this circuit will be re-cleared, including hazard trees outside of ROW. This plan will greatly aid in the prevention of some of the tree related outages that have occurred in the feeder breaker zone.
2. Also in 2011, the LEAD survey tool and FLIR will be utilized to identify deteriorating equipment for replacement.

## Pikeville District

3. A tie-line with the Barrenshe-Pounding Mill Circuit will be constructed in 2011. This will help reduce the length of outages for many customers since we will be able to transfer them to another power source during outage situations.

### **Draffin Station – Yellow Hill 12kV Circuit (3400702 - SAIDI #3)**

The major contributors to outages for this circuit are Weather-flood/slide and Equipment Failure. These two causes have contributed 84% of the total Customer Minutes Interrupted (CMI) on this circuit during 2010.

There were four separate outages that occurred on this circuit in the aftermath of flooding that contributed almost 62% of the total CMI in 2010. Some of these outages took a longer time to restore due to the severity of weather conditions and access problems.

#### Corrective Actions

Although the Company cannot prevent future flooding, we do plan to make these adjustments to improve reliability on this circuit:

1. In 2011, the LEAD survey tool and FLIR will be utilized to identify deteriorating equipment for replacement.
2. Improve sectionalizing to limit outages to as few customers as possible.
3. The Forestry Department has scheduled to do a full circuit re-clearing which began in 2010 and will be completed in 2011.

### **Feds Creek Station – Feds Creek 12kV Circuit (3409401 - SAIDI #6)**

Two outages on this circuit accounted for 91% of the total Customer Minutes of Interruption (CMI). These outages were due to equipment failure on the transmission line and a vehicle accident. The rarity of these two outages indicates no need for corrective actions to prevent future occurrences.

Tree in the ROW and Failed Equipment accounted for only 7.6% of the CMI however they did contribute 75% of the total number of outages.

#### Corrective Actions

1. In 2011, the LEAD survey tool and FLIR will be utilized to identify deteriorating equipment for replacement.
2. Feds Creek- Feds Creek circuit is also in the Pikeville District Forestry Work Plan. Full circuit re-clearing began in 2010, and is scheduled to be completed in 2011. These actions should prevent tree related outages on this circuit in the coming year.

**Feds Creek Station – Lick Creek 12kV Circuit (3409402 - SAIDI #7)**

Equipment Failure, Trees Outside of ROW, and Trees Inside ROW contributed 99.7% of the CMI for the Lick Creek circuit in 2010.

**Corrective Actions**

1. In 2011, the LEAD survey tool and FLIR will be utilized to identify deteriorating equipment for replacement.
2. Late in 2010, the Forestry group completed re-clearing of the Lick Creek circuit. This 2010 work should prevent trees from being a problem in 2011.

**Barrenshe Station – Pounding Mill 12kV Circuit (3200204 - SAIDI #10, SAIFI #2)**

The Barrenshe-Pounding Mill Circuit made the worst performing list for SAIDI and SAIFI due to tree-related and equipment failure outages. These two outage causes accounted for 77% of the CMI and 76% of the SAIFI.

**Corrective Actions**

1. In 2011, the LEAD survey tool and FLIR will be utilized to identify deteriorating equipment for replacement.
2. The entire circuit will be evaluated for additional sectionalizing to minimize the number of customers affected by any one outage.
3. Hotspot tree trimming work was performed on Peter Fork near McCarr to resolve a Repeat Outage issue that occurred on this circuit in 2010. Review of this circuit indicates that no other vegetation management work is required at this time.

**Garrett Station – Lackey 12kV Circuit (3413402 - SAIFI #5)**

Four transmission-related outages caused 67% of the SAIFI for this circuit. Two of these outages were due to lightning and one was due to fire.

**Corrective Actions**

1. Continue to use LEAD survey tool and FLIR to identify and replace any deteriorated equipment.
2. Transmission has been requested to investigate the lightning outages and take appropriate action to correct any problems found.

Pikeville District

**Garrett Station – Garrett 12kV Circuit (3413401 - SAIFI #8)**

Four transmission-related outages caused 59% of the SAIFI for this circuit. Two of these outages were due to lightning and one was due to fire.

**Corrective Actions**

1. Continue to use LEAD survey tool and FLIR to identify and replace any deteriorated equipment.
2. Transmission is being requested to investigate the lightning outages and take appropriate action to correct any problems found.

**Draffin Station – Belcher 12kV Circuit (3400701 - SAIFI #9)**

Trees inside and outside of ROW account for 45% of the total customers affected in 2010. In addition, equipment failure accounted for 18% of customers affected.

**Corrective Actions**

1. In 2011, the LEAD survey tool and FLIR will be utilized to identify and replace deteriorated equipment.
2. Hotspot tree trimming work was completed on Harless Creek and Jimmies Creek in 2010.
3. This circuit will be evaluated for additional sectionalizing work in 2011.

**Coleman Station – Peter Creek 34kV Circuit (3408303 - SAIFI #10)**

Tree related outages were the major cause for this circuit being on the SAIFI worst performing list. There were 43 tree related outage cases which affected 3,722 customers and contributed 37% of the total customers affected on this circuit in 2010. There were also 26 equipment failure outage cases which contributed 31% of the total customers affected.

**Corrective Actions**

1. In 2010, vegetation management was performed on 44 miles of this circuit and another 28 miles are planned for re-clearing in 2011.
2. Use the LEAD survey tool and FLIR to identify and replace deteriorating equipment.
3. A portion of this circuit was rebuilt in 2010 as part of a plan to serve a new large customer. In addition to this rebuild, we plan to install a second 34.5 kV breaker in Coleman Station and split the distribution circuit into two circuits. This will reduce the exposure of the 1,723 customers served by this circuit and should improve overall reliability.