RECEIVED

APR 13 2007

PUBLIC SERVICE
COMMISSION

# COMMONWEALTH OF KENTUCKY

# BEFORE THE

# PUBLIC SERVICE COMMISSION OF KENTUCKY

**IN THE MATTER OF**

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

**DIRECT TESTIMONY AND EXHIBITS OF**
**EVERETT G. PHILLIPS**

**ON BEHALF OF**

**KENTUCKY POWER COMPANY**

**April 13, 2007**

STITES & HARBISON PLLC
ATTORNEYS

421 West Main Street
Post Office Box 634
Frankfort, KY 40602-0634
[502] 223-3477
[502] 223-4124 Fax
www.stites.com

RECEIVED

APR 13 2007

PUBLIC SERVICE COMMISSION

April 13, 2007

Mark R. Overstreet
(502) 209-1219
(502) 223-4387 FAX
moverstreet@stites.com

**HAND DELIVERED**

Ms. Beth O'Donnell
Executive Director
Public Service Commission of Kentucky
211 Sower Boulevard
P.O. Box 615
Frankfort, Kentucky 40602-0615

**RE:** ***P.S.C. Case No. 2006-00494***

Dear Ms. O'Donnell:

Please find enclosed and accept for filing the original and six copies of the testimony of Everett Phillips filed on behalf of Kentucky Power Company. Copies are being served on all persons on the attached service list.

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

Very truly yours,

Mark R. Overstreet

cc: Persons on Attached List

KE057:KE188:15324:2:FRANKFORT

**CERTIFICATE OF SERVICE – PSC CASE NO. 2006-00494**

Allen Anderson
South Kentucky R.E.C.C.
P.O. Box 910
Somerset, Kentucky 42502-0910

Mark A. Bailey
Kenergy Corp.
P.O. Box 1389
Owensboro, Kentucky 42302

Rick LoveKemp
KU and LG&E
% Louisville Gas & Electric Co.
P.O. Box 32010
Louisville, Kentucky 40232-2010

Debbie Martin
Shelby Energy Cooperative, Inc.
620 Old Finchville Road
Shelbyville, KY 40065

Michael I. Williams
Blue Grass Energy Cooperative Corp.
P.O. Box 990
Nicholasville, Kentucky 40340-0990

Jackie B. Browning
Farmers R.E.C.C.
P.O. Box 1298
Glasgow, Kentucky 42141-1298

Sharon K. Carson
Jackson Energy Cooperative
115 Jackson Energy Lane
McKee, Kentucky 40447

John J. Finnigan
Duke Energy Kentucky, Inc.
139 East Fourth Street
Cincinnati, Ohio 45202

Paul G. Embs
Clark Energy Cooperative, Inc.
P.O. Box 748
Winchester, Kentucky 40392-0748

Carol H. Farley
Grayson R.E.C.C.
109 Bagby Park
Grayson, Kentucky 41143

Ted Hampton
Cumberland Valley Electric, Inc.
Highway 25E
P.O. Box 440
Gray, Kentucky 40734

Larry Hicks
Salt River Electric Cooperative Corp.
111 West Brashear Avenue
P.O. Box 609
Bardstown, Kentucky 40004

Kerry K. Howard
Licking Valley R.E.C.C.
P.O. Box 605
West Liberty, Kentucky 41472

James L. Jacobus
Inter-County Energy Cooperative Corp.
P.O. Box 87
Danville, Kentucky 40423-0087

Robert Hood
Owen Electric Cooperative, Inc.
P.O. Box 400
Owenton, Kentucky 40359

Burns E. Mercer
Meade County R.E.C.C.
P.O. Box 489
Brandenburg, Kentucky 40108-0489

Vince Heuser
Nolin R.E.C.C.
411 Ring Road
Elizabethtown, Kentucky 42701-8701

G. Kelly Nuckols
Jackson Purchase Energy Corporation
P.O. Box 4030
Paducah, Kentucky 42002-4030

Bobby D. Sexton
Big Sandy R.E.C.C.
504 11th Street
Paintsville, Kentucky 41240

Lawrence W. Cook
Assistant Attorney General
Utility & Rate Intervention Division
1024 Capital Center Drive, Suite 200
Frankfort, Kentucky 40601-8204

Michael L. Kurtz
Boehm Kurtz & Lowry
Suite 1510
36 East Seventh Street
Cincinnati, Ohio 45202

Barry L. Myers
Taylor County R.E.C.C.
P.O. Box 100
Campbellsville, Kentucky 42719

Anthony P. Overbey
Fleming-Mason Energy Cooperative
P.O. Box 328
Flemingsburg, Kentucky 41041

Frank N. King, Jr.
Dorsey, King, Gray, Norment & Hopgood
318 Second Street
Henderson, Kentucky 42420

Mellisa D. Yates
Denton & Keuler, LLP
555 Jefferson Street
P.O. Box 929
Paducah, Kentucky 42002-0929

Clayton O. Oswald
Taylor, Keller, Dunaway & Tooms
1306 West Fifth Street
P. O. Box 905
London, Kentucky 40743-0905

**DIRECT TESTIMONY**
**OF**
**EVERETT G. PHILLIPS**
**ON BEHALF OF**
**KENTUCKY POWER COMPANY**
**CASE NO. 2006-00494**

## I. INTRODUCTION

**Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND POSITION.**

A. My name is Everett G. Phillips. My business address is 11233 Kevin Avenue, Ashland, KY 41102. I am the Director of Distribution Operations for the Kentucky Power Company (Kentucky Power, KPCo or Company).

**Q. PLEASE BRIEFLY DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.**

A. I earned a bachelor's degree in Electrical Engineering in 1985 from West Virginia University. I am a registered professional engineer in the state of Kentucky and have 21 years of utility experience focused mainly on distribution reliability and operations. I began my career as an electrical engineer in Huntington, West Virginia, where I focused on reliability issues. My responsibilities then moved to supervising and managing distribution operations at a local area level in Clintwood, Virginia, for Appalachian Power Company. From there, I became Division Superintendent in Pikeville, Kentucky, where I directly managed line mechanics in the Hazard and Pikeville areas. Prior to being named to my current position, I served as Manager of Distribution Systems in Pikeville, Kentucky.

**Q. WHAT ARE YOUR RESPONSIBILITIES AS DIRECTOR OF DISTRIBUTION OPERATIONS?**

A. I am responsible for overseeing planning, construction, engineering, operation and maintenance of KPCo's distribution system. My duties include providing the reliable delivery of service safely to our customers and restoring service when outages occur. I also oversee KPCo's distribution and transmission system vegetation management program.

**Q. HAVE YOU PRESENTED TESTIMONY IN PRIOR PROCEEDINGS BEFORE THE KENTUCKY PUBLIC SERVICE COMMISSION (KPSC)?**

A. Yes, I presented testimony in Case No. 2005-00341.

**Q. WHAT EXHIBITS DO YOU SPONSOR IN THIS PROCEEDING?**

A. I am sponsoring the following exhibits attached to my testimony:

| Exhibit | Description |
|---|---|
| EXHIBIT EGP-01 | Kentucky Elevation Chart |
| EXHIBIT EGP-02 | Sample of Weekly/Monthly Reliability Reports |
| EXHIBIT EGP-03 | Sample of Sustained Outage Reports |
| EXHIBIT EGP-04 | Reliability Surveying – Segmenting for Comparability Article |
| EXHIBIT EGP-05 | Sample of Worst Performing Circuits Report |

**Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

A. I will briefly describe Kentucky Power's transmission and distribution (T&D) system and its importance in providing reliable electric service to our customers, as well as the programs designed to maintain the reliability of the T&D system. In addition, I will discuss KPCo's various measurements of our service reliability and will provide KPCo's position on establishing a reliability reporting requirement and reliability performance standards, as well as implementing minimum maintenance standards for right-of-way (ROW) maintenance and vegetation management.

## II. KENTUCKY POWER DISTRIBUTION SYSTEM OVERVIEW

**Q. PLEASE DESCRIBE KPCO'S TRANSMISSION AND DISTRIBUTION SYSTEM THAT SERVES KENTUCKY CUSTOMERS.**

A. KPCo serves approximately 175,000 retail customers in Kentucky in a service area that covers approximately 4,815 square miles in all or part of 20 eastern Kentucky counties. Our transmission system includes 1,235 miles of transmission lines in Kentucky with voltages ranging up to 765 kV. Our distribution system includes more than 9,636 miles of lower voltage lines on 205,915 company owned poles.

**Q. DOES KENTUCKY POWER'S SERVICE TERRITORY MAKE PROVIDING RELIABLE SERVICE CHALLENGING?**

A. KPCo's service territory is unique in that the customer density per line mile is sparse. In addition, Exhibit EGP-01 shows the elevation variance within KPCo's 20-county service territory when compared to other counties in the state. In order to serve customers that are more spread out across the service area, longer distribution lines are built serving fewer customers, increasing exposure to the elements that could cause electrical distribution outages. In addition, the service territory is heavily populated with trees located on steep, rugged mountains, which creates right-of-way issues unique to this type of area, such as trees or large branches outside of ROW that either slide into the line or are tall enough to fall onto the line. Another uniqueness of our service territory can be compared to the current road system of this area. Many roads coincide with the hollows formed from the mountains, so in many cases, there is only one way in and one way out. Because of the terrain, our distribution lines are built in the same manner allowing no alternatively means to serve customers if a fault, such as a tree falling on the line, does occur. In this situation, customers served by that line beyond the fault remain out of service until the fault is removed and repairs are made, increasing outage duration to the customer.

## III. DISTRIBUTION RELIABILITY PROGRAMS

**Q. PLEASE IDENTIFY KPCO'S PROGRAMS TO MAINTAIN THE RELIABILITY OF ITS TRANSMISSION AND DISTRIBUTION SYSTEM.**

A. Our programs are designed to maintain and improve reliability by minimizing service interruptions on our T&D system. They can be divided into three major categories. These categories are T&D Asset Management Programs, the Major T&D Reliability Program, and T&D Vegetation Management Programs.

**Q. PLEASE IDENTIFY THE T&D ASSET MANAGEMENT AND MAJOR T&D RELIABILITY PROGRAMS.**

A. KPCo has ongoing Distribution Asset Management Programs and Transmission Asset Management Programs designed to identify potential problems that could cause an interruption of service and implement corrective action to maintain the reliable operation of the equipment.

The Distribution Asset Management Programs focus on regular inspection and maintenance of overhead and underground facilities, including poles, reclosers, conductor, and cable. In addition, certain asset management programs address the installation of mitigation devices to help reduce the number of outages caused by animals and lightning, while another program focuses on improving reliability by sectionalizing circuits into smaller sections minimizing the impact of an outage.

The Transmission Asset Management Programs target inspection and maintenance programs for stations, transmission lines and protective relays, as well as other devices.

Major T&D Reliability Improvement Programs focus mainly on capacity-driven and customer-driven projects, such as new stations and associated transmission lines, as well as other infrastructure improvements.

**Q. ARE THESE RELIABILITY PROGRAMS AN IMPORTANT COMPONENT OF KPCO'S RELIABILITY EFFORTS?**

A. Yes. KPCo uses various combinations of programs to maintain its transmission and distribution infrastructure. Each reliability program focuses in areas where outages have interrupted large blocks of customers for long durations. KPCo continually seeks opportunities to improve service reliability, including the reliability of its distribution system.

**Q. PLEASE DISCUSS THE T&D VEGETATION MANAGEMENT PROGRAMS.**

A. KPCo's T&D Vegetation Management Programs are designed to minimize contact between a line and a tree or other vegetation. These programs are addressed in Section VII – Development of Vegetation Management Standards – later in my testimony.

## IV. RELIABILITY MEASURES

**Q. DOES KPCO UTILIZE ANY MEASURES TO REPORT AND EVALUATE THE RELIABILITY OF ITS DISTRIBUTION SYSTEM?**

A. Kentucky Power primarily uses three indices to gauge service reliability. These indices include the System Average Interruption Frequency Index (SAIFI), Customer Average Interruption Duration Index (CAIDI) and System Average Interruption Duration Index (SAIDI) and are described as follows in the Institute of Electrical and Electronics Engineers (IEEE) Standard 1366-2003:

- SAIFI indicates how often the average customer experiences a sustained interruption over a defined period of time. It is the total number of customers interrupted divided by the total number of customers served.
- CAIDI represents the average time required to restore service. It is the sum of customer interruption durations divided by the total number of customers interrupted.
- SAIDI represents the total length of time the average customer is without power in the period. It is calculated by dividing the sum of customer interruption durations by the number of customers served. SAIDI also can be calculated by multiplying SAIFI and CAIDI.

These indices are generated from our outage records over time and can be shown for the entire company, a smaller operating area, such as one of our districts, or for specific circuits.

**Q. HOW DOES KPCO UTILIZE THESE MEASURES IN ITS RELIABILITY PROGRAM?**

A. These indices are tracked over a period of time to help identify trends and opportunities for improvement. KPCo personnel monitor reliability at several levels. Distribution outages are reviewed on a daily basis throughout the territory by local management. Weekly and monthly reports of reliability in the local areas are reviewed by local personnel, who look for potential outage trends and/or patterns. Examples of these reports are provided in Exhibit EGP-02. Local reliability teams, with members from engineering, forestry, line, and supervision, meet on a regular basis to discuss current issues, such as outage patterns, necessary upgrades/repairs, etc. Through recognition of outage patterns, mitigation strategies are formulated to improve overall reliability. Because these indices are typically calculated on a 12-month ending basis, strategy results or improvements may not be apparent in the indices for a year or more. This makes it more prudent to analyze reliability data in terms of long-term data trending, rather than in short-term analysis.

**Q. WHAT OUTAGES ARE INCLUDED IN THE MEASURES EMPLOYED BY KPCO?**

A. Information historically provided to the Commission includes all sustained interruptions, which are those longer than five minutes. KPCo does produce management reports, like those included in Exhibit EGP-03, which exclude outages incurred on "Major Event Days" for its own use. For this purpose, major event days are determined in accordance with the methodology outlined in IEEE Std 1366-2003, IEEE Guide for Electric Power Distribution Reliability Indices. This standard provides a statistical method to segregate "abnormal" from "normal" days by considering daily

SAIDI values. Normal days can then be reviewed to identify reliability trends while major event days can be analyzed separately to review major event response.

**Q. HOW SHOULD MAJOR EVENTS BE ADDRESSED IN ANY OUTAGE REPORTING CRITERIA?**

A. If reporting criteria are established, major events, as defined by IEEE, should be identified and reported separately from "normal" reliability data. This would allow the KPSC to differentiate and review utility performance, during both routine and major event situations.

**Q. WHAT OTHER MEASURES DOES KPCO TRACK TO GAUGE THE RELIABILITY OF ITS T&D SYSTEM?**

A. KPCo believes relying on statistical information derived from SAIDI, SAIFI and CAIDI alone does not provide a comprehensive view of a customer's overall service experience. In addition to the reliability indices and review of outage patterns, KPCo also looks at other measures, such as customer satisfaction surveys and customer reliability complaints.

## V. DEVELOPMENT OF DISTRIBUTION RELIABILITY REPORTING

**Q. IS IT APPROPRIATE FOR THE PUBLIC SERVICE COMMISSION TO REQUIRE REGULAR REPORTING OF RELIABILITY INFORMATION FROM ALL DISTRIBUTION UTILITIES? PLEASE EXPLAIN YOUR ANSWER.**

A. KPSC has exclusive jurisdiction over rates and service of utilities and has the authority to require reporting. Pursuant to the order entered in Case No. 1999-149, KPCo has been providing this type of information for the past seven years.

**Q. SHOULD THE KPSC DEVELOP STANDARDIZED CRITERIA FOR RECORDING AND REPORTING RELIABILITY INFORMATION?**

A. Standardized metrics, such as SAIDI and the others defined in IEEE 1366, could ease the administration and the explanation of reporting requirements for Staff. However, it is not advisable to compare one utility against another based on these predefined reporting requirements. Even though the formula(s) for the reporting metrics may be identical, other factors can distort the metrics. Factors influencing each utility vary dramatically, so that reliability metrics results for KPCo, which faces geographic, economic, electrical circuitry and other obstacles, should not be set the same as other utilities within the state where the distribution system is not exposed to the same risks. Instead, KPCo proposes that each utility should be benchmarked against its own performance. This process ensures that all of the variables which affect the result of the formula-based metrics are accounted for in evaluating the utility's performance over time.

**Q. WOULD IT BE APPROPRIATE FOR THE COMMISSION TO REQUIRE RELIABILITY REPORTING AT A LEVEL SMALLER THAN THE ENTIRE DISTRIBUTION SYSTEM (I.E., BY SUBSTATION OR CIRCUIT)?**

A. Reporting at a system level over time is the best way to determine how the utility is performing. System level indices will represent average values from smaller areas of the system or circuits. Some of those smaller areas will have higher metrics and some will have lower metrics. When reporting at sub-system levels of a small utility, annual fluctuations become magnified because relatively few interruption events can force an area to appear poor performing. Those few events could result from facility failures that would not be reasonably expected to recur in the same location such as a vehicle accident breaking a pole or a substation transformer failure. Reporting at the system level allows these types of outages to not be considered area specific and they average out across the service territory. KPCo is not encouraging the KPSC to require area or circuit level reliability reporting.

**Q. ARE THERE ANY CONCERNS ABOUT SHARING RELIABILITY REPORTING INFORMATION WITHIN THE INDUSTRY OR WITH THE PUBLIC?**

A. As previously stated in my testimony, there are many factors that impact the recording and reporting of reliability indices. As a result, KPCo does not support sharing of these indices because it perpetuates the idea that this type of information is comparable.

**Q. IF RELIABILITY REPORTING WAS ESTABLISHED, HOW FREQUENTLY SHOULD REPORTS AND INFORMATION BE PROVIDED?**

A. If the Commission determined that reliability reporting was necessary, Kentucky Power believes reporting should be done on an annual basis. The reporting period must allow enough time to represent the system's response to the various weather conditions throughout the year. It must also represent system performance that indicates whether or not corrective action is required. If action is required, effective work plans can be developed and performed. Since these indices generally represent a rolling 12-month period, any work performed to improve reliability and reduce the indices will take at least 12 months after the mitigation work is completed to be fully reflected in the results, barring any other mitigating circumstances.

## VI. DEVELOPMENT OF DISTRIBUTION RELIABILITY STANDARDS

**Q. DOES KPCO BELIEVE THAT A RELIABILITY PERFORMANCE STANDARD IS APPROPRIATE? PLEASE EXPLAIN YOUR ANSWER.**

A. No. The factors influencing each utility vary dramatically, so that reliability standards for KPCo, which faces geographic, economic, electrical circuitry and other obstacles, should not be set the same as other utilities where the distribution system is not subject to the same risks. Instead, KPCo proposes that each utility be evaluated to determine if reliability is adequate under the circumstances and that programs be in place to maintain, and if necessary improve, reliability. In this regard, KPCo supports the analysis set forth in an article written by Mr. David J. Schepers, IEEE Member, entitled: Reliability Surveying – Segmenting for Comparability, attached as Exhibit EGP-04.

**Q. IS IT BETTER TO DEVELOP PERFORMANCE STANDARDS ON A UTILITY-BY-UTILITY BASIS, RATHER THAN A CIRCUIT-BY-CIRCUIT BASIS?**

A. If performance reliability standards/targets were to be developed, they should be developed at the utility system level. As previously stated, KPCo does not support reporting at levels smaller than the entire distribution system. Therefore, KPCo does not support performance standards at the lower level. Any standards should reflect each utility's own performance over time.

**Q. IF A UTILITY SPECIFIC STANDARD WERE TO BE ADOPTED, WHAT CRITERIA SHOULD BE EMPLOYED IN DEVELOPING THIS STANDARD?**

A. If performance reliability standards/targets are developed, they should be developed specifically for each individual utility. Again, there are many reasons that a utility system has the reliability that it now exhibits. These include the type of outage management system used, the recording and reporting methods employed, service territory challenges, and the present condition of the utility system that the utility has worked to construct and maintain over the past century. Any developed targets should consider a utility's historical performance using reliability indices, any changes in the methods of gathering or reporting the data, any changes in the programs the utility employs to improve reliability, and any unusual challenges to which the utility responded. As a result, historical performance information may not represent a utility's current performance. If historical information does represent a utility's current performance, then KPCo suggests using the average of the past five years' annual SAIDI values plus one standard deviation to allow for annual fluctuations. The utilities should propose a company-specific standard subject to review and approval by the Commission.

**Q. WHAT SHOULD BE A UTILITY'S RESPONSE TO NON-ATTAINMENT OF A PERFORMANCE STANDARD, OR EXPLAIN WHY A RESPONSE TO NON-ATTAINMENT WOULD NOT BE NECESSARY?**

A. Non-attainment may or may not be an indication of a problem. The proper response would be to promptly investigate the reason(s) for the non-attainment. It should be determined if the non-attainment was due to unique short-term challenges or if it indicates a longer term, more serious problem. The Commission should recognize that there is normal annual variation in reliability indices. Any performance standards should be based on long-term performance and a single year's non-attainment should not be prematurely judged as a performance failure. Upon identifying the reasons for non-attainment, a response plan could be developed. An implementation strategy, and follow-up could be conducted over the next reporting cycle or cycles to enhance performance. It should also be understood that there would be a time delay between any corrective actions taken and their influence on a utility's reliability indices.

## VII. DEVELOPMENT OF VEGETATION MANAGEMENT STANDARDS

**Q. PLEASE DESCRIBE KPCO'S T&D VEGETATION MANAGEMENT PROGRAMS.**

A. KPCo's T&D Vegetation Management Program addresses the principal cause of service interruptions on KPCo's system (excluding major events, which is contact between a line and a tree or other vegetation. Tree-related outages caused approximately 37.3 percent of the sustained, non-major event outages on KPCo's delivery system in 2006.

KPCo's Distribution Vegetation Management Program is a comprehensive, integrated vegetation management program for pruning and clearing vegetation along distribution circuits at the proper time to maintain reliability in an environmentally sound and cost-effective manner. KPCo uses a variety of management practices to control vegetation along its distribution rights-of-way, such as aerial sawing, mechanized trimming, manual trimming (roping, hand climbing), mechanized clearing, manual clearing and herbicide applications. KPCo's distribution (and transmission) vegetation management practices are conducted in accordance with standards established by the American National Standards Institute (ANSI), the Occupational Safety and Health Administration (OSHA), and the National Electrical Safety Code (NESC).

The vegetation management work plans are flexible and dynamic. Inputs to these work plans come from our visual inspections, which are performed on approximately 50 percent of KPCo's distribution circuits per year. Other inputs into the work plan include historical reliability data, line inspections, customer density, customer complaints and time elapsed since vegetation management was last performed.

**Q. PLEASE DESCRIBE KPCO'S TRANSMISSION VEGETATION MANAGEMENT PROGRAM.**

A. KPCo performs aerial vegetation patrols of its entire transmission system once a year to assist in developing a vegetation management work plan. In addition, vegetation maintenance on transmission lines is performed on an ongoing basis, depending upon the rate of growth of the vegetation and the voltage of specific transmission lines rather than on a rigid cycle basis, which would schedule circuits for maintenance, based strictly upon the time elapsed since the last maintenance work was performed.

As a result of the August 2003 blackout, the Federal Energy Regulatory Commission (FERC) directed the North American Electric Reliability Council (NERC) to develop standards for vegetation management on transmission lines. The NERC standards were effective April 7, 2006 and apply to transmission circuits 200 kV and above along with critical transmission lines of lower voltage as determined by the Regional Reliability Councils. KPCo's transmission vegetation management program is designed to comply with the NERC standards.

**Q. ARE KPCO'S TREE TRIMMING STANDARDS SIMILAR TO WHAT WAS REFERRED TO AND ATTACHED AS HANDOUT NO. 1?**

A. Yes, each of the recommended methods in Handout No. 1 is similar to Kentucky Power's current practices.

**Q. DOES KPCO BELIEVE THAT THE COMMISSION SHOULD SET TREE TRIMMING STANDARDS FOR ALL UTILITIES? PLEASE EXPLAIN YOUR ANSWER.**

A. No. The Company does not believe that uniform vegetation standards should be set for all utilities. Differences exist in service territories, terrain, customer population densities, etc. In addition, many existing distribution line easements do not specify an easement width and limit our ability to control the vegetation to that which "endangers the safe operation of the line". Establishment of a uniform clearance standard including minimum clearance widths may prove problematic. However, if uniform standards were to be adopted, KPCo would want to be actively involved in establishing them.

**Q. DOES KPCO HAVE ANY DISTRIBUTION LINES THAT ARE LOCATED ON PROPERTY NOT OWNED BY KPCO?**

A. Most of KPCo's distribution lines are located either on private easements that were obtained by KPCo or its predecessors, or within the confines of public road rights of way, or platted public utility easements in subdivisions. Some facilities are located on lands owned by KPCo, such as at electric substations or generating plant or service building sites. Some facilities may be located on private lands for which no easements were obtained, but KPCo believes it has obtained prescriptive easement rights for such facilities.

**Q. WHAT ARE KPCO'S LEGAL RIGHTS TO ACCESS ITS DISTRIBUTION LINES UNDER THESE "NON-OWNED" CIRCUMSTANCES, OR LIMITATIONS/RESTRICTIONS ON SUCH RIGHTS?**

A. Where KPCo has obtained private easements for its distribution lines, the rights KPCo may exercise are generally set forth in the written easement agreements that were granted to KPCo or its predecessors, which are recorded in the office of the County Recorder of the County where the lines are located. Most private easements grant KPCo the right to access its electric distribution facilities to construct, operate, repair, and maintain such facilities, and to cut, trim and remove trees and other vegetation within the boundaries of the easement. Many private easements also grant KPCo the right to cut, trim, and remove "danger trees" that may exist outside of and adjacent to the boundary of the easement. Where facilities are located along public road rights of way, KPCo can access its lines, and cut, trim and remove trees, within the road right of way, or branches or vegetation that overhangs the road right of way. Where facilities are located on platted utility easements in subdivisions, KPCo can access its lines, and cut, trim and remove trees located within the confines of the platted utility easement or branches or vegetation that overhangs the platted utility easement. When KPCo's facilities may be located where KPCo has prescriptive easement rights, KPCo believes it has the right to continue to cut, trim, and remove trees and vegetation in accordance with how the land was cleared when the lines were constructed. Thus, KPCo's easement rights associated with a particular right-of-way are not uniform and vary to some degree. If a uniform right-of-way standard were imposed, KPCo may have to obtain (and pay for) additional easement rights to comply with the requirement. In addition, even where easement rights exist, KPCo would expect to experience resistance and complaints from some property owners if additional right-of-way management standards were implemented. In short, imposing new standards for right-of-way management would likely cause KPCo to incur additional costs through legal proceedings and expenses associated with obtaining additional easement rights where needed.

**Q. SHOULD THE KPSC ADOPT MINIMUM STANDARDS FOR RIGHTS-OF-WAY (ROW) MANAGEMENT?**

A. KPCo does not believe that the formal adoption of minimum standards would be appropriate or feasible. Due to varying physical conditions in each utility's service territory, varying rights in easements and varying environments KPCo operates in, it may be impossible for each utility to meet a minimum standard in all of their service area.

**Q. IF THE KPSC WERE TO ADOPT A MINIMUM STANDARD FOR ROW MANAGEMENT, TO WHAT LEVEL OF DETAIL SHOULD IT BE DEFINED?**

A. If standards for rights-of-way management were adopted, KPCo proposes that each utility establish guidelines for rights-of-way maintenance to be submitted to the

Commission for review. This would allow the utility, the Commission and the public to know the guidelines – and the utility could then be called upon to describe the steps it has taken, or will implement, to satisfy the guidelines. Further, should a minimum standard be adopted, the PSC should include the possibility for variations and exceptions based on unique circumstances which fall outside the situations contemplated by the "minimum standard." In addition, the adoption of a minimum standard may cause utilities to incur incremental expenses related to achieving this requirement. Consideration should be given to real-time recovery of such higher expenses since the higher level of expense was not included in the utility's most recent rate proceedings.

**Q. WOULD A KPSC REQUIREMENT FOR A MINIMUM ROW MANAGEMENT STANDARD GIVE KPCO AN ADVANTAGE WHEN PERFORMING ROW MAINTENANCE, OR CREATE ANY DISADVANTAGES?**

A. Currently, issues and disputes arise over KPCo's proposed vegetation management plans on some of our customers' properties. These have historically been resolved through negotiation and compromise. The ability to point to a "minimum standard" may assist KPCo in resolving these disputes. However, a disadvantage would be that KPCo would lose certain flexibility that it currently has to negotiate a resolution satisfactory to the customer. This loss of flexibility will lead to customer dissatisfaction, complaints to the KPSC, and possible litigation. On balance, KPCo does not believe that establishing a minimum standard for ROW management would be beneficial.

## VIII. RESPONSE TO STAFF QUESTIONS

**Q. IN ITS RESPONSE TO ITEM NO. 1 OF STAFF'S SECOND DATA REQUEST IN THIS CASE, KENTUCKY POWER STATES THAT DISTRIBUTION OUTAGES ARE REVIEWED ON A DAILY BASIS THROUGHOUT THE TERRITORY BY LOCAL MANAGEMENT AND THAT WEEKLY AND MONTHLY REPORTS OF RELIABILITY IN THE LOCAL AREAS ARE REVIEWED BY LOCAL PERSONNEL. PROVIDE A RELATIVE SAMPLE OF THE INFORMATION ON REPORTS REVIEWED ON A DAILY BASIS AND A RELATIVE SAMPLE OF THE WEEKLY AND MONTHLY REPORTS.**

A. Samples of these reports and information are provided in Exhibit EGP-02 as stated in Section IV of my testimony.

**Q. IN ITS RESPONSE TO ITEM NO. 28, PAGE 3 OF 3 OF STAFF'S FIRST DATA REQUEST IN CASE NO. 2005-00090, KENTUCKY POWER REPORTED ACCEPTABLE VALUES OF SAIFI OF 2.392, OF CAIDI OF 197.4 AND OF SAIDI OF 472.2. EXPLAIN WHY THE VALUES REPORTED IN RESPONSE TO ITEM NO. 2 OF STAFF'S SECOND DATA REQUEST IN THIS CASE FOR CAIDI OF 3.29 AND SAIFI OF 7.87 ARE DIFFERENT.**

A. The reliability indices in response to Item No. 28, page 3 of 3 of Staff's First Data Request were reported in minutes, while the reliability indices in Item No. 2 of Staff's Second Data Request were reported in hours.

**Q. IN ITS RESPONSE TO ITEM NO. 3 OF STAFF'S SECOND DATA REQUEST IN THIS CASE, KENTUCKY POWER STATES THAT ADDITIONAL REPORTS ARE RUN TO ANALYZE THE CAUSES OF OUTAGES ON THE WORST PERFORMING CIRCUITS. DISCUSS WHO REVIEWS THESE REPORTS AND PROVIDE SEVERAL SAMPLE REPORTS.**

A. KPCo management and local supervision review these reports. A sample of the reports is shown in Exhibit EGP-05.

**Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?**

A. Yes, it does.

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION OF KENTUCKY

COMMONWEALTH OF KENTUCKY

CASE NO. 2006-00494

COUNTY OF BOYD

# AFFIDAVIT

Everett G. Phillips, upon first being duly sworn, hereby makes oath that if the foregoing questions were propounded to him at a hearing before the Public Service Commission of Kentucky, he would give the answers recorded following each of said questions and that said answers are true.

Everett G. Phillips
Everett G. Phillips

Subscribed and sworn before me by Everett G. Phillips this 11 day of April, 2007.

Notary Public

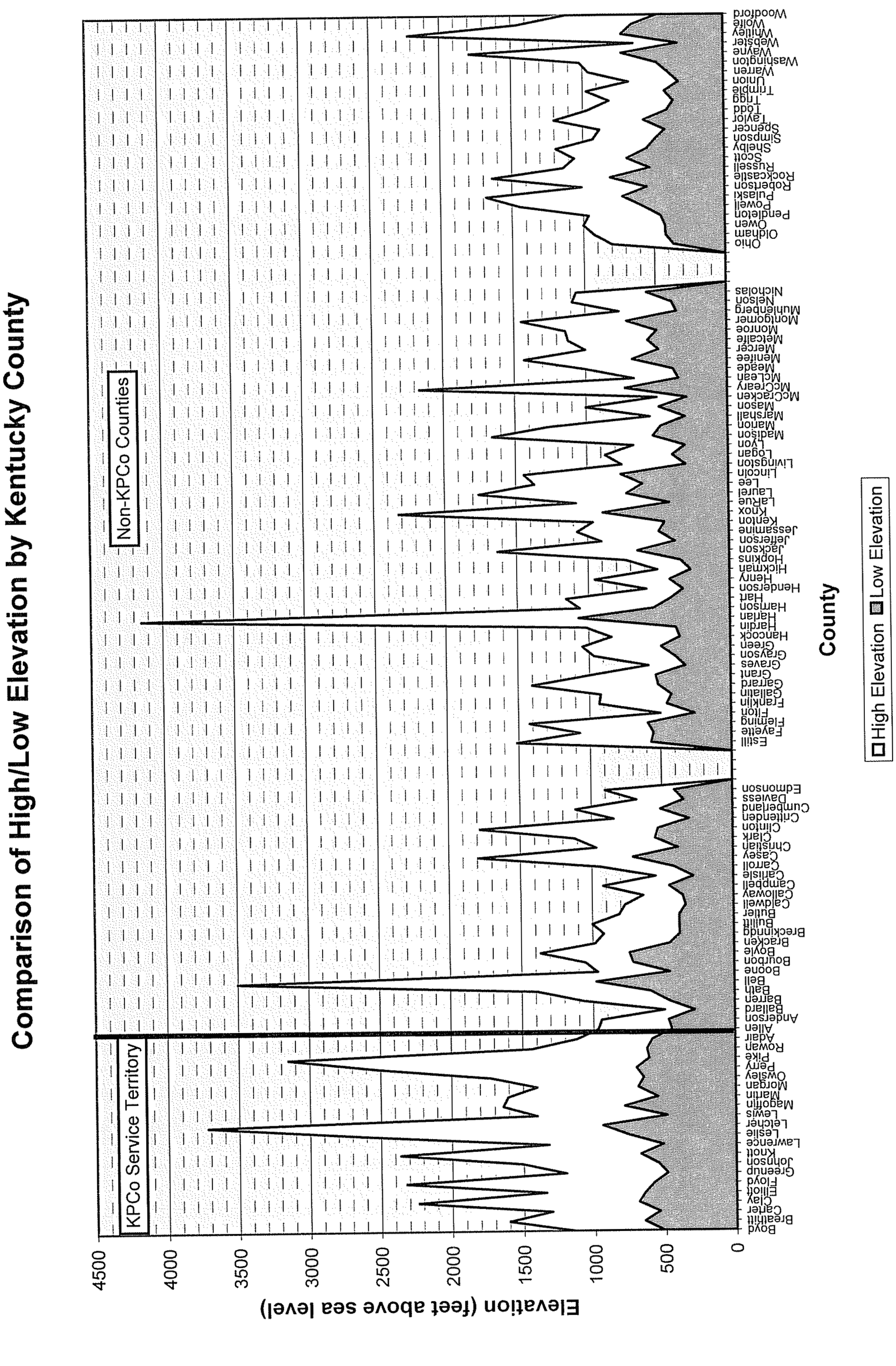
My Commission Expires June 22, 2008

# Exhibits

# EGP-1

# through

# EGP-5


Comparison of High/Low Elevation by Kentucky County
Elevation (feet above sea level)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
KPCo Service Territory
Non-KPCo Counties
Boyd
Breathitt
Carter
Clay
Elliott
Floyd
Greenup
Johnson
Knott
Lawrence
Leslie
Letcher
Lewis
Magoffin
Martin
Morgan
Owsley
Perry
Pike
Rowan
Adair
Allen
Anderson
Ballard
Barren
Bath
Bell
Boone
Bourbon
Boyle
Bracken
Breckinridg
Bullitt
Butler
Caldwell
Calloway
Campbell
Carlisle
Carroll
Casey
Christian
Clark
Clinton
Crittenden
Cumberland
Daviess
Edmonson
Estill
Fayette
Fleming
Fulton
Franklin
Gallatin
Garrard
Grant
Graves
Grayson
Green
Hancock
Hardin
Harlan
Harrison
Hart
Henderson
Henry
Hickman
Hopkins
Jackson
Jefferson
Jessamine
Kenton
Knox
LaRue
Laurel
Lee
Lincoln
Livingston
Logan
Lyon
Madison
Marion
Marshall
Mason
McCracken
McCreary
McLean
Meade
Menifee
Mercer
Metcalfe
Monroe
Montgomer
Muhlenberg
Nelson
Nicholas
Ohio
Oldham
Owen
Pendleton
Powell
Pulaski
Robertson
Rockcastle
Russell
Scott
Shelby
Simpson
Spencer
Taylor
Todd
Trigg
Trimble
Union
Warren
Washington
Wayne
Webster
Whitley
Wolfe
Woodford
County
High Elevation
Low Elevation

# Kentucky DDC

**Morning Report**

**February 14, 2007**

| Days since last recordable injury: | Days without a vehicle accident: |
|---|---|
| **74** | **27** |
| Last injury on 12-01-06 | Last vehicle accident on 01-17-07 |

| Days without Distribution field switching error: | Days without Transmission field switching error: | Days without a DDC switching error: |
|---|---|---|
| **6** | **424** | **164** |
| Last error on 2-7-07 | Last error on 12-16-05 | Last error on 09-02-06 |

**Safety:** No Report

**Switching Errors:** No Report

## Reliability for Last 24 Hours

| # of Outage | Customers Interrupted | Total Customer Minutes |
|---|---|---|
| **16** | **163** | **10,072** |

| SAIFI Target 2.44 | CAIDI Target 160 | SAIDI Target 382 |
|---|---|---|
| **0.34** | **62** | **21** |

**Liability:** No Report

**KPCo Circuit Outages:** No Report

**System Abnormalities:** (New or changed items in blue)

**Ashland:**

1-17-07 @ 1530 a section of the 10th Street/ Midtown 12kv circuit was isolated to allow line maintenance to be performed. This transferred 291 of 407 customers to Ashland/1st Street, Ashland/3rd Street and 10th Street/3rd Street circuits. Update: This section line will be restored normal sometime in February.

**Pikeville:**

**Hazard:**

04-17-06 @ 1639 - a section of the Daisy-Leslie 69kV line locked out between Daisy and Blair Fork S.S. due to a large mud slide at Leatherwood. This has Slemp and Clover

Fork stations stub fed from Leslie. This section of line is scheduled to be restored around the first of March 2007.

# WEATHER

| Ashland | Pikeville |
|---|---|
| **Today:** Cloudy with a 40 percent chance of snow showers. Much cooler with highs in the lower 20s. Northwest winds 10 to 15 mph. | **Today:** A 40 percent chance of snow showers. Cloudy, with a temperature falling to around 18 by 2pm. Northwest wind around 15 mph, with gusts as high as 25 mph. |
| **Tonight:**Mostly cloudy. A slight chance of snow showers in the evening. Colder with lows around 12. Northwest winds 5 to 10 mph. Chance of snow 20 percent. | **Tonight:** A 20 percent chance of snow showers before midnight. Mostly cloudy, with a low around 12. North northwest wind between 5 and 10 mph becoming calm. |
| **Thursday:**Partly sunny. Highs in the lower 20s. West winds 5 to 10 mph. | **Thursday:** Mostly cloudy, with a high near 21. Northwest wind between 5 and 10 mph. |
| **Thursday Night:**.Partly cloudy. Cold with lows around 8 above. West winds around 10 mph. | **Thursday Night:** Mostly cloudy, with a low around 9. West northwest wind between 10 and 15 mph, with gusts as high as 20 mph. |
| **Friday:**Partly cloudy. Highs around 30. Lows 15 to 20. | **Friday:** Scattered flurries between 7am and 8am. Partly cloudy, with a high near 33. |
| **Friday Night:**Partly cloudy. Highs around 30. Lows 15 to 20. | **Friday Night:** Mostly clear, with a low around 19. |
| **Saturday:**Mostly cloudy with a 50 percent chance of snow. Highs in the mid 30s. is 10%. | **Saturday:** A chance of snow or rain. Mostly cloudy, with a high near 39. Chance of precipitation is 40%. |

| Hazard |
|---|
| **Today:** A 30 percent chance of snow showers, mainly before 11am. Cloudy, with a temperature falling to around 19 by 5pm. North northwest wind around 15 mph, with gusts as high as 25 mph. |
| **Tonight:** Mostly cloudy, with a low around 12. North northwest wind between 5 and 10 mph. |
| **Thursday:** Partly cloudy, with a high near 23. North northwest wind between 5 and 10 mph. |
| **Thursday Night:** Partly cloudy, with a low around 10. West northwest wind around 10 mph, with gusts as high as 20 mph. |
| **Friday:** Partly cloudy, with a high near 32. |
| **Friday Night:** Mostly clear, with a low around 19. |
| **Saturday:** A chance of snow or rain. Mostly cloudy, with a high near 37. Chance of precipitation is 40%. |

# Ashland Weekly Reliability Report
## March 19 thru March 25, 2007

**33** sustained outages.

**896** customers added to SAIFI. (**Below** 1821 per week average for the yearly SAIFI goal of **1.648**)

**122,507** customer outage minutes recorded. (**Below** 291,349 customer minutes per week average to achieve annual SAIDI goal of **263.6**)

**2.13** minutes were added to the Ashland SAIDI value this week, bringing YTD SAIDI for Ashland to 38.89.

**136.7** minutes was the CAIDI for the week. (**Below** CAIDI goal of **160.0** minutes - CAIDI YTD is 137.4)

Partial restorations were performed. Without these partial restorations,
-- Customer Outage Minutes would have been 160,736
-- Minutes added to the Ashland SAIDI value for this week would have been 2.80 minutes.
-- CAIDI would have been 179.4 minutes

Some significant outages are shown below:

| Subarea Desc | Outage Nbr | Crew Name | Station Desc | Circuit Desc | Clearing Device Desc | Minor Cause Code Desc | Crew Remarks | Total Customer Affected | Total Customer Minutes Interrupted | CAIDI | Total Outage Duration Minutes | Interruption Start Date & Time | Interruption End Date & Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ashland | 62090-1 | Brown,K_PIAS | GRAYSBRAN | GRAYSBRAN | RECLOSER | TREE OUT OF ROW | 3000701//3-SPANS OF 4-A COPPER WELD DOWN POLE 1071-40 IS BROKE 40-5 RELEASED BY CREW 078S09// VER/TOM IDC XXXX | 60 | 26,040 | 434 | 434 | 03/22/2007 14:02 | 03/22/2007 21:16 |
| Ashland | 62090-1 | FRALEY,B_PIAS | GRAYSBRAN | GRAYSBRAN | RECLOSER | TREE OUT OF ROW | 3000701//3-SPANS OF 4-A COPPER WELD DOWN POLE 1071-40 IS BROKE 40-5 RELEASED BY CREW 078S09// VER/TOM IDC XXXX | 60 | 26,040 | 434 | 434 | 03/22/2007 14:02 | 03/22/2007 21:16 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ashland | 61224-1 | Tolliver,P_PIAS | HITCHINS | WILLARD | PRI OPEN | EQUIPMENT FAILURE | 3001002//POLE 279-211 #4 CU. PRIM. DOWN//BURNT OFF AT STIRRUP/// ISOLATED SOLID BLADE///PRIM. HOT UP TO FAULT POLE////IN FRONT OF 596 DAVEYS RUN (CLAUDE COFFEES RESIDENCE)/// RELEASED BY CREW 078H16//CC WAS ONLY 66 NOT 91//REPAIRED COND.ON 211 REENERGIZED UP TO 279-218/COMPLETE 22:14 IDCC CNT SEE 61284-1 XXXX | 66 | 22,495 | 341 | 367 | 03/19/2007 16:07 | 03/19/2007 22:14 |
| Ashland | 61224-1 | VIRGIN,R_PIAS | HITCHINS | WILLARD | PRI OPEN | EQUIPMENT FAILURE | 3001002//POLE 279-211 #4 CU. PRIM. DOWN//BURNT OFF AT STIRRUP/// ISOLATED SOLID BLADE///PRIM. HOT UP TO FAULT POLE////IN FRONT OF 596 DAVEYS RUN (CLAUDE COFFEES RESIDENCE)/// RELEASED BY CREW 078H16//CC WAS ONLY 66 NOT 91//REPAIRED COND.ON 211 REENERGIZED UP TO 279-218/COMPLETE 22:14 IDCC CNT SEE 61284-1 XXXX | 66 | 22,495 | 341 | 367 | 03/19/2007 16:07 | 03/19/2007 22:14 |
| Ashland | 61933-1 | GEORGE,T_PIAS | SILOAM | DISTRIBUTION | RECLOSER | FIRE - AEP, OR AFFECTING > 1 CUSTOMER | 3004301 // CC-144 //3004301 // BARN FIRE, BURNTED DOWN PRI AND NEUTRAL, POLE 879-64, 6A WIRE, CUT LOOP ON POLE 879-61, CLOSE RECLOSER ON POLE 879-387, HAVE POWER RESTORED TO ALL CUSTOMER, BUT 16, AT THIS TIME, RELEASED BY CREW 078S06 // 0225 - 128 CUST RESTORED // 0611 RESTORRED REMAINING 16 CUST // VER/DKG IDC XXXX | 144 | 18,448 | 128 | 329 | 03/22/2007 00:42 | 03/22/2007 06:11 |
| Ashland | 61933-1 | Hall,J_PIAS | SILOAM | DISTRIBUTION | RECLOSER | FIRE - AEP, OR AFFECTING > 1 CUSTOMER | 3004301 // CC-144 //3004301 // BARN FIRE, BURNTED DOWN PRI AND NEUTRAL, POLE 879-64, 6A WIRE, CUT LOOP ON POLE 879-61, CLOSE RECLOSER ON POLE 879-387, HAVE POWER RESTORED TO ALL CUSTOMER, BUT 16, AT THIS TIME, RELEASED BY CREW 078S06 // 0225 - 128 CUST RESTORED // 0611 RESTORRED REMAINING 16 CUST // VER/DKG IDC XXXX | 144 | 18,448 | 128 | 329 | 03/22/2007 00:42 | 03/22/2007 06:11 |
| Ashland | 62257-1 | FRALEY,B_PIAS | GRAYSON | LANSDOWNE | LINE FUSE | EQUIPMENT FAILURE | 3116101///BURNT OFF POLE TOP 182-100//TRUCK ACC.///1/2 MI. UP1959 ON RT///ISO. & GRND ON FUSE POLE 182-207//CC 46// POLE REPLACED AND FUSE BACK IN @ 1125, 1 CUST STILL OUT WHILE TRANSFORMER IS PUT ON NEW POLE//VER/DBM IDC NEED MORE INFO TIME OFF FIRST TICKETS EARLIER | 46 | 13,017 | 283 | 327 | 03/23/2007 06:43 | 03/23/2007 12:10 |
| Ashland | 62257-1 | VIRGIN,R_PIAS | GRAYSON | LANSDOWNE | LINE FUSE | EQUIPMENT FAILURE | 3116101///BURNT OFF POLE TOP 182-100//TRUCK ACC.///1/2 MI. UP1959 ON RT///ISO. & GRND ON FUSE POLE 182-207//CC 46// POLE REPLACED AND FUSE BACK IN @ 1125, 1 CUST STILL OUT WHILE TRANSFORMER IS PUT ON NEW POLE//VER/DBM IDC NEED MORE INFO TIME OFF FIRST TICKETS EARLIER | 46 | 13,017 | 283 | 327 | 03/23/2007 06:43 | 03/23/2007 12:10 |

## Kentucky Reliability Scorecard - Month Ending March 2007

| | DATA | | | SAIFI | | | CAIDI | | | | SAIDI | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **District** | Last Month's Number Interrup. | Last Month's Cust's Outaged | Last Month's Customer Minutes | 2007 Rolling 12 Mo | 2006 Rolling 12 Mo | % Chg 2007 vs 2006 | Last Month | 2007 Rolling 12 Mo | 2006 Rolling 12 Mo | % Chg 2007 vs 2006 | 2007 Rolling 12 Mo | 2006 Rolling 12 Mo | % Chg 2007 vs 2006 |
| ASHLAND | **173** | **9,980** | **1,512,986** | 1.853 | 1.513 | 22.48% | 151.6 | 175.3 | 163.3 | 7.35% | 324.7 | 247.0 | 31.48% |
| HAZARD | **171** | **10,257** | **1,209,059** | 3.382 | 3.426 | *-1.28%* | 117.9 | 187.1 | 162.5 | 15.12% | 632.7 | 556.7 | 13.65% |
| PIKEVILLE | **230** | **20,770** | **2,239,397** | 2.749 | 3.248 | *-15.38%* | 107.8 | 175.5 | 152.0 | 15.45% | 482.5 | 493.9 | *-2.31%* |
| **Kentucky** | **574** | **41,007** | **4,961,442** | 2.618 | 2.718 | *-3.69%* | 121.0 | 179.4 | 157.6 | 13.83% | 469.6 | 428.3 | 9.64% |
| ***TARGETS*** | | | | *2.406* | | | | *160.0* | | | *385* | | |

## Kentucky Power Reliability - Rolling 12 Months (Excluding Jurisdictional Major Event Days)

| District | Rolling x Months Ending Period | Customer Count | Nbr Interruptions | Total Customer Affected | Total Customer Minutes Interrupted | SAIFI | CAIDI | SAIDI |
|---|---|---|---|---|---|---|---|---|
| Ashland | Mar 2007 | 57,719 | 2,556 | 106,942 | 18,741,679 | 1.853 | 175.3 | 324.7 |
| Hazard | Mar 2007 | 45,749 | 2,675 | 154,723 | 28,944,500 | 3.382 | 187.1 | 632.7 |
| Pikeville | Mar 2007 | 70,139 | 3,108 | 192,799 | 33,839,637 | 2.749 | 175.5 | 482.5 |
| **Kentucky Power** | **Sum:** | **173,607** | **8,339** | **454,464** | **81,525,816** | | | |

## Kentucky Power Reliability - Rolling 12 Months (No Exclusions)

| District | Rolling x Months Ending Period | Customer Count | Nbr Interruptions | Total Customer Affected | Total Customer Minutes Interrupted | SAIFI | CAIDI | SAIDI |
|---|---|---|---|---|---|---|---|---|
| Ashland | Mar 2007 | 57,719 | 2,563 | 106,965 | 18,743,215 | 1.853 | 175.2 | 324.7 |
| Hazard | Mar 2007 | 45,749 | 2,718 | 158,562 | 30,658,218 | 3.466 | 193.4 | 670.1 |
| Pikeville | Mar 2007 | 70,139 | 3,213 | 213,673 | 47,780,660 | 3.046 | 223.6 | 681.2 |
| **Kentucky Power** | **Sum:** | **173,607** | **8,494** | **479,200** | **97,182,093** | | | |

# Reliability Surveying - Segmenting For Comparability

David J. Schepers, *IEEE Member*

**Abstract—This paper deals with utility reliability benchmarking and the various factors that affect IEEE reliability indices as calculated by the various utilities and the need to understand and segment on the basis of those factors.**

*Index Terms*— **Reliability, Surveying**

## I. Introduction

Utilities and regulators alike have for many years attempted to develop a means for measuring the performance of utilities over time. More recently, as the use of performance-based rates has come into vogue, regulators have looked for ways to benchmark an individual state's utilities against each other as well as against the utility industry in general. Current benchmarking methods have led to some false conclusions due to the fact that they don't take into account the various factors that affect reliability and that differ from utility to utility. These factors are real and present some real challenges to those interested in developing some valid benchmarks. This paper will look at the various factors that are relevant to the benchmarking discussion and need to be taken in to account in any survey or study.

The reliability indices referred herein as those standard indices as defined in the *Full Use Guide For Electric Power Distribution Reliability Indices* IEEE1366-2001.

## II. Looking At Comparability

Utilities and regulators alike have a need for better understanding how utilities compare in the level of reliability offered to customers. However, given the current state of reliability benchmarking, there are a number of problematic issues associated with the standard indices prepared by the individual utilities. These issues prevent any meaningful direct comparisons between indices of different utilities and can lead to incorrect conclusions from the indices when not clearly understood and taken into account. In this paper, the following main factors affecting direct reliability index comparison will be discussed:

- Outage Management Systems
- Circuit Connectivity
- Distribution Automation/SCADA
- Geography
- Outage Definition
- Automated Meter Reading Outage Reporting
- Storm Normalization

### A. *The Outage Management System*

What type of Outage Management System (OMS) does the utility employ? Utilities have employed various degrees of automation in the accumulation and storage of outage data. Do customer calls feed directly into the OMS? Are the calls written down and then later entered into an outage database? Are the calls retained on paper where they are counted when the indices are required? Many utilities automated systems track outages through their life cycle; many other systems do not. By their very nature, completely automated systems keep better track of the outage frequency and duration and thereby lead to higher indices than would be experienced by paper systems. For good comparisons, utilities should always be aware of the system capabilities of those other utilities included in the results. Otherwise, what appears to be poor performance on the surface may not be poor at all.

### B. *Circuit Connectivity*

While some would include this item in with automation of the OMS, this is really a separate issue. Connectivity refers to the ability of the system to infer outages onto all affected customers, even those who did not notify the utility, from data related to the received calls or the location of the affected device. When a transformer that serves 12 customers fails, but only two customers call, what does the system count, 2 or 12? A utility with complete circuit connectivity takes the 2 calls, knows the transformer serves 10 others, and will record a loss of service to 12 customers. Utilities without circuit connectivity may only count the 2 calls as affected customers. This leads to gross inequities between utilities and quite possibly the largest source of error. Without connectivity throughout the circuit and system, there is simply no way to know the exact number of customers out of service for any given component failure and record the number accordingly. After implementing automated mapping systems with circuit connectivity and

David J Schepers is and electrical Engineering graduate of the University Of Missouri at Rolla and a registered professional engineer in the states of Missouri and Illinois. David is currently Manager of Distribution Operating for Ameren Corp., St Louis, MO, and has extensive experience in electric utility operations, planning, and design.

automated OMS, utilities have been known to experience outage rates more than double previous indices. Any survey, in order to be useful to participants, should require the identification of the level of circuit connectivity employed at the utility.

*C. Distribution Automation/SCADA*

To what degree has the utility being surveyed employed substation SCADA (Supervisor Control And Data Acquisition) and/or some type of automated switching scheme on the distribution system? In one sense, one could argue that whether a utility employs distribution automation is no different from whether the utility trims its trees. Either, distribution automation or tree trimming, are strategies used to reduce outages or outage duration, and are arguably reasons for higher or lower reliability indices. However, smaller utilities without the means to employ such systems may object to being compared to others who have employed them. Alternatively, those who have such systems may feel that these systems enhance their data collection, similarly to circuit connectivity, resulting in higher indices. Knowing to what extent each survey participant has employed these systems allows utilities to identify more closely with like participants and, more importantly, look at others having higher levels of implementation and identify whether better indices have resulted. Utilities without the financial wherewithal to install these systems will be better able to explain to regulators why their indices appear worse than those that have employed them.

*D. Geography*

What type of geography is served by the utility? Utility service territories may be urban, suburban, or rural, or more likely, some combination of all of these. Distribution systems designed for rural areas are generally comprised of small substations with very long radial circuits extending for many miles, with little redundancy and few circuit ties. Systems in dense urban areas are normally made up of larger substations with multiple supplies, redundant facilities, shorter circuit lengths, and multiple tie paths. Circuit distance alone is a substantial reliability issue; a rural circuit with 20 miles of exposure is inherently less reliable than an urban circuit of 5 miles. More circuit length equates to more exposure and more points of potential failure. Dense urban areas may also employ a larger degree of underground facilities than sparse rural areas. These inherent design differences and levels of system exposure necessitate the geography be known by the participants in order for appropriate comparisons to be made.

*E. Outage Definition*

Any survey should be careful in identifying what outages are expected to be included in the reported indices. Many utilities have developed their own standards for what they include in the outage numbers, eliminating such things as maintenance (planned) outages, customer-caused outages, public-caused outages, and outages under a certain duration. The survey should clearly spell out what exclusions are proper and require utilities to identify any exceptions to the stated rules. Ideally, exclusions should be kept to a minimum in order to avoid any inequities surrounding even how the exception is identified in the utility's outage system. Even planned outages should be included in the data since utilities employ different construction and maintenance practices which may have positive or negative impact on the required frequency of planned outages. The definition of sustained interruption versus momentary interruption should be clear and used equally among all participants. IEEE 1366-2001 provides definitions and guidance in this area.

*F. Automated Meter Reading (AMR) Outage Reporting*

At the present time, automatic outage reporting through a fixed AMR network is in place at only a few utilities. However, the impact of this type of reporting is already having an effect on the calculated reliability indices at those utilities. Utilities are notified of the outage quicker, so the clock starts sooner. This can have little effect if the utility can respond quickly. However, if the utility is already responding beyond its capabilities, the clock has begun and more customer-minutes will accumulate. More importantly, when combined with circuit connectivity and an automated OMS, these additional AMR outage calls will more correctly identify the extent of the outage and the exact number of customers affected. For example, assume a tap fuse has blown affecting 20 customers, 10 on each of two distribution line transformers. Five phone calls from affected customers are received, all five from customers on the same transformer. The OMS analyzes the incoming call data and incorrectly identifies the transformer as the point of failure. Unless corrected, the outage data will reflect outages to only 10 customers instead of the correct 20. With the implementation of AMR outage reporting, the 5 customer calls are supplemented with AMR reports from all affected meters and the correct customer count is identified. Maintenance outages will also increase because line crews will be required to notify the dispatch office any time an outage is taken, or the AMR outage report will identify a failure to the OMS when there is in fact planned work in progress.

*G. Storm Normalization Methodology*

All surveys require that participating utilities report indices that are inclusive of all outages and indices that have been "storm normalized". Some surveys require the respondent to identify the method of storm exclusion. Since the normalized indices are the most useful for comparisons, having supposedly been normalized for unusual weather patterns experienced by one utility but not another, it is imperative that a method for storm-normalization be determined that is equitable for all utilities. The method should allow for the exclusion of unusual events while not being so generous to the utility as to understate to regulators and others the actual reliability performance of the utility. The data included in the indices should be reflective of what the customer experiences from year to year. Much work has been done in this area to arrive at an equitable methodology satisfactory to both utilities and regulators, but much work remains to be done before any such method is universally accepted. In the interim, surveys should have respondents clearly identify what storm normalization methodology was employed in the determination of the reported indices.

## III. Summary

Utilities and regulators are rightfully looking for ways to benchmark the performance of individual utilities against the utility's own past record as well as against others in the industry. This benchmarking is appropriate only when the proper precautions are taken to segment utilities so that relevant comparisons are made. This segmenting needs to take into not only the utility's location, geography, and system design, but also its data capture and analysis capabilities. Properly done, relevant benchmarks can be extrapolated from survey data and appropriate comparisons made.

## IV. REFERENCES

*Technical Reports:*

[1] Richard D Christie, Charles W Williams, Cheryl A Warren, "*Descriptions of Candidate Major Event Day Classification Methods*," February 8 2002.

*Papers Presented at Conferences (Unpublished):*

[1] James D. Bouford, "The Need to Segment Abnormal Events from the Calculation of Reliability Indices," prepared for the Summer Power Meeting 2002,Chicago, IL, USA.

[2] Richard D. Christie, "Statistical Methods of Classifying Major Event Days in Distribution Systems," prepared for the Summer Power Meeting 2002,Chicago, IL, USA.

[3] Daniel A Kowalewski, "A Comparable Method for Benchmarking the Reliability Performance of Electric Utilities - The Exelon Experience," prepared for the Summer Power Meeting 2002,Chicago, IL, USA.

[4] Cheryl A Warren, "Overview of 1366-2001 the Full Use Guide on Electric Power Distribution Reliability Indices," prepared for the Summer Power Meeting 2002,Chicago, IL, USA.

[5] Charles W. Williams, "Major Reliability Events – Self-Defining?," prepared for the Summer Power Meeting 2002,Chicago, IL, USA

*Papers from Conference Proceedings (Published):*

[1] Richard D Christie, "Statistical Classification of Major Reliability Event Days in Distribution Systems," submitted to *IEEE Power Engineering Society Transmission and Distribution*

*Standards:*

[1] *IEEE Full Use Guide for Electric Distribution Reliability Indices*, IEEE Standard 1366-2001, March 2001.

# Reporting Period: 01/01/2006 through 12/31/2006

## Ashland District

| Station Abbr | Circuit Abbr | Station Nbr | Circuit Nbr | Nbr Interruptions | Total Outage Duration Minutes | VAR Avg Interruption Duration | Total Customer Affected | VAR Cust Interr Magn Index | Total Customer Minutes Interrupted | Customer Count | SAIFI | CAIDI | SAIDI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BUSSEYVIL | TORCHLITE | 79 | 4 | 138 | 34,718 | 251.58 | 9,271 | 67.18 | 2,817,778 | 2,371 | 3.91 | 303.9 | 1188.434 |
| BUSSEYVIL | LOUISA | 79 | 3 | 82 | 23,696 | 288.98 | 3,109 | 37.91 | 1,031,432 | 1,269 | 2.45 | 331.8 | 812.791 |
| HITCHINS | WILLARD | 10 | 2 | 115 | 20,384 | 177.25 | 4,775 | 41.52 | 1,241,234 | 1,611 | 2.964 | 259.9 | 770.474 |
| HOODSCREE | SUMMIT | 11 | 1 | 57 | 8,503 | 149.18 | 2,826 | 49.58 | 650,249 | 924 | 3.058 | 230.1 | 703.733 |
| BIG SANDY | FALLSBURG | 2 | 1 | 60 | 14,545 | 242.42 | 3,872 | 64.53 | 705,697 | 1,287 | 3.009 | 182.3 | 548.327 |
| COALTON | CANNONSBU | 37 | 2 | 41 | 7,351 | 179.29 | 2,050 | 50 | 275,958 | 553 | 3.707 | 134.6 | 499.02 |
| BIG SANDY | BURNAUG-N | 2 | 2 | 67 | 12,437 | 185.63 | 2,150 | 32.09 | 385,638 | 820 | 2.622 | 179.4 | 470.29 |
| GRAHN | PLEASANTV | 6 | 1 | 23 | 3,905 | 169.78 | 741 | 32.22 | 182,548 | 403 | 1.839 | 246.4 | 452.973 |
| BELHAVEN | INDIANRU | 1167 | 2 | 34 | 6,781 | 199.44 | 4,988 | 146.71 | 528,908 | 1,452 | 3.435 | 106 | 364.262 |
| COALTON | U.S.60W | 37 | 1 | 67 | 12,832 | 191.52 | 2,051 | 30.61 | 417,010 | 1,200 | 1.709 | 203.3 | 347.508 |
| 10STREET | 6STREET | 21 | 1 | 18 | 1,506 | 83.67 | 437 | 24.28 | 30,931 | 100 | 4.37 | 70.8 | 309.31 |
| COALTON | TRACECREE | 37 | 3 | 43 | 6,197 | 144.12 | 2,614 | 60.79 | 240,080 | 812 | 3.219 | 91.8 | 295.665 |
| BELLEFONT | BELLEFONT | 3 | 3 | 96 | 14,562 | 151.69 | 4,455 | 46.41 | 489,431 | 1,668 | 2.671 | 109.9 | 293.424 |
| CANNONSBU | CANNONSBU | 87 | 1 | 78 | 12,804 | 164.15 | 2,771 | 35.53 | 373,873 | 1,284 | 2.158 | 134.9 | 291.178 |
| BELHAVEN | ARGILLIT | 1167 | 3 | 72 | 10,884 | 151.17 | 5,429 | 75.4 | 567,963 | 1,987 | 2.732 | 104.6 | 285.839 |
| 10STREET | 12STREET | 21 | 3 | 28 | 3,302 | 117.93 | 1,746 | 62.36 | 237,091 | 834 | 2.094 | 135.8 | 284.282 |
| HIGHLAND | FLATWOODS | 9 | 2 | 26 | 4,618 | 177.62 | 2,275 | 87.5 | 229,244 | 829 | 2.744 | 100.8 | 276.531 |
| HITCHINS | DAMRONBRA | 10 | 1 | 16 | 3,016 | 188.5 | 756 | 47.25 | 113,828 | 459 | 1.647 | 150.6 | 247.991 |
| HIGHLAND | WURTLAND | 9 | 3 | 14 | 1,978 | 141.29 | 1,000 | 71.43 | 106,948 | 444 | 2.252 | 106.9 | 240.874 |
| HAYWARD | HALDEMAN | 8 | 1 | 70 | 10,432 | 149.03 | 1,914 | 27.34 | 431,184 | 1,797 | 1.065 | 225.3 | 239.947 |
| WURTLAND | GREENUP | 1109 | 2 | 48 | 6,360 | 132.5 | 2,306 | 48.04 | 304,590 | 1,326 | 1.739 | 132.1 | 229.706 |
| S.NEAL | WHITESCRK | 2064 | 3 | 34 | 4,368 | 128.47 | 684 | 20.12 | 88,664 | 388 | 1.763 | 129.6 | 228.515 |
| HOODSCREE | RURAL | 11 | 2 | 38 | 5,157 | 135.71 | 1,336 | 35.16 | 154,540 | 725 | 1.843 | 115.7 | 213.159 |
| GRAYSBRAN | GRAYSBRAN | 7 | 1 | 53 | 9,530 | 179.81 | 1,116 | 21.06 | 256,723 | 1,206 | 0.925 | 230 | 212.871 |
| GRAYSON | LANSDOWNE | 1161 | 1 | 56 | 7,067 | 126.2 | 1,364 | 24.36 | 250,292 | 1,211 | 1.126 | 183.5 | 206.682 |
| SILOAM | SILOAM | 43 | 1 | 30 | 5,004 | 166.8 | 1,223 | 40.77 | 86,897 | 452 | 2.706 | 71.1 | 192.25 |
| BELLEFONT | FLATWOODS | 3 | 2 | 9 | 1,073 | 119.22 | 75 | 8.33 | 19,065 | 109 | 0.688 | 254.2 | 174.908 |
| S.SHORE | TAYLOR | 20 | 2 | 21 | 3,303 | 157.29 | 541 | 25.76 | 80,946 | 470 | 1.151 | 149.6 | 172.226 |
| S.SHORE | SILOAM | 20 | 1 | 36 | 7,972 | 221.44 | 1,748 | 48.56 | 179,755 | 1,050 | 1.665 | 102.8 | 171.195 |
| CANNONSBU | ROUTE3 | 87 | 2 | 108 | 22,227 | 205.81 | 1,736 | 16.07 | 323,018 | 1,983 | 0.875 | 186.1 | 162.894 |
| HOWARDCOL | 29STREET | 12 | 2 | 41 | 7,020 | 171.22 | 994 | 24.24 | 203,500 | 1,293 | 0.769 | 204.7 | 157.386 |
| 47STREET | 39STREET | 80 | 2 | 41 | 7,219 | 176.07 | 1,789 | 43.63 | 198,063 | 1,262 | 1.418 | 110.7 | 156.944 |
| LOUISA | CITY | 14 | 1 | 15 | 3,812 | 254.13 | 641 | 42.73 | 136,752 | 883 | 0.726 | 213.3 | 154.872 |
| HIGHLAND | RUSSELL | 9 | 1 | 15 | 1,529 | 101.93 | 902 | 60.13 | 115,967 | 793 | 1.137 | 128.6 | 146.238 |
| HOWARDCOL | SUMMIT | 12 | 4 | 45 | 5,152 | 114.49 | 1,507 | 33.49 | 98,503 | 741 | 2.034 | 65.4 | 132.933 |
| HOWARDCOL | 13STREET | 12 | 1 | 77 | 8,831 | 114.69 | 1,855 | 24.09 | 236,189 | 1,905 | 0.974 | 127.3 | 123.984 |
| OLIVEHILL | GLOBE | 1031 | 1 | 82 | 12,845 | 156.65 | 1,769 | 21.57 | 186,286 | 1,532 | 1.155 | 105.3 | 121.597 |
| PRINCESS | MEADE STA | 1176 | 1 | 77 | 10,511 | 136.51 | 1,319 | 17.13 | 169,598 | 1,451 | 0.909 | 128.6 | 116.884 |
| HOWARDCOL | FLOYD | 12 | 3 | 38 | 7,372 | 194 | 2,035 | 53.55 | 160,302 | 1,454 | 1.4 | 78.8 | 110.249 |
| RUSSELL | KENWOOD | 106 | 1 | 40 | 8,879 | 221.98 | 1,994 | 49.85 | 149,589 | 1,451 | 1.374 | 75 | 103.094 |
| WURTLAND | RT.503 | 1109 | 3 | 45 | 7,257 | 161.27 | 694 | 15.42 | 111,646 | 1,158 | 0.599 | 160.9 | 96.413 |
| HITCHINS | HITCH-GRA | 10 | 3 | 47 | 7,951 | 169.17 | 811 | 17.26 | 105,507 | 1,197 | 0.678 | 130.1 | 88.143 |

## Reporting Period: 01/01/2006 through 12/31/2006

## Ashland District

| Station Abbr | Circuit Abbr | Station Nbr | Circuit Nbr | Nbr Interruptions | Total Outage Duration Minutes | VAR Avg Interruption Duration | Total Customer Affected | VAR Cust Interr Magn Index | Total Customer Minutes Interrupted | Customer Count | SAIFI | CAIDI | SAIDI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 47STREET | CATLETTSB | 80 | 3 | 41 | 8,467 | 206.51 | 842 | 20.54 | 118,281 | 1,345 | 0.626 | 140.5 | 87.941 |
| PRINCESS | ROUTE 180 | 1176 | 2 | 14 | 2,740 | 195.71 | 71 | 5.07 | 23,581 | 270 | 0.263 | 332.1 | 87.337 |
| 47STREET | 49STREET | 80 | 1 | 41 | 5,324 | 129.85 | 1,147 | 27.98 | 126,104 | 1,582 | 0.725 | 109.9 | 79.712 |
| RUSSELL | BEARRUN | 106 | 2 | 26 | 5,090 | 195.77 | 1,024 | 39.38 | 59,862 | 762 | 1.344 | 58.5 | 78.559 |
| GRAYSON | DIXIEPARK | 1161 | 2 | 41 | 6,866 | 167.46 | 1,061 | 25.88 | 104,009 | 1,377 | 0.771 | 98 | 75.533 |
| BELHAVEN | THOMPSON | 1167 | 1 | 27 | 4,505 | 166.85 | 265 | 9.81 | 42,288 | 585 | 0.453 | 159.6 | 72.287 |
| HAYWARD | LAWTON | 8 | 2 | 17 | 2,494 | 146.71 | 111 | 6.53 | 23,520 | 374 | 0.297 | 211.9 | 62.888 |
| BELLEFONT | WESTWOOD | 3 | 1 | 51 | 6,183 | 121.24 | 972 | 19.06 | 80,373 | 2,062 | 0.471 | 82.7 | 38.978 |
| RUSSELL | ASHLANDOI | 106 | 3 | 1 | 39 | 39 | 7 | 7 | 273 | 8 | 0.875 | 39 | 34.125 |
| LOUISA | HIGHBOTTO | 14 | 2 | 15 | 2,802 | 186.8 | 124 | 8.27 | 18,106 | 695 | 0.178 | 146 | 26.052 |
| 10STREET | 3RD STREET | 21 | 4 | 8 | 1,846 | 230.75 | 84 | 10.5 | 7,559 | 518 | 0.162 | 90 | 14.593 |
| ASHLAND | 25-1ST STREET | 1 | 5 | 7 | 533 | 76.14 | 31 | 4.43 | 1,726 | 134 | 0.231 | 55.7 | 12.881 |
| BELLEFONT | ASHTOWNCT | 3 | 4 | 2 | 201 | 100.5 | 2 | 1 | 201 | 20 | 0.1 | 100.5 | 10.05 |
| WURTLAND | WURTLAND | 1109 | 1 | 2 | 300 | 150 | 2 | 1 | 300 | 33 | 0.061 | 150 | 9.091 |
| ASHLAND | 25-29STRE | 1 | 2 | 11 | 755 | 68.64 | 48 | 4.36 | 3,156 | 689 | 0.07 | 65.8 | 4.581 |
| ASHLAND | 25-14STRE | 1 | 3 | 3 | 175 | 58.33 | 8 | 2.67 | 395 | 129 | 0.062 | 49.4 | 3.062 |
| ASHLAND | 25-25STRE | 1 | 1 | 1 | 54 | 54 | 6 | 6 | 324 | 123 | 0.049 | 54 | 2.634 |
| 10STREET | MIDTOWN | 21 | 5 | 1 | 40 | 40 | 2 | 2 | 80 | 412 | 0.005 | 40 | 0.194 |
| 10STREET | 2ND STREET | 21 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10STREET | FRONTSTREET | 21 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 112 | 0 | 0 | 0 |
| 10STREET | WESTCENTRAL | 21 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 340 | 0 | 0 | 0 |
| MANSBACH | SHREDDER | 1092 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| OLIVEHILL | 4KV CITY | 1031 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| OLIVEHILL | W CRTRS ELEM | 1031 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| RCLND | CSXCAR | 1017 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| WRTHNGTN | CSXWELD | 1136 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | | | **Sum:** | **2450** | **423,304** | **172.78** | **93,476** | **38.15** | **15,283,555** | **57,719** | **1.62** | **163.5** | **264.87** |

Busseyville/Torchlight (0079/04) - Summary of Causes for Outages in 2006

Number of Customers Served = 2371

Circuit Miles = 193.87

| Station Abbr | Circuit Abbr | Station Nbr | Circ Nbr | Minor Cause Code Desc | Total Outages | Total Duration Minutes | Ave Interr Duration | Num Cust Interr | Cust Interr Magn Index | Cust Min of Interr | SAIFI | CAIDI | SAIDI | IDI IFI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BUSSEYVIL | TORCHLITE | 79 | 4 | TREE OUT OF ROW | 27 | 9,350 | 346.3 | 4,090 | 151.48 | 1,301,050 | 1.727 | 318.1 | 549.43 | 1.095 |
| BUSSEYVIL | TORCHLITE | 79 | 4 | VEHICLE ACCIDENT (NON AEP) | 1 | 503 | 503 | 2,497 | 2497 | 1,034,216 | 1.054 | 414.2 | 436.747 | 1.127 |
| BUSSEYVIL | TORCHLITE | 79 | 4 | WEATHER - LIGHTNING | 18 | 6,339 | 352.17 | 557 | 30.94 | 173,604 | 0.235 | 311.7 | 73.313 | 0.708 |
| BUSSEYVIL | TORCHLITE | 79 | 4 | EQUIPMENT FAILURE | 46 | 10,531 | 228.93 | 648 | 14.09 | 117,147 | 0.274 | 180.8 | 49.471 | 0.445 |
| BUSSEYVIL | TORCHLITE | 79 | 4 | TREE INSIDE ROW | 19 | 2,697 | 141.95 | 498 | 26.21 | 89,114 | 0.21 | 178.9 | 37.633 | 0.425 |
| BUSSEYVIL | TORCHLITE | 79 | 4 | TREE REMOVAL (NON AEP) | 3 | 865 | 288.33 | 96 | 32 | 29,669 | 0.041 | 309.1 | 12.529 | 0.654 |
| BUSSEYVIL | TORCHLITE | 79 | 4 | SCHEDULED COMPANY | 5 | 412 | 82.4 | 376 | 75.2 | 23,315 | 0.159 | 62 | 9.846 | 0.169 |
| BUSSEYVIL | TORCHLITE | 79 | 4 | CUST. EQUIPMENT > 1 CUSTOMER | 1 | 138 | 138 | 180 | 180 | 17,322 | 0.076 | 96.2 | 7.315 | 0.219 |
| BUSSEYVIL | TORCHLITE | 79 | 4 | ANIMAL | 6 | 1,040 | 173.33 | 58 | 9.67 | 14,206 | 0.024 | 244.9 | 5.999 | 0.516 |
| BUSSEYVIL | TORCHLITE | 79 | 4 | UNKNOWN (NON WEATHER) | 5 | 708 | 141.6 | 78 | 15.6 | 9,344 | 0.033 | 119.8 | 3.946 | 0.258 |
| BUSSEYVIL | TORCHLITE | 79 | 4 | WEATHER - UNKNOWN | 2 | 240 | 120 | 36 | 18 | 3,300 | 0.015 | 91.7 | 1.394 | 0.195 |
| BUSSEYVIL | TORCHLITE | 79 | 4 | VANDALISM | 2 | 441 | 220.5 | 148 | 74 | 3,215 | 0.063 | 21.7 | 1.358 | 0.061 |
| BUSSEYVIL | TORCHLITE | 79 | 4 | UG CONST. /DIG-INS (NON AEP) | 1 | 1,255 | 1255 | 1 | 1 | 1,255 | 0 | 1255 | 0.53 | 2.615 |
| BUSSEYVIL | TORCHLITE | 79 | 4 | OTHER | 1 | 137 | 137 | 7 | 7 | 959 | 0.003 | 137 | 0.405 | 0.286 |
| BUSSEYVIL | TORCHLITE | 79 | 4 | ERROR - FIELD | 1 | 62 | 62 | 1 | 1 | 62 | 0 | 62 | 0.026 | 0.129 |
| | | | | | **138** | **34,718** | | **9,271** | | **2,817,778** | **3.91** | **303.93** | **1,188.43** | |

Busseyville/Torchlight - Cause Code vs SAIDI