

Illinois Commerce Commission  
Assessment of  
Central Illinois Light Company's  
Annual Reliability Report and  
Electric Service Reliability  
For Calendar Year 2004

Pursuant to 83 Ill. Adm. Code 411.140

2005

## **1. Executive Summary**

Pursuant to Section 16-125 of the Illinois Public Utilities Act and the Commission's electric reliability rules as found in 83 Illinois Administrative Code, Part 411 ("Part 411"), Central Illinois Light Company ("AmerenCILCO") filed its annual electric reliability report for the 2004 calendar year. The annual reliability report AmerenCILCO filed was organized to sequentially follow the reporting requirements of Part 411, and complied with the requirements found therein.

AmerenCILCO's system average interruption frequency index ("SAIFI"), customer average interruption frequency index ("CAIFI"), and customer average interruption duration index ("CAIDI") all improved during the 2004 calendar year when compared to 2003. These improved indices indicate that AmerenCILCO's customers, on average, experienced fewer and shorter interruptions in 2004 than in 2003. Despite the improvement, AmerenCILCO's system reliability indices indicated average to below average performance when compared to the indices of all the reporting utilities. In particular, Staff is concerned by the high CAIDI AmerenCILCO has reported for the past several calendar years.

During the summer of 2005, Staff inspected five of AmerenCILCO's distribution circuits, one of which Staff had also inspected in 2004. Staff found AmerenCILCO's distribution facilities to generally be in good condition except on Circuit E10-001. Staff was alarmed by the number of locations where facilities required maintenance or replacement on that one circuit and is concerned that AmerenCILCO had allowed so many locations to deteriorate to such a degree. AmerenCILCO had completed specific projects to repair many of its facilities on several of the other circuits Staff inspected that had been performing poorly, and Staff was satisfied that AmerenCILCO had done a good job completing its reliability improvements on those other circuits. During its inspections of AmerenCILCO's distribution circuits, Staff noted several National Electrical Safety Code ("NESC") clearance violations, such as conductor with inadequate ground clearance, all of which AmerenCILCO promptly corrected. Staff provided AmerenCILCO with a summary of its inspection findings for each circuit inspected.

To improve its reliability performance, Staff suggests that AmerenCILCO: more frequently inspect its own distribution circuits, including substation equipment, and act sooner to remedy the problems it finds; strive to reduce CAIDI by modifying its practices associated with underground equipment related interruptions; and emphasize with its tree trimming crews that trees must be trimmed in such a manner that they do not contact the power lines between trimmings.

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## **2. Introduction**

This document assesses the reliability report that Central Illinois Light Company ("AmerenCILCO") filed with the Commission, and evaluates AmerenCILCO's reliability performance for the 2004 calendar year.

Beginning with the year 1999 and at least every three years thereafter, 83 Illinois Administrative Code Part 411.140 requires the Commission to assess the annual reliability report of each jurisdictional entity and evaluate the entity's reliability performance. Code Part 411.140 requires the Commission's evaluation to:

- A) Assess the reliability report of each entity.
- B) Assess the jurisdictional entity's historical performance relative to established reliability targets.
- C) Identify trends in the jurisdictional entity's reliability performance.
- D) Evaluate the jurisdictional entity's plan to maintain or improve reliability.
- E) Identify, assess, and make recommendations pertaining to any potential reliability problems and risks that the Commission has identified as a result of its evaluation.
- F) Include a review of the jurisdictional entity's implementation of its plan for the previous reporting period.

## **3. Customers and Service Territory**

AmerenCILCO stated it provided electric service to 207,610 customers in 2004, in a service territory that covers 3,700 square miles and includes 136 communities, including urban areas in and around Peoria, East Peoria, Pekin, Lincoln, and parts of Springfield. AmerenCILCO also supplies rural areas surrounding these communities, and two smaller rural areas south of the communities of Champaign and Danville.

## **4. Description of Distribution System**

AmerenCILCO stated its distribution facilities consist of 109 substations that supply 307 distribution circuits and consist of about 7,850 miles of line. Approximately 74% of these miles are overhead, and 26% are underground. AmerenCILCO operates and maintains 14 transmission and switching substations, and 34 industrial/wholesale substations.

Subsection 411.120(b)(3)(G) requires AmerenCILCO to report on the age and condition of its distribution and transmission facilities. AmerenCILCO reported its facilities were in good condition, and stated it based this conclusion on its reliability enhancement programs, technology changes and reliability indices.

AmerenCILCO provided the information shown in Table 1 about the age of its distribution equipment investments:

**Table 1: Average Age of Various Types of Distribution Equipment**

Type of Distribution Equipment	Depreciable Life (Years)	Average Age (Years)
Substation Equipment	34	19.1
Poles and Fixtures	36	18.6
Dist. Transformers	33	17.5
UG conductor and devices	25	13.6

**5. Assessment of Company's Reliability Report**

83 Illinois Administrative Code Part 411.120(b) requires each non-exempt jurisdictional entity to file an annual reliability report for the previous calendar year by June 1 of the current year. AmerenCILCO's reliability report was filed on schedule, and contained all the information necessary to comply with Subsection 411.120(b)(3). Staff also found that AmerenCILCO's report was organized in a logical manner so that finding information within the report was not difficult. AmerenCILCO did a good job describing specific projects intended to improve system reliability.

**6. Historical Performance Relative to Established Reliability Targets**

Code Part 411.140(b)(4)(A-C) establishes electric service reliability targets that jurisdictional entities (electric utilities) must strive to meet. These targets specify limitations on customer interruptions and hours of interruption time that a utility must strive not to exceed on a per customer basis. Code Part 411.120(b)(3)(L) requires each utility to provide a list of every customer, identified by a unique number, who experienced interruptions in excess of the service reliability targets, the number of interruptions and interruption duration the customer experienced in each of the three preceding years, and the number of consecutive years in which the customer has experienced interruptions in excess of the service reliability targets.

In April 2004, all regulated Illinois electric utilities agreed to report on all interruptions (controllable and uncontrollable) in relation to the service reliability targets for the reporting periods of 2003 through 2007, and to include the specific actions, if any, that the utility plans or has taken to address customer reliability concerns. The customer service reliability targets are listed in Table 2:

**Table 2: Service Reliability Targets**

Immediate primary source of service operation voltage	Maximum number of interruptions in each of the last three years	Maximum hours of total interruption duration in each of the last three years
69kV or above	3	9
Between 15kV & 69kV	4	12
15kV or below	6	18

AmerenCILCO's records indicated that 528 of its customers (+/- .25%) experienced interruptions in excess of the duration reliability target during 2004 (cumulative duration of more than 18 hours for at least 3 consecutive years). Four of the 528 customers experienced more than 100 hours of interruption time during 2004. AmerenCILCO reported one of its customers experienced interruptions that exceeded Part 411 reliability targets for five consecutive years, and two customers experienced interruptions that exceeded the targets for four consecutive years. During 2004, none of AmerenCILCO's customers experienced more than 6 interruptions for 3 consecutive years (frequency target). However, 127 of AmerenCILCO's 528 customers that experienced interruptions exceeding the duration target during 2004 also experienced more than 6 interruptions during either 1 or 2 of the previous 3 years (nearly 25%).

AmerenCILCO stated that severe weather caused most of the interruptions that exceeded the reliability targets. For roughly two-thirds of customers who experienced interruptions exceeding the reliability targets AmerenCILCO indicated it will depend upon scheduled tree trimming to improve reliability. For the remaining customers AmerenCILCO completed or plans to complete additional projects that should improve service reliability, such as replacing poles or adding protective equipment.

Staff believes that, if it is not already its practice to do so, AmerenCILCO should monitor interruptions to individual customers on an ongoing basis, and take prompt corrective action throughout the year when the same customer(s) experience multiple or lengthy interruptions. AmerenCILCO could provide much better service and circumvent most customer complaints by keeping itself aware of the condition of its distribution system, and by completing corrective actions more quickly to minimize repeat interruptions. It appeared to Staff that instead of performing maintenance on an on-going basis, AmerenCILCO waits to perform most remedial actions on its circuits until after the circuit has performed poorly, and then it forms a single specific project to address both maintenance tasks and capital improvements.

## **7. Analysis of Reliability Performance**

Reliability indices can be used to compare the reliability performance of various utilities, and indicate whether a given utility's performance is improving or degrading over time. Since each reporting utility uses its own reporting and recording methods, direct reliability index comparisons between utilities are not exact, but can still be informative. When comparing the indices reported by all the utilities that filed reliability reports for 2004, Staff observed:

- AmerenCILCO's SAIFI of 1.45 was the 4th lowest reported for 2004: about 3.5% lower than the average of the values reported by the other eight utilities.
- AmerenCILCO's CAIDI of 247 was the 3rd highest reported for 2004: about 60% higher than the average of the values reported by the other eight utilities.
- AmerenCILCO's CAIFI of 2.03 was the 5th lowest reported for 2004: about 2.5% lower than the average of the values reported by the other eight utilities.

Table 3 (a-c) shows the SAIFI, CAIDI, and CAIFI indices for 2004 as submitted by each reporting utility. Each index table is sorted from best to worst:

**Table 3: Year 2003 Reliability Indices for Reporting Utilities**

a) SAIFI		b) CAIDI		c) CAIFI	
UTILITY	SAIFI	UTILITY	CAIDI	UTILITY	CAIFI
South Beloit	0.61	MidAmerican	70	South Beloit	1.35
IPL	0.64	IPL	77	IPL	1.40
ComEd	1.21	South Beloit	96	ComEd	2.00
<b>AmerenCILCO</b>	<b>1.45</b>	ComEd	128	AmerenCIPS	2.01
AmerenIP	1.49	AmerenCIPS	143	<b>AmerenCILCO</b>	<b>2.03</b>
AmerenCIPS	1.66	Mt. Carmel	177	AmerenUE	2.05
AmerenUE	1.69	<b>AmerenCILCO</b>	<b>247</b>	AmerenIP	2.26
MidAmerican	2.03	AmerenIP	268	MidAmerican	2.72
Mt. Carmel	2.69	AmerenUE	278	Mt. Carmel	2.86

$$\text{SAIFI} = \frac{\text{Total \# Customer Interruptions}}{\text{Total \# of Customers Served}}$$

$$\text{CAIDI} = \frac{\text{Sum of all Interruption Durations}}{\text{Total \# of Customer Interruptions}}$$

$$\text{CAIFI} = \frac{\text{Total \# Customer Interruptions}}{\text{Total \# of Customers Affected}}$$

AmerenCILCO stated it had two customers receiving power from an alternative retail electric supplier ("ARES") during 2004, and those customers experienced no interruptions.

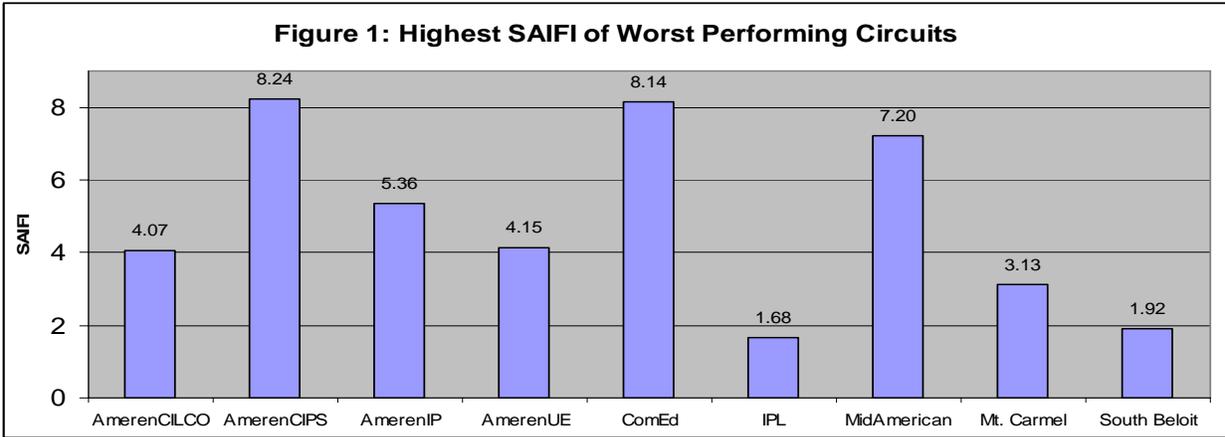
The results of an annual independent survey indicate that for 2004 AmerenCILCO's residential customers gave AmerenCILCO an average reliability score of 8.37 out of 10, and its non-residential customers gave AmerenCILCO an average reliability score of 8.75 out of 10. AmerenCILCO stated that during 2004 it received 5 complaints relating to reliability and that all were resolved.

#### Worst Performing Circuits

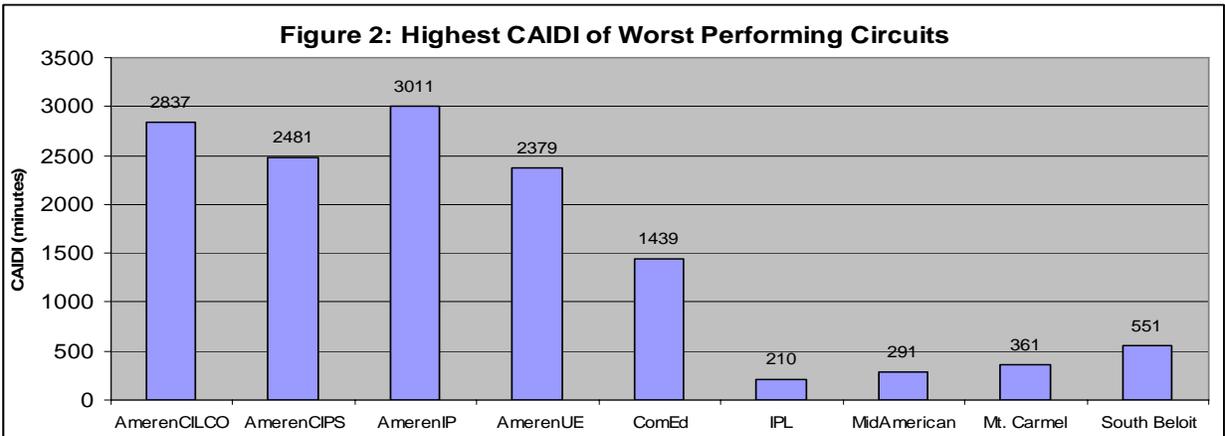
Section 411.120 requires utilities to report worst performing circuits and state corrective actions taken or planned to improve the performance of those circuits. Worst performing circuits are the 1% of a utility's distribution circuits that had the highest SAIFI, CAIDI, and CAIFI during the report year. AmerenCILCO reported three worst performing circuits for each reliability index. AmerenCILCO identified 7 different circuits as worst performing circuits since two circuits were worst performing due to both SAIFI and CAIFI.

A utility must report worst performing circuits even if all its circuits performed well during the year: the Part 411 requirement is simply that the utility report its circuits that performed the worst based on each index. Therefore, comparing the index values for worst-case circuits from utility to utility can be useful when trying to assess the relative performance of several utilities.

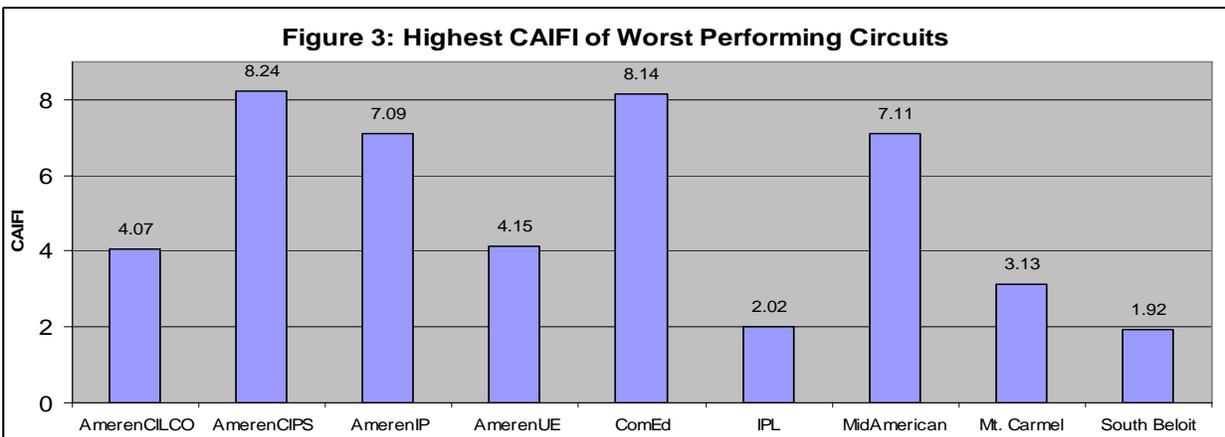
- The highest values of SAIFI reported for an individual distribution circuit during 2004 ranged from 1.68 (IPL) to 8.24 (AmerenCIPS), as illustrated by Figure 1. AmerenCILCO's highest SAIFI for an individual circuit in 2004 (4.07) was slightly less than the average of values reported.



- The highest value of CAIDI reported for an individual distribution circuit during 2004 ranged from 210 (IPL) to 3011 (AmerenIP), as illustrated by Figure 2. AmerenCILCO's highest CAIDI for an individual circuit in 2004 (2837) was the 2<sup>nd</sup> highest (worst) value reported.



- The highest value of CAIFI reported for an individual distribution circuit during 2004 ranged from 1.92 (South Beloit) to 8.24 (AmerenCIPS), as illustrated by Figure 3. As with SAIFI, AmerenCILCO's highest CAIFI for an individual circuit in 2004 (4.07) was near the average of values reported.



AmerenCILCO included statements in its reliability report regarding the operating and maintenance history of its circuits designated as worst performing, and listed corrective actions, taken or planned. AmerenCILCO explained that an ice storm on November 24, 2004, caused nearly all the outage time on its three circuits listed as worst performing circuits due to CAIDI, and no significant corrective action was performed on these circuits. For the rest of its worst performing circuits Staff was pleased that AmerenCILCO inspected the circuits, and stated it has taken or plans to take steps to improve reliability. Many of the corrective measures AmerenCILCO listed in its reliability report had not yet been completed. Unfortunately, with such a long time elapsing before corrective measures, circuits that performed poorly in 2004 will likely have similar performance for much of 2005. Staff encourages AmerenCILCO to develop processes that allow quicker implementation of reliability improvements for its circuits that perform poorly.

### Staff's Circuit Inspections

Staff inspected four of AmerenCILCO's distribution circuits during the spring of 2005 that were either worst performing circuits during 2004, or were circuits that had higher than average SAIFI indices during that year. Representatives from AmerenCILCO accompanied Staff during these inspections. In addition, on its own, Staff re-inspected parts of a fifth circuit (Circuit A68-001) that it had previously inspected during the summer of 2004.

Staff noted relatively few threats to reliable service on four of the five circuits inspected, but noted an inordinate number of locations on Circuit E10-001 where Staff observed damaged or deteriorated facilities. Items Staff noted when inspecting AmerenCILCO's circuits were conveyed to AmerenCILCO as an attachment to a June 28, 2005 email (see Attachment A). Specific information regarding each of the circuits that Staff inspected follows:

- *Circuit D69-008 (12 kV): (SAIFI=3.99; CAIDI=80; CAIFI=4.06)*

Circuit D69-008 was a worst performing circuit due to both SAIFI and CAIFI during 2004. It supplies urban areas in northwest Peoria, but also extends into more rural areas, including some areas with recent development. AmerenCILCO stated it had performed its own inspection of Circuit D69-008 in February of 2005, and as a result of its inspection issued a work package that was completed March 4, 2005. Of the 35 interruptions that occurred on this circuit during 2004, AmerenCILCO reported that 16 were due to problems in the underground: 10 due to equipment failure and 6 due to dig-ins (mostly associated with road work). In addition: 4 weather-related interruptions occurred; 3 animal-related interruptions occurred; 2 interruptions were caused by failure of overhead equipment; and 3 interruptions were caused by vehicles. AmerenCILCO reported only 1 tree-caused interruption, and stated that 5 interruptions were due to unknown causes. Tree trimming on Circuit D69-008 was last completed in October 2004.

Staff observed very few problems when inspecting Circuit D69-008. Staff noted two shell-rotted poles, a National Electrical Safety Code clearance violation, and one tree contact (Photo 1). AmerenCILCO had done a good job on its own identifying and correcting reliability threats associated with overhead equipment. Staff expects the

performance of Circuit D69-008 to substantially improve, and believes it could improve even more if AmerenCILCO would also address the root-cause of the circuit's many underground equipment related interruptions.

**Photo 1: Conifer into primary wires (D69-008)**



- *Circuit B83-001 (12 kV): (SAIFI=3.68; CAIDI=504; CAIFI=3.68)*

Circuit B83-001, which supplies customers in and around the rural community of Armington, was not a worst performing circuit during 2004, but had a SAIFI that was higher than AmerenCILCO's system SAIFI of 1.45. AmerenCILCO reported 18 sustained interruptions on this circuit during 2004: 6 due to weather; 6 due to overhead equipment failure; 4 due to underground equipment failure; 1 due to trees; and 1 due to an unknown cause. AmerenCILCO stated it completed its own inspection of Circuit B83-001 in March of 2005, and completed corrective actions on April 14. Tree trimming had been completed in December of 2004.

When inspecting Circuit B83-001, the only vegetation issues Staff observed were one tree contact along a rear lot-line and one location where vines had grown up a pole to the primary level. Other potential reliability threats Staff observed included 2 failing cross arms, one of which is shown in Photo 2, two poles that were leaning severely, and several poles with multiple woodpecker holes (Photo 3). While inspecting Circuit B83-001, Staff was pleased to note that AmerenCILCO had recently replaced several poles, and appeared to have made good use of animal guards and lightning arresters. Staff found few visible threats to reliable service following AmerenCILCO's remedial work resulting from its own inspection, and Staff expects that Circuit B83-001 will exhibit improved performance as a result of AmerenCILCO's efforts.

**Photo 2: Cross arm strained (B83-001)**



**Photo 3: Woodpecker holes (B83-001)**



- *Circuit E37-001 (12 kV): (SAIFI=3.83; CAIDI=117; CAIFI=3.83)*

Circuit E37-001, which supplies electricity to residential and commercial areas on the northeast edge of Springfield, was a worst performing circuit during 2004. Of the 9 interruptions on this circuit during 2004, 5 were weather related, and 1 interruption was attributed to each of the following: animals, trees, overhead equipment failure, and unknown. AmerenCILCO stated it completed its own inspection of Circuit E37-001 on February 2, 2005, and completed related projects on April 8. Tree trimming was last completed in October of 2004.

Much of Circuit E37-001 is built on the same poles with distribution circuits operated by City, Water, Light, and Power (Springfield's municipal). A widening of Dirksen Parkway caused AmerenCILCO to install lots of new facilities along that road. Staff was again pleased that most of AmerenCILCO's distribution transformers had animal guards installed. However, since AmerenCILCO had very recently finished its own inspection and follow-up work, Staff was disappointed to find deteriorated cross arms and/or braces at 9 locations (examples shown in Photos 4-7), and trees contacting the primary at 2 locations. AmerenCILCO should perform prompt maintenance at these locations so that this circuit does not reappear as a worst performing circuit.

**Photo 4: Two braces detached (E37-001)**



**Photo 5: Splitting cross arm (E37-001)**



Photo 6: Two braces detached (E37-001)



Photo 7: Strained cross arm (E37-001)



- *Circuit E10-001(12kV): (SAIFI=3.47; CAIDI=927; CAIFI=3.60)*

Circuit E10-001 supplies the communities of Waynesville and Hallsville and the rural areas between, covering a fairly large geographic area. Though not listed as a worst performing circuit during 2004, it had a SAIFI significantly higher than AmerenCILCO's system value of 1.45. AmerenCILCO indicated 47 interruptions occurred on E10-001 during 2004, including 18 that were weather related and 15 attributed to overhead equipment failure. The remaining interruptions were due to a variety of causes, and included 3 animal related and 2 tree related interruptions. AmerenCILCO stated it completed its own inspection of this circuit in April 2005, but that corrections to problems found during its inspection would likely not be completed until September 2005. Tree trimming was last completed in September 2003, and a mid-cycle patrol to check for clearances in the vicinity of fast growing trees was completed in February 2005.

Staff noted significantly more threats to reliable service on Circuit E10-001 than on any of the other AmerenCILCO circuits inspected. The first threat to reliable service that Staff noted was located at the substation: birds had constructed nests behind the disconnect switches on all 3 phases (Photo 8). This is a reliability threat not only because of the birds themselves, but because other animals, such as raccoons and opossums sometimes go after birds and their eggs, and might be attracted to the nests. These larger animals might cause significant facility damage if they cause a fault when climbing on energized components or the energized bus in the substation. AmerenCILCO should strive to keep its substation equipment clear of nesting debris.

Out on the circuit loose hardware was a recurring problem. Staff observed at least 6 locations where the nuts holding pole top pins to the pole were either loose or missing (Photo 9). Staff noted many splitting or rotted wooden cross arms, braces, and insulator pins (some examples shown in Photo 10-12), and 5 blown lightning arresters. Staff also noted one lightning arrester detached from its mounting so that it was suspended in the air: attached only by the wire jumpers (Photo 13). Lightning arresters were installed regularly in some areas of the circuit, but there were no

lightning arresters installed in other areas, even where significant lightning damage was evident (Photo 14). Staff observed trees contacting the primary conductor at 3 locations (example in Photo 15). On a positive note, it appeared that AmerenCILCO did a good job installing animal guards at distribution transformers. Staff noted AmerenCILCO had recently replaced several poles on the circuit, and many more poles had been marked to be replaced.

Staff discovered four NESC clearance violations on Circuit E10-001: 3 due to low neutral conductors, and 1 due to a down guy passing low over a driveway. Staff was pleased that AmerenCILCO reported it obtained the required clearances at all four locations by mid September. AmerenCILCO provided Staff with information about work it planned to complete on Circuit E10-001 stemming from its own inspection. Staff was very pleased that AmerenCILCO had planned work to improve the reliability of Circuit E10-001, but Staff was concerned to find so many locations with deteriorated or damaged facilities and that AmerenCILCO's corrective actions to improve the reliability of this circuit likely will not be completed in time to significantly affect its 2005 performance.

**Photo 8: Bird nests behind disconnects for all 3 phases (E10-001)**



**Bird Nests**

**Photo 9: Nuts missing from bolts on pole top pin (E10-001)**



**Photo 10: Failing arms and braces (E10-001)**



**Photo 11: Split cross arm (E10-001)**



**Photo 12: Failed insulator pins (E10-001)**



**Photo 13: Arrester off bracket (E10-001)**



**Photo 14: Lighting damage (E10-001)**



**Photo 15: Trees contacting primary (E10-001)**



- *Circuit A68-001 (SAIFI=4.07; CAIDI=90; CAIFI=4.07 )*

Circuit A68-001, which supplies the rural areas surrounding the community of Roanoke, was a worst performing circuit during 2004. Staff previously inspected Circuit A68-001 during the summer of 2004 because it had a worse than average SAIFI during the 2003 calendar year. AmerenCILCO indicated it had completed its own inspection of the circuit in January of 2005, and had completed the follow-up work associated with its inspection in April 2005.

In 2005, Staff elected to re-inspect several of the locations where threats to reliable service were noted during Staff's 2004 inspection to see if AmerenCILCO had performed any corrective actions at those locations. Staff re-inspected approximately half of the locations that were noted during its 2004 inspection, and was very pleased to find that AmerenCILCO had replaced or repaired nearly all of the previously noted deteriorated facilities. The only new visible threat to reliable service that Staff noted during its follow-up inspection was a pole top that had begun to split. Though Staff is concerned that AmerenCILCO had allowed so many facilities on Circuit A68-001 to deteriorate to such a degree in the first place, Staff was quite pleased with the remedial work AmerenCILCO eventually performed.

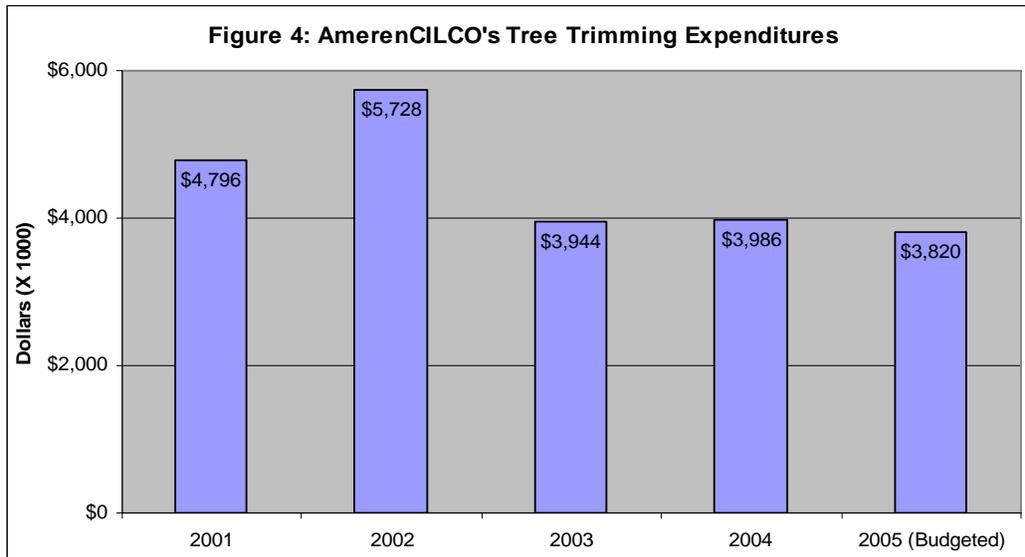
#### Tree Trimming:

AmerenCILCO operates 276 distribution circuits that require tree trimming and during 2004 trimmed approximately 25% of them. AmerenCILCO stated that it has maintained a 4-year tree-trimming cycle for 100% of its system throughout 2003 and 2004, and is committed to maintaining this cycle. Data AmerenCILCO provided to Staff indicates that during 2004 AmerenCILCO trimmed slightly more than 25% of its total miles of distribution lines that require trimming, and that it trimmed an even higher percentage of miles during 2003.

83 Illinois Administrative Code Part 305 and Section 218 of the NESC requires that AmerenCILCO keep trees from interfering with its power lines. In addition, the Commissions order in Docket 00-0699 requires that AmerenCILCO trim trees and manage vegetation as required by 83 Ill. Adm. Code 305. AmerenCILCO indicated there were 226 tree related interruptions on its distribution system during 2004, compared to 626 in 2003, and 310 in 2002. Staff is encouraged by this reduction, but also noted that interruptions AmerenCILCO categorized as weather related and unknown, both of which Staff believes often involve trees, increased significantly during 2004. When added together, the percentage of AmerenCILCO's interruptions attributed to trees, weather, and unknown has remained fairly constant over the past 3 years.

Staff noted relatively few tree contacts during its 2005 inspections of AmerenCILCO's circuits, and most of the tree contacts Staff did note appeared to involve faster growing trees or conifers planted under the power lines. Staff is encouraged by AmerenCILCO's stated plan to identify "cycle-buster" trees on its maps so that these locations can be spot-trimmed between normal tree trimming cycles. In addition, Staff is pleased by AmerenCILCO's reported efforts to replace these "cycle-buster" trees with more appropriate species.

Figure 4 illustrates AmerenCILCO's actual expenditures for tree trimming for the years 2001-2004, and its budgeted tree trimming expenditure for 2005.



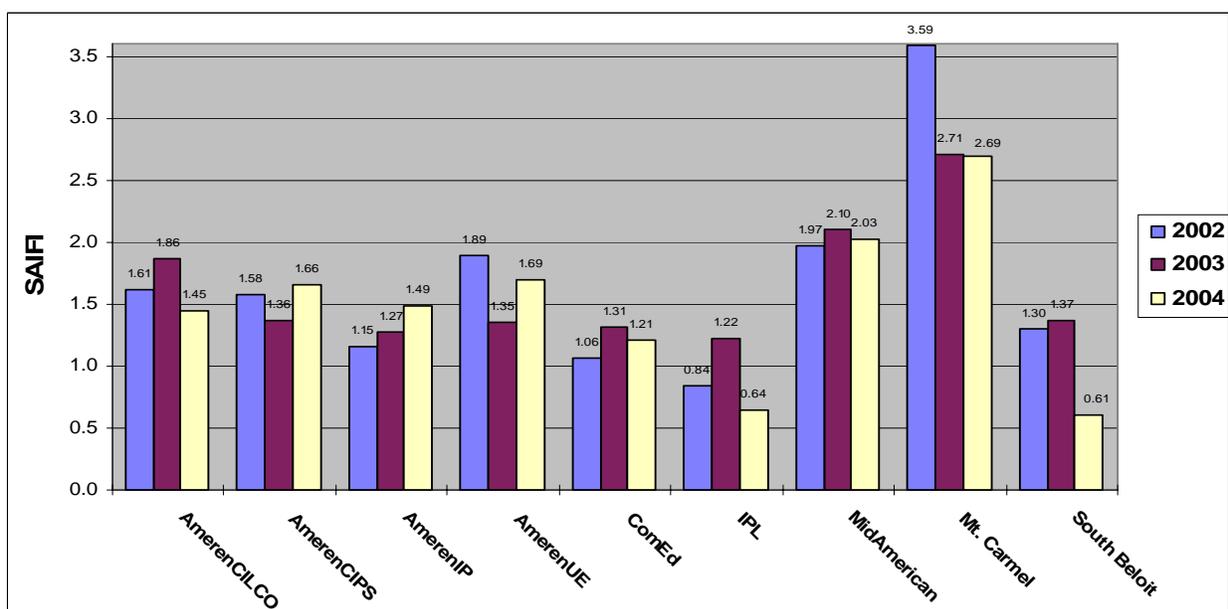
Staff has concern that AmerenCILCO is reducing its budget for tree trimming while stating it plans to implement mid-cycle trimming on certain fast growing trees. Staff plans to continue to periodically evaluate AmerenCILCO's effectiveness at keeping trees clear of its power lines.

### 8. Trends in Reliability Performance

A summary of trends in AmerenCILCO's reliability performance follows:

- *SAIFI*: Figure 5 shows system SAIFI values for years 2002-2004 for all reporting electric utilities:

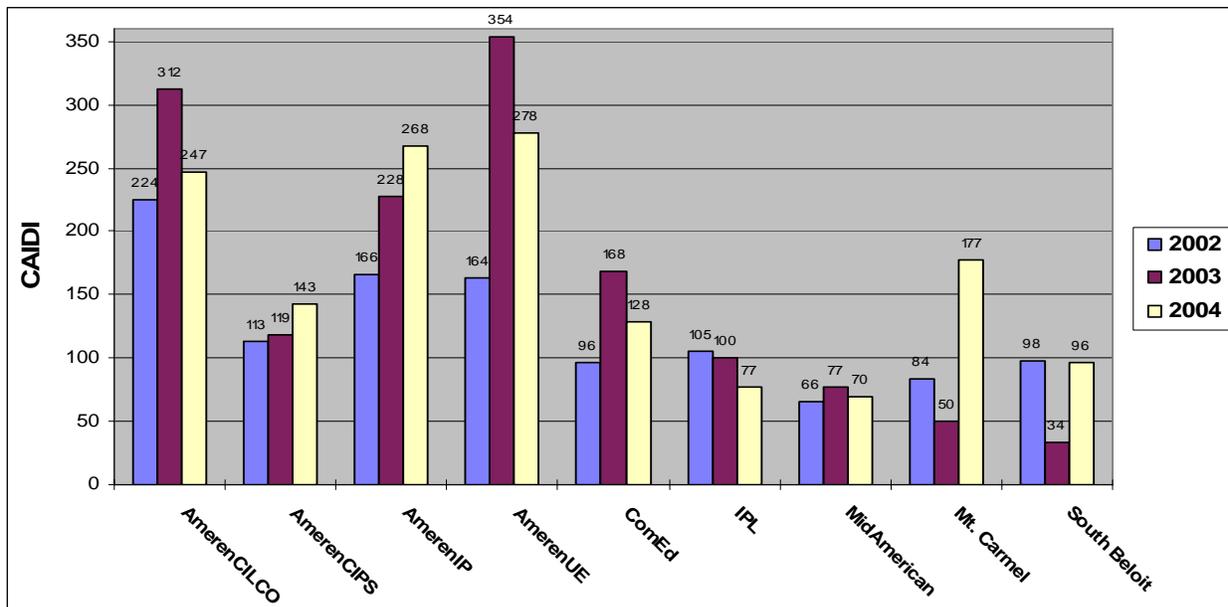
Figure 5: SAIFI by Utility (2002-2004)



- In 2002, AmerenCILCO's SAIFI was about 4% lower than the average of the SAIFI values reported by the eight other reporting utilities (AmerenCILCO's 2002 SAIFI=1.61).
- In 2003, AmerenCILCO's SAIFI increased (worsened) by approximately 16%, and was about 17% higher than the average of the SAIFI values reported by the eight other reporting utilities (AmerenCILCO's 2003 SAIFI=1.86).
- In 2004, AmerenCILCO's SAIFI decreased (improved) by approximately 22%, and was about 3% lower than the average of the SAIFI values reported by the eight other reporting utilities (AmerenCILCO's 2004 SAIFI=1.45).

➤ CAIDI: Figure 6 shows system CAIDI values for years 2002-2004 for reporting electric utilities:

**Figure 6: CAIDI by Utility (2002-2004)**<sup>1</sup>

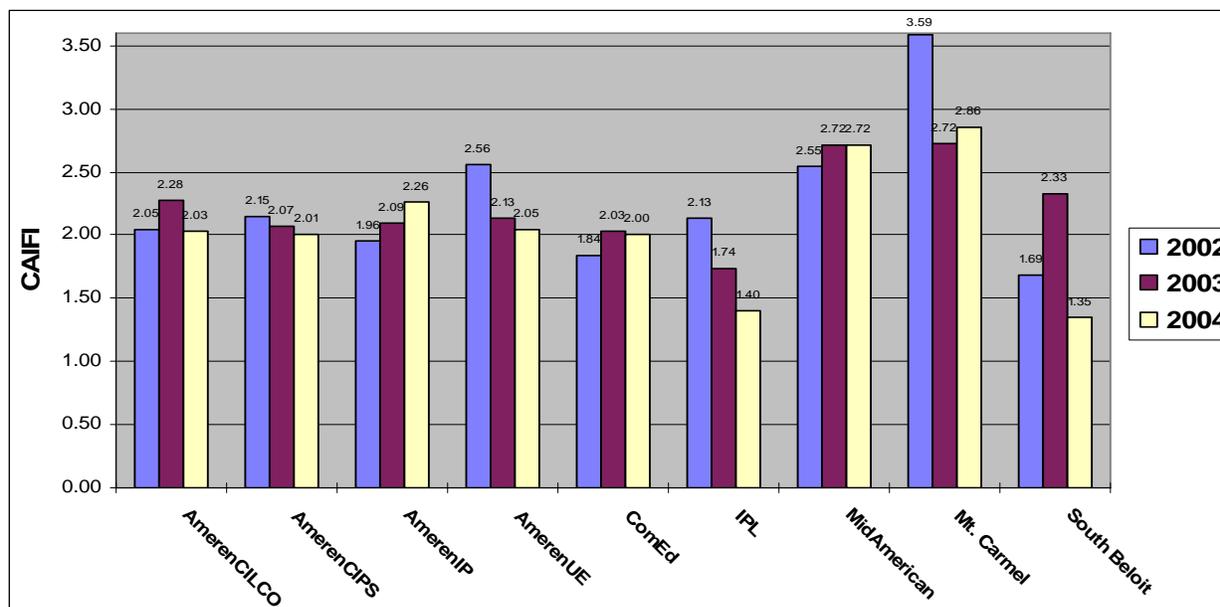


- In 2002, AmerenCILCO's had the highest (worst) CAIDI reported: approximately 101% higher than the average of the CAIDI values reported by the eight other reporting utilities (AmerenCILCO's 2002 CAIDI=224).
- In 2003, AmerenCILCO's CAIDI increased (worsened) by approximately 39%, and was about 121% higher than the average of the CAIDI values reported by the eight other reporting utilities (AmerenCILCO's 2003 CAIDI=312).
- In 2004, AmerenCILCO's CAIDI, decreased (improved) by approximately 21%, but was still about 60% higher (worse) than the average of the CAIDI values reported by the eight other reporting utilities (AmerenCILCO's 2004 CAIDI=247)

<sup>1</sup> Figure 6 illustrates that 3 Ameren electric utilities reported the worst CAIDI values each year during 2002-2004: significantly higher than the other reporting utilities. In addition, the 4<sup>th</sup> Illinois Ameren electric utility, AmerenCIPS, reported a higher (worsening) CAIDI each year.

- **CAIFI:** Figure 7 shows system CAIFI values for years 2002-2004 for reporting electric utilities:

**Figure 7 CAIFI by Utility (2002-2004)**



- In 2002, AmerenCILCO's CAIFI was about 11% lower than the average of the CAIFI values reported by the other eight utilities (AmerenCILCO's 2002 CAIFI=2.05).
- In 2003, AmerenCILCO's CAIFI increased (worsened) by approximately 11%, and was about 2% higher than the average of the CAIFI values reported by the other eight utilities (AmerenCILCO's 2003 CAIFI=2.28).
- In 2004, AmerenCILCO's CAIFI decreased (improved) by approximately 11% and was about 2% lower than the average of the CAIFI values reported by the eight other reporting utilities (AmerenCILCO's 2004 CAIFI=2.03).

AmerenCILCO's reliability indices for 2004 compared to 2003 indicate that, on average, AmerenCILCO's customers experienced fewer and shorter interruptions during 2004.

A comparison between the changes in AmerenCILCO's reliability indices from 2003 to 2004 to changes in the average of the indices from all reporting utilities further illustrates AmerenCILCO's improved reliability performance:

- AmerenCILCO's SAIFI decreased 22% from 2003 to 2004; the average of the SAIFI values from all reporting utilities decreased 7%.
- AmerenCILCO's CAIDI decreased 21% from 2003 to 2004; the average of the SAIFI values from all reporting utilities increased 3%.
- AmerenCILCO's CAIFI decreased 11% from 2003 to 2004; the average of the SAIFI values from all reporting utilities decreased 7%.

### Customer Interruption Cause Categories

The number and duration of AmerenCILCO's interruptions for 2002-2004 attributed to each interruption category listed in Table-A of Part 411 is shown in Table 4. The table shows there were more interruptions affecting AmerenCILCO's distribution system in 2004 than in 2003, but fewer than in 2002. As with most other Illinois electric utilities, AmerenCILCO indicated weather was the most common interruption cause during 2004. AmerenCILCO reported three dates on which major storms occurred in its operating area during 2004: 7/13, 11/24, and 11/25.

AmerenCILCO listed underground equipment as its third most common interruption category for each of the past 3 years. AmerenCILCO indicated that nearly one quarter of its system is underground, so a high number of interruptions related to underground equipment is not surprising (more than 12% during 2004). Since underground faults can be difficult to locate and isolate, and often take a long time to repair, AmerenCILCO's many underground interruptions likely contributed significantly to its high CAIDI.

Staff was pleased that AmerenCILCO reported fewer tree related interruptions during 2004.

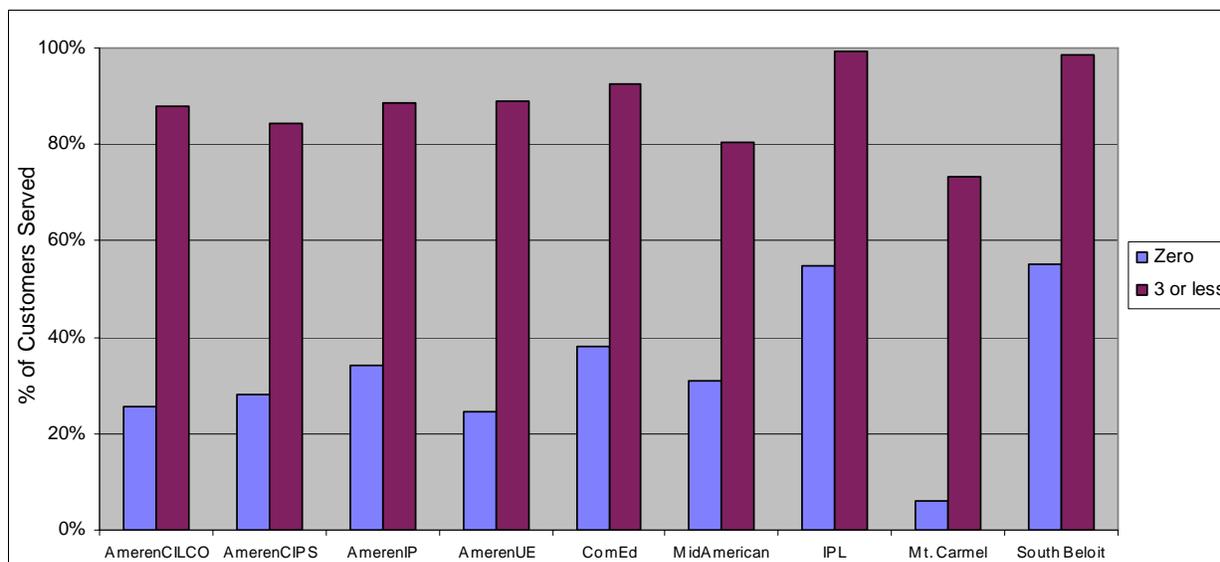
**Table 4: AmerenCILCO's Interruptions by Various Causes**

Interruption Cause	Number of Interruptions			Percentage of Interruptions		
	2004	2003	2002	2004	2003	2002
Weather Related	1611	1130	1797	28.2%	21.2%	28.5%
Overhead Equipment Related	1086	823	811	19.0%	15.5%	12.9%
Underground Equipment Related	699	676	636	12.2%	12.7%	10.1%
Animal Related	635	598	519	11.1%	11.2%	8.2%
Intentional	539	717	913	9.4%	13.5%	14.5%
Public	288	255	293	5.0%	4.8%	4.6%
Unknown	286	174	152	5.0%	3.3%	2.4%
Tree related	226	626	310	4.0%	11.8%	4.9%
Other	127	26	8	2.2%	0.5%	0.1%
Jurisdictional Entity/Contractor Personnel-Errors	105	55	86	1.8%	1.0%	1.4%
Customer	73	25	636	1.3%	0.5%	10.1%
Transmission and Substation Equipment	31	212	119	0.5%	4.0%	1.9%
Other Alternative Supplier/Utility	5	4	27	0.1%	0.1%	0.4%
<b>TOTAL (all causes)</b>	<b>5711</b>	<b>5321</b>	<b>6307</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

## Interruptions to Individual Customers

In addition to listing customers that experienced interruptions that exceeded reliability targets, AmerenCILCO's reliability report listed the number of customers that experienced various quantities of interruptions during the year. AmerenCILCO reported an increase in the number of customers experiencing no interruptions, and a general reduction in the number of customers experiencing repeat interruptions. Figure 8 illustrates the percentage of customers supplied by each reporting utility affected by zero interruptions and by 3 or fewer interruptions.

**Figure 8: Percentage of Customers with Zero and 3 or Fewer Interruptions in 2004**



- **Zero interruptions:** During 2004, 26% of AmerenCILCO's customers experienced zero interruptions. During 2003 and 2002 this value was 14% and 17%, respectively.
- **3 or Fewer Interruptions:** During 2004, 88% of AmerenCILCO's customers experienced 3 or fewer interruptions. During 2003 and 2002 this value was 81% and 83%, respectively.
- **More than six Interruptions:** During 2004, 0.8% of AmerenCILCO's customer experienced more than 6 interruptions. During 2003 and 2002 this value was 2.6% and 1.2%, respectively.

Table 5 indicates the number and percentage of customers that experienced more than 6 interruptions during each of the years 2002 through 2004 for each reporting utility. Utilities are listed from best to worst 2004 performance according to the number of customers experiencing more than 6 interruptions. Staff was pleased to observe AmerenCILCO showed significantly fewer customers experienced more than 6 interruptions during 2004 than in either of the two previous years. Staff encourages AmerenCILCO to monitor repeat interruptions to customers throughout the year and to undertake prompt corrective action when the same customer, or group of customers, experience multiple service interruptions.

**Table 5: Customers with more than 6 Interruptions:**

	2002		2003		2004	
	Customers		Customers		Customers	
Utility	Number	% of Total	Number	% of Total	Number	% of Total
South Beloit	74	0.90%	8	0.10%	0	0.00%
IPL	26	0.20%	0	0.00%	1	0.01%
Mt. Carmel	298	5.00%	38	0.70%	85	1.48%
<b>AmerenCILCO</b>	<b>2,335</b>	<b>1.20%</b>	<b>5,340</b>	<b>2.60%</b>	<b>1,613</b>	<b>0.78%</b>
AmerenUE	1,292	2.10%	624	1.00%	1,724	2.76%
MidAmerican	874	1.10%	3,082	3.70%	5,331	6.37%
AmerenIP	2,731	0.50%	4,473	0.80%	7,713	1.28%
AmerenCIPS	6,343	1.90%	2,662	0.80%	7,846	2.38%
ComEd	12,419	0.40%	24,321	0.70%	29,087	0.80%

**9. Plan to Maintain or Improve Reliability**

AmerenCILCO indicated it anticipates a decrease in both distribution capital and distribution O&M spending during 2005 when compared to 2004 and anticipates expenditures in 2006-2008 to be consistent with 2005 budgeted amounts, as illustrated by Figure 9. AmerenCILCO has reported average SAIFI and CAIFI indices for the past several years when compared to other reporting utilities and a CAIDI index that has been significantly worse than average. AmerenCILCO's planned flat distribution O&M spending levels for the next three years do not give Staff reason to expect any significant changes or improvements in AmerenCILCO's distribution maintenance activities.

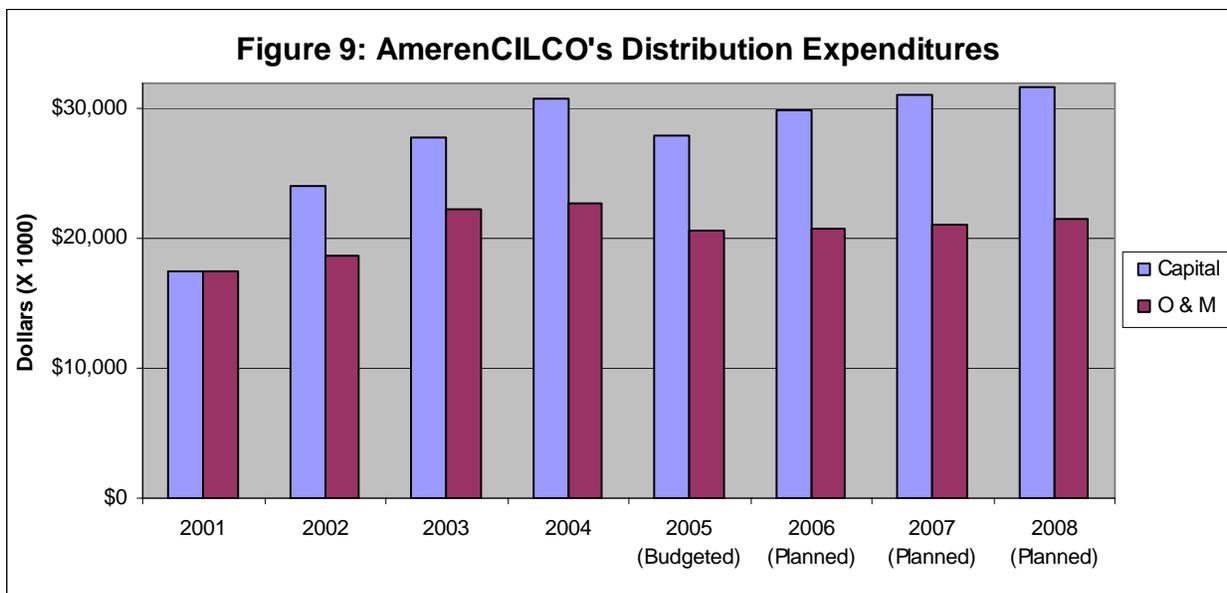
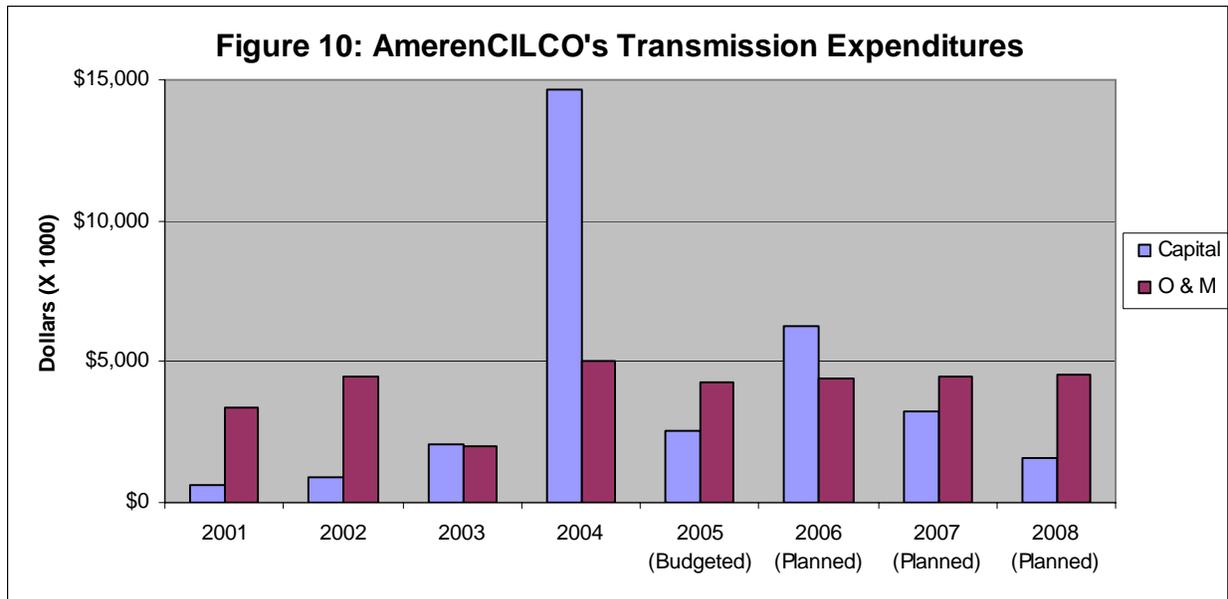


Figure 10 illustrates that AmerenCILCO budgeted a reduction in transmission capital and transmission O&M spending during 2005, and expects fluctuating transmission capital spending and fairly flat transmission O&M spending thereafter. Staff agrees with AmerenCILCO that it is reasonable for transmission capital spending to vary from year to year depending on the number of transmission construction projects scheduled.



In its 2004 reliability report, AmerenCILCO listed 29 programs that are part of its capital and maintenance budget that affect reliability. Staff agreed that each program AmerenCILCO listed could have a positive affect on reliability. AmerenCILCO stated its budgeting process does not provide details associated with each program listed, except for tree trimming. Therefore, Staff was unable to determine whether AmerenCILCO plans any expenditure in each of these programs in coming years (other than tree trimming).

Ameren Services, AmerenCILCO's unregulated affiliate service company, indicated it has formed a "Circuit Patrol Team" to help all of Ameren Corporation's Illinois electric utilities schedule periodic inspections of sub-transmission and distribution circuits with the goal of improving and/or maintaining circuit performance. Staff was very pleased to learn about this effort to improve inspection practices at AmerenCILCO. Staff was very disappointed, however, when it learned that Ameren Services does not plan to roll out the new inspection program until 2007.

In its filed reliability report AmerenCILCO identified 24 reliability-related specific projects planned for 2005, and in August of 2005, AmerenCILCO provided Staff with an update on the work completed to improve the reliability of its worst-performing circuits. In addition AmerenCILCO listed in its reliability report specific projects that it has planned for the years 2006-2008, including cost estimates for each of the projects. Staff agreed that all of the specific projects AmerenCILCO listed in its reliability report, if completed, will have a positive impact on the reliability of its distribution system.

## **10. Potential Reliability Problems and Risks**

As a result of Staff's review of AmerenCILCO's reliability report, AmerenCILCO's responses to Staff's data requests, and Staff's inspection of AmerenCILCO's distribution circuits, Staff identified the following concerns:

- AmerenCILCO did not appear to properly maintain its facilities on at least one of the distribution circuits Staff inspected. When inspecting Circuit E10-001, Staff observed dozens of locations with deteriorated arms, braces, pole tops, or loose hardware. AmerenCILCO has demonstrated its ability to identify and eliminate threats to reliable service, and Staff is quite pleased with the remedial work AmerenCILCO completed on several other circuits that Staff inspected during 2005. However, AmerenCILCO should not allow its facilities to degrade or deteriorate to such a great extent, such as occurred on Circuit E10-001, prior to performing remedial work. NESC 214 requires that lines and equipment be "...inspected at such intervals as experience has shown to be necessary." With the numerous problems observed on Circuit E10-001, it could be argued that AmerenCILCO has not satisfied the requirements of NESC 214. It is clear to Staff that AmerenCILCO needs to monitor the condition of its distribution facilities more closely, and remedy problems more promptly after it identifies threats to reliable service. AmerenCILCO should not wait until Ameren-wide inspection procedures are rolled out in 2007 to seek improvement in this area.
- AmerenCILCO's system CAIDI value in 2004 (247 minutes) continued to be very high compared to other reporting utilities. AmerenCILCO's CAIDI indicates that, on average, interruptions to AmerenCILCO's customers lasted more than four hours. In its reliability report AmerenCILCO indicated more than 12% of the interruptions on its system were underground equipment related, and that 26% of its distribution system is underground. For many reasons it typically takes more time to locate, isolate, and repair problems on underground distribution systems, and Staff suspects AmerenCILCO's significant number of underground related interruptions contributed significantly to AmerenCILCO's relatively poor CAIDI performance. AmerenCILCO should take steps to reduce the number of underground interruptions that affect its system. For example, AmerenCILCO stated its practice is to replace underground cable after the cable has failed more than 3 times. AmerenCILCO should identify specific cable types that are known to perform poorly, and should develop a replacement program for those cable types, rather than wait for 3 failures to occur before replacing those bad performers. Sometimes underground components fail due to manufacturer defect or an improper installation practice. If its underground cable connectors such as splices and elbows fail due to overheating, AmerenCILCO should periodically inspect its remaining connectors using infra-red technology and schedule repair or replacement of these components, rather than waiting for interruptions to occur. If customers supplied by radial underground taps are enduring long interruptions because of long restoration times, AmerenCILCO should consider looping its underground facilities so that an alternate source is available to supply customers.

- When inspecting AmerenCILCO's distribution circuits, Staff noted that birds had been nesting at disconnects that were mounted on the electrical bus within the substation that is the source for Circuit E10-001 (all three phases). Interruptions due to electrical faults at substations can affect a very large number of customers since multiple distribution circuits might be affected. In addition, replacement parts for damaged substation equipment might not be readily available, lengthening the outage duration. AmerenCILCO should strive to keep nesting material off of its substation equipment. In addition to its regularly scheduled substation inspections, Staff suggests that AmerenCILCO include at least a cursory inspection of the source substation bus and equipment when conducting its distribution circuit inspections, even if from outside the substation fence.
- Staff noted some tree contacts on worst performing circuits where AmerenCILCO had recently completed tree trimming. Though Staff felt that tree-trimming adjacent to the AmerenCILCO's distribution circuits that Staff inspected was improved compared to prior years, tree contacts still existed. AmerenCILCO should insist that 100% of the trees on its circuits are trimmed adequately.

### **11. Implementation of the Plan Listed in the Previous Reliability Report**

AmerenCILCO's reported 2004 capital and O&M distribution and transmission expenditures were consistent with its plan as listed in its 2003 reliability report. In its 2004 reliability report AmerenCILCO also provided information about its progress on seventeen specific projects that had been part of its 2003 reliability plan. AmerenCILCO reported that much of the work on these specific projects was completed in 2004 and early 2005. Deviations from AmerenCILCO's 2003 plan appeared to be minimal.

### **12. Summary of Recommendations**

- AmerenCILCO should more frequently inspect and more promptly maintain its distribution circuits, and should include the source substation when conducting its distribution circuit inspections.
- AmerenCILCO should strive to reduce its CAIDI by reducing the number and duration of underground equipment related interruptions.
- AmerenCILCO should insist its tree trimming personnel clear trees away from its power lines in such a manner that the trees will not contact the power lines prior to getting trimmed again.

**From:** Rockrohr, Greg  
**Sent:** Tuesday, June 28, 2005 1:31 PM  
**To:** '@ Voiles, Jackie; 'Bev Hall (BHall@ameren.com)'  
**Cc:** Stoller, Harry; Buxton, Roy  
**Subject:** Staff inspection of AmerenCILCO distribution circuits

**Attachments:** 2005\_AmerenCILCO Summary of Field Inspection.xls

The attached worksheets summarize the notes I took during my recent inspections of various AmerenCILCO distribution circuits. These worksheets are not represented as capturing all of the potential reliability problems that may exist on the circuits that I inspected: in many cases there were portions of the circuits that I did not see. My inspections are not intended to take the place of the thorough, detailed inspections that your company should periodically perform. Note that AmerenCILCO and/or Ameren Services employees accompanied me on each inspection, with the exception of the A68-001 spot-checks, which I performed when returning to Springfield from another jurisdiction.

I noted several apparent National Electric Safety Code ("NESC") clearance violations during my inspections, and have shown them in bold font in the attached worksheet summaries. I have listed these locations again below:

1. Circuit D69-008: Low neutral -near end of Martindale Ln.
2. Circuit E10-001: Low neutral -County Rd. 125 E – S/Hwy 10
3. Circuit E10-001: Low neutral -S/ County Rd. 550 N along 2nd Lane W/ County Rd. 450 E
4. Circuit E10-001: Low neutral -County Rd. 275 E 4th S/1350N
5. Circuit E10-001: Down guy only 8 feet above driveway edge –County Rd. 600 E at County Rd. 700 N

For each location where a low neutral wire is listed, please provide the actual measured height of the conductor above the ground (at its closest point). For all locations where the vertical clearance is confirmed to be less than allowed by NESC Table 232-1, please provide AmerenCILCO's plan, including a schedule, for modifying the facilities to comply with NESC requirements. Please provide this information to me no later than July 29, 2005.

I compliment AmerenCILCO for its prompt correction of an additional low neutral that was discovered at 4600 E. 1100 N, in rural Waynesville. This NESC violation was discovered April 28, during my inspection of Circuit E10-001, and was corrected on May 4. AmerenCILCO's prompt action and communication was appreciated.

If you have any questions about the information contained in the attached summaries, or the information requested above, please contact me.

**Greg Rockrohr**  
Illinois Commerce Commission  
Engineering Department -Energy Division  
217-524-0695

Summary of Distribution Circuit Field Inspection by ICC Staff			
<b>Utility:</b>	AmerenCILCO	<b>Date:</b>	4/27/05
<b>Circuit:</b>	D69-008	<b>Inspector:</b>	Rockrohr(ICC)/Frommelt(Ameren)
<b>Gen. Notes:</b> Peoria -urban area. Tree trimming completed 10/04: Tree trimming looked good except along Parkside. Very thorough use of animal guards. CILCO had done own inspection & completed follow-up work. 2004 Worst performing circuit -UG/dig-ins listed as most frequent outage cause			
Map No.	Item Description	Photo(s)	Location
1c	Shell-rot pole	1 to 3	5227 Koerner Rd.
1c	Shell-rot pole with loose pole-top pin	4	5219 Koerner Rd.
1b	<b>Pos. NESC violation: Neutral slack &amp; appears low</b>	5	End of Martindale Lane
1c	Trees growing into line	6 to 12	Parkside - E/Koerner Rd.

Summary of Distribution Circuit Field Inspection by ICC Staff			
<b>Utility:</b>	AmerenCILCO	<b>Date:</b>	4/27/05
<b>Circuit:</b>	B83-001	<b>Inspector:</b>	Rockrohr(ICC)/Glad(Ameren)
<b>Gen. Notes:</b> Armington -rural area. Tree trimming completed 1/04: Tree trimming looked good with the only contact seen on backlot easement. Good job with animal guards & arresters. CILCO had done own inspection & completed follow-up work. Several new poles. 2004 Next 10 worst performing circuit -Weather and OH listed as most frequent outage cause.			
Map No.	Item Description	Photo(s)	Location
4	Large woodpecker hole adjacent to pole top pin	14	1350 E -S/Hwy 136 & N/pvt. lane
4	Large woodpecker hole adjacent to pole top pin	17 & 18	1450 E -Between Co. Hwy. 20 & 2575 N
1	Shellrot pole with woodpecker hole	15 & 16	Pvt. lane off 1250E S/US 136
4	Vines grown to pole top	N/A	2575 N -E/1450 E
4	Pole with transformer leaning fairly severely	19	1450 E -N/Co. Hwy. 20
9a	Trees growing into primary	N/A	Behind 114 North St., in Armington
6	Cross-arm strained and twisted	20 - 24	100 N at Dale Rd.
5	Split cross-arm	N/A	1350 E -4 or 5 spans S/100N
2	Pole leaning resulting in fairly slack line	N/A	1275 E -N/US 136

Summary of Distribution Circuit Field Inspection by ICC Staff			
<b>Utility:</b>	AmerenCILCO	<b>Date:</b>	4/29/05
<b>Circuit:</b>	E37-001	<b>Inspector:</b>	Rockrohr (ICC)/Tautphaeus(Ameren)
<b>Gen. Notes:</b> Springfield -NE end of town. Tree trimming completed 10/04: Tree trimming looked good with signs of recent work at some locations. Lots of double cct. with CWLP. Animal guards installed on most trf. A few NG x-arms/braces. Lots of new facilities along Dirksen. 2004 Worst performing circuit -weather was listed as most frequent outage cause			
Map No.	Item Description	Photo(s)	Location
1b	Split cross-arm	7 & 8	N. 16th St. S/Taft
1d	Detached cross-arm braces at RR tracks	9 & 10	Taintor Rd. just E/Peoria Rd. & W/RR
1d	Shell-rot angle pole on pvt. property	13 & 14	2nd pole from end of N. Waterworks Rd. tap
1d	Cross-arm appears to be pulled over by strain.	15 & 16	Peoria Rd. at Northbrook Ct. (S/Richards Ln.)
3b	Detached cross-arm brace.	N/A	Sangamon Ave. at Harrison Ln.
3b	Split cross-arm	N/A	N. Dirksen 2 poles S/Northfield Dr.
3d	Split cross-arm & pole top	N/A	Bissell Rd. btw. N. Dirksen & Terminal
4	Detached cross-arm braces.	2 & 3	N. Dirksen N/Terminal Ave.
4a	Split cross-arm and deteriorating pole top	4 & 5	Sandhill Rd. S/Johns Rd.
4a	Trees brushing against field phase	N/A	Peoria Rd. N/Sandhill (N/Trf. #602122)
4a	Cross-arms questionable	N/A	Peoria Rd. N/Sandhill (at Trf. #602122)
4a	Trees getting very close to primary	N/A	Peoria Rd. just S/tap into Riverside Park

Summary of Distribution Circuit Field Inspection by ICC Staff			
<b>Utility:</b>	AmerenCILCO	<b>Date:</b>	5/19/05
<b>Circuit:</b>	A68-001	<b>Inspector:</b>	Rockrohr & Spencer(ICC)
<b>Gen. Notes:</b> Roanoke & rural area surrounding. Spot checks of locations noted during prior year's inspection. Many new poles, and most items that had previously been noted had been addressed. 2003 Next-ten worst performing circuit			
Map No.	Item Description	Photo(s)	Location
48	Split pole top	M17 & 18	1400 N +/- 11 poles W/2000E

Summary of Distribution Circuit Field Inspection by ICC Staff			
Utility:	AmerenCILCO	Date:	4/28/2005 & 6/10/05
Circuit:	E10-001	Inspector:	Rockrohr(ICC)/Boland(4/28 only) & Glad
<b>Gen. Notes:</b> Waynesville -rural area. Tree trimming completed 9/03/cycle-buster 2/05: Tree trimming looked good in most locations. Animal guards installed on most trf. Lightning arrester installation spotty in areas with some lightning damage evident. Some new poles. 2004 Next 10 worst performing circuit -weather & overhead listed as most frequent outage cause			
Map No.	Item Description	Photo(s)	Location
4	Bird nests behind all 3 disconnects at circuit outlet	1	Van Cleave Substation
15d	Both nuts off pole top pin bolt	2	300 E -S/Hwy 10
5	Loose bolt on pole top pin	N/A	2400 E -3 poles S/1800 N
6	Trf. pole leaning & broken crossarm brace	6 & 7	1100 N -E/2400 E : end of tap
10	Pole top pin is bent	8 to 10	900 N E/ Co. Hwy. 17
10	Pole failing (pole tagged for replacement)	N/A	200 E -N/900 N
10	Failed x-arm brace (pole tagged for replacement)	N/A	200 E N/900 N (at jog in road near top of map)
11	Failing crossarm and missing/broken braces	11 to 13	200E at 1100N (where 1100 N heads east)
12	Blown lightning arrester	N/A	100 E -N/ 1100 N
16	Neutral pin dropped through arm	N/A	300 E -N/ 900 N (at tap to trf. #(704586))
16	Several poles/arms severely twisted	N/A	900 N -W/ 300 E
16	Blown lightning arrester	18 & 19	900 N -W/ 300 E
16	Loose pole top pin -missing nut	5	300 E -N/ 800 N
16	Blown lightning arrester	N/A	900 N - West end of map, just E/ tap to trf. #(704398)
16	Split pole top	N/A	800 N - E/ 250 EAt tap to trf. #(701028)
17	Blown lightning arrester	N/A	300 E at 1100 N
17	Split pole top	N/A	1100 N W/300 E
22	Neutral with broken strand(s) midspan	N/A	400 E -N/ 900 N
23	Split pole top (tagged for replacement)	N/A	400 E -S/ 1100 N
29	Split cross-arm with single brace	14 to 16	500E -1 span S/900 N
29	Split cross-arm brace	17	500 E -N/ 800 N
30	Blown lightning arrester (appeared cut in clear)	N/A	1100 N -W/500 E : just W tap to trf. #(701278)
30	Failing Crossarm	N/A	1000 N-W/500 E
30	NESC Violation: Low neutral conductor (Fixed 5/4)	N/A	1100 N -W/500 E :tap to trf. #(701278)
33	<b>NESC violation: Guy +/-8' above edge of drive</b>	N/A	600 E at 700 N (at "T") -see NESC Table 232-1
34	Loose bolt on pole top pin	N/A	900 N W/ Pvt. Lane to trf.# (704603)
<b>Items Above were noted 4/28/05, below 6/10/05</b>			
9	<b>NESC Violation: Low neutral conductor (+/-12')</b>	1	125 E S/Hwy 10
9	Maple tree starting to contact conductor	N/A	125E N/ RR right-of-way
20	Split pole top	4	325 E S/550 N -bew 2 lanes to east
20	Split pole top	N/A	550 N -W/350 E btw 2 lanes to south
20	<b>NESC Violation: Low neutral conductor (+/-12')</b>	5	S/550 N on 2nd Lane W/450 E
20	Split pole top	N/A	550N at 2nd Lane W/450 E (at 1-phase tap to south)
20	Split pole top X 2	6	S/550 N on 2nd Lane W/450 E
20	Split pole top	N/A	550N: 2 poles E/ 1st lane W/450E
27c	Loose pole top pin	N/A	550N: 1 span W/450E
28	Pole splitting at top and failing at base	8&9	450 E 4 or 5 spans N/550 N
28	Adjacent poles cracked and splitting	N/A	450 E -5 or 6 spans N/550 N
28	Pole splitting at top -pole top pin leaning	N/A	Hwy 10 several spans W/ 500E
28	Failed insulator pins two adjacent poles	13 - 17	500 E -S/Hwy 10 at lane to east
28	Tree burning on primary	N/A	Lane E/500 E and S/ Hwy 10 (E/ trf 704573)
21	Pole splitting and leaning	N/A	425 E -3rd S/Hwy 10
21	Split pole top	N/A	425 E -1 span S/riser that is S/ Hwy 10
21	Detached ground on pole with splitting pole top	10	650 N at 400 E (corner)
21	Split pole top and old lightning damage	N/A	400 E -1 span S/650 N
21	Failing cross arm	11 & 12	400 E -2 spans S/650 N
21	Split pole top	N/A	400 E -N/600N (2 poles S/ riser)
21	Split pole top & loose bolt on pole top pin	N/A	400 E -1 span N/600N
36	Adjacent poles leaning -1with broken x-arm brace	19	1250 N -E/700 E (east edge of map 36)
36	Failing pole top (pole marked for replacement)	N/A	1250 N -W/700 E (at tap to trf 701251)
36	Failing pole (pole marked for replacement)	N/A	625 E -S/1250 N
36	Splintered pole top	18	600E -N/1100 N
35	Spindle missing on neutral clevis	N/A	1100 N -W/750 E
35	Top bolt loose on pole top pin & old lightning dmg.	N/A	1100 N -W/750 E
25	Tree burning on primary	20 - 22	Lane N/1325 N at 465 E
18	Voids in pole at cross arm mounting	24 & 25	1300 N W/300 E
18	Failing pole top	N/A	300 E -S/ 1300 N: just N/ where line turns to east
18	Split pole top	N/A	350 E -S/1200 N
18	Failing cross arm	28	350 E -S/1200 N (at trf 701979)
18	Split pole top	N/A	1200 N -7 spans W/ 350 E
19	<b>NESC Violation: Low neutral conductor (+/- 9')</b>	26	275 E 4th S/1350N
19	Split pole top and woodpecker holes	27	1350 N E/330 E
12c	Split pole top with twisted pole top pin	29	Waynesville -East St. N/4th St.
13	Lightning damage evident on pole	30	200 E -N/ 1350 N (1 span S/ riser)
7	Pole top failing	N/A	2400th Ave. at County Hwy 6 -W/Waynesville
7	Lightning damage evident on pole	31	2400th Ave. S/Co. Hwy 6 -3rd pole from N/last corner
9d	Insulator pins or x-arm appears to be failing	N/A	Tap to west from W/175 E (N/700 N)
32	Split pole top	N/A	575 E -near north end of tap
<b>Note: On map 21 the taps to trf's 705924(UG) &amp; 704559(OH) appear to be swapped.</b>			