Illinois Commerce Commission

Assessment of Commonwealth Edison Company

Reliability Report and Reliability Performance

for Calendar Year 2012

Pursuant to 83 Ill. Adm. Code 411.140

December 23, 2014

1. Executive Summary

Commonwealth Edison Company ("ComEd") prepared and filed its "2012 Electric Power Delivery Reliability Report" ("Reliability Report") by Friday, June 1, 2013, in compliance with Section 16-125 of the Public Utilities Act ("Act") and the Illinois Commerce Commission's ("Commission's") electric reliability rules as found in 83 Illinois Administrative Code, Part 411.

The Staff Assessment Report ("Report") includes five significant areas: Historical Performance Relative to Targets, Analysis of ComEd's Year 2012 Reliability Performance, Trends in ComEd's Reliability Performance, ComEd's Plan to Maintain or Improve Reliability, and Potential Reliability Problems and Risks. These are sections 5 through 9 of the Report.

The number of customers who exceeded Service Reliability Targets <u>three years consecutively</u> increased from 5,918 in 2011 to 18,379 in 2012 (see Section 5). That was a 211% increase in customers who exceeded Service Reliability Targets each year in 2010, 2011, & 2012 versus customers who exceeded Service Reliability Targets each year in 2009, 2010, & 2011.

2012 saw a 38% increase in animal-related interruptions and 34% decreases in weather- and tree-related interruptions over 2011 (see Section 6).

The 2012 four-year rolling average for ComEd system SAIFI continues its downward trend since 2008 while ComEd system CAIDI rolling average continues its upward trend since 2005 (see Sections 7 and 9 as well as Figures 22 and 15).

The substantial drop in projected future spending for Substation Total Corrective Maintenance Expenditures in Figure 39 may adversely impact future reliability if it also contributes to a reverse in the current decline in Substation Corrective Maintenance Backlogs illustrated in Figure 40 (Section 9).

Undoubtedly, intense storm activity will stress the electric distribution infrastructure and expose any weaknesses or shortfalls in material conditions, maintenance, and the quality of vegetation management (see Section 9). In the field, Staff observed vegetation making contact with and threatening ComEd's overhead electric distribution lines and equipment (see Pictures 1 and 4 as well as the Appendix). This is not consistent with Illinois Administrative Code 305.20:

> Trees that may interfere with ungrounded supply conductors should be trimmed or removed. *NOTE:* Normal tree growth, the combined movement of trees and conductors under adverse weather conditions, voltage, and sagging of conductors at elevated temperatures are among the factors to be considered in determining the extent of trimming required.

Trees should never interfere, i.e., touch, nor threaten circuit primaries during normal or adverse weather conditions during any part of the 4-year trim cycle.

Additionally, Staff observed in the field where trees formed an overhead canopy above ComEd's overhead electric distribution lines and equipment. In many cases, though the overhead canopy was trimmed well away from the primaries, overhead canopies still present a significant reliability concern during adverse weather conditions (such as high winds, early wet snows, and heavy ice storms). Studies have shown that by removing overhead canopies above primaries, restoration times can be cut nearly in half[1] after an adverse weather event.

[1] S. Guggenmoos, "Increased Risk of Electric Service Interruption Associated with Tree Branches Overhanging Conductors. UAA Quarterly, 15(4), Fall 2007, S. Guggenmoos, "Storm Hardening the Electric System Against Tree-caused Service Interruptions. T&D World, Vol. 1, No. 12, Nov 18, 2010.

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2. Introduction

Beginning with the year 1999, and at least every three years thereafter, Section 16-125(d) of the Act and 83 Ill. Adm. Code 411.140 ("Part 411.140") require the Commission to assess the annual reliability report of each jurisdictional entity ("utility") and evaluate its reliability performance. Part 411.140 requires the Commission to:

A) Assess the reliability report of each utility.

B) Assess the utility's historical performance relative to established reliability targets.

C) Identify trends in the utility's reliability performance.

D) Evaluate the utility's plan to maintain or improve reliability.

E) Include specific identification, assessment, and recommendations pertaining to any potential reliability problems and risks that the Commission has identified because of its evaluation.

F) Include a review of the utility's implementation of its plan for the previous reporting period.

This document assesses ComEd's "2012 Electric Power Delivery Reliability Report" ("Reliability Report"), filed by June 1, 2013, and evaluates ComEd's reliability performance.

In producing this document, Staff relies on any information that may come to light during the review period up to the date of this document, in addition to the Reliability Report itself.

3. ComEd's 2012 Customer Base and Service Territory

ComEd provides electric service to roughly 3.8 million customers. ComEd's service territory encompasses over 400 municipalities in northern Illinois, including the City of Chicago.

4. ComEd's Electric Distribution System

Part 411.120(b)(3)(G) states that the utility is to report on the age, current condition, reliability and performance of its existing distribution and transmission system. To comply with the requirement that a utility report on the age of its existing distribution and transmission systems, ComEd provided age data on various types of equipment. That age data included information on the median age, age distribution, and quantity by age. Table 1 lists the median age of some of the equipment that ComEd reported in its last five reports (2008 through 2012).

Table 1 Median Age (in years) of Typical Equipment

	2008	2009	2010	2011	2012
Lightning arresters					
Distribution	14	16	17	17	18
Transmission	14	7	8	9	*10*
Substation	12	10	10	11	*Note 1*
Underground cables	17	18	19	19	20
Direct Buried	16	16	16	17	17
Cables in Conduit	23	22	22	23	24
Conductors					
Distribution Copper & Other	55	57	58	59	60
Distribution Aluminum	33	35	36	37	38
Transmission	37	39	40	41	42
Poles & Towers *Note 2*					
Distribution (mostly wood)	39	41	42	43	44
Transmission Steel poles	27	29	30	31	32
Transmission Wood poles	40	42	43	44	45
Transmission Towers	41	43	44	45	46
Distribution crossarms	32	34	34	34	35
Meters	13	11	12	12	13
Distribution transformers	15	16	17	17	17
Substation Transformers	31	32	33	33	35

Note 1: ComEd is now calculating the median age of Transmission and Substation Lightning Arrestors in Combination

Note 2: ComEd reported in 2012 that the vast majority (more than 1.374 million) of Poles & Towers are used for distribution. The transmission system has a total of approximately 28,210 poles & towers.

In Staff's opinion, the increasing median age of the existing equipment in service does not provide an indication of possible reduction in distribution or transmission system reliability performance. Some equipment, such as wooden distribution and transmission poles, deteriorate with age and require more intensive (i.e. more expensive) maintenance with each passing year to maintain original design capabilities -other older equipment (such as transformers) can continue to be robust if it is well maintained. A better determinant of future reliability performance is how regularly and consistently equipment is maintained. The number of interruptions due to equipment failures or malfunctions provides a stronger basis than age alone to determine if equipment is deteriorating and reducing the reliability of the electric system.

5. ComEd's Historical Performance Relative to Established Reliability Targets

83 Ill. Adm. Code 411.140(b)(4)(A-C) establishes electric service reliability targets that a utility must strive to meet. These targets specify limitations on customer interruptions as well as hours of interruption that a utility must strive not to exceed on a per customer basis. 83 Ill. Adm. Code 411.120(b)(3)(L) requires each utility to provide a list of every customer, identified by a unique number, who experienced controllable interruptions in excess of the service reliability targets, the number of interruptions and interruption duration 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, ComEd, along with all other 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 took or planned to take to address the customer reliability concerns. In January 2008, ComEd and the other utilities agreed to extend the agreement through the 2012 reporting period. Figure 1 illustrates the total number of ComEd customers exceeding the reliability targets in 3 or more consecutive years since 2003.

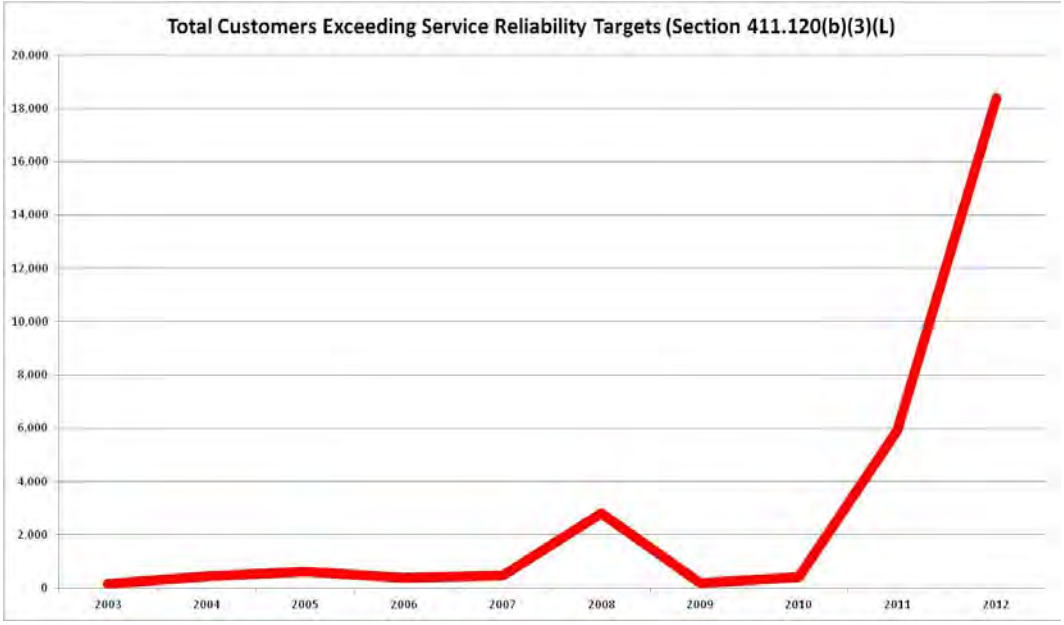

Figure 1 Total Customers Exceeding Service Reliability Targets (Section 411.120(b)(3)(L)

Table 2 summarizes the reliability targets defined in 83 Ill. Adm. Code 411.140(b)(4)(A-C) and the number of ComEd customers exceeding Service Reliability Targets in 2008 through 2012 per 83 Ill. Adm. Code 411.120(b)(3)(L) and the April 2004 & January 2008 agreements[2].

Table 2 Distribution of Customers Exceeding Service Reliability Targets

Immediate primary source of service operation level	i. Maximum number of interruptions in each of the last three consecutive years	ii. Maximum hours of total interruption duration in each of the last three years	Customers exceeding Service Reliability Targets (i. &/or ii.) in **2008**	Customers exceeding Service Reliability Targets (i. &/or ii.) in **2009**	Customers exceeding Service Reliability Targets (i. &/or ii.) in **2010**	Customers exceeding Service Reliability Targets (i. &/or ii.) in **2011**	Customers exceeding Service Reliability Targets (i. &/or ii.) in **2012**
69kV or above	3	9	0/0	0/0	0/0	0/0	0/0
Between 15kV & 69kV	4	12	0/1	0/0	0/0	0/0	0/0
15kV or below	6	18	896/1,925	67/115	140/267	207/5,711	223/18,286
Total			2,822	182	407	5,918	18,379

[2] 2012 Reliability Report, Supplemental Report, Customers Experiencing Interruptions (controllable and uncontrollable).

83 Ill. Adm. Code 411.140(b)(4)(D) states that "Exceeding the service reliability targets is not, in and of itself, an indication of unreliable service, nor does it constitute a violation of the Act or any Commission order, rule, direction, or requirement." ComEd appears to have a process in place to identify, analyze, and correct service reliability for customers experiencing a number or duration of interruptions exceeding the targets in 83 Ill. Adm. Code 411.140(b)(4)(A-C).[3] Nonetheless, ComEd should aggressively seek out any problematic maintenance or fundamental design issues that are contributing to customers exceeding the 3 year service reliability targets.

The annual number and causes of interruptions for 83 Ill. Adm. Code 411.120(b)(3)(D) are shown for the ComEd system in Table 3. Interruptions in Table 3 were as defined in 83 Ill. Adm. Code 411.20[4]. Keep in mind that in order for a customer to exceed a Service Reliability Target in Figure 1 or Table 2 that customer must exceed the maximum number of interruptions or the maximum hours of total interruption duration in each of the last three consecutive years.

Table 3 Interruptions (Supplemental Report Section 411.120(b)(3)(D))

Interruption Cause Category	2008	2009	2010	2011	2012
Animal Related	2,747	2,990	2,854	2,724	3,749
Customer	-	-	-	-	-
Intentional	2,865	2,247	2,921	3,166	2,975
Other	400	497	549	1,032	932
Overhead Equipment Related	6,994	5,794	6,435	6,342	5,902
Public	1,974	1,566	1,577	1,551	1,587
Tree Related	8,127	5,096	7,879	11,414	7,495
Transmission & Substation Equip	62	78	78	64	48
Weather Related	6,100	3,395	7,172	9,214	6,036
Underground Equipment Related	7,486	7,264	8,379	8,268	8,281
Unknown	1,063	1,050	1,269	1,531	1,737
ComEd/Contractor Errors	287	260	290	318	273
Total	**38,105**	**30,237**	**39,403**	**45,624**	**39,015**

6. Analysis of ComEd's Year 2012 Reliability Performance

In Section C, Tables 5-9 (pages C-2 through C-11) of ComEd's 2012 Reliability Report, ComEd broke out the 2012 planned and unplanned interruptions into 61 separate and detailed cause categories for the system as a whole and also for each of ComEd's four operating regions. Table 4 below compares, for the last four years, aggregations under leading cause categories that together represented roughly three-quarters of total annual interruptions.

[3] See pages 406 through 414 of Supplemental Report (Customers Experiencing Interruptions (controllable and uncontrollable) in ComEd's 2012 Reliability Report

[4] The difference between the total of interruptions in Table 3 versus other parts of the Report can be traced to the differences in the definition of "Interruption" in Part 411.20 for scheduled interruptions initiated by a utility for purposes of the targets set forth in 83 Ill. Adm. Code 411.140(b)(4) and calculating reliability indices and scheduled interruptions that are reportable under 83 Ill. Adm. Code 411.120(b)(3)(C).

Table 4 Leading Causes of Unplanned Interruptions (Table 5, ComEd 2012 Report)

	% Improvement from 2008 to 2009	2009 Interruptions	% Improvement from 2009 to 2010	2010 Interruptions	% Improvement from 2010 to 2011	2011 Interruptions	% Improvement from 2011 to 2012	2012 Interruptions
Weather Related	44%	3395	-111%	7172	-28%	9,214	34%	6,036
Animal Related	-9%	2990	5%	2854	5%	2,724	-38%	3,749
Tree Related	37%	5096	-55%	7879	-45%	11,414	34%	7,495
Overhead Equipment Related	17%	5794	-11%	6435	1%	6,342	7%	5,902
Underground Equipment Related	3%	7264	-15%	8379	1%	8,268	0%	8,281

Figure 2, below, illustrates the trend since 1998 for leading causes of unplanned interruptions.

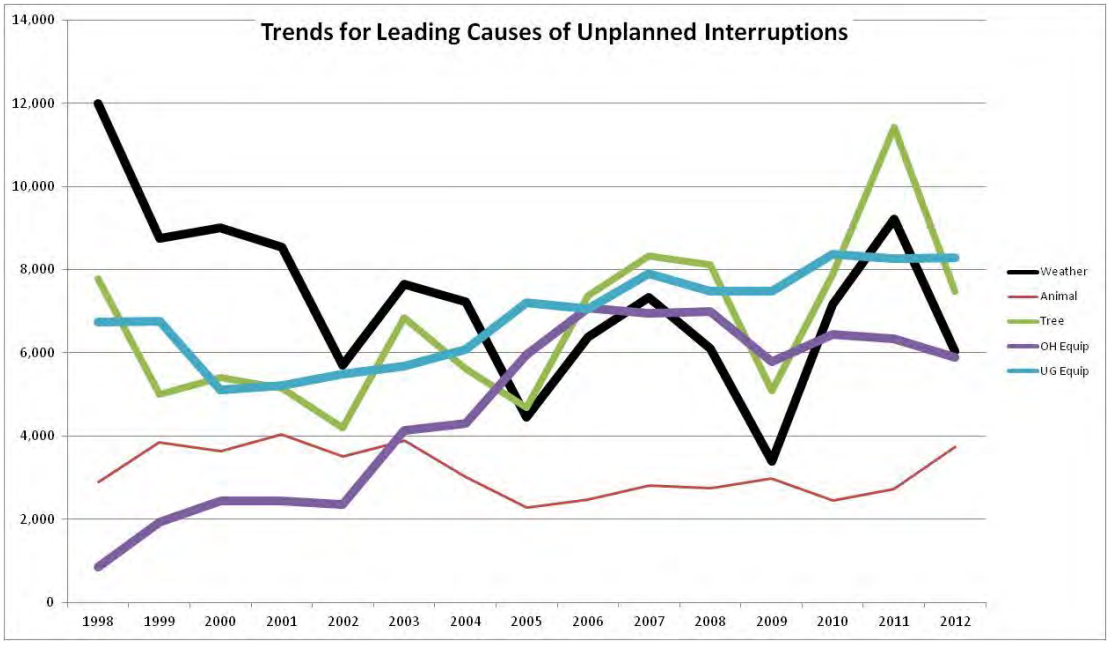

Figure 2 Trends for Leading Causes of Unplanned Interruptions

83 Ill. Adm. Code 411.120(b)(3)(G)(v) states that the utility is to perform a satisfaction survey covering reliability, customer service and customer understanding of the utility's services and prices. Through a rulemaking (Docket No. 98-0878), the Commission designed and approved a single customer survey applicable to each Illinois utility on a yearly basis starting in 2000. The utilities joined forces and, through a competitive bidding process, selected Opinion Dynamics Corporation ("ODC") to implement the study. ODC asked customers to rate ComEd's performance on a scale of zero to ten where zero means the utility is doing a poor job and ten means the utility is doing an excellent job. The mean (or average) rating from the responses to each question is presented on pages G-10 through G-13 of ComEd's 2012 Reliability Report. A summary of some ratings is shown in Table 5 for 2008 through 2012.

Table 5 -- Summary of Customer Survey Responses (average rating on zero-to-ten scale)

Customer Class		2008	2009	2010	2011	2012
Residential	Providing electric service overall	8.30	8.51	8.39	8.11	**8.41**
	Providing reliable electric service	8.32	8.49	8.37	8.03	**8.43**
Non-Residential	Providing electric service overall	8.49	8.67	8.31	7.99	**8.44**
	Providing reliable electric service	8.57	8.58	8.36	8.05	**8.51**

Figure 3 illustrates the trend of the survey responses in Table 5 from 2000 through 2012.

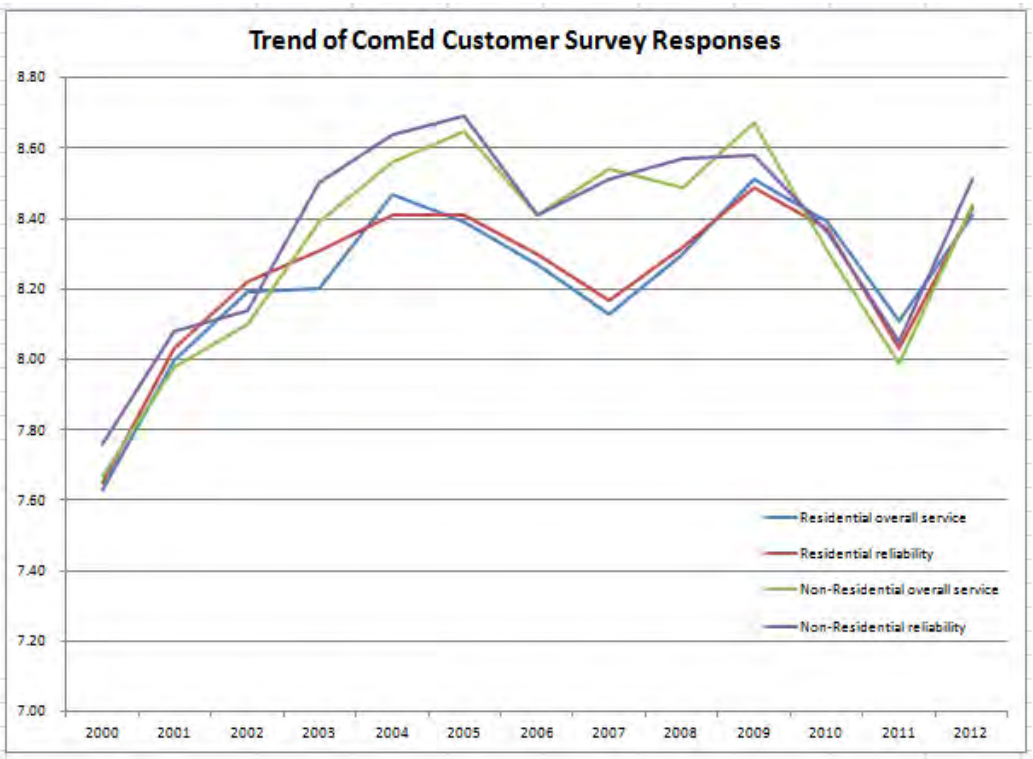

Figure 3 -- Long-Term Trend of ComEd Customer Survey Responses

Table 6 provides another perspective on customer satisfaction from the viewpoint of customer reliability complaints[5] when values from this year's Reliability Report are compared to previous years. The bottom line of the table shows the calculated number of complaints per 1,000 customers and provides a relative measure of complaints from the years 2007 through 2012 for the system.

[5] Tables on Pages G-13 & 15, ComEd's 2012 Reliability Report

Table 6 -- Trend of Customer Complaints for the Entire System

	2007	2008	2009	2010	2011	2012
Nature of Complaints	System Total	System Total	System Total	System Total	System Total	System Total
Sustained Interruptions	2,784	1,995	1,598	1,938	2,150	1,213
Momentary Interruptions	374	286	201	110	130	89
Total Low/High Voltage	631	450	370	195	139	114
Totals	3,789	2,731	2,169	2,243	2,419	1,416
Customers Served	**3,775,345**	**3,781,274**	**3,769,233**	**3,785,054**	**3,796,214**	**3,803,907**
No Customers per Complaint	996	1,385	1,738	1,687	1,569	2,686
Complaints per 1000 Customers	**1.00**	**0.72**	**0.58**	**0.59**	**0.64**	**0.37**
% change in Complaints per 1000 Customers [negative is good]	**5%**	**-28%**	**-20%**	**3%**	**8%**	**-42%**

Figure 4 compares ComEd's 2012 customer satisfaction ratings to those of the other reporting Illinois utilities.

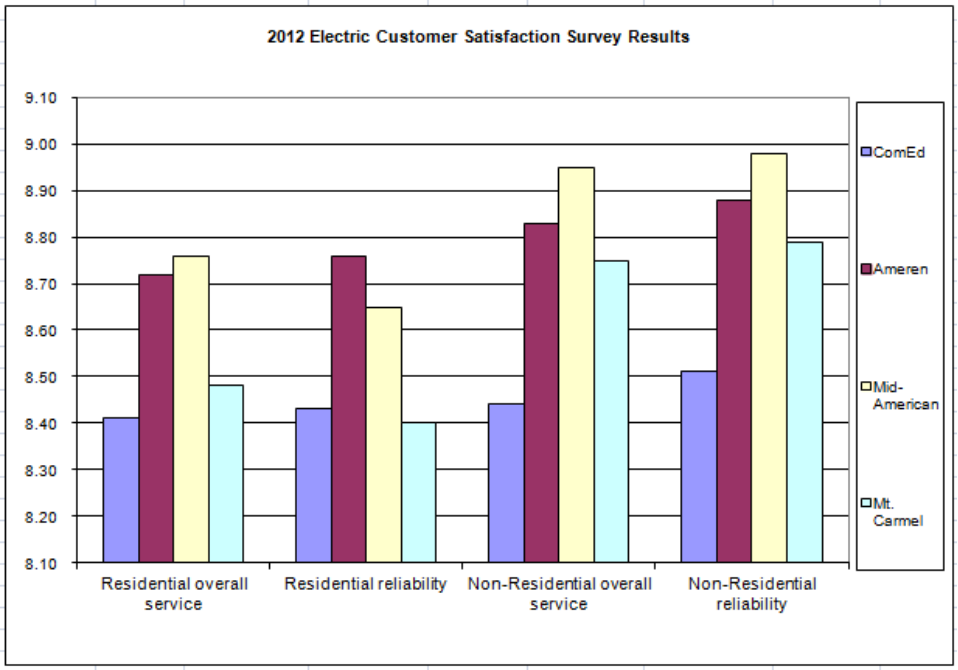

Figure 4 -- Comparison of Four Jurisdictional Utility's Customer Satisfaction Ratings for 2012

83 Ill. Adm. Code 411.120(b)(3)(K) requires the utility to report the total number of customers that experienced a set number of interruptions during 2012. Figure 5 shows the ComEd customer interruption experience for the last five years, 2008 through 2012. In Figure 5, the height of the bars indicate the number of customers who experienced a given number of interruptions during the year.

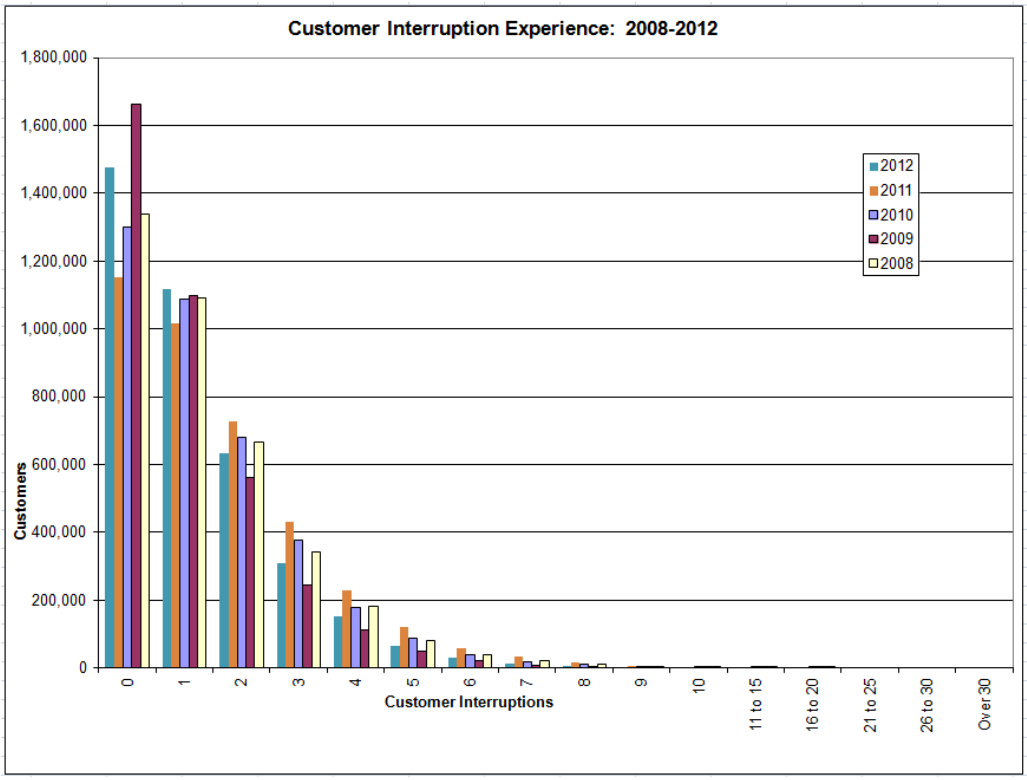

Figure 5 -- Customers Interruption Experience

Figure 6 shows the trend for the number of customers experiencing 5, 6, 7 or more interruptions for each of the last five years, 2008 through 2012.

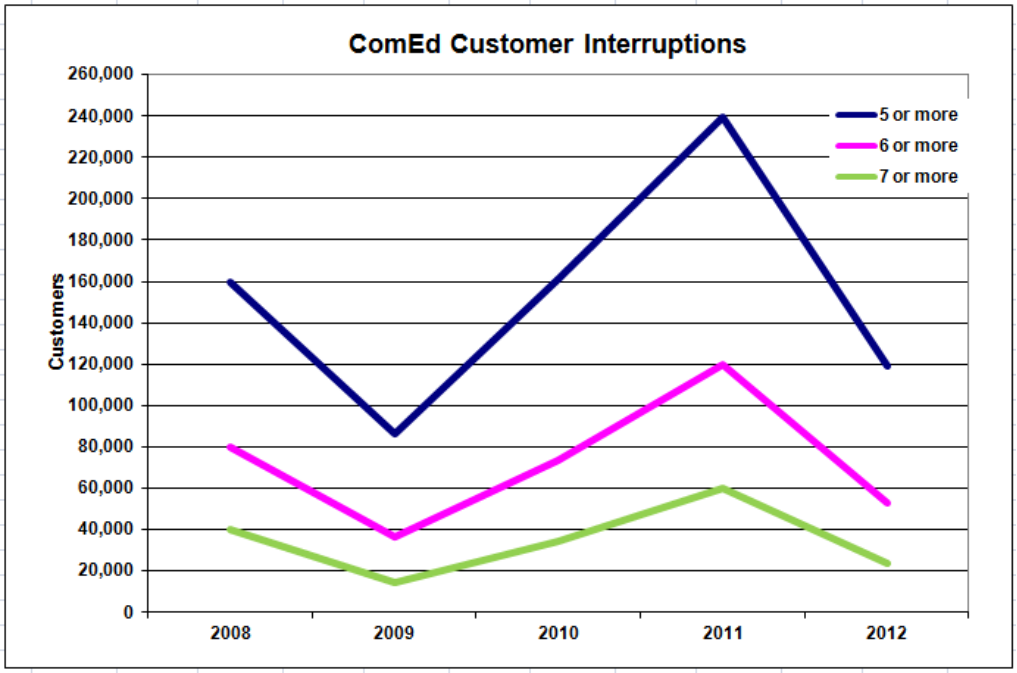

Figure 6 -- Customers Experiencing 5, 6, 7 or more Interruptions

83 Ill. Adm. Code 411.120(b)(3)(I)&(J) requires the reporting utility to list its worst performing circuits ("WPC") (subsection I) and state (subsection J) what corrective actions are planned to improve those circuits'

performance. ComEd selected its WPCs from those distribution circuits with the worst performance (highest reliability index scores) from each of its four operating areas and for each of the three reliability indices. This list totaled 111 circuits, and ComEd classified them as its worst 1% performers. Per subsection J, ComEd listed the date, number of customers affected, length of time, and cause of each interruption for each of these 111 circuits.

Worst Performing Circuit[6] Repeats from Previous Reports

Of the 111[7] WPCs in ComEd's 2012 Reliability Report, 23[8] (Table 7) represented repeats from one or more of the years 2007 through 2011.

Table 7 -- 2012 Worst Performing Circuit Repeats (within last 5 years)

	Circuit	Customers Served by Circuit as of the End of the Reporting Period	Region	Communities Served	Repeat WPC	Predominantly Urban / Rural & UG/OH	Predominantly Underground (UG) or Predominantly Overhead (OH)	Total Length of Circuit in Miles	DA Installed	Last General Circuit Inspection (Month & Year)	Last Circuit-Wide Tree Trim (Month & Year)
1	Y8273	1,163	CHICAGO	CHICAGO	SAIFI/CAIFI-2011	URBAN	UG	2.5	Yes	Dec 2012	Jan 2012
2	28TH243	540	CHICAGO	CHICAGO	SAIFI/CAIFI-2010	URBAN	OH	2.3	No	Jan 2011	Jan 2010
3	GRDX30	1,008	CHICAGO	CHICAGO	SAIFI/CAIFI-2009, SAIFI/CAIFI-2011	URBAN	UG	12.2	No	Oct 2009	Jun 2009
4	Z11863	2,469	CHICAGO	CHICAGO	SAIFI/CAIFI-2008, SAIFI/CAIFI-2010	URBAN	OH	12.2	Yes	Dec 2012	Jan 2013
5	Z15087	1,242	CHICAGO	CHICAGO	SAIFI/CAIFI-2007, SAIFI/CAIFI-2008, SAIFI/CAIFI-2010, SAIFI/CAIFI-2011	URBAN	OH	13.5	Yes	Jan 2012	May 2009
6	Y3031	374	CHICAGO	CHICAGO	SAIFI/CAIFI-2007	URBAN	OH	6.9	Yes	Apr 2011	Nov 2009
7	Y84051	182	CHICAGO	CHICAGO	CAIDI-2009	URBAN	UG	5.3	No	Oct 2012	Jan 2010
8	Z8950	295	CHICAGO	CHICAGO	CAIDI-2009	URBAN	UG	1.9	No	Mar 2012	Dec 2011
9	GRDX254	593	CHICAGO	CHICAGO	CAIDI-2008	URBAN	OH	4.0	No	May 2010	Jun 2009
10	A542	1,341	NORTHEAST	MUNDELEIN, LIBERTYVILLE	SAIFI/CAIFI-2011	URBAN	OH	24.8	Yes	Jan 2013	Mar 2012
11	W3521	979	NORTHEAST	ELMHURST	SAIFI/CAIFI-2010	URBAN	OH	7.8	No	Jan 2013	Dec 2010
12	W365	718	NORTHEAST	MILTON TWP, WHEATON, WINFIELD TWP, WINFIELD	SAIFI/CAIFI-2009	URBAN	OH	11.3	No	Aug 2011	Jul 2009
13	W4516X	708	NORTHEAST	LOMBARD, YORK TWP	SAIFI/CAIFI-2008	URBAN	OH	12.3	Yes	Dec 2012	Oct 2012
14	W348	697	NORTHEAST	VILLA PARK, ELMHURST	CAIDI-2009	URBAN	OH	2.4	No	Jan 2013	Mar 2009
15	W4564	171	NORTHEAST	ELMHURST	CAIDI-2009	URBAN	OH	2.1	No	Aug 2009	Mar 2009
16	D782	420	NORTHEAST	LEYDEN TWP, NORTHLAKE, FRANKLIN PARK	CAIDI-2008, CAIDI-2010	URBAN	OH	4.9	No	Sep 2011	Feb 2010
17	W6010	703	NORTHEAST	ADDISON TWP, ADDISON	CAIDI-2008	URBAN	UG	12.8	No	Nov 2010	Sep 2011
18	D461	149	NORTHEAST	NORTHLAKE	CAIDI-2007	URBAN	OH	1.0	No	Sep 2012	Jan 2010
19	B7507	905	NORTHWEST	DEKALB	SAIFI/CAIFI-2010	RURAL	OH	8.9	No	Mar 2012	Dec 2010
20	R8922	639	NORTHWEST	ROCKFORD TWP, ROCKFORD	SAIFI/CAIFI-2009	URBAN	UG	20.5	No	Feb 2010	Dec 2012
21	J1181	487	SOUTHERN	LOCKPORT TWP, ROMEOVILLE	SAIFI/CAIFI-2011	URBAN	OH	11.0	Yes	May 2012	Mar 2012
22	J5672	1,397	SOUTHERN	CRESTHILL, JOLIET, LOCKPORT TWP, LOCKPORT	SAIFI/CAIFI-2011	URBAN	OH	28.2	Yes	Oct 2010	Nov 2011
23	F4771	682	SOUTHERN	THORNTON TWP, SOUTH HOLLAND, LANSING, CALUMET CITY	SAIFI/CAIFI-2009	RURAL	UG	14.7	No	Dec 2012	Mar 2010

Figure 7 illustrates the distribution of these WPC repeats in ComEd's regions.

[6] 83 Ill. Adm. Code 411.20 defines "Worst-performing circuits" are those distribution circuits that, for each reliability index, are among the one percent of all circuits in an operating area (or at least one circuit for each reliability index) with the highest achieved values (lowest performance levels) for the reliability index. For the purpose of identifying worst-performing circuits, only distribution circuit interruptions and customers affected by such interruptions shall be considered in calculating the reliability indices.

[7] 111 represents approximately 2% of all ComEd distribution circuits.

[8] Staff considers a circuit to be a WPC Repeat if it had previously been a WPC for any reason. ComEd considers a Circuit to be a WPC Repeat if it had previously been a WPC in the Same Category list, i.e. a WPC frequency to WPC frequency or WPC duration to WPC duration.

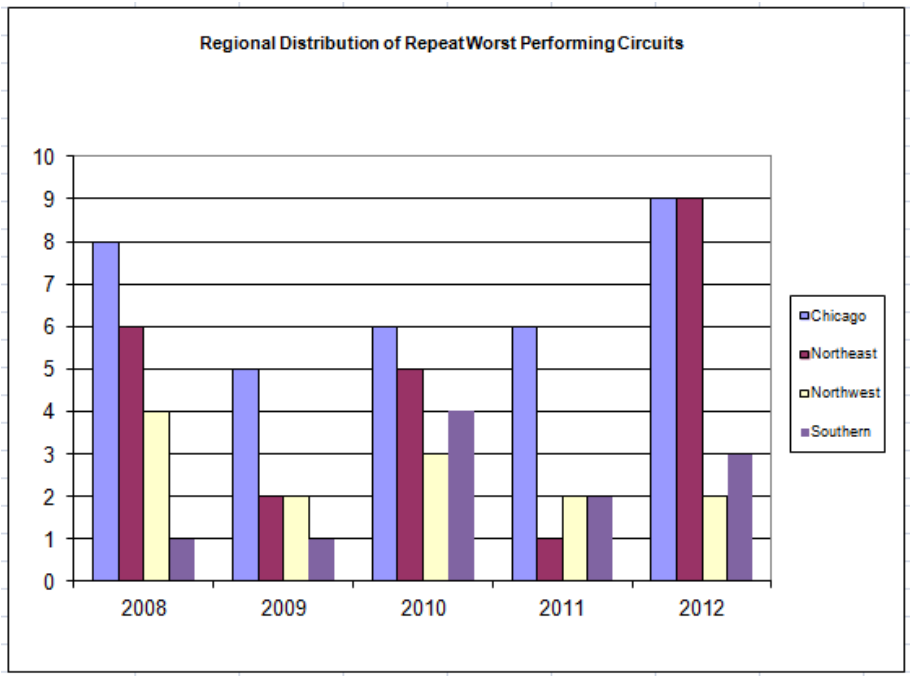

Figure 7 -- WPC Repeat Regional Distribution 2008-2012

ComEd has a finite number of distribution circuits in its system and, with the selection of the worst performing circuits each year out of that finite pool, Staff expects, due to random fluctuations alone, that in each assessment year there would be a small number of repeat circuits from the previous four years. Staff reviews the trending of these repeat circuits because there is a concern that the number of repeats from previous years may be indicative of (1) inadequacies in inspections and/or (2) non-completion of needed corrective actions and/or (3) non-completion of subsequent regular preventive maintenance for worst performing circuits from 2007 through 2011. On page J-1 of ComEd's Reliability Report, ComEd stated that it "*proactively identifies and reviews circuits that have repeated on the one percent list in the previous five years*." Further, on page J-1, ComEd goes on to describe the causes of those repeats and actions taken by ComEd to prevent future repeats on those circuits.

Figure 8 illustrates the distribution of the Worst Performing Circuits in 2012 between those that are predominantly overhead and those that are predominantly underground.

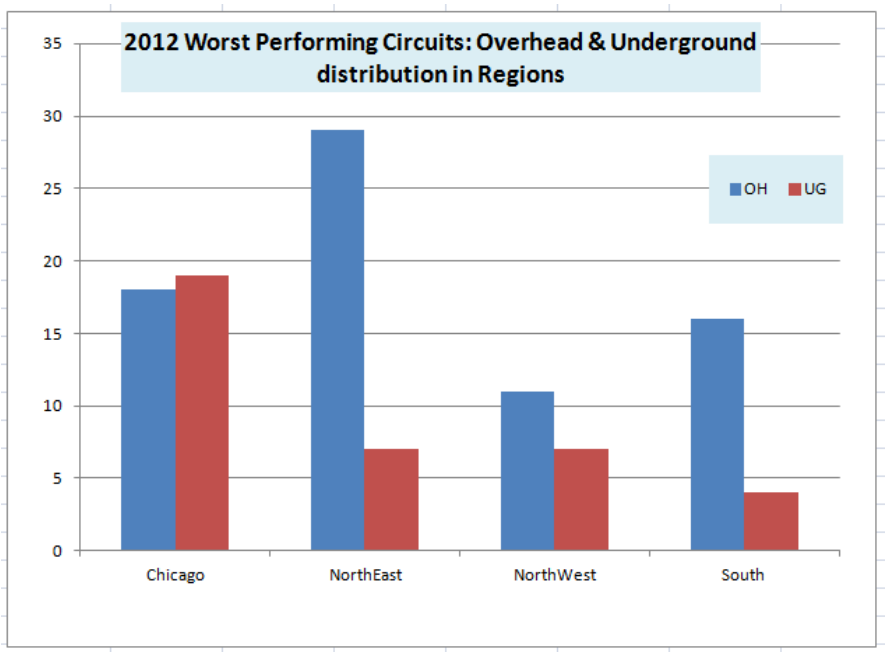

Figure 8 -- 2012 WPC Overhead & Underground distribution by Region

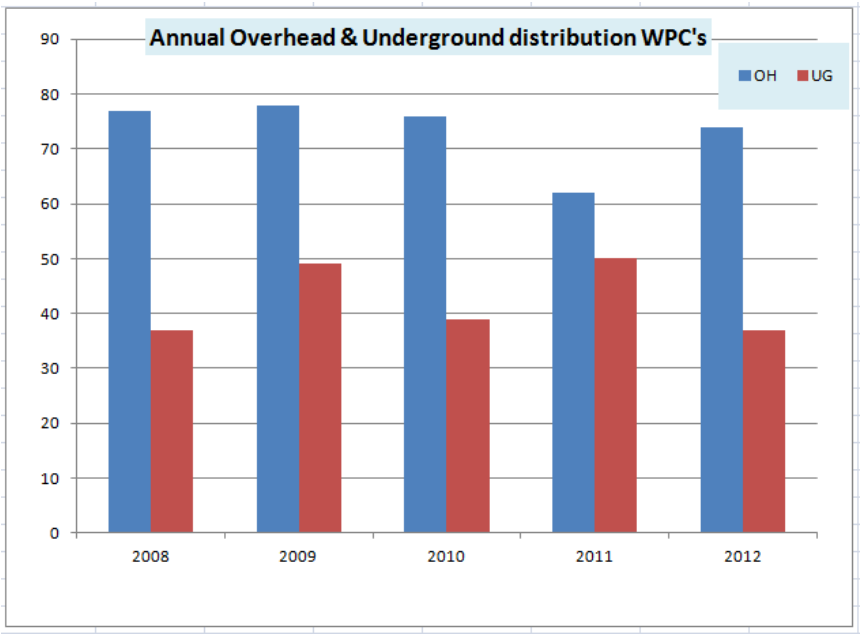

Figure 9 -- Annual WPC distribution OV & UG

Figure 9 shows that predominantly underground circuits (predominantly underground circuits are circuits that are more than 50% underground) make up a large portion of worst performing circuits over the last five years.

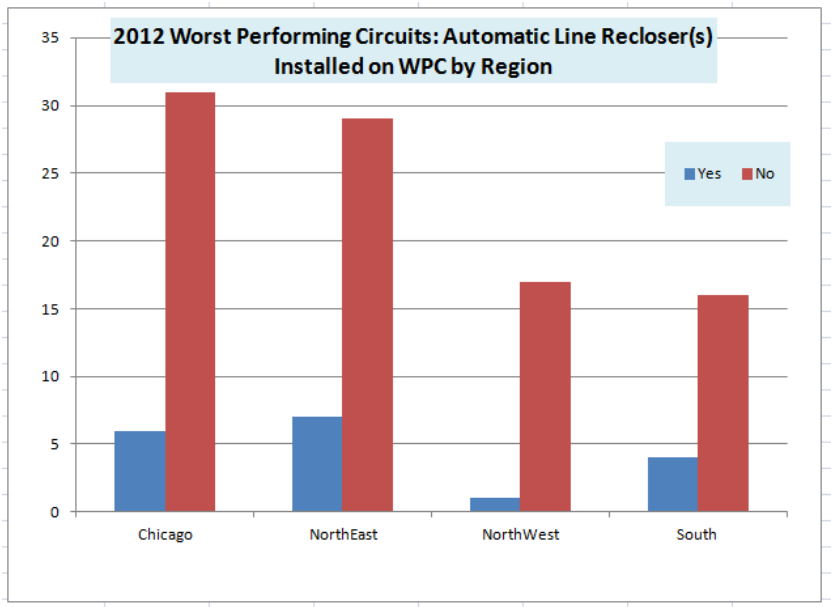

Figure 10 -- Distribution of Automatic Line Recloser(s) on WPC's by Region

Figures 10 and 11 show that a majority of the worst performing circuits do not have automatic line recloser(s)[9] installed.

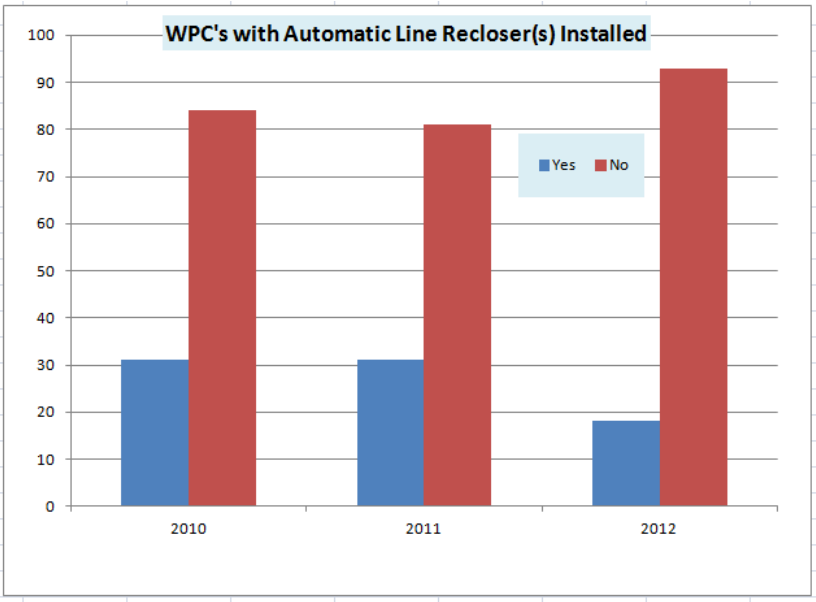

Figure 11 -- Annual Trend of WPC's with Automatic Line Recloser(s) Installed

[9] In response to data request ENG_1.2(f)(xii) the company was asked to indicate (yes or no) whether automatic line recloser(s) are installed on the WPC (not including recloser(s) being utilized as a circuit breaker within a substation). Recloser(s) are used on overhead distributions systems to detect and interrupt momentary faults. Since many short-circuits on overhead lines clear themselves, a recloser improves service continuity by automatically restoring power to the line after a momentary fault. With multiple reclosers on an overhead circuit and with proper coordination those reclosers could be used to isolate the faulted portion of a circuit and restore power to other portions of the overhead circuit.

Field Inspections

To evaluate the overall trend of conditions in ComEd's service territory, Commission Staff conducted seven field inspections in 2013, Table 8, seven fence line (from outside the substation fence) substation inspections, Table 9, and one in station substation inspection. The purpose of the inspections was for Staff to see if there were any obviously visible reasons for poor reliability performance. Staff looked for problems on circuits, such as poor tree trimming practices, broken or damaged equipment, rotten poles, and overly slack spans (low sagging lines). At substations, Staff looked for problems such as low or leaking oil in equipment, load tap changers regularly operated at extreme positions, and poor maintenance practices.

Table 8 -- Field Inspections in 2013

Circuit	Region	Communities Served	Date Inspected in 2013
B7507	NORTHWEST	DEKALB	April 30
B552	NORTHWEST	ROCK RUN-RIDOTT TWP, ROCK RUN-ROCK GROVE, LAONA TWP, BUCKEYE-DAKOTA TWP, DAKOTA, DAVIS, DURAND-LAONA	June 25
G653	SOUTHERN	CALUMET CITY, DOLTON	June 18
Random		DEKALB and DEKALB Area	April 30
Random		ELK GROVE VILLAGE Area	May 7
Random		DAVIS, WINNEBAGO, US 20, Surrounding Countryside	June 25
Random		OAK LAWN, OAK LAWN Area	October 22

Table 9 -- Substation Inspections in 2013

Substation Inspections	Date Inspected in 2013
West Dekalb (Fence Line Inspection)	April 30
Tonne	May 7
South Holland (Fence Line Inspection)	June 18
Rock City (Fence Line Inspection)	June 25
DCG125 (Fence Line Inspection)	October 22
DCG39 (Fence Line Inspection)	October 22
DCG42 (Fence Line Inspection)	October 22
DCG78 (Fence Line Inspection)	October 22

A log of Staff's field observations is contained in Appendix A. Appendix A contains only a few of the many pictures taken by Staff. Additional pictures can be found later in Section 9 – Potential Reliability Problems and Risk.

7. Trends in ComEd's Reliability Performance

Listed in Table 10 are ComEd's reliability indices as reported in the 2012 Reliability Report (for all interruptions) for ComEd's overall system, as well as each region, in comparison to the system values reported by the other utilities for 2012. Table 11 lists the reliability indices for the worst system circuit in each jurisdictional utility.

Table 10 -- Comparison of 2012 Reliability Indices

	CAIDI (minutes)	CAIFI (interruptions)	SAIFI (interruptions)
ComEd System Total	196	1.94	1.16
ComEd Chicago Region	102	1.74	0.87
ComEd Northeast Region	297	1.93	1.19
ComEd Southern Region	177	2.07	1.46
ComEd Northwest Region	180	1.92	1.26
Ameren System	136	1.71	1.05
MidAmerican System	84	2.99	2.36
Mt. Carmel System	93	4.03	3.57

Table 11 -- 2012 Reliability Indices for THE Worst System Circuit

name	CAIDI (minutes)	CAIFI (interruptions)	SAIFI (interruptions)	
Ameren	1840	4.9	4.9	CAIDI: Ckt M36184 Sub: Freemont SAIFI & CAIFI: Ckt: R93350 Sub: Wanda
ComEd	5004	7.9	7.9	CAIDI: **Ckt W3117** Sub: TSS131 Twns: West Chicago SAIFI & CAIFI: **Ckt: Z15087** Sub: TSS150 Twns: Chicago
MidAmerican	629	9.8	9.8	CAIDI: Ckt QSP214 (460674-547484) SAIFI & CAIFI: Ckt: 13-40-4 (465074-565830
Mt. Carmel	166	6.1	4.2	CAIDI, SAIFI & CAIFI: Ckt: 22000 (Allendale Feeder)

CAIDI: Customer Average Interruption Duration Report (cay' dee). This represents, for the group of customers that actually had one or more interruptions, how long, on average, the interruptions lasted.

CAIFI: Customer Average Interruption Frequency Index (cay' fee). This represents the interruption frequency for the group of customers that had interruptions. **A CAIFI index much higher than SAIFI suggests that subsets of customers experienced significantly more frequent interruptions than the overall system average.**

SAIFI: System Average Interruption Frequency Index (say' fee). This represents the number of customer interruptions divided by total system customers.

The reliability indices required by the Commission rules and provided by ComEd[10] include storm related interruptions. Staff expects that the better designed and maintained an electric system is, the smaller the number (CAIFI & SAIFI indices) or magnitude of storm related problems and the quicker the restoration of the electric system would be, also resulting in a lower system average customer interruption time (CAIDI index).

In Tables 18b, 18c, 18d, and 18e of ComEd's 2012 Reliability Report, ComEd listed reliability indices that vary from the indices as defined in 83 Ill. Adm. Code 411.20. Staff commends the use by ComEd's engineers and planners of all available tools for their own analyses and reliability improvement purposes. While Staff does look at storms and company-generated statistics that exclude purported storms to help explain year to year variations in reliability indices, Staff believes the long term trends of indices with all available data included are the least potentially problematic performance indicators. In Docket Nos. 07-0066, 07-0067, and 07-0068, Staff

[10] Page H-2, Table 18a: Reliability Indices for 2012, ComEd 2012 Reliability Report.

demonstrated how reliability indices that attempt to exclude storm periods could be misleading[11] and unsuitable[12] for Commission use. Staff used the reliability indices as required by the Commission rules.

Figure 12 illustrates ComEd's CAIDI indices over the last five years in each region. Note that **lower** bar sizes in Figure 12 represent **better** performance.

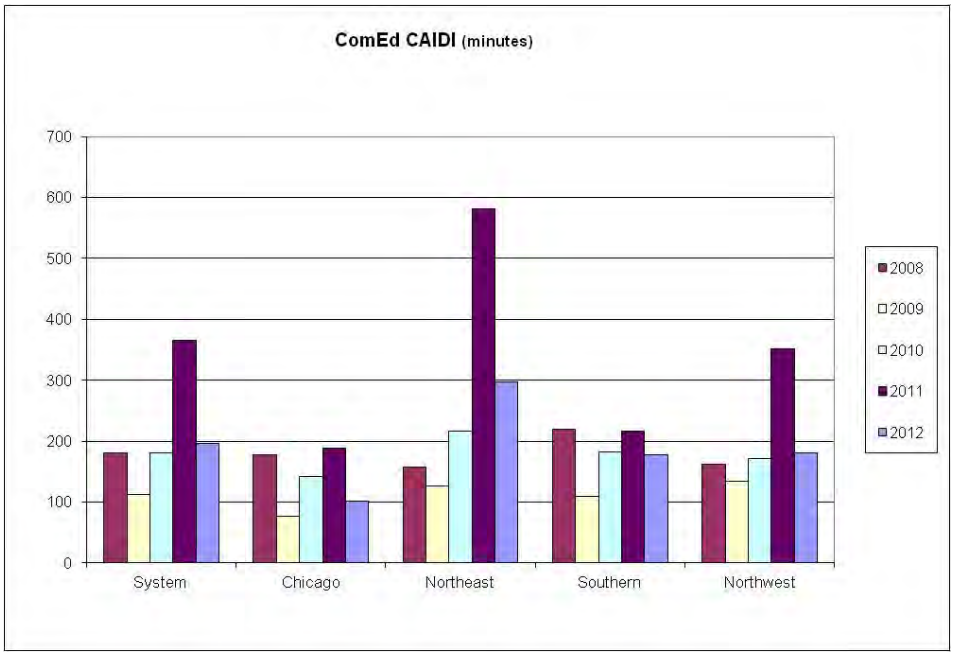

Figure 12 -- ComEd CAIDI 2008-2012

[11] "… Utilities that choose to adequately maintain their electric delivery facilities and workforces might significantly reduce the number and duration of electric service interruptions that their customers experience during storms. The reductions could cause Standard 1366 to identify fewer Major Event Days. Conversely, utilities that fail to adequately maintain their electric delivery systems and workforces might increase the number and duration of electric service interruptions that their customers experience during storms and cause Standard 1366 to identify more Major Event Days. With a larger number of Major Event Days, the utility with the inferior maintenance programs or too-small workforce might appear in the resulting reliability statistics to be performing better than the utility with the superior maintenance program and bigger workforce. …" Docket No. 07-0066 Attachment Q to Order dated January 24, 2007; Docket No. 07-0067 Attachment B to Attachment to Order dated January 24, 2007, Docket No. 07-0068 Attachment Q to Attachment to Order dated January 24, 2007.

[12] "…If Ameren utilities could classify a significant number of the electric service interruptions their customers experience as caused by the weather and use a method … to make many of those weather interruptions disappear from their statistics, then they could report reliability to the Commission that their customers could only wish for, but had never actually seen. … The disturbing possibility that Standard 1366 could alter reliability statistics to favor utilities with poor maintenance programs and inadequate workforces seems to Staff to make Standard 1366 unsuitable for Commission use. …" Docket No. 07-0066 Attachment Q to Order dated January 24, 2007; Docket No. 07-0067 Attachment B to Attachment to Order dated January 24, 2007, Docket No. 07-0068 Attachment Q to Attachment to Order dated January 24, 2007.

Figure 13 shows a comparison of CAIDI values reported for the years 2008 through 2012 by the utilities.

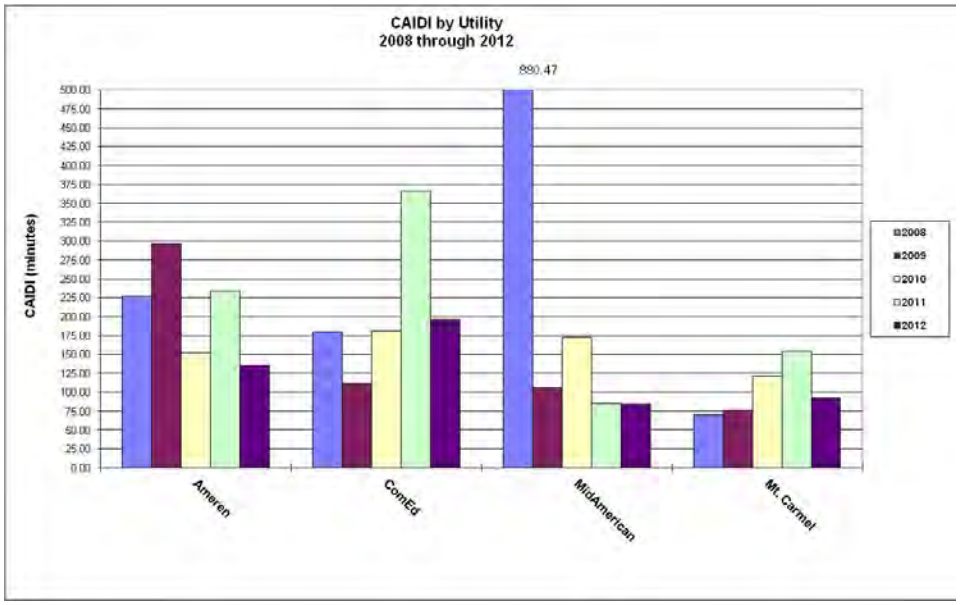

Figure 13 -- CAIDI by Utility 2008-2012

Figure 14 shows a comparison of CAIDI values for the worst circuit for each of the utilities from 2008 through 2012.

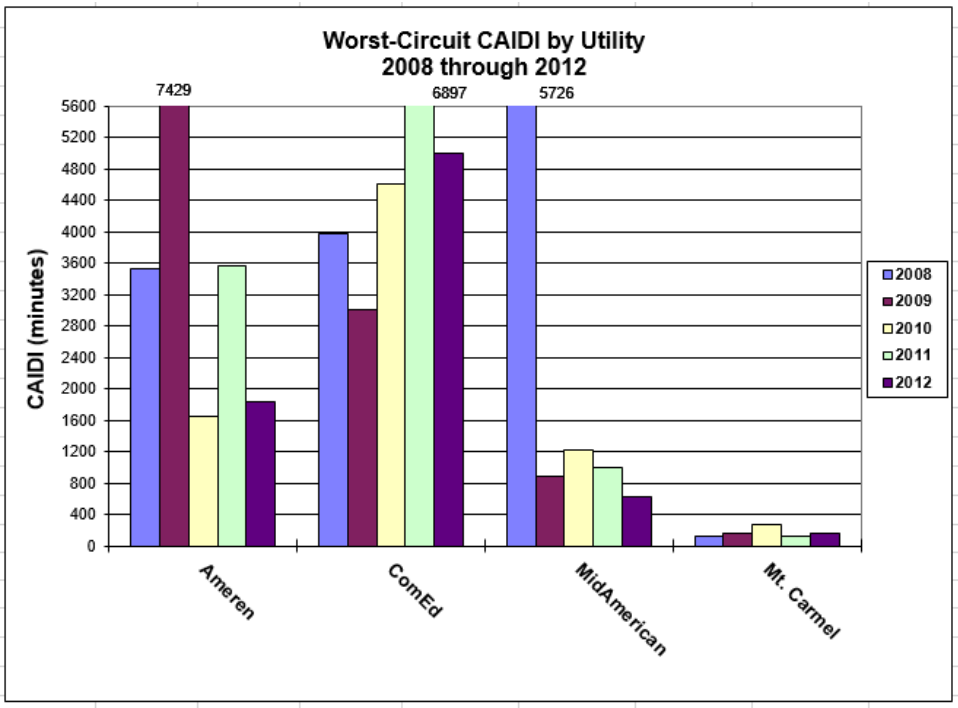

Figure 14 -- Worst Circuit CAIDI by Utility 2008-2012

Figure 15 illustrates ComEd's annual System CAIDI since 1998 and its trend based on a 4-year rolling average – since 2005 ComEd's 4-year rolling average has been trending higher.

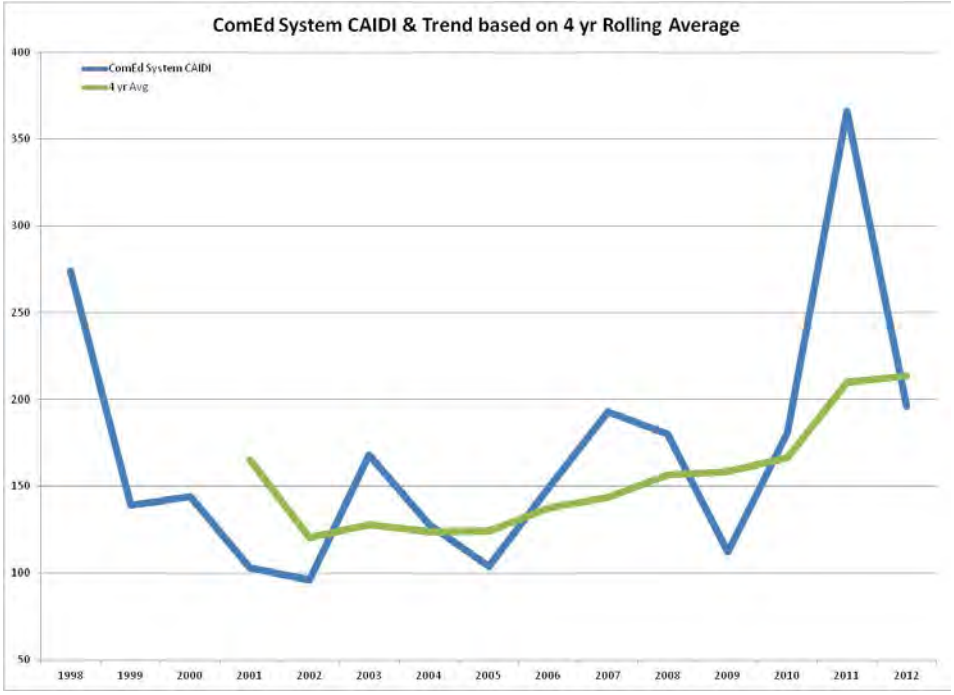

Figure 15 -- ComEd System Annual CAIDI and 4 year Rolling Average Trend

Figure 16 shows ComEd's CAIFI performance over the last 5 years for all ComEd Regions. Note that **lower** bar sizes in Figure 16 represent **better** performance.

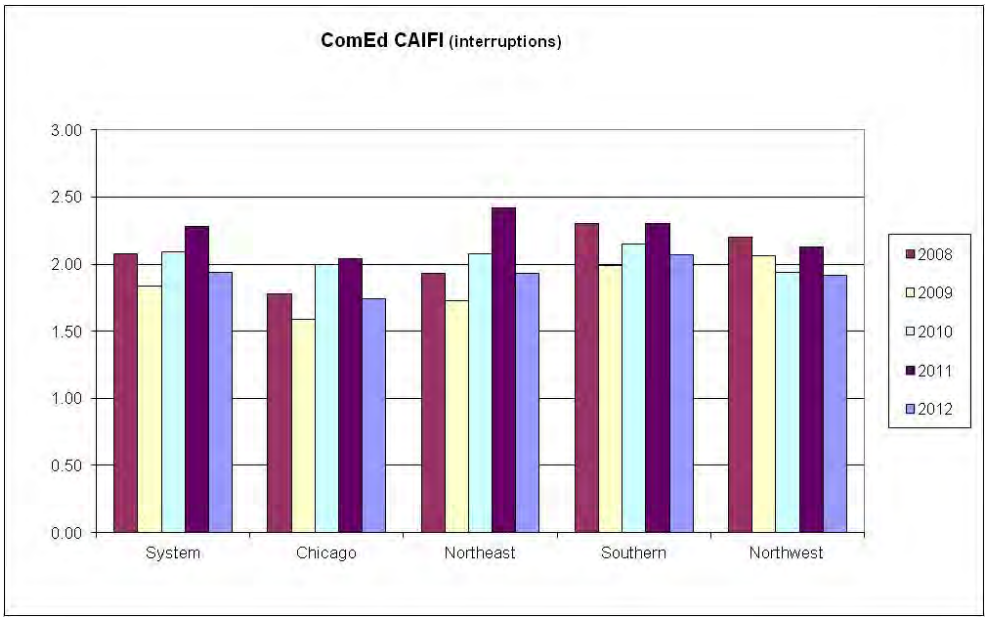

Figure 16 -- ComEd CAIFI 2008-2012

Figure 17 shows a comparison of CAIFI values reported for the years 2008 through 2012 by the utilities.

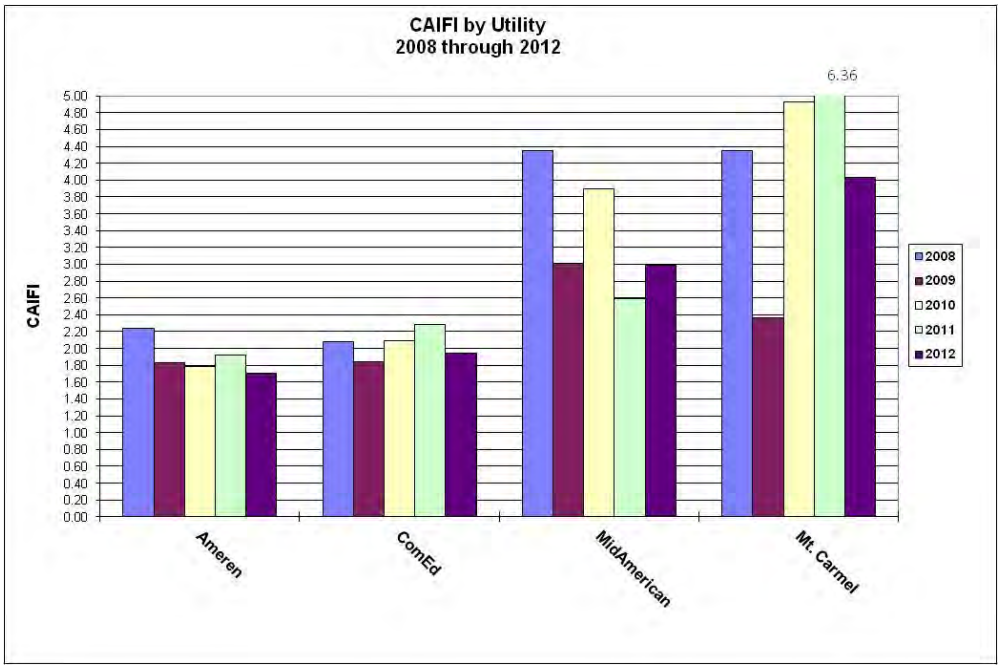

Figure 17 -- CAIFI by Utility 2008-2012

Figure 18 shows a comparison of CAIFI values for the worst-circuit for each of the utilities in 2008 through 2012.

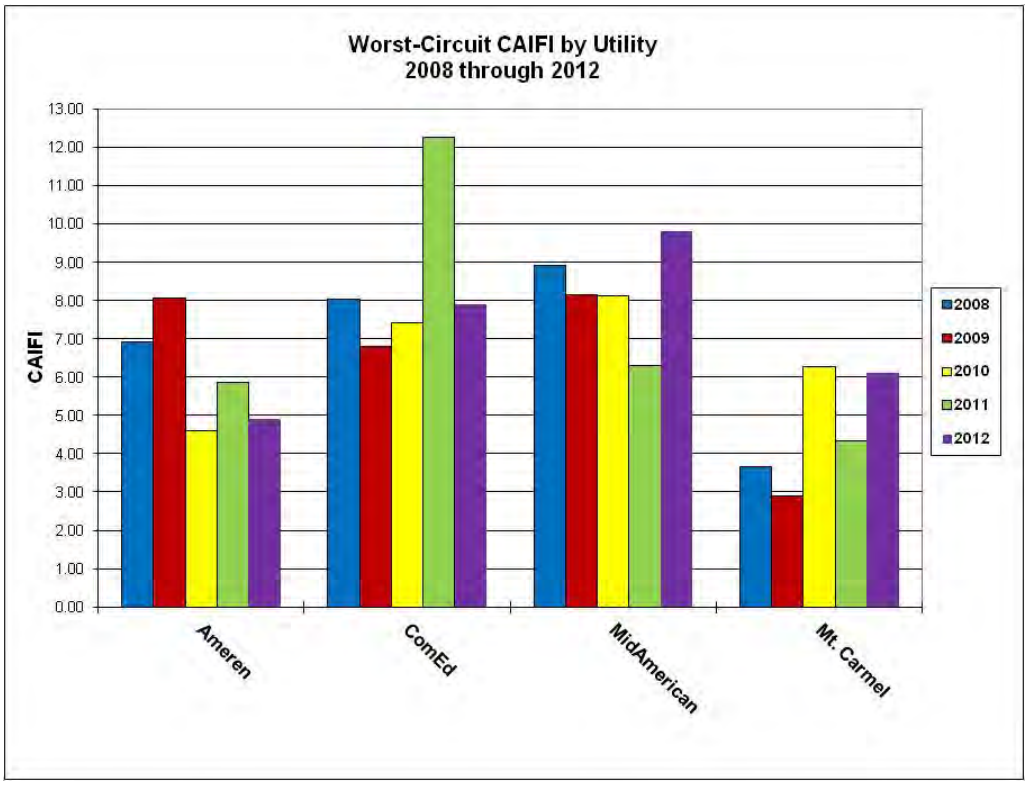

Figure 18 -- Worst Circuit CAIFI by Utility 2008-2012

Figure 19 shows ComEd's SAIFI performance over the last 5 years for all ComEd Regions. Note that **lower** bar sizes in Figure 19 represent **better** performance.

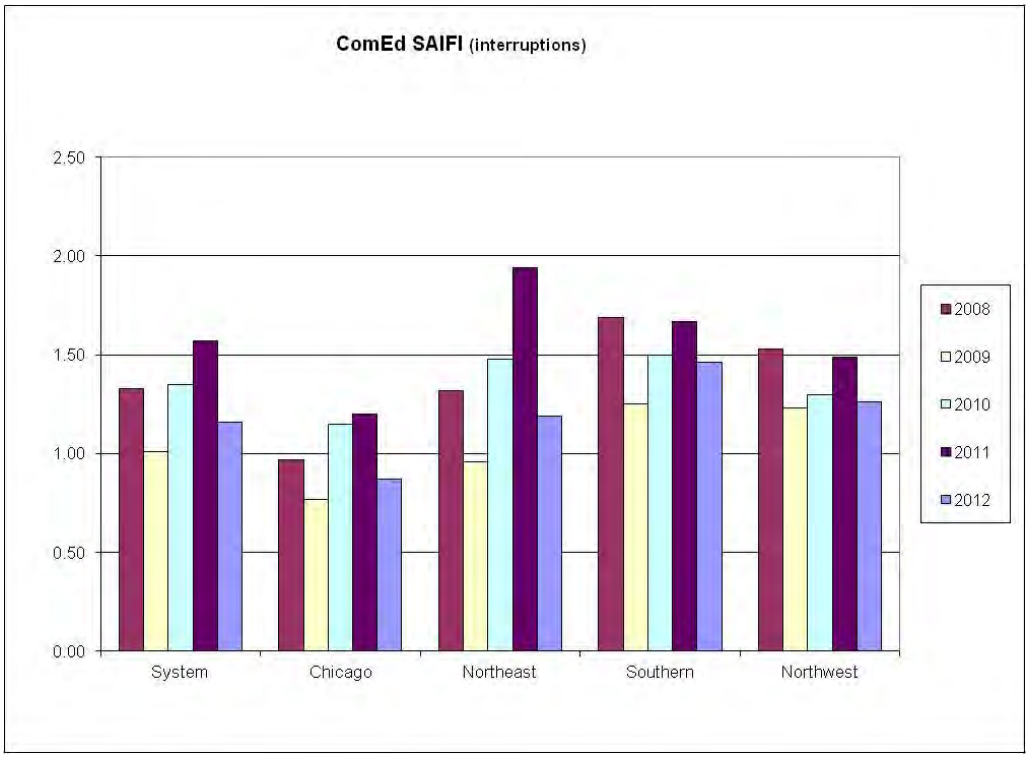

Figure 19 -- ComEd SAIFI 2008-2012

Figure 20 below shows a comparison of SAIFI values reported for the years 2008 through 2012 by the four utilities.

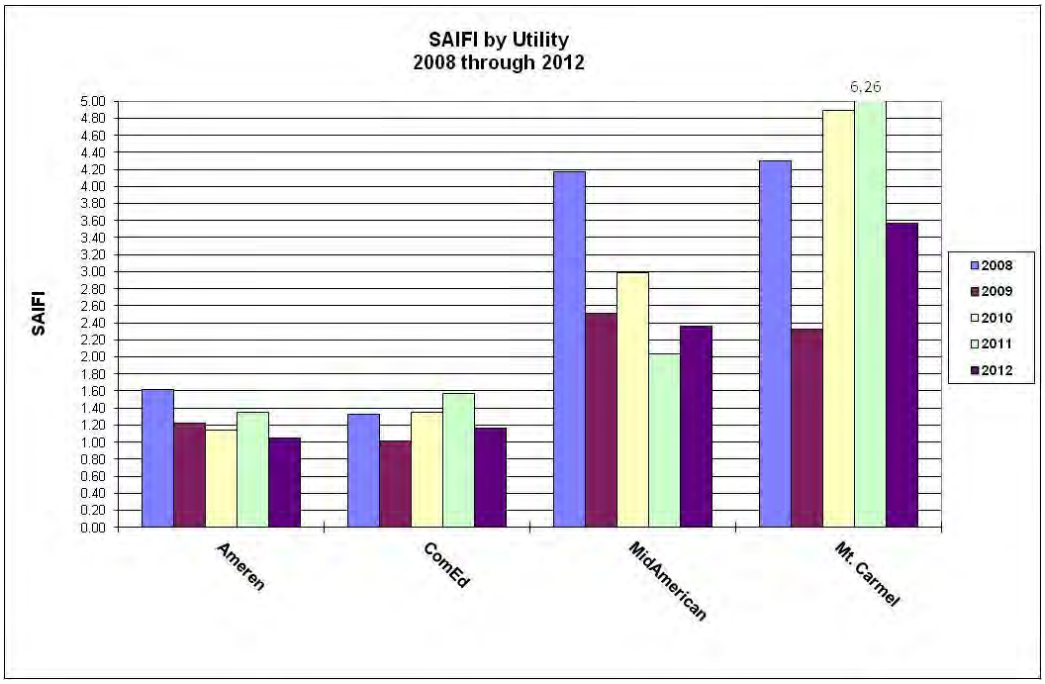

Figure 20 -- SAIFI by Utility 2008-2012

Figure 21 shows a comparison of SAIFI values for the worst performing circuit for each of the six utilities for 2008 through 2012.

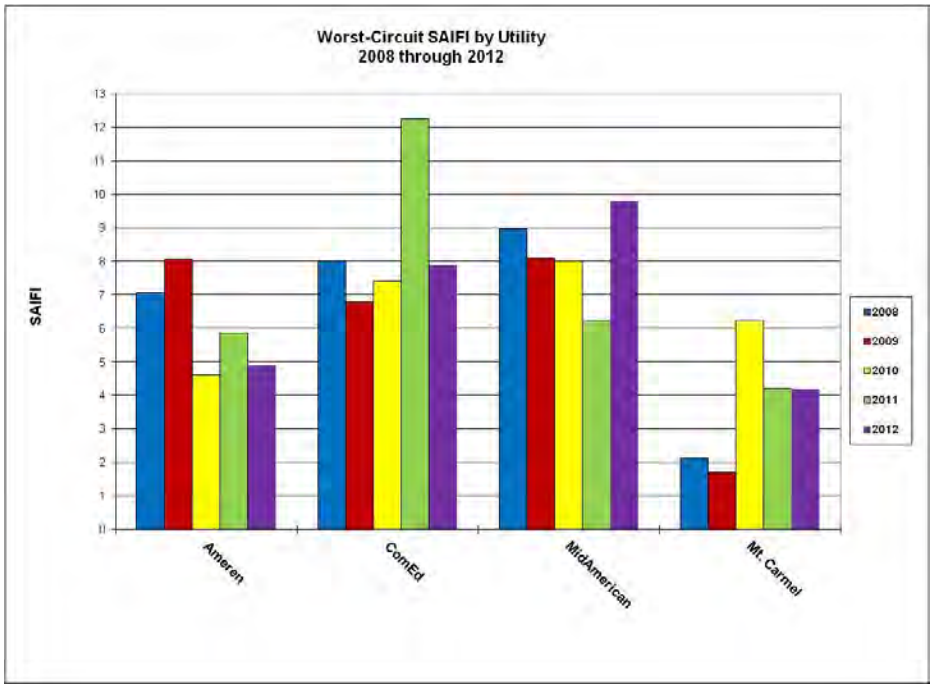

Figure 21 -- Worst-Circuit SAIFI by Utility 2008-2012

Figure 22 illustrates ComEd's annual System SAIFI since 1998 an it's trend based on a 4 year rolling average – ComEd's 4 year rolling average SAIFI has been trending down (i.e. improving) since 2008.

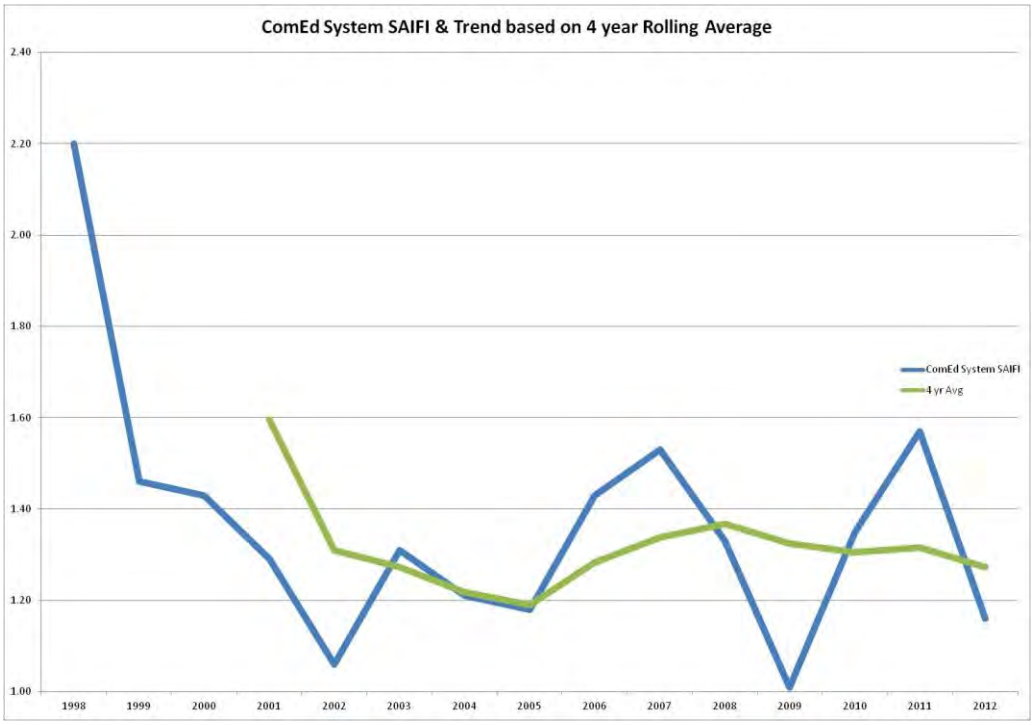

Figure 22 -- ComEd System SAIFI & 4 year Rolling Average Trend

83 Ill. Adm. Code 411.210(b)(3) states that each utility having 1,000,000 or more customers is to provide a list of substation transformers that had a peak loading that equaled or exceeded 90% of their rated normal capacity. Figure 23 shows the historical distribution, by region, of substation transformers with a peak loading at or above 90% in the last 5 years, 2008-2012.

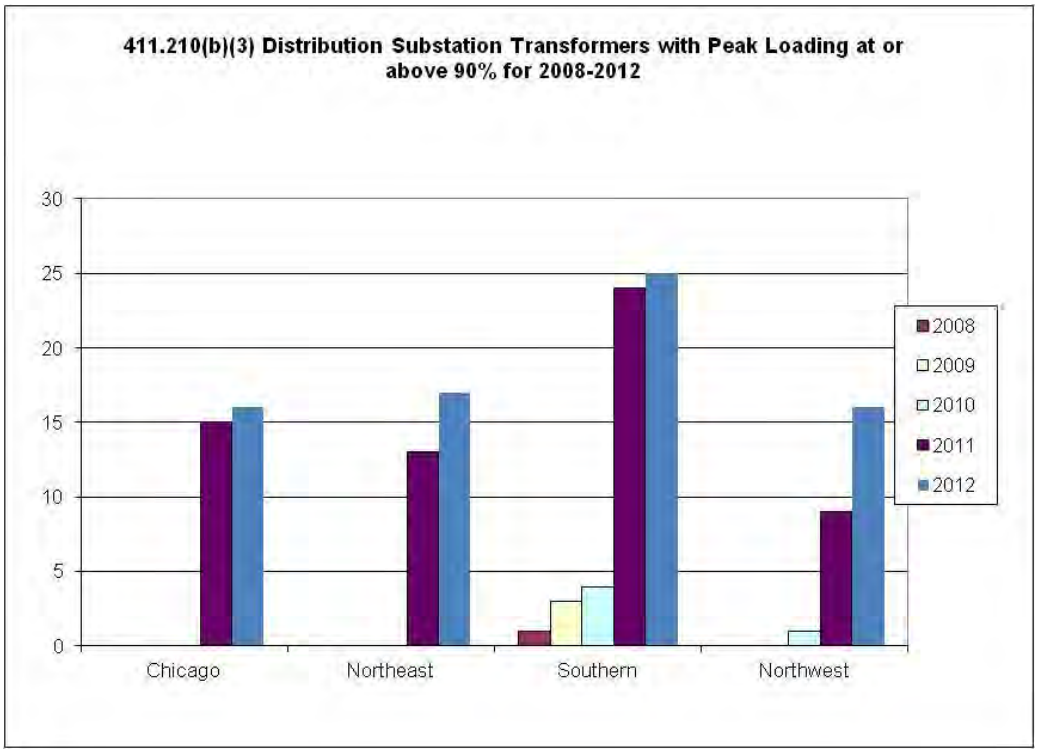

Figure 23 Distribution Substation Transformer with Peak Loading at or above 90%

When actual system peak loads approach the extreme hot weather load projections used for capacity expansion planning (see Figure 25), the trend in the number of transformers that exceed the criterion in 83 Ill. Adm. Code 411.210(b)(3) could signify reliability risks in the future. High transformer loadings can impact reliability in three ways: (1) when a substation transformer is loaded over its normal capacity rating for a length of time, the likelihood increases that the transformer may fail[13] due to cumulative thermal deterioration from overloading; (2) when a transformer is highly loaded, system reconfiguration flexibility is reduced if other failures occur in the system or if greater-than-expected load growth occurs; and (3) a trend toward a higher number of transformers exceeding the criterion in 83 Ill. Adm. Code 411.210(b)(3) at or below planning criterion load levels may signify inadequate substation capacity expansion planning.

In Figure 24, the solid red line represents actual annual peak demand while the lighter dashed lines represent the projected average weather load forecast. The average weather load forecast is not used to plan capacity expansions in the system.

[13] Higher operating temperatures, dependent in part on loading, shorten transformer life.

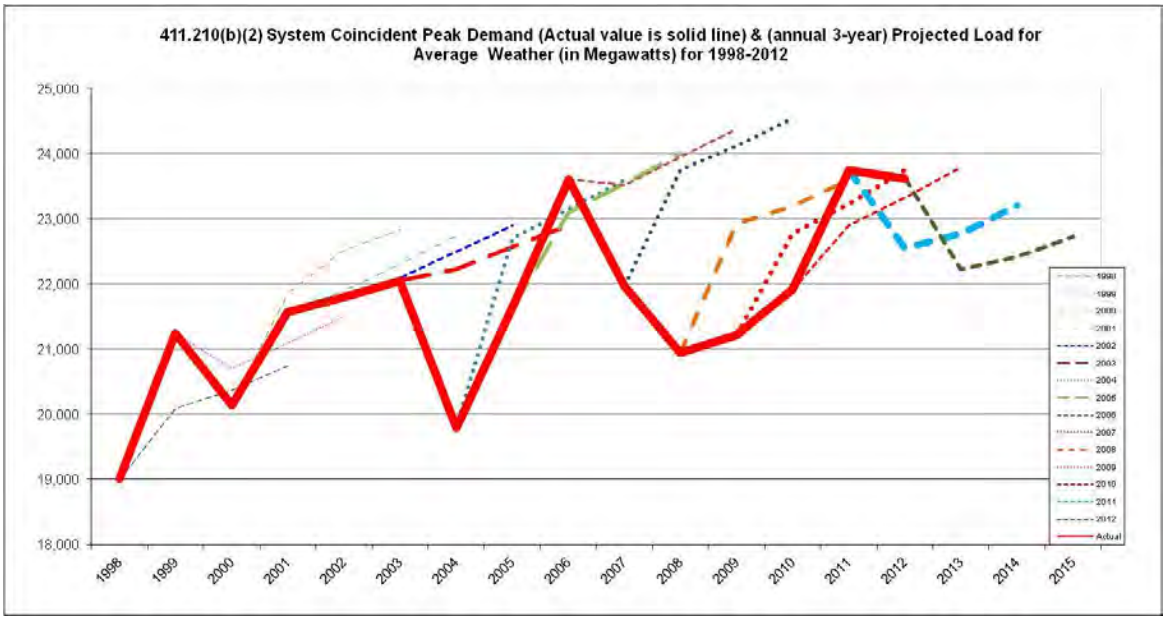

Figure 24 Actual Peak Demand and Projected Load for Average Weather

In Figure 25, the solid red line represents actual annual peak demand while the lighter dashed lines represent the projected extreme hot (90/10) weather load forecast used to plan capacity expansions in the system. Using the 90/10 load forecast for system capacity expansion planning was implemented as a result of the 1999 summer failures.

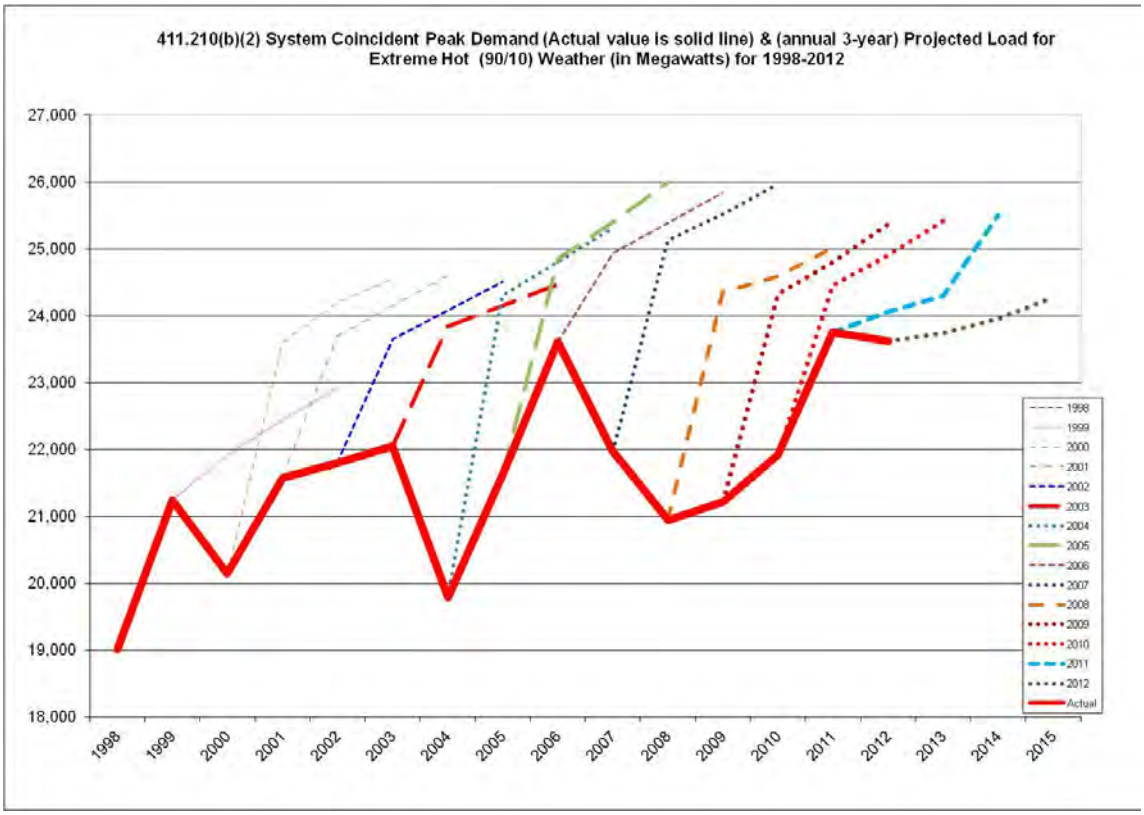

Figure 25 Actual Peak Demand and Projected Load for Extreme Hot Weather (90/10 Planning Criterion)

8. ComEd's Plan to Maintain or Improve Reliability

With information from 83 Ill. Adm. Code 411.120(b)(3)(G)(iii & iv), Figures 26 and 27 display "Construction and Maintenance Expenditures" in current and constant dollars for Distribution and Transmission, respectively.

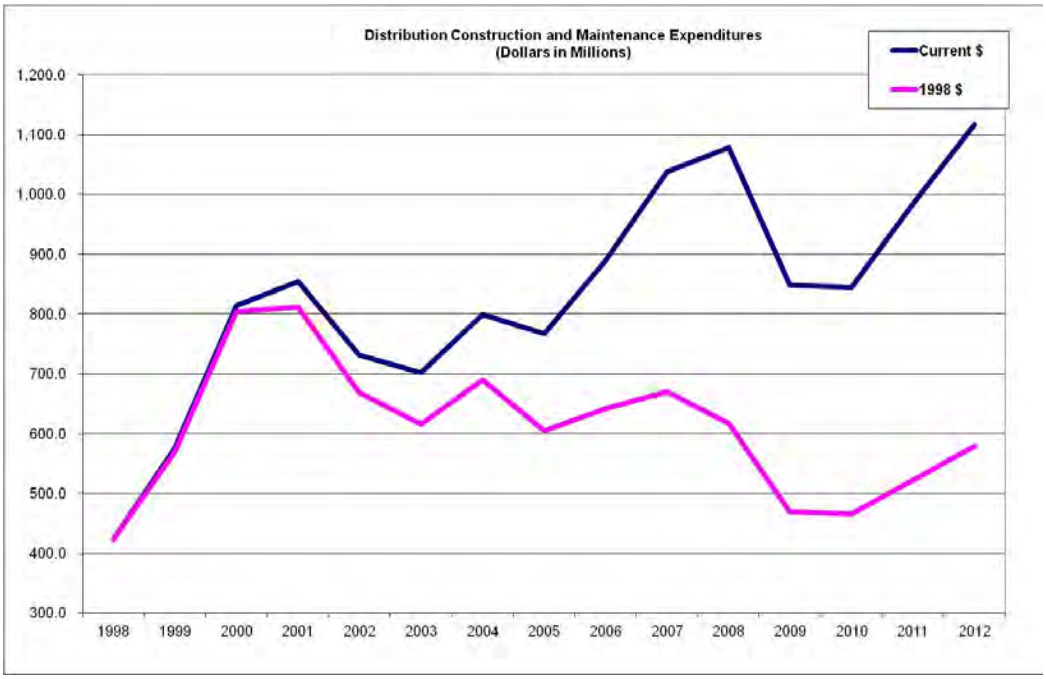

Figure 26 -- Distribution Construction & Maintenance Expenditures 1998-2012

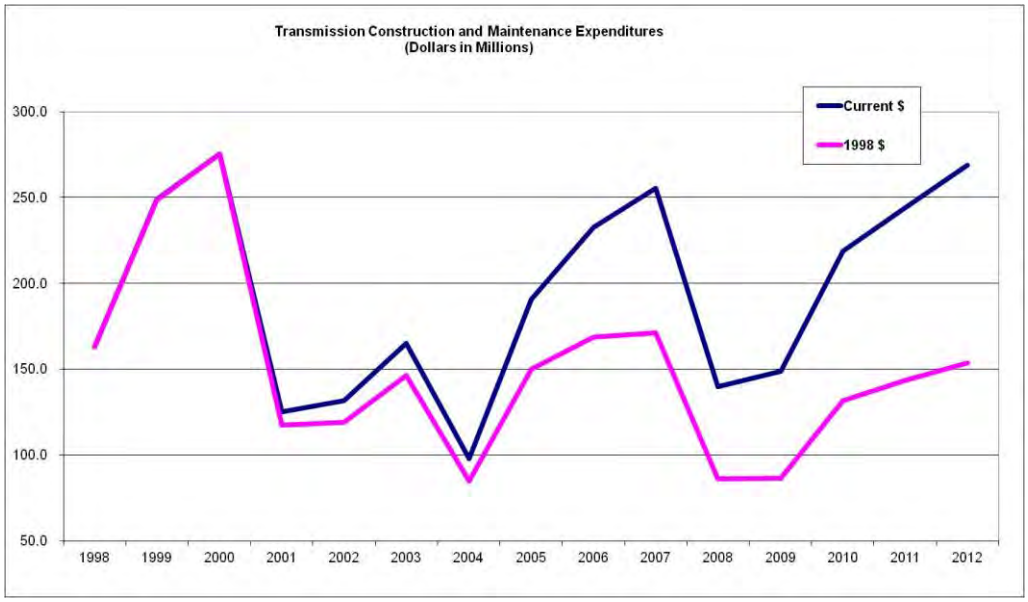

Figure 27 -- Transmission Construction & Maintenance Expenditures 1998-2012

Pages A-1 through A-8, including Table 1 on pages A-5 through A-8, of its 2011 Reliability Report, detail ComEd's plans for future investment as required by 83 Ill. Adm. Code 411.120(b)(3)(A). A summary of the current plan is shown in Table 12 along with total variances from previous plan years.

Table 12 -- 2012 Future Investment Plan ($'s in Millions)

Table 1: Projects Associated with Transmission and Distribution Pages A-4 through A-7 of 2012 Reliability Report	Plan 2013	Plan 2014	Plan 2015
Transmission System Improvements [see page A-4]	348	288	343
Distribution Capacity [see page A-5]	72	76	73
Substation [see page A-5]	63	39	37
4kv, 12kv, & 34kv Ckt Improvements [see page A-6]	191	234	334
Inspection and Maintenance [see page A-7]	139	135	127
	813	**772**	**914**
Variance from plan in 2011 Report	-110	-86	
Variance from plan in 2010 Report	261		

Greater detail of actual (using information from Part 411.120(b)(3)(B)) and projected investment plans (83 Ill. Adm. Code 411.120(b)(3)(A) information from the 2003 through 2012 Reliability Reports) is illustrated in Figures 28 through 33.

ComEd describes its plan for future investment on pages A-1 through A-7 of its 2012 Reliability Report.

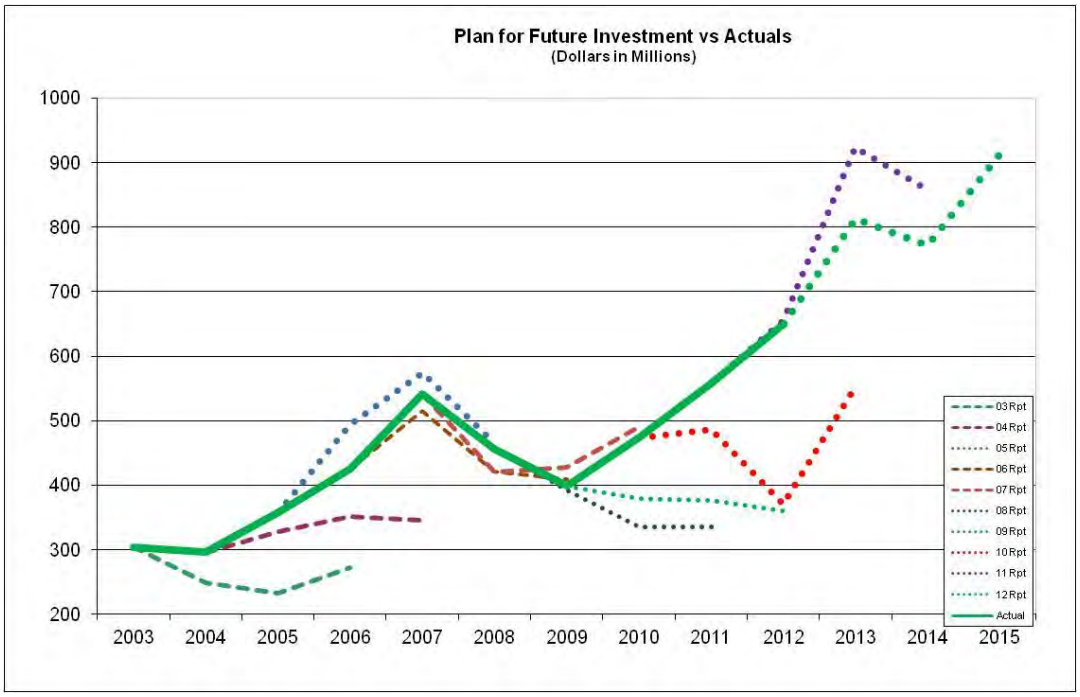

Figure 28 -- Comparison of Actual vs Plan for Future Investment 2003-2015

ComEd describes details of its plan for the Transmission System on page A-4 of the 2012 Reliability Report.

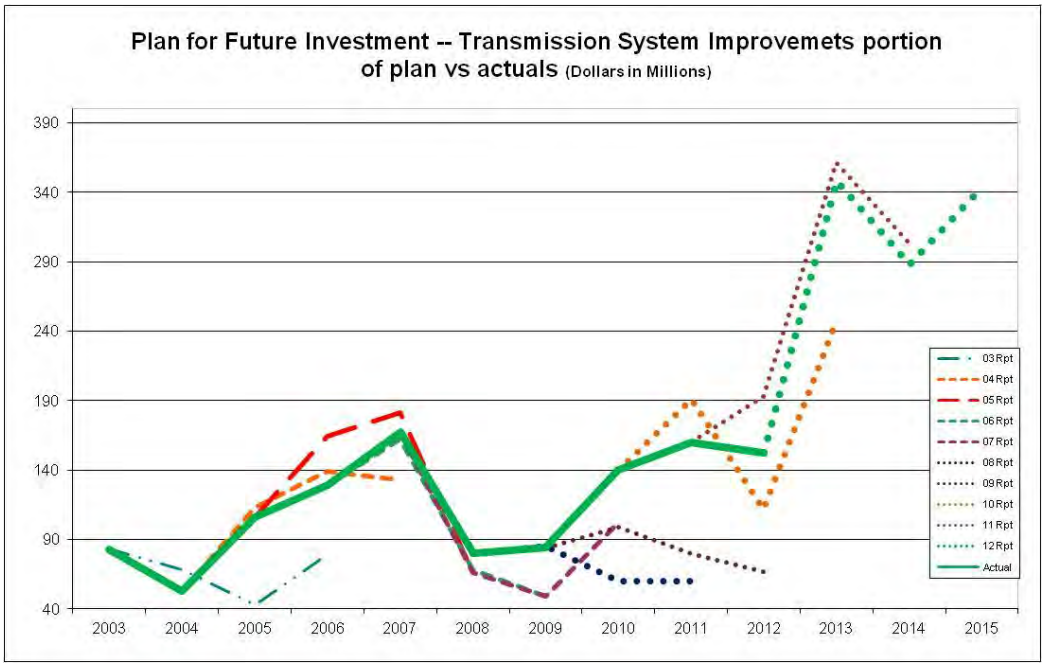

Figure 29 -- Comparison of Actual vs Plan for Future Investment -- Transmission System Improvements 2003-2015

ComEd describes details of its plan for Distribution Capacity on page A-5 of its 2012 Reliability Report.

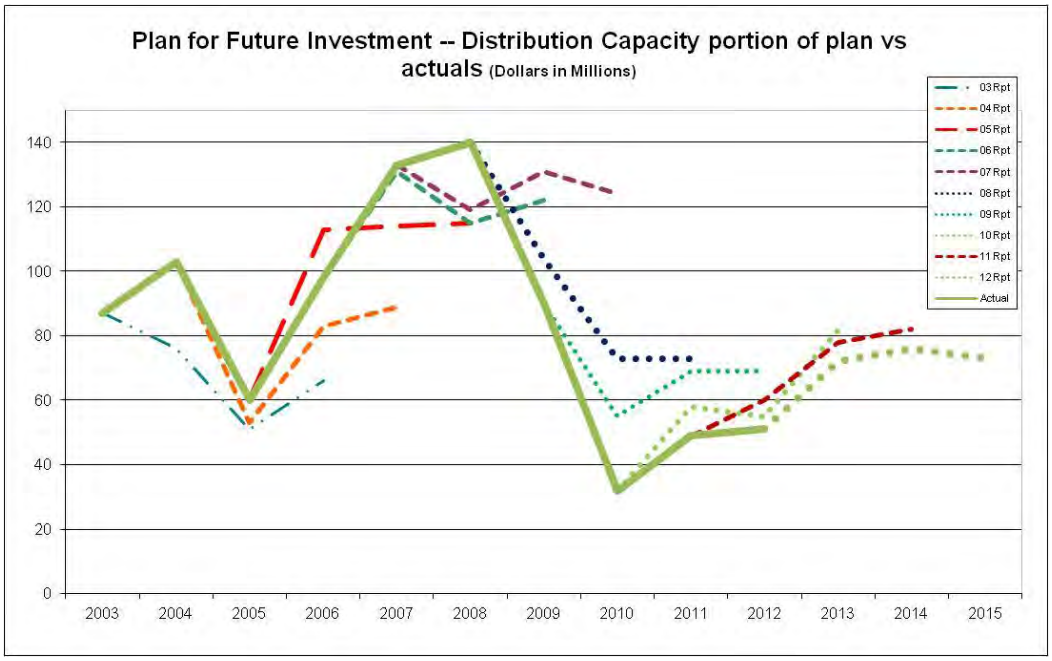

Figure 30 -- Comparison of Actual vs Plan for Future Investment -- Distribution Capacity -- 2003-2015

ComEd describes details of its plan for Substations on page A-5 of the 2012 Reliability Report.

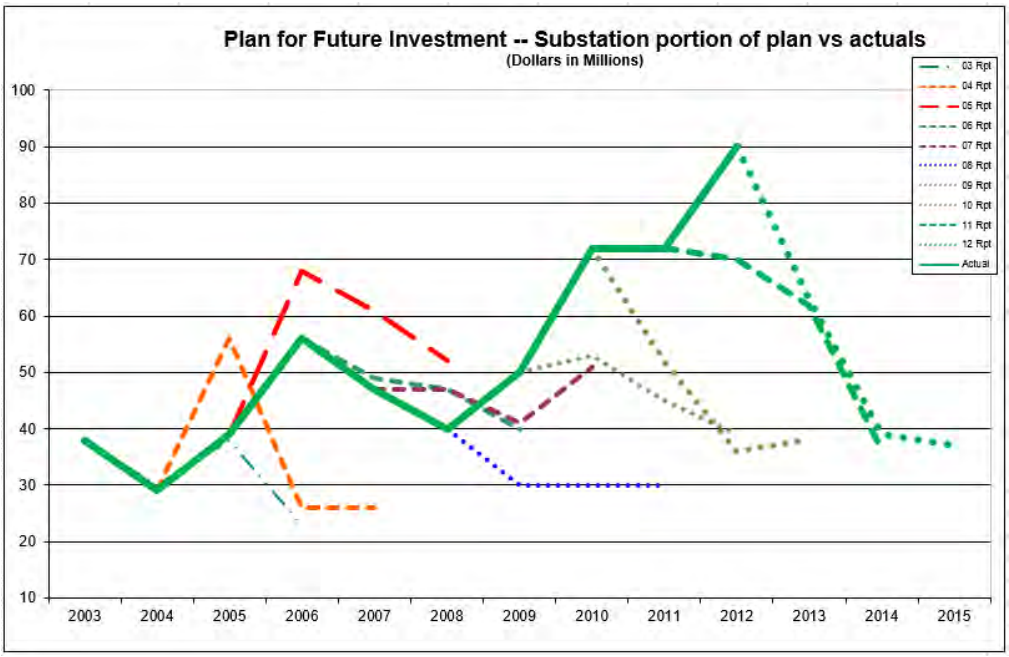

Figure 31 -- Comparison of Actual vs Plan for Future Investment -- Substation -- 2003-2015

ComEd describes details of its plan for 4, 12, and 34kV Circuit improvements on page A-6 of its 2012 Reliability Report.

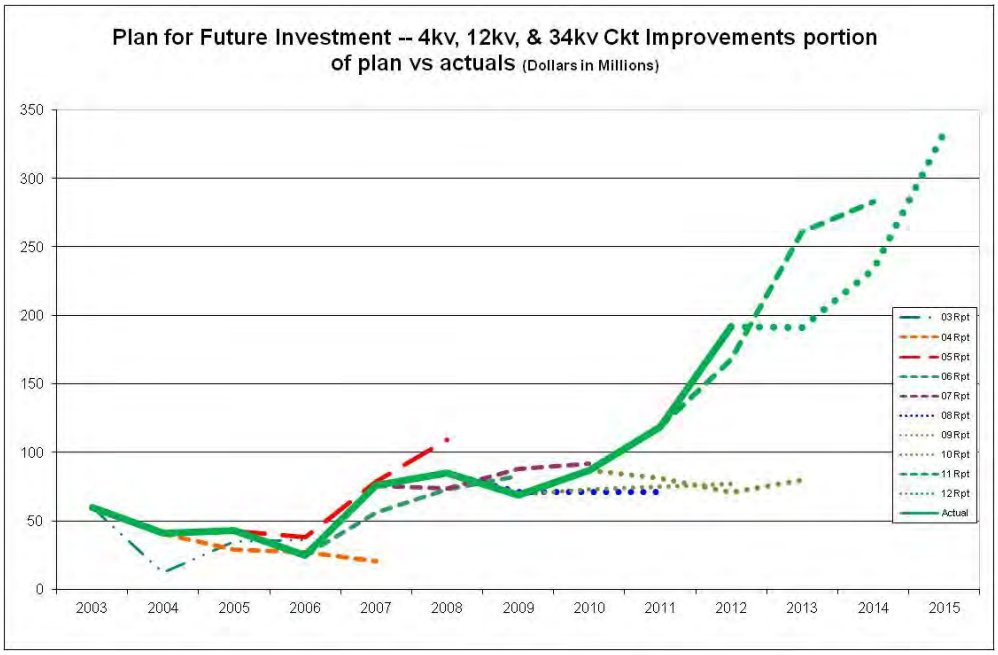

Figure 32 -- Comparison of Actual vs Plan for Future Investment -- 4kV, 12kV, & 34kV Circuit Improvements -- 2003-2015

ComEd describes details of its plan for Inspection and Maintenance on page A-7 of its 2012 Reliability Report.

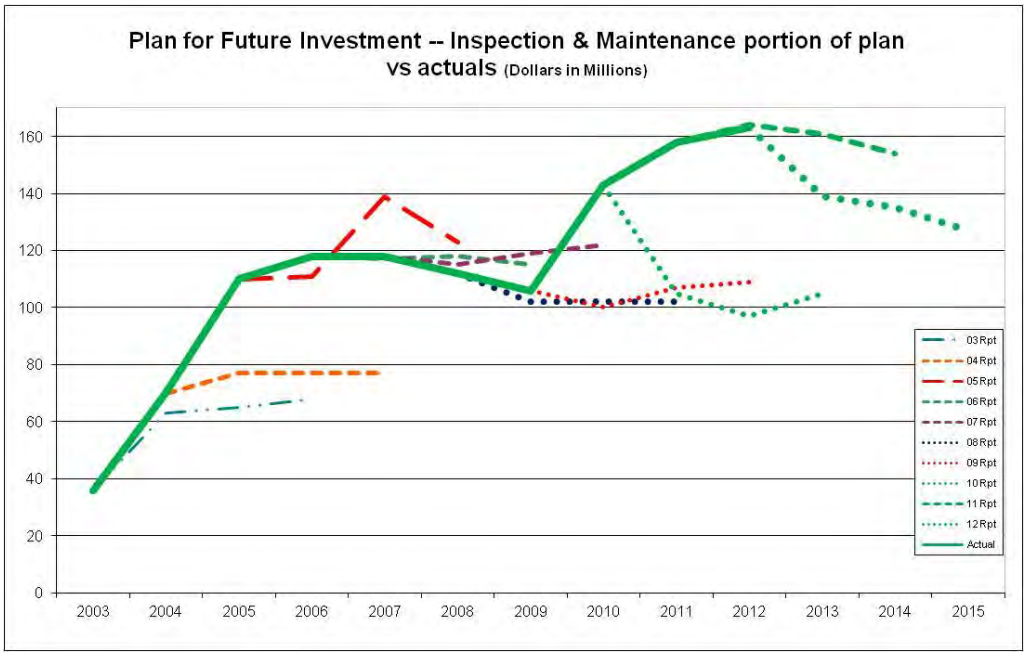

Figure 33 -- Comparison of Actual vs Plan for Future Investment -- Inspection and Maintenance -- 2003-2015

9. Potential Reliability Problems and Risks

Efficiency

Trends in spending levels alone do not explain how well ComEd is addressing reliability issues unless there is some indication of how efficiently that spending is applied. For example, if all else were equal, spending patterns similar to those in the mid-1990's would be a cause for alarm because the spending patterns of the mid-1990's were a precursor to the reliability problems of 1999. However, rarely are all things equal and a good example of this would be to look at the strides made by the utility industry in capabilities of distribution and substation automation technologies and associated costs over the past 20 years.

Reviews of spending patterns, spending levels and inspections by Staff of actual conditions in the field with assessment of work that should be done and is actually getting done is the most effective way to determine the status of plans to maintain and improve reliability.

Attachment A is Staff's "Field Inspection Log" of Staff's field inspections listed in Table's 8 and 9, earlier in this report, as well as a sample of many pictures taken in the field by Staff.

Staff observed in the field instances where more careful investment or careful attention to detail would yield greater reliability returns on ComEd's reliability investment. Staff found such an example on circuit B7507 where ComEd had not kept up with vegetation management by removing large dead branches overhanging the circuit Primary (Picture 1). On circuit B552 Staff found a rotted pole top where the J-hook primary mount was about to fall out of the pole (Picture 2).

Picture 1: 154 **Circuit B7507 – Overhang Above Primary Including Large Dead Branches**

Picture 2: 318 **Circuit B552 – Rotted Pole & J-hook primary mount about to fall out of pole**

Outside of West Dekalb Substation Staff observed a number of transmission towers, such as the one in Picture 3, with heavy rusting of the tower.

Picture 3: 125 **Transmission Tower near West Dekalb Substation – heavy rusting visible**

Inspection and Maintenance is one activity where cost moderation or even reductions are difficult to achieve without impacting reliability. Illustrative of this are the actual distribution tree trimming (vegetation management) expenditures from 1996 through 2012 as well as the three-year budget/forecasts[14] associated with the current and previous report analyses shown in Figure 34. The quality as well as quantity (illustrated by Pictures 1 & 4) of vegetation management can significantly impact the number of customer-experienced interruptions during adverse weather conditions as well as more normal conditions. The overall distribution tree trimming spending trend of Figure 34 has been upward with spending peaks in 2003, 2007 and 2012.

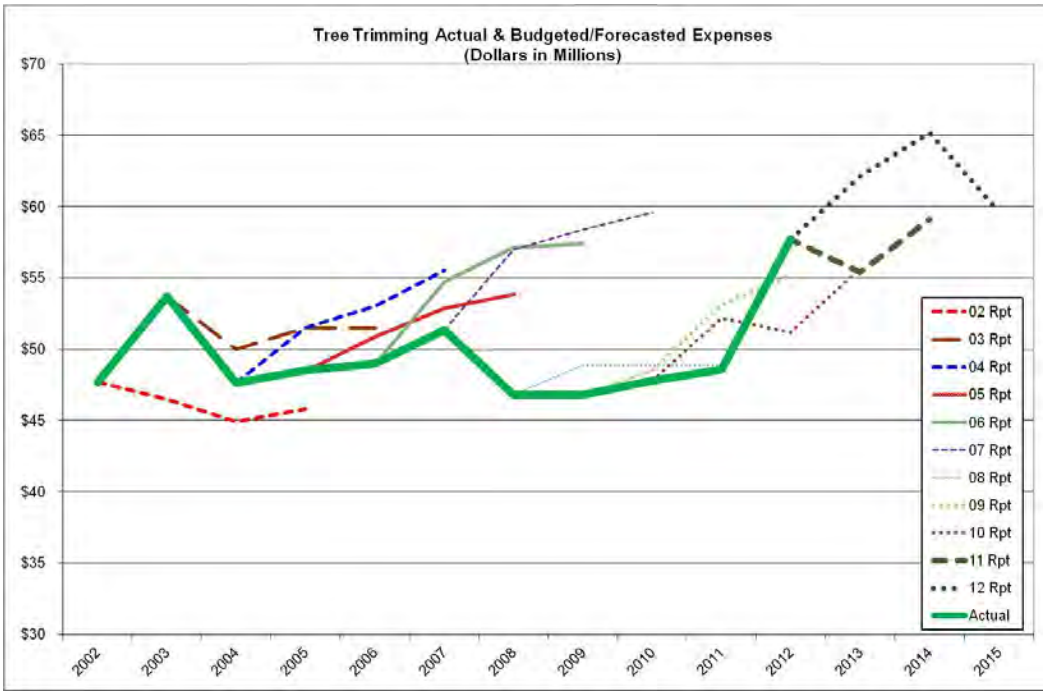

Figure 34 -- Distribution Tree Trimming Actual & Budgeted/Forecasted Expenses -- 2002-2015

[14] The first year in the future is a budget number followed by two forecast numbers.

On January 29, 2002, ComEd reaffirmed its commitment[15] to a four-year tree trimming cycle. Figure 35 indicates, based on most recent four year rolling totals of reported circuits trimmed, that ComEd is on a four-year cycle[16].

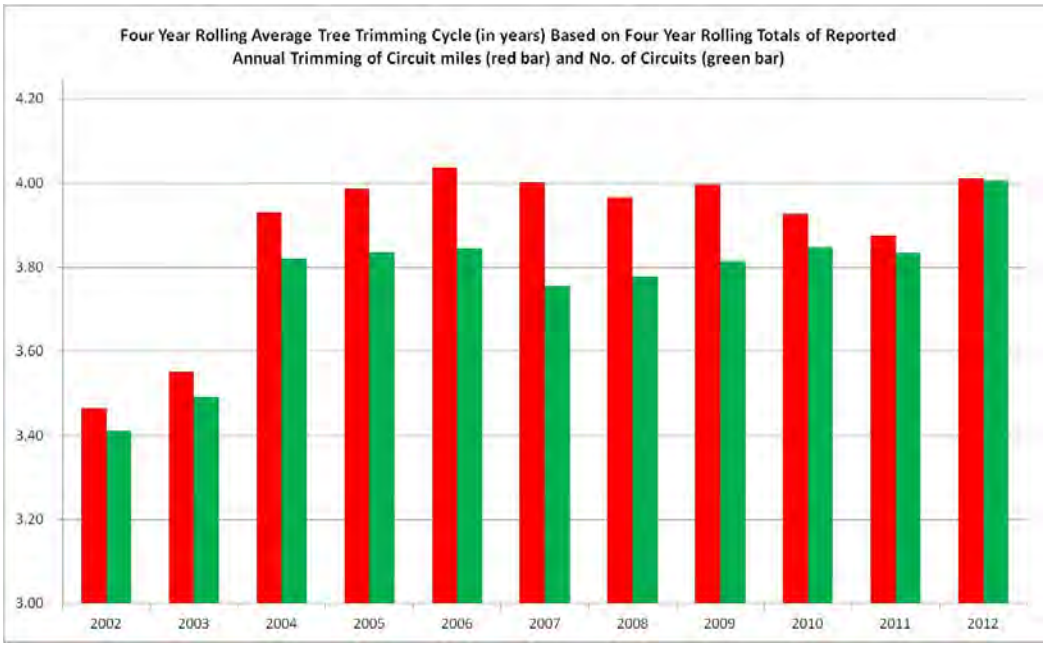

Figure 35 -- Rolling Average Distribution Tree Trimming Cycle Based on Most Recent Four Year Totals -- 2002-2012

Tree Conditions

> …[I]t is generally accepted that the single largest cause of electric power outages occurs when trees, or portions of trees, grow or fall into overhead power lines. The odds are that every single electric customer in the US and Canada has, at one time or another, experienced a sustained electric outage as a direct result of a tree and power line conflict.[17]

Tree conditions near ComEd's overhead electric distribution lines are required to meet NESC Rule 218(A)(1) as adopted from the 2002 NESC by the Commission in 83 Ill. Adm. Code 305.20 on June 15, 2003.

NESC Rule 218(A)(1) and its associated note state the following:

> Trees that may interfere with ungrounded supply conductors should be trimmed or removed.

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[15] January 29, 2002, David Helwig, ComEd, to ICC Staff, "… ComEd will remove vegetation to ensure that vegetation does not grow back into contact with ComEd's overhead electric distribution lines or grow or deteriorate into a position or a condition that threatens ComEd's overhead electric distribution lines, electric service reliability, employees, or the general public before ComEd returns to trim again in a maximum of four years …"; additionally, ComEd has made commitments to address Liberty Recommendations to bring ComEd's performance in line with good utility practices that are summarized in Liberty's "Final Report of the Investigation of Commonwealth Edison's Transmission and Distribution Systems" **http://www.icc.illinois.gov/downloads/public/en/010416ComEdLib4.zip** which is a summary of Liberty's First, Second, and Third reports: **http://www.icc.illinois.gov/downloads/public/ng/Liberty%20Report.zip** **http://www.icc.illinois.gov/downloads/public/en/000717ComEd2.zip** **http://www.icc.illinois.gov/downloads/public/en/001019ComEdLib3.zip**

[16] Since the year 2000.

[17] U.S.-Canada Power System Outage Task Force, Final Report on the August 14th Blackout in the United States and Canada: Causes and Recommendations (April 2004) (Final Blackout Report).

NOTE: Normal tree growth, the combined movement of trees and conductors under adverse weather conditions, voltage, and sagging of conductors at elevated temperatures are among the factors to be considered in determining the extent of trimming required.

Staff observed trees making contact with ComEd's overhead electric distribution lines and observed where trees and other vegetation had grown into a position that threatened ComEd's overhead electric distribution lines and equipment as well as substations. See examples in Pictures 1 & 4 as well as Appendix A.

Picture 4: 500 **Oak Lawn Substation – Vegetation Issues**

Picture 5: 564 **Worth Twp Substation – Several Animal guards on Primary have come loose from position outside fence line and have slid to equipment inside the substation**

Staff recommends ComEd continue to investigate problem areas and modify programs to advance *and maintain* a four-year (minimum) tree trimming cycle throughout its service territory that is in compliance with NESC Rule 218.

Staff observed many instances in the field where trees formed an overhead canopy above ComEd's overhead electric distribution lines and equipment. While in many cases the overhead canopy has been trimmed well away from the primaries, nevertheless these overhead canopies present a significant reliability concern during adverse weather conditions (such as high winds, early wet snows, and heavy ice storms). Studies have shown that by removing overhead canopies above primaries, restoration times can be cut nearly in half[18] in those areas after an adverse weather event.

Staff continues to recommend that, as ComEd makes additional progress in re-establishing the trim zones and removing dead wood above conductors of its distribution circuits, ComEd investigate additional ways to address danger and hazard trees (defined in ANSI A300 72.5[19] and 72.8[20]). By addressing danger and hazard trees sooner rather than later, ComEd can moderate future costs of vegetation management while improving reliability.

Staff observed many instances in the field where customers and municipalities planted trees and vines near or directly below primaries, which will be sources of future maintenance expenses and reliability issues.

Staff recommends ComEd pursue more opportunities to educate customers about the reliability consequences of planting some types of vegetation beneath or near ComEd's distribution equipment.

Maintenance

Adequate preventive and corrective maintenance programs, which include a well-planned vegetation management program discussed earlier, are the most important factors that influence long-term customer reliability.

Unfortunately, maintenance programs are one area where a company can cut spending quickly and have an immediate impact on short-term income statement performance with minimal impact on short-term reliability performance[21]. Figure 33[22] illustrates ComEd's projected and actual spending pattern for "Inspection and Maintenance". The projected inspection and maintenance expenditures for 2013-2015 are approximately at or below 2010-2012 spending levels. All things being equal, Staff would expect reliability performance to decline if lower spending patterns are sustained.

Table 1 of this report shows the median age for distribution poles increasing every year with the median age now at 44 years, meaning that half of ComEd's over 1.3 million wooden distribution poles are over 44 years old. This was graphically illustrated in ComEd's Report Figure 5, Page G-4.

Close examination of the graph (ComEd's Report, Figure 5, Page G-4) shows approximately 170,000 distribution poles that are 61 or more years old. Picture 2 illustrates what some of these older poles look like and why they lead to hardware failures and are unlikely to survive many more storm events.

Picture 5 shows how animal guards on Primaries at Worth Twp Substation have come lose and need maintenance before they can again be effective. This maintenance clearly needs to be addressed as does the

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[18] S. Guggenmoos, "Increased Risk of Electric Service Interruption Associated with Tree Branches Overhanging Conductors. UAA Quarterly, 15(4), Fall 2007, S. Guggenmoos, "Storm Hardening the Electric System Against Tree-caused Service Interruptions. T&D World, Vol. 1, No. 12, Nov 18, 2010.

[19] ANSI A300 72.5 **danger tree:** A tree on or off the right-of-way that could contact electric supply lines.

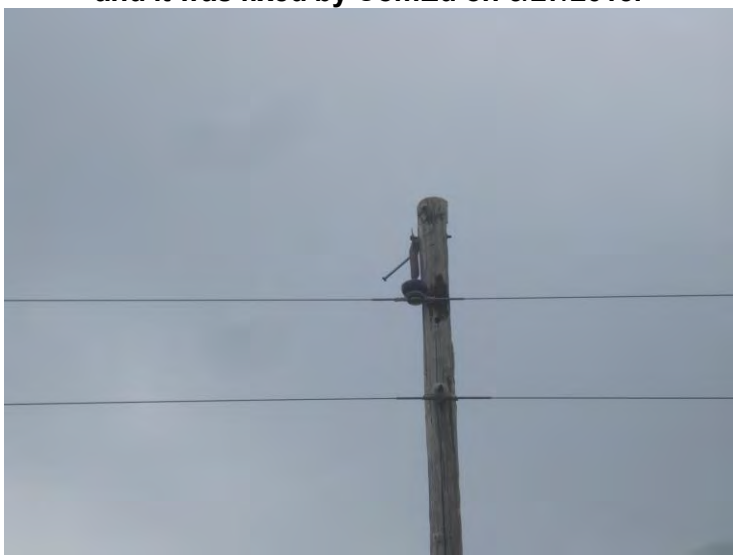
[20] ANSI A300 72.8 **hazard tree:** A structurally unsound tree that could strike a target when it fails. As used in this clause the target of concern is electrical supply lines.

[21] Staff would expect a delay of up to several years between when maintenance expenditures are cut and when material impacts will be apparent in reliability performance. An analogy would be the depressed spending levels for distribution in 1995-1998 and the service reliability problems of 1998 and 1999.

[22] The data that makes up Figure 33 is collected from Sections A and B of the current and previous ComEd Reliability Reports.

primary mount in Pictures 6 & 7. Picture 7 shows a Primary mount in Google Street view that was near failure in 2012. ComEd had identified the failing mount on 12/29/2012 and had scheduled it to be fixed in early August 2013. Picture 6 is the same mount after it had failed and was burning the pole as observed by Staff and reported to ComEd on 6/26/2013. Clearly, 7 or 8 months was too far out to schedule the maintenance of this failing primary mount.

Picture 6: 326 **Unknown Circuit near Winnebago – Primary Mount has failed, burning on Pole from Primary contact – ComEd reported that the Pole was identified by a ComEd Maintenance inspector on 12/29/2012 and issued a Priority 30 and scheduled to be fixed on 8/6/2013. Staff reported it to ComEd on 6/26/2013 and it was fixed by ComEd on 6/27/2013.**



Picture 7: Google Street View from 2012 **Primary Mount identified in Picture in Google Street View from 2012**

Figure 36 represents the annual total O&M dollars spent per ComEd customer from 2002 through 2012. The trend shows a distinct saddle shape with peaks in 2008 and again in 2011. Over time, Staff would expect the trend to steadily increase.

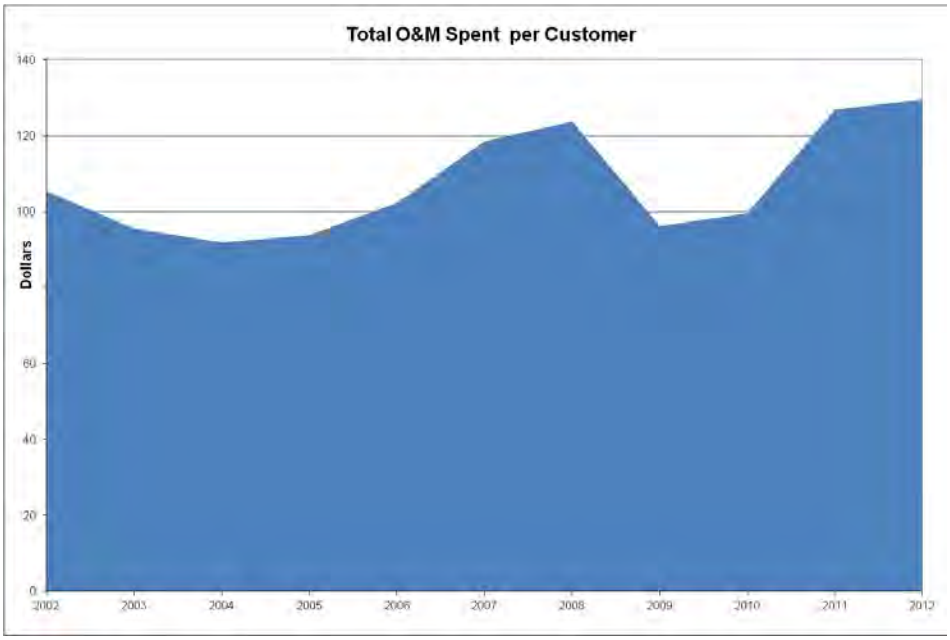


Figure 36 -- Total O&M Spent by ComEd per Customer -- 2002-2012

Figure 37 shows the trend in total annual system interruptions from 1998 through 2012 as identified in ComEd's responses to 83 Ill. Adm. Code 411.120(b)(3)(G)(ii)[23]. Staff would expect that, over time, ComEd's system total interruption levels should be in line with the 2000-2005 time period, though Staff would also expect years when rare severe storm events would push totals above those levels[24] as seen with recent weather events. The four-year-rolling-average, shown in purple on Figure 37, display's the trend for System Total Interruptions as generally rising since 2005. Staff would expect that, over time, this trend would generally level out with some bumps up and down related to weather events (all things being equal).

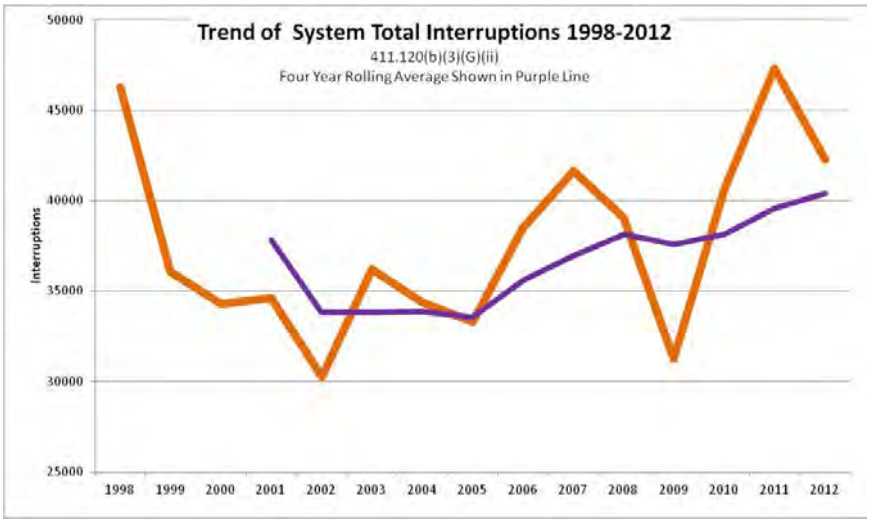


Figure 37 Trend of System Total Interruptions

[23] The 2012 System Total of 42,286 interruptions is from Table 12 on Page G-9 of ComEd's 2012 Report.
[24] With total interruption levels returning to the lower levels in subsequent years.

The Annual ComEd System CAIDI since 1998 and the 4-year rolling average trend since 2001 was illustrated in Figure 15. Since 2005 the CAIDI 4-year average has been trending higher.

The Annual ComEd System SAIFI since 1998 and the 4-year rolling average trend since 2001 were illustrated in Figure 22. While not as low as the 2002-2006 period, the 4-year rolling average trend for System SAIFI has been moderating since 2008 and trending down.

Figure 38 shows the overall trend of combined company & contract employees at the end of each year.

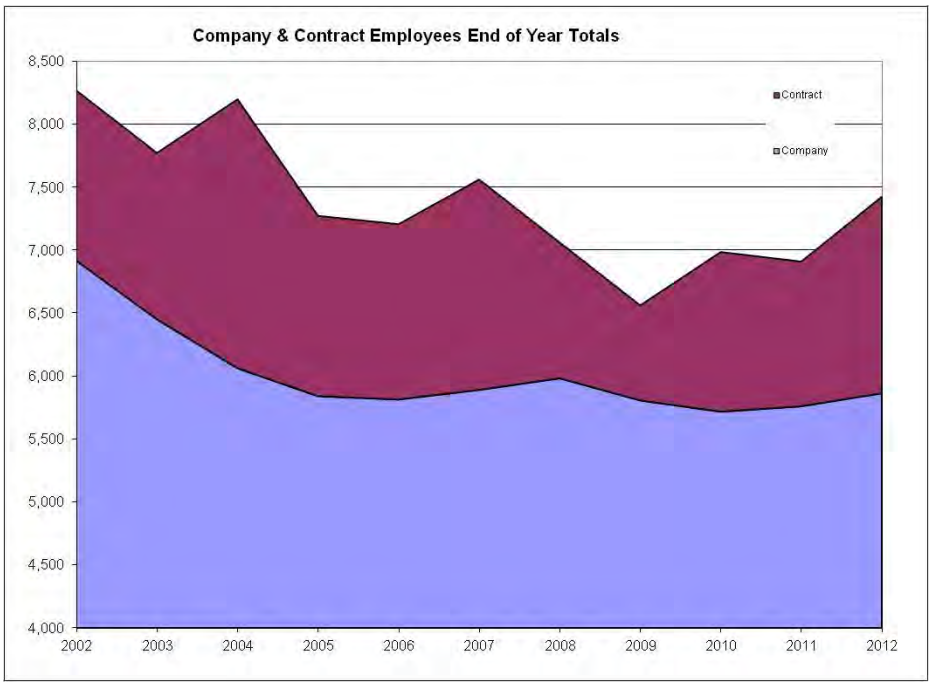


Figure 38 -- Company and Contract Employees -- End of Year Totals -- 2002-2012

With employee counts rising as shown in Figure 38 the amount of O&M dollars spent per person in ComEd's electric operations still continues to rise in Figure 39. Spending more per employee on O&M, all other things being equal, should result in improved equipment reliability and availability.

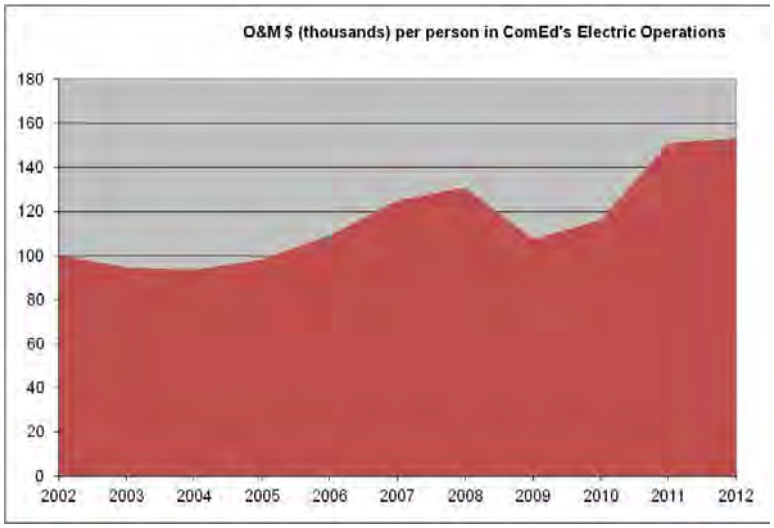


Figure 39 -- O&M $ (thousands) per person in ComEd's Electric Operations -- 2002-2012

In addition to building new substations to meet increased demand and to improve customer reliability, it is important that maintenance be scheduled and completed in substations to insure maximum capability, flexibility and reliability during periods of high demand. Figures 40 and 41 show the trends in spending on substation preventive and corrective maintenance expenditures.

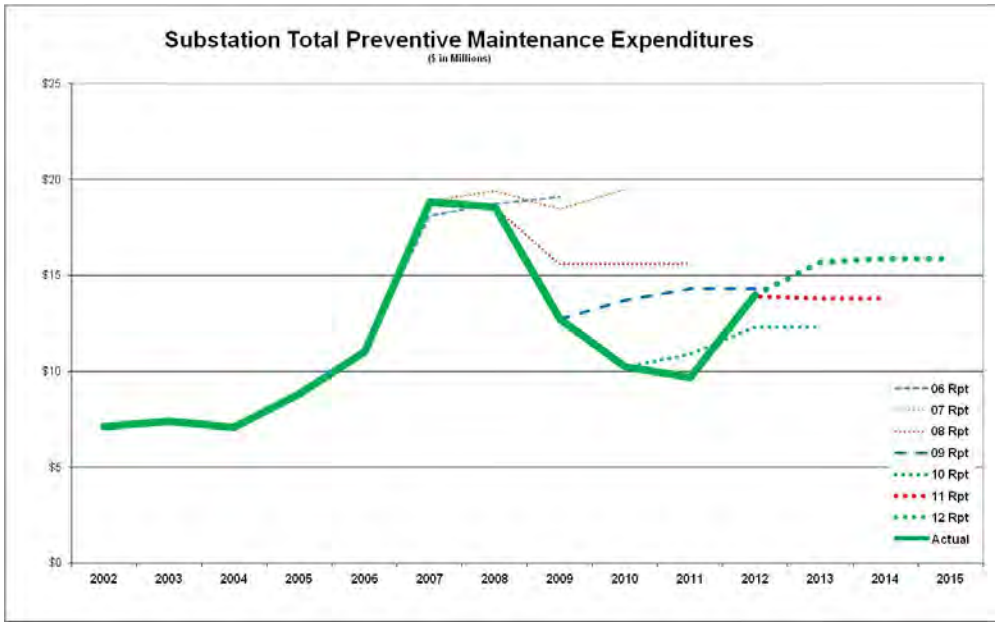


Figure 40 -- Actual vs Planned Substation Preventive Maintenance -- 2003-2015

Spending more on maintenance, all other things being equal, should result in improved equipment reliability and availability.

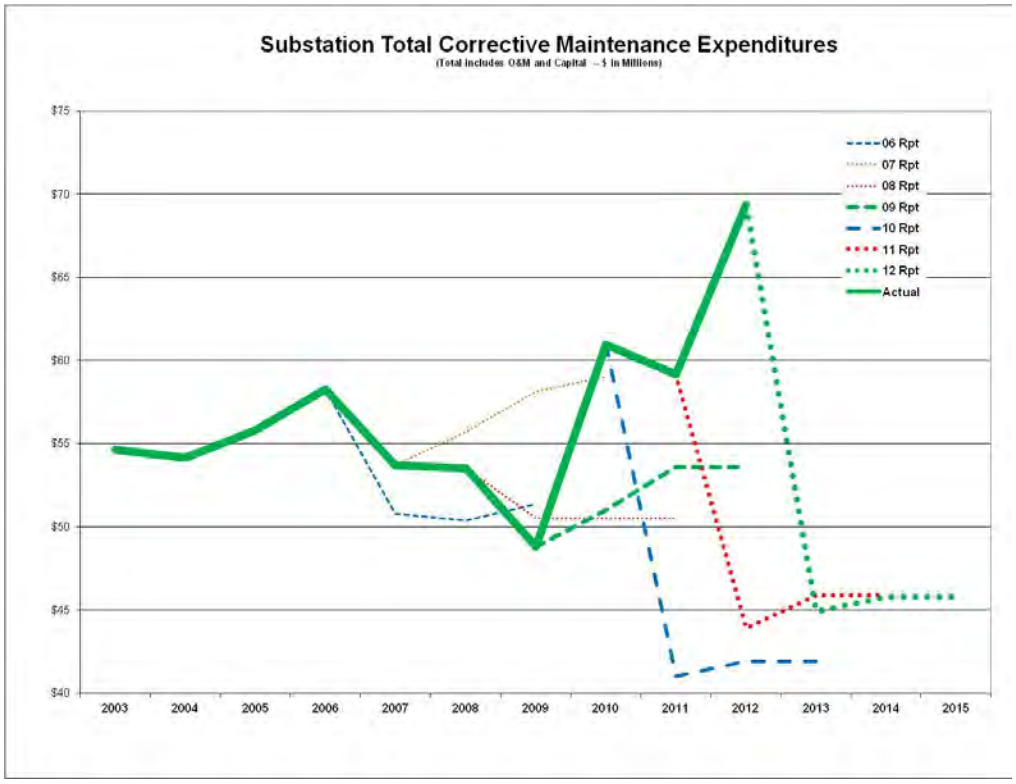


Figure 41 -- Actual vs Planned Substation Corrective Maintenance -- 2003-2015

Spending less in future years on Substation Corrective maintenance could harm equipment reliability and availability if it results in a reversal of the downward trend currently shown in Figure 42 representing Substation Corrective Maintenance backlogs.

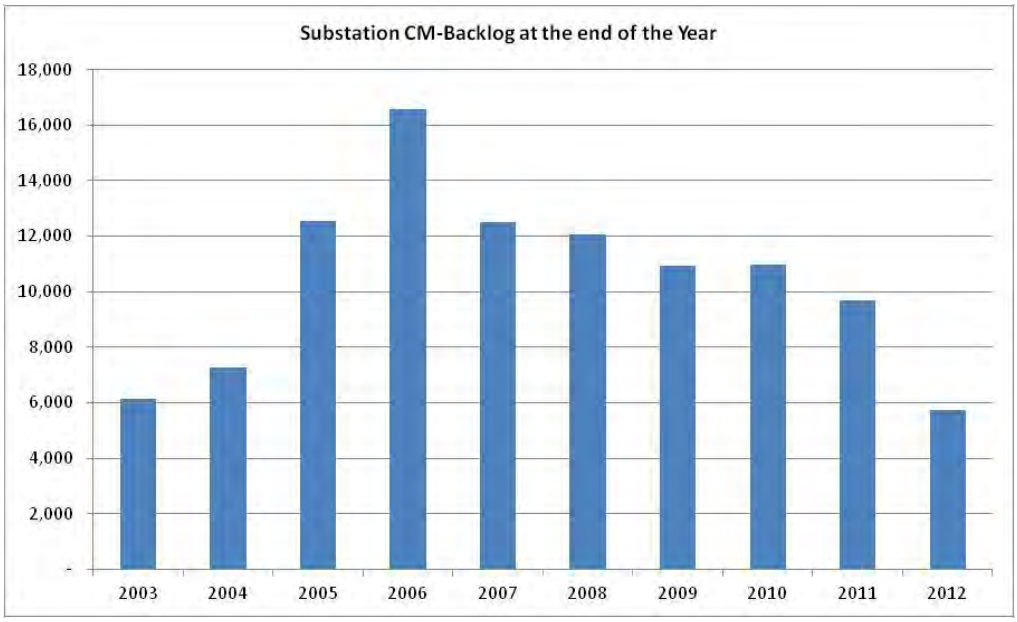


Figure 38 – End of the Year Substation Corrective Maintenance Backlog -- 2003-2012

Staff is encouraged by the decline in Distribution corrective maintenance backlogs for 2012 illustrated in Figure 43.

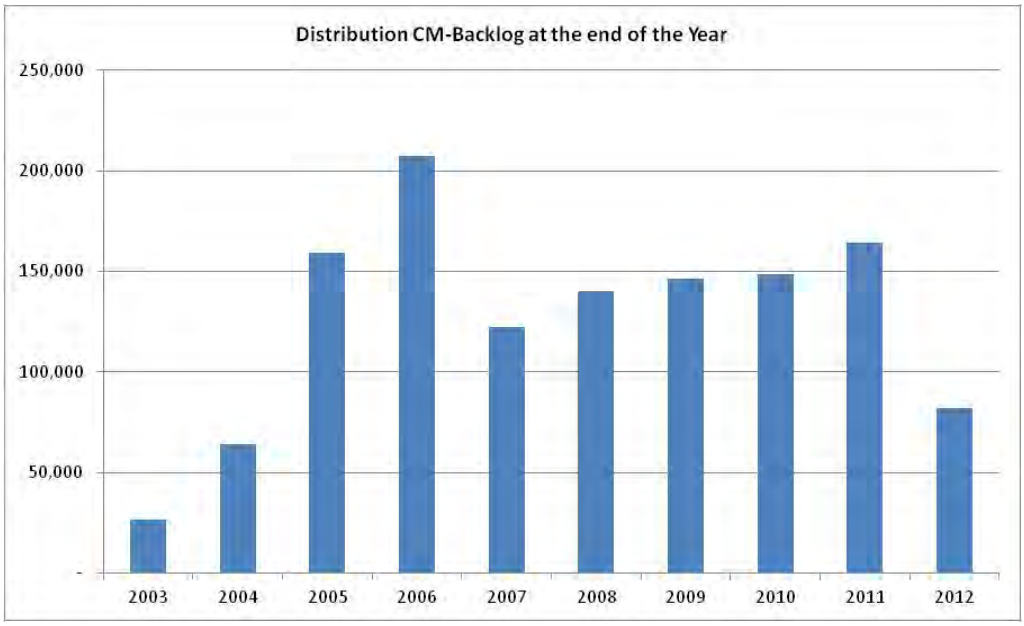


Figure 39 -- End of the Year Distribution Corrective Maintenance Backlog -- 2003-2012

During Staff's field inspections in previous years, Staff found instances of NESC violations, but few have been noted this year in Appendix A. Staff is encouraged that ComEd is actively looking for and addressing these

NESC violations as part of its regular inspection[25] cycle. Staff was further encouraged to learn that ComEd found and is correcting line clearance issues associated with its transmission system.

10. Review of ComEd's Implementation Plan for the Previous Reporting Period

A report on the significant deviations from ComEd's 2011 plan for 2012 from 2012 actual spending levels was included in ComEd's 2012 reliability report in pages B-1 through B-6. Table 13 summarizes the data from ComEd's plan.

Table 13-- Comparison of 2011 Plan for 2012 to 2012 Actual (in $ Million's)

	2011 Plan for 2012	Actual 2012	Var	% Var
Transmission System Improvements [see page B-3]	193	152	-41	-21.2%
Distribution Capacity [see page B-4]	60	51	-9	-15.0%
Substation [see page B-4]	70	90	20	28.6%
4kv, 12kv, & 34kv Ckt Improvemetns [see page B-5]	168	192	24	14.3%
Inspection and Maintenance [see page B-6]	164	163	-1	-0.6%
	655	648	-7	-1.1%

While the variances for several areas were substantial, ComEd's explanations for their major variances in response to 411.120(b)(3)(B) appear reasonable.

11. Summary of Recommendations

Staff recommends the following actions:

- Staff recommends ComEd should aggressively seek out any problematic maintenance or fundamental design issues that are contributing to customers exceeding the 3 year service reliability targets.
- Staff recommends ComEd continue to investigate problem areas and modify programs to advance *and maintain* a four-year (minimum) tree trimming cycle in compliance with NESC Rule 218 throughout its service territory.
- Staff continues to recommend that, as ComEd makes additional progress in re-establishing the trim zones and removing dead wood above conductors of its distribution circuits, ComEd investigate additional ways to address danger and hazard trees (defined in ANSI A300 72.5[26] and 72.8[27]).
- Staff recommends ComEd pursue more opportunities to educate customers on the reliability consequences of planting some types of vegetation beneath or near ComEd's distribution equipment.

[25] "… The thorough inspection of 34kV lines are performed every 2 years and 4kV and 12kV lines are inspected every 4 years. …" ComEd response to Staff DR, ENG 2.09.
[26] ANSI A300 72.5 **danger tree:** A tree on or off the right-of-way that could contact electric supply lines.
[27] ANSI A300 72.8 **hazard tree:** A structurally unsound tree that could strike a target when it fails. As used in this clause the target of concern is electrical supply lines.

The summary[1] for each inspection represents typical observations noted during the field inspections and **does not** represent all of the problems or potential problems that may exist.

To evaluate the overall trend of conditions in ComEd's service territory, Commission Staff conducted a series of field inspections in 2013. The purpose of the inspections was for Staff to see if there were any obviously visible reasons for poor reliability performance. For example, on distribution circuits Staff looked for problems such as poor tree trimming practices, broken or damaged equipment, rotten poles, and overly slack spans (low sagging lines), while at substations Staff looked for problems such as low or leaking oil, load tap changers regularly operated at extreme positions, and poor maintenance practices. It is important to note that it is not the purpose of Staff's field inspections to find problems for ComEd to fix[2] but rather to develop a picture of the overall condition of the power delivery infrastructure in ComEd's service territory.

Field Inspection Log

Utility: ComEd **Investigators: J. Stutsman (Staff)**

Feeder Ckt: B7507 **City: Dekalb** **Voltage: 12kV** **Date: Tuesday, April 30, 2013**

Photo ID	Drawing No.	Location Description	Observations at this Location
114-136		**TDC375 West Dekalb Substation**	**Fence line Inspection:** ComEd People were at the station when staff arrived – they were there as part of their normal work & not there to meet with staff. Red Fire Box noted on Fence. Fence Posts at Gate were Grounded but were not bound to Gate. Corner Fence Posts were Grounded Yard clear of Vegetation and clean of trash – Rock looked good Several Steel Poles of Transmission Line outside of Substation were Badly Rusted No Static wire from Poles on Transmission Line to Substation protecting Transmission lines into Substation Transformers and Capacitor Bank were painted and had minimal rust Northern Illinois Gas Company Gas Pipeline Sign laying on ground just outside of Substation Fence

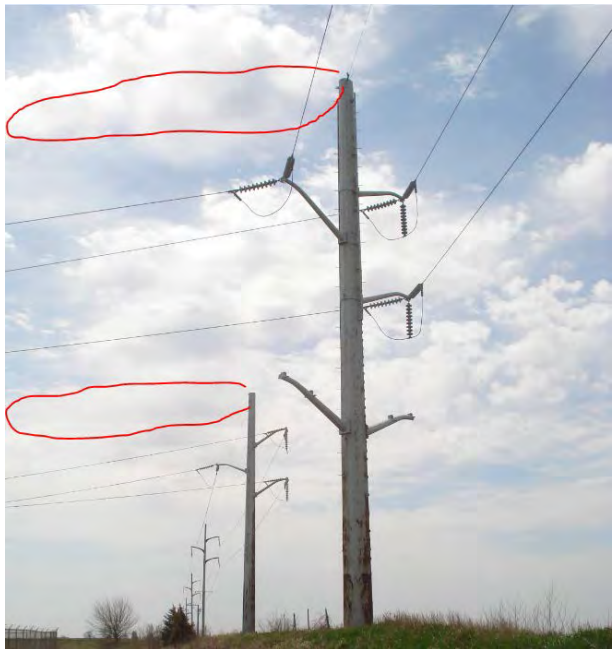
[1] Detail was provided ComEd indicating the location of most deficiencies found on the respective circuits by Staff.
[2] Though Staff would expect that those identified problems and the problems inferred would be addressed.

			Slight rust visible on radiators of North Transformer Oil Levels appeared OK in Transformer Tanks and Primary Bushings per Binocular inspection Tap changers appeared OK on both Transformers
		Feeder Ckt: B7507 City: Dekalb **Voltage: 12kV**	
142-4	2	Between 2E9 and 2E7	Signs of recent Tree Trimming
146	2	East of Park Avenue between Rolf and Agusta	Neavy OverHang
148	2	4C3	OverHang
149-50	2	2-3 poles East of 4C3 Near 630 Linden PL, Dekalb	Bad/Old Pole Top (subsidence) – 2 poles
151-3	3	2X17	Vines up Guy Wire to Cross-Arm – Down Guy is also Loose/Damaged
154-6	3	1 Pole West of 2B1	Multiple Dead Branches OverHanging Primary
157-8	3	354-22-2D9 & West of 2D9	OverHang
160-3	3	354-22-2B5 (across street from 311 Locust)	Ground cover missing and/or loose and/or broken in places The #2 is missing from the ID on Pole Side
164	3	354-22-2F7 (corner of Pearl St & Anne St)	Shell Rot/Subsidence of Pole with Ragged Pole Top
165	3	354-22-2C8	Old Transformer with Paint worn/cooked off outside
X	3	RR Crossing	OK
166	3	422290 – East of RR Crossing	Vines on Down-Guy approx ½ way up Guy Wire
167	3	117 Pearl St, Dekalb	PoleTop Extension Bent

		Feeder Ckt: Unknown Circuit(s) City: Dekalb and Dekalb Area Voltage: 12kV	
137-8	X	801 Dorken LN Dekalb	Vines covering Guy wire & Pole to top of Pole
139	x	805 Dorken LN Dekalb	Tree into Primary
140	X	817 Dorken LN Dekalb	Leaning Pole and Ragged (subsidence) Top
168-9	X	41.93613 -88.81033	Blown Lightning Arrestors
172	X	41.93476 -88.80437	Blown Lightning Arrestors on same Ckt and in close proximity to above
173-7	X	550 N. 4th St. Malta 41.93491 -88.86082	Top of Pole leaning significantly
X	X	Next Pole South of Above in Malta	Very ragged (subsidence) Pole Top

Appendix A: Log of Summer Field Observations

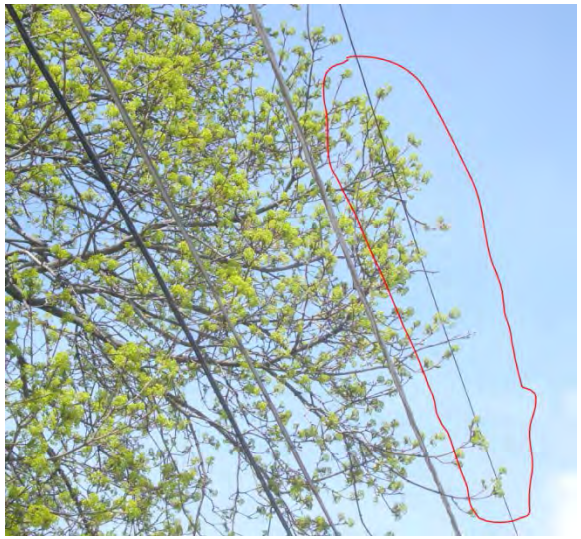
Rust & Pealing Paint
126 West Dekalb Substation



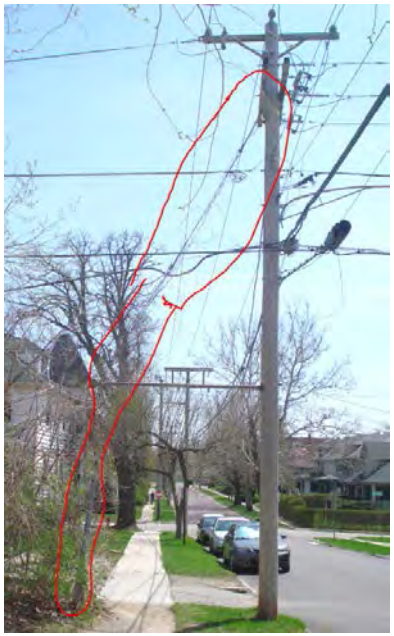
No Static Line protecting Circuits into Sub
121 West Dekalb Substation

Gas Pipeline Sign on Ground next to Fence
130

Appendix A: Log of Summer Field Observations



Tree in contact with Primary
139



Vines growing up to Cross-Arm
151

Dead Branches above Primary
156

169: Blown Lightning Arrestors

The summary[3] for each inspection represents typical observations noted during the field inspections and **does not** represent all of the problems or potential problems that may exist.

To evaluate the overall trend of conditions in ComEd's service territory, Commission Staff conducted a series of field inspections in 2013. The purpose of the inspections was for Staff to see if there were any obviously visible reasons for poor reliability performance. For example, on distribution circuits Staff looked for problems such as poor tree trimming practices, broken or damaged equipment, rotten poles, and overly slack spans (low sagging lines), while at substations Staff looked for problems such as low or leaking oil, load tap changers regularly operated at extreme positions, and poor maintenance practices. It is important to note that it is not the purpose of Staff's field inspections to find problems for ComEd to fix[4] but rather to develop a picture of the overall condition of the power delivery infrastructure in ComEd's service territory.

Field Inspection Log

Utility: ComEd **Investigators: J. Stutsman (Staff) & a number of people from ComEd Regulatory and Technical Staff**

Substation: Tonne TDC207 **City: Elk Grove Village** **Voltage: 138-34-12kV** **Date: Tuesday, May 7, 2013**

Photo ID	Drawing No.	Location Description	Observations at this Location
178-220		**TDC207 Tonne Substation**	**Yard Inspection:** Lots of construction in the Substation Yard observed New 34KV SwitchGear Bldg: Same bldg as in Franklin Park TransFormer 77 New Fire wall; Oil levels OK; LTC OK; Bushing Oil OK; Ckt Switcher; Old oil leak from bushing or radiator seal near top of Transformer; New wildlife protection on Bushings and leads; Slip over CT's to provide metering for new Circuit Breakers; 138KV Control Building Lots of new equipment and relays for 2 existing 138KV lines and 2 new lines; 34KV Control Room New Battery System for entire Station; Log Book OK Security switches on doors and Security camera and infrared Camera

[3] Detail was provided ComEd indicating the location of most deficiencies found on the respective circuits by Staff.
[4] Though Staff would expect that those identified problems and the problems inferred would be addressed.

			Transformer 79 All new Transformer New Fire Wall LTC OK; Oil levels OK; Bushings OK; Ckt Switcher Transformer 78 Some oil on side of tank for old leaks LTC OK; Oil levels OK; Bushings OK; Ckt Switcher 12KV Transformers – Transformer 74 Oil levels OK; bushing oil OK; LTC OK Minor Rust on side of Tank Transformer 73 Oil levels OK; bushing oil OK; LTC OK Minor oil leak – looks to have been an old Leak at the Radiators Transformer 72 Oil levels OK; bushing oil OK; LTC OK Some Rust 12KV Cable Duct not filled Transformer 71 Oil levels OK; bushing oil OK; LTC OK Some rust on radiators but overall they look good 12KV Yard The 12KV Yard is basically being gutted in the next year with Construction; 12KV House Complete gut job to be completed EOY 2014 New equipment and panels Log Book OK 12KV Cable Basement Fire remediation work has been done Cut Power Cable has not been capped in the Basement Station Yard Torn up by construction work 7 new poles installed with static wires connecting at top for Lightning protection Substation Yard has been expanded along with new construction
		Feeder Ckt: <u>Unknown Circuit(s)</u> City: <u>Elk Grove Village Area</u> Voltage: <u>12kV</u>	

221	X	7N649 Wood Date Rd., Wood Dale	Paint appears burnt off of side of pole mount Transformer -- Fuse Cut-out Switch appears to be open
222	X	Near: 7N649 Wood Dale Rd., Wood Dale	Excessively leaning pole – Riser molding/cover is damaged

34KV Yard with Animal Fence
179 Tonne Substation

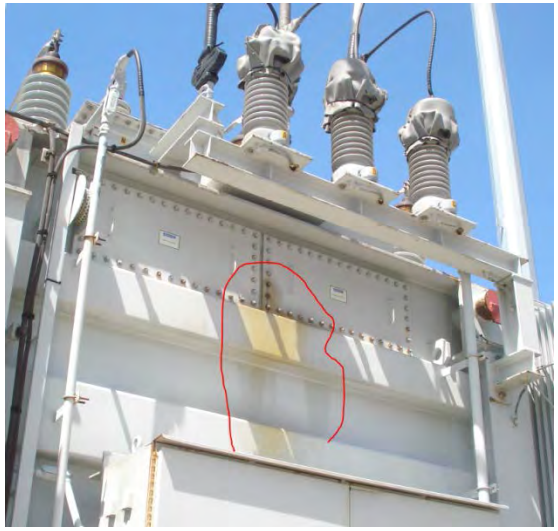
Old Oil Stain on Transformer Tank
182 Tonne Substation

New CT Rings installed on Transformer Bushing
183 Tonne Substation

Appendix A: Log of Summer Field Observations

New Substation Battery
186 Tonne Substation

New slip on Animal guards on Bushings & Leads
188 Tonne Substation

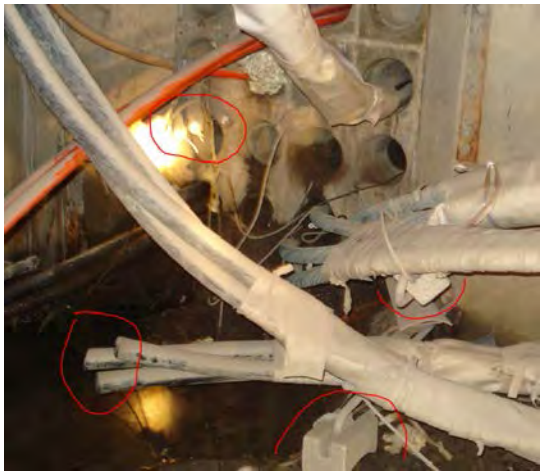


Old Oil Stains on Transformer Tank
193 Tonne Substation

Old Oil Stains on Transformer tank
199 Tonne Substation

Rust on Transformer & Equipment
201 Tonne Substation

Cable Duct not filled/sealed
203 Tonne Substation



Cut cable exposed Ends
Loose Cable Saddle
212 Tonne Substation

Fire Supression System; Floor Penetrations Sealed
In Basement
213 Tonne Substation

New Construction
New 138KV Breaker
217 Tonne Substation

The summary[5] for each inspection represents typical observations noted during the field inspections and **does not** represent all of the problems or potential problems that may exist.

To evaluate the overall trend of conditions in ComEd's service territory, Commission Staff conducted a series of field inspections in 2013. The purpose of the inspections was for Staff to see if there were any obviously visible reasons for poor reliability performance. For example, on distribution circuits Staff looked for problems such as poor tree trimming practices, broken or damaged equipment, rotten poles, and overly slack spans (low sagging lines), while at substations Staff looked for problems such as low or leaking oil, load tap changers regularly operated at extreme positions, and poor maintenance practices. It is important to note that it is not the purpose of Staff's field inspections to find problems for ComEd to fix[6] but rather to develop a picture of the overall condition of the power delivery infrastructure in ComEd's service territory.

Field Inspection Log

Utility: ComEd **Investigators: J. Stutsman (Staff) & ComEd Regulatory Staff**

Feeder Ckt: G653 **City: Calumet City & Dolton** **Voltage: 12kV** **Date: Tuesday, June 18, 2013**

Photo ID	Drawing No.	Location Description	Observations at this Location
223-252	1	**TDC465 South Holland Substation**	**Fence line Inspection:** Ground at corner post by gate Gate (North) not bonded to post or ground Rust on post/poles in yard Area around fence is cleared Dead vines on fence Weed Control tag on gate Oil OK in bushings in North most transformer External (stand-alone) fan pointed to North most transformer radiators Second (middle) transformer (#72) bushing oil levels OK Extra bushings laying on gravel in yard South most transformer (#73) bushing oil level on left OK – can not see level on other two bushings South most transformer (#73) looks like heavy leaking of oil (or spill) from

[5] Detail was provided ComEd indicating the location of most deficiencies found on the respective circuits by Staff.
[6] Though Staff would expect that those identified problems and the problems inferred would be addressed.

			transformer around base No breakers in yard Rust on Poles at far South of Yard Station ground connection visible on corner post Yard is clear of weeds Transformer #72 looks new with new transformer pad/foundation Some animal guards on equipment next to equipment without animal guards
		Feeder Ckt: G653 City: Calumet City & Dolton Voltage: 12kV	
253-7	2	15536 Sunset Drive	Secondary into Trees
258	2	15523 Sunset Drive – behind house	Very old looking pole
259-61 263-266	2	15463 Diekman Ct – behind house	Vines on Riser Pole Homeowner noted that he was the one who cut the vines and that they needed some weed killer at the base to keep them from re-growing Additional pictures of issues to either side of this homeowners yard Neighbor to South of this address shows secondary entangled by trees
262	2	15448-15458 Diekman Ct – behind house	Silver Maple growing up into primary
267	2	ROW South of 154th St. between Dorchester Ave & Diekman Ct.	Vines on Secondary – old pole top/subsidence Trees in ROW overhanging Primary
269-273	2	End of Alley between Dante ave & Dorchester Ave at 152nd St 41.618869 87.582579	Leaning pole Pole top split Cross aarm split
X	2	South of 152nd St between Dante Ave & Blackstone Ave	Wood stuck in down-guy – signs of past problems in area
	2	1460 E 154th St	Missing guy guard on down guy
275	2	15303 Stony Island	Vines on pole/secondary/guy
	3	North of 152nd St. between Madison Ave & Jeffery Ave.	Guy guard is lose
276	4	256 Chappel Ave, Calumet City	Bad pole – heavy leaning Shell rotted

	4	2nd pole South of: 256 Chappel Ave, Calumet City	Bad pole
	4	2 poles North of: 256 Chappel Ave, Calumet City	Bad pole

Vines growing up pole/Silver Maple into Primary
262

Vines on Secondary/Pole Top Subsidence/Heavy Over Hang above Primary
267

The summary[7] for each inspection represents typical observations noted during the field inspections and **does not** represent all of the problems or potential problems that may exist.

To evaluate the overall trend of conditions in ComEd's service territory, Commission Staff conducted a series of field inspections in 2013. The purpose of the inspections was for Staff to see if there were any obviously visible reasons for poor reliability performance. For example, on distribution circuits Staff looked for problems such as poor tree trimming practices, broken or damaged equipment, rotten poles, and overly slack spans (low sagging lines), while at substations Staff looked for problems such as low or leaking oil, load tap changers regularly operated at extreme positions, and poor maintenance practices. It is important to note that it is not the purpose of Staff's field inspections to find problems for ComEd to fix[8] but rather to develop a picture of the overall condition of the power delivery infrastructure in ComEd's service territory.

Field Inspection Log

Utility: ComEd **Investigators: J. Stutsman (Staff)**

Feeder Ckt: B552 **City: Rock Run-Ridott Twp, Rock Run-Rock Grove, Laona Twp, Buckeye-Dakota Twp, Dakota, Davis, Durand-Laona Twp** **Voltage: 12kV** **Date: Tuesday, June 25, 2013**

Photo ID	Drawing No.	Location Description	Observations at this Location
286-303		**DCB55 Rock City Substation**	**Fence line Inspection:** Gates not bound to Gate Posts/Ground – one gate post was visibly grounded Transformer for Feeder 551 needs painting Log Box is Very Rusty Yard is clean of weeds No Lightning Protection for Substation No Animal Guards on Lines into Sub Animal Guards on Bushings Animal Guards on Buss work Saw a "lot" of bird nests in Buss work Transformer for Feeder 551 had debris in one set of radiators cutting air flow (and cooling efficiency) Saw veg mgmt sticker on gate

[7] Detail was provided ComEd indicating the location of most deficiencies found on the respective circuits by Staff.
[8] Though Staff would expect that those identified problems and the problems inferred would be addressed.

			Could not observer bushing oil levels Transformer take oil level gages looked OK
		Feeder Ckt: B552 City: Dakota **Voltage: 12kV**	
304	1	Entrance to Substation DCB55 Device 268-20-4S2	Broken ground cover – Circuit B551
305	1	42.402216 89.48082	Shell Rotted Pole
	1	Next 3 poles west from above location	All four poles showing bad shell rot
306	1	42.40215 89.49113	Shell rotted pole with vines growing up pole
			NOTE: Many additional shell rotted poles were seen in the area above
	1	42.40174 89.47253	Loose down guy
			NOTE: also saw a number of badly leaning poles in area above
	1	42.40096 89.46536	Broken down guy wrapped around pole
307	2	42.40461 89.43760	Bad pole with vine growth
308	2	7345 Church Rd. Rock City	Bad pole & broken down guy
309-310	2	7414 Church Rd Rock City	Flaking Pole
311-312	2	6941 N. Farwell Bridge Rd Rock City	1 of 3 badly shell rotted poles in a row (going South from this pole)
313-315	2	6970 N. Farwell Bridge Rd Rock City 42.40376 89.42785	Bad Pole – broken cross-arm – floating insulator
	2	42.40405 89.40774	Broken down guy at corner – wrapped around pole

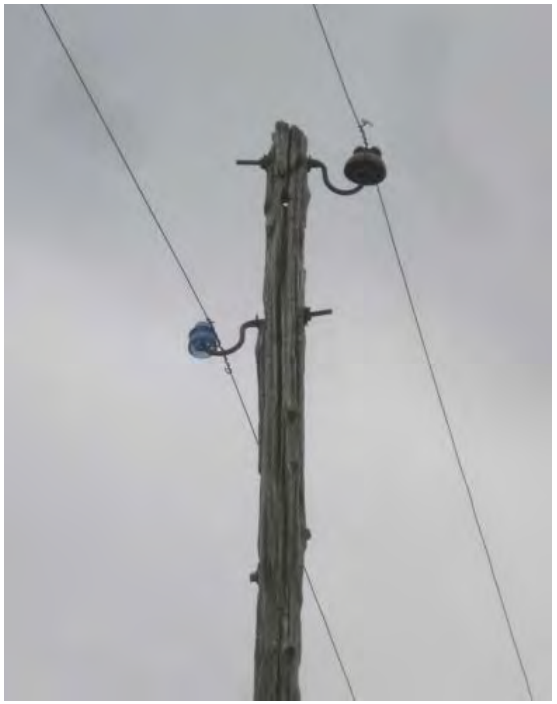
316	2	18026 Farm School Rd. Rock City	Broken branch on field side primary
317	5	42.50050 89.40086	Line Hose on Primary
	5	12498 Hartman Rd Davis	Several bad poles in immediate area
318	5	18328 Laube Rd Davis	Rotted pole – J hook primary mount about to fall out of pole
	5	18206 Laube Rd Davis	Broken down guy
	5	End of circuit on Best Rd	Missing down guy markers
	5	16625 Best Rd	Loose down guy
319-320	5	16872 Best Rd	Mounting pin has dropped or broken & primary insulator skirt has dropped to cross-arm
321-322	5	15090 Best Rd	Bad pole – loose bracket – pole top subsidence
	6	8734 E Winneshiek Rd	No Down guy markers
	6	7 poles East of above	No down guy markers
	6	269-15-1A1	Broken guy wire
		Feeder Ckt: Unknown Circuit(s) City: Davis, Winnebago, US 20, Unknown Area Voltage: 12kV	
277-8	X	42.28740 89.35086	Loose Primary Mount – Near Failure
	x	4-6 Poles West of this location: 42.28665 89.32690	Loose Primary Mount like above – Near Failure
	X	2 more Poles West of above	Loose Primary Mount – Near Failure
279-80x	X	42.28722 89.34385	Portion of Pole Top is missing exposing Primary Mount bolt

285	X	2 Poles South of: 42.28542 89.47518	Ground wire Disconnected from Neutral Wire
281, 284x	X	4 Poles South of: 42.28542 89.47518	Broken Cross-Arm Brace
282-3	X	11 Poles South of: 42.28542 89.47518	Broken or Disconnected Cross-Arm Brace
323-5	X	9683 Best Rd, Davis	Split Pole Top – Bad Pole – Loose Primary Mount
326-8 & 2 Google Street Views from 2012	X	11505 West State Rd, Winnebago 42.28209 89.26057	Primary Mount has failed – burning on Pole from Primary contact. Staff informend ComEd on June 26th – ComEd reported that it was fixed on June 27th with other work in the area. ComEd reported that the Pole was identified by a ComEd Maintenance inspector 6 months earlier on 12/29/2012 and issued a Priority 30 and was scheduled to be fixed on 8/6/2013 (WO#07651808 Task 01).

Appendix A: Log of Summer Field Observations

Radiator for Transformer had Debris blocking air flow
293 Rock City Substation

Shell “flaking” on pole
310



One of a number bad poles
312

Floating Insulator
314

Broken branch on primary
316

Primary Mount Near Failure
318

Loose primary mount
277

Primary mount exposed by missing pole top
280

Broken cross-arm brace
284

Split pole top & loose primary mount
323

Failed Primary mount with burning of pole
326

Google street view of Pic #326 location Aug 2012
showing primary mount near failure 1 yr earlier

The summary[9] for each inspection represents typical observations noted during the field inspections and **does not** represent all of the problems or potential problems that may exist.

To evaluate the overall trend of conditions in ComEd's service territory, Commission Staff conducted a series of field inspections in 2013. The purpose of the inspections was for Staff to see if there were any obviously visible reasons for poor reliability performance. For example, on distribution circuits Staff looked for problems such as poor tree trimming practices, broken or damaged equipment, rotten poles, and overly slack spans (low sagging lines), while at substations Staff looked for problems such as low or leaking oil, load tap changers regularly operated at extreme positions, and poor maintenance practices. It is important to note that it is not the purpose of Staff's field inspections to find problems for ComEd to fix[10] but rather to develop a picture of the overall condition of the power delivery infrastructure in ComEd's service territory.

Field Inspection Log

Utility: ComEd **Investigators: J. Stutsman (Staff)**

Feeder Ckt: NA **City: Oak Lawn** **Voltage: 4/12kV** **Date: Tuesday, October 22, 2013**

Photo ID	Drawing No.	Location Description	Observations at this Location
494-522	NA	**DCG125 Oak Lawn Substation**	**Fence line Inspection:** Signs of past veg issues on South Fence Serious Veg issues on West Fence Veg issues on North & East fence Minor Veg and junk in station yard White Herbicide sticker on gate No animal/squirrel guards on any lines/primaries into/out-of yard No animal guards on equipment in yard Gate Posts are tied to ground mat Gates are not bound to gate posts Lots of open space between fence and ground in some areas No guy-guard on guy lines in yard Transformer/equipment rusty Thumping sound from radiator fan(s) attached to transformer radiators

[9] Detail was provided ComEd indicating the location of most deficiencies found on the respective circuits by Staff.
[10] Though Staff would expect that those identified problems and the problems inferred would be addressed.

			Transformer Pad covered in oil but did not see active leak Apparent oil stain below transformer radiators No direct-stroke lightning protection in yard or infrastructure – may be protected by static wire of nearby higher voltage line or proximity of nearby buildings
523-551	NA	**DCG39 Oak Lawn Substation**	**Fence line Inspection:** Fence/Yard clear, for most part, of Veg though signs of past problems are evident with chunks of wood/stems in fence and stumps around outside of fence No animal/squirrel guards on lines/primaries into station yard No animal guards on equipment in yard Gate posts attached to ground mat but gates not bonded to gate posts No direct-stroke lightning protection in station yard/infrastructure Rust on some equipment White Herbicide sticker on gate Active oil leak(s) with rags to soak up leak(s) below tanks/radiators Control cables laying on station yard Area between fence & ground is blocked or filled in with material (good) Riser support outside station yard is old and showing some subsidence
552-574	NA	**DCG42 Worth Twp Substation**	**Fence line Inspection:** Vegetation on fence partially obscures company sign – lots of veg into yard – lots of veg into both gates Gate posts grounded but gates not bonded to gate posts No direct-stroke lighting protection in station yard/infrastructure Rust on Equipment in yard Parts of fence had been painted White Herbicide sticker on gate dated 6/24/2013 T00147: • Animal/squirrel guards on lines/primaries have slipped from their installed position from outside the fence-line to inside the station and against station equipment. • One animal/squirrel guard is broken

			Line 11569: • 1 Primary had no animal/squirrel guard on line – line 11569 No animal guards on equipment in station 427BG12: • Down-guy on riser pole outside station is broken and draped over cross-arm hanging loose Secondary Near Station has broken kinbs/branches on it and held down to approx 10'-12' off of ground level. Pole labled "610" has "ragged/bad" pole top Oil leaks in past but none appear to be active currently at base of older transformer under radiators (the transformer whose primary line into the substation had no animal guards on the line – Line 11569)
		Feeder Ckt: UNKN City: Oak Lawn **Voltage: 12kV**	
576	NA	Corner of W 87th St & Mobile Ave Looking West (near 41.73349 -87.77802)	Pole is heavily leaning/bent – may require guy
577	NA	Corner of W 87th St & Mobile Ave Looking East (near 41.73349 -87.77802)	Extensive Over-Hang above Primaries (typical of what was seen that day)
578-599	NA	**DCG78 Worth Twp Substation**	**Fence line Inspection:** No sign on fence identifying this substation as a ComEd substation or the name of the substation or emergency contact numbers – only identifiable via tiles "G78" on fence No direct-stroke lightning protection in yard or equipment Transformers appear in good physical shape – oil levels on transformers primaries were visible and were on low side of indicators but with the cold weather that is expected IMHO. Oil on foundation of line breaker Some vegetation into and over fence but much better than previous substations seen that day 1 (of 2) transformer has animal guards (on Feeder G785) on disconnects up in steel Feeder G786 had no animal guards on disconnects in steelwork Animal guards on bushings of breakers and transformer secondaries No animal guards on any lines into yard Gaps visible between fence bottom and station yard – boards had been used

			to block most gaps but in one place the board had warped creating openings – another place the board had fallen over – another place a board was completely missing. White Herbicide sticker on gate dated 6/24/2013 Rolled up wire in one corner of station yard
	NA	**DCG66 Oak Lawn Substation**	Should have been near-by DCG78 but I was unable to find it.
		Feeder Ckt: UNKN City: Oak Lawn **Voltage: 12kV**	
603 & 608	NA	Area behind Fresh-Line Food Store at 5355 W 95th (41.719368 -87.75489)	Transformer Bank
604	NA	Area behind Fresh-Line Food Store at 5355 W 95th (41.719368 -87.75489)	Alley behind store parking lot
605-606	NA	Area behind Fresh-Line Food Store at 5355 W 95th (41.719368 -87.75489)	Pole top split – bolts holding primary insulator standoff are in the pole split – in 606 we see that the bolts for the fuse cut-out mount are perpendicular to the pole top split and may help to hold the split together – a space gap is visible above the top bolt for the primary insulator standout mount.
607	NA	Same pole as above	Damaged and missing ground wire cover

DCG125 Oak Lawn Substation
Google Maps

Serious Veg Issues along West Fence
#500

No animal guards on equipment
#502

Transformer pad oil stain & stain below radiators—Rust on Equipment
#511

Appendix A: Log of Summer Field Observations

DCG39 Oak Lawn Substation
Google Maps

Past Veg problems around fence perimeter
#545

No animal guards on bushings & steel work
#541

No Squirrel/animal guard on primary or neutral into yard

Past & active oil leaks – Control cables laying on Station yard

#542

DCG42 Worth Twp Substation
Google Maps

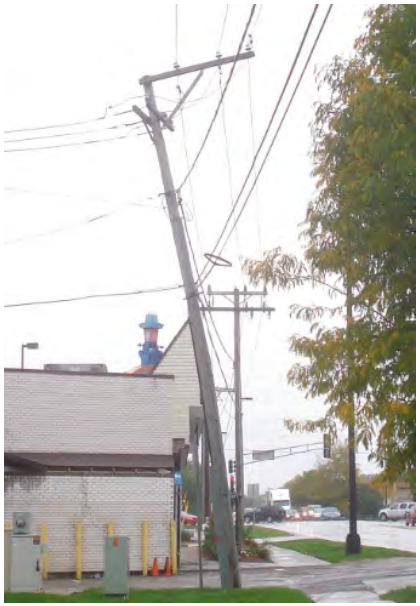
#543

Company sign & fence covered by veg
#552

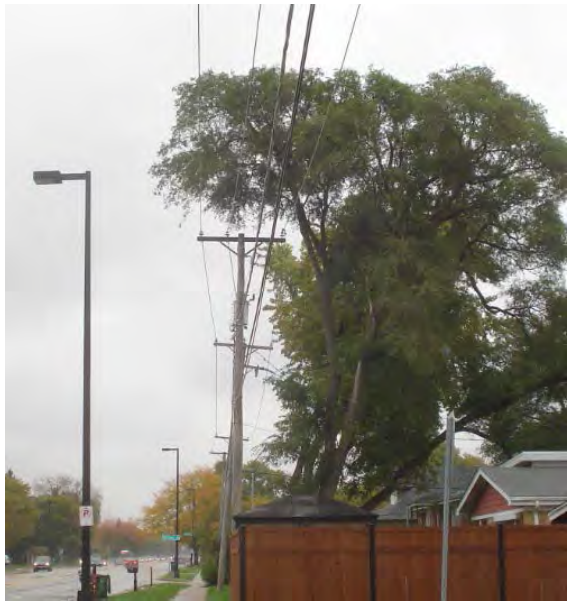
Animal/Squirrel guards broken free and slid into station hardware
#564

Broken downguy draped over crossarm & hanging freely
#562

Intersection of Mobile Ave & 87th St
Google Maps



Heavily leaning/bent pole – may require guy
#576

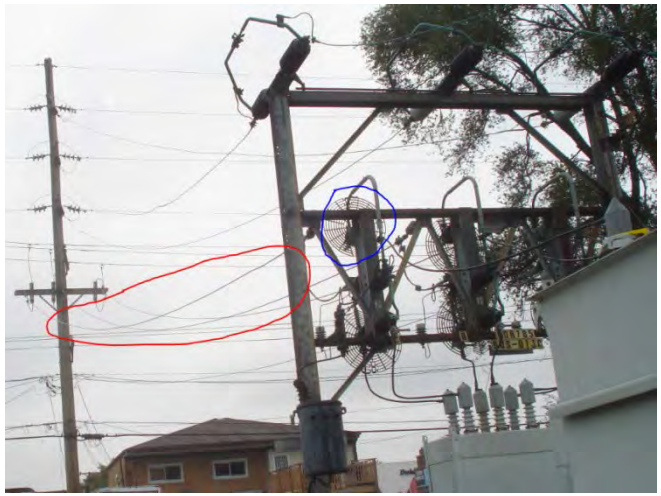


Example of overhang seen throughout area
#577

Appendix A: Log of Summer Field Observations

DCG78 Worth Twp Substation
Google Maps

G78 – only sign identifying the substation
#578



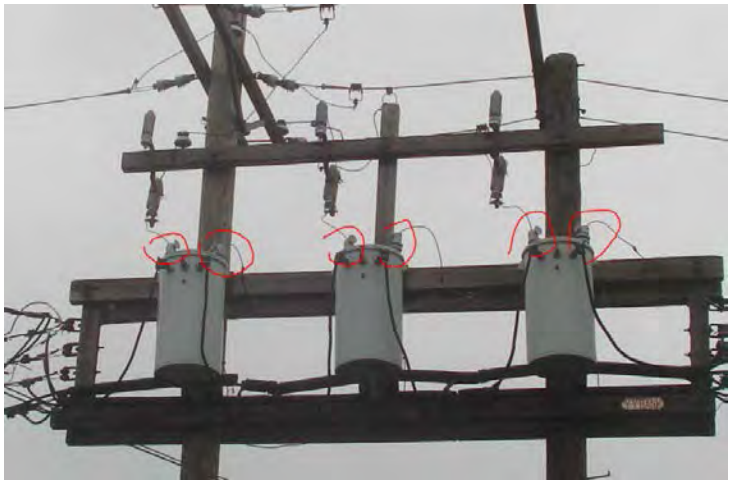
Fdr G785 no Animal Prot but some is visible on disc & Bushings
#584

Behind Fresh-Line Food Store
Google Maps

Fdr G786 no Animal Prot except Bushings
#596

Split Pole Top – Primary insulator mount bolts appear to be in split
#606

Veg along west fence line
#589



Animal guards on transformer primary bushings
#603