# Commonwealth Edison Company
# Workforce Study Analysis

## Prepared For
## Illinois Commerce Commission

## December 1, 2008

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# Commonwealth Edison Company Workforce Adequacy Analysis Report

**Prepared For**

## Illinois Commerce Commission

**For Jacobs Consultancy**

**Frank DiPalma**

**December 1, 2008**

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# 1.0 Executive Summary

## Background

The Illinois Commerce Commission (ICC, Commission, or Agency) retained Jacobs Consultancy Inc. (Jacobs Consultancy) to conduct a workforce study analysis of Commonwealth Edison Company (ComEd, Company or Utility), as specified by the Illinois Public Utilities Act, Section 4-602.

Commonwealth Edison Company is a unit of the Exelon Corporation, which owns ComEd and Philadelphia Electric Company (PECO). ComEd's service territory borders Iroquois County to the south (roughly Interstate 80), the Wisconsin border to the north, the Iowa border to the west and the Indiana border to the east. ComEd's service territory covers approximately 11,300 square miles and ComEd serves 74% of Illinois electric customers. It includes the City of Chicago, an area of about 225 square miles with an estimated population of 3 million. ComEd operates 5,300 distribution circuits with 43,700 miles of overhead lines and 44,100 miles of underground cable.

ComEd's field forces currently operate out of four major operating regions: Chicago, West, North, and South. ComEd has two call-centers located in Oakbrook, Illinois and Chicago, Illinois that serve its entire service territory.

## Objective and Scope

The objective of the study is to determine the adequacy of the total in-house staffing in each job classification or job title critical to maintaining quality, reliability, and restoring service in the Utility's Illinois service territory. The analysis also examines the total number of contractor employees in the same manner as the in-house analysis.

The study is broken down into two tasks:

- **Task 1**—The first step in determining the adequacy of the Utility's workforce was to compute and compare the yearly workforce ratios during the 1995–2006 timeframe for the pertinent job classifications by service area, district, division, or region.
- **Task 2**—The second step in the study consisted of performing a detailed examination of ComEd's workforce adequacy critical to maintaining quality, reliability, and restoring service in the Utility's Illinois service territory.

As specified in Illinois Public Utilities Act, Section 4-602, that critical workforce is defined as:

1. In-house workers, commonly referred to as "linemen"
2. Meter service or repair employees
3. Customer service call-center employees

## Approach

Our approach to Task 1—developing the workforce ratio report—consisted of collecting, rationalizing and performing an initial analysis of workforce ratios. In particular, we requested data from ComEd covering the 1995-2006 time periods on the levels of both in-house and contracted staff in each job classification or job title critical to maintaining quality, reliability, and restoring service. Specifically, data were collected and ratios were calculated for:

1. In-house workers, which consists of line workers and substation workers
2. Meter service or repair employees, which includes of meter technicians, meter readers and meter on-off employees
3. Customer service call-center staff, which includes residential, business and lead customer service agents, as well as mission control and other support service specialists
4. Contracted or outsourced employees used to support employees in categories 1, 2, or 3

Our approach to Task 2—assessing workforce adequacy— started with establishing a key study understanding, the definition of the word "adequacy." Adequacy is defined as the quality of being able to meet a need satisfactorily or being sufficient for the end in view[1]. Applying this definition to the Illinois Public Utilities Act, Section 4-602, suggests that a spectrum of staffing possibilities exists. Extremes range from providing sufficient in-house staffing that permits timely completion of all work requirements with no overtime and no use of external resources to depending heavily upon outside contractors to satisfy workload requirements that a static or shrinking in-house workforce is unable to complete in a timely fashion. Jacobs Consultancy does not believe either of these extremes can be proven to be economic or effective considering all stakeholder needs. In-house workforce adequacy should lie in the middle ground and comprise a blend of resources that cost-effectively maintains reasonable system reliability and service quality, while utilizing outside resources to meet peak workload requirements.

In our workforce adequacy analysis, we examined the existing mix of in-house and contractor workforce in the context of the job functions, level of involvement, and meeting the criteria expressed above. Consequently, we judged the adequacy of the overall workforce on the basis

[1] http://www.thefreedictionary.com/adequacy

of: system performance, levels of in-house overtime, use of contractors, existing in-house age and skills demographics, workforce plans, customer satisfaction statistics, and workload backlog.

To develop the Workforce Study Analysis report, we collected various related documents, conducted interviews with key individuals, visited several ComEd facilities and inspected numerous distribution assets, including substations. Specifically, in undertaking this analysis, we conducted 39 interviews with over 60 individuals representing both ComEd management and the bargaining units, and reviewed 142 ComEd documents.

Our detailed analysis includes comparisons of workforce levels against historical reliability indices as well as preventive and corrective maintenance orders indicative in determining workforce adequacy. We also reviewed construction results of work performed by in-house and outsourced/contracted labor. Additionally, during the interview phase of our analysis, we interviewed several union officials and bargain unit members. The union representatives articulated various concerns that added additional focus to our workforce adequacy study.

Jacobs Consultancy's study of ComEd's workforce adequacy focused on a number of discrete assessments:

- **Maintenance and Operations**—included the dispatch function, the call center during normal operations, minor outages and major outages, emergency escalation procedures, troubleshooting, coordination with other emergency agencies, mutual aid arrangements, crew mobilization, utilization of contractor forces, maintenance planning, maintenance cycles, maintenance work accomplishment, backlogs, workplace barriers, staffing adequacy, crew sizes, system inspections, vegetation management, quality control, and use of contractors. We also examined the level of technology enablers employed to support this function.
- **Training and Safety**—included the new apprentice and continuing training programs for line workers, meter staff, and call center customer service representatives. We also reviewed the importance of safety in ComEd's organization, related training and the safety results achieved.
- **Quality Review**— included a review of ComEd's quality assurance programs and observations of ComEd's electric distribution facilities to determine the quality of work performed both by in-house and outsourced/contracted personnel.
- **Call Center**—included call center metrics to gauge the level of customer support. We reviewed call center changes, emergency escalation procedures, public agency communication provisions, and customer satisfaction surveys. We also examined the level of technology enablers employed to support this function.

## Conclusions

To assess workforce adequacy in each of these areas, we examined as appropriate: staffing levels, use of contractors, overtime, work order backlog, system reliability performance, and customer satisfaction. We then balanced our analysis with ComEd's philosophy of maintaining an overall level of in-house employees needed to perform core base load work and supplementing the in-house employee efforts with contractors for workload peaks and valleys, on large projects, and for lower-skilled and specialized work.

## Line and Substation Workers

The staffing level for linemen remained fairly level over the 1995 to 2001 period, and has shown a marked decrease from 2001 to 2006, for a number of reasons, including increased efficiencies in the utilization and composition of crews and technological enhancements. The Company has relied increasingly on contractors, which made up nearly 27% of the line workforce and 24% of the combined substation and line workforces in 2006. Based on projected needs and attention to the aging workforce issues, ComEd decided to increase the linemen workforce. As a result, ComEd offered an increased number of line schools in calendar years 2007 and 2008 and has plans to offer additional schools in calendar year 2009.

ComEd's substation workforce level has declined significantly from 726 in 1995 to 384 in 2006, due to a number of factors, including changing work requirements as a result of power plant divestitures, programmatic improvements and technology enhancements. ComEd has not made substantial use of contractors for substation work, except for major construction projects, and only recently increased contractor use in 2006.

ComEd faces the same difficulty as many utilities with respect to its aging workforce of linemen and substation workers, and therefore, depends heavily on apprentice programs. With the current level of system maintenance backlog, additional work that can be anticipated from enhanced inspections and future work generated from an aging infrastructure coupled with an aging workforce, ComEd will need to carefully consider its near and long-term resource requirements.

## Meter Services Employees

The meter services staff complement was fairly level over the 1996 to 2006 period, except for a slight dip from 2000 to 2004. Meter services does not use contractors and is able to complete its annual work plan, which includes regulatory required work, by the year end. Meter readers are the primary feeder group for the Distribution Systems Operations (DSO), Construction and Maintenance (C&M), Transmission and Substations (T&S), and System Services Group organizations. The ratio of customers per meter services employee has generally inversely followed the number of meter services workers and increased from 4,474 in 1995 to 5,455 in

2006. We conclude that ComEd's meter services' workforce is adequate to provide required services.

## Call Center Staff

The Company staffs the call center in accordance with the flow of call volume and uses technology to enhance the call center's ability to service customers in an effective and efficient manner. ComEd call center internal goals and key performance indicators (KPIs) are satisfactory but are decreasing as a result of an effort by the department to balance cost while maintaining service levels within regulatory requirements. It should be noted that the call center staff covered in this study has increased from 291 in 2006 to 349 in 2008. Based on the customer satisfaction scores conducted by J.D. Power & Associates, ComEd's Customer Satisfaction Index scores have declined since 2006. Some portion of this decrease could be a result of issues such as multiple storms and/or rate increases that are beyond the direct control of the call center.

## Recommendations

Based on our analysis, we conclude the overall adequacy of ComEd's workforce has been in harmony with its philosophy to perform work at least cost. This has been accomplished by maintaining an overall level of in-house employees needed to perform core base load work, working increasingly higher levels of overtime, using contractors to supplement the workforce for workload peaks and valleys and on larger projects, and lower-skilled and specialized work.

Specifically with respect to line workers, given the declining numbers of linemen, a high level of overtime, the current level of system maintenance backlog, additional work that can be anticipated from enhanced inspections and future work generated from an aging infrastructure, coupled with an aging workforce and the need to plan ahead based on a 3 to 3.5-year apprentice program, we offer three overarching recommendations:

1. Consistent with its Staffing Plans for 2008 through 2012, ComEd should continue to aggressively increase its electric field workforce, in line with its business needs and the overall economic climate.
2. ComEd should strive to reduce high levels of overtime in the near term by balancing in-house work across department silos[2], supplemented as needed with contracted resources.

[2] Silos refer to corporate departments such as Construction and Maintenance, Transmission and Substations, Distribution System Operations, etc that because of performance measures can function independent of each other.

3. ComEd should immediately undertake an in-depth study to identify the appropriate level of overhead electrician special or troubleshooter resources, determine their organizational alignment, and analyze the difficulties currently being encountered in attracting candidates.

In addition to the above recommendations, we make a number of other recommendations throughout the report. These have been summarized in Appendix A.

# 2.0 Introduction

## 2.1 Background

### 2.1.1 Philosophy on Outsourcing and Contracting

Every electric utility is expected to extend its service to meet the needs of a growing population. Power needs to be provided in a reliable, safe, and timely fashion. To maintain high standards of service quality and safety, utility managers traditionally have opted for the control of an in-house workforce. As a result, many utilities historically did not have to rely on outside employees to provide support to its staff or rely on others to meet its customers' needs. However, today many regulated distribution utilities have developed strategies to shift risk, reduce costs, and refocus attention on core functions.

At ComEd, outsourcing and contracting has primarily sought increased flexibility in addressing: fluctuating workload volumes, larger projects, and lower-skilled and specialized work. Driven by the need to maintain in-house knowledge of the distribution and transmission system and the desire to have first responders be Company staff to ensure quality service and help preserve brand recognition, the distribution system contractors are primarily used to fill workload peaks and perform lower-skilled work. Currently, about 27% of ComEd's distribution system line work (excluding substation) is contracted.

This approach and level of contracting represents a moderate amount from our experience, and places certain obligations on the Utility's management as well as impacts on the Utility's workforce. Management must ensure that the quality of the work completed is consistent with customer service standards, that the cost of the work is reasonably similar to what the work would cost if it were performed by the in-house staff, and that high-quality customer service is provided, while the workforce may see a reduction in the total number of employees and in the breadth of job skills.

Refer to Appendix B for a more complete discussion on the utility industry outsourcing philosophy. In Appendix C, we include an overview of the events that occurred during the study period that have helped to shape organized labor at ComEd; we provide a brief review of

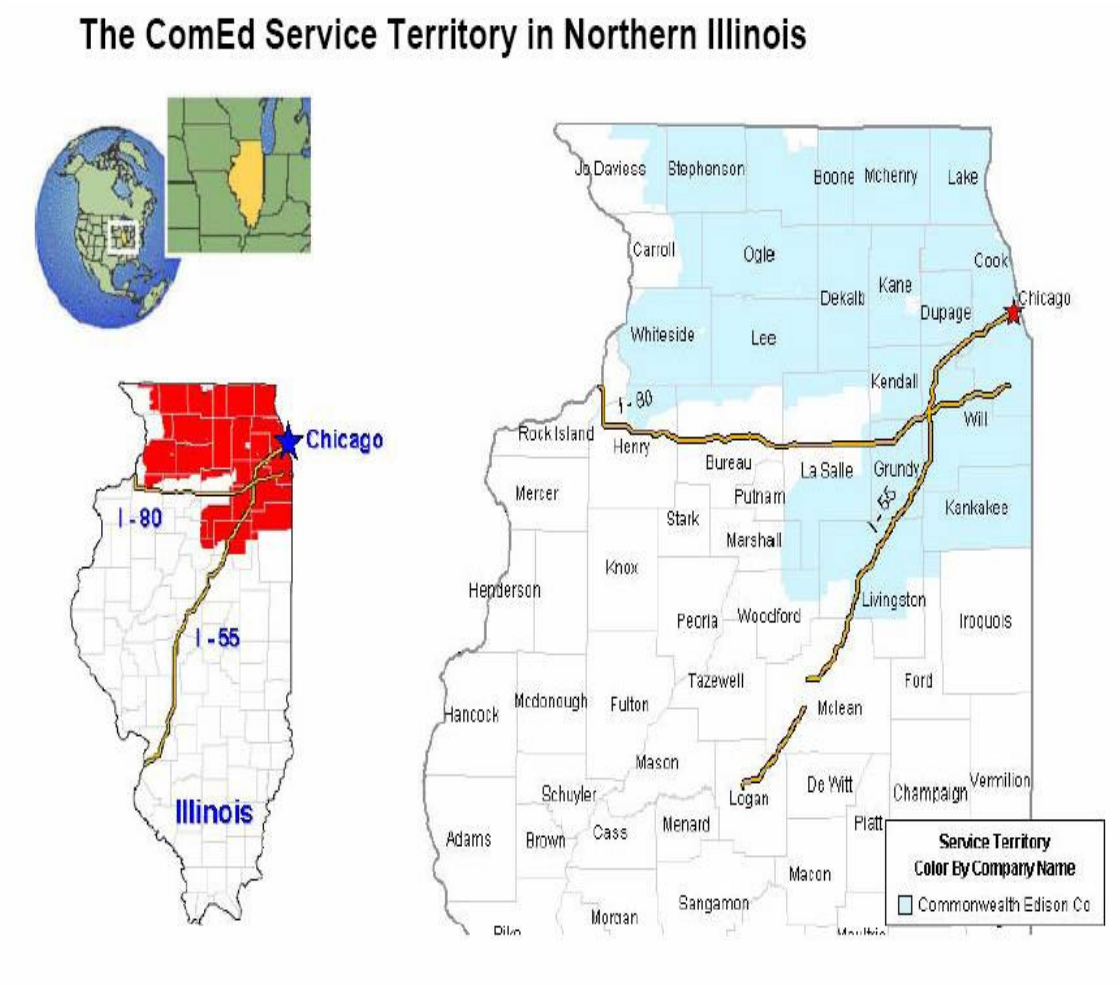
ComEd's history of outsourcing and contracting and the type of work activities contracted; and we highlight the contractor contract language contained in the agreement with the union that represents its electric employees.

### 2.1.2 Service Territory

ComEd's service territory borders Iroquois County to the south (roughly Interstate 80), the Wisconsin border to the north, the Iowa border to the west and the Indiana border to the east. ComEd's service territory covers approximately 11,300 square miles and ComEd serves 74% of Illinois electric customers. It includes the City of Chicago, an area of about 225 square miles with an estimated population of 3 million. ComEd operates 5,300 distribution circuits with 43,700 miles of overhead lines and 44,100 miles of underground cable.

ComEd's field forces currently operate out of four major operating regions: Chicago, West, North, and South. ComEd has two call-centers located in Oakbrook, Illinois and Chicago, Illinois that serve its entire service territory. ComEd's service territory is illustrated in Figure 1.

**Figure 1 - ComEd Service Territory**



## 2.2 Objective and Scope

The Illinois Commerce Commission (ICC, Commission, or Agency) retained Jacobs Consultancy Inc. (Jacobs Consultancy) to conduct a workforce adequacy analysis of ComEd, as specified by the Illinois Public Utilities Act, Section 4-602:

> Sec 4-602. Electric utility workforce study
> (a) The Commission shall conduct a comprehensive workforce analysis study of each electric utility to determine the adequacy of the total in-house staffing in each job classification or job title critical to maintaining quality reliability and restoring service in each electric utility's service territory. Each report shall contain a yearly detailed comparison beginning with 1995 and ending in 2006 of each electric utility's ratios of:
>
> (1) In-house workers, commonly referred to as "linemen", to customers;
>
> (2) Customer service call-center employees to customers; and
>
> (3) Meter service or repair employees to customers
>
> The ratios shall be reported from each utility's named service area, district, division, outlying area, village, municipality, reporting point, or region. The analysis shall determine the total number of contractor employees for the same timeframe and shall be conducted in the same manner as the in-house analysis.
>
> (b) The Commission may hold public hearings while conducting the analysis to assist in the adequacy of the study. The Commission must hold public hearings on the study and present the results to the General Assembly no later than January 1, 2009.
>
> (c) An electric utility shall bear the costs of issuing any reports required by this Section and it shall not be entitled to recovery of any costs incurred in complying with this Section.

The objective of the study is to determine the adequacy of the total in-house staffing in each job classification or job title critical to maintaining quality reliability and restoring service in the Utility's Illinois service territory. The analysis also examines the total number of contractor employees in the same manner as the in-house analysis. The study is broken down into two tasks:

Task 1 - The first step in determining the adequacy of the Utility's workforce was to compute and compare the yearly workforce ratios during the 1995–2006 timeframe for the pertinent job classifications by service area, district, division, or region.

Task 2 - The second step in the study consists of performing a detailed examination of ComEd's workforce adequacy critical to maintaining quality and reliability, and restoring service in the Utility's Illinois service territory. As specified in Section 4-602, that critical workforce is defined as:

- In-house workers, commonly referred to as "linemen"
- Meter service or repair employees
- Customer service call-center employees

## 2.3 Approach

### 2.3.1 Workforce Ratio Report

To develop the workforce ratio report, we collected, rationalized, and performed an initial analysis on workforce ratios as specified in the Illinois Public Utilities Act, Section 4-602. In particular, we requested data on the levels of both in-house and contracted staff in each job classification or job title critical to maintaining quality reliability and restoring service by examining workforce levels covering the 1995-2006 time period for:

1. In-house workers, commonly referred to as "linemen"
2. Customer service call-center employees
3. Meter service or repair employees
4. Contracted or outsourced full-time equivalent (FTE) employees for each of the above

Computing the ratio of employees to customers resulted in a very small number that is neither practical nor informative to use to assess workforce adequacy. Instead, we augmented the ratio analysis by calculating the number of customers per employee.

Due to data inconsistencies and unavailability, computing the ratios by operating region as suggested in Section 4-602 of the Illinois Public Utilities Act, will not draw any meaningful conclusions. As a result, this report will only analyze the ratios for the total ComEd workforce.

In this task, we also noted the job classifications included in each ratio analysis and identified the factors that may have affected the changes in the ratios each year.

Our approach to this task was divided into five subtasks as described below.

- **Data Collection—**We collected data emanating from the initial data requests as provided by the Utility and through our research. This information was made consistent, as practicable, and input into our web-based document control facility (eRoom).

- **Initial Analysis/Cleaning—**In this subtask, we performed our initial analysis on the data provided by ComEd to support the workforce ratio analysis. We identified any gaps or inconsistencies in the data and identified missing or questionable data. We made appropriate corrections, based on clarifications from ComEd, to the data to provide a consistent data set.

- **Additional Data Requests—**Based on our Initial Analysis/Cleaning, we formulated additional specific data requests, data explanations and other information deemed necessary for consistent data. ComEd was requested to provide responses to these additional data requests within a 10-day timeframe.

- **Data Analysis and Cleaning—**In this subtask, we incorporated the additional data received into our workforce ratio analysis model and continued data cleaning efforts to assure consistent and meaningful baseline workforce ratios to support further analysis.

- **Develop Ratio Report—**Prior to developing the reports, we coordinated with the Agency to define the workforce ratio report format and content. Following this and completion of the Data Analysis and Cleaning subtask, we proceeded to assemble the ratios and develop the final Workforce Ratio Report.

### 2.3.2 Workforce Adequacy Analysis

The Illinois Public Utilities Act, Section 4-602 states that the study is to "Determine the adequacy of the in-house staffing in each job classification critical to maintaining quality, reliability and restoring service in each electric utility service territory."

The key word to conducting the study, then, lies in the word *adequacy*, which can be defined as the quality of being able to meet a need satisfactorily or the quality of being sufficient for the end in view[3].

Applying this definition to the Illinois Public Utilities Act, Section 4-602, suggests that a spectrum of staffing possibilities exists. Extremes range from providing sufficient in-house staffing to permit timely completion of all work requirements responding to normal work load as well as responding to emergencies, with no overtime and no use of external resources to depending

[3] http://www.thefreedictionary.com/adequacy

heavily upon outside contractors to satisfy normal and emergency workload requirements that a static or shrinking in-house workforce is unable to complete in a timely fashion.
Jacobs Consultancy does not believe that either of these extremes can be proven to be economic or effective considering all stakeholders' interests. We believe that in-house workforce adequacy in the context of the Illinois Public Utilities Act, Section 4-602, should lie in the middle ground and comprise a blend of resources that accomplishes the following:

- Maintain reasonable system reliability and service quality
- Provide a cost-effective solution
- Use outside resources to supplement in-house resources to meet peak workload requirements
- Use outside resources to perform work efforts that require specialized equipment or specialized skill sets that are not economic to maintain in-house
- Permit in-house resources to maintain expertise and knowledge in their core business
- Utilize outside contractors to relieve in-house staff of non-core or non-critical workload
- Provide a reasonable level of regular and overtime opportunities to the in-house workforce
- Use of additional temporary outside resources to supplement in-house workforce and existing contract workers during emergencies

In our workforce adequacy analysis, we examined the existing mix of in-house and contractor workforce in the context of the job functions, level of involvement, and meeting the criteria expressed above. Consequently, we judged the adequacy of the overall workforce on the basis of:

- System performance
- Levels of in-house overtime
- Existing in-house age and skills demographics and workforce plans
- Customer satisfaction statistics
- Workload backlog

We have provided in Appendix B an overview of general outsourcing philosophies and ComEd's specific contracting and outsourcing philosophy.

To develop the Workforce Adequacy Analysis Report, we collected various related documents provided by the Company, conducted interviews of key individuals, visited several ComEd facilities and conducted a visual condition assessment on randomly selected distribution facilities. Specifically, in undertaking this analysis, we conducted 39 interviews with nearly 60 individuals representing both ComEd company management and the bargaining units, and reviewed 142 ComEd documents.

Our detailed analysis includes comparisons of workforce levels against historical reliability indices as well as preventive and corrective maintenance orders indicative in determining workforce adequacy. Furthermore, during the interview phase of our analysis we interviewed several union officials and bargaining unit members. The union representatives articulated various concerns that added additional focus to our workforce adequacy study.

Our study of ComEd's workforce adequacy focused on a number of discrete assessments including:

- **Maintenance and Operations**—In reviewing the operations area, we studied the dispatch function and examined linkages to the call center during normal operations and minor and major outages. We traced handling of outages and work notifications and reviewed emergency escalation procedures and provisioning of emergency operations, troubleshooting, coordination with other emergency agencies, mutual aid arrangements, crew mobilization, and utilization of contractor forces. In reviewing the maintenance function, we focused on maintenance planning, maintenance cycles, maintenance work accomplishments, backlogs, workplace barriers, staffing adequacy, crew sizes, system inspections, vegetation management, use of contractors and quality control. We also examined the level of technology enablers employed to support this function.

- **Training and Safety**— We examined new apprentice and continuing training programs for line workers, meter staff and call center customer service representatives. We sought to observe any training provided to contractors and how their capabilities were assessed. We explored the steps the Utility is taking to attract new line workers. We reviewed the importance of safety in ComEd's organization; related training and the safety results achieved and also examined the Utility's safety performance over the 1995-2006 timeframe.

- **Quality Assurance**—The study included a review of the quality assurance and control mechanisms and processes employed by ComEd in the distribution, metering, substations, construction and line work.

- **Distribution System Condition Assessment**—This assessment involved visual observations of ComEd's electric distribution facilities through conducting a random spot inspection to determine the condition of the distribution system. In areas where recent

inspection results were available, we compared the findings of the inspection reports and mitigation efforts against our observations.

- **Call Center**—We assessed call center metrics, such as call volume, abandonment rates, and call answers statistics to gauge the level of customer support that is present. We reviewed call center changes, such as staffing, training and automation enhancements. We reviewed the process for emergency situations, emergency escalation procedures, public agency communication provisions, and customer satisfaction surveys. We also examined the level of technology enablers employed to support this.

We specifically addressed staffing adequacy in two subsections titled "Staffing" contained in Section 5.1: Operations and Maintenance, and Section 5.5: Call Center.

## 2.4 Report Organization

Section 1.0 Executive Summary provides an overview of Jacobs Consultancy's key conclusions and recommendations. Only those recommendations identified as directly linked to workforce adequacy are presented in the Executive Summary. Several other recommendations are presented in the body of the report and are summarized in Appendix A.

The main body of the report is divided into two sections: Section 4.0 Ratio Investigation and Section 5.0 Workforce Adequacy Analysis. In the Ratio Investigation section, we include ratio reports for linemen, meter service, and call center employees. In the Workforce Adequacy Analysis section, assessments were conducted and an analysis made into a variety of areas including operations and maintenance, training and safety, quality assurance, distribution system condition and the call center.

The Workforce Adequacy Analysis sections contain a background description for each area and an analysis of specific topics. The Findings presented represent strengths, weaknesses, opportunities and threats, which tie directly into the facts obtained from our interviews and review of documents. The Conclusions summarize and represent our assessment of the related findings and our opinion regarding proposed opportunities associated with a specific topic. In some instances, our conclusions lead to Recommendations.

A glossary of terms is set out below to familiarize the reader with the acronyms and industry terms used throughout this report.

# 3.0 Glossary

A glossary of terms is set out below to familiarize the reader with the acronyms and industry terms used throughout this report.

## 3.1 Abbreviations

| | |
|---|---|
| ACD | Automatic Call Distributor |
| AME | Area Maintenance Engineers |
| AMR | Automated Meter Reading |
| AO | Area/Substation Operator |
| ASA | Average Speed of Answer |
| ARCOS | Automated Roster Callout System |
| BAPP | Behavioral Accident Prevention Process |
| BBS | Behavior Based Safety |
| C&M | Construction and Maintenance |
| CAIDI | Customer Average Interruption Duration Index |
| CIMS | Customer Information Management System |
| CM | Corrective Maintenance |
| COC | Contractor of Choice |
| CAP | Corrective Action Plan |
| CSR | Customer Service Representative |
| CTI | Computer Telephony Integration |
| DSO | Distribution Systems Operations |
| EEI | Edison Electric Institute |
| EMS | Energy Management System |
| eRoom | Web-based document control facility |
| ETR | Estimated Time to Restore |
| EWS | Emergent Work Supervisors |
| FIN | Fix It Now |
| FLS | First Line Supervisor |
| FTE | Full-Time Equivalent |
| GIS | Geographic Information System |
| GPS | Global Positioning System |
| HVCA | High Volume Outage Call Answering |
| IBEW | International Brotherhood of Electrical Workers |
| ICC | Illinois Commerce Commission |
| ITN | Investment Tracking Numbers |
| IVR | Interactive Voice Response Unit |
| KPI | Key Performance Indicators |

| | |
|---|---|
| LMS | Learning Management System |
| MDT | Mobile Data Terminals |
| NCR | New Construction Representatives |
| NJATC | National Joint Apprentice and Training Committee |
| Non-O&C | Non-Ordinary and Customary |
| O&C | Ordinary and Customary |
| OCC | Operation Control Center |
| OEM | Original Equipment Manufacturer |
| OES | Overhead Electrician Special |
| OMS | Outage Management System |
| PI | Performance Improvement |
| PM | Preventive Maintenance |
| QA | Quality Assurance |
| SAIDI | System Average Interruption Duration Index |
| SAIFI | System Average Interruption Frequency Index |
| SCADA | Supervisory Control and Data Acquisition |
| SSG | System Services Group |
| T&S | Transmission and Substations |
| TED-CEGIS | Tools for Engineering/Design - ComEd Geospatial Information System |
| VRU | Voice Response Unit |
| WMS | Work Management System |
| WPA | Worker Protection Assurance |

## 3.2 Common Industry Terms

| | |
|---|---|
| Automated Meter Reading (AMR) | The technology of automatically collecting data from metering devices (water, gas, electric) and transferring that data to a central database for billing and/or analyzing. |
| Automatic Call Distributor | A telephone facility that manages incoming calls and handles them based on the number called and an associated database of handling instructions. |
| Average Speed of Answer | The timing for answering the call begins when the call is queued for the ACD queue and ends when an agent (either in the primary or overflow ACD queue) answers the call. |
| Behavior Based Safety | A wide range of programs which focus almost entirely on changing the behavior of workers to prevent occupational injuries and illnesses. |

| | |
|---|---|
| Capacitor | An electrical/electronic device that can store energy in the electric field between a pair of conductors. |
| Completely Self Protected Transformer (CSP) | Efficiently and effectively disconnect the load from the transformer under overload conditions, and includes lightning protection built-in. |
| Customer Average Interruption Duration Index (CAIDI) | A distribution circuit reliability measure that represents the average time required to restore service to the average customer per sustained interruption. |
| Customer Average Interruption Frequency Index (CAIFI) | A distribution circuit reliability measure that can be used to describe trends and customer interruptions by showing the number of customers affected out of the total customer base. |
| Computer Telephony Integration (CTI) | The use of computers to manage telephone calls. |
| Customer Information System (CIS) | A broad set of customer, location, service, asset and financial information. |
| Customer Service System (CSS) | A broad set of customer, location, service, asset and financial information. |
| Energy Management System (EMS) | Electric transmission and generation controls and data acquisition system for managing electric flows on the transmission network and automatically adjusting generation output. |
| Estimated Time to Restore (ETR) | Represents the best information available at this time. |
| High Volume Outage Call Answering | Automatically take customer electric outage telephone calls and create outage service orders that are then electronically delivered directly to the Outage Management System. |
| Integrated Voice Response Unit (IVRU) | An automated telephony system that interacts with callers, gathers information and routes calls to the appropriate recipient. |
| Key Performance Indicators (KPI) | Quantitative measurements that help an organization measure progress towards goals and identify areas for improvement. |
| Mobile Data Terminals (MDT) | A computerized device used in vehicles to communicate with a central dispatch office. |

| | |
|---|---|
| National Joint Apprentice and Training Committee (NJATC) | Oversees uniform standards that are adopted and used nationwide to select and train qualified men and women for the electric industry. |
| Outage Management System (OMS) | A computer system used by operators of electric distribution systems to assist in restoration of power. |
| Quality Assurance (QA) | Systematic process of checking to see whether a product or service being developed is meeting specified requirements. |
| Recloser | A type of circuit breaker, typically used on overhead distribution lines, equipped with a mechanism that monitors and isolates electrical faults and can automatically reclose the device after it has been opened due to a transient fault. |
| Regulator | A device which has the function of maintaining a designated characteristic (i.e. voltage). |
| Substations | A subsidiary station of an electricity system where voltage is transformed from high to low or the reverse using transformers. |
| Supervisory Control and Data Acquisition (SCADA) | Electric transmission and generation controls and data acquisition system for managing electric flows on the transmission network and automatically adjusting generation output. |
| System Average Interruption Frequency Index (SAIFI) | A distribution circuit reliability measure that can be used to describe trends and the average number of interruptions that a customer would experience. |
| Transformer | A device that transfers electrical energy from one circuit to another through inductively coupled electrical conductors. |

# 4.0 Ratio Investigation

Jacobs Consultancy developed the following three ratio reports as specified in the scope of work. In the Discussion section, we explain in more detail how the data provided by ComEd was adjusted and made consistent to develop the appropriate ratios of customers to employees.

## 4.1 Ratio Reports

## 4.1.1 Linemen Employee Ratio Report

Table 1 shows the data used to compute the ratios of customers per linemen employee. Figure 2 illustrates the linemen employee ratio trend during the 1995-2006 timeframe for both in-house and contractor employees.

**Table 1 - ComEd Linemen Employee Data**

| Year | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ComEd - All Operating Areas** | | | | | | | | | | | | |
| **Number of Customers** [1] | 3,400,000 | 3,400,000 | 3,400,000 | 3,451,828 | 3,449,653 | 3,503,399 | 3,546,901 | 3,574,224 | 3,614,717 | 3,652,572 | 3,684,662 | 3,731,505 |
| **Number of Employees** [2] | | | | | | | | | | | | |
| Overhead [3] | 1,016 | 1,013 | 981 | 992 | 959 | 931 | 916 | 856 | 826 | 745 | 700 | 710 |
| System Service Tech (SSG) | 0 | 0 | 0 | 0 | 0 | 0 | 93 | 84 | 87 | 128 | 122 | 138 |
| Overhead Electric Specialist (OES)/First Responder | 176 | 180 | 178 | 180 | 191 | 211 | 203 | 212 | 209 | 225 | 240 | 236 |
| Underground [4] | 345 | 332 | 321 | 316 | 293 | 305 | 301 | 282 | 260 | 215 | 219 | 234 |
| Area Operators | 166 | 163 | 162 | 173 | 169 | 173 | 186 | 188 | 189 | 154 | 144 | 151 |
| Substation Construction Crew Leaders | 128 | 151 | 158 | 157 | 153 | 148 | 143 | 107 | 133 | 121 | 115 | 110 |
| Substation Electrical Mechanics | 398 | 355 | 337 | 333 | 312 | 309 | 298 | 284 | 244 | 230 | 222 | 208 |
| Substation Field Craft | 99 | 94 | 92 | 97 | 99 | 100 | 78 | 75 | 73 | 68 | 67 | 65 |
| Contract Construction & Maintenance FTEs [5, 6] | NA | NA | NA | NA | NA | 154 | 127 | 157 | 198 | 320 | 355 | 538 |
| Contract Substation FTEs [5, 7] | NA | NA | NA | NA | NA | 91 | 60 | 4 | 0 | 2 | 2 | 39 |
| Total Linemen In-house Employees | 2,328 | 2,288 | 2,229 | 2,248 | 2,176 | 2,177 | 2,218 | 2,088 | 2,021 | 1,886 | 1,829 | 1,852 |
| Total Linemen Contractor Employees | 0 | 0 | 0 | 0 | 0 | 245 | 187 | 161 | 198 | 323 | 357 | 577 |
| Total Linemen Employees | 2,328 | 2,288 | 2,229 | 2,248 | 2,176 | 2,422 | 2,405 | 2,249 | 2,219 | 2,209 | 2,186 | 2,429 |
| Percentage of Linemen In-house Employees | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.90 | 0.92 | 0.93 | 0.91 | 0.85 | 0.84 | 0.76 |
| Percentage of Linemen Contractor Employees | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 0.08 | 0.07 | 0.09 | 0.15 | 0.16 | 0.24 |
| **Ratios** [8] | | | | | | | | | | | | |
| Customers to Linemen In-house Employees | 1,460 | 1,486 | 1,525 | 1,536 | 1,585 | 1,300 | 1,361 | 1,476 | 1,484 | 1,412 | 1,410 | 1,171 |
| Customers to Linemen Contractor Employees | 0 | 0 | 0 | 0 | 0 | 147 | 114 | 114 | 145 | 242 | 275 | 365 |
| Customers to Total Linemen Employees | 1,460 | 1,486 | 1,525 | 1,536 | 1,585 | 1,446 | 1,475 | 1,589 | 1,629 | 1,654 | 1,685 | 1,536 |

Source: DR-009, DR-042, DR-043, DR-056

Notes:

NA = Not Available

[1] ComEd's year-end electric customers by operating center was only provided for 1998-2006. The estimated system wide customer served between 1995 and 1997 as reported in the annual Reliability Performance Reports was approximately 3.4 million customers.

[2] Hourly staffing includes employees represented by Local 15 only.

[3] Transmission has approximately 21 overhead employees. Those employees are excluded by subtracting 21 from the overhead total employee number each year.

[4] Transmission has approximately 11 underground employees. Those employees are excluded by subtracting 11 from the undergound total employee number each year.

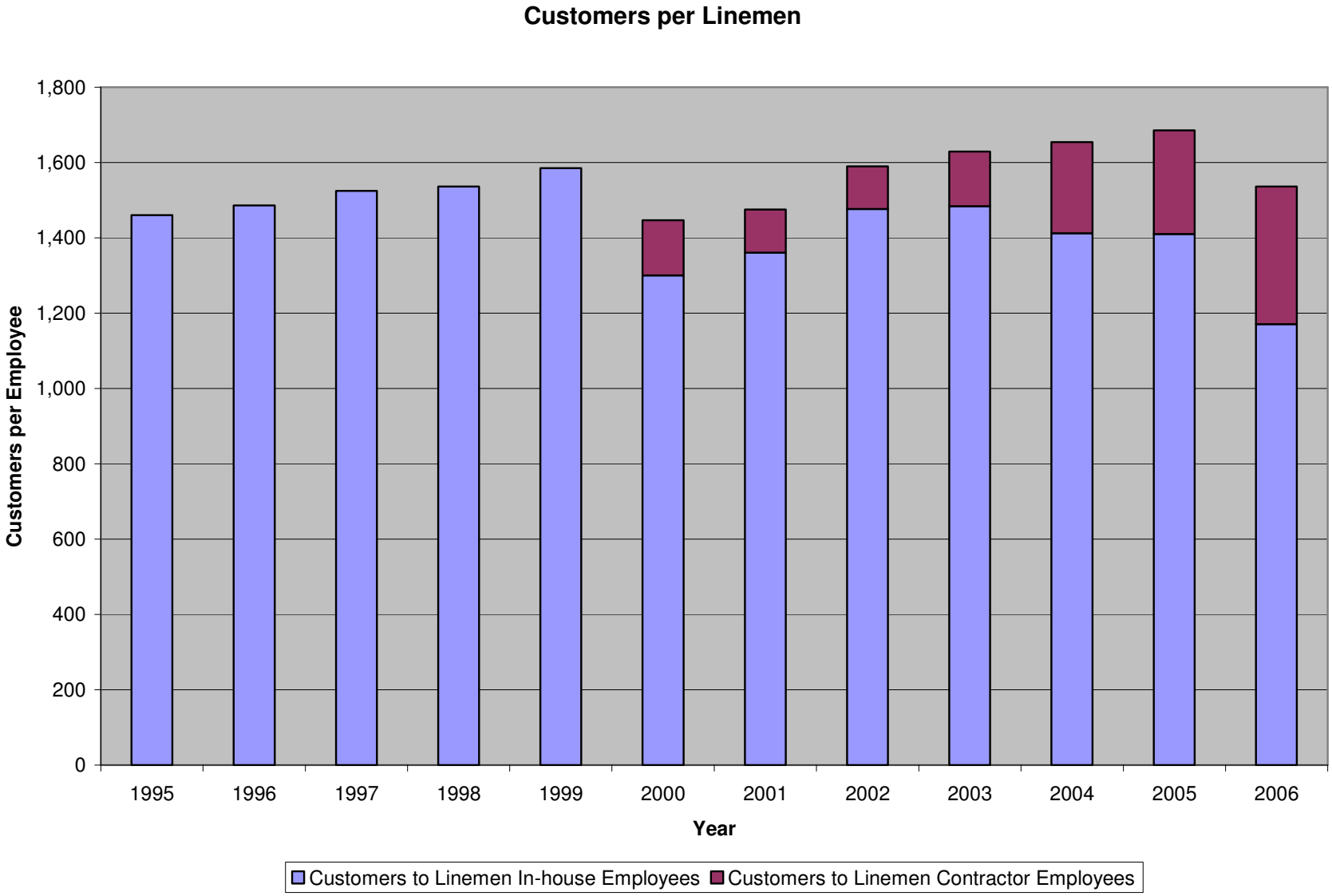
[5] Contractor full time equivalent (FTE) based on a 40-hour work week for 52 weeks for a total of 2,080 hours per year or an average of 173.3 hours per month. Data for 1995 - 1999 and January through March 2000 is not available.

[6] Contracted work includes Ordinary & Customary (O&C) work that would have been performed by ComEd employees in the Construction and Maintenance Department (job classifcations: Crewleader Overhead Electrician, Overhead Electrician, Crewleader Cable Splicer, and Cable Splicer) or System Service Technician. Outsourced labor that perform work such as vegetation management are not included in the analysis.

[7] Contracted work includes work that would have been performed by ComEd employees in the Substation Department (job classification: Electrical Mechanic). Contracted transmission work is excluded.

[8] The ratio of customers to employees is calculated instead of employees to customers as specified by Illinois Public Utilities Act, Section 4-602.

**Figure 2 - ComEd Customers per Linemen Ratios**



## 4.1.2 Call Center Employee Ratio Report

Table 2 shows the data used to compute the ratios of customers per call center employee. Figure 3 illustrates the call center employee ratio trend during the 1995–2006 timeframe for in-house employees.

**Table 2 - ComEd Call Center Employee Data**

| Year | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Oak Brook and Chicago North Call Centers** | | | | | | | | | | | | |
| **Customers** [1] | 3,400,000 | 3,400,000 | 3,400,000 | 3,451,828 | 3,449,653 | 3,503,399 | 3,546,901 | 3,574,224 | 3,614,717 | 3,652,572 | 3,684,662 | 3,731,505 |
| **Number of Employees** [2, 3] | | | | | | | | | | | | |
| Full-time CSRs | 284 | 273 | 307 | 280 | 343 | 337 | 323 | 263 | 229 | 216 | 196 | 185 |
| Part-time CSRs - FTE [4] | 43 | 33 | 26 | 175 | 180 | 192 | 147 | 115 | 110 | 117 | 110 | 106 |
| Total Call Center In-house Employees | 327 | 306 | 333 | 455 | 523 | 529 | 470 | 378 | 339 | 333 | 306 | 291 |
| Total Call Center Contractor Employees [5] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Call Center Employees | 327 | 306 | 333 | 455 | 523 | 529 | 470 | 378 | 339 | 333 | 306 | 291 |
| **Ratios** [6] | | | | | | | | | | | | |
| Customers to Call Center In-house Employees | 10,398 | 11,111 | 10,210 | 7,586 | 6,596 | 6,623 | 7,547 | 9,456 | 10,663 | 10,969 | 12,041 | 12,823 |

Source: DR-009, DR-028, DR-043, DR-056

Notes:

[1] ComEd's year-end electric customers by operating center was only provided for 1998-2006. The estimated system wide customer served between 1995 and 1997 as reported in the annual Reliability Performance Reports was approximately 3.4 million customers.

[2] Hourly staffing includes employees represented by Local 15 only.

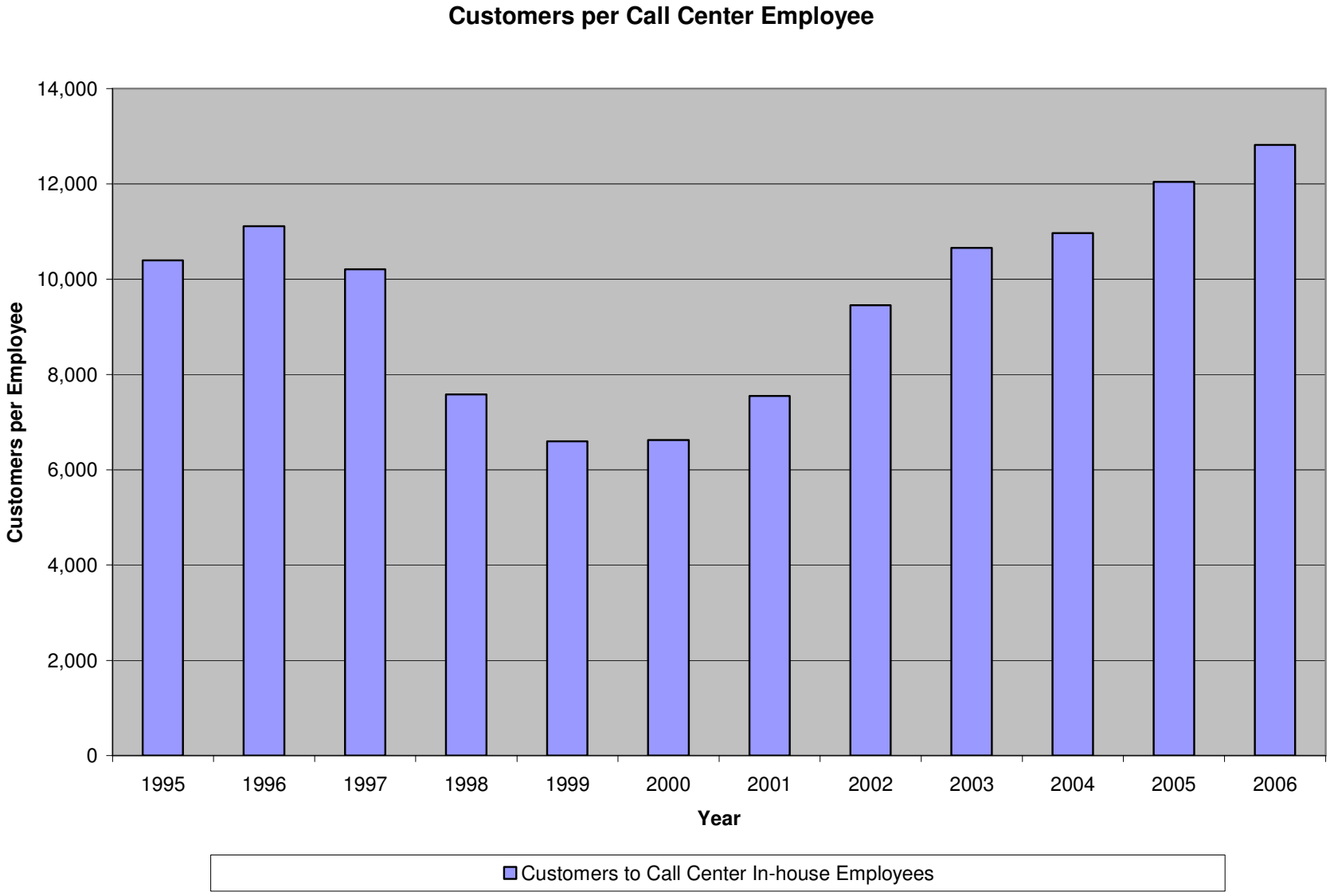
[3] Represents end-of-year snapshot of number of employees in position.

[4] Full-time equivalents based on a 40-hour work week.

[5] ComEd Customer Contact Center does not outsource bargaining unit work.

[6] The ratio of customers to employees is calculated instead of employees to customers as specified by Illinois Public Utilities Act, Section 4-602.

**Figure 3 - ComEd Customers per Call Center Employee Ratios**



## 4.1.3 Meter Service Employee Ratio Report

Table 3 shows the data used to compute the ratios of customers per meter service employee. Figure 4 illustrates the meter service employee ratio trend during the 1995–2006 timeframe for in-house employees.

**Table 3 - ComEd Meter Service Employee Data**

| Year | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ComEd - All Operating Areas** | | | | | | | | | | | | |
| **Number of Customers** [1] | 3,400,000 | 3,400,000 | 3,400,000 | 3,451,828 | 3,449,653 | 3,503,399 | 3,546,901 | 3,574,224 | 3,614,717 | 3,652,572 | 3,684,662 | 3,731,505 |
| **Number of Employees** [2] | | | | | | | | | | | | |
| Meter Readers | 528 | 478 | 519 | 483 | 523 | 470 | 486 | 482 | 473 | 460 | 514 | 530 |
| Meter Technicians [3] | 232 | 231 | 231 | 231 | 229 | 221 | 164 | 163 | 143 | 146 | 151 | 154 |
| Total Meter Service In-house Employees | 760 | 709 | 750 | 714 | 752 | 691 | 650 | 645 | 616 | 606 | 665 | 684 |
| Total Meter Service Contractor Employees [4] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Meter Service Employees | 760 | 709 | 750 | 714 | 752 | 691 | 650 | 645 | 616 | 606 | 665 | 684 |
| **Ratios** [5] | | | | | | | | | | | | |
| Customers to Meter Service In-house Employees | 4,474 | 4,795 | 4,533 | 4,834 | 4,587 | 5,070 | 5,457 | 5,541 | 5,868 | 6,027 | 5,541 | 5,455 |

Source: DR-009, DR-042, DR-043, DR-056

Notes:

[1] ComEd's year-end electric customers by operating center was only provided for 1998-2006. The estimated system wide customer served between 1995 and 1997 as reported in the annual Reliability Performance Reports was approximately 3.4 million customers.

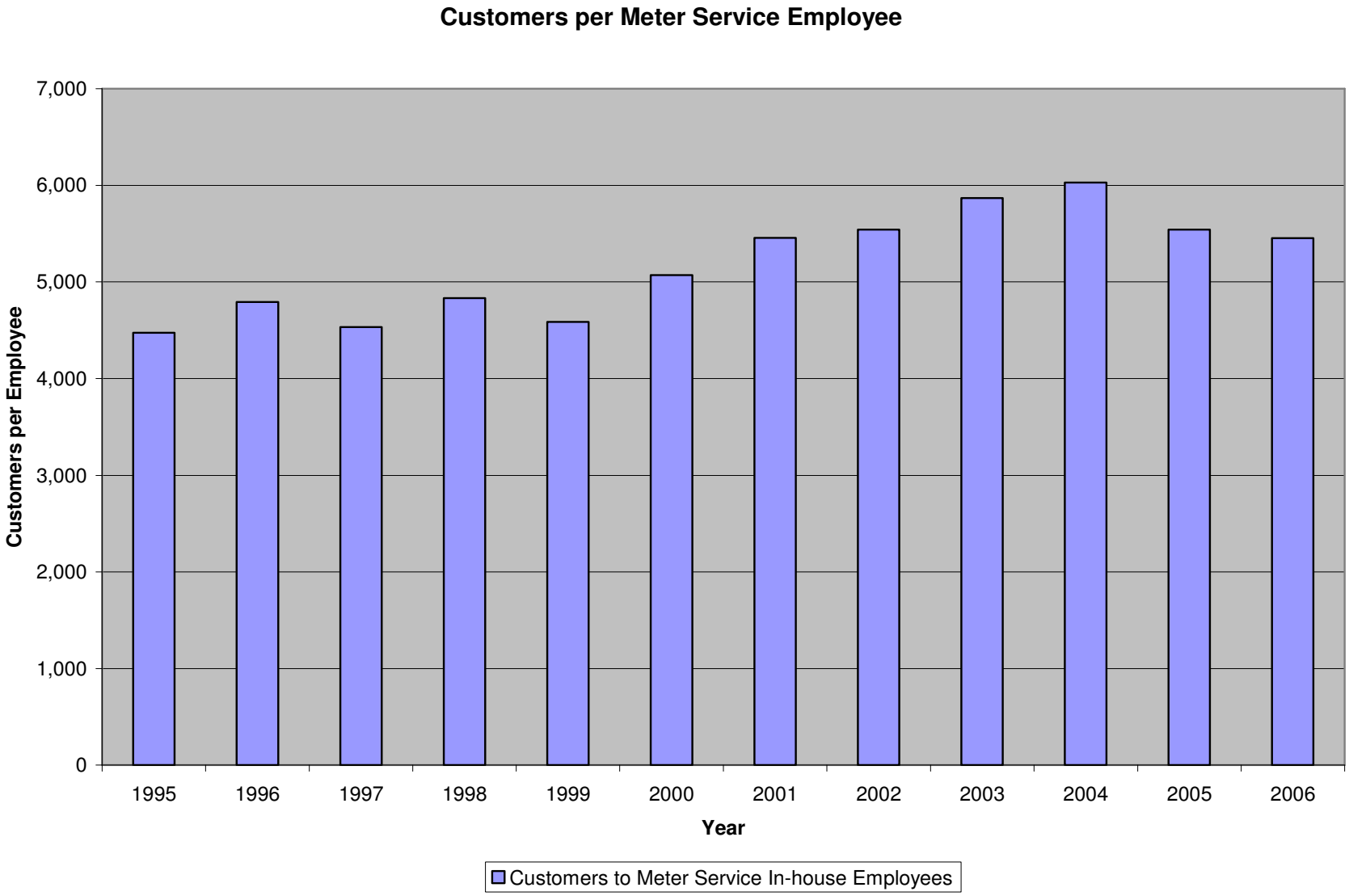
[2] Hourly staffing includes employees represented by Local 15 only.

[3] Includes Energy Technicians and Meter Mechanics.

[4] Meter reading did not use contractors during the study period. Field and Meter Services did not use contractors during the period 1995 through Spetember 2006. For the period October 2 to December 1, 2006, Field and Meter Services utilized the services of 8 meter technician contractors in Chicago North and 6 meter technician contractors in Chicago South to temporarily assist in performing a discrete function.

[5] The ratio of customers to employees is calculated instead of employees to customers as specified by Illinois Public Utilities Act, Section 4-602.

**Figure 4 - ComEd Customers per Meter Service Employee Ratios**



## 4.2 Discussion

In developing the ratios of customers to employees, we reviewed the staffing level data ComEd provided by job classification, in-house employees, and contractor employees at year end for each year during the 1995-2006 time period and made several adjustments to make the ratios consistent and easier to interpret.

### 4.2.1 Linemen Employee Ratios

ComEd's field forces currently operate out of the following four major operating regions: Chicago, North, South, and West. The regional reporting structure prior to 2003 consisted of Northern, Southern, Rock River, Chicago, and Central. Within each operating region are numerous area offices.

Due to inconsistencies in data and the changes in the regional reporting structure, calculating the ratios by operating region does not help draw any meaningful conclusions. As a result, the linemen employee ratios were calculated based on the total ComEd customers and linemen employees each year.

ComEd was only able to provide the year end number of electric customers for 1998-2006. The estimated system wide customers served between 1995 and 1997, as reported in the annual Reliability Performance Reports, was approximately 3.4 million customers, which is the number that was used in those three years[4].

The Total Linemen In-house Employees is the sum of the Overhead, System Service Technicians (SSG), Overhead Electric Special (OES)/First Responder, Underground, Area Operators, Substation Construction Crew Leaders, Substation Electric Mechanics, and Substation Field Craft employees[5]. The number of employees represents the end-of-year snapshot of the number of full-time equivalent employees represented by Local 15 in each position.

The ratio analysis does not include transmission employees[6]. Transmission currently has approximately 21 employees in the Overhead category; however, ComEd could not provide a breakdown of transmission employees in the Overhead category for each year in the study period. As a result, we excluded those employees in the analysis by subtracting 21 employees from the Overhead total employee number each year. Similarly, there are approximately 11

[4] DR-043
[5] Bargaining unit employees in the Facilities Inspector, Maintenance Inspector, Machine Operator, Underground Protection Electrician, and Underground System Recorder job classifications are not included in the Total Linemen numbers.
[6] Transmission employees can be used in call-outs for outages, but do not perform distribution related work during normal working hours.

transmission employees in Underground, and those employees were excluded from the analysis by subtracting 11 employees from the Underground total employee number each year.

The Total Linemen Contractor Employees is the sum of the Contract Construction and Maintenance FTEs and Contract Substation FTEs. Contract Transmission FTEs are excluded from the analysis. The contractor full-time equivalent is based on a 40-hour work week for 52 weeks for a total of 2,080 hours per year or an average of 173.3 hours per month. Contractor data for 1995-1999 was not available. The data for April through December 2000 and for calendar years 2001-2005 reflects Ordinary and Customary (O&C) work performed by contractors, which during this period is defined as work that is typically performed by ComEd bargaining unit employees or contracted work that was, at one time, performed by ComEd bargaining unit employees and for which ComEd is required to offer Valtin overtime[7].

Contracted work for the Contract Construction and Maintenance FTEs includes work that would have been performed by ComEd employees in the Construction and Maintenance Department or SSG in the following job classifications: Crew Leader Overhead Electrician, Overhead Electrician, Crew Leader Cable Splicer, Cable Splicer, and System Service Technician[8].

Contracted work for the Contract Substation FTEs includes work that would have been performed by ComEd employees in the Transmission & Substation Department in the Electrical Mechanic job classification. Contractors performing work that would have been performed by transmission employees are excluded from the analysis.

In late 2005, ComEd changed the manner in which contractor information is tracked so the contractor FTE data for 2006 is categorized by operating regions rather than reporting location in each region. Since our analysis is based on the contractor FTEs for the entire ComEd territory, this change did not have a significant effect.

The Total Linemen Employees is the sum of the Linemen In-house Employees and the Linemen Contractor Employees. Using the percentage of in-house employees versus contractor employees, the ratios of customers to employees in these two categories were calculated and summed together to get the overall customers per employee ratios. Figure 2 shows the in-house and contractor components that make up the customers to total linemen employees ratios based on the employee data on Table 1.

As depicted in the customer to linemen employee ratio trend in Figure 2, the total overall customers per linemen ratio has been fairly level, ranging between 1,400 and 1,600 customers per employee. Since linemen contractor data prior to 2000 was not available, we cannot

[7] DR-042 - "Valtin overtime" is voluntary overtime ComEd is required to offer to employees in an "affected work group" when ComEd uses contractors to perform certain work.
[8] Contractors that perform work on major capital improvement projects that can be done by ComEd bargaining employees are included in the O&C contractor data. Outsourced labor that performs work such as vegetation management is not included in the analysis.

quantify the level of contractor usage before that time. The data in subsequent years reflect continuous and increased use of contractors, resulting in the use of fewer in-house linemen even though the overall linemen resources per customer remained stable. In 2000, approximately 10% of linemen employees were contractors and by 2006, that percentage grew to about 24%.

There are several factors that may have impacted staffing levels. Increased efficiencies have resulted from crews working across regions, an agreement with Local 15 allowed ComEd to assign 2-person crews instead of 3-person crews, increased job site reporting, utilization of SCADA at all substations, OES assigned to emergent and non-emergent work, improved supply fill rate, job site deliveries, and the creation of the System Services Group (SSG) to allow Overhead Electricians to focus on traditional overhead C&M work. Technology improvements that may have affected staffing levels include: automated work management system, distribution automation, outage management system, Automated Roster Callout System (ARCOS), cell phones, GPS units with equipment data, and Mobile Dispatch.

### 4.2.2 Call Center Employee Ratios

Since ComEd's Oakbrook and Chicago North call centers serve electric customers across its entire service territory, we did not separate the call center employees by location, but used the total ComEd customer count in computing the ratios of call center employees to customers. The number of employees represents the end-of-year snapshot of the number of full-time equivalent employees represented by Local 15 in each position.

The Total Call Center In-house Employees is the sum of the customer-facing employees. In the case of ComEd's call centers, the Total Call Center In-house Employees only include Customer Service Representatives (CSRs)[9]. ComEd used part-time CSRs during the entire study period to balance peaks seasonally and during peak times. Since ComEd has both full-time and part-time Customer Service Representatives, the part-time CSRs full-time equivalents based on a 40-hour work week were used to compute the Total Call Center In-house Employees.

The ComEd call centers do not outsource bargaining unit work[10] so only the ratios of customers to call center in-house employees were calculated.

As depicted in the call center employee ratio trend in Figure 3, ComEd's ratios of customers per call center employee have fluctuated during the 1995-2006 timeframe, ranging from approximately 6,500 to about 12,500 customers per employee. The use of part-time CSRs to supplement the full-time call center workforce increased dramatically in 1998 and continued into

[9] New Construction Representatives (NCR) that handle customer phone calls for new residential and commercial development are not included in the analysis.
[10] DR-028

2001, and the number of full-time CSRs increased during the same period beginning in 1999, due to implementation and training needs associated with a new customer and billing system. These increases directly resulted in the ratio of customers per employee dropping significantly in 1998 through 2000. Following completion of the transition to the new customer and billing system in 2001, the number of full-time and part-time CSR employees has gradually decreased. As a result, the total number of call center resources available per customer appears to also be on a gradual decrease since 2000. Staffing levels at the call center have been impacted by technological improvements, including the conversion to CIMS (Customer Information Management System), the use of IEX to determine staffing needs based on call volume, Interactive Voice Response (IVR) technology, and Computer Telephony Integration (CTI).

### 4.2.3 Meter Service Employee Ratios

Meter service employees serving Illinois operate out of three operating regions: Chicago Region, North Region, and South Region. As discussed above, the changes in operating regions and the lack of consistent data by operating region for the 1995-2006 timeframe makes it difficult to draw meaningful conclusions when the workforce ratios are calculated by operating region. As a result, the meter service employee ratios are calculated based on the total ComEd customers and metering employees each year. The number of employees represents the end-of-year snapshot of the number of full-time equivalent employees represented by Local 15 in each position.

The Total Meter Service In-house Employees is the sum of the Meter Readers and the Meter Technicians. The Meter Technicians include Energy Technicians and Meter Mechanics. Meter Reading did not use contractors during the study period. Field and Meter Services did not use contractors during the 1995 through September 2006 time period. For the October 2 to December 1, 2006 time period, Field and Meter Services utilized the services of 8-meter technician contractors in Chicago North and 6-meter technician contractors in Chicago South to temporarily assist in performing a discrete function[11]. However, this is not significant enough to include in the ratio analysis.

Since ComEd had no meter service contractor employees during the 1995-2006 timeframe, only the ratios of customers to meter service in-house employees were calculated.

As depicted in the meter service employee ratio trend in Figure 4, ComEd's ratios of customers per meter service employee have steadily increased each year throughout the 1995-2004 timeframe but decreased slightly in the last two years of the study period. Consequently, the number of metering resources available per customer appears to be on a gradual decrease. This trend may be possible because of improved productivity from the use of automation, such

[11] DR-042

as the ITRON meter reading system to optimize routes and mobile data for Energy Technicians in 2001.

## 4.3 Conclusions

ComEd's overall contracting philosophy throughout the 1995-2006 timeframe was to use contractors to supplement its linemen workforce when necessary. Contractors were not used to augment its call center and meter service workforce during the study period.

- The total overall customers per linemen ratio has been fairly level, ranging between 1,400 and 1,600 customers per employee.
- Between 2000, the first year that linemen contractor FTE data was available, and 2006, the use of contract linemen has been continuous and increasing with fewer in-house linemen being used[12].
- ComEd uses part-time CSRs to balance peaks seasonally and during peak times at its call centers.
- The number of full-time CSR employees has gradually decreased and the number of part-time CSR employees has increased, but not by the same percentage. As a result, the total number of call center resources available per customer appears to also be on a gradual decrease since 2000. This reduction was made possible due to advances in technology and other enablers, including voice response technology and customer web access to process requests.
- The number of metering resources available per customer appears to be on a gradual decrease due to the use of new metering technology.

In general, it appears ComEd's staffing levels reflect improved processes, investment in technology and a more efficient workforce. The Company has sought to maintain an adequate workforce in its line organization by balancing a decreasing number of in-house employees with an increasing number of outsourced/contracted employees.

[12] Since 2007, the use of contract linemen has been declining.

# 5.0 Workforce Adequacy Analysis

Jacobs Consultancy assessed the areas specified in the scope of work. For each assessment area, we present our analysis in the form of findings, conclusions, and recommendations, as appropriate.

## 5.1 Operations and Maintenance

### 5.1.1 Background

#### *Operations*

In 1999 ComEd consolidated from 4 regional control centers into a single center. The Operation Control Center (OCC) is responsible for system operation at 138kV (non-power paths), 69kV, 34kV and 12 kV. OCC has two key goals:

1. Operate the system reliably and safely, including high voltage (HV) switching, load monitoring, etc.; and
2. Storm restoration, including system recovery from widespread outages.

The Energy Management System (EMS)/Supervisory Control and Data Acquisition (SCADA) system reaches down to 4 kV, mid circuit switches and circuit reclosers for monitoring and all of ComEd's sub-transmission lines are monitored. The SCADA system is able to control facilities down to 12 kV and certain 4 kV facilities. The Outage Management System (OMS) takes every operated device into account when predicting outage and location and reduces the duration of customer outages by being able to remotely monitor and control distant field equipment. ComEd is implementing a mobile dispatch system that is a Mobile Workforce Management System that combines integrated computer software and Mobile Data Terminals installed in ComEd's field employee vehicles to automate the dispatching of workers to perform certain customer-related work-orders. The mobile dispatch interfaces with other information systems such as OMS, Work Management System (WMS), Tools for Engineering Design - ComEd Geospatial Information System (TED-CEGIS), and Customer Information Management System (CIMS).

The OCC has an interface with the call center through:

- Direct and automated linkages with Customer Information Management System (CIMS)
- Live Customer Service Agent calls
- High Volume Outage Call Answering System (HVCA), which is linked to the OMS for status and estimated time to restore (ETR)

ComEd belongs to Great Lakes Mutual Assistance, a group of 14 utilities and a lengthy list of contractors for supporting outage mutual assistance response. The initiating utility will request a conference call to discuss crew availability, materials and specific needs during emergencies, or in anticipation of emergencies. The responding utility will usually also send supervisors, safety personnel, trucks and mechanics for equipment. ComEd also is a signatory to the Edison Electric Institute (EEI) Restore Power Mutual Assistance Agreement.

## *New Business*

ComEd has a group that is dedicated to new business. The group has two subgroups: System Services Group (SSG) and Design and Build. New business requests are received from large customer requests, existing customers or New Construction Representatives (NCR). The Design and Build group is divided into four sections: Large Project Groups for jobs over 1 Megawatt, Chicago North (Commercial, Industrial & Public Authority work) and Chicago South (Commercial, Industrial & Public Authority), Outside Chicago (Commercial, Industrial & Public Authority) and Residential Design. The Design and Build group has two different types of planners: General Service Representatives (GSR), who are union employees, and Design Construction Consultants, who have an engineering background and are not union employees.

The GSRs do single-phase planning using templates and billing is based off of the work estimate. The underground work is typically sent to SSG which handles the installation, and overhead service wire requests are sent to the First Line Supervisor in C&M for assignment to a crew.

Design Construction Consultants plan 3-phase work, which requires field and map review for design and billing is based off of the estimate. The planned work is sent to Work Management for scheduling of C&M crews.

The work is closed out by the installation group who also performs the Quality Assurance. Estimates are matched with actuals on a yearly basis to modify templates and design information.

## *Maintenance*

To properly assess workforce adequacy, we examined the maintenance function with a focus on maintenance planning/cycles, maintenance accomplishments, backlogs, work effort barriers, field worker adequacy, crew sizes, system inspections, vegetation management, the use of contractors, quality control, distribution system condition and technology enablers.

### *Reliability Initiatives*

ComEd has developed a series of initiatives for implementation in 2008 to support its service reliability strategic goals.[13] These include[14]:

- Executing Preventive Maintenance (PM) programs using Original Equipment Manufacturer (OEM) specifications and industry best practice.
- Executing Corrective Maintenance (CM) programs to repair or replace components identified by PMs as being degraded or otherwise adversely affecting performance.
- Executing System Modifications to improve performance by installing new equipment or enhancing the performance of existing equipment by reviewing outage causes.
- Implementing a distribution automation strategy that incorporates: 1) identification and implementation of distribution automation best practices for programs, processes, and systems and 2) staffing the organization with ownership of end to end lifecycle of distribution automation system (installation, maintenance, performance etc.).
- Executing the 2008 Phase of the Material Condition Improvement Plan, which will focus on:
    - A repeatable documented set of tools, systems, metrics, and processes to evaluate the health of the electric delivery system and its components.
    - A long-term investment strategy based upon major asset classes to support maintaining the material condition of the delivery system.
    - A strategic framework to apply the principles of condition based risk management to both short and long-term material condition decisions.
- Implementing the Equipment Health System modules and interfaces as required, supporting equipment health evaluation. This will allow for the integration of equipment records and synchronization of work order data. This initiative will prevent some equipment failures by having all available conditional data available in a common database, facilitating the analysis of the data to determine if a piece of equipment is trending towards failure.
- Implementing a distribution analysis software package to more accurately assess circuit overload, low voltage conditions and impacts of new customer load with significantly less analysis time than is possible using current methods and data acquisition. Improved

[13] Many of these programs were in place prior to 2008; however, ComEd continues to refine its programs to enhance system reliability.

[14] DR-007

accuracy and optimized system reinforcement programs will reduce capacity expansion investment, O&M and purchased power costs (for distribution energy losses).

- Integrating Distribution System Thermography Analysis with existing Reliability Inspection programs to 1) align maintenance inspection methodologies to optimize circuit reliability improvement, 2) improve analysis and planning of preventive maintenance required to drive reliability, and 3) integrate Thermography corrective maintenance tasks into current prioritization model to improve system reliability improvement.

- Developing a multi-year plan for achieving best-in-class engineering performance, enabling ComEd engineers to become key drivers of major cross-organizational improvements. The focus of the initiative includes the four broad categories of Asset Management, Supply Chain, Technology, and High Performing Organization.

- Defining and developing a training program for designers/engineers that provides the required technical basis to perform their required job functions and meets all ComEd design standards, policies, and procedures.

- Developing a First Line Supervisor (FLS) training program to increase the safety and productivity of the field crews by increasing the effectiveness of the FLS via training on the key work practices. The focus of the 2008 initiative will be to develop training for the incumbent FLS and new hires into the position, focusing on the following disciplines: overhead, underground, substation maintenance, overhead operations and substation operations. For additional discussion of the FLS training, refer to Section 4.2 Safety and Training.

- ComEd's primary preventative maintenance program for distribution lines is the Overhead Circuit Inspection Program[15]. This program is intended to identify conditions on the overhead system that require attention.

- During 2007, which ComEd asserted to be a typical year, ComEd's inspectors inspected 1,152 circuits and recorded 27,043 corrective maintenance[16] items. Of these:

    - 17 were Priority 10,

[15] DR-030

[16] Corrective maintenance items are created to correct system equipment or component conditions that render them incapable of performing their designed function. As a rule, if the specific equipment or component requiring maintenance has degraded or failed, the action required to repair it is classified as a corrective maintenance item. Examples would include: equipment removed from service due to actual or incipient failure or equipment that has the potential for rapidly increasing component degradation, leading to an inability to perform its function. Refer to Section 5.1.2, "Workload & Backlogs" section for more information on the Corrective Maintenance priority descriptions.

- 717 were Priority 20,
- 2,189 were Priority 30 and
- 24,120 were Priority 40.

- Also during 2007, ComEd's inspectors recorded more than 12,000 corrective maintenance work requests for substation facilities and equipment. Work requests are generated when an abnormal condition or equipment failure is discovered in the course of routine surveillance, diagnostic inspections and scheduled maintenance activities. Also included are requests for further investigation or repair of equipment that failed to operate properly.

- ComEd has articulated a series of distribution reliability improvement programs in its 2009-2013 business plan.[17] These programs are intended to prevent outages or reduce the number of customers impacted by an outage and are highlighted in the table and discussion below:

**Table 4 - Distribution Reliability Improvement Programs**

| Programs | Distribution Underground Equipment Faults | Distribution Overhead Equipment Faults | Weather Related Lightning | Tree / Vegetation Related | Intentional Unscheduled | Customer Satisfaction |
|---|---|---|---|---|---|---|
| Distribution Sectionalizing | X | X | X | X | X | X |
| Worst Performing Circuit Program | X | X | X | X | X | X |
| Lightning Protection | | | X | | X | X |
| Vegetation Reliability | | | | X | X | X |
| Mainline Cable Testing and Replacement Programs | X | | | | | X |
| Corrective Maintenance | | X | | | X | X |
| Regional Reliability Programs | | | | | | X |

A summary of each of these programs follows:

- Distribution Sectionalizing – This program is intended to reduce the customer impact during outages through two initiatives:
  - *Mid-Circuit Reclosers* - This program installs automated reclosers on 12 kV distribution circuits near the mid-point of the circuit in terms of the number of customers served. Supervisory control (SCADA) capability is also installed to provide additional reliability benefits. Reclosers re-configure circuits into smaller "sections," which reduces the number of customers affected by a single outage. The program targets circuits with high impact on system SAIFI.

[17] Many of these programs are currently in place and were in place prior to 2008. ComEd plans to continue and improve upon these programs in accordance with its 2009-2013 business plan.

- *Fuse Taps* - This program identifies unfused taps off the main-stem of 12 kV feeders. Fuses will be installed, and thus customer interruptions will be prevented, since a fault in the tap will only blow the fuse, not lockout the entire feeder.

- Worst Performing Circuit Program – The program is a regulatory requirement (IL Admin. Code Section 411.120) to improve the performance of the 1% worst performing circuits in each operating area. The 1% Worst Performing Circuit Program typically consists of 100-120 circuits. Reliability Engineers perform a review of fusing, trimming, recloser application, arrester application, and pole condition. Maintenance Inspectors perform a targeted visual inspection of the circuit that identifies broken equipment, such as cross-arms, poles, insulators, cutouts, blown lightning arresters, and safety hazards.

- Lightning Protection Program – The Lightning Protection Program targets upgrades for lightning protection on 12 kV and 34 kV circuits that have experienced a high number of customer interruptions due to lightning. Circuits chosen for the Lightning Protection Program will be those that offer the highest avoided customer interruptions from receiving a lightning protection upgrade.

- Vegetation Reliability Programs – There are three initiatives aimed at reducing tree-related outages:

  - *Cyclic Tree Trimming Program* (48-month commitment) - The Cyclic Tree Trimming Program is designed to minimize power interruptions and hazards caused by tree branches and other types of vegetation that come in contact with power lines. The intent is to clear limbs, trees, vines, and other plants away from power lines before they have a chance to damage facilities or equipment. There is a mid-cycle program which takes place in the second or halfway mark through the 48-month cycle. This is physically checked in the field for faster growing trees to see if they need trimming.

  - *34kV Trimming Program* - The 34 kV Trimming Program is an inspection and corrective maintenance program designed to help enhance the reliability of the 34 kV system at ComEd.

  - *Hazard / Priority Tree Removal Program* - The Hazard / Priority Tree Removal Program is designed to improve outage performance by identifying and removing trees with a high probability of falling into the conductors. Fast growing tree species are also targeted (i.e. Elm, Maple on specific circuits).

- Mainline Cable Testing and Replacement Program – This program is aimed at reducing distribution underground equipment fault outages by targeting feeders that have experienced two or more mainline failures caused by underground cable or underground

cable accessory failures in a 36-month period. The Mainline Replacement Program targets sections that are approximately 1,200 ft or less and have experienced two or more failures over a 36-month period. The Diagnostic Testing Program targets cable sections not initially meeting the replacement criteria due to length of cable therefore making them test candidates.

- Corrective Maintenance – This program is aimed at reducing distribution overhead equipment fault outages and emergent intentional unscheduled outages. Corrective maintenance is performed to repair or replace components identified as being degraded and that may adversely affect performance of the distribution system.

- Regional Reliability Programs - This program identifies improvements for both SAIFI and customer satisfaction. Regional Reliability Councils will provide ongoing recommendations to resolve areas/devices experiencing repeated outages. Regional Reliability Councils will provide a forum for Engineering, External Affairs, C&M and Operations to develop and track municipal improvement plans.

- URD Cable Replacement -The URD Assess, Treat, and Replace Program proactively treats half loops through a combination of injection and replacements. The program targets bare concentric cable, which was installed between 1966 and 1985 (8,700) miles. Much of ComEd's cable failures cluster around this aging cable.

- Device Outage Frequency Program - This program identifies devices that operated three or more times within a short timeframe (i.e., 3 months). Such devices are fuses, transformers and reclosers. Work may include a variety of actions, such as tree trimming, installing lightning arresters, coordination of tap fuse size and re-spanning or replacing conductors.

- ICC Customer Targeted Program - This program is a regulatory requirement (IL Admin. Code Section 411.140) that requires Illinois utilities to address customers with year-over-year repeated interruptions (see below for criteria):

    - *4 kV and 12 kV Circuits* - This program addresses customers on the 4 kV and 12 kV systems that have experienced more than six outages or more than 18 hours cumulative outage time in a 12-month period for three consecutive years.

    - *34 kV Circuits* - This program addresses customers on the 34 kV system that have experienced more than four outages or more than 12 hours cumulative outage time in a 12-month period for three consecutive years.

- Customer Outage Frequency Program - This program is designed to address customers with a high number of outages over multiple years. The intent of this program is to proactively reduce the number of customers who experience a very high number of outages, for example, blocks of customers on URD that are experiencing high outage

incidents, customers on long overhead feeders with repeated outage exposure, etc. Addressing these customers may decrease the number of customer complaints.

- In the substation area, ComEd has articulated the following initiatives to improve maintenance and operation:
    - Fire Protection Improvements - ComEd substation fire protection improvements consist of the following:
        - Installing Fire Wraps
        - Installing Fire Seals
        - Battery Cable Relocation
        - Installing Fire Detection Systems
        - Developing Site Fire Plans
        - Installing Fire Suppression Systems
    - Substation Transformer Maintenance Templates - The maintenance program includes predictive maintenance including visual inspection, diagnostic testing and maintenance activities. Performance of the PM activities allows problems to be identified, prioritized and addressed prior to major component failure. ComEd is implementing Substation Transformer Maintenance Templates which define the periodicity of the specific maintenance tasks to address Autotransformers and Phase Shifters, which are on a three-year maintenance cycle, and the remaining Power Transformers are on a six-year maintenance cycle.
    - Transmission & Substations (T&S) Bus Inspection / Hardening - The Bus Lock Out plan focuses on buses with high customer counts and leading causes of bus lock outs. The plan evaluates buses with the following performance issues:
        - Circuit Breakers, Power Reclosers, and Relays
        - Other factors for consideration are wildlife protection, insulators and lightning arrestors

## *Operating Efficiency Initiatives*

- ComEd participated in the "Exelon Way" beginning in April of 2003, which was aimed at the integration and centralization of key functions, consolidating and aligning key business areas and standardizing and simplifying key processes. The Company utilized benchmarking and applied appropriate best practices to better align its workforce with core work. The Company was able to "free-up" FTE capacity as a result of these programs, including both in-house craft, clerical and contracted staff, amounting to 1,163

FTEs from 2003 to 2006. A sample listing of the initiatives adopted, as driven by the best practices observed follows:

**Table 5 - Improvement Initiatives[18]**

| Improvement Initiative | Best Practices |
|---|---|
| Common PM programs using RCM and diagnostics to reduce equipment failures | RCM programs and work prioritization |
| Bundle CM and PM, utilize "Fix-It-Now" teams | Asset management model approach |
| Implement mobile data technology | Streamline dispatch and workload |
| Field operations efficiency | Crews do own switching, right-sized, inspections done as part of normal work |

- Exelon Energy Delivery (ComEd's parent company) established a process known as Communities of Practice[19] under the Delivery Peer Group Program, which is intended to drive standardization, identify best practices, and promote teamwork between Exelon's energy delivery companies, ComEd and PECO. There are currently 10 Communities of Practice:

    1. Construction and Maintenance
    2. Distribution Engineering
    3. Distribution System Operations
    4. Emergency Response
    5. Finance
    6. Meter to Market
    7. New Business
    8. Project, Contract & Vegetation Management
    9. Transmission and Substation
    10. First Line Supervisors

- Also under the Delivery Peer Group Program, ComEd and PECO utilize "Forums", an assembly of cross-company, multi-discipline leaders, with the goal of developing

[18] DR-039

[19] DR-107

strategies to improve utility performance. There is currently a Forum in the following areas:

- Customer Satisfaction
- Human Performance/Safety/Environmental
- Smart Grid

- ComEd uses a Quality Circle[20] approach called Performance Improvement (PI) Teams, who follow a structured process that employs techniques drawn from Six Sigma, Lean Process Improvement, and Total Quality Management. PI teams look for "quick-hit" opportunities. An important aspect of these teams is involving employees who understand the day-to-day issues; this leads to defining effective solutions. Examples of PI team studies include:
  - Oil sampling process improvement for the T&S organization – resulted in increased craft worker productivity
  - Underground cable replacement process for the C&M organization, which resulted in increased worker productivity through more efficient use of crew member/worker skills.
  - Demolition Request (where the customer has requested service to be removed to facilitate structure demolition) process improvement for DSO to address customer complaints, improve customer satisfaction and improve productivity. The study resulted in increased automation and improved accuracy and quality of information use in the process.

## 5.1.2 Findings

### *Maintenance Planning*

- ComEd's maintenance initiative descriptions and schedules are described below:
  - Condition Reporting[21] is a foundational building block of ComEd's Corrective Action Program (CAP), which has been in place since 2004. CAP and Condition Reporting are utilized by ComEd's Operations and Operations Support departments including, Construction & Maintenance, Operations Control Center (OCC), Engineering, Customer Operations, Fleet, Supply and Information Technology. At every level of the workforce, employees are encouraged to

[20] DR-108

[21] DR-127

recognize and report opportunities. Condition Reports address a variety of issues, but generally fall into two categories: consequential events (i.e., worker injuries, vehicle accidents, preventable interruptions, significant equipment failures); and precursor conditions, i.e., a condition or behavior that, if uncorrected, could have lead to an incident. ComEd's workforce generates between 5,000 and 6,000 condition reports annually. On October 27, 2008, ComEd implemented a new web-based Condition Reporting IT infrastructure that streamlines the Condition Reporting process as well as enables Human Performance to better trend and analyze potential areas of improvement.

- Inspection and Maintenance Cycles – ComEd has a detailed and comprehensive schedule for major equipment maintenance inspections and servicing. The following table summarizes the overall program for equipment[22]. Details of inspection cycles may be found in Appendix D.

**Table 6 - Inspection and Maintenance Cycles and Scope[23]**

| Equipment | Scope | Calendar Year 2008 Frequency[24] |
|---|---|---|
| Distribution Vaults | Visual, Structural, Sump | 1-3 Years |
| Padmount Transformers | Visual, Security Check | 0.5-5 Years |
| Automatic Throw-over | Calibration Control Cabinet Inspection, Visual, Internal Inspection | 1-2 Years |
| Aerial Conductor | Visual, Thermography | 0.5-4 Years |
| Cutouts & Disconnects | Visual, Thermography | 0.5-4 Years |
| Aerial Gang-Operated Switch | Visual, Thermography | 0.5-4 Years |
| Reclosers (Line) | Visual, Operations Counter Reading | 2 Years |
| Distribution Wood Poles | Visual, Ground Line Detailed, Sound & Bore, Pole Treatment | 2-4 Years and variable |
| Pole-Top Capacitors | Amp Balance Test, Visual, Thermography, Functional Test, Oil Switch Replacement | 1-4 Years |
| Pole-Top Regulators | Visual, Thermography, Functional Test | 6 months - 4 Years |

[22] Information in Table 6 pertains to 2008 only. ComEd continually evaluates inspection and maintenance frequencies so these frequencies may change in the future.

[23] DR-003

[24] The frequency varies based on scope of the maintenance item and its criticality.

| Equipment | Scope | Calendar Year 2008 Frequency[24] |
|---|---|---|
| Cathodic Protection (UG) | Rectifier Inspection, Galvanic Anode Current Reading, Monitor Cable Sheath Voltage, Impressed Current CP System Survey, Reverse Current Switch Inspection, Bondtie Monitoring, Standard C5202 - Pipeline Crossing Monitoring | 1 month - 3 Years |
| Distribution Manhole | Visual | 3-Years |
| Pole-Top Transformer | Visual, Thermography | 6 months - 4 Years |
| Submersible Switches | Visual | 3 Years |
| Distribution Network Protector | Operations Counter Reading, Visual, Maintain Contacts and Arc Chutes, Circuit Breaker, Inspection, Clean & Lubricate, Relay and Mechanism Frame Inspection, Enclosure Inspection, Enclosure Leak Test, Relay Calibration | 1-5 Years |
| Circuit Breaker, Vacuum, 4 - 34 kV | Check Red (Closed) Indicating Lamp, Visual, Thermography, Contact Resistance (Ductor) Test, Hi Pot Test on Vacuum Bottles, Exercise Mechanism, Aux Contact Block Inspection, Cubicle / Cabinet Maintenance, Mechanism Lubrication / Maintenance, Inspect Vacuum Bottles, Check Control Cabinet / Cubicle Heaters | 5 Weeks - 6 Years |
| Circuit Breakers, Air Magnetic, 4-12 kV | Check Red (Closed) Indicating Lamp, Visual, Thermography, Contact Resistance (Ductor) Test Exercise Mechanism, Aux Contact Block Inspection, Cubicle / Cabinet Maintenance, Mechanism Lubrication / Maintenance, Check Control Cabinet / Cubicle Heaters | 5 Weeks - 6 Years |
| Circuit Breaker, Oil, 4-13 kV | Check Breaker Oil Level, Check Red (Closed) Indicating Lamp, Visual, Oil Dielectric Test Thermography, Check Overflow Tank Level, Exercise Mechanism, Mechanism Lubrication, Check Heaters | 5 Weeks - 4 Years |
| Circuit Breaker, Oil, 34 kV and Above | Check Red (Closed) Indicating Lamp, Monitor Compressor Run Time, Visual Inspection Oil Quality Test, Thermography, Profile Breaker Operation, Contact Resistance (Ductor) Test Power Factor Test, Travel Test, Drain Air Receiver Moisture, Compressor Maintenance, Exercise Mechanism, Mechanism Lubrication / Maintenance, Pressurized Vessel Inspection, Relief Valve Replacement, Internal Inspection, Pilot / Control Valve Refurbishment, Mechanism Refurbishment, Check Control Cabinet Heaters, Check of Gauges and Pressure Switches, Functional Alarm Test, Textolite Sleeve Bearing Wear | 5 Weeks - 24 Years |
| Circuit Breaker, Air Blast, 66 kV and Above | Check Red (Closed) Indicating Lamp, Monitor Compressor Run Time, Visual Inspection, Thermography, Contact Resistance (Ductor) Test , Power Factor Test, Timing Test , Drain Air Receiver Moisture, Air Moisture Test, SF6 Moisture Test, Compressor Maintenance, Exercise Mechanism, Internal Inspection, Check control cabinet heaters, Check of Gauges and Pressure Switches, Functional Alarm Test | 5 Weeks - 12 Years |
| Substation | Monitor Phase/Neutral Balance, Visual, Check Control | 5 Weeks - 4 |

| Equipment | Scope | Calendar Year 2008 Frequency[24] |
|---|---|---|
| Capacitor Bank | Cabinet Heaters / Vac. Oil Switch, Thermography | Years |
| Voltage Regulator | Monitor Output Voltage ,Visual, Oil DGA, Oil Quality Test, Thermography, Calibrate Voltage Control | 5 Weeks - 1 Year |
| Switch, Motor Operated | Visual, Thermography, Operate/Inspect/Lubricate, Contact Resistance (Ductor Test), Blade and Hinge Assembly Maintenance, Check Cabinet Heaters | 5 Weeks - 12 Years |
| Reclosers (Substation) | Visual Inspection, Check Contact Erosion Wear Indicator, Inspect Operator Mechanism, Inspect Recloser Control Cabinet, Oil Dielectric Test, Contact Resistance (Ductor) Test, Mechanism Lubrication, Control Battery Replacement, Check Cabinet Heaters, Thermography, Functional Operations Check | 5 Weeks - 3 Years |

- Pole Inspections – ComEd uses a formal two-pronged pole inspection process:
  - For the visual inspection program conducted by line inspectors, the inspectors complete a 24 point inspection covering pole, pole top equipment and crossarms, conductor, clearances, animal protection, guy wires and vegetation. These inspections are conducted on a 4-year cycle for 4 kV and 12 kV circuits and on a 2-year cycle for 34 kV. Pole sounding is not a component of these inspections, nor is a detailed estimate of vegetation encroachment.
  - OSMOSE is contracted to conduct ground-line inspections on about 50,000 poles annually, effectively a 26-year cycle. The results of these inspections are provided in a weekly report, and required corrective maintenance (pole replacements or reinforcements) are entered into PassPort. While ComEd has performed safety audits on OSMOSE crews, they have not conducted quality assurance audits, although OSMOSE has its own inspectors. ComEd is planning to implement a random inspection in the next year.
- Vegetation Management - ComEd uses a Cyclic Trimming Process[25]. The objective is to trim all the trees under and immediately adjacent to the primary conductors and associated neutral or secondary conductors that have the potential to contact the primary conductors within the maintenance cycle. The current preventive maintenance cycle is 48 months[26]. The work is planned and managed through source substation projects (the substation from which the circuits to be trimmed emanate) with the ultimate goal of reducing long-term costs and maintaining system reliability. Clearances are based on conductor

[25] DR-139

[26] DR-005

voltage, construction type and the species, location, structure, and health of the trees. The 2008 distribution trim budget is $48.2 million. ComEd's vegetation management program includes several components:

- **Tree Removal Process** - The goal of this process is to cost effectively remove the most non-compatible trees and brush that are located directly beneath or immediately adjacent to primary conductors. The intent is to maintain or ultimately reduce the required trimming work scope for subsequent cycles. This process includes identification and removal of the most critical hazardous trees that present an immediate safety or reliability threat to ComEd facilities. These trees are often very large and could be located outside of the standard maintenance zone. The trees are prioritized based on voltage, number of phases, tree species, and condition of tree.
- **Herbicide Process** - The objective of this program is to control all non-compatible undesirable vegetation less than 2 inches in diameter at breast height and under 10 feet in height that are located directly beneath or immediately adjacent to all primary conductors. The team's intent is to establish a plant environment consisting of compatible species plants, which will inhibit future growth of non-compatible species.
- **Scheduled Outage Process** - This process provides support for the safe, cost effective implementation of scheduled customer outages, for the purpose of completing distribution preventive and corrective maintenance work scope.
- **Refusal Process** - The vegetation management refusal process provides clear and concise instructions on how to respond to and complete customer refusals in order to maintain circuit integrity.
- **Quality Assurance and Quality Control -** The goal of this process is to ensure that routine maintenance work performed by the Line Clearance Contractor meets the established proper arboricultural and clearance guidelines.
- **Tree Replacement –** ComEd may replace trees on a selective and limited basis to improve customer satisfaction.
- **Mid-cycle Program** – This program takes place in the second or halfway mark through the 48-month cycle, with a physical check in the field for faster growing trees to see if they need trimming.
- **Hot Spotting** - This process is utilized as part of the vegetation management program through regular line inspections and during emergent work. However, the line inspection process only notes tree

limbs in contact with the conduction or extremely heavy vine growth. Reliability engineering also looks at vegetation, but these actions have not been formalized at this time.

- The 48-month mandated trim cycle is in our opinion less efficient than a 4-year cycle since all the circuits emanating from a substation may not be on the same 48-month cycle, necessitating trim crews to return to that substation to complete the other circuits at a later time.

### *Crew Scheduling*

- Category Owners represent seven main work/financial categories[27]:
  - Capacity Expansion
  - Corrective Maintenance
  - Facility Relocation
  - New Business
  - Generation
  - Preventive Maintenance
  - System Performance
- The Category Owners determine the level of support needed from internal resources to support their programs and projects for the following year. The proposed work is separated by Ordinary and Customary (O&C) work, Non-Ordinary and Customary (Non-O&C) work, proposed work location, individual bargaining unit disciplines, and Investment Tracking Numbers (ITN).
- Proposed Non-O&C work is allocated to contractors.
- Proposed O&C work is allocated to internal resources in the C&M, T&S, and SSG organizations until the internal resources by discipline are fully utilized in both straight time and overtime.
- Any proposed O&C work remaining will typically utilize external contracted resources.
- The category owners are responsible for obtaining funding approval and monitoring the overall spending to ensure that the category remains on budget.
- The crews operate out of 31 primary work centers geographically dispersed among the four major regions (South, Chicago, West and North).

[27] DR-008

- ComEd's internal workforce was allocated among the following activities over the 2004 to 2006 period:

**Table 7 - In-house Workforce Project Allocations**

| Category | 2004 | 2005 | 2006 |
|---|---|---|---|
| Capacity Expansion | 3% | 2% | 3% |
| Corrective Maintenance | 49% | 54% | 52% |
| Facility Relocation | 3% | 2% | 2% |
| Generation | 1% | 2% | 1% |
| New Business | 30% | 28% | 29% |
| Preventative Maintenance | 9% | 9% | 8% |
| System Performance | 5% | 4% | 4% |

- Work initiation depends on the category of work:
    - Design – includes system modification, capacity expansion, new business, and work to improve system performance based on reliability stats. Work requests come from the Engineering Department, which enters into PassPort the manpower, type of work, etc.
    - Corrective Maintenance (CM) work – includes repairs from the inspection program. The Inspectors enter information into handhelds that feed into PassPort. Maintenance inspections are on a 2-year cycle for 34 kV circuits and a 4-year cycle for 4 kV and 12 kV circuits no matter how the circuit performs. These inspections are different from reliability engineer inspections, which are based on design changes and the reliability history of the line.
    - Preventative Maintenance (PM) work – includes manhole inspections, substation breaker overhauls, etc. This work is already set-up in PassPort and is auto-generated. The PM work will create CM work orders and work requests are generated for repairs. Distribution PM Results are also reviewed by the reliability engineer. Area maintenance engineers get data from substations and analyze the work results.
    - Facilities Relocates – work comes from the Engineering group as initiated by governmental authorities.
- Slightly less than 50% of the work is contained in the work management system; what is not included comprises:
    - Priority 10 and 20 work assigned to Fix It Now (FIN) teams. These teams were created to protect scheduled work from interruptions
    - Cable fault crews work 25-30 cable faults daily
    - Tally board type items, for example new service orders that reflect small jobs

- There is a work screening committee chaired by the work control coordinator and includes representatives from different groups in operations, engineering, and supply, as needed. The committee reviews the work and validates that it was initiated correctly with correct priority and department.
- Each of the 4 major regions has a Work Management organization that conducts weekly performance meetings on Thursday to discuss how well work has been executed. There are separate meetings for C&M and T&S.
- Job-site reporting is used and crews can travel across regional boundaries. For example, there are 15-20 people currently assigned to a large construction job at a location outside the geographical boundary covered by their normal reporting location – this is viewed as being more cost effective than using a contractor.
- The C&M & T&S work groups have the flexibility to move resources from region-to-region to help restore service after storms or to other areas with a work overload.
- The Overhead Electrician Special (OES), under DSO, are also able to work across regional boundaries during normal working hours. OES are responsible for switching, emergent work, troubleshooting and routine distribution line maintenance. They are the first responders for outages and look for flags or targets and receive the corrective information from the OCC. They will also do capacitor and regulator inspections, which cover preventative maintenance, and will do minor repairs.
- Area operators, also under DSO, are responsible for switching, emergent work, troubleshooting, disconnect, racking out breakers and routine maintenance in the substation system. They are the first responders for outages and look for flags or targets and receive the corrective information from the OCC. They will also do station maintenance, rectifier reading and maintain batteries. The area operators will do inspections which cover preventive maintenance and will try to do minor repairs but if problems are found, will write up work orders.
- Emergent Work Supervisors (EWS) are on-ground leaders in each office who handle emergent work and prioritize its execution. The EWS have first line supervisors (FLS) reporting to them. Each FLS oversees about 4-5 crews.
- Each EWS also has a FIN supervisor and planner to screen and execute the work category Priority 10 and 20 items (high priority).
- FIN supervisors prioritize emergent work in each work center. Twenty percent of their resources are assigned to FIN work. FIN teams consist of all internal employees, and these teams will work on Priority 30 backlog if they're not working on emergent or high priority work.

- Job site delivery started in 2004. There are 30 people dedicated to making deliveries that are scheduled everyday, but they also take calls during the day to complete nonscheduled deliveries. During emergencies, 160-170 bargaining unit employees and SSG employees help with deliveries.
- For normal crew staging and work start at the area offices, materials are palletized on the loading dock. Crews check and load trucks, taking about 15-20 minutes prior to rolling out. Emergent work stock items are in common bins.
- Over the years, ComEd has made changes that have helped to facilitate more effective and productive crew deployment. These include:
    - Emergency response by the closest available resource regardless of company or union affiliation
    - Expanded geographic areas of responsibility for relay, metering, substation and line workers
    - Unrestricted contracting on pole inspections
    - Supply specific storerooms across ComEd's entire territory
- Forestry crews are outsourced and are typically assigned by circuits that are scheduled for vegetation management in the upcoming trim cycle.

### *Use of In-House Crews vs. Contractors*

As a result of arbitrations surrounding the collective bargaining unit at ComEd, there is a distinct difference between the definition of outsourcing and contracting. "Contracting" refers to contractors performing work that is ordinarily and customarily performed by ComEd bargaining unit employees. In most situations in which ComEd uses contractors on ordinary and customary work, ComEd is required to provide employees in the work group involved with the opportunity to work 8 hours of scheduled OT. ComEd's obligation to provide the scheduled overtime when contracting arises from an arbitration award issued by a five member arbitration board chaired by Arbitrator Valtin. "Outsourcing" refers to the use of contractors to perform work that is not ordinarily and customarily performed by ComEd bargaining unit employees.

- Outsourced functions include: cable injection, greenfield (new) substation construction, rebuild large transformers, overhead transmission inspections and manhole inspections, vegetation management and pole test/treat services.
- ComEd's philosophy in the C&M group is to use contractors for a level of baseline work plus fill-in for seasonal requirements and major projects under $100,000.
- Most contracted major projects over $100,000 are handled by the Engineering and Project Management organization. In some cases, New Business, C&M, and T&S

organizations handle contracted projects over $100,000. This work may either be contracted or assigned to internal resources, depending upon the availability during the timeframe needed.

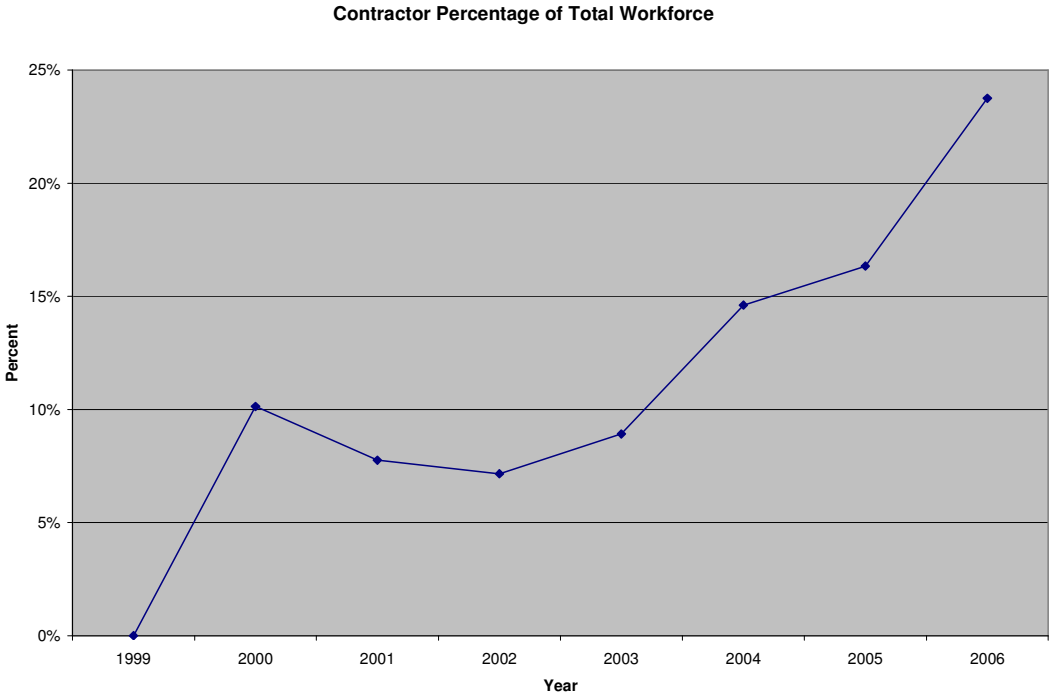
- ComEd conducts analyses periodically to determine if certain functions should be retained in-house or outsourced/contracted. ComEd considers the following factors as part of the analysis: continue to monitor the performance of the subject function, whether performed in-house or outsourced/contracted, and conduct further studies as needed to make appropriate adjustments:
    - Impact on in-house workforce
    - Core competency work
    - Reliability impact
    - Customer benefit
    - Financial cost/benefit
- During the interview process, numerous ComEd management staff stated that recent studies done to compare distribution system construction costs indicated the in-house workforce was more effective, even with overtime costs included.
- In general, for the 1995 to 2006 time period, line construction core business activities were assigned to the ComEd in-house workforce first. Contractor crews were used to shave peaks and/or complete projects of a larger scale, requiring special equipment or skills (such as larger directional boring or excavation equipment, larger cable stringing equipment, concrete conduit encasement, etc.), that would otherwise tie-up ComEd resources for an extended period of time, or that would require extensive travel from one of ComEd's fixed operating centers.
- On both substation construction and overhead line construction projects, work that was handled previously by contractors is increasingly being brought back in-house. This helps to provide in-house employees with more exposure to the overall distribution system, thus allowing them to gain more technical experience.
- Meter maintenance, repair and service work is completed in-house.
- Additionally, certain activities such as pole testing and treating, post construction clean-up (e.g. grounds restoration, leveling, seeding, etc.), distribution line survey work and JULIE locating (outside the City of Chicago) have been outsourced.
- The Substation Maintenance & Relay group has also used a similar philosophy. Activities which do not require the skill sets associated with relay technicians or substation journeyman have been outsourced to contractors. Examples are: foundation construction, fencing repair and installation, grounds maintenance, etc.

- Aside from small local contractors, ComEd has outsourcing/contracting agreements with a number of contractors, in the following areas[28,29]:
    - Distribution construction and maintenance
    - Vegetation:
    - Heavy hauling
    - Electrical testing:
    - Civil underground construction:
    - Wood pole inspection and treatment:
    - Cable injection:
    - Pole delivery
    - Locating:
    - Aerial inspection:
- ComEd has historically used contractors to maintain its field worker complement. Since 1999, the percentage of contract workers has increased from 7% in 2002 to 24% in 2006, which represents a significant increase.

[28] DR-026

[29] DR-061

**Figure 5 - Contractors as a Percentage of Total Field Workforce**




## *Workload and Backlogs*

- Work is identified from field inspections, load analysis, distribution circuit peak demand studies, 4 kV and 12 kV studies, distribution engineering studies, government highway projects, the top 1% worst performing circuits, and deteriorated facilities.
- C&M workload is monitored on a daily basis through means of the C&M Daily Status Report[30]. The data in this report is reviewed daily and is used as a central mechanism for tracking progress among the seven ComEd C&M regions and identifying whether or not the maintenance items are greater than historical targets to ensure the system configuration is not at-risk. The report uses color-coded charts to facilitate management by exception and draw attention to underperforming areas. This information is used during the daily joint ComEd/PECO System Status call for C&M where leadership conducts a high-level discussion regarding the state of the system.
- Critical and non-critical work is scheduled together to ensure a continuous work stream and to assure that all problems on a particular facility are resolved.

[30] DR-121

- ComEd utilizes the following corrective maintenance priority descriptions[31] to plan the urgency of the work requirements[32]:
    - Priority 10 immediate response required work item is worked on a 24/7 basis until complete or until compensatory actions allow downgrading the priority. These items will have direct and immediate impact to CAIDI and SAIFI.
    - Priority 20 work should begin within 24 hours with allowance for work planning and system conditions. This work is targeted to be completed within 14 days. These items will be addressed on normal work hours unless overtime is agreed upon between the appropriate stakeholders. These items will have high probability of affecting CAIDI and SAIFI within 14 days.
    - Priority 30 work is intended to address existing conditions that are considered to have high impact on CAIDI and SAIFI. The risk of impacting CAIDI and SAIFI is such that the work cannot be scheduled as Priority 40. To the extent practical, this work should be scheduled in accordance with the work window or FEG. This work should be completed within 8 weeks.
    - Priority 40 work is based on program timetable or need date not meeting the criteria for priorities 10, 20 or 30 corrective maintenance. An impact on SAIFI/CAIDI would result only if the condition degrades. This work shall be bundled and completed to meet the program timetable and/or need date. Priority 40s shall be scheduled in accordance with the appropriate Work Management processes.
    - Prior to 2007, there were additional priority codes, namely 50, 60, 70 and 80. Starting in 2004/2005, ComEd began to review these items to determine if they should be re-prioritized or dropped. In some cases, these items represented work that is currently done on the spot and not recorded, such as replacing a substation general lighting light bulb. In other cases, these items represented work elements that had been completed as part of other work, but never cleared from the database. The remaining items were re-prioritized as appropriate into higher priority categories, mostly Priority 40. ComEd is still actively involved in this process.

[31] Work priority descriptions pertain to 2008 only. ComEd continually reviews work priorities so these priorities may change in the future.

[32] DR-030

- ComEd's work backlog,[33] defined as items identified for future work[34] and expressed as a percent of total work hours (regular time and overtime), peaked at about 149% in 2005 and declined to about 102% in 2006. As discussed above, this level of "backlog" has included numerous work requests that were either accomplished as part of other work requests or represented items that should have been removed from the database, but were left in. Total hours of backlog dropped from about 5,671,000 in 2005 to about 3,499,000 (a reduction of 38%) by the third quarter of 2008. Nonetheless, this still represents a significant level of backlog.

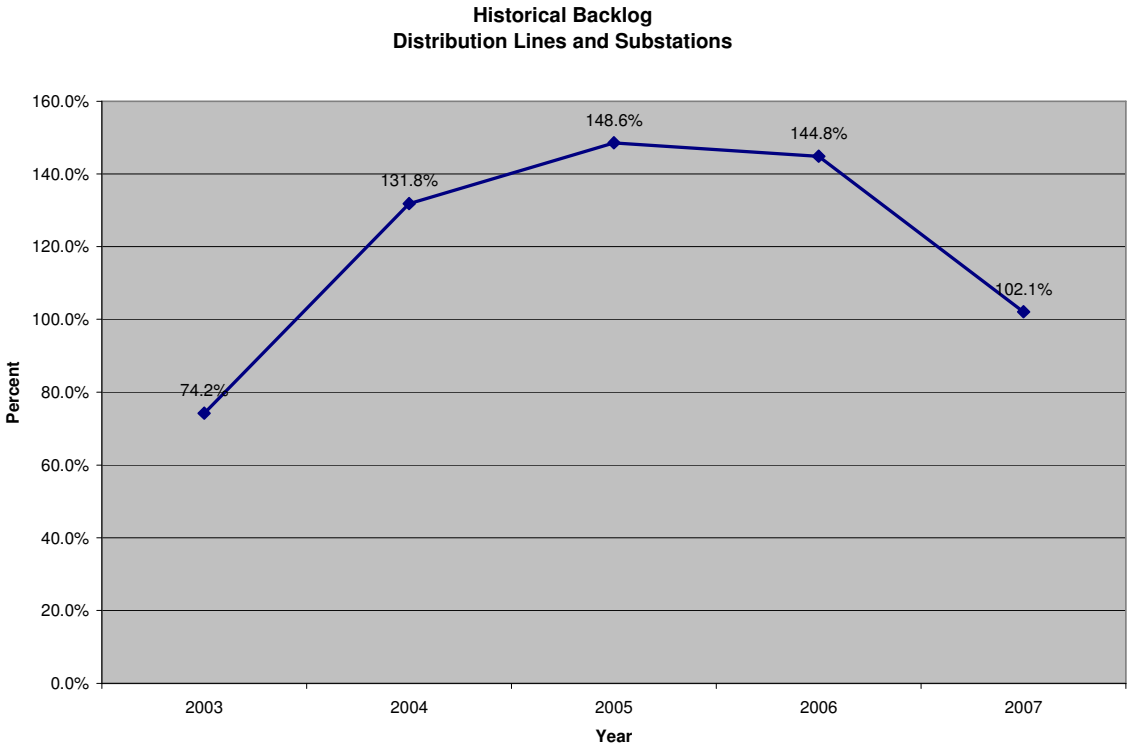
- Distribution line work backlog at 85.9% in 2007, consisted of mostly Priority 30 and 40 items, with the majority in Priority 40, as shown in Figure 7. All Priority 10 items were completed during the year and only 0.2% of Priority 20 items remained at year end.

- As depicted in Figure 8, substation work backlog at 157% in 2007, consisted of primarily Priority 40 items and this classification grew considerably with reclassification of the old Priority 50-80 items. Many of the substation work request items in Priority 40 represent work that requires an outage to be scheduled during which to complete the work. These items will be scheduled to be accomplished during other planned substation work throughout the year.

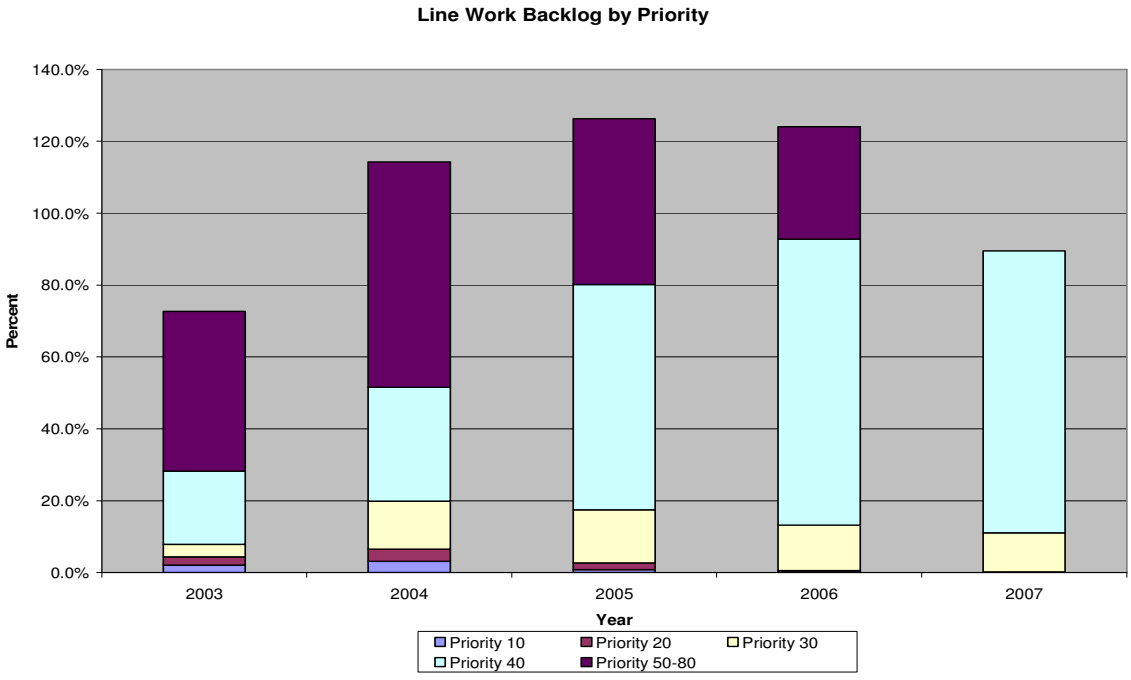
[33] DR – 063 and DR - 064

[34] The presence of an item on the backlog does not necessarily indicate that the work is past-due or has not been completed in a timely fashion.

## Figure 6 - Historical Work Backlog[35]

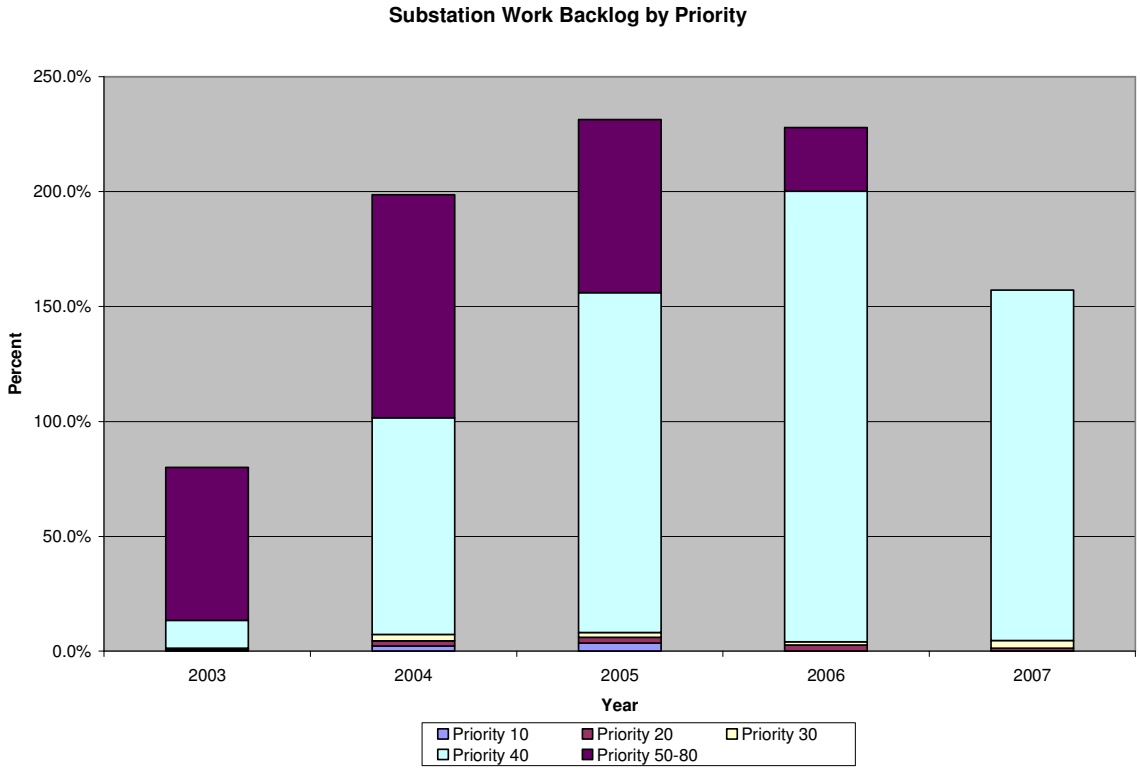



## Figure 7 - Line Work Backlog




[35] Backlog was computed from the hours worked by priority in DR-063 and DR-064 as a percentage of total hours worked in DR-067.

**Figure 8 - Substation Work Backlog**




- The Meter Services group has no historical regulatory backlog and anticipated completing all current regulatory work by December 31.

## *Distribution Organization*

- ComEd's distribution organization is physically and functionally separated into three distinct organizations:
    - Construction & Maintenance (C&M), who have responsibility for all transmission and distribution line construction, maintenance and outage response. Worker classifications include:
        - Crew Leader Underground
        - Cable Splicer
        - Crew Leader Overhead
        - Overhead Electrician
    - Distribution Systems Operation (DSO), who have responsibility for first responder actions for outages, switching for distribution line clearance and substation and

distribution outage restoration and some distribution equipment and substation inspections. Worker classifications include:

- Overhead Electrician Special (OES), also commonly known as troubleshooters or first responders
- Area/Substation Operator (AO)
- Distribution Testing

- Transmission & Substations (T&S), who have responsibility for transmission and distribution substations (along with transmission line and substation construction, maintenance). Worker classifications include:
  - Crew Leader Construction
  - Electrical Mechanic (SSC)
  - Transmission Overhead
  - Transmission Underground
  - T&S Field

- The function of the OES requires close coordination with line crews during outages and is typically aligned with the line crew function in many other utilities.
- Recently, ComEd has experienced difficulty filling the OES position. The difficulty may be attributed to the following factors:
  - OES work a 7-8 week rotating shift to provide 24x7 coverage. While the shift rotation schedule is fixed at the beginning of the year, it was reported that the shift schedule may be modified on the fly to accommodate illness and/or vacations. Some Union members reported that this can be disruptive to the OES and their families.
  - We also heard that in areas with OES openings, OES are working overtime to fulfill the normal shift schedule.
- The function of the AO is to provide distribution switching at the substation for line clearance and restoration. Their other duties include substation inspections and minor maintenance. A group such as this is typically aligned with the substations O&M function in many other utilities.
- The function of Distribution Testing is cable fault locating, sign off on new equipment and PM. In addition, this group will perform equipment testing and in some cases, they will assist or conduct testing on behalf of C&M

### *Staffing*

- ComEd's average attrition rates, excluding internal transfers are within industry averages and are shown in the following tables[36]:

**Table 8 - Workforce Attrition for C&M, DSO and T&S**

| Attrition | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | Total |
|---|---|---|---|---|---|---|---|
| Resignations | 6 | 7 | 13 | 13 | 13 | 7 | 59 |
| Discharges | 3 | 9 | 6 | 6 | 10 | 10 | 44 |
| Death & LTD | 9 | 7 | 7 | 11 | 4 | 3 | 41 |
| Retirements | 70 | 67 | 44 | 59 | 36 | 46 | 322 |
| VSPs | 0 | 64 | 0 | 0 | 0 | 0 | 64 |
| **Total** | **88** | **154** | **70** | **89** | **63** | **66** | **530** |

**Table 9 - Attrition Rate**

| Area | 5 Year Average Attrition Rate |
|---|---|
| C&M | 4.60% |
| DSO | 5.90% |
| T&S | 3.60% |

- ComEd conducts workforce analysis and staffing studies periodically, in which they thoroughly examine staffing needs throughout the organization based on the following assessment areas:
  - Existing Headcount
  - Transfer Activity
  - Attrition Analysis
  - Age Profiles
  - Potential Retirements
  - Tenure Profiles
  - Workforce Diversity
- ComEd identifies the expected source for each job title as to whether it will be filled through internal feeders or through entry level hires or external experienced resources.
- ComEd reports that plans are underway to recruit and hire qualified external candidates to meet the resource requirements for the OES position.

[36] DR-085

- To attract new talent from within ComEd's service territory, the Company and City Colleges of Chicago, formed a partnership in 2006 to provide Chicago residents a new track into ComEd's overhead line worker program. The Dawson Technical Institute[37] Overhead Electrical Line Worker Program provides a line worker craft training curriculum designed to improve skill levels, reduce on-the-job training times and attract a diverse and local employee population. As of August 2008, the Company had hired 29 of the 72 students who graduated from the program.

- In 2006 and 2007, ComEd visited a number of technical schools to recruit line workers. The seven schools that were visited geographically ranged from Georgia to Minnesota. During these visits, ComEd tested and hired students for the Overhead Department.

- Prior to 2006, ComEd typically did not hire externally for its internal line schools. Instead, these schools were filled through internal promotions from Meter Reading, Fleet and SSG. Subsequently, ComEd has increasingly hired from outside as well as from the line schools, and in the June 2008 class, 29% were external hires.

- We summarize the results of the most recent study (2008-2012 projections)[38] in the following table for staffing areas relevant to this adequacy analysis. The table indicates additions for each position. As reflected in the table, the primary source for these positions is the meter reader category.

[37] DR-111

[38] DR-010, Study conducted in 2006

**Table 10 - Workforce Projections**[39]

| Organization | Job Category | Source | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|
| DSO | Area Operator | not specified | 6 | 5 | 10 | 7 |
| | OES | ECOS[40]/External | 4 | 2 | 4 | 5 |
| | **DSO Total** | | **10** | **7** | **14** | **12** |
| C&M | Overhead Electrician | Meter/SSG | 45 | 30 | 30 | 60 |
| | CED Crew Leader | Overhead Electrician/OES | 15 | 15 | 15 | 15 |
| | CED Splicer | Meter/SSG | 20 | 20 | 20 | 20 |
| | Crew Leader-Cable | Splicer | 6 | 6 | 6 | 6 |
| | CED FLS | ECOS/External | 5 | 5 | 5 | 5 |
| | EW Supervisor | ECOS | 1 | 2 | 2 | 0 |
| | **C&M Total** | | **92** | **78** | **78** | **106** |
| SSG | Technicians | Entry/Meter | **48** | **36** | **36** | **36** |
| T&S | Sub. Const. Worker | Meter/SSG | 10 | 10 | 10 | 10 |
| | Sub. Const. Crew Leader | Substation Mechanic | 4 | 4 | 4 | 4 |
| | FLS | ECOS | 1 | 0 | 3 | 6 |
| | Loop Tech Mechanic | Meter/SSG/Substation Mechanic | 0 | 0 | 3 | 3 |
| | Loop Tech FLS | ECOS | 1 | 1 | 2 | 0 |
| | **T&S Total** | | **16** | **15** | **22** | **23** |
| | **Total Additions** | | **166** | **136** | **150** | **177** |

- First Line Supervisors (FLS) are first and foremost recruited from within the ComEd line organizations. In some cases, candidates are transfers from other functions within ComEd and may or may not have prior technical experience. FLS hired from outside the Company typically do not have direct technical experience. Upon a review of 31 recent FLS hires or promotions, we found:
    - 16 FLS (or 52%) came directly from the line organization and had significant direct technical experience.
    - 6 FLS (or 19%) came from other functional areas within ComEd and did not generally have direct technical experience.
    - 9 FLS (or 29%) came from external sources and with the exception of 2 who did not have direct technical experience.

[39] This table is limited to forward year 2011 since some results in DR-010 did not contain figures for year 2012.

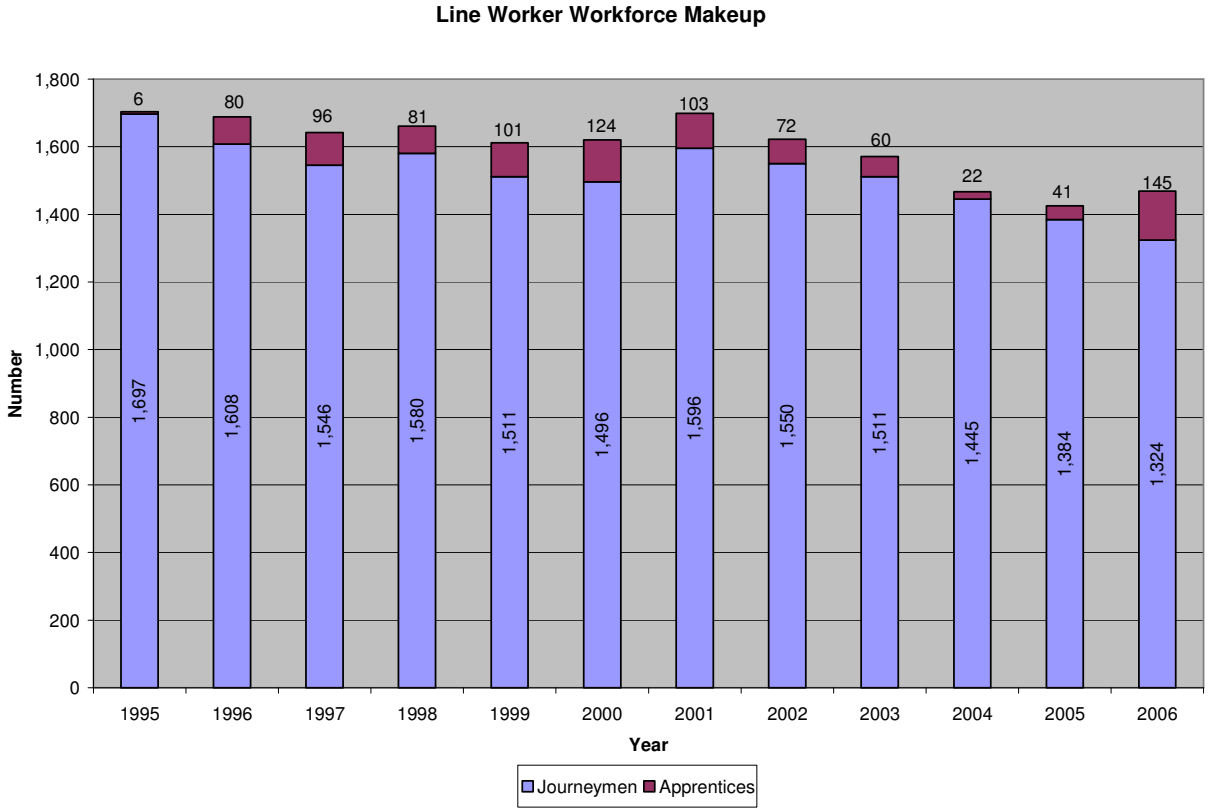
[40] "ECOS" is ComEd's internal resource for employees to view postings for open and available positions. Open and available management positions are posted through ECOS. Bargaining unit positions are posted manually via an e-mail to the Union leadership and bulletin board postings at job sites. For purposes of the Workforce Projections, "ECOS" refers generally to the fact that the position is posted and candidates are sought through the posting process.

- Recognizing the need to enhance the knowledge base of the FLS, the Company has instituted an On-Board/Orientation Process for FLS consisting of orientation, classroom training, on-the-job training, mentoring and in-place learning to provide both technical training for those without direct field experience as well as safety, human resources, and labor relations training. The program requires new FLS to spend field time with an experienced FLS.

## Line workers

- The in-house line worker staff complement, including apprentices, is depicted in the following figure.

**Figure 9 - Line Worker Workforce Makeup**

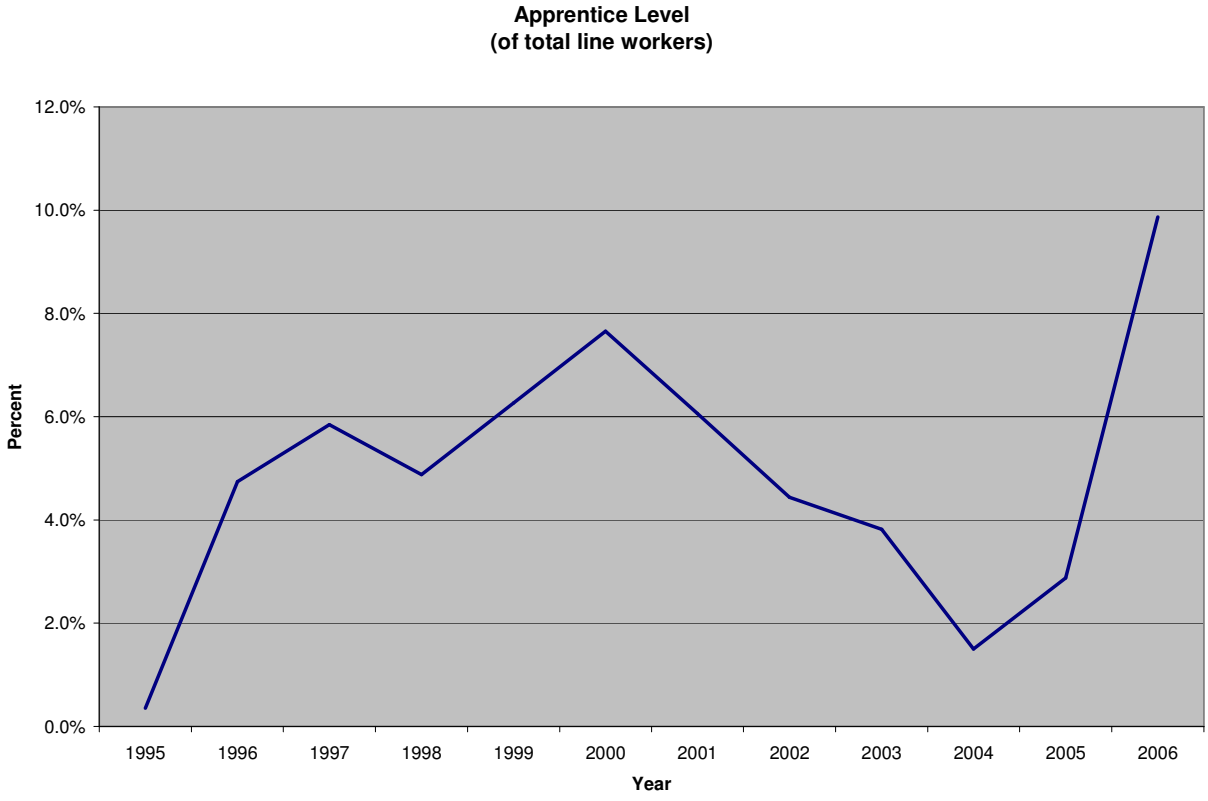



- The staffing level for linemen remained fairly level over the 1995 to 2006 period, with some decreases in the mid 2000s.
- The reduction in employee count from 2003/2004 is attributed to a number of factors:
  - Improved processes and technology
  - Change to 2 person crews from 3 person crews

- Increased job-site reporting
- Increased efficiencies
- Increased use of contractors
- Increased overtime from 21% to 27%

- In October, 2008 the OES position was authorized at 248 while the current staffing level was 226, representing a shortfall of 22 FTE's, or almost 9%. Since the authorized level varies by month, the shortfall could be even greater during peak summer workload periods. The OES staffing shortfall was contributed to by a loss of 21 OES in 2007 due to retirements and other attrition.
- The composition of apprentices has varied somewhat historically, but has averaged between 4% and 5% of the workforce.

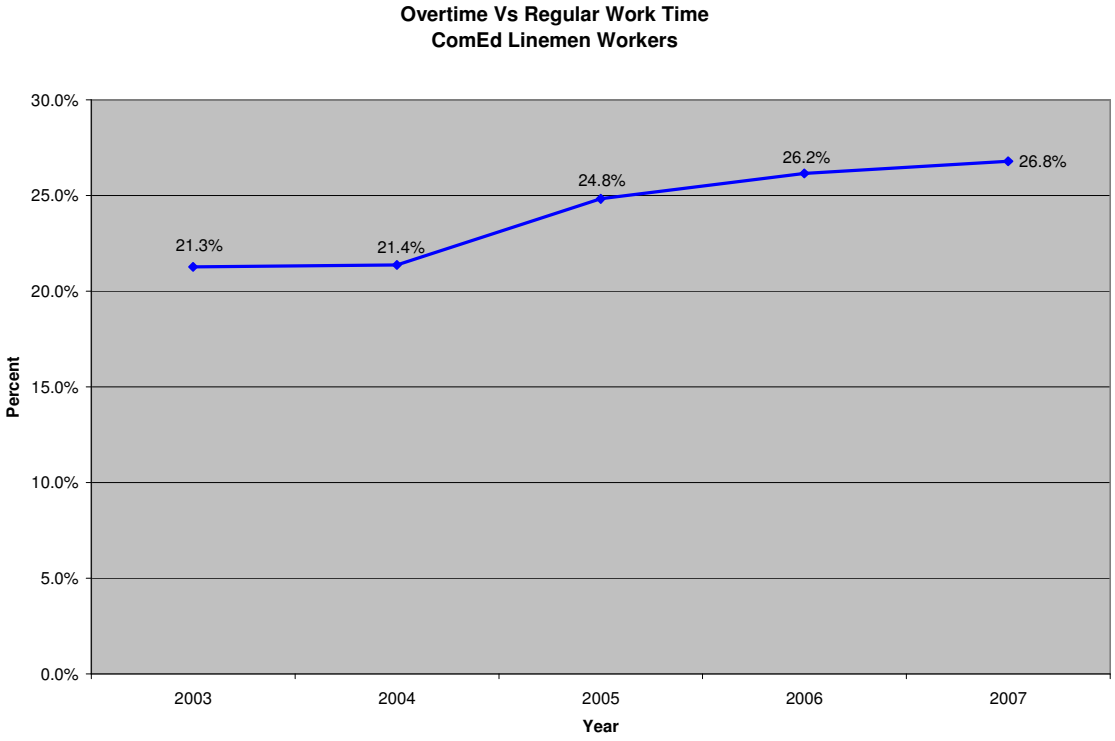
**Figure 10 - Line Worker Apprentice Level**




- Figure 11 shows overtime has steadily increased over the 2003 to 2007 period, reaching 26.8% in 2007. The results described are consistent with figures reported during our interviews and are high compared to industry averages. Overtime in the 15% to 20% range is the typical industry practice.

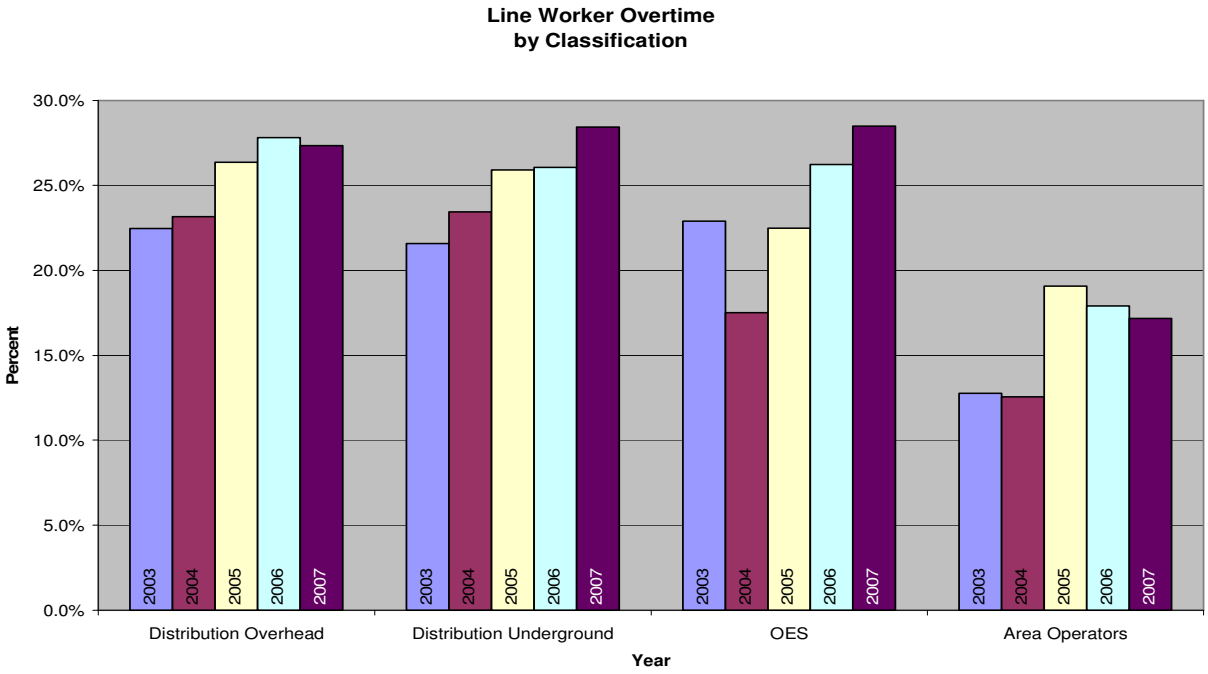
- When assigning overtime, ComEd generally seeks volunteers to satisfy the overtime requirements. If a sufficient number of volunteers are not obtained, ComEd can force employees with the least amount of cumulative overtime to work the overtime. In addition, pursuant to its obligations under the Valtin Award (described in more detail in Appendix C), ComEd also offers "Valtin overtime" that employees are free to decline without consequence.

**Figure 11 - Line Worker Overtime vs. Regular Work Time**



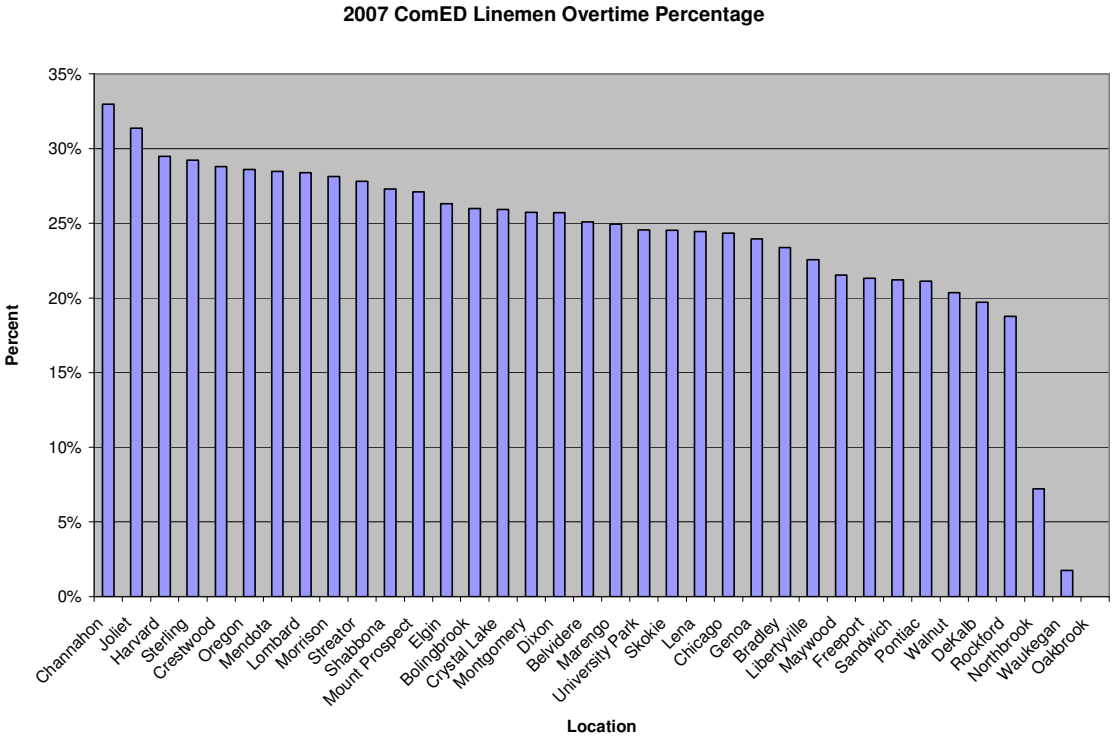

- During our interviews, we heard that overtime for troubleshooters (OES) was "excessively high" and a source of employee dissatisfaction. While the overall level of overtime for the OES group is high, it is similar to the levels of overtime for overhead and underground line workers. However, the level of overtime for the OES classification has increased rapidly from 2004, as depicted in the following chart.

**Figure 12 - Line Worker Overtime by Classification**



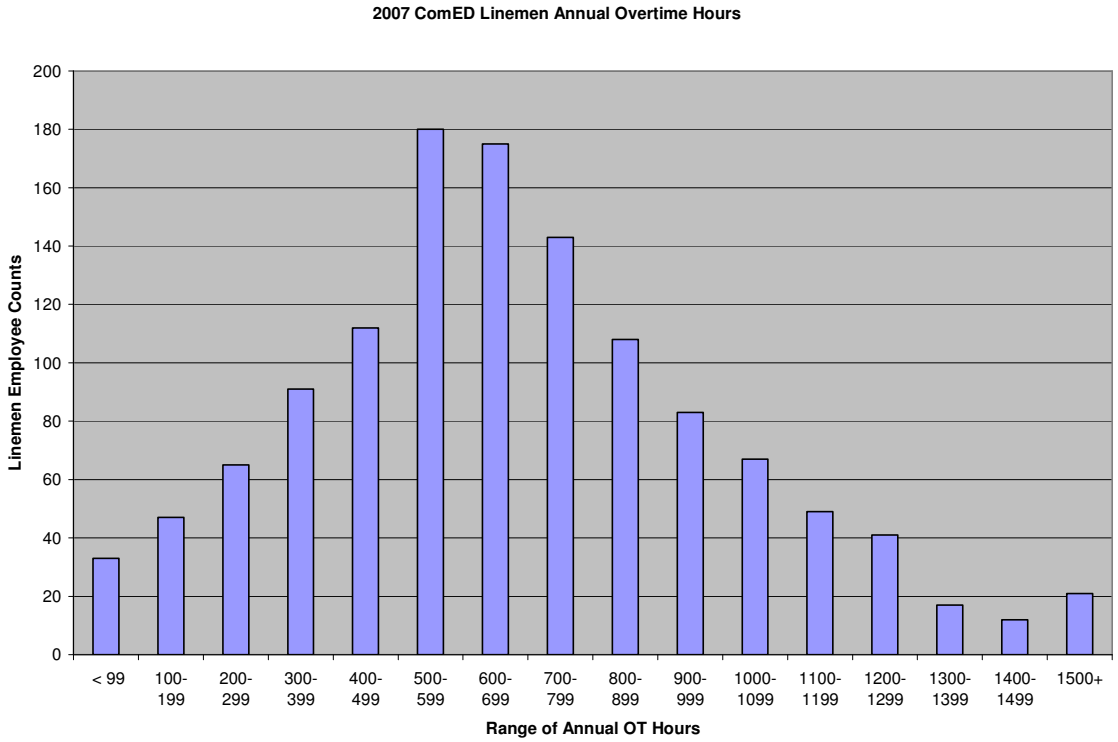

- Overtime varies among work locations, as depicted in the following figure. Figure 13 shows that over 50% of the Area Offices work over 25% overtime and that 2 locations work in excess of 30%.

**Figure 13 - Linemen Overtime by Location**



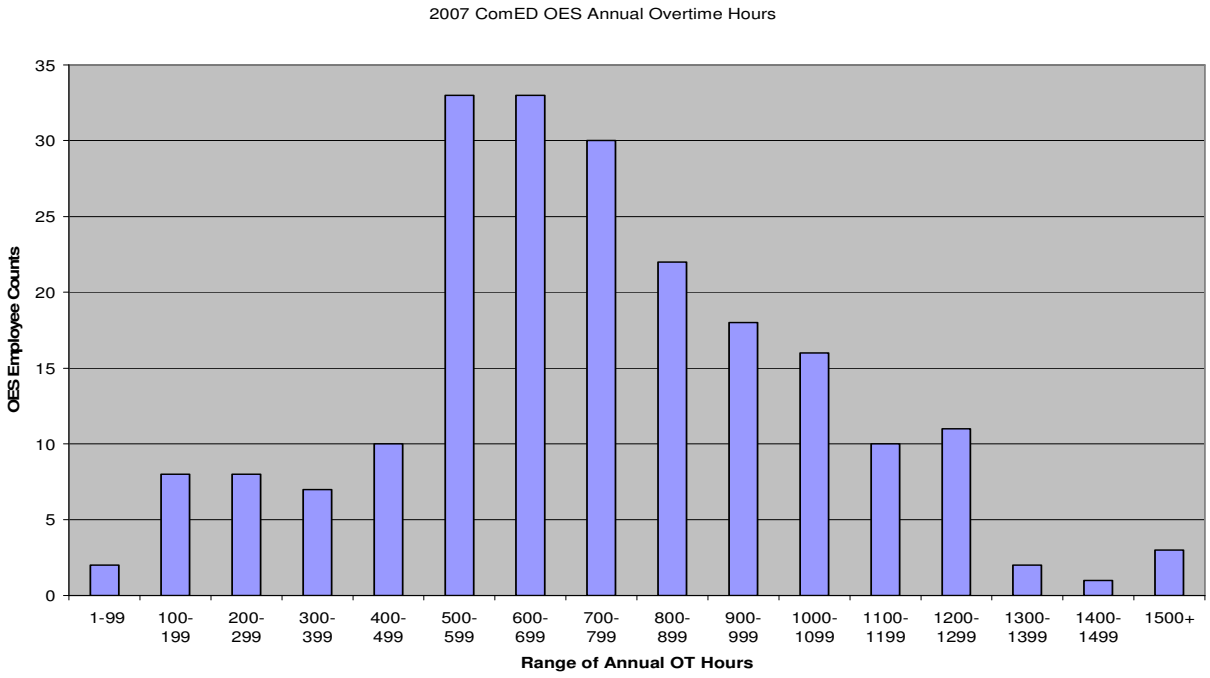

- During the interview process, we heard that significant amounts of overtime were commonplace, in some instances amounting to in excess of 1000 hours of overtime worked annually. While the level of overtime is high, it is clustered in the range of 500-800 annual hours of overtime, which is equivalent to an overtime rate of 28% to 44%, based on base work hours of about 1,800 hours.

**Figure 14 - Linemen Range of Annual Overtime Hours**



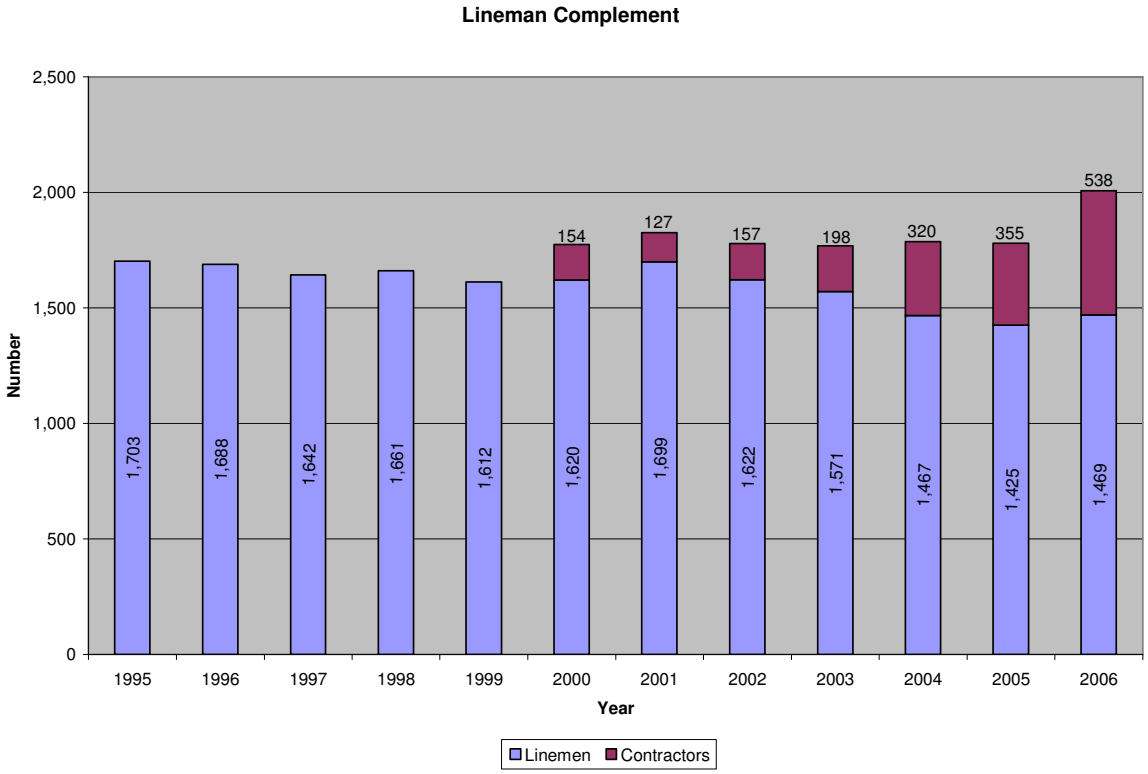

- As shown below, OES are, on average, working a higher level of overtime than linemen.

**Figure 15 - OES Range of Annual Overtime Hours**



- Overtime for ComEd crews has remained consistently high and the use of contractors has increased significantly, indicating that the level of workload may be increasing such that the Company should consider augmenting its workforce consistent with ComEd's work plan.

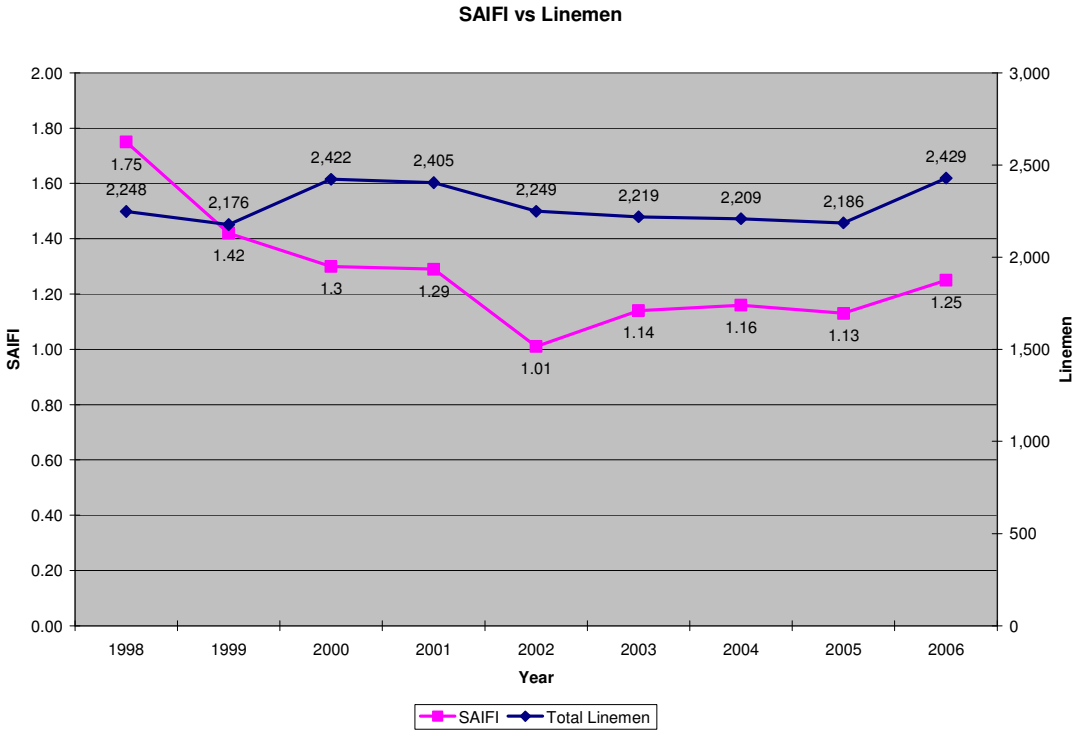
**Figure 16 - Linemen In-house vs. Contractor Complement**



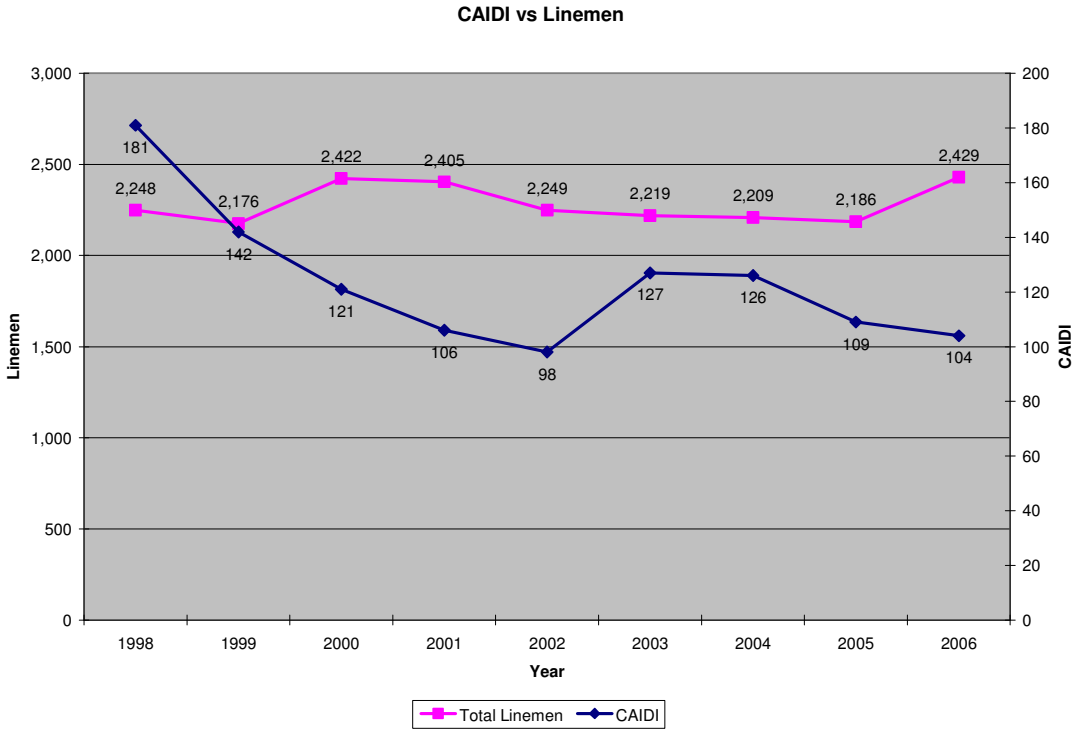

- ComEd has stated that it utilizes its system performance in terms of reliability and other indices to determine areas of focus. In the following two figures, we show the relationships between staff level changes (journeymen, apprentices and contract workers) and changes in reliability for System Average Interruption Frequency Index (SAIFI) and Customer Average Interruption Duration Index (CAIDI)[41].

[41] SAIFI and CAIDI represent all sustained outages (IEEE definition excluding major events)

## Figure 17 - SAIFI vs. Linemen




## Figure 18 - CAIDI vs. Linemen



- As depicted in the preceding figures, the number of linemen (journeymen, apprentices and contract workers) has been remained essentially level with an 11% increase in 2006. In terms of commonly used electric industry measures, SAIFI has consistently improved, and was at a level of 1.25 annual interruptions per customer in 2006. CAIDI has also consistently improved to 104 minutes for 2006. SAIFI and CAIDI are both better than the second quartile of peer group performance (excellent performance). ComEd's 2008 reliability goals are 1.21 annual interruptions and 95 minutes for duration.

- Another set of measures used by ComEd to validate its overall service level includes customer satisfaction surveys. Overall customer satisfaction survey results are reported in the Call Center section of this report. With regard to reliability, the ICC mandates that the Utility provide a survey that captures customer sentiment toward their satisfaction with ComEd's level of "providing electric service." We have reproduced the results from this survey in the following table for 2000 through 2006.

**Table 11 - ICC Mandated Customer Reliability and Satisfaction Study[42]**
**Overall Satisfaction with "Providing Electric Service"**
**0-10 scale, total satisfied scores = 6-10**

| Year | Residential | Non-Residential |
|---|---|---|
| 2000 | 7.63 | 7.67 |
| 2001 | 8.00 | 7.98 |
| 2002 | 8.19 | 8.10 |
| 2003 | 8.20 | 8.39 |
| 2004 | 8.47 | 8.56 |
| 2005 | 8.39 | 8.65 |
| 2006 | 8.27 | 8.41 |

0-10 scale, mean scores

**Substation Workers**

- ComEd's substation workforce count has declined by 39%, from 625 in 1995 to 383 in 2006. There were several factors that contributed to this reduction:

    - T&S had a large program of work in the mid 90's to install SCADA in every substation. This work took approximately 30 FTE's to support this program over the years. The program is now complete.

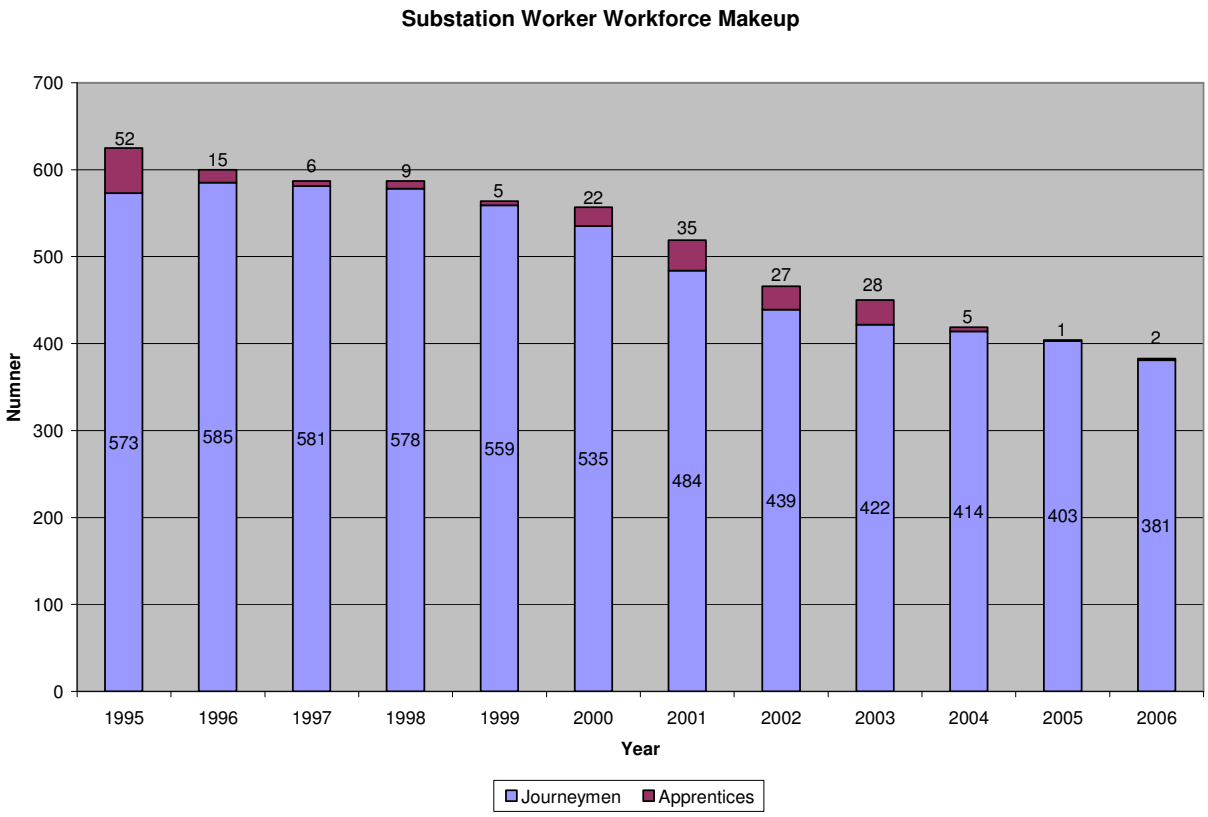
    - T&S supported nuclear outages and still does. In the 90's and early 2000, outages used to last 4-6 months. Today's outages last 15-20 days. Additionally, the substation maintenance group was utilized for large projects internal to the stations when resource requirements were in lower demand cycles.

[42] DR-023 Attachment 9 pages 10 and 52

- T&S had a significant infrastructure enhancement in the City of Chicago in early 2000's that had significant remote end work. Substation maintenance group supported this work but now the program is complete.
- ComEd divested 8 fossil plants in 1999 that resulted in T&S work over the next five years to fully separate the previously integrated systems. Previous to the divestiture, Substation maintenance group supported large project/construction work at the fossil plants during lower cyclic periods of demand.
- A work management system was incorporated bundling CMs and PMs to a defined outage. This led to productivity improvements eliminating mobilization and demobilization time. The bundling of oil samples into regional cycle plans also increased productivity of a low hour/high quantity task that previously resulted in multiple visits and high travel times.
- A new preventative maintenance program has been put in place with increased emphasis on diagnostics. It also incorporates new requirements based on technology advancements in regard to gas and vacuum breakers, which require far less maintenance.
- T&S has also negotiated new labor agreements to better utilize its work force (i.e. one-person job assignments).
- Heavy Hauling used to be inside of the T&S organization and it has been transitioned to the Supply organization.
- Exelon's decommissioning of the Zion Nuclear Station resulting in a decrease in work scope.
- Re-assignment of some general maintenance inspection work to the Area Operators in the Distribution System Operations group.

- The Company has run a number of apprentice classes over the 1995-2006 time period, adding 207 apprentices, or about 17 per year on average, but has only added 3 apprentices during 2005 and 2006.

**Figure 19 - Substation Worker Workforce Makeup**

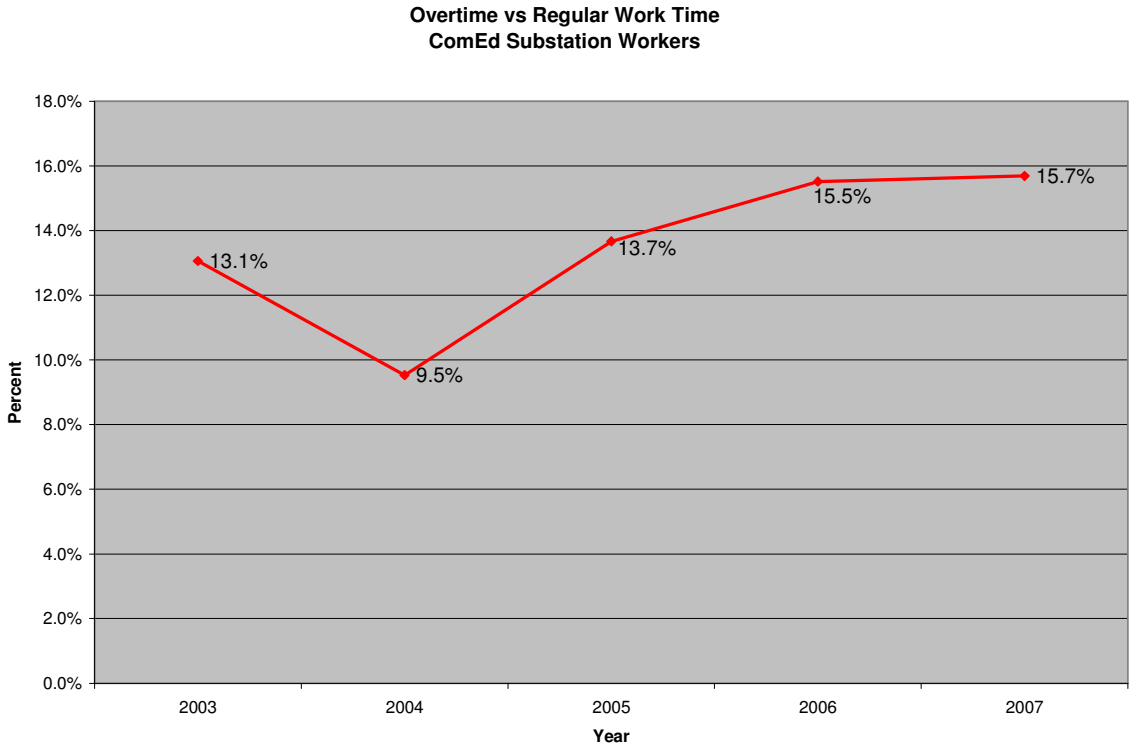



- The Company has not historically utilized significant levels of contract services, except in cases where fast-track or specialized projects were better served with contracting. For example, the SCADA system implementation and expansion during 2000/2001.

**Figure 20 - Substation In-house vs. Contractor Complement**


- ComEd has recently begun to actively take back contractor work in substation construction.
- The level of substation worker overtime has increased slightly since 2003, reaching 15.7% in 2007.
- Baseline overtime is planned as part of the budget process.

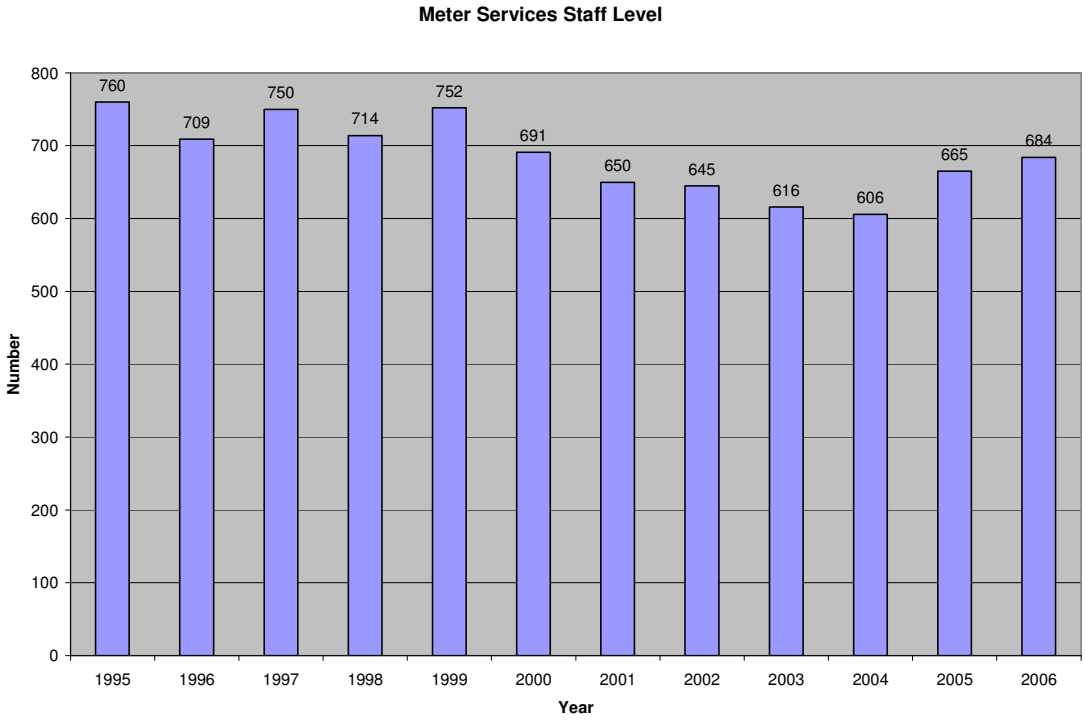
**Figure 21 - Substation Overtime vs. Regular Work Time**




## Meter Service Workers

- The Meter Services staff complement was fairly level over the 1996 to 2006 period, but dipped somewhat over the 2000-2004 period.
- Meter Services does not make use of contractors.
- Meter Services is able to complete its work plan, which includes regulatory required work, by the end of each year.

**Figure 22 - Meter Services Complement**




## *Technology Enablers*[43]

- ***Work Management System*** (WMS) is an off-the-shelf information technology solution that replaces numerous individual technologies with a single platform to improve the integration of work functions and therefore the management of end-to-end business processes. WMS supports various applications that support ComEd work activities including purchasing, inventory management, field work by crews including minor maintenance and major construction tracking, work commitments to external agencies, tracking major internal initiatives, accounts payable, labor entry and reporting, project management, design engineering and contract management. The WMS applications include PassPort Action Tracking, PassPort Work Management, Design Engineering and Document Management. Additional functionality is provided with integration to other ComEd systems including the Customer Information Management System (CIMS), ComEd Business Management Systems (PeopleSoft Financials and Human Resources Management), and ComEd's Scheduling Tool (Artemis Project View). The WMS system is closely integrated with vendor software PassPort Supply and Accounts Payable module.

- ***Mobile Dispatch*** is the Mobile Workforce Management System that combines integrated computer software and Mobile Data Terminals installed in ComEd's field

[43] DR-024

employee vehicles to automate the dispatching of workers to perform certain customer-related work orders. Furthermore, Mobile Dispatch interfaces with other information systems such as OMS, Work Management System, TED-CEGIS and CIMS (Customer Information Management System). Key Mobile Dispatch features include electronic up-to-date maps, real-time dispatch of trouble tickets and outage calls, access to PassPort Work Order Packages, timesheets, improved response time, GPS/directions/navigation system, and shorter outage durations. In May, 2008 ComEd installed MDTs in trucks for OES, Area Operators, and Maintenance Inspectors are currently training the T&S section and C&M began training in October 2008.

- ***SCADA*** (Supervisor Control and Data Acquisition) systems enable both remote monitoring and recording of the status and condition of devices critical to the Transmission and Distribution system, and remote operation of devices allowing for rapid corrective action to system anomalies. By utilizing the SCADA system, ComEd is able to reduce the duration of customer outages by being able to remotely monitor and control distant field equipment. The ComEd SCADA system also contains features that allow the users to study the Transmission System to ensure it is functioning in its optimal state based on the current system configuration and study potential future states of the system. The current SCADA system, ABB Network Manager System version 2003, has been in service since 2005. The application runs on redundant application and database servers at ComEd's Corporate Computer Center. This configuration allows for full system fail-over automatically in the event of hardware failure. In addition, a fully replicated disaster recovery site is located at an alternate ComEd facility. This site would be activated in the event of the need to shut down operations from the corporate computer datacenter.

- ***GIS*** the TED-CEGIS Application (Tools for Engineering Design - ComEd Geospatial Information System), is a combination of the General Electric Smallworld Design Manager and Core Spatial Technology software packages versions 4.1, and several other third party add on software packages. The GE Smallworld software belongs to an application class known as geospatial information systems, providing geographical representation of the assets, computer aided design functionality connectivity/traceability of utility network, and version control management of the engineering designs throughout the project lifecycle. The later function enables both the "as-is" and "to-be" configuration of assets to be viewed. TED-CEGIS is utilized to design/engineer the distribution system in the ComEd service territory, both new service and reliability enhancements for existing circuits. As such, it is the data source of distribution system assets, electrical connectivity and asset location, for other information technology applications such as the Outage Management System (OMS), Customer Information Management System (CIMS), and Asset and Work Management (PassPort). Also, TED-CEGIS functionality enables the creation of maps and drawings used by operating groups within ComEd. The application has been in release based maintenance mode since the late 1990's. The TED functionality GE Design Manager was added in 2002,

significantly reducing the cost of creating operating maps. Upgrade to the most current GE Smallworld 4.1 versions was completed in 2007.

- ***OMS*** (Outage Management System) is utilized to: improve employee and public safety by reducing the reliance on paper maps; track the current operating condition of the distribution electrical grid; enable ComEd to meet customer needs for outage related information by relaying location data; provide more accurate estimated restoration times; predict outage locations; and facilitate crew dispatch and management. Due to the above efficiencies resulting in reduced outage times, OMS' are becoming the standard information system in use in the industry. The OMS utilized by ComEd is ABB Network Manager Distribution Management System (NM-DMS) version 2004.2.6. The system has been in release based maintenance mode since August 2006. The application runs on redundant application and database servers at ComEd corporate computer datacenter. This configuration allows for full system fail-over automatically in the event of hardware failure. In addition, a fully replicated disaster recovery site would be activated in the case of need to shut down operations from the corporate computer datacenter. In May of 2007, ComEd also installed a Quality Assurance System to allow for full functional and diagnostic testing of any component or operating system modifications or enhancements. The Operation Command Center (OCC) is the main user of the OMS. Operations Dispatchers and Load Dispatchers utilize the system to dispatch and manage the flow of crews and system load in response to daily operations for planned and emergency maintenance. The OMS allows for geographical representation of the network. The system displays the "as operated" status of the network (abnormal devices, tags, outages, crew information, etc.). This allows the Operations Dispatchers to perform operations and analysis of the system as is and allows for switching and operations routines to be developed. The Network Display provides geographic and schematic views, land base data, device states, and outage and trouble call information. During storm and emergency operations, in addition to operations dispatchers at the OCC, the Emergency Preparedness group deploys up to 36 secondary service dispatchers to regional storm centers located in Libertyville, Rockford, Chicago South, and Crestwood. These sites and dispatchers utilize versions of the OMS that is specifically designed for these storm centers.

- ***ARCOS***[44] (Automated Roster Callout System) is used to expedite the callout process and improve callout rates. Prior to the system implementation, callout rates were in the 8% to15% response range, which was inadequate for the Company to properly respond to system issues and outages. Following implementation and modifications of ARCOS and the callout expectations, the system and process produced a callout response rate of 25% to 35%, where it remains today. ARCOS is utilized at a number of utilities, including Kansas Power & Light, Dominion Virginia Electric Power, and Xcel Energy, Inc. The callout expectation process at ComEd is viewed negatively by the workforce

[44] DR-080

primarily because it is possible for an employee to work high levels of overtime and after missing/declining call-outs above the defined threshold, be subject to discipline. The Company has responded by modifying the parameters of the callout expectations and the circumstances in which employees will be charged with declined callouts in an effort to resolve issues.

- ComEd also depends on a collection of other information systems to assist in efficiently operating the business. These include:
    - Call Center Systems (please see descriptions under the Call Center section of this report)
    - Condition-based Asset Management
    - PeopleSoft EPS Financials
    - Learning Management System (LMS)
    - Payroll/Human Resources/Time & Labor (HRPC)
    - NERC Compliance Systems
    - Feeder Lockout System
    - Storm Restoration System
    - Switching Request System
    - Legislative Dashboard
    - Weather Forecasting Systems
    - Various IT Infrastructure Systems for telephony, data, email, etc.
- The EMS/SCADA system's reach is down to 12 kV for monitoring and control. This allows the Outage Management System to rapidly group related outage calls to the device that has operated and speeds the restoration process, as well as provide relevant information back to the call center system(s).

## 5.1.3 Conclusions

### *Operations*

ComEd employs a state-of-the-art control center to monitor and control the sub- transmission and distribution system. The Utility's SCADA reaches down to the 4 kV system for monitoring and SCADA has control capabilities down to 12 kV and certain 4 kV facilities. SCADA interfaces directly with the OMS for feeder outage notification and geographical display of outages.

### *Maintenance*

ComEd has a robust maintenance planning function that meets or exceeds industry norms. The maintenance planning function specifies depth and frequency of line and substation inspections, NESC code compliance, switching and control equipment maintenance intervals. The Company's maintenance planning function makes use of triggering mechanisms to identify required remedial maintenance work. These triggering mechanisms include reliability performance and component operating trends. For example, the 1% worst performing circuits are identified for remediation on an annual basis, device performance degradation and underground cable replacement needs.

### *Staffing*

ComEd has recognized that its workforce is aging and has recently made efforts to increase its journeyman levels, to attract and retain apprentices to replace retirees and other workforce decreases by conducting its Staffing Plans[45].

The Company has stated that studies done to compare distribution system construction costs indicated the in-house workforce was more effective than contracted resources, even with overtime costs included.

ComEd states that its policy is to maintain an overall level of in-house employees that is needed to perform core base load work, supplementing in-house employee efforts with contractors for workload peaks and valleys, large projects, and lower-skilled and specialized work. However, the penetration of contractor FTEs increased significantly from 2000 to 2006, and in 2006 accounted for approximately 24% of the total line and substation workforce.

The staffing level for linemen remained fairly level over the 1995 to 2001 period, and has shown a marked decrease from 2001 to 2006. The Company has relied increasingly on contractors, which made up nearly 27% of the line workforce in 2006.

The Company's key field operating forces are working relatively high levels of overtime, reaching 26.8% in 2007. This rate is high in comparison with industry averages.

Overtime for the OES position has steadily increased in the last several years, reaching levels similar to those for linemen. However, due to the difficulty in filling open OES positions, OES in some areas are working overtime to fill shifts, in addition to the overtime worked for a callout. As a result, some individuals perceive the OES overtime as more burdensome and potentially having a greater negative impact on lifestyle. Historically a steady source of OES in the

[45] DR-010

suburbs came from lateral moves from the Chicago area or through promotions from the Overhead Electrician ranks; however, postings for OES vacancies throughout the Company have had few bids. Generally in this industry, OES or Troubleshooters would come from the linemen ranks. However, due to separate organizations between linemen and OES and the level of workload among linemen, this source does not appear to be viable at this time in ComEd.

ComEd's substation workforce level, including apprentices, has declined significantly from 625 in 1995 to 383 in 2006. ComEd has not made substantial use of contractors for substation work, except for major construction projects.

The meter services staff complement was fairly level over the 1996 to 2006 period, but dipped somewhat over the 2000-2004 period.

Line supervisors spend the majority of their day in the service center handling scheduling and other paperwork. They spend the balance of an average day in the field, primarily conducting safety audits and project quality inspections.

### *Work Scheduling and Backlog*

ComEd conducts a series of meetings each month to address workload requirements and to balance the workload across crews and define the level of contractor involvement that is required. These meetings include: weekly workload planning, monthly meetings to review project requirements and timing, and monthly meetings to balance the workload among in-house crews and contractors. There is very little Priority 10 or 20 backlog and the bulk of the backlog is comprised of Priority 40 items. Backlog overall stands at about 100% of the annual work hours normally applied in that area but ComEd is still in the process of combing the database to eliminate items that should no longer be classified in the system as outstanding.

### *Technology Enablers*

ComEd has a robust set of integrated applications that serve to support the maintenance, dispatch and operations functions. ComEd continues to expand and integrate functionality to leverage information technology to enhance productivity and effectiveness. For example, ComEd is actively expanding the implementation of MDTs for the line crews to enhance their communications and productivity potential.

### 5.1.4 Recommendations

5.1.1 Consistent with its Staffing Plans for 2008 through 2012, ComEd should continue to aggressively increase its electric field workforce, consistent with its business needs and the overall economic climate.

5.1.2 ComEd should strive to reduce high levels of overtime in the near term by balancing in-house work across department silos, supplemented as needed with contracted resources.

5.1.3 ComEd should immediately undertake an in-depth study to identify the appropriate level of OES resources, determine their organizational alignment, and analyze the difficulties currently being encountered in attracting candidates.

## 5.2 Training and Safety

### 5.2.1 Background

The training and safety function is an essential human resource support component of any business. Working safely means the workers leave the workplace in the same condition as when the workday began, while training refers to the acquisition of knowledge, skills and competencies resulting from teaching. In the electric distribution industry, training forms the core of apprenticeships and provides the backbone for technical education. Apprentice programs supply the training for the initial qualifications, while refresher training provides the opportunity for continued technical development. At ComEd, electric technical training consists of a combination of both training in the classroom and on the job.

The quality and effectiveness of the training and safety function is one of the most enduring sources of a sustainable, competitive advantage for companies today. Without a well-trained and safe workforce, it would be difficult for any utility to attract new employees, maintain satisfied customers and develop supportive shareholders. Thus, an organization gains a competitive advantage amongst its key stakeholders by encouraging and creating a safe environment and by training its people, allowing them to use their expertise and ingenuity to meet clearly defined objectives.

### 5.2.2 Findings

#### *Training*

- ComEd technical training is performed at five Illinois training facilities. Four training facilities, located in Melrose Park, Joliet, Lombard (Glenbard), and Rockford, are used to instruct and demonstrate field crew and operator related skills. While the fifth training

center, located in Oak Brook, is used primarily to train customer service representatives (call-center) and meter services employees.

- The Rockford training facility reopened in 2007 to accommodate an increasing number of line school trainees. The training center consists of classrooms for instruction and an outdoor yard where training and demonstration of various line department activities takes place. Currently, ComEd is evaluating the need to build a new training facility at Rockford[46].

- The Oak Brook Commercial training center is used for customer operations related training and includes such programs as: residential and non-residential billing, revenue management, Customer Information Management System (CIMS), small commercial account instruction, single phase meter, three phase meter, and meter reading. In addition, other training at the facility includes specific system application training such as: Artemis 7, PassPort, Mobile Dispatch and Tool for Engineering Design.

- ComEd technical training is a responsibility of the Training Director. This position is a direct report to the Vice President of Strategic and Support Services. Each field crew and operator training center has a manager and permanent instructor staff. All trainers have an extensive background in electric power distribution operations.

- In addition, bargaining unit employees are an integral part of the training effort and act as demonstrators to provide training in both the classroom and the pole yard. These demonstrator-trainers are selected based on qualifications as opposed to seniority. This helps assure that they are skilled in current technical requirements, as well as being able to effectively deliver the training.

- ComEd reports that the 2008 training budget for Construction and Maintenance, Transmission and Substations, Distribution System Operations, and Customer Operations will total over $6.1 million. Within the overall training budget, the largest amount, $2.5 million, is for Construction and Maintenance related training[47].

- The major training activities, which support the main operating groups occur, in the four field crew and operator training centers and are summarized in Table 12. Types of training conducted at these facilities include: classroom, hands-on demonstration and practice exercises.

[46] DR-094

[47] DR-014

**Table 12 - Major Training Activities by Training Center**

| Function | Operating Group Served | Melrose Park | Joliet | Glenbard | Rockford |
|---|---|---|---|---|---|
| Overhead | Construction and Maintenance | X | X | X | X |
| Overhead Electrician Special | Distribution System Operations | X | X | | X |
| Substation Maintenance | Transmission and Substations | X | X | | X |
| Substation Operator | Distribution System Operations | X | X | | X |
| Underground | Construction and Maintenance | X | | | |
| New Business | System Service Group | | | X | X |

Source: DR-075 and DR-14

- Field crew, substation operator and customer service representative training is sorted into three broad categories: initial and progression training, compliance training and refresher training:
    - Initial and progression training – knowledge and skills required for and to progress in job classification
    - Compliance training - compliance related knowledge required by a regulatory agency, such as OSHA or EPA
    - Refresher training - renew infrequently used skills, teach new skills or remedial instruction
- Initial, and job classification progression training for overhead electrician (journeyman linemen) covers a span of three and a half years and consists of: seven days of pole climbing, 15 weeks of basic line school, 36 weeks of on-the-job training and evaluation, four weeks of single phase school, 60 weeks of on-the-job training and evaluation, four weeks of three-phase school and 90 days of on-the-job training and evaluation.
- Initial and job classification progression training for underground workers (cable splicer) covers a span of three years and consists of: seven days of pole climbing, 12 weeks of starting splicer school, 32 weeks of on-the-job training and evaluation, five weeks of basic splicer school, 56 weeks of on-the-job training and evaluation, four weeks of basic splicer school and 32 weeks of on-the-job training and evaluation.
- Initial and job classification progression training for substation construction workers consists of: five weeks of a starting school and two progression schools each lasting four weeks. There is on-the-job training and evaluation between the initial and progression schools.

- Training programs for overhead and underground training are internally created by the Utility and are not certified or credited by any third party organization or entity. For example, the training program does not use the templates of the National Joint Apprentice and Training Committee (NJATC) nor is it accredited by the Illinois Department of Labor[48].

- ComEd has established a Training Council chaired by a department vice president and attended by the training director, a training manager, line managers, available instructors, first-line supervisors (FLS) and bargaining unit employees. The purpose of the Council is to review the effectiveness of the various training programs, approve topics for annual refresher training, and review the progress of apprentices and helpers during their on-the-job training and evaluation phases[49].

- ComEd has also established a Curriculum Review Committee chaired by a line department manager and attended by a training program manager, available instructors, a (FLS) from each region (two from Chicago due to work differences) and bargaining unit employee from each region (two from Chicago due to work differences). The purpose of the committee is to select the refresher/continuing training topics for the incumbent workforce as well as determine the method of delivery. Potential training topics include: new equipment, job scope changes, procedural changes, technical bulletins/safety alerts, business plan initiatives and feedback from evaluations[50].

- Given the three and a half year line apprentice training program and three-year cable splicer and substation training programs, ComEd has to hire in advance of known retirements or hire experienced journeymen, if it wishes to maintain its current journeyman employment levels and in-house technical skills. This practice helps to develop staff so they are ready when needed and supports knowledge transfer.

- Table 13 describes the linemen number of apprentices for the 10-year period under study. As can be seen, the ComEd organization hired new apprentices in every year. However, the total complement of journeyman linemen, including crew leaders, has been reduced from 1,697 in 1995 to 1,324 in 2006. This amounts to a reduction in staff of almost 22%. However, the reduction in staff is actually greater from a skills gap perspective. Given the length of the apprentice program, plus the reality that it takes another three years at a minimum to create a fully versed journeyman lineman, it will be at least six years until the newly hired apprentice is as technically qualified as the linemen leaving the journeyman position. Thus, from a skills gap perspective, assuming historical journeyman linemen attrition, the effective linemen workforce will be significantly lower before the impact of the most recently hired apprentices is fully felt.

[48] DR-111

[49] DR-100

[50] DR-099

**Table 13 - Linemen Apprentice Staffing Levels**

ComEd Linemen Apprentices

| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Overhead | 0 | 50 | 51 | 49 | 93 | 76 | 58 | 49 | 41 | 17 | 26 | 101 |
| Underground | 0 | 29 | 42 | 17 | 3 | 34 | 41 | 10 | 2 | 2 | 12 | 30 |
| Area Operators | 6 | 1 | 3 | 15 | 5 | 14 | 4 | 13 | 17 | 3 | 3 | 14 |
| Total Apprentices | 6 | 80 | 96 | 81 | 101 | 124 | 103 | 72 | 60 | 22 | 41 | 145 |
| Total Journeymen [1] | 1,697 | 1,608 | 1,546 | 1,580 | 1,511 | 1,496 | 1,596 | 1,550 | 1,511 | 1,445 | 1,384 | 1,324 |
| Total Linemen [2] | 1,703 | 1,688 | 1,642 | 1,661 | 1,612 | 1,620 | 1,699 | 1,622 | 1,571 | 1,467 | 1,425 | 1,469 |
| Variance | | -15 | -46 | 19 | -49 | 8 | 79 | -77 | -51 | -104 | -42 | 44 |

[1] Total Journeymen would include all other linemen that were not apprentices.

[2] Total linemen departures can not be determined other than comparing variations in total linemen from one year to the next.

- Table 14 describes the number of substation apprentices for the 10-year period under study. As can be seen, the ComEd organization hired apprentices in every year except 1996. However, the total complement of substation journeyman has been reduced from 573 in 1995 to 381 in 2006. This amounts to a reduction in staff of almost 33%. However, the reduction in staff is actually greater from a skills gap perspective. Given the length of apprentice program, plus the reality that it takes another three years at a minimum to create a fully versed substation journeyman, it will be at least six years until the newly hired apprentice is as technically qualified as the substation journeyman leaving the journeyman position. Thus, from a skills gap perspective, assuming historical substation journeyman attrition, the effective substation workforce will be significantly lower before the impact of the most recently hired apprentices is fully felt.

**Table 14 - Substation Apprentice Staffing Levels**

ComEd Substation Apprentices

| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Substation Electrical Mechanics | 33 | 0 | 1 | 1 | 1 | 19 | 29 | 27 | 24 | 1 | 1 | 2 |
| Substation Field Craft | 19 | 15 | 5 | 8 | 4 | 3 | 6 | 0 | 4 | 4 | 0 | 0 |
| Total Apprentices | 52 | 15 | 6 | 9 | 5 | 22 | 35 | 27 | 28 | 5 | 1 | 2 |
| Total Journeymen [1] | 573 | 585 | 581 | 578 | 559 | 535 | 484 | 439 | 422 | 414 | 403 | 381 |
| Total Substation [2] | 625 | 600 | 587 | 587 | 564 | 557 | 519 | 466 | 450 | 419 | 404 | 383 |
| Variance | | -25 | -13 | 0 | -23 | -7 | -38 | -53 | -16 | -31 | -15 | -21 |

[1] Total Journeymen would include all other substation employees that were not apprentices.

[2] Total substation departures can not be determined other than comparing variations in total substation employees from one year to the next.

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- Historically, refresher training consists of three days to a week of training per year. Refresher training topics for C&M include: spacer cable installation, inspecting overhead conductors, mid-point reclosurer/sectionalizer demonstration and review, underground rural development review, etc. Refresher topics for T&S include: SF 6 gas handling, storm restoration activities, use of test equipment, lock out tag out review, etc. Refresher topics for DSO include: storm restoration process, fault wizard, trip saver device, relays, dead front switchgear, etc. In addition, various groups within Customer and Marketing Services periodically receive refresher training similarly appropriate for their job responsibilities.

- The Utility has forged a relationship with the City Colleges of Chicago by establishing the Dawson Technical Institute Overhead Electrical Line Worker Program. Established in 2006, the program was designed to improve the skill level of entry-level employees, reduce on-the-job training time and attract a local and diverse employee population. As of August 2008, it has hired 29 of the 72 students who graduated from the program.

- Prior to the spring of 2007, the feeder groups for apprentices came exclusively from Meter Readers, Fleet Service employee and SSG Technicians. Upon satisfactorily passing a CAST test, they go to pole climbing school to determine if they should work in overhead or underground.

- After the spring of 2007, the feeder group for apprentices was expanded to include both internal promotions and external hires from technical schools. Table 15 summarizes the number of internal versus external hires since 2007.

**Table 15 - Source of Apprentices**

| | Total Number of Employees | Internal Promotions (percent) | External Hires (percent) |
|---|---|---|---|
| Spring 2007 | 83 | 57% | 43% |
| Winter 2007 | 49 | 84% | 16% |
| Spring 2008 | 58 | 71% | 29% |

- Outsourced/contracted service providers, such as electrical contractors, are not trained by ComEd. Management requires that the service provider retain and provide a qualified workforce. The training centers, however, do provide training to non-electrical contractors such as substation entering training and meter replacement training. In addition, periodically training is provided to firemen and police on working around energized conductors.

- ComEd offers two Crew Leader Training/Development Academies through the training department, one for T&S and the other for C&M. Both academies are four-day programs covering technical, administrative and leadership topics. The anticipated outcome is improved field execution, communications and performance of critical tasks. Feedback from bargaining unit interviewee participants was very positive. In addition, C&M implemented an Onboard Orientation/Evaluation process for new Construction Crew Leaders. This process helps provide crew leaders with information and skills to lead their fellow bargaining unit employees. Also, an Onboard Orientation process for C&M, T&S, F&MS and SSG construction field apprentices occurs during their training and initial assignment.

- To help support the varied background new first-line supervisors may bring to their position, ComEd has just initiated in October of 2008 an Onboard Orientation process for FLS. This training program consists of orientation, classroom training, on-the-job training, mentoring and in-place learning. In order to help ensure success, the training must be completed within 12 months of the FLS being assigned to the position.

## *Safety*

- The ComEd safety organization consists of eight regional safety professionals, five safety program specialists and five performance assessment specialists. The safety organization reports to the Environmental, Health and Safety Director, who in turn reports to the Vice President Strategic and Support Services. In addition, the Company president has taken a very strong personal interest in employee safety.

- The region safety specialists support safety related activities for all groups within the region. Job responsibilities and activities include: conducting safety audits and inspections, coordinating safety committees, coaching supervisors and teaching safety habits to ComEd field employees and its contractors. The Performance Assessment Group is responsible for safety performance assessment and specialized root cause analysis for different operations areas.

- A current initiative of the Safety Department is working with management and bargaining unit employees on safety procedural adherence. Bargaining unit employees indicated that the format of the existing procedures for certain critical tasks were not field friendly. The challenge was to identify critical tasks performed in the field and develop a more user friendly format for instructing employees on the processes and procedures for performing those critical tasks. The group first looked at underground faults, and through numerous interviews with bargaining unit employees focusing on design suggestions, the group developed a high quality, laminated Critical Task Tool field procedure with pictures and clear step-by-step instructions. Employee feedback, thus far, has been very positive.

- The Company has in place the Target Zero program to integrate safety initiatives throughout the Utility by actively engaging all employees. Requiring development by employees at the department level, the program calls for specific actions to address workplace risks and accident prevention for various safety related programs including:

    - bargaining unit led Behavioral Accident Prevention Process (BAPP)
    - soft tissue injury prevention
    - employee involvement and leadership commitment
    - team identified specific risk assessments
    - vehicle accident prevention

  Once the goals and action plans are approved, departments then pursue their plans, periodically monitoring progress.

- Bargaining unit employees are encouraged to participate as facilitators and observers in BAPP. BAPP calls for observations, peer-to-peer feedback on at-risk behaviors (without discipline) and near hits and enhanced safety communications as well as other

opportunities to improve safety practices. ComEd reports it has approximately 400 trained bargaining unit BAPP observers.

- ComEd supports bargaining unit employee involvement in local, regional and executive Safety Councils. The purpose of the Council is to promote industrial safety and occupational health by providing a forum to address and seek resolution of employee safety and health concerns. Individual employee concerns, which cannot be resolved by the employee's immediate supervisor, are documented and brought into the Safety Council to be resolved.

- The Company has in effect rules of accepted principles of business and social conduct called "Employee Standards of Conduct." This document includes several work rules that are critical or fundamental to safe work practices and potentially could endanger employee health and safety if ignored. The "Employee Standards of Conduct" document clearly states that not following these rules will result in progressive performance management steps, ranging from a non-disciplinary Level 1, documented job performance counseling, to a Level 6, discharge. According to the specific violation circumstances, the Company determines whether a particular disciplinary step may be skipped or repeated. In 2007, the Company reported over 170 disciplinary interventions ranging from a Level 2, written reprimand, to Level 6, discharge[51]. At the same time, the Utility is asking employees to report all accidents and discuss near accident misses so that others can learn. Certain union members indicated they are fearful to present this information because it could result in discipline. Some ComEd management stated, however, that they are not aware of employees who are afraid to report accidents, while others indicate that they had.

- The Company exceeds OSHA's annual inspection requirement by performing safety inspections more frequently. Safety audits of employees are conducted by both management personnel and field safety professionals. Safety audits focus on work practices, behaviors, equipment and vehicles. The audit process addresses exemplary safety performance and practices as well as non-conformance. Observations include: obvious safety omissions like hardhats, use of wheel chocks, position of the vehicles, etc. and electric safety observations like proper grounding, condition of rubber goods, compliance with Worker Protection Assurance (WPA) work practices, etc.

- In an effort to obtain feedback on various safety programs and initiatives, the Company recently utilized an employee Quality Circle concept. ComEd reports on April 22, 2008 that 17 bargaining unit employees from various regions and departments attended a Safety Quality Circle. The employees identified their top five concerns as follows:

    - certain safety rules are not practical
    - discipline is applied to "accidents"

[51] DR-68

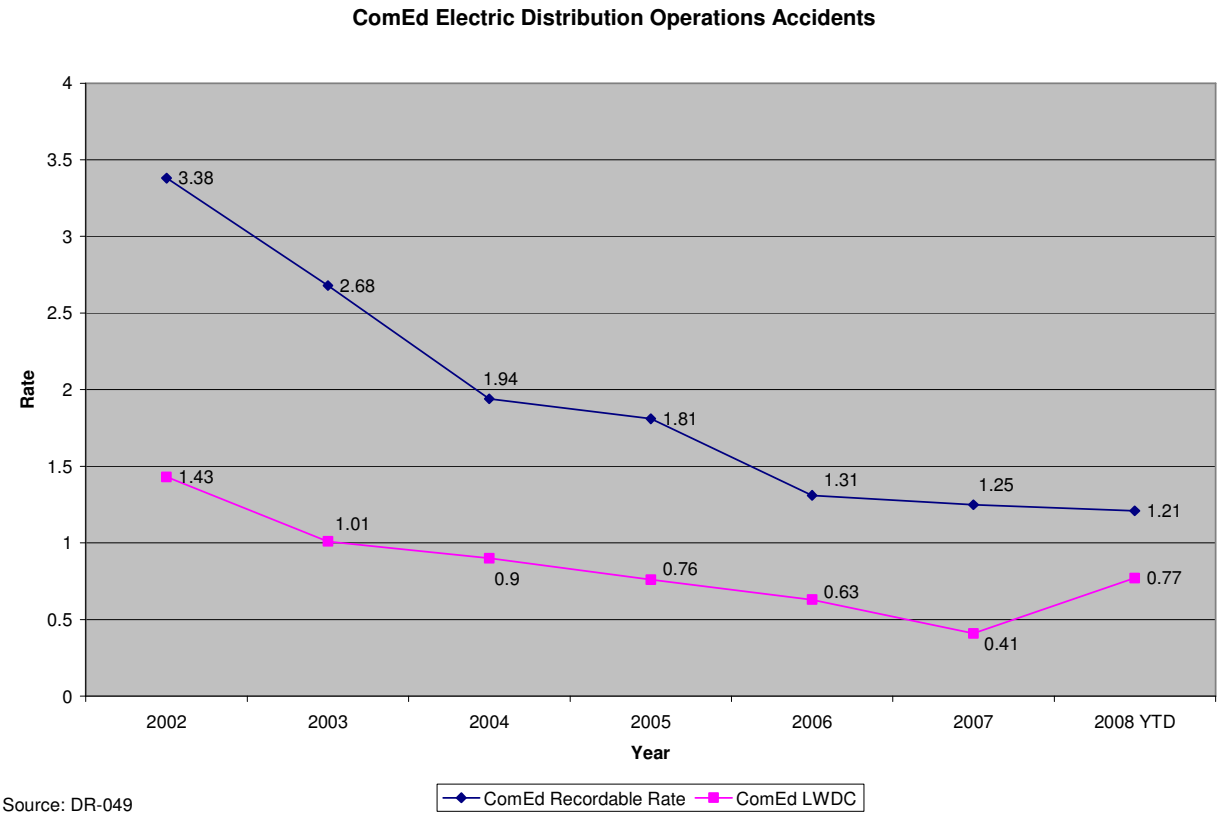
- a "wall" exists between bargaining unit and management
- safety related training needs to be improved
- BAPP support needs to be enhanced

Subsequently, the Company continues to convene Quality Circle sessions to develop action plans to address each of the five concerns raised. ComEd indicated it plans to hold additional Quality Circle meetings to monitor action plan progress and continue to address safety program issues[52].

- In order to increase the safety of its employees as well as the general public, ComEd employs a Job Briefing Sheet concept. The Job Brief Sheet requires identification of hazards associated with a specific job site and the work to be performed. In addition to completing the form, the crew leader discusses the information with his team and with any employees entering the work zone.
- ComEd conduct safety audits of their contractors. In addition, they contractually require that the contractor comes to them with a viable safety training program in place and that can meet the safety requirements for the contracted work.
- Formal safety training programs are presented annually or on a periodic basis to various work groups. Each group receives training appropriate for hazards associated with their work activities. Safety training programs presented in 2007 included: personal protective equipment, hazard communications, asbestos, emergency evacuation training, confined space entry, fire extinguisher, first aid/CPR training, PCB & Oil Spill Training, CDL and defensive driver training, etc.
- Figure 23 below shows the OSHA recordable injury rate and the LWDC (lost work day case) rates for ComEd between 2002 and 2008 year-to-date. Both rates result from a comparison of the number of injuries to the number of hours worked and describe progressively the severity associated with ComEd accident experience.

**Figure 23 - Electric Distribution Operations Accidents**

[52] DR-72




Source: DR-049

- From the preceding figure, it can be seen that:
    - The recordable injury rate has gradually decreased from a high of 3.38 to an annual low of 1.25 reached in 2007, and is continuing to trend favorably through YTD July 2008.
    - Similarly the LWDC rate has consistently declined from a high of 1.43 to an annual low of .41 reached in 2007. However, YTD July 2008 the trend has reversed.
- The Company's OSHA recordable safety performance in 2007 was in the top decile and ranked number four among similar Investor Owned Utilities. Based on this measure, ComEd's performance has improved by 63% since 2002.

## 5.2.3 Conclusions

### *Training*

ComEd technical training is performed at five Illinois training facilities. Four training facilities are used to instruct and demonstrate field crew and operator related skills, the fifth facility is dedicated to customer operations training. The apprentice overhead electrician (journeyman

lineman), apprentice underground workers (cable splicers), and apprentice substation construction workers training programs are typical of apprentice programs found in the electric distribution industry. Bargaining unit employees are an integral part of the training effort and act as classroom and pole yard demonstrators. Their selection is based on qualifications as opposed to seniority, helping to assure that they are skilled in current technical requirements, as well as being able to effectively deliver the training.

Field crew, operator and customer service representative training is defined by three broad categories: initial and progression training, compliance training and refresher training. ComEd has established a Training Council to review the effectiveness of various training programs, approved topics for annual refresher training, and review the progress of the premises. In addition, it has also established a curriculum review committee to select the refresher/continuing training topics for an incumbent workforce as well as determined methods of training delivery.

Given the length of time involved in the various apprentice training programs, ComEd has to hire in advance of known retirements or hire experienced journeymen linemen if it wishes to maintain its current journeymen employment levels and in-house technical skills. Internal promotions primarily from the meter reader group and more recently external hires serve as the feeder groups for future apprentices.

ComEd has recently instituted crew leader training and development programs to improve field execution, communications and performance of critical tasks. In addition, the Company has just initiated an Onboard Orientation process for first-line supervisors.

ComEd does not utilize the apprentice training templates developed by the National Electric Contractor Association and the International Brotherhood of Electrical Workers (IBEW).

## *Safety*

Safety, as stated by all levels of management and bargaining unit personnel, is a leading ComEd objective. Based on our experience, the emphasis placed on safety is consistent with what other utilities are requiring in today's workplace. The Company promotes a proactive Target Zero Program while maintaining employee accountability through its "Employee Standards of Conduct." The Company also supports numerous opportunities for bargaining unit involvement to improve safety practices. ComEd conducts extensive safety training and inspections.

While the Company seeks to obtain feedback on various safety programs and initiatives utilizing the Quality Circle concept, feedback to employees regarding resolution to safety related concerns remain. The Company is encouraged to expand its feedback to employees regarding resolutions of safety related concerns, action steps identified and measured progress.

The Utility's OSHA recordable safety performance in 2007 was in the top decile and ranked number four among similar Investor Owned Utilities.

### 5.2.4 Recommendations

5.2.1 Study the value of participating in the National Joint Apprentice and Training Committee (NJATC) program as a way to increase the cost effectiveness of training qualified craft workers.

5.2.2 In order to address employee safety concerns, proactively communicate the issues identified and efforts underway by the Safety Quality Circle.

## 5.3 Quality Assurance

### 5.3.1 Background

Formalized and documented quality assessment and control process for substations, distribution lines, and meter servicing and vegetation management are essential to ensure that the construction and maintenance of the system meets specification and safety standards. This is particularly critical where contracted services are employed, as is the case at ComEd. The quality assurance processes for substations, distribution lines, and meter servicing and vegetation management are discussed below.

### 5.3.2 Findings

#### *Overall*

- ComEd's quality assurance process is a rigorous and documented system. ComEd has an Operational Governance and Quality Assurance organization reporting at the Vice President level. This organization has three primary functions:

    1. Management Model – A framework to manage and operate within strategic focus areas. The model is used to sets programs, process and procedure documents to guide each area of practice. The model has a mechanism to assure that peer groups and delivery operations work together with chief officers to make sure models are employed and working. There are monthly delivery operations governance (community practice) meetings.

    2. Quality Services – Maintains QA manual and process. There are three level of QA:

- Drop-in Assessment – These are general observations of fundamentals to determine how the group executes against guidelines. These assessments are triggered by the balanced review but could be directed by specific issue areas to change prioritization schedule for the year. Results are verified and shared with line management where corrective actions are identified. The resulting CAP (Corrective Action Plan) is monitored via PassPort. An example would be substation cable troughs not well enough marked to see during snow cover.
- Focused Observations – particular area(s) of focus – examine performance trends that are not where they should be.
- QA Audit – This is a larger effort with a broader focus or topic, i.e., Event-Free process. These audits are conducted across all ComEd groups every 2-3 months and generate best practice sharing.

3. Peer Groups – Intended to seek out and recommend appropriate best practice adoption. The peer groups set programs, metrics and goals. There are two people in ComEd and one in PECO who are Peer Group Coordinators who set agendas, meetings, etc. Sponsored membership is at the VP level and peer groups are staffed with managers.

- The QA group in ComEd is made up of former construction workers or former engineers. The staff of the QA group is provided an outside 3-day training course on how to perform QA/QC and a 2-day course in business writing. Most of their quality control expertise is gained through on-the-job training. ComEd is currently developing formalized qualifications for the inspector position.
- There are three QA assessors in the ComEd organization. They conduct 19-20 quality services audits annually (Drop-ins, Focused Observations and QA Audits). They use subject matter experts when required and will clarify results with line managers. The assessors get matrixed direction from the Director of QA. Assessors can stop work if an infraction is hazardous.
- ComEd maintains a process to accommodate “whistle-blowers.”
- The QA organization has “black belts” on the team to head the Process Improvement Teams. These teams are similar to a General Electric (GE) “workout session.” It was reported that these teams are more successful when represented employees are included.
- Management review meetings are held monthly and bi-monthly. Line managers meet with superiors to review metrics, issues and improvement opportunities. No formal minutes are kept, but there is a presentation deck (PowerPoint). These meetings are

attended by VPs, regional managers, and can include the SVP and some of the regional managers' direct reports even at the FLS level.

- Crew leaders have responsibility for quality control for each job. The addition of the Crew Leader Academy has helped to expand the crew leader's responsibility wider than just the physical work.
- Some work processes have QA elements built into the work steps, with independent review requirements, for example, transmission UG line splices.
- While FLS field visits are mainly focused on safety checks, they perform quality assurance reviews during the job site visits.
- The Maintenance Inspection group of approximately 40 employees reviews the overhead distribution system, covering about ¼ the system annually.
- Contract coordinators perform field reviews for contracted work.
- ComEd maintains a "contractor of choice[53]" program to assure quality and consistency. The Contractor of Choice (COC) program is a method through which ComEd contracts major distribution and transmission substation work. Contractors earn the status of COC (also referred to as alliance contractors) through a formal request for proposal and review through an evaluation process, which considers safety, quality and cost. A COC is a fully qualified contractor who must demonstrate an ability to complete projects in a safe, timely and cost effective manner. To qualify as a COC, the contractor must have previously proven itself capable of successfully completing large-scale projects while engaging in a collaborative process designed to help further minimize ComEd's costs. This also ensures ComEd is granting work to a contractor familiar with ComEd's systems, safety rules and demand for high-quality work. Indeed, after each project, a COC is evaluated based on performance criteria such as safety, schedule adherence and financial controls.
- ComEd has developed a comprehensive set of departmental tri-fold documents[54] that illustrates both the corporate high-level commitment to quality and lists in detail the behaviors and practices deemed to contribute to overall quality. These tri-folds are made available to all employees.
- ComEd has established quality assurance and control expectations for its contractors. ComEd manages compliance with these expectations through a formal audit process.

[53] DR-126

[54] DR-088

***Vegetation Management***

- Vegetation management is entirely outsourced. The quality assurance process includes[55]:

    1. The vegetation contractors are expected to conduct their own internal QC program.
    2. ComEd contracts with Davey tree to conduct a 100% quality review on all of Asplundh's vegetation work. Once the trim work is completed, the audit is conducted within 30 days.
    3. In addition ComEd's QA/QC process requires a 10% spot check on Asplundh's and Davey's tree work. ComEd has recently increased the spot checks to 20%.

### 5.3.3 Conclusions

Based on the inspection results described above, we conclude ComEd has a formal and well documented quality assessment and control process for substations, distribution lines, and meter servicing and vegetation management. However, ComEd should continue its planned efforts to implement and enhance its quality assurance over OSMOSE for wood pole ground line inspections and expand its internal distribution inspection program to include pole sounding and more definitive vegetation encroachment documentation.

### 5.3.4 Recommendations

5.3.1 Continue planned efforts to implement and enhance its quality assurance over OSMOSE for wood pole ground line inspections.

5.3.2 Expand internal distribution inspection program to include more definitive vegetation encroachment documentation.

## 5.4 Distribution System Condition Assessment

### 5.4.1 Background

A component of this workforce adequacy review is to determine the relative physical condition of the distribution system, which drives resource requirements to maintain and improve the system. For example, should the system condition review indicate deficiencies that are not being currently addressed, the level of future resources may be higher than projected. As per our

[55] DR-026

proposal, we specified: "We will examine the Utilities" physical facilities and the electrical distribution system." The following sections detail our approach to this assignment and the results found during the physical field inspections.

## *Distribution Underground Facilities*

We reviewed year 2007 ComEd inspection records[56] for manholes to determine the relative level of system condition. The inspection records indicate that only 21 facilities had conditions that required current action (Priority 10-30) and 97.3% of the conditions found were classified as Priority 40.

**Table 16 - 2007 Manhole Inspection Results**

| Item | Count | Percent |
|---|---|---|
| Manholes Inspected | 8438 | |
| Work Orders Issued | 724 | 8.58% |
| Priority 10 | 0 | 0.00% |
| Priority 20 | 3 | 0.04% |
| Priority 30 | 18 | 0.21% |
| Priority 40 | 705 | 8.36% |

Overall, 7,714 manholes (91.4%) were considered in satisfactory condition, requiring no corrective maintenance.

## *Distribution Overhead Lines*

We developed a random sample of ComEd's circuits, including worst performing circuits, to be visually inspected. This sample was developed using a binomial sample methodology with a 90% confidence level and a 10% error rate, as is typically used in the utility industry to formulate condition assessments. We believe that the results of the visual inspections are representative of the overall ComEd distribution system. Our inspectors were accompanied by Company engineers and other staff who provided locating services for the subject facility inspections. We examined a total of 767 poles covering 9 circuits across the ComEd service area.

We developed and employed a tailored Circuit Inspection Form and the results of the inspections were documented in a database for analysis. For each pole, we visually inspected and recorded the following information:

**Table 17 - Circuit Inspection Methodology**

| Inspection Item | Methodology |
|---|---|
| Location | Roadside or in the right-of-way |
| Pole Condition | Visual check for damage, leaning and sounding the pole for rot at the butt and at |

[56] DR-105

| | |
|---|---|
| | about 4 feet up |
| Number of phases | Number |
| X-Arms | Type and condition |
| Insulators | Condition |
| Devices | Type and condition |
| Conductor/Shield | Condition |
| Guy/Anchor | Type and condition |
| Attachments | Type |
| ROW Condition | Encroachment of vegetation along the span from the prior pole to the subject pole |

### *Substations*

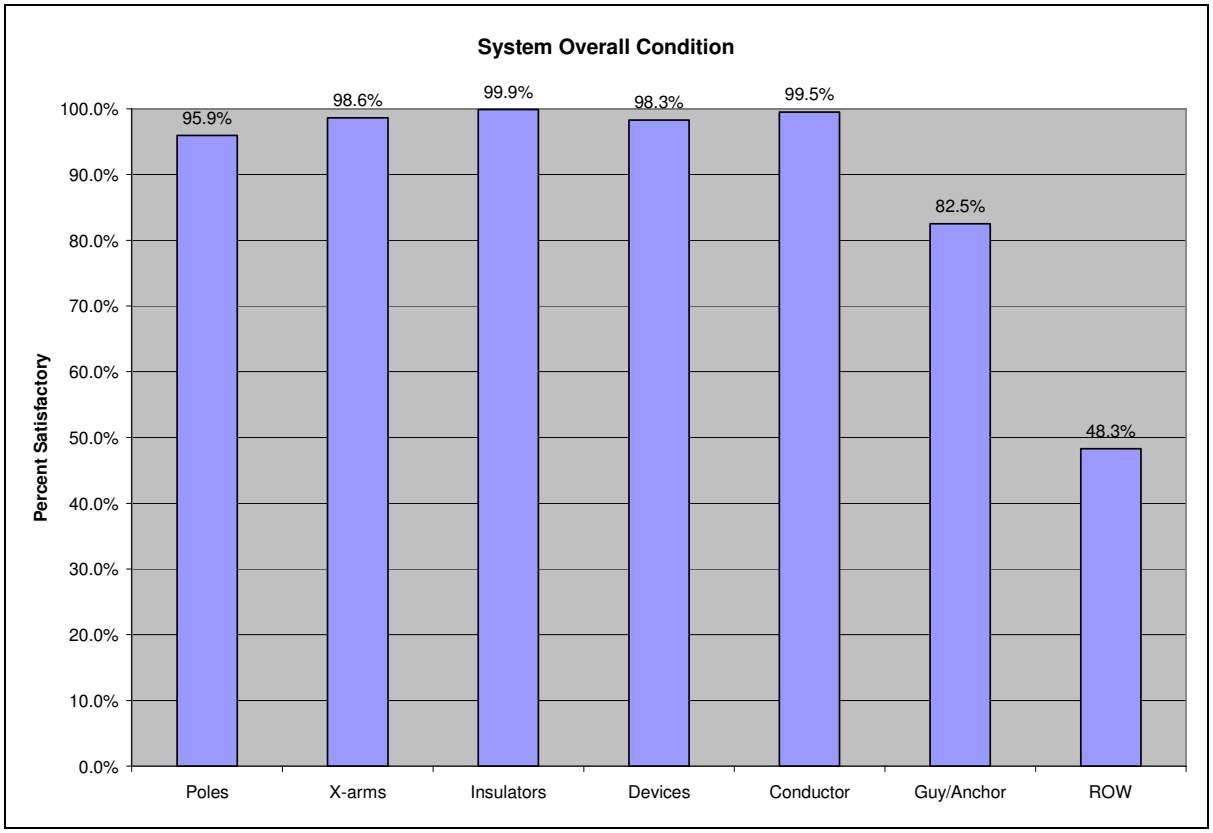
As part of the distribution system inspection process, the inspectors inspected six distribution substations that were within the circuit selections for ComEd.

## 5.4.2 Findings

### *Distribution Overhead Lines*

- ComEd's distribution system appears to be in good condition electrically and mechanically based on the inspection results shown below.

**Figure 24 - Summary of System Inspection Results**




- Details of the inspection results are shown in the table below.

# Table 18 - Details of Inspection Results

| Pole Condition | Count | Percent |
|---|---|---|
| 0-Satisfactory | 731 | 95.9% |
| 1-Upper Pole Decay | 7 | 0.9% |
| 2-Ground Line Decay | 11 | 1.4% |
| 3-Termite Damage | 1 | 0.1% |
| 4-Slight Lean (< 15 deg) | 28 | 3.7% |
| 5-Severe Leaning (> 15 deg) | 2 | 0.3% |
| 6-Broken | 0 | 0.0% |
| 7-Treated (Wrap, etc) | 0 | 0.0% |
| 8-C-Trussed | 3 | 0.4% |
| 9-Adjacent Pole (Old & Needs Removal) | 4 | 0.5% |
| 10-Other | 8 | 1.0% |

| Insulator Condition | Count | Percent |
|---|---|---|
| 0-Satisfactory | 762 | 99.9% |
| 1-Contaminated, Residue | 0 | 0.0% |
| 2-Visible Crack | 0 | 0.0% |
| 3-Broken | 1 | 0.1% |
| 4-Leaning | 0 | 0.0% |
| 5-Tie Unraveled | 0 | 0.0% |
| 6-Pin Pull/Pushing Thru Arm | 0 | 0.0% |
| 7-Pin Broken | 0 | 0.0% |
| 8-Pin corroded | 0 | 0.0% |
| 9-Other | 0 | 0.0% |
| | 763 | 100.0% |

| X-Arm Type | Count | Percent |
|---|---|---|
| 0-Wooden (Single) | 500 | 59.1% |
| 1-Wooden (Double) | 127 | 15.0% |
| 2-Stand-Off-Metal | 0 | 0.0% |
| 3-Stand-Off- Poly | 1 | 0.1% |
| 4-Stand-Off w/ Squirrel Guard | 0 | 0.0% |
| 5-Alley Arm | 106 | 12.5% |
| 6-None | 111 | 13.1% |
| 7-Other - list | 1 | 0.1% |
| | 846 | 100.0% |

| X-Arm Condition | Count | Percent |
|---|---|---|
| 0-Satisfactory | 722 | 98.6% |
| 1-Split | 8 | 1.1% |
| 2-Burnt/Rotted | 0 | 0.0% |
| 3-Termite Damage | 1 | 0.1% |
| 4-No Braces (on X-arm) | 0 | 0.0% |
| 5-Failing @ Thru-Bolt | 1 | 0.1% |
| 6-Broken | 0 | 0.0% |
| 7-Corroded | 0 | 0.0% |
| 8-Other | 0 | 0.0% |
| | 732 | 100.0% |

| Device | Count | Percent |
|---|---|---|
| 0-None | 152 | 8.5% |
| 1-Fuse (Cut-Out) | 516 | 28.8% |
| 2-Arrestor | 532 | 29.7% |
| 3-XFMR | 438 | 24.4% |
| 4-Capacitor-Fixed | 9 | 0.5% |
| 5-Capacitor-Switched | 1 | 0.1% |
| 6-Regulator (No.) | 2 | 0.1% |
| 7-Recloser/Sectionalizer | 49 | 2.7% |
| 8-Disconnects-Single Blade | 1 | 0.1% |
| 9-3-Phase Tie Switch (Type) | 88 | 4.9% |
| 10-Riser on Pole | 5 | 0.3% |
| 11-Other - List | 0 | 0.0% |
| | 1793 | 100.0% |

| Device Condition | Count | Percent |
|---|---|---|
| 0-Satisfactory | 1607 | 98.3% |
| 1-Corrosion, Rust, Pitting | 7 | 0.4% |
| 2-Bushing Broken/Cracked | 2 | 0.1% |
| 3-Arrestor - Missing | 1 | 0.1% |
| 4-Arrestor - Obsolete | 0 | 0.0% |
| 5-Arrestor - Long Lead | 0 | 0.0% |
| 6-Arrestor/Failed/Damaged | 11 | 0.7% |
| 7-Hardware Hanging | 0 | 0.0% |
| 8-XFMR Disc'd (Needs Remov | 0 | 0.0% |
| 9-Riser Pothead/Connection P | 0 | 0.0% |
| 10-Riser w/o Ventilation | 0 | 0.0% |
| 11-Other | 7 | 0.4% |
| | 1635 | 100.0% |

| Conductor Condition | Count | Percent |
|---|---|---|
| 0-No Visible Problems | 759 | 99.5% |
| 1-Conductor Sag | 4 | 0.5% |
| 2-Tight Phase Separation | 0 | 0.0% |
| 3-Poss Clearance Violation | 0 | 0.0% |
| 4-Clamps Worn/Loose | 0 | 0.0% |
| 5-Ties Unraveled | 0 | 0.0% |
| 6-Pitted,Corrosion | 0 | 0.0% |
| 7-Strands Broken | 0 | 0.0% |
| 8-Some Melting | 0 | 0.0% |
| 9-Guy, Other Contact | 0 | 0.0% |
| 10-Ground Wire Cut or Missing | 0 | 0.0% |
| 11-Other | 0 | 0.0% |
| | 763 | 100.0% |

| Shield Wire Condition | Count | Percent |
|---|---|---|
| 0-Satisfactory | 756 | 100.0% |
| 1-No Shield Wire | 7 | 0.9% |
| 2-Shield Wire < 45 Degrees | 0 | 0.0% |
| 3-Shield Wire > 45 Degrees | 0 | 0.0% |
| 4-Corrosion | 0 | 0.0% |
| 5-Broken Strands | 0 | 0.0% |
| 6-Other - List | 0 | 0.0% |
| | 756 | 100.0% |

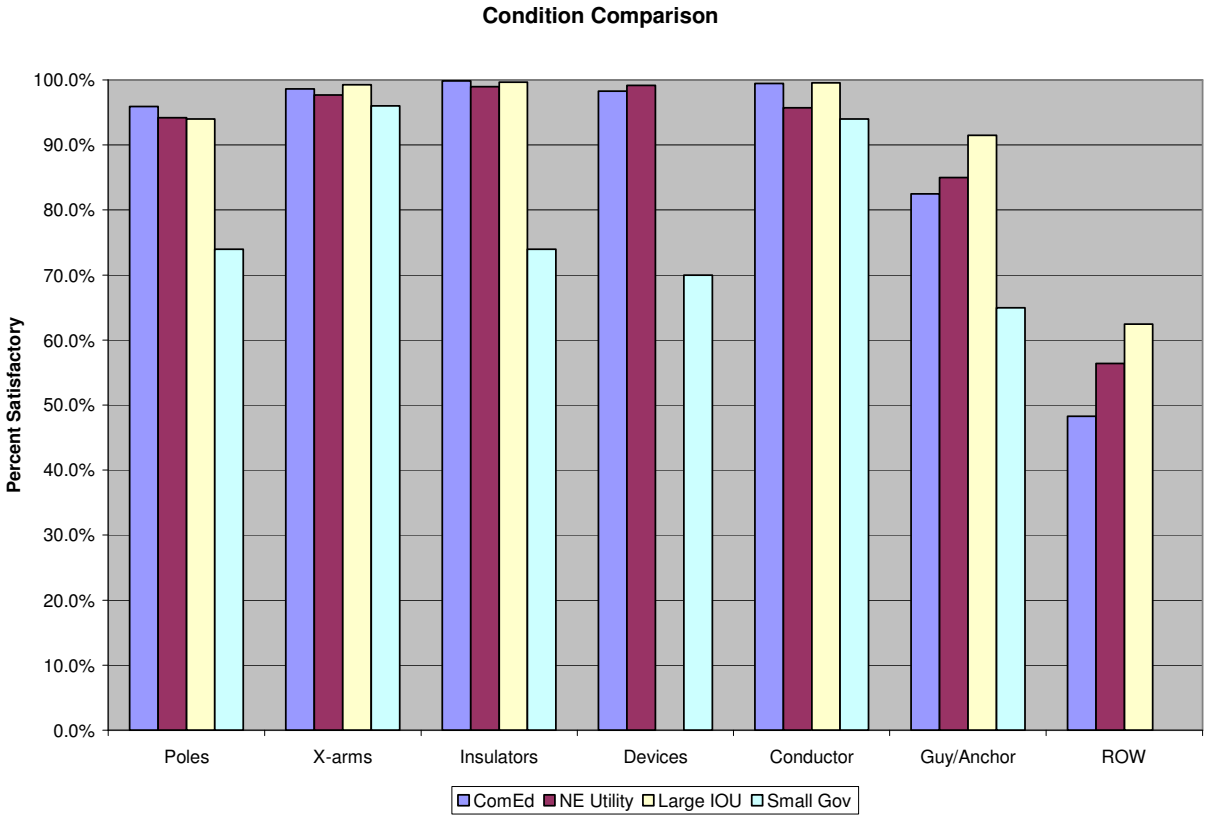
| ROW Condition | Count | Percent |
|---|---|---|
| 0-Clear (No trees or Underbrush) | 193 | 25.3% |
| 1-Trees/Limbs >8' | 175 | 23.0% |
| 2-Trees/Limbs 3>d<8' | 229 | 30.1% |
| 3-Trees/Limbs < 3' | 102 | 13.4% |
| 4-Trees/Limb Contact | 47 | 6.2% |
| 5-Danger Tree | 0 | 0.0% |
| 6-Underbrush w/in 3' | 1 | 0.1% |
| 7-Vines, Moderate | 0 | 0.0% |
| 8-Vines, Severe | 15 | 2.0% |
| 9-Other | 1 | 0.1% |

| Guy/Anchor Condition | Count | Percent |
|---|---|---|
| 0-Satisfactory | 146 | 82.5% |
| 1-Guy Wire Strands Broken | 0 | 0.0% |
| 2-Guy Rusted | 15 | 8.5% |
| 3-Anchor-Tight | 0 | 0.0% |
| 4-Anch - Loose or Broken | 0 | 0.0% |
| 5-Guy Missing or Deteriorated | 3 | 1.7% |
| 6-Slack Span on Stub | 0 | 0.0% |
| 7-Guard Defective/Missing | 8 | 4.5% |
| 8-Other | 3 | 1.7% |

| Attachments | Count | Percent |
|---|---|---|
| 1-Telephone | 610 | 80.1% |
| 2-CATV | 623 | 81.8% |
| 3-Unknown | 8 | 1.0% |
| 4-Pole Extender | 5 | 0.7% |
| 5-Secondary | 346 | 45.4% |
| 6-Service | 518 | 68.0% |
| 7-Street Light/Spotlight | 98 | 12.9% |
| 8-Other | 10 | 1.3% |
| | 762 | 100.0% |

- ComEd's overhead electric distribution system condition compares favorably, except for vegetation, with several other utilities [57] for which we have conducted condition assessments.

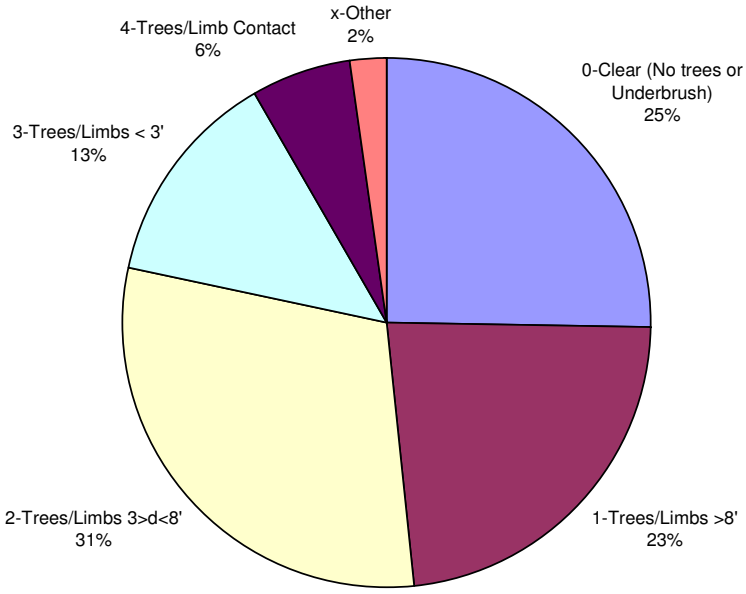
**Figure 25 - System Condition Comparison**




[57] The New England Utility is mid-sized, the Large IOU and the Small Government utilities cannot be identified as per contractual confidentiality agreements.

- Vegetation encroachment appears consistent with a 4-year trim cycle (as illustrated in the diagram below).

**Figure 26 - Status of Vegetation Encroachment**




- 48.3% of the ROW is clear of vegetation or with vegetation beyond 8 feet; this is substantially below results for other medium to large Investor Owned Utilities (at 62.5% or more).
- However, over 30% of the circuits have vegetation within 3 to 8 feet of the conductor, which can pose a risk within the next 1-3 years, depending on the species and its growth rate. This could indicate that while the vegetation management program has produced results this year that appear to be satisfactory, there is risk that if the program is continued unchanged, future years growth may produce a situation in which the trim program begins to lag behind growth patterns.
- Additionally, based on our physical inspection, only 19.6% of the circuits have vegetation in direct contact with the conductor or within 3 feet, which poses an immediate risk. This can be considered normal given a four-year trim cycle as some of these circuits may be at or near the end of the cycle and ready for trim. The overall ROW condition is depicted in the following:

**Table 19 - ROW Condition**

| ROW Condition | Percent | Risk Factors |
|---|---|---|
| 0-Clear (No trees or Underbrush) | 25.3% | |
| 1-Trees/Limbs >8' | 23.0% | Risk factor in 3-5 years |
| 2-Trees/Limbs 3>d<8' | 30.1% | Risk factor in 1-3 years |
| 3-Trees/Limbs < 3' | 13.4% | Immediate Risk Factor |
| 4-Trees/Limb Contact | 6.2% | |
| x-Other | 2.2% | |

## *Distribution Substations*

- In general, the condition of the distribution substations appeared adequate. The inspectors' impression ratings ranged from fair to good. In some cases, access fence and gate grounding was inadequate. The substation yards ranged from clean to some trash present. There were several instances in which there was evidence of oil leaks and rusting. Details of the inspections are shown in the following table.

**Table 20 - Distribution Substation Condition**

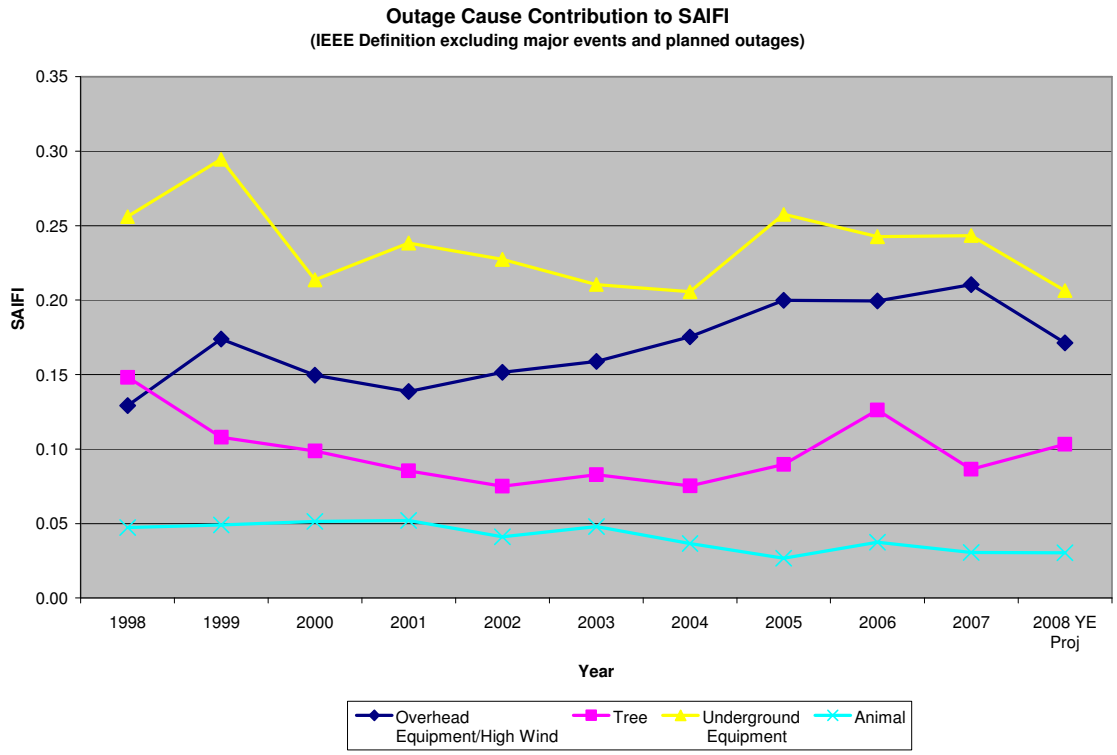
| Designation | SS 513 | TDC 461 | TSS 59 | TDC 431 | TDC 555 | DCE 71 |
|---|---|---|---|---|---|---|
| Name | Aurora | Crestwood | Cicero | Shorewood | Glen Ellyn | Dorr Township |
| # Transformers | 6 | 4 | 3 | 3 | 2 | 3 |
| Voltages | 34/4 and 34/12 | 138/12 | 34/12 | 138/12 and 138/4 | 138/12 | 34/12 and 34/4 |
| Landscape Condition | n/a | OK | n/a | Yard clear | n/a | Good |
| Fence Condition | Poor | Good but shrub growth a problem | Good | Good | Som rusted sections and vine growth | Fair |
| Fence Grounding | None | Yes | None | None | Yes | Through post |
| Gate Grounding | None | Yes | None | Yes | Yes | Yes |
| Safety Signs | Yes | Yes | Yes | Yes | Yes | Yes |
| Emergency Signs | yes | Yes | Yes | Yes | yes | Yes |
| Station Cleanliness | Good | Good | Acceptable, some trash evident | Good | Good | Good |
| Structure Condition | Good | Good | Good | Excellent | Good | Good |
| Structure Paint | OK with some surfa | Some rust showing, but other areas appear to have been painted | Rust evident | n/a | Good | Good overall some surface rust |
| Structure Grounding | Good | Good | Good | Good | Good | Good |
| Equipment Condition | Good | Good | Good | Good | Good | Good |
| Equipment Paint | Good | Good | Good | Good | Good | Good |
| Equipment Grounding | Good | Good | Good | Good | Good | Good |
| Oil Leaks | None | At least 2 transformers have leaks | Some old leaks evident | None | None | None |
| Comments | Yard, structure and equipment appears in good condition. Fence and gates need attention and grounding | Shrubs growing in fence line into yard | n/a | Large sub overall good condition | n/a | 4kV switchgear cabinet with some surface rust, north fence has vegetation growth inside an outside fence |

## *Outage Analysis*

Despite ComEd's excellent reliability performance in terms of interruptions (SAIFI), our inspectors found several issues that could portend potential future problems with the overhead distribution system. In particular, they found that 3.7% of the poles had a slight lean (<15 degrees), 1.4% had ground line decay and 0.9% had upper pole decay. While the average age of ComEd's distribution poles is only 37 years, we were concerned that the system may be degrading faster than anticipated. Consequently, we further examined the contribution to SAIFI for several outage causes.

The following chart[58] illustrates trends over the 1998 to 2008 period for four selected outage cause categories. This data is based on the IEEE definition excluding major events and planned outages and therefore, should be representative of baseline trends in outage causes and reflect the condition of the system.

**Figure 27 - Outage by Cause (Number)**




- ComEd does a commendable job in classifying outage causes into 13 major classifications with a number of sub-classifications within those major classifications. This permits the Company to study trends as part of its preventative maintenance programs.

[58] DR-142

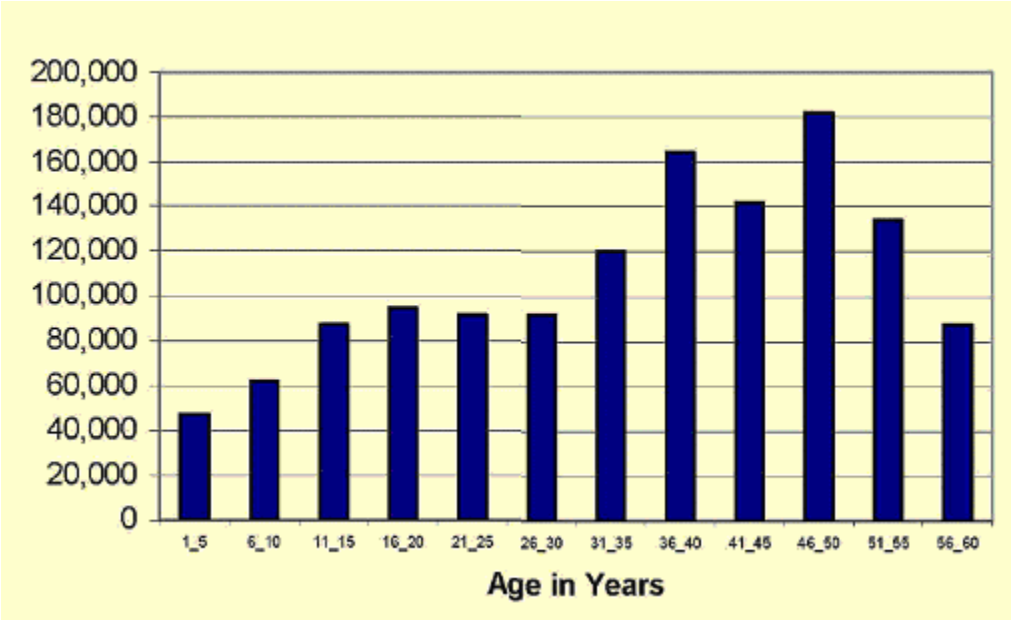
- ComEd's "unknown" and "other" classifications have averaged 3% and 4%, respectively, which is significantly better than industry, which averages over 20%.
- ComEd embarked on an animal mitigation program, in which they installed animal guards on many facilities and animal-caused outage contribution to SAIFI have been reduced markedly from 0.05 in 1998 to 0.03 in 2008.
- Tree-related outages have been relatively consistent, but do exhibit a slightly increasing trend from 0.08 in 2004 to 0.10 in 2008
- Underground equipment failures, measured on a contribution to SAIFI have been on a downward (improving) trend and are expected to be at 0.21 by the end of 2008.
- Overhead equipment failures, measured as contribution to SAIFI, have been increasing at a rate of about 0.5% annually reaching 0.21 in 2007, but are expected to drop to 0.17 by the end of 2008.
- ComEd's distribution asset age profile is depicted in the following table and aside from copper conductor, the system is relatively young by industry standards. In particular, ComEd's pole plant averages 37 years old:

**Figure 28 - Distribution Asset Age Profile**

| Distribution System Asset | Median Age (Years) |
|---|---|
| Wooden Poles | 37 |
| Crossarms | 31 |
| Transformers | 15 |
| Conductor (copper and other) | 57 |
| Conductor (aluminum) | 32 |
| Lightning Arrestors | 13 |
| UG Primary (direct-buried) | 17 |
| UG Primary (in conduit) | 31 |
| URD | 16 |

- ComEd's pole age demographics[59] are shown below:

**Figure 29 - Pole Age Demographics**




- ComEd's distribution wood pole replacements have averaged about 6,000 poles annually for the last 4 years and is on a decreasing trend. At 2008, replacement levels of less than 0.5%, the pole plant on average would not be replaced for well over 200 years. In our opinion, this is excessive and could lead to future system performance and reliability and potentially large capital cost issues.
- However, approximately 1,500 poles have been reinforced annually over that past four years, which increases the renewed distribution assets and may delay the need for pole replacement in the future.

## 5.4.3 Conclusions

Based on our physical inspection, ComEd's overhead distribution plant appears to be in good mechanical and electrical condition.

ComEd's distribution substations appear to be in adequate electrical and mechanical condition; however, fence and gate grounding should be examined during regular inspections.

[59] DR-023, Attachment 9, Page G-4

The increase in overhead line equipment failures is a concern, based on our outage analysis. However, as noted earlier, ComEd has conducted asset replacement studies and regularly assesses the condition of the system to help drive preventative and corrective maintenance activities.

While the current trim results appear satisfactory, there may be a risk that the program, defined as a 48-month cycle, may become less than adequate in the future.

### 5.4.4 Recommendations

5.4.1 ComEd should review its substation inspections to assure the adequacy of fence and gate grounds.

5.4.2 ComEd should continue to regularly review failure mode analyses for overhead equipment to identify and mitigate the increase in failure rates.

5.4.3 Review vegetation management programs to ensure that the 48 month trim cycle coupled with mid-cycle and spot trims is optimized with regard to clearance barriers and species growth rates.

5.4.4 Implement strengthened quality assurance reviews on contracted tree trim work.

5.4.5 Enhance quality assurance on contracted pole inspections and validation of poles marked for reinforcement and/or replacement.

5.4.6 Expand the distribution line inspection process to include more definitive coding of the status of vegetation encroachment as a supplementary data input to the overall vegetation management planning process, in particular mid-cycle trim and spot time analysis.

## 5.5 Call Center

### 5.5.1 Background

ComEd has call centers located in Oakbrook and Chicago North that service all the ComEd Illinois service territory. There are five groups within the call center: Residential, Bilingual, Customer Correspondence Group, Business Customer Service Team and Commercial Clerks[60]. A brief description of each group follows:

[60] DR-031

- Residential is a team of Customer Service Representatives (CSR) who responds to and handles customer telephone inquiries. Most of ComEd's CSRs work on the Residential team.
- Bilingual is a team of CSRs whose primary function is to handle Spanish speaking customer calls, as well as overflow of English residential related calls.
- Customer Correspondence Group is a team of CSRs whose primary function is processing requests received via U.S. mail, Voice Response Unit (VRU), fax, email or the internet. The team also handles residential related calls as needed.
- Business Customer Service Team is a group of CSRs whose primary function is to handle small businesses up to 400 kW.
- Commercial Clerks act as the first level for escalated calls where CSRs are unsuccessful in effectively handling the situation or the interaction requires collaboration with another department.

The call center uses numerous shifts to cover call volume and staff their locations to meet the hours of operations as shown below.

- Normal residential business (English and Spanish) Monday - Friday 7am - 6pm and Saturday 9am - 1pm.
- Business Customer Service Team - Small business Monday - Friday 8am - 6pm.
- ComEd has Customer Service Representatives available 24 hours x 7 days a week x 365 days a year for outage and emergency related calls.

ComEd has internet and VRU self-service functionality that is available 24 hours x 7 days a week x 365 days for customers' convenience. The call center participates in ComEd Emergency Operations. The Company has numerous major technology enablers that help the call centers perform their mission.

## 5.5.2 Findings

### *Staffing*

- The call center is staffed with approximately 349 employees that directly interact with customers. ComEd uses part-time employees who receive benefits to supplement their full-time staff. The staff composition is 172 full-time CSRs, 155 part-time CSRs and 22 Commercial Clerks. ComEd does not have any CSRs who are on call but, like other

areas of ComEd, the call center uses ARCOS, an automated roster callout system that calls out CSRs in order of least amount of cumulative overtime. New CSRs receive five weeks of training that covers Customer Information Management System (CIMS) functionality and how to view and process in the various system windows in order to accurately answer residential customer inquiries[61] as well as on the job training. The ComEd call center experiences an average turnover rate of 28.5% annually for the 2003 to 2008 (August 31)[62] period, which is slightly above industry standards. As with other utilities, these numbers include both CSRs promoting to other areas of ComEd as well as those who leave ComEd.

### *Scheduling*

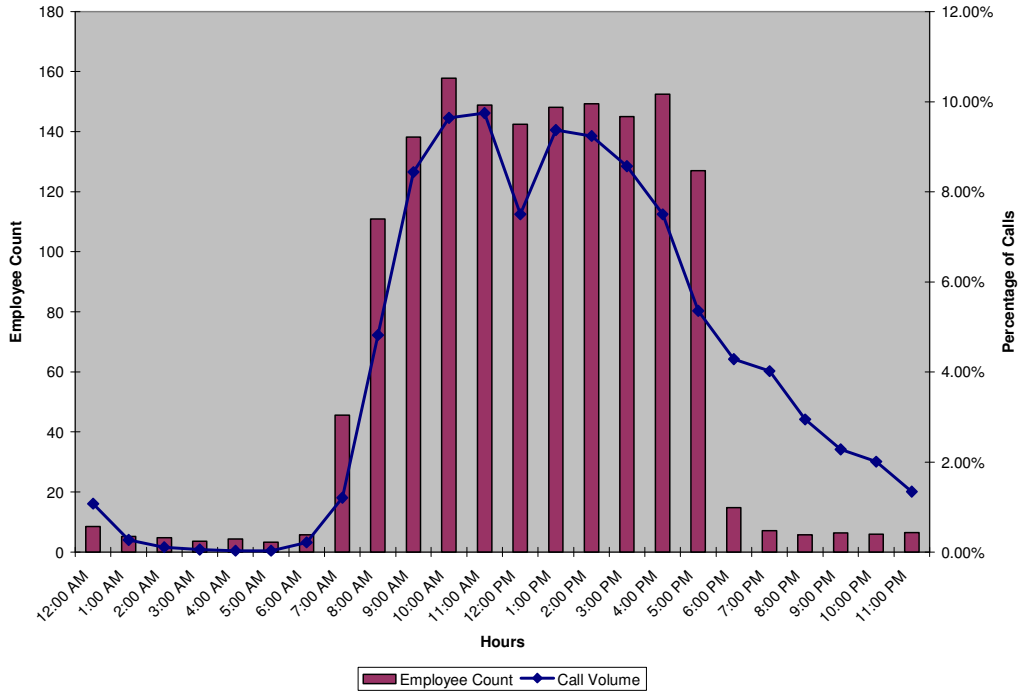
- The first shift begins at 7:00am, and ComEd brings on additional CSRs every 30 minutes thereafter. The Company has an electronic workforce management system and call center optimization software that looks at half-hour increments and historical call patterns to determine the total number of FTEs needed and to determine shift assignments, but prefers to make incremental adjustments to staff based on known issues[63].
- We analyzed how the CSR's shifts were scheduled to determine the adequacy of staff during the peak call times.

[61] DR-014 DR-045 DR-046

[62] DR-085

[63] DR-047

**Figure 30 - Call Center Hourly Staffing**




- As can be seen in the above figure, the addition of CSRs is consistent with the typical hourly increase in call volume[64].

## *Technology*

- The Company uses numerous primary systems to enable the call center personnel to better serve the customer. These systems are integrated with other company systems such as meter reading, outage management and service order. Below is a brief description of each system[65].

  **IVR / Call Routing Systems**

  ComEd utilizes an Aspect Automatic Call Distributor (ACD), a Periphonics Interactive Voice Response Unit (IVR) and a CISCO Computer Telephony Integration (CTI) system to route incoming customer phone calls. One ACD is located at the Chicago North and the other ACD is located at the Oakbrook Customer Care Center. The IVR units for both centers are identical and are physically located at the Oakbrook Care Center. Customers are prompted to

[64] Teletraffic Modeling for Personal Communications Services, Derek Lam, Donald C. Cox, Jennifer Widom, Electrical Engineering & Computer Science Depts. Stanford University
[65] DR-024

select the reason for their phone call and are then routed to the IVR or agent that is best suited to satisfy their needs. These systems also provide the backbone of call center reporting, including average speed of call answer, average handle time, abandon rates and the system calculates service levels.

**Info Quest**

Info Quest is a web-based online library used by CSRs to ensure customers receive consistent, accurate information. It contains training material, job aids, daily communication and bulletins. Info Quest is also used for taking surveys, online training and knowledge checks. All of these tools are designed to enhance the knowledge and skills of the CSRs.

**Witness**

The Witness system is a phone call recording tool used to monitor and evaluate phone calls to insure the proper quality standards are being achieved. This system records and stores the audio of all phone calls entering the ComEd call center and can be accessed over the web. Witness also records the video of selected phone calls so analysts can view the actions taken by the agent on their desktop to handle the customer's call. Witness was deployed at ComEd in the 3rd Quarter of 2006.

**IEX Total View**

IEX Total View is a workforce management software tool that is used to better manage the overall productivity. This is achieved through automation of: time and labor management, employee demand forecasting and scheduling, employee and manager self-service, and absence and leave management.

**Call Center Data Warehouse**

This system stores 30 months of phone call data from the IVR/Routing systems scheduling data from work force management tool, data from quality management tool and some data from CIMS in an easy-to-access database. The data is viewed and accessed through a reporting tool called Business Objects that user's access through a web browser. The data from this system is used to generate business cases and improvement opportunities down to the agent level, as well as first touch resolution strategies.

**Virtual Hold**

Virtual Hold is a virtual queuing solution that helps the contact center meet service level targets with reduced staffing requirements. The Virtual Hold software educates callers of their estimated wait time and gives them the choice of remaining on hold or receiving a callback when it's their turn to speak with an

agent. The Virtual Hold solution was implemented at ComEd in the 4th Quarter of 2007.

**Inova Readerboards**

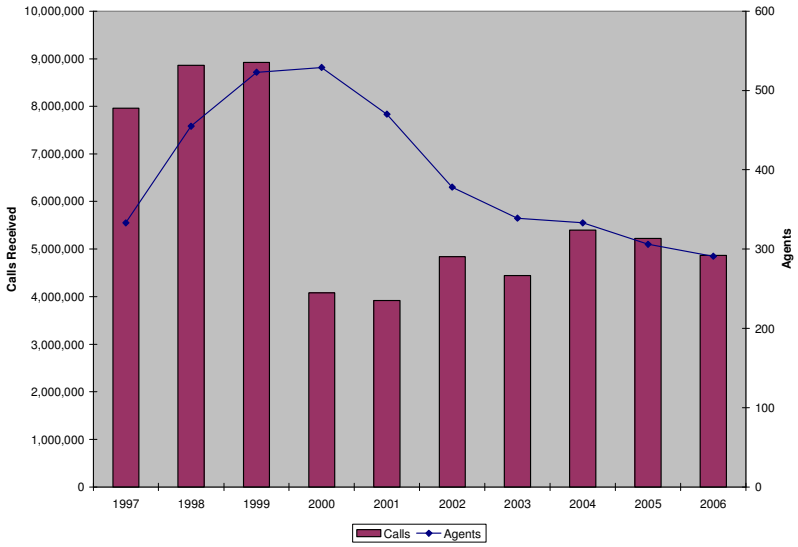
Inova Readerboards instantly deliver vital call center operations management information that guides decisions and drives action. The Readerboards allow the real-time dissemination of critical call center staffing and performance information, as well as the ability to display customizable, real-time updates regarding weather conditions, field crew activities and any other pertinent data that may benefit call center agents as they communicate with external customers.

## *Performance*[66]

- Customer contact call center performance is typically evaluated on the basis of key measures such as:
  - Average Speed of Answer (ASA)
  - Service Level (%)
  - Rate of Abandoned Calls (%)
- Each of these measures is highly susceptible to the influence of factors such as the number of CSRs available to handle calls and the average or longest duration of typical calls. Both of these factors are dependent on the circumstances and events being encountered. During normal operations, the number of CSRs may or may not be adequate, depending on the time of the event, the day(s) on which it occurs or the duration involved. Similarly, it is not unusual for the duration of calls to be longer during emergency situations as explanations tend to take longer than under routine conditions. We have excluded the automated agent so we can evaluate the performance of the live agents.
- The Company has set 2008 goals for:
  - Average Speed of Answer—calls answered in 27 seconds or less
  - Service Level— 80% of all calls answered within 30 seconds
  - Abandonment Rate—number of calls that were not answered 2.7%

[66] DR-113

**Figure 31 - Total Calls Received by Live Agents**




- As the total number of calls received has decreased, the number of live agents has also decreased. This is attributed to the increase in call volume answered by the Company's IVR as shown in the following chart.

**Figure 32 - Total Calls Received by IVR**

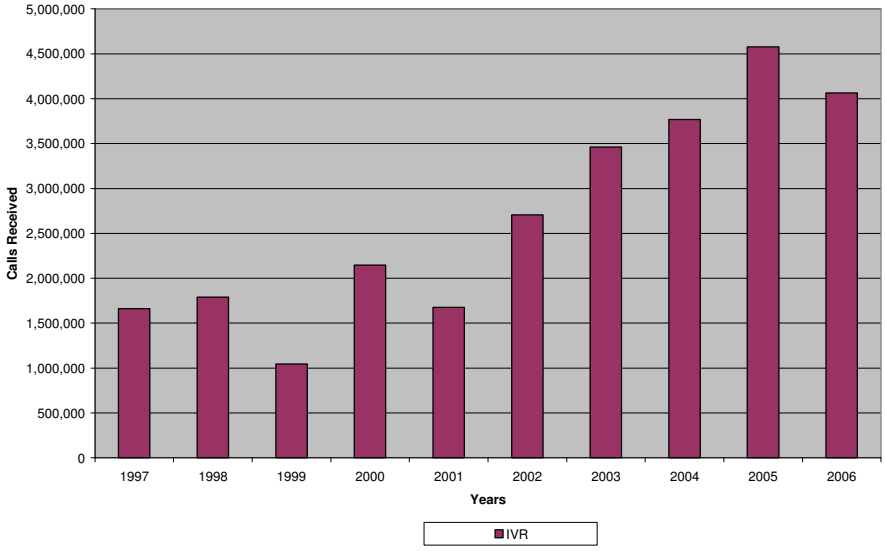
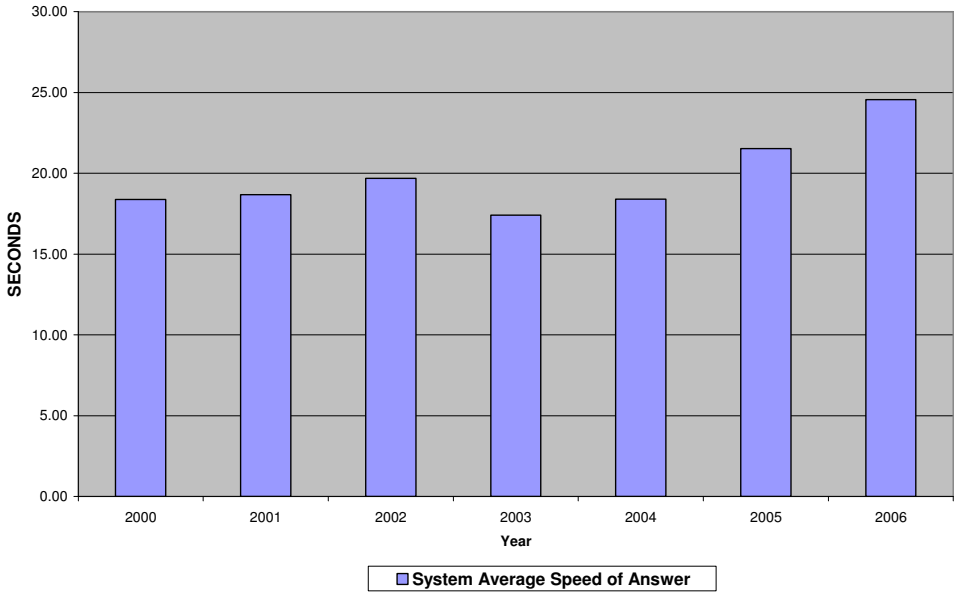



**Figure 33 - System Average Speed of Answer**

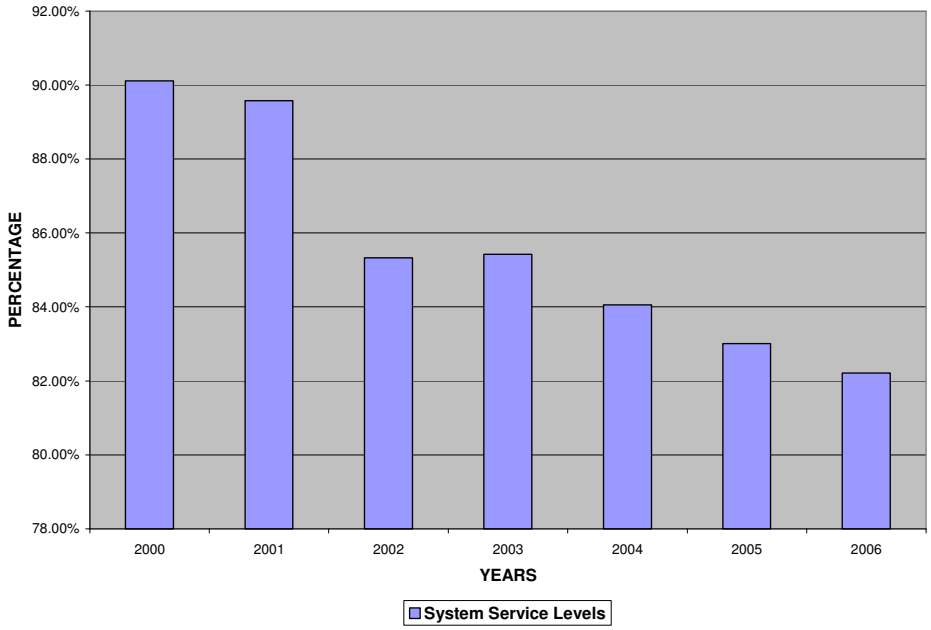



- The average speed of answer is better than the state's goal of 60 seconds in 7 out of the 7 years.
- The Company has set a 2008 system goal of an ASA of 27 seconds. When the data from the study period is matched to the 2008 goal, the ASA has been better than the

goal 7 out of 7 years. While meeting the goal, the ASA is on an upward trend (getting worse).

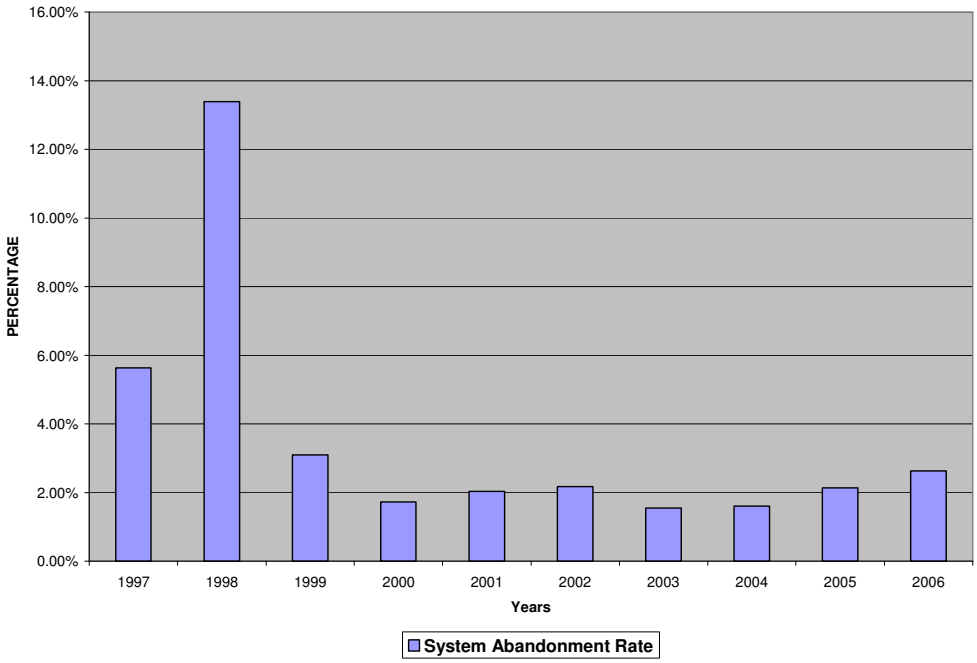
**Figure 34 - System Service Level**

**Number of Calls Answered Within 30 Seconds**




- The Company has set a 2008 system goal of a Service Level of 80% of all calls answered within 30 seconds. When the data from the study period is matched to the 2008 goal, the Service Level has been better than the goal 7 out of 7 years. While meeting the goal, Service Level is on a downward trend (getting worse).

**Figure 35 - System Abandonment Rate**




- The Abandonment Rate is decreasing slightly but has met the industry average for utility inbound call centers of 3.5%[67] in 8 of 10 years. They have met the state mandated levels of 10%[68] for each year since it was enacted in 2000.
- The Company has set a 2008 system goal of Abandonment Rate of 2.7%. When the data from the study period is matched to the 2008 goal, the Abandonment Rate has been better than the goal 7 out of 10 years. While meeting the goal, Abandonment Rate has been on a downward trend over the 1997-2006 period, but has been increasing from 2004 to 2006.
- J.D. Power & Associates includes ComEd in its residential and business customer satisfaction benchmarking surveys[69]. The Utility has received a satisfactory rating in the studies but has shown a decrease in customer satisfaction since 2006. Below is the result of the study.

[67] Purdue University Call Center Benchmark Study @ 2006

[68] DR-028

[69] DR-044 The J.D. Power & Associates Customer Satisfaction Index captures customer perception on six key factors: power quality and reliability, price, billing and payment, corporate citizenship, communications, and customer service.

**Table 21 - J.D. Power & Associates Customer Satisfaction Index**

| Year[1] | Residential Electric | Business Electric |
|---|---|---|
| 2002 | 90 | N/A |
| 2003 | 93 | 85 |
| 2004 | 90 | 90 |
| 2005 | 93 | 100 |
| 2006[2] | 624 | 678 |
| 2007 | 597 | 652 |
| 2008 | 556 | 671 |

1. Indicates year of publication
2. In 2006, J.D. Power & Associates moved from giving index scores based on a centered-to-100 scale, to giving scores based on a maximum 1000 point scale, in order to provide improved reporting and trending capabilities. Whereas the "high" scores on the centered-to-100 scale were normally in the 110-120 range, the "high" scores on the maximum 1000 point scale typically range from 690-770.

## 5.5.3 Conclusions

The Company staffs the call center in accordance with the flow of call volume and uses technology to enhance the call center's ability to service customers in an effective and efficient manner. The technologies employed include: IVR / Call Routing Systems, Info Quest, Witness, IEX Total View, Call Center Data Warehouse, Virtual Hold, Inova Readerboards. ComEd call center internal goals and KPIs are satisfactory but are moving in an adverse direction which implies either/or intentional balancing of costs and service level, extended call handling time and/or insufficient staff to handle the call volume. It should be noted that the call center staff covered in this study has increased from 291 in 2006 to 334 in 2008.

ComEd's Customer Satisfaction Index scores as determined by J.D. Power & Associates have declined since 2006. This could be a result of issues such as multiple storms and/or rate increases which is beyond the direct control of the call center.

## 5.5.4 Recommendations

5.5.1 ComEd should continue to monitor the performance indicators and adjust staff levels to meet the stated goals.

# Appendix A

## List of Recommendations

| Section | No. | Recommendation |
|---|---|---|
| Operations & Maintenance | 5.1.1 | Consistent with its Staffing Plans for 2008 through 2012, ComEd should continue to aggressively increase its electric field workforce, in line with its business needs and the overall economic climate. |
| | 5.1.2 | ComEd should strive to reduce high levels of overtime in the near term by balancing in-house work across department silos, supplemented as needed with contracted resources. |
| | 5.1.3 | ComEd should immediately undertake an in-depth study to identify the appropriate level of overhead electrician special or trouble shooter resources, determine their organizational alignment, and analyze the difficulties currently being encountered in attracting candidates. |
| Training & Safety | 5.2.1 | Study the value of participating in the National Joint Apprentice and Training Committee (NJATC) program as a way to increase the cost effectiveness of training qualified craft workers. |
| | 5.2.2 | In order to address employee safety concerns, proactively communicate the issues identified and efforts underway by the Safety Quality Circle. |
| Quality Assurance | 5.3.1 | Continue planned efforts to implement and enhance its quality assurance over OSMOSE for wood pole ground line inspections. |
| | 5.3.2 | Expand internal distribution inspection program to include more definitive vegetation encroachment documentation. |
| Distribution System Condition Assessment | 5.4.1 | ComEd should review its substation inspections to assure the adequacy of fence and gate grounds. |
| | 5.4.2 | ComEd should continue to regularly review failure mode analyses for overhead equipment to identify and mitigate the increase in failure rates. |
| | 5.4.3 | Review vegetation management programs to ensure that the 48 month trim cycle coupled with mid-cycle and spot trims is optimized with regard to clearance barriers and species growth rates. |
| | 5.4.4 | Implement strengthened quality assurance reviews on contracted tree trim work. |
| | 5.4.5 | Enhance quality assurance on contracted line inspections and validation of poles marked for reinforcement and/or replacement. |
| | 5.4.6 | Expand the distribution line inspection process to include more definitive coding of the status of vegetation encroachment as a supplementary data input to the overall vegetation management planning process, in particular mid-cycle trim and spot time analysis. |
| Call Center | 5.5.1 | ComEd should continue to monitor the performance indicators |

| | | |
|---|---|---|
| | | and adjust staff levels to meet the stated goals. |

# Appendix B

## Background

Every electric utility is expected to extend its service to meet the needs of a growing population. Power is needed to be provided in a reliable, safe, and timely fashion. To maintain high standards of service quality and safety, utility managers traditionally have opted for the control of an in-house work force. As a result, many utilities did not have to rely on others to provide support to its staff or rely on others to meet its customers' needs.

In view of regulatory reform and restructuring, many regulated distribution utilities developed strategies to shift risk, reduce costs, and refocus attention on core functions. Core functions are the tasks the Utility and its in-house workforce perform best. Utility management decisions to outsource raise questions about the relationships between the distribution utility and its employees, the external service providers, the regulators and the ultimate customer. This report focuses on the relationship between the distribution utility, its workforce and customers.

Outsourcing can be defined as creating a long-term, results-oriented relationship with an external service provider for activities traditionally performed within the Company. Usually, the term "outsourcing" applies to a complete business process, where some degree of managerial control and risk are shared by the service provider. This compares to the relatively straightforward procurement of goods or services where support is rendered, but the Company continues to assume the risks and takes management responsibility for the requested service.

## Outsourcing Philosophy

Essential distribution functions include distribution system planning: the construction, operation, and maintenance of the distribution circuits and substations; connection of new residential, commercial, and industrial customers; and the monitoring and emergency restoration of the distribution system. Most utilities contract out a portion of construction and maintenance of the distribution system, including functions like tree trimming and other right-of-way maintenance as well as distribution line and substation construction. All essential distribution functions are potential candidates for outsourcing. The business benefits that can be achieved through outsourcing are well documented and have been proven by past experience, both within and outside the utility industry. These benefits include:

- Cost savings are typically achieved by lower labor costs, increased productivity, and economies of scale delivered by an outsource service provider.
- Performance improvement is generally delivered through the use of technologies and business processes that may be better than those employed by the Utility, and where

the service provider can invest and focus on functions that are core to its business but not core to the Utility that chooses to outsource them.

- Increased flexibility/scalability is provided through contract terms that support different levels of business activity, allowing costs to fluctuate with changing volumes of work. This is a key benefit for utilities with fluctuating activity volumes.
- Access to innovation and best practices is made available by the service provider whose primary business is to support specific business functions. This focus allows them to build expertise and access a broader market of clients, enabling them to identify and leverage good ideas from a wide base of exposure.
- Access to a labor force is supplied by a service provider who focuses on specific functions, hires resources specifically for these functions, and provides greater career development opportunities associated with the performance of a specific type of work, may lead to enhanced efficiencies.

At ComEd, outsourcing/contracting has primarily sought increased flexibility in addressing fluctuating workload volumes and to perform lower-skilled or specialized work. Typically, contractors are assigned projects of a larger scale, projects requiring special equipment or skills, work activities that would tie up in-house resources for an extended period or to augment staffing when necessary (temporary seasonal work) and for storm restoration. ComEd's contracting philosophy is balanced by the need to maintain in-house knowledge of the distribution & transmission system and the desire to have first responders be Company staff to ensure quality service, and help preserve brand recognition. As of 2006, contractors to supplement the in-house workforce accounted for approximately 24% of the total workforce performing distribution system line and substation work.

This approach and level of outsourcing and contracting represents a moderate amount from our experience, and places certain obligations on the Utility's management as well as impacts on the Utility's workforce. Management must ensure that the quality of the work completed is consistent with customer service standards that the cost of the work is reasonably similar to what the work would cost if were performed by the in-house staff, and that high quality customer service is provided. At the same time, the workforce may see a reduction in the total number of employees as well as a reduction in the breadth of job skills. Unions may attempt to erect barriers to outsourcing through their negotiated labor agreements by seeking language which may prohibit or greatly limit the Company's ability to outsource. In addition, unions may seek to gain support for their position by using their political influence concerning job loss.

# Appendix C

## Organized Labor

This appendix presents an overview of the events that occurred during the study period which have helped to shape organized labor at ComEd. We first list the extensive organizational changes and then the more typical utility technological enhancements that have taken place. We then briefly review the history of outsourcing and the type of work activities ComEd contracted. Finally, we highlight the subcontractor contract language contained in the Company's agreement with its union IBEW Local Union 15, which has remained unchanged throughout the study period.

### Events Impacting Workforce Employment

Over the study period, ComEd employees were impacted by mergers, industry restructuring, and organizational changes. In addition, the workforce was directly affected by numerous material, equipment and automation changes.

A chronology of major events impacting the workforce included:

- 1996: ComEd sold Kincaid and Stateline generating stations
- 1998: ComEd implemented a new Customer Information Management System (CIMS)
- 1999: ComEd sold all of its remaining fossil generating stations to Midwest Generation
- 2000: ComEd's parent company, Unicom Corporation, merged with Philadelphia Electric Company (PECO) to form Exelon Corporation
- 2000: All of the nuclear generating stations were transferred from ComEd to Exelon Generation Company, LLC
- 2000: Certain ComEd functions, such as certain human resources, finance, and legal were transferred to Exelon's Business Services Company
- 2007: Exelon decentralized senior management for ComEd & PECO, moving staffing for certain functions back to ComEd

Throughout the study period, various material, vehicle, equipment and automation improvements were made. Some major improvements included:

- Installed work management system to enhance coordination, communications and customer service
- Installed SCADA to provide remote control of the system and real-time data

- Installed distribution automation on the 34kV and 12 kV systems
- Switched to Outage Management System for switching, taking, and real-time connectivity information
- Utilize the IEX system to base CSR staffing needs on call volume
- Have employed Interactive Voice Response and Computer Telephone Integration technologies
- Optimized meter routes through ITRON automation
- Utilizing mobile data terminals for various workgroups

## Outsourcing/Contracting History and Activities

In general, line construction core business activities have been assigned to the ComEd employees first and contractor crews have been used to help smooth out workload peaks and valleys. Typically, contractors are assigned projects of a larger scale, projects requiring special equipment or skills, work activities that would tie up in-house resources for an extended period or to augment staffing when necessary (temporary seasonal work) and for storm restoration. Increased ComEd workforce efficiencies resulted from sending crews across regional and local boundaries to assist with schedules and other work, increasing use of two-person crews for work that was historically performed by three-person crews, and increasing the use of job site reporting.

In addition, the Company has increased the efficiency of its employees by forming a separate group called System Services Group (SSG) to perform activities that do not require the high skill levels possessed by journeyman linemen, relay technicians and substation journeymen. SSG primarily performs trenching and other similar work associated with installing underground cable to new residential construction projects.

## Labor Agreement Contracting Language

The electric bargaining unit employees of ComEd are members of IBEW local 15. Within this local, there are two bargaining units:

- Most represented employees, slightly over 3,700, are represented by an agreement that expired on September 30, 2008. The parties have reached a tentative agreement for a new contract that will be presented to the bargaining unit membership for vote.

- A second represented group, formed in 1998 and currently consisting of approximately 150 employees, is covered by a separate collective bargaining agreement set to expire on October 1, 2009. Employees covered by this agreement work in the System Services Group.

The section of the IBEW Local 15 labor agreement (that expired on September 30, 2008) concerning contracting of work is contained in Article V - Working Conditions, Section 7. This section indicates that the Company will not contract any work which is "ordinarily and customarily" done by its regular employees if as a result it would become necessary to layoff or reduce the rate of pay of any effected employees. The second paragraph of Article V, Section 7 goes on to state that ComEd's objective is to reduce the necessity of using outside contractors for work that is ordinarily and customarily performed by ComEd employees and that where circumstances permit, ComEd will meet with union representatives to review various alternatives to contracting before deciding whether to contract out such work. The third paragraph of Article V, Section 7 states that before deciding whether or not to contract out work, consideration will be given to providing the opportunity for overtime to the workgroup involved. This overtime could either be instead of or in conjunction with the contemplated contracted work. Also, consideration will be given to other alternatives to contracting which would permit greater utilization of ComEd employees so long as the requirements of the work to be performed and other restraints can be met.

The labor agreement section dealing with contracting has been tested over the years. The Union filed hundreds of grievances over alleged violations of Article V, Section 7, specifically with respect to contracting out of "work which was customarily done by its regular employees." In 1988, Arbitrator Valtin was presented with 15 grievances to, among other things, test the question of whether the work involved was “ordinarily and customarily” done by ComEd employees. In his discussion, Arbitrator Valtin’s Award identifies seven work tasks as not being “ordinarily and customarily” performed by in-house employees. He also determined that if the Company decided to use contractors to perform work “ordinarily and customarily” performed by ComEd employees, “employees in the work group involved” had to be offered eight hours of scheduled overtime work. The scheduled eight hours of overtime opportunity has become known as “Valtin overtime.” Overtime worked during callouts, emergencies, or to fill shifts does not count towards the Valtin overtime requirement, unless the callout, emergency, of filled shift occurs during the scheduled Valtin overtime. Valtin overtime is, in all cases, voluntary overtime and ComEd employees are always free to decline the Valtin overtime opportunity without consequence.

Contract negotiations in 1994 helped to establish the future tone for contracting at ComEd by establishing key definitions for contracting and outsourcing. These definitions are:

- Contracting is supplementing normal in-house work and activities of company crews or supplementing a specific skill that is required.

- Outsourcing or “permanent contracting” occurs when the entire work process is totally done by outside forces and eliminated from the in-house workforce.

# Appendix D

## Inspection and Maintenance Cycles and Scope[70]

| Equipment | Scope | Calendar Year 2008 Frequency | Comment |
|---|---|---|---|
| Distribution Vaults | Visual | 3 Years | |
| | Structural | 1-3 Years | Depends on criticality |
| | Sump | 3 Years | |
| Padmounts | Visual | 5 Years | Depends on criticality |
| | Pressure | 0.5-5 Years | Depends on criticality |
| Automatic Throw-over | Calibration | 2 Years | |
| | Control Cabiner Inspection | 1 Year | |
| | Visual | 1 Year | |
| | Internal Inspection | 2 Years | |
| Aerial Conductor | Visual | 2-4 Years | Depends on criticality |
| | Thermography | 0.5-4 Years | Depends on criticality |
| Cutouts & Disconnects | Visual | 2-4 Years | Depends on criticality |
| | Thermography | 0.5-4Years | Depends on criticality |
| Aerial Gang-Operated Switch | Visual | 2-4 Years | Depends on criticality |
| | Thermography | 0.5-4Years | Depends on criticality |
| Reclosers | Visual | 2 Years | |
| | Operations Counter Reading | 2 Years | |
| Distribution Wood Poles | Visual | 2-4 Years | Depends on criticality |
| | Ground Line Detailed | Variable | |
| | Sound & Bore | Variable | |
| | Pole Treatment | As Needed | |
| Pole-Top Capacitors | Amp Balance Test | 1-4 Years | Depends on criticality |
| | Visual | 1-4 Years | Depends on criticality |
| | Thermography | 2-4 Years | Depends on criticality |
| | Functional Test | 1-4 Years | Depends on criticality |
| | Oil Switch Replacement | 4 Years | |
| Pole-Top Regulators | Visual | 2 Years | |
| | Thermography | 0.5-4 Years | Depends on criticality |
| | Functional Test | 2 Years | |
| Cathodic Protection (UG) | Rectifier Inspection | 1 Month | |
| | Galvanic Anode Current Reading | 3-Years | |
| | Monitor Cable Sheath Voltage | 3-Years | |
| | Impressed Current CP System Survey | 1-2 Years | Depends on criticality |
| | Reverse Current Switch Inspection | 6 Months | |
| | Bondtie Monitoring | 1-3 Years | Depends on criticality |
| | Standard C5202 - Pipeline Crossing Monitoring | 1-3 Years | Depends on criticality |
| Distribution Manhole | Visual | 3 Years | |

[70] Information in this table pertains to 2008 only. ComEd continually evaluates inspection and maintenance frequencies so these frequencies may change in the future.

| Equipment | Scope | Calendar Year 2008 Frequency | Comment |
|---|---|---|---|
| Pole-Top Transformer | Visual | 2-4 Years | |
| | Thermography | 0.5-4 Years | Depends on criticality |
| Submersible Switches | Visual | 3 Years | |
| Distribution Network Protector | Operations Counter Reading | 1 Year | |
| | Visual | 1 Year | |
| | Maintain Contacts and Arc Chutes | 1-5 Years | Depends on criticality |
| | Circuit Breaker Inspection | 1-5 Years | Depends on criticality |
| | Clean & Lubricate | 1-5 Years | Depends on criticality |
| | Relay and Mechanism Frame Inspection | 1-5 Years | Depends on criticality |
| | Enclosure Inspection | 1-5 Years | Depends on criticality |
| | Enclosure Leak Test | 1-5 Years | Depends on criticality |
| | Relay Calibration | 1-2 Years | Depends on criticality |
| Circuit Breaker, Vacuum, 4 - 34 kV | Check Red (Closed) Indicating Lamp | 5W-6M | Depends on criticality |
| | Visual | 5W-6M | Depends on criticality |
| | Thermography | 1-4 Years | Depends on criticality |
| | Contact Resistance (Ductor) Test | 6-Years | |
| | Hi Pot Test on Vacuum Bottles | 6-Years | |
| | Exercise Mechanism | 3-Years | |
| | Aux Contact Block Inspection | 6-Years | |
| | Cubicle / Cabinet Maintenance | 6-Years | |
| | Mechanism Lubrication / Maintenance | 6-Years | |
| | Inspect Vacuum Bottles | 6-Years | |
| | Check Control Cabinet / Cubicle Heaters | 5W-6M | Depends on criticality |
| Circuit Breakers, Air Magnetic, 4-12 kV | Check Red (Closed) Indicating Lamp | 5W-6M | Depends on criticality |
| | Visual | 5W-6M | Depends on criticality |
| | Thermography | 1-4 Years | Depends on criticality |
| | Contact Resistance (Ductor) Test | 6-Years | |
| | Exercise Mechanism | 3-Years | |
| | Aux Contact Block Inspection | 6-Years | |
| | Cubicle / Cabinet Maintenance | 6-Years | |
| | Mechanism Lubrication / Maintenance | 6-Years | |
| | Check Control Cabinet / Cubicle Heaters | 5W-6M | Depends on criticality |
| Circuit Breaker, Oil, 4 - 13 kV | Check Breaker Oil Level | 5W-6M | Depends on criticality |
| | Check Red (Closed) Indicating Lamp | 5W-6M | Depends on criticality |
| | Visual | 5W-6M | Depends on criticality |
| | Oil Dielectric Test | 1-Year | |
| | Thermography | 1-4 Years | Depends on criticality |
| | Check Overflow Tank Level | 5W-6M | Depends on criticality |
| | Exercise Mechanism | 3-Years | |
| | Mechanism Lubrication / Maintenance | 3-Years | |
| | Check Heaters | 5W-6M | Depends on criticality |
| Substation Capacitor Bank | Monitor Phase/Neutral Balance | Continuous | SCADA |
| | Visual | 5W-6M | Depends on criticality |
| | Check Control Cabinet / Vac. Oil Switch | 5W-6M | Depends on criticality |
| | Thermography | 1-4 Years | Depends on criticality |

| Equipment | Scope | Calendar Year 2008 Frequency | Comment |
|---|---|---|---|
| Circuit Breaker, Oil, 34 kV and Above | Check Red (Closed) Indicating Lamp | 5W-6M | Depends on criticality |
| | Monitor Compressor Run Time | 5W-6M | Depends on criticality |
| | Visual Inspection | 5W-6M | Depends on criticality |
| | Oil Quality Test | 1-Year | |
| | Thermography | 1-4Years | |
| | Profile Breaker Operation | 3-Years | |
| | Contact Resistance (Ductor) Test | 3-Years | |
| | Power Factor Test | 3-Years | |
| | Travel Test | 3-Years | |
| | Drain Air Receiver Moisture | 5W-6M | Depends on criticality |
| | Compressor Maintenance | 1-Year | |
| | Exercise Mechanism | 3-Years | |
| | Mechanism Lubrication / Maintenance | 3-Years | |
| | Pressurized Vessel Inspection | 3-Years | |
| | Relief Valve Replacement | 3-Years | |
| | Internal Inspection | 12-Years | |
| | Pilot / Control Valve Refurbishment | 12-Years | |
| | Mechanism Refurbishment | 24-Years | |
| | Check Control Cabinet Heaters | 5W-6M | Depends on criticality |
| | Check of Gauges and Pressure Switches | 3-Years | |
| | Functional Alarm Test | 3-Years | |
| | Textolite Sleeve Bearing Wear | 3-Years | |
| Circuit Breaker, Air Blast, 66 kV and Above | Check Red (Closed) Indicating Lamp | 5-Weeks | |
| | Monitor Compressor Run Time | 5-Weeks | |
| | Visual Inspection | 5-Weeks | |
| | Thermography | 1-Year | |
| | Contact Resistance (Ductor) Test | 3-Years | |
| | Power Factor Test | 3-Years | |
| | TimingTest | 3-Years | |
| | Drain Air Receiver Moisture | 5-Weeks | |
| | Air Moisture Test | 1-Year | |
| | SF6 Moisture Test | 1-Year | |
| | Compressor Maintenance | 3-Years | |
| | Exercise Mechanism | 3-Years | |
| | Internal Inspection | 12-Years | |
| | Check control cabinet heaters | 5-Weeks | |
| | Check of Gauges and Pressure Switches | 3-Years | |
| | Functional Alarm Test | 3-Years | |
| Voltage Regulator | Monitor Voltage Level | 5-Weeks | |
| | Visual | 5-Weeks | |
| | Oil DGA | 1-Year | |
| | Oil Quality Test | 1-Year | |
| | Thermography | 1-Year | |
| | Calibrate Voltage Control | As required | |
| Switch, Motor Operated | Visual | 5-Weeks-6M | |

| Equipment | Scope | Calendar Year 2008 Frequency | Comment |
|---|---|---|---|
| | Thermography | 1-4 Years | Depends on criticality |
| | Operate/Inspect Lubricate | 3-6 Years | Depends on criticality |
| | Contact Resistance (Ductor Test) | 3-6 Years | Depends on criticality |
| | Blade and Hinge Assembly Maintenance | 12-Years | Or As Required |
| | Check Cabinet Heaters | 5-Weeks-6M | |
| Circuit Switcher | Visual | 5-Weeks | |
| | Thermography | 1-Year | |
| | Contact Resistance (Ductor Test) | 3-6 Years | Depends on criticality |
| | Operate/Inspect Lubricate | 3-6 Years | |
| | Check Cabinet Heaters | 5-Weeks | |
| Reclosers | Visual Inspection | 5-Weeks | |
| | Check Contact Erosion Wear Indicator | 3-Years | |
| | Inspect Operator Mechanism | 3-Years | |
| | Inspect Recloser Control Cabinet | 3-Years | |
| | Oil Dielectric Test | 3-Years | Depends on criticality |
| | Contact Resistance (Ductor) Test | 3-Years | |
| | Mechanism Lubrication | 3-Years | |
| | Control Battery Replacement | 3-Years | |
| | Check Cabinet Heaters | 5-Weeks | |
| | Thermography | 1-Year | |
| | Functional Operations Check | 3-Years | |