

## Appendix E

### STAFF INVESTIGATION REPORT

January 5, 2009

Redacted Version

**SUBJECT:** [REDACTED]

**SUMMARY:** [REDACTED]

[REDACTED]

In Staff's opinion, ComEd devoted too few management personnel to transmission system vegetation management for the available work load. That meant ComEd had to depend on contractor reports to monitor the transmission vegetation management program and had no effective independent field verification program of its own. As late as July 7, 2008, ComEd had assured the Commission Staff that it was trimming trees on a five-year maintenance cycle and conducting annual foot inspections of ALL transmission facilities.

Staff believes that ComEd needs to reassess the level of commitment and resources necessary to effectively manage its transmission vegetation management programs. Further, the failures that led to this incident may have similar roots in vegetation management programs for ComEd's distribution system requiring reassessments in distribution vegetation management.

**WHY TRANSMISSION LINE VEGETATION MANAGEMENT IS IMPORTANT:** The Federal Energy Regulatory Commission, in a September 7, 2004, report, noted the consequences of vegetation management failures on transmission lines.

On August 14, 2003, an electric power blackout affected large portions of the Northeast and Midwest United States and Ontario, Canada. President George W. Bush and Prime Minister Jean Chrétien established a joint U.S.-Canada Power System Outage Task Force (Task Force) to investigate the causes of the blackout and how to reduce the possibility of future outages. On April 5, 2004, the Task Force issued a Final Blackout

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Report<sup>4</sup> stating that one of the four primary causes of the blackout was inadequate vegetation management (tree pruning and removal).

As described in the Blackout Solutions<sup>5</sup> report, “A perfect storm of near-peak demand, computer errors, obsolete equipment, inadequate training and miscommunication resulted in cascading ... power outages ...” lead to the 2003 event. While Chapter 4 of the Blackout Report lists the full spectrum of causes that contributed to the 2003 event the tipping point was reached with the failure of three 345-kV lines. In describing the 345-kV line failures that initiated the cascade of failures that directly caused the 2003 blackout the Final Blackout Report authors stated, “These line trips were not random. Rather, each was the result of a contact between a line and a tree that had grown so tall that, over a period of years, it encroached into the required clearance height for the line.”<sup>6</sup>



### THE COMED EVENT:



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<sup>4</sup> U.S.-Canada Power System Outage Task Force, Final Report on the August 14<sup>th</sup> Blackout in the United States and Canada: Causes and Recommendations (April 2004) (Final Blackout Report).

<sup>5</sup> Page 1, Blackout Solutions, June 2004, Final Report of the Special Task Force on the Condition and Future of the Illinois Energy Infrastructure.

<sup>6</sup> Page 57, Chapter 4, U.S.-Canada Power System Outage Task Force, Final Report on the August 14<sup>th</sup> Blackout in the United States and Canada: Causes and Recommendations (April 2004) (Final Blackout Report).



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[REDACTED]

[REDACTED]

On July 30<sup>th</sup>, Staff learned that a [REDACTED] was briefly mentioned on page 73 of the “Combined Notes To Consolidated Financial Statements” for Exelon, PECO, and ComEd. On July 31<sup>st</sup>, Staff sent ComEd a number of questions because ComEd’s vegetation management failure was an apparent violation of ICC Administrative Code Part 305<sup>12</sup>. On August 7, 2008, ComEd responded that RFC, NERC, and FERC had responsibility<sup>13</sup> for the reliability of the interstate transmission grid and that ComEd’s iterative process with RFC and NERC would be closed out in six

[REDACTED]

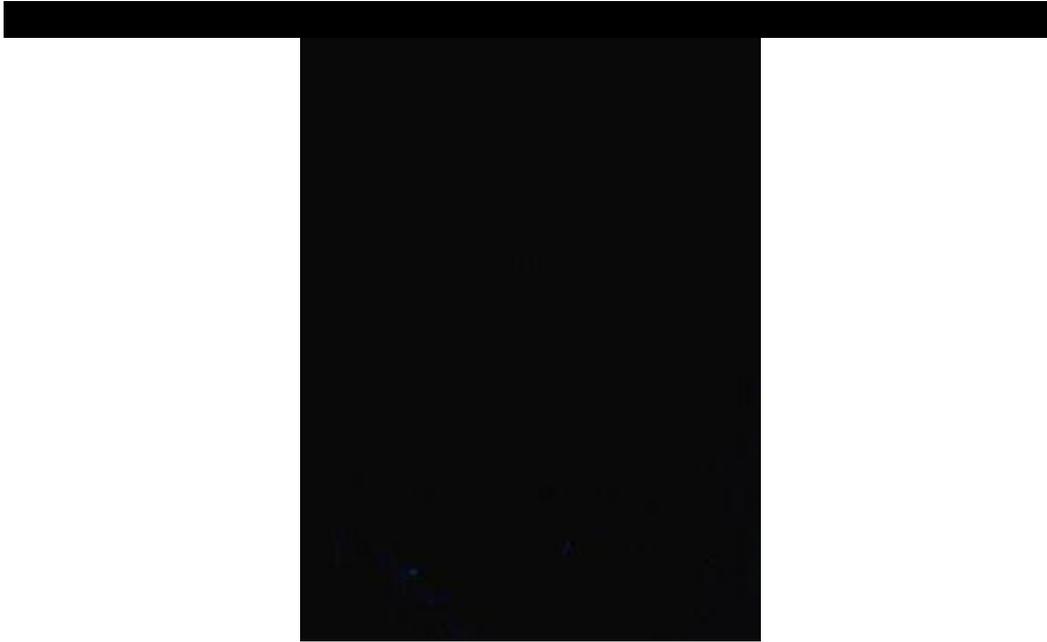
[www.rfirst.org](http://www.rfirst.org)

<sup>12</sup> NESC Rule 218(A)(1) of the 2002 NESC Part 2 adopted by the Commission in Illinois Administrative Code 305.20 on June 15, 2003, states: “Trees that may interfere with ungrounded supply conductors should be trimmed or removed. NOTE: Normal tree growth, the combined movement of trees and conductors under adverse weather conditions, voltage, and sagging of conductors at elevated temperatures are among the factors to be considered in determining the extent of trimming required.”

<sup>13</sup> NERC Standard FAC-003-1(A)(4)(3) This standard shall apply to all transmission lines operated at 200 kV and above and to any lower voltage lines designated by the RRO as critical to the reliability of the electric system in the region.

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months. ComEd stated it would keep Staff informed throughout the RFC process providing “the ICC with full details on the incident and the corrective actions that will be taken to prevent recurrence.”<sup>14</sup>



**COMED’S VEGETATION MANAGEMENT PROGRAM:** ComEd previously reported that it clears vegetation away from its electric transmission lines every five years by removing all vegetation that might grow or fall into the lines from the sides, the top, and underneath.<sup>15</sup> The objective is to ensure no tree interference with ComEd transmission lines except under very unusual circumstances such as a very strong wind blowing broken tree limbs into the line from outside the clearing zones<sup>16</sup>. ComEd also reported that it conducts annual foot patrols and aerial inspections of all transmission facilities.<sup>17</sup>



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<sup>14</sup> ComEd e-mail to ICC Staff on Thursday, August 7, 2008, 5:15PM.

<sup>15</sup> Below the lines of a 345-kV the clearance should be greater than 30 feet and if clearances were 20 feet or less it would be cause for immediate “Fix-It-Now” (FIN) action



<sup>16</sup> A typical right-of-way for a 345-kV electric transmission line is about 150 feet wide. ComEd guidelines VM-ED-P029 specify that for a nominal line voltage of 345kV and spans greater than 1,000 feet, the proposed VM side clearance measured horizontally from outside conductor to vegetation is 43 feet. This is the clearance that crews should trim to during scheduled cyclic maintenance.

<sup>17</sup> In its July 7, 2008, response to Staff data request ENG 4.2, ComEd stated in part: “...ComEd conducts an annual foot patrol inspection of all transmission facilities each year to ensure system safety and reliability with respect to vegetation, including tree to conductor clearance and dead or declining trees with the potential to fail and impact the facilities. Additionally, vegetation management and transmission engineering conduct an aerial inspection of the transmission system. ... ComEd is currently on a 5 year maintenance cycle for the Trimming and Removal and Herbicide programs. ...”

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ComEd hires contractors to perform its transmission line tree removal. According to ComEd's policies, those contractors survey the transmission line rights-of-way, develop plans to perform the necessary clearing work, and complete the tree trimming and tree removal to provide the required clearance between the trees and the lines.

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Then, the contractors file reports with ComEd to explain what work was done and any work that remains to be done.

To make sure the tree removal contractors are performing the work to ComEd's standards, ComEd hires a quality assurance contractor to perform inspections of the first contractor's tree removal work. When ComEd gets the reports from the tree removal contractor, the quality assurance contractor is sent to inspect the first contractor's work. If the quality assurance contractor's reports indicate that any work fails to meet ComEd's standards, the first contractor must revisit the site and correct its mistakes.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

### **WHY COMED'S PROGRAM FAILED:**

[REDACTED]

[REDACTED] ComEd had only one person [REDACTED] supervising all (tree removal clearing and quality assurance) work performed by all the contract personnel on all the transmission line rights-of way on the entire ComEd transmission system. The ComEd transmission system includes about 5,378 overhead transmission miles. [REDACTED]

Additionally, this single ComEd employee has been trying to keep up with a full-time office workload of managing the assignments and workloads of the various contractors while also bearing responsibility for field verification of tree removal and quality assurance contractor performance. This single transmission vegetation management employee [REDACTED] at least one day each week in the field.<sup>32</sup> [REDACTED] Staff

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[REDACTED]

<sup>32</sup> The ComEd transmission system stretches from the east side to the west side of Illinois and from the northern Illinois border to Peoria and Pawnee in central Illinois. The distances from Chicago to Quad Cities and Pawnee are about 170 miles (travel time of 3 hours one way) and 218 miles (travel time of 3 hours and 45 minutes one way), respectively. The magnitude of ComEd's system, at a total of 5,378 miles, would limit how much a single transmission vegetation management person would be able to inspect one day per week.

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believes no single person could possibly perform that job satisfactorily: the job is just too big.

[REDACTED]

[REDACTED]

[REDACTED]

**STAFF FOLLOW-UP:** Staff will continue to follow this issue in the future as the company reports its progress in developing satisfactory changes to their programs and procedures to further minimize the likelihood of future transmission and distribution system contacts with vegetation.

Only ComEd's 345-kV and 765-kV transmission lines fall within the scope of NERC's Standard FAC-003-1<sup>34</sup> while ComEd's 2,770<sup>35</sup> miles of 138-kV transmission lines are (unless designated critical by RFC) outside NERC's scope. On the other hand, ComEd's entire transmission and distribution system is covered by many similar, if not

[REDACTED]

<sup>34</sup> NERC Standard FAC-003-1(A)(4)(3) *This standard shall apply to all transmission lines operated at 200 kV and above and to any lower voltage lines designated by the RRO as critical to the reliability of the electric system in the region.*

<sup>35</sup> Page 3, Liberty Consulting Group, Report on a Focused Review of Commonwealth Edison's Transmission System Protection, December 16, 2003.

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the same, ComEd procedures, practices, and management. Similarly, reliability of service to Illinois electric customers<sup>37</sup>, which is under the purview of the ICC, depends upon ComEd's entire transmission and distribution system.

Staff believes that this incident reflects potentially far reaching program deficiencies in ComEd's transmission & distribution vegetation management programs as well as other maintenance programs. A lack of depth or misallocation in staffing assignments or priorities impacted ComEd's comprehensive quality control and management oversight of vegetation management programs for transmission lines. The issue of applying insufficient resources and people to perform the necessary work and to assure quality control was addressed in a review of ComEd's substation<sup>38</sup> and distribution<sup>39</sup> maintenance programs. Regarding these transmission line issues, ComEd needs to make sure it has enough of its own people in the field doing quality checks to verify contractors' oral and written reports. Staff will look into the existence of similar staffing issues that may exist in ComEd's maintenance programs and ComEd's oversight of the distribution and substation system. Staff believes that comprehensive quality control and management oversight are fundamental to a good reliability program.

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<sup>37</sup> Illinois Public Utilities Act (220 ILCS 5/1-102) "*The General Assembly finds that the health, welfare and prosperity of all Illinois citizens require the provision of adequate, efficient, reliable, environmentally safe and least-cost public utility services ...*"

<sup>38</sup> Chapter 11, Investigation of Commonwealth Edison's Transmission and Distribution Systems, Liberty Consulting Group, June 2000.

<sup>39</sup> These are very similar to the quality control and management issues noted in the Staff memorandum to the Commission "Liberty Verification of ComEd's 3<sup>rd</sup> Quarter 2002 Report" on February 3, 2003 which stated in part: "...Staff review of Liberty's report identified one material issue that has been discussed in the past and was identified by Liberty in the continuing verification of ComEd's inspection and maintenance on worst performing feeders. During the course of their verification this quarter, Liberty found that ComEd did not perform all the repairs that it had reported as performed on the year 2000 one percent worst performing feeders and that accuracy and consistency of the inspection reports continues to be problematic. What is important to note is that this quarter's verifications concentrated mainly on circuits that had repairs reported as completed and that were "checked" a second time by ComEd earlier in the year 2002 as a result of Liberty's findings on earlier samples of ComEd's year 2000 one percent worst performing feeders. The performance problems uncovered by Liberty on a sample of feeders, after ComEd had checked all year 2000 feeders a second time to be complete and accurate, were a surprise to ComEd management and resulted in personnel changes in some regions as well as ComEd's Executive Vice President of Energy Delivery Operations asking for a meeting with Staff on December 16, 2002, to specifically discuss what he intend to do in light of the latest Liberty findings. ComEd has found Liberty's actions to be valuable insights into areas where management controls are lacking. ComEd is planning to organize a group within their organization that would verify work done in distribution, substation, and tree trimming. ..."