

STATE OF NEW YORK  
DEPARTMENT OF PUBLIC SERVICE

Interoffice Memorandum

June 4, 2008

TO: THE COMMISSION

FROM: OFFICE OF ELECTRIC, GAS, AND WATER

SUBJECT: Case 04-M-0159 – Proceeding on Motion of the Commission to Examine the Safety of Electric Transmission and Distribution Systems

RECOMMENDATION: This item is for information only and reports on the status of compliance with the Commission's Electric Safety Standards.

SUMMARY

On January 5, 2005, the Commission established Electric Safety Standards to safeguard the public from exposure to stray voltage.<sup>1</sup> To accomplish this goal, electric utilities are required to annually test all of their publicly-accessible electric facilities for stray voltage and inspect all of their electric facilities at least once every five years. The utilities are also required to annually test streetlights<sup>2</sup> along public thoroughfares for stray voltage, regardless of who owns them. This testing is generally a manual process performed using handheld devices (manual testing). Consolidated Edison Company of New York, Inc. (Con Edison), however, has also been using a recently developed mobile detection vehicle to supplement its required testing program. The mobile detector is

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<sup>1</sup> Case 04-M-0159, Proceeding on Motion of the Commission to Examine the Safety of Electric Transmission and Distribution Systems, Order Instituting Electric Safety Standards (issued January 5, 2005).

<sup>2</sup> The term "streetlights" means and includes utility- and municipal electric-owned streetlights located on, along, or adjacent to public thoroughfares and areas and traffic signal poles and devices; it does not include privately-owned fixtures, such as those located in private parking lots.

limited to use in regions served predominantly by underground facilities, but is able to identify stray voltage on a variety of objects, and is not limited to utility facilities. The company performed four system-wide sweeps with the mobile detector in 2007, with 12 scheduled for the period from April 2008 through March 2009 as ordered by the Commission in Case 07-E-0523.

Manual stray voltage testing was performed on approximately 4 million facilities statewide in 2007, with 3205 stray voltage findings identified; 3090 were found by the investor-owned utilities<sup>3</sup> and the remaining 115 were found by the municipal electric utilities. Overhead distribution facilities accounted for 1267 (40%) of the total in 2007. Of the 3205 stray voltage findings 660 (20%) were at voltage levels of 8 V or higher.<sup>4</sup> Findings on streetlights accounted for 567 (86%) of the conditions at voltage levels of 8 V or higher.

In 2007, there were 294 calls from customers reporting shock incidents that resulted in confirmed cases of stray voltage; 88 were caused by problems with utility facilities and 206 were traced back to faulty customer equipment or wiring. The totals in 2007 were a marked decrease from the 2006 levels of 436 calls, with 132 traced back to utility facilities and 304 due to problems on customer equipment.

The Electric Safety Standards require that each utility inspect<sup>5</sup> at least 20% of its electric facilities per year. More than 70% of the electric facilities statewide have

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<sup>3</sup> The investor-owned utilities consist of Con Edison, Central Hudson Gas & Electric Corporation (Central Hudson), New York State Electric & Gas Corporation (NYSEG), Niagara Mohawk Power Corporation d/b/a National Grid (National Grid), Rochester Gas and Electric Corporation (RGE), and Orange and Rockland Utilities, Inc. (Orange & Rockland).

<sup>4</sup> The voltage level of 8 V or higher corresponds to the Commission's minimum acceptable detection range for testing equipment.

<sup>5</sup> An inspection requires a qualified individual to evaluate and examine the entire structure to determine its condition and the potential for it to cause or lead to safety hazards or adversely effect reliability. Unlike stray voltage testing, this task requires opening access covers and entering underground facilities, such as manholes.

been inspected over the past three years. The investor-owned utilities have identified and repaired approximately 75,000 deficiencies that were compromising the safety and/or reliability of the electric system. The inspection program also identified numerous less significant deficiencies that were entered into work order systems for repair as part of scheduled work activities.

As demonstrated by the statistics, stray voltage found on streetlights continues to be a major concern, particularly in Con Edison's service territory. Based on the results observed to date, both the stray voltage testing and inspection programs are needed to continue to identify unsafe conditions and maintain overall reliability. Staff also encourages the utilities to continue their development of programs focused on known areas of concern, such as streetlights.

As a companion piece to this report, Staff is presenting proposed modifications to the original 2005 order that established the Electric Safety Standards to provide further guidance to the utilities with respect to consistency of testing protocols and reporting requirements.

### BACKGROUND

On January 5, 2005, the Commission adopted a set of Electric Safety Standards that established proactive steps for ensuring the safety of the public from stray voltage and enhancing the reliability of the electric system in the State of New York. The Electric Safety Standards include: (1) annual stray voltage testing of electric facilities accessible to the public, using qualified voltage detection devices; (2) inspections of utility electric facilities on a minimum of a five-year cycle; (3) recordkeeping, certification, quality assurance and reporting requirements; and (4) adoption of the National Electric Safety Code as the minimum standard governing utility construction, maintenance, and operations. The standards require utilities to use a certified voltage detector able to sense voltages from 8 to 600 V. All of the investor-owned utilities and many of the municipal electric utilities decided to use the same handheld device, which has a certified voltage range from 4.5 to 600 V. Whenever any voltage detector indicates

the presence of voltage, the utilities would re-test the facility using a portable volt meter with a 500-ohm shunt resistor<sup>6</sup> to determine the level of voltage present. Experience with the voltage detector revealed that it is capable of indicating the presence of voltage below the 4.5 volt rating. The standards also require that where a utility finds stray voltage, it must immediately make the facility safe and repair it within 45 days. A performance mechanism was adopted to ensure the utilities maintain proper focus on safety and compliance with the Electric Safety Standards.

In a July 2005 Order, the Commission modified certain aspects of the Electric Safety Standards in response to a joint petition for rehearing from Central Hudson, NYSEG, National Grid, and RG&E; a petition for rehearing from Orange & Rockland, and a separate petition for rehearing from NYSEG and RG&E. It extended the date for testing of overhead distribution and transmission facilities, including substations, to August 31, 2006 for electric utilities other than Con Edison. All utilities, however, were still required to complete testing on underground facilities and streetlights by November 30, 2005. Additionally, the requirements for certification of the test results by a company officer were clarified and the need for interior inspections of fiberglass handholes was eliminated.

On November 30, 2006, ORU filed a petition for a waiver from performing stray voltage testing on distribution and transmission facilities annually. Instead, ORU proposes that it test for stray voltage on these facilities as part of its five-year inspection programs, and continue testing streetlights on an annual basis. As part of its initial review, Staff determined that it would be more appropriate to review the petition following the 2007 testing and inspection cycle. By doing so, additional testing data would be available, including a second cycle of testing results on the upstate utilities' overhead distribution and transmission facilities.

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<sup>6</sup> The resistor is utilized to simulate the resistance of the human body in contact with the energized object.

The information compiled over the past three years is inconclusive and Staff is not convinced that changes reducing requirements should be made at this time. Therefore, Staff believes it is premature for the Commission to address the ORU petition at this time. In a companion item, however, Staff will be recommending revisions to the original order to address several issues, including consistency of data reporting, reporting cycles, and extent of testing.

**STRAY VOLTAGE TESTING**

The Electric Safety Standards established annual stray voltage testing requirements to ensure the public safety of electric systems. Utilities are currently required to complete testing by November 30 of each year.

**Table 1: Summary of Stray Voltage Findings**

Company	Stray Voltage Findings in 2007 Test Cycle	Stray Voltage Findings In Previous Test Cycle
Con Edison	678	929
National Grid	559	488
NYSEG	570	477
RGE	289	444
Central Hudson	987	504
Orange & Rockland	7	8
Municipal Electric Utilities	115	377
Totals	3205	3227 <sup>1</sup>

Note: The totals include streetlights, traffic controls, overhead and underground distribution, substations, and transmission.

<sup>1</sup> For all companies, with the exception of Con Edison, the totals for this test cycle include stray voltage findings in 2005 for overhead distribution and transmission

Table 1 lists the number of stray voltage incidents detected as a result of the testing programs developed in response to the Electric Safety Standards.<sup>7</sup> The table lists all voltage findings at 1 V or above. Stray voltage testing was performed on almost 4 million transmission and distribution facilities across the State. Tables 2 and 3 detail the breakdown of the findings by category for 2006 and 2007.

**Table 2: Summary of Stray Voltage Findings by Facility Type – 2007 Test Cycle**

<b>Company</b>	<b>Streetlights</b>	<b>Underground Distribution</b>	<b>Overhead Distribution<sup>1</sup></b>	<b>Transmission<sup>2</sup></b>	<b>Total Findings</b>
Con Edison	659	10	9	0	678
National Grid	290	9	198	62	559
NYSEG	86	0	270	214	570
RGE	52	2	78	157	289
Central Hudson	5	8	629	345	987
Orange & Rockland	0	0	7	0	7
Municipal Electric Companies	12	18	85	0	115
Total	1104	47	1276	778	3205

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<sup>7</sup> These findings do not include instances of stray voltage discovered by company personnel as part of their routine work or instances found by other means, such as customer reports. This data also does not include instances of stray voltage discovered by mobile detection performed by Con Edison.

**Table 3: Summary of Stray Voltage Findings by Facility Type – 2006 Test Cycle**

<b>Company</b>	<b>Streetlights</b>	<b>Underground Distribution</b>	<b>Overhead Distribution<sup>1</sup></b>	<b>Transmission<sup>2</sup></b>	<b>Total Findings</b>
Con Edison	877	15	22	15	929
National Grid	48	19	342	79	488
NYSEG	92	0	131	254	477
RGE	187	3	53	201	444
Central Hudson	1	0	324	179	504
Orange & Rockland	1	1	6	0	8
Municipal Electric Utilities	8	369 (Note 3)			377
<b>Total</b>	<b>1214</b>	<b>38</b>	<b>878</b>	<b>728</b>	<b>3227</b>

Notes:

<sup>1</sup> Overhead distribution includes substation facilities.

<sup>2</sup> Transmission includes both overhead and underground facilities.

<sup>3</sup> A breakdown of this data by category was not available for 2006

Overall, stray voltage testing resulted in 0.22% of utility facilities testing positive for stray voltage in 2007. Individual detection rates for underground distribution, overhead distribution, and transmission are 0.008%, 0.036%, and 0.419%, respectively. The municipal electric utilities identified 115 stray voltage findings related to overhead distribution facilities, which equates to a detection rate of 0.06%.

Of the 3205 stray voltage conditions found by handheld devices on the investor-owned transmission and distribution facilities, 2545 were low voltage in nature (less than 8 V) and mostly related to improper grounding issues. Table 4 breaks down the findings above 8 V.

**Table 4: Summary of Stray Voltage Findings Greater Than 8 V – 2007 Test Cycle**

<b>Company</b>	<b>Streetlights</b>	<b>Underground Distribution</b>	<b>Overhead Distribution</b>	<b>Transmission</b>	<b>Total Findings</b>
Con Edison	349	8	5	0	362
National Grid	135	2	15	2	154
NYSEG	56	0	26	5	87
RGE	11	0	0	26	37
Central Hudson	4	0	2	2	8
Orange & Rockland	0	0	0	0	0
Municipal Electric Companies	12	0	0	0	12
Totals	567	10	48	35	660

As can be seen from the tables, the area of greatest concern remains streetlights, in particular with Con Edison. As described in the following section, Con Edison is undertaking a special program to address this issue.

Con Edison’s Supplemental Mobile Detector Program

As part of its commitment to researching alternate ways to detect stray voltage, Con Edison has helped develop a mobile detector. The detector uses a sensor to measure low level electric and magnetic fields. An operator, viewing a console from the vehicle’s passenger compartment, is alerted graphically and by audio tone to the presence of stray voltage. Unlike the handheld devices used in Con Edison’s manual testing program, the mobile detector does not make direct contact with objects to test for stray voltage. Instead, the sensors detect the presence of an electric field and the technicians must then perform manual testing to pinpoint the source of the stray voltage. As a result, testing via this method identifies stray voltage on any facilities in the vicinity and is not limited to utility assets. Stray voltages found on such objects when using the mobile detector are mitigated by Con Edison and the area is made safe.

In 2005, Con Edison purchased five vehicles and began using the mobile detectors to test for stray voltage in addition to the manual testing program required by the Electric Safety Standards. Con Edison has obtained what it believes are positive results utilizing the mobile detectors and has recently expanded its fleet to 15 vehicles. The company is using the mobile detector to perform multiple system-wide sweeps of its underground regions per year. In addition, Con Edison uses the mobile detector following major snow events<sup>8</sup> and as a precautionary measure in regions known to draw large crowds, such as parades and the New Year's celebration at Times Square. In 2007 the company completed four complete scans of its underground system (compared to two in 2006) and one storm scan of the five boroughs, plus an additional complete scan of Manhattan and the Bronx. The results of those scans are summarized in Table 5 below.

Con Edison has filed a formal petition with the Commission seeking approval to use the mobile detector exclusively to comply with the testing requirements contained in the original Order and forgo manual testing in areas where the mobile testing can be performed. Staff has evaluated the petition, which includes a testing report prepared by an independent and certified testing facility, and has requested that additional testing be conducted to allay concerns about the mobile detector's effectiveness under specific conditions. It is anticipated that the additional testing will take several months to complete, at which time the petition will be reassessed. Based on a preliminary analysis of the testing results obtained thus far, this testing regimen yields a far more extensive picture of the extent of the problem than the manual testing, which is solely focused on utility assets. A drawback of the technology is that it cannot be used in urban areas where overhead facilities are present adjacent to underground facilities, but Staff is convinced that it is an effective technology that should be explored further and implemented by the other utilities. In order to obtain input from other interested parties,

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<sup>8</sup> Con Edison has committed to conduct surveys continuously for at least five days after a snowstorm, which the company defines as the combination of below freezing temperatures, road salting, and visible, persistent ground accumulation of snow. These conditions have historically resulted in an increase in stray voltage conditions.

Staff is soliciting comments on the efficacy of utilizing mobile stray voltage detection statewide in the companion item.

**Table 5: Summary of Findings by Con Edison in 2007 Utilizing the Mobile Detector**

(Taken from the 2007 company compliance report)

Stray Voltage Location	Total Locations	Con Edison Responsibility	Non-Con Edison Responsibility
Streetlight	2109	771	1338
Traffic Light	912	64	848
Sidewalk	446	398	48
Con Ed Cover	306	289	17
Gate/Fence/Awning	228	109	119
Traffic Sign	160	7	153
Customer Equipment	106	29	77
Scaffolding	88	16	72
Bus Shelter	38	2	36
Fire Hydrant	34	25	9
Phone Booth	22	9	13
Traffic Control Box	20	2	18
Non-Con Ed Cover	14	11	3
Pole	7	4	3
Water Pipe	4	4	0
Riser	1	1	0
Trench	1	1	0
Other	5	0	5
Totals	4501	1742	2759

Con Edison’s Isolation Transformer Program

Given the high number of stray voltage conditions directly related to streetlights, Con Edison has evaluated alternative ways to mitigate the public’s exposure. One of the company’s efforts is the development of an isolation transformer. Depending on the source of the stray voltage, the flow of electricity may be prevented from traveling through a secondary path, such as a human or animal in contact with the metallic streetlight, when an isolation transformer is utilized.

By the end of 2008, the company expects to have 4000 units installed, and over the next 10 years the company plans to purchase and install up to 163,000 of these transformers and associated connectors in service boxes supplying streetlamps and traffic lights in New York City and Westchester.

**SHOCK REPORTS**

In addition to testing programs, the utilities become aware of potential stray voltage locations based on reports by the public. Utilities are required to respond to and investigate all shock reports received, including reports involving domestic animals. This requirement also applies regardless of whether or not there are injuries involved. Tables 6 and 7 provide a summary for 2007 and 2006, respectively, of the electric shock reports received by the utilities where investigation yielded actual voltage findings. The table also classifies the shock reports based on the source of the stray voltage. Investigations of shock reports where the cause of the voltage was determined to be the responsibility of the utility are classified as utility issues. Customer issues include shock incidents that are caused by non-utility facilities or the improper use of customer-owned equipment. All incidents of this nature were reported to Staff in accordance with the notification requirements of the Electric Safety Standards.

**Table 6: Summary of Shock Reports in 2007**

Company	2007 Shock Reports	Company Responsibility	Customer Responsibility
Con Edison	132	46	86
National Grid	139	31	108
NYSEG	5	2	3
Rochester Gas & Electric	3	2	1
Central Hudson	3	2	1
Orange & Rockland	12	5	7
Municipal Electric Utilities	0	0	0
Total	294	88	206

**Table 7: Summary of Shock Reports in 2006**

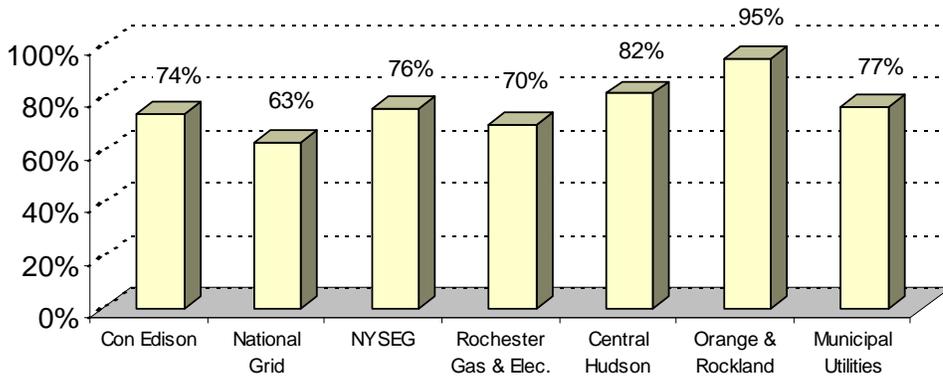
<b>Company</b>	<b>2006 Shock Reports</b>	<b>Company Responsibility</b>	<b>Customer Responsibility</b>
Con Edison	188	89	99
National Grid	179	34	145
NYSEG	14	1	13
Rochester Gas & Electric	16	0	16
Central Hudson	16	4	12
Orange & Rockland	23	4	19
Municipal Electric Utilities	0	0	0
Total	436	132	304

**INSPECTIONS OF ELECTRIC FACILITIES**

The Electric Safety Standards require the inspection of all electric facilities over a five-year cycle. This requirement was introduced to identify and eliminate deficiencies before they become serious safety hazards. The process involves a careful visual examination of an electric facility to identify any damage that may cause hazardous conditions or adversely impact reliability. Covers of underground facilities, and any water or debris within the structure, must be removed prior to the inspection taking place. Inspections are performed by a combination of company employees and contractors, all of whom first received appropriate safety and other training.

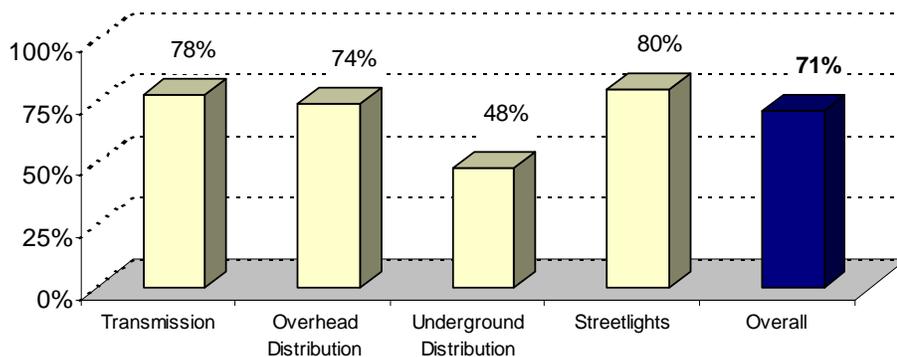
In conjunction with the five-year inspection cycle, the Electric Safety Standards require utilities to complete inspections in fifths; that is 20% of their total facilities in the first year and 40% of their total facilities by the end of the second year, etc. All utilities met or exceeded the overall targets for inspecting their facilities in 2007. Figure 3 shows the percentage of visual inspections performed for each of the investor-owned utilities and the municipal electric utilities since the adoption of the Electric Safety Standards.

**Figure 3:** Percentage of Inspections Completed From January 5, 2005 through November 30, 2007



As of November 30, 2007, more than 70% of the State’s electric facilities have been inspected. Figure 4 shows the percentage of facilities inspected by equipment type for the investor-owned utilities. Inspection of transmission and overhead distribution via foot patrols has gone well, probably due to the openness and easy accessibility to these facilities. Since 2005, more than 2.6 million inspections have been performed by the investor-owned utilities.

**Figure 4:** Percent of Inspections Completed by Equipment Type



National Grid, NYSEG, and RG&E are companies which own streetlights and are required to inspect them in accordance with the Electric Safety Standards. Given the extent of stray voltage findings on streetlights, last year Staff requested inspection efforts be accelerated. As a result, NYSEG and RG&E have nearly

completed an inspection of all utility-owned streetlights. National Grid is 77% complete with its streetlight inspections.

The percent of inspections on underground facilities continues to lag behind the other classifications. Generally, these inspections are more time consuming and conducted by a smaller subsection of workers compared to overhead inspections. The underground inspections also commonly take place during overnight hours to be less disruptive to automotive and pedestrian traffic, thereby creating a safer working environment.

Con Edison, which owns the largest amount of underground facilities, continues to show difficulty in performing inspections on its system. Although it inspected less than 10% of its total system for each of the past few years, it met the overall 60% goal because it completed such a large volume of its total system inspections in 2005. In 2006, Con Edison's inspection program was significantly affected by the power outages in the Long Island City section of Queens. In 2007, Con Edison performed only 36,000 inspections on its underground system. In January 2008, Con Edison hired two outside contractors to supplement its workforce to complete all underground inspections within the five year period. The contractors started performing inspections in February 2008. While the company has taken steps to emphasize the inspection process, the Company still has a significant effort ahead to meet the requirements of the Electric Safety Standards. Therefore, Staff will continue to closely monitor Con Edison's efforts.

Over the past three years, the inspection programs have identified substandard conditions of varying degrees of repair priority. Con Edison has identified 72,376 serious conditions since 2005. Included in this count are conditions where preventative measures were taken at the time of inspection such as the installation of heat shrinks caps on cable and sealing ducts at the time of discovery. Con Edison has reported that all 72,376 serious conditions have been permanently repaired. The upstate utilities have reported finding and fixing 3,133 safety or critical reliability hazards over the past three years.

Non-critical substandard conditions identified during inspections do not pose safety hazards and are entered into work order systems for repair as part of scheduled work activities. With the January 15, 2008 report, Staff began to collect data to evaluate how efficient the utilities are at making repairs to the conditions found. Our initial review determined that the utilities have been making repairs to high and intermediate level repairs. Repairs on low level conditions, however, have not been productive. National Grid has accumulated a significant backlog of work to be performed. The company has reported it has corrected only 15,741 (9%) of the 171,575 low level deficiencies identified in 2005. Central Hudson and ORU have only repaired 22% and 9% of its 2005 inspection findings, respectively. The other utilities did not provide enough information about 2005 to properly assess their repair actions. Inspections not leading to repair activities are a concern to Staff. Therefore, we are proposing repair requirements, as discussed further in the companion item, to ensure inspection findings are addressed. Staff is also working with National Grid to address the backlog from an operations and maintenance perspective and with capital investment projects associated with the Keyspan merger requirements.

#### CERTIFICATION AND PERFORMANCE MECHANISM

To ensure the utilities maintain the necessary focus on the safety and reliability of their electric systems, the Electric Safety Standards require an officer to annually certify the results of the testing and inspection programs under penalty of perjury. Each of the utilities provided signed statements certifying that it performed the requisite number of stray voltage tests and inspections in 2007.

The Electric Safety Standards also establish a performance mechanism for the utilities to ensure compliance with the Electric Safety Standards. This mechanism includes annual performance targets for stray voltage testing and annual facility inspections, with associated revenue adjustments. All of the utilities achieved the target levels prescribed, and as a result no revenue adjustments will be imposed.

### COMPLIANCE MONITORING

To ensure proper compliance with the Electric Safety Standards, Staff has maintained frequent contact with all the utilities, individually and collectively, over the past three years. In early 2005, the investor-owned utilities formed a working group to collectively discuss issues related to stray voltage testing. The working group has proven to be an effective means to raise and resolve issues, identify best working practices, and establish a common understanding of the extent of stray voltage across the State. The discussions have evolved over the past two years from addressing implementation issues, such as data collection, to focusing more on stray voltage mitigation efforts, including discussing practices used by utilities outside of New York.

Staff actively participates in the working group sessions. Currently, group discussions are held monthly, either by a conference call or a face-to-face meeting. These activities have helped the utilities maintain an overall understanding of Staff's expectations from the Electric Safety Standards and an understanding of the extent of stray voltage in New York State.

Staff has performed a number of field visits at the investor-owned utilities to determine whether the utilities implemented proper programs to comply with Electric Service Standards. The initial focus of the visits was to ensure that stray voltage testing, inspections, and data collection process were being done properly. Specifically, Staff verified that utilities located and tested all required facilities for stray voltage. The field visits also monitor the quality assurance programs, which generally encompass random sampling of the testing and inspection records to verify the accuracy of data collected. These verification activities will continue into the future, and it is expected that the frequency of field visits will increase going forward.

In regards to inspections, utilities have already begun the process of minimizing mistakes in their data collection processes by requiring that certain fields be entered before a record can be saved, and offering limited selections based on previous choices (e.g., a phase wire that has detached from an insulator can only be coded as a high priority response). These types of data collection changes should be pursued to

maximize the efficiency of the data collection process. Several utilities have separate database systems to track inspection and repair work. The utilities should be looking to coordinate the recordkeeping process for inspections, quality assurance and repair activities.

### CONCLUSION

All of the utilities are in compliance with the testing and inspection requirements of the Electric Safety Standards. Staff will continue to actively monitor utility compliance and other practices aimed at detecting or minimizing the presence of stray voltage.

The requirements of the Electric Safety Standards have resulted in the identification of locations with sizable stray voltage levels where mitigation was necessary to maintain public safety, and the standards remain an effective means to ensure the safe and reliable operation of the electric system. Revisions to the standards will be presented to the Commission in a separate item, and the major thrust of these changes will be to enhance consistency of testing and reporting protocols.

Respectfully submitted,

Patrick Maher  
Safety Section  
Office of Electric, Gas, and Water

Reviewed by:

Saul Abrams  
Office of General Counsel

Christian Bonvin  
Distribution Systems Section  
Office of Electric, Gas & Water

Gavin Nicoletta  
Chief  
Safety Section  
Office of Electric, Gas, and Water

Michael Worden  
Chief  
Distribution Systems Section  
Office of Electric, Gas and Water

Approved by:

Michael Scott  
Deputy Director  
Office of Electric, Gas & Water

Thomas Dvorsky  
Director  
Office of Electric Gas & Water