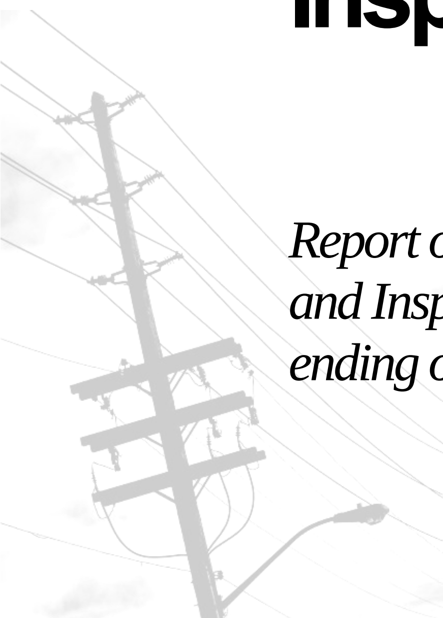
Rochester Gas and Electric Corporation

Stray Voltage Test and Inspection



Report on the results of Stray Voltage Tests and Inspections for the 12-month period ending on November 30, 2005

Table of Contents

Background

On January 5, 2005, in Case 04-M-0159, the New York State Public Service Commission ("Commission" or "PSC") adopted a set of statewide safety standards ("Electric Safety Standards") that apply to the electric utilities subject to the Commission's jurisdiction, Order Instituting Safety Standards, issued January 5, 2005 ("Safety Order"). Further, pursuant to the Commission's Order on Petitions for Rehearing and Waiver (the "Order") issued and effective on July 21, 2005 in Case 04-M-0159 – Proceeding on Motion of the Commission to Examine the Safety of Electric Transmission and Distribution Systems, the Commission modified the Electric Safety Standards and required each utility, including Rochester Gas and Electric Corporation ("RG&E" or the "Company") to file a comprehensive report by January 15 each year that:

- Details the results of stray voltage tests and inspection conducted by the utility over the 12-month period ending on November 30 of the prior calendar year
- Addresses the performance mechanism specified in Section 10 of the Electric Safety Standards adopted by the PSC in the Safety Order
- Contains the certifications described in Section 7 of the Electric Safety Standards adopted by the PSC in the Safety Order
- Discusses the analyses undertaken on the causes of stray voltage within the utility's electric system, the conclusions drawn therefrom, the preventive and remedial measures identified, and the utility's plans to implement those measures
- Includes all other information that is pertinent to the issues addressed by the Electric Safety Standards

Overview

Company Profile

RG&E is located in upstate New York and serves approximately 356,000 electric customers and about 291,000 gas customers. RG&E covers an area of about 2,700 square miles or 6% of upstate New York, and serves a primarily urban area composed of 1 large city and 80 towns and villages.

RG&E's electric delivery infrastructure consists of 950 circuit miles of transmission lines, 5,100 circuit miles of primary distribution, 193 electric substations, 44,473 underground facilities and 13,673 streetlight/traffic signal facilities. This system includes an estimated 223,000 distribution structures and 18,400 transmission structures. RG&E serves an average of 132 customers per square mile.

Program

RG&E, in April, 2005, developed and initiated a Testing Pilot Program ("Pilot"). The purpose of the Pilot was to evaluate programs and processes of a testing program, prior to starting a much larger statewide testing effort. The Pilot practices and procedures were evaluated and modifications and enhancements were made as necessary to ensure that stray voltage testing was consistent with the Electric Safety Standards and that the results were accurate.

The Company began stray voltage testing on a statewide basis in July, and successfully completed stray voltage testing on all of its publicly accessible streetlights and electric facilities served by underground systems, as required by the Order, in mid-November.

RG&E's Stray Voltage Testing and Inspection Program is separated into four major categories or facility groups: streetlights, underground, overhead distribution and transmission. These groups are defined in more detail in the Stray Voltage Testing and Inspection Program sections.

The program developed by RG&E also addressed daily stray voltage testing of all facilities and equipment accessed by work crews in the course of their regularly scheduled daily activities.

Stray Voltage Testing Program

The objective of the testing program is to identify and mitigate voltage conditions that should not ordinarily exist on an electric facility. RG&E designed its stray voltage testing plan to fully meet the requirements set forth in the Electric Safety Standards.

Categories or Facility Groups

Streetlights

This group includes all metallic and concrete RG&E owned streetlights, municipal owned streetlights and streetlight handhole covers. Testing of streetlights was performed at night when the fixture was energized. Streetlights on wood poles are included in the overhead distribution category.

In addition to streetlights, this group also includes traffic signal facilities. Traffic signal facilities include the various traffic control structures seen primarily at intersections and crosswalks, such as poles used to hang traffic and pedestrian control lights, pushbuttons, control cabinets and traffic signal handhole covers.

All municipally owned streetlight records are maintained on company maps, with the exception of streetlights owned by the City of Rochester. The task of finding and ensuring all streetlights were tested was accomplished through the joint effort of RG&E personnel with City of Rochester Streetlighting personnel to determine the ownership and location of streetlights.

Using the information gathered by RG&E and City of Rochester Streetlighting personnel, RG&E contractors tested all streetlights, including those owned by the City of Rochester. If a Level I stray voltage was found on a structure owned by the Company or a municipality other than the City of Rochester, a job notification was generated and the repair was made immediately. If a Level I stray voltage was found on a City of Rochester structure, the City of Rochester was notified and appropriate repairs were made. When the structure was repaired, RG&E was notified and the structure was tested a second time to ensure that there was no voltage present.

Underground

The underground category includes all facilities that are located either at grade level or below grade. Included in the underground facilities are padmount switchgear cases, padmount transformer cases, electric utility manhole covers, submersible transformer covers, electric utility handhole covers, network vaults and grates.

Overhead Distribution

This group of facilities includes distribution poles that have ground wires, riser pipes, guy wires/anchors, capacitor control boxes, recloser control boxes, regulator control boxes, switch control boxes, overhead switch handles, streetlights and CATV control/amplifier boxes.

Distribution poles as described above, with transmission overbuild, are included in this overhead distribution category.

Substation fences and fences around padmount switchgear and/or transformers are also included in this category.

Transmission

Transmission facilities consist of all overhead transmission towers, poles and structures with operating voltages at or above 34.5kV. RG&E tested a portion of its transmission under the Pilot and will resume testing transmission facilities in the first quarter of 2006. RG&E expects to complete such testing of transmission facilities by mid year.

Testing Procedures

Stray voltage tests were performed by qualified test personnel on all electric utility facilities capable of conducting electricity. Test personnel were issued the following documents: Facilities Requiring Stray Voltage Testing, Stray Voltage Test Procedure and Response Notification Procedure.

Facilities Requiring Stray Voltage Testing

RG&E developed a list of facilities that require testing in compliance with the PSC's Order. This document is included in Appendix 1.

Stray Voltage Test Procedure

RG&E developed a Stray Volt Test Procedure to govern the testing performed by all RG&E personnel and contractors. This procedure is included in Appendix 1.

Response Notification Procedures

RG&E developed a Response Notification Procedure to govern the guarding and reporting of all detected stray voltage. This procedure details the appropriate action for all response levels: Critical, Immediate and No Response. The Response Notification Procedure is included in Appendix 1.

Training

Prior to the commencement of any field testing activities, supervisory and office support personnel from the testing contractor were given training by the Company. The method and approach for the training effort was that RG&E provided comprehensive training to the contractors' supervisory personnel, who in turn trained the field testers. This training consisted of a detailed review of the Stray Voltage Testing Procedure; operation of the HD voltage tester and Fluke Multimeter; how to use the test equipment; how to respond to various levels of voltages found including guarding of facilities; and how to read the various circuit and facility maps given to the testing contractor.

Additional training was given by Company and equipment manufacturer's representatives on the positional (GPS) and data acquisition/logging equipment. The positional (GPS) and data acquisition/logging equipment was furnished by RG&E for use by the testing contractors. GPS equipment is utilized to provide a mechanism for contractor quality control.

Equipment

Stray Voltage measurement equipment is calibrated annually by a certified test laboratory. The following equipment was utilized by RG&E:

Voltage Detection

The HD Electric LV-S-5 hand held Low Voltage Detector was utilized for the detection of stray voltage in accordance with the manufacturer's operating instruction manual to assure proper application. The LV-S-5 was designed to detect the presence of voltage exceeding 4.5 VAC. The presence of a voltage of 4.5 VAC or greater initiated a flashing red light in the tip of the detector. A PT-LV-5 Low Voltage Detector Tester was used to provide a field test of the LV-S-5 Detector to assure proper operation.

The LV-S-5 was used to individually test all conductive material or equipment accessible to the general public, on or encasing utility structures or equipment, for the presence of stray voltage.

Voltage Measurement

The Fluke Model 7-600 Multimeter was utilized to perform a contact test of the conductive material or equipment if the LV-S-5 detected a voltage. The Fluke 7-600 is a true RMS voltmeter with an input impedance of 2000 ohms (Ω).

The voltage measurement was made between the conductive material or equipment and a remote ground (see Ground Rod and 40 Ft. Cable Reel descriptions). If the measured voltage did not exceed 30 VAC, a shunt resistor (see Shunt Resistor description) was installed across the input terminals of the Fluke 7-600. The shunt resistor reduced the effective input impedance of the voltmeter to 500Ω. All voltages measured with the Fluke 7-600 were recorded, and appropriate response notifications issued based on the voltage measured.

Shunt Resistor

The shunt resistor was a 680Ω, 5 watt resistor installed in a plastic box with banana plugs for insertion into the input jacks of the Fluke 7-600. The equivalent impedance of the parallel impedance of the 2000Ω multimeter input and the 680Ω shunt resistor was 507Ω. If the voltage measured by the Fluke 7-600 without the resistor indicated a voltage level exceeding 30 VAC, the shunt resistor was not utilized to obtain a voltage measurement because such high voltage levels can damage the shunt resistor. It is assumed that any structure with a recorded voltage level exceeding 30 VAC without the resistor would have voltage above the critical level with the resistor, so all such cases were recorded and addressed as critical stray voltage issues.

Ground Rod

The ground rod is a 5/8 inch diameter, 18 inch long copper rod with one pointed end. The ground rod was generally installed into the earth within 3 feet from the material or equipment to be tested. If a suitable ground location could not be found within 3 feet of the material or equipment, the cable reel was used for locating the ground rod beyond 3 feet from the material or structure.

40 Ft. Cable Reel

The cable reel is a 40 foot reel of #14 wire with an attached Mueller #49C alligator clip and banana plug. The cable reel was used when a suitable ground rod location could not be found within 3 feet of the material or equipment to be tested.

Personnel

At the peak of the program, 124 people were involved in developing and implementing RG&E's Stray Voltage Testing and Inspection Program. RG&E assigned a full time Project Manager to oversee the program. Other internal resources from Maps and Records, Maintenance Engineering and Field Operations were utilized as needed.

In addition, RG&E contracted staff in two areas: Program Development/Support Personnel and Testing Contractor Personnel.

Program Development/Support Personnel

RG&E hired a third-party IT contractor to design, build, and manage a data collection and reporting application for stray voltage testing and inspection data. The Stray Voltage application requires full time IT contractor support to manage and maintain the application.

A full time contractor was hired to serve as the Stray Voltage Application Business Analyst and Project Data Coordinator between RG&E staff and all contractors.

In order to support its overall Quality Assurance effort on data collected in the field, RG&E hired six full-time contractors for the duration of the project.

In addition, a Field Coordinator was contracted by RG&E to serve as a liaison between RG&E and contract field personnel in the RG&E service area.

Testing Contractor Personnel

This category includes a staff of over 50 field testers and back office support personnel required for the timely completion of the Stray Voltage Testing Program.

Stray Voltage Level Classification

When RG&E performed stray voltage testing on facilities, the voltages as detected by the HD Detector were categorized into three levels with appropriate response criteria, as shown in Table 1.

Voltage Level	Voltage Range	Required Response
Level I	$8.0 \leq x$	Critical
Level II	$4.5 \leq x < 8$	Immediate
Level III	$0.0 \leq x < 4.5$	None

Table 1 – Voltage Levels

Level I Voltage

Any measured voltage, as specified in the Stray Voltage Test Procedure, equal to or greater than 8 Volts Alternating Current (VAC) was deemed critical. If voltages at this level or higher detected in areas where the public can make contact with the facility, the facility was guarded. The area was made safe. Repairs were completed within 45 days.

Level II Voltage

Any measured voltage, as specified in the Stray Voltage Test Procedure, equal to or greater than 4.5 VAC and less than 8 VAC necessitated an immediate response. If voltages at this level were detected, the Project Foreman determined whether or not the facility required guarding and the immediacy of corrective action. The voltage was investigated to determine whether or not it ordinarily exists; if it does not, the voltage was investigated to determine if a source could be identified and if it could be corrected.

Level III Voltage

Any measured voltage, as specified in the Stray Voltage Test Procedure, equal to or greater than 0 VAC and less than 4.5 VAC was considered to be at a level that did not require immediate remedial action. This voltage poses no threat to public safety. The voltage was investigated to determine whether or not it ordinarily exists; if it does not, the voltage was investigated to determine if a source could be identified and if it could be corrected.

Not Detected

Any test on which the HD Detector fails to indicate the presence of voltage, as specified in the Stray Voltage Test Procedure.

Structures Inaccessible to the Public

There are several types of Inaccessible structures as described below. If the contractor could not reach the structure to perform a test, it was identified as “Inaccessible” and all other pertinent data was collected in the field. Contractors made every attempt to locate and test all structures. There were a total of 2,279, or 1.2% of the total structures visited, in these categories.

Private Property

The structure was not tested if it was located on private property and was inaccessible due to walls, fences or barriers such as a locked gate, if excavation or bush/tree removal was required, or if there was unauthorized construction around the structure.

RG&E Property

The structure was not tested if the structure was behind a company fence that limited access to the structure to authorized personnel only.

Buried / Paved Over

The structure was not tested if it had been covered over with dirt, pavement, or other foreign objects that would prohibit public access and prevent testing the structure. Contractors noted the structure ID on the issued maps and turned them in to Maintenance Engineering for verification with the Maps and Records Department. If Maps and Records confirmed that the structure does exist, company and contractor crews followed up and attempted to locate, uncover, and test the structure. If the structure could not be found, it was then considered removed from the field, and revisions to mapping were generated.

Inside Building

If a contractor identified a structure as being inside a building, RG&E personnel verified that the structure was actually inside the building. If the RG&E personnel verified that the structure was accessible to the public, a test was performed. Typically, customer owned equipment that is inside a building is in a locked equipment room that is accessible to authorized personnel only.

Limited Access Highways

The testing of structures located on limited access highways and interstates presents a safety risk to testing personnel, and those structures on limited access highways are typically not accessible to the public. The structure was not tested if RG&E personnel verified that it was not accessible to the public and it was located on a major city, state, or national highway.

Stray Voltage Inspection Program

The objective of all inspections is to conduct a careful and critical examination of an electric facility by a qualified individual to determine the condition of the facility and the potential to cause or lead to safety hazards or adverse effects on reliability. RG&E's inspection program was designed to visually inspect every facility at least once over a period of five years as required by the Order.

Inspections conducted during routine maintenance and other work not directly related to the inspection program count as an inspection visit, provided that the inspection is performed using the same safety and reliability criteria and to the same extent as would otherwise be required under the Electric Safety Standards.

Categories or Facility Groups

Streetlights

RG&E did not perform any streetlight inspections in 2005. Commencing in 2006, after the modification of RG&E's streetlight contractor responsibilities, the contractor shall perform an annual inspection of 25% of RG&E owned streetlights for the next four (4) years. In 2010 the program shall be modified to inspect 20% of RG&E's streetlights annually.

Underground

The underground inspection program provides a comprehensive inspection of RG&E manholes, handholes, vaults, sub-holes, padmount transformers, padmount switchgear and all equipment, devices and cables present within these structures. This includes inspection of structural integrity, drainage electrical integrity of all equipment and cables (as permissible by visual inspection), mechanical integrity of all equipment and cables (as permissible by visual inspection), dangerous conditions and potential threats to electric system reliability.

Overhead Distribution

The overhead distribution inspection and maintenance program is a comprehensive program to identify and correct electric overhead distribution circuit deficiencies on all poles, equipment, and devices present on all distribution structures including guy wires/anchors, crossarms, switches, conductors and other accessory equipment.

Each division is required to visually inspect 20% of all distribution circuits annually within their respective division. On the identified circuits, 100% of all overhead assets must be inspected. Thermography inspections on main line electric circuits could be included in this program, but are not mandatory.

RG&E also conducts annual inspections of all their substations. This effort is a comprehensive inspection of all equipment located within the facility by field personnel. Numerous inspections of substation equipment occur during the year as a result of ongoing maintenance work, but the annual inspection is a separate and independent activity.

Transmission
The objective of all transmission inspections is to identify and correct circuit deficiencies on all transmission circuits and structures.

The transmission inspection program is divided into two categories based on voltage class:

- 115KV – Comprehensive Helicopter Inspection or Foot Patrol
- Below 115KV – Comprehensive Foot Patrol

The comprehensive helicopter inspection involves performing low level (pole top), slow speed (stop & hover), comprehensive inspection of transmission circuits to identify structure, conductor and equipment damage, defects and deficiencies. Helicopter maintenance capabilities are used where appropriate to perform maintenance functions.

Transmission inspections are accomplished through a comprehensive foot patrol, performed by an inspector competent in line inspection procedures. All inspection data will be entered on a per structure basis and managed electronically via company issued handheld units. Inspections include a visual examination of all transmission towers, poles, guy wires, risers, overhead conductors, switches, and other aboveground equipment and facilities.

Inspection Procedure
The annual performance target for inspections includes all existing Maintenance Engineering and Operations inspection programs if the inspection and collected data satisfies the Electric Safety Standards.

The number of facilities to be inspected in the first cyclic inspection program shall be determined by one of the following methods:

- If an estimated number of facilities is known, 20% of that estimated number shall be inspected annually.
- If only an estimated number of circuit miles is known, 20% of that estimated number of miles shall be inspected annually.

Electric facility inspections shall be performed by trained and qualified personnel.

Inspection personnel shall wear all appropriate Personal Protective Equipment (PPE) (e.g. vests, gloves, safety glasses, steel-toed boots, etc.) in accordance with OSHA and Company safety procedures and practices.

Inspection personnel shall comply with all appropriate safety procedures and practices specified by the Company (e.g. manhole entry, manhole rescue and work zone protection) when performing inspections.

Repair Prioritization

Inspection discrepancies have been classified into Level I, Level II and Level III conditions based on the severity of each discrepancy as it relates to public safety and electric system reliability. Level I discrepancies are the most critical, requiring immediate attention. Level II and Level III conditions, as determined by the inspector, are addressed as specified in the descriptions below.

Level I Condition

A Level I Condition is a condition of any electrical equipment, device or structure on an electric transmission or distribution system, overhead or underground, that poses a serious and immediate threat to either the safety of the general public or the reliability of the electric transmission or distribution system. Such conditions shall require an immediate response by the appropriate maintenance and repair personnel to correct the situation. Examples of such conditions include, but are not limited to, switches on manhole floors, tree limbs on conductors, conductors laying on crossarms, holes in padmount transformer cases, damaged conductors, floating primary conductors, broken primary ties, broken grounds, low hanging or downed conductors, broken poles, broken crossarms, and major woodpecker damage.

Level II Condition

A Level II Condition is a condition of any electrical equipment, device or structure that, if not corrected for an extended period of time (6 months or more), could develop into a Level I Condition. Such conditions require a response within a 60 day period based on the evaluation of the inspector. Examples of such conditions include, but are not limited to, damaged poles, damaged crossarms, broken crossarm supports, excessively corroded manhole equipment such as switches and transformers, damaged cable and conductors, excessively leaking cable joints, and moderate woodpecker damage.

Level III Condition

A Level III Condition is a condition of any electrical equipment, device or structure that has deficiencies, but those deficiencies do not pose any risk to public safety or the reliability of the electric transmission or distribution system. These conditions can be corrected through normal electric system maintenance practices within 12 - 24 months based on the evaluation of the inspector. Examples of such deficiencies include, but are not limited to, chipped or cracked suspension insulators, minor woodpecker holes, bent insulator pins, leaning poles, and loose pole braces.

Daily Work Stray Voltage Testing

The RG&E Operations Department instituted stray voltage testing procedures, to be included in the routine responsibilities of all field personnel, effective June 20, 2005. This initiative is in addition to the Stray Voltage Testing and Inspection Programs already described. The intent of the daily testing is to ensure that no stray voltage exists that could endanger the general public or company or contract personnel. These facility tests are not reported in the stray voltage testing database.

The stray voltage test was performed upon arrival at each job site and before departing the job site either at the end of the workday or upon completion of the job. Operations personnel performed a daily test, in accordance with the Stray Voltage Test Procedure, on the facilities and equipment in close proximity to the job site.

The Stray Voltage Test Procedure was performed only on facilities that require opening doors, access panels, manhole covers, handhole covers or any other entry mechanism. Facilities that do not require personnel to touch them do not require implementation of the Stray Voltage Test Procedure.

Should a stray voltage situation be identified, the crew was responsible for correcting the stray voltage source. If the crew was unable to resolve the situation, they obtained the required technical support, personnel or equipment necessary to resolve the situation.

No structures with stray voltage were found in this daily test initiative.

Testing and Inspection Results

Testing

In the course of the RG&E Stray Voltage Testing Program, completed on November 30, 2005, contractors visited 190,759 structures and identified 47 facilities with a Level I Stray Voltage as described in the Stray Voltage Testing Procedure, resulting in a detection rate of .025%. As a result of this program, RG&E conducted stray voltage testing on approximately 64% of its entire system. In each of the Level I stray voltage cases, the contractor guarded the location until relieved by RG&E personnel. RG&E personnel made each location safe before leaving the location. All RG&E Level I stray voltage cases were permanently repaired within the 45-day requirement. Table 2 displays the 47 cases of Level I stray voltage in the overall Stray Voltage Program.

Structure Type	Total Structures	Structures Visited	Stray Voltages	Detection Rate
Streetlight	13,673	13,673	45	0.329%
Underground	44,473	44,473	2	0.004%
Distribution	223,000	130,754	0	0.000%
Transmission	18,400	1,859	0	0.000%
	299,546	190,759	47	0.025%

Table 2 – Overall Stray Voltage

Streetlights

Streetlight facilities are defined in the Stray Voltage Program section and in accordance with the Safety Order.

RG&E contractors visited 13,673 (100%) of its streetlight structures to perform a stray voltage test; all of these structures had stray voltage criteria. Of the structures tested, only 45 were found with a Level I stray voltage, for a .33% detection rate. Table 3 displays a summary of all streetlight test results.

Streetlight (of 13,673 total visited there were 0 not required)*

Voltage Levels	Voltages Found	Percent of Tested
Level I	45	0.33%
Level II	26	0.19%
Level III	96	0.70%
Not Detected	13,495	98.70%
Inaccessible	11	0.08%
	13,673	100.00%

Table 3 – Streetlight Stray Voltage

*** "Not required" includes all structures with no stray voltage criteria (e.g. wood poles with no down guys or down grounds; fiberglass streetlight structures; fiberglass handholes)**

Underground

RG&E contractors visited 44,473 (100%) of its underground structures to perform a stray voltage test; all of these structures had stray voltage criteria. Of the structures tested, only 2 were found with a Level I stray voltage, for a detection rate of less than .001%. Table 4 displays a summary of all underground test results.

Underground (of 44,473 total visited there were 0 not required)*

Voltage Levels	Voltages Found	Percent of Tested
Level I	2	0.00%
Level II	0	0.00%
Level III	81	0.18%
Not Detected	43,058	96.82%
Inaccessible	1,332	3.00%
	44,473	100.00%

Table 4 –Underground Stray Voltage

Overhead Distribution

RG&E contractors visited 130,754 of its distribution structures to perform a stray voltage test; 54,227 of these structures did not have stray voltage criteria. Of the 76,527 structures with stray voltage criteria, 0 were found with a Level I stray voltage. Table 5 displays a summary of all distribution test results.

Distribution (of 130,754 total visited there were 54,227 not required)*

Voltage Levels	Voltages Found	Percent of Tested
Level I	0	0.00%
Level II	1	0.00%
Level III	532	0.70%
Not Detected	75,075	98.10%
Inaccessible	919	1.20%
	76,527	100.00%

Table 5 – Overhead Distribution Stray Voltage

Transmission

RG&E contractors visited 1,859 transmission structures to perform a stray voltage test; all of these structures had stray voltage criteria. Of the structures tested, 12 were found with a Level I voltage. However, upon investigation the Company has found these voltages to be conditions inherent to the design and operation of the system. These are not shock voltages attributable to structure or equipment defects (see Transmission Level I Responses below).Table 6 displays a summary of all transmission test results.

Transmission (of 1,859 total visited there were 0 not required)*

Voltage Levels	Voltages Found	Percent of Tested
Level I	12	0.65%
Level II	13	0.70%
Level III	265	14.25%
Not Detected	1,552	83.49%
Inaccessible	17	0.91%
	1,859	100.00%

Table 6 – Transmission Stray Voltage

Transmission Level I Responses

Critical responses were initiated for the 12 wood transmission pole structures exhibiting 8 VAC or greater.

- Ground inspections were performed on the 12 structures. No deficiencies were identified.
- Ground resistance measurements were performed to determine if any of the structure grounds exhibited an excessive resistance. No excessive resistances were identified.
- Ground wire current measurements were performed to determine if any ground wire conducted excessive current flow. No excessive currents were measured.
- A comprehensive aerial inspection was performed on all structures on the circuits in question. No deficiencies were identified that would generate a stray voltage condition.
- The response voltage measurements were generally higher than the initial measurements. Subsequent voltage measurements performed on these structures produced voltages that varied based on system loading.
- Additionally, several of the structures exhibiting voltages of 8 VAC or greater were connected to counterpoise in addition to the driven grounds.
- The 34.5kV underbuild on the 115kV construction appears to be a contributing factor.

Based on the accrued information, the stray voltages measured on the 12 transmission structures appear to be conditions inherent to the design and operation of the system. The voltage results from a difference in potential between the static wire and a remote ground. These are not shock voltages attributable to structure or equipment defects.

The cause of the voltages is attributable to a combination of circulating currents on the static wire and induced voltages due to the circuit configuration of the 115kV and 34kV conductors on the structures. RG&E evaluated the installation of additional grounds on some of these structures to determine if these voltages mimic typical distribution stray voltage conditions. Additional grounds on distribution circuits in response to stray voltage typically do not mitigate the voltages, but cause the voltage to be transferred to another structure or increased in magnitude due to a lowered structure ground resistance. RG&E anticipates working collaboratively with the PSC and other utilities to appropriately report on and respond to these conditions.

Inspection

RG&E conducts separate inspection programs for the equipment in each of the four categories or facility groups: underground, streetlights, overhead distribution and transmission. The Company has completed inspections on 16% of underground facilities, 52% of overhead distribution facilities and 14% of transmission facilities. This represents a total inspection of 37% of RG&E's total system.

Streetlights

RG&E will commence inspection of streetlight facilities in 2006.

Underground

As a result of the inspection program, 16% of the underground system has been inspected. This inspection identified 13 structures with discrepancies, of the 7,349 structures inspected. Table 7 displays a summary of all underground inspection results.

Underground

Inspection Conditions	Discrepancies Found	Percent of Inspected
Condition I	0	0.00%
Condition II	3	0.04%
Condition III	10	0.14%
	13	0.18%

Table 7 – Underground Inspection

Overhead Distribution

As a result of the inspection program, 52% of the overhead distribution system has been inspected. This inspection identified 448 structures with discrepancies, of the 70,071 structures inspected. Table 8 displays a summary of all distribution inspection results.

Overhead Distribution

Inspection Conditions	Discrepancies Found	Percent of Inspected
Condition I	314	0.45%
Condition II	55	0.08%
Condition III	79	0.11%
	448	0.64%

Table 8 – Streetlight Inspection

Transmission

As a result of the inspection program, 14% of the transmission system has been inspected. This inspection identified 1 structure with discrepancies, of the 2,520 structures inspected. Table 9 displays a summary of all distribution inspection results.

Transmission

Inspection Conditions	Discrepancies Found	Percent of Inspected
Condition I	0	0.00%
Condition II	0	0.00%
Condition III	1	0.04%
	1	0.04%

Table 9 – Transmission Inspection

Analysis of Results

Summary of Critical Responses

The RG&E 2005 stray voltage testing identified 47 Level I facilities that required safeguarding and repair out of 190,759 facilities visited, for a detection rate of .025%. All critical responses were made safe immediately and repaired within 45 days.

The itemized breakdown of causes is contained in Table 10.

Structure Type	Cause of Stray Voltage	Stray Voltages Found
Streetlights	Defective Neutral Connection – Handhole	16
Streetlights	Defective Neutral Connection – Light Pole	13
Streetlights	Defective Neutral – Underground Cable	12
Underground	Defective Conductor Connection – Handhole	2
Streetlights	Defective Neutral – Traffic Signal Pole	1
Streetlights	Defective Neutral – Traffic Signal Handhole	1
Streetlights	Defective Light Fixture	1
Streetlights	Defective Conductor Connection – Light Pole	1
		47

Table 10 – RG&E Itemized Causes of Critical Responses

Based on the causes of the critical responses, RG&E inspectors will thoroughly inspect fixtures, neutral connections and the correct wiring of street light poles while performing structure inspections.

Other Pertinent Information

Quality Assurance Measures Instituted

Data Submission Quality Assurance

The Stray Voltage Database Administrator is charged with the responsibility of receiving, controlling, and maintaining all testing data associated with the stray voltage project. Throughout the testing effort, the testing contractor submits their testing data to RG&E in the form of batch files.

Testing data batch files are submitted to the Stray Voltage Data Administrator for QA/QC reviews. The first review that takes place is for data accuracy. If approved, IT Data Managers load the file into the production database and forward a copy of the file to Global Positioning System (GPS) Data Manager, for the second review, to check the data for positional accuracy (See Stray Voltage GPS QA/WC Process). If the data is not acceptable, the Data Administrator notifies the contractor of such and the reasons for failure. The Testing Contractor remedies the problems and re-submits the failed file with corrections.

Following vendor batch file approval through the program administrator, the batch is loaded into RG&E's data storage facility (SDE) in ArcMAP. ArcMAP is the GIS software tool that is used to check the vendor point data for quality assurance. Gross geographical errors can easily be located during the loading process. The batch is rejected if gross geographical errors are found.

Vendor data is first analyzed against Real-Time Kinematics (RTK) control data. These are random poles that were GPS located by RG&E's field crew prior to vendor pole locating. Vendor points must fall within a seven foot radius of the control points. If points fall outside of this radius, they "fail" this QA/QC analysis.

Secondly, data is analyzed against New York State Orthophotography. Each batch of data is broken down by tester name. Based on the total number of points (by tester), a random sample set is analyzed. The sample set is based on military standard sampling procedures (MIL-STD-105E: Sampling Procedures and Tables for Inspection by Attributes). RG&E uses General Inspection Level I, and a 4.0 Acceptable Quality Level Tables I and II-A. Again, vendor points must fall within a seven foot radius of the pole location on the photography. If the sample set does not achieve an acceptable level according to the table, the tester "fails" this QA/QC analysis. After all tester sample points are analyzed in a batch, they are totaled. If more than 5% of the sample points fail, the entire batch "fails" this QA/QC analysis.

And thirdly, data is checked for duplicates. An analysis is run to search for duplicate pole locations. Points with identical structure ID's are flagged as duplicates.

Other tests are performed to check for attribute accuracy, such as the latitude and longitude coordinates, street names, dates and times, Positional Dilution of Precision (PDOP) values, and pole numbers.

In addition, other geographic checks are performed to find anomalies in the data, for example, large amounts of digitized points or irregularities in pole locations. The GPS time element is also analyzed for realistic data collection patterns. The result from this time analysis sometimes calls into question whether a tester could feasibly be at the pole to perform the stray voltage test.

Results of the QA/QC GPS data review are recorded on the Stray Voltage Tracking Log located on the corporate server, Stray Voltage/Project Tracking directory. Reports of the QA/QC results are copied to the GPS_Reviews folder in the above directory. A status report is emailed to the Data Administrator, who then forwards the QA/QC Reports to the vendor. Any other findings or anomalies in the data are reported to the project managers.

Random Quality Assurance

On an ongoing basis, RG&E is performing many quality assurance measures to ensure testing data accuracy. These include investigations into 1) inaccessible structures to determine nature of inaccessibility, 2) performance of individual testers, 3) miscellaneous anomalies found in testing data, 4) checking circuit maps to ensure all distribution poles have been visited. Data for individual testers can be reviewed to determine their accuracy and performance. Problem testers are identified to the testing contractor and, if need be, removed from testing effort. Any discrepancies found as a result of random data sampling checks like wrong town or street name and incorrect spellings would be corrected.

In addition to these measures, the Field Coordinator conducted random field visits to ascertain that field contractors were performing tests on all required structures. During these visits, the Field Coordinator answered questions about map reading, structure IDs and location of structures. In addition to field visits, the Field Coordinator also performed follow up on randomly chosen completed maps to check that all structures were tested and recorded properly.

Research and Development

As part of the Stray Voltage Program development, RG&E evaluated the Sarnoff SVD2000 Detector.

Sarnoff SVD2000 Stray Voltage Detector

On November 15, 2005, RG&E representatives attended a presentation and demonstration of the Sarnoff SVD2000 Stray Voltage Detector developed by the Sarnoff Corporation in Princeton, New Jersey. The purpose of the visit was to determine the applicability of the SVD2000 for use in the RG&E Stray Voltage Testing Program.

SVD2000 Design Specifications

The SVD2000 provides an innovative design concept for the measurement of ground level, low voltage electric fields within a nominal 15 feet of the detection device with the vehicle moving at a nominal 15 miles per hour.

The SVD2000 processor unit produces digital and audio outputs to provide visual and audio alerts for the detection and identification of low voltage electric fields.

Two side-looking video cameras, suitable for night vision and enclosed in weatherproof enclosures, provide visual identification of stray voltage site locations.

The vehicle electrical system is the power source for the SVD2000 detector, processor systems and cameras.

Conclusions

Based on discussion with Sarnoff personnel and observations of the operation of the SVD2000, RG&E technical experts concluded the following:

- The actual voltage level measurement performance is dependent on several external factors such as background noise, temperature, humidity, excitation source geometry, obstructions and vehicle speed.
- The electric fields produced by high voltage overhead lines cause saturation of the electric field detection devices and render the system ineffective.
- The present application of the SVD2000 is restricted to those locations where high voltage distribution and transmissions systems are underground.

It is the opinion of RG&E personnel that the SVD2000 is not recommended at this time for the RG&E electric distribution and transmission systems. The design of the RG&E electric system is predominately high voltage overhead construction, and the amount of strictly underground construction within RG&E does not justify the unit cost of the SVD2000.

If technological changes are made to circumvent the influence of high voltage electric fields, the design concept of the SVD2000 may be a cost effective means of detecting stray voltage on grade level and roadside installations, and RG&E would be willing to reconsider the applicability of this device for the RG&E system.

Shock Reports

2005 Reported Electric Shocks

In 2005 there were eighteen (18) reported electrical shock incidents within the Company's franchise area reported to the PSC. Out of the eighteen (18) reported electrical shock incidents, two (2) incidents were potentially attributable to stray voltage conditions on RG&E's distribution system.

Fifteen (15) of the reported shock incidents did not result in injury. Of the remaining three (3), one incident, a fatality, resulted when a worker employed by a customer contacted a 12kv primary cable with an aluminum ladder. The other two (2) incidents were attributable to contractors jack-hammering into underground primary cables. On both occasions a contractor employee was transported to a hospital for observation.

The breakdown of all the causes of the shock incidents is a follows:

Two (2) – Shock attributed to neutral connections on service to customers
Two (2) – Shock attributable to customer contacting or too close to HV conductors
Five (5) – Shock attributable to customer/contractor actions damaging utility equipment
Four (4) – Shock attributable to defective customer equipment
One (1) – Shock attributed to customer actions on customer owned equipment
Two (2) – No cause found or questionable report
Two (2) – No response due to cancellation by notifying agency

Shunt Resistor

The following defines why shunt resistors are utilized in the measurement and identification of stray voltage versus induced voltage. Overhead power lines are not shielded conductors, and the electric fields surrounding them can induce voltages onto metallic objects within the fields. These fields are not indicative of a failed component of the electric system. Normally induced voltages are not harmful, and in most situations, humans cannot feel or detect these voltages. However, induced voltages can trigger the HD LV-S-5 stray voltage indicator and cause a high impedance digital voltmeter to falsely indicate a harmful stray voltage condition.

A very high input impedance digital voltmeter is designed not to draw a sufficient current capable of affecting the circuit being tested. However, a high input impedance voltmeter has the disadvantage of not being able to distinguish between a stray voltage capable of delivering a harmful electric shock and a harmless induced voltage incapable of generating sufficient current to cause an injury.

When using a high input impedance digital voltmeter to determine whether or not a voltage has the capacity to deliver sufficient current to cause injury, a shunt resistor is used to reduce the voltmeters input impedance. The voltage developed across the resultant voltmeter input impedance (the parallel combination of the shunt resistor and voltmeter input impedance) by the current flowing through it indicates the potential for the voltage to cause injury.

Therefore, a shunt resistor is used in combination with the voltmeters when a potential stray voltage has been identified by the HD LV-S-5 detector. The size of the shunt resistor is determined by the input impedance of the digital voltmeters to comply with PSC recommendations.

Appendix 1 – Procedures

Facilities Requiring Stray Voltage Testing
The following facilities shall be tested for stray voltage as defined in the Stray Voltage Test Procedure. Each facility listed with the described attachment(s) is considered one test unit.

Streetlight Facilities
Utility / Municipal Streetlight Poles
- Metallic (light shall be activated)
- Concrete (light shall be activated)

Utility / Municipal Street Light Handhole Covers (light shall be activated)

Traffic Signal Poles – Wood and Metallic (light shall be activated)
- Ground wires
- Riser pipes
- Guy wires/anchors
- Traffic signal handhole covers
- Traffic signal pedestals
- Traffic signal cabinets

Overhead Distribution Facilities
- Ground wires
- Riser pipes
- Guy wires/anchors
- Capacitor control boxes
- Recloser control boxes
- Regulator control boxes
- Switch control boxes
- Overhead switch handles
- CATV control/amplifier boxes
- Substation Fences – Utility and Customer Owned
- Electric Equipment Fences – Utility and Customer Owned

Underground Facilities
- Padmount switchgear cases
- Padmount transformer cases
- Electric utility manhole covers
- Submersible transformer covers
- Electric utility handhole covers
- Network vaults and grates

Transmission Facilities
- Ground wires
- Riser pipes
- Guy wires/anchors
- Switch control boxes
- Switch handles

Stray Voltage Test Procedure

- Stray Voltage Tests shall be performed by qualified test personnel on all above ground electric utility facilities that are capable of conducting electricity as specified in company Facilities Requiring Stray Voltage Testing.
- Test personnel shall be issued the following documents: Facilities Requiring Stray Voltage Testing and Response Notification Procedure.
- Test personnel shall wear all appropriate PPE (e.g. vests, gloves, safety glasses, steel-toed boots, etc.) in accordance with OSHA and all other respective utility safety procedures and practices.
- The operation of all Voltage Detectors and Multimeters shall be verified daily. Verification shall be performed before beginning daily testing and upon completion of the daily tests.
- Test equipment batteries shall be changed periodically to assure proper operation of the detectors and detector testers. The frequency should be based on operating experience.

Voltage Detection Procedure

The HD Electric LV-S-5 Direct Contact Voltage Detector shall be the principal voltage detection device for the RG&E Stray Voltage Project.

1. LV-S-5 Setup
   - The HD Electric PT-LV-S-5 Low Voltage Detector Tester shall be used in accordance with the Instruction Manual to verify proper operation.
   - The LV-S-5 detector is always on. It does not have an on/off switch. The LV-S-5 is activated by the presence of voltage exceeding 4.5 VAC.
   - The presence of a voltage is indicated by the flashing red light in the end of the detector.

2. LV-S-5 Operation
   - The LV-S-5 shall be held and used per Instruction Manual to assure proper application.
   - Holding the LV-S-5 as instructed, move the Voltage Detector towards the facility to be tested until contact is made.
   - Individually test all conductive devices on each structure.
   - If the detector light is activated on contact by any one (1) device on a structure, proceed to Voltage Measurement Procedure
   - If the detector light is not activated on contact with any device on a structure, no voltage is present on the structure. Proceed to Data Entry Requirements.

Voltage Measurement Procedure

- All voltage measurements shall be conducted between metallic surfaces that are clean and bare.
- A reference ground shall be established for the test using the 18” copper rod provided or other suitable ground (e.g. portable ground, system neutral, grounded metallic case, etc.).
- The voltage measurement shall be made between the structure facility on which the voltage was detected and the reference ground.

1. Multimeter (VOM) Setup Procedure
    - Plug test leads into Multimeter.
    - Turn VOM on.
    - Select auto range or the highest voltage range.
2. Multimeter Tests Without 500 Ohm Resistor Installed
    - Connect test leads; BLACK to reference ground, RED to structure or device. Note: If test leads are insufficient to span the distance between the reference ground and the structure or device to be tested, use the Cable Reel provided for added length.
    - Measure and record voltage.
    - If the measured voltage is less than 30 VAC, proceed to Step 3.
    - If the measured voltage exceeds 30 VAC do not proceed to Step 3. A measured voltage exceeding 30 VAC requires implementation of the Response Notification Procedure (Critical Response).
    - Remove test leads from VOM.
3. Multimeter Tests With 500 Ohm Resistor Installed
    - Insert resistor box into VOM.
    - Insert test leads into resistor box placed in into the VOM.
    - Connect test leads; BLACK to reference ground, RED to structure or device. Note: If test leads are insufficient to span the distance between the reference ground and the structure or device to be tested, use the Cable Reel provided for added length.
    - Measure and record voltage.
4. Response To Measured Voltage With 500 Ohm Resistor Installed
    - Measured Voltage ≥ 8 VAC
        - Initiate Response Notification Procedure (Critical Response).
    - 4.5 VAC ≤ Measured Voltage < 8 VAC
        - Initiate Response Notification Procedure (Immediate Response).
    - 0 ≤ Voltage Measured < 4.5 VAC
        - No Response Required.

<u>Data Entry Requirements</u>
Complete data fields as required on hand-held devices.

Response Notification Procedure

Critical Response Notification (CRN)

Level I Voltage ($V_{Resistor} \geq 8$ VAC) or Condition

Tester responsibilities:

- Immediately contact an Energy Control Center System (ECC) Operator and Contractor Coordinator to initiate the CRN.
- Guard the device until relieved by a guard, response crew, or other authorized personnel.
- Record the CRN and notification time into the stray voltage database.

Contractor Coordinator responsibilities:

- Contact ECC and determine if a Guard is necessary to replace the tester.
- Verify the structure has been made safe.
- Issue a follow for the CRN in Work Management to the appropriate Scheduler
- Verify thorough completion of the CRN within 45 days.
- Provide all necessary documentation to Stray Voltage Project Manager.

System Operator responsibilities:

- Assign a response crew to the CRN.
- Determine the crew response time and contact the Project Coordinator for coordination of guard requirements.
- Obtain the required technical support, personnel or equipment necessary to provide resolution if the crew cannot make safe the Level I voltage or condition.

Response Crew responsibilities:

- Respond to investigate the Level I voltage or condition.
- Investigate the structure to identify the source, implement corrective action, make it safe or de-energize the source.
- Perform a Stray Voltage Test before leaving work site.

Immediate Response Notification (IRN)

Level II Voltage ($4.5 \leq V_{Resistor} < 8$ VAC) or Condition

Tester responsibilities:

- Contact the Contractor Coordinator to determine if the structure requires guarding and initiate the IRN.
- Record the IRN and notification time into the stray voltage database.

Contractor Coordinator responsibilities:

- Determine if a Guard is required and if so, coordinate the replacement of the tester.
- Initiate notification request to a System Operator for a Response Crew to identify the source, determine whether or not the voltage ordinarily exists and, if the source can be corrected, implement corrective action.
- Verify thorough completion of the IRN.

Response Crew responsibilities:

- Respond to the Level II voltage or condition.
- Investigate the IRN to identify the source, determine whether or not the voltage ordinarily exists, and, if the source can be corrected, implement corrective action.
- Perform a Stray Voltage Test before leaving work site.

No Response

Level III Voltage (0 VAC ≤ $V_{Resistor}$ < 4.5 VAC) or Condition

Tester responsibilities:

- Enter the measurement or condition in the stray voltage database.

Contractor Coordinator responsibilities:

- None.

System Operator responsibilities:

- None.

Response Crew responsibilities:

- None.

Performance Mechanism

Public Service Commission Performance Mechanism

In the Safety Order, as modified by the Order, the Commission adopted a performance mechanism that establishes acceptable parameters for the testing and inspection programs mandated by the Safety Order, and may be used to reduce a utilities authorized rate of return for failure to meet the parameters.

Utility's Annual Performance Targets

a) The annual performance target for stray voltage testing shall be 100% of all electric facilities and streetlights that must be tested. Facilities that are inaccessible and which pose no risk to public health and safety will not be considered in the determination of whether the target has been achieved.

b) Failure to achieve the annual performance target for stray voltage testing shall result in a rate adjustment of 75 basis points.

c) For the first year of stray voltage testing, the performance target shall be 100% of all streetlights and electric facilities served by underground utility systems. Failure to achieve this performance target shall result in a rate adjustment of 37.5 basis points.

d) The annual performance target for inspections shall be based on the percentage of the average number of electric facilities that must be inspected each year in order to comply with the five-year inspection cycle. That is, the target based on the one-fifth of the total number of the utility's electric facilities. The specific targets will be as follows:

    a. First year inspection goal 85% of annual target

    b. Second year inspection goal 90% of annual target

    c. Annual inspection goal thereafter 95% of annual target

    d. Fifth year inspection goal 100% of facilities to be inspected

e) Failure to achieve the annual performance target for inspections shall result in a rate adjustment of 75 basis points.

Certifications

In accordance with Section 7 of the Electric Safety Standards, the President or officer of each Utility with direct responsibility for overseeing stray voltage testing and inspections shall provide annual certification to the Commission that the utility has, to the best of their knowledge, exercised due diligence in carrying out a plan, including quality assurance, that is designed to meet the stray voltage testing and inspection requirements and that the utility has:

- Tested all of its publicly accessible electric facilities and streetlights, except those identified in the January 15 Report

- Inspected the requisite number of electric facilities

Following are the Stray Voltage Testing and Inspection Certifications for Rochester Gas and Electric Corporation.

CERTIFICATION – STRAY VOLTAGE TESTING

STATE OF NEW YORK)
) ss.:
COUNTY OF MONROE)

Laura S. Conklin, on this 16th day of January, 2006, certifies as follows:

1. I am the Vice President, Technical Services for Rochester Gas and Electric Corporation, (the "Company"), and in that capacity I make this Certification for the period ending November 30, 2005, based on my knowledge of the testing program adopted by the Company in accordance with the Public Service Commission's *Order Instituting Safety Standards*, issued January 5, 2005 and the *Order on Petitions for Rehearing and Waiver*, issued July 21, 2005, in Case 04-14-0159 (collectively the "Order"), including the Quality Assurance Program filed by the Company with the Commission.

2. In accordance with the requirements of the Order, the Company developed a program designed to test (i) all of the publicly accessible Electric Facilities owned by the Company ("Facilities") and (ii) all Streetlights located in public thoroughfares in the Company's service territory ("Streetlights"), as identified through a good faith effort by the Company, for stray voltage (the "Stray Voltage Testing Program").

3. I am responsible for overseeing the Company's Stray Voltage Testing Program and in that capacity I have monitored the Company's Stray

Voltage Testing Program for the period ending November 30, 2005 (the "Testing Period").

4. I hereby certify that, to the best of my knowledge, information and belief, the Company has exercised due diligence in carrying out its plan designed to meet the stray voltage testing requirements for the Testing Period. Except for untested structures that are identified as inaccessible to the public in the Company's Annual Report, submitted herewith, the Company is unaware of any Facilities served by the underground system or Streetlights that were not tested during the Testing Period.

5. I make this certification subject to the condition and acknowledgment that it is reasonably possible that, notwithstanding the Company's exercise of due diligence, there may be Facilities served by the underground system and Streetlights that, inadvertently, may not have been tested or were not discovered or known after reasonable review of Company records and reasonable visual inspection of the areas of the service territory where Facilities served by the underground system and Streetlights were known to exist or reasonably expected to be found.

Laura S. Conklin

Laura S. Conklin
Vice President, Technical Services

CERTIFICATION – INSPECTIONS

STATE OF NEW YORK)
) ss.:
COUNTY OF MONROE)

Michael H. Conroy, on this 16th day of January, 2006, certifies as follows:

1. I am the Vice President, Operations for Rochester Gas and Electric Corporation (the "Company"), and in that capacity I make this Certification for the period ending November 30, 2005, based on my knowledge of the inspection program adopted by the Company in accordance with the Public Service Commission's *Order Instituting Safety Standards*, issued January 5, 2005 and the *Order on Petitions for Rehearing and Waiver*, issued July 21, 2005, in Case 04-M-0159 (collectively the "Order"), including the Quality Assurance Program filed by the Company with the Commission.

2. The Company has an inspection program that is designed to inspect all of its electric facilities on a five-year inspection cycle, as identified through a good faith effort by the Company ("Facilities"), in accordance with the requirements of the Order (the "Facility Inspection Program").

3. I am responsible for overseeing the Company's Facility Inspection Program and in that capacity I have monitored the program during the period ending November 30, 2005 (the "Testing Period").

4. I hereby certify that, to the best of my knowledge, information and belief, the Company has exercised due diligence in carrying out its plan designed

to meet its inspection requirements and that the Company has inspected the requisite number of Facilities during the Testing Period, in order to comply with the five-year inspection cycle required under the Order.

Michael H. Conroy
Vice President, Operations