January 12, 2007

Honorable Jaclyn Brilling  
Secretary  
State of New York  
Public Service Commission  
Three Empire State Plaza  
Albany, NY 12223

RE: Case No. 04-M-0159 – Proceeding on Motion of the Commission to Examine the Safety of Electric Transmission and Distribution Systems

2006 ANNUAL REPORT

Dear Secretary Brilling:

Niagara Mohawk Power Corporation d/b/a National Grid (the "Company") is writing to submit an original and five (5) copies of the Company's 2006 Annual Report for "Elevated Voltage Testing and Facility Inspection" performed in accordance with the New York State Public Service Commission's, January 5, 2005 and July 21, 2005 orders (the "Safety Orders") in the above-referenced proceeding.¹ Also included with the 2006 Annual Report are the latest versions of the Company's revised procedures governing the testing and inspection programs, along with signed originals of the certifications required under the Safety Orders.

Kindly acknowledge receipt of this filing by date-stamping as received the enclosed duplicate copy of this letter and returning it in the enclosed, self-addressed envelope.

Respectfully submitted,

Jeremy J. Euto

Enclosures  
c: Susan Pelkey  
Robert Visalli/Denise Gerbsch

STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

CASE NO. 04-M-0159

National Grid

Elevated Voltage Testing and Facility Inspection

2006 Annual Report

January 12, 2007
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- Attachment 7 - Monthly Reporting to PSC Staff
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Executive Summary

On January 05, 2005, the New York State Public Service Commission issued an order in Case No. 04-M-0159 instituting safety standards for all regulated electric utilities (the “January Order”).1 The January Order directed utilities to annually:

- Test 100% of publicly accessible electrical facilities for the presence of elevated voltage;
- Visually inspect 20% of facilities for defects;
- Implement a quality assurance (QA) process to monitor the program;
- Seek out and test certain municipally owned facilities; and
- Complete the program by November 30th of each year.

Targets for Elevated Voltage testing were modified in the Commission’s July 21, 2005 Order in Case No. 04-M-0159 (the “July Order”)2 to include:

- Test 100% of publicly accessible conventional underground equipment annually;
- Test 100% of publicly accessible streetlight equipment annually;
- Test 100% of municipal owned streetlights and traffic controls annually;
- Test approximately half of their System by Nov 30, 2005 and complete the testing program for the entire system by Aug 31, 2006; and
- Inspect 20% annually, and 100% of all facilities every five years for visual defects.3

Targets for the Elevated Voltage testing program established in the January Order and July Order (the “Safety Orders”) were met by National Grid. The elevated voltage testing results are quantified in the table below. The table only includes the first cycle of testing for the distribution / transmission / sub transmission and substations programs, and the second cycle of testing for the streetlight and underground programs. The table does not include the first cycle of elevated voltage testing for streetlights and underground assets as they were reported to the commission in the ‘National Grid Elevated Voltage Testing and Facility Inspection 2005 Annual Report’ filed in January 2006 annual report.

<table>
<thead>
<tr>
<th>Program</th>
<th>Total Units</th>
<th>Units Completed</th>
<th>% Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution</td>
<td>1,205,991</td>
<td>1,205,991</td>
<td>100</td>
</tr>
<tr>
<td>Underground</td>
<td>93,751</td>
<td>93,751</td>
<td>100</td>
</tr>
</tbody>
</table>

3 Pursuant to the Commission’s July Order in Case No. 04-M-0159, the specific target for inspections during the second year is 18% (i.e., 90% of the annual 20% target). July Order, Appendix A, p. 6.
The same results are qualified to show only those facilities that exhibited voltage in the following table. These facilities are represented in units and as a percentage of all tests performed in a specific program.

<table>
<thead>
<tr>
<th>Program</th>
<th>1.0 – 4.4 volts</th>
<th>4.5 – 7.9 volts</th>
<th>8.0 – 24.9 volts</th>
<th>25 – 99 volts</th>
<th>&gt; 100 volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution (Units)</td>
<td>262</td>
<td>25</td>
<td>12</td>
<td>22</td>
<td>5</td>
</tr>
<tr>
<td>Underground (units)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Street Light (Units)</td>
<td>12</td>
<td>12</td>
<td>21</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Transmission (Units)</td>
<td>79</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Substation (Units)</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- Units are simply a count of tests completed
- Only voltages greater than or equal to 4.5 volts are mitigated
- Cycle 1 results are included for Distribution / Transmission & Substations
- Cycle 2 results are included for Street Lights and Underground

Based upon the large population of voltage tests completed, conclusions drawn include:

- very few elevated voltage conditions are apparent as a percentage of the total system assets;
- elevated voltage conditions found on Street Lights has reduced significantly over the testing performed during 2005;
- there were no elevated voltage conditions exceeding the threshold 4.5 volts on the transmission system or on substations fences;
- there were no elevated voltage conditions identified on underground assets
- modifications to the program should be considered to allow for mobile testing of assets, to remove the transmission assets from the requirements of the ‘Safety Orders’, and to scale back testing requirements of underground assets to a more focused approach and only include assets for conventional underground (network) areas.

Targets for Inspection programs as established by the Safety Orders were met or exceeded. The results are quantified below for the second cycle of Facility Inspections.
A two year view of the inspection programs since the ‘Safety Orders’ were issued is depicted in the next table. All inspection programs are ahead of the established goal.

<table>
<thead>
<tr>
<th>Program</th>
<th>Units / Miles Completed</th>
<th>% of System Completed</th>
<th>PSC Goal %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution</td>
<td>16,198 (mi)</td>
<td>45</td>
<td>35</td>
</tr>
<tr>
<td>Underground</td>
<td>24,030</td>
<td>51</td>
<td>35</td>
</tr>
<tr>
<td>Streetlights</td>
<td>33,441</td>
<td>53</td>
<td>35</td>
</tr>
<tr>
<td>Transmission</td>
<td>4,251 (mi)</td>
<td>48</td>
<td>35</td>
</tr>
<tr>
<td>Substation</td>
<td>856</td>
<td>100</td>
<td>35</td>
</tr>
</tbody>
</table>

- Distribution and Transmission are reported in Miles. Underground, Streetlights and Substations are reported in units.
- PSC Goal % is based on first year criteria of 17% plus second year criteria of 18%.

Inspections deficiencies are identified by code and priority. The priorities include: E – Emergency; A – As soon as practical; B- As directed by Distribution Engineering, C – Items being trended by and reviewed by Distribution Engineering.

Summary of maintenance code priorities collected during the 2006 Inspection program are identified in the following table.

<table>
<thead>
<tr>
<th>Program</th>
<th>Priority E</th>
<th>Priority A</th>
<th>Priority B</th>
<th>Priority C</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution</td>
<td>180</td>
<td>6,266</td>
<td>100,019</td>
<td>40,935</td>
<td>77,760</td>
</tr>
<tr>
<td>Underground</td>
<td>18</td>
<td>450</td>
<td>5,449</td>
<td>3,989</td>
<td>7,745</td>
</tr>
<tr>
<td>Streetlights</td>
<td>1</td>
<td>42</td>
<td>269</td>
<td>5,196</td>
<td>258</td>
</tr>
<tr>
<td>Transmission</td>
<td>0</td>
<td>233</td>
<td>8,434</td>
<td>2,92</td>
<td>4,421</td>
</tr>
<tr>
<td>Substation</td>
<td>42 items identified for Fence and Yard</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The category of ‘Other’ consists of (F) Forestry codes, (I) Inventory codes and (P) Performance codes for work completed during the actual inspection.
Background

The New York State Public Service Commission (the “Commission”) issued an Order Instituting Safety Standards in January of 2005 (the January Order). During the investigation of a contact incident in New York City, the Commission deemed there was sufficient justification to move forward with an order requiring all utilities to proactively search for evidence of “stray voltage”. Stray voltage for the Order is defined as voltage conditions on electrical equipment that should not ordinarily exist. Based on discussions with the utilities, Department of Public Service Staff (“Staff”), and manufacturers of testing equipment, a level of 4.5 volts was established as a threshold voltage condition above which National Grid would consider the voltage condition stray or elevated. Utilities have historically used the term “stray voltage” in connection with neutral to earth voltage difference. For purposes of its internal operations and this report, National Grid uses the term “elevated voltage” (“EV”) interchangeably with stray voltage to avoid any such confusion or misunderstanding.

In response to the January Order, National Grid and the other utilities filed plans for implementation and compliance with the order on February 22, 2005. Certain of the utilities also filed requests for waivers and rehearing and/or clarification of the requirements of the January Order. The Commission addressed the requests for rehearing and waiver requests in its July 21, 2005 Order (referred to collectively with the January Order as the “Safety Orders”).

The plan filed on February 22, 2005 detailed the approach National Grid would take to meet the requirements of the Safety Orders. Staff stated that while they would review the plans submitted by the utilities, they did not expect the Commission to formally approve the utilities’ plans. Staff indicated that they would notify the utilities of any deficiencies in the plans’ compliance with the Safety Orders.

The Safety Orders called for EV testing of all publicly accessible facilities within the electric utility system. Specifically, if a facility was accessible to the public, within reach of the ground and contained conductive equipment, an EV test was to be performed with a qualified voltage detection device. In addition the Safety Orders called upon utilities to:

- visually inspect all facilities over a 5 year period;
- meet record keeping, certification and reporting requirements; and
- adopt the National Electric Safety Code (NESC) as the minimum standard governing utility construction, maintenance and operation.

As part of the reporting requirements the utilities were directed to file an annual report that would include:

- details of the voltage testing program and inspections program conducted over the last twelve months;
- discussion of the performance mechanism described in the Safety Orders;
- certifications regarding program implementation;
- discussion of the analysis undertaken on the causes of elevated voltage with the utility’s electric system, the conclusions drawn there from, and the preventative and remedial measures identified, and the utility’s plans to implement those measures; and
- all other pertinent information.

In its July 21, 2005 Order, the commission further clarified the requirements of the January Order, directing the utilities to:

- test 100% of their publicly accessible conventional underground equipment annually;
- test 100% of their publicly accessible streetlight equipment annually;
- test 100% of municipal owned streetlights and traffic controls annually;
- test approximately half of their System by Nov 30, 2005 and complete the testing program for the entire system by Aug 31, 2006; and
- inspect 20% annually, and 100% of all facilities every five years for visual defects.

In response to the Safety Orders, National Grid developed electric operating procedures, created an organization to manage the project, developed a database to house the information collected, purchased testing devices, developed training programs and hired contractors to perform the testing.

In order to meet the demands of the Safety Orders a program manager was hired to oversee the project. The project was broken down into several key areas. These included:

- EV testing for Distribution facilities
- EV testing for Underground facilities
- EV testing for Streetlight facilities
- EV testing for Transmission facilities
- EV testing for Substation fences
- Inspection of Distribution facilities
- Inspection of Underground facilities
- Inspection of Streetlight facilities
- Inspection of Transmission facilities
- Inspection of Substations

Each area of the project was managed with a combination of internal workforce and contractors. The Maintenance Inspection & Assessment group was created to manage EV testing work and follow up repairs and to manage the field inspections and subsequent repairs.

There are approximately 1.5 million locations to be visited for EV testing in the Company’s New York service territory.
For inspections, 20% of installed assets are required to be visually inspected annually. Recognizing the difficulty for the initial years, the Safety Orders allowed some leeway for the Inspection goal, permitting utilities to complete 85% of the annual 20% goal or 17% of asset inspections in year one and 90% of the annual 20% goal or 18% of asset inspections in year two. The National Grid inspection goals for year two of the program included 7,093 miles of distribution, 1,814 miles of transmission, 8,963 manhole/hand-hole inspections, and 0 streetlight inspections. Streetlight inspections were not scheduled for year two as the inspections during year one put National Grid far ahead of schedule.

The New York Utility group continued to meet to discuss and compare individual testing and inspection programs during 2006. The group met periodically with the Staff to discuss progress and the expectations of Staff regarding the programs, collaborate with Staff for monthly report development, discuss how to interpret requirements of the Safety Orders, and generally review common issues that utilities were experiencing. The working group and Staff also held bi-monthly conference calls to discuss emerging issues.

The 2006 Annual Report is intended to reflect program status through November 30, 2006. This report is also intended to serve as a comprehensive update to the National Grid programs addressing the Safety Orders, details of which were originally filed with the Commission on February 22, 2005 and again on January 13, 2006.

As suggested by the Commission in the January Order, as National Grid develops a better understanding of the testing and inspection programs and results, the Company may, herein or via separate filing, provide additional comments regarding how the testing and inspection programs may be modified and/or improved.
Overview

National Grid New York service territory covers an enormous geographical area in upstate New York. The franchise covers approximately 24,700 square miles. There are approximately 1,500,000 electric customers within the franchise area. For this program the Company broke the electric system into a variety of subprograms to schedule and track the testing and inspections. The categories included distribution, underground, streetlights & traffic signals, transmission, and substations.

The distribution system consists of structures supporting circuits energized at voltages of up to 15kV. This system spans close to 36,000 miles and is made up of approximately 1,300,000 poles. The EV testing is currently performed by contractors. The facility inspections are currently performed by an internal workforce.

The underground system is made up of approximately 93,000 metallic manholes, hand-holes, vaults, URD pad mounted transformers, switchgear, etc. Pursuant to the Safety Orders, fiberglass hand holes were exempt from testing.\(^5\) The EV testing of the underground system is currently performed by contractors. The facility inspections of the underground system are currently performed by an internal workforce.

The streetlight system contains approximately 80,000 underground fed metallic streetlight standards and municipally owned lights and traffic control devices. Overhead fed street lights on wooden poles are not counted within the street light program. EV testing of the overhead fed lights is contained within the distribution program. For the underground fed metallic streetlight standards EV testing, the tests were performed by contractors at night when the light is operational. The traffic control EV testing takes place in conjunction with the contractors’ testing of the overhead and underground systems during the daytime hours. The streetlight facility inspections on Company owned facilities take place during the day and are performed by an internal workforce.

The transmission category includes the sub-transmission system for this program. This consists of structures that support circuits energized at voltages of 23kV, 34.5kV, 46kV, 69kV, 115kV, 230kV and 345kV. The transmission system spans the entire state, is approximately 8,900 miles in length and contains approximately 100,000 structures (combined wood structures and steel towers). The EV testing on transmission is performed by a combination of contractors and internal workforce. In many instances, the most difficult part of testing a transmission tower is physically getting to the tower. Therefore, the database and the internal hand held computer were set up to accept EV tests on transmission while an employee was at the location for a visual inspection or the contractor was at the tower for an EV test.

There are 856 substations in the Company’s New York system. EV results for substation fences were collected internally by the operating group. The initial dataset established

\(^5\) July Order, p. 23.
identified 866 Substation locations to be tested of which a number of these were retired locations.

At the start of this program no database existed within the Company to track EV testing, a database needed to be developed. National Grid utilized a combination of internal employees and services from Computapole to develop the database and a means by which to move the data into the database. At the beginning of the project, the Company created a ‘Data Document’ for contractors to follow for receiving and returning data to National Grid in a consistent process. A series of data validations were put in place to perform a basic check on the data before receiving the information back into the database. Once the data are received, the supervisors and analysts can run reports against the data.
Testing and Inspection

Elevated Voltage Testing

The elevated voltage testing program was segmented into a number of categories. These include: distribution facility testing, underground testing, streetlights & municipally owned facility testing, overhead transmission facility testing, substation fence testing and daily work area testing. The details of the Company’s elevated voltage testing procedures and protocols are included in the NG EOP – G0016 entitled "Elevated Equipment Voltage Testing," provided in Attachment 1. This EOP has been updated since the original National Grid filing in February 2005. The Company has included the most recent copy in this filing.

Recognizing the enormity of this undertaking, the Company determined that contracting the majority of the EV testing work would be necessary in order to meet the schedule demands of the Safety Orders. After a review of contractor proposals, the Company contracted with two companies to perform this work. Two contractors were selected due to the large number of variables to get the project started. Should a single contractor fail to achieve its objective, the second contractor would be available to increase its role to complete the required testing. Early in 2006 National Grid scaled back to a single contractor due to the confidence built that a single contractor could complete the project by the established deadlines.

Test equipment selected for the program was the HD electric company LV-S-5. This unit was the only I.E.C. category IV rated device available. The company acquired 750 devices to be used for the EV testing of the system by the contractors as well as daily testing requirements by the Company’s workforce. A list of approved multi meters was developed and communicated to the workforce. A 470 ohm shunt resistor is also necessary for use with the multi meter. Materials for the shunt resistors were purchased, assembled and tested by the Company’s electrical test lab. The shunt resistors were distributed to the workforce along with the HD test equipment in August 2005.

The company trained the contractors’ primary employees in May 2005. The contractors then hired and trained their employees on the safety requirements and the procedure for performing the EV testing. Contractors were trained in: Proper use of appropriate Personal Protective Equipment, Work Area Protection, Hazard Communication, First Aid CPR (for multi person crews), Proper use of the certified voltage detection units and multimeters, and Hazardous condition identification. During the training, contractors were provided with a review of our electric system in order to accurately convey to their employees what they were looking at and how to code the information.

As part of its program development and training, the Company used a ‘trigger value’ to initiate response when voltage was identified. This trigger voltage used was 4.5 volts. This value was derived from the approved voltage test device (HD Electric LV-S-5). The test equipment is designed to trigger or illuminate at 5 volts with a + or − 10% sensitivity range. In general, this means the unit could trigger at a value as low as 4.5 volts. If a
voltage was identified using the HD detector, then a multi-meter with a 470 ohm shunt resistor was used to make an actual measurement. Should the voltage collapse below 4.5 volts, then the data was collected and no further action was taken. Should the voltage reading be sustained at 4.5-7.9 volts then the facility was to either be barricaded / flagged / or guarded depending on its location and volume of pedestrian traffic. Should the voltage reading exceed 8.0 volts then the facility was guarded until the Company responded to trouble shoot and eliminate the condition.

When EV conditions are identified by the contractors, they follow a procedure established to provide assurance that the Company can track the incident and immediately follow up. The procedure requires the contractor to call a centralized dispatch number at National Grid that is staffed 24 hours per day, 365 days per year. Pertinent information would be provided to the dispatcher including where the facility was located, what voltage was measured and whether the contractor was required to stand guard. The Dispatch center would then provide the various control centers with an order for a qualified crew to respond to each such location. The crew would investigate and resolve the hazardous condition. If the crew could not make repairs immediately, they would eliminate the hazard and provide sufficient information for follow up by the appropriate group. This information was then entered into the Elevated Voltage database.

In light of the magnitude of the undertaking and the amount of data initially generated, the data flow process between the contractors and National Grid required a series of procedural enhancements to work properly. The process required the contractors to structure their data in a very specific manner. The contractors would perform the testing, collect the data, and post data files to a controlled directory on the National Grid web. The data would have a validation program run against it by a National Grid analyst to ensure that key fields were populated properly. After validation, the data was either accepted into the database or it was rejected and returned to the contractor. Reasons for rejected data were communicated to the contractors (e.g., data structure, missing data, etc.). This data flow process was established to provide assurance that information was collected and turned over to National Grid in a consistent manner, regardless of the contractor.

Distribution

Overview

The company queried its Geographical Information System (GIS) for data related to Overhead Distribution. It was determined that, rather than target distribution facilities with conductive equipment within reach of the ground, the contractors would visit 100% of the poles that were publicly accessible. The purpose of visiting 100% of the publicly accessible poles was to insure that the Company captured data on poles that had conductive facilities added but not captured in the source database. As of August 31, 2006 the distribution system was 100% completed in the National Grid New York territory.
Results
As a consequence of meetings and discussions with Staff, a standard monthly report was established for all the New York utilities. This monthly report is shared with Staff to provide status information as to the progress for each utility. The standard report was developed so results from various utilities could be compared. A copy of the Company’s report is found in Appendix 7. The results of the Distribution program through August 31, 2006 (the deadline for cycle one testing) show that 1,205,991 locations completed. There were an additional 94,523 locations completed by November 30, 2006. The additional structures are tied to EV testing for cycle two (deadline of November 2007).

The units tested relate to poles on the distribution system. Contractors are required to test anything on and around each pole to provide assurance that the area was clear of any elevated voltages. If a pole contained 2 guy wires, a ground wire, a conduit riser and a phone box adjacent to the pole, then the contractor was instructed to test all items and return a single record to National Grid.

For the testing completed, the following voltages were found.

<table>
<thead>
<tr>
<th>Voltage on …</th>
<th>1.0 – 4.4 volts</th>
<th>4.5 – 7.9 volts</th>
<th>8.0 – 24.9 volts</th>
<th>25 – 99 volts</th>
<th>&gt; 100 volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole</td>
<td>88</td>
<td>8</td>
<td>5</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Ground</td>
<td>53</td>
<td>9</td>
<td>6</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Guy</td>
<td>113</td>
<td>8</td>
<td>5</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Riser</td>
<td>25</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>39</td>
<td>5</td>
<td>0</td>
<td>12</td>
<td>4</td>
</tr>
</tbody>
</table>

When voltage was identified, the contractor captured the specific information on where the voltage was located. This breakdown is seen below.

<table>
<thead>
<tr>
<th>Voltage facilities with Voltage between …</th>
<th>1.0 – 4.4 volts</th>
<th>4.5 – 7.9 volts</th>
<th>8.0 – 24.9 volts</th>
<th>25 – 99 volts</th>
<th>&gt; 100 volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole</td>
<td>88</td>
<td>8</td>
<td>5</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Ground</td>
<td>53</td>
<td>9</td>
<td>6</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Guy</td>
<td>113</td>
<td>8</td>
<td>5</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Riser</td>
<td>25</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>39</td>
<td>5</td>
<td>0</td>
<td>12</td>
<td>4</td>
</tr>
</tbody>
</table>

Note that totals of voltages found details (pole, ground, etc) may add up to more than the total facilities within a voltage range. This occurs because voltage may have been found on more than one item on the same pole. For example if a pole was tested and voltage was found on the guy wire and the ground, then both items are reflected in the details but only one location is identified in the Total Facilities line.

Note that this table contains results from both Cycle 1 and Cycle 2 testing.

Of the locations found with voltage, National Grid investigates and mitigates at locations that exceed 4.5 volts. The following table describes work performed to respond to locations with voltages found in excess of 4.5 volts.
<table>
<thead>
<tr>
<th>Quantity</th>
<th>Work Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Arrester</td>
</tr>
<tr>
<td>1</td>
<td>Cable Feed</td>
</tr>
<tr>
<td>9</td>
<td>Down Ground</td>
</tr>
<tr>
<td>11</td>
<td>Equipment Other</td>
</tr>
<tr>
<td>10</td>
<td>Ground Connection</td>
</tr>
<tr>
<td>2</td>
<td>Guy</td>
</tr>
<tr>
<td>1</td>
<td>Induced</td>
</tr>
<tr>
<td>2</td>
<td>Insulator</td>
</tr>
<tr>
<td>1</td>
<td>Neutral</td>
</tr>
<tr>
<td>5</td>
<td>None Required</td>
</tr>
<tr>
<td>12</td>
<td>Procedure</td>
</tr>
<tr>
<td>1</td>
<td>Remade Connections</td>
</tr>
<tr>
<td>2</td>
<td>Service Wire</td>
</tr>
<tr>
<td>7</td>
<td>Customer Problem</td>
</tr>
<tr>
<td>65</td>
<td>Total</td>
</tr>
</tbody>
</table>

Note that this table contains results from both Cycle 1 and Cycle 2 testing.

The locations identified as ‘procedure not properly followed’ generally occurred early in the testing program. These items should not be interpreted as the result of the Company not responding to an EV incident. It is quite the opposite. These were locations where the contractor was restricted from using the shunt resistor because of the level of voltage initially identified at a facility. Initial procedures restricted the use of the shunt resistor to voltages detected at 30 volts or less. Subsequent modifications allowed the shunt resistor to be used to 100 volts and then eventually the Company removed the voltage limitation. The purpose of the initial restrictions was due to the nature of the shunt resistor that was utilized for the tests. The unit was a 3 watt resistor that was not designed to withstand a full 120 volts for more than say, 30 seconds. If a voltage reading was collected and it exceeded the voltage limitation from the procedure (at that point in time) the contractor would call in the EV and stand guard. The responding crew began to investigate and make modification in an attempt to eliminate voltage. Neither the contractor nor the responding crew used a shunt resistor to bleed off any inductive voltage at these locations (i.e., to get a more accurate determinate of the found voltage). The Company included these locations as EV records even though the Company believes the majority would have shown no voltage had a suitable shunt resistor been used. Each of these locations was rechecked with the shunt resistor in place to ensure no real voltage source existed. After several procedural changes, use of the shunt resistor is now permitted at all times. This clarification significantly reduced the number of false positive reports of an elevated voltage condition.
Underground

Overview

The company queried its Geographical Information System (GIS) for data related to Underground facilities. Underground facilities included manholes, hand-holes, vaults, pad mounted transformers, pad mounted switchgear, etc. The GIS data were supplemented with paper and electronic maps for the underground transmission system. The Safety Orders set a schedule requiring testing for 100% of publicly accessible conventional underground equipment and priority URD equipment by November 30, 2006.

The company attempted to define ‘priority URD’ equipment as URDs located within the large metropolitan areas of the franchise. Communication of the specific assets included in this definition became too cumbersome and the contractors were directed to simply complete testing of the entire underground system. This provided assurance that the Company did not miss facilities due to misinterpretation of conventional underground or priority URD equipment. Originally the Company provided the contractor with 93,751 underground units. The total number of underground units decreased from the testing performed in 2005. This decrease was primarily due to the removal of fiberglass hand holes from the dataset.

Results

A standard monthly reporting was established for all the New York utilities. This monthly report is shared with Staff to provide status information as to the progress for each utility. The standard report was developed so the various utilities could be compared. A copy of the November 2006 report is found in Appendix 7. The results of the Underground system testing program through November 30, 2006 shows a completion of 100% of the underground program for cycle 2 or 93,751 units.

A unit relates to manholes, hand holes, vaults, pad mounted equipment, etc. on the underground system. Contractors are required to test anything on and around each manhole / hand hole to provide assurance that the area was clear of any elevated voltages.

For the testing completed, the following voltages were found.

<table>
<thead>
<tr>
<th>Underground # Units with Voltage between …</th>
<th>1.0 – 4.4 volts</th>
<th>4.5 – 7.9 volts</th>
<th>8.0 – 24.9 volts</th>
<th>25 – 99 volts</th>
<th>&gt; 100 volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle 1</td>
<td>17</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Cycle 2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Locations where voltages were found were segmented off to show which equipment the voltage was found on. This breakdown is seen below.
Underground Facilities with Voltage between …

<table>
<thead>
<tr>
<th>Voltage on …</th>
<th>1.0 – 4.4 volts</th>
<th>4.5 – 7.9 volts</th>
<th>8.0 – 24.9 volts</th>
<th>25 – 99 volts</th>
<th>&gt; 100 volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand hole</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Manhole</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Switchgear</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Transformer</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Vault Cover</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pedestal</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note that this table contains results from both Cycle 1 and Cycle 2 testing.

Note that the ‘Other’ category in the preceding table is generally made up of codes for equipment that would not exist on the underground system. For example if the contractor tested a hand hole and found voltage, the Company may have received a code of guy wire back for that asset. Additional data validation checks were added that are intended to prevent these errors in the future.

Of the items that were found with voltage, National Grid investigates and mitigates at locations that exceeded 4.5 volts. The following table describes work performed to respond to locations on the underground system with voltages found in excess of 4.5 volts.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Work Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cleaned out Hand hole / Dried</td>
</tr>
<tr>
<td>1</td>
<td>Procedure not properly followed (subsequent testing showed no voltage)</td>
</tr>
</tbody>
</table>

The location identified as ‘Procedure not properly followed’, was found to not contain voltage when the National Grid crew responded and collected voltage readings. The final reading was milli-volts and it was determined that the contractor had failed to use a shunt resistor in his testing.

**Streetlights**

**Overview**

This portion of the program included the testing of publicly accessible metallic streetlights and traffic control equipment. During the first cycle of testing (2005), the Company queried its Outdoor Lighting Data System (OLDS) for data related to Streetlight standards that were metallic and an Access database for the Traffic Controls. For the second cycle of testing (2006) the company utilized the data collected during 2005 and supplement with any new installations fro the OLDS system. The purpose for using this data was to insure we provided the testing contractors with the maximum number of locations that may require a test. The Safety Orders set a schedule for 100%
of publicly accessible street light facilities to be tested for elevated voltage by November 30, 2006. In addition to these facilities, the contractors were directed to locate any other municipally owned streetlights and traffic control structures that may not have been in the original lists.

Results
A standard monthly reporting was established for the New York utilities. This monthly report is shared with Staff to provide status information as to the progress for each utility. The standard report was developed so that results from the various utilities could be compared. A copy of the November 2006 report is found in Appendix 7. The results of the cycle 2 streetlight program through November 30, 2006 shows a completion of 100% of the streetlight /traffic control which equates to 80,030 units.

The units tested relates to streetlights and traffic control. Contractors are required to test anything on and around each device to provide assurance that the area was clear of any elevated voltages.

For the testing completed to date (both Cycle 1 and Cycle 2), the following voltages were found.

<table>
<thead>
<tr>
<th>Streetlight / Traffic Control</th>
<th>1.0 – 4.4 volts</th>
<th>4.5 – 7.9 volts</th>
<th>8.0 – 24.9 volts</th>
<th>25 – 99 volts</th>
<th>&gt; 100 volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle 1</td>
<td>223</td>
<td>84</td>
<td>60</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Cycle 2</td>
<td>12</td>
<td>12</td>
<td>21</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

The results for cycle 2 testing shows a significant decrease of elevated voltage conditions identified. The expectations were that the first cycle of testing would identify the majority of problems and the second cycle of testing should find fewer issues.

Locations where voltages were found were segmented off to show which equipment the voltage was found on. This breakdown is seen below.

<table>
<thead>
<tr>
<th>Streetlight / Traffic Control Facilities with Voltage between …</th>
<th>1.0 – 4.4 volts</th>
<th>4.5 – 7.9 volts</th>
<th>8.0 – 24.9 volts</th>
<th>25 – 99 volts</th>
<th>&gt; 100 volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole</td>
<td>234</td>
<td>92</td>
<td>77</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Traffic Signal</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Control Box</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pedestrian Crossing</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note that this table contains results from both Cycle 1 and Cycle 2 testing.
Of the items that were found with voltage, National Grid investigates and mitigates at locations that exceeded 4.5 volts. The following table describes work performed to respond to locations on the streetlight system with voltages found in excess of 4.5 volts.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Work Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Cable and Ground</td>
</tr>
<tr>
<td>10</td>
<td>Cable Feed</td>
</tr>
<tr>
<td>49</td>
<td>Ground Connection</td>
</tr>
<tr>
<td>2</td>
<td>Lamp Wiring</td>
</tr>
<tr>
<td>9</td>
<td>Luminaire Change</td>
</tr>
<tr>
<td>34</td>
<td>Neutral</td>
</tr>
<tr>
<td>8</td>
<td>None Required</td>
</tr>
<tr>
<td>5</td>
<td>Photo Eye</td>
</tr>
<tr>
<td>7</td>
<td>Poor Insulation</td>
</tr>
<tr>
<td>1</td>
<td>Procedure Not Followed</td>
</tr>
<tr>
<td>42</td>
<td>Remade all Connections</td>
</tr>
<tr>
<td>7</td>
<td>Customer Problem</td>
</tr>
</tbody>
</table>

Note that this table contains results from both Cycle 1 and Cycle 2 testing.

Transmission

Overview

The company derived its Transmission and Sub-transmission data from a combination of databases. For the purpose of this report all transmission and sub-transmission structures are included under the title ‘Transmission Structures’. The Safety Orders set a schedule for testing 100% of transmission that is publicly accessible by August 31, 2006.

It became apparent early in the testing that the HD Electric LV-S-5 test device would prove to be too cumbersome to use within transmission right of ways. The electric field present on / near / under transmission towers caused the device to ‘trigger’ or illuminate the majority of the time. Several attempts were made by HD Electric to design a ground shield for the test device which would eliminate the false positive trigger. One of these ground shields did prove to have superior results to eliminating the false positive readings, however by that point in time, the Company had decided to utilize the multimeter/shunt resistor and retrieve a voltage reading from each structure.

Results

Monthly results of the EV testing program are forward to Staff. These results are included in Appendix 7. The results of the transmission program through August 31, 2006 show National Grid a completing 100% of the required testing or 111,068 units. There were an additional 6,005 locations completed by November 30, 2006. The additional structures are tied to EV testing for cycle two (deadline of November 2007).
The units tested relates to transmission structures. Contractors tested anything on (and around) each structure to provide assurance the area was clear of elevated voltages. A structure could be made up of a metallic tower or wood pole(s) / guys. Some structures contained upwards of 6 poles. Each multi pole structure is counted as one item in the testing database.

For the testing completed during cycle 1 and ongoing for cycle 2, the following voltages were found:

<table>
<thead>
<tr>
<th>Transmission Structures</th>
<th># Units with Voltage between …</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.0 – 4.4 volts</td>
</tr>
<tr>
<td>Totals</td>
<td>79</td>
</tr>
<tr>
<td>Cycle 1</td>
<td>79</td>
</tr>
<tr>
<td>Cycle 2</td>
<td>0</td>
</tr>
</tbody>
</table>

Locations where voltages were found were segmented off to show which equipment the voltage was found on. This breakdown is seen below.

<table>
<thead>
<tr>
<th>Transmission Facilities</th>
<th>Voltage on …</th>
<th>1.0 – 4.4 volts</th>
<th>4.5 – 7.9 volts</th>
<th>8.0 – 24.9 volts</th>
<th>25 – 99 volts</th>
<th>&gt; 100 volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lattice</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pole</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ground</td>
<td>57</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Guy</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note that this table contains results from both Cycle 1 and Cycle 2 testing.

At the request of Staff, we reviewed the 79 locations to look for a common tie. We identified that all 79 locations were tested by two of the contractor employees very early in the program (summer 2005). The locations were retested by National Grid supervision. Only 3 of the locations were found to have a voltage greater than 1 volt. The highest reading was 1.77 volts which is below the established action level within the procedure. It was determined that the cause of the voltage readings during the first test may have been attributed to tester error. The individuals were not properly using the shunt resistor with the multi meter.

Substations

Overview

The substation facilities are made up of 856 locations. The EV testing data will show 866 locations. The difference is due to additional locations provided to the field for testing in the initial dataset, but were found to be stations that no longer existed. Not all of the 856 locations require testing since not all substations have publicly accessible
electric facilities (e.g., substations located in brick buildings). The data source for the identification of substation facilities will be the AIMMS (Asset Information Maintenance Management System). Internal workforce collected this information during their routine inspections. The Safety Orders set a schedule for 100% of substation fence testing of August 31, 2006.

**Results**

Testing was completed in early 2006 for all substations. Monthly results of the EV testing program are forwarded to Staff. These results are included in Appendix 7. The results of the substation program through August 31, 2006 show National Grid a completing 100% of the required testing or 866 units. The have been no additional structures are for EV testing for cycle two (deadline of November 2007).

The units tested relates to a substation facility.

<table>
<thead>
<tr>
<th>Substation # Units with Voltage between …</th>
<th>1.0 – 4.4 volts</th>
<th>4.5 – 7.9 volts</th>
<th>8.0 – 24.9 volts</th>
<th>25 – 99 volts</th>
<th>&gt; 100 volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle 1</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cycle 2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Locations where voltages were found were segmented off to show what equipment the voltage was found on. This breakdown is seen below.

<table>
<thead>
<tr>
<th>Substation Underground Facilities with Voltage between …</th>
<th>1.0 – 4.4 volts</th>
<th>4.5 – 7.9 volts</th>
<th>8.0 – 24.9 volts</th>
<th>25 – 99 volts</th>
<th>&gt; 100 volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fence</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Inspection Programs

Similar to the EV program, National Grid’s inspection program was segmented into five categories: distribution facility inspection; underground facility inspections; streetlights inspections; transmission facility inspections; substation inspections. Each program is summarized by its associated Electric Operating Procedure. These inspections include visual inspections of the assets to determine if deficiencies exist. Deficiencies are captured by codes entered into handheld computers. Data is then downloaded for review and follow up work.

Distribution

Overview

The distribution inspections program was developed to meet the requirements of the Safety Orders to inspect distribution facilities over a five year period. The details for overhead inspection procedures and protocols for distribution overhead facilities are provided in NG-USA EOP D004, entitled “Distribution Line Patrol and Maintenance,” provided in Attachment 2.

The Distribution Line Patrol and Maintenance program generally consists of patrols conducted by qualified workers that can identify deficiencies or non-standard construction conditions on the facilities. The patrols are scheduled in such a manner that each distribution feeder and associated equipment would be examined at least once every five years.

Distribution (15 kV and less) facilities requiring inspection include Company electric facilities on overhead structures. The database of this equipment is included in GIS and provided in electronic format to the inspector going to the site. The inspectors also utilize hardcopy maps for a distribution circuits to assist during field work. GPS latitude and longitude coordinates and other basic facility information for each pole are downloaded into Computapole hand held devices. The inspector electronically documents inspection of the facility in the Computapole hand held unit. Deficiencies that can be captured are summarized in the EOP (Attachment 2). Deficiencies are prioritized to identify how quickly they should be addressed. The priorities include: E – Emergency; A – As soon as practical; B- As directed by Distribution Engineering, C – Items being trended by and reviewed by Distribution Engineering, F – Forestry Issue, I – Inventory items, P – work performed in the field during the inspections.

Results

Progress on the distribution inspection program is measured by miles of distribution circuits inspected. Results are reported through the Computapole database as the circuits are completed. Annual goals will slightly exceed or fall short of 20% of the Distribution system due to the varying lengths of feeders that are inspected during a year. Results of the 2006 program are:
## Total Miles Goal

<table>
<thead>
<tr>
<th>Total Miles Goal</th>
<th>Miles Completed</th>
<th>% Goal Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,093</td>
<td>8,049</td>
<td>113</td>
</tr>
</tbody>
</table>

*Goals established at the start of the inspection year to select circuits based on last inspection date and on requests based on circuit performance.

A summary of deficiencies reported by category is attached. All codes reported have a ‘default’ priority that an inspector is allowed to raise or lower based on their evaluation. Each category has a number of different deficiencies that could be identified but are grouped together for this display.

### Distribution Facilities Deficiencies found

<table>
<thead>
<tr>
<th>Category</th>
<th>Priority E</th>
<th>Priority A</th>
<th>Priority B</th>
<th>Priority C</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchor</td>
<td>61</td>
<td>32</td>
<td>19</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Animal Guard</td>
<td>1</td>
<td>92</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arrester</td>
<td>2</td>
<td>243</td>
<td>235</td>
<td>162</td>
<td>11,612</td>
</tr>
<tr>
<td>Capacitor</td>
<td>38</td>
<td>281</td>
<td>7,433</td>
<td>1,158</td>
<td>602</td>
</tr>
<tr>
<td>Cross arm</td>
<td>61</td>
<td>32</td>
<td>19</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Cutout</td>
<td>1</td>
<td>92</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GIS</td>
<td>5</td>
<td>7,114</td>
<td>420</td>
<td>402</td>
<td></td>
</tr>
<tr>
<td>Ground</td>
<td>4</td>
<td>501</td>
<td>7,720</td>
<td>487</td>
<td>24</td>
</tr>
<tr>
<td>Guy</td>
<td>1</td>
<td>491</td>
<td>17,931</td>
<td>5,631</td>
<td>10,269</td>
</tr>
<tr>
<td>Insulator</td>
<td>102</td>
<td>346</td>
<td>2,846</td>
<td>120</td>
<td>12</td>
</tr>
<tr>
<td>PM Trans</td>
<td>7</td>
<td>169</td>
<td>163</td>
<td>1,944</td>
<td>2,804</td>
</tr>
<tr>
<td>Pole</td>
<td>3</td>
<td>380</td>
<td>27,404</td>
<td>1,8692</td>
<td>32,246</td>
</tr>
<tr>
<td>Primary</td>
<td>14</td>
<td>452</td>
<td>1,355</td>
<td>4,168</td>
<td>3,400</td>
</tr>
<tr>
<td>Recloser</td>
<td>2</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulator</td>
<td>3</td>
<td>198</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riser</td>
<td>5</td>
<td>279</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Row</td>
<td>12</td>
<td>7</td>
<td>1</td>
<td>920</td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>1</td>
<td>84</td>
<td>1,402</td>
<td>82</td>
<td>7,098</td>
</tr>
<tr>
<td>Sectionalizer</td>
<td>7</td>
<td>85</td>
<td>1,065</td>
<td>38</td>
<td>8,297</td>
</tr>
<tr>
<td>Service</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spacer Cable</td>
<td>5</td>
<td>400</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Streetlights</td>
<td>2,837</td>
<td>8,326</td>
<td>246</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Switch</td>
<td>1</td>
<td>2</td>
<td>322</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Switch Gear</td>
<td>3</td>
<td>13</td>
<td>70</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Transformer</td>
<td>278</td>
<td>20,324</td>
<td>809</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
<td>6266</td>
<td>100,019</td>
<td>40,935</td>
<td>77,760</td>
</tr>
</tbody>
</table>

National Grid - 2006 Annual Report
Elevated Voltage Testing and Facilities Inspection
Deficiencies identified as E priority were addressed immediately or made safe and referred for additional follow up. ‘A Priority’ items identified before November 1, 2006 were scheduled to be completed by November 30, 2006.

**Underground**

**Overview**
The underground inspections program was developed to meet the requirements of the Safety Orders to inspect underground facilities over a five year period. The details for the underground inspection procedures and protocols provided in NG-USA EOP UG006, entitled “Underground Inspection and Maintenance,” provided in Attachment 3.

The Underground program consists of patrols conducted by qualified workers that can identify deficiencies or non-standard construction conditions on the facilities.

Underground electrical facilities requiring inspection include all facilities that are used for housing primary and secondary circuits, but not the conduit systems between facilities. For example, two manholes on a street that house primary cable and cable splices would be visually inspected. However, the conduit systems connecting the two manholes and the cable within that conduit will not be inspected. The source database to provide the information of the location of the underground assets is primarily GIS. It is recognized that not all of the underground facilities reside in GIS and therefore underground maps will be used to support this effort.

GPS latitude and longitude coordinates and other basic facility information for each location are downloaded into Computapole hand held devices. The inspector electronically documents inspection of the facility in the Computapole hand held unit. Types of deficiencies captured are summarized in the EOP (Attachment 3). Deficiencies are prioritized to identify how quickly they should be addressed. The priorities include: E – Emergency; A – As soon as practical; B- As directed by Distribution Engineering, C – Items being trended by and reviewed by Distribution Engineering, P – work Performed in the field during the inspections.

**Results**
The underground inspections program is executed and measured in units. A unit inspected could be a manhole, a pad mounted transformer, a hand hole, etc. Each unit is tracked in the Computapole database so the Company can measure the number of inspections and the work identified during the inspections. The listed goals were established in the Company’s February 2005 plan filed in response to the Safety Orders. Note that individual year goals are anticipated to slightly exceed or fall short of 20% of the Underground system. Some areas with limited underground assets may be scheduled

---

6 Pursuant to the Commission’s July Order, fiberglass hand holes are generally excluded from the underground inspection program
for completion in a single year as opposed to 20% per year (e.g., all Genesee region manholes/hand-holes were scheduled for year 5 of the program).

<table>
<thead>
<tr>
<th>Total Unit Goal *</th>
<th>Units Completed</th>
<th>% Goal Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>8,963</td>
<td>14,695</td>
<td>164</td>
</tr>
</tbody>
</table>

* Goals were established in the Feb 2005 submittal outlining National Grid’s plan

A summary of deficiencies reported is attached. All codes reported have a ‘default’ priority that an inspector is allowed to raise or lower based on their evaluation. Each category has a number of different deficiencies that could be identified but are grouped together for this display.

<table>
<thead>
<tr>
<th>Underground Facilities Deficiencies found (by Priority)</th>
<th>Priority E</th>
<th>Priority A</th>
<th>Priority B</th>
<th>Priority C</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anodes</td>
<td>23</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GIS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand holes</td>
<td>5</td>
<td>155</td>
<td>2,957</td>
<td>644</td>
<td>1,213</td>
</tr>
<tr>
<td>Manholes</td>
<td>70</td>
<td>2,088</td>
<td>122</td>
<td>2,508</td>
<td></td>
</tr>
<tr>
<td>Network Protector</td>
<td>9</td>
<td>6</td>
<td>13</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Submersible Equip</td>
<td></td>
<td>3</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switchgear</td>
<td>3</td>
<td>16</td>
<td>94</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>Transformer</td>
<td>12</td>
<td>193</td>
<td>228</td>
<td>3,057</td>
<td>3,941</td>
</tr>
<tr>
<td>Trench</td>
<td>8</td>
<td>27</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaults</td>
<td>1</td>
<td>12</td>
<td>124</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>450</td>
<td>5,449</td>
<td>3,989</td>
<td>7,745</td>
</tr>
</tbody>
</table>

Deficiencies identified as E priority were addressed immediately or made safe and referred for additional follow up by Design. ‘A Priority’ items identified before November 1, 2006 were scheduled to be completed by November 30, 2006.

**Streetlights**

**Overview**

The streetlight inspections program was developed to meet the requirements of the Safety Orders to inspect all streetlights over a five year period. Streetlights mounted on distribution poles are inspected within the distribution inspection program. Therefore this portion of the inspection program only included underground fed lamp standards. The details for the streetlight inspection procedures and protocols are provided in NG-USA EOP G0017, entitled “Streetlight Standard Inspection Program,” provided in Attachment 5.

The Streetlight inspection program consists of daytime patrols conducted by qualified workers that can identify deficiencies or non-standard construction conditions on the
facilities. The patrols are scheduled in such a manner that all streetlights would be examined at least once every five years. Streetlights to be inspected are only those the company owns or maintains. Streetlights owned and maintained by others are not included within this inspection program. Traffic control equipment that is owned and maintained by others is not included in this inspection program.

The source database for this equipment is the Outdoor Lighting Data System (OLDS). An inspection application and handheld were developed specifically for this portion of the Order since none existed previously. The data was provided in an electronic format to the inspectors scheduled to inspect the standards. The majority of standards did not have GPS latitude and longitude coordinates within the source database. The inspector was instructed to select the appropriate light from the hand held and electronically document deficiencies. A summary table of deficiencies is found the EOP (Attachment 5). Deficiencies are prioritized to identify how quickly they should be addressed. The priorities include: E – Emergency; A – As soon as practical; B- As directed by Distribution Engineering, C – Items being trended by and reviewed, P – work Performed in the field during the inspections.

**Results**

The streetlight inspection program is executed and measured in units. A unit inspected is equivalent to an underground fed streetlight. The streetlight inspections include underground fed streetlights owned or maintained by the Company. These lights may include fiberglass light standards (whereas the EV testing program does not include non-conductive fiberglass standards). Each unit is tracked in the Computapole database so the Company can measure the number of inspections and the work identified during the inspections.

<table>
<thead>
<tr>
<th>Total Unit Goal *</th>
<th>Units Completed</th>
<th>% of Goal Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>4,840</td>
<td>-</td>
</tr>
</tbody>
</table>

*Goals were established in the Feb 2005 submittal outlining National Grid’s plan, however since the inspections during the first year far exceeded the 20%, no inspections were planned for 2006.

A summary of deficiencies reported is attached. All codes reported have a ‘default’ priority that an inspector is allowed to raise or lower based on their evaluation. Each category has a number of different deficiencies that could be identified but are grouped together for this display.

| Streetlight Facilities Deficiencies found (by Priority) |
|-----------------------------------------------|---|---|---|---|
| Deficiency    | Priority E | Priority A | Priority B | Priority C / Other |
| Arm            |             |             |             | 15 |
| Foundation     |             |             | 4           | 3  |
| Luminaire      |             | 7           | 118         | 2,621 |
| Standard       | 1           | 35          | 147         | 2,782 |
| Total          | 1           | 42          | 269         | 5,421 |
Transmission

Overview

The Transmission overhead inspections program was developed to meet the requirements of the Safety Orders to inspect all transmission facilities over a five year period. The details for overhead inspection procedures and protocols for distribution overhead facilities are provided in NG-USA EOP T007, entitled “Transmission Line patrol 23kv-345kv” provided in Attachment 4.

The Transmission line patrol program consists of patrols conducted by qualified workers that can identify deficiencies or non-standard construction conditions on the facilities. The patrols are scheduled in such a manner that each line and associated equipment would be examined at least once every five years.

Transmission electrical facilities requiring inspection include the Company’s facilities on overhead structures. The database of this equipment is included in Corridor Manager for Transmission assets and in a separate database for the sub-transmission assets. The asset location data is provided in electronic format to the inspector going to the site. The inspectors also utilize hardcopy maps to assist during field work. GPS latitude and longitude coordinates and other basic facility information for each structure are downloaded into Computapole hand held devices. The inspector electronically documents inspection of the facility in the Computapole hand held unit. Deficiencies that can be captured are summarized in the EOP (Attachment 4). Deficiencies are prioritized to identify how quickly they should be addressed. The priorities include: E – Emergency; A – As soon as practical; B- As directed by Distribution Engineering, C – Items being trended by and reviewed by Distribution Engineering, F – Forestry Issue.

Results

The transmission inspection program is executed and measured by miles of transmission inspected. Transmission for the purpose of this report includes voltages of 23 kV and above. These results are reported through the Computapole database as line inspections are completed.

<table>
<thead>
<tr>
<th>Total Miles Goal*</th>
<th>Miles Completed</th>
<th>% of Goal Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,814</td>
<td>1,998</td>
<td>110</td>
</tr>
</tbody>
</table>

* Goals established at the start of the inspection year to select circuits based on last inspection date and on requests based on circuit performance

A summary of deficiencies reported is attached. All codes reported have a ‘default’ priority that an inspector is allowed to raise or lower based on their evaluation. Each category has a number of different deficiencies that could be identified but are grouped together for this display.
### Transmission Facilities Deficiencies found (by Priority)

<table>
<thead>
<tr>
<th>Deficiency</th>
<th>Priority E</th>
<th>Priority A</th>
<th>Priority B</th>
<th>Priority C</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole</td>
<td>32</td>
<td>4923</td>
<td>750</td>
<td>513</td>
<td></td>
</tr>
<tr>
<td>Tower</td>
<td>1</td>
<td>105</td>
<td>191</td>
<td>705</td>
<td></td>
</tr>
<tr>
<td>Conductor</td>
<td>104</td>
<td>130</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line HDW</td>
<td>6</td>
<td>974</td>
<td>89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foundation</td>
<td></td>
<td></td>
<td>36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROW</td>
<td>1</td>
<td>5</td>
<td>12</td>
<td>1274</td>
<td></td>
</tr>
<tr>
<td>Misc</td>
<td>89</td>
<td>2201</td>
<td>1836</td>
<td>1928</td>
<td></td>
</tr>
<tr>
<td>GIS</td>
<td></td>
<td></td>
<td></td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Osmose</td>
<td>64</td>
<td>6</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>233</td>
<td>8,438</td>
<td>2,942</td>
<td>4,421</td>
<td></td>
</tr>
</tbody>
</table>

Deficiencies identified as E priority were addressed immediately or made safe and referred for additional follow up by Design. ‘A Priority’ items identified before November 1, 2006 were scheduled to be completed by November 30, 2006.

### Substations

#### Overview

The Company conducted a Substation inspection program prior to the Safety Orders. Substations are inspected throughout each calendar year. The details for the Substation inspection procedures and protocols are provided in NG-USA EOP 400.06.1, entitled “Substation V&O Inspection Standard” and NG-USA EOP 400.06.2 entitled “Substation V&O Inspection Procedure”, copies of which are provided in Attachment 6.

Substation inspections are more complex than other facility inspections. The information generated from an inspection is captured in the Asset Information Maintenance Management System (AIMMS). Work orders are created and supervisory review determines what is to be done to correct the work generated. Inspection schedules vary based on the type of substation, the criticality of the station, or the type of equipment contained within the substation. Inspection schedules may vary with the time of year or condition of the system. Substations are generally inspected on a two month schedule. Inspections included in this report only included information related to the security of the substation. Items related to the fence condition, the yard condition, lighting, vegetation were included.

#### Results

For the calendar year 2006, 100% of substations were visited for inspections. The majority of substations are visited more frequently; however, for the purpose of this program and reporting the Company will only utilize a single inspection per substation. Work orders created, completed or pending are prioritized in a different method than the other programs reported. The data provided for the inspections shows:
Deficiencies that were reported during the selections of inspections were divided into several categories. These included issues with vegetation, fences, lighting and other.

<table>
<thead>
<tr>
<th>Deficiency</th>
<th>Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fence</td>
<td>16</td>
</tr>
<tr>
<td>Vegetation</td>
<td>13</td>
</tr>
<tr>
<td>Lighting</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>42</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Substations</th>
<th>Inspections Completed</th>
<th>% of Goal Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>856</td>
<td>856</td>
<td>100</td>
</tr>
</tbody>
</table>

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Elevated Voltage Testing and Facilities Inspection
Performance Mechanisms

Performance mechanisms outlined in the Safety Orders established that the Commission:

“needs to establish metrics against which [the Commission] will measure and determine the utilities’ performance and compliance.” January Order, p.34.

As outlined in the results section of this report, the Safety Orders require the utilities to perform voltage testing on 100% of publicly accessible streetlights and traffic controls, 100% of publicly accessible conventional underground and priority URD, and approximately half of the overall electric system in total by November 30, 2005. The remainder of the system was to be tested for elevated voltage by August 31, 2006. The second cycle of streetlight testing and underground testing was to be completed by November 30, 2006.

| Elevated Voltage Testing Cycle 1 Due August 31, 2006 |
|---------------------------------|-------------|-------------|
| Facilities                      | Total Units | Units Completed | % Completed |
| Distribution                    | 1,205,991   | 1,205,991    | 100         |
| Underground                     | 109,793     | 109,783      | 100         |
| Streetlights*                   | 79,866      | 79,866       | 100         |
| Transmission                    | 111,068     | 111,068      | 100         |
| Substation                      | 866         | 866          | 100         |

*Note that streetlights include traffic controls but excludes fiberglass standards

<table>
<thead>
<tr>
<th>Elevated Voltage Testing Cycle 2 Due November 30, 2006 **</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilities</td>
</tr>
<tr>
<td>Underground</td>
</tr>
<tr>
<td>Streetlights*</td>
</tr>
</tbody>
</table>

*Note that streetlights include traffic controls but excludes fiberglass standards
** Cycle 2 Elevated Voltage Testing for Distribution / Transmission and Substations is due by November 30, 2007

As noted in the attached certification, National Grid has implemented the EV testing program to comply with the requirements of the Safety Orders.

The Safety Orders recognized the challenges faced by the utilities in setting up the inspection programs.

“The inspection program is more intensive than the testing program, and the utilities’ contention that they need time to integrate it into their routine maintenance activities is reasonable. Therefore, we will phase-in the performance targets for annual inspections. Doing so, however, does not change the requirement that all facilities be inspected at least once every five years. Starting with this overall requirement, the utilities should inspect at least one-fifth of their facilities each year. We therefore base the performance targets on a percentage of the average number of facilities that must be inspected each year. The specific
targets for purposes of the performance mechanism will be 85%, 90%, and 95% of the one-fifth amount for calendar years 2005, 2006, and 2007, respectively. Each year thereafter, the performance target will be 95%, except that in every fifth year, each utility must ensure that it has inspected all of its facilities.” January Order, pp. 34-35

As outlined in the results section of this report, National Grid’s inspection programs contemplated annual inspections on 20% of distribution, 20% of underground, 20% of streetlights, 20% of transmission and 100% of substations. It should be noted that inspections performed by circuit will generally push the annual inspection rate slightly higher or lower than 20% due to the varying lengths of circuits. When schedules are established the 20% range is used as a guide, however 100% must be patrolled over the 5 year period. The PSC Order called for utilities to meet a minimum of 85% of the 20% goal in year one and 90% of the 20% goal in year two. This equates to 17% and 18% of the system respectively. In conversations with Staff, it was determined that measurements of meeting the established goal would be in total and not by individual program.

Also of note, is that the Streetlight Units for inspections is different than streetlight units for EV testing. Streetlight inspections do not include traffic controls or non company owned units, but they do include fiberglass standards (which were excluded from the EV testing program).

<table>
<thead>
<tr>
<th>Facilities</th>
<th>Units / Miles Goal</th>
<th>Units / Miles Completed</th>
<th>% of Goal Completed</th>
<th>% of System Completed</th>
<th>% YR 2 PSC Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution*</td>
<td>7,093</td>
<td>8,049 (mi)</td>
<td>103</td>
<td>22.0</td>
<td>18.0</td>
</tr>
<tr>
<td>Underground</td>
<td>8963</td>
<td>14,695</td>
<td>169</td>
<td>59.0</td>
<td>18.0</td>
</tr>
<tr>
<td>Streetlights**</td>
<td>0</td>
<td>4,840</td>
<td>-</td>
<td>8.0</td>
<td>18.0</td>
</tr>
<tr>
<td>Transmission*</td>
<td>1,998 (mi)</td>
<td>100</td>
<td>23.0</td>
<td>18.0</td>
<td></td>
</tr>
<tr>
<td>Substation</td>
<td>856</td>
<td>856</td>
<td>100</td>
<td>100</td>
<td>18.0</td>
</tr>
</tbody>
</table>

*Transmission and Distribution facilities are reported in Miles. All other facilities are measured in units.

**Note that Streetlights excludes traffic controls, exclude municipally owned/maintained standards, but includes fiberglass standards.

The cumulative total for the inspection program to date are:

<table>
<thead>
<tr>
<th>Program</th>
<th>Units / Miles Completed</th>
<th>% of System Completed</th>
<th>PSC Goal %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution</td>
<td>16,198 (mi)</td>
<td>45</td>
<td>35</td>
</tr>
<tr>
<td>Underground</td>
<td>24,030</td>
<td>51</td>
<td>35</td>
</tr>
<tr>
<td>Streetlights</td>
<td>33,441</td>
<td>53</td>
<td>35</td>
</tr>
<tr>
<td>Transmission</td>
<td>4,251 (mi)</td>
<td>48</td>
<td>35</td>
</tr>
<tr>
<td>Substation</td>
<td>856</td>
<td>100</td>
<td>35</td>
</tr>
</tbody>
</table>
Certification

In order to comply with the certification requirements of the Safety Orders, National Grid is submitting certification documents for both the Elevated Voltage Testing program and the Facility Inspection program. The signed certification documents are attached hereto as Attachment 9. The process of certification requires a ‘Chain of Command’ sign off. This process requires that the Supervisors of the Maintenance Inspection and Assessment group sign a certification that the inspection and the elevated voltage testing programs were performed in accordance with the prescribed procedures. The Manager for the Maintenance Inspection and Assessment group then is required to sign off on the final report. This process of upward cascading signatures is to provide assurance to the Senior Vice President of Distribution Network Services that the program was properly implemented and the results are accurate. Only the final certification documents are provided in this annual report.
Analysis

This section includes information related to EV causes and modifications to the EV programs as the Company moves forward.

Distribution Testing

The volume of EV issues greater than 4.5 volts found during distribution testing is considered extremely small. The majority of items were either related to ground connections or to procedural issues. Certain procedural issues caused National Grid to react to locations reported to have EV during early testing, where it was subsequently determined that no voltage existed. These procedural issues have been addressed through training and reinforcement with the contractors and employees.

Proactively finding the EV conditions related to ground connections should, in part, be achieved as inspectors visually evaluate pole conditions. The inspectors visit 20% of facilities each year and currently look to identify broken or deteriorated ground conditions. To the extent the existing inspections programs have been identifying issues and additional work items, the programs have already helped to keep the number of EV conditions on distribution small.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Work Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Arrester</td>
</tr>
<tr>
<td>1</td>
<td>Cable Feed</td>
</tr>
<tr>
<td>9</td>
<td>Down Ground</td>
</tr>
<tr>
<td>11</td>
<td>Equipment Other</td>
</tr>
<tr>
<td>10</td>
<td>Ground Connection</td>
</tr>
<tr>
<td>2</td>
<td>Guy</td>
</tr>
<tr>
<td>1</td>
<td>Induced</td>
</tr>
<tr>
<td>2</td>
<td>Insulator</td>
</tr>
<tr>
<td>1</td>
<td>Neutral</td>
</tr>
<tr>
<td>5</td>
<td>None Required</td>
</tr>
<tr>
<td>12</td>
<td>Procedure</td>
</tr>
<tr>
<td>1</td>
<td>Remade Connections</td>
</tr>
<tr>
<td>2</td>
<td>Service Wire</td>
</tr>
<tr>
<td>7</td>
<td>Customer Problem</td>
</tr>
<tr>
<td>65</td>
<td>Total</td>
</tr>
</tbody>
</table>

Streetlight Testing

The majority of the EV conditions identified on streetlights were related to poor connections, missing grounds and deficiencies in the cable and luminaries. Although the incident of elevated voltage significantly dropped from cycle 1 to cycle 2 testing, street lighting still remains a target for the most potential to cause an elevated voltage condition.
Of the streetlight locations identified with elevated voltage conditions during cycle 2, the poor neutral and ground connections dominated the causes.

**Underground, Transmission and Substation Testing**

There were no issues to review related to EV testing for underground facilities, transmission facilities or substation fences.

It is recommended that the transmission system be removed from the elevated voltage testing program. There were no issues proactively identified on transmission and due to the extreme difficulty in accessing many of the locations, there is no benefit to the public in performing an annual test on these assets. The Company is pursuing a firm to prepare a technical report that will substantiate why transmission is unlikely to lead to elevated voltage conditions. It is expected that this report will be used to further support changes to the ‘Safety Orders’.

While there were no issues identified on substation fences, the contractor performing elevated voltage testing on distribution poles has to visit each substation as a starting point for the distribution feeders.

The underground system did not identify any elevated voltage conditions during the cycle 2 testing. The testing of these assets could be more efficient and better focused if the requirement was limited to the urban areas and specifically to the secondary hand holes (street lights and building services). This change coupled with a mobile testing program, would enhance the elevated voltage program.
Database improvements

The database for the EV testing program was developed quickly to respond to the original Safety Orders. Once testing started and data was submitted, the Company began to understand where additional fields and validations could be established to improve the database. The database design was relatively static during the first cycle of testing. Changes initiated over 2006 included the standardization of causes for EV conditions, standardized reports for management and Staff, reports and queries to assist supervision in monitoring open elevated voltage orders, addition of audit codes to tie elevated voltage cases to the follow up audit by supervisors, retain history to compare results of an asset test between cycles, and data base enhancements to allow other National Grid service territories to store elevated voltage testing results.
Other Pertinent Information
This section contains information that relates to the Elevated Voltage Testing program or
the Inspection program for National Grid. Topics included are updates to the procedures
originally filed with the Commission in February 2005 and updated with the January
2006 Annual report, updates to the QA program implemented, a summary of shock calls
received by the Company for the period of January 2006 through December 2006, and
R&D activities during 2006.

Procedure Updates
These procedures were reviewed for updates after the January 2006 annual report
submittal to the Commission. Updates were necessary in order to provide a National
Grid USA procedure including New York and New England.

<table>
<thead>
<tr>
<th>Procedure Number</th>
<th>Procedure Description</th>
<th>Date of Rev</th>
</tr>
</thead>
<tbody>
<tr>
<td>NG USA EOP-D004</td>
<td>Distribution Line Patrol and Maintenance</td>
<td>05/01/06</td>
</tr>
<tr>
<td>NG USA EOP-UG006</td>
<td>Underground Inspections and Maintenance</td>
<td>08/01/06</td>
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<tr>
<td>NG USA EOP-G017</td>
<td>Street Light Inspections</td>
<td>04/01/06</td>
</tr>
<tr>
<td>NG USA EOP-G016</td>
<td>Elevated Equipment Voltage Testing</td>
<td>05/01/06</td>
</tr>
<tr>
<td>NG USA EOP T007</td>
<td>Transmission line patrol 23kv-345kv</td>
<td>04/01/06</td>
</tr>
<tr>
<td>NG USA EOP 400.06.1</td>
<td>Substation V&amp;O Inspections</td>
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</tr>
<tr>
<td>NG USA EOP 400.06.2</td>
<td>Substation V&amp;O Inspections</td>
<td>09/14/06</td>
</tr>
</tbody>
</table>

Revised procedures are included with this filing as Attachments 1 through 6.

The most significant changes were associated with NG USA EOP-G016 Elevated
Equipment Voltage Testing. The EOP has been revised by separating Massachusetts from
the additional New England states. Section III is the new Massachusetts requirements.
Section VIII also notes annual reporting requirements in Massachusetts.

NG USA EOP-D004
“B” work completion date changed to March 31st of that fiscal year.
Feeder hardening and the Distribution Inspection program have been consolidated into a
single inspection.

NG USA EOP-T007
“B” work completion date changed to March 31st of that fiscal year.

NG USA EOP- UG006
Section 3 Massachusetts revised.
Quality Assurance

Overview

Quality Assurance programs have been developed to assure the integrity of the data developed during inspection and testing. It is the accuracy, thoroughness and integrity of the data that is sought; not what the data convey. The data characterize the condition of the assets. Having confidence in the data provides assurance that the actual condition of the assets (as provided by the data) is accurately known.

Statistical principles attest to the fact that the accuracy and thoroughness of inspections and tests (i.e., the “population”) can be estimated by assessing the accuracy/thoroughness of a limited, randomly chosen subset (i.e., “sample”) of such inspections/tests.

The Company implemented a Quality Assurance program that is typically used in manufacturing to assess the quality of continuous product streams. This “model” fits well with the EV Test and Inspection initiatives which are generally year-round efforts.

The program, referred to as “Statistical Process Control” (SPC) simply consists of:

- choosing and assessing samples from among the stream of products (inspection/test data) as such products are completed;
- plotting the level of quality on a time-line graph; and
- analyzing the graph:
  - comparing the level of quality of the samples against the minimum threshold sought
  - examining trends that may be symptomatic of impeding quality degradation; and
  - performing in-depth diagnosis, if warranted, to isolate potential root-causes of degradation to identify/implement corrective actions to defeat such causes. This approach foster early intervention and correction prior to the development or significant accumulation of unacceptable data.
SPC’s development, adjustments and modifications for use in EV Testing and Inspections evolved in parallel with the execution of the 2005 programs, was used more efficiently in 2006 due to training and growing familiarity of the Auditors to the process.

Assets are widely dispersed geographically and a randomly chosen sub-set of such assets would generally be widely dispersed requiring significant travel time to audit. Initially, to help counter this, double the number of random choices required was collected (ie: “group”) and Auditors allowed to deliberately choose half the “group” for audit based on their close proximity to one-another. However, to foster true randomness and, thus, the integrity of the random sampling process, this practice was discontinued.

Many other opportunities exist to optimize the processes; to simplify the logistics:

- Some opportunities exist in software applications; limiting the platforms used and making data processing, consolidation and summary more automated and seamless.

- Reducing Auditor’s preparation time, currently consisting of:
  - determining sampled assets’ precise locations
  - making maps of respective areas at the appropriate scale (in sufficient numbers) to ensure obvious landmarks are identifiable
  - determining routes to respective assets
  - “self-navigate” through such routes by continuously referring to paper-maps and land-marks as they’re driving

It is anticipated that the analyst, having randomly chosen assets, could:

- construct respective optimal travel routes
- create electronic files of such routes and email such routes to the Auditors

Auditors’ efforts would then be reduced to downloading the routes into their Navigation/GPS unit and following the directions enunciated by such unit.

Taken together, derived efficiencies in data-processing and Auditors’ planning/preparation effort will enable an increase in the number of Audits performed and foster the pursuit of other activities.

Results

Quality Assurance statistics for Elevated Voltage Testing and Asset Inspections are treated separately being that the EV effort has generated a considerable amount of data and the respective compliance rating is very high at 99.1%. Confidence in the EV Testing initiative is, therefore, high and suggests the re-allocation of some audit resources to initiatives having nominal or unconfirmed QA-confidences.
Elevated Voltage Testing:
Two hundred, eighteen (218) audits were conducted (ie: tests repeated) and the level of compliance was conservatively calculated as 99.1%.

Asset Inspections:
Seven hundred, ninety four (794) Inspection audits were conducted:
- 84% on Distribution
- 11% on Underground
- 5% on Transmission

With the exception of Distribution, audits have yielded favorable compliance ratings. For Distribution Inspections, compliance rating for Critical Codes is 94.5% and 74% considering all Codes.

Merging Distribution, Underground and Transmission inspection audit results together, there was:
- 95.0% Compliance considering only Critical Maintenance Codes
- 76.3% Compliance considering all Maintenance Codes

The following SPC-Compliance charts echo these statistics:

![SPC Chart - Critical](image1)

![SPC Chart - All](image2)
With Distribution Inspections representing the majority of the inspection work and having the lowest Compliance rating, those Maintenance Codes that were missed by Inspectors/identified by Auditors is tracked; as is their frequency.

It is anticipated that, as dialog continues between Inspectors/Auditors and the applicability of Maintenance Codes, Inspections will continue to improve in consistency.
Summary of Electric Shocks

Staff requested that a summary of Electric Shock Reports for the calendar year be included in the annual report. This information has been provided to staff on a monthly basis beginning in March 2006 (Attachment 7C).

Reported shock orders are qualified when a call comes to the Call Center. Once the order type is selected, an order is created and dispatched, based on the day or time, to the appropriate center for response. Once the order is worked, the System Operational Dispatch center is notified for status and follow up to the Commission Staff. Cases are faxed / emailed to the Staff within 24 hours of their occurrence.

The following is a summary of the Electric Shock Reports, received/handled by System Operations Dispatch and reported to the Commission during 2006.

Total shock calls received during 2006 was 242 orders. The following is a break down of orders received:

- Voltage Found: 133
- Unsubstantiated: 63
- Employee Contact: 1
- Non-Employee Contact: 45

For incidents where medical attention was sought:
- Employee: 1
- Non-Employee: 17
- Domestic Animal: 1

A break down of ownership of the 133 Voltage Found:
- National Grid: 34
- Customer Owned: 99
Research and Development

During 2005 and 2006, the Company researched various products currently available or under development to determine if there would be value for the Elevated Voltage Testing program or for the Facility Inspection programs. The following provides a synopsis of these efforts.

Sarnoff SVD 2000

During July 2005, the Company contacted Sarnoff for a demonstration of the SVD 2000. Sarnoff developed equipment to scan for EV conditions from a moving vehicle. In November 2005 a National Grid representative visited the Sarnoff plant for a demonstration of the device and review of the improvements that had been implemented. Sarnoff then provided a presentation and demonstration of the SVD2000 at our Millbury Training Center on September 7, 2006.

The vehicle was provided for National Grid to evaluate for 10 days using National Grid employees to drive the vehicle and interpret the data received. The SVD2000 was tested in four Divisions in New England and the Eastern Division in New York. We selected areas that were predominantly underground electrical circuit construction such as downtown urban areas or newer residential areas. Overhead primary lines create interference that the casual user could not differentiate from real elevated voltage conditions.

During our evaluation with the SVD2000, we tested approximately 10,000 metallic facilities in a five day period. Nine instances of elevated voltage on company owned equipment and one instance of elevated voltage on customer owned equipment were identified.

The Sarnoff SVD2000 product allows a large area to be scanned for stray voltage in a short amount of time. The equipment could not be used in areas with overhead primary lines, overhead transmission lines or near substations. The equipment was successful in locating problems in areas where the electric system is predominantly underground construction.

During December, we hired Sarnoff to test areas of the Western Division to evaluate the potential for use on locating elevated voltage conditions where the electric system is overhead construction but is located behind the housing (back lot construction). It was thought that this type of construction might provide enough distance from the test equipment to diminish the interference caused by the overhead circuits. By using the highly trained Sarnoff employees to monitor the test equipment, we were able to successfully use the equipment. The device could not be used to find elevated voltage conditions on metallic equipment directly on wood distribution poles, however, we believe it could be used to successfully replace manual testing of underground fed streetlights, manholes / hand holes, etc where overhead construction is in the back lot.
American Electric Lighting
American Electric Lighting is offering a new photo eye control ROAM. Although not yet fully developed, this photo-control could possibly detect stray voltage in the light fixture and transmit the reading back to the utility. American Electric Lighting is working to enhance the system to also detect stray voltage in the poles that the fixtures are mounted on. We will investigate a pilot project once the enhanced system is complete.

University outreach
Technology Transfer group met with the University at Buffalo to discuss potential projects to consider for R&D initiatives. The university is currently reviewing the initiatives and will develop a more complete proposal.
Attachment Summary

Attachment 1 - NG USA EOP–G0016 Elevated Equipment Voltage Testing

Attachment 2 - NG USA EOP-D004 Distribution Line Patrol and Maintenance

Attachment 3 - NG USA EOP-UG 06 Underground Inspection and Maintenance

Attachment 4 - NG USA EOP-T007 Transmission Line Patrol and Maintenance 23kV – 345kV

Attachment 5 - NG USA EOP-G017 Street Light Standard Inspection Program

Attachment 6 - NG USA EOP-400.06.1 Substation V&O Inspection Standard and EOP-400.06.2 Substation Inspection Procedure

Attachment 7 - Monthly Reporting to PSC Staff

7A – Cycle One Elevated Voltage Testing for All Assets due August 31, 2006
7B – Cycle Two Elevated Voltage Testing for Streetlights / Traffic Controls and Underground due November 30, 2006
7C – Reported Shocks for Calendar Year 2006
7D – Visual Inspection Summary for A and E Priorities

Attachment 8 – Quality Assurance Program

Attachment 9 - Certifications
SUBJECT: Elevated Equipment Voltage Testing

REFERENCE:

NYPSC Order 04-M-0159
Applicable National Grid Safety Rules & Procedures
Testing Equipment Operation Instructions

GENERAL INFORMATION:

The purpose of this procedure is to outline the requirements for the annual elevated equipment voltage testing on National Grid Facilities in New York as required by the New York Public Service Commission’s “Electric Safety Standards” issued on January 5, 2005. Additionally the Massachusetts Department of Telecommunications and Energy provided a series of recommendations on December 9, 2005 that have been included in this procedure.

This procedure also outlines corporate requirements for elevated equipment voltage testing in New Hampshire and Rhode Island. The variance in requirements between New York, Massachusetts, New Hampshire, and Rhode Island is based on sound utility practice versus regulatory requirements.

PROGRAM ADMINISTRATOR:

Distribution Engineering Services

APPLICABILITY

This procedure applies to all personnel involved with or responsible for the testing of facilities designated by this EOP for elevated equipment voltage.

SCOPE:

I. Facilities Where Elevated Equipment Voltage Testing/Documentation is Required – New York
   A. Street Lights and Municipally Owned Facilities
   B. Substation Fences
   C. Overhead Distribution Facilities
   D. Overhead Transmission Facilities
   E. Underground Facilities
   F. Daily Work Areas
   G. Exemptions

II. Facilities Where Elevated Equipment Voltage Testing/Documentation is Required – New Hampshire and Rhode Island
   A. Street Lights
   B. Overhead Distribution Facilities
   C. Underground Facilities
   D. Daily Work Areas
   E. Exemptions

Supersedes Document Dated: 07/25/05
Authorized By: Director-Distribution Engrg. Services
Approved By: VP - Engineering Services
III. Facilities Where Elevated Equipment Voltage Testing/Documentation is Required – Massachusetts
   A. Street Lights
   B. Overhead Distribution Facilities
   C. Underground Facilities
   D. Daily Work Areas
   E. Exemptions

IV. Test Equipment
V. Test Procedure
VI. Corrective Action Requirements
VII. Database Requirements
VIII. Annual Reporting and Certification Requirements
IX. Responsibility
X. Definitions
XI. Training

I. FACILITIES WHERE ELEVATED EQUIPMENT VOLTAGE TESTING/DOCUMENTATION IS REQUIRED – NEW YORK

A. Street Lights and Municipally Owned Facilities
   1. Company owned metallic street lighting standards are required to be tested for elevated equipment
      voltage annually. This test is to be performed while the light is operating.
   2. Municipally owned street light systems that National Grid directly provides energy to must be
      tested for elevated equipment voltage annually. National Grid will complete this testing unless
      assurances of the completion of required testing and transfer of such test data are made by the
      appropriate municipality. This test is to be performed while the light is operating.
   3. Municipal owned metallic traffic signal standards and accessible devices are to be tested annually
      for elevated equipment voltage by National Grid.
   4. All street lights identified on public thoroughfares regardless of ownership are to be tested
      annually.
   5. All street lights under a maintenance contract are to be tested annually.
   6. Exceptions not requiring elevated equipment voltage testing: private lighting, park associations,
      parking lots, fiberglass (or other non-conductive) street light standards, and locations where street
      light standards are not publicly accessible, such as facilities located in the center of highways that
      cannot be accessed without stopping traffic or creating potentially hazardous situations for the
      worker and/or public.

B. National Grid Substation Fences
   1. Metallic fencing surrounding substations with National Grid Facilities shall be tested for elevated
      equipment voltage annually. This fencing can be customer owned for customer stations, if a
      National Grid facility is part of the station.

C. Overhead Distribution Facilities
   1. Towers and/or metallic poles with distribution facilities shall be tested annually for elevated
      equipment voltage.
   2. The following equipment on wood distribution poles requires annual elevated equipment voltage
      testing:
      a. Metallic riser guard or conduit (company or non-company).
      b. Uncovered or uninsulated down ground (company or non-company).
      c. Down guy (company or non-company).
      d. Any other publicly accessible conductive piece of equipment (company or non-
         company) on the pole within reach from the ground.
3. Exceptions: Customer meters and customer meter poles are excluded.

D. Overhead Transmission Facilities
   1. Towers and/or metallic poles with transmission facilities shall be tested annually for elevated equipment voltage.
   2. The following equipment on wood transmission poles or structures require annual elevated equipment voltage testing:
      a. Metallic riser guard or conduit (company or non-company).
      b. Uncovered or uninsulated down ground (company or non-company).
      c. Down guy (company or non-company).
      d. Any other publicly accessible conductive piece of equipment (company or non-company) on the pole or structure within reach from the ground.

E. Underground Facilities
   1. Annual elevated equipment voltage testing is required on all of the following equipment where accessible to the public.
      a. All metallic manhole covers, vault covers and grates, junction box covers, handhole covers, pad mount transformers, and switchgear.
   2. Exceptions: Non-metallic concrete or fiberglass pads or handholes are not required to be tested.

F. Daily Job Site Test Requirements
   1. Each job site where National Grid personnel or its contractors complete a work assignment shall be tested for elevated equipment voltage at the end of the work day or the completion of the assignment. This testing requirement is considered good utility practice and does not require specific documentation.
   2. Exceptions:
      a. Substation fencing will not require elevated equipment voltage testing unless scheduled as part of the inspection program or if work was done on the fencing.
      b. In a storm situation, where mutual aid is required, testing by other than National Grid personnel will not be required.

G. Exemptions
   1. A completely fenced in area where access is denied to the general public and where access is only achieved by climbing a fence. Good judgment is required by the tester in these scenarios.

II. FACILITIES WHERE ELEVATED EQUIPMENT VOLTAGE TESTING/DOCUMENTATION IS REQUIRED – NEW HAMPSHIRE AND RHODE ISLAND

A. Company Owned Street Lights
   1. Testing will be performed during each outage investigation notification and the data will be recorded for each instance.

B. Overhead Distribution Facilities
   1. Wood distribution poles require testing to be completed on metallic risers in conjunction with the distribution patrol program covered by NG-USA EOP D004.
   2. Documentation is only required on metallic risers found to be at an elevated voltage requiring repair. Testing data is not required for a facility that is found to be operating as designed.

C. Underground Facilities
   1. Testing for elevated equipment voltage shall be done while completing scheduled inspections of underground equipment covered by NG-USA EOP UG006, Underground Inspection and
Maintenance. The following items are to be tested on a five year cycle, padmount transformers, switchgears, and metallic handhole covers.

2. Testing for elevated equipment voltage shall be completed on underground facilities while completing working inspections covered by NG-USA EOP UG006. The metallic items to be tested are manholes covers, vault covers, handhole covers, splice box covers, junction box covers, padmount transformers, switchgear, and submersible equipment covers.

D. Daily Job Site Test Requirements
   1. Each job site where National Grid personnel or its contractors complete a work assignment shall be tested for elevated equipment voltage at the end of the work day or the completion of the assignment. **This testing requirement is considered good utility practice and does not require specific documentation.**
      a. In a storm situation, where mutual aid is required, testing by other than National Grid personnel will not be required.

F. Exemptions
   1. A completely fenced in area where access is denied to the general public and where access is only achieved by climbing a fence. Good judgment is required by the tester in these scenarios.

III. FACILITIES WHERE ELEVATED EQUIPMENT VOLTAGE TESTING/DOCUMENTATION IS REQUIRED – MASSACHUSETTS

A. Company Owned Street Lights
   1. Company owned metallic street lighting standards are required to be tested for elevated equipment voltage on a five year cycle.
   2. Exceptions: Testing shall not be completed at locations where street light standards are not publicly accessible, such as facilities located in the center of highways that cannot be accessed without stopping traffic or creating potentially hazardous situations for the worker and/or public.

B. Overhead Distribution Facilities
   1. Wood distribution poles require testing to be completed as noted below in conjunction with the distribution patrol program covered by NG-USA EOP D004.
   2. The following equipment on wood distribution poles requires annual elevated equipment voltage testing:
      a. Metallic riser guard or conduit (company or non-company).
      b. Uncovered or uninsulated down ground (company or non-company).
      c. Down guy (company or non-company).
      d. Any other publicly accessible conductive piece of equipment (company or non-company) on the pole within reach from the ground.

C. Underground Facilities
   1. Elevated equipment voltage testing is required on all of the following equipment where accessible to the public on a five year cycle.
      a. All metallic manhole covers, vault covers and grates, junction box covers, handhole covers, pad mount transformers, secondary pedestals, and switchgear.
   2. Exceptions: Non-metallic concrete or fiberglass pads or handholes are not required to be tested.

D. Daily Job Site Test Requirements
   1. Each job site where National Grid personnel or its contractors complete a work assignment shall be tested for elevated equipment voltage at the end of the work day or the completion of the assignment. **This testing requirement is considered good utility practice and does not require specific documentation.**
a. In a storm situation, where mutual aid is required, testing by other than National Grid personnel will not be required.

F. Exemptions
1. A completely fenced in area where access is denied to the general public and where access is only achieved by climbing a fence. Good judgment is required by the tester in these scenarios.

IV. TEST EQUIPMENT
A. A hand held device (proximity detection unit) that is capable of detecting voltage from 8 volts to 600 volts.
B. A portable AC digital high impedance volt meter must have the ability to take readings with and without an input load impedance of 500 ohms.
C. The handheld devices utilized must be certified to indicate a minimum of 8 volts and be capable of withstanding a maximum of 1000 volts by an independent laboratory. The portable AC digital volt meter must be capable of measuring a minimum of 0.1 volt and a maximum of 1000 volts, the following units has been certified:
   1. HD Electric model LV-S-5 (5-600 volts).
   2. Fluke 85
   3. Fluke 87
   4. Fluke 170 series or equivalent
   5. Fluke 175
   6. Fluke 177
   7. Fluke 179
   8. Fluke 187
   9. Fluke 189

V. TEST PROCEDURE
A. Job Briefing
   1. At minimum, the following information must be communicated to all personnel at the beginning of each shift for elevated equipment voltage testing:
      a. Structures are never to be touched with a bare hand while performing the tests, only the voltage detector or meter probe is to be used to make contact with the facilities.
      b. Appropriate PPE must be worn.
      c. Each individual needs to be aware of his/her surroundings at all times.
      d. Make sure to observe all traffic before entering a street, either at intersections or any other point.
      e. Traffic safety vest (DOT Compliant Class II) is to be worn at all times when exposed to traffic. Be aware that when bending down, the visibility benefits of the traffic safety vest are diminished.
      f. Obey all traffic control devices.
      g. When working in the street, face oncoming traffic whenever possible.

B. Measurements for voltages will be performed in accordance with the following:
   1. Initial measurements for the presence of voltage shall be made using a certified proximity detection unit as noted in the testing equipment certified equipment list in Section IV C.
      a. To verify the proper operation of the proximity detector, follow operating instructions for the particular certified unit being utilized, this is to be done daily.
b. After verification that the detection unit is working, approach the area/equipment to be tested. The proximity detector will illuminate prior to touching the area/equipment being tested if voltage is present. If the proximity detector does not illuminate in close proximity to the area/equipment touch the area/equipment to be tested with the probe of the unit.

2. If this test detects voltage, repeat the test with the portable AC voltmeter:
   a. Measurements with a portable AC voltmeter shall be taken on clean bare metallic surface (structure, ground wire, etc.)
   b. When using a portable AC voltmeter, connection shall be made to suitable neutral or ground source with the common (black) lead.
      i. In locations where the neutral or ground point is at a distance in excess of the voltmeter lead length, the connection to the neutral/ground shall be made with up to 25’ of # 16 stranded copper lead wire (covered), the other end of which shall be securely connected to the negative (black) probe of the meter. When using such “extension leads” appropriate care shall be taken in the placement of such leads so as to not create a physical hazard to workers, pedestrian or vehicular traffic.
      ii. In locations where a system ground is not available, or the existing ground registered voltage upon the proximity test, a metal rod shall be firmly embedded into the earth to a depth of no less than 6” to create a ground reference point for the measurement to be taken. The reference point should be as close as practicable to the facility being tested to simulate an elevated equipment voltage situation (3’ to 4’). On occasion longer leads may be necessary to find undisturbed earth (up to 25’).
   c. The “live” meter probe lead shall then be placed into contact with the structure under inspection.
      i. Install a 500 ohm input load impedance on the volt meter. Measure the voltage and record this voltage in the database for the site.

V. CORRECTIVE ACTION REQUIREMENTS

A. If an elevated equipment voltage condition is found and verified by the Test Procedure in Section IV, the site is to be guarded until made safe by Company personnel or if municipally owned, made safe by the owner or company. Guarded for the purposes of this EOP is defined as guarded by a person or a protective barrier that prevents public contact if the elevated equipment voltage found is greater than 4.5 volts. **If the voltage measures less than 4.5 volts and is found to be consistent with system operation design (no visual evidence of a problem upon review) no further action is required.** If the voltage measures greater than 4.5 volts and less than 8 volts it can either be guarded in person or by a protective barrier that prevents public contact, contact your supervisor for required action. It is expected that sound judgment shall be utilized in this application. If the voltage measures greater than 8 volts immediate response is required using the notification in section B below.

B. The following notification process for personnel to respond shall be utilized.

1. Notification by location:
   b. Bay State West and North & Granite: Westboro Control Center 508-389-9032.
   c. Bay State South, and Ocean State: Lincoln Control Center 401-335-6075.
2. Inform the operator that this is an elevated equipment voltage call, giving inspector name, company (if not National Grid), unique ID, address where problem is identified, facility number, circuit number, ownership, type of equipment, voltage found and whether they are physically guarding or leaving the site after flagging and installing a protective barrier. National Grid personnel or designee will be assigned to respond.

C. Temporary repairs may be used to correct the elevated equipment voltage thereby removing the need to guard the site.

D. Except as noted in VI.E, permanent repairs to the equipment shall be made within 45 days of the occurrence.

E. If permanent repairs can not be made within 45 days due to extraordinary circumstances, the company shall periodically perform site visits to monitor the condition of the temporary repair. For New York, all exceptions must be identified and justified in the annual reporting of the program to the NYPSC.

F. The Tester/Inspector may detect a minimal voltage level that is attributable to the design of the facility and not the result of an improper condition, no corrective action is required in this instance.

G. The individuals conducting the elevated equipment voltage tests on street light standards shall have a supply of “Angel guards” available for installation if the cover is missing or wires are found to be exposed to the public at the time of testing. Angel guards shall only be installed after the testing of the street light standard is complete and 1) there is no indication of elevated equipment voltage above 4.5 volts, or 2) repairs have been completed to correct the elevated equipment voltage.

H. The elevated equipment voltage tester shall report any potentially hazardous conditions found on National Grid facilities seen visually during the survey process.

I. Customer Owned Equipment

1. Where the Company finds elevated equipment voltage above 4.5 volts and identifies its source as customer-owned equipment, the Company shall guard the site and notify the customer or a responsible person, as appropriate, that a potentially hazardous situation exists. The Company shall advise the customer or responsible person that the cause of the elevated equipment voltage must be immediately remedied.
2. Company personnel are encouraged to work with the customer to determine and rectify the problem. If the customer agrees to accept the Company’s assistance, the Company may charge a reasonable cost for this effort.
3. The Company may temporarily remove a customer’s meter or take such other actions as are appropriate and necessary to protect the public.

VI. DATABASE REQUIREMENTS

A. The database in use shall be easily searchable for information and reporting.

B. Information fields required to be completed for facilities:

1. Survey Date
2. Region
3. District
4. Contractor
5. GIS ID/Asset # (Unique ID)
6. Facility Type
7. Owner
8. Feeder/Circuit
9. Line #
10. Tax District
11. Pole/Structure/Equipment ID
12. Street Name
13. Inspectors Name
14. GPS Taken
15. Pre-load Match
16. Elevated Equipment Voltage Test Required
17. Voltage Found Y/N
18. Voltage Measurement
19. Type of Equipment (See Appendix A)
20. Immediate Action Taken
21. Person Notified
22. Permanent Repair Date
23. Type of Repair
24. Person Responsible for repair (Employee ID)

VII. NEW YORK ANNUAL REPORTING AND CERTIFICATION REQUIREMENTS

A. Each Regional program supervisor shall provide certification to the program manager that the Region they supervise has complied with the elevated equipment voltage testing and inspection program as ordered by the PSC.

B. The program manager shall provide certification to the Vice President Distribution Network Strategy and the Senior Vice President of Distribution Network Strategy that the organization has complied with the elevated equipment voltage testing and inspection program as ordered by the PSC.

C. Written certification of the completion and results of every elevated equipment voltage test and inspection shall be completed, as well as a certification that all unsafe conditions identified have been remediated by appropriate company personnel.

D. The President or officer with direct responsibility for overseeing the elevated equipment voltage testing and inspection shall provide an annual certification to the NYPSC that the Company has tested all of its publicly accessible conductive surface electric facilities and all street lights, as well as completed all required inspections.

E. The annual reporting and certification is required by January 15 of each year. In addition to certifications, it shall address the following:
   1. Analyses of elevated equipment voltage data to show trends or common causes.
   2. Discussion of performance mechanism, if required.
   3. Changes to program implementation due to lessons learned.

F. The Company shall maintain its written certification and other documentary proof of its testing at its’ Albany, Buffalo, and Syracuse office facilities. These documents shall be made available to the public for review upon request.

VIII. MASSACHUSETTS REPORTING REQUIREMENTS

A. National Grid shall submit an annual report that includes the following:
   1. Annual reports that list inspection and testing data, including number of inspections conducted by equipment type.
2. Number of elevated equipment voltage events detected by inspection personnel versus call-ins or notification by third parties.
3. Variance reports on current year inspection targets.
4. Elevated equipment voltage events detected on equipment that is not included in elevated equipment voltage equipment inspection schedules (which will enable the DTE to determine if the company is inspecting and testing the correct equipment).
5. Number of exceptional or non-routine events that required reporting to OSHA or other government organizations due to injuries or other substantive impacts.

IX. RESPONSIBILITY

A. Distribution Engineering Services
   1. Update program as necessary.
   2. Provide field support and training upon request.
   3. Act as liaison with existing database vendor when required.

B. Field Operations
   1. Ensure the elevated equipment voltage program as outlined in this EOP is implemented properly and timely.
   2. Ensure that the program as outlined in the EOP is completed each year.
   3. Provide qualified personnel to complete elevated equipment voltage testing.
   4. Ensure all elevated equipment voltage testers have been trained.

C. C&MS Management
   1. When requested by Field Operations/Distribution Network Strategy obtain, schedule and manage contractors to perform elevated equipment voltage testing.
   2. Ensure all elevated equipment voltage testers have been trained.
   3. Manage contractual terms and conditions including all change orders and resource requirements.
   4. Establish a process for the delivery of work, collection of data, invoice verification and payment, and reporting to local management and Distribution Network Strategy.
   5. Manage any established support processes such as back office support or data entry clerks.

D. Elevated Equipment Voltage Inspector
   1. Demonstrate the ability and proficiency to perform elevated equipment voltage testing per this EOP.
   2. Demonstrate the ability to become proficient in the use of the appropriate database.
   3. Possess the ability to do walking patrols, collect information, edit data, and guard unsafe facilities.
   4. Attend elevated equipment voltage training program.

E. T&D Technical Training
   1. Provide training upon request.

F. Distribution Network Strategy
   1. Provide input into program revisions.
   2. Ensure the elevated equipment voltage program as outlined in this EOP is implemented properly and timely.
   3. Ensure the program as outlined in the EOP is completed each year.
   4. Provide qualified personnel to complete elevated equipment voltage testing.
   5. Ensure all elevated equipment voltage testers have been trained.
   6. Provide program management.
IX. DEFINITIONS:

A. “Stray Voltage” – As defined by NYPSC the term “Stray Voltage” means voltage conditions on electric facilities that should not ordinarily exist.

B. Proximity Detection Unit – A low voltage hand held detector used to test exposed metallic surfaces and conductors for the presence of low voltage from 8V to 600V.

C. Elevated Equipment Voltage Inspector – The individual performing the elevated equipment voltage inspection.

E. Handheld Computer - An electronic Data recording device that is used in the field to create a record of conditions found.

F. Elevated Equipment Voltage – An A.C. rms voltage difference between utility equipment and the earth, or to nearby grounded facilities that exceeds the lowest perceptible voltage levels for humans.

X. TRAINING:

A. Distribution Engineering Services with assistance from the database vendor will provide training on the utilization of handheld computers and the selected database.

B. At a minimum, each worker conducting these tests should have knowledge and training in the following areas:

1. Proper use of appropriate Personal Protective Equipment.
2. Work Area Protection.
4. First Aid CPR (This is required only on multi-person crews.)
5. The proper use of certified voltage detection units and voltmeters.

The attendance of this training shall be documented.
# TYPE OF EQUIPMENT

## APPENDIX A

<table>
<thead>
<tr>
<th>TYPE</th>
<th>CODE</th>
<th>EQUIPMENT DESCRIPTION</th>
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NG-USA EOP G016

“Elevated Equipment Voltage Testing”

05/01/06

Revisions made throughout document.
## TYPE OF EQUIPMENT
### APPENDIX A

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NG-USA EOP G016

“Elevated Equipment Voltage Testing”

05/01/06

Revisions made throughout document.
GENERAL INFORMATION:

The purpose of this procedure is to outline the requirements for the patrol and maintenance activities associated with National Grid Distribution feeders. The Distribution Maintenance Program was designed to provide for a patrol and subsequent maintenance of each distribution feeder once every five years. The patrols are conducted by a Distribution Inspector identifying all required maintenance on a hand held computer. The maintenance items identified through this patrol are separated into five priority categories A, B, C, E and F priority. The problem codes identified default to the appropriate priority. The default priority can be adjusted by the individual performing the inspection based on actual field conditions. These priority categories are defined as follows:

A Priority - An identified facility/component or tree condition that must be repaired/replaced as soon as practicable.

B Priority – An identified facility/component condition that shall be considered for repair/replacement as the feeder is scheduled for maintenance by Distribution Planning and Engineering. These identified conditions will be corrected as preventive maintenance and or facility life extension.

C Priority – An identified facility/component condition that is being trended and reviewed by Distribution Planning and Engineering that may require replacement through the engineering process (Requires project/Capital expenditures). Non-capital conditions identified under this priority will be corrected at the discretion of field operations.

E Priority – An identified facility/component that must be replaced/repaired immediately to address public safety or system reliability.

All E priority conditions identified in the field shall be called in by the Distribution Inspector as follows:
1. Notification by location:
   b. Bay State West and North & Granite: Westboro Control Center 1-508-389-9032.
   c. Bay State South, and Ocean State: Lincoln Control Center 1-401-335-6075.

2. Detailed information provided to the regional notification location:
   a. Identify yourself as a Company Distribution Inspection and your work reporting area.
   b. Details of the E Priority Condition:
      i. Problem found.
      ii. District, Feeder No., Line No., Tax District and Pole No.
      iii. Street address and any additional information that would assist in finding the location of the problem.
      iv. If you are standing by or have secured the location.

F Priority – An identified forestry condition that should be scheduled as time permits, within the routine right-of-way maintenance and danger tree removal schedules.

ALL “A PRIORITY” CONDITIONS IDENTIFIED PRIOR TO NOVEMBER 1ST MUST BE REPAIRED/CORRECTED BY NOVEMBER 30TH IN THE NEW YORK SERVICE TERRITORY DUE TO REGULATORY REPORTING.

ALL “A PRIORITY” CONDITIONS IDENTIFIED SHALL BE REPAIRED/CORRECTED WITHIN 12 MONTHS OF INSPECTION IN ALL NEW ENGLAND SERVICE TERRITORIES.

ALL “E PRIORITY” CONDITIONS SHALL BE CORRECTED IMMEDIATELY UPON NOTIFICATION.

ALL “F PRIORITY” CONDITIONS IDENTIFIED DURING THE PATROL ARE TRANSMITTED TO THE SYSTEM FORESTRY GROUP ON AN ANNUAL BASIS FOR INCLUSION IN THE RIGHT-OF-WAY MAINTENANCE PROGRAM.

PROGRAM ADMINISTRATOR:

Distribution Engineering Services

APPLICABILITY

This procedure applies to all personnel involved with or responsible for the inspection and repair of Overhead (OH) Distribution facilities. Additionally all Underground Residential Developments (URDs) and Underground Commercial Developments (UCDs) will be scheduled for inspection on the feeder schedule for this OH Distribution Line Patrol and Maintenance EOP. Refer to Underground Inspection and Maintenance NG USA EOP-UG006 for further information on the underground program.
SCOPE:

Distribution Maintenance
I. Definitions
II. Distribution Patrol
III. Equipment To Be Inspected and Maintenance Codes
IV. Distribution Maintenance Database
V. Maintenance Schedule
VI. Completion of Maintenance Codes
VII. Responsibilities
VIII. Training

I. DEFINITIONS

Patrol - A walking/vehicle assessment of National Grid distribution facilities for the purpose of determining the condition of the facility and it’s associated components.

Hand Held Computer - An electronic data recording device that is used in the field to create a record of conditions found.

Desktop Computer – A personal computer that is connected to the National Grid network that is used to download the Hand Held Computer and retrieve the information in the form of reports.

Distribution Inspector – An employee that has been trained to identify deficiencies or non-standard construction conditions on National Grid facilities.

II. DISTRIBUTION PATROL

Distribution Patrols are conducted by a Distribution Inspector that has been trained to identify deficiencies or non-standard construction conditions on National Grid facilities. Distribution patrols are scheduled in such a manner that each distribution feeder is examined in the field once every five (5) years. In NY, the patrols shall be completed by November 30 due to regulatory reporting. In NE the patrols shall be completed by March 31. The most current Distribution Patrol schedule can be found in the Distribution Maintenance Program data base (RPT 1310 Feeder Patrol Status). New Distribution Feeders added to the system will be incorporated through our Geographic Information System (GIS) system and added to the appropriate inspection cycle. If the Distribution Inspector finds unmapped facilities from the information supplied from GIS, the inspector shall add the information into the hand held computer for maintenance tracking purposes. National Grid G011 EOP, Preparation and Distribution of Electric Facilities Records, identifies the correct procedure for updating GIS records, if needed.

Distribution Patrol data is recorded by the Distribution Inspector on a hand held computer and downloaded to the Distribution Maintenance Program. The Distribution Inspector shall also complete maintenance code 118, stencil installed and maintenance code 220, guy wire marker if found deficient upon inspection while at the site. Maintenance Codes are shown on the Distribution Field Survey Worksheet (Exhibit 1).
The hand held computer is to be used as the primary vehicle for recording maintenance problems in the field. There may be times where it is not practicable to use the hand held computer. In these cases, the person performing the inspection should record the information on the Distribution Field Survey Worksheet (Exhibit 1). Once complete, the Distribution Field Survey Worksheet information must be input into the Distribution Maintenance Program by the inspector, clerk, or supervisor or their designee.

III. EQUIPMENT TO BE INSPECTED AND MAINTENANCE CODES

- Wood Pole Mounted Street Light
- Poles
- Crossarms
- Insulators
- Primary
- Transformers
- Capacitor
- Regulator
- Sectionalizer
- Recloser
- Switches
- Ground
- Guy
- Anchor
- Secondary
- Service
- ROW
- GIS
- Spacer Cable
- Cutout
- Risers
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<th>STREETLIGHT</th>
<th>CAPACITOR</th>
<th>GUY</th>
<th>SPACER CABLE</th>
<th>RECLINER</th>
<th>PRIMARY</th>
<th>TRANSFORMER</th>
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<td>Street light Hazard Cond.</td>
<td>160 A Oil Weeping</td>
<td>222 B Excessive Slack</td>
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<td>099 A</td>
<td>Not Bonded</td>
<td>161 A Bulging</td>
<td>223 A Broken Wire</td>
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<td>100 B</td>
<td>Not Bonded to Standards</td>
<td>162 B Bushings Brkn/Crkd</td>
<td>225 B NonStd Bonding/Insul</td>
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<tr>
<td>101 I</td>
<td>Osmose Priority Pole</td>
<td>164 B Blown Fuse</td>
<td>226 A Req’d-Jt. Owned</td>
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<td>102 I</td>
<td>Osmose Reject Pole</td>
<td>165 B Improper/Missing Bond</td>
<td>227 A Req’d-Sole NG</td>
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<td>103 I</td>
<td>Down Ground &amp; Rod Present</td>
<td>166 B Animal Guard Missing</td>
<td>231 F In Trees</td>
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<td>104 C</td>
<td>D’bl Wood-NG Tmsf Req’d</td>
<td>167 B LA Blown/Missing/Imprr</td>
<td>234 B Floating</td>
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<td>232 B Improper Sag</td>
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<td>170 A Oil Weeping</td>
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<td>250 F Brush/Tree</td>
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<td>261 I Pole/line #ing error</td>
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<td>Stencil /Correction Req’d</td>
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<td>Damage Arm</td>
<td>180 A Oil Weeping</td>
<td>261 I Pole/line #ing error</td>
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<td>269 I Other GPS/GIS errors</td>
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<td>271 B Bracket Damage</td>
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<td>187 B LA Blown/Missing/Impmr</td>
<td>272 B Bracket not bonded</td>
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<td>190 A Oil Weeping</td>
<td>273 B Messenger not bonded</td>
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<td>Untied or Floating</td>
<td>191 B Busing Brkn/Crkd</td>
<td>274 B Messenger guard msag</td>
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<td>275 B Cutout bracket not bonded</td>
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<td>AL Cap Assoc W/Switch/Fuse</td>
<td>193 B Ctrl Cab Hght/Gnd</td>
<td>276 B Uncovered Splice</td>
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<td>135 B</td>
<td>Covered Wire on Porcelain</td>
<td>194 B Improper/Missing Bond</td>
<td>278 A Defective Cutout</td>
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<tr>
<td>136 B</td>
<td>Crossarm Wood Brace</td>
<td>195 B Animal Guard Missing</td>
<td>279 A L.A. Blown/Missg/Impmr</td>
<td>/</td>
<td>/</td>
<td>/</td>
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<tr>
<td>137 B</td>
<td>Damage Arm</td>
<td>196 B LA Blown/Missg/Impmr</td>
<td>281 I Potted Porcelain</td>
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<td>/</td>
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<td>138 B</td>
<td>Insuff. Grnd Clearance</td>
<td>197 B Switch</td>
<td>282 B Bonded Porcelain</td>
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<td>139 B</td>
<td>Damaged Cond/Brkn Strands</td>
<td>198 B Gang Oper’d Defective</td>
<td>283 I Enclosed</td>
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<td>140 B</td>
<td>In Trees</td>
<td>200 B Single Phase Defective</td>
<td>284 B Non Porcelain</td>
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<td>201 B Improper/Missing Bond</td>
<td>289 B Other</td>
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<td>LA Transition or Tap-blown/missing/improper</td>
<td>203 B Ground Required</td>
<td>290 B Impmr Cable Supp/Terminate</td>
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<td>LA End of Lineblown/missing/improper</td>
<td>204 B Handle Not Bonded</td>
<td>291 B Improper/missing bond</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>150 A</td>
<td>Oil Weeping</td>
<td>210 A Wire Broken/Loose</td>
<td>293 B L.A. Blown/Missg/Impmr</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>151 A</td>
<td>Bushings Brkn/Crkd</td>
<td>211 A Hazard Condition</td>
<td>294 B Missing Ground Wire</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>152 A</td>
<td>Missing Ground Wire</td>
<td>212 B Guard Req’d</td>
<td>801 A Identified priority pole</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>153 B</td>
<td>LA Blown/Missing/Improper</td>
<td>213 B Non Standard</td>
<td>802 B Identified reject pole</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>154 B</td>
<td>Non Std Install of Gap</td>
<td>214 B Not bonded to neutral</td>
<td>803 I Excess Chkg (N)Offrd</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>155 B</td>
<td>Improper/Missing Bond</td>
<td>215 B Guy Wire Marker</td>
<td>804 C Climbing Insp req’d (not reject)</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>156 B</td>
<td>Non Std Install of Gap</td>
<td>216 B Guy Insulator Required</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
</tbody>
</table>
IV. DISTRIBUTION MAINTENANCE DATA BASE

The Distribution Maintenance database consists of information collected in the field down loaded from the hand held computer and data gathered from other sources entered from the desktop computer. The hand held computer can be down loaded to any National Grid desk top computer that is connected to the network by an employee that has been authorized to perform this function. The Distribution Maintenance database is used by various departments throughout National Grid to generate maintenance reports and cost estimates.

V. MAINTENANCE SCHEDULE

Maintenance activities are scheduled by priority categories, with the exception of “E Priority” which requires immediate repair. All “A Priority” conditions identified prior to November 1 must be repaired/corrected by November 30 in New York. The “A Priority” conditions that exist in New England service territories shall be scheduled for repair/correction within a rolling 12 month basis. The “B Priority” conditions are scheduled based on the reliability of the feeder, load served, and reported condition of the facilities. The “B Priority” maintenance is to be performed on feeders selected by Distribution Planning and Engineering, and identified in the “Energy Delivery Work Plan”. All “B Priority” maintenance as outlined in the “Energy Delivery Work Plan” must be completed by March 31. The “C Priority” maintenance work will be completed as planned and directed by the Distribution Planning and Engineering department (Capital expenditures) after reviewing annually for trends that would require expenditures.

ALL MAINTENANCE WORK IS TO BE COMPLETED PER NATIONAL GRID DISTRIBUTION STANDARDS.

VI. COMPLETION OF MAINTENANCE CODES

The replacement/repair of an identified maintenance problem code after completed in the field must be updated in the database. The completion of the maintenance problem codes can be done through the edit screen found on the desktop computer. Field personnel that perform the work are required to complete the work order form providing the date completed, and employee ID number. The work order form is returned to the T&D Supervisor who will close out the completed maintenance problem codes in the database at their desk top computer or designate the inspector or clerk to close out the maintenance code. Additional maintenance problems that maybe discovered and completed by personnel must be noted on the work order ticket so they can be recorded as work completed on that specific facility.

ALL MAINTENANCE WORK PERFORMED THAT WAS IDENTIFIED ON THE WORK ORDER OR DISCOVERED DURING THE REPAIR/CORRECTION OF THE ORIGINAL MAINTENANCE PROBLEM MUST BE LISTED ON THE DATABASE AND THEN CLOSED OUT WHEN COMPLETE.
VII. RESPONSIBILITIES:

Distribution Engineering Services

1. Update EOP as necessary.
2. Provide Customer Operations support and training as requested.

Customer Operations

1. Ensure the work generated by the Distribution Maintenance Program and assigned by Distribution Planning and Engineering is completed in the appropriate time frame.
2. Request assistance from CMS when necessary to complete work assigned in the appropriate time frame.

Contract Management Services

1. At the request of Customer Operations obtain, schedule and manage contractors to perform inspections and required maintenance.

Distribution Inspector

1. Demonstrate the ability to identify maintenance concerns and the aptitude to become proficient in the use of a hand held computer and desktop computer.
2. Demonstrate the understanding and requirements of this NG-USA EOP D004.
3. Possess the ability to do walking patrols, collect information on a hand held, download to a desktop computer, edit data, provide requested information/reports/work tickets to supervision, and track/close out work completed in the database system.

Distribution Asset Strategy

1. Select circuits to be patrolled for a running five-year cycle.
2. Ensure circuits scheduled for patrol are completed each year.
3. Provide input into program revisions.
4. Provide qualified line personnel as inspectors to provide consistent and accurate identified maintenance concerns/problems.
5. Provide program management.

Process and Systems

1. Provide and support database.

T&D Technical Training

1. Provide training upon request.

VIII. TRAINING:

1. The National Grid Training Department along with Distribution Engineering Services will provide training for the identification of A, B, C, E, and F maintenance items to the qualified employee who will be performing the inspections.
NG-USA EOP D004

“Distribution Line Patrol and Maintenance”

05/01/06

“B” work completion date changed to March 31.
REFERENCE:

NY PSC Order 04-M-0159
Applicable National Grid Safety Rules and Procedures
Distribution Line Patrol and Maintenance NG-USA EOP D004
Elevated Equipment Voltage Testing NG USA EOP-G016
Transmission Line Patrol and Maintenance NG USA EOP – T007
Massachusetts DTE Directive 12/9/05

GENERAL INFORMATION:

The purpose of this procedure is to outline the requirements for the patrol and maintenance activities associated with National Grid’s underground transmission and distribution facilities.

The variance in inspection procedures in New York, Massachusetts, New Hampshire, and Rhode Island service territories is due to the requirements of New York Public Service Order 04-M-0159 and the Massachusetts Department of Telecommunications and Energy recommendations of December 9 2005, which is incremental to National Grid in New York and Massachusetts.

This program is designed for the patrol and designated maintenance of underground facilities on a five year schedule. The Inspector will record all required maintenance on an approved National Grid database.

The underground distribution facility maintenance items identified through this patrol are separated into four priority categories A, B, C, and E priority. The problem codes identified default to the appropriate priority. The default priority can be adjusted by the individual performing the inspection based on actual field conditions. These priority categories are defined as follows:

A Priority - An identified facility/component that must be repaired/replaced as soon as practicable.

B Priority – An identified facility/component condition that shall be considered for repair/replacement as the feeder is scheduled for maintenance by Distribution Planning and Engineering. These identified conditions will be corrected as preventive maintenance and or facility life extension.

C Priority – An identified facility/component condition that is being trended and reviewed by Distribution Planning and Engineering that may require replacement through the engineering process (Requires project/Capital expenditures). Non-capital conditions identified under this priority will be corrected at the discretion of field operations.

E Priority – An identified facility/component that must be replaced/repaired immediately to address public safety or system reliability. The inspector shall notify the appropriate operations department for immediate response and corrective action any time an E priority is found during an inspection.

ALL “E” PRIORITY CONDITIONS SHALL BE CORRECTED IMMEDIATELY UPON NOTIFICATION.
ALL "A PRIORITY" CONDITIONS IDENTIFIED PRIOR TO NOVEMBER 1ST MUST BE REPAIRED/CORRECTED BY NOVEMBER 30TH IN THE NEW YORK SERVICE TERRITORY DUE TO REGULATORY REPORTING.

ALL "A PRIORITY" CONDITIONS IDENTIFIED SHALL BE REPAIRED/CORRECTED WITHIN 12 MONTHS OF INSPECTION IN ALL NEW ENGLAND SERVICE TERRITORIES.

PROGRAM ADMINISTRATOR:

Distribution Engineering Services

APPLICABILITY

This procedure applies to all personnel involved with or responsible for the inspection or maintenance of underground transmission and distribution facilities.

SCOPE:

I. PATROLS
   1. New York

Inspection of underground equipment will be scheduled in such a manner that each Underground Facility will be examined once every five years. These patrols shall be completed by November 30th of the schedule year.

One-fifth of all underground utility components should be inspected each year. URD and UCD facilities shall be inspected on the existing overhead distribution circuit schedule. Additionally all riser poles are inspected in accordance with the Transmission and Distribution Overhead Inspection Programs, NG-USA EOP T007 and NG-USA EOP D004. Customer owned manholes and vaults that enclose National Grid equipment shall require the inspection of these National Grid facilities.

The T&D Superintendent’s are responsible to create the patrol schedule for their respective Regions for the remainder of underground facilities. The Inspector uses a hand held computer to record region, district, employee ID, feeder number, structure ID number, GPS location, tax zone, line number, comments and maintenance problem codes. The Inspector while patrolling shall also complete the following maintenance codes if found deficient upon inspection: 617 – manhole missing nomenclature, 639 - network transformer-missing nomenclature, 660 – switchgear missing nomenclature, 681 – transformer missing nomenclature, 707 – vaults improper nomenclature. The Inspector will input the code into the handheld as required, as well as completing the work unit in the handheld upon field completion while at the site. If the Inspector finds unmapped facilities from the information supplied from the Geographic Information System (GIS), refer to NG-USA EOP G011, Preparation and Distribution of Electric Facilities Records, for required procedure for corrections.
2. **New Hampshire and Rhode Island**

   Inspection of designated underground equipment will be scheduled in such a manner that each designated Underground Facility will be examined once every five years. These patrols shall be completed by March 31st of the fiscal year.

   One-fifth of all metallic handholes, padmount transformers and switchgear shall be inspected annually. The metallic handhole covers shall be opened for a visual inspection. An external visual inspection shall be completed on the padmount transformers and switchgear. Additionally all separable components in the metallic handholes are to be inspected by infrared. Refer to NG-USA EOP UG001 for infrared procedure. An “E Priority” shall be assigned to a temperature gradient greater than 20º, although it is recognized that consideration must be taken as to whether a customer outage will occur at this time and the negative impact the outage could have on the customer. This may require scheduling an outage with the customer within one week to satisfy this requirement. An “A Priority” shall be assigned to a temperature gradient between 10º and 20º. A “B Priority” shall be assigned to a temperature gradient less than 10º. Additionally, an elevated equipment voltage test shall be completed at each location, refer to NG-USA EOP-G016.

   A working inspection on underground facilities is required for all manholes, vaults, handholes, splice boxes, junction boxes, padmount transformers, switchgear and submersible equipment, each time a crew performs work at one of these facilities. The format for data collected shall follow this EOP. All separable components in these facilities are to be inspected by infrared. Additionally an elevated equipment voltage test shall be completed at each location, refer to NG-USA EOP-G016.

   All transmission riser poles are inspected in accordance with the Transmission NG-USA EOP-T007.

   The T&D Superintendent’s are responsible to create the patrol schedule for their respective Regions for the designated underground facilities. The Inspector uses a hand held computer to record region, district, employee ID, feeder number, structure ID number, GPS location, line number, comments and maintenance problem codes. The Inspector, while patrolling or crew while inspecting, shall also complete the following maintenance codes if found deficient upon inspection, 617 – manhole missing nomenclature, 639 - network transformer- missing nomenclature, 660 – switchgear missing nomenclature, 681 – transformer missing nomenclature, 707 – vaults improper nomenclature. The Inspector will input the code into the handheld as required, as well as completing the work unit in the handheld upon field completion while at the site. If the Inspector finds unmapped facilities from the information supplied from GIS, refer to NG-USA EOP G011, Preparation and Distribution of Electric Facilities Records, for required procedure for corrections. Crews performing working inspections are to follow the same protocol for inspections by using either a handheld data entry unit or paper inspection logs requiring data entry by clerical support.

3. **Massachusetts**

   Inspection of designated underground equipment will be scheduled in such a manner that each designated Underground Facility will be examined once every five years. These patrols shall be completed by March 31st of the fiscal year.

   One-fifth of all manholes, vaults, metallic handholes, padmount transformers and switchgear shall be inspected annually. The metallic handhole covers shall be opened for a visual inspection. Manholes and vaults shall be opened and entered for inspection. An external visual inspection shall be completed on the padmount transformers and switchgear. Additionally all separable components in the metallic handholes, manholes, and vaults are to be inspected by infrared. Refer to NG-USA EOP UG001 for infrared procedure. An “E Priority” shall be assigned to a temperature gradient greater than 20º, although it is recognized that consideration must
be taken as to whether a customer outage will occur at this time and the negative impact the outage could have on the customer. This may require scheduling an outage with the customer within one week to satisfy this requirement. An “A Priority” shall be assigned to a temperature gradient between 10º and 20º. A “B Priority” shall be assigned to a temperature gradient less than 10º. Additionally, an elevated equipment voltage test shall be completed at each location, refer to NG-USA EOP-G016.

A working inspection on underground facilities is required for all manholes, vaults, splice boxes, junction boxes, padmount transformers, switchgear and submersible equipment, each time a crew performs work at one of these facilities. The format for data collected shall follow this EOP. All separable components in these facilities are to be inspected by infrared. Additionally an elevated equipment voltage test shall be completed at each location, refer to NG-USA EOP-G016.

All transmission riser poles are inspected in accordance with the Transmission NG-USA EOP-T007.

The T&D Superintendent’s are responsible to create the patrol schedule for their respective Regions for the designated underground facilities. The Inspector uses a hand held computer to record region, district, employee ID, feeder number, structure ID number, GPS location, line number, comments and maintenance problem codes. The Inspector, while patrolling or crew while inspecting, shall also complete the following maintenance codes if found deficient upon inspection, 617 – manhole missing nomenclature, 639 - network transformer-missing nomenclature, 660 – switchgear missing nomenclature, 681 – transformer missing nomenclature, 707 – vaults improper nomenclature. The Inspector will input the code into the handheld as required, as well as completing the work unit in the handheld upon field completion while at the site. If the Inspector finds unmapped facilities from the information supplied from GIS, refer to NG-USA EOP G011, Preparation and Distribution of Electric Facilities Records, for required procedure for corrections. Crews performing working inspections are to follow the same protocol for inspections by using either a handheld data entry unit or paper inspection logs requiring data entry by clerical support.

II. EQUIPMENT TO BE INSPECTED AND MAINTENANCE CODES

This EOP requires the visual inspection of the following facilities as designated above for either New York, New Hampshire, Rhode Island or Massachusetts, which require opening, and may require pumping on some items to assure a proper inspection:
- Manholes
- Vaults
- Handholes – non-fiberglass
- Splice boxes – non-fiberglass
- Junction boxes – non-fiberglass
- Pad mount transformers
- Pad mount switchgears
- Submersible equipment
- Handholes – fiberglass do not require opening
- Splice boxes – fiberglass do not require opening
- Junction boxes – fiberglass do not require opening

Table 1 on page 4 details the Inspection Program and Maintenance Codes.
### INSPECTION PROGRAM AND MAINTENANCE CODES

#### TABLE 1

<table>
<thead>
<tr>
<th>Maintenance Code</th>
<th>Description</th>
<th>Expense or Capital</th>
<th>Default priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>Handholes - Broken/damaged/unsecured</td>
<td>E</td>
<td>B</td>
</tr>
<tr>
<td>602</td>
<td>Handholes - Missing nomenclature</td>
<td>E</td>
<td>C</td>
</tr>
<tr>
<td>603</td>
<td>Handholes – Primary or Secondary needs repair</td>
<td>E</td>
<td>B</td>
</tr>
<tr>
<td>604</td>
<td>Handholes – Other (use comments)</td>
<td>E</td>
<td>B</td>
</tr>
<tr>
<td>605</td>
<td>Infrared Inspection – Separable Components</td>
<td>E</td>
<td>B</td>
</tr>
<tr>
<td>610</td>
<td>Manhole - Bonded</td>
<td>E</td>
<td>B</td>
</tr>
<tr>
<td>611</td>
<td>Manholes - Cable/Joint leaking</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>612</td>
<td>Manholes - Cables bonded</td>
<td>E</td>
<td>B</td>
</tr>
<tr>
<td>614</td>
<td>Manholes - Cracked/broken</td>
<td>C</td>
<td>B</td>
</tr>
<tr>
<td>615</td>
<td>Manholes - Fire proofing</td>
<td>E</td>
<td>C</td>
</tr>
<tr>
<td>616</td>
<td>Manholes - Improper grade</td>
<td>E</td>
<td>B</td>
</tr>
<tr>
<td>617</td>
<td>Manholes - Missing nomenclature</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>620</td>
<td>Manholes - Rerack</td>
<td>E</td>
<td>B</td>
</tr>
<tr>
<td>621</td>
<td>Manholes - Ring/cover repair/replace</td>
<td>C</td>
<td>B</td>
</tr>
<tr>
<td>630</td>
<td>Network Protector - Barriers broken/damaged</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>632</td>
<td>Network Protector - Oil leak</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>633</td>
<td>Network Protector - Worn/damaged gasket</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>635</td>
<td>Network transformer - Bushing Broken/Cracked</td>
<td>E</td>
<td>B</td>
</tr>
<tr>
<td>637</td>
<td>Network transformer - Low oil</td>
<td>E</td>
<td>B</td>
</tr>
<tr>
<td>638</td>
<td>Network transformer - Missing Ground</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>639</td>
<td>Network transformer - Missing nomenclature</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>642</td>
<td>Network transformer - Oil Weeping</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>643</td>
<td>Network transformer - Rusted/ Paint peel</td>
<td>E</td>
<td>C</td>
</tr>
<tr>
<td>651</td>
<td>Switchgear - Barrier broken/damaged/unsecured</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>652</td>
<td>Switchgear - Base broken/damaged</td>
<td>C</td>
<td>B</td>
</tr>
<tr>
<td>654</td>
<td>Switchgear - Cable Not Bonded</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>656</td>
<td>Switchgear - Door Broken/Damaged</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>657</td>
<td>Switchgear – Excessive vegetation</td>
<td>E</td>
<td>C</td>
</tr>
<tr>
<td>659</td>
<td>Switchgear - Missing ground</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>660</td>
<td>Switchgear - Missing Nomenclature</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>661</td>
<td>Switchgear – Other</td>
<td>E</td>
<td>C</td>
</tr>
<tr>
<td>662</td>
<td>Switchgear - Rusted/Paint peeling</td>
<td>E</td>
<td>C</td>
</tr>
<tr>
<td>672</td>
<td>Transformer - Bushing Broken/Cracked</td>
<td>E</td>
<td>B</td>
</tr>
<tr>
<td>673</td>
<td>Transformer - Door Broken/damaged/unsecured</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>675</td>
<td>Transformer - Elbows tracking/burned</td>
<td>E</td>
<td>B</td>
</tr>
<tr>
<td>676</td>
<td>Transformer – Excessive vegetation</td>
<td>E</td>
<td>C</td>
</tr>
<tr>
<td>680</td>
<td>Transformer - Missing Ground</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>681</td>
<td>Transformer - Missing nomenclature</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>682</td>
<td>Transformer – Mud/debris</td>
<td>E</td>
<td>C</td>
</tr>
<tr>
<td>684</td>
<td>Transformer - Oil Weeping</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>685</td>
<td>Transformer - Pad broken/damaged</td>
<td>E</td>
<td>B</td>
</tr>
<tr>
<td>686</td>
<td>Transformer - Protection (ballards) damaged</td>
<td>C</td>
<td>B</td>
</tr>
<tr>
<td>687</td>
<td>Transformer - Rusted/ Paint peeling</td>
<td>E</td>
<td>C</td>
</tr>
<tr>
<td>690</td>
<td>Trench - Exposed Cable</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>692</td>
<td>Trench Path - Sunken</td>
<td>E</td>
<td>B</td>
</tr>
</tbody>
</table>
III. MAINTENANCE DATABASE

The Maintenance database consists of data downloaded from the hand held and data entered from the desktop computer. The field hand held can be downloaded to any National Grid desk top computer that is connected to the network and the inspector is logged on as a valid user of the UG Maintenance program. The National Grid desktop computer is also used to generate various reports and work tickets depending on the user’s need. These reports are utilized to schedule and accomplish distribution maintenance work.

IV. MAINTENANCE

The maintenance activities are scheduled by priority categories with all “A Priority” conditions identified prior to November 1 repaired/corrected by November 30\textsuperscript{th} in New York. The “A Priority” conditions that exist in New England service territories shall be scheduled for repair/corrected on a rolling 12 month basis. The “B Priority” conditions are scheduled based on the reliability of the circuit, load served, and condition of facilities. The “B Priority” maintenance is to be performed on circuits selected by Distribution Planning and Engineering, and identified in the “Energy Delivery Work Plan”. All “B Priority” maintenance as outlined in the “Energy Delivery Work Plan” must be completed by March 31 of that fiscal year. The “C Priority” maintenance work will be completed as planned and directed by the Distribution Planning and Engineering department (Capital expenditures) after reviewing annually for trends that would require expenditures. All “E Priority” conditions shall be responded to immediately upon notification for correction.

V. WORK MANAGEMENT

The time recording of both patrol and maintenance activities is accomplished in the Severn Trent Operating Resource Management System (STORMS).

STORMS requires that the Distribution Inspector/Operations Personnel fill out a daily time sheet. The Distribution Inspector would record their time actually performing the foot patrol inspection of the Distribution system under the DO2105 Activity along with the appropriate work order or a work request if the patrol has been scheduled. For Transmission and Sub-transmission facilities the inspector shall utilize activity TO2100. Work orders or work request numbers can be obtained from the Operations Supervisor or from the Distribution Planning/Area Resource Coordinator (ARC).

Operations Personnel performing scheduled maintenance on the Distribution System should record their time actually performing maintenance activities under the appropriate work request number set up by their Distribution Planning/ARC in their respective area. Operations Personnel performing maintenance activities that have not been scheduled should charge the DM2105 activity along with appropriate work order number.
For Transmission and Sub-transmission utilize activity TM2100. STORMS work request numbers are created when the work has been scheduled by Distribution Planning/ARC. Work orders or work request numbers can be obtained from the Operations Supervisor or from the Distribution Planning/ARC.

VI. COMPLETION

The replacement/repair of an identified maintenance problem code after completion in the field must be updated in the database. The completion of the maintenance problem codes can be done through the edit screen found on the desktop computer. Field personnel that perform the work are required to complete the work order form providing the date completed, and employee ID number. The work order form is returned to the T&D Supervisor who will close out the completed maintenance problem codes in the database at their desktop computer or designate the inspector or clerk to perform the close out. Additional maintenance problems that may be discovered and completed by personnel must be noted on the work order ticket so they can be recorded as work completed on that specific facility.

ALL MAINTENANCE WORK PERFORMED THAT WAS IDENTIFIED ON THE WORK ORDER OR DISCOVERED DURING THE REPAIR/CORRECTION OF THE ORIGINAL MAINTENANCE PROBLEM MUST BE LISTED ON THE DATABASE AND THEN CLOSED OUT WHEN COMPLETE.

VII. DEFINITIONS

**Desktop Computer**: A personal computer that is connected to the National Grid network and used to download the Hand Held device and retrieve the information in the form of reports.

**Elevated Equipment Voltage Test**: An A.C. rms voltage difference between utility equipment and the earth, or to nearby grounded facilities that exceeds the highest perceptible voltage levels for humans.

**Hand Held Computer**: An electronic data recording device that is used in the field to create a record of conditions found.

**Hand-Hole**: An enclosure identified for use in underground systems, provided with an open or closed bottom, and sized to allow personnel to reach into, but not enter, for the purpose of installing, operating, or maintaining equipment or wiring or both.

**Infrared Inspection**: An inspection conducted to detect abnormal heating conditions associated with separable connectors. An infrared inspection is required before work begins in an enclosed space, enclosure, padmounted transformer or padmounted switchgear.

**Inspector**: An underground qualified worker who can identify deficiencies or non-standard construction conditions on National Grid facilities.

**Manhole**: An enclosure identified for use in underground systems, provided with an open or closed bottom, and sized to allow personnel to enter, for the purpose of installing, operating, or maintaining equipment or wiring or both.

**Patrol**: An assessment of National Grid facilities for the purpose of determining the condition of the facility and any associated components.

**Service Box**: See Hand-hole

**Submersible Equipment**: Electric equipment such as transformers and switches that, are generally located within a Hand-hole, Manhole, or Vault.
URD: Underground Residential Distribution

UCD: Underground Commercial Distribution

Underground Distribution Facilities: Manholes, vaults, hand-holes and service boxes, padmounted equipment and the components and equipment contained in these structures. (See GENERAL INFORMATION above).

User: An individual who the program administrator has authorized to use the inspection reporting program.

Vault: An enclosure, above or below ground, which personnel may enter and which is used for the purpose of installing, operating, or maintaining equipment or wiring or both.

VIII. RESPONSIBILITIES

Distribution Engineering Services

1. Update program as necessary.
2. Provide field support and training as requested.

Customer Operations

1. Ensure the Underground Maintenance Program as outlined in this EOP is implemented properly and timely.
2. Select circuits to be patrolled for a running five-year cycle and ensure that the circuits scheduled for patrol are completed each year.
3. Provide qualified personnel as the inspectors, to provide consistent and accurate identified maintenance concerns/problems.
4. Ensure program is completed annually as required.

Inspector

1. Demonstrate the ability to identify maintenance concerns and the aptitude to become proficient in the use of a hand held computer and desktop computer.
2. Demonstrate the understanding and requirements of this EOP.
3. Possess the ability to do walking patrols, collect information on a hand held, download to a desktop computer, edit data, provide requested information/reports/work tickets to supervision, and track/close out work completed in the database.

C&MS

1. At the request of Customer Operations/Distribution Network Strategy obtain, schedule and manage contractors to perform inspections and perform required maintenance.
2. Ensure the Underground Maintenance Program as outlined in this EOP is implemented properly and timely.
3. Ensure program is completed annually as required.
Distribution Network Strategy
1. Provide inspectors where applicable.
2. Provide input into program revisions.
3. Provide program management.
4. Ensure program is completed annually as required.
5. Ensure inspectors are trained.
6. Ensure the Underground Maintenance Program as outlined in this EOP is implemented properly and timely.

Process and Systems
1. Provide and support database.

T&D Technical Training
1. Provide training upon request.

IX. TRAINING

1. Distribution Engineering Services with assistance from the database vendor will provide training on the utilization of handheld computers and the selected database.
2. Distribution Engineering Services along with the training department will provide training for the identification of A, B, C, and E maintenance items to the qualified employee who will be performing the inspections.
Section 3 - Massachusetts revised.
REFERENCE:

NY PSC Order 04-M-0159
Applicable National Grid Safety Rules and Procedures
Elevated Equipment Voltage Testing NG-USA EOP G016

GENERAL INFORMATION:

The purpose of this procedure is to outline the requirements for the patrol and maintenance activities associated with National Grid USA Transmission circuits. The Transmission Maintenance Program is designed to address a variety of maintenance activities required to maintain a safe and reliable Transmission System. Due to the diverse service territories, system construction and voltages, National Grid will utilize the following definitions below to designate which maintenance activities in this EOP are completed in the sections discussed.

- Transmission NY 115kV and above
- Sub-transmission NY 23kV up to and including 69kV
- Transmission New England 69kV and above
- Sub-transmission New England 23kV up to and including 46kV

These patrol and maintenance activities include a ground based patrol on a five year cycle, aerial Infrared on a three year cycle, Transmission Tower footing inspection and repair on a twenty year cycle, Transmission Wood Pole Inspection and Treatment on a ten year cycle, general aerial patrols on a one year cycle, Comprehensive Helicopter Inspections as needed, and Transmission Tower Painting on a twenty year basis. Elevated Equipment Voltage testing on Transmission and Sub-transmission facilities is covered by EOP G016.

APPLICABILITY:

This procedure applies to all personnel involved with or responsible for the inspection and repair of Transmission facilities.

PROGRAM ADMINISTRATOR:

Distribution Engineering Services

Supersedes Document Dated: 07/25/05
Authorized By: Director – Distribution Engineering Services
Approved By: VP – Network Asset Management
I. GROUND BASED PATROL INSPECTION AND MAINTENANCE

Transmission
Sub-transmission

1. Transmission patrols are conducted by a line qualified worker that can identify hazards, deficiencies or non-standard construction conditions on National Grid facilities. The patrols are scheduled in such a manner that each transmission circuit is examined in the field once every five years. Any new facilities added to the system will be incorporated through our Geographic Information System and added to the appropriate inspection cycle.

The patrols are conducted by an Inspector identifying all required maintenance on a hand held computer. The maintenance items identified through this patrol are separated into five priority categories A, B, C, E and F priority. The problem codes identified default to the appropriate priority. The default priority can be adjusted by the individual performing the inspection based on actual field conditions. These priority categories are defined as follows:

A Priority - An identified facility/component or tree condition that must be repaired/replaced as soon as practicable.

B Priority – An identified facility/component condition that shall be considered for repair/replacement as the circuit is scheduled for maintenance by Transmission Asset Management. These identified conditions will be corrected as preventive maintenance and or facility life extension.

C Priority – An identified facility/component condition that is being trended and reviewed by Transmission Asset Management annually that may require replacement through the engineering process (requires project/capital expenditures). Non-capital conditions identified under this priority will be corrected at the discretion of field operations in consultation with Transmission Asset Management.

E Priority – An identified facility/component that must be replaced/repaired immediately to address public safety or system reliability. The inspector shall notify the appropriate operations department for immediate response and corrective action any time an E priority is found during an inspection.

F Priority – An identified forestry condition that should be scheduled as time permits, within the routine right-of-way maintenance and danger tree removal schedules.
ALL “A PRIORITY” CONDITIONS IDENTIFIED PRIOR TO NOVEMBER 1ST MUST BE REPAIRED/CORRECTED BY NOVEMBER 30TH IN NEW YORK.

ALL “A PRIORITY” CONDITIONS IDENTIFIED SHALL BE REPAIRED/CORRECTED WITHIN 12 MONTHS OF INSPECTION IN ALL NEW ENGLAND SERVICE TERRITORIES.

ALL “E PRIORITY” CONDITIONS SHALL BE CORRECTED IMMEDIATELY UPON NOTIFICATION.

ALL “F PRIORITY” CONDITIONS IDENTIFIED DURING THE PATROL ARE TRANSMITTED TO THE SYSTEM FORESTRY GROUP ON AN ANNUAL BASIS FOR INCLUSION IN THE RIGHT-OF-WAY MAINTENANCE PROGRAM.

The Transmission patrol schedule/status is created and tracked by report RPT 3100 Circuit Patrol Status. The T&D Superintendent’s or Transmission Line Services management are responsible to create this schedule for their respective areas. The inspector uses a hand held computer to inspect scheduled circuits recording area, district, employee ID, circuit, pole number, GPS location, type, material make up, condition of steel/concrete, wood pole inspection year and treatment, specific pole information, maintenance problem codes and comments. The Maintenance Problem code listing is shown on the Transmission Field Survey Worksheet (Exhibit 1). The material make up screen will also include prompts for condition information when either steel or lattice is chosen. The condition rating for steel will be on a 1 to 6 scale and concrete condition will be on a 1-5 scale. These scales are as shown:

<table>
<thead>
<tr>
<th>Steel Condition</th>
<th>Concrete Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Serviceable</td>
<td>1 Serviceable</td>
</tr>
<tr>
<td>2 Intact</td>
<td>2 Light Deterioration</td>
</tr>
<tr>
<td>3 Light Corrosion</td>
<td>3 Medium Deterioration</td>
</tr>
<tr>
<td>4 Light Pitting</td>
<td>4 Severe Deterioration</td>
</tr>
<tr>
<td>5 Significant Pitting</td>
<td>5 Very Severe Deterioration</td>
</tr>
<tr>
<td>6 Very Severe Deterioration</td>
<td></td>
</tr>
</tbody>
</table>

The Inspector, while patrolling, shall also complete maintenance codes “532 – Tower numbers missing” and “581 – stencil required”, if found deficient upon inspection. For these two codes, the Inspector will input the code into the handheld as required, as well as completing the work unit in the handheld upon field completion while at the site.

The hand held computer is to be used as the primary vehicle for recording maintenance problems in the field. There will be times where it is not practicable to use the hand held computer due to unfamiliarity or access to one (example: line crew finds maintenance problem and needs to document/record). The method to be used to document/record maintenance in these situations shall be the Transmission Field Survey worksheet, Exhibit 1. This worksheet must be entered into the Transmission database through the desk top computer by inspector, clerk, or supervisor.
## TRANSMISSION FIELD SURVEY WORKSHEET

<table>
<thead>
<tr>
<th>Patrolled Circuit/No.</th>
<th>Unique ID</th>
<th>Pole/Tower No.</th>
<th>Voltage</th>
<th>District</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional Circuit/No.</td>
<td>Unique ID</td>
<td>Pole/Tower No.</td>
<td>Voltage</td>
<td>Distri</td>
</tr>
</tbody>
</table>

### TYPE
- A) Single
- B) H. Frame
- C) 3 Pole
- D) 4 Pole
- E) 5 Pole
- F) 6 Pole
- G) Flex-Tower
- H) Square-Tower
- I) Hairpin
- J) Other

### MATERIAL
- A) Wood (fill in information for each pole i.e 2 pole, 3 pole, 4 pole, etc.)
  - Height ______ Class ______ Year Set ______ Manufacturer ______
  - Year Last Treated ______ Treatment A) External B) Internal C) Both D) Other E) Unknown F) None

### CONFIGURATION
- Deadend
- Target
- Switch Structure
- Davit Arm
- Stand Off
- Other

### STEEL/LATICE CONDITION

<table>
<thead>
<tr>
<th>(Circle One)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
</table>

### POLE *

<table>
<thead>
<tr>
<th>Sub. No.</th>
<th>Priority/ QTY</th>
<th>CONDUCTOR **</th>
<th>Circuit No.</th>
<th>Priority/ QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>510 A BROKEN</td>
<td>/</td>
<td>541 B CONDUCTOR</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>511 B VISUAL ROTTING</td>
<td>/</td>
<td>542 B STATIC</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>512 C LEANING</td>
<td>/</td>
<td>543 A GROUND WIRE</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>513 B REPLACE SINGLE ARMS</td>
<td>/</td>
<td>544 B SLEEVE/CONN</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>514 B REPL DOUBLE ARM</td>
<td>/</td>
<td>545 B RESAG</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>515 B REPAIR BRACES</td>
<td>/</td>
<td>546 B UNDER 25 FT.</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>516 B REPLACE BRACES</td>
<td>/</td>
<td></td>
<td>/</td>
<td>/</td>
</tr>
</tbody>
</table>

### FOUNDATION – GENERAL

<table>
<thead>
<tr>
<th>(Circle One)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
</table>

### LINE HARDWARE

<table>
<thead>
<tr>
<th>Sub. No.</th>
<th>Priority/ QTY</th>
<th>CONDUCTOR **</th>
<th>Circuit No.</th>
<th>Priority/ QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>517 B REPLACE ANCHOR</td>
<td>/</td>
<td>551 B INSULATORS/DAM</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>518 B INSTALL ANCHOR</td>
<td>/</td>
<td>552 B INSULATOR PLUMB</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>519 B REPAIR/REPLACE GUY WIRE</td>
<td>/</td>
<td>553 B HARDWARE DAM</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>521 B TIGHTEN GUY WIRE</td>
<td>/</td>
<td>555 I LIGHTING ARRESTER</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>522 B REPLACE/INSTALL GUY SHIELD</td>
<td>/</td>
<td></td>
<td>/</td>
<td>/</td>
</tr>
</tbody>
</table>

### FOUNDATION – GENERAL

<table>
<thead>
<tr>
<th>Sub. No.</th>
<th>Priority/ QTY</th>
<th>CONDUCTOR **</th>
<th>Circuit No.</th>
<th>Priority/ QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>524 B GUY NOT BONDED</td>
<td>/</td>
<td>563 B EROSION</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>525 B LIGHTNING DAMAGE</td>
<td>/</td>
<td>571 F EROSION</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>526 B WOODPECKER DMG</td>
<td>/</td>
<td>572 F ENCROACHMENTS</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>527 B INSECTS</td>
<td>/</td>
<td>572 F ENCROACHMENTS</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>531 A TOWER LEGS BROKEN</td>
<td>/</td>
<td>573 F DEBRIS</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>532 A NUMBERS MISSING</td>
<td>/</td>
<td>574 F DANGER TREE</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>534 B LOOSE BOLTS/HARD</td>
<td>/</td>
<td>575 F GATE BROKE</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>535 B REPAIR ANTI-CLimb</td>
<td>/</td>
<td>576 A OIL/GAS LEAK</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>536 F VEGETATION ON TOWER</td>
<td>/</td>
<td>577 F ENCROACHMENTS</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>537 B STRUCTURE DAMAGE</td>
<td>/</td>
<td>578 A STENCIL STRUCTURE</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>538 B STRAIGHTEN TOWER</td>
<td>/</td>
<td>579 A SWITCH DAMAGED</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>539 B ARMS DAMAGED</td>
<td>/</td>
<td>580 A DAMAGED GROUND</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>540 B REPLACE SIGNS</td>
<td>/</td>
<td>581 A INSTALL WRNG SIGN</td>
<td>/</td>
<td>/</td>
</tr>
</tbody>
</table>

### MISCELLANEOUS

<table>
<thead>
<tr>
<th>Sub. No.</th>
<th>Priority/ QTY</th>
<th>CONDUCTOR **</th>
<th>Circuit No.</th>
<th>Priority/ QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>541 B BROKEN</td>
<td>/</td>
<td>582 A REPLACED SIGNS</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>542 B VISUAL ROTTING</td>
<td>/</td>
<td>583 A REMOVE STEPS</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>543 A LEANING</td>
<td>/</td>
<td>584 A ADD DIRT &amp; TAMP</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>544 B REPLACE SINGLE ARMS</td>
<td>/</td>
<td>585 A REPLACE SIGNS</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>545 B REPL DOUBLE ARM</td>
<td>/</td>
<td>586 A REMOVE STEPS</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>546 B REPAIR BRACES</td>
<td>/</td>
<td>587 A ADD DIRT &amp; TAMP</td>
<td>/</td>
<td>/</td>
</tr>
</tbody>
</table>

### Comments:

---

**Enter Sub. No. if a multiple Structure**

**Enter Circuit No. if more than circuit on pole**
2. EQUIPMENT TO BE INSPECTED AND MAINTENANCE CODES

- Towers
- Poles
- Crossarms
- Insulators
- Switches
- Reclosers & Sectionalizers
- Conductor
- Grounds
- Guys
- Anchors
- Risers
- Foundations
- ROW

II. AERIAL HELICOPTER PATROL

Transmission Sub-transmission NY

Aerial Helicopter Patrols shall be done on a one-year cycle providing for a visual examination of all Transmission lines. This patrol shall be accomplished by a line-qualified worker recording items such as broken or flashed insulators, leaning structures, broken hardware, tree conditions, ROW problems, and conductor clearance problems. Any item that is observed that might affect the operation, reliability, or safety of the general public must be reported and documented. The use of Exhibit I as a template along with a tape recorder during flight is highly recommended. Conditions/Maintenance problems identified are to be prioritized “A, B, C, E, F” as described in this procedure and must be entered into the database for scheduling and tracking. Additional guidance for tree and insulator problems is shown in Table III and IIIA.

TREE CLEARANCE

(TABLE III)

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Vertical or Lateral Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>23-46 kV</td>
<td>4’ or less</td>
</tr>
<tr>
<td>69 kV</td>
<td>6’ or less</td>
</tr>
<tr>
<td>115 kV</td>
<td>10’ or less</td>
</tr>
<tr>
<td>230 kV</td>
<td>14’ or less</td>
</tr>
<tr>
<td>345 kV</td>
<td>18’ or less</td>
</tr>
</tbody>
</table>
INSULATOR GUIDANCE TABLE
(TABLE IIIA)

Number of Good
Vertical Insulators in String

**Priority A:**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>115 KV</th>
<th>4 or less out of 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>230 KV</td>
<td>7 or less out of 14</td>
</tr>
<tr>
<td></td>
<td>345 KV</td>
<td>10 or less out of 17</td>
</tr>
</tbody>
</table>

**Priority B:**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>115 KV</th>
<th>5 or less out of 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>230 KV</td>
<td>9 or less out of 14</td>
</tr>
<tr>
<td></td>
<td>345 KV</td>
<td>12 or less out of 17</td>
</tr>
</tbody>
</table>

**Priority C:**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>115 KV</th>
<th>6 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>230 KV</td>
<td>10 or more</td>
</tr>
<tr>
<td></td>
<td>345 KV</td>
<td>13 or more</td>
</tr>
</tbody>
</table>

III. TOWER FOOTING INSPECTION AND REPAIR

Transmission

The tower footing inspection and repair maintenance activity is scheduled for a 20-year cycle. This activity consists of excavating the tower footing a minimum of 24” below grade, cleaning the footer, visual inspection, welding or concrete repair if required, application of a protective coating, backfill and compact soil.

IV. WOOD POLE INSPECTION AND TREATMENT

Transmission

The wood pole inspection and treatment maintenance activity is scheduled for a 10-year cycle. This activity consists of excavating the base of a wood pole 18” below grade, shaving/removal of any decayed wood, measurements of the circumference, drilling, measurements for voids, evaluate pole strength per NESC requirements, treat with preservatives, plug drilled holes, backfill and compact soil and perform an overall visual inspection of the structure.

V. AREAL HELICOPTER INFRARED PATROLS

Transmission

Sub-transmission NY

The Aerial Helicopter Infrared Patrol maintenance activity is scheduled for a 3-year cycle with bulk power circuits done yearly. This activity consists of an aerial viewing of transmission line components through a thermal imaging camera. Transmission components found with a temperature between 1 and 20 degrees Centigrade above the “reference temperature”* should be monitored for change and addressed accordingly. Components found to be greater than 20 degrees Centigrade above the “reference temperature” are to be addressed within the next year. Transmission components found to
be greater than 40 degrees Centigrade above the reference temperature are to be addressed as soon as possible as system operating conditions allow. In order to verify the location of the component identified by IR with a temperature anomaly, it is suggested that repair crews utilize a live line micro ohmmeter, such as the SensorLink Corp. Ohmstik, as a confirmation tool.

*Reference Temperature – Reference Temperature refers to the normal real time operating temperature of the conductor or apparatus, which includes all influences that create this temperature such as load, weather and condition. The thermovision camera must have the capability to accurately detect the temperature differential, in degrees C, between the “hot spot” temperature and the nearest point which reflects the expected reference temperature, so as to identify and prioritize the defects found.

VI. COMPREHENSIVE HELICOPTER PATROL

Transmission

The Comprehensive Helicopter Patrol maintenance activity is a comprehensive methodical examination of all components comprising the transmission system by helicopter. The patrol is documented on a structure by structure component based in a data format with pictures. Components that are identified as critical carry the same definitions as “A Priority” work. This type of maintenance activity is conducted on an as needed basis to identify specific problems, reliability issues, or to document condition for planned rebuilds or upgrades.

VII. TOWER PAINTING

Transmission

The Tower painting maintenance activity consists of applying a protective coating system to steel transmission structures. This activity is usually scheduled on a 20-year basis to extend the service life of the steel or meet specific aerial marking requirements per FAA regulations.

VIII. MAINTENANCE DATA BASE

The Maintenance database consists of information (data) downloaded from the hand held and information (data) entered from the desktop computer. The field hand held can be down loaded to any National Grid desk top computer that is connected to the network, and is logged on as a valid user of the T&D Maintenance program. The National Grid desktop computer is also used to generate various reports and work tickets depending on the users needs. These reports are utilized to schedule and accomplish transmission maintenance work.

IX. MAINTENANCE

The maintenance activities are scheduled by priority categories. “E Priority” requires immediate repair. All “A Priority” conditions identified prior to November 1 must be repaired/corrected by November 30th in New York. The “A Priority” conditions that exist in New England service territories shall be scheduled for repair/corrected on a rolling 12 month basis. The “B Priority” conditions are scheduled based on the reliability of the circuit, load served, Line Importance Factor, and condition of facilities. The “B Priority” maintenance is to be performed on circuits selected by Transmission Asset Management (transmission) and Distribution Network Strategy (sub-transmission) and identified in the “Energy Delivery Work Plan”. All “B Priority” maintenance as outlined in the “Energy Delivery Work Plan” must be completed by March 31 of that fiscal year. The “C Priority” maintenance work will be completed as planned and directed by Transmission Asset Management and Distribution Network Strategy (Capital expenditures) after reviewing annually for
trends that would require expenditures. Any “C Priority” work that is not capital expense will be completed at the discretion of the T&D Operating department in consultation with Transmission Asset Management or Distribution Network Strategy.

ALL MAINTENANCE WORK IS TO BE COMPLETED PER NATIONAL GRID STANDARDS.

X. TIME REPORTING

The time recording of both patrol and maintenance activities is accomplished in the Severn Trent Operating Resource Management System (STORMS).

STORMS requires that the Transmission Inspector/Operations Personnel fill out a daily time sheet. The Transmission Inspector would record their time actually performing the foot patrol inspection of the Transmission and Sub-transmission system under the TO1160 Activity along with the appropriate work order or a work request if the patrol has been scheduled. Work orders or work request numbers can be obtained from the Operations Supervisor or from the Transmission Planning/Area Resource Coordinator (ARC).

Operations Personnel performing scheduled maintenance on the Transmission and Sub-transmission systems should record their time actually performing maintenance activities under the appropriate work request number set up by their Transmission Planning/ARC in their respective area. Operations Personnel performing maintenance activities that have not been scheduled should charge the TM1160 activity along with appropriate work order number. STORMS work request numbers are created when the work has been scheduled by Transmission Planning/ARC. Work orders or work request numbers can be obtained from the Operations Supervisor or from the Transmission Planning/ARC.

XI. COMPLETION

The replacement/repair of an identified maintenance problem code must be completed in the database upon field completion. The completion of the maintenance problem codes can be done through the edit screen found on the desktop computer. Field personnel that perform the work are required to complete the work order form providing the date completed, and employee ID number. The work order form is returned to the T&D Supervisor or Transmission Line Services Supervisor who will close out the completed maintenance problem codes in the database at their desk top computer or designate the inspector or clerk to perform the close out. Additional maintenance problems that maybe discovered and completed by personnel must be noted on the work order ticket so they can be recorded as work completed on that specific facility.

ALL MAINTENANCE WORK PREFORMED THAT WAS IDENTIFIED ON THE WORK ORDER OR DISCOVERED DURING THE REPLACEMENT/REPAIR/CORRECTION OF THE ORGINAL MAINTENANCE PROBLEM MUST BE LISTED ON THE DATABASE AND THEN CLOSED OUT WHEN COMPLETE.

XII. DEFINITIONS:

Ground Based Patrol - A walking/vehicle assessment of National Grid transmission facilities for the purpose of determining the condition of the facility and its associated components.

Hand Held Computer - An electronic Data recording device that is used in the field to create a record of conditions found.
Desktop Computer – A personal computer that is connected to the National Grid network that is used to download the Hand Held device and retrieve the information in the form of reports.

Transmission Inspector – A line-qualified worker that can identify deficiencies or non-standard construction conditions on National Grid facilities.

Aerial Infrared – Helicopter based thermographic imaging of connections and equipment.

Tower Footing – Embedded support structure that supports a Transmission tower.

Aerial Patrols – Helicopter based visual examination of Transmission facilities and equipment.

Comprehensive Helicopter Patrol – A comprehensive methodical examination of all components comprising the transmission system by helicopter.

XIII. RESPONSIBILITIES

Distribution Engineering Services
1. Update program as necessary.
2. Provide Customer Operations support and training as requested.

Customer Operations/Transmission Line Services
1. Ensure the Maintenance Program as outlined in this NG-USA EOP T007 is implemented properly and timely.
2. Select circuits to be patrolled for a running five-year cycle and ensure that the circuits scheduled for patrol are completed each year.
3. Provide a qualified line personnel as the inspector, to provide consistent and accurate identified maintenance concerns/problems.

Contract Management Services
1. At the request of Customer Operations obtain, schedule and manage contractors to perform inspections and perform required maintenance.

Inspector
1. Demonstrate the ability to identify Transmission maintenance concerns and the aptitude to become proficient in the use of a hand held computer and desktop computer.
2. Demonstrate the understanding and requirements of this NG-USA EOP T007.
3. Possess the ability to do walking patrols, collect information on a hand held, download to a desktop computer, edit data, provide requested information/reports/work tickets to supervision, and track/close out work completed in the database system.

Distribution Network Strategy
1. Provide input into program revisions.
2. Provide qualified personnel to complete inspection where applicable.
3. Ensure the Maintenance Program as outlined in this NG-USA EOP T007 is implemented properly and timely.
4. Ensure inspectors are trained where applicable.
5. Provide program management.
Process and Systems
1. Provide and support database.

T&D Technical Training
1. Provide training upon request.

Transmission Network Asset Strategy
1. Provide input into program revisions.
2. Provide schedule for Tower Footing Inspection, Wood Pole Inspection and Treatment, Aerial Helicopter Infrared Patrols, Comprehensive Helicopter Patrols, and Tower Painting.

XIV. TRAINING

1. Distribution Engineering Services with assistance from the database vendor will provide training on the utilization of handheld computers and the selected database.
2. Distribution Engineering Services along with the training department will provide training for the identification of A, B, C, E, and F maintenance items to the qualified worker who will be performing the inspections.
“B” work completion date changed to March 31 of that fiscal year.
SUBJECT: Street Light Standard Inspection Program

REFERENCE:

Applicable National Grid Safety Rules and Procedures
NY PSC Order 04-M-0159
Elevated Equipment Voltage NG-USA EOP G016

GENERAL INFORMATION:

The purpose of this procedure is to outline the requirements for the inspection cycle for Street Light Standard installations owned by National Grid in New York as required by the New York Public Service Commission’s “Electric Safety Standards” issued on January 5, 2005. This procedure specifies the inspection interval and requirements for New York only.

The inspection shall include identifying and reporting the physical condition of street lighting equipment on street lighting standards. Street lights attached to wood poles are inspected as part of the Overhead Distribution Inspection Patrol covered by NG-USA EOP D004.

All street lighting equipment will be inspected for physical damage, potentially hazardous conditions or obvious deterioration.

Inspections will be recorded on a hand held computer. The maintenance items identified during this inspection will be separated into four priority categories A, B, C, and E priority. The problem codes identified default to the appropriate priority. The default priority can be adjusted by the individual performing the inspection based on actual field conditions. These priority categories are defined as follows:

A Priority - An identified facility/component that must be repaired/replaced as soon as practicable.

B Priority – An identified facility/component condition that shall be considered for repair/replacement as the facilities are scheduled for maintenance by Distribution Planning and Engineering. These identified conditions will be corrected as preventive maintenance and or facility life extension.

C Priority – An identified facility/component condition that is being trended and reviewed by Distribution Planning and Engineering that may require replacement through the engineering process (Requires project/Capital expenditures). Non-capital conditions identified under this priority will be corrected at the discretion of field operations.
E Priority – An identified facility/component that must be replaced/repaird immediately to address public safety or system reliability. The inspector shall notify the appropriate operations department for immediate response and corrective action any time an E priority is found during an inspection.

ALL “A PRIORITY” CONDITIONS IDENTIFIED PRIOR TO NOVEMBER 1ST MUST BE REPAIRED/CORRECTED BY NOVEMBER 30TH.

ALL “E PRIORITY” CONDITIONS SHALL BE CORRECTED IMMEDIATELY UPON NOTIFICATION.

Equipment will be inspected on a five year cycle such that one-fifth of the inspections should be scheduled on an established annual basis.

PROGRAM ADMINISTRATOR:

Distribution Engineering Services

APPLICABILITY:

This procedure applies to all personnel involved with or responsible for the inspection and maintenance of street lighting standards and associated facilities owned by National Grid in New York.

SCOPE:

I. Patrols
II. Equipment to be Inspected and Maintenance Codes
III. Maintenance Data Base/Reports
IV. Maintenance
V. Work Management
VI. Completion
VII. Definitions
VIII. Responsibilities
IX. Training

I. PATROLS:

Street Lighting inspections will be performed as patrols and are conducted by a street light qualified worker. The patrols are scheduled in such a manner that street lighting facilities are inspected once every five years. Street Light Asset Management is responsible for creating this schedule for their respective areas. The Distribution Inspector uses a hand held computer to record employee ID, region, district, street lighting installation standard number, GPS location, Priority A, B, C and E maintenance items, and comments. The listing of these maintenance items are shown in Table I. Any new facilities added to the system will be incorporated through our Street Light Inventory Data (OLDS) and added to the appropriate inspection cycle. The street light standards inspections scheduled for the year shall be completed by November 30th. The inspector shall place the street light standard number on the facility if not found numbered during the patrol.

II. EQUIPMENT TO BE INSPECTED AND MAINTENANCE CODES:

- Luminaires
- Arms
- Standards
- Foundations
- Conductor
### TABLE I

**PRIORITY A, B and C MAINTENANCE ITEMS FOR OUTDOOR LIGHTING**

<table>
<thead>
<tr>
<th>Category</th>
<th>CODE</th>
<th>Default Priority</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luminaire</td>
<td>300</td>
<td>B</td>
<td>Light &quot;ON&quot; Day</td>
</tr>
<tr>
<td></td>
<td>301</td>
<td>B</td>
<td>Replace Lens</td>
</tr>
<tr>
<td></td>
<td>302</td>
<td>C</td>
<td>Clean</td>
</tr>
<tr>
<td></td>
<td>303</td>
<td>C</td>
<td>Paint</td>
</tr>
<tr>
<td></td>
<td>304</td>
<td>C</td>
<td>Replace Wattage Label</td>
</tr>
<tr>
<td></td>
<td>305</td>
<td>A</td>
<td>Wires Exposed</td>
</tr>
<tr>
<td></td>
<td>306</td>
<td>B</td>
<td>Damaged - Replace</td>
</tr>
<tr>
<td></td>
<td>307</td>
<td>I</td>
<td>Missing</td>
</tr>
<tr>
<td></td>
<td>308</td>
<td>C</td>
<td>Other - Comments</td>
</tr>
<tr>
<td>Arm</td>
<td>320</td>
<td>B</td>
<td>Damaged - Replace</td>
</tr>
<tr>
<td></td>
<td>321</td>
<td>C</td>
<td>Damaged - Repair</td>
</tr>
<tr>
<td></td>
<td>322</td>
<td>C</td>
<td>Rust - Paint</td>
</tr>
<tr>
<td></td>
<td>323</td>
<td>C</td>
<td>Other - Comments</td>
</tr>
<tr>
<td>Standard</td>
<td>330</td>
<td>B</td>
<td>Struct Damage - Replace</td>
</tr>
<tr>
<td></td>
<td>331</td>
<td>C</td>
<td>Damaged/Leaning - Repair</td>
</tr>
<tr>
<td></td>
<td>332</td>
<td>C</td>
<td>Paint/Maintenance</td>
</tr>
<tr>
<td></td>
<td>333</td>
<td>A</td>
<td>Access Cover - Replace</td>
</tr>
<tr>
<td></td>
<td>334</td>
<td>B</td>
<td>Bad Wiring - Repair</td>
</tr>
<tr>
<td></td>
<td>335</td>
<td>C</td>
<td>Stencil Required</td>
</tr>
<tr>
<td></td>
<td>336</td>
<td>B</td>
<td>Temporary Overhead</td>
</tr>
<tr>
<td></td>
<td>337</td>
<td>A</td>
<td>Ground - Repair</td>
</tr>
<tr>
<td></td>
<td>338</td>
<td>I</td>
<td>Knockdown/Missing</td>
</tr>
<tr>
<td></td>
<td>339</td>
<td>C</td>
<td>Other - Comments</td>
</tr>
<tr>
<td>Foundation</td>
<td>350</td>
<td>B</td>
<td>Damaged/Leaning - Repair</td>
</tr>
<tr>
<td></td>
<td>351</td>
<td>B</td>
<td>Anchor Bolts Damaged</td>
</tr>
<tr>
<td></td>
<td>352</td>
<td>B</td>
<td>Elevated - Repair</td>
</tr>
<tr>
<td></td>
<td>353</td>
<td>C</td>
<td>Other - Comments</td>
</tr>
</tbody>
</table>

**Note:** The default priority of “I” for missing luminaries and street light standards is utilized for informational use only. If the standard is missing or missing a street light head, the item shall be reviewed with records, if found to be a required and an active asset it shall be changed to an A priority.

### III. MAINTENANCE DATA BASE/REPORTS

The maintenance data base consists of records downloaded from the hand held computers and information entered from the desktop computers. The records can be downloaded to the database through any desktop computer that is connected to the network and the inspector is logged on as a valid user of the Street Light Standard Inspection program. The desktop computer is also used to generate various reports and work tickets, depending on the user’s need. These reports/work tickets are utilized to schedule and accomplish distribution maintenance work.
IV. MAINTENANCE

The maintenance activities are scheduled by priority categories, with the exception of “E Priority” which requires immediate repair. All “A Priority” conditions identified prior to November 1 repaired/corrected by November 30th. The “B Priority” conditions are scheduled based on the reliability of the circuit, and age of facilities. The “B Priority” maintenance is to be performed as selected by Distribution Planning and Engineering and identified in the “Energy Delivery Work Plan”. All “B Priority” maintenance as outlined in the “Energy Delivery Work Plan” must be completed by March 31 of that fiscal year. The “C Priority” maintenance work will be completed as planned and directed by the Distribution Planning and Engineering department and Street Light Asset Management (Capital expenditures) after reviewing annually for trends that would require expenditures. Any “C Priority” work that is not capital expense will be completed at the discretion of the T&D operating department.

V. WORK MANAGEMENT

The time recording of both patrol and maintenance activities is accomplished in the Severn Trent Operating Resource Management System (STORMS).

STORMS requires that the Distribution Inspector/Operations Personnel fill out a daily time sheet. The Distribution Inspector would record their time actually performing the foot patrol inspection of the Distribution system under the DO4025 Activity along with the appropriate work order or a work request if the patrol has been scheduled. Work orders or work request numbers can be obtained from the Operations Supervisor or from the Distribution Planning/Area Resource Coordinator (ARC).

Operations Personnel performing scheduled maintenance on the Distribution System should record their time actually performing maintenance activities under the appropriate work request number set up by their Distribution Planning/ARC in their respective area. Operations Personnel performing maintenance activities that have been not been scheduled should charge the DM4025 activity along with appropriate work order number. STORMS work request numbers are created when the work has been scheduled by Distribution Planning/ARC. Work orders or work request numbers can be obtained from the Operations Supervisor or from the Distribution Planning/ARC.

VI. COMPLETION

The repair/correction of an identified maintenance item must be reported in the database. This reporting can be done through the edit screen found on the desktop computer. Field personnel that perform the repair/correction are required to complete the work order form providing the date completed, and employee ID number. The work order form is returned to the T&D Supervisor who will report the completed maintenance items in the database at their desktop computer, or designate the distribution inspector or a clerk to perform the reporting. Additional maintenance items, not in the database, that may be discovered and completed by personnel must be noted on the work order ticket so they can be recorded as work completed on that specific facility.

ALL MAINTENANCE WORK PERFORMED THAT WAS IDENTIFIED ON THE WORK ORDER OR DISCOVERED DURING THE REPAIR/CORRECTION OF THE ORIGINAL MAINTENANCE ITEM MUST BE LISTED IN THE DATABASE AND THEN REPORTED WHEN COMPLETE.
VIII. DEFINITIONS

Patrol – A walking assessment of distribution facilities for the purpose of determining the condition of the facility and its associated components.

Hand Held Computer – A portable, self-contained electronic data recording device used to create a record of conditions found in the field.

Distribution Inspector – A street light qualified employee who can identify deficiencies, or non-standard construction conditions, on the Company’s distribution facilities.

Valid User – An individual who has been authorized to use the Street Lighting Maintenance Program by the Program Administrator.

Street Light Standard – A metallic or fiberglass pole which supports street lighting luminaire(s) and associated wiring.

IX. RESPONSIBILITIES

Distribution Engineering Services
1. Update program as necessary
2. Provide field support and training as requested.

Customer Operations
1. Provide qualified personnel as the distribution inspectors, to provide consistent and accurate data or to contact Contract Management Services for contracting where applicable.

Distribution Inspector
1. Demonstrate the ability to identify maintenance items and the aptitude to become proficient in the use of a hand held computer and desktop computer.
2. Demonstrate the understanding and requirements of this National Grid EOP.
3. Possess the ability to do patrols, collect information on a hand held, download to a desktop computer, edit data, provide requested information/reports/work tickets to supervision, and track/close out work completed in the database.

Contract Management Services
1. At the request of Customer Operations/Distribution Network Strategy obtain, schedule and manage contractors to perform inspections and perform required maintenance.

Street Light Asset Management
1. To develop a five-year inspection schedule of all facilities covered by this EOP.

Distribution Network Strategy
1. Provide input into program revisions.
2. Ensure the program as outlined in this EOP is completed each year.
3. Provide qualified personnel to inspect where applicable.
4. Ensure all inspectors have been trained.
5. Provide program management.
Process and Systems
   1. Provide and support database.

T&D Technical Training
   1. Provide training upon request.

VII. TRAINING

1. Distribution Engineering Services with assistance from the database vendor will provide training on the utilization of handheld computers and the selected database.
2. Distribution Engineering Services along with the training department will provide training for the identification of A, B, C and E maintenance items to the qualified worker who will be performing the inspections.
Minor changes to procedure.
VISUAL AND OPERATIONAL (V&O) INSPECTION

SUBSTATION MAINTENANCE STANDARD

1. Introduction

Substation Inspection or Visual and Operational (V&O) Inspection of each Substation and Switchyard is a key element in the National Grid USA preventive maintenance program. V&O Inspections are performed with the apparatus in service and are designed to detect abnormal conditions before the apparatus is damaged or a customer outage occurs. Data collected during the V&O Inspection is one of the elements used by AIMMS to prioritize individual apparatus for complete and diagnostic inspections.

2. Schedule

Each transmission and distribution substation and switchyard will have a V&O Inspection at least bimonthly.

3. V&O Guidelines

3.1 To provide uniform and effective V&O Inspections throughout National Grid, the EOP Book should be referenced for detailed information on the inspection of each type of apparatus.

1) Some of the typical items to be checked include: air, hydraulic and gas pressures, operation counters, oil levels and temperatures, and visual condition.

3.2 The station should be inspected for cracked or broken line terminators, bus supports and post insulators, heat discolored wire and wire terminations and blown surge arresters. All fuses and disconnects should be checked for proper seating and heat discoloration.

3.3 Alarm and communication radios operation should be verified. The telephones should be checked for proper operation.

3.4 Station Service secondary supplies should be checked alive and transfer switches checked for correct position.

3.5 Structures and foundations should be inspected for deterioration, damage and paint condition.

3.6 Substation security measures must be checked for proper operation and signs of unauthorized entry. This includes: fencing, gates, warning signs, entry alarms, locks and chains.

3.7 General substation housekeeping should also be taken care of.
INTRODUCTION
This procedure describes the methods used to perform Visual and Operational (V&O) Inspections of electrical substations used in the transmission and distribution of electricity.

PURPOSE
V&O Inspections, are performed with the apparatus in service, and are used to:
- Verify the security of fences, gates etc. that prevent entry of the public, and provide a legal record of their inspection.
- Detect any hazards to company employees or the public.
- Verify that animal protection measures are present and in good condition.
- Detect abnormal conditions before the apparatus is damaged or a customer outage occurs.
- Collect data (counter readings, fault operations etc.) used to prioritize individual apparatus inspections.
- Collect data (regulator travels, load readings, relay targets etc.) used for system operation purposes.

ACCOUNTABILITY
Substation and other Supervisors supervising inspection and maintenance activities.
Substation and other Workers performing inspection and maintenance activities.

REFERENCES
National Grid USA Safety Handbook
EOP 400.13.1 Oil Leak Reporting Procedure
EOP 400.08.1 Trouble Reporting Procedure
EP-14 Oil Filled Electrical Equipment Management
Manufacturer’s Installation, Operating, and Maintenance manuals for the specific equipment to be inspected.
Manufacturer’s operating manuals for the specific test equipment to be used.
PROCEDURE CONTENTS

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1. Test Equipment Required.
   1.1 Digital Multi-meter, IEC 1010-1 Cat. IV
       1) Spare battery
   1.2 Recloser Battery test meter with load test feature.
       a) For Form 3 Recloser battery tests.
   1.3 Hand held Infrared Thermometer

2. Materials Required.
   2.1 PDA with National Grid V&O software installed.
   2.2 Substation V&O Inspection Report form.
   2.3 Inspection Report from last V&O inspection.
   2.4 Substation V&O Checklist form.
   2.5 Clipboard
   2.6 Binoculars
   2.7 Flashlight
   2.8 Magnet for resetting drag hands
   2.9 Additional items listed in Appendix A
3. **Initial Substation Entry**
   3.1 Personal Protective Equipment.
      1) Minimum requirement is ANSI Z41/EH rated safety footwear, hard hat and safety glasses.
   3.2 Vehicles entering substation.
      1) Lower and/or insure antennas will maintain minimum approach distances to energized conductors and apparatus.
      2) Use extreme caution when maneuvering to avoid hitting apparatus or structures or violating minimum approach distances.

4. **Inspect Yard**
   4.1 Perform a quick initial inspection for:
      1) Alarms.
      2) Cut or removed ground grid or ground grid connections.
      3) Obvious damage.
      4) Security of gates, fence and locks.
      5) Unusual noises.

5. **Notify the System Operator**
   5.1 Inform them you are in the Station for a V&O Inspection and that you will be testing alarms.
   5.2 Ask System Operator if any equipment has been tagged out or relays blocked.

6. **Reporting**
   6.1 Fill out top of the V&O Inspection Checklist.
   6.2 Verify the correct Substation Inspection is selected in the PDA.
   6.3 During the V&O Inspection all abnormal conditions, including check blocks, should be marked in red pen or pencil. Abnormal check blocks, and conditions, should also be explained under remarks.
      1) See Appendix B – Trouble Reporting and Appendix C – Oil Leak Reporting for definitions and additional information.
   6.4 Record findings in the PDA if listed in the PDA “round”. Record other readings on the Substation V&O Inspection form or the Substation V&O Checklist form.
   6.5 Fill out top of both sides of the Substation - V&O Inspection Report
      1) Enter the work order number
      2) Enter the complete name and number of the substation being inspected.
      3) Fill the names of the person or persons performing the inspection.
      4) Number each sheet used in the inspection and put the total pages used for the station on all sheets.
      5) Fill in date of the V&O Inspection.
      6) Record starting time of inspection including am/pm.
      7) Ambient Temperature - Record outside temperature.
      8) Record the control house (inside) temperature.
7. **Control House**

   7.1 Check control house door locks working and in good condition.

   7.2 **Station Log Book**

      1) Enter the date, time and employee names who are performing the V&O Inspection.
      2) Check the Station Log Book for abnormal conditions that can be corrected during the V&O Inspection.
         a) After the V&O Inspection, record all abnormal problems found in the Log Book, with red pen, and whether they were corrected or not.

   7.3 **Verify Check Lists Posted – New England only.**

      1) Approved Apparatus List.
      2) Ungrounded Apparatus List.
      3) Energized Apparatus List.

   7.4 **SPCC – SPCC locations only.**

      1) Verify SPCC Plan is available at the substation.
      2) Verify SPCC notification list posted.
      3) Check oil spill containment kits complete and in good condition.

   7.5 **Control Panels**

      1) **Indicating Lights**
         a) Check that the indicating lights on the control board are working.
         b) Check the available stock of spare bulbs; restock as necessary.
         c) Inspect rear of Control boards for any signs of overheating, burned wiring, moisture, etc.

   7.6 **Noises - Listen for any unusual noises from relays, modules, RAPRs, timer circuits etc.**

   7.7 **Relay targets and alarms.**

      1) Record targets and alarms on the V&O Report and in the station log book.
         a) List the apparatus affected indicating circuit designation, phase and type of relay or alarm,
      2) Reset and report relay targets and alarms to the System Operator and your supervisor.

   7.8 **Reclosing Relays**

      1) Check that reclosing relays are in service.
         a) Record any reclosing relays that are off and tagged.
         b) Report any reclosing relays that are off and not tagged to the System Operator.
      2) Verify mechanical reclosing relays is are in the start or zero position.

   7.9 **Ground Trip Switches (cutouts)**

      1) Check that all ground trip relays are in service (ON).
         a) Record any ground trip switches that are off and tagged.
         b) Report any ground trip switches that are off and not tagged to the System Operator.
7.10 Bus Transfer Schemes
1) Check both buses alive (load ammeters, bus voltmeters bus alive lights).
2) Check timers reset
3) Check that the sequence timers in normal position
4) Check transfer scheme auto
   a) Record any auto transfer switches that are manual or off and tagged.
   b) Report any auto transfer switches that are manual or off and not tagged to the System Operator.
5) Check tie breakers properly setup (setup varies by station scheme).

7.11 High Side Transfer Schemes
1) Check both lines alive (load ammeters, line alive lights).
2) Check timers reset
3) Check that the sequence timers in normal position
4) Check transfer scheme auto
   a) Record any auto transfer switches that are manual or off, and tagged.
   b) Report any auto transfer switches that are manual or off, and not tagged to the System Operator.
5) Check air break/circuit breaker/circuit switcher status (open or closed).

7.12 Annunciator and Alarm Test Switches
1) Annunciator panel
   a) Move toggle switches, that are not tagged, to the TEST position to check lights. This will send an alarm to the Control Center.
   b) To clear trouble condition, turn the toggle switch to the reset position, then back to ON.
   c) Check with supervisor before testing any switches that are in the off position.
   d) Verify the System Operator received the alarms.
2) Test Switches
   a) If the alarm light is on perform steps b) through f).
   b) Verify the System Operator received the alarm.
   c) Open knife blades one by one and leave open until the light goes out and the alarm clears.
   d) Close the knife switches opened one at a time, checking for alarm indications.
   e) When the alarm light comes on reopen the last switch closed and continue closing the rest. This will find multiple alarms, if present.
   f) Operating the knife switches does not reset this type of alarm system. The light only stays out when the trouble condition has cleared.
3) Repair of alarm conditions.
   a) Alarm conditions should be corrected during the V&O Inspection.
   b) If the alarm condition can not be corrected during the V&O:
      The alarm should be cleared by opening the test twitch or turning the annunciator switch to OFF.
      The switch should be tagged with the date, reason and inspectors name.
      Both the System Operator and your supervisor should be notified that the alarm condition exists and the alarm point is off.

7.13 Radio Alarms
1) Inspect condition of radio system for damage, and proper operation.
2) If individual alarms have not been sent to the System Operator send a test alarm to from the radio cabinet.
   a) Verify the System Operator received the alarm.
3) Make sure cabinet door is closed so the receiver voice communication is disabled.

7.14 Tags and Switching Order/Markup Pads and Supplies
1) Check the stock of Clearance and Control Tags.
   a) Restock as necessary.
2) Check the stock of Ground Device Identification Tickets (GDIT).
   a) Restock as necessary.
3) Check the stock of Filed Switching Order Pads
   a) Restock as necessary.
4) Check that pens (red and blue/black) and pencils are available.
   a) Restock as necessary.

7.15 Control House Heating and Lighting
1) Test control house lighting.
   a) Replace any defective bulbs, or ballasts or sockets.
2) Test emergency lighting.
   a) Replace batteries if needed
3) Inspect heaters, fans and thermostats for proper operation. Make sure fans are not broken or bound up and they are in good working order.

7.16 Station Service and Transfer Switch
1) Check transfer switch on preferred supply
2) Check transfer switch for damage or overheating.
3) Test and record preferred and alternate secondary voltages at transfer panel.

7.17 Check AC supply panels for:
1) Tripped circuit breakers.
2) Circuit breakers in the proper position.

7.18 Check DC Circuit Breaker of Fuse Panel
1) Check DC supply panels for:
   a) Tripped circuit breakers or blown fuses.
   b) Circuit breakers in the proper position.
7.19 Protective Grounds  
1) Check that grounds in station are in sets of 3 and that they are hung up properly.  
2) Check that the phase end and ground clamps are in good working order.  
3) Lubricate as required.  
4) Inspect for the cracked or cut insulation and broken conductor strands.  
5) Replace or repair damaged protective grounds. Do not leave damaged grounds at the station.

7.20 Switch Sticks  
1) Inspect Switch Sticks and Grounding Sticks for current dielectric test date.  
   a) Send out of date sticks to lab for testing.  
2) Inspect Switch Sticks and Grounding Sticks for surface contamination, damage and proper operation.  
   a) Clean if necessary  
3) Insure Switching and Grounding Sticks are stored properly.

7.21 Fire Equipment  
1) Inspect fire extinguishers to be properly secured and in their marked locations.  
2) Update inspection cards.  
3) Record out of date fire extinguishers on the V&O and record for future replacement.  
4) Discharged fire extinguishers shall be reported to the appropriate supervisor for recharging.  
5) Discharged or partially discharged fire extinguisher shall be removed from the substation.

7.22 Phone Lists  
1) Verify local and regional System Operator phone numbers are posted and correct.  
2) Verify that the emergency telephone list is posted and clearly visible at each telephone location.

7.23 Cleanliness and General Condition -  
1) Clean control house floors and sanitary facilities, empty wastebaskets and dust as necessary.  
2) Inspect control house for water leaks.  
3) Check for signs of animal entry into control house.  

7.24 Turn on yard lights, so they can be checked during the Yard Inspection.

8. **Yard Inspection**  
8.1 Walk the fence and inspect:  
1) Barbed wire - Strands to be intact and tight.  
2) Fence fabric - Holes or breaks in the chain link.  
3) Fence Ties - Loose or missing fence tie wires.  
4) Fence Erosion - Signs of erosion or digging under the fence.  
   a) Space below fence should be less than 3 inches.
5) Grounding - Ground conductor and connections secure and connected at every other fence post. Posts on both sides of gates should be grounded.

6) Fence Posts – Sound, not rusted through at ground level and not been raised by frost.

8.2 Gates
1) Test gates for proper operation.
   a) Gates should swing easily out of the way.

2) When closed, the gates should be chained tightly, or locked, with minimal space.

3) Verify locking chains, hardware and locks present and in good condition.

8.3 Check for proper “Danger High Voltage” warning signs:
1) Every 50 feet along perimeter of fence.

2) On gates and on non-hinged side of gate. (see National Grid Standard #0105)

8.4 Substation yard security problems shall be corrected or reported immediately to supervisor.

8.5 Vandalism related problems should be specifically recorded as such, and reported to supervisor.

8.6 Yard Lights
1) Check all yard lights working. (Yard lights should have been turned on during control house inspection.)

2) Repair broken bulbs, glass fixtures, spot light heads, or other lighting that needs attention.
   a) If work cannot be completed safely and while maintaining safe work clearances or if special equipment such as a bucket truck is needed, note on the V&O report.

8.7 Vegetation
1) Check for any growth of trees or vegetation in fence and gate areas that animals or people could used to climb over the fence.
   a) Cut or record for the Arborist to have removed.

2) Record vegetation growth within the substation that requires spraying or removal.

8.8 Bus and structure.
1) Record missing or damaged animal protection devices.

2) Inspect insulators for:
   a) Broken, chipped or damaged skirts.
   b) Carbon tracking or flash over.
   c) Surface contamination (dirt, rust, salt spray etc.).
   d) Broken or damaged insulators should be recorded on V&O Report.

3) Broken porcelain should be picked up off the ground.

4) Visually inspect current and voltage transformers for damage or signs of overheating.

5) Visually inspect arresters for:
   a) Blown or damaged arresters
   b) Surface contamination
6) Visually inspect potheads and cable terminators for:
   a) Damage and leaking compound.
   b) Surface contamination

8.9 Unusual Noises
1) Be alert for arcing, gurgling and pinging noises which could indicate imminent and
   violent equipment failure.
2) Report unusual noises immediately and record them on the V&O Report.

8.10 Structure and apparatus ground connections
1) Inspect for any cut, broken or missing ground connections to apparatus, structures and
guy wires.
2) Inspect static wires and record any problems.
3) Visually Inspect Station Service Transformers for:
   a) Evidence of oil leaks on transformer tank, and on the ground.
   b) Bushing damage or surface contamination.
   c) Damaged or improperly closed primary fuses.
   d) Output Voltage if not previously measured at station service transfer switch.

8.11 Inspect buildings junction boxes, structures etc. for overall paint condition
1) Record items needing attention.

8.12 Clean up substation yard.
1) Remove broken porcelain, debris, and trash
2) If area requires major clean up or crushed stone requires leveling, note on V&O Report.
3) If equipment or materials are intentionally stored in the yard insure that they are neatly
   placed and not a hazard to personal. Barricade area if necessary.
   a) Storage should be in compliance with EOP 499.10.1 Substation Work Area
      Identification Procedure.

9. Oil Leak Reporting
9.1 Oil filled apparatus must be inspected for any signs of leaks.
1) The oil leak status shall be recorded for each piece of oil filled apparatus that has an oil
   leak screen in the PDA.
2) Leaks from small apparatus that do not have an oil leak screen in the PDA should be
   recorded in a PDA notes screen.
9.2 Oil Leak Status Codes
1) Oil leaks are categorized as follows:
   a) Unknown – Unknown is used to indicate that no information has been entered in AIMMS for this equipment.
   b) Clean - Apparatus is dry and shows no evidence of oil leaks.
   c) Repaired – A leak is found and repaired, note the repairs made.
   d) Weep - Anytime the external surface of a piece of apparatus is wet with oil. Note the location and, if possible, cause of the leak.
   e) Leak - Oil is running off or about to run off the external surface of containers or electrical apparatus. Required Action

9.3 Leaks categorized as Leak require immediate action to stop the leak or contain the released oil.

9.4 All leaks require creation of a Leak Report Work Order.
1) When the supervisor reviews the V&O inspection work order round screen all leak status changes and notes will show up as exceptions.
2) The Supervisor will then create a Leak Report Work order (Type LR) in Work Order Tracking or Quick Reporting.

9.5 Leaks From PCB Equipment
1) If a leak is discovered from equipment classified as over 500 ppm PCB cleanup must begin within 48 hours (40 CFR 761.30(a)(1)(x).
2) The inspection records must also include:
   a) The location of the leak;
   b) The estimate of fluid released;
   c) The date and description of any cleanup, containment, repair or replacement;
   d) The results of any containment (for example, was containment successful or not).
   e) The daily inspection results required for uncorrected, active leaks (refer to Environmental Procedure EP-14).
   f) The records must be available for inspection by the EPA and must be maintained for at least three years after disposal of the equipment.

10. Apparatus Inspections
Refer to the V&O Inspection sections of the following EOP’s for apparatus inspections.

Circuit Breakers
EOP 401.01.2 – Air Magnetic Circuit Breaker Maintenance Procedure
EOP 401.02.2 – Oil Circuit Breaker Maintenance Procedure
EOP 401.03.2 – Vacuum Circuit Breaker Maintenance Procedure
EOP 401.04.2 – Air Blast Circuit Breaker Maintenance Procedure
EOP 401.05.2 – Two Pressure Gas Circuit Breaker Maintenance Procedure
EOP 401.06.2 – Gas Puffer Circuit Breaker Maintenance Procedure
EOP 401.07.2 – Station Recloser Maintenance Procedure
EOP 401.08.2 – Vacuum Switch Maintenance Procedure
Transformers
  EOP 402.01.2 – Power – 15 MVA and above Maintenance Procedure
  EOP 402.02.2 – Power – Below 15 MVA Maintenance Procedure
  EOP 402.03.2 – Dry Type Transformer Maintenance Procedure
Instrument Transformers
  EOP 403.01.2 – Currents, Potentials and Metering Maintenance Procedure

Voltage Regulators
  EOP 404.01.2 – Step Voltage Regulator Maintenance Procedure
  EOP 404.02.2 – Induction Voltage Regulator Procedure

Emergency Generators
  EOP 405.01.2 – Emergency Generators Maintenance Procedure

Batteries & Chargers
  EOP 406.01.2 – Lead/Acid Battery Maintenance Procedure
  EOP 406.03.2 – Static Changers Maintenance Procedure

Sensing Devices
  EOP 407.01.1 – Bushing Potential Device Maintenance Procedure
  EOP 407.02.2 – Coupling Capacitors and CCVTs Maintenance Procedure
  EOP 407.03.2 – Wave Trap Maintenance Procedure
  EOP 407.04.2 – Resistive Coupled Potential Device Maintenance Procedure

Capacitors
  EOP 408.01.2 – Station Capacitor below 69kV Maintenance Procedure

Disconnect Switches
  EOP 409.01.2 – Disconnect Switches Maintenance Procedure
  EOP 409.02.2 – Circuit Switchers Maintenance Procedure
  EOP 409.03.2 – High Speed Grounding Switch Maintenance Procedure
  EOP 409.04.2 – Gas Insulated Disconnect Switch Maintenance Procedure
  EOP 409.05.2 – Gas Insulated Ground Switch Maintenance Procedure

Load Tap Changer
  EOP 412.01.2 – Load Tap Changer Maintenance Procedure

Reactors
  EOP 413.01.2 – Dry Type Reactor Maintenance Procedure
  EOP 413.02.2 – Oil Filled Reactor Maintenance Standard

Surge Arresters
  EOP 419.01.2 – Surge Arrester Maintenance Procedure

Network Protectors
  EOP 421.03.2 – Network Transformers and Protectors Maintenance Procedure
11. Final Checklist
11.1 Turnoff yard lights
11.2 Verify all abnormal conditions found are entered in station log book.
11.3 Call the System Operator and notify them that the V&O Inspection has been completed and you will be leaving the station.
   a) Report any abnormal conditions, alarms or relay targets found.
11.4 Turn control house lights off and lock doors.
11.5 Re-arm security alarms.
11.6 Close and securely lock gate.
11.7 Turn in completed V&O Inspection Report to supervisor.
11.8 Return PDA to cradle and upload Station Inspection “round”.

12. Appendix A. - Additional Materials
Not all of the listed items will be required in all areas. It is suggested that the items required for a particular area be stocked in the vehicle used for V&O Inspections or a large container that can be taken when inspections are to be done.

12.1 Cleaning Supplies
   1) Broom and dust pan
   2) Rags
   3) Trash bags

12.2 Repair and Maintenance
   1) Shovel
   2) Ladder
   3) Electrical tape
   4) Small hand tools

12.3 Personal Protective Equipment
   1) Acid resistant gloves
   2) Face Shield and Apron

12.4 Station Supplies
   1) Spare Station Log Books
   2) System Operator (phone number) cards
   3) Spare operations counter cards
   4) Pen, pencils and erasers (red pencil for trouble)
   5) Clearance and Control Tags
      a) Red Tags
      b) Non-Reclose Assurance (NRA) Tags
      c) Hold Tags
      d) Station Control (SCT) Tags
      e) Worker Placards
   6) Ground Device Identification Tickets (GDIT)
   7) Field Switching Order pads
12.5 Security Supplies
1) Spare Padlocks Locks:
   a) Long shank 5105873
   b) Short shank 5105872
2) Chain for gates
3) Fence tie wire
4) Fence fabric
5) Warning signs 0810029

12.6 Indicating Lamps and Lenses:
1) Switchboard. LED (Red) S/C 5100183
2) Lens Cap (Red) S/C 5695322
3) Switchboard. LED (Green) S/C 5100184
4) Lens Cap (Green) S/C 5695321
5) Switchboard. LED (Amber & White) S/C 5100185
6) Lens Cap (Amber) S/C 5695320
7) Lens Cap (White) S/C 5100186
8) Switchboard Lamp 24EX S/C 5844590
9) Switchboard Lamp 145 Volt, 15W S/C 5841410
10) Indicating Bulb type 49 S/C 5843078
11) Indicating Bulb type 47 S/C 5843100
12) 18 Volt Miniature 0.11A Automotive S/C 5843110
13) Indicating 35V, .06A S/C 5843132
14) Indicating type 43A S/C 5843250
15) Switchboard Lamp 24X S/C 5844610
16) Switchboard Lamp 55C S/C 5844630
17) Indicating Lamp 120 P.S.B. S/C 5841359
18) (for V.S.A. Reclosers)

12.7 Incandescent Lamps:
1) Incandescent Lamp 75 Watt S/C 5841739
2) Incandescent Lamp 100 Watt S/C 5841840
3) Incandescent Lamp 135 Watt S/C 5842001
4) Incandescent Lamp 200 Watt S/C 5842150
5) Mogul Base Lamp 500 Watt S/C 5842390 Flood lamp PAR 38 100 Watt S/C 5842045
6) Fluorescent Lamps:
7) 8 FT Single Pin Lamp 75 Watt S/C 5841050
8) 4 FT Bi - Pin Lamp 40 Watt S/C 5840950
9) 4 FT Single Pin Lamp 40 Watt S/C 5840940
10) 8 FT Recessed Pin Lamp 105 Watt S/C 5841130
12.8 Spare emergency light batteries
12.9 Spare fuses
12.10 Recloser control and trip fuses
  a) Reclosers often use time delay fuses that are similar in appearance to AGC types. If the wrong type fuse is installed it will blow after a couple of operations.
  
2) Cartridge fuses
  a) 5A
  b) 10A
  c) 15A
  d) 20A
  e) 30A

3) AGC Fuses
  a) 2 A slow blow and instantaneous
  b) 5A slow blow and instantaneous
  c) 10A slow blow and instantaneous
  d) 20A slow blow and instantaneous

12.11 Spare nitrogen bottles
12.12 Battery Supplies
  a) 5 Gallon distilled water and battery filler S/C 5599778
  b) Battery NO SMOKING Signs S/C 5483448
  c) Extra hydrometer S/C 5474448
  d) Extra thermometer S/C 487304
  e) Baking Soda
  f) Spare eyewash bottles S/C 5890600
  g) Nylon brush to clean battery posts
  h) Battery grease

12.13 Spare recloser batteries
13. Appendix B – Trouble Reporting

13.1 Trouble
   1) The term trouble is defined as any condition which occurs on the equipment that has or could affect the ability of that equipment to perform its required function.

13.2 Severe Trouble
   1) A severe trouble condition is a situation that is immediately hazardous to the system operation and/or personnel. These troubles are immediately reported to the System Operator and to the person in charge of the substation. The employee shall secure the area and warn unauthorized people to stay clear of the danger.

   2) Examples of Severe Trouble
      a) Dead station battery
      b) Blown bushings or cable terminator
      c) Downed live lines
      d) Multiple broken support insulators
      e) Electrical fires
      f) Grounds cut in station
      g) Loss of station service power
      h) Broken pole or structure
      i) Blown by pass/shunt arresters on regulators
      j) Low oil levels
      k) Unusually noises

13.3 Not Immediately Fixable Trouble
   1) These troubles are reported to the System Operator and the person in charge of the substation. They shall also be noted on the V&O form and station logbook in red and scheduled for repair at a later date.

13.4 Examples of Not Immediately Fixable Trouble
   a) Surge Arrester blown
   b) Broken operating rods on disconnects
   c) Damaged bus support insulators

13.5 Fixable Trouble
   1) Fixable items should be repaired as they are discovered during the V&O Inspection. This insures that the station is maintained in the best possible operating condition and prevents unnecessary return trips. The items fixed should be noted on the V&O Report and in the station logbook.

   2) Examples of Fixable Trouble
      a) Low Battery electrolyte
      b) Replacing blown lamps
      c) Changing filters
      d) Installing missing covers
e) Installing signs
f) Repairing holes in fence
g) Installing new locks
h) Cleaning and repairing oil leaks
i) Tightening compressor belts
j) Changing recloser batteries
k) Replacing control fuses
l) Changing nitrogen bottles
m) Changing Silica Gel turned pink or white
n) Cleaning and repairing leaks
## Monthly Elevated Voltage Status Report

### Testing Summary

<table>
<thead>
<tr>
<th>Facilities</th>
<th>Total System Units Requiring Testing</th>
<th>Units Completed</th>
<th>Percent Completed</th>
<th>Units with Voltage Found (&gt;= 1.0v)</th>
<th>Percent of Units Tested with Voltage (&gt;= 1.0v)</th>
<th>Units Classified as Inaccessible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution Facilities</td>
<td>1,205,991</td>
<td>1,205,991</td>
<td>100.00%</td>
<td>326</td>
<td>0.027%</td>
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<tr>
<td>Underground Facilities</td>
<td>109,793</td>
<td>109,793</td>
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<td>19</td>
<td>0.017%</td>
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<td>79,866</td>
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<td>379</td>
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<tr>
<td>Substation Fences</td>
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<td>100.00%</td>
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<td>1.848%</td>
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<tr>
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<td>79</td>
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<td>TOTAL</td>
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<td>100.00%</td>
<td>819</td>
<td>0.05%</td>
<td>66,634</td>
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</table>

Update covers Testing completed through November 2006 for preload year 2005 - New York

Definition of Inaccessible: Unable to get to a location due to fence, animals, dense brush, swamp, terrain, highway

Additional Notes: At this time Transmission includes all structures 23kv - 345kv
# Monthly Elevated Voltage Status Report

## Summary of Voltages Found

<table>
<thead>
<tr>
<th>Category</th>
<th># of units between 1.0v and 4.4v</th>
<th># of units between 4.5v and 7.9v</th>
<th># of units between 8.0v - 24.9v</th>
<th># of units between 25.0v - 99.9v</th>
<th># of units greater than 100.0v</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Distribution Facilities</strong></td>
<td></td>
<td></td>
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<td>Pole (910)</td>
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<td>8</td>
<td>5</td>
<td>9</td>
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<td>111</td>
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<td>Ground (914)</td>
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<td>Guy (915)</td>
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<td>Other</td>
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<td><strong>Underground Facilities</strong></td>
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<td>Handhole / Pull box (950)</td>
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<td><strong>Street Lights / Traffic Signals</strong></td>
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<td>Metal Street Light Pole (971/981)</td>
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<td>58</td>
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<td><strong>Substation Fences</strong></td>
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<tr>
<td>Fence (995)</td>
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<tr>
<td><strong>Transmission</strong></td>
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<tr>
<td>Lattice Tower (931)</td>
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<td>Pole (930)</td>
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<td>20</td>
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<tr>
<td>Ground (933)</td>
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<td>Guy (934)</td>
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<td>Other</td>
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<td>0</td>
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</tr>
</tbody>
</table>

**Totals**                      | 597                              | 109                              | 73                              | 35                              | 5                             | 819    

**NOTE** - National Grid is only mitigating those locations where voltage is confirmed to be 4.5 volts or greater.

**NOTE** - Individual facility counts (pole, ground, guy, etc) may add up to more than the total on a summary line due to voltage on multiple facilities at a single location or pole.

**NOTE** - "Other" category generally includes incorrect facility types reported (example - a pole code turned in for voltage found on an underground device).
### Monthly Elevated Voltage Status Report

<table>
<thead>
<tr>
<th>Mitigation Efforts</th>
<th>Units with Voltage Found &gt;= 4.5 volts</th>
<th>Units Permanently Repaired</th>
<th>Units Scheduled for Repair by Utility</th>
<th>Units Scheduled for Repair by Others</th>
<th>Repairs Made</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution Facilities</td>
<td>64</td>
<td>64</td>
<td>0</td>
<td>0</td>
<td>(1) Arrestor; (1) CableFeed; (8) DownGround; (11) EquipOther(usecomments); (10) GroundConnection; (2) Guy; (1) InduceVoltage; (2) Insulator; (1) Neutral; (5) NoneRequired; (12) ProcedureNotFollowed; (1) RemadeAllConnections; (2) ServiceWire; (7) Z-CustomerProblem</td>
</tr>
<tr>
<td>Underground Facilities</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>(1) EquipOther(usecomments); (1) NoneRequired</td>
</tr>
<tr>
<td>Street Lights / Traffic Signals</td>
<td>156</td>
<td>156</td>
<td>0</td>
<td>0</td>
<td>(18) Cable&amp;Ground; (9) CableFeed; (41) GroundConnection; (2) LampWiring; (9) LuminaireChange; (11) Neutral; (7) NoneRequired; (5) PhotoEye; (4) PoorInsulation; (1) ProcedureNotFollowed; (42) RemadeAllConnections; (7) Z-CustomerProblem</td>
</tr>
<tr>
<td>Substation Fences</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Transmission</td>
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</tr>
</tbody>
</table>

**Cycle 1 Elevated Voltage Testing for All Assets due August 31, 2006**

Attachment 7A

01/07/2007 RPT9140 2005 Preload year through November 30 2006.XLS
## Monthly Elevated Voltage Status Report

<table>
<thead>
<tr>
<th>Testing Summary</th>
<th>Total System Units Requiring Testing</th>
<th>Units Completed</th>
<th>Percent Completed</th>
<th>Units with Voltage Found (&gt;= 1.0v)</th>
<th>Percent of Units Tested with Voltage (&gt;= 1.0v)</th>
<th>Units Classified as Inaccessible</th>
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</thead>
<tbody>
<tr>
<td><strong>Distribution Facilities</strong></td>
<td>Monthly Update</td>
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<tr>
<td></td>
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<td>93,751</td>
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<tr>
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<td>2,318</td>
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<td><strong>Substation Fences</strong></td>
<td>Monthly Update</td>
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<tr>
<td><strong>Transmission</strong></td>
<td>Monthly Update</td>
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</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>Monthly Update</td>
<td>173,781</td>
<td>173,781</td>
<td>100.00%</td>
<td>48</td>
<td>4,807</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12,346</td>
<td>7.10%</td>
<td>0.03%</td>
<td>0.00%</td>
<td>1,166</td>
</tr>
</tbody>
</table>

Update covers Testing completed through November 2006 for preload year 2006 - New York

Definition of Inaccessible: Unable to get to a location due to fence, animals, dense brush, swamp, terrain, highway

Additional Notes: At this time Transmission includes all structures 23kv - 345kv
# Monthly Elevated Voltage Status Report

<table>
<thead>
<tr>
<th>Summary of Voltages Found</th>
<th># of units between 1.0v and 4.4v</th>
<th># of units between 4.5v and 7.9v</th>
<th># of units between 8.0v - 24.9v</th>
<th># of units between 25.0v - 99.9v</th>
<th># of units greater than 100.0v</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Distribution Facilities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Pole (910)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Ground (914)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Guy (915)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Riser (916)</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Underground Facilities</strong></td>
<td></td>
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</tr>
<tr>
<td>Handhole / Pull box (950)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Manhole (951)</td>
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<tr>
<td>Padmount Switchgear (952)</td>
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<tr>
<td>Padmount Transformer (953)</td>
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<tr>
<td>Vault – Cover/Door (954)</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>Pedestal</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Street Lights / Traffic Signals</strong></td>
<td>12</td>
<td>12</td>
<td>21</td>
<td>3</td>
<td>0</td>
<td>48</td>
</tr>
<tr>
<td>Metal Street Light Pole (971/981)</td>
<td>12</td>
<td>10</td>
<td>19</td>
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<tr>
<td>Traffic Signal Pole (991)</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Control Box (992)</td>
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<tr>
<td>Pedestrian Crossing Pole (993)</td>
<td>0</td>
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<td>Other</td>
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<tr>
<td><strong>Substation Fences</strong></td>
<td></td>
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<tr>
<td>Fence (995)</td>
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<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td><strong>Transmission</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Lattice Tower (931)</td>
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<td>0</td>
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<tr>
<td>Pole (930)</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ground (933)</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>Guy (934)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>12</td>
<td>12</td>
<td>21</td>
<td>3</td>
<td>0</td>
<td>48</td>
</tr>
</tbody>
</table>

**NOTE** - National Grid is only mitigating those locations where voltage is confirmed to be 4.5 volts or greater.

**NOTE** - Individual facility counts (pole, ground, guy, etc) may add up to more than the total on a summary line due to voltage on multiple facilities at a single location or pole.

**NOTE** - "Other" category generally includes incorrect facility types reported (example - a pole code turned in for voltage found on an underground device).
# Monthly Elevated Voltage Status Report

<table>
<thead>
<tr>
<th>Mitigation Efforts</th>
<th>Units with Voltage Found &gt;=4.5 volts</th>
<th>Units Permanently Repaired</th>
<th>Units Scheduled for Repair by Utility</th>
<th>Units Scheduled for Repair by Others</th>
<th>Repairs Made</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution Facilities</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Underground Facilities</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Street Lights / Traffic Signals</td>
<td>36</td>
<td>36</td>
<td>0</td>
<td>0</td>
<td>(1)CableFeed; (8)GroundConnection; (23)Neutral; (1)NoneRequired; (3)PoorInsulation</td>
</tr>
<tr>
<td>Substation Fences</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Transmission</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

## Shock Reports from the Public

### December 2006 Report

**Quarterly Update** | **Yearly Total**
--- | ---

### I. Total shock calls received:

<table>
<thead>
<tr>
<th>Type</th>
<th>Quarterly</th>
<th>Yearly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Found</td>
<td>5</td>
<td>133</td>
</tr>
<tr>
<td>Unsubstantiated</td>
<td>2</td>
<td>63</td>
</tr>
<tr>
<td>Employee Contact</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Non-Employee Contact</td>
<td>1</td>
<td>45</td>
</tr>
</tbody>
</table>

### II. Medical Attention Sought:

<table>
<thead>
<tr>
<th>Type</th>
<th>Quarterly</th>
<th>Yearly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Non-Employee</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>Domestic Animal</td>
<td>1</td>
<td>1</td>
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</table>

*The following sections apply for the incidents listed as "Voltage Found" in Section I*

### III. Equipment owner:

<table>
<thead>
<tr>
<th>Type</th>
<th>Quarterly</th>
<th>Yearly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utility</td>
<td>1</td>
<td>34</td>
</tr>
<tr>
<td>Non-utility (Coned only)</td>
<td>1</td>
<td>99</td>
</tr>
<tr>
<td>Customer</td>
<td>4</td>
<td>99</td>
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</tbody>
</table>

### IV. Action to make safe:

<table>
<thead>
<tr>
<th>Action</th>
<th>Quarterly</th>
<th>Yearly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent repair at time of discovery</td>
<td>36</td>
<td>150</td>
</tr>
<tr>
<td>Temp. repair at time of discovery</td>
<td>16</td>
<td>50</td>
</tr>
<tr>
<td>Cut and cap service line</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>Customer circuit breaker or fuse</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Barriers</td>
<td>1</td>
<td>28</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>28</td>
</tr>
</tbody>
</table>

### V. Voltage Source:

<table>
<thead>
<tr>
<th>Source</th>
<th>Quarterly</th>
<th>Yearly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streetlight service line</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Streetlight base connection</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Streetlight internal wiring or light fixture</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Issue with primary, joint, or transformer</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Defective service line</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Abandoned service line</td>
<td>2</td>
<td>49</td>
</tr>
<tr>
<td>Customer wiring</td>
<td>2</td>
<td>37</td>
</tr>
<tr>
<td>Customer equipment</td>
<td>2</td>
<td>37</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>28</td>
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</tbody>
</table>

### VI. Voltage Range:

<table>
<thead>
<tr>
<th>Range</th>
<th>Quarterly</th>
<th>Yearly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0V to 4.4V</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>4.5V to 7.9V</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>8.0V to 24.9V</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>25.0V to 99.9V</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>100.0V or higher</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>No Reading Primary Involved</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>No Reading</td>
<td>1</td>
<td>74</td>
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</tbody>
</table>
## Visual Inspection Programs

### Transmission

<table>
<thead>
<tr>
<th>Deficiencies Identified</th>
<th>Repair Priority Codes</th>
<th>Repair Complete</th>
<th>Repair Pending*</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>E (Immediate)</td>
<td>A (By Nov 30)</td>
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<tr>
<td></td>
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</tr>
<tr>
<td>510 POLE - Broken</td>
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<td></td>
</tr>
<tr>
<td>511 POLE - Visual Rotting</td>
<td></td>
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<tr>
<td>512 POLE - Leaning</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>513 POLE - Replace Single Arms</td>
<td>16 7 9</td>
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<tr>
<td>514 POLE - Replace Double Arms</td>
<td>5 2 3</td>
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</tr>
<tr>
<td>515 POLE - Repair Braces</td>
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<tr>
<td>516 POLE - Replace Braces</td>
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<tr>
<td>517 POLE - Replace Anchor</td>
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<tr>
<td>518 POLE - Install Anchor</td>
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<tr>
<td>519 POLE - Repair/Replace Guy Wire</td>
<td>521 POLE - Tighten Guy Wire</td>
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<tr>
<td>520 POLE - Replace/Install Guy Shield</td>
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<tr>
<td>524 POLE - Guy Not Bonded</td>
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<tr>
<td>525 POLE - Lightning Damage</td>
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<tr>
<td>526 POLE - Woodpecker Damage</td>
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<tr>
<td>527 POLE - Insects</td>
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</tr>
<tr>
<td>531 TOWER - Tower Legs Broken</td>
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<tr>
<td>532 TOWER - Numbers Missing</td>
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</tr>
<tr>
<td>534 TOWER - Loose Bolts/Hard</td>
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<tr>
<td>535 TOWER - Repair Anti-Climb</td>
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<tr>
<td>536 TOWER - Vegetation on Tower</td>
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<tr>
<td>537 TOWER - Structure Damage</td>
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<tr>
<td>538 TOWER - Straighten Tower</td>
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<tr>
<td>539 TOWER - Arms Damaged</td>
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</tr>
<tr>
<td>541 CONDUCTOR - Conductor</td>
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<tr>
<td>542 CONDUCTOR - Static</td>
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<tr>
<td>543 CONDUCTOR - Ground Wire</td>
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</tr>
<tr>
<td>544 CONDUCTOR - Sleeve/Conn</td>
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<tr>
<td>545 CONDUCTOR - Resag</td>
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<tr>
<td>546 CONDUCTORS - Under 25 ft</td>
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<tr>
<td>551 LINE HDW - Insulators/Dam</td>
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<td>552 LINE HDW - Insulator Plumb</td>
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<tr>
<td>553 LINE HDW - Hardware Dam</td>
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<tr>
<td>555 LINE HDW - Lightning Arrester</td>
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<tr>
<td>563 FOUNDATION - Erosion</td>
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<tr>
<td>571 RIGHT OF WAY - Erosion</td>
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</tr>
<tr>
<td>572 RIGHT OF WAY - Encroachments</td>
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</tr>
<tr>
<td>573 RIGHT OF WAY - Debris</td>
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</tr>
<tr>
<td>574 RIGHT OF WAY - Danger Tree</td>
<td></td>
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</tr>
<tr>
<td>575 RIGHT OF WAY - Gate Broke</td>
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</tr>
<tr>
<td>576 RIGHT OF WAY - Oil/Gas Leak</td>
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</tr>
<tr>
<td>581 MISC - Stencil Structure</td>
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</tr>
<tr>
<td>582 MISC - Switch Damaged</td>
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</tr>
<tr>
<td>583 MISC - Damaged Ground</td>
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<tr>
<td>584 MISC - Install Warning Sign</td>
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</tr>
<tr>
<td>585 MISC - Replace Signs</td>
<td></td>
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</tr>
<tr>
<td>586 MISC - Remove Steps</td>
<td></td>
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</tr>
<tr>
<td>587 MISC - Add Dirt and Tamp</td>
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<td></td>
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</tr>
<tr>
<td>760 GIS map doesn't match field</td>
<td></td>
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</tr>
<tr>
<td>761 GIS Equipment stenciling in error on GIS</td>
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<tr>
<td>762 GIS Equipment/hardware missing in GIS</td>
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</tr>
<tr>
<td>763 GIS Equip removed in fld, remv from GIS</td>
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<tr>
<td>769 GIS Other GPS/GIS errors</td>
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<td>901 Osmose - Identified priority pole</td>
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<td>904 Osmose - Climbing Insp re'q (not rej)</td>
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* "Pending Repairs" are all A-Priorities

### Totals

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Inclusive Dates: Dec. 1, '05 thru Nov 30, '06
### Visual Inspection Programs

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**Totals:**

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<td>675 Transformer - Elbows tracking/burned</td>
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</tr>
<tr>
<td>690 Trench - Exposed Cable</td>
<td>8</td>
<td>8</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>692 Trench Path - Sunken</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>702 Vaults - Cracked/broken</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>703 Vaults - Damaged/broken cover</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>704 Vaults - Damaged/broken door</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>705 Vaults - Damaged/broken ladder</td>
<td></td>
<td></td>
<td>12</td>
<td>12</td>
<td></td>
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<tr>
<td>706 Vaults - Improper grade</td>
<td></td>
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<tr>
<td>707 Vaults - Improper nomenclature</td>
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<td></td>
</tr>
<tr>
<td>708 Vaults - Light not working</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>712 Vaults - Sump pump broken</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>730 Anodes - Missing</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>18</td>
<td>448</td>
<td>437</td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>
I. Quality Assurance Approach for the Elevated Voltage Test and Asset Inspection Programs:

A. General:

The accuracy, thoroughness and integrity of the information and data developed by the Programs was measured by the implementation of the Statistical Process Control (SPC) quality assurance approach. SPC is typically applied to manufacturing processes and is a universally accepted method by which mass-production processes are monitored to verify the respective process is:

- in control (i.e: not trending towards wide variation/inconsistencies)
- quantitatively compliant with the level of quality sought

Graphs provided by the SPC method provide a way of detecting quality degradation trends and to intervene before such trends compromise overall quality goals.

Charting and Evaluating SPC Information:

Literature indicates that processes are always subject to a certain amount of variation due to “chance”; that such variation is inevitable. “Natural variation” has generically been quantified by industry as being 3 Standard Deviations (or $3\sigma$). Variations below $3\sigma$ are considered “special causes” and prompts the investigation for its root-cause and corrective action.

The quality goal sought is to maintain the Average Percent Compliance (as cumulative calculated as the Program continues) at or above that targeted.

Sample/Audit Sizes:

Literature also indicates that sample sizes should be on the order of $1/p^2$; where “$p$” is the targeted maximum fraction of non-compliances. Thus, for $p = 5\%$, $1/p = 20$ Samples.
**B. Quality Measurement:**

i. **General:**

Compliance audits (sampling) consists of repeating completed Elevated Voltage Tests or completed Asset Inspections. Audit results are compared with the previously completed Tests/Inspection results and such Tests/Inspections are rated as Compliant or Non-Compliant.

The ratio of the number of Audits resulting in a Compliant rating to the total number of Audits conducted (expressed as percent) constitutes the quality level being achieved in the Test/Inspection Program.

ii. **Elevated Voltage Tests:**

Elevated Voltage (EV) Testing needs to provide results that

- precisely match Audit results
- or
- are conservative with respect to Audit results

Unlike Asset Inspections, only three “attributes” are assessed for EV Testing

a) Voltage Test is Required
b) Test indicated presence of Voltage
c) Voltage measured was equal to/conservative with respect to the Audit

The level of compliance for each EV Test is quantified in Step 2 as described below
iii. Asset Inspections:

There are many generic attributes assessed in the course of inspecting an asset; some being subjective and based on experience and judgment.

Therefore, it is unreasonable to expect an exact correlation between the results of Inspections and those of Audits.

Instead, Inspection compliance will be based on Inspection results:

- precisely matching
  
or
- being conservative with respect to Audit results.

The following is a brief description of the two-step process used for Asset Inspection Compliance evaluations:

i. Comparison review of each individual attribute identified as an issue for an Asset (ie: designation of appropriate Maintenance Codes). The chart below illustrates the three possible outcomes for each Maintenance Code identified during Inspections and/or Audits.

### Treatment of Code-by-Code Comparisons:

<table>
<thead>
<tr>
<th>Asset Inspection</th>
<th>Maintenance Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>B</td>
</tr>
</tbody>
</table>

#### Possible Outcomes

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Disposition</th>
<th>Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>A = B</td>
<td>Match (Compliance)</td>
<td>0</td>
</tr>
<tr>
<td>A is a Code &amp; B is Null</td>
<td>Inspection Conservative</td>
<td>1</td>
</tr>
<tr>
<td>A is Null &amp; B is a Code</td>
<td>Inspection Non-Compliance</td>
<td>2</td>
</tr>
</tbody>
</table>

2. Final Rating of an Asset’s Inspection. The following chart illustrates the full spectrum of Inspection versus Audit Comparison possibilities:
should all comparisons be any or all of Cases 1, 2 or 3, Inspection results were in agreement or conservative with respect to Audits. As such, the respective Inspection is deemed compliant

- should any comparison be Case 4, 5, 6 or 7, Inspection results were not in agreement nor conservative with respect to Audits; the respective Inspection is deemed non-compliant

The following is a pictorial representation of the effect of this two-step process.

Each rectangle is viewed as containing the Maintenance Codes identified in the Inspection and the follow-up Audit; Codes appearing in

- both the Inspection and Audit rectangles are matches
- the Inspection rectangle but absent from the Audit rectangle are “Unmatched Inspection Codes”
- the Audit rectangle but absent from the Inspection rectangle are “Unmatched Audit Codes”

The treatment of the appearance of those three possibilities in rating the Inspection Compliance of the respective Asset is addressed in the “Label” column of this pictorial.
iv. **Unbundling of EV Testing and Inspections for QA Assessments:**

The SPC Method used for 2005 blended EV Testing statistics with those of Inspections. For 2006, the QA Assessments of EV Testing and that of Inspections was conducted separately and distinctly. Given the high Compliance rating of EV Test Audits and the relative simplicity of EV Testing in general in comparison to Inspections, it was prudent to unbundle these two efforts and avoid cloaking weaknesses/improvement opportunities in the Inspection Program.
C. Results:

i. Elevated Voltage Testing:

Each Test (or asset visited and potentially requiring Testing) consisted of 3 components that were audited and evaluated for compliance rating:

a) whether Testing was required
b) whether Voltage was detected
c) level of Voltage measured (with flagging of those instances when Voltage equal to/greater than 4.5)

Generally, each component constituted 33-1/3% of a maximum possible total of 100% compliance for each asset visited and would stand on its own merit. However, if component “a” was recorded as “no” in the initial test (asset visit) and indicated as “yes” in the audit, the level quality of the respective asset would be indicated as 0% regardless of whether Voltage was detected in the Audit.

Two hundred, eighteen (218) audits were conducted (ie: tests repeated) and the level of compliance was calculated as 99.1%. These statistics include 79 EV Tests conducted on Transmission Facilities by 2 particular Inspectors within the same specific 2 week “window”. The results of these Tests were, in general, conservative and, therefore, compliant in accordance with the conventions set forth in this Report. However, the prominence of these Tests with respect to the specific time-frame and personnel infers the presence of some peculiar anomaly (albeit, conservative) and suggests the single Non-Compliance found (although trivial (Voltage measured in Audit being 1.77; 0.27 greater than the Test)) as being unlikely to re-occur. Adjusting for this 2-week/2-person anomaly, the EV Test Compliance Rating would be calculated as 99.5%

Due to the high rate of compliance, an SPC chart need not be plotted.
ii. **Asset Inspection:**

Seven hundred, ninety four (794) Audits of Inspections were conducted (ie: inspections repeated). Recognizing the subjectivity, experience and judgment that is inherent in the Inspections and the strong likelihood of results differing between initial Inspections and the Audits, the level of quality was measured considering the evaluation of:

- of only those *critical characteristics* viewed as potentially posing an imminent risk to public health and safety; level of compliance was calculated at:
  
  95.0%

- *all characteristics* level of compliance calculated was 76.3%

The following Compliance charts correspond to these statistics.
D. Quality Assurance System; Documentation/Traceability:

i. General Architecture:

Spreadsheets served as the Audit form. As such, original audit spreadsheets were retained and respective data consolidated/summarized on other spreadsheets.

Therefore, data in the highest level spreadsheet (eg: “0_Summary-2006.xls”) is may be tracked to respective Audit spreadsheets (eg: “n:\.... \FH-Audits\12-2006a\Distrib-Audits-Region-50-FH.xls”)
II. Quality Assurance Approach – Moving Forward:

A. General:

The Statistical Process Control (SPC) Quality Assurance approach has many merits and features that make it extremely suitable for monitoring and managing the integrity, thoroughness and accuracy of Test and Inspection information/data. Based on the statistics provided by SPC, the intensity of Audits can be shifted from aspects of the Test/Inspection Program that are shown to be of high quality and shifted to aspects that merit enhanced Audit focus. Thus, Quality Assurance resources are effectively used by directing such resources where they are most beneficial.

The SPC approach was non-existent and new to the personnel involved with the National Grid – New York 2005 Test/Inspection Program. Its development, adjustments and modifications evolved in parallel with the execution of the 2005 New York Test/Inspection Program, went through further refinements in 2006 and will be further enhanced going forward in 2007 (ref: Section B, below).

B. Continuous Improvement; Expanding Quality Assurance/Control Initiatives:

1. Planning:

   The planning (or scheduling) of Audits was identified as an improvement item in 2005. With 84% of the inspection audits being Distribution, scheduling of such Audits is prudent. Auditing of scheduled Feeder-Hardening inspections is currently serving as a partial schedule for Distribution Audits.

2. EV Testing – Inaccessible Assets:

   Year 2005 data included an excessive amount “inaccessible” dispositions. Correspondingly, it was planned to audit the accuracy of these dispositions. However, the Contractor implemented a procedure scrutinizing the use of the “inaccessible” disposition and, thus, the issue has become less urgent.

3. Special Audits – Underground Asset Inspections and Elevated Voltage Testing
The 2005 Report identified a benefit to auditing the Inspection of Underground assets. Such was implemented and constitutes 11% of the Audits conducted.

Likewise, the 2005 Report identified a benefit to conducting Audits of EV Tests that resulted in the detection of voltage. However, the appearance of other opportunities for program improvement and the extremely rare instances of Elevated Voltage encouraged focus onto other issues.

4. Simplicity and Efficiency

The initial Quality Assurance effort used a multitude of platforms and was labor-intensive for the Auditors with respect to precisely locating the randomly chosen (audit) Assets on maps prior to going into the field, charting routes that were optimal then following such routes.

Limited use of more robust applications for randomly choosing samples is still necessary. However, primary reliance on spreadsheets as the audit “form” as well as data consolidation/summary is being pursued; such files serving as documentation and controlled as such.

A considerable amount of efficiencies are available by seamlessly providing the optimal travel-routes for Audits as electronic files to be downloaded in Auditors’ navigation units and simply following the directions enunciated by such units.

5. Asset Inspections; A-Priority Work

Auditing to confirm the completion of A-Priority work was discussed in the 2005 Report. Database queries are run/retained monthly summarizing the number of A and E Priority instances as well as the number still requiring completion. Monthly review of this data includes a comparison of “Repair Pending” quantities with those of previous months; to determine whether “Pending” quantities are remaining stable or are climbing.
6. Assets found in the field that were not reflected in database records

The sketch below illustrates the two categories of Asset Outliers encountered during the course of the EV Test Program and planned for investigation in 2006:

- Assets found in the field that were not reflected in database records
- Assets not found in the field that were reflected in database records

With another year of electronic data available and the adoption of Navigation equipment, pursuit of this issue was more suitable for 2007.

7. Training:

Training has been performed and procedures/reference material enhanced to foster consistency in the use of Inspection Codes that are, by nature, subjective.

In the course of issuing Audit Results, the Maintenance Codes identified by Auditors but missed by Inspectors are highlighted and conveyed to the field*. Review of the missed Codes is conducted along with a review of procedures/reference material. Continued improvement in the consistency between Inspectors and Auditors is, therefore, fostered.
CERTIFICATION - ELEVATED VOLTAGE TESTING

STATE OF NEW YORK

) ) ss.

COUNTY OF ONONDAGA

) )

Edward Dienst, on this 14th day of January, 2007, certifies as follows:

1. I am the Senior Vice President of Niagara Mohawk Power Corporation d/b/a National Grid (the “Company”), and in that capacity I make this Certification for the annual period ending November 30, 2006 based on my knowledge of the testing program adopted by the Company in accordance with the Public Service Commission’s orders issued and effective January 5, 2005 and July 21, 2005 in Case 04-M-0159 (the “Orders”), including the Quality Assurance Program filed by the Company with the Commission.

2. In accordance with the requirements of the Orders, 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 elevated voltage (the “Elevated Voltage Testing Program”).

3. I am responsible for overseeing the Company’s Elevated Voltage Testing Program and in that capacity I have monitored the Company’s Elevated Voltage Testing Program during the twelve months ended November 30, 2006 (the “Twelve-Month Period”).

4. I hereby certify that, to the best of my knowledge, information and belief, the Company has implemented and completed its Elevated Voltage Testing program for the Twelve Month Period. Except for untested structures that are identified as temporarily inaccessible in the Company’s Annual Report, submitted herewith, the Company is unaware of any Facilities or Streetlights that were not tested during the Twelve-Month Period.

5. I make this certification subject to the condition and acknowledgment that it is reasonably possible that, notwithstanding the Company’s good faith implementation and completion of the Elevated Voltage Testing Program, there may be Facilities 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 and Streetlights were known to exist or reasonably expected to be found.

Edward J. Dienst

Sworn to before me this 14th day of January, 2007

Notary Public: __________________________

Jeremy J. Euto
Notary Public, State of New York
Qualified in Onondaga County No. 02EU031383
CERTIFICATION - INSPECTIONS

STATE OF NEW YORK

COUNTY OF ONONDAGA

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1. I am the Senior Vice President of Niagara Mohawk Power Corporation d/b/a National Grid (the “Company”), and in that capacity I make this Certification for the annual period ending November 30, 2006 based on my knowledge of the inspection program adopted by the Company in accordance the Public Service Commission’s orders, issued and effective January 5, 2005 and July 21, 2005 in Case 04-M-0159 (the “Orders”), 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 Orders (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 twelve months ended November 30, 2006 (the “Twelve-Month Period”).

4. I hereby certify that, to the best of my knowledge, information and belief, the Company has implemented and completed its Facility Inspection Program to inspect 18% of its Facilities during the year 2006, in order to comply with the five-year inspection cycle required under the Orders.

Edward J. Dienst

Sworn to before me this 14th day of January, 2007
Notary Public:

Jeremy J. Euto
Notary Public, State of New York
Qualified in Onondaga County No. 02EU031383