Patric R. O'Brien
Assistant General Counsel

February 9, 2016

VIA ELECTRONIC FILING

Honorable Kathleen H. Burgess
Secretary
New York State Public Service Commission
Three Empire State Plaza
Albany, New York 12223-1350

Re: Case 04-M-0159 – Proceeding on Motion of the Commission to Examine the Safety of Electric Transmission and Distribution Systems – 2015 ANNUAL REPORT

Dear Secretary Burgess:

Niagara Mohawk Power Corporation d/b/a National Grid submits for filing its *2015 Annual Stray Voltage Testing and Facility Inspection Report* in the above proceeding.

Should you have any questions or concerns, please do not hesitate to contact me. Thank you for your time and attention.

Respectfully submitted,

/s/Patric R. O'Brien
Patric R. O'Brien

Attachments

40 Sylvan Road, Waltham, MA 02451
T: 781.907.1850 ■ F: 781.907.5701 ■ patric.r.obrien@nationalgrid.com ■ www.nationalgrid.com

State of New York
Public Service Commission

Case 04-M-0159

Niagara Mohawk Power Corporation
d/b/a National Grid

Stray Voltage Testing and Facility Inspection

2015 Annual Report

Report on the results of stray voltage testing and facility inspections
for the 12-month period ended December 31, 2015

February 9, 2016

Table of Contents

I. Background

The New York State Public Service Commission's ("Commission") Electric Safety Standards adopted on January 5, 2005 in Case 04-M-0159, with subsequent revisions issued on July 21, 2005, December 15, 2008, March 22, 2013, and January 13, 2015 (collectively referred to herein as the "Safety Standards" or "Order"), require annual stray voltage testing of certain electric facilities accessible to the public and inspections of utility electric facilities on a minimum of a five-year cycle.

In the March 22, 2013 Order, the Commission revised the annual testing requirement for stray voltage. Under the revision, overhead distribution facilities, underground residential distribution ("URD") facilities, overhead and underground transmission structures, and substation fences will be tested for stray voltage at least once every five years. Streetlights and underground distribution facilities will continue to be tested annually.

This report describes Niagara Mohawk Power Corporation's d/b/a National Grid ("Niagara Mohawk" or "Company") stray voltage detection program and facility inspection program conducted for the 12-month period ended December 31, 2015.

II. Company Overview

Niagara Mohawk provides electric service to approximately 1,600,000 customers in a service area of approximately 25,000 square miles in New York State. The Company operates an electric transmission and distribution system. For the stray voltage detection and facility inspection programs, Niagara Mohawk divides its system into subprograms to schedule and track testing and inspections. The subprograms include the Company's (a) distribution overhead system, (b) distribution and transmission underground system, (c) streetlight system, (d) transmission overhead system, and (e) substations.

a. Distribution Overhead System

Niagara Mohawk's distribution overhead system consists of structures supporting circuits energized at voltages of up to 15kV and spans close to 32,000 miles. Stray voltage testing of the distribution system is currently performed by Niagara Mohawk and contractors. Facility inspections of the distribution system are currently performed by the Company's internal workforce and contractors.

b. Distribution and Transmission Underground System

Niagara Mohawk's distribution and transmission underground system is made up of facilities such as manholes, hand-holes, vaults, and switchgear. Fiberglass hand holes are exempt from stray voltage testing under the Safety Standards.[1] Stray voltage testing of the Company's underground system is currently performed by contractors. Facility inspections of the underground system are currently performed by contractors.

[1] *See* July 21, 2005 Order, at 23; March 22, 2013 Order, at Appendix A, 3(c).

c. Streetlight System

Niagara Mohawk's streetlight system contains underground fed metallic streetlight standards and municipally-owned streetlights and traffic control devices. Overhead fed streetlights on wooden poles are not counted within the streetlight program for stray voltage testing. For the underground fed metallic streetlight standards, contractors perform the stray voltage testing at night when the lights are operational. Stray voltage testing on traffic control devices 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 external workforce.

d. Transmission Overhead System

Niagara Mohawk's transmission overhead system, which includes the sub-transmission system, consists of structures that support circuits energized at voltages of 12 kV, 23kV, 34.5kV, 46kV, 69kV, 115kV, 230kV, and 345kV. The transmission system spans the entire state and is approximately 8,465 miles in length. Stray voltage testing on the transmission system is performed by Niagara Mohawk and contractors.

e. Substations

There are 908 substations in Niagara Mohawk's service territory. Stray voltage results for substation fences were collected internally by the operating group. The initial dataset identified 908 substation locations to be tested of which a number of these are customer-owned locations.

III. Stray Voltage Testing Program

During the calendar year that ended December 31, 2015, the Company conducted stray voltage testing of 100% of all Company and non-Company owned metallic streetlights and traffic signals and 100% of all publicly accessible Company-owned underground distribution facilities that are capable of conducting electricity. In addition, the Company conducted stray voltage testing of its publicly accessible overhead distribution facilities, URD facilities, overhead and underground transmission structures, and substation fences that are capable of conducting electricity.

In addition, and in compliance with the Safety Standards, Niagara Mohawk:

a. Immediately safeguarded and/or mitigated all voltage findings ≥ 1.0 volt. In instances where the stray voltage finding was determined to be caused by customer-owned equipment, the area was immediately made safe and the customer or responsible person associated with the premises was notified of the unsafe condition and the need for the customer to arrange for a permanent repair. Voltage findings determined to be caused by a Company-owned facility were immediately safeguarded and/or mitigated. All permanent repairs were made within 45 days.

b. Tested all publicly accessible structures and sidewalks within a 30 foot radius of the electric facility or streetlight where there was a stray voltage finding ≥ 1. 0 volt.

c. Responded, investigated, and mitigated positive findings of shock incidents reported by the public.

Niagara Mohawk visited 403,862 facilities for stray voltage testing in calendar year 2015. Testing was not required on 125,258 facilities because: the facilities are wood utility poles that have no attached appurtenances capable of conducting electricity; the facilities' electrically conductive appurtenances are not accessible to the public (pre-wired wood); the facilities are enclosed in fiberglass (non-conductive materials); the facilities are de-energized; and/or the facilities are inaccessible to the public.

Inaccessible facilities include:

a. Locked Gate/Fence – Poles behind locked gates and fences that are not accessible to the public, *i.e*., facilities located in fenced areas owned by other utilities such as water companies.

b. Dangerous Grades – Poles located on cliffs and other dangerous grades are generally inaccessible to Company personnel and the general public and are approached only under urgent circumstances. The performance of stray voltage testing on these facilities would constitute an unacceptable risk to the employee.

c. Company Property – Poles located on Company property such as substations are accessible only to Company personnel and authorized contractors.

d. Vaults – Structures located inside buildings. These structures are accessible only to Company and building maintenance personnel.

e. Limited Access Highway Facilities – Structures located on highways and exit and entrance highway ramps. The performance of stray voltage testing on these structures would constitute an unacceptable risk to the employee.

As required by the Safety Standards, Niagara Mohawk performed 3,161 miles of mobile testing system scans between January 1, 2015 and December 31, 2015. A summary of the results of the mobile testing scans is contained in Appendix 8, which is a copy of the Company's mobile scan report filed with the Commission on December 9, 2015.

IV. Facility Inspection Program

The Safety Standards require Niagara Mohawk to visually inspect approximately 20% of its facilities annually, resulting in a five-year inspection goal for all facilities to be inspected.

Niagara Mohawk visually inspects its overhead distribution and transmission systems on a five-year cycle from the ground, as prescribed by the Safety Standards.

In addition, Niagara Mohawk performs the following inspections, some of which are recurring on specific cycles, some of which are scheduled on an as-needed basis:

- Aerial Infrared – Helicopter-based thermographic imaging of connections and equipment.
- Tower Footing – Embedded support structure that supports a transmission tower.
- Wood Pole – Inspection of the wood pole at and below the ground line.
- 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.

Niagara Mohawk's ground-based visual inspection program is segmented into five categories: distribution facility inspection; underground facility inspections; streetlight inspections; transmission facility inspections; and substation inspections.[2] Each program is summarized by its associated procedure document. The 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.

In accordance with the Safety Standards, Niagara Mohawk uses the following severity levels to establish priority for repairs and scheduling:

a. Level I – Repair as soon as possible but not longer than one week. A Level I classification represents an actual or imminent safety hazard to the public or a serious and immediate threat to the delivery of power. Critical safety hazards present at the time of the inspection shall be guarded until the hazard is mitigated.

b. Level II – Repair within one year. A Level II classification represents conditions that are likely to fail prior to the next inspection cycle and represent a threat to safety and/or reliability should a failure occur prior to repair.

[2] Substation inspections are more complex than those performed on other facilities and differ in variety of ways including, but not limited to: inspection schedules, system that captures inspection data, and work prioritization (supervisory review determines work to be completed versus Levels I-IV). Substation inspection procedure and protocols are provided in Attachment 15 (SMS 400.06.1 entitled "Substation V&O Inspection Standard" and SMP 400.06.2 entitled "Substation V&O Inspection Procedure).

c. Level III – Repair within three years. A Level III classification represents conditions that do not present immediate safety or operational concerns and would likely have a minimal impact on the safe and reliable delivery of power should a failure occur prior to repair.

d. Level IV – A Level IV classification represents conditions found, but repairs are not needed at this time. Level IV is used to track atypical conditions that do not require repair within a five-year timeframe. This level is used for future monitoring purposes and planning proactive maintenance activities.

In accordance with the Safety Standards, when a temporary repair is located during an inspection or is performed by the Company, best efforts are made to make a permanent repair of the facility within 90 days. Temporary repairs that remain on the system for more than 90 days are due to extraordinary circumstances (*i.e.,* storms and outage constraints), and usually require extensive repair activity. Niagara Mohawk has compiled a list of exceptions of temporary repairs that still remain in place after the 90 day requirement. The list and justifications can be found in Appendix 5 of this report.

Niagara Mohawk provides classroom and field training to personnel inspecting facilities in accordance with the Company's Electric Operating Procedures ("EOPs"). The classroom training covers topics including: EOPs, distribution maintenance inspection and elevated voltage testing training, Computapole handheld training, Computapole database training, distribution vegetation training, geographic information system training, feeder patrols training, and basic electricity training.

The Company provides new distribution inspectors with training upon hiring, with ongoing yearly refresher courses. As part of the refresher training, Niagara Mohawk updates all training materials due for updates from the following year. Specifically, the updates are done yearly using relevant EOPs and Company standards that have been updated.

V. Company Facilities

Niagara Mohawk has approximately 1,525,011 individual facilities that must be visited for stray voltage testing and approximately 1,567,943 individual facilities that require a facility inspection. These facilities are broken down into the following five main categories and are summarized in the tables beginning on page 9:

a. Distribution Overhead – The Company's testing criterion for distribution overhead facilities involves testing all Company-owned or jointly-owned wood poles with utility electrical facilities located on both public thoroughfares and customer property, including backyards or alleys. Stray voltage testing is performed on all wooden poles with metallic attachments such as ground wires, ground rods, anchor guy wires, riser pipes, or any electrical equipment within reach of the general public. Distribution overhead facilities are included in both the stray voltage and facility inspection programs.

b. Distribution and Transmission Underground Facilities –The Company's testing criterion for underground facilities involves testing all subsurface structures, including above ground, pad-mounted structures. Included in the underground facilities are padmount switchgear cases, padmount transformer cases, electric utility manhole covers, submersible transformer covers, electric utility handhole covers, network vaults, and grates. These facilities are included in both the stray voltage and facility inspection programs. Inspections of the underground system involve underground and padmount assets.

c. Streetlights and Traffic Signals – Streetlights include Company-owned metal pole streetlights and municipal-owned metal pole streetlights to which the Company provides service. The testing criterion for streetlights and traffic signals involves testing all metal pole streetlights, traffic signals, and pedestrian crosswalk signals located on publicly accessible thoroughfares. Stray voltage testing of streetlights is performed at night while the fixtures are energized. Privately-owned light fixtures are not included in the stray voltage testing program per the Safety Standards.[3] All Company-owned streetlights are included in the facility inspection program.

d. Substation Fences - Niagara Mohawk operates and maintains 908 substation facilities that are necessary for the operation of the electric grid. These substations are fenced in for security, as well as to ensure the safety of the general public. Substation fences are included in the stray voltage testing program.

e. Transmission Overhead Structures – The testing criteria for transmission overhead structures involves testing all structures, guys, and down leads attached to the facilities. Transmission structures support circuit voltages of 12 kV and greater. Transmission poles with distribution underbuild are included in the transmission category. All transmission structures are included in both the stray voltage and facility inspection programs.

VI. Annual Performance Targets

In compliance with the Safety Standards, Niagara Mohawk met the annual performance target for stray voltage testing of 20% of overhead distribution facilities, URD facilities, overhead and underground transmission structures, and substation fences, as well as 100% of metallic streetlights and underground distribution facilities. In addition, in compliance with the Safety Standards, Niagara Mohawk met the annual performance target for inspection of approximately 20% (*i.e.,* 95% of the annual target of 20%, or 19%) of its electric facilities for the period that ended December 31, 2015.

[3] March 22, 2013 Order, at Appendix A, §§ 1(d) and 3(a).

The results are summarized in the tables below.

Stray Voltage Testing Results

Elevated Voltage Testing Annual Summary			
Program	**Total Units**	**Units Completed in 2015**	**% Completed**
Distribution**	1,308,890	268,752	20.532
Underground	28,343	28,343	100.000
Streetlights*	84,814	84,814	100.000
Transmission**	102,056	22,225	21.777
Substation	908	908	100.000

*Note: Streetlights include traffic controls but exclude fiberglass standards.
**Note: Pursuant to the March 22, 2013 Order, the Company is required to test 100% of streetlights and underground distribution facilities annually. Overhead distribution facilities, URD facilities, overhead and underground transmission structures, and substation fences are required to be tested at least once every five years.

Facility Inspection Program Results

Category	Total System Units	Units Completed in 2015	Actual Inspected in 2015
Overhead Distribution	1,238,964	255,736	20.641%
Overhead Transmission	103,181	22,679	21.979%
Underground	93,698	17,254	18.414%
Pad-mounted Transformers	66,262	12,268	18.514%
Streetlights	65,838	12,664	19.235%
TOTAL	1,567,943	320,601	20.447%

Inspection Performance Summary

Overhead Distribution Facilities

Inspection Year	Number of Overhead Distribution Structures Inspected	% of Overall System Inspected (Cumulative)
2015	255,736	21%

Overhead Transmission Facilities

Inspection Year	Number of Overhead Transmission Facilities Inspected	% of Overall System Inspected (Cumulative)
2015	22,679	22%

Underground Facilities

Inspection Year	Number of Underground Facilities Inspected	% of Overall System Inspected (Cumulative)
2015	17,254	18%

Padmount Transformers

Inspection Year	Number of Padmount Transformers Inspected	% of Overall System Inspected (Cumulative)
2015	12,268	19%

Streetlights

Inspection Year	Number of Streetlights Inspected	% of Overall System Inspected (Cumulative)
2015	12,664	19%

VII. Certifications

Pursuant to Section 7 of Appendix A of the Safety Standards, the president or officer of each utility with direct responsibility for overseeing stray voltage testing and facility inspections shall provide an annual certification to the Commission that the utility has, to the best of his or her knowledge, exercised due diligence in carrying out a plan, including quality assurance, that is designed to meet the stray voltage testing and inspection requirements, and that the utility has:

- Tested its publicly accessible electric facilities and street lights in accordance with the Safety Standards, and

- Inspected the requisite number of electric facilities.

The certifications are attached as Appendix 17 to this report.

VIII. Analysis of Causes of Findings and Stray Voltage

The Safety Standards require the electric utilities to perform an inventory on all stray voltage findings and report on the number of these findings each year. Section 1(f) of the December 15, 2008 Order defines a finding as "[a]ny confirmed voltage reading on an electric facility or streetlight greater than or equal to 1 volt measured using a volt meter and 500 ohm shunt resistor." Section 1(c) defines stray voltage as "[v]oltage conditions on electric facilities that should not ordinarily exist. These conditions may be due to one or more factors, including, but not limited to, damaged cables, deteriorated, frayed, or missing insulation, improper maintenance, or improper installation." Utilities are required to report on all findings whether or not the voltage is normal to the electric system.

Niagara Mohawk identified 83 instances of stray voltage during the Company's manual stray voltage testing program in 2015. These voltages resulted from a variety of conditions including: deterioration of conductors; age of equipment; exposure to the elements; and various customer related issues. A majority (25) of stray voltage conditions identified were on distribution structures. Down grounds was the leading cause of stray voltage findings.

The following table contains a breakdown of the causes of stray voltage findings identified through the Company's 2015 manual testing effort. Niagara Mohawk has repaired and/or mitigated all findings that were determined to be hazardous. Mobile testing findings are addressed in the Mobile Stray Voltage Testing Report attached as Appendix 8.

Structure Type	Cause of Stray Voltage	Stray Voltages Found
Distribution	Cable & Ground	1
Distribution	Cable Feed	1
Distribution	Down Ground	7
Distribution	Equip Other	2
Distribution	Ground Connection	5
Distribution	Guy	4

Distribution	Neutral	5
Street Lights – Traffic Signals	Info Missing	26
Street Lights – Traffic Signals	Cable Feed	2
Street Lights – Traffic Signals	Equip Other	1
Street Lights – Traffic Signals	Ground Connection	4
Street Lights – Traffic Signals	None Required	2
Street Lights – Traffic Signals	Poor Insulation	1
Street Lights – Traffic Signals	Remade All Connections	1
Street Lights – Traffic Signals	Service Wire	1
Transmission	Down Ground	16
Transmission	Ground Connection	1
Transmission	Guy	3
TOTAL		83

In accordance with the Safety Standards, when Niagara Mohawk discovered a finding on an electric facility or streetlight during stray voltage testing, the Company tested all publicly accessible structures and sidewalks within a minimum 30 foot radius of the electric facility or streetlight. Niagara Mohawk did not identify any additional findings associated with the initial test structure as a result of the 30-foot radius testing.

IX. Analysis of Inspection Results

Note: Total Number of Deficiencies may add up to more than the total Locations with Deficiencies due to deficiencies on multiple facilities at a single location.

Overhead Distribution Structures

Table of Locations with Deficiencies

Locations Inspected	Locations w/ Deficiencies	% Locations w/ Deficiencies
255,736	113,290	44.299%

Breakdown of Locations with Deficiencies

Priority Rating	Number of Deficiencies	% Deficiencies Found
1	741	0.346%
2	11,434	5.351%
3	60,550	28.340%
4	140,929	65.961%
Total:	213,654	100.000%

Overhead Transmission Facilities

Table of Locations with Deficiencies

Locations Inspected	Locations w/ Deficiencies	% Locations w/ Deficiencies
22,679	16,597	73.182%

Breakdown of Locations with Deficiencies

Priority Rating	Number of Deficiencies	% Deficiencies Found
1	15	0.048%
2	367	1.183%
3	2,676	8.630%
4	27,948	90.137%
Total:	31,006	100.000%

Underground Facilities

Table of Locations with Deficiencies

Locations Inspected	Locations w/ Deficiencies	% Locations w/ Deficiencies
17,254	8,495	49.234%

Breakdown of Locations with Deficiencies

Priority Rating	Number of Deficiencies	% Deficiencies Found
1	92	0.960%
2	564	5.886%
3	105	1.095%
4	8,821	92.058%
Total:	9,582	100.000%

Pad-mount Transformers

Table of Locations with Deficiencies

Locations Inspected	Locations w/ Deficiencies	% Locations w/ Deficiencies
12,268	3,283	26.760%

Breakdown of Locations with Deficiencies

Priority Rating	Number of Deficiencies	% Deficiencies Found
1	47	0.626%
2	435	5.794%
3	0	00.000%
4	7,025	93.579%
Total:	7,507	100.000%

Streetlights

Table of Locations with Deficiencies

Locations Inspected	Locations w/ Deficiencies	% Locations w/ Deficiencies
12,664	8,582	67.766%

Breakdown of Locations with Deficiencies

Priority Rating	Number of Deficiencies	% Deficiencies Found
1	9	0.067%
2	214	1.606%
3	19	0.142%
4	13,076	98.182%
Total:	13,318	100.000%

In 2015, Niagara Mohawk identified an overall total of 275,067 deficiencies:

- Priority Rating 1 Total = 904, or 0.328% of the overall total.
- Priority Rating 2 Total = 13,014, or 4.731% of the overall total.
- Priority Rating 3 Total = 63,350, or 23.030% of the overall total.
- Priority Rating 4 Total = 197,799 (inventory), or 71.909% of the overall total.

X. Quality Assurance

Electric Quality Assurance/Quality Control Program

National Grid's Elevated Voltage ("EV") and Visual Inspection & Maintenance ("I&M") Quality Assurance/Quality Control program provides for increased program continuity, monthly audits for monitoring of program performance, and assurance that a Quality Assurance/Quality Control ("QA/QC") program independent of the EV and I&M work groups is maintained.

Separate of the independent Electric QA/QC program, Quality Control ("QC") assessments audits are conducted by National Grid I&M supervisory staff. The purpose of the QC audits is to self-validate recorded findings involving all distribution, transmission, and sub-transmission assets that have been inspected to identify potential maintenance codes and elevated voltage issues. Conversely, the independent Electric QA/QC program encompasses a quantitative random sampling of the entire population of inspection derived from the field audited EV testing and I&M inspections.

Revisions to QAQC Program 2015

The Electric QA/QC program made the following revision in 2015:

- A "Misidentified Maintenance Code" table has been added for 2015. This table provides the reader the trending analysis of maintenance codes that were mistakenly identified by the field inspector for a particular region.
- Additional Maintenance Code table has been revised.

I&M Risk Levels Identified: The analysis of the QA/QC I&M Program data is intended to identify the nature and magnitude of Risk Level 1 and 2 as applicable to the I&M Program results.

Electric QA/QC I&M Risk Level Definitions
QA/QC program involves performing an additional QA/QC audit of randomly-selected assets having been previously assessed by the field inspector, with the intent of verifying previously identified maintenance codes.
Risk 1 • Reliability/Safety Concern. • Identified facility/component repaired or replaced within one week of the inspection date.
Risk 2 • Facility/component condition that must be repaired/replaced within one year. • QA/QC identification of maintenance codes that may affect reliability.
Risk 3 • Facility/component condition that must be repaired/replaced within three years. • QA/QC identification of maintenance codes that may not affect reliability. • The QA/QC inspector determined the original I&M inspector's maintenance code was incorrect. • The independent field inspector determines a data quality issue.

Asset Inspection & Maintenance Audits

National Grid's Electric QA/QC group audited 7,351 distribution, transmission and sub-transmission assets that had been field inspected for maintenance during 2015. The method used to confirm and/or achieve the required quality of asset audits involved follow-up field audits by QA/QC personnel through a monthly random sample, with the intent of verifying identified maintenance codes derived from the population of assets inspected by field force operations during calendar year 2015. This process captured incorrect or missed maintenance codes, and noted timeliness of repairs when evident. To achieve a minimum 95% level of confidence, applicable to the entire population of inspection data and resulting random sample analysis, commonly applied statistical principles were utilized to conduct the audit process.

The QA/QC field audit process is designed to validate the field inspector findings. Results are considered to be passing when there is a match between the field inspection maintenance codes and QA/QC follow-up audit results. Based upon the accrued inspection data provided by the Company's Inspections Department, and the findings identified through follow-up QA/QC process, the overall accuracy of field inspection findings that impacts reliability (Risk 1 and Risk 2), was validated at **95**%.

2015 Field Inspections – QA/QC Audit Results

The following table illustrates the population and breakdown of assets inspected by field force and field compliance percentages related to system reliability concerns (Risk Levels 1&2 findings) identified through QA/QC process during calendar year 2015:

Asset Category	I&M Field Inspector	QA/QC Field Auditor		QA/QC Risk Levels		Compliance Percent (%)
	Assets Inspected	Assets Audited	MCodes Audited	Risk 1	Risk 2	
Distribution	255,736	6323	9,076	2	490	95%
Sub-Transmission	10,920	561	996	0	24	98%
Transmission	11,759	467	665	0	31	95%
		Total Compliance Percent				**95%**

QA/QC I&M Audit Analysis

National Grid desires a minimum threshold for inspection compliance percentage at 95%. QA/QC analysis of regional findings by misidentified maintenance codes and also additional maintenance codes are conducted for the purpose of determining compliance percentage of maintenance code trending for a particular region.

- Misidentified MCode – When the field inspector incorrectly identifies a maintenance code for a condition found at a structure.

- Additional MCode – When the QAQC inspector identifies a maintenance code that the field inspector did not account for at a structure.

If the compliance percentage is less than 95% to 90%, the electric QA/QC group conducts further analysis of accrued data for potential trending. Operations is responsible for corrective action where applicable. If the validation accuracy is less than 90%, Operations is responsible for further trending analysis and/or corrective action and implantation plan to improve field force inspections.

QAQC Misidentified Maintenance Code Trends

Region	QAQC Misidentified MCodes	MCode Description	Trending Quantity	Total Sample Size Audited YTD	Compliance Percent
48	152-Dist	Transformer missing ground wire at pole	16	1117	98%
	157-Dist	Transformer improper/missing bond	17		98%
	212-Dist	Ground guard required	24		98%
	221-Dist	Guy wire not in compliance with code NESC	15		99%
	291-Dist	Riser – Improper /Missing Bond	11		99%
50	155-Dist	Transformer – Animal Guards Required	21	1037	98%
51	212-Dist	Ground guard required	11	1452	99%
54	212-Dist	Ground guard required	29	1373	98%
60	212-Dist	Ground guard required	23	1432	98%
	221-Dist	Guy wire not in compliance with code NESC	12		99%
62	212-Dist	Ground guard required	11	1389	99%
	221-Dist	Guy wire not in compliance with code NESC	51		96%

QAQC Additional Maintenance Code Trends

Region	QAQC added MCodes	MCode Description	QTY	Total Sample Size Audited YTD	Compliance Percent
48	099-Dist	Streetlight not bonded	16	1117	99%
	115-Dist	Riser guard required	22		98%
	116-Dist	Visual rotted pole top	11		99%
	118-Dist	Pole stencil/ correction required	43		96%
	153-Dist	Transformer - LA blown, missing/improper	22		98%
	156-Dist	Non standard bonding of transformer xo bushings	35		97%
	207-Dist	Switch – L.A. Blown/ Missing Bond	11		99%
	212-Dist	Ground guard required	30		97%
	221-Dist	Guy wire not in compliance with code NESC	16		99%
	225-Dist	Guy wire non standard bonding or Isolation	34		97%
	291-Dist	Riser improper/missing bond	17		99%
	293-Dist	Riser lightning arrester blown, missing/improper	11		99%
	584-SubT	Misc- Install or replace warning signs	24	143	83%
50	116-Dist	Visual rotted pole top	10	1037	99%
	153-Dist	Transformer - LA blown, missing/improper	25		98%
	155-Dist	Transformer – Animal Guards Required	15		99%
	157-Dist	Transformer improper or missing bond	14		99%
	207-Dist	Switch – L.A. Blown/ Missing Bond	22		98%
	212-Dist	Ground guard required	10		99%
	221-Dist	Guy wire not in compliance with code NESC	44		96%
	584- SubT	Misc – Distribution under built	17	77	80%
	591- SubT	Misc – Distribution under built	13		83%
51	116-Dist	Visual rotted pole top	11	1452	99%
	118-Dist	Pole stencil/ correction required	18		99%
	153-Dist	Transformer LA blown, missing/improper	13		99%
	155-Dist	Transformer – Animal Guards Required	15		99%
	207-Dist	Switch – L.A. Blown/ Missing Bond	13		99%
	221-Dist	Guy wire not in compliance with code NESC	33		98%
	584- SubT	Misc – Distribution under built	4	205	98%
54	118-Dist	Pole stencil/ correction required	14	1373	99%
	153-Dist	Transformer LA blown, missing/improper	13		99%
	155-Dist	Transformer – Animal Guards Required	11		99%
	157-Dist	Transformer improper or missing bond	13		99%
	220- Dist	Guy Wire Marker missing	10		99%
	221-Dist	Guy wire not in compliance with code NESC	32		98%
	528- SubT	Pole- Aerial number missing	17	160	89%
	581- SubT	Misc- Stencil Line/Structure Number at Ground	10		94%
	584- SubT	Misc- Install or replace warning signs	40		75%

QAQC Additional Maintenance Code Trends

Region	QAQC added MCodes	MCode Description	QTY	Total Sample Size Audited YTD	Compliance Percent
56	118-Dist	Pole stencil/ correction required	13	589	98%
	153-Dist	Transformer LA blown, missing/improper	10		98%
	221-Dist	Guy – Not in compliance with NESC Code	17		98%
57	221-Dist	Guy – Not in compliance with NESC Code	23	687	97%
60	132-Dist	I7-Alluminum Dead-end	11	1432	99%
	157-Dist	Improper/Missing Bond	12		99%
	221-Dist	Guy – Not in compliance with NESC Code	29		98%
62	118-Dist	Pole stencil/ correction required	17	1389	99%
	157-Dist	Improper/Missing Bond	11		99%
	212-Dist	Ground guard required	10		99%
	221-Dist	Guy wire not in compliance with code (NESC)	24		98%
	526- Trans	Wood Pecker Damage	12	80	85%

I&M Results – Repairs

Per the Safety Standards, the QA/QC program is responsible to verify permanent repairs have been made in response to field force operations inspections performed, along with the timeliness of the repair. The 2015 field force inspection process yielded the following asset deficiencies and repair activities for I&M defined Level 1, Level 2, and Level 3 priorities:

Summary of Deficiencies and Repair Activity Resulting from the Inspection Process

Year	Priority Level / Repair Expected		Deficiencies Found (Total)	Repaired Within Required Time Frame	Repaired Past Required Due Date	Not Repaired and Not Due	Not Repaired – Overdue
2015							
	I	Within 1 week	904	840	49	0	15
	II	Within 1 year	13014	2495	0	10519	0
	III	Within 3 years	63350	858	0	62492	0
	IV	N/A	198304	62403	0	135901	0
	Temp Repairs	Within 90 days	195	163	4	15	13

The QA/QC group performed 446 Level 1 only follow-up field audits and validated that the 433 repairs were completed within the required time frame and 13 Level 1 have not been repaired and are overdue.

Elevated Voltage (EV) Assets Audited

The National Grid QA/QC 2015 EV Field Audit program targeted an overall minimum confidence level of 95% applicable to field force operations inspection of its Distribution, Underground, Transmission and Sub-Transmission assets. Additionally, a minimum confidence level of 98% should be realized for tested streetlights and traffic controls. The inspection process requires elevated voltage testing be conducted for each utility asset that is capable of conducting electricity and is publicly accessible. For each QA/QC EV audit to have successfully "passed," the following test parameters must be validated:

- The voltage recording shall be below established regulatory thresholds ($\leq$ 1volt or mitigated)
- All assets having a "testable object" were in fact tested by the field Inspector.

EV Risks Identified

The analysis of the QA/QC EV Program data is intended to identify the nature and magnitude of Risk 1 and 2 as applicable to the EV Program results.

Electric QA/QC EV Risk Level Definitions
QA/QC program methodology involved performing an additional QA/QC audit of randomly-selected assets having been previously tested by field inspector. For the QA/QC test to have "passed," it must confirm that all assets having a "testable object" were in fact tested.
Risk 1 • An elevated voltage reading was identified by the EV field tester and the independent QA/QC audit found the voltage not mitigated below regulatory/company thresholds after the forty-five (45) days. • The QA/QC inspector measured a voltage that exceeds the regulatory/company thresholds greater than or equal to 1 volt.
Risk 2 • The EV field tester determined there was not a testable object, and the independent QA/QC auditor identifies a testable component existed at the audited asset. • The EV field tester determined there was in fact a testable component and the independent QA/QC auditor revealed no testable component at the audited asset.
Risk 3 • The EV field tester and or the independent QA/QC field auditor deem the structure inaccessible or non testable. • The independent QA/QC field auditor determines a data quality issue. • Reasonable effort to effectively eliminate the stray voltage condition on overhead Sub-Transmission or Transmission structures was attempted but it some cases cannot achieve a reading of 1 volt or less after mitigation due to neutral currents and induced voltages.

2015 QAQC EV Field Asset Audit Results

The QA/QC group audited **6,704** elevated voltage assets for distribution, transmission and sub-transmission during eight operating regions.

QA/QC EV Assets Audited

Region	QA/QC Assets Audit Totals
48	1,327
50	778
51	1,005
54	787
56	506
57	579
60	765
62	957
Total	**6,704**

Total QA/QC EV Asset Audits Totals by Category Type

Category Type	Region 48	Region 50	Region 51	Region 54	Region 56	Region 57	Region 60	Region 62	Totals
Distribution	650	594	614	595	345	391	446	573	**4,208**
Underground	5	0	16	0	0	4	0	62	**87**
Sub Trans	81	58	110	51	79	10	48	54	**491**
Transmission	70	57	25	12	45	45	13	26	**293**
Streetlights	521	69	240	129	37	129	258	242	**1,625**
Totals	**1,327**	**778**	**1,005**	**787**	**506**	**579**	**765**	**957**	**6,704**

2015 QAQC EV Field Asset Audit Results – Risk Level

Risk Level 1 Identified

The National Grid 2015 QA/QC EV audits achieved an overall confidence level of **100%** for Risk 1 level for distribution, underground, transmission and sub-transmission assets.

Additionally, an overall confidence level of **100%** for Risk 1 Level was achieved for the electric QA/QC EV streetlight/ traffic control audits.

QA/QC Risk 1 Level Identified

Category Type	Region 48	Region 50	Region 51	Region 54	Region 56	Region 57	Region 60	Region 62	Total
Distribution	0	0	0	0	0	0	0	0	0
Underground	0	0	0	0	0	0	0	0	0
Sub Trans	0	0	0	0	0	0	0	0	0
Transmission	0	0	0	0	0	0	0	0	0
Streetlights	0	0	0	0	0	0	0	0	0
Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Risk Level 2 Identified

A total of 540 QA/QC EV audits (approximately 12% of 6,704 audits performed) resulted in Risk Level 2 being identified. The National Grid 2015 QA/QC EV audits achieved an overall confidence level of **92%** accuracy of identification of testable components.

QA/QC Risk Level 2 Identified

Category Type	Region 48	Region 50	Region 51	Region 54	Region 56	Region 57	Region 60	Region 62	Total
Distribution	139	60	25	35	5	16	26	20	326
Underground	0	0	0	0	0	0	0	0	0
Sub Trans	8	24	12	3	3	0	9	1	60
Transmission	4	1	10	0	0	2	0	0	17
Streetlights	107	3	8	1	0	0	0	18	137
Totals	**258**	**88**	**55**	**39**	**8**	**18**	**35**	**39**	**540**

QA/QC EV Audit Analysis - Risk Level 1 & 2

(1) Category Type: Distribution, Underground, Sub-Transmission & Transmission

Region	Dist, UG, SubT, Trans			Compliance Percent	Electric QAQC Additional Analysis Required	Operations Corrective Action Required
	Risk 1	Risk 2	Assets Audited		>90% and ≤95%	<90%
48	0	151	1,327	89%		X
50	0	85	778	89%		X
51	0	47	1,005	95%	X	
54	0	38	787	95%	X	
56	0	8	506	98%		
57	0	18	579	97%		
60	0	35	765	95%	X	
62	0	21	957	98%		

Note: In regions where QA/QC field audits validated the minimum confidence level to have been met or exceeded, no additional analysis or corrective action is required (N/A).

- If the validation accuracy range is 90% to 95% (Distribution, Underground, Sub-Transmission & Transmission), the electric QA/QC group will conduct further analysis of accrued data for potential trending. Operations will be responsible for corrective action where applicable.

- If the validation accuracy is less than 90% (Distribution, Underground, Sub-Transmission & Transmission), Operations is responsible for further trending analysis and/or corrective action and implantation plan to improve field force inspections.

(2) Category Type: Streetlights & Traffic Controls

Regions	Street Lights & Traffic Controls			Compliance Percent	Electric QAQC Additional Analysis Required	Operations Corrective Action Required
	Risk 1	Risk 2	Total Sample Size Audited		>95% and ≤98%	<98%
48	0	1	521	99%		
50	0	3	69	96%		
51	0	8	240	97%		
54	0	1	129	99%		
56	0	0	37	100%		
57	0	0	129	100%		
60	0	0	258	100%		
62	0	18	242	94%	X	

Note: In regions where QA/QC field audits validated the minimum confidence level to have been met or exceeded, no additional analysis or corrective action is required (N/A).

- If the validation accuracy range is 95% to 98% (Street Lights & Traffic Controls), the electric QA/QC group will conduct further analysis of accrued data for potential trending. Operations will be responsible for corrective action, where applicable.

- If the validation accuracy is less than 95% (Street Lights & Traffic Controls), Operations is responsible for further trending analysis and/or corrective action and implantation plan to improve field force inspections

Summary

QA/QC I&M Audit Program

The National Grid QA/QC analysis of the additional maintenance codes missed (defects) conducted in 2015 by the National Grid QAQC team concluded the following:

Sub-transmission

Maintenance Code 584 (Install/Replace Warning Sign) and MCode 591 (Misc – Distribution Under built), was missed repetitively across the NY territory. QA/QC discovered 85 errors applicable to maintenance Code 584.

Transmission

Maintenance Code 526 (Wood Pecker Damage) QA/QC discovered 12 errors applicable to maintenance Code 526.

Action item:
The Electric QA/QC and Electric Operations conducted further analysis of the data file and additional investigation into identification of deficiency causal factors. Corrective actions have been assigned to the appropriate regional Inspection groups.

QA/QC EV Program

No Risk Level 1 deficiencies for Distribution, Underground, Sub transmission & Transmission were identified through the QA/QC audit process. Based upon the compliance percentage of QAQC inspection program findings (100% accuracy), further analysis of the accrued QAQC EV inspection data is not warranted.

Action Item: NA

Streetlight EV Data Quality Deficiencies (Risk 3):

A total of 106 audits resulted in a data quality problem being realized. The issue involved the EV field inspector having determined that a non-testable object was identified as testable object. In each of these instances the follow-up QA/QC Field auditor verified the asset was a non testable object (Fiberglass/Composite Streetlight Standard).

Action Item: The QA/QC group has submitted corrective actions to the inspection group to address the non conformances and also have implemented steps to avoid recurrence.

APPENDIX SUMMARY

Appendix 1: Stray Voltage Testing Summary

Appendix 2: Summary of Energized Objects

Appendix 3: Summary of Shock Reports from the Public

Appendix 4: Summary of Deficiencies and Repair Activity Resulting from the Inspection Process

Appendix 5: Temporary Repair Exceptions

Appendix 6: Inspections Summary

Appendix 7: Summary of Overdue Repairs

Appendix 8: Mobile Testing

Appendix 9: NG-USA EOP G016 Elevated Equipment Voltage Testing

Appendix 10: NG-USA EOP D004 Distribution Line Patrol and Maintenance

Appendix 11: NG-USA EOP UG006 Underground Inspection and Maintenance

Appendix 12: NG-USA PR 06.01.601.001 Transmission Line Maintenance Procedure

Appendix 13: NG-USA EOP G017 Street Light Standard Inspection Program

Appendix 14: NG-USA EOP G004 Shock Complaints

Appendix 15: NG-USA SMS 400.06.1 Substation V&O Inspection Standard and SMP 400.06.2 Substation Inspection Procedure

Appendix 16: NG-USA EOP G029 Tracking Temporary Repairs To Electric System

Appendix 17: Certifications

Appendix 1

Stray Voltage Testing Summary

Appendix 1

Stray Voltage Testing Summary

Nationalgrid Data as of December 31, 2015	Total System Units Requiring Testing	Units Completed	Percent Completed	Units with Voltage Found (>= 1.0v)	Percent of Units Tested with Voltage (>= 1.0v)	Units Classified as Inaccessible
Distribution Facilities	1,308,890	268,752	20.53%	25	0.009%	2,766
Underground Facilities	28,343	28,343	100.00%		0.000%	543
Street Lights / Traffic Signals	84,814	84,814	100.00%	38	0.045%	541
Substation Fences	908	908	100.00%	3	0.33%	490
Transmission	102,056	22,225	21.78%	20	0.09%	
TOTAL	1,525,011	405,042	26.56%	86	0.02%	4,340

Appendix 2

Summary of Energized Objects

Appendix 2

Summary of Energized Objects (Manual Testing)

nationalgrid	Initial Readings				Readings After Mitigation		
	1 - 4.4 V	4.5 - 24.9 V	> 25 V	Total	< 1 V	1 - 4.4 V	> 4.5 V
Distribution Facilities	19	2	4	25	24	1	0
Pole (910)	1	1	1	3	3	0	0
Ground (914)	7	1	0	8	7	1	0
Guy (915)	11	1	2	14	14	0	0
Riser (916)	3	0	0	3	2	1	0
Other	0	0	1	1	1	0	0
Underground Facilities	0	0	0	0	0	0	0
Handhole / Pull box (950)	0	0	0	0	0	0	0
Manhole (951)	0	0	0	0	0	0	0
Padmount Switchgear (952)	0	0	0	0	0	0	0
Padmount Transformer (953)	0	0	0	0	0	0	0
Vault – Cover/Door (954)	0	0	0	0	0	0	0
Pedestal	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Street Lights / Traffic Signals	21	10	7	38	7	0	0
Metal Street Light Pole (971/981)	20	7	5	32	6	0	0
Traffic Signal Pole (991)	1	3	1	5	0	0	0
Control Box (992)	0	0	1	1	1	0	0
Pedestrian Crossing Pole (993)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Substation Fences	3	0	0	3	3	0	0
Fence (995)	3	0	0	3	3	0	0
Other	0	0	0	0	0	0	0
Transmission	18	2	0	20	20	0	0
Lattice Tower (931)	0	0	0	0	0	0	0
Pole 930)	0(	0	0	0	0	0	0
Ground (933)	15	1	0	16	16	0	0
Guy (934)	0	0	0	0	0	0	0
Other	3	1	0	4	4	0	0
Totals	61	14	11	86	85	1	0

NOTE - National Grid is only mitigating those locations where voltage is confirmed to be 1.0 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 facilties 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).

Appendix 3

Summary of Shock Reports from the Public

Appendix 3

Summary of Shock Reports from the Public

nationalgrid 2015 1st Quarter January 1, 2015 - March 31, 2015	Quarterly Update	Yearly Total
I. Total shock calls received:	**17**	**17**
Unsubstantiated		
Normally Energized Equipment		
Stray Voltage:		
Person	17	17
Animal		
II. Injuries Sustained/Medical Attention Received Due To SV		
Person		
Animal		
III. Voltage Source:	**17**	**17**
Utility Responsibility		
Issue with primary, joint, or transformer	1	1
Secondary joint (Crab)		
SL service Line		
Abandoned SL service line		
Defective service line		
Abandoned service line		
OH Secondary		
OH Service		
OH Service neutral	2	2
Pole		
Riser		
Other		
Customer Responsibility		
Contractor damage		
Customer equipment/wiring	14	14
Other Utility/Gov't Agency Responsibility		
SL Base Connection		
SL Internal wiring or light fixture		
Overhead equipment		
IV. Voltage Range:	**17**	**17**
1.0V to 4.4V		
4.5V to 24.9V	1	1
25V and above	1	1
Unknown	15	15

nationalgrid 2015 2nd Quarter April 1, 2015 - June 30, 2015	Quarterly Update	Yearly Total
I. Total shock calls received:	**43**	**60**
Unsubstantiated		
Normally Energized Equipment	10	10
Stray Voltage:		
Person	31	48
Animal	2	2
II. Injuries Sustained/Medical Attention Received Due To SV		
Person		
Animal		
III. Voltage Source:	**33**	**50**
Utility Responsibility		
Issue with primary, joint, or transformer	5	6
Secondary joint (Crab)		
SL service Line		
Abandoned SL service line		
Defective service line		
Abandoned service line		
OH Secondary	1	1
OH Service	1	1
OH Service neutral	4	6
Pole		
Riser		
Other	1	1
Customer Responsibility		
Contractor damage		
Customer equipment/wiring	21	35
Other Utility/Gov't Agency Responsibility		
SL Base Connection		
SL Internal wiring or light fixture		
Overhead equipment		
IV. Voltage Range:	**33**	**50**
1.0V to 4.4V	1	1
4.5V to 24.9V	4	5
25V and above	6	7
Unknown	22	37

nationalgrid 2015 3rd Quarter July 1, 2015 - September 30, 2015	Quarterly Update	Yearly Total
I. Total shock calls received:	**44**	**113**
Unsubstantiated	7	7
Normally Energized Equipment	4	14
Stray Voltage:		
Person	33	90
Animal		2
II. Injuries Sustained/Medical Attention Received Due To SV		
Person	2	2
Animal		
III. Voltage Source:	**42**	**92**
Utility Responsibility		
Issue with primary, joint, or transformer	2	8
Secondary joint (Crab)		
SL service Line	1	1
Abandoned SL service line		
Defective service line		
Abandoned service line		
OH Secondary	1	2
OH Service	3	4
OH Service neutral	3	9
Pole		
Riser		
Other	2	3
Customer Responsibility		
Contractor damage	3	3
Customer equipment/wiring	27	62
Other Utility/Gov't Agency Responsibility		
SL Base Connection		
SL Internal wiring or light fixture		
Overhead equipment		
IV. Voltage Range:	**42**	**92**
1.0V to 4.4V	4	5
4.5V to 24.9V	2	7
25V and above	7	14
Unknown	29	66

nationalgrid 2015 4th Quarter October 1, 2015 - December 31, 2015	Quarterly Update	Yearly Total
I. Total shock calls received:	**32**	**145**
Unsubstantiated	5	12
Normally Energized Equipment	6	20
Stray Voltage:		
Person	21	111
Animal		2
II. Injuries Sustained/Medical Attention Received Due To SV		
Person	1	3
Animal		
III. Voltage Source:	**21**	**113**
Utility Responsibility		
Issue with primary, joint, or transformer	1	9
Secondary joint (Crab)		
SL service Line		1
Abandoned SL service line		
Defective service line		
Abandoned service line		
OH Secondary	1	3
OH Service	2	6
OH Service neutral	1	10
Pole		
Riser		
Other		3
Customer Responsibility		
Contractor damage		3
Customer equipment/wiring	16	78
Other Utility/Gov't Agency Responsibility		
SL Base Connection		
SL Internal wiring or light fixture		
Overhead equipment		
IV. Voltage Range:	**21**	**113**
1.0V to 4.4V	1	6
4.5V to 24.9V		7
25V and above	5	19
Unknown	15	81

Appendix 4

Summary of Deficiencies and Repair Activity Resulting from the Inspection Process

Appendix 4

Summary of Deficiencies and Repair Activity Resulting from the Inspection Process

Detail of Deficiencies by Facilities	2011				2012				2013				2014				2015			
Priority Level	I	II	III	Temp Repairs	I	II	III	Temp Repairs	I	II	III	Temp Repairs	I	II	III	Temp Repairs	I	II	III	Temp Repairs
Repair Expected	Within 1 week	Within 1 year	Within 3 years	Within 90 days	Within 1 week	Within 1 year	Within 3 years	Within 90 days	Within 1 week	Within 1 year	Within 3 years	Within 90 days	Within 1 week	Within 1 year	Within 3 years	Within 90 days	Within 1 week	Within 1 year	Within 3 years	Within 90 days
Overhead Facilities																				
Repaired in Time Frame	366	23671	16210	83	358	29531	21354	170	326	17900	6946	133	408	21114	6971	139	694	2355	843	152
Repaired - Overdue	5	1239	165	7	2	2553	462	12	2	729	0	15	5	1367	0	4	35	0	0	4
Not Repaired - Not Due	0	0	0	0	0	0	0	0	0	0	10819	0	0	0	24791	0	0	9079	59707	13
Not Repaired - Overdue	0	0	27	0	0	57	650	0	0	52	0	1	0	219	0	1	12	0	0	11
Total Overhead Facilities	371	24910	16402	90	360	32141	22466	182	328	18681	17765	149	413	22700	31762	144	741	11434	60550	180
Underground Facilities																				
Repaired in Time Frame	76	1273	286	6	75	1326	154	8	219	642	30	7	124	848	164	13	84	19	1	6
Repaired - Overdue	0	526	6	0	0	419	1	1	6	205	0	3	1	28	0	0	5	0	0	0
Not Repaired - Not Due	0	0	0	0	0	0	0	0	0	0	261	0	0	0	112	0	0	545	104	2
Not Repaired - Overdue	0	0	46	0	0	5	7	0	0	379	0	0	0	112	0	0	3	0	0	0
Total Underground Facilities	76	1799	338	6	75	1750	162	9	225	1226	291	10	125	988	276	13	92	564	105	8
Pad Mount Facilities																				
Repaired in Time Frame	17	300	1	1	26	259	1	1	42	272	0	4	36	429	0	8	47	53	0	0
Repaired - Overdue	0	13	0	0	0	2	0	0	1	21	0	1	0	4	0	0	0	0	0	0
Not Repaired - Not Due	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	382	0	0
Not Repaired - Overdue	0	0	0	0	0	1	0	0	0	43	0	0	0	12	0	0	0	0	0	0
Total Pad Mount Facilities	17	313	1	1	26	262	1	1	43	336	0	5	36	445	0	8	47	435	0	0
Streetlight Facilities																				
Repaired in Time Frame	1	688	11	0	0	403	0	0	0	549	0	0	0	128	0	0	2	0	0	0
Repaired - Overdue	0	14	0	0	8	48	0	0	0	53	0	0	0	1	0	0	7	0	0	0
Not Repaired - Not Due	0	0	0	0	0	0	0	0	0	0	1	0	0	0	18	0	0	214	19	0
Not Repaired - Overdue	0	19	2	0	0	22	1	0	0	33	0	0	0	11	0	0	0	0	0	0
Total Streetlight Facilities	1	721	13	0	8	473	1	0	0	635	1	0	0	140	18	0	9	214	19	0
Transmission Facilities																				
Repaired in Time Frame	24	224	1982	3	21	506	1830	1	13	257	299	0	10	346	190	3	13	68	14	5
Repaired - Overdue	2	108	389	6	2	95	420	2	2	109	0	0	0	75	0	0	2	0	0	0
Not Repaired - Not Due	0	0	0	0	0	0	0	0	0	0	1036	0	0	0	2267	0	0	299	2662	0
Not Repaired - Overdue	0	6	156	3	0	36	829	0	0	40	0	0	0	66	0	0	0	0	0	2
Total Transmission Facilities	26	338	2527	12	23	637	3079	3	15	406	1335	0	10	487	2457	3	15	367	2676	7

Summary of Deficiencies and Repair Activity Resulting from the Inspection Process - Level IV Conditons										
Overhead Facilities	**2011**		**2012**		**2013**		**2014**		**2015**	
	Number of Conditions Found	**Number of Conditions Repaired**	**Number of Conditions Found**	**Number of Conditions Repaired**	**Number of Conditions Found**	**Number of Conditions Repaired**	**Number of Conditions Found**	**Number of Conditions Repaired**	**Number of Conditions Found**	**Number of Conditions Repaired**
Overhead Facilities										
Pole Condition										
Pole Condition	26342	16905	38697	26656	45514	27252	56517	34487	53515	36304
Grounding System	12666	0	31825	4	35172	0	45969	22	10429	1
Anchors/Guy Wire	48642	13223	56924	16883	52733	13552	55710	9250	33072	14306
Cross Arm/Bracing	2103	1	2335	0	1656	0	1285	0	1323	0
Riser	0	0	0	0	1	0	1	0	0	0
Conductors										
Primary Wire/Broken Ties	1044	0	916	0	880	0	0	0	0	0
Secondary Wire	1	0	438	0	1	0	1	0	1	0
Neutral	0	0	0	0	0	0	0	0	0	0
Insulators	9084	1	8502	0	6548	1	5660	0	8338	0
Pole Equipment										
Transformers	24968	29	26794	110	26462	15	22200	3	27914	0
Cutouts	28359	1	35711	2	42126	1	3400	4	382	0
Lightning Arrestors	2818	0	2741	1	2441	0	3149	0	3731	0
Other Equipment	370	0	411	1	382	1	359	0	619	0
Miscellaneous										
Trimming Related	1669	1285	2045	1816	2227	399	3007	14	1528	0
Other	46	0	57	0	14	0	69	14	77	3
Overhead Facilities Total	158112	31445	207396	45473	216157	41221	197327	43794	140929	50614
Transmission Facilities										
Towers/Poles										
Steel Towers	199	0	316	0	144	2	777	49	1486	0
Poles	3499	11	2744	3	2923	2	1950	0	3314	1
Anchors/Guy Wire	224	213	737	447	921	603	742	397	1156	686
Crossarm/Brace	0	0	0	0	0	0	0	0	0	0
Grounding System	43	0	40	0	17	0	1071	0	451	0
Conductors										
Cable	9	0	37	0	46	0	25	1	25	0
Static/Neutral	0	0	2	0	0	0	0	0	0	0
Insulators	138	0	249	0	159	0	160	0	220	0
Miscellaneous										
Right of Way Condition	377	0	382	6	558	34	314	25	276	1
Other	7924	2962	11350	3685	13454	5752	13779	3329	21020	4142
Transmission Facilities Total	12413	3186	15857	4141	18222	6393	18818	3801	27948	4830

Underground Facilities										
Underground Structures										
Damaged Cover	10	0	7	0	5	1	19	0	5	0
Damaged Structure	226	63	321	102	272	83	727	61	389	35
Congested Structure	0	0	0	0	0	0	0	0	0	0
Damaged Equipment	124	4	143	3	235	1	211	0	223	0
Conductors										
Primary Cable	2	2	1	1						
Secondary Cable	11	11	4	4	2	2	0	0	0	0
Neutral Cable	0	0	0	0	0	0	0	0	0	0
Racking Needed	23	23	6	6	4	4	1	0	0	0
Miscellaneous										
Other	5644	1937	4162	1050	6932	1515	7627	1922	8204	2727
Underground Facilities Total	6040	2040	4644	1166	7450	1606	8585	1983	8821	2762
Pad Mount Transformers										
Underground Structures										
Damaged Structure	3036	2197	2148	1649	2189	788	1712	666	1892	678
Damaged Equipment	0	0	0	0	0	0	0	0	0	0
Damaged Cable	0	0	0	0	0	0	0	0	0	0
Oil Leak	0	0	0	0	0	0	1	0	1	0
Off Pad	0	0	0	0	0	0	0	0	0	0
Lock/Latch/Penta	0	0	0	0	0	0	0	0	0	0
Miscellaneous										
Other	5824	4822	3767	2869	4534	2544	4409	2888	5132	3519
Pad Mount Transformer Total	8860	7019	5915	4518	6723	3332	6122	3554	7025	4197
Streetlights										
Streetlight										
Base/Standard/Light	6996	3	6105	5	4465	0	5195	4	6954	0
Handhole/Service Box	0	0	0	0	0	0	0	0	0	0
Service/Internal Wiring	4696	2	393	1	866	0	983	2	4146	0
Access Cover	11142	1	1271	0	2116	0	1522	2	1834	0
Miscellaneous										
Other	260	0	222	0	52	0	283	1	142	0
Streetlight Total	23094	6	7991	6	7499	0	7983	9	13076	0
Total Level IV Conditions										
Overall Total	208,519	43,696	241,803	55,304	256,051	52,552	238,835	53,141	197,799	62,403

Summary of Deficiencies and Repair Activity Resulting from the Inspection Process

Year	Prority Level / Repair Expected		Deficiencies Found (Total)	Repaired In Time Frame	Repaired - Overdue	Not Repaired - Not Due	Not Repaired - Overdue
2011							
	I	Within 1 week	491	484	7	0	0
	II	Within 1 year	28081	26156	1900	0	25
	III	Within 3 years	19281	18490	560	0	231
	IV	N/A	208519	43696	0	164823	0
	Temp Repairs	Within 90 days	109	93	13	0	3
2012							
	I	Within 1 week	492	480	12	0	0
	II	Within 1 year	35263	32025	3117	0	121
	III	Within 3 years	25709	23339	883	0	1487
	IV	N/A	241803	55304	0	186499	0
	Temp Repairs	Within 90 days	195	180	15	0	0
2013							
	I	Within 1 week	611	600	11	0	0
	II	Within 1 year	21284	19620	1117	0	547
	III	Within 3 years	19392	7275	0	12117	0
	IV	N/A	256054	52552	0	203502	0
	Temp Repairs	Within 90 days	164	144	19	0	1
2014							
	I	Within 1 week	584	578	6	0	0
	II	Within 1 year	24760	22865	1475	0	420
	III	Within 3 years	34513	7325	0	27188	0
	IV	N/A	238835	53141	0	185694	0
	Temp Repairs	Within 90 days	168	163	4	0	1
2015							
	I	Within 1 week	904	840	49	0	15
	II	Within 1 year	13014	2495	0	10519	0
	III	Within 3 years	63350	858	0	62492	0
	IV	N/A	198304	62403	0	135901	0
	Temp Repairs	Within 90 days	195	163	4	15	13

Appendix 5

Temporary Repair Exceptions

Appendix 5

Temporary Repair Exceptions

National Grid has 8 temporary repair exceptions to report.

Distribution

Feeder#	Line#	Pole#	Location	Region	Op District	Date Inspected	Comments	Maint Code	Priority	Comments	Work Order#	Quantity
26553	7	93	/scotch ridge rd	60	32	04/08/2015 9:41	223		9		19209253	1
13451	86	5-3	KRUTZ LN	62 35		06/25/2015 9:42		127	9	1		
9263	8	24	EAGLE HARBOR RD	50 06		07/02/2015 10:46	heavy vegetation on pole	128 9		leaning	1	
9263	10	27-1	HEMLOCK RIDGE RD	50 06		08/04/2015 9:02		116	9	1		
0461	4	22	DUTCH HILL (OFF ROAD)	51 10		09/01/2015 11:57	UNABLE TO DO PROPER HAMMER TEST AS SURROUNDED BY HEAVY MULTIFLORAL & VEGETATION VISUAL FROM APPROXIMATELY 4FT AWAY ACTUALLY LEVEL 2	120 9		POOR CONDITIO N	1	
7656	34	10977	W SHELBY RD	50 06		09/15/2015 9:16	crossarm is being used to raise service wire over road. Lower bolt is missing nut and pulling out. Upper bolt is loose	123 9		lower bolt loose	1	
42752	125	66-2	County Hwy 28	60 33		10/01/2015 10:25	Pole is currently tied off to trees for support	111 9		Hollow below grade	1	

Transmission

Circuit ID#	Structure#	Region	District	Location	Structure Type	Date Inspected	Maint Code	Priority	Quantity	Comments	Circuit Name	Work Order#
T5580	112	60 99		BETWEEN STERLING RIDGE + I -90	H-	05/14/2015 9:12	514 9		1	CROSSARMS CUT SHORT OF POLE AND BEING HELD BY MECHANICAL DEVICE. NOT PROPER	4 Riverside to Reynolds (T5580)	

										ATTACHMEN		

Appendix 6

Inspections Summary

Appendix 6

2015 PSC QTR 4 REPORT

NATIONAL GRID 2015- 2019 Inspection Summary	Total System Units	2015 Units Completed	2016 Units Completed	2017 Units Completed	2018 Units Completed	2019 Units Completed	2015-2019 Units Completed	2015-2019 Percent Completed
Distribution - Unique Inspections	1,238,964	255,736					255,736	20.64%
Distribution - Total Inspections	0	256,914					256,914	n/a
Underground Facilities - Unique	93,698	17,254					17,254	18.41%
Underground Facilities - Total	0	17,956					17,956	n/a
URD - Unique Inspections	66,262	12,268					12,268	18.51%
URD -Total Inspections	0	12,295					12,295	n/a
Street Light / Traffic Sig - Unique	65,838	12,664					12,664	19.24%
Street Light / Traffic Sig - Total	0	12,702					12,702	n/a
Transmission - Unique Inspections	103,181	22,679					22,679	21.98%
Transmission - Total Inspections	0	22,957					22,957	n/a
Grand Total - Unique Inspections	1,567,943	320,601					320,601	20.45%

Appendix 7

Summary of Overdue Repairs

Appendix 7

Summary of Overdue Repairs for Level II Repairs

Year	Facilities	-- Repaired -- Number of Days Overdue				-- Not Repaired -- Number of Days Overdue				Comments
		1-30	31-90	91-180	>180	1-30	31-90	91-180	>180	
2011	Distribution									
	Transmission									
	Subtransmission				2				8	Not Repaired: 8 Items
	Underground									
	Pad-mounts									
	Streetlights									
2012	Distribution								57	Not Repaired: 57 Items
	Transmission								3	Not Repaired: 3 Items
	Subtransmission								33	Not Repaired: 33 Items
	Underground								3	Not Repaired: 3 Items
	Pad-mounts									
	Streetlights									
2013	Distribution								52	Not Repaired: 52 Items
	Transmission								16	Not Repaired: 16 Items
	Subtransmission				6				28	Not Repaired: 28 Items
	Underground				45				374	Not Repaired: 374 Items
	Pad-mounts									
	Streetlights									
2014	Distribution	60	1				4	12	203	Not Repaired: 219 Items
	Transmission		13	6			2	51	1	Not Repaired: 54 Items
	Subtransmission				7		14		5	Not Repaired: 19 Items
	Underground		1	1			15	30	67	Not Repaired: 112 Items
	Pad-mounts									
	Streetlights									
2015	Distribution									
	Transmission									
	Subtransmission									
	Underground									
	Pad-mounts									
	Streetlights									

Summary of Overdue Repairs for Level III Repairs

Year	Facilities	-- Repaired -- Number of Days Overdue				-- Not Repaired -- Number of Days Overdue				Comments
		1-30	31-90	91-180	>180	1-30	31-90	91-180	>180	
2011	Distribution				2				27	Not Repaired: 27 Items
	Transmission				4				4	Not Repaired: 4 Items
	Sub Transmission								166	Not Repaired:166 Items
	Underground								45	Not Repaired: 45 Items
	Pad-mounts									
	Streetlights									
2012	Distribution	50	140	2		3	406	52	184	Not Repaired: 645 Items
	Transmission							76	351	Not Repaired: 427 Items
	Sub Transmission					22		151	243	Not Repaired: 416 Items
	Underground					2		1	1	Not Repaired: 4 Items
	Pad-mounts									
	Streetlights									
2013	Distribution									
	Transmission									
	Sub Transmission									
	Underground									
	Pad-mounts									
	Streetlights									
2014	Distribution									
	Transmission									
	Sub Transmission									
	Underground									
	Pad-mounts									
	Streetlights									
2015	Distribution									
	Transmission									
	Sub Transmission									
	Underground									
	Pad-mounts									
	Streetlights									

Appendix 8

Mobile Testing

Patric R. O'Brien
Assistant General Counsel

December 9, 2015

VIA ELECTRONIC FILING

Honorable Kathleen H. Burgess
Secretary
New York State Public Service Commission
Three Empire State Plaza
Albany, New York 12223-1350

Re: Case 10-E-0271 – In the Matter of Examining the Mobile Testing Requirements of the Electric Safety Standards

Dear Secretary Burgess:

Niagara Mohawk Power Corporation d/b/a National Grid ("Niagara Mohawk") submits for filing its 2015 Mobile Stray Voltage Testing Report pursuant to the Commission's *Orders Requiring Additional Mobile Stray Voltage Testing*, issued July 21, 2010 and June 23, 2011 in the above proceeding. The report details the results of Niagara Mohawk's mobile testing in the cities of Buffalo, Niagara Falls, and Albany during 2015.

Should you have any questions or concerns, please do not hesitate to contact me. Thank you for your time and attention.

Respectfully submitted,

/s/Patric R. O'Brien
Patric R. O'Brien

40 Sylvan Road, Waltham, MA 02451
T: 781.907.1850 ■ F: 781.907.5701 ■ patric.r.obrien@us.ngrid.com ■ www.nationalgrid.com

nationalgrid

2015 Mobile Stray Voltage Testing Report
December 9, 2015

A Background

Niagara Mohawk Power Corporation d/b/a National Grid ("Niagara Mohawk" or "Company") submits its 2015 Mobile Stray Voltage Testing Report ("Report") pursuant to the Public Service Commission's *Order Adopting Changes to Electric Safety Standards* issued December 15, 2008 in Case 04-M-0159 and *Orders Requiring Additional Mobile Stray Voltage Testing*, issued July 21, 2010 and June 23, 2011 in Case 10-E-0271 (collectively, the "Orders"). In compliance with the Commission's Orders, Niagara Mohawk's 2015 mobile testing consisted of one mobile scan in Albany and Niagara Falls and two mobile scans in Buffalo. The results of the mobile scans are detailed in the tables below.

Niagara Mohawk utilized Power Survey LLC ("Power Survey") to conduct the mobile scans. Niagara Mohawk also utilized Power Survey to perform the mobile scans in 2009 through 2014.

B. Mobile Testing Verification Process

Niagara Mohawk verifies a stray voltage finding made by the mobile scan by using its own internal testing verification procedure as outlined in Section V of the Company's Electric Operating Procedure NG-USA EOP G016. Verification entails using an HD probe to test all metallic objects in the area using a ground reference point as close as practical to the facility being tested up to 25 feet. In the event a suitable ground source cannot be located within the 25 foot range, the Company employs Power Survey's verification procedure, which allows for using a ground reference point of within 100 feet of the structure.

C. Mobile Testing Results by City

1. Albany

Testing began in Albany on October 26, 2015 and was completed on October 29, 2015 with the following results:

a. Total stray voltage findings = 116
b. Stray voltage findings at 4.4v and below = 88 (76%)
c. Stray voltage findings at 4.5v and above = 28 (24%)
d. Miles scanned = 229
e. Niagara Mohawk structures scanned = 4,695

Events/Hits							
	2009	2010	2011	2012	2013	2014	2015
Albany	101	217	148	168	106	127	116
97% of events in 2015 were found on streetlights							

2. Niagara Falls

Testing began in Niagara Falls on May 21, 2014 and was completed on May 22, 2015 with the following results:

a. Total stray voltage findings = 53
b. Stray voltage findings at 4.4v and below = 48 (91%)
c. Stray voltage findings at 4.5v and above = 5 (9%)
d. Miles scanned = 43
e. Niagara Mohawk structures scanned = 1,317

Events/Hits							
	2009	2010	2011	2012	2013	2014	2015
Niagara Falls	54	11	47	15	12	13	53
100% of events in 2015 were found on streetlights							

3. Buffalo

Niagara Mohawk conducted two separate mobile scans of Buffalo in 2015. The first mobile scan began on May 4, 2015 and was completed on June 11, 2015 with the following results:

a. Total stray voltage findings = 471
b. Stray voltage findings at 4.4v and below = 399 (85%)
c. Stray voltage findings at 4.5v and above = 72 (15%)
d. Miles scanned = 1,466
e. Niagara Mohawk structures scanned = 27,831

The second mobile scan began on September 14, 2015 and was completed on October 21, 2015 with the following results:

a. Total stray voltage findings = 605
b. Stray voltage findings at 4.4v and below = 514 (85%)
c. Stray voltage findings at 4.5v and above = 91 (15%)
d. Miles scanned = 1,423[1]
e. Niagara Mohawk structures scanned = 27,781[2]

Events/Hits													
	2009	2010-Scan 1	2010-Scan 2	2011-Scan 1	2011-Scan 2	2012-Scan 1	2012-Scan 2	2013-Scan 1	2013-Scan 2	2014-Scan 1	2014-Scan 2	2015-Scan 1	2015-Scan 2
Buffalo	2,678	931	837	714	566	316	260	345	570	450	293	471	605
Approx 92% of events were found on streetlights (2015 Scans 1 & 2)													

[1] Variances in mileages are directly attributable to the same crews performing both scans and optimizing their routes during the second scan resulting in less overlap.
[2] Variances in scanned structures are attributable to unscannable assets due to inaccessible roadways due to construction, road blocks, and private roads.

A majority of the 2015 findings were below 4.5v in Albany (76%), Niagara Falls (91%), and Buffalo (85% in Scan 1 and 85% in Scan 2).

D. Mobile Testing Repair/Mitigation Efforts

As of November 20, 2015, Niagara Mohawk has completed 69% of the total permanent repairs in Buffalo (Scan 1 & Scan 2), Niagara Falls, and Albany.

A summary table illustrating repair status by region can be found in Appendices A-E. These tables are updated as of November 20, 2015.

E. Mobile Testing Program Costs

As of November 23, 2015, the mobile scan surveys totaled $2,144,510.

City	Actual Miles	Events Found	Event Rate	Repairs	Mobile Inspection Cost
Buffalo Scan 1	1,466	471	0.32	471	$2,031,480
Buffalo Scan 2	1,423	605	0.43	252	
Niagara Falls	43	53	1.23	53	$39,367
Albany	229	116	0.51	2	$68,846
Total	3,161	1,245		778	$2,144,510

F. Mobile and Manual Testing Program Comparison

It cost the Company on average 9 times more to conduct mobile testing (per mile cost) when compared to manual testing (per unit cost) in Albany, Niagara Falls, and Buffalo in 2015.

	Albany		Niagara Falls		Buffalo Scan 1 & 2	
2015 Estimated Costs	**Manual[3]**	**Mobile**	**Manual**	**Mobile**	**Manual**	**Mobile**
Non-Streetlighting Eqp.	$10,022	$68,846	$2,397	$39,367	$58,179	$2,031,480
Metallic Streetlighting Eqp.	$2,939		$1,260		$18,712	
Delta	Δ$55,885		Δ$35,710		Δ$1,954,589	

[3] The estimated manual testing costs are based on the per unit cost of conducting a manual elevated voltage test in Albany, Niagara Falls, and Buffalo and the number of facilities scanned during mobile testing in 2015. The numbers reflect what it would have cost the Company had it performed manual testing in these cities in 2015.

Appendix A
Mobile Testing & Repair Summary

NY Stray Voltage Mobile Testing Summary Report 2015
11/20/2015

	Buffalo Scan 1	Buffalo Scan 2	N. Falls	Albany	*Grand Total*
Testing Summary					
Total Number of Events	471	605	53	116	**1,245**
At or Above 4.5 Volts	72	91	5	28	**196**
Between 1.0 and 4.4 Volts	399	514	48	88	**1,049**
Total NGRID Owned Events (streetlights)	471	605	53	116	**1,245**
At or Above 4.5 Volts	72	91	5	28	**196**
Between 1.0 and 4.4 Volts	399	514	48	88	**1,049**
Total Private Owned Events	34	15	0	0	**49**
At or Above 4.5 Volts	19	6	0	0	**25**
Between 1.0 and 4.4 Volts	15	9	0	0	**24**
Survey Percent Complete by City					
Buffalo (Scan 1)	1466				**100.00%**
Buffalo (Scan 2)		1423			**100.00%**
Niagara Falls			43		**100.00%**
Albany				229	**100.00%**
Total Miles To Be Scanned (estimates)	1,466	1,423	43	229	**3,161**

NY Stray Voltage Mobile Testing Repair Summary Report 2015
11/20/2015

	Buffalo Scan 1	Buffalo Scan 2	N. Falls	Albany	*Grand Total*
Repair Summary					
NGRID Repairs					
Required	471	605	53	116	**1,245**
Completed	471	344	53	48	**916**
Pending (All repairs)	0	261	0	68	**329**
Pending (De-energized streetlights)	0	42	0	19	**61**
Exceeding 45 Days	0	2	3	0	**5**
Percent Complete	100.00%	56.86%	100.00%	41.38%	**73.57%**
TOH Repairs	15	7	0	0	**19**
TOH Complete	15	0	0	0	**15**
TOH Pending	0	7	0	0	**4**
TOH Exceeding 90 Days	0	0	0	0	**0**
TOH Percent Complete	100.00%	0.00%	100.00%	100.00%	**78.95%**
Private Repairs					
Required	34	15	0	0	**49**
Completed	34	15	0	0	**49**
Pending	0	0	0	0	**0**
Exceeding 45 Days	0	0	0	0	**0**
Percent Complete	100.00%	100.00%	100.00%	100.00%	**100.00%**
Total Repairs Pending	0	261	0	68	**329**
Total Repairs Complete	471	344	53	48	**916**
Total Repairs Percent Complete	100.00%	56.86%	100.00%	41.38%	**73.57%**

Appendix B

Summary of Energized Objects - Mobile Testing - City of Niagara Falls

nationalgrid
Data as of November 20, 2015

	Initial Readings				Readings After Mitigation		
	1 - 4.4 V	4.5 - 24.9 V	> 25 V	Total	< 1 V	1 - 4.4 V	> 4.5 V
Distribution Facilities	0	0	0	0	0	0	0
Pole (910)	0	0	0	0	0	0	0
Ground (914)	0	0	0	0	0	0	0
Guy (915)	0	0	0	0	0	0	0
Riser (916)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Underground Facilities	0	0	0	0	0	0	0
Handhole / Pull box (950)	0	0	0	0	0	0	0
Manhole (951)	0	0	0	0	0	0	0
Padmount Switchgear (952)	0	0	0	0	0	0	0
Padmount Transformer (953)	0	0	0	0	0	0	0
Vault – Cover/Door (954)	0	0	0	0	0	0	0
Pedestal	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Street Lights / Traffic Signals	48	4	1	53	53	0	0
Metal Street Light Pole (971/981)	48	4	1	53	53	0	0
Traffic ignal ole 98 1)	P 0(	0	0	0	0	0	0
Control ox 992)	B 0(	0	0	0	0	0	0
Pedestrian Crossing Pole (993)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Substation Fences	0	0	0	0	0	0	0
Fence 995)	0(	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Transmission	0	0	0	0	0	0	0
Lattice ower 931)	T 0(	0	0	0	0	0	0
Pole 930)	0(	0	0	0	0	0	0
Ground (933)	0	0	0	0	0	0	0
Guy (934)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Miscellaneous Facilities	0	0	0	0	0	0	0
Sidewalk	0	0	0	0	0	0	0
Gate/Fence/Awning*	0	0	0	0	0	0	0
Control Box	0	0	0	0	0	0	0
Scaffolding	0	0	0	0	0	0	0
Bus Shelter	0	0	0	0	0	0	0
Fire Hydrant	0	0	0	0	0	0	0
Phone Booth	0	0	0	0	0	0	0
Water Pipe	0	0	0	0	0	0	0
Riser	0	0	0	0	0	0	0
Other**	0	0	0	0	0	0	0
Totals	48	4	1	53	53	0	0

*Includes railing
**Including but not limited to manhole cover, sewer cover, no parking sign, parking meter, private sign, stop sign, storm grate.

Appendix C

Summary of Energized Objects - Mobile Testing - City of Albany

nationalgrid
Data as of November 20, 2015

	Initial Readings				Readings After Mitigation		
	1 - 4.4 V	4.5 - 24.9 V	> 25 V	Total	< 1 V	1 - 4.4 V	> 4.5 V
Distribution Facilities	0	0	0	0	0	0	0
Pole (910)	0	0	0	0	0	0	0
Ground (914)	0	0	0	0	0	0	0
Guy (915)	0	0	0	0	0	0	0
Riser (916)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Underground Facilities	0	0	0	0	0	0	0
Handhole / Pull box (950)	0	0	0	0	0	0	0
Manhole (951)	0	0	0	0	0	0	0
Padmount Switchgear (952)	0	0	0	0	0	0	0
Padmount Transformer (953)	0	0	0	0	0	0	0
Vault – Cover/Door (954)	0	0	0	0	0	0	0
Pedestal	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Street Lights / Traffic Signals	87	25	3	115	48	0	0
Metal Street Light Pole (971/981)	86	24	3	113	46	0	0
Traffic ignal ole 98 1)	P 1(	1	0	2	2	0	0
Control ox 992)	B 0(	0	0	0	0	0	0
Pedestrian Crossing Pole (993)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Substation Fences	0	0	0	0	0	0	0
Fence 995)	0(	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Transmission	0	0	0	0	0	0	0
Lattice ower 931)	T 0(	0	0	0	0	0	0
Pole 930)	0(	0	0	0	0	0	0
Ground (933)	0	0	0	0	0	0	0
Guy (934)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Miscellaneous Facilities	1	0	0	1	0	0	0
Sidewalk	0	0	0	0	0	0	0
Gate/Fence/Awning*	0	0	0	0	0	0	0
Control Box	0	0	0	0	0	0	0
Scaffolding	0	0	0	0	0	0	0
Bus Shelter	0	0	0	0	0	0	0
Fire Hydrant	0	0	0	0	0	0	0
Phone Booth	0	0	0	0	0	0	0
Water Pipe	0	0	0	0	0	0	0
Riser	0	0	0	0	0	0	0
Other**	1	0	0	1	0	0	0
Totals	88	25	3	116	48	0	0

*Includes railing
**Including but not limited to manhole cover, sewer cover, no parking sign, parking meter, private sign, stop sign, storm grate.

Appendix D

Summary of Energized Objects - Mobile Testing - City of Buffalo Scan 1

nationalgrid
Data as of November 20, 2015

	Initial Readings				Readings After Mitigation		
	1 - 4.4 V	4.5 - 24.9 V	> 25 V	Total	< 1 V	1 - 4.4 V	> 4.5 V
Distribution Facilities	0	0	0	0	0	0	0
Pole (910)	0	0	0	0	0	0	0
Ground (914)	0	0	0	0	0	0	0
Guy (915)	0	0	0	0	0	0	0
Riser (916)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Underground Facilities	0	0	0	0	0	0	0
Handhole / Pull box (950)	0	0	0	0	0	0	0
Manhole (951)	0	0	0	0	0	0	0
Padmount Switchgear (952)	0	0	0	0	0	0	0
Padmount Transformer (953)	0	0	0	0	0	0	0
Vault – Cover/Door (954)	0	0	0	0	0	0	0
Pedestal	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Street Lights / Traffic Signals	369	61	5	435	435	0	0
Metal Street Light Pole (971/981)	359	55	4	418	418	0	0
Traffic Signal Pole (991)	10	6	1	17	17	0	0
Control ox 992)	B 0(	0	0	0	0	0	0
Pedestrian Crossing Pole (993)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Substation Fences	0	0	0	0	0	0	0
Fence 995)	0(	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Transmission	0	0	0	0	0	0	0
Lattice ower 931)	T 0(	0	0	0	0	0	0
Pole 930)	0(	0	0	0	0	0	0
Ground (933)	0	0	0	0	0	0	0
Guy (934)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Miscellaneous Facilities	30	6	0	36	35	0	1
Sidewalk	0	0	0	0	0	0	0
Gate/Fence/Awning*	0	0	0	0	0	0	0
Control Box	0	0	0	0	0	0	0
Scaffolding	0	0	0	0	0	0	0
Bus Shelter	0	1	0	1	1	0	0
Fire Hydrant	0	0	0	0	0	0	0
Phone Booth	0	0	0	0	0	0	0
Water Pipe	0	0	0	0	0	0	0
Riser	0	0	0	0	0	0	0
Other**	30	5	0	35	34	0	1
Totals	399	67	5	471	470	0	1

*Includes railing
**Including but not limited to manhole cover, sewer cover, no parking sign, parking meter, private sign, stop sign, storm grate.

Appendix E

Summary of Energized Objects - Mobile Testing - City of Buffalo Scan 2

nationalgrid
Data as of November 20, 2015

	Initial Readings				Readings After Mitigation		
	1 - 4.4 V	4.5 - 24.9 V	> 25 V	Total	< 1 V	1 - 4.4 V	> 4.5 V
Distribution Facilities	0	0	0	0	0	0	0
Pole (910)	0	0	0	0	0	0	0
Ground (914)	0	0	0	0	0	0	0
Guy (915)	0	0	0	0	0	0	0
Riser (916)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Underground Facilities	0	0	0	0	0	0	0
Handhole / Pull box (950)	0	0	0	0	0	0	0
Manhole (951)	0	0	0	0	0	0	0
Padmount Switchgear (952)	0	0	0	0	0	0	0
Padmount Transformer (953)	0	0	0	0	0	0	0
Vault – Cover/Door (954)	0	0	0	0	0	0	0
Pedestal	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Street Lights / Traffic Signals	507	83	6	596	338	0	0
Metal Street Light Pole (971/981)	491	76	6	573	319	0	0
Traffic Signal Pole (991)	14	7	0	21	17	0	0
Control ox 992)	B 2(	0	0	2	2	0	0
Pedestrian Crossing Pole (993)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Substation Fences	0	0	0	0	0	0	0
Fence 995)	0(	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Transmission	0	0	0	0	0	0	0
Lattice ower 931)	T 0(	0	0	0	0	0	0
Pole 930)	0(	0	0	0	0	0	0
Ground (933)	0	0	0	0	0	0	0
Guy (934)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Miscellaneous Facilities	7	2	0	9	6	0	0
Sidewalk	0	0	0	0	0	0	0
Gate/Fence/Awning*	0	0	0	0	0	0	0
Control Box	0	0	0	0	0	0	0
Scaffolding	0	0	0	0	0	0	0
Bus Shelter	0	0	0	0	0	0	0
Fire Hydrant	0	0	0	0	0	0	0
Phone Booth	0	0	0	0	0	0	0
Water Pipe	0	0	0	0	0	0	0
Riser	0	0	0	0	0	0	0
Other**	7	2	0	9	6	0	0
Totals	514	85	6	605	344	0	0

*Includes railing
**Including but not limited to manhole cover, sewer cover, no parking sign, parking meter, private sign, stop sign, storm grate.

Appendix 9

NG-USA EOP G016 Elevated Equipment Voltage Testing

INTRODUCTION

The purpose of this procedure is to outline the requirements for the annual equipment elevated 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, the New York Public Service Commission's "Order Adopting Changes to Electric Safety Standards issued and effective on December 15, 2008, the New York Public Service Commission's "Order Requiring Additional Mobile Stray Voltage Testing" issued and effective on July 21, 2010 and the New York's Public Service Commission "Order Granting Petition In Part and Modifying Electric Safety Standards" issued and effective on March 22, 2013.

This procedure also outlines requirements for equipment elevated voltage testing in Rhode Island and requirements by the Rhode Island Public Utilities Commission in Docket 4237 "Order to Establish a Contact Voltage Detection, Repair and Reporting Program" issued on November 9, 2012, and the subsequent order issued on February 1, 2013.

Additionally the Massachusetts Department of Telecommunications and Energy provided a series of recommendations on December 9, 2005, that have been included in this procedure.

While there are variances in requirements between New York, Massachusetts, and Rhode Island driven by particular regulatory requirements in each State, the minimum requirements are based on sound utility practice.

PURPOSE

This procedure applies to all personnel involved with or responsible for the testing, repair and reporting of facilities designated by this EOP for equipment elevated voltage. It should be noted that the term "Contact Voltage" has been adopted and is used in the EOP (refer to definitions section).

ACCOUNTABILITY

1. Standards, Policies and Codes
   A. Update program as necessary.
   B. Provide personnel guidance and assistance as requested.

2. Inspection s & Maintenance
   A. Ensure the equipment elevated voltage program as outlined in this EOP is implemented properly and timely.
   B. Ensure that the program as outlined in the EOP is completed each year.
   C. Provide qualified personnel to complete equipment elevated voltage testing.
   D. Ensure all equipment elevated voltage inspectors have been trained.

3. Equipment Elevated Voltage Inspector

   A. Demonstrate the ability and proficiency to perform equipment elevated voltage testing per this EOP.

   B. Demonstrate the ability to become proficient in the use of the appropriate database.

   C. Possess the ability to do walking patrols, collect information, edit data, and guard unsafe facilit ies.

   D. Attend equipment elevated voltage training program.

4. Learning & Development

   A. Provide training upon request.

5. Distribution Network Strategy

   A. Provide input into program revisions.

   B. Ensure the equipment elevated voltage program as outlined in this EOP is implemented properly and timely.

   C. Ensure the program as outlined in the EOP is completed each year.

   D. Provide qualified personnel to complete equipment elevated voltage testing.

   E. Ensure all equipment elevated voltage inspectors have been trained.

   F. Provide program management. .

REFERENCES

NYPSC Order 04-M-0159
NYPSC Order Adopting Changes to Electric Safety Standards
NYPSC Order Requiring Additional Mobile Stray Voltage Testing
RIPUC Docket 4237 Order 20871 (November 9, 2012) and Order 20950 (February 1, 2013)
Proposed Rhode Island Electric Contact Voltage Program, Revised October 2, 2012 (Docket 4237)
NYSPSC Order Granting Petition in Part and Modifying Electric Safety Standards
Applicable National Grid Safety Rules & Procedures
Testing Equipment Operation Instructions

DEFINITIONS

Contact Voltage (Draft definition as defined by the Working Group of the Institute of Electrical and Electronic Engineers (IEEE)): Voltage resulting from abnormal power system conditions that may be present between two conductive surfaces that can come into contact by members of the general public and/or animals. Contact voltage is caused by power system fault current as it flows through the impedance of available fault current pathways. Contact voltage is not related to normal system operation and can exist at levels that may be hazardous.

Contact Voltage Area (CVA): Designated underground distribution areas within the cities of Providence, Pawtucket, Newport and Woonsocket established in the "proposed Rhode Island Electric Contact Voltage Program", Revised October 2, 2012 (Docket 4237).

Equipment Elevated 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.

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

Finding: Any confirmed voltage reading on an electric facility or streetlight greater than or equal to 1V measured using a volt meter and a 500 ohm shunt resistor.

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

Mitigation: Corrective actions performed by the utility to address the stray voltage finding.

Proximity Detection Unit: A low voltage hand held detector used to test exposed metallic surfaces and conductors for the presence of low voltage from 6V to 600V.

Shall: The word shall is to be understood as mandatory.

Should: The word should is to be understood as advisory.

Stray Voltage: As defined by NYPSC the term "Stray Voltage" means voltage conditions on electric facilities that should not ordinarily exist.

Stray Voltage Testing: The process of checking an electric facility for stray voltage using a device capable of reliably detecting and audibly and/or visually signaling voltages in the range of 6 to 600 volts.

Total Harmonic Distortion (THD): This term has come into common usage to define either voltage or current "distortion factor."

Distortion Factor (harmonic factor): The ratio of the root-mean-squared of the harmonic content to the root-mean-squared value of the fundamental quantity, expressed as a percent of the fundamental.

$$DF = \sqrt{\frac{sum\_of\_squares\_of\_amplitudes\_of\_all\_harmonics}{square\_of\_amplitude\_of\_fundamental}} * 100\%$$

DOCUMENT CONTENTS

Table of Contents

1.0 FACILITIES WHERE EQUIPMENT ELEVATE VOLTAGE TESTING/DOCUMENTATION IS REQUIRED – NEW YORK

1.1 Street Lights and Municipally Owned Facilities

1.1.1 Company owned metallic street lighting standards are required to be tested for equipment elevated voltage annually. This test is to be performed while the light is operating.

1.1.2 Municipally owned street light systems that National Grid directly provides energy to shall be tested for equipment elevated 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.

1.1.3 Municipal owned metallic traffic signal standards and accessible devices are to be tested annually for equipment elevated voltage by National Grid.

1.1.4 All street lights identified on public thoroughfares regardless of ownership are to be tested annually.

1.1.5 All street lights under a maintenance contract are to be tested annually. Exceptions not requiring equipment elevated 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.

1.2 National Grid Substation Fences

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

1.3 Overhead Distribution Facilities

1.3.1 Towers and/or metallic poles with distribution facilities shall be tested for equipment elevated voltage at an annual rate of twenty percent (20%) in conjunction with field inspections on a five-year cycle.

1.3.2 The following equipment on wood distribution poles requires equipment elevated voltage testing at an annual rate of twenty percent (20%) in conjunction with field inspections on a five-year cycle:

1. Metallic riser guard or conduit (company or non-company).
2. Uncovered or uninsulated down ground (company or non-company).
3. Down guy (company or non-company).
4. Any other publicly accessible conductive piece of equipment (company or non-company) on the pole within reach from the ground.

1.3.3 Exceptions: Customer meters and customer meter poles are excluded.

1.4 Overhead Transmission Facilities

1.4.1 Towers and/or metallic poles with transmission facilities shall be tested for equipment elevated voltage at an annual rate of twenty-percent (20%) in conjunction with field inspections on a five-year cycle.

1.4.2 The following equipment on wood transmission poles or structures require equipment elevated voltage testing at an annual rate of twenty-percent (20%) in conjunction with field inspections on a five-year cycle:

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.

1.5 Underground Facilities

1.5.1 Annual equipment elevated 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, and handhole covers.

1.5.2 Pad-mounted transformers and switchgear are tested at an annual rate of twenty percent (20%) in conjunction with field inspections on a five-year cycle.

1.5.3 Starting in 2010 and continuing thereafter, unless changed by subsequent order of the NY Public Service Commission, two mobile stray voltage surveys shall be conducted annually in Buffalo and one mobile stray voltage survey is required to be conducted annually in Albany and Niagara Falls.

1.5.4 Exceptions: Non-metallic concrete or fiberglass pads or handholes or pull/splice boxes are not required to be tested.

1.6 Daily Job Site Test Requirements

1.6.1 Each job site where National Grid personnel or its contractors complete a work assignment shall be tested for equipment elevated voltage at the start and at the end of the work day or at the start or at the completion of the assignment. This testing requirement is considered good utility practice and does not require specific documentation.

1.6.2 Exceptions:

a. Substation fencing will not require equipment elevated 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.

1.7 Exemptions

1.7.1 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.

2.0 FACILITIES WHERE EQUIPMENT ELEVATED VOLTAGE TESTING/DOCUMENTATION IS REQUIRED – RHODE ISLAND

2.1 Company Owned Street Lights

2.1.1 Company owned metallic street lighting standards are required to be tested for equipment elevated voltage on a three-year cycle.

2.1.2 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 the public.

2.2 Overhead Distribution Facilities

2.2.1 Towers and/or metallic poles with transmission facilities shall be tested for equipment elevated voltage at an annual rate of twenty-percent (20%) in conjunction with field inspections on a five-year cycle..

2.2.2 The following equipment on wood transmission poles or structures require equipment elevated voltage testing at an annual rate of twenty-percent (20%) in conjunction with field inspections on a five-year cycle:

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.

2.3 Underground Facilities

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

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

2.3.3 Starting in Fiscal Year 2013 and continuing thereafter, unless changed by subsequent order of the Rhode Island Public Utilities Commission, mobile contact voltage surveys will be performed in designated Contact Voltage Areas (CVA) The mobile surveys will be performed on a five-year cycle. A survey of 100 percent of the CVA will be performed the first year of the program followed by 20 percent of the CVA in successive years.

2.4 Daily Job Site Test Requirements

2.4.1 Each job site where National Grid personnel or its contractors complete a work assignment shall be tested for equipment elevated voltage at the start and at the end of the work day or at start and at 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.

2.5 Exe mptions

2.5.1 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.

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

3.1 Company Owned Street Lights

3.1.1 Company owned metallic street lighting standards are required to be tested for equipment elevated voltage on a five year cycle.

3.1.2 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.

3.2 Overhead Distribution Facilities

3.2.1 Towers and/or metallic poles with transmission facilities shall be tested for equipment elevated voltage at an annual rate of twenty-percent (20%) in conjunction with field inspections on a five-year cycle.

3.2.2 The following equipment on wood transmission poles or structures require equipment elevated voltage testing at an annual rate of twenty-percent (20%) in conjunction with field inspections on a five-year cycle:

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.

3.3 Underground Facilities

3.3.1 Equipment elevated 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-mounted transformers, secondary pedestals, and pad-mounted switchgears.

Exceptions: Non-metallic concrete or fiberglass pads or handholes or pull/splice boxes are not required to be tested.

3.4 Daily Job Site Test Requirements

3.4.1 Each job site where National Grid personnel or its contractors complete a work assignment shall be tested for equipment elevated voltage at the start and at the end of the work day or at the start or at 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.

3.5 Exe mptions

3.5.1 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.

4.0 TEST EQUIPMENT

4.1 A hand held device (proximity detection unit) that is capable of detecting voltage from 6 volts to 600 volts.

4.2 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.

4.3 The handheld devices utilized shall be certified by an independent test laboratory as being able to reliably detect voltages of 6 – 600 volts. The following units have been certified:

4.3.1 HD Electric model LV-S-5 (5-600 volts).

Fluke 85
Fluke 87
Fluke 170 series or equivalent
Fluke 175
Fluke 177
Fluke 179
Fluke 187
Fluke 189

4.4 Mobile Voltage Detection Equipment:

Narda 8950/10 Stray Voltage System
SVD2000 Stray Voltage Mobile Detector

5.0 TEST PROCEDURE

5.1 Job Briefing

5.1.1 At minimum, the following information shall be communicated to all personnel at the beginning of each shift for equipment elevated 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 shall 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.

5.2 Measurements for voltages will be performed in accordance with the following:

5.2.1 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 4.0, 4.3.

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.

5.2.2 If this test detects voltage, repeat the test with the portable AC voltmeter (The 500 ohm resistor is NOT used in this initial test):

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.

1. 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.
2. 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. An alternate method is available for obtaining a ground reference point utilizing an aluminum plate in lieu of driving a ground rod. The reference point should be as close as practicable to the facility being tested to simulate an equipment elevated 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 to determine the voltage.

1. Voltages readings greater than 30 volts shall be recorded in the database for the site.
2. For voltage readings less than 30 volts, install a 500 ohm input load impedance resistor on the volt meter. Take another voltage measurement and record this voltage in the database for the site.

5.2.3 Measurements for elevated voltages/contact voltage using mobile technology will be performed in accordance with the following:

a. Mobile testing is performed by contract crews driving pre-determined routes in Contact Voltage Areas searching for elevated voltage levels. The equipment used is mounted to vehicles and detects voltage levels greater than 1 volt while driving at speeds of up to 25 mph near underground facilities. Once elevated voltages are detected the crew stops and performs a thorough check with certified manual testing equipment to determine if there is contact voltage present.

5.2.4 Any positive indications by either mobile testing or hand held tools shall be followed up with multi-meter measurements on the target structures. Voltage measurements shall be taken in accordance with Section 5.2.2 above. The investigators shall verify that a suitable ground (i.e. a ground that is not energized) is used as a reference. Ground source location shall be marked with tape, paint or flag for future testing of repair work.

5.2.5 A Total Harmonic Distortion (THD) test method will be implemented as a pilot for Rhode Island mobile elevated voltage testing. THD will be determined by the

use of a Fluke Power Quality clamp meter or a Fluke scope meter both of which have the ability to measure THD.

6.0 CORRECTIVE ACTION REQUIREMENTS FOR ELEVATED VOLTAGE FINDINGS

6.1 State Specific Requirements

6.1.1 New York

If equipment elevated voltage condition is found and verified by the Test Procedure in Section 5.0, 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 purpose of this EOP is defined as guarded by a person or a protective barrier that prevents public contact if the equipment elevated voltage found is greater than 1 volt. **If the voltage measures less than 1 volt 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 or equal to 1 volts and less than 4.5 volts it can either be guarded in person or by a protective barrier that prevents public contact, contact your supervisor for required action. Sound judgment shall be utilized in this application. If the voltage measurement is greater than or equal to 4.5 volts it shall be guarded by an equipment elevated voltage inspector or a Company employee that has been trained to stand by on energized facilities, and immediate response is required using the notification in Section 6.3 below.

6.1.2 Massachusetts and Rhode Island

If equipment elevated voltage condition is found and verified by the Test Procedure in Section 5.0, 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 purpose of this EOP is defined as guarded by a person or a protective barrier that prevents public contact if the equipment elevated 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. Sound judgment shall be utilized in this application. If the voltage measurement is greater than 8 volts it shall be guarded by an equipment elevated voltage inspector or a Company employee who has been trained to stand by on energized facilities; an immediate response is required using the notification in section 6.3 below

6.1.3 Rhode Island Total Harmonic Distortion Pilot

Under the Total Harmonic Distortion (THD) pilot in Section 5.2.5, if during mobile testing of the Contact Voltage Area the voltage measures greater than 1 volt and less than 4.5 volts and has a total harmonic distortion of less than 10% the voltage will be considered contact voltage. These areas will then be safeguarded from the public and permanent repairs will be made. If the total harmonic

distortion is greater than 10% and no visual defects are found, no further action will be required.

6.1.4 New York and Rhode Island

In the event of an elevated voltage finding on an electric facility or street light during the stray voltage test procedure, all publicly accessible structures and sidewalks within a minimum 30 foot radius of the electric facility or street light must be tested for stray voltage.

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

6.2.1 Notification by location:

a. New York: contact Systems Operations Dispatch 1-877-716-4996

b. New England North, Northborough Distribution Control Center:

1. North Shore (MA) 1-877-247-3606
2. Merrimack Valley (MA) 1-877-247-3607
3. Central (MA) 1-877-247- 3608
4. Western (MA) 1-877-247-3609

c. New England South, Northborough Distribution Control Center

1. Capital (RI) 1-877-247-3610
2. Coastal (RI) 1-877-247-3599
3. Southeast (MA) 1-877-411-3812
4. South Shore (MA) 1-877-411-5599

6.2.2 Inform the operator that this is an equipment elevated 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.

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

6.4 Except as noted in Section 6, 6.6, permanent repairs to the equipment shall be made within 45 days of the occurrence.

6.5 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 shall be identified and justified in the annual reporting of the program to the NYPSC.

6.6 The Stray Voltage Tester/Equipment elevated Voltage 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.

6.7 The individuals conducting the equipment elevated 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 equipment elevated voltage above 1 volt, or 2) repairs have been completed to correct the equipment elevated voltage.

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

6.9 Customer Owned Equipment

6.9.1 Where the Company finds equipment elevated voltage above 1 volt 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 equipment elevated voltage shall be immediately remedied.

6.9.2 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.

a. The Company may temporarily remove a customer's meter or take such other actions as are appropriate and necessary to protect the public.

7.0 DATABASE REQUIREMENTS

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

7.2 Information fields required to be completed for facilities:

Survey Date
Region
District
Contractor
GIS ID/Asset # (Unique ID)
Facility Type
Owner
Feeder/Circuit
Line #
Tax District
Pole/Structure/Equipment ID
Street Name
Inspectors Name
GPS Taken
Pre-load Match
Equipment elevated Voltage Test Required
Voltage Found Y/N
Voltage Measurement

Type of Equipment (See Appendix A)
Immediate Action Taken
Person Notified
Permanent Repair Date
Type of Repair
Person Responsible for repair (Employee ID)

7.3 Information fields required to be completed for facilities in mobile testing

Survey Date
Region
District
Contractor
Facility Type
Owner
Pole/Structure/Equipment ID
Street Name
GPS taken
Voltage Measurements
Type of Equipment (see Appendix A)
Immediate Action Taken
Person Notified
Permanent Repair Date
Type of Repair

8.0 NEW YORK ANNUAL REPORTING AND CERTIFICATION REQUIREMENTS

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

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

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

8.4 The President or officer with direct responsibility for overseeing the equipment elevated 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.

8.5 The President or officer with direct responsibility for overseeing facility inspections shall provide an annual certification to the Commission that the utility is in compliance with its inspection program and has inspected the requisite number of electric facilities. Additionally, at the end of the five-year inspection cycle, the officer shall certify that all of the utility's electric facilities have been inspected at least once.

8.6 The annual reporting and certification is required by February 15 of each year. In addition to certifications, it shall address the following:

8.6.1 Details the results of stray voltage test results and inspections conducted over the 12-month period ending December 31 of the prior calendar year. (A separate report will be required for inspections from November 1 – December 31, 2008 to account for transition to calendar year reporting.)

8.6.2 Addresses the performance mechanism contained in Section 10 of the PSC Order Adopting Changes to Electric Safety Standard effective December 15, 2008 (December 15, 2008 Order).

8.6.3 Contain certification describe in 8.3, 8.4 and 8.5 of this section.

8.6.4 Contain a breakdown of the voltage findings in a tabular format as detailed in Attachment 1 of the December 15, 2008 Order; for all findings that result in a reading of 1 V or more after completion of mitigation efforts, a detail report of company efforts shall be provided.

8.6.5 Contain a breakdown of the shock reports received from the public as detailed in Attachment 2 of the December 15, 2008 Order.

8.6.6 Discussion of the analysis undertaken on the causes of the stray voltage within the Company's electric system, the conclusions drawn there from, the preventative and remedial measures identified, and the Company's plan to implement those measures.

8.6.7 Description of the priority levels used to gauge the severity of a deficiency, including repair timeframes, and details the requirements for training personnel to properly identify and categorize the deficiencies.

8.6.8 Contain a breakdown of facilities to be inspected, unique inspection conducted per year, and the cumulative number of unique inspections conducted to meet the five year requirement.

8.6.9 Contain a breakdown of the deficiencies found, permanent repair actions taken by year, whether a repair was completed within the required timeframe, and the number of deficiencies awaiting repair. This information should be provided on a yearly basis by priority level and by equipment groupings as detailed in Attachment 3 of the December 15, 2008 Order.

8.6.10 Contain a review and analysis of the inspection results. Identifying areas of concern along with remedial actions or future plans to alleviate inadequacies in current program assets.

8.6.11 Description of the quality assurance program along with the results from quality assurance activities conducted during the year.

8.6.12 Any additional information that is pertinent to the issues addressed by the safety standards should also be included.

8.7 The Company shall file reports on their mobile stray voltage testing with the Secretary of the New York PSC within 45 days after completion of the mobile testing or February 15, 2011, whichever is earliest, and in each subsequent year. The filing shall include the historic results and costs associated with the manual test program in each area listed in Section 1.5 of this procedure.

8.8 The Company is required by the December 15, 2008 Order to have independence in the quality assurance program required by the order. The management and personnel performing the quality assurance activities shall be separate from those performing the required stray voltage testing and inspection activities.

8.9 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.

9.0 MASSACHUSETTS REPORTING REQUIREMENTS

9.1 National Grid shall submit an annual report that includes the following:

9.1.1 Annual reports that list inspection and testing data, including number of inspections conducted by equipment type.

9.1.2 Number of equipment elevated voltage events detected by inspection personnel versus call-ins or notification by third parties.

9.1.3 Variance reports on current year inspection targets.

9.1.4 Equipment elevated voltage events detected on equipment that is not included in equipment elevated voltage equipment inspection schedules (which will enable the DTE to determine if the company is inspecting and testing the correct equipment).

9.1.5 Number of exceptional or non-routine events that required reporting to OSHA or other government organizations due to injuries or other substantive impacts

10.0 Rhode Island Reporting Requirements

10.1 National Grid shall submit an annual report that includes the following in a searchable form:

10.1.1 Event record number

10.1.2 Location of testing

10.1.3 Date and time of testing

10.1.4 Company or customer asset

10.1.5 Failed equipment type

10.1.6 Voltage recorded

10.1.7 Personal injuries to members of the public, pets or property damage

10.1.8 Any other equipment involved and age

10.1.9 Prior incidents at this location in the past five years

10.1.10 Corrective actions taken at the location and date taken

10.1.11 Number of customers if service is interrupted while making repairs

10.1.12 Duration of interruption

10.1.13 Summary of investigation into cause of the incident

10.1.14 Number of calls to the company “shock” line

10.1.15 Total repair costs by Contact Voltage Area

10.1.16 All information as provided for in Section 7.3

The Company will provide a summary of the above information as part of the report. In addition, the Company will include a recommendation for which specific CVAs will be tested the following year, whether there are any recommended changes to the CVAs and whether there are any advances in technology for detection of elevated voltages.

11.0 TYPE OF EQUIPMENT - APPENDIX A

TYPE	CODE	EQUIPMENT DESCRIPTION
Distribution 910		Pole
911		Regulator
912		Sectionalizer
913		Recloser
914		Ground
915		Guy
916		Riser
	917	Switch Handle Mechanical Operated
	929	Distribution – Other (use comments)
Transmission 930		Pole
931		Tower
932		Guy
933		Ground
934		Riser
	935	Switch Hand Mechanical Operator
	949	Transmission – Other (use comments)
Underground 950		Handhole
951		Manhole
952		Switchgear
953		Transformer
	954	Vault – Cover/Door
	969	Underground – Other (use comments)
Street Light	970	Handhole
971		Standard
	979	Street light – Other (use comments)
Customer Street Light/Other	980 Handhole	
981		Standard
	989	Customer SL/Other – Other (use comments)
Traffic Control	990	Handhole
991		Standard
992		Control Box
993		Pedestrian Crossing Pole
	999	Traffic control – Other (use comments)

12.0 REVISION HISTORY

Version	Date	Description of Revision
1.0	04/01/11	This document supersedes document dated 08/17/09.
2.0	09/30/13	This document supersedes document dated 04/01/11.

Appendix 10

NG-USA EOP D004 Distribution Line Patrol and Maintenance

INTRODUCTION

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 (5) years in NY and once every six (6) years in NE. The patrols are conducted by a Distribution Inspector identifying all required maintenance on a *Windows*® based hand held computer. The maintenance items identified through this patrol are separated into four priority levels 1, 2, 3, and 4. The problem codes identified default to the appropriate priority level. The default priority level can be adjusted by the individual performing the inspection based on actual field conditions. These priority levels are defined as follows:

Level 1- An identified facility/component or tree condition that must be repaired/replaced within 1 week.

Level 2 - *Identified facility/component condition that must be repaired/replaced within 1 year.*

Level 3 – *Identified facility/component condition that must be repaired/replaced within 3 years.*

Level 4 – This priority category is to collect inventory information on actual field conditions to be used by Investment Strategy and Work Planning.

All Level 1 priority conditions identified in the field shall be called in by the Distribution Inspector as follows:

Notification by location:

New York: System Operations Dispatch 1-877-716-4996
NE North: Westboro Control Center 1-508-421-7879
NE South: Lincoln Control Center 1-508-421-7885

Detailed information provided to the regional notification location:

Identify yourself as a Company Distribution Inspector and your work reporting area.

Details of the Level 1 Priority Condition:

Problem found.
District, Feeder No., Line No., Tax District and Pole No.
Street address and any additional information that would assist in finding the location of the problem.
If you are standing by or have secured the location.

Notification to area Inspections Supervisor for follow-up.

PURPOSE

This procedure applies to all personnel involved with or responsible for the inspection and repair of Overhead (OH) Distribution facilities, Underground Residential Developments (URDs) and Underground Commercial Developments (UCDs).

ACCOUNTABILITY

1. Distribution Engineering Services
   A. Update EOP as necessary.
2. Customer Operations
   A. Ensure the work generated by the Distribution Maintenance Program and assigned by Asset Strategy and Investment Planning is completed in the appropriate time frame.
   B. Request assistance from CMS when necessary to complete work assigned in the appropriate time frame.
3. Contract Management Services
   A. At the request of Customer Operations obtain, schedule and manage contractors to perform inspections and required maintenance.
   B. Provide input into program revisions.
4. Distribution Inspector
   A. Demonstrate the ability to identify maintenance concerns and the aptitude to become proficient in the use of a hand held computer and desktop computer.
   B. Demonstrate the understanding and requirements of this NG-EOP D004.
   C. Possess the ability to do walking patrols, collect information on a hand held, download to a desk top computer, edit data, provide requested information/reports/work tickets to supervision, and track/close out work completed in the database system.
5. Distribution Asset Strategy
   A. Select program codes/circuits to be scheduled for maintenance repair work using data collected through Distribution Maintenance Program.
   B. Approve changes to the maintenance code table.
   C. Select circuits to be patrolled for a running five-year cycle.
   D. Provide input into program revisions.
6. Inspections
   A. Ensure circuits scheduled for patrol are completed each year.
   B. Provide qualified personnel as inspectors to provide consistent and accurate identified maintenance concerns/problems.
   C. Provide program management.
   D. Report System Maintenance progress monthly by Division.

7. Process and Systems.
   A. Provide and support database.

REFERENCES

Applicable National Grid Safety Rules and Procedures

NY PSC Order 04-M-0159

NY PSC Order Order Adopting Changes to Electric Safety Standard, December 2008

Elevated Equipment Voltage Testing NG-EOP G016

Underground Inspection NG USA EOP UG006

Massachusetts DTE Directive 12/9/05

DEFINITIONS

Patrol: A walking/vehicle assessment of National Grid distribution facilities for the purpose of determining the condition of the facility and its associated components.

Hand Held Computer: A *Windows*® based 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.

TRAINING

Provide training upon request.

DOCUMENT CONTENTS

Table of Contents

1.0 DISTRIBUTION PATROL

1.1 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 and once every six (6) years in NE. In NY, the patrols shall be completed by December 31 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 *Windows*® based hand held computer for maintenance tracking purposes. NG-USA EOP G011, Preparation and Distribution of Electric Facilities Records, identifies the correct procedure for updating GIS records, if needed.

1.2 Distribution Patrol data is recorded by the Distribution Inspector on a *Windows*® based 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, maintenance code 660, switchgear missing nomenclature, maintenance code 681, transformer missing nomenclature, and maintenance code 745, enclosure missing nomenclature if found deficient upon inspection while at the site. Maintenance Codes are shown on the Distribution Field Survey Worksheet #NG0236 (Page 7). The Distribution Field Survey Worksheet can be used by the field to record maintenance items and is used for informational purposes only. The latest distribution maintenance codes are downloaded to the Hand Held Computer each time there is a change that affects the maintenance code table contained in the Distribution Maintenance Database. Printed copies of the latest maintenance code tables may be obtained by running a report on the look up tables from the Distribution Maintenance Database.

1.3 The *Windows*® based 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 #NG0236).
http://docuweb3:8092/ngs/servlet/NgStreamer?name=NG0236+Dist+Field+Survey+Wksht+D004

Once complete, the Distribution Field Survey Worksheet information must be input into the Distribution Maintenance Database by the inspector, clerk, or supervisor or their designee.

2.0 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
Switchgear
Padmount Transformers
Enclosures

DISTRIBUTION FIELD SURVEY WORKSHEET

nationalgrid

REGION	DISTRICT	EMPLOYEE ID	DATE
FEEDER	TAX DISTRICT/TOWN	MAP #	
LINE # / ROUTE #	POLE #/SUFFIX #		
LOCATION			
# MAIN LINE CATV ATTACHMENT 1 2 3 4 5	# MAIN LINE TELEPHONE ATTACHMENT 1 2 3 4 5	STREET LIGHT ATTACHED ☐ Yes ☐ No	

WOOD POLE MOUNTED STREET LIGHT	P/Q	SECTIONALIZER	P/Q	CUTOUT	P/Q
098 1,2,9 (NR) ☐ Street Light Hazard Cond.	/	180 1,2,9 (NR) ☐ Oil Weeping	/	280 1,2,9 (R) ☐ Defective Cutout	/
099 2,9 (NR) ☐ Not Bonded	/	181 1,2 (R) ☐ Bushings Broken/Cracked	/	281 2 (R) ☐ Potted Porcelain	/
POLE		182 2,9 (R) ☐ Missing Ground Wire	/	282 4 (NR) ☐ Banded Porcelain	/
106 3 (NR) ☐ Dbl Wood-NG Trnsf Req'd	/	183 4 (NR) ☐ Control Cab Height/Ground	/	283 4 (NR) ☐ Enclosed	/
107 4 (NR) ☐ Dbl Wood-Tel Trnsf Req'd	/	184 3,9 (R) ☐ Improper/Missing Bond	/	284 4 (NR) ☐ Non Porcelain	/
108 4 (NR) ☐ Dbl Wood-CATV Trnsf Req'd	/	185 3,9 (R) ☐ Animal Guard Missing	/	285 4 (NR) ☐ Hybrid	/
110 1,2,9 (R) ☐ Broken/severely damaged	/	186 3,9 (R) ☐ LA Blown/Missing/Improper	/	286 4 (R) ☐ SpurTap Not Fused	/
111 1,2,3,4 (RP) ☐ Visual Rotting Grd Line	/	**RECLOSER**		289 4 (NR) ☐ Other	/
113 3 (NR) ☐ CuNap Treated Bthmark Yr	/	190 1,2,9 (NR) ☐ Oil Weeping	/	**RISER**	
114 2,4 (R) ☐ Woodpecker Holes	/	191 1,2 (R) ☐ Bushings Broken/Cracked	/	290 1,2,3,9 (NR) ☐ Improp Cable Supp/Term	/
115 1,2,3,9 (NR) ☐ Riser Guard Req'd	/	192 2,9 (R) ☐ Missing Ground Wire	/	291 2,9 (R) ☐ Improper/Missing Bond	/
116 1,2,3,4 (RP) ☐ Visual Rotting Pole Top	/	193 4 (NR) ☐ Control Cab Height/Ground	/	292 3,9 (R) ☐ Animal Guard Missing	/
117 1,2 (NR) ☐ Leaning Pole	/	194 3,9 (R) ☐ Improper/Missing Bond	/	293 2,3,9 (R) ☐ LA Blown/Missing/Improper	/
118 P (NR) ☐ Stencil / Correction Req'd	/	195 3,9 (R) ☐ Animal Guard Missing	/	**INFRARED**	
119 4 (NR) ☐ Bird's Nest	/	196 2,3,9 (R) ☐ LA Blown/Missing/Improper	/	400 1,2,3,9 (R) ☐ Problem - Switch	/
CROSSARM		**SWITCH**		401 1,2,3,9 (R) ☐ Problem - Cutout	/
120 1,2,4,9 (R) ☐ Damage Arm	/	203 1,2 (R) ☐ Gang Oper'd Defective	/	402 1,2,3,9 (R) ☐ Problem - Splice	/
121 1,2,4 (NR) ☐ Loose/Defective Pins	/	204 1,2,3,9 (R) ☐ Single Phase Defective	/	403 1,2,3,9 (R) ☐ Problem - Other	/
122 3,9 (NR) ☐ Wooden Pine 13.2kv	/	205 3,9 (R) ☐ Improper/Missing Bond	/	**HANDHOLES**	
123 1,2,4 (R) ☐ Loose Brace, Hrdwr	/	207 3,4,9 (R) ☐ LA Blown/Missing/Improper	/	600 1,2,9 (NR) ☐ Broken/Damaged/Unsecured	/
124 1,2,4,9 (R) ☐ Damage Dbl Crossarm	/	208 2,9 (NR) ☐ Handle Not Bonded	/	602 P (NR) ☐ Missing Nomenclature	/
125 1,2,4,9 (R) ☐ Damage Alley Arm	/	**GROUND**		603 1 (R) ☐ Secondary Needs Repair	/
127 1,2,9 (R) ☐ Primary On Arm	/	210 1,2,9 (R) ☐ Wire Broken/Loose	/	604 4 (NR) ☐ Other (use comments)	/
INSULATOR		211 1,2,9 (R) ☐ Hazard Condition	/	**SWITCHGEAR**	
130 1,2 (R) ☐ Broken/Cracked/Flashed	/	212 3,4 (NR) ☐ Guard Req'd	/	651 1,2,3,9 (R) ☐ Barrier Brkn/Dmgd/Unsec	/
131 1,2,9 (R) ☐ Floating	/	213 3,4 (NR) ☐ Non Standard	/	652 1,2 (NR) ☐ Base Broken/Damaged	/
132 3,4 (NR) ☐ I7 Aluminum Capped	/	214 3,9 (NR) ☐ Not Bonded to Neutral	/	654 2,9 (R) ☐ Cable Not Bonded	/
133 3,9 (R) ☐ Non-Standard Voltage	/	**GUY**		656 2,9 (R) ☐ Door Broken/Damaged	/
134 3,4 (NR) ☐ AL Cap Assoc w/Switch/Fuse	/	220 P (NR) ☐ Guy Wire Marker	/	657 F (NR) ☐ Excessive Vegetation	/
PRIMARY		221 2,9 (NR) ☐ Not in Compliance w/Code	/	659 2,9 (R) ☐ Missing Ground	/
140 1,2,9 (R) ☐ Insuff. Grnd Clearance	/	222 3,9 (NR) ☐ Excessive Slack	/	660 P (NR) ☐ Missing Nomenclature	/
141 1,2,3,9 ☐ Damaged Cond/Brkn Strands	/	223 1,2,3,9 (R) ☐ Broken Wire	/	661 4 (NR) ☐ Other	/
142 1, F (NR) ☐ Limbs on Primary	/	225 4 (NR) ☐ Guy not Bonded/Isolated	/	662 4 (NR) ☐ Rusted/Paint Peeling	/
145 1,2,3,9 (R) ☐ Dmg'd Stirups/Connector	/	per Standards		**PAD TRANSFORMER**	
146 2,3 (R) ☐ Improper Sag	/	**ANCHOR**		672 1,2,3,9 (R) ☐ Bushing Broken/Cracked	/
147 4 (R) ☐ LA Missing Transition	/	226 1,2,3,9 (NR) ☐ Req'd - Jt. Owned	/	673 1,2,P (R) ☐ Door Broken/Damaged	/
148 4 (R) ☐ LA Missing End of Line	/	227 1,2,3,9 (NR) ☐ Req'd - Sole NG	/	675 1,2 (R) ☐ Elbows/Terminator/	/
149 3,9 (R) ☐ LA Blown	/	**SECONDARY**		Tracking/Burned	
TRANSFORMER		231 1,F (NR) ☐ Limb on Secondary	/	676 F (NR) ☐ Excessive Vegetation	/
150 1,2,9 (NR) ☐ Oil Weeping	/	232 1,2 (NR) ☐ Improper Sag	/	680 2,9 (R) ☐ Missing Ground	/
151 1,2 (R) ☐ Bushings Broken/Cracked	/	234 1,2,3,9 (NR) ☐ Floating	/	681 P (NR) ☐ Missing Nomenclature	/
152 2 (R) ☐ Missing Ground Wire	/	**SERVICE**		684 1,2,9 (NR) ☐ Oil Weeping	/
153 2,4 (R) ☐ LA Blown/Missing/Improper	/	240 1 (NR) ☐ Ins. Loose from House	/	685 1,2,3,4,9 (NR) ☐ Pad Broken/Damaged	/
155 4 (R) ☐ Animal guards required	/	241 1,F (NR) ☐ Limb on Service	/	686 4 (NR) ☐ Protection (Ballards)	/
156 3,9 (NR) ☐ Non Std Install of Gap	/	243 1 (NR) ☐ Non Std/Unsecured	/	687 4 (NR) ☐ Rusted/Paint Peeling	/
157 2,9 (R) ☐ Improper/Missing Bond	/	**ROW**		**ENCLOSURES**	
CAPACITOR		250 F (NR) ☐ Brush/Tree/Washout	/	740 1,2,3,4,9 (R) ☐ Base Broken/Cracked	/
160 1,2,9 (NR) ☐ Oil Weeping	/	**GIS**		741 1,2,3,9,P (R) ☐ Door Brkn/Dmgd/Unsec	/
161 1,2,9 (R) ☐ Bulging	/	260 4 (NR) ☐ Map Doesn't Match Field	/	742 1,2,3,9 (R) ☐ Elbows Tracking/Burned	/
162 1,2 (R) ☐ Bushings Broken/Cracked	/	261 4 (NR) ☐ Pole/Line Numbering Error	/	743 F (NR) ☐ Excessive Vegetation	/
163 2,9 (NR) ☐ Missing Ground Wire	/	262 4 (NR) ☐ Equip/Hardware/Missing	/	744 2 (NR) ☐ Missing Ground	/
164 2,9 (NR) ☐ Blown Fuse	/	263 4 (NR) ☐ Equip Removed in Field,	/	745 P (NR) ☐ Missing Nomenclature	/
165 3,9 (NR) ☐ Improper/Missing Bond	/	Remove From GIS		746 4 (NR) ☐ Rusted/Paint Peeling	/
166 3,9 (R) ☐ Animal Guard Missing	/	269 4I (NR) ☐ Other GPS/GIS Errors	/	**POLE INSPECTION**	
167 3,9 (R) ☐ LA Blown/Missing/Improper	/	**SPACER CABLE**		801 1,2,3,4,9 (NR) ☐ Identified Priority Pole	/
168 4 (NR) ☐ Control Cab Heigh/Ground	/	270 1,2,3,9 (R) ☐ Damaged/Missing Spacer	/	802 1,2,3,4,9 (NR) ☐ Identified Reject Pole	/
REGULATOR		271 1,2,3,9 (R) ☐ Bracket Damage	/	803 4 (NR) ☐ Excessive Checking	/
170 1,2,9 (NR) ☐ Oil Weeping	/	272 3,9 (R) ☐ Bracket Not Bonded	/	804 4 (NR) ☐ Climbing Inspection	/
171 1,2 (R) ☐ Bushings Broken/Cracked	/	273 3,9 (R) ☐ Messenger Not Bonded	/		
172 2,9 (R) ☐ Missing Ground Wire	/	274 3,9 (R) ☐ Messenger Guard Missing	/		
174 4 (NR) ☐ Control Cab Height/Ground	/	276 3,9 (R) ☐ Uncovered Splice	/	**KEY**	
175 3,9 (R) ☐ Improper/Missing Bond	/			P/Q = Priority / Quantity	
176 3,9 (R) ☐ Animal Guard Missing	/			NR = Maint. Code May Not Direct Affect Reliability	
177 3,9 (R) ☐ LA Blown/Missing/Improper	/			R = Maint. Code May Affect Reliability	
				RP = Maint. Code May Affect Reliability and Has Specific Program to Place to Address	

Comments:

NG0236 (01.11)

3.0 DISTRIBUTION MAINTENANCE DATA BASE

3.1 The Distribution Maintenance database consists of information collected in the field down loaded from the *Windows*® based hand held computer and data gathered from other sources entered from the desktop computer. The *Windows*® based 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.

3.2 The Distribution Maintenance database contains information to be used by Asset Strategy and Investment Planning to track maintenance codes that may affect reliability (R), affect reliability that have a specific program in place to address (RP), or may not directly affect reliability (NR):

4.0 MAINTENANCE SCHEDULE

4.1 Maintenance activities are scheduled by priority Levels. All “Level 1 Priority” conditions identified must be repaired/corrected within 1 week. All “Level 2 Priority” conditions identified must be repaired/corrected within 1 year. All “Level 3 Priority” conditions must be repaired within 3 years. Level 4 Priority is for inventory purposes only.

4.2 Once the Distribution Feeder is completed in the Distribution Maintenance Database or 21 days have elapsed since the inspection, the Level 2 and Level 3 Priority maintenance codes are downloaded into STORMS. Expense maintenance work goes straight to scheduling while the capital work goes to Distribution Design. Level 1 Priority maintenance codes are communicated by the Distribution Inspector directly to the field operations group for the area where the feeder is located.

5.0 COMPLETION OF MAINTENANCE CODES

5.1 Level 1 priority maintenance codes completion process:

5.1.1 Distribution Inspector contacts System Operations Dispatch (SOD) providing information on the Level 1 maintenance item and fills out a Level 1 Priority Report Form (page 10).

5.1.2 SOD generates a PowerOn order from Regional Control.

5.1.3 Inspections Supervisor captures PowerON ID # and details for Level 1 maintenance item status. Inspections Supervisor tracks Level 1 maintenance status with operations ensuring that the Level 1 item is completed within 1 week. Inspection Supervisor closes out the Level 1 maintenance item in the Distribution Maintenance Database by adding the PowerOn ID # number to maintenance record.

5.2 Level 2 and Level 3 priority maintenance codes are completed in the Distribution Maintenance database once the 699 requirement is completed in STORMS for the work request associated with the maintenance code.

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

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

Level "1" & Elevated Voltage Priority Report Form

Any Level "1" Priority or Elevated Voltage condition found must be called into Dispatch.

Feeder:_____

Line #:_____

Pole #:_____

Closest Meter #:_____

Street Address: _____

City/Town: _____

Level "1" Priority/Elevated Voltage condition found.

_____

_____

Call Dispatch to inform that this is either an Elevated Voltage call or an Inspection issue.

Dispatcher notified: _____

Date/Time: _____

Inspector: _____

6.0 REVISION HISTORY

Version	Date	Description of Revision
1.0	04/01/11	This document supersedes document dated 08/17/09.

Appendix 11

NG-USA EOP UG006 Underground Inspection and Maintenance

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 levels 1, 2, 3, and 4. The problem codes identified default to the appropriate priority level. The default priority level can be adjusted by the individual performing the inspection based on actual field conditions. These priority Levels are defined as follows:

Level 1- An identified facility/component or tree condition that must be repaired/replaced within 1 week.

Level 2 - Identified facility/component condition that must be repaired/replaced within 1 year.

Level 3 – Identified facility/component condition that must be repaired/replaced within 3 years.

Level 4 – This priority category is to collect inventory information on actual field conditions to be used by Investment Strategy and Work Planning.

All Level 1 priority conditions identified in the field shall be called in by the Underground Inspector as follows:

1. Notification by location:
    a. New York: contact System Operations Dispatch 1-877-716-4996.
    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 Underground Inspector and your work reporting area.
    b. Details of the Level 1 Priority Condition:
        i. Problem found.
        ii. District, Circuit/Feeder No., Line No., Tax District and Manhole/vault 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.

APPLICABILITY:

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

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: A 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.

Secondary Splice Box: An enclosure identified for use in underground systems. A secondary splice box may be required where the customer's number of secondary cables exceeds the maximum allowed amount on the transformer.

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.

PROGRAM ADMINISTRATOR:

Distribution Engineering Services

SCOPE:

Underground Transmission and Distribution Facility Maintenance

I. Patrols
II. Equipment to be Inspected and Maintenance Codes
III. Maintenance database
IV. Maintenance Schedule
V. Completion of Maintenance Codes
VI. Responsibilities

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 December 31st 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 Inspection group is responsible to create the patrol schedule for their respective Regions for the remainder of underground facilities. The Inspector uses a Windows based 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: 602 – Handhole missing nomenclature, 617 – manhole missing nomenclature, 639 - network transformer- missing nomenclature, 660 – switchgear missing nomenclature, 681 – transformer missing nomenclature, and 707 – vaults improper nomenclature. The Inspector will input the code into the Windows based 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 31h 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. A "Level 1 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. A "Level 2 Priority" shall be assigned to a temperature gradient between 10º and 20º. A "Level 3 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 Inspection group is 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, 602 – Handhole missing nomenclature, 617 – manhole missing nomenclature, 639 - network transformer- missing nomenclature, 660 – switchgear missing nomenclature, 681 – transformer missing nomenclature, and 707 – vaults improper nomenclature. The Inspector will input the code into the Windows based 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 31 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. A "Level 1 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. A "Level 2 Priority" shall be assigned to a temperature gradient between 10º and 20º. A "Level 3 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 Inspection group 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, 602 – Handhole missing nomenclature, 617 – manhole missing nomenclature, 639 - network transformer- missing nomenclature, 660 – switchgear missing nomenclature, 681 – transformer missing nomenclature, and 707 – vaults improper nomenclature. The Inspector will input the code into the Windows based 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 New York, New Hampshire, Rhodes 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

.

Maintenance Codes are shown on the Underground Field Survey Worksheet (Table 1). The Underground Field Survey Worksheet can be used by the field to record maintenance items and is used for informational purposes only. The latest transmission maintenance codes are downloaded to the Hand Held Computer each time there is a change that affects the maintenance code table contained in the Underground Maintenance Database. Printed copies of the latest maintenance code tables may be obtained by running a report on the look up tables from the Underground Maintenance Database.

INSPECTION PROGRAM AND MAINTENANCE CODES
TABLE 1

UNDERGROUND FIELD SURVEY WORKSHEET		
DATE:	INSPECTOR NAME:	EMPLOYEE ID
DIVISION	DISTRICT	FEEDER:

TOWN:	STREET:	POLE, MANHOLE, VAULT #	SUFFIX #

Handhole		Manhole		Net Protect		Net XFMR's		Switchgear		Transformer			
Vault		Trench		Submersible		Pull Box		Other		Equipment #			

MANHOLES, HANDHOLES, VAULT STRUCTURES
Water (in hole) Yes No

EV Test Required: Yes No Voltage Action Taken: Repaired De-energized
EV Found Voltage: Yes No

Gas Monitor Readings		Alarm Setting
Lower Explosive Limit (LEL)		10% or above
Oxygen (0_2)		% below 19.5, above
Carbon Monoxide (CO)		33 ppm
Hydrogen Sulfide (H_2S)		10 ppm

GIS	P/Q
260 **4** (NR) GIS map doesn't match field	/
261 **4** (NR) GIs Pole/line numbering in error on GIS	/
262 **4** (NR) GIS equip/hardware missing in GIS	/
263 **4** (NR) GIS equip removed in field, remove from GIS	/
269 **4** (NR) GIS Other GPS/GIS Errors	/
HANDHOLES	
600 **2** (NR) Broken/damaged/unsecured	/
602 **P** (NR) Missing nomenclature	/
603 **1** (R) Secondary needs repair	/
604 **4** (NR) Other (use comments)	/
MANHOLE	
610 **2** (NR) Ground rods missing	/
611 **2** (R) Cable/Joint leaking	/
612 **2** (NR) Cables bonded/grid defective	/
614 1,2,3,**4** (NR) Cracked/broken	/
615 **3** (R) Fire proofing	/
616 **4** (NR) Improper grade	/
617 **P** (NR) Missing nomenclature	/
620 **2** (NR) Rerack	/
621 1,2,**3**,4 (NR) Ring/cover repair/replace	/
622 1,**4** (NR) Roof condition – use comments	/
623 1,**4** (NR) Chimney Condition – comments	/
624 **4** (NR) Manhole needs cleaning	/
625 **1** (R) Secondary needs repair	/
626 4 (NR) No Holes in Manhole Cover	/
NETWORK PROTECTOR	
630 **2** (R) Barriers broken/damage	/
632 **1** (R) Oil leak	/
633 **2** (NR) Worn/damaged gasket	/
NETWORK TRANSFORMER	
635 **2** (R) Bushing Broken/cracked	/
637 **2** (R) Low oil	/
638 **1** (NR) Missing ground	/
639 **P** (NR) Missing nomenclature	/
642 1, **2** (R) Oil Weeping	/
643 **4** (NR) Rusted/paint peel	/
SWITCHGEAR	
651 1,**2**,3 (R) Barrier broken/damaged/unsecure	/
652 1,2,**3** (NR) Base broken/damaged	/
654 **2** (R) Cable not bonded	/
656 1,**2**,3 (R) Door Broken/Damaged	/

SWITCHGEAR	P/Q
657 **F** (NR) Excessive vegetation	/
659 **2** (R) Missing ground	/
660 **P** (NR) Missing nomenclature	/
661 **4** (NR) Other	/
662 **4** (NR) Rusted/Paint Peeling	/
TRANSFORMER	
672 1,2,**3** (R) Bushing Broken/Cracked	/
673 1,**2**,3 (R) Door Broken/damaged/unsecure	/
675 1,2,**3** (R) Elbows/tracking/burned	/
676 **F** (NR) Excessive vegetation	/
680 **1** (R) Missing Ground	/
681 **P** (NR) Missing nomenclature	/
682 **4** (NR) Mud/debris	/
684 1,**2** (NR) Oil Weeping	/
685 1,2,**3**,4 (NR) Pad broken/damaged	/
686 **4** (NR) Protection (ballards) damage	/
687 **4** (NR) Rusted/Paint peeling	/
688 1,**2** (NR) Pad Pushed Off Base	/
TRENCH	
690 **1** (R) Exposed Cable	/
692 **4** (NR) Path – Sunken	/
VAULTS	
700 **2** (NR) Cable missing bond	/
702 1,2,3,**4** (NR) Cracked/broken	/
703 1,2,**4** (NR) Damaged/broken cover	/
704 1,2,**4** (NR) Damaged/broken door	/
705 1,**2**,4 (NR) Damaged/broken ladder	/
706 1,2,**3**,4,P (NR) Improper grade	/
707 4,**P** (NR) Improper nomenclature	/
708 **4** (NR) Light not working	/
712 **4** (NR) Sump pump broken	/
713 **1** (R) Secondary needs repair	/
SUBMERSIBLE EQUIPMENT	
720 1,2,3,**4** (R) Excess Corrosion	/
721 1,2,3,**4** (R) Physical damage	/
722 1,**2** (R) Leaking	/
ANODES	
730 **3** (R) Missing	/
731 **3** (NR) Need replacement	/

KEY
PQ = Priority Quantity
NR = Maint.Code May Not Directly Affect Reliab.
R = Maint. Code May Affect Reliability
RP = Maint. Code May Affect Reliab. and Has Specific Program to Place to Address

Comments:

NG-0244 7/09

III. MAINTENANCE DATABASE

The Maintenance database consists of data downloaded from the Windows based hand held and data entered from the desktop computer. The Windows based hand held used in the field, 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 SCHEDULE

Maintenance activities are scheduled by priority Levels. All "Level 1 Priority" conditions identified must be repaired/corrected within 1 week. All "Level 2 Priority" conditions identified must be repaired/corrected within 1 year. All "Level 3 Priority" conditions must be repaired within 3 years. Level 4 Priority is for inventory purposes only.

Once the Underground Circuit/Feeder is completed in the Underground Maintenance Database, the Level 2 and Level 3 Priority maintenance codes are downloaded into STORMS. Expense maintenance work goes straight to scheduling while the capital work goes to Underground Engineering. Level 1 Priority maintenance codes are communicated by the Underground Inspector directly to the field operations group for the area where the feeder is located.

V. COMPLETION OF MAINTENANCE CODES

The completion of Level 1 priority maintenance codes is performed by the field operations Supervisor or their designee. Level 2 and Level 3 priority maintenance codes are completed in the Underground Maintenance database once the 699 requirement is completed in STORMS for the work request associated with the maintenance code.

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

VI. RESPONSIBILITIES:

Distribution Engineering Services

1. Update program as necessary.

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.

Underground 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 desk top 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.
2. Ensure the Underground Maintenance Program as outlined in this EOP is implemented properly and timely.
3. Provide inspectors where applicable.
4. Ensure inspectors are trained.
5. Provide program management.
6. Ensure program is completed annually as required.

Asset Strategy and Policy

1. Provide input into program revisions.
2. Provide program management.
3. Ensure program is completed annually as required.
4. 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.

REFERENCE:

NY PSC Order 04-M-0159
NY PSC Order Order Adopting Changes to Electric Safety Standard, December 2008
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

NG-USA EOP UG006

“Underground Inspection and Maintenance”

08/17/09

Changed levels from ABC to 1234 and added Underground Field Survey Worksheet.

Appendix 12

NG-USA PR 06.01.601.001 Transmission Line Maintenance Procedure

Ground Based Visual Inspection

Revision History

Version	Date	Revision	Author	Reviewer	Approver
1.0	02/02/2010	Initial	J.M.McGrath		M.S.Browne
2.0	01/07/2011	Code changes, corrections	J.M.McGrath		M.S.Browne
2.1	2/3/2011	Code changes, warning sign revision, changed wood pole evaluation methodology	J.M.McGrath		M.S.Browne

Note: This document supersedes EOP T007 – Transmission Line Patrol and GL 06.01.118 – Visual Inspection of Transmission Line Assets

Table of Contents

FORWARD

1.0 General

1.1 The purpose of this procedure is to outline the requirements for the visual Inspection from ground level of National Grid US transmission circuits.

1.2 All applicable safety and environmental rules must be followed when executing these Inspections. Inspectors shall be aware of hazards that may be encountered.

1.3 Inspectors shall be notified by TLOME for all changes to this document and are to be trained yearly on this procedure. New Inspectors shall be trained on this document prior to performing this inspection.

1.4 This procedure is associated with Specification SP.06.01.601.000, Transmission Line Inspection and Maintenance.

2.0 Administration

2.1 Maintenance of this document is the responsibility of Transmission Line Operations and Maintenance Engineering (TLOME).

2.2 Specific planned work performed under this procedure will be coordinated by TLOME via a Work Plan document to be released prior to the start of each fiscal year.

3.0 Application

3.1 This document applies to all overhead line assets managed by National Grid US Transmission as defined by Transmission Group Procedure 12 (TGP 12) and applies to anyone performing Inspection and Maintenance activities on these assets. It is expected that this procedure be executed by Qualified Personnel as determined by training specific to the task performed.

4.0 References

4.1 Transmission Line Inspection and Maintenance Specification, SP.06.01.601.000

4.2 Transmission Line Switch Inspection Procedure, PR.06.01.601.008

4.3 Transmission Wood Pole Inspection and Treatment Procedure, PR.06.01.601.005

4.4 Transmission Steel Structure Foundation/Footer Inspection and Repair SP.06.01.601.004

4.5 National Grid Employee Safety Handbook

5.0 Definitions

5.1 Ground Based Visual Inspection – An Inspection performed from a stationary ground position. Movement along the line between Inspection points may be by vehicle or foot

5.2 Hand Held Computer – A data recording device that is used in the field to create a record of conditions found for the purposes of communicating this data to a Maintenance Management System

5.3 Inspection – A careful viewing of assets to find defects and other problems that require Maintenance or monitoring

5.4 Inspection and Maintenance Program – National Grid's planned program for Inspecting and Maintaining its transmission lines.

5.5 Inspector – Qualified Personnel who identify defects via a specific type of Inspection

5.6 Maintenance – Work to correct defects or other problems. This work is often generated through the Inspection process

5.7 Maintenance Management System (MMS) – A computer application that schedules and tracks Inspections and/or Maintenance work

5.8 National Grid Representative – National Grid personnel designated as the point of contact for a contracted inspector

5.9 Pocket – A void in a pole resulting from damage, weathering or decay. This may lower the strength of the pole.

5.10 Qualified Personnel – Personnel trained to safely perform a specific Inspection.

5.11 Work Plan – A document published each fiscal year that, among other things, lists all Inspection and Maintenance scheduled for the year.

6.0 Follow Up Prioritization

6.1 Assets are to be assessed as follows:

- All assets are to be graded based on worst critical member/location or discrete area, i.e. the weakest link of the asset.
- Each steel structure, pole or member is to be graded according to Sections 10 and 11 of this procedure, using scales found in Appendix B, for engineering reference.
- Each concrete foundation is to be graded according to Section 12 of this procedure, using scales found in Appendix C, for engineering reference.
- Switches shall be inspected according to Procedure Section 21. Defects shall be assigned a Maintenance Priority Level of 1 to 4 per Appendix I.
- All other assets shall be inspected according to the applicable section and defects found shall be assigned a Maintenance Priority Level of 1 to 4 in accordance with Appendices D-I.

6.2 Once reported, defects shall be repaired or addressed as follows per Transmission Line Inspection and Maintenance Specification, SP.06.01.601.000:

- Level 1 – Address within 1 week*
- Level 2 – Address within 6 months**
- Level 3 – Address within 3 years**
- Level 4 – Monitor condition or use for studies

* Time period starts on the day the problem is found
**Time period starts when the defect is entered into Computapole

6.3 Any exceptions to the grading guide below shall only be made with approval of TLOME. Any changes to levels already entered into Computapole shall only be made with approval of TLOME.

6.4 All Level 1 conditions shall be reported no later than two hours after discovery as follows:

- New York – Contact Transmission Control Center @ (315) 460-2110
- New England – Contact Transmission Control Center @ (800) 423-6029

- Indicate problem found
- Indicate circuit and structure number
- Indicate street address and any additional information that would assist in identifying the location
- Indicate if you are standing by or have safely secured the location
- Indicate whether someone from In House Construction or Engineering is required for evaluation (immediate or not)

6.5 In cases where, in the judgment of the inspector, a serious safety issue may exist, the Inspector may be required to stand by a defect until other personnel arrive. This may be by the decision of the inspector or other groups. It is extremely important that the Inspector keep themselves and others a safe distance away from any hazards that are encountered. In such cases, the Safety group or National Grid Representative may also be advised.

7.0 Documentation

7.1 Information gathered from the Ground Based Visual Inspection shall be documented in the Computapole Maintenance Management System via the Hand Held Computer. If the computer isn't available, information can be temporarily documented on the Transmission Field Survey Worksheet in Appendix A.

8.0 Other Inspections

8.1 This document may be utilized in conjunction with other Inspections and condition assessments such as engineering walk-downs etc. by personnel not typically engaged in Inspections. If any defects are found that are considered Level 1, it is expected that Section 6 above shall be followed. All Level 1 and 2 defects found shall also be reported to the following:

- Manager of TLOME, via phone or email, as soon as possible.

8.2 It is strongly encouraged that Level 1 and 2 defects found be evaluated by personnel from In House Construction or Transmission Inspections as soon as possible. This may not be necessary if the Inspection is being performed by someone with sufficient knowledge of transmission line construction that can fully understand the impact of the defect.

9.0 Responsibilities

9.1 Transmission Line O&M Engineering

- Create the transmission line portion of the Work Plan outlining the circuits that are to be inspected and otherwise addressed according to this specification in a given fiscal year.
- Provide guidance and support for the execution of the Inspection and Maintenance Program
- Approve exceptions as noted above

9.2 System Delivery

- Ensure the Inspection Program as outlined in the Fiscal Year Work Plan is safely executed according to this specification and its associated procedures in a timely manner.
- Repair problems found during Inspection

9.3 Transmission Inspections

- Provide National Grid Representative when contractors are used
- Be qualified to perform specific Inspections and identify defects.
- Be qualified to perform applicable basic Maintenance such as the installation of guy guards and stenciling.
- Follow all applicable National Grid US Safety Rules.
- Demonstrate the understanding and requirements of this specification and all related procedures and guidelines.

9.4 Transmission Investment Management

- Track performance of Work Plan completion
- Track performance of Maintenance within assigned priority level time frames

9.5 Transmission Network Asset Strategy

- Provide input into program revisions.

PROCEDURE

10.0 General

10.1 All assets must be physically visited and visually inspected so that all potential defects can be identified. Exceptions must have approval from the appropriate department manager and be documented in the Maintenance Management System.

10.2 The intent of this procedure is to visit assets in order as they physically exist in the field and apply the appropriate Inspection to each asset. To conform to the current Maintenance Management System input process, the steps in this procedure are arranged so as to line up numerically with the Computapole Maintenance priority codes.

10.3 All elements of this procedure are intended to be performed from ground level. Tools to facilitate a clear, close up view of assets, such as binoculars or scopes, should be used where necessary.

10.4 Some Computapole codes do not apply to this Inspection and are not included in this procedure. A complete list of Computapole codes including valid levels and STORMS qualifiers is in Appendix J.

11.0 Inspect Steel Condition

11.1 Grading Reference:

- Appendix B - Steel Evaluation Categories (1-6 Rating)

11.2 Inspection Note:

- Grade all steel collectively. The overall tower rating shall be assigned as the visual rating of the worst 5% of members on the tower or discrete area on the steel pole, or the visual rating of the worst critical members, e.g. tower legs and insulator attachment points, whichever is worse.
- Structures rated as 4 or worse will require additional review, so additional photos and notes should be taken to assist in structure evaluation.
- At the discretion of the Inspector, any structure may be classified as 6 “Very Severe Deterioration” due to special circumstances. The reason for this must be reported in the Inspection report.

11.3 Visually inspect for the following:

- Steel condition
- Weathering steel for excessive corrosion of joints. Report any excessive corrosion of weathering steel joints to Transmission Line O&M Engineering.

12.0 Inspect Steel Grillage Foundation

12.1 Grading Reference:

- Appendix B - Steel Evaluation Categories (1-6 Rating)

12.2 Visually inspect for the following:

- Steel condition above grade

13.0 Inspect Concrete Foundation

13.1 Grading Reference:
- Appendix C - Concrete Evaluation (1-5 Rating)

13.2 Inspection Note:
- At the Inspector's discretion, any structure foundation may be classified as 5: Very Severe Deterioration. The reason for this must be given in the Inspection report.

13.3 Visually inspect for the following:
- Poor workmanship, including honeycombing
- Cracking, including pattern or solitary cracks
- Disintegration and deterioration of concrete
- Distortion/movement resulting in change in alignment of structure components
- Seepage – movement of water/fluids through pores
- Spalling – development of fragments
- Delamination
- Degradation of steel/concrete interface
- Excessive corrosion of reinforcement
- Condition of anchor bolts. Ensure all hardware present and tight.

14.0 Inspect Wood Poles and Structures - Overall

14.1 Grading Reference:
- Appendix D (Maintenance Priority Level 1-4 Rating)

14.2 Sound pole, visually inspect for the following and grade using the indicated code (note – unless an immediate risk of failure exists, poles with visual rotting and/or hollow sound should be classified as a Level 4 and scheduled for a Wood Pole Inspection):
- Code 510 - Broken
- Code 511 - Visual rotting/hollow sounding pole
- Code 512 - Leaning
- Code 513 - Replace single arm
- Code 514 - Replace double arm
- Code 515 - Repair brace
- Code 516 - Replace brace
- Code 517 - Replace anchor
- Code 518 - Install anchor
- Code 519 – Repair/replace guy wire
- Code 521 - Tighten guy wire
- Code 522 - Replace guy shield
- Code 524 - Guy bonding
- Code 525 - Lightning damage
- Code 526 - Woodpecker damage
- Code 527 - Insects
- Code 528 - Aerial number missing

15.0 Inspect Wood Poles – Individual

15.1 Grading Reference:
- Appendix E (Maintenance Priority Level 1-4 Rating)

15.2 Note: A C-Truss repair is not considered a temporary repair. However, if a pole with a C-Truss is significantly deteriorated, it shall be graded as if no C-Truss was installed.

15.3 Identify via badge left after Wood Pole Groundline Inspection. Use only Level 4 and are meant to be a documentation of pole labeling that results from the Wood Pole Groundline Inspection:
- Code 901 - Identified priority pole
- Code 902 - Identified reject pole
- Code 903 - Excessive checking
- Code 904 - Climbing inspection required
- Code 905 - No inspection tag

16.0 Inspect Steel Poles and Structures

16.1 Grading Reference:
- Appendix F (Maintenance Priority Level 1-4 Rating)

16.2 Visually inspect for the following and grade using the indicated code:
- Code 531 - Broken legs
- Code 532 - Aerial number missing
- Code 534 - Loose or missing bolts/hardware
- Code 535 - Anti climb equipment damaged/missing
- Code 536 - Vegetation on tower
- Code 537 - Structure damage
- Code 538 - Tower needs straightening
- Code 539 - Arms damaged

17.0 Inspect Conductor

17.1 Grading Reference:
- Appendix G (Maintenance Priority Level 1-4 Rating)

17.2 Note: TLOME may revise levels for conductor damage based on factors such as mechanical and electrical loading.

17.3 Visually inspect for the following and grade using the indicated code:
- Code 541 - Conductor condition overall
- Code 542 - Static wire condition overall
- Code 543 - Ground wire condition overall
- Code 544 - Sleeve/splice/connector condition
- Code 546 - Clearance issues

18.0 Inspect Insulators/Hardware

18.1 Grading Reference:
- Appendix G (Maintenance Priority Level 1-4 Rating)

18.2 Note – Where multiple strings of insulators are encountered, each string shall be evaluated on its own.

18.3 Visually inspect for the following and grade using the indicated code:
- Code 551 - Insulator damage
- Code 552 - Insulators out of plumb
- Code 553 - Hardware loose or damaged
- Code 555 - Lightning arrestor issues

19.0 Inspect Foundation – General

19.1 Grading Reference:
- Appendix H (Maintenance Priority Level 1-4 Rating)

19.2 Visually inspect for the following and grade using the indicated code:
- Code 563 - Erosion

20.0 Inspect Right of Way

20.1 Grading Reference:
- Appendix I (Maintenance Priority Level 1-4 Rating)
- All Code 574 – Danger Trees rated as an "F"

20.2 Visually inspect for the following and grade using the indicated code:
- Code 571 - Erosion
- Code 572 - Encroachments
- Code 573 - Debris
- Code 574 - Danger trees
- Code 575 - Broken gates
- Code 576 - Oil/Gas/Hazmat leak

21.0 Inspect Miscellaneous

21.1 Grading Reference:
- Appendix I (Maintenance Priority Level 1-4 Rating)

21.2 Visually inspect for the following and grade using the indicated code:
- Code 581 - Structure not marked – ground level
- Code 582 - Switch damaged (see below)
- Code 583 - Switch ground damaged (see below)
- Code 584 - Install warning sign
- Code 585 - Replace warning sign
- Code 586 - Remove steps
- Code 587 - Add dirt and tamp
- Code 589 - Bird Nest
- Code 590 - Excessive bird perching

22.0 Inspect Switch – Visual Inspection

22.1 Grading Reference:
- Appendix I (Maintenance Priority Level 1-4 Rating)

22.2 Inspection Note:
- This inspection can be performed from the ground with the switch in service. Refer to the Line Switch Inspection Procedure, PR06.01.601.008 for further

information. Since one code is used for most of this inspection, note problem details.

22.3 Visually inspect for the following and grade using the indicated code:

- Code 582 Noise – Arcing and other abnormal noise, if energized. If disconnect switches are making unusual noises while energized, leave the area immediately and contact the appropriate control center.
- Code 582 Insulators – Surface contamination, tracing, damaged porcelain
- Code 582 Primary Connections – Discoloration of or heat rising from connections (overheating), cracks, visibly loose connections
- Code 582 Live Parts – Blades properly turned into jaws (horizontal), damaged or misaligned arcing horns, damaged, misaligned or missing parts
- Code 582 Load break interrupters – Damage or deterioration
- Code 582 Operating mechanism – Properly locked, operating pipe for breakage, bending, phase to phase linkage for breakage, bending, manual operating mechanism for damage, deterioration or missing parts
- Code 583 Operating mechanism properly grounded

23.0 Document GIS Data Issues

23.1 Grading Reference:

- Appendix I (Maintenance Priority Level 1-4 Rating)

23.2 Document all mismatches between the GIS and the field as follows:

- Code 760 - GIS map mismatch
- Code 761 - GIS – equipment stencil mismatch
- Code 762 - GIS – equipment/hardware missing
- Code 763 - GIS – equipment removed in field
- Code 769 - GIS – other GPS/GIS errors

24.0 Engineering-Specific Inspection

24.1 This section contains additional guidelines for Inspections related to engineering activities and is not to be included in the regular Ground Based Visual Inspection. The guidelines presented below shall be used by engineers completing and interpreting field Inspections as part of preliminary engineering as specified in SP.06.01.101 “Transmission Engineering and Design Services”.

24.2 The sum total of the guidance provided in sections 9 through 23 shall be used in completing engineering analysis of lines.

24.3 Notes on Priority Codes

- Priority 1 – Reserved for immediate and substantial threats to public safety and/or system reliability. These should generally be very rare
- Priority 2 – Items which require repair due to a near term risk of failure, the repairs should not wait for the normal two-year project life cycle
- Priority 3 – Repairs are required, but a more deliberate approach can be taken over a two-year period

- Priority 4 – Repairs should be completed if the work is incidental to another project, but the item can wait for the next Inspection cycle for further assessment

24.4 The following features or defects shall be determined and documented:

- Asset Information
  - Structure Number
  - Circuit
  - Tower/Pole ID# including circuit according to National Grid nomenclature
  - Tower/Pole Location in Latitude/Longitude format
  - Tower/Pole Groundline elevation
  - Structure location (City/Town and State)
- Visual Inspection
  - Year Installed
  - Tower/Pole Height
  - Structure Height
  - Structure Type
  - Structure Description (painted/galvanized/weathered/foundation)
  - Structure condition(s) and overall rating
  - Presence of steel distress or deterioration
  - Concrete foundation condition(s) and overall rating
  - Presence of concrete foundation distress or deterioration
  - Concrete foundation surface mapping diagram
  - Mechanical or fire damage
  - Broken hardware such as insulators or adversely impacted structural components such as foundations
  - Adjacent roads, railroads, parks, and other areas considered frequently accessible by the general public
  - Any unusual conditions or safety hazards
  - Digital photographs
  - Field sketches of foundation condition

25.0 Temporary Repairs

25.1 Some defects encountered may have been repaired temporarily. These defects shall be inspected monthly by Transmission Inspections, until a permanent repair is completed.

25.2 If an Inspector encounters a temporary repair, the defect shall still be reported with a note indicating a temporary repair.

Appendix A – Transmission Field Survey Worksheet

TRANSMISSION FIELD SURVEY WORKSHEET

Patrolled Circuit/No.	Unique ID	Pole/Tower No.	Voltage	District
Additional Circuit/No.	Unique ID			
Area	Between _____ Rd. And _____ Rd.	Date	Employee ID	
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 ☐ B) Steel ☐ C) Lattice			
CONFIGURATION	☐Deadend ☐Tangent ☐Switch Structure ☐Davit Arm ☐Stand Off ☐Other			
STEEL/LATTICE CONDITION	(Circle One) 1 2 3 4 5 6	FOUNDATION: STEEL CONCRETE	(Circle One) 1 2 3 4 5 6 1 2 3 4 5	

POLE * *Enter Sub No. if a Multiple Structure	Sub. No.	Priority Qty
510 1, **2** (R) ☐Broken		/
511 1,4 (RP) ☐Visual Rotting		/
512 1,2,3,**4** (R) ☐Leaning		/
513 1,2,**3** (R) ☐Replace Single Arms		/
514 1,2,**3** (R) ☐Replace Double Arm		/
515 1,2,**3** (R) ☐Repair Braces		/
516 1,2,**3** (R) ☐Replace Braces		/
517 1,**2** (R) ☐Replace Anchor		/
518 1,2,**3**,4 (R) ☐Install Anchor		/
519 1,2,**3** (R) ☐Repair/Replace Guy Wire		/
521 2,**3** (R) ☐Tighten Guy Wire		/
522 **P** (NR) ☐Replace/Install Guy Shield		/
524 **4** (R) ☐Guy Not Bonded		/
525 1,2,**3**,4 (RP) ☐Lightning Damage		/
526 2,**3**,4 (RP) ☐Woodpecker Damage		
527 2,4 (RP) ☐Insects		
528 **4 (NR)** ☐Aerial Number Missing		/
TOWER		
531 1,**2** (R) ☐Tower Legs Broken		/
532 **4** (NR) ☐Aerial Numbers Missing		/
534 1,2,**3** (R) ☐Loose Bolts/Hard		/
535 **4** (NR) ☐Repair Anti-Climb		/
536 **F** (R) ☐Vegetation On Tower		/
537 1,2,**3** (R) ☐Structure Damage		/
538 1,2,**3**,4 (R) ☐Straighten Tower		/
539 1,2,**3**,4 (R) ☐Arms Damaged		/
POLE INSPECTION		
901 **4** (RP) ☐Identified Priority Pole		/
902 **4** (RP) ☐Identified Reject Pole		/
903 **4** (RP) ☐Excess Checking		/
904 **4** (RP) ☐Climbing Inspection Req'd		
905 **4** (RP) ☐No Inspection Tag		/

CONDUCTOR ** **Enter Circuit No. if More Than Circuit on Pole	Circuit No.	Priority Qty
541 1,2,**3** (R) ☐Conductor		/
542 1,2,**3** (R) ☐Static		/
543 1,2,**3** (R) ☐Ground Wire		/
544 1,2,**3** (R) ☐Sleeve/Conn.		/
546 1,**4** (NR) ☐Under 25 Ft.		/
LINE HARDWARE		
551 1,2,**3**,4 (R) ☐Insulators/Dam		/
552 **4** (R) ☐Insulator Plumb		/
553 1,2,**3**,4 (R) ☐Hardware Dam		/
555 **2** (R) ☐Lightning Arrestor		/
FOUNDATION – GENERAL		
563 1,2,**3**,4 (R) ☐Erosion		/
RIGHT OF WAY		
571 1,2,**4** (NR) ☐Erosion		/
572 **4** (NR) ☐Encroachments		/
573 **4** (NR) ☐Debris		/
574 **F** (R) ☐Danger Tree		/
575 **4** (NR) ☐Gate Broke		/
576 **4** (NR) ☐Oil/Gas Leak		/
MISCELLANEOUS		
581 4,P (NR) ☐Stencil/Line/ Struct No. Ground level		/
582 1,2,**3**,4 (R) ☐Switch Damaged		/
583 **2** (R) ☐Damaged Ground		/
584 **4**,**P** (NR) ☐Install/Replace Warning Sign		/
586 **4** (NR) ☐Remove Steps		/
587 **3**,4 (R) ☐Add Dirt & Tamp		/
589 1,**3**,4 (R) ☐Bird Nest		/
590 **4** (R) ☐Bird Perching		/
GIS		
760 **4** (NR) ☐GIS Map Doesn't Match Field		/
761 **4** (NR) ☐GIS Equip. Stenciling In Error		/
762 **4** (NR) ☐GIS Equip/Hardware Missing		/
763 **4** (NR) ☐GIS Equip. Removed In Field Remove from GIS		/
769 **4** (NR) ☐GIS Other GPS/GIS Errors		/

NR=Maint. Code may not directly affect reliab.
R=Maint. Code may affect reliability.
RP = Maintenance Code may affect and has specific program in place to address.

Comments on rear of sheet

NG0237 (12/09)

Appendix B – Steel Evaluation Categories

Visual Rating 6 – Very Severe Deterioration
Perforated Element – severe physical damage

Visual Rating 5 – Significant Pitting
Significant pitting – loss of section clearly visible, edges feathered/thinned

Visual Rating 4 – Light Pitting
Some very light edge roughening. Loss of greater majority of coating and zinc layers. Corroded surface would dominate surface preparation – remedial action using wire brush, scraper and brushed paint not sufficient to give greatly increase life

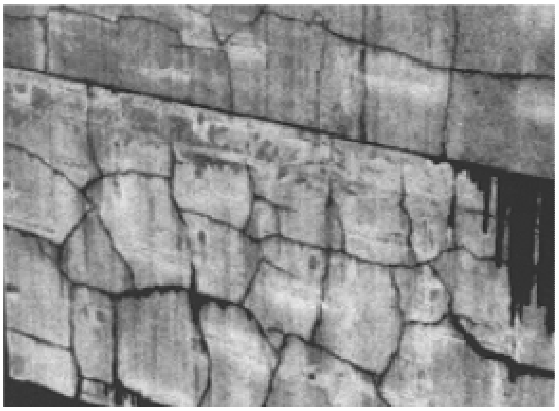
Visual Rating 3 – Light Corrosion
Very light surface corrosion, majority of coating intact

Visual Rating 2 – Intact
Paint coating over all surface – overcoat may not be intact and some very small areas (<1%) of light corrosion may be present. Galvanizing intact except for some very small areas (<1%) of light corrosion

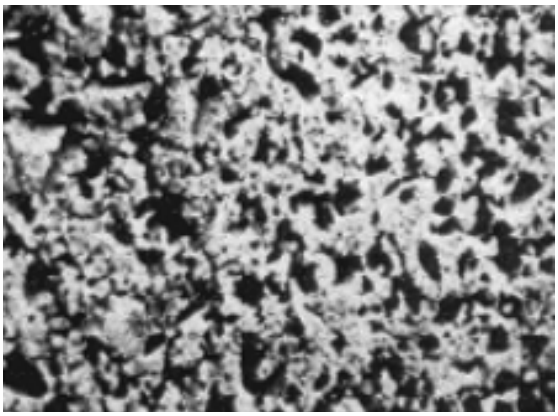
Visual Rating 1 – Serviceable
Fully painted – overcoat and undercoat intact
Fully galvanized – coating intact

Appendix C – Concrete Evaluation Categories/Rating Matrix

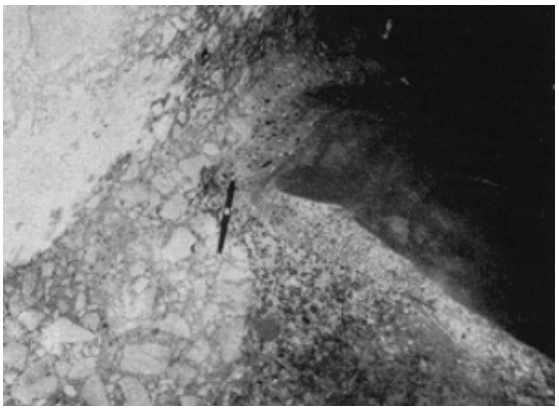
Honeycombing
Construction faults, poor workmanship



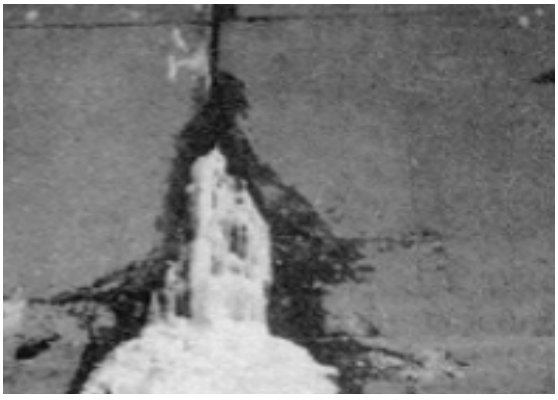
Pattern Cracking



Disintegration
Deterioration of concrete into small fragments



Erosion/Abrasion



Seepage
Movement of water or other fluids through pores

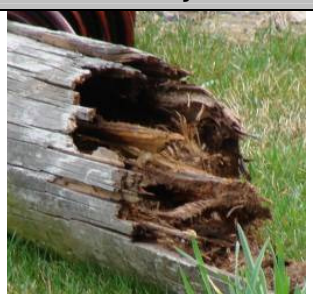
Spalling
Development of fragments

Distortion or Movement
Change in alignment of the components of a structure

Delamination
Degradation of steel/concrete interface

		Overall Foundation Rating				
		Very Severe Deterioration 5	**Severe Deterioration 4**	**Medium Deterioration 3**	**Light Deterioration 2**	**Serviceable 1**
Concrete Foundation Condition Categories	**Cracking**	Wide cracks (over 0.08" width)	Medium Cracks (between 0.04" and 0.08" width)	Fine Cracks (0.04" width)	Negligible	Negligible
	Disintegration	Very Severe Disintegration (loss of mortar and coarse aggregate at a depth greater than 0.8")	Severe Disintegration (loss or mortar between 0.4" and 0.8" around coarse aggregate)	Medium Disintegration (loss of surface mortar between 0.2" and 0.4" and exposure of coarse aggregate)	Light Disintegration (no exposure of coarse aggregate)	Negligible
	Spalling	Large spall (greater than 0.8" in depth and greater than 6" in any dimension)	Small spall (not greater than 0.8" in depth or greater than 6" in any dimension)	Negligible	Negligible	Negligible

Appendix D – Wood Poles and Structures Evaluation

Typical Pole Defects		
Bark Inclusion	**Checking (Solitary)**	**Checking (Around Periphery of Pole)**
		
The growth of the main stem around a dead branch	The separation of fibers parallel to the grain and extending towards the center of the pole	Multiple checks around entire pole circumference
Cross Break	**Mechanical Damage**	**Split**
		
The separation of fibers perpendicular or at an angle to the grain	Transportation and erection damage due to machinery such as chainsaws or cranes	The cracking of a pole due to mechanical connections or the intersection of checks
Dead Streak	**Decay**	**Decay Knot**
The growth of the main stem around the dead wood	 The softening of the pole due to fungal growth	Knots which have decayed and can extend towards the center of the pole
Pocket		
A Solitary Check, a series of checks at one location, or area of decay at the surface of the wood pole		

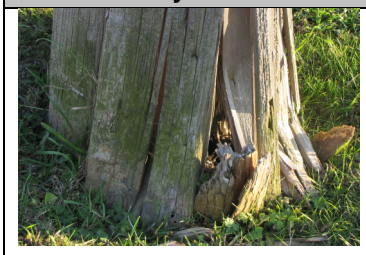
510 Pole – Broken

- Used when pole is broken due to impact, stress etc.

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
Damage poses significant risk of imminent failure	 Damage is not an immediate threat to the integrity of the network or to public safety	N/A	N/A

511 Pole – Visual Rotting

- Used for physical damage which compromises the strength and/or integrity of the pole (checking, dead streak, bark inclusion, cross break, decay, burning, hollow sounding pole)

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
 Damage poses significant risk of imminent failure	N/A	N/A	 All Others

512 Pole – Leaning

- Used when pole/structure is out of plumb(excludes raked angle structures which are intentionally out of plumb due to line angle)

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
Leaning pole which in Inspector's judgment poses immediate and substantial threat to public safety and/or system reliability	Pole top deflection in Inspector's judgment poses a near-term risk to structure integrity	 Slope > 2" per 10' pole height	All other leaning poles

513 Pole – Replace Single Arm

• Used for damaged single arms. Arm refers to any horizontal member extending out from the main structure generally to support the conductor.

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
Arm damage poses immediate and substantial threat to public safety and/or system reliability	Substantial damage to cross section of arm causing the arm to deflect – failure may occur under non-extreme loading	 Appreciable damage – failure may occur under extreme loading	N/A

514 Pole – Replace Double Arm

• Used for damaged double arms.

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
Arm damage poses immediate and substantial threat to public safety and/or system reliability	Substantial damage to cross section of arm causing the arm to deflect – failure may occur under non-extreme loading	Appreciable damage – failure may occur under extreme loading	N/A

515 Pole – Repair Braces

• Used for damage to braces. Braces refer to intermediate members that connect parts of the structure.

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
Brace damage poses immediate and substantial threat to public safety and/or system reliability	Substantial damage to cross section of brace causing the arm to deflect – failure may occur under non-extreme loading	Appreciable damage – failure may occur under extreme loading	N/A

516 Pole – Replace Braces

• Used for damage to braces or missing braces. Braces refer to intermediate members that connect parts of the structure.

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
Brace damage or lack of brace poses immediate and substantial threat to public safety and/or system reliability	Substantial damage to cross section of brace or lack of brace causing the arm to deflect – failure may occur under non-extreme loading	Appreciable damage – failure may occur under extreme loading	N/A

517 Pole – Replace Anchor

- Used for damage to anchor rod or head or pull out of the anchor

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
Guy failure poses immediate and substantial threat to public safety and/or system reliability	Anchor rod has corroded substantially or is broken, or anchor has pulled out and is no longer functioning as a structural member, or a guy should be present but is not	Appreciable damage – failure may occur under extreme loading	Superficial damage – but will not fail in 5 years

518 Pole – Install Anchor

- Used when necessary anchor is missing

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
Damage poses immediate and substantial threat to public safety and/or system reliability	Damage is not an immediate threat to the integrity of the network or to public safety	N/A	N/A

519 Pole – Repair/Replace Guy Wire

- Used when a guy wire or its associated hardware, included fiberglass or wood rods, are in need of repair or replacement

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
Guy failure poses immediate and substantial threat to public safety and/or system reliability	Guy is broken or seriously compromised (e.g. broken strands)	Guy is currently structurally sound, but has been compromised by corrosion, damage, etc.	N/A

521 Pole – Tighten Guy Wire

- Used when a guy wire has gone slack, as from anchor pull out, structure movement, etc.

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	Slack guy is causing excessive structure deflection or overstress of other guys	 Slack guy is not causing excessive structure deflection or overstress of other guys or the structure	N/A

522 Pole – Replace Guy Shield

- Used when guy shield is damaged. Inspector should install a new one.

All Priority Level "P" Perform

524 Pole – Guy Not Bonded

- Used when guy bond is inadequate or missing

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Guy not bonded

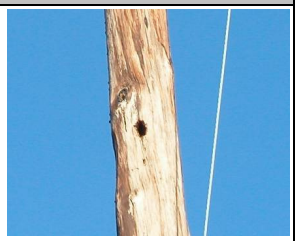
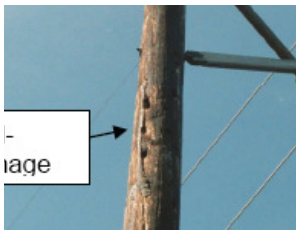
525 Pole – Lightning Damage

- Used when pole is damaged due to lightning.

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
Damage in Inspector's judgment poses immediate and substantial threat to public safety and/or system reliability	Non-serviceable Damage	 Serviceable Damage	Superficial Damage

526 Pole – Woodpecker Damage

- Used when pole is damaged by woodpeckers creating nests in pole

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	 Several Large (>5") Diameter Holes	 Single Large (>5") Diameter Holes	 Several Small (<5") Diameter Holes

527 Pole – Insects • Used when pole is damaged by insects			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Damage poses significant risk of imminent failure	N/A	N/A	All other noticeable damage
528 Pole – Aerial Number Missing • Used when aerial numbers are not installed where required			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
N/A	N/A	N/A	Aerial numbers are required at all road crossing, all structures ending in zero, and the first and last structures of a line.

Appendix E – Individual Wood Pole Evaluation

901 Osmose – Identified Priority Pole

- Used to document pole identified as a priority reject on Wood Pole Groundline Inspection

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	All

902 Osmose – Identified Reject Pole

- Used to document pole identified as a reject on Wood Pole Groundline Inspection

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	All

903 Osmose – Inspect Excessive Check (not reject)

- Used to document pole identified as having excessive checking on Wood Pole Ground Line Inspection

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	All

904 Osmose – Climbing Inspection Required (not reject)

- Used to document pole identified as needing a climbing inspection on Wood Pole Ground Line Inspection

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	All

905 Osmose – No Inspection Tag

- Used to document pole that has no evidence of prior Wood Pole Inspections. Not required for poles under 10 years old.

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	All

Appendix F – Steel Poles and Structures Evaluation

531 Tower – Tower Legs Broken

- Used when tower legs are broken

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
Leg damage which in Inspector's judgment poses immediate and substantial threat to public safety and/or system reliability	Leg damage which in Inspector's judgment poses a near-term risk to structure integrity	N/A	N/A

532 Tower – Aerial Number Missing

- Used when aerial numbers are not installed where required

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Aerial numbers are required at all road crossing, all structures ending in zero, and the first and last structures of a line.

534 Tower – Loose Bolts/Hardware

- Used loose or missing connections on hardware

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
Missing connections on members in judgment of Inspector pose an immediate and substantial threat to public safety and/or system reliability	Missing connections	 Loose Connections	N/A

535 Tower – Repair Anti-Climb

- Used to repair anti-climb device

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Anti-climbing device needs repair

536 Tower – Vegetation on Tower

- Used when vegetation needs to be cleared from tower

All Priority Level "F" - Forestry

537 Tower – Structure Damage • Used for broken, bent or missing members on tower			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
 Damage in judgment of Inspector poses and immediate and substantial threat to public safety and/or system reliability	 Broken or nearly broken members	 Damage/Excessive bending on minor members	N/A
538 Tower – Straighten Tower • Used when tower is out of alignment			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Leaning tower in judgment of Inspector poses immediate and substantial threat to public safety and/or system reliability	Substantial deflection, near-term risk to structural stability	Appreciable deflection, ability of tower to sustain extreme loading conditions may be compromised	Aesthetic only
539 Tower – Arms Damaged • Used when the arms on a tower are damaged			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Damaged arms in Inspector's judgment pose an immediate and substantial threat to public safety and/or system reliability	Arm damage poses a risk of failure under routine loading e.g. a near term risk of failure	Arm damage poses a risk of failure under heavy loading	Superficial damage only

Appendix G – Conductor and Line Hardware Evaluation

541 Conductor – Bird Caging (Add comment – Bird Caging)

- Used to rate conductor bird caging.

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	 Bird Caging

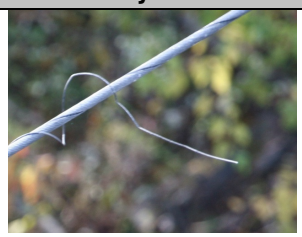
541 Conductor – Broken (Add comment – Broken Conductor)

- Used to rate conductor damage.
- Note: TLOME may revise priority levels based on an engineering evaluation of factors such as mechanical and electrical loading.

230kV and Above

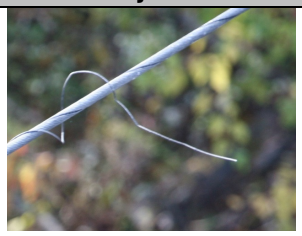
Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
 Any broken conductors	N/A	N/A	N/A

115kV and Below

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
 Significant percentage of broken strands	 Small percentage of broken strands	N/A	N/A

542 Conductor – Static

- Used to rate static wire damage.
- Note: TLOME may revise priority levels based on an engineering evaluation of factors such as mechanical and electrical loading.

230kV and Above			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
 Any broken conductors	N/A	N/A	N/A
115kV and Below			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
 Significant percentage of broken strands	 Small percentage of broken strands	Exterior damage which does not pose a near-term threat	N/A

543 Conductor – Ground Wire • Used for any damage to the ground leads on the structure			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Ground wire damage in judgment of Inspector poses an immediate and substantial threat to public safety and/or system reliability; this includes a loose ground wire near the top of the pole which may be a risk to contact the conductor	Ground wire missing or disconnected/broken on 3 or more adjacent structures	Ground wire missing or disconnected/broken on isolated structures only, or ground wire is loose near the base of the pole where there is no risk of contacting the conductor	N/A
544 Conductor – Sleeve/Connector • Used for damage to splices or connectors on the shield/static wire or conductors			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Failure in judgment of Inspector poses an immediate and substantial threat to public safety and/or system reliability	Visible physical damage to connector/splice/conductor	Visible corrosion at splice/connector	N/A
546 Conductor – Under 25 Feet • Used for substandard clearances and conductors with excessive sag.			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Conductor poses significant risk of danger to the public	N/A	N/A	General Guidelines by Voltage: • 69kV – 115kV 25 ft • 230kV – 345kV 30 ft Clearances must meet requirements of latest National Electric Safety Code, as well as local requirements (e.g. MA CMR

551 Line Hardware – Insulator Damage

- Used for chipped or broken insulators.
- Insulators that are physically separated are always Level 1

NOTE: A chipped or cracked insulator (porcelain damage does not reach more than ½ way to the center of the insulator) may not be counted as a damaged insulator if damage is not severe. This is up to the inspector's discretion.

Number of Insulators in String	Number of Damaged Insulators per String			
	Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
Any	Any Physical Separation	N/A	N/A	N/A
5	2 or more	1	N/A	N/A
6	2 or more	1	N/A	N/A
7	3 or more	2	1	N/A
8	3 or more	2	1	N/A
9	3 or more	2	1	N/A
10	4 or more	3	2	1
11	4 or more	3	2	1
12	4 or more	3	2	1
13	4 or more	3	2	1
14	5 or more	3 or 4	2	1
15	5 or more	4	2 or 3	1
16	5 or more	4	2 or 3	1
17	6 or more	4 or 5	2 or 3	1
18	6 or more	4 or 5	2 or 3	1
19	6 or more	4 or 5	3	2 or less
20	6 or more	5	3 or 4	2 or less
21	7 or more	5 or 6	3 or 4	2 or less

Broken Insulators		Separated Insulators	
			

552 Line Hardware – Insulator Plumb

- Used for insulators unintentionally out of plumb

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
			
N/A	N/A	N/A	Usually a sign of high amplitude conductor movement, galloping.

553 Line Hardware – Hardware Damage • Used for any damage to other line hardware			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Hardware damage in Inspector's judgment poses and immediate and substantial risk to public safety and/or system reliability	Structural Hardware damage which poses a near-term risk to structural integrity	Structural Hardware damage, e.g. damaged connections	Cosmetic Damage
555 Line Hardware – Lightning Arrestor • Used when a lightning arrestor is damaged or has failed			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
N/A	Arrestor has failed. Lightning arrestors fail by disconnecting and falling away from the conductor	N/A	N/A

Appendix H – Foundation Evaluation

563 Foundation – Erosion • Used for any erosion around foundations			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Erosion in Inspector's judgment poses and immediate and substantial risk to public safety and/or system reliability	Erosion is compromising structural integrity	Structure not yet at risk, but erosion appears to be progressing at a significant rate	Small erosion, may eventually become significant

Appendix I – ROW/Misc./Switch/GIS Evaluation

571 Right of Way – Erosion

- Used for any overall erosion in ROW

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
Erosion exposes counterpoise and presents a significant danger to public and/or vehicular traffic	Erosion exposes counterpoise and presents a danger to public	N/A	Any other ROW erosion, i.e. washed out road or culverts

572 Right of Way - Encroachments

- Used for any unapproved use of ROW or things too close to lines

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	 Any encroachments

573 Right of Way – Debris

- Used for any debris in ROW

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Any debris in ROW blocking access

574 Right of Way – Danger Tree

- Used for any danger trees adjacent to lines

REPORT ALL TO TRANSMISSION FORESTRY

Voltage	Vertical or Lateral Clearance	
23 – 46kV	4’ or less	**All Priority Level “F” - Forestry**
69kV	6’ or less	
115kV	10’ or less	
230kV	14’ or less	
345kV	18’ or less	

575 Right of Way – Gate Broken

- Used for broken ROW gates

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Broken gate

576 Right of Way – Oil/Gas Leak

- Used for any oil, gas leaks or other foreign substances in ROW. Notify System Delivery immediately

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Oil/gas found in ROW

581 Misc – Stencil Line/Structure Number at Ground

• Used when line/structure number is missing. Inspector to stencil structure

Priority Level 1	Priority Level 2	Priority Level P	Priority Level 4
N/A	N/A	Inspector stencils number	Inspector cannot stencil number

581 Misc – Stencil Line/Structure Number at Ground

• Used when line/structure number is missing. Inspector to stencil structure.

All Priority Level "P" - Perform

582 Misc – Switch Damaged

• Used when switch is damaged

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
Visible arcing is present or condition could result in immediate failure.	Switch may fail, burning and other evidence of arcing	Switch may not be able to be operated, but likely won't fail and put the line out of service	Insignificant damage

583 Misc – Damaged Switch Ground

• Used for damaged switch grounds

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	Ground grid is exposed or lead is damaged	N/A	N/A

584 Misc – Install/Replace Warning Sign

• Used for damaged or missing warning signs. Warning signs required on both sides of all structures (2 signs total).

Priority Level 1	Priority Level 2	Priority Level P	Priority Level 4
N/A	Install warning signs at all structures that are adjacent to roads, regularly traveled pedestrian thoroughfares, or places where persons frequently gather (such as schools or public playgrounds)	Sign installed/replaced by Inspector	Install/replace signs at a low risk location where public interaction is not likely.

585 Misc – Replace Signs

• Used for missing aerial structure signs. Aerial circuit and structure ID is required on all structures at road crossings, the first and last structures of a line, and all structures ending in zero.

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Install/replace signs

586 Misc – Remove Steps

• Steps must be removed at least 10' from the ground line

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Remove steps

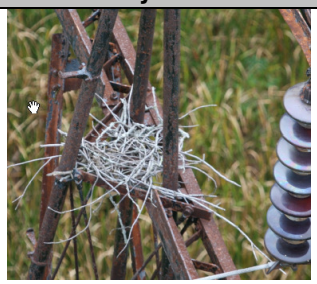
587 Misc – Add Dirt and Tamp

- Used on poles when fill dirt is insufficient

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	Structure may be weakened by absence of tamped dirt around base	 Dirt and tamping required around base of pole

589 Misc – Bird Nest

- Used when bird nests are found on line

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
 Bird nest in Inspector's judgment poses and immediate and substantial risk to public safety and/or system reliability	N/A	 Limited risk of bird contact but nest should be removed	No risk of contact such as very small nests or those at bottom of structure

589 Misc – Bird Perching

- Used when bird perching could lead to problems

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	 Birds perching on line or evidence of bird perching on line

760 GIS – Map Does Not Match Field

- Used when GIS map does not match field

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Note error

761 GIS – Equipment Stenciling in Error in GIS			
• Used when equipment labels do not match GIS			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
N/A	N/A	N/A	Note error
762 GIS – Equipment/Hardware Missing in GIS			
• Used when equipment is missing on GIS			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
N/A	N/A	N/A	Note error
763 GIS – Equipment Removed in Field, Remove from GIS			
• Used when equipment has been removed in field but not on GIS			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
N/A	N/A	N/A	Note error

769 GIS – Other GPS/GIS Errors			
• Used for all other GIS errors			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
N/A	N/A	N/A	Note error

Appendix J – Complete List of Computapole Codes

Code	Description	CAP/EXP	Default Level	Valid Levels
501	OSMOSE - Identified priority pole	C	3	2
502	OSMOSE - Identified reject pole	C	3	3
503	OSMOSE - Insp excessive check (not rej)	C	4	4
504	OSMOSE - Climbing Insp re'q (not rej)	C	4	4
901	OSMOSE - Identified priority pole	E	4	4
902	OSMOSE - Identified reject pole	E	4	4
903	OSMOSE - Insp excessive check (not rej)	E	4	4
904	OSMOSE - Climbing Insp re'q (not rej)	E	4	4
510	POLE - Broken	C	2	12
511	POLE - Visual Rotting	C	3	14
512	POLE - Leaning	E	4	1234
513	POLE - Replace Single Arms	C	3	123
514	POLE - Replace Double Arms	C	3	123
515	POLE - Repair Braces	E	3	123
516	POLE - Replace Braces	E	3	123
517	POLE - Replace Anchor	E	2	12
518	POLE - Install Anchor	C	3	1234
519	POLE - Repair/Replace Guy Wire	E	3	123
521	POLE - Tighten Guy Wire	E	3	23
522	POLE - Replace/Install Guy Shield	E	P	P
524	POLE - Guy Not Bonded	E	4	4
525	POLE - Lightning Damage	C	3	1234
526	POLE - Woodpecker Damage	E	3	234
527	POLE - Insects	E	3	14
528	POLE - Aerial Number Missing	E	4	4
531	TOWER - Tower Legs Broken	E	2	12
532	TOWER - Aerial number Missing	E	4	4
534	TOWER - Loose Bolts/Hard	E	3	123
535	TOWER - Repair Anti-Climb	E	4	4
536	TOWER - Vegetation on Tower	E	F	F
537	TOWER - Structure Damage	E	3	123
538	TOWER - Straighten Tower	E	3	1234
539	TOWER - Arms Damaged	E	3	1234
540	CONDUCTOR - Infrared Problem	E	3	123
541	CONDUCTOR - Conductor	E	3	123
542	CONDUCTOR - Static	E	3	123
543	CONDUCTOR - Ground Wire	E	3	123
544	CONDUCTOR - Sleeve/Conn	E	3	123
546	CONDUCTOR - Under 25 ft	E	4	14
547	Infrared Problem Identified	E	2	124
552	LINE HDW - Insulator Plumb	E	4	4
553	LINE HDW - Hardware Dam	E	3	1234
555	LINE HDW - Lightning Arrestor	C	2	2
556	LINE HDW - Infrared Problem	C	3	123
563	FOUNDATION - Erosion	E	3	1234
571	RIGHT OF WAY - Erosion	E	4	124
572	RIGHT OF WAY - Encroachments	E	4	4
573	RIGHT OF WAY - Debris	E	4	4
574	RIGHT OF WAY - Danger Tree	E	F	F
575	RIGHT OF WAY - Gate Broke	E	4	4

Code	Description	CAP/EXP	Default Level	Valid Levels
576	RIGHT OF WAY - Oil/Gas Leak	E	4	4
581	MISC - Stencil Lin/Struct num at ground	E	P	4,P
582	MISC - Switch Damaged	E	3	1234
583	MISC - Damaged Switch Ground	E	2	2
584	MISC - Install/Replace Warning Sign	E	4	4P
585	MISC - Replace Signs	E	4	4
586	MISC - Remove Steps	E	4	4
587	MISC - Add Dirt and Tamp	E	3	34
588	Switch - Infrared Problem	E	3	123
589	MISC - Bird Nest	E	3	134
590	MISC - Bird Perching	E	4	4
760	GIS - Map Doesn't Match Field	E	4	4
761	GIS - Equip. Stenciling In Error	E	4	4
762	GIS - Equip/Hardware Missing	E	4	4
764	GIS - Equip. Removed In Field Remove from GIS	E	4	4
769	GIS - Other GPS/GIS Errors	E	4	4

Notes

1. All Level 1 codes do not enter STORMS. The expectation is that the situation will be reported immediately, work complete within a week and a confirming work order used to track costs.
2. All Level 2 and 3 codes pass through STORMS and Design
3. All Level P codes imply that work was done by the inspector to correct defect
4. All Level F codes go to Forestry
5. All Level 4 codes are for notation only, they do not enter STORMS
6. All codes marked "E" are expense
7. All codes marked "C" are capex

Appendix 13

NG-USA EOP G017 Street Light Standard Inspection Program

INTRODUCTION

The purpose of this procedure is to outline the requirements for the inspection cycle for Street Light Standard installations owned by National Grid.

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 Windows® based hand held computer. The maintenance items identified during this inspection will be separated into four priority levels 1, 2, 3, and 4. The problem codes identified default to the appropriate level. The default level can be adjusted by the individual performing the inspection based on actual field conditions.
These priority levels are defined as follows:

Level 1- An identified facility/component or tree condition that must be repaired/replaced within 1 week.

Level 2 - Identified facility/component condition that must be repaired/replaced within 1 year.

Level 3 – Identified facility/component condition that must be repaired/replaced within 3 years.

Level 4 – This priority category is to collect inventory information on actual field conditions to be used by Investment Strategy and Work Planning.

All Level 1 priority conditions identified in the field shall be called in by the Inspector as follows:

1. Notification by location:
   a. New York: contact System Operations Dispatch 1-877-716-4996.
   b. NE North: Westboro Control Center 1-508-389-9032.
   c. NE South: Lincoln Control Center 1-401-335-6075.

2. Detailed information provided to the regional notification location:
   a. Identify yourself as a Company Inspector and your work reporting area.
   b. Details of the Level 1 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.
3. Notification to area Inspections Supervisor for follow-up.

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

PURPOSE

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.

ACCOUNTABILITY

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

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

3. Distribution Inspector
   A. Demonstrate the ability to identify maintenance items and the aptitude to become proficient in the use of a hand held computer and desktop computer.
   B. Demonstrate the understanding and requirements of this National Grid EOP.
   C. Possess the ability to do patrols, collect information on a hand held, down load to a desktop computer, edit data, provide requested information/reports/work tickets to supervision, and track/close out work completed in the database.
      Provide qualified personnel to inspect where applicable.
   D. Ensure all inspectors have been trained.

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

5. Network Asset Strategy
   A. Provide input into program revisions.
   B. Ensure the program as outlined in this EOP is completed each year.
   C. To develop and/or revise a five-year inspection schedule of all facilities covered by this EOP.
   D. Develop Outdoor Lighting Asset Strategy

6. Process and Systems
   A. Provide and support database.

COORDINATION

Not Applicable

REFERENCES

Applicable National Grid Safety Rules and Procedures
NY PSC Order 04-M-0159
NY PSC Order Order Adopting Changes to Electric Safety Standard, December 2008
Elevated Equipment Voltage NG-USA EOP G016

DEFINITIONS

Patrol: A walking assessment of distribution facilities for the purpose of determining the condition of the facility and it's associated components.

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

Inspector: A qualified employee or contractor who can identify deficiencies, or non-standard construction conditions, on the Company's street light 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 shaft and arm assembly which supports street lighting luminaire(s) and associated wiring.

TRAINING

T&D Technical Training - Provide training upon request.

DOCUMENT CONTENTS

Table of Contents

1.0 STREET LIGHT 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. The Outdoor Lighting group is responsible for creating and/or revising this schedule for the respective geographic areas. The Distribution Inspector uses a Windows® based hand held computer to record employee ID, region, district, street lighting installation standard number, GPS location, Priority Level 1, 2, 3 and 4 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 Customer Service System – Outdoor Lighting (CSS-OL) database and added to the appropriate inspection cycle. The street light standards inspections scheduled for the year shall be completed by December 31st. The inspector shall place the CSS-OL street light standard number on the facility if not found numbered during the patrol.

2.0 EQUIPMENT TO BE INSPECTED AND MAINTENANCE CODES

2.1 Luminaires

2.2 Arms

2.3 Standards

2.4 Foundations

2.5 Conductor

TABLE I

PRIORITY 1, 2 and 3 MAINTENANCE ITEMS FOR OUTDOOR LIGHTING

Category	CODE	Default Priority	Description
Luminaire	300	2	Light "ON" Day
	301	2	Replace Lens
	302	4	Clean
	303	4	Paint
	304	4	Replace Wattage Label
	305	1	Wires Exposed
	306	2	Damaged - Replace
	307	4	Missing
	308	4	Other - Comments
Arm	320	2	Damaged - Replace
	321	4	Damaged - Repair
	322	4	Rust - Paint
	323	4	Other - Comments
Standard	330	2	Structure Damage - Replace
	331	4	Damaged/Leaning - Repair
	332	4	Paint/Maintenance
	333	1	Access Cover - Replace
	334	4	Bad Wiring - Repair
	335	4	Stencil Required
	336	2	Temporary Overhead *
	337	2	Ground - Repair
	338	4	Knockdown/Missing
	339	4	Other - Comments
Foundation	350	4	Damaged/Leaning - Repair
	351	4	Anchor Bolts Damaged
	352	4	Elevated - Repair
	353	4	Other - Comments

Note: The default priority of Level 4 for missing luminaries and street light standards is utilized for informational use only. If the street light standard is missing or missing a luminaire, the item shall be reviewed with records, if found to be a required and an active asset it shall be changed to a Level 1 priority.

***Refer to EOP NG-EOP G029 (Tracking Temporary Repairs to Electric System) for tracking and reporting of temporary repairs.**

3.0 STREET LIGHT MAINTENANCE DATABASE/REPORTS

The Street Light 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.

4.0 MAINTENANCE SCHEDULE

Maintenance activities are scheduled by priority Levels. All "Level 1 Priority" conditions identified must be repaired/corrected within 1 week. All "Level 2 Priority" conditions identified must be repaired/corrected within 1 year. All "Level 3 Priority" conditions must be repaired within 3 years. Level 4 Priority is for inventory purposes only.

Once the Street Light Patrol is completed in the Street Light Maintenance Database or 21 days have elapsed since the inspection, the Level 2 and Level 3 Priority maintenance codes are downloaded into STORMS. Expense maintenance work goes straight to scheduling while the capital work goes to Distribution Design. Level 1 Priority maintenance codes are communicated by the Distribution Inspector directly to the field operations group for the area where the feeder is located.

5.0 COMPLETION

The completion of Level 1 priority maintenance codes is performed by the field operations Supervisor or their designee. Level 2 and Level 3 priority maintenance codes are tracked in the Street Light Maintenance database and placed into the Customer Service System – Outdoor Lighting (CSS-OL) database. CSS-OL database automatically initiates a STORMS order. CSS-OL database is updated once the associated STORMS orders are complete for the work request associated with the maintenance code from the Street Light Database.

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

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

6.0 REVISION HISTORY

Version	Date	Description of Revision
1.0	02/16/10	This document supercedes document dated 07/25/05.

Appendix 14

NG-USA EOP G004 Shock Complaints

INTRODUCTION

This procedure describes the requirements for investigating and reporting on a customer's shock complaint. A shock complaint is a customer call that states a person has received a shock. When investigating of a shock complaint, Company field personnel must determine if the shock was caused by faulty customer equipment, a neutral-to-earth voltage associated with the Company's distribution system, or an external DC voltage source. Regardless of the cause, a shock complaint is considered an emergency and shall be dispatched as soon as possible. The appropriate Dispatch or Control Center shall be notified of all shock incidents by the field, and all communications shall be completed as required by National Grid Electric Operating Procedure NG-EOP G009.

PURPOSE

This document details specific steps that should be followed when National Grid receives a shock complaint call.

ACCOUNTABILITY

1. Distribution Engineering Services
    A. Update procedure as necessary
2. Operations
    A. Ensure that this procedure is understood and implemented
    B. Ensure that all personal are trained in this procedure.
3. Employee
    A. Demonstrate the understanding of this procedure.
    B. Comply with the requirements of this procedure.

COORDINATION

N/A

REFERENCES

National Grid Employee Safety Handbook

National Grid Safety and Health Policies & Procedures

NG-USA EOP G003 Shock and/or Neutral-to-Earth Voltage Complaint

NG-EOP G009 Personal Injury Accidents/Newsworthy Event Reports

Metering Services Department Procedure MS505 Shock Complaint

Metering Services Department Procedure MS508 Warning Tag Electric

National Grid OH Construction Standards

DEFINITIONS

Shock Voltage: Voltage between two points that is high enough to be perceptible to people.

Primary Voltage: All distribution circuit cables or conductors energized at 4, 15, 23, or 34.5 kV.

Shall: The word shall is to be understood as mandatory.

Should: The word should is understood as recommended.

TRAINING

Provide line personnel with training, through progression schools and as necessary.

DOCUMENT CONTENTS

Table of Contents

1.0 SAFETY

1.1 All work shall be performed in accordance with the National Grid Employee Safety Handbook and all appropriate National Grid Electric Operating Procedures.

1.2 All appropriate Personal Protective Equipment including, but not limited to, hard hat, safety glasses/eye protection, rubber protective equipment, appropriate footwear and FR clothing shall be worn when performing work as required by the National Grid Employee Safety Handbook and applicable work procedures.

2.0 ORDER PROCESSING

2.1 Regardless of the cause, all shock complaints are considered an emergency order type that requires immediate dispatch. When the Customer Contact Center (CCC) receives a call from a customer stating that a person has received a shock, the CCC:

2.1.1 Immediately transfers to Dispatch any calls from 911 officials with an associated emergency or life threatening situation.

2.1.2 Retrieve the customer's account information and verify the customer's account information on the Account window.

2.1.3 Inform the customer that someone needs to be present at the premise in order for the shock complaint to be investigated. Inform the customer that their service may be disconnected if no one is present at the premise and a problem is detected.

2.1.4 Complete the Issue Investigation Order for Account or a Service Order Form (paper copy) in its entirety and fax the completed form to the appropriate dispatch office when the Customer Service System is down.

2.1.5 Call Dispatch office to verify receipt the Investigation Order or the Faxed Service Order.

3.0 INVESTIGATION

3.1 The individual investigating (generally a field service representative) a shock complaint shall:

3.1.1 Initiate Shock and/or Neutral to Earth Voltage Complaint Investigation Form NG0024 (Exhibit 1) http://infonetus/formscatalogweb/forms/NG0024.pdf

Use this form on **every** shock complaint order, even when the individual conducting the investigation resolves the problem him/herself without involving outside departments.

3.1.2 Make the first check with a National Grid approved testing device between a known ground source and the origin of the shock.

3.1.3 If the test between the ground and the shock source indicates higher than secondary voltages:

a. Safely evacuate customer(s) from the premise.

b. Contact Customer Meter Services Supervisor and System Operations Dispatch from a remote location and request Electric Operations assistance.

c. Safeguard and keep the hazardous area clear until Electric Operations provides relief.

3.1.4 If the test between ground and the source of the shock indicates secondary or lower voltages:

a. Connect an AC multi-range voltmeter (such as Fluke 87) that provides true RMS at the same location and observe the readings. Leave the voltmeter connected at this location.

b. Check for proper bonding. If additional bonding is required, assist or advise the customer accordingly.

c. Open the customer's main breaker(s)/fuse(s), remove the meter and observe the voltmeter.

1. If voltage drops to zero, the problem is within the customer's equipment.
   i. Reinstall meter and close main breaker(s)/fuse(s).
   ii. Isolate the trouble circuit by opening each breaker/fuse one at a time until the voltage reading on the voltmeter drops to zero.
   iii. Identify equipment and wiring on troubled circuit.
   iv. Isolate and disconnect troubled equipment or wiring and issue an Electric Warning Tag Form NG0023 (Exhibit 2). http://infonetus/formscatalogweb/forms/NG0023.pdf
   v. The individual conducting the investigation shall inform the customer to contact a licensed electrician or appliance repair person to check out internal wiring or appliances.
   vi. Record this information on the Shock and/or Neutral to Earth Voltage Complaint Investigation Form NG0024 (Exhibit 1).
2. If the voltage does not drop to zero, each customer on the same secondary shall be disconnected in the same manner as above. Any other customers in close proximity and with a common water supply may also have to be checked. In each case, the voltmeter should remain connected at the original complaint's premise.
3. If voltage is still present after steps 1 & 2 have been completed, it will be necessary to determine if the condition is the result of a neutral-to-earth AC source or a DC voltage. Connect the AC-DC multi-range voltmeter that provides true RMS and use the DC scale to observe readings:
   i. If DC voltage is measured, the problem is with a DC source (i.e., cable TV, telephone). Inform the customer that the problem is with a source that National Grid cannot correct or check.
   ii. Record this information on the Shock and/or Neutral to Earth Voltage Complaint Investigation Form NG0024 (Exhibit 1).
   iii. Notify Communications Companies.
4. If voltage is still present after steps 1 & 2 have been completed and the voltage is AC:
   i. Further investigation is required by the Engineering Lab in NE or the Meter and Test Department in NY as per Electric Operating Procedure G003 – Shock and/or Neutral-to-Earth Voltage Complaint.
   ii. Record this information on the Shock and/or Neutral to Earth Voltage Complaint Investigation Form NG0024 (Exhibit 1) and forward to the Engineering Lab in NE or the Meter and Test Department in NY.

EXHIBIT 1
"Shock and/or Neutral-to-Earth Voltage Complaint Investigation Report" (Form #NG0024)
http://infonetus/formscatalogweb/forms/NG0024.pdf

SHOCK AND/OR NEUTRAL TO EARTH VOLTAGE COMPLAINT INVESTIGATION REPORT

nationalgrid

Customers's Name		Phone
Street, Road, Etc.	Circuit	Pole or Enclosure
City, Town, Village		

TEST LOCATION SKETCH

VOLTAGE READINGS

CIRCUIT CONFIGURATION	A.C. Volts		D.C. Volts		CORRECTIVE ACTION
	As Found	As Left	As Found	As Left	
Normal					
Meter Removed					

REMARKS

DATE: BY:

NG0024 (11.06)

EXHIBIT 2
"Warning Notice" Form #NG0023
http://infonetus/formscatalogweb/forms/NG0023.pdf

WARNING NOTICE

TO OUR CUSTOMER

M _____

_____

In response to your request we have inspected your electrical installation and found the cause of your service failure to be as follows:

_____ Short in _____

_____ Defective _____

_____ Overlooaded Branch Circuit

_____ General Overload

_____ Over-fused Branch Circuits

_____ _____

_____

NOTE: Replacing of blown fuses will not correct the trouble listed above.

We recommend that you call your:

_____ Electrical Contractor

_____ Appliance Repairman

to make the necessary repairs.

nationalgrid

SERVICE REP _____

DATE _____

NG0023(01.06)

4.0 REVISION HISTORY

Version	Date	Description of Revision
1.0	07/14/11	This document supersedes document dated 02/01/07.

Appendix 15

NG-USA SMS 400.06.1 Substation V&O Inspection Standard and SMP 400.06.2 Substation Inspection Procedure

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.

PURPOSE

N/A

ACCOUNTABILITY

N/A

COORDINATION

N/A

REFERENCES

N/A

DEFINITIONS

N/A

TRAINING

N/A

DOCUMENT CONTENTS

Table of Contents

1.0 SCHEDULE

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

2.0 PROBLEMS AND DISCREPANCIES

2.1 Severe Trouble shall be reported to the responsible Control Center and the person in charge of the substation immediately.

2.1.1 The employee shall secure the area and warn unauthorized people to stay clear of the danger.

2.1.2 A severe trouble condition is a situation that is hazardous to the system operation and/or National Grid employees or the public.

2.2 Problems and discrepancies found should be repaired during the V&O Inspection whenever possible.

2.3 Problems and discrepancies not corrected during the V&O Inspection shall be recorded on the Inspection Card (Apparatus Inspections) or as a note in the PDA (Station V&O Inspections).

2.3.1 The Supervisor reviewing the inspection shall generate follow-up work orders to document the required work.

3.0 V&O GUIDELINES

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

3.1.1 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.

4.0 REVISION HISTORY

Version	Date	Description of Revision
1.0	12/26/06	Corrected - Formatting Changed - Header title, Document number prefix Changed - First page footer to reference Documentum Removed – Subtitle Added – AIMMS PM numbers
1.1	05/23/07	Document Added - Documentum Version # to headers Added - File name to footer
1.2	08/20/07	Problems And Discrepancies Added - Section
2.0	06/30/09	Converted to new EDO format - content unchanged

[PAGE INTENTIONALLY LEFT BLANK]

VISUAL AND OPERATIONAL (V&O) INSPECTION

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

SMS 400.13.1 Oil Leak Reporting Procedure

SMS 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

Table of Contents

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.

2. Materials Required.

2.1 PDA with National Grid V&O software installed.
2.2 Clipboard
2.3 Binoculars
2.4 Flashlight
2.5 Magnet for resetting drag hands
2.6 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 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 and Correcting Problems and Discrepancies

6.1 Severe Trouble shall be reported to the responsible Control Center and the person in charge of the substation immediately.

1) The employee shall secure the area and warn unauthorized people to stay clear of the danger.
2) A severe trouble condition is a situation that is hazardous to the system operation and/or National Grid employees or the public.
   a) See Trouble Reporting Appendix at the end of this document for additional information on trouble reporting.

6.2 See the section Oil Leak Reporting for information on reporting oil leaks.

6.3 Document all paint and preservation problems.

1) Rust, corrosion, or fading to the point where primer, or bare metal shows.

6.4 Problems and discrepancies found should be repaired during the V&O Inspection whenever possible.

6.5 Problems and discrepancies not corrected during the V&O Inspection shall be recorded on the Inspection Card (Apparatus Inspections) or as a note in the PDA (Station V&O Inspections).

1) The Supervisor reviewing the inspection shall generate follow-up work orders to document the required work.

6.6 Record findings in the PDA if listed in the PDA “round”.

1) Record other readings or problems as Notes in the PDA
2) If performing an apparatus inspection record the V&O Inspection portion in the V&O section of the Inspection Card.

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 that 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 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.

7.4 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.

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

7.6 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.

7.7 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 are in the start or zero position.

7.8 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.

7.9 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).

7.10 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).

7.11 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.

7.12 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.

7.13 Tags and Clearance and Control switching forms 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.

7.14 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.

7.15 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.

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

7.17 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.

7.18 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.

7.19 Switch Sticks
1) Inspect Switch Sticks and Grounding Sticks for current dielectric test date.
   a) Send out of date sticks to lab for testing or;
   b) Test locally using approved methods, test equipment and competent, trained personnel.
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.

7.20 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.

7.21 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.

7.22 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.

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

8. Yard Inspection

8.1 Unusual Noises
1) Be alert for arcing, gurgling and pinging noises which could indicate imminent and violent equipment failure.

8.2 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.

8.3 Gates
1) Test gates for proper operation.
   a) Gates should swing easily out of the way.
2) When closed, the gates should by chained tightly, or locked, with minimal space.
3) Verify locking chains, hardware and locks present and in good condition.

8.4 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)

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

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

8.7 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.

8.8 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.

8.9 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
7) 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 equipment and structure foundations.
1) Large cracks.
2) Settling (not level).
3) Deterioration (large areas of surface erosion, stone showing).

8.12 Inspect Cableways

8.13 Damage, missing or broken cover sections and deterioration.

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

8.15 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 SMS 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 SMS's for apparatus inspections.

Circuit Breakers

SMP 401.01.2 – Air Magnetic Circuit Breaker Maintenance Procedure
SMP 401.02.2 – Oil Circuit Breaker Maintenance Procedure
SMP 401.03.2 – Vacuum Circuit Breaker Maintenance Procedure
SMP 401.04.2 – Air Blast Circuit Breaker Maintenance Procedure5
SMP 401.05.2 – Two Pressure Gas Circuit Breaker Maintenance Procedure
SMP 401.06.2 – Gas Puffer Circuit Breaker Maintenance Procedure
SMP 401.07.2 – Station Recloser Maintenance Procedure
SMP 401.08.2 – Vacuum Switch Maintenance Procedure

Transformers

SMP 402.01.2 – Power – 15 MVA and above Maintenance Procedure
SMP 402.02.2 – Power – Below 15 MVA Maintenance Procedure
SMP 402.03.2 – Dry Type Transformer Maintenance Procedure

Instrument Transformers
- SMP 403.01.2 – Currents, Potentials and Metering Maintenance Procedure Voltage Regulators
- SMP 404.01.2 – Step Voltage Regulator Maintenance Procedure
- SMP 404.02.2 – Induction Voltage Regulator Procedure

Emergency Generators
- SMP 405.01.2 – Emergency Generators Maintenance Procedure

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

Sensing Devices
- SMP 407.01.2 – Bushing Potential Device Maintenance Procedure
- SMP 407.02.2 – Coupling Capacitors and CCVTs Maintenance Procedure
- SMP 407.03.2 – Wave Trap Maintenance Procedure
- SMP 407.04.2 – Resistive Coupled Potential Device Maintenance Procedure

Capacitors
- SMP 408.01.2 – Station Capacitor below 69kV Maintenance Procedure

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

Load Tap Changer
- SMP 412.01.2 – Load Tap Changer Maintenance Procedure

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

Metal Clad Bus and Switchgear
- SMP 417.02.2 – Metal Clad Bus, Switchgear and Substation Maintenance Procedure

Surge Arresters
- SMP 419.01.2 – Surge Arrester Maintenance Procedure

Network Protectors
- SMP 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) Clearance and Control Switching forms

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 5842390Flood 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) 30 A
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

14. Record of Revisions

Revision	Changes
08/20/2007	Reporting Changed – Section name to Reporting and Correcting Problems and Discrepancies Revised – Section extensively revised Materials Required Removed - Substation V&O Inspection Report form, Inspection Report from last V&O Inspection, Substation V&O Checklist form.
09/30/2007	Switch Sticks Added - or; Test locally using approved methods, test equipment and competent, trained personnel.

Appendix 16

NG-USA EOP G029 Tracking Temporary Repairs To Electric System

INTRODUCTION

The purpose of this procedure is to outline the steps to be taken when a temporary repair is made to the electric system to restore service or maintain public safety until a permanent repair can be made. Every effort should be made to make permanent repairs within 90 days. For those rare exceptions when permanent repairs are not made within 90 days, special reporting and periodic site visits are required to monitor the temporary repairs until the permanent repairs are completed.

PURPOSE

This procedure applies to all personnel who are responsible for initiating temporary repairs along with employees who are responsible for designing, planning, scheduling and construction of permanent repairs made at locations where temporary repairs were made to restore service or maintain public safety.

ACCOUNTABILITY

1. Distribution Engineering Services
    A. Update procedure as necessary.
2. Customer Operations
    A. Ensure the components of the procedure are implemented.
    B. Ensure workers are trained in this procedure.
    C. Provide revision input as necessary.
3. Workers
    A. Demonstrate the understanding of the procedure.
    B. Comply with the requirements of the procedure.
4. Inspections
    A. Ensure components of this procedure are implemented.
    B. Track temporary repairs identified by Inspections
    C. Provide periodic inspections of temporary repairs greater than 90 days.
    D. Compile and submit report to PSC.

COORDINATION

Not Applicable

REFERENCES

State of New York Public Service Commission Order 04-M-0159
State of New York Public Service Commission Order 04-M-0159 Adopting Changes to Electric Safety Standards Effective December 15, 2008.

DEFINITIONS

Confirming Work Request: Any emergency work completed in the field, does not require scheduling and is not billable to a 3rd party.

Level 9: This priority category is used when a temporary repair is identified in the field by Inspections.

Non-confirming Work Request: Any emergency work not completed in the field, requires scheduling and is not billable to a 3rd party.

Permanent Repair: Repaired in accordance with National Grid Standards.

Property Damage Claim: Billable emergency work.

TRAINING

Provided by appropriate National Grid training program.

DOCUMENT CONTENTS

Table of Contents

1.0 TEMPORARY REPAIRS MADE BY OPERATIONS

Temporary repairs that are made by operations to restore service or maintain public safety until permanent repairs can be made; are recorded by Distribution Support Services utilizing a pre-formatted form that will require all pertinent information needed in order for the Temporary Repair to be entered into the Maintenance Database. The form will then be e-mailed to a 'group' mailbox that the Inspections Department Administrative staff will be authorized to access. Information from the attached form will be used by the admins to enter the Temporary Repair into the Maintenance Database with the appropriate maintenance code, and assigned a priority of Level 9. The Level 9 would indicate that this a temporary repair that should be completed within 90 days. Maintenance codes assigned a Level 9 will be downloaded from the maintenance database nightly into STORMS. Level 9 codes associated with a maintenance item will be assigned directly to Scheduling to be scheduled within 20 business days. Level 9 codes that require design will be downloaded from maintenance database and placed in the work queue for the Distribution Design Supervisor or Engineering Supervisor for the appropriate area. Scheduling will have 20 business days to schedule the Level 9 work request to the field for completion.

2.0 TEMPORARY REPAIRS DISCOVERED BY INSPECTIONS

Temporary repairs located by Inspections during an inspection are to be recorded in the Maintenance Database with the appropriate maintenance code and with an assigned priority Level 9. The Level 9 would indicate that this a temporary repair that should be completed within 90 days. Maintenance codes assigned a Level 9 will be downloaded from the maintenance database nightly into STORMS. Level 9 codes associated with a maintenance item will be assigned directly to Scheduling to be scheduled within 20 business days. Level 9 codes that require design will be downloaded from maintenance database and placed in the work queue for the Distribution Design Supervisor or Engineering Supervisor for the appropriate area. Scheduling will have 20 business days to schedule the Level 9 work request to the field for completion.

3.0 TEMPORARY OVERHEAD REPAIRS (TOH)

Temporary overhead repairs (TOH) are utilized by operations to restore service while the underground cable that generally serves the facilities is being repaired. TOH's that meet National Grid Overhead Standards for construction would not be considered a temporary repair that would need to be tracked under this procedure. TOH's not meeting National Grid Overhead Standards for construction are required to be tracked under this procedure as a temporary repair and follow the process outlined in paragraph 1 above.

4.0 TEMPORARY REPAIRS NOT COMPLETED WITHIN 90 DAYS

Every effort should be made to complete temporary repairs within 90 days. In extraordinary circumstances, which may include major storms, where repairs may extend beyond 90 days (exceptions), the company shall periodically perform site visits to monitor the condition of the temporary repairs. The company shall also report these exceptions as part of the reporting requirements outlined in the State of New York Public Service Commission Order 04-M-0159 Adopting Changes to Electric Safety Standards Effective December 15, 2008.

The Inspections group is responsible for tracking all temporary repairs that extend beyond 90 days. The initial periodic inspection should take place after 90 days and every 45 days until the permanent repair is made. The Inspection supervisor should run a report from the maintenance database for open Level 9 codes. The periodic inspection time frame lines up with the periodic inspection requirements for the elevated voltage findings requirements and could be run at the same intervals.

It is strongly encouraged that these temporary repairs be completed as soon as practicable to limit the burden of tracking these repairs.

5.0 NYS PUBLIC SERVICE COMMISSION REPORTING

Temporary repairs that are beyond 90 days must be identified and justified as part of the reporting requirements of the PSC Orders referenced below. The 90 days time period commences on the day the temporary repair was made or the day the temporary repair was located. Inspections will be responsible for consolidating the temporary repair information from operations and from the maintenance database in order to prepare the report that will be submitted to the PSC. The report will identify the temporary repairs that exceeded 90 days, the periodic site visit information and the justification for the repair taking longer than 90 days. Inspections shall file the report by February 15 each year.

6.0 REVISION HISTORY

Version	Date	Description of Revision
1.0	05/07/10	This is a new document.

Appendix 17

Certifications

CERTIFICATION
STRAY VOLTAGE TESTING

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

Keith P. McAfee, on this 1 day of February 2016, certifies as follows:

1. I am the Vice President, Maintenance and Construction, New York Electric, 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 December 31, 2015 (the "Twelve-Month Period") 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, July 21, 2005, December 15, 2008, March 22, 2013, and January 13, 2015 in Case 04-M-0159 (collectively the "Orders"), including the Quality Assurance Program filed by the Company with the Commission.

2. In accordance with the requirement of the Orders, the Company developed a program designed to test (i) all publicly accessible underground electric distribution facilities owned by the Company ("Underground Distribution Facilities") on an annual basis, (ii) all metallic streetlights and traffic signal poles located in public thoroughfares in the Company's service territory to which the Company provides service ("Streetlights") on an annual basis, and (iii) all publicly accessible overhead distribution facilities, underground

residential distribution ("URD") facilities, overhead and underground transmission facilities, and substation fences owned by the Company at least once every five years ("Facilities"), all as identified through a good faith effort by the Company for stray voltage (the "Stray Voltage Testing Program").

3. I am responsible for overseeing the Company's Stray Voltage Testing Program.

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

5. I make this certification subject to the condition and acknowledgement that it is reasonably possible that, notwithstanding the Company's good faith implementation and completion of the Stray Voltage Testing Program, there may be Facilities, Underground Distribution 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, Underground

Distribution Facilities, and Streetlights were known to exist or reasonably expected to be found.

Keith P. McAfee

Sworn to before me on this 1st day of February, 2016

Notary Public: Lisa M Wemple

LISA M. WEMPLE
Notary Public, State of New York
Qualified in Fulton County No. 4984095
Commission Expires July 15, 20 19

CERTIFICATION
FACILITY INSPECTIONS

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

Keith P. McAfee, on this 1 day of February 2016, certifies as follows:

1. I am the Vice President, Maintenance and Construction, New York Electric, 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 December 31, 2015 (the "Twelve-Month Period") based on my knowledge of the inspection program adopted by the Company in accordance with the Public Service Commission's Orders issued and effective January 5, 2005, July 21, 2005, December 15, 2008, March 22, 2013, and January 13, 2015 in Case 04-M-0159 (collectively 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.

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 approximately 20 % of its Facilities during calendar year 2015, to comply with the five-year inspection cycle required under the Orders.

Keith P. McAfee

Sworn to before me on this 1st day of February, 2016

Notary Public: Lisa M Wemple

LISA M. WEMPLE
Notary Public, State of New York
Qualified in Fulton County No. 4984095
My Commission Expires July 15, 2019