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

2019 Annual Report

Report on the results of stray voltage testing and facility inspections
for the 12-month period ended December 31, 2019

February 15, 2020

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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, 2019.

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

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

the Company's underground system is currently performed by contractors. Facility inspections of the underground system are currently performed by contractors.

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 substations in Niagara Mohawk's service territory. Stray voltage results for substation fences were collected internally by the operating group. The initial dataset identified 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, 2019, 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 $\geq$ 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 372,492 facilities for stray voltage testing in calendar year 2019. Testing was not required on 125,035 facilities because: the facilities are wood utility poles that have no attached appurtenances capable of conducting electricity; or 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, (*e.g*., 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 highway exit and entrance 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 2,763 miles of mobile testing system scans between January 1, 2019 and December 31, 2019. 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 6, 2019.

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 (400.13.2 Substation Maintenance Visual and Operational (V&O) Inspection).

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 (*e.g.,* 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 90day 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 1,525,895 individual facilities that must be visited for stray voltage testing and approximately 1,581,103 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 criteria 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 (*e.g.* ground wires, ground rods, anchor guy wires, or riser pipes), and/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 criteria 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 criteria 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 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

The year ended December 31, 2019 was the fifth and final year of the Company's stray voltage and inspection Cycle 3 program. The Company met the annual performance target for stray voltage testing of 100% of metallic streetlights and traffic signals and Company-owned underground distribution facilities. In addition, the Company conducted stray voltage testing of 100% of its overhead distribution facilities, URD facilities, overhead and underground transmission structures, and substations during the five-year period ended December 31, 2019.

The Company also met the fifth-year performance target for inspections of 100% of its electric facilities for the five-year period ended December 31, 2019.

[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 2019**	**% Completed**
Distribution**	1,308,059	242,391	18.531%
Underground	28,208	28,208	100.000%
Streetlights*	84,528	84,528	100.000%
Transmission**	104,229	17,365	16.660%
Substation	868	868	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 2019	Actual Inspected in 2019
Overhead Distribution	1,242,883	228,478	18.383%
Overhead Transmission	104,875	17,580	16.763%
Underground	98,013	19,015	19.400%
Pad-mounted Transformers	69,809	13,123	18.798%
Streetlights	65,523	15,890	24.251%
TOTAL	1,581,103	294,086	18.600%

Inspection Performance Summaries

Overhead Distribution Facilities

Inspection Year	Number of Overhead Distribution Structures Inspected	% of Overall System Inspected (Cumulative)
2015	255,736	21%
2016	258,385	21%
2017	260,764	21%
2018	251,012	20%
2019	228,478	18%

Overhead Transmission Facilities

Inspection Year	Number of Overhead Transmission Facilities Inspected	% of Overall System Inspected (Cumulative)
2015	22,679	22%
2016	22,303	22%
2017	24,012	23%
2018	22,310	21%
2019	17,580	17%

Underground Facilities

Inspection Year	Number of Underground Facilities Inspected	% of Overall System Inspected (Cumulative)
2015	17,254	18%
2016	17,582	19%
2017	19,460	20%
2018	25,046	25%
2019	19,015	19%

Padmount Transformers

Inspection Year	Number of Padmount Transformers Inspected	% of Overall System Inspected (Cumulative)
2015	12,268	19%
2016	13,985	21%
2017	13,793	20%
2018	17,161	24%
2019	13,123	19%

Streetlights

Inspection Year	Number of Streetlights Inspected	% of Overall System Inspected (Cumulative)
2015	12,664	19%
2016	13,264	20%
2017	13,198	20%
2018	14,532	22%
2019	15,890	24%

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 "any 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 "voltage 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 16 instances of stray voltage during the Company's manual stray voltage testing program in 2019. 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 (14) of stray voltage conditions identified were on distribution structures.

The following table contains a breakdown of the causes of stray voltage findings identified through the Company's 2019 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 Voltage Found
Distribution	Down Ground	1
Distribution	Guy	6
Distribution	Induce Voltage	5
Distribution	None Required	1
Distribution	Poor Insulation	1
Street Lights - Traffic Signals		1
Transmission	None Required	1
TOTAL		16

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.

VIII. 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
228,478	97,788	42.800%

Breakdown of Locations with Deficiencies

Priority Rate	Number of Deficiencies	% Deficiencies Found
1	894	0.532%
2	3,121	1.857%
3	33,726	20.072%
4	130,284	77.538%
Total:	168,025	100.000%

Overhead Transmission Facilities

Table of Locations with Deficiencies

Locations Inspected	Locations w/Deficiencies	%Locations w/Deficiencies
17,580	13,548	77.065%

Breakdown of Locations with Deficiencies

Priority Rate	Number of Deficiencies	% Deficiencies Found
1	8	0.033%
2	122	0.510%
3	1,217	5.083%
4	22,597	94.374%
Total:	23,944	100.000%

Underground Facilities

Table of Locations with Deficiencies

Locations Inspected	Locations w/Deficiencies	%Locations w/Deficiencies
19,015	10,188	53.579%

Breakdown of Locations with Deficiencies

Priority Rate	Number of Deficiencies	% Deficiencies Found
1	110	0.973%
2	545	4.820%
3	85	0.752%
4	10,567	93.455%
Total:	11,307	100.000%

Pad-mount Transformers

Table of Locations with Deficiencies

Locations Inspected	Locations w/Deficiencies	%Locations w/Deficiencies
13,123	3,410	25.985%

Breakdown of Locations with Deficiencies

Priority Rate	Number of Deficiencies	% Deficiencies Found
1	74	1.077%
2	414	6.024%
3	69	1.004%
4	6,316	91.896%
Total:	6,873	100.000%

Streetlights

Table of Locations with Deficiencies

Locations Inspected	Locations w/Deficiencies	%Locations w/Deficiencies
15,890	7,479	47.067%

Breakdown of Locations with Deficiencies

Priority Rate	Number of Deficiencies	% Deficiencies Found
1	0	0.000%
2	243	2.195%
3	319	2.881%
4	10,509	94.924%
Total:	11,071	100.000%

In 2019, Niagara Mohawk identified an overall total of 221,220 deficiencies:

- Priority Rating 1 Total = 1,086, or 0.490% of the overall total.
- Priority Rating 2 Total = 4,445, or 2.009% of the overall total.
- Priority Rating 3 Total = 35,416, or 16.009% of the overall total.
- Priority Rating 4 Total = 180,273 (inventory), or 81.490% of the overall total.

IX. 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") 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 results derived from the field audited EV testing and I&M inspections.

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 & 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 1 year. • QA/QC identification of maintenance codes which may affect reliability.
Risk 3 • Facility/component condition that must be repaired/replaced within 3 years. • QA/QC identification of maintenance codes which may not affect reliability. • The QA/QC auditor determined the original I&M inspector's maintenance code was incorrect. • The independent QA/QC auditor determines a data quality issue.

Asset Inspection & Maintenance Audits

National Grid's Electric QA/QC group audited (7,611) distribution, transmission and sub-transmission assets that had been field inspected for maintenance during 2019. The method used to confirm and/or achieve the required quality of asset audits, involved follow-up field audit 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 2019. This process captured incorrect or missed maintenance codes and noted timeliness of repairs when evident. In order 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 **97**%.

2019 Field Inspections – QA/QC Audit Results

The following table illustrates the population and breakdown of assets inspected by field force and compliance percentages related to system reliability concerns (Risk Levels 1 & 2 findings) identified through QA/QC process during calendar year 2019

Asset Category	I & M Field Inspector	QA/QC Field Auditor		QA/QC Risk Levels		Compliance Percent (%)
	Assets Inspected	Assets Audited	M Codes Audited	Risk 1	Risk 2	
Distribution	228,478	6781	8764	8	294	97%
Sub-Transmission	9,864	416	860	0	18	98%
Transmission	7,653	414	673	0	5	99%
		Total Compliance Percent				**97%**

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 missed maintenance codes are conducted for the purpose of determining compliance percentage of maintenance code trending for a particular region.

- Misidentified Maintenance Code – When the field Inspector incorrectly identifies a maintenance code for a condition found at a structure.

- Missed Maintenance Code – When the QA/QC 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 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%, Operations is responsible for further trending analysis and/or corrective action and implantation plan to improve field force inspections.

QA/QC Misidentified Maintenance Code Trends

Region	QA/QC Misidentified M Codes	Maintenance Code Description	Trending Quantity	Total Sample Size Audited YTD	Compliance Percent
48	221-Dist	Guy – Not in compliance with NESC Code	13	1044	99%
50	581-Sub-T	Misc. – Stencil line/Structure number	10	126	92%
51	218-Dist	Guy – Not in compliance with NESC Code	12	998	99%
54	115-Dist	Pole – Riser guard required	11	1338	99%
	153-Dist	Transformer – LA blown/missing/improper	10		99%
	221-Dist	Guy – Not in compliance with NESC Code	18		99%
56	212-Dist	Ground – Wire broken/loose	18	1073	98%

QA/QC Missed Maintenance Code Trends

Region	QA/QC added M Codes	Maintenance Code Description	QTY	Total Sample Size Audited YTD	Compliance Percent
48	099-Dist	Street Light – Not Bonded	15	1044	99%
	152-Dist	Transformer – Missing ground wire	24		98%
	213-Dist	Ground – Non-Standard	10		99%
	215-Dist	Guy – Guy Span not in compliance w/Code	17		98%
	221-Dist	Guy – Guy Span not in compliance w/Code	12		99%
	272-Dist	Spacer Cable – Bracket not bonded	21		98%
	274-Dist	Spacer Cable – Messenger guard missing	12		99%
	584-Trans	Misc. – Install/Replace warning signs	11	84	87%
50	153-Dist	Transformer – LA blown/missing/improper	12	817	99%
	157-Dist	Transformer – LA blown/missing/improper	10		99%
	218-Dist	Guy – Not in compliance with code	21		97%
51	218-Dist	Guy – Not in compliance with code	10	998	99%
54	099-Dist	Street Light – Not Bonded	14	1338	99%

	155-Dist	Transformer – Animal Guards Required	30		98%
	215-Dist	Guy – Guy Span not in compliance w/Code	12		99%
	221-Dist	Guy – Not in compliance with NESC Code	11		99%
56	118-Dist	Pole – Stencil/correction required	18	1073	98%
	152-Dist	Transformer – Missing ground wire	13		99%
	155-Dist	Transformer – Animal Guards Required	17		98%
	157-Dist	Transformer – Improper/missing bond	28		97%
	212-Dist	Ground – Guard required	18		98%
	215-Dist	Guy – Guy Span not in compliance w/Code	17		98%
	221-Dist	Guy – Not in compliance with NESC Code	10		99%

Region	QA/QC added M Codes	Maintenance Code Description	QTY	Total Sample Size Audited YTD	Compliance Percent
57	118-Dist	Pole – Stencil/correction required	18	1263	99%
	213-Dist	Ground – Non-Standard	15		99%
62	155-Dist	Transformer – Animal Guards Required	10	1266	99%
	213-Dist	Ground – Non-Standard	14		99%

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 2019 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
2019							
	I	Within 1 week	1086	1064	22	0	0
	II	Within 1 year	4445	980	0	3465	0
	III	Within 3 years	35416	371	0	35045	0
	IV	N/A	180694	47918	0	132776	0
	Temp Repairs	Within 90 days	77	56	5	3	13

The QA/QC group performed 216 Level 1 only follow-up field audits and validated that the 197 repairs were completed within the required time frame and 19 Level 1 had not been repaired and were overdue at time of audit.

Elevated Voltage (EV) Assets Audited

The National Grid QA/QC 2019 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 can conduct electricity and is publicly accessible. In order 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 (≤ 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 & 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. In order 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 auditor found the voltage not mitigated below regulatory/company thresholds after the 45 days. • The QA/QC auditor 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.

2019 QA/QC EV Field Asset Audit Results

The QA/QC group audited **8910** elevated voltage assets for Distribution, Underground, Transmission, Sub-Transmission and Streetlights during eight operating regions.

QA/QC EV Assets Audited

Region	QA/QC Assets Audit Totals
48	1345
50	843
51	953
54	1270
56	1080
57	1133
60	1027
62	1259
Total	**8910**

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	821	549	729	1032	852	883	776	1004	**6646**
Underground	25	48	33	30	45	42	53	30	**306**
Sub Trans	42	48	30	32	125	96	10	27	**410**
Transmission	43	32	16	29	50	42	165	90	**467**
Streetlights	414	166	145	147	8	70	23	108	**1081**
Totals	**1345**	**843**	**953**	**1270**	**1080**	**1133**	**1027**	**1259**	**8910**

2019 QA/QC EV Field Asset Audit Results – Risk Level

Risk Level 1 Identified

The National Grid 2019 QA/QC EV audits achieved an overall confidence level of **100%** for Risk Level 1 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 218 QA/QC EV audits (approximately 2% of 8910 audits performed) resulted in Risk Level 2 being identified. The National Grid 2019 QA/QC EV audits achieved an overall confidence level **98%** 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	37	13	30	25	17	12	24	36	**194**
Underground	1	0	2	0	3	0	1	3	**10**
Sub Trans	2	0	1	0	5	1	0	0	**9**
Transmission	0	0	0	0	0	0	0	0	**0**
Streetlights	3	0	0	0	0	2	0	0	**5**
Totals	**43**	**13**	**33**	**25**	**25**	**15**	**25**	**39**	**218**

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

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

Region	Dist., UG, Sub-T, Trans			Compliance Percent	Electric QA/QC Additional Analysis Required	Operations Corrective Action Required
	Risk 1	Risk 2	Assets Audited		≥90% and ≤95%	<90%
48	0	40	931	96%		
50	0	13	677	98%		
51	0	33	808	96%		
54	0	25	1123	98%		

56	0	25	1072	98%		
57	0	13	1063	99%		
60	0	25	1004	98%		
62	0	39	1151	97%		

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.

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

(2) Category Type: Streetlights & Traffic Controls

Regions	**Street Lights & Traffic Controls**			**Compliance Percent**	**Electric QA/QC Additional Analysis Required**	**Operations Corrective Action Required**
	Risk 1	**Risk 2**	**Total Sample Size Audited YTD**		**≥95% and ≤98%**	**<95%**
48	0	3	414	99%		
50	0	0	166	100%		
51	0	0	145	100%		
54	0	0	147	100%		
56	0	0	8	100%		
57	0	2	70	97%	97%	
60	0	0	23	100%		
62	0	0	108	100%		

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 Electric QA/QC analysis of the Missed maintenance codes (defects) conducted in 2019 by the National Grid QA/QC team concluded that the following:

Distribution

Maintenance Code 218/221 (Guy – Not in compliance with NESC Code) was missed repetitively across the NY territory. QA/QC discovered 101 errors applicable to maintenance Code 218/221.

Sub-Transmission

Maintenance Code 584 (Misc. – Install/Replace Warning Sign) was missed repetitively across the NY territory. QA/QC discovered 13 errors applicable to maintenance Code 584.

Transmission

Maintenance Code 584 (Misc. – Install/Replace Warning Sign) was missed repetitively across the NY territory. QA/QC discovered 16 errors applicable to maintenance Code 584.

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 and Transmission were identified through the QA/QC audit process. Based upon the compliance percentage of QA/QC inspection program findings (100% accuracy), further analysis of the accrued QA/QC EV inspection data is not warranted.