

Paul E. Haering
Senior Vice President
Engineering & Operations



February 15, 2019

RE: Case 04-M-0159

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

Dear Secretary Burgess,

Enclosed, for filing with the Commission, is Central Hudson Gas and Electric's "Contact (Stray) Voltage Test and Facility Inspection Annual Report for 2018" in compliance with the Safety Standards Order 04-M-0159 of January 5, July 21, 2005, December 15, 2008, March 22, 2013, and January 13, 2015 for Contact (Stray) Voltage Testing and Inspection.

This report details the completion status of Central Hudson's Contact (Stray) Voltage Testing and Facility Inspection program for the period from January 1, 2018 through December 31, 2018. The program efforts in 2018 have resulted in the testing and/or inspection of 62,582 devices. Central Hudson successfully completed all required contact (stray) voltage testing and inspection activities for all facility categories: Overhead Distribution, Manholes and Pull Boxes, Pad Mounted Equipment, Substation Fences, Streetlights and Traffic Signals, and Overhead Transmission.

There were ten (10) contact (stray) voltage conditions identified as defined by the Safety Standards definition of stray voltage, "voltage conditions on electric facilities that should not ordinarily exist." This represents a failure rate of less than 0.01% of all facilities tested for stray voltage. In 2018, contact (stray) voltage was not found on any manholes, pullboxes and substation fences.

Communications regarding distribution inspections and stray voltage testing should be directed to Heather Adams, Director – Electric Distribution and Standards, via email at HAdams@cenhud.com or by phone at 845-486-5552. For information regarding transmission inspections, please contact Marvyn James, Director – Electric System Design, via email at MJames@cenhud.com or by phone at 845-486-5542.

Sincerely,

A handwritten signature in blue ink that reads "Paul E. Haering".

Cc: Tammy Mitchell – NYS PSC
Christian Bonvin – NYS PSC
Jason Pause – NYS PSC
Patrick Maher – NYS PSC



**CENTRAL HUDSON GAS & ELECTRIC
CORPORATION**

CONTACT (STRAY) VOLTAGE TESTING

And

FACILITY INSPECTIONS

Report

On the results of the

2018 Contact (Stray) Voltage Testing and Facility Inspections

February 15, 2019

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I. Background

The New York State Public Service Commission's ("PSC" or "Commission") Electric Safety Standards Order issued on January 5, 2005 (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"), requires electric utilities in New York State to test all of their publicly accessible overhead distribution facilities, underground residential distribution facilities, overhead and underground transmission facilities, and substation fences at least once every five years. The Order also requires all non-URD underground facilities, municipally owned traffic signals and streetlights, to be tested for contact (stray) voltage annually. The Order requires utilities to inspect all utility owned electric facilities every five years.

This report describes Central Hudson's contact (stray) voltage detection program and equipment inspection program conducted in 2018.

II. Company Overview

Central Hudson Gas & Electric Corporation is a regulated transmission and distribution utility that provides electric service to approximately 300,000 customers in a service area of approximately 2,600 square miles in eight counties of New York State's Mid-Hudson River Valley. Central Hudson's service territory extends north from the suburbs of metropolitan New York City to the Capital District of Albany.

Central Hudson owns substations having an aggregate transformer capacity of 5,882 MVA. Central Hudson's electric transmission system consists of approximately 629 pole miles of line. The electric distribution system consists of approximately 7,176 pole miles of overhead lines and 1,583 trench miles of underground primary lines.

III. Contact (Stray) Voltage Testing Program

On March 22nd, 2013, the Commission issued a revision to the Order reducing the scope of contact (stray) voltage testing. Poles (transmission and distribution), URD pads, and substation fences require a contact (stray) voltage test once in five years. Streetlights, traffic signals, and underground structures (manholes and pullboxes) must be tested annually. The target numbers in this report reflect the reduced scope of the testing requirements.

During the twelve-month period ending December 31, 2018, contact (stray) voltage testing was completed on Central Hudson's publicly accessible electric transmission and distribution facilities that are capable of conducting electricity as directed by the Order. Contact (stray) voltage testing was also conducted on all Company and non-Company owned metallic streetlights and traffic signals. Central Hudson also tested all publicly accessible facilities within thirty feet of a component found to have an elevated voltage in accordance with the Order.

In addition, as required by the Order, Central Hudson:

- a. Immediately safeguarded and/or mitigated all contact (stray) voltages $\geq 1.0 V_{ac}$. In instances where the contact voltage finding was determined to be caused by equipment not owned by Central Hudson, the area was immediately made safe and the municipalities, customers, or responsible parties associated with the premises were notified of the unsafe condition and the need for them to arrange for a permanent repair. Voltage findings that were caused by a Central Hudson owned facility were immediately safeguarded and/or mitigated. All permanent repairs were completed within 45 days, except in extreme circumstances.
- b. Tested all publicly accessible structures and sidewalks within a 30 foot radius of the electric facility or streetlight where there was a voltage finding $\geq 1.0 V_{ac}$.
- c. Responded to and investigated all shock incidents reported by the public and mitigated positive findings.

All of the facilities in Central Hudson's Contact (Stray) Voltage Testing Program that were targeted for testing in 2018 were visited. Of the 62,582 facilities visited, 654 locations did not have a contact (stray) voltage test performed because their electrically conductive appurtenances were deemed inaccessible. Inaccessible locations were defined in the Order as locations that have locked gates/fences, are located in dangerous terrain, or are located on limited access highways.

Contact (Stray) Voltage Mitigation Efforts

Central Hudson identified one hundred forty-seven (147) locations with voltage readings greater than or equal to $1 V_{ac}$. Of the one hundred forty-seven locations, ten (10) apparatuses from eight (8) different sources were found to have contact voltage (defined as stray voltage in the Order) and were mitigated:

- Three (3) distribution poles in the Kingston District fed from the same source had voltage discoveries of $4.3 V_{ac}$, $3.042 V_{ac}$, and $2.162 V_{ac}$. The discoveries were all located on the down ground. Crews responded and determined this was an issue with the connections to the system neutral. The responding crews changed the neutral connectors and cleaned the wire to mitigate all three discoveries.

One (1) municipally owned street light in the Kingston district had a voltage discovery of $5.09 V_{ac}$. Central Hudson cut taps to the street light, and the discovery was mitigated below $1 V_{ac}$ by the City's electrician within 45 days of discovery. The street light was reconnected to the grid when the completion of repairs was confirmed.

- Three (3) municipally owned street lights in the Poughkeepsie district fed from separate sources had discoveries of $36.25 V_{ac}$, $7.86 V_{ac}$, and $5.914 V_{ac}$. Central Hudson cut taps to the street lights, and the discoveries were mitigated below $1 V_{ac}$ by the City's electrician within 45 days of discovery. The street lights were reconnected to the grid when the completion of repairs was confirmed.

- Three (3) municipally owned streetlights in the Fishkill district fed from separate sources had discoveries of 38.41 V_{ac}, 13.25 V_{ac}, and 12.49 V_{ac}. Central Hudson cut taps to the street lights, and the discoveries were mitigated below 1 V_{ac} by the City's electrician within 45 days of discovery. The street lights were reconnected to the grid when repairs were confirmed.

There were three (3) additional findings that were 180 Hz dominant and exceeded 10% THD (total harmonic distortion) and so classified as naturally occurring, but were mitigated because the voltage measured over 4.5 V_{ac}. Two (2) of these findings occurred on distribution poles and were due to an issue with the connections to the system neutral. Responding crews changed and cleaned the neutral connections to mitigate the voltage. One (1) finding occurred on a transmission structure and was due to a broken down ground connection. Responding crews replaced the connection to mitigate the voltage.

IV. Facility Inspection Program

The Order requires Central Hudson to visually inspect 100% of its electric facilities within five years. This equates to inspecting approximately 20% of these facilities annually.

In accordance with the Order, Central Hudson uses the following severity levels to report deficiencies to the PSC and establish priority for repairs and scheduling:

Level I – Repair as soon as possible but not longer than one week. A Level I deficiency is an actual or imminent safety hazard to the public or poses 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.

Level II – Repair within one year. A Level II deficiency is 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.

Level III – Repair within three years. A Level III deficiency does not present immediate safety or operational concerns and would likely have minimum impact on the safe and reliable delivery of power if it does fail prior to repair.

Level IV – Condition 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 should be used for future monitoring purposes and planning proactive maintenance activities.

In accordance with the PSC requirements, when a temporary repair is located during inspection or performed by the Company, best efforts are put forth 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, such as storms, require extensive repair activity, or have special requirements. Central Hudson began tracking temporary repairs in the 2009 calendar year. Results from this tracking have been compiled and described in Appendix 4 of this report.

V. Company Facilities

Based on the requirements of the Order, Central Hudson identified 62,582 individual electric facilities that required testing for the presence of contact (stray) voltage in 2018. These facilities were also inspected at the time of the contact (stray) voltage test. These facilities are broken down into four main categories as follows:

Distribution Overhead – Testing of distribution overhead with an operating voltage of 34.5 kV or less, includes all utility owned or joint use wooden poles with utility electrical facilities that are located on public thoroughfares or customer property, including backyards and alleys. There are approximately 210,818 distribution pole structures in Central Hudson’s service territory. Contact (stray) tests are 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 every 5 years. Distribution overhead facilities are included in and the facility inspection program.

Underground Facilities – Testing of underground facilities is comprised of subsurface structures, including above ground, pad-mounted structures. There are approximately 16,515 underground facilities that comprise Central Hudson’s system. Within this total are approximately 1,250 manholes and pullboxes and approximately 15,265 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. Contact (stray) tests are performed on all publicly accessible underground residential distribution facilities every 5 years. Contact (stray) tests are performed on all publicly accessible non-URD underground facilities annually. These facilities are included in the facility inspection program.

Streetlights and Traffic Signals – Testing of street lights and traffic signals includes all metal pole streetlights, traffic signals, and pedestrian crosswalk signals located on publicly accessible thoroughfares. There are approximately 6,121 metal pole streetlights and approximately 783 traffic signals within Central Hudson’s service territory. This total includes 187 metal pole streetlights owned by Central Hudson with the balance of the equipment owned by various municipalities. All contact (stray) voltage testing of streetlights is performed annually at night while the fixtures are energized. Pursuant to the Order, area and street lighting that is privately owned is not included in the contact (stray) voltage testing program. All Company-owned streetlights are included in the facility inspection program.

Transmission Structures – Testing of transmission structures includes all structures, guys, and down grounds attached to the structures. There are approximately 8,819 individual structures that comprise Central Hudson’s transmission system. Transmission structures support circuit voltages of 69 kV and above. Transmission structures as described above, with distribution underbuild, are included in this transmission category. Contact (stray) tests are performed on all publicly accessible transmission structures every 5 years. Transmission structures are included the facility inspection program.

Substation Fences – Testing of substation fences includes fencing on the outside of the substation. There are approximately 102 substation fences in Central Hudson’s territory. All substation fences are included in the contact (stray) voltage testing program.

VI. Annual Performance Targets


Central Hudson performed the required contact (stray) voltage testing and facilities inspections in accordance with the requirements set forth in the Order.

In compliance with the Order, Central Hudson has met the annual performance target for contact voltage by testing approximately 20% of the publicly accessible electric facilities and 100% of streetlights, traffic signals, manholes, and pullboxes for the twelve month period ending December 31, 2018.

In addition, Central Hudson has met the performance target for facility inspections by inspecting approximately 20% of its electric facilities during the one-year period ending December 31, 2018 as defined in the Order.

The results are summarized in the tables as follows:

2018 Contact (Stray)Voltage Testing Results

	Total System Units Requiring Testing	Units Completed	Percent Completed
Distribution Facilities	50,094	50,094	100%
Underground Facilities Non-URD	3,306	3,306	100%
	1,250	1,250	100%
Street Lights / Traffic Signals	6,904	6,904	100%
Substation Fences	19	19	100%
Transmission (69kV and Above)	2,259	2,259	100%
TOTAL	62,582	62,582	100%

Facility Inspection Program Results

Category	Inspection Target Through 2018	Cumulative Total of Units Inspected 2015 - 2019 (Actual)
Overhead Distribution	n/a	82.97%
Overhead Transmission	n/a	90.12%
Underground (Non-URD)	n/a	68.00%
Pad-mounted Transformers	n/a	81.37%
Streetlights	100%	100%
System Total	73%	81.13%

5-Year Inspection Performance Summary

Overhead Distribution Facilities

Central Hudson performs inspections on overhead distribution facilities on a five-year cycle. As of 2018, there were approximately 210,818 distribution poles in Central Hudson’s system. There was a slight increase in the pole total from Q3 due to additional structures being discovered during data reconciliation and successfully inspected in Q4.

Inspection Year	Overhead Distribution Structures Inspected	% of Overall System Inspected (Yearly)	% of Overall System Inspected (Cumulative)
2015	42,184	20.01%	20.01%
2016	39,220	18.60%	38.61%
2017	43,466	20.62%	59.23%
2018	50,094	23.76%	82.99%
2019			

Overhead Transmission Facilities

Central Hudson performs inspections on overhead transmission facilities on a five-year cycle. As of 2018, there were approximately 8,819 transmission poles in Central Hudson’s system.

Inspection Year	Overhead Transmission Facilities Inspected	% of Overall System Inspected (Yearly)	% of Overall System Inspected (Cumulative)
2015	1,855	21.03%	21.03%
2016	2,300	26.08%	47.11%
2017	1,534	17.39%	64.51%
2018	2,259	25.62%	90.12%
2019			

Manholes and Pullboxes

Central Hudson performs inspections on manholes and pullboxes on a five-year cycle. As of 2018, there were approximately 1,250 manholes and pullboxes in Central Hudson’s system.

Inspection Year	Manholes and Pullboxes Facilities Inspected	% of Overall System Inspected (Yearly)	% of Overall System Inspected (Cumulative)
2015	198	15.84%	15.84%
2016	224	17.92%	33.76%
2017	217	17.36%	51.12%
2018	211	16.88%	68.00%
2019			

Padmount Transformers

Central Hudson performs inspections on padmount transformers on a five-year cycle. As of 2018, there were approximately 15,265 padmounts in Central Hudson’s electric system.

Inspection Year	Padmount Transformers Inspected	% of Overall System Inspected (Yearly)	% of Overall System Inspected (Cumulative)
2015	4,903	32.12%	32.12%
2016	3,904	25.57%	57.69%
2017	1,558	10.21%	67.90%
2018	2,056	13.47%	81.37%
2019			

Streetlights

Central Hudson performs inspections on Company-owned streetlights annually in conjunction with contact voltage testing. As technicians perform contact voltage testing, they also perform a visual inspection of the streetlights.

Inspection Year	Streetlights Inspected	% of Overall System Inspected (Yearly)	% of Overall System Inspected (Cumulative)
2015	187	100%	100%
2016	187	100%	100%
2017	187	100%	100%
2018	187	100%	100%
2019			

VII. Certifications

Pursuant to Section 7 of Appendix A of the Order, the President or Officer of each utility with direct responsibility for overseeing contact (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 contact (stray) voltage testing and inspection requirements, and that the utility has:

- Tested all of its publicly accessible electric facilities and street lights/traffic signals, as referred to in the body of the February 15 Report, and
- Inspected the requisite number of electric facilities.

The certifications are attached as Exhibit 1 of this report.

VIII. Analysis of Causes of Findings and Contact Voltage

All New York State utilities compile an inventory of all findings and report on the number of these findings each year. Section 1(f) of the January 13, 2015 Order defines a finding as “any confirmed voltage reading on an electric facility or streetlight ≥ 1 volt measured using a volt meter and 500 ohm shunt resistor.” Section 1(c) of the Order 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.”

To distinguish between dangerous contact voltage and naturally occurring voltage, field forces use a handheld oscilloscope meter to classify these different types of voltages. By looking at the total harmonic distortion of a voltage waveform and the breakdown of the harmonics, in addition to the condition of the location, the proper actions can be taken.

If contact voltage is present, then the waveform will appear as a perfect 60 Hz sinusoidal wave with 10% or less total harmonic distortion. These voltages result from a variety of conditions including: deterioration of conductors; age of equipment; exposure to the elements; and various customer related issues. These voltages should not exist on normally operating electric facilities and are considered to be contact voltages per Section 1(c) of the Order.

Section 3(h) of the Order requires “Mitigation shall be completed on any stray voltage findings.” Through the efforts of the Contact Voltage testing program, Central Hudson has been able to complete repairs to address these issues and mitigate the danger associated with these elevated voltages.

When examining a naturally occurring voltage on a handheld oscilloscope, high harmonic content from different frequencies (generally 180 Hz and 300 Hz) will cause distortion in the voltage waveform. Causes of these voltages include, but are not limited to, naturally

occurring neutral to earth voltages (as part of a multi-grounded WYE power system); poor soil grounding conditions; imperfect load balancing between phases; long low voltage, single phase circuit spurs with high current loads; capacitive coupling; and proximity to transmission lines. Since all of these voltage sources are considered part of a normally operating electrical distribution system, they do not require mitigation per the Order.

Although not all findings are due to contact voltage, utilities are required to report on all findings, regardless of whether or not the voltage is within normal operating parameters. It was determined that one hundred thirty seven (137) of the findings identified in this year’s testing effort were within normal operating parameters (93.20%), and not due to contact voltage. Inclusion of these naturally occurring voltages in the findings gives the perception that there are more potentially hazardous voltage findings than actually exist. True hazardous voltages have been identified and mitigated through the contact (stray) voltage testing program.

In accordance with the PSC requirements, when a finding was discovered on an electric facility during contact (stray) voltage testing, the Company performed contact (stray) voltage testing on all publicly accessible structures and sidewalks within a minimum 30 foot radius of the electric facility or streetlight.

IX. Harmonics Analysis

Central Hudson has continued to apply the use of harmonics analysis to determine if voltages discovered in the field are dangerous contact voltage or naturally occurring/neutral to earth voltage (NEV) common in a normally functioning electric system. After analysis, the voltages can be classified into one of three categories. The following table (Table 1) depicts a breakdown of findings by asset class:

Table 1 - Category Classification Criteria

<u>Category One Voltage</u>	<u>Category Two Voltage</u>	<u>Category Three Voltage</u>
<ul style="list-style-type: none"> • Voltage is $\geq 1V_{ac}$ • Sinusoidal waveform • 60 Hz dominant • Total Harmonic Distortion is $< 10\%$ THD 	<ul style="list-style-type: none"> • Voltage is $1V_{ac} - 4.5V_{ac}$ • Non-sinusoidal waveform • Is 180 Hz dominant • Total Harmonic Distortion is $> 10\%$ THD 	<ul style="list-style-type: none"> • Voltage is $\geq 4.5V_{ac}$ • Non-sinusoidal waveform • Is 180 Hz dominant • Total Harmonic Distortion is $> 10\%$ THD
<p>These voltages are considered contact voltage, which is hazardous and should not be present in a normally functioning electric system.</p>	<p>These voltages are considered non-hazardous Neutral to Earth Voltages and are considered part of a normally functioning electric system.</p>	<p>These voltages require additional field-testing and review to determine if the source is due to a system abnormality or if it is a result of a normally functioning electric system. Central Hudson attempts to mitigate these voltages at the time of discovery.</p>

Please note that Central Hudson mitigates all voltages in accordance with the Safety Order

Analysis of Findings

Since 2014, the documented accounts of dangerous contact voltage has been consistently less than 0.01% of the assets tested each year on Central Hudson's electric system. The aggregate of the findings over the past five years shows that contact voltages comprise 20.07% (60) of the 299 findings during this time period (see Table 3).

Contact voltage on Overhead Distribution accounts for 11.04% of the total voltage findings among all assets. Street and Traffic Light contact voltage accounts for 8.03% of the total findings and URD (Pads) contact voltage accounts for 1.00% of the total findings over the past 5 years. There have been no findings of contact voltage in the Underground (Non-URD), Transmission, and Substation Fence groups (see Table 2 & 3).

Although there are fluctuations in the total number of category two voltage conditions, these naturally occurring conditions have accounted for 79.60% of the voltage findings from 2014-2018. Category two voltages are expected to fluctuate due to weather and load conditions. These voltages can be considered part of a properly functioning multi-grounded wye electric system, and pose no threat to the public. There have been no findings of naturally occurring voltage in the Underground (Non-URD) and Substation Fence groups (see Table 2).

In 2018, there were three (3) instances of Category 3 voltage findings. The findings did not have a sinusoidal waveform and were 180 Hz dominant, but exceeded the voltage threshold of 4.5 volts. Two (2) of these findings occurred on distribution poles and were due to an issue with the connections to the system neutral, and one (1) finding occurred on a transmission structure and was due to a broken down ground connection. The voltages associated with these findings were mitigated to less than one volt at the time of discovery. Since 2011, Central Hudson has found only five instances of Category 3 voltages on Central Hudson's equipment.

By differentiating between dangerous contact voltage and naturally occurring voltages, field crews can be effectively dispatched to mitigate dangerous voltage conditions ensuring the safety of the public while maintaining reliability of the system in a financially responsible manner.

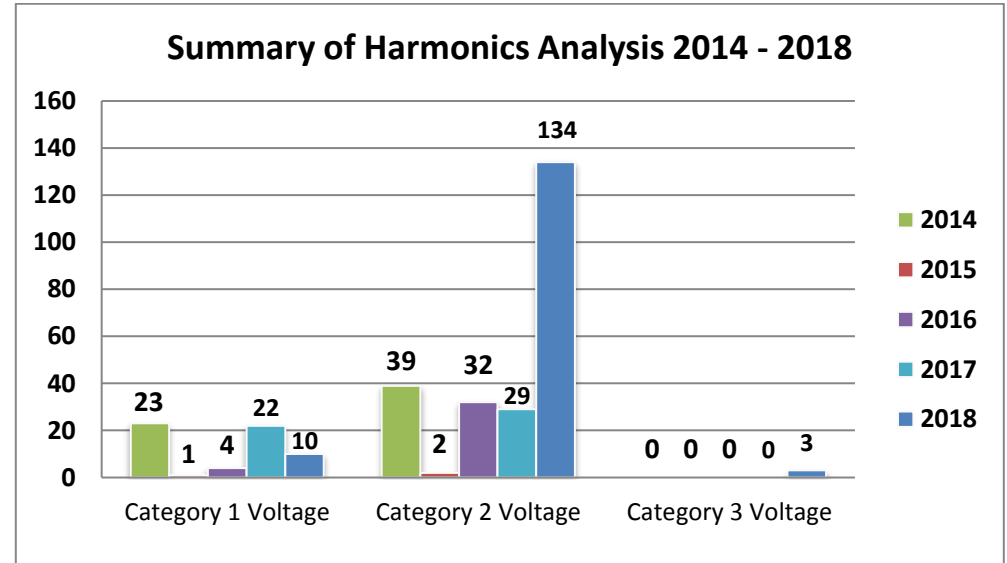
Table 2 - Summary of Findings by Asset Class

Asset Class	2014			2015			2016			2017			2018		
	Cat. 1	Cat. 2	Cat. 3	Cat. 1	Cat. 2	Cat. 3	Cat. 1	Cat. 2	Cat. 3	Cat. 1	Cat. 2	Cat. 3	Cat. 1	Cat. 2	Cat. 3
OH Poles	15	38	0	0	2	0	0	5	0	15	27	0	3	58	2
Non-URD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
URD (Pads)	2	1	0	1	0	0	0	0	0	0	2	0	0	0	0
SL & TS	6	0	0	0	0	0	4	1	0	7	0	0	7	0	0
Trans OH	0	0	0	0	0	0	0	26	0	0	0	0	0	76	1
Sub Fence	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	23	39	0	1	2	0	4	32	0	22	29	0	10	134	3

Table 3 - Summary of All Findings by Asset Class

Asset Class	Total Findings (2014 - 2018)		
	Cat. 1	Cat. 2	Cat. 3
Overhead Distribution	33	130	2
Underground (Non-URD)	0	0	0
URD (Pads)	3	3	0
Street and Traffic Lights	24	1	0
Transmission Overhead	0	102	1
Substation Fences	0	0	0
Total	60	236	3

Chart 1 - Summary of Harmonic Analysis



X. Analysis of Inspection Results

Discussion of Inspection Findings/Repairs

During the inspection process, two or more deficiencies can be reported at a single location during an inspection. Since there is no direct correlation between the number of deficiencies reported and the number of locations with deficiencies, this data has been tabulated separately.

In 2018, the most common type of deficiencies found in Central Hudson's service territory were Level III conditions, representing 8,643 out of the 14,500 total deficiencies found (59.61%). There was a substantial increase in Level III findings this year partly due to an increase in inspections over the past three year average. Central Hudson completed inspections on 50,095 poles, 8,471 more poles than the three year average of 41,624. In addition, the Kingston district is the largest of the five Operating Districts and also has some of the oldest infrastructure in Central Hudson's system.

The three most common deficiencies at all severity levels involve the overhead distribution system. These deficiencies are: Rotten Poles (5,194; 60.09% of priority level III deficiencies), Broken Ground Molding (3,022; 54.66% of priority level IV deficiencies), and No Guy Guard (1,758; 31.80% of priority level IV deficiencies).

Currently, Central Hudson is utilizing contract employees to help reduce the number of Level IV deficiencies. Targeted guy guard replacements are being completed by contract employees. To reduce the backlog of broken ground moldings, Central Hudson is utilizing contractor technicians to complete the repairs. Central Hudson also uses contractors to add pole tags where they are missing.

Trimming is performed over the entire service territory on a cyclical basis; however, the contract overhead inspectors will also trim vines that are growing up equipment that is not in contact with primary conductor or equipment at the time of the inspection. Contractor trimming crews or Company service crews are sent to assess and mitigate vine, trimming, and danger tree conditions that cannot be addressed by the contract overhead inspectors in areas not scheduled for routine trimming.

Overhead Distribution Structures

Table of Locations with Deficiencies for 2018

Locations Inspected	Locations w/ Deficiencies	% Locations w/ Deficiencies	% Locations w/ Deficiencies Requiring Repair in 1 year
50,095	12,116	24.18%	0.32%

Breakdown of Deficiencies for 2018

Priority Rating	Number of Deficiencies	% of Overhead Distribution Deficiencies Found
I	16	0.12%
II	145	1.04%
III	8,421	60.40%
IV	5,360	38.44%
Total:	13,942	100%

Overhead Transmission Facilities

Table of Locations with Deficiencies for 2018

Locations Inspected	Locations w/ Deficiencies	% Locations w/ Deficiencies	% Locations w/ Deficiencies Requiring Repair in 1 year
2,259	385	17.04%	4.43%

Breakdown of Deficiencies for 2018

Priority Rating	Number of Deficiencies	% of Overhead Transmission Deficiencies Found
I	0	0.00%
II	100	25.98%
III	175	45.45%
IV	110	28.57%
Total:	385	100%

Manholes and Pullboxes

Table of Locations with Deficiencies for 2018

Locations Inspected	Locations w/ Deficiencies	% Locations w/ Deficiencies	% Locations w/ Deficiencies Requiring Repair in 1 year
211	2	0.95	0.00%

Breakdown of Deficiencies for 2018

Priority Rating	Number of Deficiencies	% of Manhole and Pullbox Deficiencies Found
I	0	0.00%
II	0	0.00%
III	0	0.00%
IV	3	100.00%
Total:	3	100%

Padmount Transformers

Table of Locations with Deficiencies for 2018

Locations Inspected	Locations w/ Deficiencies	% Locations w/ Deficiencies	% Locations w/ Deficiencies Requiring Repair in 1 year
2,056	151	7.34%	3.26%

Breakdown of Deficiencies for 2018

Priority Rating	Number of Deficiencies	% of Padmount Transformer Deficiencies Found
I	2	1.19%
II	65	38.46%
III	47	27.81%
IV	55	32.54%
Total:	169	100%

Streetlights

Table of Locations with Deficiencies for 2018

Locations Inspected	Locations w/ Deficiencies	% Locations w/ Deficiencies	% Locations w/ Deficiencies Requiring Repair in 1 year
187	0	0.00%	0.00%

Breakdown of Deficiencies for 2018

Priority Rating	Number of Deficiencies	% of Streetlight Deficiencies Found
I	0	n/a
II	0	n/a
III	0	n/a
IV	0	n/a
Total:	0	n/a

Over 95% of repairs are completed within their required timeframes. The only exceptions are generally for Severity III findings where transmission rebuild projects are planned in the near future. Please see the footnotes to Appendix 3 for additional information.

XI. Inspection Driven Reliability and Efficiency Improvement Programs

Central Hudson has recognized the opportunity to use the inspection program as a means to help improve system reliability. Operations and Engineering have deployed “micro-surveys” to be completed by contracted technicians in line with contact (stray) voltage testing and inspection surveys. These micro-surveys were added to the existing inspection survey as a line item, and completed during the regular round of testing and inspections, eliminating the need for a second mobilization. The data that is collected during the survey is then aggregated and used to make a more efficient response plan based on what the goal is for each individual micro-survey. These surveys have included inventories for cutouts, animal guards, and streetlights. In addition, third party attachment surveys are conducted along with this program.

Cutouts

Porcelain cutouts can fail when exposed to the elements for long periods. Porcelain cutouts can develop cracks in the insulators. When these cracks fill with water and become exposed to freezing conditions, the cracks can expand. Over time, the constant freezing and thawing can open the crack further. When water flows through the crack, it can create a path for the electricity to track, bypassing the fuse.

Prior to the 2010 inspection year, Central Hudson replaced porcelain cutouts with polymer cutouts located in the first zone of protection and/or protecting circuit segments of 500 customers or more. In 2010, a micro-survey was added to the contact voltage testing and inspection survey to confirm the cutouts were replaced and capture any that may have been missed. The data collected was aggregated and used to formulate a replacement plan in line with current operational plans and scheduled maintenance in order to avoid a second mobilization to the facility to replace the cutout(s).

Streetlights

In 2011, a micro-survey was added to inventory streetlights mounted on wooden poles in the electric distribution system. These streetlights are visually inspected from the ground when contractor technicians perform a voltage test. After the survey was completed, 30,000 pole mounted streetlights were inventoried.

The micro-survey documented the head type, body type, bulb type (when applicable), bulb wattage (when applicable), width (set back style only), and decorative arm (tear drop type only). This information was stored and will be used to update the GIS system available to line crews when repairs are scheduled to ensure that the correct bulb/wattage was on the truck, thus saving a second mobilization.

Animal Guards

Central Hudson has experienced an increasing trend of outages caused by wildlife. In 2012, a survey of animal guards was conducted on our system to inventory what style animal guard is currently installed on transformers. This data was imported into our GIS system to show locations that needed an upgrade to a modern, more effective animal guard. This is used by District Operating Engineers in conjunction with reliability data to help guide when to upgrade and/or replace animal guards.

Poles

During the inspection survey, poles are probed below grade by contractor technicians as they perform an inspection. Using a screwdriver, technicians probe the pole at grade to around the base. While probing the pole, technicians test for low resistance to the probe. Technicians will record the pole as “unsatisfactory” in the PDA if rot is suspected as a result of the probe test. A Central Hudson Field Supervisor will perform a site visit to confirm the preliminary assessment before recommending replacement. Central Hudson maintains a spending plan in the capital budget to replace any pole that is found to be rotten during the inspection process.

Third Party Attachments

During the inspection, contract inspectors also make note of non-company attachments on the pole and count the number of through bolts, guy wires, and other attachments such as cameras, and area lights. This information is compared to Company records and updated as needed.

XII. Quality Assurance

Central Hudson continues to utilize an external auditor to perform its QA/QC program to review the effectiveness and accuracy of the contact (stray) voltage testing and facility inspection programs and their associated activities. The external auditor reports directly to Central Hudson's Internal Auditing Department and submits audit reports simultaneously to the Internal Auditing Department and the Program Manager for review. If there are any findings, an action plan is assembled to address the concerns identified by the external auditor. These audits have resulted in specific improvements to the various processes, which have contributed toward increasing program efficiency and accuracy as well as reducing potential for future errors. The QA/QC program calls for several types of audits and for constant feedback with respect to the data collection and processing. The various audits cover personnel training, field testing and inspection procedures and practices, testing and inspection records, and field trailing audits.


For 2018, five separate audits were completed: initial training (1), field-testing and inspection activities (2), and test data records (1), as well as a comprehensive year-end audit for all 2018 records. The completed audits indicated that all significant activities associated with the contact (stray) voltage testing and facilities inspection programs were conducted in accordance with established protocols.

XIII. Other Pertinent Information

Central Hudson continues to participate in the NYS Residential Stray Voltage Committee Activities continues to ensure that the best operational, construction and maintenance practices are being utilized. Central Hudson also participates with the New York State Utilities and Department of Public Service Staff in discussing issues and opportunities regarding both Contact (Stray) Voltage Testing and Facility Inspections. Central Hudson also attends the annual Jodie Lane National Conference for Stray Voltage Detection and Mitigation and participates in several other EPRI programs to improve the safety and reliability of its electric system.


Appendix 1: Summary of Contact (Stray) Voltage Findings – 2018

The table below shows Central Hudson’s Contact (Stray) Voltage Mitigation efforts. Of the 147 locations with findings of 1 Volt or greater, 10 facilities required mitigation to less than 1 Volt due to having contact (stray) voltage caused by the deterioration of conductors or defective equipment. Three (3) locations were deemed “naturally occurring” but exceeded the 4.5V threshold and were mitigated.

	Initial Readings				Readings after Mitigation (where mitigation is required)		
	1V to 4.4V	4.5V to 24.9V	25V and Over	Totals	< 1 V	1V to 4.4V	4.5V and Over
Distribution Facilities	60	3	-	63	5	-	-
Pole	-	-	-	-	-	-	-
Ground	31	3	-	34	5	-	-
Guy	28	-	-	28	-	-	-
Riser	-	-	-	-	-	-	-
Other	1	-	-	1	-	-	-
Underground Facilities	-	-	-	-	-	-	-
Handhole / Pull box	-	-	-	-	-	-	-
Manhole	-	-	-	-	-	-	-
Padmount Switchgear	-	-	-	-	-	-	-
Padmount Transformer	-	-	-	-	-	-	-
Vault – Cover/Door	-	-	-	-	-	-	-
Pedestal	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
Street Lights / Traffic Signals	-	5	2	7	7	-	-
Metal Street Light Pole	-	5	2	7	7	-	-
Traffic Signal Pole	-	-	-	-	-	-	-
Control Box	-	-	-	-	-	-	-
Pedestrian Crossing Pole	-	-	-	-	-	-	-
Other - NOT LISTED	-	-	-	-	-	-	-
Substation Fences	-	-	-	-	-	-	-
Fence	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
Transmission (69kV and Above)	76	1	-	77	1	-	-
Lattice Tower	-	-	-	-	-	-	-
Pole	2	-	-	2	-	-	-
Ground	66	1	-	67	1	-	-
Guy	8	-	-	8	-	-	-
Other	-	-	-	-	-	-	-
Miscellaneous Facilities	-	-	-	-	-	-	-
Sidewalk	-	-	-	-	-	-	-
Gate/Fence/Awning	-	-	-	-	-	-	-
Control Box	-	-	-	-	-	-	-
Scaffolding	-	-	-	-	-	-	-
Bus Shelter	-	-	-	-	-	-	-
Fire Hydrant	-	-	-	-	-	-	-
Phone Booth	-	-	-	-	-	-	-
Water Pipe	-	-	-	-	-	-	-
Riser	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-

Note - Findings will include naturally and non-naturally occurring voltages. Naturally occurring voltages can include, but are not limited to, induction, capacitive coupling, and neutral to earth voltage. All of which are part of a normally functioning multi-grounded Wye electric distribution system. Central Hudson only mitigates situations with non-naturally occurring voltages in compliance with PSC Order 04-M-0159.

Appendix 2: Summary of Shock Reports from the Public – 2018

	2018 Total
I. Total Shock Calls Received:	25
Unsubstantiated	3
Normally Energized Equipment	0
Stray Voltage:	
Person	22
Animal	0
II. Injuries Sustained/Medical Attention Received	2
Person	2
Animal	0
III. Voltage Source:	25
Utility Responsibility	
Overhead Distribution System	5
Underground Distribution System	0
Transmission Distribution System	0
Other Utility / Gov't Agency Responsibility	
Streetlight	0
Other (Total)	3
Customer Responsibility(Total)	17
IV. Voltage Range:	25
Unrecorded/Below 1V	22
1.0V to 4.4V	1
4.5V to 24.9V	1
25V and above	1

Appendix 3: Summary of Deficiencies by Facility

Summary of Deficiencies and Repair Activity Resulting from the Inspection Process															
Priority Level	2014			2015			2016			2017			2018		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
	Within 1 week	Within 1 year	Within 3 years	Within 1 week	Within 1 year	Within 3 years	Within 1 week	Within 1 year	Within 3 years	Within 1 week	Within 1 year	Within 3 years	Within 1 week	Within 1 year	Within 3 years
Overhead Facilities															
Repaired in Time Frame	9	188	4,865	4	147	5,319	10	84	2,835	2	148	2,146	15	36	1,975
Repaired - Overdue	-	11	13	-	-	11	-	2	-	-	13	-	1	-	-
Not Repaired - Not Due	-	-	-	-	-	-	-	-	929	-	-	1,522	-	109	6,446
Not Repaired - Overdue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Overhead Facilities	9	199	4,878	4	147	5,330	10	86	3,764	2	161	3,668	16	145	8,421
Underground Facilities															
Repaired in Time Frame	-	5	31	-	2	10	-	-	13	-	14	18	-	-	-
Repaired - Overdue	-	1	-	-	-	-	-	-	-	-	2	-	-	-	-
Not Repaired - Not Due	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Not Repaired - Overdue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Overhead Facilities	-	6	31	-	2	10	-	-	13	-	16	19	-	-	-
Pad Mount Facilities															
Repaired in Time Frame	3	41	121	27	99	305	11	56	245	4	29	61	2	59	17
Repaired - Overdue	-	1	2	-	1	1	-	-	-	1	-	-	-	-	-
Not Repaired - Not Due	-	-	-	-	-	-	-	-	-	-	-	2	-	6	30
Not Repaired - Overdue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Overhead Facilities	3	42	123	27	100	306	11	56	245	5	29	63	2	65	47
Streetlight Facilities															
Repaired in Time Frame	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Repaired - Overdue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Not Repaired - Not Due	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Not Repaired - Overdue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Streetlight Facilities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Transmission Facilities															
Repaired in Time Frame	-	-	7	-	2	49	-	13	20	-	6	28	-	14	8
Repaired - Overdue	-	-	-	1	13	60	-	1	-	-	19	-	-	-	-
Not Repaired - Not Due	-	-	1	-	-	-	-	-	107	-	-	150	-	86	167
Not Repaired - Overdue	-	-	-	-	-	233	-	8	-	-	31	-	-	-	-
Total Transmission Facilities	-	-	8	1	15	342	-	22	127	-	56	178	-	100	175

Appendix 3A: Summary of Deficiencies and Repair Activity Resulting from the Inspection Process

Summary of Deficiencies and Repair Activity Resulting from the Inspection Process							
Year	Priority Level / Repair Expected		Deficiencies Found (Total)	Repaired In Time Frame	Repaired - Overdue	Not Repaired - Not Due	Not Repaired - Overdue ¹
2014	I	Within 1 week	12	12	-	-	-
	II	Within 1 year	247	234	13	-	-
	III	Within 3 years	5,040	5024	15	-	1 ²
	IV	N/A	8,086	8,076	N/A	10	N/A
2015	I	Within 1 week	32	31	1	-	-
	II	Within 1 year	264	250	14	-	-
	III	Within 3 years	5,988	5,683	72	-	233 ³
	IV	N/A	5,028	4,741	N/A	287	N/A
2016	I	Within 1 week	21	21	-	-	-
	II	Within 1 year	164	153	3	-	8 ⁴
	III	Within 3 years	4,149	3,113	-	1,036	-
	IV	N/A	2,636	2,484	N/A	152	N/A
2017	I	Within 1 week	7	6	1	-	-
	II	Within 1 year	262	197	34	0	31 ⁵
	III	Within 3 years	3,928	2,253	-	1,675	-
	IV	N/A	4,894	4,394	N/A	500	N/A
2018	I	Within 1 week	18	17	1	-	-
	II	Within 1 year	310	109	-	201	-
	III	Within 3 years	8,643	2,000	-	6,643	-
	IV	N/A	5,528	2,334	N/A	3,194	N/A

¹ 2010 – One defect on the HK line will be addressed in 2019.

² 2014 – One defect on the G line is currently being addressed through construction.

³ 2015 – Repairs associated with one hundred seventy two (172) defects on the CL line are in permitting and scheduled for repair in 2019, Forty-seven (47) defects on the H Line are currently in permitting and scheduled to be addressed in a 2021 Rebuild Project. Repairs associated with six (6) overdue defects on the SB Line are currently in permitting and scheduled to be addressed in a 2020 Rebuild Project. Four (4) defects on the HK line will be addressed in 2019. Three (3) defects on the MK line will be addressed in 2019. One (1) defect on the P Line will be addressed in the 2nd half of 2019 as part of an OPGW Installation project.

⁴ 2016 – Repairs associated with eight (8) defects on the WH Line are currently in design and scheduled for replacement in 2019.

⁵ 2017 – Repairs associated with six (6) defects on the 301 Line and seven (7) defects on the 303 Line, are currently in construction. Repairs associated with two (2) defects on the CW line, five (5) defects on the DW line, and four (4) defects on the HF Line are currently in design and scheduled to be addressed in the 2019 Rebuild Project. Repairs associated with six (6) defects on the HG line are scheduled to be completed in 2019. One (1) overdue defect on the J line will be addressed in 2019.

Appendix 4: Temporary Repair Exceptions

The process of tracking temporary repairs throughout all divisions in Central Hudson is a complex one requiring interfacing of multiple systems and coordination of several organizations. Currently, Central Hudson has developed an automated system to track temporary repairs and produce reports for line crews and supervisors to better manage the process. The system has automated most of the work associated with tracking temporary repairs, but manual intervention is still required. Central Hudson continues to utilize contact (stray) voltage technicians to update the inventory annually.

Overall, Central Hudson completed permanent repairs on 49 out of 52 locations (94.23%) identified in 2018. Of the repairs completed, 47 of the 49 repairs were completed within the 90 day time frame stated in the Order. One (1) of the remaining repairs is overdue and two (2) are not due.

Many factors can contribute to temporary repairs being completed outside of the 90 day window. For example, the process of getting a work order created, estimate generated, and highway permits obtained can cause the permanent repair to be completed outside of the 90 day time frame. Other conditions outside of Central Hudson's control that can cause delays include weather, field conditions, equipment rentals, and available load capacity due to switching requirements. Similar to deficiencies identified during inspections, qualified personnel prioritize temporary repairs based on circuit reliability and public safety.

Once a temporary condition is identified, the Company re-evaluates the location and determines if additional safeguards are required to protect the interest of the public, and if so, puts them in place immediately.

Exhibit 1: Certifications

CERTIFICATION
[STRAY VOLTAGE TESTING]

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

Paul E. Haering, on this 15th day of February 2019, certifies as follows:

1. I am the Senior Vice President, Engineering & Operations of Central Hudson Gas and Electric (the “Company”), and in that capacity I make this Certification for the annual period ending December 31st, 2018 based on my knowledge of the testing program adopted by the Company in accordance the Public Service Commission’s Orders issued and effective January 5, 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 requirements of the Orders, the Company developed a program designed to test (i) all of the publicly accessible electric facilities owned by the Company (“Facilities”) and (ii) all streetlights located in public thoroughfares in the Company’s service territory (“Streetlights”), as identified through a good faith effort by the Company, for stray voltage (the “Stray Voltage Testing Program”).
3. I am responsible for overseeing the Company’s Stray Voltage Testing Program and in that capacity I have monitored the Company’s Stray Voltage Testing Program during the twelve months ended December 31st, 2018 (the “Twelve-Month Period”).

4. I hereby certify that, to the best of my knowledge, information and belief, the Company has implemented and completed its Contact (Stray) Voltage Testing program for the Twelve Month Period. Except for untested structures that are identified as temporarily inaccessible in the Company's Annual Report, submitted herewith, the Company is unaware of any Facilities or Streetlights that were not tested during the Twelve-Month Period.
5. I make this certification subject to the condition and acknowledgment that it is reasonably possible that, notwithstanding the Company's good faith implementation and completion of the Contact (Stray) Voltage Testing Program, there may be Facilities and Streetlights that, inadvertently, may not have been tested or were not discovered or known after reasonable review of Company records and reasonable visual inspection of the areas of the service territory where Facilities and Streetlights were known to exist or reasonably expected to be found.

Handwritten signature

Sworn to before me this 15th day of February, 2019

Notary Public:



CERTIFICATION
[FACILITY INSPECTIONS]

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

Paul E. Haering, on this 15th day of February 2019, certifies as follows:

1. I am the Senior Vice President, Engineering & Operations of Central Hudson Gas and Electric (the “Company”), and in that capacity I make this Certification for the annual period ending December 31st, 2018 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, 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 and in that capacity I have monitored the program during the twelve months ended December 31st, 2018 (the “Twelve-Month Period”).

4. I hereby certify that, to the best of my knowledge,
information and belief, the Company has implemented and
completed its Facility Inspection Program to inspect
approximately 20 % of its Facilities during calendar year
2018, in order to comply with the five-year inspection cycle
required under the Orders.

Paul E. Hoenig

Sworn to before me this 15th day of February, 2019

Notary Public:

Maureen M. Kverek

