CENTRAL HUDSON GAS & ELECTRIC CORPORATION

2016

ELECTRIC RELIABILITY REPORT

MARCH 31, 2017

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Attachments:

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1. Overall Assessment of Reliability Performance

a) Corporate Overview/Definitions

Improved electric reliability and power quality continue to be important objectives for Central Hudson. The five Operating Divisions have SAIFI and CAIDI goals in accordance with the 2004 Order Adopting Changes to Standards on Reliability of Electric Service to guide their efforts to provide our customers with the best possible electric service reliability. In 2016, Central Hudson met the PSC rate target for the CAIDI index but did not meet the PSC rate target for the SAIFI index. Central Hudson's 2016 non-storm SAIFI was 1.33, which is above the PSC SAIFI rate target of 1.3. Central Hudson's 2016 non-storm CAIDI was 2.34, which is below the PSC CAIDI rate target of 2.5.

The Electric Distribution and Standards Engineering Section have the responsibility in the Engineering Group to closely monitor the Central Hudson electric system and to analyze and develop plans to improve the performance and the reliability of electric service to all Central Hudson customers. In 2016, the Distribution Engineering Section consisted of four subsections: Electric Operations, Electric Construction Standards, and Electric Distribution Planning (two teams with focus on Interconnections and Distribution Automation). All reported to the Director of Electric Distribution and Standards. The section staffing included:

- 1 Electric Distribution Operations Section Leader
    - 5 Electric Operations Engineers
    - 1 Stray Voltage and Inspections Contractor
- 1 Electric Distribution Construction Standards Engineer Lead
    - 2 Electric Distribution Standards Engineers
    - 1 Electric Distribution Standards Contractor
- 1 Electric Distribution Planning Engineer Lead
    - 2 Electric Distribution Planning Engineering Technicians
    - 1 Electric Distribution Planning Engineer
    - 1 Electric Distribution Planning Contractor
- 1 Electric Distribution Planning Engineer Lead
    - 2 Electric Distribution Automation Engineers

All of the above employees were located in the Corporate Headquarters in Poughkeepsie, with the exception of the five Electric Operations Engineers. The Electric Operations Engineers were located throughout the service territory. Two were located in the Lower Hudson Division, one in the Mid-Hudson Division, and two in the Upper Hudson Division.

The following report details the 2016 reliability performance of the Central Hudson System and an assessment of the five operating areas' performance. This assessment includes a five-year history of performance, listings of both the SAIFI and CAIDI indices, and a synopsis of our current power quality programs.

****** NOTE ******

For clarification purposes, Central Hudson Substations are named by their geographic location. In addition, the distribution circuits emanating from them are numbered in accordance with their operating voltage. For example, a circuit operating at less than 5 kV is a three digit number, a 15 kV circuit is typically a four digit number with the second digit being a "0," and the 34.5 kV circuits are four digits with the second number being a "3." Also, where possible, sequential numbers are used for the circuits feeding from the same substation.

b) Corporate Performance List

i) 5 Year Detailed Assessment of Performance Indices (SAIFI & CAIDI)

The tables below summarize Central Hudson's performance over a period of five years. The SAIFI indices are calculated by dividing the total number of customers interrupted by the total number of customers served. The CAIDI indices are calculated by dividing the sum of the customer interruption duration by the total number of customers interrupted.

	SAIFI (Without Storms)	**CAIDI** (Without Storms)	**SAIFI** (With Storms)	**CAIDI** (With Storms)
2012	1.00	2.38	1.80	8.55
2013	1.03	2.30	1.06	2.36
2014	1.24	2.27	1.61	3.74
2015	1.28	2.07	1.38	2.09
2016	1.33	2.34	1.44	2.51
5-Year Average	1.17	2.27	1.46	4.17

Table 1a – 5-Year System SAIFI & CAIDI Performance Indices

	CAIDI (Without-Storms)				
	2012	**2013**	**2014**	**2015**	**2016**
Work Hours	1.64	1.61	1.63	1.49	1.52
Non-Work Hours	2.73	2.66	2.53	2.37	2.78

Table 1b – 5-Year System CAIDI Work Hours vs. Non-Work Hours (Without Storms)

Cause Code	**Cause Code Description**	**SAIFI**						**CAIDI**					
		2012	**2013**	**2014**	**2015**	**2016**	**5-Year Average**	**2012**	**2013**	**2014**	**2015**	**2016**	**5-Year Average**
2	Tree Contacts	0.378	0.456	0.468	0.564	0.563	0.486	2.82	2.65	2.74	2.58	2.84	2.72
3	Overloads	0.003	0.009	0.007	0.004	0.008	0.006	3.12	2.14	3.69	3.31	1.56	2.57
4	Operating or Working Errors	0.008	0.033	0.006	0.064	0.064	0.035	1.95	0.30	1.10	0.30	2.00	1.03
5	Apparatus or Equipment Failures	0.234	0.185	0.294	0.215	0.229	0.231	2.30	2.19	2.33	1.78	1.75	2.08
6	Accidents or Events Not Under the Utility's Control	0.215	0.156	0.276	0.283	0.296	0.246	1.68	2.00	1.57	1.60	1.85	1.72
7	Prearranged	0.016	0.011	0.018	0.005	0.007	0.011	1.71	1.84	3.04	2.68	2.06	2.28
8	Customer's Equipment or Failures	0.001	0.001	0.002	0.001	0.002	0.001	4.07	1.86	4.69	2.28	3.03	3.45
9	Lightning	0.053	0.084	0.030	0.030	0.035	0.046	3.16	2.31	2.25	2.82	3.87	2.80
10	Unknown or Unclassified	0.094	0.092	0.137	0.112	0.123	0.112	2.09	2.06	1.85	2.02	2.06	2.01

Table 2 – 5-Year System SAIFI & CAIDI Performance Indices by Cause Code

Evaluating Table 2 indicates outages due to “tree contacts” (Cause Code 2) are the number one non-storm SAIFI driver for 2016. Tree contact SAIFI has increased 50% since 2012. In 2016, the largest contributor to tree contact SAIFI was limbs and trees from outside the clearance zone (59% of Cause Code 2 SAIFI). The continued elevated level of tree SAIFI can be attributed to danger trees as well as inclement weather throughout the year that was not significant enough to code as a storm. Danger trees are trees that are located outside of the limits of our easements but pose a threat to the reliability of our distribution system. To begin to mitigate the impacts of danger trees, beginning in 2016, within 10 business days of each tree related outage that causes a breaker lock-out, an assessment has been performed by the Line Clearance personnel to collect data related to tree failure mode, condition, species, and location (inside or outside right of way). Line Clearance personnel will assist the Director of Line Clearance in identifying trends in the data related to failure mode, condition, species, and location, and develop an effective process for identification and removal of danger trees along pre-scheduled distribution circuits.

Additionally, Central Hudson engaged Environmental Consultants, Inc. (ECI) to provide an updated assessment on the line clearance program and the state of tree-related outages. Some of ECI’s recommendations were to obtain increased funding to return to a four-year trimming schedule, create a separate schedule for circuits affected by the residency of protected bat species and to obtain funding for a widespread removal of Ash trees along three-phase circuitry to combat tree mortality caused by the Emerald Ash Borer.

In 2016, 60% of the top 20 drivers for tree SAIFI occurred during rain, wind, and/or lightning weather conditions. Of the total 2,888 tree related interruptions, only 23% occurred during a calm/normal day, and 37% occurred during adverse weather conditions that did not code for storm. More details about non-coding storms can be found in the district assessments in Section 2 of this report. The vegetation management programs are further discussed in Section 3a of this report.

Outages as a result of “accidents or events not under the utility’s control” (Cause Code 6) was the second highest non-storm SAIFI driver in 2016. Code 6’s increased by 5% compared to 2015, and was driven primarily by vehicles striking Central Hudson’s equipment (50% of Cause Code 6 SAIFI). 2016 saw a 4% increase in SAIFI caused by vehicles striking Central Hudson’s equipment as compared to 2015, primarily because the first and second zones of protection were impacted more frequently. Out of a total of 244 vehicle hit CH equipment incidents for 2016, the top 15 accounted for 41% of the overall 2016 vehicle hit pole SAIFI. The second driver of Cause Code 6 SAIFI was squirrels (32% of Cause Code 6 SAIFI). 2016 saw an increase of 15% in overall squirrel-related SAIFI compared to 2015. Central Hudson is continuing to use Electronic Reclosers to improve transient protection on the distribution system, as well as continued installation of squirrel guards and covered tap wires. See Section 1d for details on the number of Electronic Reclosers installed in 2016.

Outages as a result of “apparatus or equipment failures” (Cause Code 5) was the third highest non-storm SAIFI driver in 2016. Code 5’s increased by 7% compared to 2015. The top driver for Code 5 SAIFI in 2016 was conductor/cable (18% of Cause Code 5 SAIFI). The next top driver was substation equipment (16% of Cause Code 5 SAIFI) which occurred in only 4 events: (1) a bus fault due to moisture ingress, (2) the mis-operation of a sudden pressure relay, (3) a faulty relay leading to an erroneous breaker lockout and (4) the failure on a substation transformer’s LTC. The third and fourth drivers in 2016 were splices and poles, together accounting for 19% of Cause Code 5 SAIFI. District Operating Engineers have begun to obtain infrared cameras to supplement the annual thermographic inspections that are performed to proactively detect failing connections. Central Hudson’s walking inspection program continues to detect a significant number of poles that are in need of replacement which will continue to reduce outages caused by pole failures going forward.

Non-storm CAIDI in 2016 increased by 13% when compared to 2015 and was 3% higher than the five year average. The number of non-storm interruptions in 2016 increased by 16% when compared to 2015. Tree-related outages increased at a faster pace with a 26% increase. The share of tree-related outages relative to all non-storm outages increased from 36% to 39%. Lastly, the CAIDI for these tree-related outages in 2016 increased 10% when compared to 2015. Central Hudson is working to improve CAIDI through an initiative that was implemented in 2014 to track the two components that determine the duration of an outage namely response time and repair time. Utilizing a Business Intelligence tool, Cognos, the Electric T&D Department is collecting data that is being used to identify potential opportunities to improve response time and/or repair time. In many cases, the response time has been improved by scheduling additional crews to respond to outages at the end of the day or after hours and weekends based on the weather predictions and repair time has been improved through the identification of additional switching opportunities. Engineering and Operations continue to work collaboratively to identify additional cost effective opportunities to improve our CAIDI performance. Specific CAIDI drivers are discussed in the Operating Area Performance section of this report (Section 2).

ii) Description of all major storms excluded from the reliability indices

February 2016

- February 24th through February 26th, 2016 – Wind and Rain Storm

  The Fishkill District experienced a wind and rain event that caused 67 interruptions and affected 3,631 customers (approximately 7.4% of the Fishkill operating area's customers). The storm coded based on duration. Four (4) customers experienced an interruption lasting over 24 hours. Priority was given to repairs that would restore the largest number of customers. Seven of the outages separately impacted groups of over 200 customers each.

April 2016

- April 3rd through April 4th, 2016 – Wind, Rain, and Snow Storm

  The Kingston District experienced a wind, rain, and snow event that caused 82 interruptions and affected 5,757 customers (approximately 8.8% of the Kingston operating area's customers). The storm coded based on duration. Eight (8) customers experienced an interruption lasting over 24 hours. Five of the outages separately impacted groups of over 200 customers each. Priority was given to repairs that would restore the largest number of customers. The OB and HG Transmission lines both locked out in addition to the Woodstock 3014 circuit breaker. The Frost Valley Generator and Dashville ALT team both successfully operated during this event to save a total of 472 customers.

July 2016

- July 1st through July 2nd, 2016 – Wind and Rain Storm

  The Poughkeepsie District experienced a wind and rain event that caused 47 interruptions and affected 3,787 customers (approximately 5.0% of the Poughkeepsie operating area's customers). The storm coded based on duration. Eight (8) customers experienced an interruption lasting over 24 hours. Priority was given to repairs that would restore the largest number of customers. During this event the Todd Hill 6052 and Manchester 6094 circuit locked out. The Stringham Road ALT team successfully operated during this event to save a total of 368 customers.

August 2016

- August 13th through August 14th, 2016 – Wind, Lightning, and Rain Storm

  The Kingston District experienced a wind, lightning, and rain event that caused 91 interruptions and affected 9,851 customers (approximately 15.1% of the Kingston operating area's customers). The storm coded based on the number of customers interrupted (over 10% of the district's customers). Priority was given to repairs that would restore the largest number of customers. During this event the Woodstock 3013 circuit locked out. Central Hudson crews mobilized quickly to reduce the overall restoration time. Seven of the outages separately impacted groups of over 200 customers each.

November 2016

- November 11th – Wind Gusts

  The Kingston District experienced a wind event that caused 24 interruptions and affected 7,516 customers (approximately 11.5% of the Kingston operating area's customers). The storm coded based on the number of customers interrupted (over 10% of the district's customers). During this event the Boulevard 1012, 1014, and Woodstock 3012 circuits locked out. Priority was given to repairs that would restore the largest number of customers. Four of the outages separately impacted groups of over 200 customers each. Central Hudson crews mobilized quickly to reduce the overall restoration time. Three ALT teams successfully operated during this event to save a total of 851 customers.

- November 20th through November 22nd, 2016 – Wind and Snow

  The Poughkeepsie District experienced a wind and snow event that caused 84 interruptions and affected 4,402 customers (approximately 5.8% of the Poughkeepsie operating area's customers). The storm coded based on duration. Sixty-five (65) customers experienced an interruption lasting over 24 hours. Priority was given to repairs that would restore the largest number of customers. During this event the Millerton 7081 circuit was opened due to a loss of a phase on the GE-Line. The Winchell Mountain Road ALT team successfully operated during this event to save a total of 309 customers.

iii) Corrective actions to be taken in areas where reliability performance indices were not met

In 2016, Central Hudson did not meet the PSC rate target for the SAIFI metric; however the PSC rate target for the CAIDI metric was met. Central Hudson's 2016 non-storm SAIFI was 1.33, which is above the PSC SAIFI rate target of 1.30. Central Hudson's 2016 non-storm CAIDI was 2.34, which is below the PSC CAIDI rate target of 2.5. There are two main driving forces for Central Hudson having missed the SAIFI target:

(1) an increase in tree-related related outages and customers impacted
(2) an apparent increase in distracted drivers leading to an increase in Central Hudson's equipment being struck by vehicles.

Central Hudson is working to reduce tree-related related outages by having engaged Environmental Consultants, Inc. (ECI) to provide an updated assessment on the Central Hudson line clearance program and the state of tree-related outages. The highlights of ECI's recommendations were to obtain increased funding to return to a four-year trimming schedule, create a separate schedule for circuits affected by the residency of protected bat species and obtain funding for a widespread removal of Ash trees along three-phase circuitry to combat tree mortality caused by the Emerald Ash Borer. The Kingston District has been at the epicenter of the outbreak of the Emerald Ash Borer infestation in the Central Hudson territory. The conditions in the district are hospitable to the prevalence of Ash trees and as such the rapid spreading of the pest. ECI examined the health of a sample of the Ash tree population and found that conditions in Kingston to be in the most advanced state of decline as seen in Chart 1.

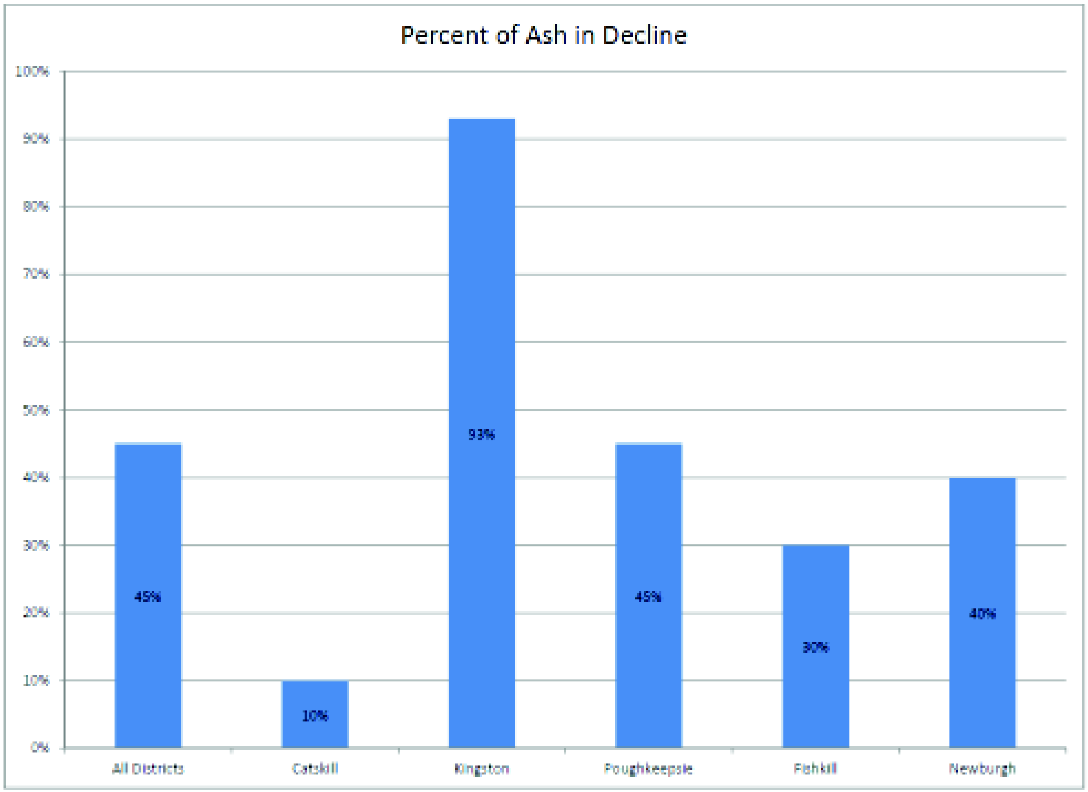

Chart 1 – Estimated Extent of EAB Infestation per ECI Study

To reduce the incidence of vehicle striking Central Hudson equipment, a public multi-media adverting campaign has been initiated to encourage the public to reduce distracted driving.

iv) Corrective actions to be taken in response to adverse trends or performance in specific areas or categories

Cause codes 3, 4 and 7 through 10 have seen a relatively flat performance level when compared to previous year's SAIFI and CAIDI and the 5-Year Average values during 2016. As mentioned previously in Section 1.b.i and 1.b.iii, the driving factors for the decline in SAIFI performance during 2016 were Code 2 and 6, with modest increases in Code 5 but an improvement in the 5-year trend. Central Hudson strives to continue the tree trimming program as scheduled within budget constraints and implement spot trimming and danger tree removal as necessary to help reduce the amount of tree related incidents. Central Hudson enlisted Environmental Consultants, Inc. (ECI) to provide an updated assessment on the Central Hudson line clearance program and the state of tree-related outages. The highlights of ECI's recommendations were to obtain increased funding to return to a four-year trimming schedule, create a separate schedule for circuits affected by the residency of protected bat species and to obtain funding for a widespread removal of Ash trees along three-phase circuitry to combat tree mortality caused by the Emerald Ash Borer. Central Hudson will be filling a deferral petition in the near term requesting additional funding to begin to attack the Ash tree risk. The next rate case filling will also include an additional funding request to continue this effort and to address ECI's other recommendations. To reduce the incidence of vehicle striking Central Hudson equipment, a public multi-media adverting campaign has been initiated to encourage the public to reduce distracted driving. The increase in Code 5 outages were driven by two large substation outages, a bus fault due to moisture ingress into switchgear and an oil breach of a pressure sensor relay while a substation was in an abnormal configuration due to infrastructure upgrade work in progress.

c) Major distribution capital investments made in the year and their impact on reliability

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d) Details about distribution reliability projects/investments made in the year and their impact on reliability

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Remote Communication

Central Hudson utilizes Sensus RTM (formerly referred to as Telemetric) communication devices to provide communications to DA devices. In 2015 AT&T announced that they would no longer support 2G radio communications. Because 223 Sensus RTM radios relied on 2G radio communications, Central Hudson replaced all 2G Sensus RTM radios with 4G radios in 2016. This project ensures we will maintain communications to our field devices until the Network Strategy program is fully rolled out.

A Network Strategy project is in progress to replace our existing Sensus cellular communications in most locations. The Network Strategy solution will provide enhanced communications to our field devices. Intelligent electronic devices on the distribution system will communicate over the Tier 2 communications platform before transitioning to the Tier 1 platform for backhaul to the Distribution Management System (DMS). The Tier 2 network strategy will provide sufficient bandwidth to allow more frequent data polling from our field devices.

Distribution Line Infrared Surveys

During the summer of 2016, distribution line infrared surveys were conducted in each of the five operating areas. These surveys help identify equipment that have poor connections that will eventually lead to a thermal failure. By identifying these “hot spots”, action can be taken to proactively prevent outages due to equipment failure. Distribution line infrared surveys of the three-phase mainline of all distribution circuits were completed in 2016. There were 50 items found that were deemed “Immediate”, “Serious”, or “Critical” in 2016. The majority of repairs on items deemed “Immediate” have been completed. Remaining repairs will be completed before the 2017 summer peak. The total cost of the infrared survey in 2016 was $16,875. Repairs made are not considered major capital investment work, and are handled through expense at the operating area level.

e) Details about distribution reliability projects/investments to be taken based on the results from the annual distribution facility inspection reports provided in February of each year

Central Hudson performs physical inspections of the following facilities:

- Distribution Overhead
- URD – Pad-Mounted equipment
- Underground – Manholes / Pull Boxes
- Transmission Overhead

Facility inspections continue to be performed at the same time as contact (stray) voltage testing whenever possible. Inspectors are instructed to be conservative and report anything that looks questionable, which will then be reviewed by a Central Hudson employee prior to repair/replacement. This is a more efficient utilization of available resources to ensure all potential issues are identified. Due to the complexity of the network system and intricacies of working in manholes and pull boxes, Central Hudson personnel are utilized to perform inspections on these facilities.

In 2008, Central Hudson began to utilize line clearance crews to replace guy guards that had been broken or were missing from guy wires. Line Clearance Crews are able to store extra guy guards on their vehicles easily and tend to spend several minutes at a location while performing their trimming duties. This program has been a success. In 2012, 2013, 2014, 2015 and 2016; 4,382, 4,230, 5,695, 2,454, and 1,639 locations had missing guy guards replaced, respectively. Currently, there are 172 known locations in need of replacement guy guards.

Facility inspections provide the benefit of identifying locations in need of trimming. Since 2012, 7,348 trimming conditions were identified and ranked as Level III, 83 trimming conditions were identified and ranked as Level II, and 13 trimming conditions were identified and ranked as Level I. Of the total 7,444 vine conditions identified, 7,417 (99.64%) were closed within the established "Time Frame for Repair", and 27 conditions are not due and will be repaired at a later date ("Not Repaired, Not Due").

Facility inspections help identify poles in need of replacement. Careful inspections determine if poles are in need of replacement due to conditions such as broken poles, severe pole lean, pole rot, wash out, evidence of flashover, and woodpecker holes. Replacements are included in an annual Distribution Pole Replacement Program. As a direct result of facilities inspections, approximately 1064 poles were replaced in 2016. Expenditures associated with pole replacements as a result of facility inspections are not tracked separately from other types of pole work; therefore 2016 expenditures are not available. In addition, many poles identified are replaced through larger capital budget projects. $823,000, $810,000, $810,000 and $1,000,000 were budgeted for the total Distribution Pole Replacement Program in 2013, 2014, 2015 and 2016 respectively**.** $1,800,000 has been budgeted for 2017. These budgets do not reflect total expenditures on pole replacements.

Facility inspections help identify manholes and pull boxes, padmount transformers and switches, as well as cable and underground equipment that are in need of repair. Several items were addressed in 2016, including wall reinforcements, broken covers, major ceiling repair, rusted I-beams, tripping hazards, clearing of debris, cable fire-proofing, transformer oil leaks, oil switch leaks, network protector replacements and cable repairs. The cost associated with these repairs was approximately $667 thousand in 2016.

Facility inspections were utilized to drive reliability and efficiency improvement programs. In previous years Central Hudson had contract technicians perform micro-surveys as a part of regular facility inspections and testing. These included a cutout inventory by composition (porcelain or polymer), pole mounted streetlight inventory (including head type, body type, bulb type (when applicable), bulb wattage (when applicable), width, and decorative arm) and wildlife protector survey to check if all transformers had the approved wildlife protector installed on the primary bushing. The findings from micro-surveys performed from 2010 to 2012 have been reviewed and are being used to help plan replacement and maintenance programs throughout the upcoming year. No micro-surveys are planned going forward due to the decreased scope of stray voltage testing to approximately 20% of Central Hudson assets. This reduction has limited the synergies that were identified in performing a "micro-survey" while performing stray voltage testing. However, inspectors have been requested to look for items such as multiple automatic splices in a span that will assist in the development of future reliability improvement projects.

2. Division/Operating Area Performance

CATSKILL OPERATING DISTRICT

a) Detailed assessment of the Catskill District reliability performance indices (SAIFI & CAIDI) and all applicable cause codes. Assessment should include annual and five-year performance information for each measure and each cause code.

	PSC SAIFI Objective	SAIFI (Without Storms)	PSC CAIDI Objective	CAIDI (Without Storms)
2012	1.0	0.89	2.00	1.95
2013	1.0	1.03	2.00	2.14
2014	1.0	1.61	2.00	2.32
2015	1.0	1.45	2.00	1.60
2016	1.0	1.29	2.00	1.90
5 Year Average		1.25		1.99

Table 3 – 5-Year Catskill SAIFI & CAIDI Performance Indices

Cause Code	Cause Code Description	SAIFI						CAIDI					
		2012	2013	2014	2015	2016	5-Year Average	2012	2013	2014	2015	2016	5-Year Average
2	Tree Contacts	0.345	0.426	0.301	0.595	0.430	0.419	2.07	2.28	2.65	2.04	1.91	2.16
3	Overloads	0.000	0.002	0.000	0.000	0.000	0.001	8.61	2.77	2.86	1.53	1.71	2.87
4	Operating or Working Errors	0.000	0.001	0.000	0.000	0.142	0.029	1.27	1.12	2.07	1.67	2.37	2.36
5	Apparatus or Equipment Failures	0.191	0.148	0.851	0.379	0.207	0.355	1.94	2.07	2.53	0.68	1.97	1.97
6	Accidents or Events Not Under the Utility's Control	0.210	0.202	0.299	0.288	0.288	0.257	1.85	1.60	1.60	1.58	1.67	1.65
7	Prearranged	0.013	0.009	0.008	0.002	0.014	0.009	2.18	1.52	1.92	1.15	1.66	1.80
8	Customer's Equipment or Failures	0.000	0.000	0.000	0.000	0.004	0.001	0.00	4.57	0.00	2.45	0.23	0.30
9	Lightning	0.027	0.132	0.03	0.058	0.010	0.052	1.99	2.47	1.90	2.42	2.65	2.35
10	Unknown or Unclassified	0.100	0.105	0.121	0.128	0.190	0.129	1.70	2.35	1.97	1.97	1.79	1.94

Table 4 – 5-Year Catskill SAIFI & CAIDI Performance Indices by Area

b) If SAIFI/CAIDI targets were not met, provide the following:

i) Description of problems that resulted in failure to meet the target

During 2016, the Catskill Operating Area had a SAIFI of 1.29 (excluding "major storm" activity). The 1.29 SAIFI index is higher than the established operating area target of 1.00 by 0.29 and is approximately 3% higher than the 5-year average SAIFI index of 1.25. This was an 11% improvement from the 2015 SAIFI value of 1.45.

There was one key driver that caused the Catskill Operating Area non-storm SAIFI objective to be exceeded:

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1) On July 4, the Westerlo W-1234 Low Side Transformer Breaker mis-operated and opened after a 69 kV "NW" single operation occurred. Both Westerlo circuits 1091 and 1092, and a portion of Freehold circuit 2071 that was being fed by Westerlo circuit 1092, were affected by this outage. A total of 4,885 customers were affected by this outage. The Catskill District's non-storm SAIFI would have been 1.15 or 8% lower than the five year average if the "W-1234" outage was excluded.

As shown in the tables in Section 5 of this report, of the 27 circuits in the Catskill Operating Area, 48% of these circuits (13 out of 27) performed at or better than the Electric Service Standard SAIFI level of 1.0. 89% of the Catskill circuits (24 out of 27) performed better than the Electric Service Standard CAIDI level of 2.00 (120 minutes per interruption).

ii) Historical O&M efforts and expenditures within the Catskill area (to the extent possible) for each of the past 5 years

Central Hudson does not identify O&M efforts and expenditures on a District level. This is done on a System level and is addressed in Section 3 of this report.

iii) Corrective actions to be taken with target dates for completion

1) Circuit 1071 and 1083 – Polyphase and reconductor Route 9W 3.0 miles from New Baltimore to the New York State Thruway entrance in Coxsackie. This is an infrastructure/reliability improvement project. Scheduled for completion during the fourth quarter of 2017.

2) Circuit 1092- Rebuild Single Phase along Route 357 and Hale Road, 5.0 Miles. This is a 10X reliability improvement project. Scheduled for completion during the second quarter of 2017.

3) Circuit 2001 /2042 - Install a VIPER ALT on Route 23A in Palenville. This is a reliability improvement project. Scheduled for completion in the third quarter of 2017.

4) Install two electronic reclosers in 2017. The electronic reclosers will replace existing Type V4L recloser installations. Scheduled for completion during the fourth quarter of 2017.

c) Confirm compliance with corrective actions identified in last year's report if Catskill missed the targets in the previous year.

The following 2016 projects were listed in the 2015 annual report as being expected to improve the future reliability in the Catskill Operating Area. More time will be needed to realize the impact on reliability these projects will have.

1) 3X Action Items – The District continues to monitor the 3X report on a monthly basis in order to identify locations in need of animal guards. This is a proactive step in reducing the number of outages caused by squirrels.

2) Trimming was performed on 10 of the 10 scheduled Catskill circuits during 2016. The trimming is expected to improve each circuit's reliability and the District's as a result.

3) Circuit 2001 – Rebuild mainline to Palenville along Cauterskill Road and Route 23A, 3.0 miles- Part II of II. This is an infrastructure/reliability improvement project. Completed in the fourth quarter of 2016.

4) Circuit 1074 – Rebuild circuit mainline from the Coxsackie Substation to Murderskill Road, 2.5 miles. This is an infrastructure/reliability improvement project. Completed in the second quarter of 2016.

5) Circuit 2005 – Rebuild single phase along Warren Stein Road, 3.5 miles. This is an infrastructure improvement project. Completed in the second quarter of 2016.

6) Circuit 1071 – Roberts Hill Road and High Rock Road 10X Rebuild – 4.0 miles. This is a 10X report project that will rebuild the single phase lines feeding 98 customers. This project was 50% completed during 2015 and the remainder was completed during the first quarter of 2016.

7) Installed two electronic reclosers to replace existing Type V4L recloser installations as the first fuse point for circuit 2001 and circuit 1074. Completed during the fourth quarter of 2016.

KINGSTON OPERATING DISTRICT

a) Detailed assessment of the Kingston District reliability performance indices (SAIFI & CAIDI) and all applicable cause codes. Assessment should include annual and five-year performance information for each measure and each cause code.

	PSC SAIFI Objective	**SAIFI** (Without Storms)	**PSC** CAIDI Objective	**CAIDI** (Without Storms)
2012	1.00	1.08	2.25	2.54
2013	1.00	1.53	2.25	2.48
2014	1.00	1.76	2.25	2.43
2015	1.00	1.58	2.25	2.45
2016	1.00	1.79	2.25	2.53
5 Year Average		1.55		2.48

Table 5 – 5-Year Kingston SAIFI & CAIDI Performance Indices

Cause Code	**Cause Code Description**	**SAIFI**						**CAIDI**					
		2012	**2013**	**2014**	**2015**	**2016**	**5-Year Average**	**2012**	**2013**	**2014**	**2015**	**2016**	**5-Year Average**
2	Tree Contacts	0.475	0.736	0.809	0.899	1.032	0.790	3.09	3.09	2.88	2.80	3.10	2.96
3	Overloads	0.004	0.005	0.001	0.001	0.001	0.002	4.31	4.31	1.65	1.58	3.70	3.58
4	Operating or Working Errors	0.010	0.140	0.002	0.014	0.041	0.041	3.66	3.66	0.87	2.45	0.81	0.66
5	Apparatus or Equipment Failures	0.250	0.304	0.451	0.222	0.179	0.281	2.49	2.49	2.11	2.37	2.06	2.28
6	Accidents or Events Not Under the Utility's Control	0.197	0.201	0.293	0.288	0.345	0.265	1.35	1.35	1.53	1.50	1.39	1.60
7	Prearranged	0.032	0.007	0.013	0.002	0.012	0.013	1.90	1.90	2.31	2.13	1.94	2.01
8	Customer's Equipment or Failures	0.000	0.000	0.001	0.001	0.004	0.001	7.56	7.56	3.10	3.05	4.03	3.68
9	Lightning	0.036	0.036	0.027	0.025	0.022	0.034	2.96	2.96	5.59	3.38	4.44	3.36
10	Unknown or Unclassified	0.079	0.079	0.159	0.129	0.153	0.120	2.23	2.23	2.18	2.15	2.05	2.13

Table 6 – 5-Year Kingston SAIFI & CAIDI Performance Indices by Area

b) If SAIFI/CAIDI targets were not met, provide the following:

i) <u>Description of problems that resulted in failure to meet the target</u>

During 2016, the Kingston Operating Area had a SAIFI of 1.79 and a CAIDI of 2.53 (excluding 'major storm' activity). The 1.79 SAIFI index is higher than the established operating area target of 1.00 by 0.79 and is approximately 15% higher than the 5-year average SAIFI index of 1.55. The 2.53 CAIDI index is higher than the established operating area minimum of 2.25 by 0.28 and is approximately 2% higher than the 5-year average CAIDI index of 2.48.

The Kingston District non-storm SAIFI objective was exceeded primarily due to "tree contacts." Tree outage SAIFI was 15% higher in 2016 when compared to 2015 and 31% higher than the 5-year average. Due to inadequate funding, during 2017, only six circuits in the Kingston District are scheduled for trimming. These circuits serve 7,004 customers comprising 11% of the district's total customer count. The scheduled trimming is expected to provide some offset to the deterioration in the tree-related SAIFI in the Kingston District.

As previously mentioned in Section 1.B.iii, the Kingston District has been at the epicenter of the outbreak of the Emerald Ash Borer infestation in the Central Hudson territory. The conditions in the district are hospitable to the prevalence of Ash trees and as such the rapid spreading of the pest. The impact of the infestation is showing up within the reliability data as seen in Chart 2 where it is clear that tree outages are increasing at a faster pace in the Kingston District and trees emanating from outside the clearance zone are contributing to customer interruptions at an increasing rate.

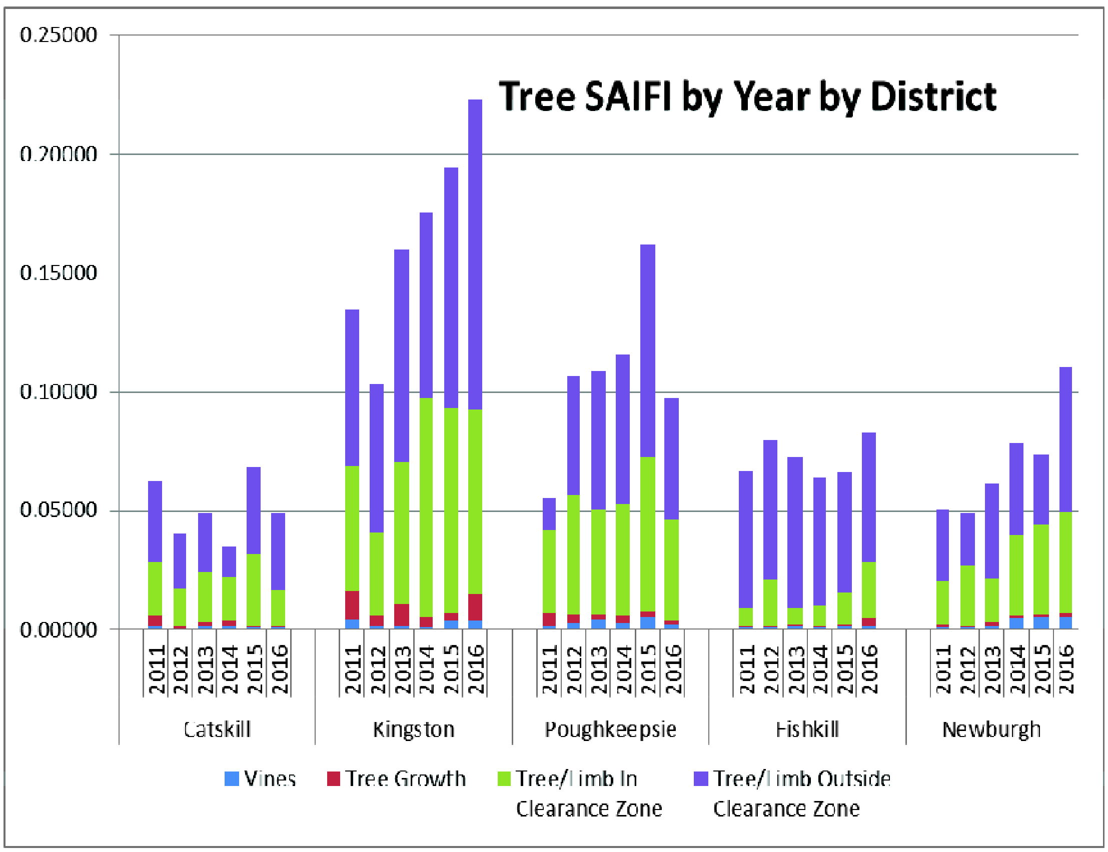

Chart 2 – Historical Tree-Related Outage SAIFI by District and secondary cause code

As shown in the tables in Section 5 of this report, of the 66 circuits in the Kingston Operating Area, 45% of these circuits (30 out of 66) performed at or better than the Electric Service Standard

SAIFI level of 1.0. 62% of the Kingston circuits (41 out of 66) performed better than the Electric Service Standard CAIDI level of 2.25 (135 minutes per interruption).

Non-storm CAIDI in 2016 increased by 3% when compared to 2015 and was 6% higher than the five year average. The number of non-storm interruptions in 2016 increased by 27% when compared to 2015. Tree-related outages increased at a faster pace with a 45% increase. The share of tree-related outages relative to all non-storm outages increased from 42% to 48%. Lastly, the CAIDI for these tree-related outages in 2016 increased 11% when compared to 2015.This increasing amount of interruptions caused by tree-related issues were the main driver for the CAIDI exceeding the target. While two other categories, *Customer Equipment Failure* and *Lightning*, had higher CAIDI levels, their relative weight was insignificant against the tree category. That is, there were multitudes more cases involving trees (997) than *Customer Equipment Failure* (71) and *Lightning* (26). Likewise, *Trees* accounted for 70.5% of the year's ECM, whereas *Customer Equipment Failure* was only 0.4% and *Lightning* was only 2.2%.

ii) <u>Historical O&M efforts and expenditures within the Kingston area (to the extent possible) for each of the past 5 years</u>

Central Hudson does not identify O&M efforts and expenditures on a District level. This is done on a System level and is addressed in Section 3 of this report.

iii) <u>Corrective actions to be taken with target dates for completion</u>

1) Due to inadequate funding, tree trimming of only six Kingston District circuit is scheduled throughout 2017. The planned trimming is expected to improve each circuit's reliability and in turn the District total. Scheduled completion is 4Q 2017.

2) A portion of the KO Cable is slated for reconductoring with larger wire to increase the capacity of the circuit to ensure sufficient reserve to the Jansen Ave. Substation. Work is scheduled to be completed in Q3 2017.

3) A portion of the mainline for the Honk Falls 3071 circuit is slated to be rerouted around Plank Road which has been the home of several large tree-related outages. The existing mainline will be extended down Route 55 and then new circuitry will be built along Church Street. Additional sectionalizing devices will be installed to relocate the existing 3071/3072 tie point as well as to turn the Plank Road circuitry into a fused spur line. Work is scheduled to be completed in Q3 2017.

4) A project is planned to Polyphase 1.2 miles of the Lincoln Park 2016 circuit along Main Street, Parkside Drive, and Douglas Drive into the hamlet of Ruby to provide an alternate feed into this neighborhood. It is currently fed radially via 60 year-old cable built underneath the Thruway. Work is scheduled to be completed in Q4 2017.

5) Central Hudson is looking to enact the recommendations made by Environmental Consultants, Inc. (ECI) to improve Central Hudson's tree-related outage performance. These recommendations included obtaining increased funding to return to a four-year trimming schedule, creating a separate schedule for circuits affected by the residency of protected bat species and obtaining funding for a widespread removal of Ash trees along three-phase circuitry to combat tree mortality caused by the Emerald Ash Borer. Completion of this effort depends on funding levels.

c) Confirm compliance with corrective actions identified in last year's report if Kingston missed the targets in the previous year.

The following 2016 projects were listed in the 2015 annual report as being expected to improve the future reliability in the Kingston Operating Area. More time will be needed to realize the impact on reliability these projects will have.

1) Twenty Kingston circuits were scheduled for trimming in 2016. The planned trimming is expected to improve each circuit's reliability and in turn the District total. Trimming for eight of these circuits was completed during the fourth quarter of 2016 and one was completed during the first quarter of 2017. Trimming on four more circuits is currently in progress with the remaining circuits expected to be finished during 2017.

2) Sturgeon Pool New Substation. In addition to a brand new substation, this multiple year project serves to convert the 341 circuit to high voltage, subsume and convert the Dashville 345 to high voltage, and create strong tie points with nearby circuits. Scheduled completion is in the 2nd Quarter of 2017.

3) Olivebridge 2094 Microgrid. This multiple year and multiple stage project looks to site an end-of-line 1 MVA single phase standby generator to provide backup reliability for frequently interrupted customers. Following further analysis, this project was abandoned in favor of a rebuild of the infrastructure in the problem area, much of which will require replacement regardless of the microgrid installation. . The project will be submitted for inclusion in the 2018-2022 5 Year Capital Budget.

4) Reconductor 3012 Tinker Street. This 1.0 mile reconductoring will increase the wire's emergency capacity when carrying Boiceville via the 3011 ALT. Project was completed during 2016.

5) Maverick Road 3011/3013 ALT team. This automatic load transfer team will address the outages associated with the 3011 mainline in the first zone of protection that runs through the woods for 1.4 miles. Scheduled completion is Q3 2017.

6) Granite Road 3024 Convert & Reconductor. This project aims to eliminate #8 copper primary and relocate an off-road feed with poor reliability. Scheduled completion is tentatively scheduled for Q4 2018.

7) Samsonville 3082 Reconductor. Reconductoring 1.2 miles of thermally stressed #4 copper and increase resiliency. Scheduled completion is Q4 2017.

8) Install VIPER Automatic Load Transfer Team on Foxhall and Flatbush in Kingston. This will provide immediate restoration for 619 customers (approx. 3.3 MVA) in the event of an upstream loss of voltage. Scheduled for completion in Q2 2017.

9) Relocate Sundown On-Road. This 1.0 mile pole relocation will improve reliability and patrol time for 456 customers. On hold due to NYC DEP land-use permitting.

POUGHKEEPSIE OPERATING DISTRICT

a) Detailed assessment of the Poughkeepsie District reliability performance indices (SAIFI & CAIDI) and all applicable cause codes. Assessment should include annual and five-year performance information for each measure and each cause code.

	PSC SAIFI Objective	SAIFI (Without Storms)	PSC CAIDI Objective	CAIDI (Without Storms)
2012	1.20	1.11	2.25	2.79
2013	1.20	0.85	2.25	2.38
2014	1.20	1.15	2.25	2.13
2015	1.20	1.23	2.25	2.41
2016	1.20	1.16	2.25	2.73
5 Year Average		1.10		2.49

Table 7 – 5-Year Poughkeepsie SAIFI & CAIDI Performance Indices

Cause Code	Cause Code Description	SAIFI						CAIDI					
		2012	2013	2014	2015	2016	5-Year Average	2012	2013	2014	2015	2016	5-Year Average
2	Tree Contacts	0.424	0.448	0.457	0.641	0.386	0.471	3.48	2.50	2.39	2.86	3.50	2.92
3	Overloads	0.006	0.007	0.024	0.012	0.021	0.014	2.09	2.38	3.76	3.35	0.86	2.54
4	Operating or Working Errors	0.001	0.005	0.007	0.006	0.080	0.020	0.61	1.07	0.96	1.87	3.37	2.97
5	Apparatus or Equipment Failures	0.280	0.138	0.123	0.231	0.192	0.193	2.27	1.96	2.74	1.75	2.39	2.18
6	Accidents or Events Not Under the Utility's Control	0.193	0.119	0.242	0.202	0.294	0.210	1.83	2.02	1.74	1.69	1.98	1.85
7	Prearranged	0.024	0.014	0.046	0.009	0.008	0.020	1.53	3.30	3.49	3.96	2.51	2.96
8	Customer's Equipment or Failures	0.003	0.003	0.002	0.001	0.001	0.002	4.26	1.24	4.53	1.37	4.37	3.19
9	Lightning	0.071	0.044	0.021	0.024	0.059	0.044	4.10	3.20	0.79	3.02	3.11	3.21
10	Unknown or Unclassified	0.105	0.074	0.223	0.107	0.121	0.126	2.64	2.49	1.34	2.18	2.38	2.03

Table 8 – 5-Year Poughkeepsie SAIFI & CAIDI Performance Indices by Area

b) If SAIFI/CAIDI targets were not met, provide the following:

i) <u>Description of problems that resulted in failure to meet the target</u>

During 2016, the Poughkeepsie Operating District had a SAIFI of 1.16 (excluding "major storm" activity). The 1.16 SAIFI index is lower than the established operating area target of 1.20 by 0.04 and is approximately 5% higher than the 5-year average SAIFI index of 1.10. The District had a CAIDI OF 2.73 (excluding "major storm" activity). This index is higher than the established operating area target of 2.25 by 0.48 and is approximately 10% higher than the 5-year average CAIDI index of 2.49. Central Hudson met the corporate target CAIDI but exceeded the target SAIFI. Individual District targets however, are not in line with the corporate objectives.

As shown in the tables in Section 5 of this report, of the 71 circuits in the Poughkeepsie Operating District, 32% of these circuits (23 out of 71) performed at or better than the Electric Service Standard SAIFI level of 1.2. 39% of the Poughkeepsie circuits (28 out of 71) performed better than the Electric Service Standard CAIDI level of 2.25 (120 minutes per interruption).

The Poughkeepsie Operating District non-storm CAIDI objective was exceeded for the following reasons:

1) Tree-related outages were the leading cause of outages and customer interruptions in the district during 2016. The CAIDI for these outages increased by 22% over 2015. Since tree-related outages are the leading cause for outages and customer interruptions overall district is driven by results in this category.

2) There is a significant presence of Ash trees throughout the Poughkeepsie District which are being subjected to the infestation of the Emerald Ash Borer. This invasive species has been destroying these trees throughout Central Hudson's service territory and has resulted in power outages (primarily in the Catskill and Kingston Operating Districts). There is evidence of the Emerald Ash Borer starting to affect trees in the northern portions of the Poughkeepsie Operating District. If proactive measures are not taken to address this issue, it is anticipated that there will be a greater effect on reliability in future years. Section 1 of this document describes the efforts to be proactive on this issue.

3) The circuits fed from the Spackenkill Substation were scheduled for routine trimming during 2016. Line clearance efforts were delayed until the latter part of the year as a result of environmental conservation efforts for the Northern Long-eared Bat. The 2016 non-storm CAIDI for tree-related outages on circuits fed from the Spackenkill Substation was 2.98. This is a 44% increase in comparison to the 2015 CAIDI of 2.07 for tree-related outages on these circuits.

ii) <u>Historical O&M efforts and expenditures within the Poughkeepsie area (to the extent possible) for each of the past 5 years</u>

Central Hudson does not identify O&M efforts and expenditures on a District level. This is done on a System level and is addressed in Section 3 of this report.

iii) Corrective actions to be taken with target dates for completion

1) 6057 Circuit – Relocate approximately 1.5 miles of circuitry on-road along Camby Rd. – 4th Quarter 2017

2) 7095 Circuit – Convert 7.7 miles of 4800 to single phase 7620 along McGhee, Rt. 83, Hunns Lake, Pugsley Hill, Shaefer, Carpenter Hill, and Conklin Hill. This would eliminate cascading voltage issues, eliminate 4800 circuitry, and create 5 high voltage ties. – 3rd Quarter 2017

3) 6003 Circuit – Extend the 6003 by rebuilding circuitry along College Ave to Worrall Ave. Tap into circuitry along Worrall to MH 90. Replace cable from MH 90 to MH 122. Install 1500 kVA padmount stepdown by Maryland Ave Substation. Retire Maryland Avenue Substation. – Tentatively scheduled for 1st Quarter 2018.

4) 7023 Circuit – Rebuild the 7023 circuit as an underbuild under the new G Line – 4th Quarter 2017

5) 7013 Circuit – Repurpose an existing tie breaker to create a new distribution circuit position to provide additional operating flexibility in the area – 3rd quarter 2017

6) 6093 Circuit – Reconductor and Convert Circuitry to 13.2kV along Springside Ave. – 4th Quarter 2017

7) Install and program 3 VIPERs – 4th Quarter 2017

8) Due to inadequate funding, tree trimming of only one Poughkeepsie District circuit is scheduled throughout 2017, increasing the reliability of 283 customers. – 4th Quarter 2017

c) Confirm compliance with corrective actions identified in last year's report if Poughkeepsie missed the targets in the previous year.

The following 2016 projects were listed in the 2015 annual report as being expected to improve the future reliability in the Poughkeepsie Operating Area. More time will be needed to realize the impact on reliability these projects will have.

1) 6097 Circuit – Build 0.7 miles of double circuit construction along Rt. 44 to extend the 6097 circuit & allow for offloading the 6092 circuit. – Complete in 2016

2) 6057 Circuit – Relocate approximately 1.5 miles of circuitry on-road along Camby Rd. – Deferred to 2017

3) 7013 Circuit – Polyphase 3.0 miles of single phase circuitry and repurpose an existing tie breaker to create a new distribution circuit position to take on load of surrounding circuits to defer need for a new Stanfordville Transformer – Polyphasing completed in Q3 2016, Breaker repurposing deferred to 2017

4) 6003 Circuit – Extend the 6003 by rebuilding circuitry along College Ave to Worrall Ave. Tap into circuitry along Worrall to MH 90. Replace cable from MH 90 to MH 122. Install 1500 kVA padmount stepdown by Maryland Ave Substation. Retire Maryland Avenue Substation. – Deferred to 2017.

5) 7025 Circuit – Convert approximately 1.2 miles of circuitry along Killearn Drive due to voltage, loading & stray voltage concerns. – Complete in 2016

6) 7095 Circuit – Convert 7.7 miles of 4800 to single phase 7620 along McGhee, Rt. 83, Hunns Lake, Pugsley Hill, Shaefer, Carpenter Hill, and Conklin Hill. This would eliminate cascading voltage issues, eliminate 4800 circuitry, and create 5 high voltage ties. – Deferred to 2017

7) Install and program 5 VIPERs – Deferred to 2017

8) Tree trimming of 21 Poughkeepsie District circuits scheduled throughout 2016 will increase the reliability of 23,630 customers. – 2nd Quarter 2017

FISHKILL OPERATING DISTRICT

a) Detailed assessment of the Fishkill District reliability performance indices (SAIFI & CAIDI) and all applicable cause codes. Assessment should include annual and five-year performance information for each measure and each cause code.

	PSC SAIFI Objective	**SAIFI** (Without Storms)	**PSC** CAIDI Objective	**CAIDI** (Without Storms)
2012	1.20	1.04	2.00	2.08
2013	1.20	1.01	2.00	2.06
2014	1.20	0.96	2.00	2.16
2015	1.20	1.19	2.00	1.68
2016	1.20	1.31	2.00	2.38
5 Year Average		1.10		2.07

Table 9 – 5-Year Fishkill SAIFI & CAIDI Performance Indices

Cause Code	**Cause Code Description**	**SAIFI**						**CAIDI**					
		2012	**2013**	**2014**	**2015**	**2016**	**5-Year Average**	**2012**	**2013**	**2014**	**2015**	**2016**	**5-Year Average**
2	Tree Contacts	0.488	0.449	0.394	0.406	0.510	0.449	2.22	2.31	2.71	2.26	2.28	2.35
3	Overloads	0.002	0.030	0.001	0.003	0.008	0.009	4.19	0.97	2.70	3.51	2.25	1.59
4	Operating or Working Errors	0.030	0.004	0.015	0.235	0.045	0.066	1.44	1.14	1.01	0.15	1.05	0.44
5	Apparatus or Equipment Failures	0.172	0.171	0.180	0.207	0.341	0.214	2.18	1.91	2.07	2.27	1.52	1.92
6	Accidents or Events Not Under the Utility's Control	0.219	0.170	0.254	0.235	0.257	0.227	1.62	1.79	1.51	1.45	3.24	1.96
7	Prearranged	0.006	0.005	0.004	0.008	0.001	0.005	0.93	0.85	1.21	1.33	1.98	1.15
8	Customer's Equipment or Failures	0.000	0.000	0.006	0.000	0.000	0.001	0.00	2.45	4.54	0.00	0.00	4.51
9	Lightning	0.068	0.150	0.065	0.006	0.053	0.068	2.20	1.99	1.54	6.68	6.55	2.74
10	Unknown or Unclassified	0.058	0.032	0.039	0.091	0.092	0.062	2.48	2.33	2.51	1.94	1.91	2.14

Table 10 – 5-Year Fishkill SAIFI & CAIDI Performance Indices by Area

b) If SAIFI/CAIDI targets were not met, provide the following:

i) <u>Description of problems that resulted in failure to meet the target</u>

During 2016, the Fishkill Operating Area had a SAIFI of 1.31 and a CAIDI of 2.38, excluding major storm activity. The 1.31 SAIFI index did not meet the established operating criteria of 1.20 and is 19% higher than the 5-year average SAIFI index of 1.10. The 2.38 CAIDI index is 19% higher than the established operating area minimum of 2.0 and 15% higher than the 5-year average CAIDI. Central Hudson met the corporate target for CAIDI but not for SAIFI. Individual District targets are not in line with the corporate targets.

The Fishkill Operating District non-storm SAIFI and CAIDI objectives were exceeded for the following reasons:

1) On April 10^{th}, the radial FT Line locked out due to a vehicle hitting a guy wire, causing it to snap and wrap around two phases. This event interrupted 5,073 customers for almost five and half hours. Without this event, Fishkill SAIFI would have been 1.21 and CAIDI would have been 2.11.

2) On February 16^{th}, moisture collected in the overhead bus work at the Shenandoah Substation causing a flashover and loss of power to the two circuits served by this portion of the substation. This event affected 3,802 customers and comprised 57% of the increase in equipment failure caused customer interruptions

3) The 2016 non-storm SAIFI for tree-related outages within the Fishkill District increased 26% over 2015. Tree trimming of twenty-two Fishkill District circuits serving 30,002 customers was planned during 2016 to improve the reliability of these customers. Line clearance efforts were delayed until the latter part of the year as a result of environmental conservation efforts for the Northern Long-eared Bat. The twenty-two circuits whose trimming was delayed saw a 52% increase in tree-related SAIFI in 2016 as compared to 2015. The remaining circuits in the Fishkill District saw a 4% decline in tree-related SAIFI in 2016 as compared to 2015.

As shown in Section 5 of this report, of the 42 circuits in the Fishkill Operating Area, 60% of these circuits (25 out of 42) performed at or better than the Electric Service Standard SAIFI level of 1.2. 45% of the Fishkill circuits (19 out of 42) performed better than the Electric Service Standard CAIDI level of 2.0 (120 minutes per interruption).

ii) <u>Historical O&M efforts and expenditures within the Fishkill area (to the extent possible) for each of the past 5 years</u>

Central Hudson does not identify O&M efforts and expenditures on a District level. This is done on a System level and is addressed in Section 3 of this report.

iii) <u>Corrective actions to be taken with target dates for completion</u>

1) BF Cable – Remove the BF Cable and replace it with three miles of 13.2kV distribution circuitry. This project represents Phase III in the ultimate plan to retire Beacon and Conway Place Substations. Once completed, strong ties will exist to help decrease outage duration. This project was begun in 2016 and is scheduled for completion in the third quarter of 2017.

2) 8056/8051 – Rebuild/Polyphase 1.6 miles of the 8051 and 8056 circuits to increase operational flexibility and decrease both CAIDI and SAIFI. Scheduled for completion in the fourth quarter of 2017.

c) Confirm compliance with corrective actions identified in last year's report if Fishkill missed the targets in the previous year.

The Fishkill District met its SAIFI and CAIDI targets in 2015. The following 2016 projects were listed in the 2015 annual report as being expected to improve the future reliability in the Fishkill Operating Area. More time will be needed to realize the impact on reliability these projects will have.

1) Fishkill Smart Grid Phase II – Installed Fishkill Smart Grid Phase II VIPERs, regulators and switched capacitors. Completed in the third quarter of 2016.

2) 8056/8051 – Rebuild/Polyphase 1.6 miles of the 8051 and 8056 circuits to increase operational flexibility and decrease both CAIDI and SAIFI. Scheduled for completion in the fourth quarter of 2017.

3) BF Cable – Remove the BF Cable and replace it with three miles of 13.2kV distribution circuitry. This project represents Phase III in the ultimate plan to retire Beacon and Conway Place Substations. Once completed, strong ties will exist to help decrease outage duration. This project was begun in 2016 and is scheduled for completion in the third quarter of 2017.

4) 881/882/8015L/8085L – Finish conversion of the 881, 882, 8015L and 8085L circuits. This project represents Phase IV in the ultimate plan to retire Beacon and Conway Place Substations. Once completed, strong ties will exist to help decrease outage duration. This project is tentatively scheduled for completion in 2018.

5) 8086/8066 – Polyphase 0.7 miles and convert/polyphase an additional 1.3 miles of the 8066 circuit on South Mountain Pass Road. This project represents Phase I in the ultimate plan to eliminate a large pocket of 4.8kV construction and create a strong tie between the 8066 and 8086 circuits at the southern border of Central Hudson service territory. This project is tentatively scheduled for completion in 2018.

NEWBURGH OPERATING DISTRICT

a) Detailed assessment of the Newburgh District reliability performance indices (SAIFI & CAIDI) and all applicable cause codes. Assessment should include annual and five-year performance information for each measure and each cause code.

	PSC SAIFI Objective	**SAIFI** (Without Storms)	**PSC** CAIDI Objective	**CAIDI** (Without Storms)
2012	1.20	0.86	2.00	2.10
2013	1.20	0.78	2.00	2.20
2014	1.20	0.90	2.00	2.24
2015	1.20	1.04	2.00	1.77
2016	1.20	1.13	2.00	1.86
5 Year Average		0.94		2.01

Table 11 – 5-Year Newburgh SAIFI & CAIDI Performance Indices

Cause Code	**Cause Code Description**	**SAIFI**						**CAIDI**					
		2012	**2013**	**2014**	**2015**	**2016**	**5-Year Average**	**2012**	**2013**	**2014**	**2015**	**2016**	**5-Year Average**
2	Tree Contacts	0.192	0.241	0.310	0.290	0.434	0.293	2.38	2.76	3.00	2.21	2.58	2.60
3	Overloads	0.002	0.005	0.001	0.000	0.004	0.003	3.30	4.78	3.77	3.75	3.91	4.17
4	Operating or Working Errors	0.002	0.002	0.007	0.085	0.045	0.028	0.59	1.57	1.42	0.16	0.60	0.39
5	Apparatus or Equipment Failures	0.236	0.154	0.148	0.126	0.248	0.183	2.33	2.20	2.22	1.93	1.19	1.93
6	Accidents or Events Not Under the Utility's Control	0.254	0.126	0.300	0.389	0.286	0.271	1.74	1.80	1.48	1.68	1.48	1.62
7	Prearranged	0.001	0.016	0.008	0.001	0.000	0.005	1.45	0.70	2.54	0.74	0.00	1.28
8	Customer's Equipment or Failures	0.001	0.001	0.002	0.001	0.001	0.001	2.72	3.76	5.81	2.65	3.04	4.14
9	Lightning	0.051	0.081	0.018	0.042	0.021	0.043	3.07	2.18	1.61	2.33	1.41	2.29
10	Unknown or Unclassified	0.117	0.157	0.102	0.110	0.088	0.115	1.56	1.75	2.32	1.78	2.01	1.86

Table 12 – 5-Year Newburgh SAIFI & CAIDI Performance Indices by Area

b) If SAIFI/CAIDI targets were not met, provide the following:

i) <u>Description of problems that resulted in failure to meet the target</u>

During 2016, the Newburgh District met its SAIFI and CAIDI targets. SAIFI (without storms) was 5.8% below the PSC SAIFI objective and CAIDI (without storms) was 7% below the PSC CAIDI objective.

ii) <u>Historical O&M efforts and expenditures within the Newburgh area (to the extent possible) for each of the past 5 years</u>

Central Hudson does not identify O&M efforts and expenditures on a District level. This is done on a System level and is addressed in Section 3 of this report.

iii) <u>Corrective actions to be taken with target dates for completion</u>

Targets were met.

c) Confirm compliance with corrective actions identified in last year's report if Newburgh missed the targets in the previous year.

Targets were met.

3. Reliability Programs

a) List, describe and provide a detailed assessment of distribution reliability programs and investments. Provide program budgets and actual expenditures for each of the past 5 years.

The expenditures listed for the following reliability programs and investments are installation expenditures.

Remote Communication

For more information, see the Remote Communication summary in Section 1d of this report.

Distribution Line Infrared Surveys

As of 2010, the distribution line infrared surveys of the three-phase mainline of all distribution circuits are being conducted annually. Infrared surveys help identify equipment that have poor connections that will eventually lead to a thermal failure. By identifying these “hot spots”, action can be taken to proactively prevent outages due to equipment failure. In 2011, a 3-year contract was awarded to a Contractor who was able to conduct this survey for roughly one third of the cost compared to previous years, without a sacrifice to quality or quantity. The distribution line infrared surveys were completed at a cost of $13,000 in 2011, $13,750 in 2012 and $16,250 in 2013. In 2014, a new 3-year contract was awarded. The distribution line infrared surveys were completed at a cost of $16,250 in 2014, $16,250 in 2015 and $16,875 in 2016. There were 199 items found that were deemed “Immediate”, “Serious”, or “Critical” in 2015. In 2016, 50 items were deemed “Immediate”, “Serious”, or “Critical.” The majority of repairs have been completed on items deemed “Immediate” and the remaining repairs will be completed before the 2017 summer peak. Repairs made are not considered major capital investment work, and are handled through expense on a District level. This spring we will go to bid for a new 3-year contract.

3X Report

The 3X report, which is completed on a monthly basis, is designed to acknowledge those protective devices that have operated at least 3 times in a 12-month period for the same or unknown causes. Each month, the Electric Operating Engineers review the 3X report for their District and determine if a plan of action is needed to address repeat outages at specific locations. The overall goal of this report is to improve reliability and decrease SAIFI. Corrective action is carried out throughout the year, and typically involves installing animal guards or lightning arrestors, or performing spot trimming. This work is not considered major capital investment work, and is handled through expense on a District level.

10X Report / Customers Experiencing Multiple Interruptions (CEMI)

In 2008, a program was developed to determine areas with significantly below average reliability on the Central Hudson system. This program allows us to determine the number of customers that experience a given number of outages in a calendar year. The 10X report was created as a way to determine how many customers on our system experience 10 or more outages in a 12-month period. This report shows the areas with significantly below average reliability by plotting them on a map for each given District. It should be noted that the 10X report targets areas in *specific locations* on a circuit. Upgrades or programs only address these specific locations, not the entire circuit. At times it may be found that different areas may develop over a number of years on the same circuit, and that the same solution can be successfully employed to different areas of the circuit. Table 13 below is a summary of trimming completed on 10X circuits that had experienced numerous tree outages during the past 5 years. Expenditures associated with trimming are discussed later in this section of the report.

District	Circuit	Year(s) Identified in 10X Report	Routine Trimmed	Spot Trimming
Catskill	1092	2012	2013	
Catskill	1083	2015	2016	
Catskill	2005	2012	2011, 2013	
Catskill	2041	2011	2011	
Catskill	2042	2011	2011	
Catskill	2061	2011	2012	
Catskill	2385	2014	2015	
Kingston	1021	2011	2011	2011
Kingston	2094	2011, 2012, 2013	2011, 2013	
Kingston	3012	2012, 2013	2014	
Kingston	3022	2012	2013	
Kingston	3024	2012	2013	
Kingston	3078	2012	2012	
Kingston	3081	2013	2014	
Kingston	3091	2012	2013	
Poughkeepsie	6057	2012	2013	
Poughkeepsie	7025	2015		2016
Poughkeepsie	7071	2014	2011-2012, 2015	
Poughkeepsie	7072	2014	2015	
Poughkeepsie	7091	2014	2012, 2015	
Fishkill	8022	2012	2013	
Fishkill	8066	2011, 2012	2013	
Fishkill	8072	2012	2012	
Fishkill	8086	2011	2012	
Fishkill	8093	2012	2012	
Newburgh	4043	2012	2012	
Newburgh	4097	2012	2011, 2013	
Newburgh	5004	2015	2016	2016
Newburgh	5013	2011	2012	
Newburgh	5021	2012	2014	

Table 13 – Trimming in response to 10X

In response to the 2012 10X report (performed in 2013) squirrel guards were installed on the Catskill 1071 and Newburgh 5051 circuits. A fuse was also added to an off-road spur on the Newburgh 5051 circuit in order to improve reliability for the upstream customers. In response to the 2013 10X report (carried out in 2014), a load pocket on the Newburgh 4002 circuit was transferred to a more reliable feeder in order to lessen the outage frequency for these customers. In response to the 2014 10X report (carried out in 2015), to improve reliability for the Kingston 2094 and Newburgh 5021 circuits, transformers and insulators were changed out on the 2094 circuit due to affected customers fed from pole number K11851 on Ashokan Rd. and arrestors, cutouts, and taps were all changed out along the 5021 line which feeds Sparking Ridge Rd. In response to the 2015 10X report (carried out in 2016), to improve reliability for the Kingston 1014 and 3023, squirrel guards were installed on all transformers on the affected circuitry. To improve reliability for the Poughkeepsie 7025 and Newburgh 5004, squirrel guards and covered taps were installed on the transformers on the affected circuitry. To improve reliability for the Poughkeepsie 7071, squirrel guards were installed on the problem transformers along with replaced flash-damaged lightning arrestors and transformers. Actual expenditures associated with fusing upgrades (unless part of a specific program) are not tracked and therefore cannot be included. This work is not considered major capital investment work, and is handled through expense on a District level. The Cutout Replacement Program is discussed later in this section, and expenditures related to the entire program can be found in Section 3b.

For areas that involved infrastructure improvements, a number of projects were completed in response to the 2011, 2012, 2013, 2014 and 2015 10X reports. These projects have not only helped reduce the number of outages for 10X customers, but have also positively impacted non-10X customers residing on the same circuit. The following are the Capital Budget projects that were completed.

Catskill

2071 Circuit – Single-phase rebuild was started in 2008 and completed in 2009 for a total cost of $202,000. Before this project, the area fed by this section of circuitry averaged 4 outages per year. In 2009, this was reduced to 1.3 outages per year. Since 2011 and 2012, the number of customers interrupted on the 2071 circuit (not including storms), has decreased by 22% and 42% respectively, compared to the previous 4 years. The 2071 circuit did not appear on the 2011 or 2012 10X report. In 2013, the 2071 circuit saw a 13% decrease in number of customers interrupted compared to the average of the previous 4 years. The 2071 circuit did not appear on the 2013 10X report and in 2014, saw a 4% improvement for non-storm circuit interruption count compared to the average of the previous 4 years. The 2071 circuit did not appear on the 2014 or 2015 10X report.

1071 Circuit – The 1071 circuit appeared on the 2012 10X report. In order to improve reliability for the affected areas, a project proposal was submitted in 2014 to rebuild 4.25 miles of single phase circuitry on-road along Route 51, Sodom Road, and Shady Lane. The estimated cost of this project is $640,000 and is scheduled for 2017. Once completed, reliability should significantly improve.

1091 Circuit – The 1091 circuit appeared on the 2014 10X report. This involved customers affected along Route 408 and Kropp Road. In order to resolve the reliability problems in the area, a capital budget project was submitted in 2015 to rebuild 3.5 miles of single phase circuitry. This project is currently scheduled for 2017 at an estimated cost of $650,000.

1092 Circuit – A reconductor job for the 1092 circuit along County Route 351 in Rensselaerville was completed in 2012. The total cost was $402,000. The 2012 non-storm circuit SAIFI for the 1092 circuit showed a 29% improvement compared to the average of the previous 4 years. The 1092 circuit did not appear on the 2011 10X report. Although the 1092 circuit did appear on the 2012 10X report, the project mentioned above was not finished until the end of 2012. The completion of this project as well as tree trimming performed in 2013 has helped improve the 2013 non-storm circuit SAIFI by 37% compared to the average of the previous 4 years. The 1092 circuit did not appear on the 2013 10X report. The 1092 circuit did appear on the 2014 10X report; however, the area affected was along Route 357 and Hale Road. In 2015, a budget project was submitted to rebuild 5.0 miles of single phase circuitry along these roads in order to resolve the reliability problems in the area. This project is tentatively scheduled to be completed in 2020 at an estimated cost of $875,000. The 1092 circuit did appear on the 2015 10X report; however, the area affected was along Stonebridge Road. In 2016, a budget project was submitted to rebuild 0.75 miles of single phase circuitry along this road in order to resolve the reliability problems in the area. This project is tentatively scheduled to be completed in 2018 at an estimated cost of $150,000.

2005 Circuit – The 2005 circuit appeared on the 2012 10X report. In order to improve reliability for the areas affected, two projects were submitted in 2014. The first project was completed in 2014 and involved rebuilding 1.25 miles of 3 phase circuitry along Ross Ruland Rd. The total cost for this project was $316,455. The second project involves rebuilding 2.5 miles of single phase circuitry along Warren Stein Road and Country Route 67. This project was completed in 2016 and was budgeted for $375,000. The 2005 circuit did not appear on the 2014 10X report, however it did appear on the 2015 10X report.

Kingston

2094 Circuit – In 2014 and 2015, the 2094 circuit appeared on the 10X report for the Olivebridge area. In order to improve reliability for this area, a capital budget project was submitted in 2015 to create a 1MVA single phase standby microgrid generator along Ashokan Road near Spillway Road to pick up 123 customers. Following further analysis, this project was abandoned in favor of a rebuild of the infrastructure in the problem area, much of which will require replacement regardless of the microgrid installation. The project will be submitted for inclusion in the 2018-2022 5 Year Capital Budget.

3011 Circuit – The 3011 circuit appeared on the 2011 10X Report. Although this appearance was partly due to the weakened trees that continued to fall after Irene, two projects are planned for the West Shokan area. These projects are tentatively scheduled for completion in 2018 and were submitted to eliminate the off-road circuitry gaps along High Point Mountain Road and McMillian Road. After these projects are completed, they will greatly help reduce the amount of outages in the area. In 2017, an Electronic Recloser installation is also slated for the 3011 circuit as part of the Distribution Automation Program (discussed later in this section). This installation will allow the 2094 circuit to pick up the 3011 in the event of an SR line trip out. This project is expected to help improve reliability. The 3011 circuit did not appear on the 2012, 2013, 2014 or 2015 10X reports.

3012 Circuit – The 3012 circuit appeared on the 2011, 2012, 2013, 2015 10X Reports. Grogkill and Romano Road are located in a valley at the end of the 3012 circuit. In 2012, a project was submitted to help reliability for the area. The estimated cost of this project is $100,000 and after its completion in 2019, the feeds to Grogkill and Mount Tobias Road will be relocated on-road along Rt. 212 in Willow. Electronic reclosers were also installed in 2013 and 2014 on the 3012 circuit as part of the Distribution Automation Program. The 3012 circuit did not appear on the 2014 10X report.

3091 Circuit – The 3091 circuit appeared on the 2012 10X report. In 2012 a project was scheduled for completion in order to rebuild 1.5 miles on-road along Rt. 55A. Because a DEP permit is required to move the circuitry on road, this project is currently on hold awaiting the permit. Once completed, reliability should improve for the affected areas. The cost of this project is estimated to be $450,000. The 3091 circuit did not appear on the 2013, 2014 or 2015 10X reports.

3024 Circuit – The 3024 circuit appeared on the 2012 10X report. This circuit was part of Smart Grid Pilot involving the installation of an electronic recloser which was completed in 2014 at a cost of $45,921. The installation of the new electronic recloser will create a more robust feeder as it becomes less susceptible to transient outages. More time will be needed to fully realize this projects impact on reliability. In 2017, a VIPER ALT team will become operational which will allow 10X customers on the 3024 circuit to be transferred to the 3023 in the event of a source side outage. The 3024 circuit did not appear on the 2013, 2014 or 2015 10X reports.

Poughkeepsie

6057 Circuit – The 6057 circuit appeared on the 2012 10X report. The areas affected were located in a pocket near the end of the feeder. In order to improve reliability, in 2012, electronic reclosers were installed at a cost of $44,000. The 6057 circuit did not appear on the 2013, 2014 or 2015 10X reports.

7052 Circuit – The 7052 circuit appeared on the 2012 10X report. The ALT that serves the affected areas was out of service for some time, but eventually repaired in 2012. Electronic reclosers located in the first zone of protection replaced type D's in 2012 as well, at a cost of $53,000. The 7052 also did not appear on the 2013, 2014 or 2015 10X reports.

Fishkill

8066 Circuit – The reliability of 690 customers had been historically impacted by a 0.4 mile off-road portion of spacer cable. In order to improve reliability to these customers, this portion of circuitry was moved on-road. The total 2012 capital investment was $198,000. While the 8066 circuit did show up on the 2012 10X report, these outages were tree related. Trimming was completed in 2013. The 8066 circuit did not appear on the 2013 10X report and the 2014 non-storm circuit SAIFI showed an improvement of 41% compared to the average of the previous 4 years. The 8066 circuit did not appear on the 2014 or 2015 10X reports.

8072 Circuit – The 8072 circuit appeared on the 2012 10X report. Towards the end of 2012, a project was completed to convert Long Hill and Hortontown Road to 13.2kV. During the conversion, old infrastructure was replaced and moved on road. The total cost for this project was $147,441. Since this project has been completed, the number of customers interrupted in 2013 has decreased by 14% compared to the previous 4 years. The 8072 circuit did not appear on the 2013 10X report. The 2014 non-storm circuit SAIFI continued to show an improvement of 21% compared to the average of the previous 4 years. The 8072 circuit did not appear on the 2014 or 2015 10X reports.

Newburgh

4011/5013 Circuit – Extend the 5013 circuit to Huckleberry Turnpike in Plattekill (fed by 4011 circuit) and move the 5013 circuit from off-road to on road in Freetown Highway area. This project started in 2010 and circuitry for the 5013 circuit was moved on road in May 2011. The total cost was $245,115. As of March 2012, these customers are now also protected by an ALT. Compared to the average of the previous 4 years, the 2012 non-storm circuit SAIFIs for the 4011 and 5013 circuits saw an 81% and 75% improvement, respectively. The 4011 and 5013 circuits did not appear on the 2012 10X report. In 2013, these circuits saw a 47% and 66% improvement in circuit SAIFIs compared to the average of the previous 4 years. The 4011 and 5013 circuits did not appear on the 2013 10X report. In 2014, the 4011 saw an 8% improvement in circuit interruption count compared to the previous 4 years. Also in 2014, the 5013 saw an improvement of 20% in non-storm circuit SAIFI compared to the average of the previous 4 years. The 4011 and 5013 circuits did not appear on the 2014 or 2015 10X reports.

5021 Circuit – The 5021 circuit appeared on the 2012 10X report. To address this project, in 2013, a project was submitted to relocate the existing old infrastructure on-road along Route 299. This project was completed in the second quarter of 2015 at a total capital cost of $59,370. More time will be needed to fully realize this projects impact on reliability. The 5021 circuit did not appear on the 2015 10X report.

Circuits over 6MVA and 1.5MVA

As mentioned in Section 1d of this report, the "Circuits over 6MVA or 1.5MVA" report (Circuits Over 6) provides a means of monitoring and balancing load growth on a local level, and is a proactive program that addresses reliability by allowing for operational flexibility for emergency switching and maintenance.

To address specific operational flexibility concerns related to the Circuits Over 6 Reports of the past 5 years, a number of new distribution circuits were installed, infrastructure and equipment upgrades were completed, and circuits were offloaded through shifting tie points with adjacent circuits. Actual expenditures associated with most local load transfers are not tracked, and therefore cannot be included. This work is not considered major capital investment work, and is handled through expense on a District level. Details on the 2016 load transfers driven by the 2015 Circuits Over 6 Report can be found in Section 1d of this report. The following is a summary of substation and distribution infrastructure improvement projects, including new distribution circuits.

1. In the 2007, 2008, 2009, 2012, and 2013 Circuits Over 6 Report, the Newburgh 5021 circuit was identified as operating above its normal design rating. Local load transfers were carried out until the new Galeville Substation could be completed. A Capital Budget project was developed for 2010 that would utilize new Galeville circuitry to offload the 5021 circuit as well as provide load relief to the New Paltz and Highland areas. 2.8 miles of circuitry was polyphased on Libertyville Road in order to provide load relief to this area. The associated capital cost through 2010 was $527,000 and an additional $234,000 was spent in 2011 to complete the project. After determining 2.5 miles of conductor along Rt. 299 was only #4 and #2 Al, in order to push the 5031 circuit into the Village of New Paltz, the 2.5 miles required reconductoring. This project was completed in 2014 at a total capital cost of $336,068 and allowed for the 5021 to be successfully offloaded.

2. Prior to 2008, the Newburgh 5001 and 5002 circuits were identified as operating above their normal design ratings. The 5001 also appeared on the 2011 and 2012 Circuits Over 6 Report. Local load transfers were carried out until the Marlboro Substation expansion could be completed. The substation expansion involved installing a new transformer, switchgear and protective relaying, and was completed in 2008. Distribution work for the new Marlboro 5004 circuit was completed in 2008 and this circuit was used to offload the 5001 and 5002 circuits, as well as provide needed capacity for additional load growth in the area. The distribution line work resulted in a capital investment of $327,000 in 2008. In 2012, an additional $362,000 was spent to polyphase 1 mile of the 5004 circuit to provide load relief to the 5001 circuit.

3. In 2010, work began on a new circuit out of Coldenham to further relieve the 4023 and 4012 circuits out of the Coldenham and West Balmville Substations. The 4023 and 4012 also came up on the 2011 Circuits Over 6 Report. The work associated with the new circuit out of Coldenham was completed in 2012. The total length of the new circuit is 4.5 miles and the capital costs associated with this new circuit were $339,000 in 2010, $528,000 in 2011 and $106,000 in 2012.

4. In the 2006 and 2007 Circuits Over 6 Report, the Kingston 385 circuit was identified as operating above its normal design rating. Distribution work to convert approximately 3.0 miles of the 3076L (4kV) circuit to 13.2kV operation was started in 2008 and completed in January of 2009. Step-down transformers were installed on the new 13.2kV portion of the 3076 circuit, which allowed it to offload the adjacent 377 circuit (4 kV). Through a shifting of tie points, the 377 circuit was then able to offload the overloaded 385 circuit. The circuit exit and distribution line work resulted in a capital investment of $101,000 in 2008 and $68,000 in 2009. To address remaining thermal concerns in the area as well as the appearance of the 385 and 386 circuits on the 2010 and 2011 Circuits Over 6 Report, the substation was rebuilt and all distribution work was completed in 2012. The total 2012 capital investment for substation and distribution line work was $1.177 million and $1.913 million, respectively.

5. In the summer of 2010, the Saugerties 302 circuit was estimated to have a minimum peak load of 1.55MVA, which is slightly above its design rating. Due to voltage issues observed, Phase 1 of a 2 phase project to convert the 302 circuit was initiated in 2013. The total capital cost for distribution line work in 2013 was $305,782. In 2014, phase 2 of this project was finalized at a total capital cost of $79,523. The completion of this project will allow for some circuit reconfigurations in order to provide some load relief for the 3002 circuit. In 2006, it was also determined that a new substation would be required to replace the existing Saugerties Substation. The in-service date of the new substation was June of 2013. The new substation increased load serving capability in the area, as well as improved operational flexibility for emergency switching and maintenance. The total 2013 capital investment for the substation and distribution line work was $1.629 million and $934 thousand, respectively.

6. In the 2011 Circuits Over 6 Report, the Poughkeepsie 621 circuit was identified as operating above its normal design rating. The extension of the Manchester Substation 6094 circuit on Worrall Avenue was proposed to allow for load shifting and balancing between the 6094, 621 and 622 circuits. This work was started in 2011 and completed in 2012. The capital costs associated with this work was $643,000 in 2011 and $75,000 in 2012.

7. In 2011 and 2012, the 4043 circuit in Newburgh has appeared on the Circuits Over 6 Report as operating above its normal design rating. In 2013, this circuit was upgraded to high capacity. As a

result, this circuit is now operating within its rating. The project was started and completed in 2013. The total 2013 capital investment was $249,000 for distribution line work and $106,000 for substation work. The total capital investment for final substation work in 2014 was $1,661.

8. In the 2012 and 2013 Circuits Over 6 Report, the Newburgh 406, 4041, 4044, 4053 circuits appeared as operating above its normal design criteria. In 2013, a new high capacity circuit was installed out of Union Avenue Substation in Newburgh. As a result, the 406 was relieved and portions of the 4041, 4044, and 4053 circuits were transferred to the new circuit. This project was started and completed in 2013. The total 2013 capital investment for the substation and distribution line work was $35 thousand and $1.346 million, respectively.

9. Since 2011, the Kingston 1012 circuit has appeared on the Circuits Over 6 MVA Report for operating above its normal design rating. In 2013, the 1023 circuit was extended to allow for it to offload a portion of the 1012 circuit. In 2012, Phase I was completed and Phase II was completed for 2013. The total 2012 capital investment for Phase I was $206,000 and Phase II was $535,000.

10. Since 2010, the Poughkeepsie 7051 circuit has been identified as operating above its normal design rating. In 2013, construction of a new Milan 7062 circuit was proposed. Phase 1 and 2 of this project were completed in 2013 and 2014. The total capital investment spent in 2013 was $372,000 and $738,000 for 2014. Phase 3 of this project was finalized in 2015 allowing for the northeast portion of the 7051 circuit to be offloaded. The total capital investment spent in 2015 was $620,000.

11. To offload the 6061 and 7024 Poughkeepsie circuits operating above their design rating since 2011, in 2014 a project was initiated to rebuild 1.3 miles along Pendell Rd., Creek Rd., and Smith St. as a 13.2kV 6061/6065 double circuit using 336 bare AA phase conductors. This project was started and completed in 2014 at a total capital investment of $646,715.

12. To address limited switching capabilities which caused the 4026, 5052, and 5053 circuits to appear at least once on the Circuits over 6MVA report since 2011, in 2014, a brand new circuit was installed out of Maybrook Substation in the Newburgh District. This project was started and completed in 2014 and has allowed for load relief on each of the three circuits. The total capital investment for substation work was $103,915. The total capital costs for distribution line work was $479,108.

13. Due to lack of operational flexibility and thermal concerns in the Northeast Dutchess area, in 2012 it was recommended that a new 7013 circuit fed from the Hibernia Substation be constructed. This project also sought to address the loading concerns for the 7011 circuit which appeared on the Circuits Over Rating Report since 2011. This project was started in 2016 and will be finished in 2017.

14. In the 2012, 2013, 2015 and 2016 Circuits Over 6 Report, the Manchester 6092 circuit was identified as operating above its normal design rating. A Capital Budget project was completed in 2016 to build 0.7 miles of double circuit, three-phase 13.2kV circuitry along Rt. 44 from the old Delaval Plant to James St. using 336 bare AA phase conductors. This project would allow the Manchester 6097 circuit to offload approximately 1 MVA from the 6092 circuit. More details on this project, including the 2016 capital costs, can be found in Section 1d.

<u>ALT Switch Installations</u>

Automatic Load Transfer (ALT) switch teams transfer pockets of load to alternate feeds for loss of primary feed. Central Hudson has 62 of these teams installed system wide. Over the past 5 years, ALT switch operations have accounted for an average of 4.38% savings in total system SAIFI and 5.60% savings in non-storm system SAIFI. Table 14 below shows the benefits this form of automation has had in regards to non-storm SAIFI saved for specific cause codes that have historically had the largest impact on reliability.

Cause Code	Cause Code Description	5-Year Average SAIFI Savings
2	Tree Contacts	7.46%
5	Apparatus or Equipment Failures	5.52%
6	Accidents or Events Not Under the Utility's Control	3.23%

9	Lightning	7.07%
10	Unknown or Unclassified	2.18%

Table 14 – ALT Switch Program - % SAIFI Saved

The approximate installation cost is $115,000 per team. Locations are identified each year to be a part of the program. In 2016, one new Automatic Load Transfer (ALT) switch team that was started in 2015 was completed. Two planned ALT teams for Newburgh are being installed as part of Smart Grid. One team that was started in 2016 will be completed in 2017. In addition to the ALTs being installed as a part of the Smart Grid Program, there is a 2017 budget for additional ALT switch teams of $115,000 in addition to the carryover project from 2016.

<u>14.4kV Cable Replacement</u>

Central Hudson has approximately 55 miles of 14.4kV paper and lead cable used in the sub-transmission system. Several cables are over 60 years old and failures of these cables are typically associated with cracks in the lead shield. A 5-phase cable replacement program was created in 2008 to address the 14.4kV feeds into the Poughkeepsie Secondary Network. Each phase consists of two parts. The first part of each phase involves underground conduit and manhole upgrades, and the second part involves the cable replacement utilizing the new infrastructure.

Phases 1 through 3 of both the infrastructure and cable replacements (approximately 0.7 miles) were completed prior to 2012.

Phase 4 involved installing a new duct bank and manhole system on Main Street, between Market Street and Liberty Street (approximately 0.1 miles) and installing new underground cable for the PO, PU and PK network feeds. The new duct bank and manhole installation was completed in 2012 at a cost of $227,000. Cable was pulled through this section in 2012 at a cost of $168,000. The remaining cable termination work in this section was completed in 2013 at a cost of $109,000.

Phase 5 involved installing a new duct bank and manhole system on Main Street, between Liberty Street and South Hamilton Street (approximately 0.25 miles) and installing new underground cable for the PO, PU and PK network feeds. The infrastructure portion of this final phase was completed in 2013 at a cost of $422,000. The final cable replacement phase of this program was completed in 2014 at a cost of $532,000. The total cost for all 5 phases of the infrastructure replacement was approximately $2.375 million. The total cost for all 5 phases of the underground cable replacement was approximately $2.177 million.

Overhead cable replacement projects associated with the 14.4kV Cable Replacement Program between 2010 and 2013 involved the Poughkeepsie PH cable, and the Newburgh WN and UW cables. The overhead portion of the PH cable was replaced in 2011 at a cost of $120,000. The majority of the overhead portion of the WN cable (approximately 3.0 miles) was replaced in 2010 at a cost of $675,000. The remaining WN cable replacement was completed in 2011 at a cost of $490,000. A study of the area fed by the New Windsor Substation was completed in 2011. It was determined that the UW cable would no longer be needed. It was eliminated in 2013 and the substation was retired in 2014.

<u>Newburgh Secondary Network</u>

A multi-phase capital budget program to address cables and infrastructure in the Newburgh secondary network was initiated in 2014. In 2014, approximately 0.22 miles of nearly 90 year old tile duct east of Johnston Street (south side of Broadway) was replaced, and 5 pull boxes had roof and wall repairs performed. The total 2014 capital investment was approximately $532,000.

New cables were installed in the new conduit system in 2015. The total 2015 capital investment was approximately $242,000.

Approximately 0.32 miles of secondary network cables were replaced west of Johnston Street (south side of Broadway) in 2016. The total 2016 capital investment was approximately $463,000

Distribution Automation

Central Hudson has implemented Electrical Distribution Design's (EDD) model-based Distributed Engineering Workstation (DEW). With this advanced modeling software Central Hudson is able to realize continuous improvement in distribution system reliability, efficiency, capacity and security as smart grid is implemented over time as a strategic part of capital investment. This software will allow for an open architecture that can adapt as technology advances and priorities change. DEW will be capable of performing integrated system analyses for planning, design and operations management.

Conceptual design work and plan development for the rollout of the Smart Grid Program commenced in 2011. The High Falls Substation 3021, 3022, 3023 and 3024 circuits were selected for application and funding under NYSERDA PON 1913. The total cost was estimated to be $3.0 million. NYSERDA funding of $1.5 million was secured in 2012. The NYSERDA funding covered the Central Hudson and EDD labor involved with developing a standardized interface between Central Hudson's GIS system and DEW, as well as modeling the entire distribution system in DEW. PON 1913 was completed in September of 2015.

Central Hudson applied for additional NYSERDA funding to include the transmission system into Smart Grid integration under PON 2474. The demonstration project conducted for PON 2474 consisted of automatic distribution circuit restoration following a transmission line outage of the radial feed to the Woodstock Substation (3011, 3012, 3013 and 3014 circuits). In order for the auto restoration to be completed, 13 electronic reclosers were deployed throughout the Woodstock Substation circuits. NYSERDA funded $967,800 of PON 2474, which paid for Central Hudson's and EDD's labor involved with DEW modeling of the transmission system. Central Hudson funded $900,000 to cover all electronic device installation. PON 2474 was completed in September 2016.

In 2015, the Distribution Automation program began a transition from pilot to full scale rollout. In addition to electronic device installation and circuit reconductoring, the project includes deployment of a network communication system of radios with a fiber/microwave backbone, as well as a Distribution Management System. These components will form the backbone of the Fault Locating, Isolation, and Service Restoration (FLISR) scheme as well as the VVO/CVR scheme (Volt-VAR Optimization and Conservation Voltage Reduction). In order to track the progress of all three projects, milestones were developed for every six months.

During 2016, the Distribution Automation project installed 31 switched capacitors, 5 voltage regulator sets and controllers, and 44 electronic reclosers. The installation of these devices follows the recommendations established through the detailed plans completed in accordance to the milestones. The milestones for Distribution Automation also establish time frames for the number FLISR ready devices and VVO devices. In 2016, the integration of the Distribution Management System (DMS) completed many significant milestones. During 2016 the DMS project was able to complete the Production Development System, and successfully complete factory acceptance testing. By the end of 2016, the DMS was able to import Central Hudson circuitry from the GIS and also display telemetry data from electronic field devices. Central Hudson's Network Strategy project purchased 600 radios into standard stock as part of the tier 2 roll out in 2016. Network Strategy has been able to achieve communication between field devices over both tier 2 and tier 1 to Central Hudson headquarters. Central Hudson has successfully met each milestone and has shown significant progress in each of the three projects. The total capital expenditures for 2016 were approximately $3.3 million for Distribution Automation, $2.9 million for DMS and $4.6 million for Network Strategy. For additional information, please reference Central Hudson's Project Milestones & Testing Report on Distribution Automation, Distribution Management System, and Network Strategy filed September 21, 2015 as part of Case 14-E-0318 and 14-G-0319.

Cutout Replacement

In 2002, Central Hudson developed a cutout replacement program. The program was divided into 3 phases. Phase 1 was replacement of all 1st zone porcelain cutouts with polymer cutouts. Approximately 5,000 cutouts were replaced through 2006. Phase 2 was replacement of all porcelain cutouts in the 2nd zone with over 1,500 customers. Approximately 1,107 cutouts were replaced as part of the 2007 program. Phase 3 was divided into parts 'a' and 'b'. Phase 3a involved replacement of all porcelain cutouts that resulted in exposure to between 1,000 and 1,500 customers. Approximately 2,976 cutouts were replaced as part of the 2008 program. Phase 3b is replacement of all porcelain cutouts that have between 500 and 1,000 customers. This phase started in 2009 and was completed in early 2010. Approximately 8,036 cutouts were replaced.

Following the completion of the cutout replacement program, micro-surveys were performed to identify cutouts that may have been missed. Approximately $214,000 was spent between 2012 and 2013, addressing these locations. Between 2014 and 2016, Central Hudson continued to proactively monitor and address cutout replacements as necessary at the district level. The Company is currently evaluating the potential for additional replacement programs to further replace porcelain cutouts. However, customers affected by cutout failure have been steadily declining over recent years. During, the previous five years, cutout failures have been between the second and fourth leading cause of equipment failure. In 2016, this sub cause code declined to be the sixth leading cause of equipment failure related customer interruptions.

Breaker Replacement

Breaker failures are not a common occurrence, but they have the potential to impact a significant number of customers. In 2008, the Breaker Replacement plan was developed as a means to improve the Central Hudson infrastructure and maintain system reliability. Breaker replacements were prioritized based on duty rating, condition assessment and obsolescence. 35 substation breakers were replaced in the first year of the program. The expenditures for the Breaker Replacement program are shown in Table 16 below.

	2012	2013	2014	2015	2016
Breaker Replacement Program Expenditures ($000)	$3,760	$2,221	$3,808	$2,400	$1,600

Table 16 – Breaker Replacement Program

$1.5 million has been budgeted for 2017 to replace an additional 48 breakers. A portion of these breakers were purchased or designed in 2016. A total of 98 breakers were identified and replaced between 2011 and 2016. The need to replace additional breakers is an on-going process and will continue based on real time field evaluation and condition assessments.

Overcurrent Protection and Reliability Practices – Quanta Technology Distribution Audit

In 2007, Quanta Technology was contracted to conduct a distribution system audit. The audit focused on overcurrent protection and reliability practices. To perform this audit, Quanta Technology reviewed several internal documents to determine Central Hudson’s current practices. The recommendations in the report were based on a comparison of Central Hudson’s current practices to current industry practice. The current industry practices that were recommended to improve reliability were completed in 2008.

Early in 2012, the pilot program was concluded and considered a success. In 2013, Distribution Engineering issued criteria for applying instantaneous reclosing and lateral fuse saving throughout the service territory. Distribution Engineering has been working with the Electric System Protection group to review the application of instantaneous auto-reclose to substation distribution circuit breakers on a case-by-case basis. All current electronic recloser installations have been configured for instantaneous auto-reclose to provide fault protection along the distribution circuit, thereby minimizing customer impact for transient faults. All future electronic recloser installations will be completed with instantaneous auto-reclose enabled.
Recommended practices based upon the Quanta Technology Study and implementation are detailed below:

1. Lateral Fusing – The audit identified benefits associated with the selection of lateral fuse sizes that allow for maximizing transient protection. The ultimate goal is to minimize permanent interruptions. Central Hudson's current practice is to size these lateral fuses based on load current. In 2008, 8 circuits were chosen in the Poughkeepsie and Catskill Districts to be used in a field trial. In Poughkeepsie, the 7011, 7012, 7041, 7042 and 6052 circuits were chosen. In Catskill, the 1091, 1092 and 2005 circuits were chosen. On these circuits, lateral fuse sizes in the first two zones of protection were increased in order to optimize a 'fuse save' methodology. The circuits that were selected have microprocessor-based relays for distribution protection.

All fuse changes were completed in 2008 and this field trial lasted through the end of 2009. Per the Quanta recommendation, a new section in the Distribution Engineering Guides was created in 2008 to address application guidelines on lateral fusing methodologies. Upgrades were made as part of the cutout replacement program. The eight circuits used in the aforementioned trial experienced an average of 2 fewer permanent outages per circuit in 2009. Outage data for 2010, 2011 and 2012 continued to show similar results. Based on these findings, it was recommended that deployment of the "fuse saving" methodology be implemented on the Central Hudson system on circuits with customers who are not sensitive to momentary interruptions. This expansion will be coordinated in conjunction with recommendations from the District Engineers to provide optimal coverage without compromising the overall protection scheme. In 2012, the Catskill district marginally expanded this "fuse saving" method on a couple of spur lines. No additional lateral fusing was implemented for the 2013, 2014, 2015 or 2016 calendar years.

In 2009 Distribution Engineering began studying the application of instantaneous reclose settings as a pilot program at the Union Avenue Substation and on 2 electronic reclosers, which would have an impact on fusing in the first 2 zones. The result of this is further discussed under *Instantaneous Reclose for Substations Breakers*.

2. Electronic Reclosers – The audit identified the benefits associated with the use of electronic reclosers as the first protective device. These devices can provide a wide variety of additional relaying features that can improve system reliability and reduce maintenance costs. Per the Quanta recommendation, a new section in the Distribution Engineering Guides was created in 2008 to address application guidelines of electronic reclosers, as well as a methodology for providing remote communication.

   Central Hudson's practice prior to 2009 was to use hydraulic reclosers. Installation of electronic reclosers is expected to result in improved reliability. They provide an improvement of outage prioritization, instant notification of momentary interruptions via Telemetric units, additional fuse saving, available fault data to allow for troubleshooting of outages and result in more flexible protection of the system. Based on data sampled from the Kingston District from 2009 through 2012, each unit saves approximately 5 outages on average per year.

   In 2010 and forward, approximately 13 units per year are being replaced, prioritized based on customer count and coordinated with the current recloser maintenance cycle as well as other planned capital projects. These 13 new units per year are in addition to the electronic reclosers that will be installed on each new distribution circuit. In 2010, 17 new electronic reclosers were installed at a cost of $601,000. In 2011, only nine of the 13 planned new electronic reclosers were installed due to the unusually large impact of the 2011 storms. The total 2011 cost of the new electronic reclosers was approximately $434,520. In 2012, $588,691 was spent to install 14 new electronic reclosers. In 2013, 14 new electronic reclosers were installed at a cost of $537,447. In 2014, 16 new electronic reclosers were installed at a cost of $714,938. In 2015, 10 new electronic reclosers were installed at a cost of $486,515. In 2016, no new electronic reclosers were installed for Poughkeepsie, Kingston or Catskill. A number of recloser installations were completed as part of Distribution Automation programs for Fishkill and Newburgh and are outlined in the Distribution Automation section. The cost of the program is expected to be $350,000 for 2017.

3. Instantaneous Reclose for Substation Breakers and Electronic Reclosers - Instantaneous reclose is the theory of re-energizing an electrical system within 12-30 cycles following a transient fault to restore the integrity of the system. 12-30 cycles equates to approximately 0.2–0.5 seconds, which should be ample time for transient faults to clear and small enough time to go unnoticed by rotating machines and electric drives. Therefore, the ultimate goal of instantaneous reclose is to allow for transient faults to clear while providing uninterrupted power to the end users.

   The Newburgh Union Avenue Substation circuits were chosen for a pilot program to implement instantaneous reclose. 2009 was the first year of this program. For each breaker operation resulting from a fault in the 1st zone of protection, customer calls were tracked. It was anticipated that with the new instantaneous reclose relay settings, there would be little to no impact to customers. This study concluded in March of 2012. Table 17 below shows the results from 2009 through 2012.

Year	Number of Breaker Operations	Number of Breaker Operations Resulting in Customer calls
2009	7	1
2010	8	0
2011	2	0
2012	6	0

Table 17 – Number of Breaker Operations and Resulting Customer Calls due to 1st Zone Faults

Due to the success of the study, Central Hudson continues to program distribution circuit breaker relays and electronic reclosers with instantaneous autoreclosing whenever feasible. Central Hudson plans to implement autoreclosing system wide as changes are made in a substation. The current process involves Electric System Protection notifying the District Electric Operations Engineer when an opportunity for application arises, such as the installation of new relays or if relays require setting changes for other purposes. Instantaneous autoreclose is not applied to circuits where sectionalizers are implemented downstream or on feeders where non-inverter based generation is present.

Because solar PV inverters take up to 2 seconds to detect an island and open, with the higher penetration of these resources the Company will have to significantly reduce implementation of this scheme over the next several years. This is particularly true on feeders where reclose blocking is applied in lieu of Direct Transfer Trip (DTT) for anti-islanding protection. With the reduction in instantaneous reclose usage, not only will the opening of the recloser be more visible to the customer, but it will result in the need to reduce the reach of these reclosers, negatively impacting SAIFI.

5-Year Capital Budgets and Expenditures

Table 18 below is a summary of 5-year distribution capital budgets and expenditures. The "Total Improvement Blankets" include minor overhead line improvement, infrastructure damage repairs, and underground line improvement. "Total Limited Term" includes overhead service replacements as well as other overhead minor equipment repairs/replacements. The "Total Relocation Blanket" includes expenditures involved with highway rebuilds. "Total Specifics" are major capital improvement projects.

	2012		2013		2014		2015		2016	
	Budgeted	**Expended**	**Budgeted**	**Expended**	**Budgeted**	**Expended**	**Budgeted**	**Expended**	**Budgeted**	**Expended**
Total Improvement Blankets	$4,680	$5,795	$4,969	$6,222	$4,942	$3,981	$8,087	$7,110	$9,634	$9,732
Total Limited Term	$1,530	$1,432	$1,500	$1,252	$1,350	$995	$0	$1,135	$0	$3,333
Total Relocation Blanket[3]	$115	-$23	$162	$126	$170	$50	$0	-$10	$75	$74
Total Specifics	$17,474	$14,755	$14,787	$12,278	$18,942	$15,511	$21,285	$20,503	$22,081	$18,501
TOTAL BUDGET GROUP 15	**$23,799**	**$21,959**[1]	**$21,418**	**$19,878**	**$25,403**[2]	**$20,537**[1]	**$29,372**	**$28,738**	**$31,790**	**$31,585**

Table 18 – Distribution 5-Year Budgets and Expenditures ($000)

[1]Historic restoration efforts in 2010, 2011, 2012 and 2014 as a result of the February 2010 snow storms, Hurricane Irene, the October 2011 snow storm, Super Storm Sandy and the November 2014 Thanksgiving snow storm resulted in decreased capital budget spending due to the lengthy restoration process after these events, loss of contract and company personnel to mutual aid, and mitigation of temporary repairs resulting from the restoration process.
[2]In 2014, the initial budget was lower ($22.154 million) and dollars were moved to enable authorization of work orders.
[3]Column added in 2014 to include distribution relocation budgets and expenditures.

Tables 19a and 19b summarize the total Transmission and Substation 5-year budgets and expenditures. These areas are indirectly related to Distribution in that they have an impact on reliability.

	Budgeted	Expended
2012 Total Budget	$11,227	$10,072
2013 Total Budget	$12,094	$11,512
2014 Total Budget	$13,123	$13,344
2015 Total Budget	$19,498	$19,284
2016 Total Budget	$20,846	$21,368

Table 19a – Transmission 5-Year Budgets and Expenditures ($000)

	Budgeted	Expended
2012 Total Budget	$17,372	$16,941
2013 Total Budget	$13,746	$13,022
2014 Total Budget	$14,722	$15,335
2015 Total Budget	$16,670	$17,199
2016 Total Budget	$19,309	$19,369

Table 19b – Substation 5-Year Budgets and Expenditures ($000)

Vegetation Management

Tree interruptions have historically been the greatest driver of Central Hudson's electric service reliability. Over the past five years, tree contacts have accounted for approximately 41% of Central Hudson's non-storm SAIFI.

In order to facilitate a description of Central Hudson's current vegetation management practices, it is helpful to provide the context of their origin. In 2001 the Enhanced Reliability Program was established. As part of that program, 960 miles of distribution circuits were trimmed using a new "Enhanced Trimming" specification. This specification, which was used on selected three-phase mainlines, calls for the removal of all overhang above the conductors, and provides for up to a fifteen-foot side clearance and fifteen foot under clearance. In addition, identified danger trees outside of the right-of-way are removed. Circuits for this Enhanced Trimming Program were ranked based on historical data for three-phase interruptions due to storm and tree outages using a cost per outage avoided metric ($/COA).

Central Hudson's routine trimming program that was used prior to March of 2007 was defined as a "Box" specification. Due to continual ongoing concerns regarding the significant impact of vegetation related outages on reliability, in July 2006, Central Hudson contracted with Environmental Consultants, Inc. (ECI) to assess our vegetation management practices. ECI is recognized as an expert in the industry having performed these types of reviews for over 150 utilities. Their study was completed on March 30, 2007 and the results and recommendations were reviewed with PSC staff on June 17, 2007. Some of ECI's recommendations included:

- The use of a "Modified Enhanced Trimming" (now "Routine Trimming") specification (emphasizing greater clearance and removal of more trees within the right-of-way) for the three-phase and single-phase distribution circuits as the standard for routine trimming on all lines.

- The continued selective use of "Enhanced Trimming" specification prioritized based on tree-caused customer interruptions per mile for the three-phase.

- Establish an ongoing work acceptance process designed to formally document and confirm work quality and work completion to established standards.

Following the review of the consultant's report and recommendations with PSC staff, Central Hudson moved forward implementing these recommendations, and currently uses the "Modified Enhanced Trimming" specification as its routine trimming program. This program has replaced the routine "box" trimming as our new standard for all circuits. Since 2011, the Modified Enhanced Trimming specification has simply been called the "Routine Trimming" program. As part of this change in specification, the trimming program cycle was changed to a four-year cycle. The four-year cycle was chosen based on analyzing the projected reliability improvement and cost associated between continuing with the current cycle applying modified enhanced trimming and a four-year cycle utilizing box trimming.

In August 2016, Central Hudson engaged Environmental Consultants, Inc. (ECI) to provide an updated assessment on Central Hudson's line clearance program and the state of tree-related outages. Some of ECI's recommendations from this updated report were to obtain increased funding to return to a four-year trimming schedule, create a separate schedule for circuits affected by the residency of protected bat species and to obtain funding for a widespread removal of Ash trees along three-phase circuitry to combat tree mortality caused by the Emerald Ash Borer.

Self Assessment

As mentioned above, one of ECI's recommendations was the establishment of a self-assessment program. Central Hudson discussed the status of its self-assessment program with Staff on March 18, 2008. At that meeting, Central Hudson indicated that a contract had been developed with ECI to perform a quality assurance audit of the trimming that was performed.

The self-assessment process is a two-part process. The first part is a field audit assessment performed by the contractor. The second part is an assessment of the reliability of the circuits trimmed using the "Modified Enhanced Trimming" specification. This is based on the system SAIFI statistics for pre and post trimming.

As part of our initial self-assessment and review of the Modified Enhanced Tree Trimming Program a field audit was conducted. These audits were completed in October and November of 2008. These circuits were field reviewed in their entirety as part of our initial test program for the field audits. Any follow-up items that were recommended from the field audits were identified and forwarded to the Director of Line Clearance for a corrective action plan and schedule for completion on all the findings. The audits will typically take place during the trimming process or after each circuit completion date to ensure that proper clearances have been obtained. It is planned that all circuit miles will be reviewed for each circuit being trimmed.

In 2011, the Routine Trimming program sustained a total improvement of 30.47% for tree related outages and 24.34% for the combination of tree and storm related outages. This same level of reliability improvement was maintained in 2012. In 2013, the total improvement for tree related outages was 27%. In 2014, the total improvement seen for tree and storm related outages, combined, were 33%. The aggregate total reliability improvement of tree and storm related outages would have been even better had it not been for the 5 most severe storms in Central Hudson's history (Twin Peaks in 2010, Tropical Storm Irene and "SnowFall" in 2011, Tropical Storm Sandy in 2012 and "SnowBird" in 2014). Expenditures related to the Tree Trimming program are listed in section 3e of this report.

Tree related outages represent the largest contributor to the SAIFI metric. In 2016, the contribution of non-storm tree related SAIFI compared to the overall system SAIFI was 42.4%. The increase in tree related SAIFI compared to the average of the previous 4 years was 15.9%. 2016 tree related storm SAIFI also saw an increase of 32.9% compared to the previous year. Non-storm tree related SAIFI as well as tree related SAIFI including storms are metrics that will continue to be measured for 2017. The five-year business plan incorporates improved performance related to SAIFI. To meet these targets, Central Hudson has identified and initiated implementation plans to improve performance. This includes collecting and reviewing tree related data after breaker lockouts, further reviewing trends related to trees species (particularly ash trees), as well as establishing an effective process for identifying and removing danger trees. In 2016, Central Hudson also engaged a consultant, Environmental Consultants, Inc. (ECI), to assess Central Hudson's line clearance program. For more information on opportunities and plans to improve our tree trimming program, including the recommendations provided by ECI, please see prior Section 1.b.i.

<u>Facility Inspection</u>

Central Hudson's facility inspection program has been in place for many years. All of Central Hudson's facility inspection activities comply with the minimum requirements set forth in the standards. The purpose of the inspections is to visually evaluate the equipment associated with overhead distribution and transmission facilities, and underground distribution facilities. Prior to the Order, Central Hudson had in place a comprehensive inspection program that in many cases exceeded the minimum requirements set forth in the standards. Inspection frequency for distribution and transmission structures is based on a five-year cycle. The following is a summary of the facility inspection program as reviewed in Central Hudson Gas & Electric's Electric System Planning Guides dated October 2013.

Structure Categories

Central Hudson Gas and Electric has approximately 233,770 individual facilities that require testing for the presence of stray voltage and in some cases facility inspection. These facilities are broken down into five main categories including:

- Distribution Overhead - wooden poles, guy wires, metallic risers and all attached devices that are accessible from the ground

- Underground Facilities - manholes, pull boxes, URD pad-mounted equipment and all devices associated with underground facilities

- Transmission Structures - all structures, guys, and down leads attached to the structures. Transmission structures support circuit voltages of 69 kilovolts and greater. Facilities that house circuits of lower voltage in addition to the transmission voltage levels are included in this category.

Distribution Overhead

There are approximately 209,296 distribution pole structures in Central Hudson's territory. These consist of primarily wooden poles. The poles support electric power distribution lines and equipment as well as telephone, cable, and other miscellaneous attachments. Those distribution structures that have ground wires, metallic risers, guy wires, or metal control boxes are required to be tested for stray voltage as part of the program. Distribution overhead facilities are included in both the stray voltage and inspection programs.

Underground Facilities

There are 1,252 system manholes and pull boxes as well as 14,640 URD pad-mounted devices on Central Hudson's system. The manholes and pull boxes are primarily located in Central Hudson's network areas. Pull boxes are typically provided with a concrete cover in a cast iron frame. Manholes are covered with a cast iron cover, steel grating, or reinforced concrete cover. The pad-mounted devices are associated with our URD (Underground Residential Distribution) system. The pad-mounted devices are installed on concrete or fiberglass bases and are themselves enclosed in metallic or fiberglass cabinets. These locations are included in both the stray voltage and facility inspection programs.

Transmission

Transmission facilities consist of all overhead transmission towers and pole structures with operating voltages of 69 kV or higher. There are a total of 8,582 individual transmission poles/towers in Central Hudson's system. Transmission structures that are either metallic or wood and have down grounds, guys or riser pipes were tested for stray voltage as part of this program. All transmission structures are field inspected as part of Central Hudson's facility inspection program.

Expenditures related to the Facility Inspection Program are listed in Table 20 below.

	2012	2013	2014	2015	2016
Total Budgeted	$722,184	$578,907	$627,166	$1,043,264	$917,973
Total Expenditures	$590,645	$753,505	$785,321	$1,010,464	$887,913

Table 20 – 5-Year Facility Inspection Program Expenditures

b) Operations and Maintenance (O&M) budgets and actual expenditures associated with reliability programs for each of the past 5 years

Table 21 below summarizes the total O&M 5-year budgets and expenditures.

		2012	2013	2014	2015	2016
Catskill	Budgeted	$1,487,937	$2,826,688	$1,291,112	$1,310,380	$1,107,594
	Actuals	$1,341,542	$1,443,175	$1,054,428	$1,107,802	$1,247,168
Construction	Budgeted	$3,040,399	$2,559,234	$3,404,897	$5,492,651	$3,626,364
	Actuals	$3,241,547	$3,197,770	$4,090,687	$5,112,891	$4,815,980
Fishkill	Budgeted	$1,591,570	$1,884,755	$1,520,979	$1,513,020	$1,001,822
	Actuals	$1,255,618	$1,795,347	$1,198,754	$1,758,820	$1,328,865
Kingston	Budgeted	$2,042,231	$3,450,350	$2,168,703	$ 2,251,692	$ 2,056,438
	Actuals	$1,868,266	$3,039,507	$2,058,170	$ 2,564,279	$ 2,434,120
Newburgh	Budgeted	$2,006,817	$2,772,009	$2,143,792	$2,177,578	$2,018,768
	Actuals	$1,895,690	$2,438,877	$2,009,243	$2,369,689	$2,204,731
Poughkeepsie	Budgeted	$2,116,397	$2,439,098	$1,925,843	$2,259,054	$2,575,166
	Actuals	$1,611,130	$2,576,318	$2,147,951	$ 2,545,377	$ 2,134,722
Service Workers	Budgeted	$669,878	$490,040	$609,605	$747,774	$857,857
	Actuals	$545,401	$813,099	$719,700	$973,550	$689,381
Total Budgets		$12,955,229	$16,422,174	$13,064,931	$15,752,149	$13,426,008
Total Actuals		$11,759,194	$15,304,093	$13,278,933	$16,432,408	$14,854,968

Table 21 – 5-Year O&M Budgets and Expenditures

c) The yearly average and peak field/construction work force numbers by job title for each of the past 5 years

The following is a listing of field/construction job titles:

Superintendent/Operating Supervisor
Line Foreman
Associate Line Foreman
Utility Forester **(new title in 2012)**
Assistant Utility Forester **(new title in 2014)**
Associate Utility Forester **(new title in 2015)**
T & D Maintenance Planner
Working Foreman/Woman 2/C LES&T (Line)
Lineman/Linewoman 1C, 2/C and 3/C
Service Worker A & B
Chief Line Clearance Man/Woman
Working Foreman/Woman 2/C LES&T (Splicer)
Working Foreman/Woman 1/C – PC
Splicer 1/C, 2/C & 3/C
Field Clerk/Storekeeper

Peak and average work force numbers by specific job title are not available. Table 22 below summarizes the total field/construction work force numbers over the past 5 years.

	2012		2013		2014		2015		2016	
Title	**Peak**	**Avg.**	**Peak**	**Avg.**	**Peak**	**Avg.**	**Peak**	**Avg.**	**Peak**	**Avg.**
Work Foreman/Woman 2/C LES&T	35	34	35	31	32	31	32	30	33	31.4
Work Foreman/Woman 2/C LES&T – Splicer	1	1	0	0	1	1	3	1	3	3
Working Foreman/Woman 1C - PC	9	8	17	13	17	16	15	14	14	12.3
Lineman/Linewoman 1/C	39	37	37	33	33	31	32	29	32	24.6
Service Worker A	31	30	32	31	30	29	31	30	31	28.6
Service Worker B	3	1	0	0	5	1	2	0	8	2.3
Lineman/Linewoman 3/C	14	8	18	14	18	13	22	18	24	17.3
Splicer 1/C	5	5	6	5	5	5	6	5	6	5.3
Splicer 2/C	3	2	4	3	6	4	5	3	3	1.7
Splicer 3/C	2	2	2	2	2	2	2	0	0	0
Chief Line Clearance Man/Woman	2	2	2	2	2	2	2	2	2	2
Utility Workers	8	4	2	2	5	2	6	3	5	3.1
Line Foreman	17	16	18	17	18	17	18	18	22	20.7
Associate Line Foreman					2	1	2	2	2	2
Line Clearance Foreman*	1	1	1	1	1	1	1	1	0	0
Utility Forester	2	2	3	3	1	1	2	1	2	2
Associate Utility Forester							1	1	1	1
Assistant Utility Forester					2	2	2	2	1	1
Director	3	3	3	3	5	4	5	5	5	5
Superintendent/Operating Supervisor	6	5	7	7	6	5	5	5	5	5
Engineer	1	1	1	1	1	1	1	1	1	1
T & D Planner	3	1	3	2	5	4	4	4	4	3.9
Lineman/Linewoman 2/C	7	5	7	7	19	12	17	15	30	22.3
Field Clerk/Storekeeper	12	12	12	12	13	12	13	12	12	4.8
Total	204	180	210	189	229	197	229	203	246	200.3

Table 22 – 5-Year Field/Construction Work Force Numbers

In 2012, the Line Clearance Foreman title was replaced with Utility Forester

d) The yearly average and peak contractor crew numbers used by title/classification for each of the past 5 years

The following is a listing of title/classification of the contractor Line Clearance crews and Line Crews:

Line Clearance Personnel:	Line Crew Personnel
AF - (working) Foreman	Superintendent
JT - Journeyman Trimmer	General Foreman
T3 - Trimmer Class 3	Foreman
T2 - Trimmer Class 2	Working Foreman
T1 - Trimmer Class 1	Journeyman Lineman
	Apprentice 1st through 7th

Table's 23a and 23b summarize the average and peak Line Clearance and Line contractor FTE's over the past 5 years.

	2012	2013	2014	2015	2016
Average Contractor FTE	118	102.5	112	106	114.55
Peak Contractor FTE	189	123.6	138	131.9	158.65

Table 23a – 5-Year Average and Peak Contractor Line Clearance FTE's

	2012	2013	2014	2015	2016
Average Contractor FTE	48	17.4	29.7	52.55	53.86
Peak Contractor FTE	210	34.2	428	89.04	71.09

Table 23b – 5-Year Average and Peak Contractor Line FTE's

e) Distribution tree trimming budgets and actual expenditures for each of the past 5 years

Table 24 below is a summary of all Distribution Line clearance expenditures for each year over the past 5 years.

	2012	2013	2014	2015	2016
Total Budgeted (Distribution)	$10,610,724	$12,205,622	$11,258,596	$11,848,998	$13,318,253
Total Expenditures (Distribution)	$9,540,773	$12,717,942	$11,991,679	$11,450,271	$12,938,783
Total Budgeted (Transmission)	$2,127,248	$1,402,861	$1,708,745	$1,908,766	$1,741,062
Total Expenditures (Transmission)	$2,867,681	$1,367,029	$1,960,584	$1,973,514	$2,436,732

Table 24 – 5-Year Distribution Line Clearance Expenditures

4. Power Quality (PQ)

a) Provide PQ information as outlined in Section 4(d) of the service standards

A. 2016 Goals/Objectives/Targets for Power Quality:

The Company will continue its 2016 objective to improve power quality at the customer level. Central Hudson views power quality improvement as an opportunity to offer our customers expertise in the form of advisory services, systems, and equipment, which all add value to their electric service.

Responsibility for this objective includes members of the Customer Services Group and the Engineering Services Group. These groups continue the function of working with industrial, commercial and residential customers to define their power quality needs and to develop practical, cost-effective solutions to respond to these needs.

The work scope is as follows:

1) The Customer Services and the Engineering Services Groups will continue to meet with commercial, industrial, and residential customers to define their power quality needs and to develop practical, cost-effective solutions to their power quality concerns. These meetings will be arranged through the 4 District Directors.

2) Detailed reports will be individually prepared for each customer, summarizing the findings of the power quality assessment and recommending an action plan to improve the customer's power quality.

Central Hudson will continue to monitor momentary interruptions through its SCADA system, where available, in accordance with the 2004 Order Adopting Changes to Standards on Reliability of Electric Service. The Distribution Engineering Section will continue to review in detail the circumstances surrounding all distribution substation breaker operations in order to improve power quality. A proactive step taken in 2009 to improve power quality was to implement instantaneous reclose on the Union Avenue Substation distribution breakers as part of a pilot program. As expected, this pilot program reduced significantly the impact that transient faults had on the customers fed from this substation. Distribution Engineering will work with the Electric System Protection group to review applying instantaneous auto-reclose to substation distribution circuit breakers and instantaneous reclose settings will be implemented in all future electronic recloser installations wherever feasible. But unfortunately, the high penetration of solar PV will cause Central Hudson to reduce the application of this program for our customers, Details of this program and results to date, as well as the need to reduce implementation, are discussed in section 3a of this report.

<u>B. Power Quality Program – 2015 Activities:</u>

During 2016, the Customer Services and Engineering Services Groups continued to meet with residential, commercial and industrial customers to assess their power quality needs. The team worked with several of these customers to identify and resolve power quality problems, regardless of whether the root cause was the customer's or Central Hudson's equipment. As part of this program, Central Hudson continued to distribute the brochure entitled "Understanding & Avoiding Commercial Power Disturbances."

Central Hudson has continued to provide training to personnel involved with power quality. Central Hudson has also remained actively involved in industry initiatives such as EPRI's Power Quality Business Unit Council and Power Quality Interest Group. The activities will ensure that Central Hudson personnel remain in touch with the latest developments in power quality and can network with other industry experts concerning power quality equipment or case studies.

Central Hudson continues to participate with the NYPSC initiative to review and address power quality issues with the large industrial customers. Historically, Central Hudson has worked with Global Foundries on an ongoing basis to address power quality issues, to communicate and coordinate scheduled maintenance activities, and to work together during switching procedures to minimize customer impact. The NYPSC Power Quality work has enhanced this relationship by adding additional structure to event reporting and communication.

The parties have met during the year to review and discuss these incidents to identify trends, track follow-up activity, and investigate areas for improvement. In addition to disturbances which originated within Central Hudson's service territory, disturbances which were caused by events outside of the Central Hudson Service territory were also reviewed and options to mitigate the effects of these disturbances were explored during the course of year. The implementation of a "Premium Power" contract was discussed and a meeting was held with a third party to review the potential installation of site-specific devices to provide power quality ride-thru capability during system events. These efforts are expected to continue in 2017.

Central Hudson has worked over the past few years with IBM/Global Foundries and EPRI on a specific project to address power quality issues. The project included two scopes, the first phase is to perform a power quality investigation of IBM/Global Foundries to determine the susceptibility of current tool sets and identify cost effective design and mitigation strategies, and the second phase is to use this information and information from other investigations to propose modifications to the existing SEMI F47 criteria that will close gaps in the current criteria and develop recommendations for new testing standards.

In August 2015, the power quality investigation phase was completed and a number of devices and controls were found to be operating well below the SEMI F47 power quality standard. There were a number of recommendations developed for improvements within the manufacturing facility which would improve the facility's ability to ride through power disturbances both within and outside of the facility. The costs for these improvements were nominal when compared to the impact of these power disturbances or the cost of a feeder or utility level solution. Based on the success of the initial power quality study, additional power quality studies have been discussed for manufacturing areas that were not tested.

During 2016, Central Hudson and Global Foundries continued to work together to track system incidents that had an impact on Global Foundries. Central Hudson has continued to report, on a quarterly basis, all power quality events that have been identified by the customer as having impacted their facilities. In addition, Central Hudson installed power quality monitoring at the feeder level during the second quarter of 2016, to improve its ability to track and monitor power quality events at the facility.

C. Power Quality Complaints – Data Collection Methodology, Reporting, Requirements and Results:

Background

As stated in Section 3, Service Reliability Objectives, of PSC Cases 02-E-1240 and 02-E-0701, the New York State Public Service Commission requires all large electric utilities to record the number of power quality complaints received, the number of investigations conducted during the year and the results of the investigations. The results of the investigations must indicate if the origin of the disturbance was the responsibility of the utility or customer and be categorized as follows: momentary interruptions, over voltage condition, under voltage condition, voltage sags and swells, transients, harmonics and noise or unknown.

As stated in Section 5 of the Cases mentioned above, these results must be included in an annual report to the PSC by March 31 of every year along with other specified information regarding electric service standards.

Data Collection Methodology

Power quality complaints are investigated by our field forces. Depending on the nature of the investigation, a dispatch order or trouble order is created to track the investigation from the time the complaint is received to the time the investigation is completed. The employee conducting the investigation will note on the order the nature of the disturbance and results of the investigation. All information regarding the order is recorded electronically through our Customer Information System (CIS).

Data Reporting

An internal program was created to query data from our CIS regarding power quality complaint investigations. The program "pulls" relevant data from all dispatch and trouble orders that have been created to track the investigations. Program output is then imported in Excel format. Once summarized in spreadsheet format, the records are scrutinized, sorted, categorized and tallied, by administrative staff, based on reporting requirements mentioned above. Table's 25a, 25b and 25c provide details of the Power Quality Program for 2016:

2016 Power Quality Program Report

District	PQ Complaints Received	Investigations Conducted
Catskill	**27**	**27**

Kingston	**56**	**56**
Poughkeepsie	**58**	**58**
Fishkill	**41**	**41**
Newburgh	**79**	**79**
Total:	**261**	**261**

Table 25a – Number of PQ Complaints Received and Investigations Conducted by Operating District

District	Central Hudson	Customer	Unknown	Total
Catskill	**12**	**5**	**10**	**27**
Kingston	**18**	**21**	**17**	**56**
Poughkeepsie	**20**	**19**	**19**	**58**
Fishkill	**13**	**10**	**18**	**41**
Newburgh	**24**	**29**	**26**	**79**
Total:	**87**	**84**	**90**	**261**

Table 25b – Origin of Disturbance by Operating District

	Catskill	Kingston	Poughkeepsie	Fishkill	Newburgh	Total
Momentary Interruptions	1	5	3	2	3	14
Over Voltage	5	12	7	5	10	39
Under Voltage	4	1	5	1	7	18
Voltage Sag/Swell	6	13	15	7	25	66
Transients	0	1	2	0	0	3
Harmonics & Noise	0	0	0	0	1	1
Unknown	6	10	16	16	22	70
No Problem	6	15	10	11	10	52
Totals	27	57	58	42	78	262

Table 25c – Disturbance Category by Operating District

b) Provide the number of momentary interruptions recorded and the MAIFIe calculation on a company-wide basis along with by operating division for each of the past 5 years

Central Hudson separates all momentary interruptions by voltage class. Voltage class is defined as the voltage at the substation at which the operation occurred to cause a momentary interruption to customers. Momentary interruptions have been recorded for all circuits with full and limited monitoring systems. An exemption was granted in January, 2006 for all circuits that do not have Supervisory Control and Data Acquisition (SCADA) systems. In summary, 94% of Central Hudson's feeders affecting 95% of Central Hudson's customers have a form of SCADA equipment (limited or non-limited) that capture operations, including momentary operations.

MAIFIe uses a total district customer count in its calculations. Events related to faults initiated at the transmission and sub transmission voltage level include customer counts for distribution circuits for which monitoring is not available. Table 26a is a summary of all recorded momentary interruptions for each Operating District, as well as the System total from 2012 through 2016. Table 26b is the calculated MAIFIe for each Operating District, as well as the System total from 2012 through 2016.

It should be noted that in some cases, it is desirable to sustain a momentary interruption to avoid a permanent interruption for transient faults, which the electric industry typically states accounts for 80-85% of faults.

Operating District	Year				
	2012	2013	2014	2015	2016
Catskill	9	23	20	16	15
Kingston	37	50	55	45	53
Poughkeepsie	46	37	47	41	50
Fishkill	34	24	27	25	17
Newburgh	42	30	38	43	57
System Total	168	164	187	170	192

Table 26a – 5-Year District and System Number of Momentary Interruptions

Operating District	Year				
	2012	2013	2014	2015	2016
Catskill	0.238	2.353	1.155	0.676	0.749
Kingston	0.866	1.700	1.266	1.153	1.307
Poughkeepsie	1.040	0.767	0.998	0.718	0.734
Fishkill	0.725	0.476	0.605	0.529	0.427
Newburgh	0.787	0.490	0.723	0.839	0.826
System Total	0.794	1.038	0.941	0.807	0.833

Table 26b – 5-Year District and System MAIFIe

5. Circuit Performance

a) Provide a listing of circuits, by operating area, based on SAIFI and CAIDI performance for the calendar year

CATSKILL OPERATING DISTRICT

Circuits Sorted By Individual Circuit SAIFI (Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
2389	Catskill	1,710	5,301	10825.734	379.850	3.100	122.532
2071	Catskill	1,238	3,275	5593.250	271.078	2.645	102.472
1092	Catskill	2,240	5,586	10132.101	271.396	2.494	108.830
1091	Catskill	1,692	4,000	7431.234	263.519	2.364	111.469
1071	Catskill	1,443	2,938	5538.550	230.293	2.036	113.109
2061	Catskill	2,104	3,518	10391.650	296.340	1.672	177.231
2001	Catskill	1,941	3,187	5685.617	175.753	1.642	107.040
2387	Catskill	330	535	980.750	178.318	1.621	109.991
1074	Catskill	896	1,348	2046.683	137.055	1.504	91.099
2004	Catskill	1,160	1,693	1493.133	77.231	1.459	52.917
1072	Catskill	696	991	1791.033	154.399	1.424	108.438
2006	Catskill	818	970	1565.450	114.825	1.186	96.832
2042	Catskill	1,575	1,683	2648.600	100.899	1.069	94.424
2385	Catskill	1,914	1,989	5496.283	172.297	1.039	165.800
3002L	Catskill	119	102	101.433	51.143	0.857	59.667
2043	Catskill	1,279	1,056	2108.017	98.891	0.826	119.774
1083	Catskill	1,504	1,193	2030.683	81.011	0.793	102.130
2041	Catskill	1,571	1,064	2002.283	76.472	0.677	112.911
1081	Catskill	998	640	976.883	58.730	0.641	91.583
2005	Catskill	1,986	1,096	1923.517	58.112	0.552	105.302
2003	Catskill	1,819	822	1074.683	35.449	0.452	78.444
2081	Catskill	1,135	495	847.733	44.814	0.436	102.756
1082	Catskill	1,496	260	528.900	21.213	0.174	122.054
1076	Catskill	1,192	204	296.500	14.925	0.171	87.206
2002	Catskill	1,535	249	338.350	13.225	0.162	81.530
1000H	Catskill	2	0	0	0	0	0
2082	Catskill	1	0	0	0	0	0

Circuits Sorted By Individual Circuit CAIDI
(Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
2061	Catskill	2,104	3,518	10391.650	296.340	1.672	177.231
2385	Catskill	1,914	1,989	5496.283	172.297	1.039	165.800
2389	Catskill	1,710	5,301	10825.734	379.850	3.100	122.532
1082	Catskill	1,496	260	528.900	21.213	0.174	122.054
2043	Catskill	1,279	1,056	2108.017	98.891	0.826	119.774
1071	Catskill	1,443	2,938	5538.550	230.293	2.036	113.109
2041	Catskill	1,571	1,064	2002.283	76.472	0.677	112.911
1091	Catskill	1,692	4,000	7431.234	263.519	2.364	111.469
2387	Catskill	330	535	980.750	178.318	1.621	109.991
1092	Catskill	2,240	5,586	10132.101	271.396	2.494	108.830
1072	Catskill	696	991	1791.033	154.399	1.424	108.438
2001	Catskill	1,941	3,187	5685.617	175.753	1.642	107.040
2005	Catskill	1,986	1,096	1923.517	58.112	0.552	105.302
2081	Catskill	1,135	495	847.733	44.814	0.436	102.756
2071	Catskill	1,238	3,275	5593.250	271.078	2.645	102.472
1083	Catskill	1,504	1,193	2030.683	81.011	0.793	102.130
2006	Catskill	818	970	1565.450	114.825	1.186	96.832
2042	Catskill	1,575	1,683	2648.600	100.899	1.069	94.424
1081	Catskill	998	640	976.883	58.730	0.641	91.583
1074	Catskill	896	1,348	2046.683	137.055	1.504	91.099
1076	Catskill	1,192	204	296.500	14.925	0.171	87.206
2002	Catskill	1,535	249	338.350	13.225	0.162	81.530
2003	Catskill	1,819	822	1074.683	35.449	0.452	78.444
3002L	Catskill	119	102	101.433	51.143	0.857	59.667
2004	Catskill	1,160	1,693	1493.133	77.231	1.459	52.917
1000H	Catskill	2	0	0	0	0	0
2082	Catskill	1	0	0	0	0	0

KINGSTON OPERATING DISTRICT

Circuits Sorted By Individual Circuit SAIFI
(Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
3091	Kingston	1,757	9,940	28294.767	966.241	5.657	170.793
5084K	Kingston	641	2,918	5330.250	498.931	4.552	109.601
5022K	Kingston	32	138	306.533	574.750	4.313	133.275
3011	Kingston	1,798	5,844	20430.632	681.779	3.250	209.760
345	Kingston	430	1,392	2833.600	395.386	3.237	122.138
3012	Kingston	3,101	9,694	25311.383	489.740	3.126	156.662
3024	Kingston	2,368	7,314	17174.150	435.156	3.089	140.887
3082	Kingston	2,144	6,571	17837.985	499.197	3.065	162.879
2016	Kingston	2,171	6,401	11502.933	317.907	2.948	107.823
3023	Kingston	1,895	5,350	11323.416	358.525	2.823	126.992
1014	Kingston	1,745	4,635	7141.917	245.567	2.656	92.452
2094	Kingston	2,498	6,567	21493.334	516.253	2.629	196.376
3078	Kingston	1,748	3,868	10697.683	367.197	2.213	165.941
3003	Kingston	2,259	4,535	8053.600	213.907	2.008	106.553
1022	Kingston	2,327	4,233	12680.665	326.962	1.819	179.740
3022	Kingston	1,572	2,731	6005.600	229.221	1.737	131.943
1013	Kingston	885	1,461	5803.234	393.440	1.651	238.326
2017	Kingston	1,032	1,667	1077.550	62.648	1.615	38.784
3021	Kingston	1,690	2,666	5810.417	206.287	1.578	130.767
1011	Kingston	1,568	2,446	7344.601	281.043	1.560	180.162
3014	Kingston	1,614	2,483	6412.866	238.397	1.538	154.963
1003	Kingston	1,100	1,672	5050.633	275.489	1.520	181.243
3071	Kingston	719	1,064	2169.667	181.057	1.480	122.350
2011	Kingston	930	1,346	1962.700	126.626	1.447	87.490
3095	Kingston	418	556	1877.633	269.517	1.330	202.622
391	Kingston	278	353	785.267	169.482	1.270	133.473
3005	Kingston	67	85	147.817	132.373	1.269	104.341
1024	Kingston	1,946	2,463	7917.383	244.113	1.266	192.872
2091	Kingston	605	754	1360.183	134.894	1.246	108.237
377	Kingston	69	82	558.867	485.971	1.188	408.927
1021	Kingston	935	1,090	1497.767	96.113	1.166	82.446
2001K	Kingston	132	149	483.033	219.561	1.129	194.510
3081	Kingston	1,252	1,392	3057.383	146.520	1.112	131.784
1023	Kingston	18	19	64.917	216.389	1.056	205.000
3006	Kingston	26	27	6.400	14.769	1.038	14.222
3002	Kingston	1,958	2,032	5246.517	160.772	1.038	154.917
3096	Kingston	332	332	2111.633	381.620	1.000	381.620
375	Kingston	163	163	214.617	79.000	1.000	79.000
3001	Kingston	2,477	2,423	3746.767	90.757	0.978	92.780
2092	Kingston	1,023	978	1801.467	105.658	0.956	110.519

Circuits Sorted By Individual Circuit SAIFI (cont.)
(Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
121	Kingston	160	124	2018.733	757.025	0.775	976.806
3004	Kingston	1,135	857	1386.667	73.304	0.755	97.083
3013	Kingston	1,786	1,331	3419.417	114.874	0.745	154.143
112	Kingston	721	472	5595.667	465.659	0.655	711.314
2093	Kingston	2,147	1,161	2786.650	77.876	0.541	144.013
396	Kingston	512	247	389.833	45.684	0.482	94.696
2015	Kingston	1,860	841	3055.833	98.575	0.452	218.014
2014	Kingston	155	64	76.800	29.729	0.413	72.000
2013	Kingston	995	380	487.267	29.383	0.382	76.937
1012	Kingston	1,716	646	1412.583	49.391	0.376	131.200
3083	Kingston	526	194	596.783	68.074	0.369	184.572
341	Kingston	400	111	451.533	67.730	0.278	244.072
3076	Kingston	1,089	268	430.033	23.693	0.246	96.276
111	Kingston	589	94	182.667	18.608	0.160	116.596
3072	Kingston	776	107	594.200	45.943	0.138	333.196
2012	Kingston	317	20	17.900	3.388	0.063	53.700
122	Kingston	251	13	28.817	6.888	0.052	133.000
123	Kingston	33	0	0	0	0	0
1001	Kingston	1	0	0	0	0	0
2018	Kingston	29	0	0	0	0	0
300KO	Kingston	1	0	0	0	0	0
300GM	Kingston	1	0	0	0	0	0
397	Kingston	12	0	0	0	0	0
3NTWK	Kingston	365	0	0	0	0	0
1002	Kingston	3	0	0	0	0	0
395	Kingston	20	0	0	0	0	0

Circuits Sorted By Individual Circuit CAIDI
(Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
121	Kingston	160	124	2018.733	757.025	0.775	976.806
112	Kingston	721	472	5595.667	465.659	0.655	711.314
377	Kingston	69	82	558.867	485.971	1.188	408.927
3096	Kingston	332	332	2111.633	381.620	1.000	381.620
3072	Kingston	776	107	594.200	45.943	0.138	333.196
341	Kingston	400	111	451.533	67.730	0.278	244.072
1013	Kingston	885	1,461	5803.234	393.440	1.651	238.326
2015	Kingston	1,860	841	3055.833	98.575	0.452	218.014
3011	Kingston	1,798	5,844	20430.632	681.779	3.250	209.760
1023	Kingston	18	19	64.917	216.389	1.056	205.000
3095	Kingston	418	556	1877.633	269.517	1.330	202.622
2094	Kingston	2,498	6,567	21493.334	516.253	2.629	196.376
2001K	Kingston	132	149	483.033	219.561	1.129	194.510
1024	Kingston	1,946	2,463	7917.383	244.113	1.266	192.872
3083	Kingston	526	194	596.783	68.074	0.369	184.572
1003	Kingston	1,100	1,672	5050.633	275.489	1.520	181.243
1011	Kingston	1,568	2,446	7344.601	281.043	1.560	180.162
1022	Kingston	2,327	4,233	12680.665	326.962	1.819	179.740
3091	Kingston	1,757	9,940	28294.767	966.241	5.657	170.793
3078	Kingston	1,748	3,868	10697.683	367.197	2.213	165.941
3082	Kingston	2,144	6,571	17837.985	499.197	3.065	162.879
3012	Kingston	3,101	9,694	25311.383	489.740	3.126	156.662
3014	Kingston	1,614	2,483	6412.866	238.397	1.538	154.963
3002	Kingston	1,958	2,032	5246.517	160.772	1.038	154.917
3013	Kingston	1,786	1,331	3419.417	114.874	0.745	154.143
2093	Kingston	2,147	1,161	2786.650	77.876	0.541	144.013
3024	Kingston	2,368	7,314	17174.150	435.156	3.089	140.887
391	Kingston	278	353	785.267	169.482	1.270	133.473
5022K	Kingston	32	138	306.533	574.750	4.313	133.275
122	Kingston	251	13	28.817	6.888	0.052	133.000
3022	Kingston	1,572	2,731	6005.600	229.221	1.737	131.943
3081	Kingston	1,252	1,392	3057.383	146.520	1.112	131.784
1012	Kingston	1,716	646	1412.583	49.391	0.376	131.200
3021	Kingston	1,690	2,666	5810.417	206.287	1.578	130.767
3023	Kingston	1,895	5,350	11323.416	358.525	2.823	126.992
3071	Kingston	719	1,064	2169.667	181.057	1.480	122.350
345	Kingston	430	1,392	2833.600	395.386	3.237	122.138
111	Kingston	589	94	182.667	18.608	0.160	116.596
2092	Kingston	1,023	978	1801.467	105.658	0.956	110.519
5084K	Kingston	641	2,918	5330.250	498.931	4.552	109.601
2091	Kingston	605	754	1360.183	134.894	1.246	108.237
2016	Kingston	2,171	6,401	11502.933	317.907	2.948	107.823

Circuits Sorted By Individual Circuit CAIDI (cont.)
(Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
3003	Kingston	2,259	4,535	8053.600	213.907	2.008	106.553
3005	Kingston	67	85	147.817	132.373	1.269	104.341
3004	Kingston	1,135	857	1386.667	73.304	0.755	97.083
3076	Kingston	1,089	268	430.033	23.693	0.246	96.276
396	Kingston	512	247	389.833	45.684	0.482	94.696
3001	Kingston	2,477	2,423	3746.767	90.757	0.978	92.780
1014	Kingston	1,745	4,635	7141.917	245.567	2.656	92.452
2011	Kingston	930	1,346	1962.700	126.626	1.447	87.490
1021	Kingston	935	1,090	1497.767	96.113	1.166	82.446
375	Kingston	163	163	214.617	79.000	1.000	79.000
2013	Kingston	995	380	487.267	29.383	0.382	76.937
2014	Kingston	155	64	76.800	29.729	0.413	72.000
2012	Kingston	317	20	17.900	3.388	0.063	53.700
2017	Kingston	1,032	1,667	1077.550	62.648	1.615	38.784
3006	Kingston	26	27	6.400	14.769	1.038	14.222
300GM	Kingston	1	0	0	0	0	0
2018	Kingston	29	0	0	0	0	0
123	Kingston	33	0	0	0	0	0
1002	Kingston	3	0	0	0	0	0
3NTWK	Kingston	365	0	0	0	0	0
395	Kingston	20	0	0	0	0	0
1001	Kingston	1	0	0	0	0	0
300KO	Kingston	1	0	0	0	0	0
397	Kingston	12	0	0	0	0	0

POUGHKEEPSIE OPERATING DISTRICT

Circuits Sorted By Individual Circuit SAIFI
(Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
6053	Poughkeepsie	702	2,705	7734.467	661.066	3.853	171.559
6055	Poughkeepsie	1,392	4,797	15766.733	679.601	3.446	197.207
6057	Poughkeepsie	1,886	6,044	15310.799	487.088	3.205	151.993
6052	Poughkeepsie	888	2,668	6139.434	414.827	3.005	138.068
6051	Poughkeepsie	924	2,502	11347.650	736.860	2.708	272.126
7011	Poughkeepsie	1,967	5,181	13988.584	426.698	2.634	161.999
7012	Poughkeepsie	1,737	4,356	10286.933	355.334	2.508	141.693
7053	Poughkeepsie	1,238	2,716	6648.033	322.199	2.194	146.864
6056	Poughkeepsie	597	1,217	3667.200	368.563	2.039	180.799
6001	Poughkeepsie	1,355	2,728	6119.717	270.984	2.013	134.598
7081	Poughkeepsie	1,812	3,593	11061.433	366.273	1.983	184.716
7051	Poughkeepsie	1,733	3,226	8955.600	310.061	1.862	166.564
7055	Poughkeepsie	1,678	3,036	5082.200	181.724	1.809	100.439
6093	Poughkeepsie	1,426	2,350	5052.549	212.590	1.648	129.001
6005	Poughkeepsie	89	146	451.383	304.303	1.640	185.500
7062	Poughkeepsie	751	1,202	6278.233	501.590	1.601	313.389
6064	Poughkeepsie	158	249	610.050	231.665	1.576	147.000
6092	Poughkeepsie	2,070	2,955	3590.283	104.066	1.428	72.899
6011	Poughkeepsie	1,130	1,560	3928.633	208.600	1.381	151.101
7025	Poughkeepsie	2,267	2,864	10457.350	276.772	1.263	219.079
6094	Poughkeepsie	864	1,076	1966.950	136.594	1.245	109.681
6091	Poughkeepsie	536	666	1146.800	128.373	1.243	103.315
7072	Poughkeepsie	1,285	1,587	9940.000	464.124	1.235	375.803
7091	Poughkeepsie	1,714	2,038	6444.667	225.601	1.189	189.735
6044	Poughkeepsie	931	1,103	1786.983	115.165	1.185	97.207
7071	Poughkeepsie	1,082	1,270	8486.783	470.616	1.174	400.950
7023	Poughkeepsie	310	361	1197.617	231.797	1.165	199.050
7085	Poughkeepsie	641	700	3821.800	357.735	1.092	327.583
6066	Poughkeepsie	1,164	1,223	1240.783	63.958	1.051	60.872
6095	Poughkeepsie	1,077	1,108	1526.600	85.047	1.029	82.668
6062	Poughkeepsie	850	874	1922.533	135.708	1.028	131.982
7052	Poughkeepsie	1,082	1,104	2758.700	152.978	1.020	149.929
6004	Poughkeepsie	257	259	597.900	139.588	1.008	138.510
500MS	Poughkeepsie	2	2	2.267	68.000	1.000	68.000
7395	Poughkeepsie	1	1	2.400	144.000	1.000	144.000
6074	Poughkeepsie	1,620	1,615	3397.650	125.839	0.997	126.228
6041	Poughkeepsie	1,040	1,000	3423.350	197.501	0.962	205.401
6068	Poughkeepsie	1,140	1,091	1791.583	94.294	0.957	98.529
7024	Poughkeepsie	2,235	1,967	3044.717	81.737	0.880	92.874
7092	Poughkeepsie	428	359	1224.017	171.591	0.839	204.571

Circuits Sorted By Individual Circuit SAIFI (cont.)
(Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
6097	Poughkeepsie	1,261	934	1537.850	73.173	0.741	98.791
6096	Poughkeepsie	1,466	1,084	1897.800	77.673	0.739	105.044
622	Poughkeepsie	613	436	1709.067	167.282	0.711	235.193
6046	Poughkeepsie	2,994	2,090	5486.584	109.952	0.698	157.510
7054	Poughkeepsie	1,553	1,016	2912.417	112.521	0.654	171.993
6042	Poughkeepsie	1,625	921	2606.233	96.230	0.567	169.787
NYSEG	Poughkeepsie	11	6	28.567	155.818	0.545	285.667
6003	Poughkeepsie	1,918	963	2716.833	84.990	0.502	169.273
500PO	Poughkeepsie	2	1	0.433	13.000	0.500	26.000
6065	Poughkeepsie	1,899	948	1456.266	46.012	0.499	92.169
7061	Poughkeepsie	1,925	800	3200.367	99.752	0.416	240.027
6002	Poughkeepsie	2,479	937	2835.150	68.620	0.378	181.546
6073	Poughkeepsie	1,525	561	1036.183	40.768	0.368	110.822
7095	Poughkeepsie	284	102	311.900	65.894	0.359	183.471
6045	Poughkeepsie	630	225	682.817	65.030	0.357	182.084
6043	Poughkeepsie	1,030	358	500.983	29.184	0.348	83.964
6075	Poughkeepsie	1,511	516	1485.667	58.994	0.341	172.752
7056	Poughkeepsie	679	201	521.800	46.109	0.296	155.761
7042	Poughkeepsie	1,325	327	1132.717	51.293	0.247	207.838
7041	Poughkeepsie	1,972	375	1197.583	36.438	0.190	191.613
6063	Poughkeepsie	538	101	325.083	36.255	0.188	193.119
624	Poughkeepsie	324	45	113.417	21.003	0.139	151.222
6061	Poughkeepsie	1,071	128	279.017	15.631	0.120	130.789
6008	Poughkeepsie	2,012	187	375.067	11.185	0.093	120.342
7058	Poughkeepsie	139	6	18.300	7.899	0.043	183.000
623	Poughkeepsie	318	13	23.617	4.456	0.041	109.000
621	Poughkeepsie	313	0	0	0	0	0
5000W	Poughkeepsie	1	0	0	0	0	0
5NTWK	Poughkeepsie	885	0	0	0	0	0
500PU	Poughkeepsie	1	0	0	0	0	0
500PD	Poughkeepsie	3	0	0	0	0	0

Circuits Sorted By Individual Circuit CAIDI
(Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
7071	Poughkeepsie	1,082	1,270	8486.783	470.616	1.174	400.950
7072	Poughkeepsie	1,285	1,587	9940.000	464.124	1.235	375.803
7085	Poughkeepsie	641	700	3821.800	357.735	1.092	327.583
7062	Poughkeepsie	751	1,202	6278.233	501.590	1.601	313.389
NYSEG	Poughkeepsie	11	6	28.567	155.818	0.545	285.667
6051	Poughkeepsie	924	2,502	11347.650	736.860	2.708	272.126
7061	Poughkeepsie	1,925	800	3200.367	99.752	0.416	240.027
622	Poughkeepsie	613	436	1709.067	167.282	0.711	235.193
7025	Poughkeepsie	2,267	2,864	10457.350	276.772	1.263	219.079
7042	Poughkeepsie	1,325	327	1132.717	51.293	0.247	207.838
6041	Poughkeepsie	1,040	1,000	3423.350	197.501	0.962	205.401
7092	Poughkeepsie	428	359	1224.017	171.591	0.839	204.571
7023	Poughkeepsie	310	361	1197.617	231.797	1.165	199.050
6055	Poughkeepsie	1,392	4,797	15766.733	679.601	3.446	197.207
6063	Poughkeepsie	538	101	325.083	36.255	0.188	193.119
7041	Poughkeepsie	1,972	375	1197.583	36.438	0.190	191.613
7091	Poughkeepsie	1,714	2,038	6444.667	225.601	1.189	189.735
6005	Poughkeepsie	89	146	451.383	304.303	1.640	185.500
7081	Poughkeepsie	1,812	3,593	11061.433	366.273	1.983	184.716
7095	Poughkeepsie	284	102	311.900	65.894	0.359	183.471
7058	Poughkeepsie	139	6	18.300	7.899	0.043	183.000
6045	Poughkeepsie	630	225	682.817	65.030	0.357	182.084
6002	Poughkeepsie	2,479	937	2835.150	68.620	0.378	181.546
6056	Poughkeepsie	597	1,217	3667.200	368.563	2.039	180.799
6075	Poughkeepsie	1,511	516	1485.667	58.994	0.341	172.752
7054	Poughkeepsie	1,553	1,016	2912.417	112.521	0.654	171.993
6053	Poughkeepsie	702	2,705	7734.467	661.066	3.853	171.559
6042	Poughkeepsie	1,625	921	2606.233	96.230	0.567	169.787
6003	Poughkeepsie	1,918	963	2716.833	84.990	0.502	169.273
7051	Poughkeepsie	1,733	3,226	8955.600	310.061	1.862	166.564
7011	Poughkeepsie	1,967	5,181	13988.584	426.698	2.634	161.999
6046	Poughkeepsie	2,994	2,090	5486.584	109.952	0.698	157.510
7056	Poughkeepsie	679	201	521.800	46.109	0.296	155.761
6057	Poughkeepsie	1,886	6,044	15310.799	487.088	3.205	151.993
624	Poughkeepsie	324	45	113.417	21.003	0.139	151.222
6011	Poughkeepsie	1,130	1,560	3928.633	208.600	1.381	151.101
7052	Poughkeepsie	1,082	1,104	2758.700	152.978	1.020	149.929
6064	Poughkeepsie	158	249	610.050	231.665	1.576	147.000
7053	Poughkeepsie	1,238	2,716	6648.033	322.199	2.194	146.864
7395	Poughkeepsie	1	1	2.400	144.000	1.000	144.000
7012	Poughkeepsie	1,737	4,356	10286.933	355.334	2.508	141.693

Circuits Sorted By Individual Circuit CAIDI (cont.)
(Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
6004	Poughkeepsie	257	259	597.900	139.588	1.008	138.510
6052	Poughkeepsie	888	2,668	6139.434	414.827	3.005	138.068
6001	Poughkeepsie	1,355	2,728	6119.717	270.984	2.013	134.598
6062	Poughkeepsie	850	874	1922.533	135.708	1.028	131.982
6061	Poughkeepsie	1,071	128	279.017	15.631	0.120	130.789
6093	Poughkeepsie	1,426	2,350	5052.549	212.590	1.648	129.001
6074	Poughkeepsie	1,620	1,615	3397.650	125.839	0.997	126.228
6008	Poughkeepsie	2,012	187	375.067	11.185	0.093	120.342
6073	Poughkeepsie	1,525	561	1036.183	40.768	0.368	110.822
6094	Poughkeepsie	864	1,076	1966.950	136.594	1.245	109.681
623	Poughkeepsie	318	13	23.617	4.456	0.041	109.000
6096	Poughkeepsie	1,466	1,084	1897.800	77.673	0.739	105.044
6091	Poughkeepsie	536	666	1146.800	128.373	1.243	103.315
7055	Poughkeepsie	1,678	3,036	5082.200	181.724	1.809	100.439
6097	Poughkeepsie	1,261	934	1537.850	73.173	0.741	98.791
6068	Poughkeepsie	1,140	1,091	1791.583	94.294	0.957	98.529
6044	Poughkeepsie	931	1,103	1786.983	115.165	1.185	97.207
7024	Poughkeepsie	2,235	1,967	3044.717	81.737	0.880	92.874
6065	Poughkeepsie	1,899	948	1456.266	46.012	0.499	92.169
6043	Poughkeepsie	1,030	358	500.983	29.184	0.348	83.964
6095	Poughkeepsie	1,077	1,108	1526.600	85.047	1.029	82.668
6092	Poughkeepsie	2,070	2,955	3590.283	104.066	1.428	72.899
500MS	Poughkeepsie	2	2	2.267	68.000	1.000	68.000
6066	Poughkeepsie	1,164	1,223	1240.783	63.958	1.051	60.872
500PO	Poughkeepsie	2	1	0.433	13.000	0.500	26.000
5NTWK	Poughkeepsie	885	0	0	0	0	0
500PD	Poughkeepsie	3	0	0	0	0	0
500PU	Poughkeepsie	1	0	0	0	0	0
5000W	Poughkeepsie	1	0	0	0	0	0
621	Poughkeepsie	313	0	0	0	0	0

FISHKILL OPERATING DISTRICT

Circuits Sorted By Individual Circuit SAIFI
(Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
8093	Fishkill	1,722	5,116	5970.917	208.046	2.971	70.026
8086	Fishkill	1,037	2,718	7823.916	452.686	2.621	172.713
8063	Fishkill	1,480	3,867	9171.351	371.811	2.613	142.302
8095	Fishkill	1,852	4,379	16543.983	535.982	2.364	226.682
8096	Fishkill	1,008	2,337	5337.850	317.729	2.318	137.044
8016	Fishkill	924	2,080	5220.600	339.000	2.251	150.594
8015	Fishkill	2,119	4,615	3924.049	111.110	2.178	51.017
8071	Fishkill	2,033	4,323	8647.533	255.215	2.126	120.021
8072	Fishkill	1,515	3,067	7569.017	299.763	2.024	148.073
8051	Fishkill	1,823	3,525	3523.466	115.967	1.934	59.974
8091	Fishkill	2,019	3,814	10443.133	310.346	1.889	164.286
8066	Fishkill	1,516	2,768	8034.117	317.973	1.826	174.150
8021	Fishkill	425	695	1612.717	227.678	1.635	139.227
8087	Fishkill	2,883	4,238	20257.384	421.590	1.470	286.796
8022	Fishkill	639	903	1609.200	151.099	1.413	106.924
8092	Fishkill	1,854	2,374	3140.766	101.643	1.280	79.379
8085	Fishkill	1,153	1,405	6864.583	357.220	1.219	293.149
8094	Fishkill	2,447	2,772	5681.800	139.317	1.133	122.983
8011	Fishkill	787	847	1024.900	78.137	1.076	72.602
8012	Fishkill	316	311	903.083	171.472	0.984	174.228
8023	Fishkill	1,148	1,037	2648.917	138.445	0.903	153.264
882	Fishkill	796	711	2306.750	173.876	0.893	194.662
8056	Fishkill	1,700	1,129	2277.033	80.366	0.664	121.012
8052	Fishkill	1,982	1,215	2368.500	71.700	0.613	116.963
8045	Fishkill	1,386	817	1225.217	53.040	0.589	89.979
8062	Fishkill	1,321	642	2518.150	114.375	0.486	235.341
8043	Fishkill	1,551	648	1330.350	51.464	0.418	123.181
8065	Fishkill	1,425	465	919.783	38.728	0.326	118.682
8014	Fishkill	1,962	489	1610.417	49.248	0.249	197.597
8024	Fishkill	1,135	237	432.383	22.857	0.209	109.464
8046	Fishkill	1,474	292	707.867	28.814	0.198	145.452
8013	Fishkill	994	170	267.567	16.151	0.171	94.435
8044	Fishkill	1,315	216	518.367	23.652	0.164	143.991
8055	Fishkill	1,135	179	555.717	29.377	0.158	186.274
700TR	Fishkill	1	0	0	0	0	0
700CM	Fishkill	2	0	0	0	0	0
8064	Fishkill	1	0	0	0	0	0
881	Fishkill	280	0	0	0	0	0
8025	Fishkill	30	0	0	0	0	0
700DC	Fishkill	1	0	0	0	0	0

Circuits Sorted By Individual Circuit SAIFI (cont.)
(Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
8041	Fishkill	1	0	0	0	0	0
8061	Fishkill	93	0	0	0	0	0

Circuits Sorted By Individual Circuit CAIDI
(Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
8085	Fishkill	1,153	1,405	6864.583	357.220	1.219	293.149
8087	Fishkill	2,883	4,238	20257.384	421.590	1.470	286.796
8062	Fishkill	1,321	642	2518.150	114.375	0.486	235.341
8095	Fishkill	1,852	4,379	16543.983	535.982	2.364	226.682
8014	Fishkill	1,962	489	1610.417	49.248	0.249	197.597
882	Fishkill	796	711	2306.750	173.876	0.893	194.662
8055	Fishkill	1,135	179	555.717	29.377	0.158	186.274
8012	Fishkill	316	311	903.083	171.472	0.984	174.228
8066	Fishkill	1,516	2,768	8034.117	317.973	1.826	174.150
8086	Fishkill	1,037	2,718	7823.916	452.686	2.621	172.713
8091	Fishkill	2,019	3,814	10443.133	310.346	1.889	164.286
8023	Fishkill	1,148	1,037	2648.917	138.445	0.903	153.264
8016	Fishkill	924	2,080	5220.600	339.000	2.251	150.594
8072	Fishkill	1,515	3,067	7569.017	299.763	2.024	148.073
8046	Fishkill	1,474	292	707.867	28.814	0.198	145.452
8044	Fishkill	1,315	216	518.367	23.652	0.164	143.991
8063	Fishkill	1,480	3,867	9171.351	371.811	2.613	142.302
8021	Fishkill	425	695	1612.717	227.678	1.635	139.227
8096	Fishkill	1,008	2,337	5337.850	317.729	2.318	137.044
8043	Fishkill	1,551	648	1330.350	51.464	0.418	123.181
8094	Fishkill	2,447	2,772	5681.800	139.317	1.133	122.983
8056	Fishkill	1,700	1,129	2277.033	80.366	0.664	121.012
8071	Fishkill	2,033	4,323	8647.533	255.215	2.126	120.021
8065	Fishkill	1,425	465	919.783	38.728	0.326	118.682
8052	Fishkill	1,982	1,215	2368.500	71.700	0.613	116.963
8024	Fishkill	1,135	237	432.383	22.857	0.209	109.464
8022	Fishkill	639	903	1609.200	151.099	1.413	106.924
8013	Fishkill	994	170	267.567	16.151	0.171	94.435
8045	Fishkill	1,386	817	1225.217	53.040	0.589	89.979
8092	Fishkill	1,854	2,374	3140.766	101.643	1.280	79.379
8011	Fishkill	787	847	1024.900	78.137	1.076	72.602
8093	Fishkill	1,722	5,116	5970.917	208.046	2.971	70.026
8051	Fishkill	1,823	3,525	3523.466	115.967	1.934	59.974
8015	Fishkill	2,119	4,615	3924.049	111.110	2.178	51.017
8025	Fishkill	30	0	0	0	0	0
700TR	Fishkill	1	0	0	0	0	0
881	Fishkill	280	0	0	0	0	0
8064	Fishkill	1	0	0	0	0	0
8061	Fishkill	93	0	0	0	0	0
700DC	Fishkill	1	0	0	0	0	0
700CM	Fishkill	2	0	0	0	0	0
8041	Fishkill	1	0	0	0	0	0

NEWBURGH OPERATING DISTRICT

Circuits Sorted By Individual Circuit SAIFI
(Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
4096	Newburgh	20	235	797.483	2392.450	11.750	203.613
4093	Newburgh	1,087	5,986	15344.884	847.004	5.507	153.808
4097	Newburgh	1,400	5,691	11074.018	474.601	4.065	116.753
4002	Newburgh	272	712	2535.000	559.191	2.618	213.624
5033	Newburgh	695	1,736	4553.300	393.091	2.498	157.372
5021	Newburgh	1,764	4,098	5404.884	183.840	2.323	79.134
5022	Newburgh	867	1,893	3901.367	269.991	2.183	123.657
5043	Newburgh	2,109	4,463	7512.932	213.739	2.116	101.003
4013	Newburgh	2,102	4,373	14158.017	404.130	2.080	194.256
5002	Newburgh	779	1,611	2226.117	171.460	2.068	82.909
5025	Newburgh	160	321	221.283	82.981	2.006	41.361
5041	Newburgh	2,020	4,014	9795.183	290.946	1.987	146.415
5082	Newburgh	1,701	3,188	5144.217	181.454	1.874	96.817
5034	Newburgh	200	372	1412.367	423.710	1.860	227.801
4052	Newburgh	2,250	4,061	2590.851	69.089	1.805	38.279
5023	Newburgh	2,087	3,549	1967.950	56.577	1.701	33.270
5024	Newburgh	1,307	2,198	1164.933	53.478	1.682	31.800
4014	Newburgh	710	1,091	3716.600	314.079	1.537	204.396
4042	Newburgh	1,643	2,499	5360.016	195.740	1.521	128.692
4015	Newburgh	1,175	1,787	1635.467	83.513	1.521	54.912
5001	Newburgh	1,872	2,633	3547.167	113.691	1.407	80.832
5083	Newburgh	1,588	2,191	2921.100	110.369	1.380	79.994
4011	Newburgh	1,700	2,216	3824.334	134.976	1.304	103.547
5054	Newburgh	324	420	989.800	183.296	1.296	141.400
4026	Newburgh	489	629	1291.616	158.481	1.286	123.207
5004	Newburgh	1,547	1,906	2536.834	98.390	1.232	79.858
4092	Newburgh	249	299	264.750	63.795	1.201	53.127
5003	Newburgh	1,498	1,692	4122.917	165.137	1.130	146.203
5051	Newburgh	1,156	1,259	2750.850	142.778	1.089	131.097
5013	Newburgh	1,656	1,757	3954.483	143.278	1.061	135.042
4053	Newburgh	1,606	1,613	2551.783	95.334	1.004	94.921
4003	Newburgh	1	1	2.433	146.000	1.000	146.000
4041	Newburgh	2,086	2,033	3342.217	96.133	0.975	98.639
4094	Newburgh	1,109	1,079	1267.967	68.601	0.973	70.508
5052	Newburgh	2,279	2,172	2820.000	74.243	0.953	77.901
5042	Newburgh	586	509	880.067	90.109	0.869	103.741
5012	Newburgh	1,857	1,137	2005.067	64.784	0.612	105.808
4044	Newburgh	1,576	918	1552.867	59.119	0.582	101.495
5011	Newburgh	1,341	742	2058.867	92.119	0.553	166.485
5031	Newburgh	2,089	1,107	3427.983	98.458	0.530	185.799
4051	Newburgh	1,748	896	3092.550	106.152	0.513	207.090
5081	Newburgh	1,938	880	1267.683	39.247	0.454	86.433
4022	Newburgh	519	234	445.000	51.445	0.451	114.103

Circuits Sorted By Individual Circuit SAIFI (cont.)
(Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
4095	Newburgh	1,221	536	1771.883	87.070	0.439	198.345
4024	Newburgh	1,096	451	570.850	31.251	0.411	75.945
4091	Newburgh	774	294	694.100	53.806	0.380	141.653
4023	Newburgh	1,968	657	777.133	23.693	0.334	70.971
5084	Newburgh	1,405	467	1136.233	48.522	0.332	145.983
4047	Newburgh	1,035	320	715.917	41.502	0.309	134.234
4054	Newburgh	2,493	536	1239.100	29.822	0.215	138.705
4012	Newburgh	1,314	266	549.300	25.082	0.202	123.902
4043	Newburgh	2,610	511	1020.700	23.464	0.196	119.847
5030	Newburgh	37	7	29.800	48.324	0.189	255.429
4045	Newburgh	762	144	305.300	24.039	0.189	127.208
4046	Newburgh	471	80	164.800	20.994	0.170	123.600
402	Newburgh	129	17	29.183	13.574	0.132	103.000
4021	Newburgh	1,639	179	322.267	11.797	0.109	108.022
410	Newburgh	817	63	186.767	13.716	0.077	177.873
4027	Newburgh	836	61	144.683	10.384	0.073	142.311
406	Newburgh	902	61	99.983	6.651	0.068	98.344
403	Newburgh	751	14	39.917	3.189	0.019	171.071
4001	Newburgh	1	0	0	0	0	0
407	Newburgh	110	0	0	0	0	0
800WN	Newburgh	3	0	0	0	0	0
572	Newburgh	525	0	0	0	0	0
5053	Newburgh	77	0	0	0	0	0
5005	Newburgh	1	0	0	0	0	0
4025	Newburgh	57	0	0	0	0	0
8NTWK	Newburgh	405	0	0	0	0	0
571	Newburgh	461	0	0	0	0	0
4098	Newburgh	1	0	0	0	0	0
800NB	Newburgh	1	0	0	0	0	0

Circuits Sorted By Individual Circuit CAIDI
(Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
5030	Newburgh	37	7	29.800	48.324	0.189	255.429
5034	Newburgh	200	372	1412.367	423.710	1.860	227.801
4002	Newburgh	272	712	2535.000	559.191	2.618	213.624
4051	Newburgh	1,748	896	3092.550	106.152	0.513	207.090
4014	Newburgh	710	1,091	3716.600	314.079	1.537	204.396
4096	Newburgh	20	235	797.483	2392.450	11.750	203.613
4095	Newburgh	1,221	536	1771.883	87.070	0.439	198.345
4013	Newburgh	2,102	4,373	14158.017	404.130	2.080	194.256
5031	Newburgh	2,089	1,107	3427.983	98.458	0.530	185.799
410	Newburgh	817	63	186.767	13.716	0.077	177.873
403	Newburgh	751	14	39.917	3.189	0.019	171.071
5011	Newburgh	1,341	742	2058.867	92.119	0.553	166.485
5033	Newburgh	695	1,736	4553.300	393.091	2.498	157.372
4093	Newburgh	1,087	5,986	15344.884	847.004	5.507	153.808
5041	Newburgh	2,020	4,014	9795.183	290.946	1.987	146.415
5003	Newburgh	1,498	1,692	4122.917	165.137	1.130	146.203
4003	Newburgh	1	1	2.433	146.000	1.000	146.000
5084	Newburgh	1,405	467	1136.233	48.522	0.332	145.983
4027	Newburgh	836	61	144.683	10.384	0.073	142.311
4091	Newburgh	774	294	694.100	53.806	0.380	141.653
5054	Newburgh	324	420	989.800	183.296	1.296	141.400
4054	Newburgh	2,493	536	1239.100	29.822	0.215	138.705
5013	Newburgh	1,656	1,757	3954.483	143.278	1.061	135.042
4047	Newburgh	1,035	320	715.917	41.502	0.309	134.234
5051	Newburgh	1,156	1,259	2750.850	142.778	1.089	131.097
4042	Newburgh	1,643	2,499	5360.016	195.740	1.521	128.692
4045	Newburgh	762	144	305.300	24.039	0.189	127.208
4012	Newburgh	1,314	266	549.300	25.082	0.202	123.902
5022	Newburgh	867	1,893	3901.367	269.991	2.183	123.657
4046	Newburgh	471	80	164.800	20.994	0.170	123.600
4026	Newburgh	489	629	1291.616	158.481	1.286	123.207
4043	Newburgh	2,610	511	1020.700	23.464	0.196	119.847
4097	Newburgh	1,400	5,691	11074.018	474.601	4.065	116.753
4022	Newburgh	519	234	445.000	51.445	0.451	114.103
4021	Newburgh	1,639	179	322.267	11.797	0.109	108.022
5012	Newburgh	1,857	1,137	2005.067	64.784	0.612	105.808
5042	Newburgh	586	509	880.067	90.109	0.869	103.741
4011	Newburgh	1,700	2,216	3824.334	134.976	1.304	103.547
402	Newburgh	129	17	29.183	13.574	0.132	103.000
4044	Newburgh	1,576	918	1552.867	59.119	0.582	101.495
5043	Newburgh	2,109	4,463	7512.932	213.739	2.116	101.003
4041	Newburgh	2,086	2,033	3342.217	96.133	0.975	98.639
406	Newburgh	902	61	99.983	6.651	0.068	98.344
5082	Newburgh	1,701	3,188	5144.217	181.454	1.874	96.817
4053	Newburgh	1,606	1,613	2551.783	95.334	1.004	94.921
5081	Newburgh	1,938	880	1267.683	39.247	0.454	86.433

Circuits Sorted By Individual Circuit CAIDI (cont.)
(Data excludes Major Storms)

Circuit #	Operating Area	Customers Served	Customers Interrupted	Interrupted Customer Hours	SAIDI (Minutes per Customer)	SAIFI (Interruptions per Customer)	CAIDI (Minutes per Interruption)
5002	Newburgh	779	1,611	2226.117	171.460	2.068	82.909
5001	Newburgh	1,872	2,633	3547.167	113.691	1.407	80.832
5083	Newburgh	1,588	2,191	2921.100	110.369	1.380	79.994
5004	Newburgh	1,547	1,906	2536.834	98.390	1.232	79.858
5021	Newburgh	1,764	4,098	5404.884	183.840	2.323	79.134
5052	Newburgh	2,279	2,172	2820.000	74.243	0.953	77.901
4024	Newburgh	1,096	451	570.850	31.251	0.411	75.945
4023	Newburgh	1,968	657	777.133	23.693	0.334	70.971
4094	Newburgh	1,109	1,079	1267.967	68.601	0.973	70.508
4015	Newburgh	1,175	1,787	1635.467	83.513	1.521	54.912
4092	Newburgh	249	299	264.750	63.795	1.201	53.127
5025	Newburgh	160	321	221.283	82.981	2.006	41.361
4052	Newburgh	2,250	4,061	2590.851	69.089	1.805	38.279
5023	Newburgh	2,087	3,549	1967.950	56.577	1.701	33.270
5024	Newburgh	1,307	2,198	1164.933	53.478	1.682	31.800
407	Newburgh	110	0	0	0	0	0
4025	Newburgh	57	0	0	0	0	0
4001	Newburgh	1	0	0	0	0	0
5005	Newburgh	1	0	0	0	0	0
4098	Newburgh	1	0	0	0	0	0
572	Newburgh	525	0	0	0	0	0
5053	Newburgh	77	0	0	0	0	0
8NTWK	Newburgh	405	0	0	0	0	0
571	Newburgh	461	0	0	0	0	0
800NB	Newburgh	1	0	0	0	0	0
800WN	Newburgh	3	0	0	0	0	0

b) Provide an analysis of the worst performing circuits. The analysis must cover a minimum of 5% of the circuits and include a description of the methodology used to identify the worst performing circuits

Through a State-wide Order for Standards on Reliability of Electric Service, the Public Service Commission requires that "each company shall develop and maintain a program for analyzing its worst-performing circuits during the course of each year…the companies shall analyze a minimum of five percent of its circuits as part of its circuit review program each year." The 21 circuits listed below represent approximately 7% of Central Hudson's electric distribution circuits.

The 2016 list included the worst 5% of circuits based on non-storm system SAIFI, and the worst 5% of circuits based on non-storm system ECM. In order to maintain a balance between addressing reoccurring problems (using 5 year averages) and new problems (looking at current year values), the following weighting is used to calculate the worst circuits: previous year, 50% weight; previous year – 2, 25% weight; previous year – 3, 15% weight; previous year – 4, 5% weight; previous year – 5, 5% weight. Table 27a is a list of the worst 5% of circuits based on System SAIFI. Table 27b is a list of the worst 5% of circuits based on System ECM. Table 27c is the combined worst 5% of circuits based on both System SAIFI and System ECM. Attachment #1 of this report is an analysis of each circuit listed in Table 27c.

District	Circuit #	Weighted System SAIFI
Kingston	3091	0.016
Kingston	3012	0.016
Kingston	3024	0.012
Kingston	3082	0.011
Kingston	2094	0.011
Kingston	2016	0.011
Poughkeepsie	6057	0.010
Newburgh	4093	0.010
Kingston	3011	0.010
Newburgh	4097	0.009
Catskill	1092	0.009
Kingston	3023	0.009
Catskill	2389	0.009
Poughkeepsie	7011	0.009
Fishkill	8093	0.008
Poughkeepsie	6055	0.008
Kingston	1014	0.008
Fishkill	8015	0.008
Kingston	3003	0.007

Table 27a –Worst 5% based on System SAIFI

District	Circuit #	Weighted System ECM
Kingston	3012	2.51
Kingston	2094	2.13
Kingston	3011	2.03
Fishkill	8087	2.01
Kingston	3082	1.77
Kingston	3024	1.70
Fishkill	8095	1.64
Poughkeepsie	6055	1.56
Newburgh	4093	1.52
Poughkeepsie	6057	1.52
Newburgh	4013	1.40
Poughkeepsie	7011	1.39
Kingston	1022	1.26
Kingston	3091	1.23
Kingston	2016	1.14
Poughkeepsie	6051	1.13
Kingston	3023	1.12
Newburgh	4097	1.10

Table 27b – Worst 5% based on System ECM

Catskill	Kingston	Poughkeepsie	Fishkill	Newburgh
1092	1014	6051	8015	4013
2389	1022	6055	8087	4093
	2016	6057	8093	4097
	2094	7011	8095	
	3003			
	3011			
	3012			
	3023			
	3024			
	3082			
	3091			

Table 27c – 2016 Worst Circuit List

6. Circuit Performance (Network)

a) Listing of network feeders (primary voltage) by operating area based upon the number of open automatics for the calendar year

Central Hudson has a total of nine (9) network feeders that serve less than 1% of its customers. None of these primary feeders experienced a fault that resulted in a negative impact to the Secondary Network customer reliability.

b) Analysis of the worst performing feeders. The analysis must cover a minimum of 5% of the feeders and include a description of the methodology used to identify the worst performing feeders

Central Hudson does not perform a "worst feeder analysis" on its Network Feeders due to the relatively small size of the network and very small percentage of customers fed from each network.

- END -