Georgia Power Company

Residential Meter Sample Testing Report

2024



Georgia Power

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Executive Summary

The Georgia Power Company Residential Meter Sample Testing Report is submitted to the Georgia Public Service Commission each year describing the results of watt-hour meter testing. ***The purpose of the testing program is to determine the calibration of the in-service meter population***. This program is not intended to address the calibration of an individual meter, but to monitor and trend the performance of the entire meter population and then identify issues before they reach an unacceptable defective rate.

This program analyzing the AMI (Advanced Metering Infrastructure) meter population was performed in accordance with Section E, Paragraph 8 of Georgia Power Company Rules and Regulations as approved by the Georgia Public Service Commission.

The report includes:

- A description of the sample test methodology
- Analyzed test results
- Any corrective action required

The results of the 2024 Sample Testing Plan are shown in Table A below. The defective percentages and numbers shown in this report are statistical *calculations* based on verified sampling techniques.

Sample Testing Plan and Results - Table A

Meter Manufacturer	Meter Code	Number of Meters in Service	Number of Meters in Sample	Expected % Defective in Population	Type Meter
Sensus	124P01, 194P01, 114P01	1,539,362	375	0.00%	AMI (2-way)
Sensus	124P02, 194P02, 114P02	67,929	150	0.00%	AMI (2-way)
Sensus	125P01	48,579	50	0.00%	AMI (2-way)
Sensus	125P02	11,817	100	0.00%	AMI (2-way)
Sensus	125P04	8,688	75	0.00%	AMI (2-way)
Sensus	132P01, 142P01	7,559	25	0.00%	AMI (2-way)
Sensus	132P02, 142P02	2,706	50	0.00%	AMI (2-way)
Sensus	132P04, 142P04	276	15	0.00%	AMI (2-way)
Sensus	124P04, 194P04, 114P04	188,957	200	0.00%	AMI (2-way)
Sensus	124P15	369,784	200	0.00%	AMI (2-way)
Landis + Gyr	124B04, 113B04 125B04, 194B04	3,782	25	0.00%	AMI (2-way)
Landis + Gyr	124B14, 194B14, 113B14	321,935	150	0.00%	AMI (2-way)
Elster	124D02, 125D02, 114D02	32,945	130	0.00%	AMI (2-way)
OPT OUT	Various	626	604	0.00%	Non-AMI
Total		**2,604,945**	**2,149**		

Note: A 0% defective failure rate is used to denote a failure rate below 0.004%. Table B-5 of ANSI Z1.9-2008 standard does not extend to failure rates below 0.004% for a 200-size sample (or one failure in 25,000 units).

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Results

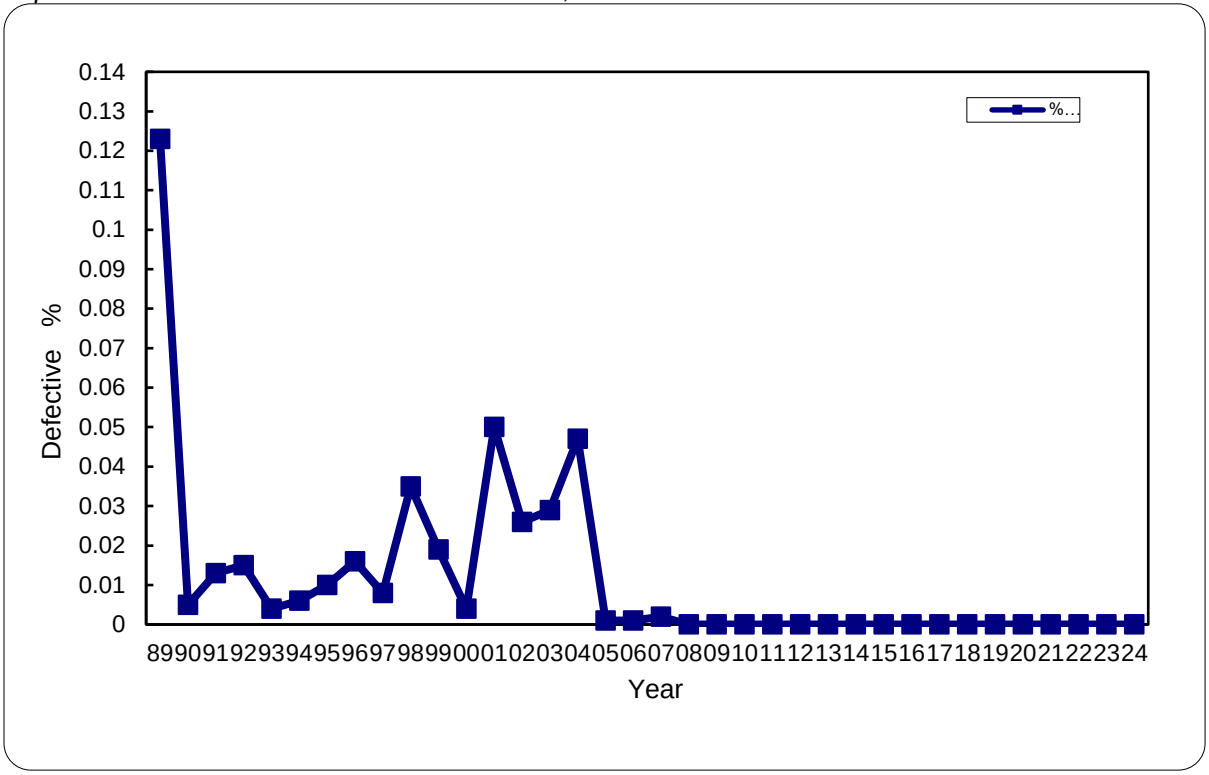
No corrective actions are required for any meter strata. The results of the sample testing plan for meters in service in 2024 indicates that there are no systemic meter metrology issues that need to be corrected at this time. Full details on each meter type are shown on the following pages.

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Historical Defective Meter Rates

Historically, the sample testing plan allows Georgia Power to monitor the meter population and identify remediation steps to maintain the +/- 2% acceptable range. Chart A shows the trending of the defective rates for the entire residential population of meters.

Expected Defective Rate for Residential Meters, 1988-2024 – Chart A



The sharp upward trend was primarily due to the increase in the failure rate of the three oldest meter groups installed on the system. These meters were types I-30, J, and MF. The meters were subsequently removed from the system. In 1989 these three groups comprised only 1.45% of the total meter population, but accounted for 71% of the failures resulting in a defective rate of 167 times higher than the general population.

In 2001 a program was initiated to replace obsolete meters with newer types (see Table B). The system performance improved as a result of the retrieval programs.

Retrieval Program - Table B

Meter Type	Meter Code	Placed in Retrieval
*MK	34B040	2001
MQ	34B060	2001
J2	34C040	2004
D5	34D090	2003
D	34D040	2005
J3	34C060	2005
*ICN	13P019, 34P019	2018
*ICN320	35P019	2019

*This meter group was being remediated because of functionality and not accuracy

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Terms and Definitions

The terms and definitions employed in this plan/procedure are in accordance with ANSI/ASQC Z1.9-2008, *Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming*. Mil-Std-414, dated 11 June 1957, and Notice 1, dated 8 May 1968, are canceled. Future references should be made to an accepted non-Government Standard such as the ANSI/ASQC Z1.9-2008. The tables and procedures contained within ANSI/ASQC Z1.9-2008 are those of the original Mil-Std-414, suitably modified to achieve interchangeability.

Acceptable Quality Limit: The *Acceptable Quality Limit* (AQL) is defined as the maximum percentage or proportion of nonconforming units in a lot or batch that, for purposes of acceptance sampling, can be considered satisfactory as a process average. The AQL is a nominal value expressed in terms of percent nonconforming specified for a single quality characteristic. The protection provided by the sampling test plan can be expressed in terms of risk. The AQL used in the Georgia Power Company Test Plan of 2.5% ideally lowers the risk {or lowers the probability} of acceptance as product quality drops below this AQL.

Bar-X (Sample Mean): Arithmetic mean, calculated by taking the sum of a set of numbers, X_1, X_2, X_3 ….. , Xn, divided by n. The X-bar, mean or average of numbers is used in statistics to determine the central position of data as that data relates to a set of numbers. The X-bar in the Meter Sample Test Report is used to establish the central tendency of the calibration data and is then compared to the test result plot points to the upper and lower limits.

Inspection: *Inspection* is the process of measuring, examining, testing, gauging, or otherwise comparing a unit of product with the applicable requirements. Appropriate electrical meter tests determine whether those meters manufactured and those in use maintain their established parameters over time and usage.

Inspection by Attributes: *Inspection by Attributes* is an inspection wherein the unit of product is classified simply as a *nonconforming unit* or *conforming* with respect to a given requirement or set of requirements. *Inspection by Attributes* as applied to the Meter Test program determines whether the tested meters are within their test parameters, and thus are labeled *conforming* or *nonconforming*.

Inspection by Variables: *Inspection by Variables* is inspection wherein a specified quality characteristic on a unit of product is measured on a continuous scale, such as pounds, inches, feet per second, etc., and a measurement is recorded. *Inspection by Variables* determines whether a particular parameter such as power is within its plus or minus requirements or not. A variable is any characteristic that has increments of good or increments of bad.

Lot (Lot Size, Population): A lot or population is a collection of units of product from which a sample is to be drawn and inspected to determine conformance with the acceptance criteria. The lot or populations of meters from all of the same manufacturer or the same class rating have been grouped by their homogenous characteristic.

Nonconformance: The failure of a unit of product to meet specified requirements. A failed meter is considered a *nonconforming* unit of product.

Operating Characteristic (OC) Curve: The OC curve indicates the relationship between the quality of lots submitted for inspection and the probability of acceptance. The protection afforded by sampling, that is, its capability to discriminate between good and bad quality can be calculated. The fact that these risks can be quantified makes it possible to state statistically (numerically) and predict product quality within a 95% confidence interval. An Operating Characteristic Curve is a graphical way of depicting the protection a sampling plan will provide.

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Percent Nonconforming: The extent of nonconformance of product shall be expressed in terms of *percent nonconforming*. The percent nonconforming for a quality characteristic of a given lot is the number of units of product nonconforming for that characteristic divided by the total number of units of product and multiplied by one hundred. Percent nonconforming is a mathematical expression to express a fractional amount of a whole or population.

Quality Characteristic: The *quality characteristic* for variable inspection is that characteristic of a unit of product that is actually measured to determine conformance with a given requirement. The Quality Characteristic in the Meter Test program is the conformance test applied to the meters sampled. The conformance test either yields a pass or a failure of all specification requirements.

Quality Index: A level to measure or compare the quality effort. Once the data is collected concerning the acceptability of a group of meters, that data is measured against a parameter or level to determine whether or not the level of acceptability has changed or remained the same.

Sampling Plans: A *sampling plan* is a procedure, which specifies the number of units of product from a lot, which is to be inspected, and the criterion for acceptability of the lot. Sampling plans designated in this procedure are applicable to the inspection of a single quality characteristic of a unit of product.

Sigma (or σ the standard deviation of the sample mean): The most widely used measure of variability is the *standard deviation* or *sigma*. It is defined as the square root of the average squared deviation from the mean. This value is a statistical expression which is used to describe a characteristic of data. Data will typically cluster around some central point or number. In the Meter Sample Test Report, the central point of data is the mean or X-bar; for calibration, this is typically 100%. The *sigma* establishes limits indicating a distribution of the test data (in Charts B-O these data points are evaluated within +/- 3 sigma limits).

Specification Limit: The *specification limit(s)* is the requirement that a quality characteristic should meet. This requirement may be expressed as an upper specification limit or a lower specification limit, called herein a single specification limit; or both upper and lower specification limits, called herein a double specification limit.

Variability: *Variability* is that characteristic which describes the tendency of a distribution to spread out from a centralized location. The two methods of measuring variability are by determining the range or determining the standard deviation. Low v*ariability* in meter calibration is desired.

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Sampling Principles, Inspection Economics, and Testing Standards

Sampling refers to the evaluation of a portion of a population (lot, batch, etc.) for the purpose of obtaining useful information about it. Normally, an acceptance or rejection decision is made based upon the results of the inspection or test of a sample of items from an entire lot.

Advantages of a sampling program:

- Economy: Valid evaluations of large populations of meters can be performed for a fraction of the cost.
- Less intrusive to the customer: Fewer customers are affected by employing sampling techniques.
- Less damage to the product from reduced handling: Incidentals at inspection are a defect source.
- Minimize inspector error induced by monotony of 100% inspection
- Focus is on quicker corrective actions and urges preventive measures in identifying and monitoring variations in performance of products proactively
- Properly designed sampling plans commonly require study of the actual required quality level in a lot. Resulting knowledge is a useful tool for the individual and organization

Other alternatives to sample testing for inspecting or testing a lot of products include:

- No inspection or testing
- Large or small samples
- 100% inspection and testing
- Redundant inspection and testing (greater than >100%)

The high reliability associated with components in complex electronic equipment coupled with automatic testing equipment resulted in the economic justification of sampling.

All in-service residential meters have been tested under the Selective Meter Test Program since 1965. The program is based on the Military Standard MIL STD 414 (1957), (ANSI Z 1.9-1972), (ANSI/ASQC Z 1.9-2008) *Sampling Procedures and Tables for Inspection by Variables for Percent Defective*, developed by the United States Department of Defense.

This type of sampling plan, while not originally developed for this application, is particularly well suited for meter inspection programs because it applies to a single quality characteristic which can be measured on a continuous scale for a double specification limit (i.e. fast and slow), and for which quality is expressed in terms of percent defective. This plan also has the advantage of providing a high confidence level for a relatively small sample size, resulting in a significant savings in testing costs, and at the same time, providing a highly accurate picture of the performance of each group of meters in the system.

The Selective Meter Test Program as applied to meter calibration is designed for an upper limit of 102%, a lower limit of 98%, and an acceptable quality limit (AQL) of 2.5. If the statistical analysis of the data for any group of meters results in more than 2.5% of the meter population being outside the upper and lower limits, corrective action is needed. These specifications (currently ANSI C12.1-2008) are almost universally accepted throughout the electric utility industry and dates back to the American National Standard Code for Electricity Metering, Fifth Edition, (ANSI C12, 1965).

When a single AQL value is established for the upper and lower specification limits combined for a single quality characteristic, the following steps are used.

- Determine the sample size code letter from Table A-2 of ANSI/ASQC Z1.9, by using the lot size and the inspection level II (normal).
- Select the plan from the Master Table B-3 of ANSI/ASQC Z1.9. Obtain the sample size (n) and the maximum allowable percent nonconforming (M).

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- Select at random the sample of (n) units from the lot; test and record the measurement of the quality characteristic on each unit of the sample.
- Compute the sample mean and the estimate of the lot standard deviation.
- Compute the quality index ($\mathbf{Q_L}$ and $\mathbf{Q_U}$).
- Determine the estimate of the lot percent nonconforming from Table B-5 of ANSI/ASQC Z1.9.
- If the estimated lot percent nonconforming is equal to or less than the maximum allowable percent nonconforming M, the lot is acceptable.
- If the estimated lot percent nonconforming is greater than the maximum allowable percent nonconforming M, the lot is rejected

The design of the program results in a 95% confidence level. Only a 5% chance or one chance in 20, of a group of meters exceeding the AQL would go undetected in any given year. The confidence is increased by a factor of 20 for each additional year of history on the group resulting in only one chance in 400 of a bad group going undetected for two consecutive years or one chance in 8,000 of a bad group going undetected for three consecutive years. It takes only a few short years to build the confidence in the system to a very high level.

Residential meters are divided into homogeneous groups; groups of like age, type, manufacturer, and rating. A random sample of meters is selected from each population group. The meters are removed and tested at the customers' location with a van specially equipped for testing. The test boards in the vans are checked daily against a reference standard. The meters are reinstalled after testing. The test results are used to calculate accuracy (Bar-X), standard deviation (Sigma), and percent defective for each group. The calculation formulas are:

Bar-X = $\mathbf{\Sigma X/N}$

Sigma, or $\sigma = \sqrt{\{[\Sigma(X - \text{Bar } X)^2]/(N-1)\}}$

$\mathbf{Q_L}$ = **(Bar X – Lower Limit)**/σ

$\mathbf{Q_U}$ = **(Upper Limit - Bar X)**/σ

Where:

Σ = Summation

X = Accuracy of Individual Meters

Bar-X = Average Accuracy of Meters in the Group

N= Number of Meters in the Group

σ = Standard Deviation

$\mathbf{Q_L}$ = Quality Index Lower

$\mathbf{Q_U}$ = Quality Index Upper

Lower Limit = 98%

Upper Limit = 102%

The $\mathbf{Q_L}$ and $\mathbf{Q_U}$ are then used to determine the estimated lot percent low and percent high for each group from Table B-5 of ANSI/ASQC Z1.9-2008. The lot percent defective is the sum of percent low and percent high. The maximum allowable lot percent defective which represents a population percent defective of 2.5% (2.5 AQL), can be found in Table B-3 of ANSI/ASQC Z1.9-2008, using the appropriate sample size.

A group of meters is considered acceptable if the estimated lot percent defective is equal to or less than the maximum allowable percent defective from Table B-3, and if neither $\mathbf{Q_L}$ nor $\mathbf{Q_U}$ is a negative value.

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Residential Sampling Plan

The 2024 Residential Sampling Test plan includes meters from each AMI strata. A complete summary of the meters in service, as well as those found in stock, are seen in Table C.

Meter Population - Table C

Meter Manufacturer	Meter Strata	Number of Meters in Stock	Number of Meters in Service	Total Number of Meters Owned
Sensus	IconA	28,748	1,539,362	1,568,110
Sensus	IconA G32	2,115	67,929	70,044
Sensus	IconA 320A	411	48,579	48,990
Sensus	IconA 320A G32	445	11,817	12,262
Sensus	IconA 320A G4	2,452	8,688	11,140
Sensus	SEICNA1	3,736	7,559	11,295
Sensus	SEICNA2	1,678	2,706	4,384
Sensus	SEICNA4	848	276	1,124
Sensus	IAG4	14,685	188,957	203,642
Sensus	SSRC	22,931	369,784	392,715
Landis + Gyr	LG Focus	597	3,782	4,379
Landis + Gyr	LG Focus RC	8,928	321,935	330,863
Elster	Elster A3	7,495	32,945	40,440
Various	OPT OUT	676	626	1,302
Total		**95,745**	**2,604,945**	**2,700,690**

Table C contains stock information meters in the sample test plan. The higher stock number is the result of equipment being received for installation. As meters are placed into service, the sample sizes are adjusted accordingly for subsequent samplings.

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To initiate the sampling testing plan, a random sample of the 2024 meter population (Table D) was pulled for testing. The actual testing is performed on the customer's site by Georgia Power Company employees. Documented test instructions are used to insure consistency in accordance with GPC Metering Services Quality Management processes.

Sample Size - Table D

Meter Manufacturer	Meter Strata	Number of Meters in Service	Number of Meters in Sample	Chart
Sensus	IconA	1,539,362	375	B
Sensus	IconA G32	67,929	150	C
Sensus	IconA 320A	48,579	50	D
Sensus	IconA 320A G32	11,817	100	E
Sensus	IconA 320A G4	8,688	75	F
Sensus	SEICNA1	7,559	25	G
Sensus	SEICNA2	2,706	50	H
Sensus	SEICNA4	276	15	I
Sensus	IAG4	188,957	200	J
Sensus	SSRC	369,784	200	K
Landis + Gyr	LG Focus	3,782	25	L
Landis + Gyr	LG Focus RC	321,935	150	M
Elster	Elster A3	32,945	130	N
Various	OPT OUT	626	604	
Total		**2,604,945**	**2,149**	

Meters with full-load accuracy errors due to damage or tampering are not included in the sample test calculations since they are not representative of the general population. The sample test meters excluded in 2024 are shown in Table E.

Analysis of Excluded Meters – Table E

Meter Manufacturer	Meter Strata	Meters Tested	# Failed	Problem
All	All	2,149	0	None
Total		**2,149**	**0**	

NOTE: The Opt-Out group of meters are comprised of both Mechanical and Solid-State (Non-AMI) construction. They are presently in use throughout the service area. The meters within this category are comprised of several different meter platforms with small populations. It is considered a unique category for evaluation due to it being grouped by rate versus meter platform. As a result, it does not lend itself to the traditional GPC Sample Testing Plan. Each meter within this group was 100% accuracy tested and summarized within the 2021 Residential Meter Sample Testing Report. With this information, GPC has determined that these meters fit a periodic based test plan.

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Results from the Statistical Analysis

Table F includes the resulting statistics of each meter strata tested in the 2024 Sample Testing Plan. It includes the sample mean (Bar-X), the standard deviation of the sample mean (sigma), and the corresponding high and low quality indices.

Sampling Statistics - Table F

Meter Manufacturer	Meter Strata	Sample Size	Bar-X variance from 100%	Sigma	Q_L	Q_U
Sensus	IconA	375	-0.022	0.120	16.48	16.85
Sensus	IconA G32	150	-0.050	0.181	10.77	11.33
Sensus	IconA 320A	50	0.030	0.094	21.53	20.89
Sensus	IconA 320A G32	100	0.020	0.063	31.86	31.23
Sensus	IconA 320A G4	75	0.020	0.051	39.45	38.67
Sensus	SEICNA1	25	0.000	0.139	14.39	14.39
Sensus	SEICNA2	50	-0.043	0.066	29.74	31.05
Sensus	SEICNA4	15	0.030	0.083	24.52	23.79
Sensus	IAG4	200	0.010	0.132	15.23	15.08
Sensus	SSRC	200	0.010	0.080	25.03	24.78
Landis + Gyr	LG Focus	25	-0.044	0.074	26.54	27.73
Landis + Gyr	LG Focus RC	150	0.000	0.097	20.64	20.64
Elster	Elster A3	130	-0.051	0.080	24.48	25.77
Various	OPT OUT	604	-0.027	0.256	7.71	7.92
Total		**2,149**				

Using the methodology from ANSI/ASQC Z1.9-2008, referenced in *Terms and Definitions,* the data in Table F indicates the following evaluation as represented in Table G.

Expected Population Defect Rate – Table G

Meter Manufacturer	Meter Strata	Population	% Low	% High	% Defect	Chart
Sensus	IconA	1,539,362	0.0%	0.0%	0.0%	B
Sensus	IconA G32	67,929	0.0%	0.0%	0.0%	C
Sensus	IconA 320A	48,579	0.0%	0.0%	0.0%	D
Sensus	IconA 320A G32	11,817	0.0%	0.0%	0.0%	E
Sensus	IconA 320A G4	8,688	0.0%	0.0%	0.0%	F
Sensus	SEICNA1	7,559	0.0%	0.0%	0.0%	G
Sensus	SEICNA2	2,706	0.0%	0.0%	0.0%	H
Sensus	SEICNA4	276	0.0%	0.0%	0.0%	I
Sensus	IAG4	188,957	0.0%	0.0%	0.0%	J
Sensus	SSRC	369,784	0.0%	0.0%	0.0%	K
Landis + Gyr	LG Focus	3,782	0.0%	0.0%	0.0%	L
Landis + Gyr	LG Focus RC	321,935	0.0%	0.0%	0.0%	M
Elster	Elster A3	32,945	0.0%	0.0%	0.0%	N
OPT OUT	Various	626	0.0%	0.0%	0.0%	
Total		**2,604,945**	**0.0%**	**0.0%**	**0.0%**	

Results

Based on the results of the 2024 Residential Sample Test Plan, the expected defect rate of each stratum is 0.0%.

Note: A 0% defective failure rate is used to denote a failure rate below 0.004%. Table B-5 of ANSI Z1.9-2008 standard does not extend to failure rates below 0.004% for a 200-size sample (or one failure in 25,000 units).

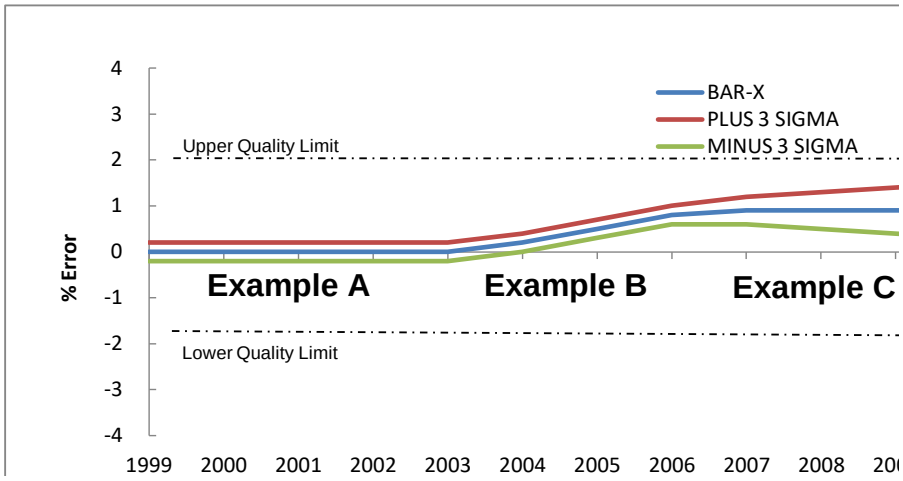
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How to Read the Test Results
Average Accuracy & Standard Deviation

The following pages show the test results of each strata of meter in the Georgia Power residential population. The purpose of the chart is to trend and measure key values that indicate the status of meter calibration over time. Consider the following chart (this is for information purposes only – it does not represent any actual meter type):

Understanding the Chart

The center blue line represents the average accuracy of the calibration of the meter when measuring kWh energy usage. Over time, it is desired that this line remains flat and close to 100.0% accuracy (0% Error).



The top red line represents the average accuracy plus three standard deviations calculated from the accuracy of each of the meters in the sample data. The bottom green line represents the average accuracy minus three standard deviations calculated from the accuracy of each of the meters in the sample data.

Together, the red and green lines indicate that it is expected that 99.7% of all of the meters from the population fall within the two lines. This is a standard way of indicating the variance over a period of time, for the purpose of indicating trends in the data (see next section).

Example A – A flat trending line near 100.0% with close variance to the mean indicates that the meter strata are not changing over time and that the vast majority of meters are close to 100% accurate. This is the desired state.

Example B – An upwardly changing trend in reference to the mean indicates that the calibration in this meter strata is running faster than each of the previous years. The close variance of the data indicates that the entire meter population is changing in the same way.

Example C – A flat trending line higher than 100.0% by itself may not be a reason for concern, but the increasing variability of the data suggests that some action may be necessary, including replacement of the meter strata.

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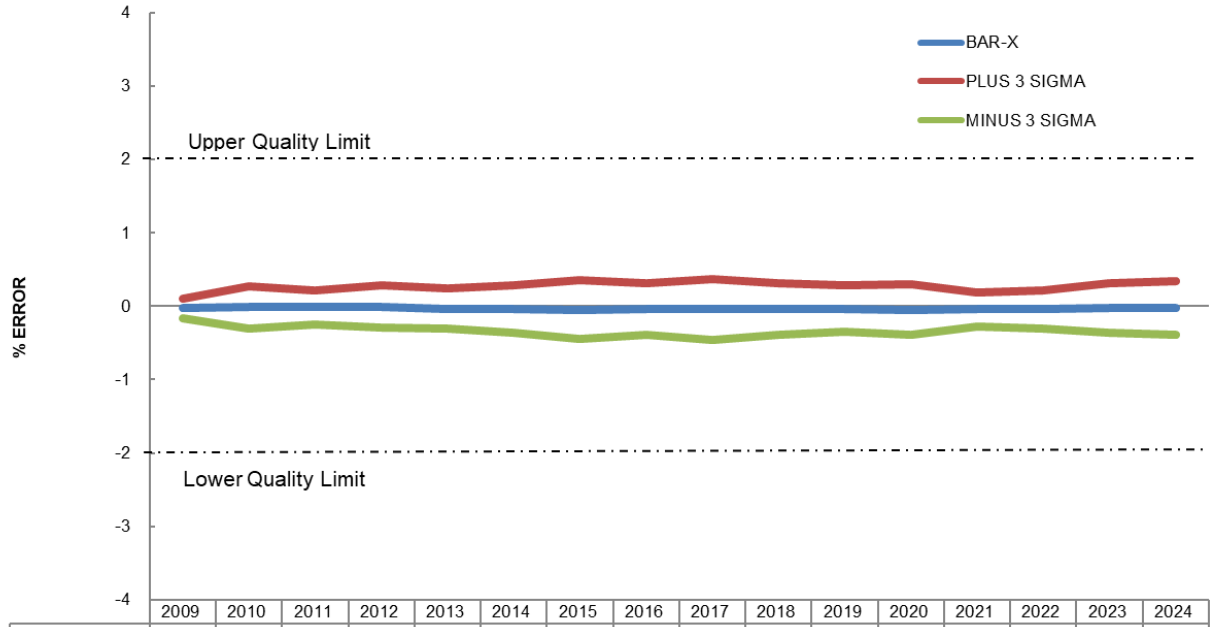
Test Results – Sensus iConA Meter
Average Accuracy & Standard Deviation

Chart B shows the average accuracy (indicated by Bar-X) and an indication of the variability of the data (indicated by a range of plus or minus three standard deviations).

This meter is still in service throughout the AMI service area and is currently being installed. This meter was not used prior to 2008.

At the beginning of the 2024 sample test period, there were over 1,530,000 of these meters in service (see Table C). This meter is a 0.2% accuracy class meter.

Average Accuracy and Standard Deviation - Sensus Meter iConA (ICNA) – Chart B
Form 2S, 12S, 1S Meter Code: 124P01, 194P01, 114P01



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
BAR-X	-0.0286	-0.0128	-0.0149	-0.0020	-0.0300	-0.0370	-0.0440	-0.0310	-0.0420	-0.0400	-0.0340	-0.0440	-0.0400	-0.0390	-0.0240	-0.0220
PLUS 3 SIGMA	0.1070	0.2740	0.2179	0.2800	0.2430	0.2930	0.3580	0.3200	0.3720	0.3110	0.2840	0.2950	0.1940	0.2220	0.3150	0.3380
MINUS 3 SIGMA	-0.1642	-0.2996	-0.2477	-0.2840	-0.3030	-0.3670	-0.4460	-0.3820	-0.4560	-0.3910	-0.3520	-0.3830	-0.2740	-0.3000	-0.3630	-0.3820

Evaluation:
The test results from 2024 indicate that there are no issues with this meter stratum that need addressing.

Remediation:
No remediation is necessary, nor is any recommended.

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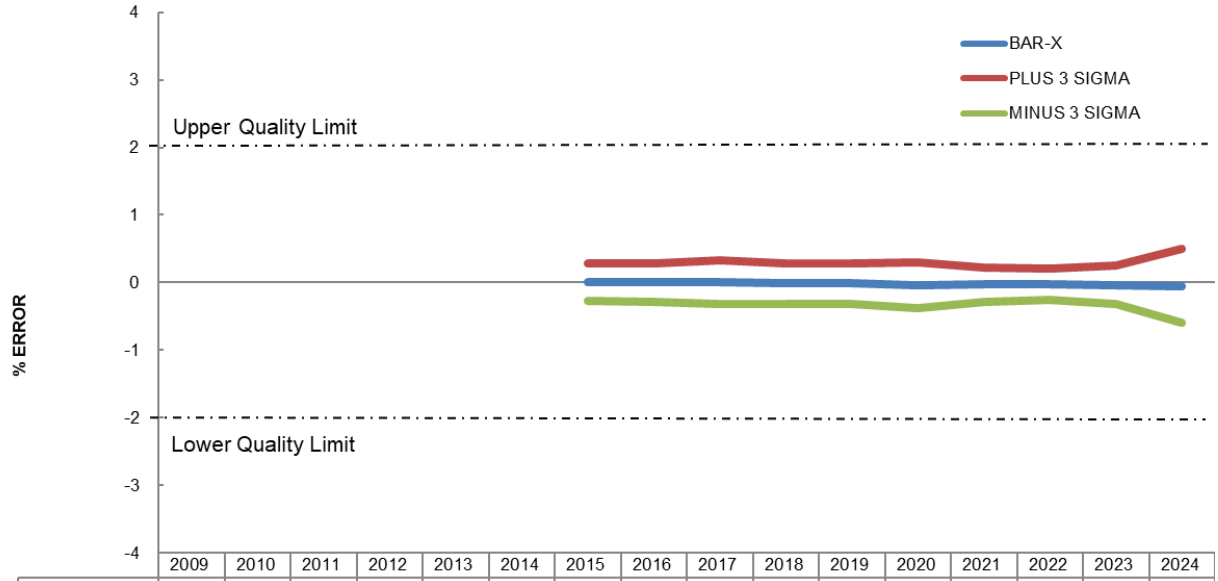
Test Results – Sensus iConA Gen 3.2 Meter
Average Accuracy & Standard Deviation

Chart C shows the average accuracy (indicated by Bar-X) and an indication of the variability of the data (indicated by a range of plus or minus three standard deviations).

This meter is still in service throughout the AMI service area and is currently being installed. This meter was not used prior to 2015.

At the beginning of 2024 there were over 67,000 of these meters in service (see Table C). This meter is a 0.2% accuracy class meter. This meter is still in service throughout the AMI service area.

Average Accuracy and Standard Deviation – Sensus Meter iConA Gen 3.2 (IAG32) - Chart C
Form 2S, 12S, 1S *Meter Codes: 124P02, 194P02, 114P02*



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
BAR-X							0.0040	0.0000	0.0080	-0.0130	-0.0140	-0.0350	-0.0280	-0.0310	-0.0320	-0.0500
PLUS 3 SIGMA							0.2830	0.2880	0.3260	0.2870	0.2830	0.3010	0.2240	0.2000	0.2569	0.4930
MINUS 3 SIGMA							-0.2750	-0.2880	-0.3100	-0.3130	-0.3110	-0.3710	-0.2800	-0.2620	-0.3209	-0.5930

Evaluation:
The test results from 2024 indicate that there are no issues with this meter stratum that need addressing.

Remediation:
No remediation is necessary, nor is any recommended.

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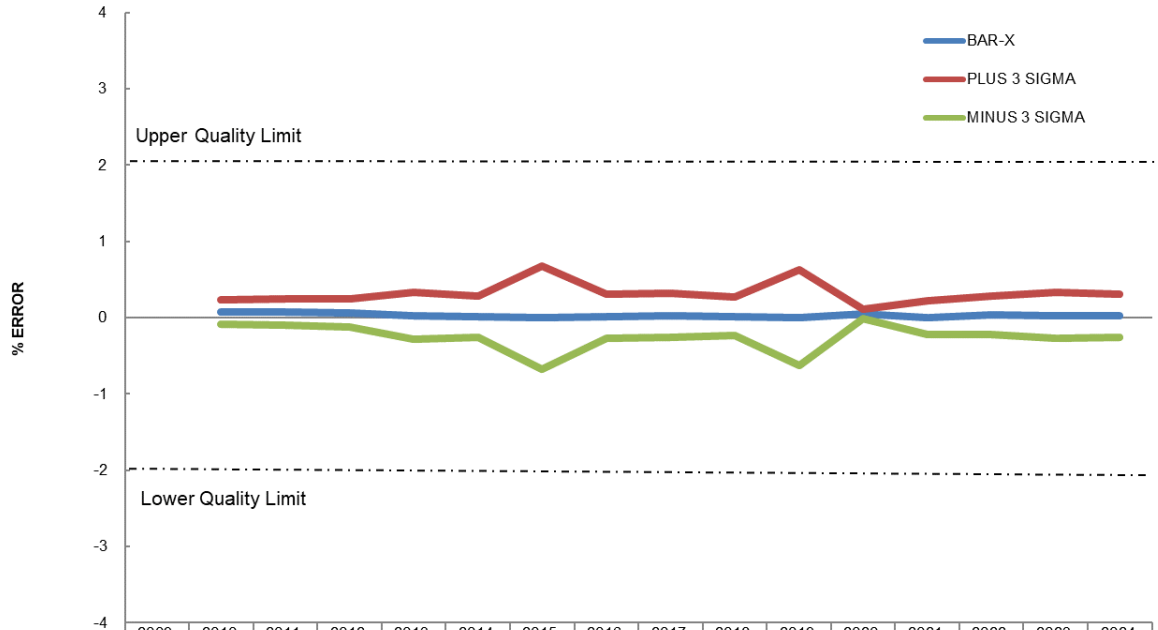
Test Results – Sensus iConA 320A Meter
Average Accuracy & Standard Deviation

Chart D shows the average accuracy (indicated by Bar-X) and an indication of the variability of the data (indicated by a range of plus or minus three standard deviations).

This meter is still in service throughout the AMI service area and is currently being installed. This meter was not used prior to 2010.

At the beginning of the 2024 sample test period, there were over 48,000 of these meters in service (see Table C). This meter is a 0.2% accuracy class meter.

Average Accuracy and Standard Deviation - Sensus Meter iConA 320A (ICNA320) – Chart D
Form 2SE Meter Code: 125P01



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
BAR-X		0.0773	0.0722	0.0610	0.0270	0.0180	-0.0040	0.0180	0.0270	0.0160	0.0030	0.0500	-0.0020	0.0320	0.0300	0.0300
PLUS 3 SIGMA		0.2366	0.2471	0.2440	0.3360	0.2880	0.6710	0.3030	0.3180	0.2650	0.6330	0.1130	0.2170	0.2840	0.3270	0.3129
MINUS 3 SIGMA		-0.0820	-0.1027	-0.1220	-0.2820	-0.2520	-0.6790	-0.2670	-0.2640	-0.2330	-0.6270	-0.0130	-0.2210	-0.2200	-0.2670	-0.2529

Evaluation:
The test results from 2024 indicate that there are no issues with this meter stratum that need addressing.

Remediation:
No remediation is necessary, nor is any recommended.

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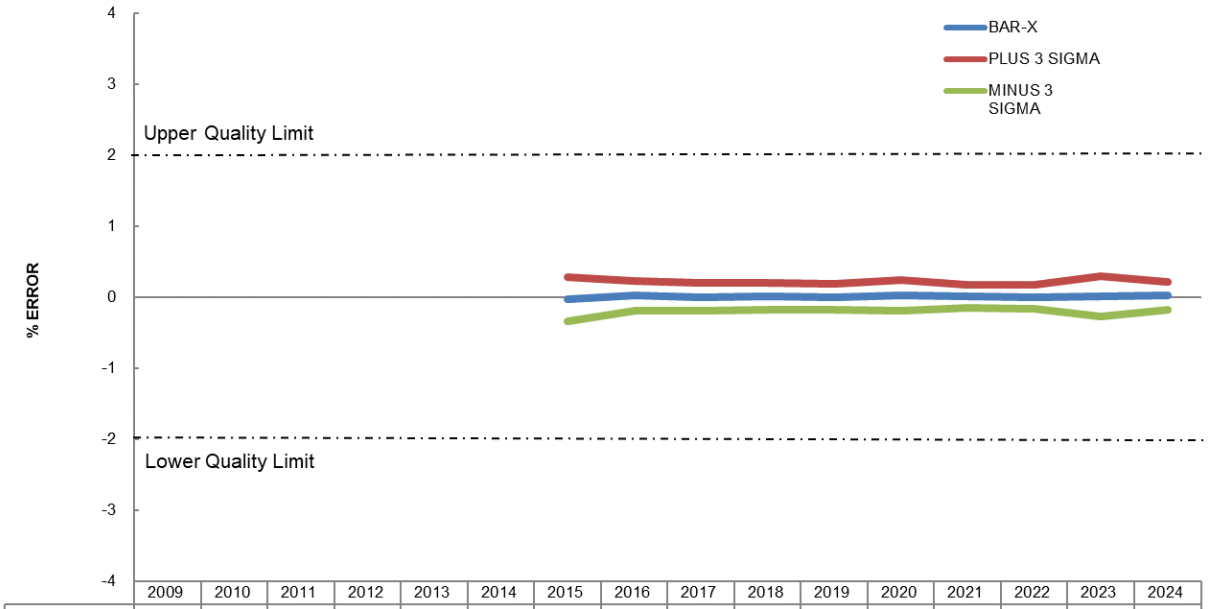
Test Results – Sensus iConA 320A Gen 3.2 Meter
Average Accuracy & Standard Deviation

Chart E shows the average accuracy (indicated by Bar-X) and an indication of the variability of the data (indicated by a range of plus or minus three standard deviations).

This meter is still in service throughout the AMI service area and is currently being installed. This meter was not used prior to 2015.

At the beginning of the 2024 sample test period, there were over 11,000 of these meters in service (see Table C). This meter is a 0.2% accuracy class meter.

Average Accuracy and Standard Deviation - Sensus Meter iConA 320A Gen 3.2 (IA320G32) – Chart E
Form 2SE Meter Code: 125P02



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
BAR-X							-0.0290	0.0210	0.0050	0.0130	0.0050	0.0280	0.0160	0.0030	0.0100	0.0200
PLUS 3 SIGMA							0.2830	0.2280	0.2030	0.2020	0.1820	0.2410	0.1780	0.1710	0.2965	0.2102
MINUS 3 SIGMA							-0.3410	-0.1860	-0.1930	-0.1760	-0.1720	-0.1850	-0.1460	-0.1650	-0.2765	-0.1702

Evaluation:
The test results from 2024 indicate that there are no issues with this meter stratum that need addressing.

Remediation:
No remediation is necessary, nor is any recommended.

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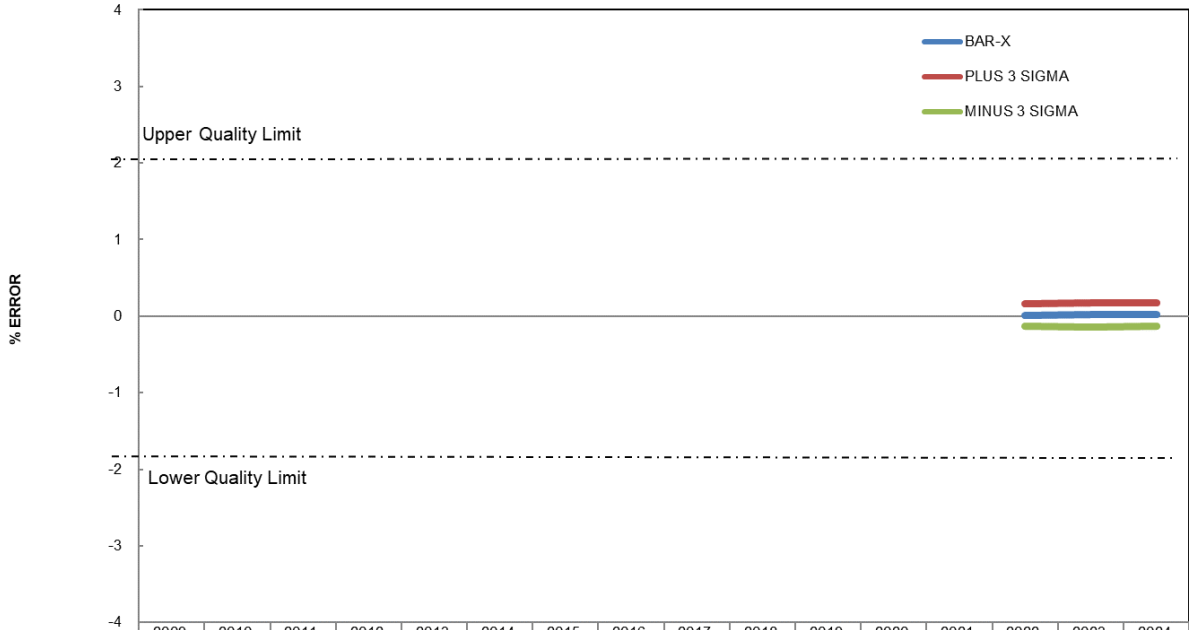
Test Results – Sensus iConA 320A Gen 4 Meter
Average Accuracy & Standard Deviation

Chart F shows the average accuracy (indicated by Bar-X) and an indication of the variability of the data (indicated by a range of plus or minus three standard deviations).

This meter is still in service throughout the AMI service area and is currently being installed. This meter was combined with IA320G32 until the 2022 sampling period. It is now a unique stratum for evaluation.

At the beginning of the 2024 sample test period, there were over 8,000 of these meters in service (see Table C). This meter is a 0.2% accuracy class meter.

Average Accuracy and Standard Deviation - Sensus Meter iConA 320A Gen 4 (IA320G4) – Chart F
Form 2SE Meter Code: 125P04



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
BAR-X														0.0140	0.0200	0.0200
PLUS 3 SIGMA														0.1580	0.1769	0.1736
MINUS 3 SIGMA														-0.1300	-0.1369	-0.1336

Evaluation:
The test results from 2024 indicate that there are no issues with this meter stratum that need addressing.

Remediation:
No remediation is necessary, nor is any recommended.

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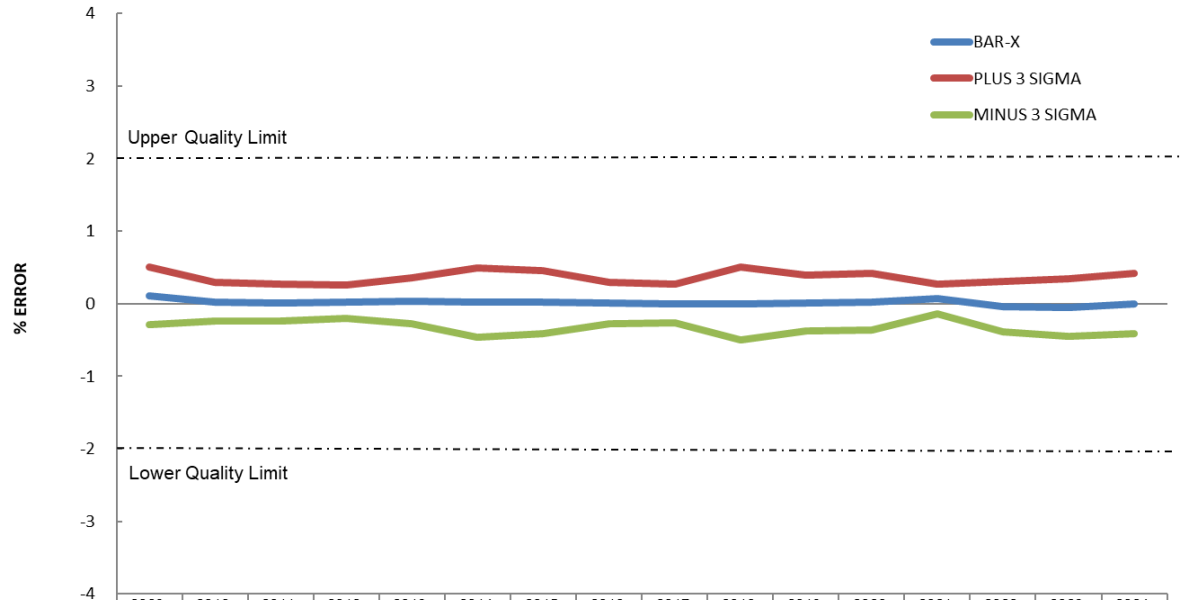
Test Results – Sensus iCon A Gen 2 Meter
Average Accuracy & Standard Deviation

Chart G shows the average accuracy (indicated by Bar-X) and an indication of the variability of the data (indicated by a range of plus or minus three standard deviations).

This meter is still in service throughout the AMI service area but is not actively being purchased or installed. This meter was not used prior to 2007.

At the beginning of 2024, there were over 7,000 of these meters in service (see Table C). This meter is a 0.2% accuracy class meter.

Average Accuracy and Standard Deviation - Sensus Meter iConA Gen 2 (SEICNA1) – Chart G
Form 4S, 3S Meter Codes: 142P01, 132P01



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
BAR-X	0.1119	0.0268	0.0141	0.0260	0.0370	0.0170	0.0210	0.0090	0.0010	0.0020	0.0040	0.0230	0.0670	-0.0370	-0.0490	0.0000
PLUS 3 SIGMA	0.5109	0.2920	0.2724	0.2600	0.3550	0.4910	0.4530	0.2940	0.2650	0.5060	0.3880	0.4130	0.2740	0.3110	0.3470	0.4170
MINUS 3 SIGMA	-0.2871	-0.2384	-0.2442	-0.2080	-0.2810	-0.4570	-0.4110	-0.2760	-0.2630	-0.5020	-0.3800	-0.3670	-0.1400	-0.3850	-0.4450	-0.4170

Evaluation:
The test results from 2024 indicate that there are no issues with this meter stratum that need addressing.

Remediation:
No remediation is necessary, nor is any recommended.

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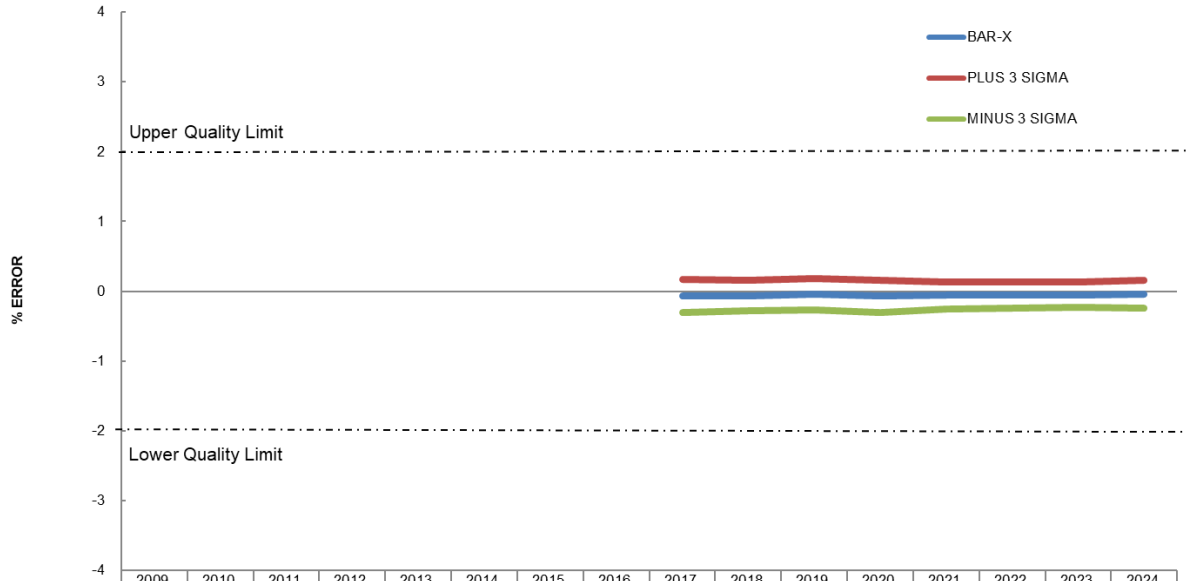
Test Results – Sensus iCon A Gen 3.2 Meter
Average Accuracy & Standard Deviation

Chart H shows the average accuracy (indicated by Bar-X) and an indication of the variability of the data (indicated by a range of plus or minus three standard deviations).

This meter is in service throughout the AMI service area and is currently being installed. This meter was not used prior to 2016.

At the beginning of 2024, there were over 2,000 of these meters in service (see Table C). This meter is a 0.2% accuracy class meter.

Average Accuracy and Standard Deviation - Sensus Meter iConA Gen 3.2 (SEICNA2) – Chart H
Form 4S, 3S Meter Codes: 142P02, 132P02



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
BAR-X									-0.0700	-0.0630	-0.0460	-0.0690	-0.0580	-0.0590	-0.0520	-0.0430
PLUS 3 SIGMA									0.1640	0.1530	0.1760	0.1620	0.1370	0.1300	0.1325	0.1544
MINUS 3 SIGMA									-0.3040	-0.2790	-0.2680	-0.3000	-0.2530	-0.2480	-0.2365	-0.2404

Evaluation:
The test results from 2024 indicate that there are no issues with this meter stratum that need addressing.

Remediation:
No remediation is necessary, nor is any recommended.

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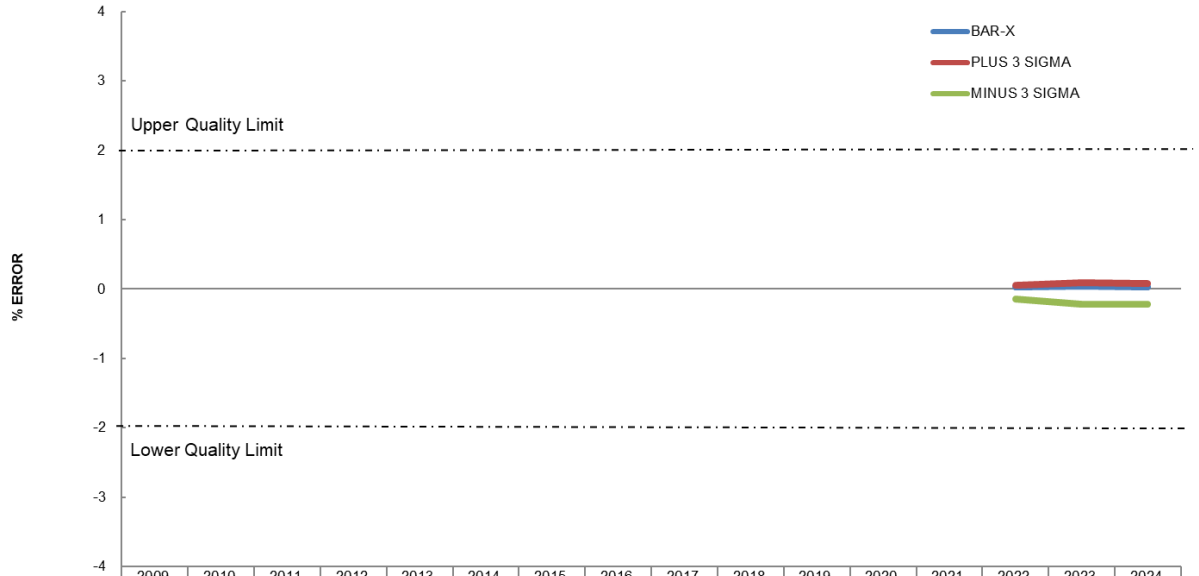
Test Results – Sensus iCon A Gen 4 Meter
Average Accuracy & Standard Deviation

Chart I shows the average accuracy (indicated by Bar-X) and an indication of the variability of the data (indicated by a range of plus or minus three standard deviations).

This meter is still in service throughout the AMI service area and is currently being installed. This meter was combined with SEICNA2 meters until the 2022 sampling period. It is now a unique stratum for evaluation.

At the beginning of 2024, there were over 200 of these meters in service (see Table C). This meter is a 0.2% accuracy class meter.

Average Accuracy and Standard Deviation - Sensus Meter iConA Gen 4 (SEICNA4) – Chart I
Form 4S, 3S Meter Codes: 142P04, 132P04



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
BAR-X														0.0250	0.0400	0.0300
PLUS 3 SIGMA														0.0550	0.0865	0.0828
MINUS 3 SIGMA														-0.1400	-0.2195	-0.2184

Evaluation:
The test results from 2024 indicate that there are no issues with this meter stratum that need addressing.

Remediation:
No remediation is necessary, nor is any recommended.

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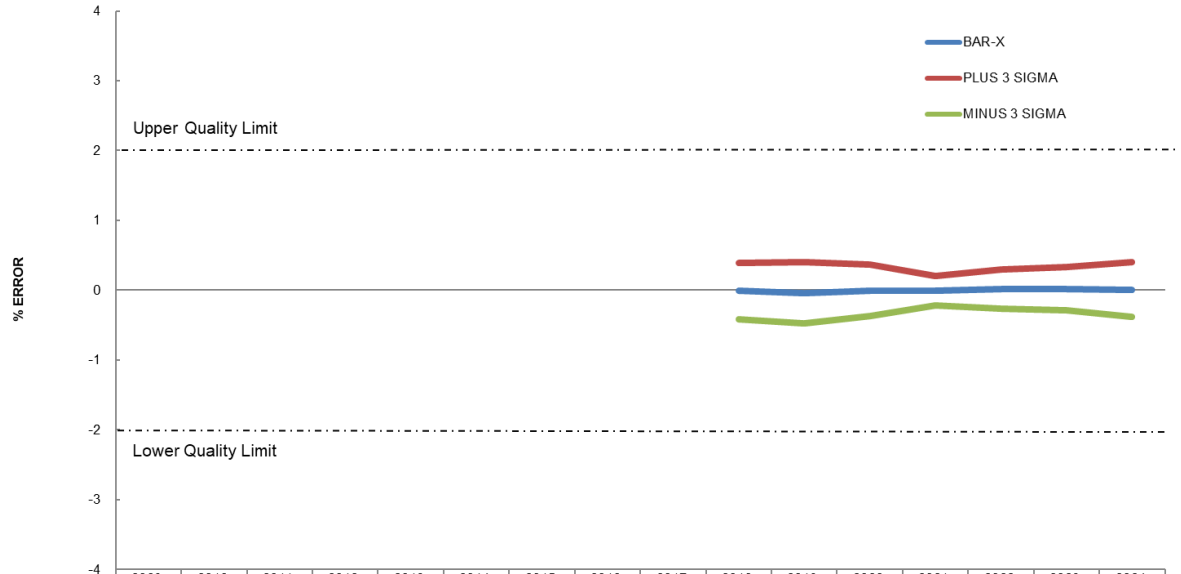
Test Results – Sensus iConA Gen 3/4 Meter
Average Accuracy & Standard Deviation

Chart J shows the average accuracy (indicated by Bar-X) and an indication of the variability of the data (indicated by a range of plus or minus three standard deviations).

This meter is in service throughout the AMI service area and is currently being installed. This meter was not used prior to 2017.

At the beginning of the 2024 sample test period, there were over 180,000 of these meters in service (see Table C). This meter is a 0.2% accuracy class meter.

Average Accuracy and Standard Deviation - Sensus Meter iConA Gen 3/4 (IAG4) – Chart J
Form 2S, 12S, 1S Meter Code: 124P04, 194P04, 114P04



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
BAR-X										-0.0110	-0.0370	-0.0020	-0.0040	0.0210	0.0200	0.0100
PLUS 3 SIGMA										0.3910	0.4040	0.3640	0.2090	0.3030	0.3320	0.4060
MINUS 3 SIGMA										-0.4130	-0.4780	-0.3680	-0.2170	-0.2610	-0.2920	-0.3860

Evaluation:
The test results from 2024 indicate that there are no issues with this meter stratum that need addressing.

Remediation:
No remediation is necessary, nor is any recommended.

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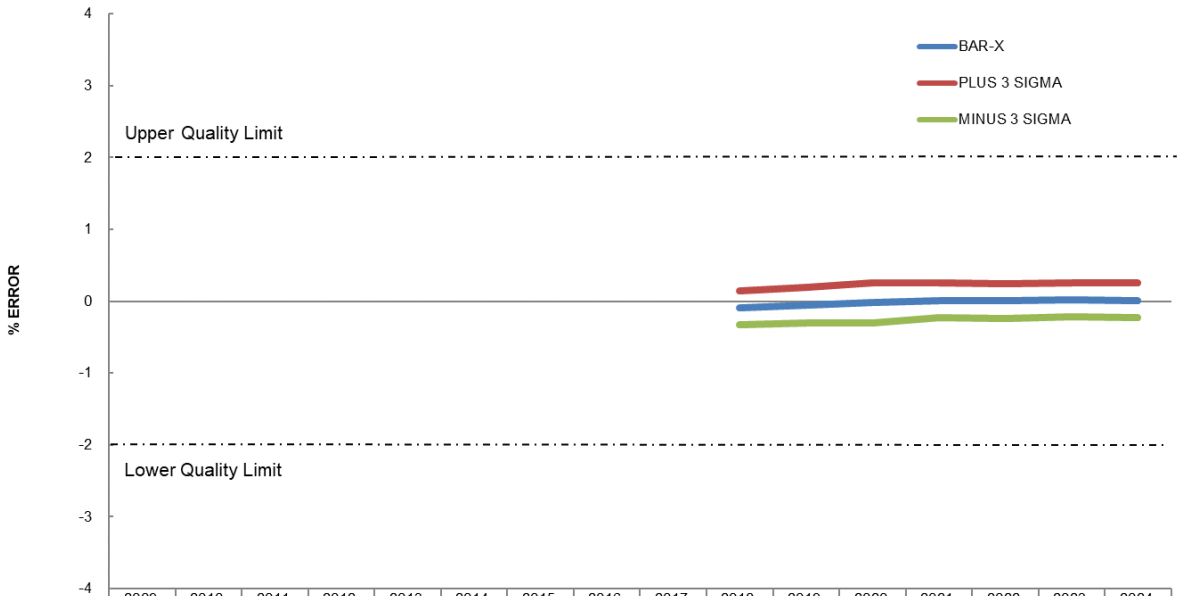
Test Results – Sensus Stratus Gen 4 RC/DC Meter
Average Accuracy & Standard Deviation

Chart K shows the average accuracy (indicated by Bar-X) and an indication of the variability of the data (indicated by a range of plus or minus three standard deviations).

This meter is in service throughout the AMI service area and is currently being installed. This meter was not used prior to 2017.

At the beginning of the 2024 sample test period, there were over 360,000 of these meters in service (see Table C). This meter is a 0.2% accuracy class meter.

Average Accuracy and Standard Deviation - Sensus Meter Stratus Gen 4 RC/DC (SSRC) – Chart K
Form 2S Meter Code: 124P15



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
BAR-X										-0.0940	-0.0530	-0.0220	0.0100	0.0010	0.0200	0.0100
PLUS 3 SIGMA										0.1430	0.1960	0.2540	0.2530	0.2440	0.2567	0.2509
MINUS 3 SIGMA										-0.3310	-0.3020	-0.2980	-0.2330	-0.2420	-0.2167	-0.2309

Evaluation:
The test results from 2024 indicate that there are no issues with this meter stratum that need addressing.

Remediation:
No remediation is necessary, nor is any recommended.

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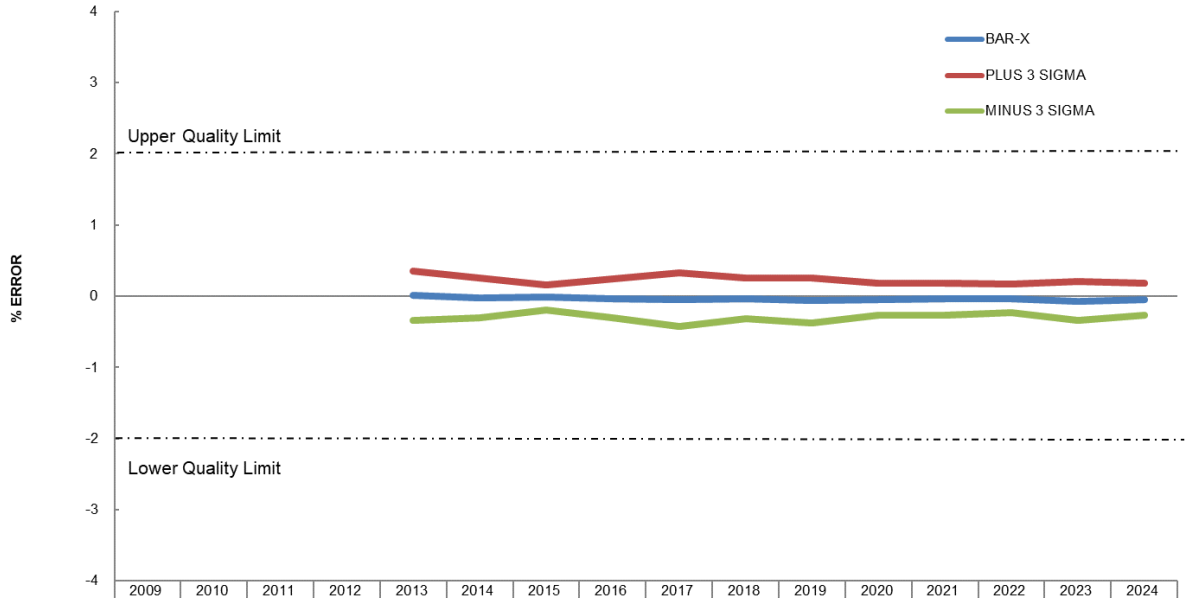
Test Results – Landis + Gyr Focus Meter
Average Accuracy & Standard Deviation

Chart L shows the average accuracy (indicated by Bar-X) and an indication of the variability of the data (indicated by a range of plus or minus three standard deviations).

This meter is still in service throughout the AMI service area and is currently being installed. This meter was not used prior to 2013.

At the beginning of the 2024 sample test period, there were over 3,500 of these meters in service (see Table C). This meter is a 0.2% accuracy class meter.

Average Accuracy and Standard Deviation – Landis + Gyr Meter Focus (LGFOCUS1) – Chart L
Form 2S, 2SE, 12S, 1S Meter Codes: 124B04, 125B04, 194B04, 113B04



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
BAR-X					0.0090	-0.0250	-0.0170	-0.0310	-0.0440	-0.0320	-0.0620	-0.0430	-0.0420	-0.0330	-0.0680	-0.0440
PLUS 3 SIGMA					0.3540	0.2510	0.1570	0.2390	0.3340	0.2560	0.2530	0.1790	0.1800	0.1650	0.2089	0.1771
MINUS 3 SIGMA					-0.3360	-0.3010	-0.1910	-0.3010	-0.4220	-0.3200	-0.3770	-0.2650	-0.2640	-0.2310	-0.3449	-0.2651

Evaluation:
The test results from 2024 indicate that there are no issues with this meter stratum that need addressing.

Remediation:
No remediation is necessary, nor is any recommended.

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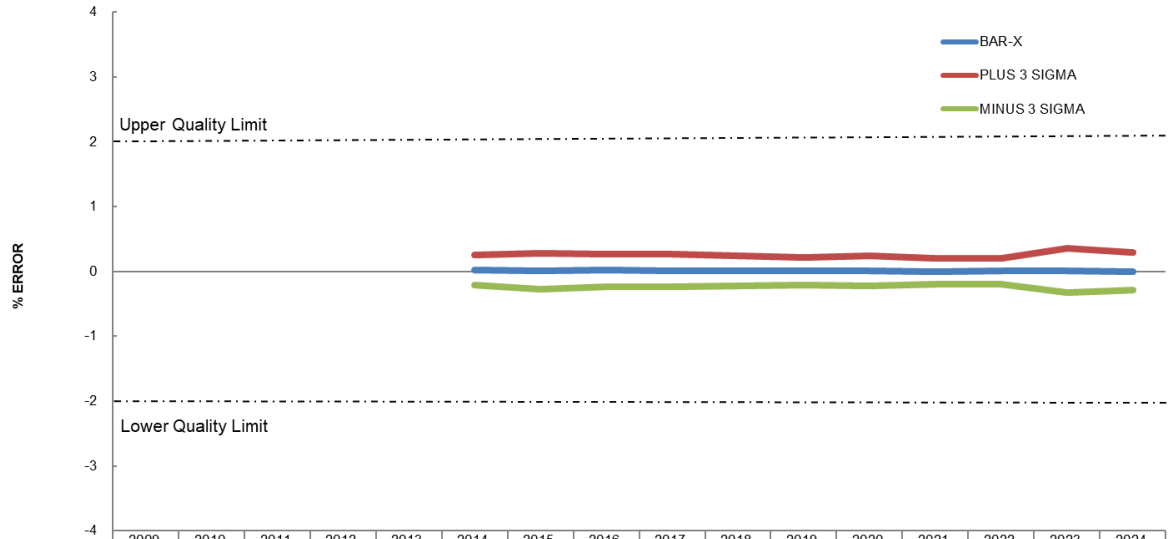
Test Results – Landis + Gyr Focus RC/DC Meter
Average Accuracy & Standard Deviation

Chart M shows the average accuracy (indicated by Bar-X) and an indication of the variability of the data (indicated by a range of plus or minus three standard deviations).

This meter is still in service throughout the AMI service area and is currently being installed. This meter was not used prior to 2014.

At the beginning of the 2024 sample test period, there were over 320,000 of these meters in service (see Table C). This meter is a 0.2% accuracy class meter.

Average Accuracy and Standard Deviation – Landis + Gyr Meter Focus RC/DC (LGFOCRC) – Chart M
Form 1S, 2S, 12S Meter Codes: 113B14, 124B14, 194B14



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
BAR-X						0.0250	0.0030	0.0150	0.0130	0.0050	0.0040	0.0070	-0.0010	0.0040	0.0100	0.0000
PLUS 3 SIGMA						0.2560	0.2790	0.2640	0.2620	0.2330	0.2140	0.2350	0.1970	0.2020	0.3490	0.2907
MINUS 3 SIGMA						-0.2060	-0.2730	-0.2340	-0.2360	-0.2230	-0.2060	-0.2210	-0.1990	-0.1940	-0.3290	-0.2907

Evaluation:
The test results from 2024 indicate that there are no issues with this meter stratum that need addressing.

Remediation:
No remediation is necessary, nor is any recommended.

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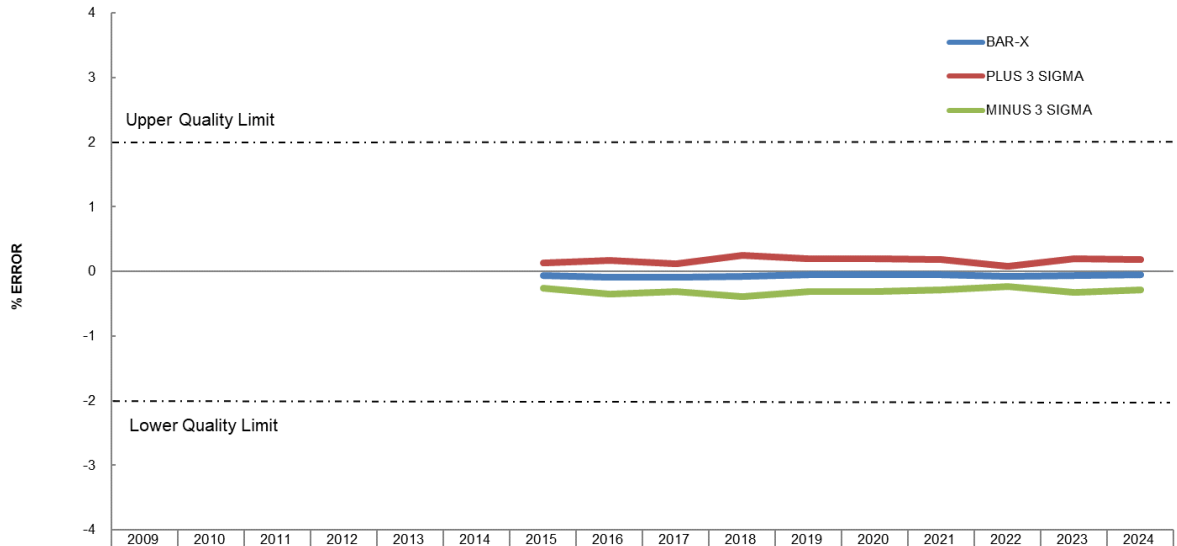
Test Results – Elster A3 Meter
Average Accuracy & Standard Deviation

Chart N shows the average accuracy (indicated by Bar-X) and an indication of the variability of the data (indicated by a range of plus or minus three standard deviations).

This meter is still in service throughout the AMI service area and is currently being installed. This meter was combined with ABB 1 phase meters until the 2015 sampling period. It is now a unique stratum for evaluation.

At the beginning of 2024, there were over 32,000 meters in service (see Table C). This meter is a 0.2% accuracy class meter.

Average Accuracy and Standard Deviation - Elster A3 Meters (ELA3) – Chart N
Form 2S, 2SE, 1S *Meter Codes:* 124D02, 125D02, 114D02



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
BAR-X							-0.0630	-0.0890	-0.0940	-0.0730	-0.0530	-0.0540	-0.0480	-0.0760	-0.0590	-0.0510
PLUS 3 SIGMA							0.1320	0.1660	0.1190	0.2480	0.1990	0.2040	0.1860	0.0800	0.2029	0.1878
MINUS 3 SIGMA							-0.2580	-0.3440	-0.3070	-0.3940	-0.3050	-0.3120	-0.2820	-0.2320	-0.3209	-0.2898

Evaluation:
The test results from 2024 indicate that there are no issues with this meter stratum that need addressing.

Remediation:
No remediation is necessary, nor is any recommended.

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Test Results – Opt-Out Meters
Testing Summary & Results

At the beginning of the 2024 test reporting period, there were 626 meters in service (see Table C) categorized as Opt-Out. The majority of these meters are 0.5% accuracy class meters.

Meter Form and Meter Class Breakdown – Table Q

Meter Form	Meter Class	Number of Meters
2S	200	489
2SE	320	137
Total		**626**

This group of meters is comprised of both Mechanical and Solid-State (Non-AMI) construction. They are in use throughout the service area. It is considered as a unique category for evaluation due to it being presently grouped by rate versus meter platform. As a result, it does not lend itself to traditional GPC's Sample Testing Plan based on ANSI/ASQ Z1.7-2008. This is due to the diversity of this group of meter types and its small overall population size.

This Opt-Out group represents over 35 different meter strata. A major portion of this population averages approximately eight meters per stratum, ranging from one meter in the smallest groupings to 309 in the largest group. Neither the statistical projections nor the economic advantages are realized in a sampling approach. This led GPC to perform 100% accuracy testing on each meter within this category.

Testing Results – Table R

Test Results	Number of Meters
Meters tested	604
Failed GPSC Calibration Limits of +/- 2.0% (and replaced)	0
Failed GPC Internal Calibration Limits of +/- 0.5%	26
Meter no longer in service at time of test	13
Meter replaced with AMI	0
Customer refusal	4
Access issues	5

Evaluation:
The test results from 2024 indicate that there are no issues with this meter stratum that need addressing.

Remediation:
No remediation is necessary, nor is any recommended. Ongoing GPC work processes plan on failed meter replacements to align into existing strata to enable sampling to occur in later years if necessary.

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