



Modern Electricity Meter Safety, Accuracy and Performance Testing

Prepared for

Sensus

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Executive Summary

We all expect electricity meters to function seamlessly, transparently, and accurately. A meter should fade into the background – a tireless workhorse – and should be trusted to never over-account for the energy we consume. It may not be top-of-mind, but meter design, testing, and installation methodologies are all critical factors in how that forgotten electricity meter will perform its daily duties.

Today’s meters are feature-rich computers, capable of measuring, recording, and transmitting many types of data. Compared with electromechanical, kilowatt-hour-only meters, modern meters operate differently and have the potential to fail differently. As meter design has continued to evolve, we must also investigate whether or not meter testing has kept pace. The right levels of meter testing can replicate actual field conditions to:

- Boost consumer confidence and overall safety.
- Contribute to improved device performance and accuracy.
- Help utilities better plan for installations, device replacement, or faulty socket detection.

But what are the “right” levels of electricity meter testing? There is no single gold standard test, no universal seal that designates superior meter performance. Rather, there are multiple standards that define meter tests along safety and accuracy dimensions. Historically, the American National Standards Institute (ANSI) has provided the fundamental code for safety and accuracy meter testing. Building upon a subset of the entire suite of ANSI tests, Underwriters Laboratories (UL) has layered on its version of safety-focused meter tests as well in their own meter testing standard. Both ANSI and UL provide a solid foundation for electricity meter standards, and they continue to improve the safety and performance benchmarks.

Still there are deficiencies within the existing standards. This report examines the history of electricity meter design and testing. It suggests multivariate testing and further investigation of modern meter failure modes could help address some current shortcomings. Derived from real-world conditions and occurrences, additional testing could help to test, detect, and – in some cases – predict failure at the network, site, and device levels.



1 Introduction and Motivation

Electricity meters are designed for endurance and the ability to withstand harsh environments. When they are installed outdoors, they are exposed daily to sunlight, water, wind, dust, and temperature fluctuations. Certain situations may require meter replacements – such as a utility’s life cycle management program (aging), or for accuracy testing (to see if they have drifted), or as part of an advanced metering infrastructure (AMI) deployment. These replacements can disrupt what was previously considered a stable system. Safe and accurate meter function requires several elements to support this system.

Key Components

Electricity customers own the **meter socket** that the meter is plugged into, while the **meter** is the property of the utility (of any type, including an Investor-Owned Utility (IOU), municipal, or cooperative). Should a meter need to be changed, the meter socket may require maintenance to return it to its “factory” specifications. Socket maintenance can mean adjustment or replacement of a few components, up to simply replacing the entire socket. A few of the most common maintenance needs are tightening the connection on the service conductors, adjusting the gap of the jaws, addressing corrosion issues, or completely replacing the jaws. The integrity of the **meter socket** must also be checked to ensure that there are no holes where water may enter and no other signs of disrepair. Many maintenance techniques focus on tightening physical bonds for the current-carrying parts, since loose connections lead to potentially unsafe heating

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conditions. Additionally, the socket needs to be waterproof to avoid creating unsafe paths for current and to minimize corrosion on the interior metal parts.

Current State of Testing

Meters are designed and tested according to standards to ensure safety, accuracy, and durability. The tests stress the meter electrically, mechanically, and environmentally to replicate a range of operating conditions in the field. Those standards are derived from a rigorous process with input from a wide range of stakeholders, including industry experts from meter manufacturers, utilities, and other industry specialists.

As modern metering technology is deployed, and as utilities encounter new issues with installations, there is a need to expand the testing. There are two motivating factors. The first is due to evolving meter types. Modern electricity meters exhibit different operational and failure modes than the electromechanical meters they replace. The second motivating factor is the state of the socket at the time of replacement. Socket deterioration after decades of operation is a common, though often overlooked, contributor to meter performance issues.

There is a process to raise awareness about the need for expanded testing. Additional tests that take modern meters and socket condition into consideration can be defined by a vendor or by a utility, or by a combination of the two. Once the test reaches a certain level of refinement, it may be submitted to the standards associations (ANSI or UL, for example) to be considered for inclusion in the official codes published for the metering industry. This process allows the additional testing recommendations to be reviewed by industry experts who are equipped to evaluate technical design and to determine value in terms of meeting business needs. Those industry experts serve on the standards committee that will ultimately determine whether the additional testing will be codified into future testing standards.

1.1 Type Certification and Implications

Accuracy is a critical metric to determine electricity meter viability. Yet a closer look at the particular failure modes of meters could result in great strides toward increased meter safety.

Type certification focuses on a meter's ability to maintain accurate measurements under a variety of internal and external influences. This accuracy is the basis for customer confidence in their utilities – customers must believe they receive an accurate accounting for their electricity consumption. Type tests also identify design requirements for meter engineers, as well as a standardized way to demonstrate that their designs will satisfy societal, utility, and customer needs.

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Since the type tests prioritize accuracy, meter failure modes are a secondary focus. Presumably, customers are not at risk since they are protected by their service panel equipment. Therefore, a meter can fail within some parameters, but if it continues to function across a pre-determined operating range and no extra energy is misattributed as customer consumption, that meter is still considered accurate.

A few tests examine the failure modes of meter components, such as the cover. The use of plastic covers necessitates a test to ensure that in the unlikely circumstance where an electricity meter cover is exposed to flames, the cover will not contribute to the continuation of the flame. Another example is the internal temperature rise test, used to examine the heat rejection characteristics of the meters as it relates to safe operation over time.

During its operational lifetime, meters can be expected to perform and withstand many operating conditions while safely and accurately serving as a measuring, recording, and transmitting instrument. When meters were constructed from predominantly metal parts and a glass cover, there were a few well-known failure modes that might lead to unsafe conditions. Modern meters are essentially computers with more electronics, more plastic parts (including the cover), and different failure modes that are still being uncovered.

Meter testing has been codified into industry standards since the early 1900s and is maintained in an iterative program that requires revision (or reaffirmation) every five years or so. This cycle is designed to accommodate new technology developments. At the same time, the five-year cycle provides a stable operational target for meter performance, allowing for manufacturing economies of scale. The experts involved in the standardization of the testing bring issues for discussion, propose tests and define new procedures or limits for existing tests. The result is more robust and comprehensive standards testing with each revision.

The introduction of modern, feature-rich metering is a key driver of the current cycle in the standards iteration process. The need to assess the different failure modes of these technologically advanced devices warrants a fresh approach to testing philosophies.

1.2 The Value of Accuracy and Safety

Meter accuracy can be quantified to discrete levels and can be used to compare different devices. The accuracy of the billing quantity, the kilowatt-hour, is directly calculable from a price. For example:

Two meters, one with a straight inaccuracy of 0.5% and another of 1.0%, for a service where the price of electricity is \$0.10/kWh.

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For an annual consumption of 12,000kWh, meter one measures 11,940kWh while meter two measures 11,880kWh. At a rate of \$0.10/kWh, meter one results in an under-charge of \$6 while meter two results in an under-charge of \$12.¹

If every meter under-registered the consumption by 1%, for 100,000 customers, this is \$120,000 per year of lost revenue.

Albeit a simplified example, this demonstrates how accuracy can be directly tied to revenue, and a business case can be built to support investments in more accurate metering.

Safety is more important than accuracy, but is also less tangible. There is a cost for safe service panels, meter sockets, meters, service drops, transformers, lateral lines, etc., but how is overall safety calculated? The industry relies upon setting codes and standards, then applying rigorous testing, and finally certifications, to provide assurance around safety. Nevertheless, there is no directly calculable value for safety.

Despite this, the standards are continually revised to accommodate expert contributions and changing operational conditions that inform and help facilitate manufacturing of products that are as safe as possible. Examples of safety-oriented tests include impulse voltage testing, or lightning strike simulation. Devices need to withstand this phenomenon without exhibiting an undesirable failure mode such as melting or igniting the electronics and/or meter housing. Ideally, the device withstands the extremes of the test and continues to operate. However, maintaining operation is not guaranteed. It is still acceptable for a device to fail, provided it fails in a safe manner that protects the consumer.

Other Safety Factors

As previously mentioned, there is a significant potential safety risk posed by the extended time lapse since the initial installation of any meter/socket system. When meters are replaced, it is common to find that those meter sockets require maintenance. Yet socket maintenance is not straightforward. Since the socket is technically owned by the customer, the customer is responsible for maintaining it. Yet the socket cannot be maintained by the customer without removing the meter, which is illegal. Therefore, most sockets are not examined after the initial installation until the utility-owned meter is exchanged.

Assuming the utility has deemed it necessary to exchange a meter, it is rare that the customer/socket owner is even present during this swap, much less have the skills required to

¹ This is much simpler than reality, but illustrative to show the calculable impact of inaccuracy in measurement. The reality is that the population of meters has a statistical range of accuracies that vary within an allowable band.



perform any needed maintenance on the socket. Simple maintenance can be done by utility personnel or contractors, while full socket replacements usually require a licensed electrician.

This scenario illustrates the unrealistic expectations of the end consumer, but the example also highlights the impractical expectations around the longevity of the equipment and system. No manner of type testing and initial specifications intended to prove out designs will cover the performance of the electric meter *and* socket after exposure to field conditions over extended periods of time.

Rather than expecting the system to remain in “as new” condition, the assumption should be that the system will require some repair, then implementing standards around the steps required after any hands-on work to leave a safe, stable meter/socket system in place.

Rarely, the value of safety is defined through legal action, though this is exactly what most want to avoid. When a dispute is litigated, an agreement is negotiated or a decision is made about the relative safety of a device for a particular situation, then a judgment follows specifying the reparations to be made for that situation. Of course, safety value of this type is an unknown and unforeseen variable.



2 *Examination of Testing Goals*

The American National Standards Institute (ANSI) C12.1 standard has been used for electricity meters since the first edition published in 1910. Founded on scientific and technical principles for testing safety and accuracy under a variety of conditions, it also keeps in mind the commercial requirements. There is a host committee that manages the evolution of the standard, and the participants regularly form tactical subgroups to address topics of interest. For example, there have been groups dedicated to harmonics, definitions for power, service switch testing, auxiliary devices, upgradeability, in-service testing, demand type testing, field testing, and temperature rise. These group topics can be influential, as new tests, and even new standards, have been published as a result of subgroup efforts.

In May 2013, Underwriters Laboratories (UL) developed and published UL 2735, an electricity meter safety standard. As a test suite, the standard focuses on safety aspects of the meter and adds to the rigorous tests of ANSI C12.1. Some of the UL tests stress the meter beyond the ANSI C12.1 tests, and also include flammability, shock, impact, and drop tests.

2.1 *Accuracy/Safety Perspective*

ANSI C12.1 defines accuracy tests that account for both internal and external influences. The accuracy of the meter is measured against the performance of a reference. For certain tests, an

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accuracy performance check is required after the test. All testing is done with the industry expectation that the meters will function accurately and safely throughout testing and operation. The following list provides an overview of ANSI testing.

Table 1: ANSI C12.1 Standard Test List (External influence tests are in ***bold italics***)

No load test	Effect of current surges in ground conductors test
Starting load test	Effect of superimposed signals test
Load performance test	Effect of voltage variation – secondary time base test
Effect of variation of power factor test	Effect of variation of ambient temperature – secondary time base test
Effect of variation of voltage test	Effect of electrical fast transient/burst test
Effect of variation of frequency test	<i>Effect of electrical oscillatory surge withstand capability test</i>
Equality of current circuits test	<i>Effect of radio frequency interference test</i>
Internal meter losses test	<i>Radio frequency conducted and radiated emission test</i>
Temperature rise test	<i>Effect of electrostatic discharge test</i>
Effect of register friction test	<i>Effect of storage temperature test</i>
Effect of internal heating test	<i>Effect of operating temperature test</i>
Effect of tilt test	<i>Effect of relative humidity test</i>
Stability of performance test	<i>Mechanical shock test</i>
Independence of elements test	<i>Transportation drop test</i>
<i>Insulation test</i>	<i>Mechanical vibration test</i>
<i>Voltage interruptions test</i>	<i>Transportation vibration test</i>
<i>Effect of high voltage line surges test</i>	<i>Weather simulation test</i>
<i>Effect of external magnetic field test</i>	<i>Salt-spray test</i>
<i>Effect of variation of ambient temperature test</i>	<i>Rain tightness test</i>
<i>Effect of temporary overloads test</i>	



2.2 Safety/Survivability Perspective

UL 2735 testing stresses the meter differently, with some tests designed to replicate conditions other than those by ANSI. Starting with a subset of the ANSI tests, the UL standard then defines additional tests that validate the design of the meters. For example, UL tends to emphasize the lack of exposure to live parts within the design. The different design tests mean UL’s failure criteria also differ from ANSI’s. In general, while functionality loss is permitted, UL expects that any failure of the device should not result in a sustained dangerous condition. Comparatively, the main concern for ANSI tests is any impact on the accurate registration under the various conditions. The table below lists the defined tests in UL 2735.

Table 2: UL 2735 Standard Test List (includes tests shared with ANSI C12.1 standard)

Tests Referenced in UL 2735 from ANSI C12.1	Tests Defined in UL 2735
C12.1 Temperature rise (as modified by 15.7 of this standard)	Flammability test
C12.1 Insulation resistance	Static test
C12.1 Effect of high voltage line surges	Impact test
C12.1 Effect of temporary overloads (as modified by UL 2735)	Drop test
C12.1 Effect of electrical fast transient/burst test	Enclosure requirements
C12.1 Effect of radio frequency interference	Clearance and creepage distances requirements
C12.1 Radio frequency conducted and radiated emissions test	Current transformers requirements
C12.1 Effect of electrostatic discharge (ESD) (as modified by UL 2735)	Batteries and battery charging requirements
	Load control switches requirements
	Printed wiring boards requirements
	Application of fault conditions testing

2.3 What do the differences in tests imply?

The UL standard incorporates many of the ANSI standard tests, but includes additional tests and a paper design review. The two standards are not competitive and one testing approach does not detract from the other – both are valid. There is no superior test that results in better meters. However, different certifications may have different applications and connotations.



Since ANSI code prescribes meter safety and accuracy for revenue purposes, it is the base requirement found in state and local legislations.

From the consumer perspective, UL certification offers familiar validation as it is typically associated with retail electrical products. This can reassure the energy consumer who is more familiar with equipment endorsement featuring a UL logo.

We should note that vendors and utilities regularly define and may require testing that goes beyond the ANSI and UL tests. Examples include:

Water intrusion tests subject the meter and socket to conditions replicating direct water fall, replicating a downspout or continuous hose spray, at full load. The expectation is that no dangerous condition results.

Advanced environmental testing that better mimics field conditions wherein temperature, humidity, and voltages are varied while the meter is functioning. The multiple variables and functional setup goes beyond some of the standard testing that may focus on only one variable such as temperature, without including load.

Highly accelerated life testing (HALT) exposes any design weaknesses and allows quicker iterative modifications to address them.

With all of these beyond-the-standard tests, the expectation is that the meter survives without loss of function or accuracy. The rationale for testing at this level is to better meet installation conditions as compared to the “type” test conditions.

2.4 What do the differences in tests mean for design?

The goal of any test plan is to ensure the product operates as intended, boosting confidence in overall product design and performance. All test results could potentially impact design depending on outcome. Additional tests, such as the UL tests over and above the ANSI core (Table 2), may indicate that a redesign is necessary to satisfy the UL criteria. This would also be true of additional tests as defined by the utility. With more tests come greater demands on the design to help pass those tests. Additional testing can result in robust device designs that surpass the current standards.



3 Modern Metering Features that Address Accuracy and Safety in the Field

3.1 The Kilowatt-hour and Beyond

The kilowatt-hour (kWh) is the commonly-used billing quantity for delivered energy. However, using kilowatt-hours to understand other system conditions or to examine issues can be problematic. Today, there are other features or measurements that can be used to address potential accuracy and safety issues where basic kWh information falls short.

For example, **demand** – measured in kilowatts – is an extremely useful quantity for managing the grid. When paired with energy, demand can yield valuable information about system conditions, customer behavior, and equipment needs for operations support. **Voltage** measurements at every service point, regardless of customer type, are becoming more valuable for grid management, empowering utilities with better, real-time indicators of grid health. Utilities then create programs to further empower their customers by helping manage energy expenses (for certain load types) and through broader customer service. Another feature of modern meters is a robust set of health indicators, commonly called **flags**. They can be set to immediately indicate potential problems (voltage or outage flags), to support further investigation (tamper flags), to show whether the meter passed various self-tests, or for other uses.

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3.2 Analytics

The additional measures such as demand, voltage, and flags contribute to a continuous data stream that must be managed. Like so many other industries, the electric industry turns to analytics for sifting through volumes of data for useful grid insights.

For example, in a more widespread outage, meters publishing outage flags can provide visibility of the breadth of the outage. Paired with information from the supervisory control and data acquisition (SCADA) system, crews can be rapidly and surgically dispatched to repair, for example, a lost line. However, data analysis of just a few outage flags, paired with voltage values, may indicate issues other than a lost line. Perhaps the line voltage regulator operation failed, or a tap-changing transformer did not operate. Maybe there was some local, distributed generation added to the circuit, or there was a bit of non-technical loss being taken. The access to different data types and sources allows for agile analysis and faster responses.

Advanced analytics allow the system operators to apply their training and knowledge of their system to the new and numerous data from the meters and other grid equipment, permitting them to uncover issues before they escalate into costly and potentially unsafe problems. In the stated examples where generation was added (unknown to the utility) or some non-technical loss occurred, both instances could lead to potentially life-threatening conditions for utility personnel and customers. The availability and analysis of the types of data now available provide unprecedented levels of visibility, awareness, and responsiveness that can translate into safer systems for all.



4 Case Studies

The advances in electricity meter design enable better monitoring of power systems at the consumer level. These capabilities include monitoring the internal temperature of the meter, the load current, and the voltage. These variables are used not just for reporting purposes, but can also alert utilities to take action against the potentially dangerous results of extreme operating conditions.

These design elements are steps in the right direction of preemptive detection, but there are still concerns to be addressed. The fundamental issue of determining socket viability remains elusive. Vendors, utilities, testing organizations, and consultants across the AMI industry have spent years trying to pinpoint whether a meter socket is good or should be replaced, or if that socket can accept a smart meter replacement.

4.1 *Overtemperature and Overcurrent*

Overtemperature is usually due to a high customer load being served, meaning a higher current being drawn through the meter, and a higher internal temperature under the meter cover. Another source of high temperatures is a poor fit at the interface between the meter and socket. This causes minor arcing over the minute air gap and a higher temperature under the meter cover.

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By design, the meters will survive most overcurrent conditions and will continue to operate safely while accurately measuring the load. Customer protection comes from their load panel, where there are fuses or breakers designed to open during an overcurrent condition, thus removing the load from being served.

Meter design features can help safely handle temperature rise, even when not due to loading conditions. Meters can monitor their own internal temperature and be programmed to correlate the temperature to the current draw and time. They can then rapidly communicate that data to utility analysts to aid in deciding whether or not to remove the load.

Many meter vendors provide temperature measured on a single location on the printed circuit board (PCB) that is close to the outer plastic cover. Extensive analysis of several months of data indicates this approach is a successful way of detecting heating issues emanating from the meter socket and meter blade connection. At the 2013 Edison Electric Institute Fall Transmission, Distribution and Metering Conference, American Electric Power presented on how that methodology and analysis permitted the issuance of 525 preemptive work orders during their AMI rollout. Their field technicians uncovered issues on 448 installations needing repair or resulting in replacements. This equates to around a 450 parts per million occurrence.²

Sensus had used a similar technique for years in its products, but recently introduced an enhancement for detecting when these heating events are occurring. Sensus' meters use two separate temperature sensors, one on the PCB close to the outer cover, and a second located internally near the base of the meter. This provides a faster, more accurate detection mechanism, and allows for setting temperature thresholds much closer to the points of heat generation. With dual sensors, the meter can eliminate the effects of solar loading, compare the temperature rise over time between the sensors, and detect if the meter-to-socket connection is overheating.

Confident in the accuracy of the dual-sensor methodology, Sensus developed a meter function that automatically stops power from flowing and discontinues the heating process when in overtemperature/overcurrent states. These meters have service switches with configurable thresholds that can open automatically (with no remote control required) to halt the power flow and overheating. Several utilities have successfully deployed and operated the dual-sensor meters with this function. Hundreds of potentially dangerous hot socket events have been stopped with this dual-sensor technology. One Midwest utility with an existing aging meter population provided the new technology to its entire meter population. Over six months, at

² http://www.eei.org/meetings/Meeting_Documents/Dimpfl,%20Ken.pdf



least 10% of the meters opened their service switches due to the temperatures in the socket exceeding the configured threshold. When the utility visited those sites to investigate, they found that in over 95% of those cases, the meter socket required replacement or repair.

4.2 Voltage

Overvoltage and undervoltage conditions can result from a number of system changes. The voltage lowers as a result of circuit loading, and utilities offset this voltage drop effect with capacitive support (capacitor banks, or “cap banks”) activated under daily, monthly, or seasonal schemes (depending upon condition severity). Tap-changing transformers are another solution for these undervoltage conditions, typically for shorter term variations.

Overvoltages may be either temporary, due to load variations, or long-term, due to designed operations, though within standard limits.³ An example is setting the voltage at the high end of the ANSI standard limits at the substation transformer so the last load point at the end of the longest service circuit is just above the lower limit.

For long-term conditions, such as those caused by lowering the voltage under a voltage conservation program, the utility must use customer meters to monitor the resulting current rise⁴ and temperature to guard against potentially unsafe operations. Rather than focus on a single system parameter, utilities should take a holistic view of the distribution network and metering as one system. This means developing a monitoring and control approach that takes the richer meter measurement suite into account. Programmable meter features can work in concert with distribution network-level equipment to address issues and support service-level-based protective schemes.

Short-term events are usually related to conditions such as lightning strikes, a blown transformer, or a higher-voltage transmission line falling on a lower-voltage distribution line. These faults cause disturbances that can cause a meter fault, or in extreme conditions, may cause a meter to dislodge from the socket, smoke, melt, or burn. There are components to protect the meter and customer from some events, but extreme events could exceed the specification of the meter and those protection components may be consumed during an event, leaving no protection. In addition, customer-oriented overvoltage protective equipment is not part of typical installations. While there are protective devices available, they are usually only

³ ANSI C84.1.

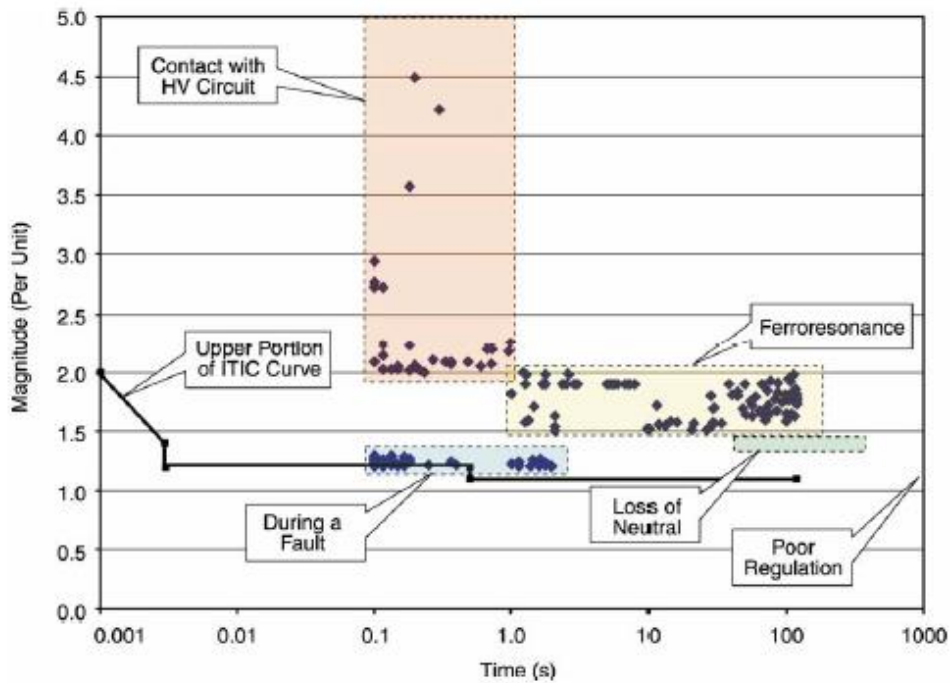
⁴ Constant power loads draw more current when the voltage is lowered if the power demand remains unchanged.



installed on troublesome services and not universally required. These short-term overvoltage events create conditions that are neither wholly contained in the ANSI nor the UL specifications. Testing tends to account for a single occurrence during the test plan. Yet field conditions may see rapid recurrences within a short timeframe, and many events may occur over the service lifetime of the equipment.

Electric Power Research Institute (EPRI) conducted distribution line monitoring to study the “Effects of Temporary Overvoltage on Residential Products” culminating in the March 2005 report on the same.⁵ The conditions detailed both the magnitude and duration of events that residential products and electric meters could see from the distribution system. EPRI’s graph below shows the number of events noted, the magnitude, and the duration. Neither ANSI nor UL 2735 have provisions in their testing requirements that address this wide variety of temporary overvoltage conditions.

Figure 3: EPRI – Temporary Overvoltage (TOV) Events Grouped by Query Results *(Used with permission)*



⁵ *Effects of Temporary Overvoltage on Residential Products: System Compatibility Research Project*, EPRI, Palo Alto, CA: 2005. 1008540.



These conditions may result in not only damage to consumer equipment, but also to the electric meter depending on magnitude and duration.

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5 *Ultimate Benefits*

Today's electricity meter testing and standards are robust. ANSI and UL certifications are comprehensive and their methodologies are iterative. Yet it takes time to prioritize and incorporate new tests that keep pace with current technologies. Additional testing can help fill those interim gaps. Improved consumer safety and confidence, device performance, and overall value are the key benefits of additional testing.

End Consumer Safety

Customer expectations do not necessarily adhere to the timelines required to update the standards. Additional testing is intended to replicate conditions not yet codified but are still reflective of real-world circumstances that end consumers may experience. Vendors, utilities, and other parties all work to improve the testing and requirements for meter and socket products to maintain high quality and safe delivery of electricity.

Device Performance and Accuracy

Additional testing supports device performance and accuracy claims across a broader set of conditions than standard testing. Also the vendors, utilities, and other parties are now exploring multiple variables, where two or more conditions are tested to better mimic actual field settings. Those designing the tests are challenged to identify clear and repeatable success and failure criteria applicable across a variety of products. Also the technical merit and business value must

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be balanced to ensure the overall value of information gained is worth the investment of performing the additional tests.

Utility Business to End Customer Value

Additional testing increases value since the results help to avoid failures that could compromise customer safety. While it's difficult to argue against the value of safety, we must still weigh the costs of additional testing. Typically the cost of testing is spread over a number of devices, and the net value of testing outweighs those costs for both utilities and end customers.

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6 Conclusion

Technological advances leave virtually no area untouched, and the electricity meter industry is no exception. Yet the life cycle of meters is long, resulting in a unique mix of circumstances and considerations for the safety and performance of electricity meters. The industry must also factor in the differences in device performance between electromechanical devices and new solid-state meters. Similarly, new installations versus existing installations, where sockets have been in place for decades, directly affect performance and safety.

Meter testing is intended to assess the devices under a variety of realistic, stressful conditions, but there is no silver bullet to preempt every circumstance that could impact meter performance. Standards-based testing yields safe and accurate products. However, utilities, vendors, and other industry parties work to introduce additional testing and design that goes above and beyond current standards. If some testing is good, then it can be even better to add tests that more closely reflect real world conditions. The results of the additional testing can improve overall design to deliver a more accurate, safer product.