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White Paper

## Functional vs. Revenue Accuracy Testing in Modern Metering

### Introduction

Electric meter testing has traditionally centered on revenue accuracy, the ability of a meter to measure energy consumption within defined tolerances. While this remains a foundational requirement, the evolution of Advanced Metering Infrastructure (AMI) has introduced additional operational expectations for meters.

Modern meters are no longer limited to measurement functions; they operate as intelligent devices within a broader network. This shift has led utilities to expand testing practices to include both revenue accuracy and functional performance.

### Defining Revenue Accuracy

Revenue accuracy refers to the meter's ability to measure electrical energy consumption correctly. This is typically evaluated under controlled conditions using known loads and reference standards.

Accuracy testing ensures:

- Compliance with applicable standards
- Fair and consistent billing
- Confidence in measurement performance

### Defining Functional Performance

Functional performance relates to how a meter operates within its intended environment. This includes:

- Communication with network systems

- Execution of remote commands
- Firmware behavior and updates
- Event detection and reporting
- Response to electrical conditions

Functional validation confirms that the meter performs its operational roles beyond measurement.

### **Historical Perspective**

In electromechanical and early electronic metering systems, testing focused almost exclusively on accuracy. Meters operated independently, with limited interaction beyond measurement.

With the introduction of AMI, meters became integrated components of communication and control systems. As a result, testing requirements expanded to address operational functionality.

### **Why Both Accuracy and Functionality Matter**

Focusing solely on measurement performance may not fully reflect how a meter will behave in service. Operational issues such as communication failures, incorrect configurations, or command execution problems can impact system performance even if the meter is measuring accurately.

Conversely, a meter that functions correctly but does not meet accuracy requirements is not suitable for revenue applications.

A comprehensive validation approach ensures that meters:

- Measure accurately
- Operate reliably within the system
- Integrate effectively with utility infrastructure

## **Integrating Validation Practices**

Utilities may integrate accuracy and functional validation within a single testing workflow or perform them as part of coordinated processes. The specific approach depends on factors such as:

- Meter type and technology
- Utility standards and procedures
- Testing equipment and capabilities
- Operational requirements

Regardless of method, the objective remains the same: to confirm that meters are both accurate and fully operational prior to deployment.

## **Challenges in Modern Meter Testing**

As metering systems become more complex, utilities face challenges including:

- Managing multiple meter types and firmware versions
- Ensuring consistency across testing locations
- Balancing throughput with thorough validation
- Adapting to evolving communication technologies

Addressing these challenges requires adaptable testing strategies and clearly defined validation criteria.

## **Conclusion**

The evolution of metering technology has expanded the scope of testing from a singular focus on revenue accuracy to a broader evaluation of functional performance. In modern AMI environments, both aspects are essential to ensuring reliable operation and accurate billing.

By incorporating both accuracy and functional validation into their processes, utilities can better prepare meters for deployment and reduce the risk of operational issues.