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Application Note

How to Simulate Voltage Sags and Disconnect Events in Meter Testing

Introduction

Electric meters operate in environments where electrical conditions can vary significantly. Events such as voltage sags, interruptions, and service disconnects are part of normal system operation and can impact meter behavior.

Simulating these conditions during testing allows utilities to evaluate how meters respond before they are deployed in the field.

Understanding Voltage Sags

A voltage sag is a temporary reduction in voltage below nominal levels. These events can occur due to:

- System faults
- Large load changes
- Switching operations

Meters must be able to:

- Continue operating during the event
- Accurately detect and log the condition
- Resume normal operation afterward

Understanding Disconnect Events

Disconnect events refer to the intentional or unintentional interruption of service. In AMI systems, these may include:

- Remote disconnect and reconnect operations
- Power interruptions due to system conditions

Meters are expected to:

- Execute disconnect and reconnect commands correctly
- Maintain proper state awareness
- Record and report the event accurately

Why Simulation Is Important

Field conditions are not always predictable or repeatable. Testing under controlled conditions allows utilities to:

- Evaluate meter behavior consistently
- Identify potential issues prior to deployment
- Verify that event detection and logging functions operate correctly

Simulation helps reduce uncertainty and improves confidence in meter performance.

Methods for Simulating Electrical Events

Simulation approaches may vary depending on testing capabilities and objectives. Common methods include:

1. Controlled Voltage Variation

Adjusting voltage levels to replicate sag conditions allows evaluation of meter response and event detection.

2. Interrupting Supply Conditions

Introducing controlled interruptions simulates disconnect events and verifies meter behavior during loss and restoration of power.

3. Command-Based Testing

Executing system commands (such as disconnect/reconnect) in a controlled environment allows verification of operational response.

Key Considerations

When simulating these events, utilities should consider:

- Repeatability of test conditions
- Alignment with expected field scenarios
- Accurate monitoring of meter response
- Verification of event logging and reporting

Ensuring consistency in testing helps produce reliable and comparable results.

Conclusion

Simulating voltage sags and disconnect events provides valuable insight into how meters will perform under real-world conditions. By incorporating these simulations into testing processes, utilities can better evaluate meter behavior and reduce the likelihood of issues after deployment.