Evaluating the Accuracy of Smart Meters: A Case Study from Texas

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Utilities are increasingly deploying advanced meter infrastructure (AMI) as an initial step toward a smarter grid, which will support energy savings efforts and provide information to customers on their energy use. Advanced meters are a key part of the envisioned smart grid that enables new demand response and energy efficiency programs with features that include two-way communications between the customer and the electricity provider, recording of interval consumption data, automatic delivery of data to utilities, and remote diagnostic capabilities.

Smart Meter Deployments Are Presenting Novel Challenges to Utilities

Public concerns have given rise to the need for additional study of advanced metering technology, systems, and processes. In the case of AMI deployment in Texas, the accuracy of the new advanced meters was called into question. As a result, the Public Utility Commission of Texas initiated a statewide study to investigate the accuracy of the deployed advanced meters and systems.

A Multifaceted Approach Was Used To Evaluate Large Deployments in Texas

Several analyses were used as part of the overall methodology to determine the implications of AMI deployment on the accuracy of metered consumption. The scope of the study spans three electric utilities and approximately 1.5 million advanced meters. Four independent tests were performed on statistical samples of both advanced meters and traditional electro-mechanical meters: 1) new meter laboratory testing, 2) deployed meter laboratory testing, 3) in-field testing, and 4) side-by-side laboratory testing. The testing process and the results are explained for each test group.

Meter Accuracy Tests Were Fairly Conclusive -- Smart Meters are More Accurate Than the Electromechanical Meters They Replace

Meter testing results indicate that advanced meters exhibit a near-perfect mean accuracy and a statistical variance nearly two orders of magnitude less than the traditional electro-mechanical meters. Customer consumption analysis, once weather affects have been accounted for, does not indicate any statistically significant difference due to the meters themselves or the metering system. However, an interesting finding of this investigation highlights new challenges arising from AMI deployment such as integrating and analyzing new types of data, ensuring communications reliability, and remotely diagnosing meter health.

Implications for Smart Meter Deployments

This investigation has two important implications for AMI deployments:

- The accuracy of the AMI meters is a significant improvement over the traditional electro-mechanical meters. Meter accuracy can be statistically evaluated by a measurement and verification process, but meter accuracy should not pose a barrier to deployment.

- Signals from AMI meters can include useful information beyond consumption, such as self-diagnosis of meter health. The development of capability to fully integrate the functionality of AMI meters should be incorporated into project plans to ensure accuracy and to help realize the full benefit of the technology. The data collection and analysis processes should be evaluated following deployment to verify the proper handling of meter signals.