Theoretical Framework for a Prototype Measurement and Verification Meter that Supports Basic M&V 2.0 Principles

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Abstract

A theoretical framework is presented for a prototype M&V meter. The development of the framework was guided by the regulations, standards, and operating procedures in South Africa. The possibility of further development for other M&V markets, or for more advanced M&V methods than presented here, are not excluded. Longstanding fundamental considerations that are associated with the classical approach towards M&V, such as process transparency and data integrity, are provided for in the framework. Newer considerations that are associated with the more recent approaches of M&V2.0 are also provided for, such as data granularity and real time reporting. Conceptually speaking, the equipment of the industry standard data acquisition path is combined in a single node, and the extent of the quality control path (QCP) is reduced to one piece of equipment. The framework is supported by the development of Simulink models that provide some basic functionality, which includes 1) keeping date and time with a real time clock that also compensates for special or alternative billing days, 2) sampling and converting analogue values on power line measurement channels for the actual energy consumption, and integrating to 30 minute profile values, 3) sampling and converting analogue values on a 4 20 mA or a 0 10 V sensor measurement channel, or counting pulses on a digital pulse channel for the energy driver, and integrating to 30 minute profile values, 4) storing a baseline model of the form y = mx + c, and calculating 30 minute adjusted baseline- and savings profile values, and 5) checking savings values, sorting into time-of-use periods, and applying emission- and water consumption factors, all in accordance with a reporting construct that supports South African reporting protocols. The Simulink models have large numbers of elements, and at this time exist as separate models that function independently of one another. Simulation results show that the models perform their intended functions. The models will be interconnected appropriately during prototyping in order to function as the sub-models of a larger model, and additional sub-models will be developed for more complex functions. An introductory overview of the existing and future models is presented; details will be presented at a more advanced stage of development.

Keywords

QCP, M&V 2.0, M&V meter.