

ADVANCED CONDITION MONITORING OF PRIMARY EQUIPMENT WITH THE STANDARD SERIES IEC 61850 AND IEC 61400-25

The focus of the globally well accepted and used Standard series IEC 61850 is the provision of interoperability of intelligent electronic devices (IED) and tools for the automation, control, protection, and configuration of substations. Application domains like wind and hydro power plants and other decentralized energy resources (e.g., combined heat and power) have extended the standard information models and communication mappings provided by IEC 61850. First standards of the series IEC 61400-25 (IEC 61850 for wind turbines) have already been published. Other standards are under way.

Most of these definitions are related to the operation of the power system. During the recent years people have realized that the standard IEC 61850 provides also a useful basis for the (condition) monitoring of the primary power system equipment – the crucial assets that need best care and attention. Maintenance and asset management can use the new standardized information such as critical vibration, temperature, oil level, gas density et cetera. Such extensions cover the monitoring of equipment in substations (e.g., switchgear, transformers, on-load tap changers, automatic voltage regulation devices, gas compartments, and lines) and on generation sites (e.g., generators, gearboxes, transmission systems, and towers in wind turbines). Comprehensive input for the extension of the existing standard series IEC 61850 has been provided recently. IEC TC 88 (wind turbines) standardizes IEC 61850 compliant information models for condition monitoring of wind turbines (IEC 61400-25-6) to cover the crucial areas of wind turbines.

Condition monitoring is crucial for any kind of power generation plants – especially for huge (offshore) wind parks due to the weather conditions that heavily impact the maintenance and repair. Myriads of sensors have been and will be installed anywhere to monitor the condition of the foundation, tower, rotors, gearboxes, generators to name a few. The virtually unlimited amount of monitoring information needs to be managed and communicated efficiently in a standardized fashion. Currently there is a proliferation of vendor-specific solutions that requires high costs for the exchange and integration in multi-vendor systems.

An IEC 61850 compliant system for monitoring a high voltage transformer (380/110 kV) has been successfully installed at a substation at RWE (the second biggest German utility) by end of 2007. The monitoring system uses existing and new information models, client-server communication, GOOSE messaging and sampled value information exchange from conventional current and voltage transformers. The objective of the project is to demonstrate the feasibility of the IEC 61850 process bus for protection, control, and equipment monitoring under real high voltage conditions.

The new extensions seem to be a pivotal point for the future electric power system. This paper presents and discusses the various efforts related to the international standardization. A solution of a comprehensive monitoring system based on IEC 61850 and IEC 61400-25-6 using off the shelf components will be presented. And the benefits and challenges of condition monitoring using standards will be discussed.

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2. This paper has not been previously presented.

3. This paper is best-suited for the following topic category:
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