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MONITORING OF POWER SYSTEM AND COMMUNICATION INFRASTRUCTURES BASED ON IEC 61850 AND IEC 61400-25

The focus of the first edition of IEC 61850 was on substation operational aspects (mainly protection and control). Various groups have identified that IEC 61850 is the basis of further applications, e.g., monitoring of functions, processes, primary equipment, and the communication infrastructure in substations and other power system application domains. The second edition and other extensions provide new definitions to keep the high quality and availability of power systems, to reduce commissioning time and life cycle costs.

Edition 2 of IEC 61850 provides new data objects for (condition) monitoring of power systems. Monitoring provides many new data objects for critical measurements like temperatures, oil levels, gas densities, maximum number of connections exceeded et cetera. Such extensions cover the monitoring of equipment like switchgear, transformers, on-load tap changers, automatic voltage regulation devices, gas compartments, and lines; generators, gearboxes, and towers in wind turbines; communication infrastructure like Ethernet switches and routers. Myriads of sensors are needed to monitor the condition of the wind power foundation, tower, rotors, gearboxes, generators to name a few. The new standard IEC 61400-25-6 extends IEC 61850 with condition monitoring data objects for wind turbines. IEC 61850-7-4, 7-410, 7-420, and IEC 62351-7 (security) provide a huge list of new data objects. A lot of these data objects are needed for, e.g., NERC CIP compliance or other security reporting requirements.

The abstract data objects are the basis for a sustainable interoperability in the power industry – abstract means, they can be mapped to many protocols, sustainable means, they can be used “forever”. The abstract objects can be mapped to MMS as defined in IEC 61850-8-1 or (according to IEC 61400-25-4) to Web Services, OPC-XML, IEC 60870-5-10x, or DNP3.

The new extensions are a pivotal point for the interoperability in the future electric power systems – they can make the system smarter than it was in the past. This paper presents and discusses the benefits and challenges of the various model extensions in edition 2 of IEC 61850 and other standards. Realizations in practical use in power utilities will be presented, too.

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See you in Tampa.