

Improving Wind Farm Operation

Through Consistent Use Of The IEC 61400-25 and IEC 61850 Standards

Since the IEC 61850 standard series was adopted in 2003, more and more equipment manufacturers are offering products supporting this standard. Meanwhile, the IEC 61850 standard has become generally accepted as a standard for facilities that are planned or starting new construction.

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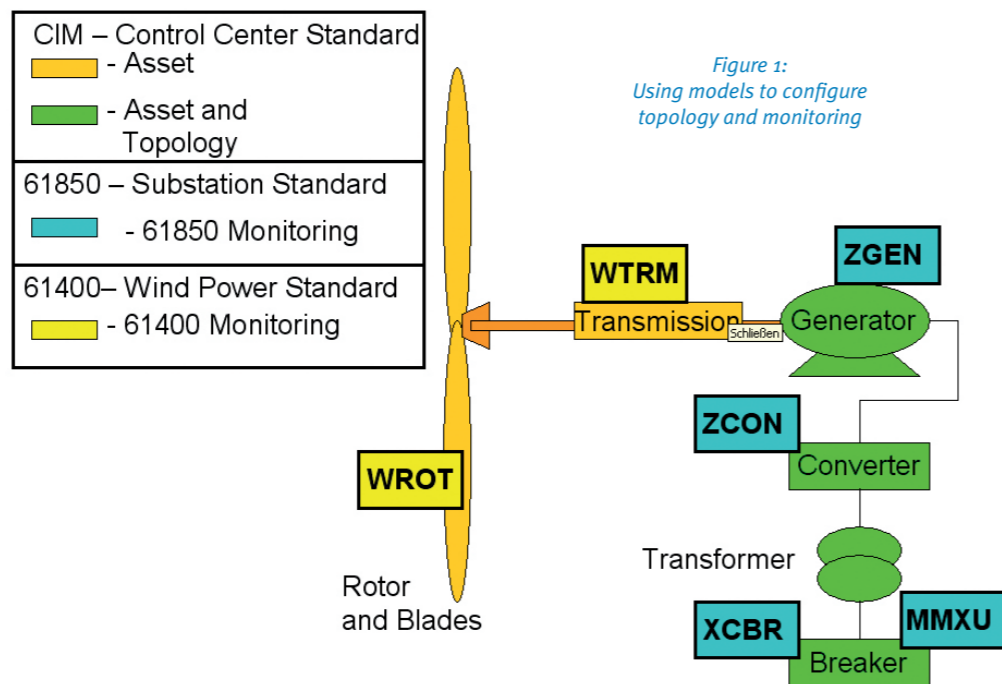


Figure 1: Using models to configure topology and monitoring

Although the official purpose of the IEC 61850 standard is to facilitate communication within substations through standardization of the device/object models and communications services, IEC 61850 can be extended easily to different purposes.

IEC 61850 standard series and its extensions

This can be done by inserting additional parts into the IEC 61850 series of standards describing additional object models for hydroelectric power plants and distributed energy resources (DER) as is happening with IEC 61850-7-410 and IEC 61850-7-420 respectively. An alternative method would be the introduction of an

additional standard such as the IEC 61400-25 standard for wind energy applications.

MMS – an established protocol

A key feature of the IEC 61850 series of standards, and the other standards based on it, is that the object definitions and their services are defined in an abstract form that is independent of any specific communication protocols.

Separate parts of the standard specify the communication protocols which are used for the implementation of the abstract objects and services. The current version of the IEC 61850-8-1 document specifies a mapping of the abstract objects and services

to the Manufacturing Messaging Specification (MMS) Protocol (ISO 9506) over TCP/IP networks to map the abstract objects and a majority of the services. Some services like GOOSE and Sampled Measured Values (process bus) use other protocols directly over Ethernet.

IEC 61400-25 – a different approach

The IEC 61400-25 standard uses a slightly different approach. Part 4 of this standard – which is going to be published now – does not specify a single protocol mapping to a communication protocol for the implementation of the abstract object models and services. Instead, IEC 61400-25-4 provides mappings to five different communication

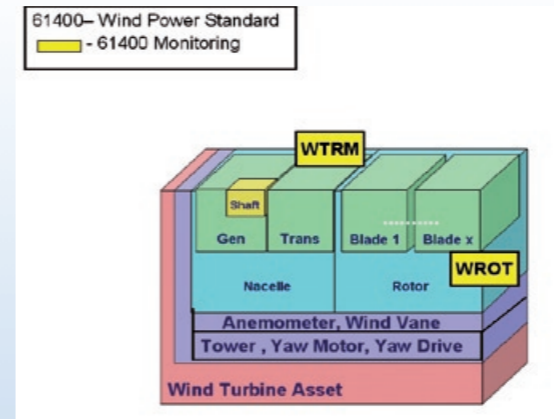


Figure 2:- Using Appropriate Standards – Wind Turbine as Standard Assets

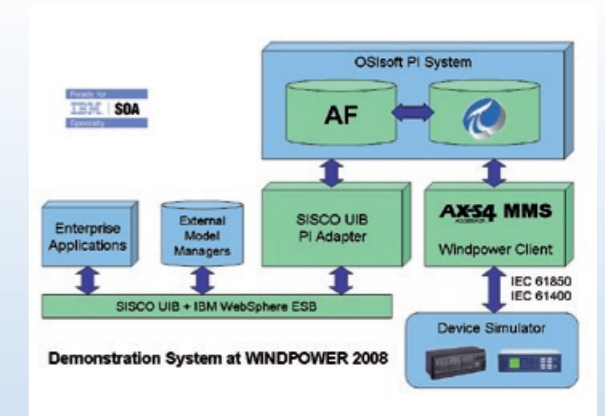


Figure 3:- Demonstration System at Windpower 2008

protocols. In addition to the MMS mapping there are mappings for SOAP-based web services, OPC/XML-DA, IEC 60870-5-104, and DNP3. Thus the possibility exists that two applications, which both implement IEC 61400-25 compliant object models and services on the application level, are nevertheless not able to communicate with each other if they are using different communication protocols for the implementation of the object models and services.

At first glance that does not seem to be a serious deficiency, since the operators of individual wind farms may specify the communication protocols to be used in their plants. For the equipment manufacturers,

however, increased development costs will result if they have to offer their devices with up to 5 different implementations of the communication protocol mappings instead of only one. In the long run this will also become a handicap for the operators of the wind farms because the isolated solutions for individual wind farms will need to be integrated into larger units requiring the purchase, installation, configuration and maintenance of gateways and translators to handle the incompatible protocol mappings at substantial expense. As the experience with the IEC 61850 shows – a standard specified only for the communication inside substations – the same protocol will also be

used for communication to systems above the substation level and to other substations as well. Likewise, the communication according to IEC 61400-25, although specified only for use inside the wind farms, will result being used for communication between different systems in the future.

MMS – also suited for wind energy

Thus, in our opinion, the mapping of the object models and services to MMS should be the first choice for IEC 61400-25 as well. In addition, the communication between IEC 61400-25 devices and IEC 61850 devices can be established more easily without gateways or trans-

lators. An additional consideration is that the Intercontrol Center Communications Protocol (ICCP) per IEC 60870-6 TASE.2 that is used on several levels in the production, transport and distribution of electricity also uses the same protocol mappings to MMS as IEC 61850-8-1. By adapting MMS for the IEC 61400-25 protocol mapping a more consistent and simpler communications architecture will result.

Support by expert partnership

The products provided from SISCO Inc and AMA-SYSTEMS respectively are

- ▶ Libraries for APIs for several operating systems.
- ▶ Sourcecode for “embedded” solutions.
- ▶ OPC interfaces to link user applications.
- ▶ Complete gateways which require configuration only.

These qualified products of company SISCO Inc. and the services of AMA-SYSTEMS including qualified trainings and individual workshops persuaded more than 150 customers in Europe.

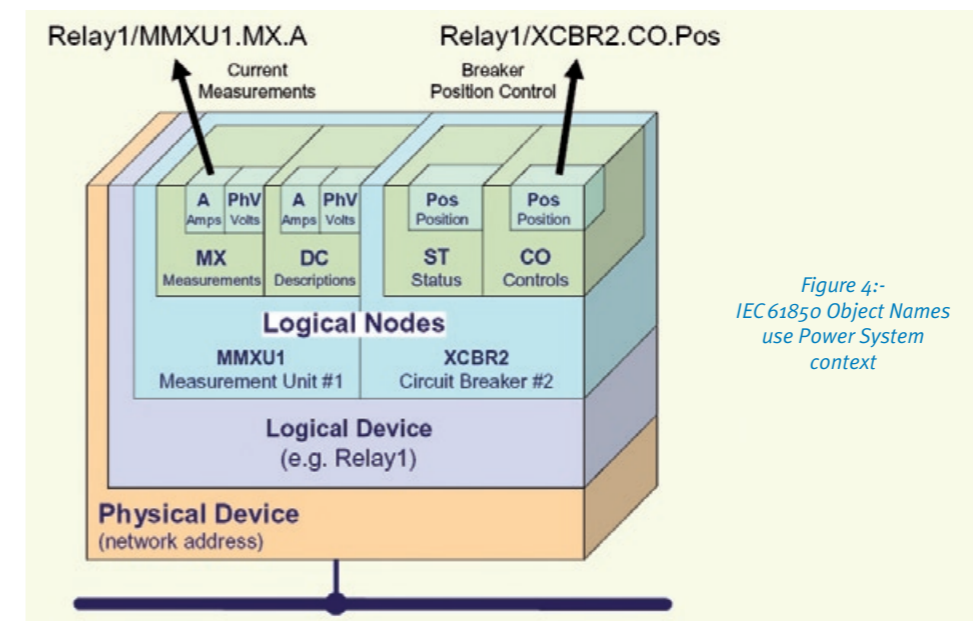


Figure 4:- IEC 61850 Object Names use Power System context