风力发电厂通信标准化

新的国际规则为风力发电厂提供了统一的信息交换标准——既降低成本又节省人力

Standardising plant communication

New international regulations provide uniform standards for information exchange in wind power plants – reducing cost and manpower

由于风能已成为世界首选能源之一，所以近年来顺利整合风能与大规模电站发电的组合已成为焦点。

实际上，现代化的通讯设施，诸如基于以太网的工业等级质量局域网等是当今风力发电厂所使用的标准。此外，在现代，与调度中心和远程控制中心的通信也至关重要。

国际规则

IEC 61400-25是最新发布的国际规则，它统一了风力发电厂的通信标准。该标准规定了现代通讯所要求的所有设施，使用对象信息建模以适应信息系统的服务导向架构，适用于现代化风力发电厂的运营和维护。

在应用一个更为灵活，更具扩展性的架构方面，现代化的传输系统、分配系统和调度系统承受着巨大的压力。鉴于传统系统只能管理为数不多的发电机组，现代化能源管理系统应可管理数目众多的发电机组。由于IEC 61400-25标准涉及了若干设备，既可支持现有的传输协议，又可支持更为现代化的协议，比如web services协议和基于XML的协议，促进了传输的平稳性，从而支持了这方面的发展。

标准化系统

IEC标准系列61400-25，有着标准化的数据名和数据语义，为获取风力发电厂的信息提供了解决方案。它可以作为独立部分提供监控解决方案，并另使用单一的系统来储存、分析、显示风能信息。此外，该标准可使来自不同风轮机厂商的设备以统一的方式进行监控，从而开创了一个新的局面。

风力发电厂通常拥有一系列来自不同厂商、不同技术发展水平的风轮机，此风轮机高效运营和有效维护的前提来自风轮机发电机组的操作信息和历史信息获取的统一性。IEC标准系列61400-25

Smooth integration of wind power in the generation portfolio of large-scale utilities has become a focal point during the last few years, as wind power has become one of the world's preferred energy sources.

Modern communication facilities – such as Ethernet-based LAN systems of industrial grade quality – are a de facto standard in modern wind power plants of today. In addition, communication with the dispatch centre and remote control centre is essential in modern power generation systems.

International regulations

IEC 61400-25 is a newly released international regulation addressing communication standards for wind power plants. It specifies all required facilities for modern communication, using object-oriented information modelling to fit into service-oriented architecture of information systems applied for operation and maintenance of modern wind power plants.

Modern transmission, distribution and dispatching systems are under great pressure to apply a more flexible and scalable structure; where the traditional systems were based on managing a small number of generation units, the modern energy management systems must manage a huge number of generation units. The IEC 61400-25 supports this development, as the standard includes several facilities to assist smooth transition by supporting existing transmission protocols as well as more modern protocols like web services and XML based-protocols.

A standardised system

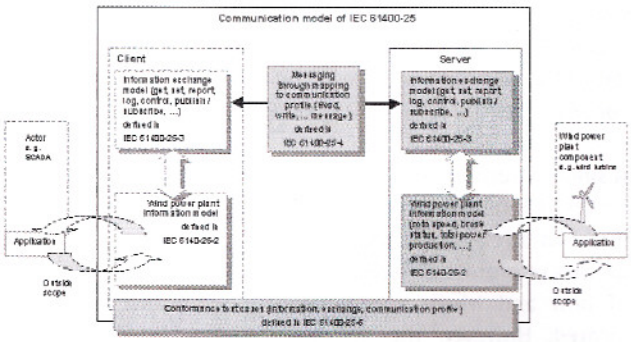
The IEC standard series 61400-25 provides a solution for access to wind power plant information with standardised data names and semantics. It makes it possible to provide monitoring and control solutions as separate parts, and to use a single system to store, analyse, and present wind power information. In addition, the standard opens up for control and monitoring of information from different wind turbine vendors in a uniform manner.

Uniform access to operational and historical information from wind turbines generation units is a prerequisite for efficient and effective operation and maintenance of wind power plants that have a mix of wind turbines from different vendors and wind turbines at various evolutionary levels. This is where the IEC standard series 61400-25 "WIND TURBINES – Communications for Monitoring and Control of Wind Power Plants" could add great value to wind power based generation business.

The last part of the standard was approved in August 2008, so the full standard series is now ready for implementation in wind power plants and wind turbines.

The IEC 61400-25 was developed in order to provide uniform information exchange for monitoring and control of wind power plants. It will eliminate the issue of proprietary communication systems utilizing a wide variety of protocols, labels, semantics, etc., thus enabling wind power plant operators to exchange information with different wind turbines independently of the vendor. It also enables wind turbines from different vendors to communicate with other devices in a wind power plant more easily, at any location and at any time.

IEC 61400-25 概念通信模型
Conceptual communication model of the IEC 61400-25



“风轮机—风力发电厂监控通信”可在这方面极大地增加基于风能的发电业务价值。

该标准的最后一部分于2008年8月通过批准，所以，现已做好准备，将完整的标准系列用于风力发电厂和风轮机。

编制IEC 61400-25标准旨在为风力发电厂的监控提供统一的信息交换标准。该标准可消除专有通信系统利用众多协议、标签、语义等的弊端，使风力发电厂的操作人员独立地与不同厂家的风轮机交换信息；同时不论在何时何地，不同厂商的风轮机也可更方便地与其他风力发电厂设备交换信息。

Reducing cost and manpower

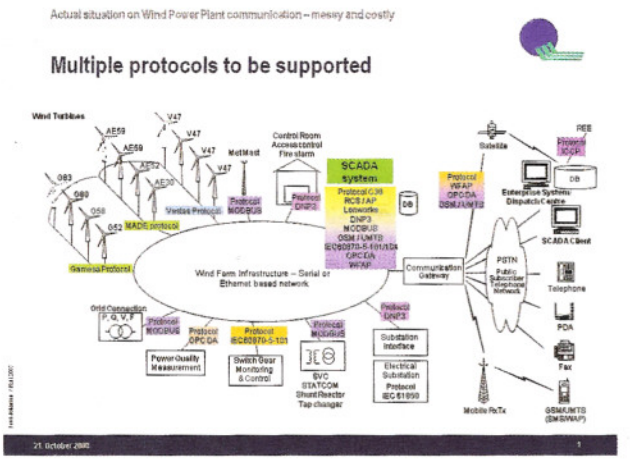
Object-oriented data structures make engineering and handling of the huge amounts of information provided by wind power plants less time-consuming and more efficient. Scalability, connectivity, and interoperability can be maximized to reduce cost and required manpower to establish grid integration.

The standard is a basis for simplifying the roles that the wind turbine and SCADA system play. The crucial part of the wind power plant information, information exchange methods, and mapping to communication profiles are standardized. They build a basis to which procurement specifications and contracts can easily refer.

The focus of the standard is on the communications between wind power plant devices such as wind turbines and external systems such as SCADA systems or dispatching centres. Internal communication within a wind power plant device, such as internal communication in a wind turbine, is outside the scope of the standard.

The standard can be applied to any wind power plant operation concept, i.e., both in individual and integrated operations. The application area of the IEC 61400-25 covers

IEC 61400-25发布之前的风力发电厂情况
Situation in wind power plant before the IEC 61400-25



降低成本，节省人力

面向对象的数据架构可更省时、高效地设计和处理风力发电厂拥有的海量信息。互联性、互操作性和可扩展性得到了最大程度的发挥，降低了建立电网一体化的成本并节省了所需的人力。

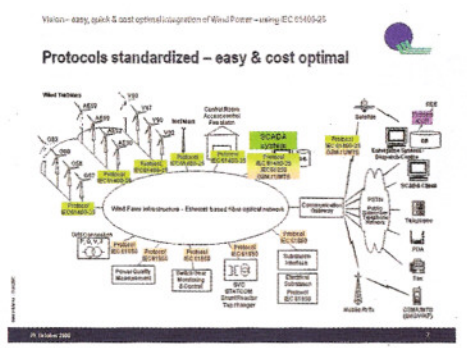
该标准是简化风轮机和SCADA系统作用的基础。风力发电厂信息、信息交换方法以及映射至通信规约的关键部分得以标准化。它为采购规格和采购合同提供了便于参考的基础。

该标准重点针对风力发电厂设备（例如：风轮机）和外部系统（例如：SCADA系统）或调度中心之间进行的通信。风力发电厂设备内的内部通信，例如，风轮机内部通信，就不在本标准范围之内。

该标准可应用于任何风力发电厂运营，既包括独立运营也包括综合运营。IEC61400-25的应用领域涵盖所有风力发电厂运营所需的设备，例如：气象系统（气象信息系统）、电力传输网络、接口系统（例如：变电站）和风力发电厂管理系统。

有关馈线和变电站的相关内容，IEC61400-25参考了IEC 61850标准系列——变电站通信网络和系统协议，并以IEC 61850标准系列的信息建模概念为基础。

IEC 61400-25发布后的风力发电厂情况
Situation in wind power plant after the IEC 61400-25



all devices required for the operation of wind power plants, for example the meteorological system (weather information system), the electrical transmission network and interface systems such as substations, and the wind power plant management system.

For information associated with feeders and substations, the standard IEC 61400-25 refers to the standard series IEC 61850 – communication networks and systems in substations. The IEC 61400-25 standard is based on the information modelling concept from the IEC 61850 standard series.

A single interface

IEC 61400-25 defines how to model the information, information exchange, and mapping to specific communication profiles or protocols stacks. The standard excludes a definition of how and where a communication interface should be located. However, the objective of the standard is that information associated with a single wind power plant device, such as the wind turbine, should be accessible through a standard interface.

The IEC 61400-25 series is designed for a communication environment supported by a client-server model. Three areas are defined, and each is modelled separately to ensure the scalability of implementations: wind power plant information model, information exchange model, and mapping of the two models to a standard communication profile.

The wind power plant information model and the information exchange model, viewed together, constitute an interface between a client and a server. In this conjunction, the wind power plant information model serves as an interpretation frame for the wind power plant information. The wind power plant information model is used by a server to offer a client a uniform, device-oriented view of the wind power plant data. The information exchange model reflects the whole active functionality of the server.

The IEC 61400-25 series enables connectivity between a heterogeneous combination of a unique client and multiple servers (for example wind turbines) from different manufacturers.

The IEC 61400-25 series defines a server with the following aspects:

Information provided by a wind power plant device, for example wind turbine alarms, status or measured values of a certain time interval is modelled and made available for client access. The information modelled for wind power plants is defined in the IEC 61400-25-2.

Services to exchange values of the modelled information are defined in the IEC 61400-25-3.

The IEC 61400-25-5 defines test cases associated with information, services and protocol stacks for conformance testing of servers and clients.

To ease the use of the new standard some people from the standard development team have initiated a user group in order to support the use of the standard. ■

This article was written by Knud Johansen of Q-Technology