Supervisory Control and Data Actuation Systems: Competitive Advantages in Wind

The Supervisory Control and Data Acquisition (SCADA) systems that control modern wind farms are valuable tools for the industry. They not only enable efficient operations and management of wind power plants, but they are also the key to the future of the industry. Data collection and analysis is essential to achieving highly automated turbines and wind farms. As such, the SCADA systems offered by the various original equipment manufacturers (OEMs) can play a major role in their competitiveness in the market.

Modern OEM SCADA Solutions

In the energy industry, minor changes can result in major bottom line improvements. While many SCADA systems offered by OEMs are functionally similar, unique benefits, even when relatively small, can become major selling points. Each vendor has a different approach to improving their offering.

For example, over the past decade web access to wind farms' systems has become a must-have. Today, nearly every OEM offers a web based portal for easy access to information. However, Alstom has taken this a step further by adding e-mail and SMS alerts to their WindAccess system[i].

Figure 1: A wind farm

The team at Siemens has begun offering two major benefits of their own. Their primary value proposition is that their solution is multi-level, combining two independent but complementary systems[ii]. The turbine has its own SCADA with a long term database that interacts with the control center. Since these are able to function on their own, the system is extremely resilient to failure. Additionally, this redundancy can help to ensure that all data being analyzed is as accurate as possible. To help roll this out, they have taken advantage of the SIMATIC WinCC Open Architecture, which provides a foundation on which customers can easily upgrade to their multi-level solution[iii].

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Nordex Control 2's feature package mirrors this emphasis on long term resiliency. Their leading feature is an independent back-up system that regularly captures data averages and stores them to prevent data loss during communication breaks[iv]. However, unlike Siemens, they have actually focused their efforts on minimizing hardware in the wind turbines, believing that environment-related wear is likely to result in interruptions and high maintenance costs.

While nearly all wind power OEMs strive to offer precise, timely data, Senvion has made this a central focus of their system's evolution. They offer exact-to-the-second data access, enabling highly accurate management of wind farms[v]. In theory, using such precise information can allow power plant management teams to operate more efficiently, reducing costs and downtime.

Vestas has recognized that many SCADA solutions offered up until now have been almost exclusively targeted at larger operations. As such, they have released a lighter version of their VestasOnline system called Compact II. This is easy to install and provides many of the most important data functions with significantly less hardware[vi]. With a similar focus on closely fitting each customer's needs, they have made scalability and modularity a central part of their VestasOnline Business platform.

Of course all of the benefits would be rendered meaningless by poor user experience design. Enercon has recognized this reality and invested into offering user-friendly interfaces[vii]. While often overlooked in favor of technical features, an easy-to-use interface can save significant time and money for the customer.

Some of the most significant product benefits aren't features of the SCADA at all. General Electric has used its WindSCADA system to drive the development of a solution called Wind PowerUP. They claim that this can increase output by up to 5 percent by fine tuning each turbine's operation using data analyses[viii]. This system can automatically manage the drivetrain speed, torque, yaw, pitch, aerodynamic, and component interactions. In doing so, it will lock in on the best settings to maximize power output.

Suzlon has also focused on the bigger picture by creating their own Suzlon Australia Monitoring Center[ix]. This round the clock monitoring team enables customers to outsource the management of their wind farms. This ensures their customers can rest assured that their plants will be monitored by a team of experts.

Coming Expansions of SCADA Solutions

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Several OEMs have recently made announcements about their planned product line expansions in the near future. Some of key points of focus are on improvements to their SCADA solutions. These range from visions of the future of wind power to new features that will help to drive OEMs' market growth.

Dr. Andre Wenzel of Nordex Energy believes that the future lies in integration of a wide range of operations and management systems into their systems in turbines[x]. Wenzel used the example of the integration of Nordex's Anti-Icing System into their system as an

Figure 2: SCADA dashboard

early step in a much broader effort. He indicated that by unifying the many parts of a wind farm into a centralized system, they will be able to achieve significantly more automation than is currently possible.
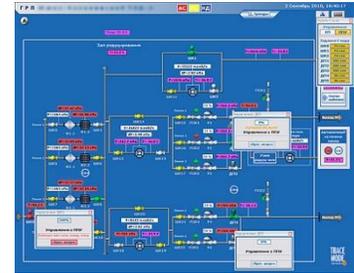
Siemens has made transparency a focus of their product development. Understanding the pressure to reduce time and costs, they have made it easy to access operational information, regardless of role[xi]. The flexibility of their WinCC platform has allowed them to represent data in a variety of ways so that management personnel can gain as much insight as engineers.

The team at General Electric has also released their Digital Wind Farm product line. This is their take on the next evolution of wind farms. It is a highly integrated approach that leverages significant computerization of systems to allow centralized control. Notably they have added to their WindSCADA system by creating a proactive monitoring system that will detect drive train and other turbine issues before they occur[xii].

Not all recent developments have been technological. Alstom took a unique approach to growth by certifying its research and development personnel by the European Quality Assurance standards[xiii]. The staff working on the WindAccess SCADA are included in this and, as such, will be able to more easily achieve new patents for their progressive work. This move was intended to underscore the firm's commitment to continuous innovation and patent development.

Trends in Development and Strategy

While each original equipment manufacturer is striving to differentiate their offering, it is clear that they all share some common opinions about the future of the industry. In both their current solutions and future plans, several key trends highlight a future of greater automation and efficiency.

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Integration of systems around highly computerized and automated SCADA solutions has increasingly become a goal of essentially every OEM. Dr. Wenzel of Nordex highlighted this is particular but it is also evident in both Siemens and GE's recent announcements. In particular General Electric's use of their data platform to launch automation technologies is a prime example of how an integrated approach can provide major benefits. In the case of PowerUP, GE claims that they can increase profits by up to 20%[xiv].

Another commonality in the OEMs offering is an emphasis on robustness. As the majority of SCADA solutions are now offering comparable core functionality, factors such as uptime and data delivery time are becoming more important to wind farm operators. Siemens and Nordex have both made this a central focus; however, nearly every manufacturers' systems include some type of back-up.

Finally, many of the OEMs are moving towards more accurately recorded information. Several have historically used averaged data for the sake of reducing the amount to be stored. However, as it is becoming easier and cheaper to store big data, companies such as Senvion are providing more precise information. Combined with better automation, this enhanced data will help to serve the market need for more predictive capabilities[xv]. An early example of this is General Electric's Digital Wind Farm.

There can be no doubt the modern wind industry is driven by data and analysis. As such, the SCADA solutions offered by wind power equipment manufacturers have become essential competitive advantages. While each OEM provides a different range of features and benefits, they all share the common goals of automation, integration, and proactivity. Future innovations in this space are sure to result in impressive levels of efficiency and significant reduction in the need for operator intervention in the wind power industry.

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Maryruth Belsey Priebe

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Maryruth can't help but seek out the keys to environmental sustainability - it's the fire that gets her leaping out of bed every day. With green writing interests that range from sustainable business practices to net-zero building designs, environmental health to cleantech, and green lifestyle choices to social entrepreneurism, Maryruth has been exploring and writing about earth-matters and ethics for over a decade. You can learn more about Maryruth's work

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