INDEPENDENT ACCESS SOLUTIONS FOR **SENVION WIND TURBINES**

Successful wind turbine operation requires owners and operators, as well as their contracted service companies, to have complete access to their wind turbines at any time. Only in this way is it possible to quickly rectify any malfunctions or faults, ensure efficient operation of a turbine and guarantee profitability.

This does not just apply to physical access by means of the keys to the plant. For modern wind turbines, digital access to the turbine controller software, its data and commands is essential. Access is necessary in order to control operating sequences, identify plant states and detect any faults in time so that the appropriate interventions can be made.

So much for the theory. In practice, however, it is mainly the wind turbine manufacturer who manages these access rights, not the plant operator. This case study addresses the following questions:

- What are the resulting risks for the plant operator?
- Which preventative measures should be implemented?
- What solution models are available?

CHALLENGES AND RESPONSIBILITIES OF THE PLANT OPERATORS, ENERGY SUPPLIERS AND SERVICE PROVIDERS

The profitability of a wind turbine and thus the financial success of its operator depends on its availability. Predictive maintenance, remote maintenance, and, when necessary, timely repair maintain the value of a plant and increase its lifespan.

These activities

- can be carried out independently by the operator, or the company's service department;
- can be outsourced to qualified specialist companies;
- or can be contracted out to the plant manufacturer on the basis of a service agreement.

However, in all cases it is the sole responsibility of the operator to decide who is technically qualified to maintain and repair wind turbines. Ultimately, manufacturers rightly ensure the operator's compliance with the operating manual for the wind turbine. The operating manual also often stipulates that the operator must ensure that unauthorized access to the control system is prevented and that maintenance and repair work is only carried out by suitably trained and authorized personnel.

In the past, this type of access restriction was relatively easy to implement in conventional power plant technology. Modern IT-protected control systems, however, require access rights to very complex software, in which data protection and cyber security, i.e. protection from manipulation of the plant, also have a part to play. The assignment of these access rights must therefore be the responsibility of the owner or operator of the plant.

If the plant operator decides to outsource plant maintenance to the turbine manufacturer (based on a maintenance contract), the manufacturer must verify the suitability of the maintenance provider. This maintenance provider is then granted a time-limited access right by the plant operator. Only in this way can the operator fulfill the responsibility described above.

However, it is standard practice for the access rights to the plant controller to be managed via software by the manufacturer and not the plant operator. This is not a problem if there is a valid service contract with the plant manufacturer. Access rights can be managed, i.e. extended, modified or deleted by the plant manufacturer, as required by the operator.

This situation nevertheless becomes problematic if collaboration with the manufacturer no longer goes smoothly, ownership has changed and the new owner is no longer able or no longer wants to maintain the service contracts, or if the plant manufacturer closes down his entire business operation.

This has the following consequence for plant operators: They can no longer fulfill their obligations and responsibilities on their own. In the worst case they are not even able to acknowledge or delete fault messages and thus operate their plants.

Owners and operators must therefore answer the following questions:

- Who owns the "key" to my plant?
- Do I have the necessary access rights to ensure the operation of the plant?
- Can I meet my obligation as operator and protect the property from improper access?
- Can I record my operating data safely in order to fulfill my burden of proof towards partners and authorities?
- What is the right solution for me?

HYPOTHETICAL CASE:
INSOLVENCY OF A PLANT MANUFACTURER

One example illustrates the problems involved with this standard practice:

A wind turbine manufacturer has concluded service contracts with several customers. These contracts also define the access mechanism for the plants: The plant manufacturer issues new passwords for plant access at least every three months. This gives the plant operator secure protection from unauthorized access to their plants and at the same time saves the associated management effort involved. However, this is only in place as long as the maintenance contract is running.

If the plant manufacturer enters insolvency, the liquidator has the right to terminate any number of service contracts.

This presents customers of the bankrupt company with a previously unknown, serious problem: They can no longer operate their plants in accordance with the requirements stipulated in the operating manual. There is also an even more serious problem: Existing passwords will become invalid within three months at the latest. Operators no longer have access to their own plant and cannot restore operation in the event of a fault. For operators, this is a situation that threatens their company's existence.

THREE POSSIBLE SOLUTIONS

There are three possible ways of avoiding this situation or, in the best case, preventing it entirely:

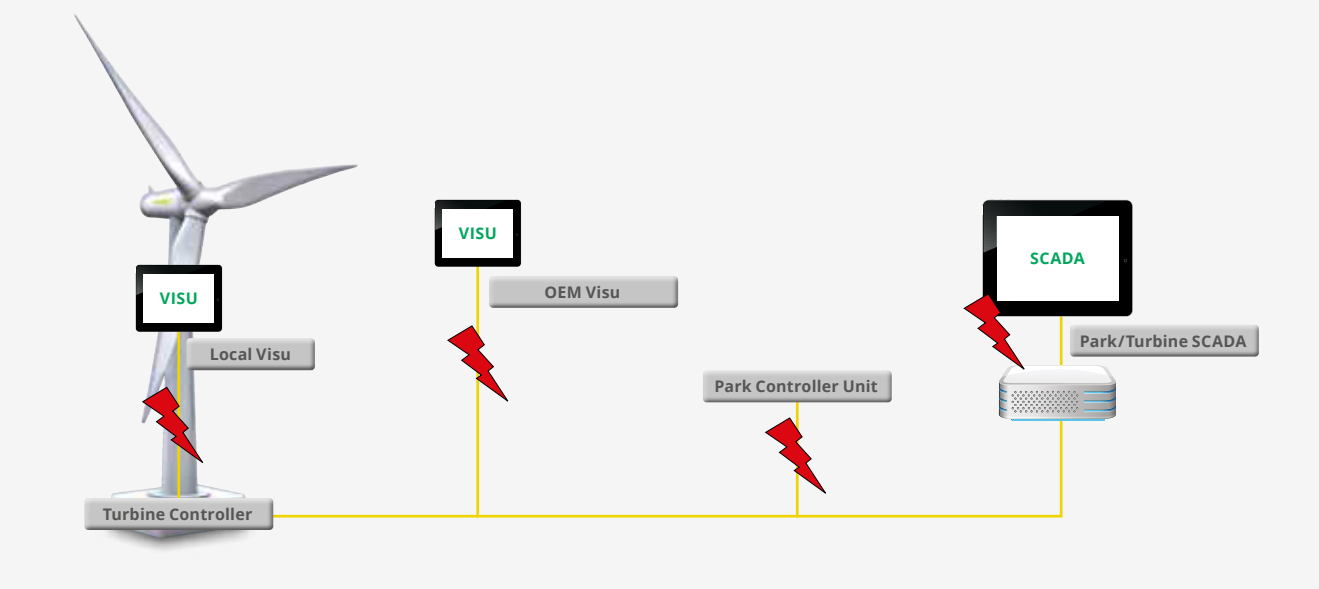


Figure 1: Example: The operator loses access to his plant within three months at the latest.

1. If the plant manufacturer is acquired (new ownership structure), service contracts are concluded with the new owner, who has also taken over the intellectual property of the manufacturer. However, what appears to be a satisfactory solution nevertheless produces a new dependence.

2. A completely new software is installed on the turbines. This is equivalent to a complete retrofit. Depending on the site and the regulations in place, this also involves a lengthy process of recertification. And rightly so, since the operational management software depicts load and safety mechanisms that were implemented on the basis of the mechanical design and load calculation of the wind turbine concerned. Changing or even entirely replacing these software components would lead to the type certification of the wind turbine becoming void. This would affect construction and operating permits, as well as the risk models of the insurers and investors. A potential risk for the continuation of a wind power project, which cannot be underestimated.

   This solution must also be evaluated from an economic perspective. This is particularly the case with well-running plants, where no major operating problems are expected and no maintenance work is required in the foreseeable future.

3. Access to the system is generalized so that plant operators can take over the user management themselves. In order for the recertification process mentioned to be avoided, it must be ensured here that the operational management software of the plant manufacturer is not changed.

This third possibility is examined in greater detail below, as this solution is vendor neutral and can be implemented very quickly. Furthermore, it can also cater for issues such as IT security and protection against cyber criminality.

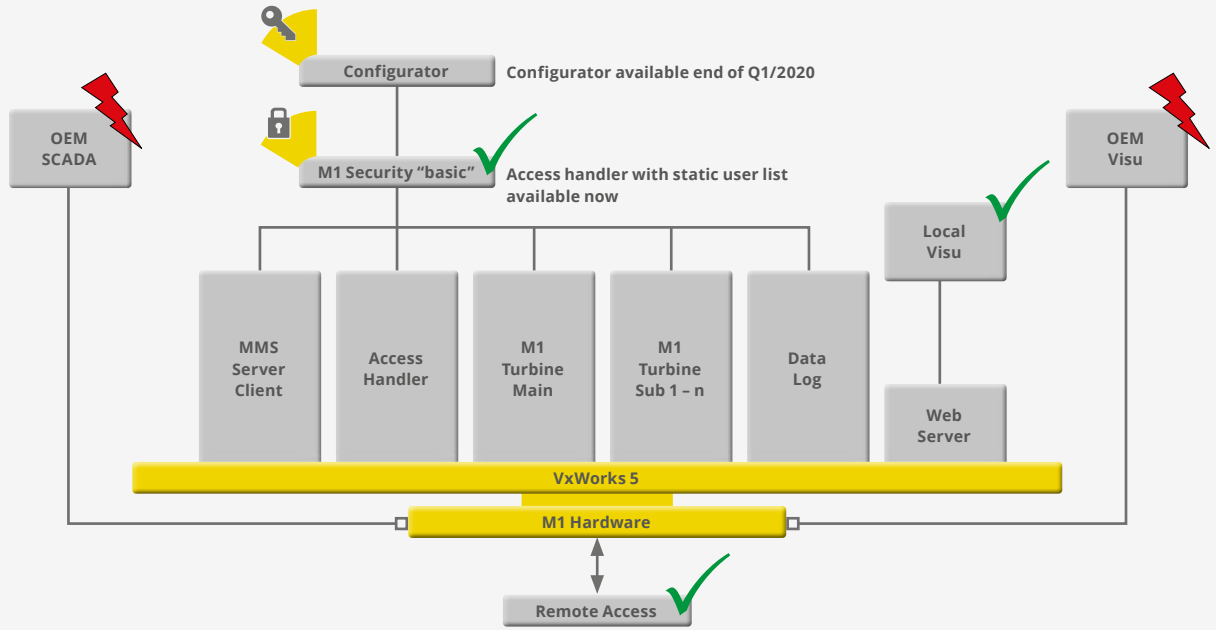
STEP 1: **DEVELOPMENT OF A STAND-ALONE BASIC SOLUTION**

The requirements placed on the access software can be summarized as follows:

- the wind turbine operator is given (again) access to plants with the corresponding authorization levels;
- these can be managed by the operator;
- the operational management software is not changed, IP rights are not violated.

Bachmann has successfully developed a software package to meet these requirements, by which operators can manage the user rights for suitably trained and authorized personnel. New users can be created and obsolete users deleted. Access levels can be assigned according to the degree of training and the work to be carried out. It is also possible to set the expiry date of passwords individually.

Initial installations in different wind farms have now been completed successfully (cf. case study "KS-Energiesysteme"). Customer feedback indicates that it is a solution that meets owners and operators' turbine access right requirements, particularly with regard to specifying who is given which access rights and when.



M1SenAccessBasic

- Basic solution for protecting access to systems
- Manages operator-specific access as an add-on for the existing controller
- Dynamic access management (users and passwords configurable by the customer (all encrypted) up to security level "service"
- Access to specified operating functions (safety critical functions excluded)
- Complete remote access to the M1 controller system (with Bachmann diagnostic tools, e.g. SolutionCenter, M1 ServiceCenter)
- Pure software add-on, no hardware modification necessary
- Can be upgraded to M1SenAccessSCADA solution

Figure 2: M1SenAccessBasic software structure to an existing system

STEP 2: **FULL ACCESS TO ALL SYSTEMS**

Besides this basic "M1SenAccessBasic" solution, which has been available since February 2020, Bachmann is currently working on an expansion, which gives administrator rights to owners and operators of wind turbines and allows complete access to the data interface without violating existing IP rights.

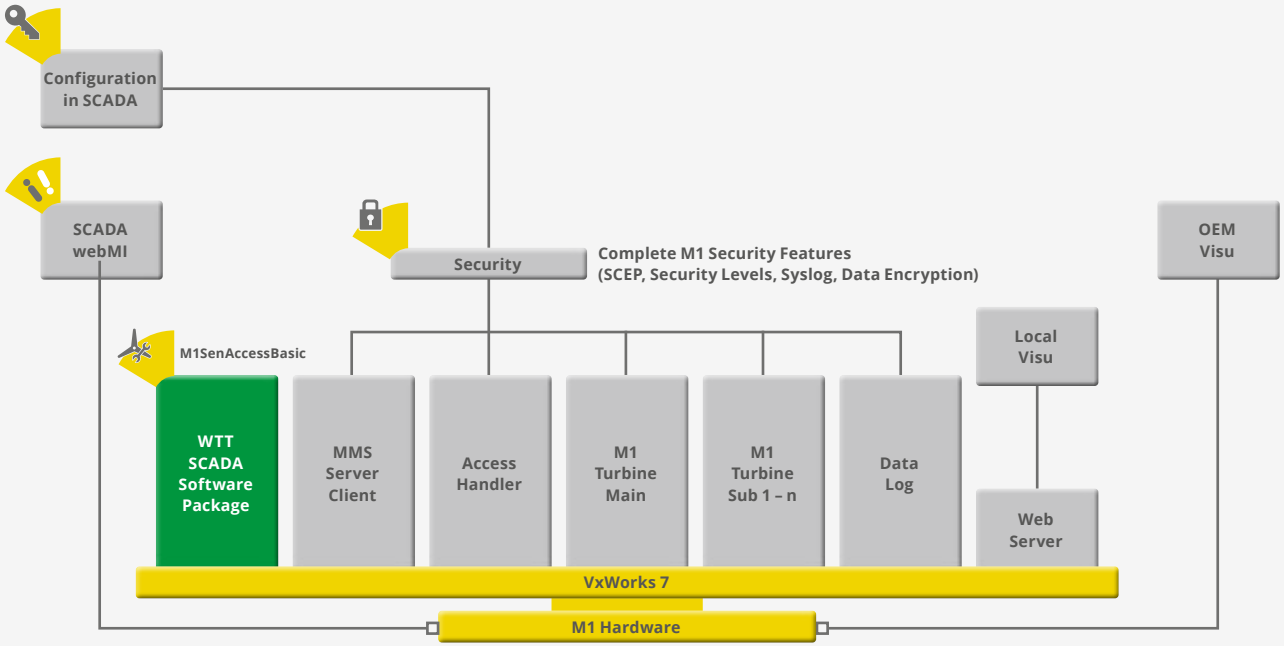
The solution will be launched on the market in Q2 2020 as part of Bachmann's expansion of the Wind Power Scada System (WPS).

SCADA

Many operators of wind turbines use a so-called SCADA system for the remote monitoring of their plant. This type of overall control center system can monitor and control several plants simultaneously. The latest state-of-the-art technology consists of web-based portals with a visualization solution.

If the termination of the service contract also stops access to this type of web-based portal by the operator, this usually means that the operator not only has no access to her remote maintenance system, but she also loses any historical data stored in this portal. This data is also required for the provision of verification to partners, investors and authorities.

M1SenAccessSCADA provides plant operators with a high-end SCADA solution, which covers all remote monitoring requirements in addition to the requirements with regard to operational management. It also provides complete access protection based on the operating system (VxWorks 7).



M1SenAccessSCADA

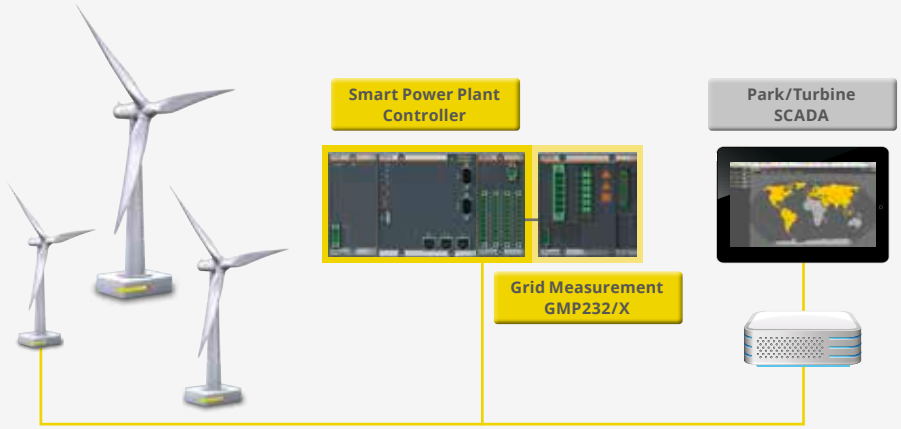
- Complete access protection based on VxWorks 7
- Use of Bachmann WPS SCADA based on an IEC 61400-25 interface
- Complete depiction of operating parameters
- High-end SCADA solution which covers all service requirements for remote monitoring in addition to the requirements for operational management
- Complete remote access to M1 controller systems (with additional Bachmann tools, e.g. SolutionCenter)
- CPU upgrade to multicore technology (MC212, MC220) and operating system upgrade to VxWorks 7 (including security levels)

Figure 3: M1SenAccessSCADA

Solution for condition/structural health monitoring und park controlling

The integration of additional data such as for condition monitoring and structural health monitoring is often critical for the long-term operation of wind turbines. Particularly here, it is important to create a correlating database, e.g. to determine the lifetime of the plants. This is particularly important for issues such as extending service life.

Like the system for accessing the individual turbines, the Smart Power Plant Controller software module enables complete access to all controllers in the system as well as remote access to the basic M1 single solution. No hardware modifications are necessary since the system operates as a software add-on.



Smart Power Plant Controller

- Full access to the existing park controllers
- Same concept as for turbine control
- Complete remote access to M1 controller system (with additional Bachmann tools, e.g. SolutionCenter, M1 ServiceCenter)
- Pure software add-on, no hardware modification necessary
- Can be upgraded for use inside the Bachmann WPS SCADA (only with CPU upgrade)
- Option: Replacement of the existing park controller with the „Smart Power Plant Controller“ Bachmann product
- Certified according to VDE-AR-N-4110/4120

Figure 4: Park controller module

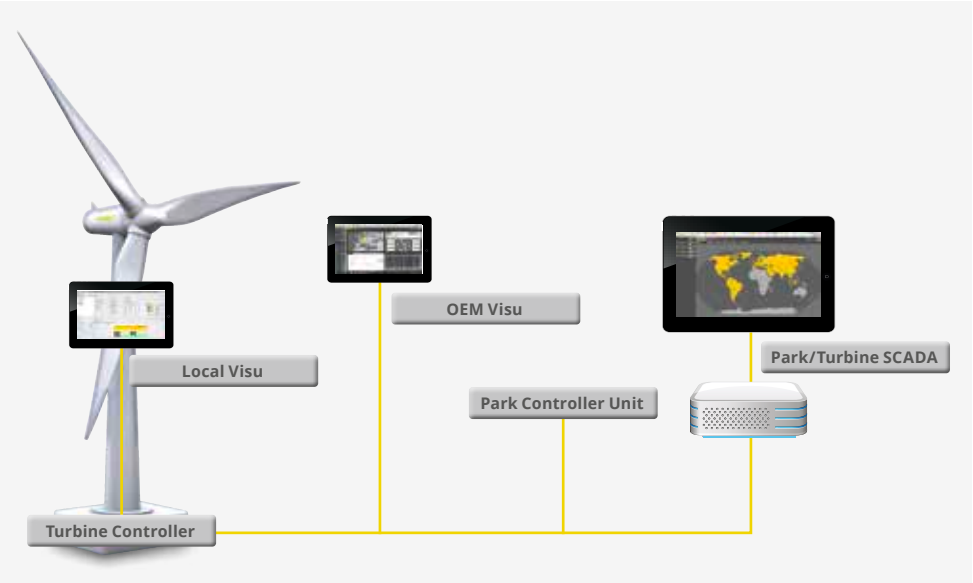


Figure 5: Topology of a wind farm with unrestricted access and integrated park controller

Future investment security for IT systems

Data security and cyber security represent an issue in the future that is vital for the energy sector. Many old plants are equipped with IT technology that matched the state of the art when the plant was commissioned or was even superior to it. The risks in this area, however, have increased rapidly in recent years and many plants do not or no longer meet IT and cyber security requirements.

Thanks to their structure, solutions like the Bachmann Operator Solution based on new software functions restore the state of the art and also provide the basis for future adaptions and updates.

CASE STUDY: **KS-ENERGIESYSTEME**

Interview with Ulrich Kreuzberger,
CEO of KS-Energiesysteme,
Bachmann customer from Baden-Württemberg, Germany

Why did you need to change?

As operators we were faced with the insolvency of Senvion and the challenge that we only had very restricted access to the controllers of our wind turbines. The access level available to us only offered display functions. The termination of service contracts by the liquidator meant that we had little opportunity to operate and maintain our plant.

Did the company suffer any damage?

If the plant has a fault that causes the shutdown of the plant, the income from energy production is lost. As the access to the plant available makes it impossible to rectify the fault, the risks involved can be a total shutdown since the banks providing the finance can no longer be served. Senvion had denied access to our property.

How did you come across Bachmann?

Fortunately, the OEM had not used its own controller hardware, and the name Bachmann was written on the controller. The direct approach of the technically-minded operator then led straight to the PLC manufacturer. We asked here straightaway whether it was possible to provide us with access to our wind turbine.

What was your experience of the collaboration?
What were the highlights?

Bachmann sales responded very quickly and initial personal contact was made at the 2019 Husum Wind fair. Since the initial contact, Bachmann has always been ready to listen to our problems and our requirements as operators.

Bachmann recognized immediately that we were looking for a legal solution to manage access to our plants on our own. It was always clear to us and to Bachmann that a new solution was necessary that did not require access to the existing passwords of the plant manufacturer.

How long did it take to implement a solution?

As operators we were naturally impatient and could hardly wait for the initial test installation in December. Bachmann appreciated this and always did all it could to meet the deadline. We never had the feeling that we were being left out in the rain. All the contacts at Bachmann could always be reached and were able to help us.

What is the result?

We now have full access to the controller of our wind turbine, and this enables us to maintain and operate our plant on our own. We are now able to start and stop the plant on our own and implement the necessary measures for restarting the plant in the event of a fault. Direct remote access to our plants is now considerably faster than the previous solution via the web portal.

We can now also at last ensure that only those persons have access to the controller system of our wind turbines who are authorized to do so. The different access levels also enable to us clearly assign responsibilities according to the appropriate level of training. Personnel who are solely responsible for operating the plant can thus be granted a lower access level. We can likewise now exclude users who are required to no longer have access to the plant. We can thus lock the "door".

What are the benefits compared to a retrofit (customer view)?

The plant controller is part of the type certification. We are obliged to operate the plant in accordance with the type certification. The idea of replacing the entire controller was therefore not even considered. This solution meets our plant access requirements precisely without affecting any controller functions related to certification.

» As operators with a technical background we are now able to carry out our operational management and maintenance of our Senvion plants ourselves. For us, this also results in cost savings during ongoing operation.

Particularly in extreme weather conditions, we can reconnect our wind turbines considerably faster to the network than plants supervised by large remote monitoring centers. These cases involve considerably longer downtimes. As operators we can now provide our own support here.

A first step in the right direction has now been completed. The next thing we would like is to have a vendor neutral visualization solution for the remote monitoring of our wind turbines.

Bachmann was definitely the right choice! Compared to other controller manufacturers, Bachmann has the best solution focus. «

Ulrich Kreuzberger,
CEO of KS-Energiesysteme

CONCLUSION:
INDEPENDENT ACCESS SOLUTIONS PROVIDE SECURITY – NOW AND IN THE FUTURE

For owners and operators of wind turbines, dependence on the plant manufacturer regarding the management of access rights to the plant controller represents a risk that should not be underestimated. Service contracts are also no guarantee that access to the plant is ensured for its entire lifetime.

New software solutions like the Bachmann Access Solution provides plant operators with complete access to their plant (again) in only a few hours and for all turbine types. The existing turbine software with its load and safety controller is fully retained. Protracted validation times and recertification processes involving considerable time and resources are thus avoided.

Besides customized user access management, the plant operator is given complete and unrestricted access to all turbine parameters. The flexibility of the solution also promotes the use of SCADA solutions, while monitoring systems and park controllers can also be integrated. Thanks to SSL/TSL encryption, the software increases IT security at the same time – a key factor in view of the increased requirements placed on data security in the network.

FACTBOX

- Solution for all Senvion turbine types (MMxx, 3.xM, 6.x, ...) fitted with Bachmann
- Short installation/setup time
- No intervention in the existing turbine software (load and safety critical mechanisms of the plant controller) eliminating the need for validation and recertification
- Complete access to all turbine parameters
- Individual user/access management
- Full SCADA functionality with Wind Power SCADA (WPS) from Bachmann
- Standard communication interface (IEC 61400-25 / OPC UA)
- Security and access protection in accordance with SSL/TSL

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List of figures