automation solutions

bachmann.

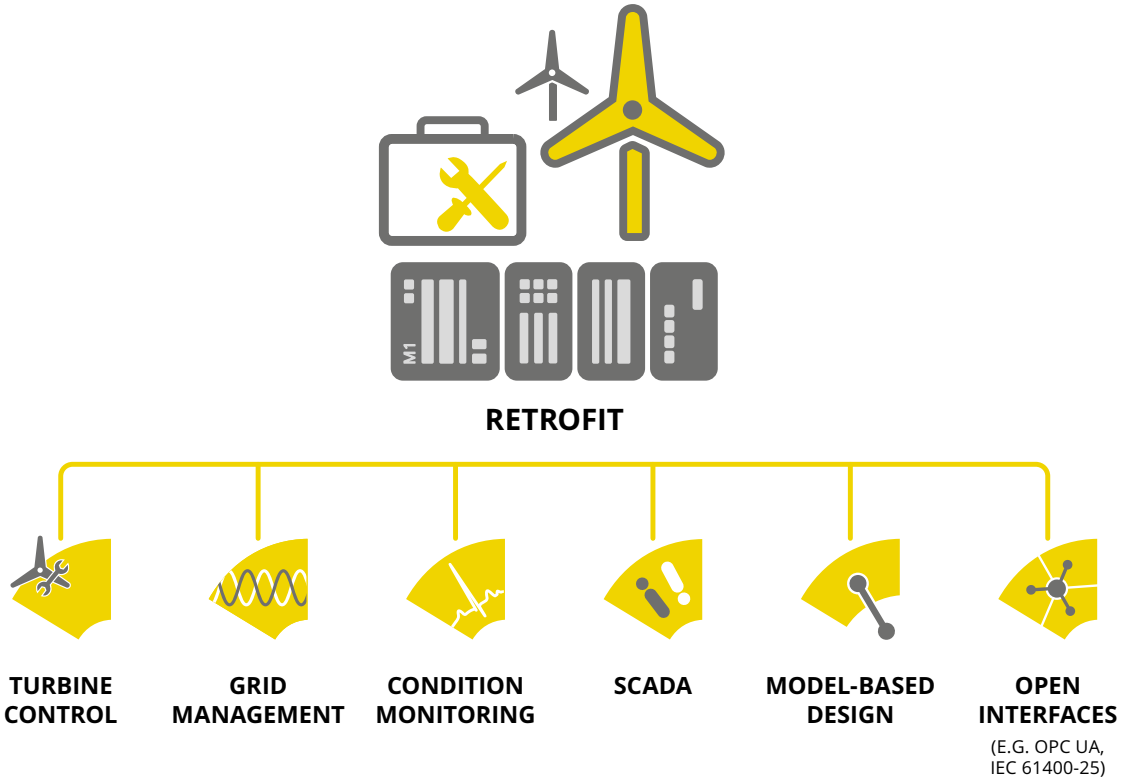
Turbine controls retrofit at the tip of your fingers

Enhanced Control. Extended Lifetime. Maximum Yield.

energy.industry.maritime.

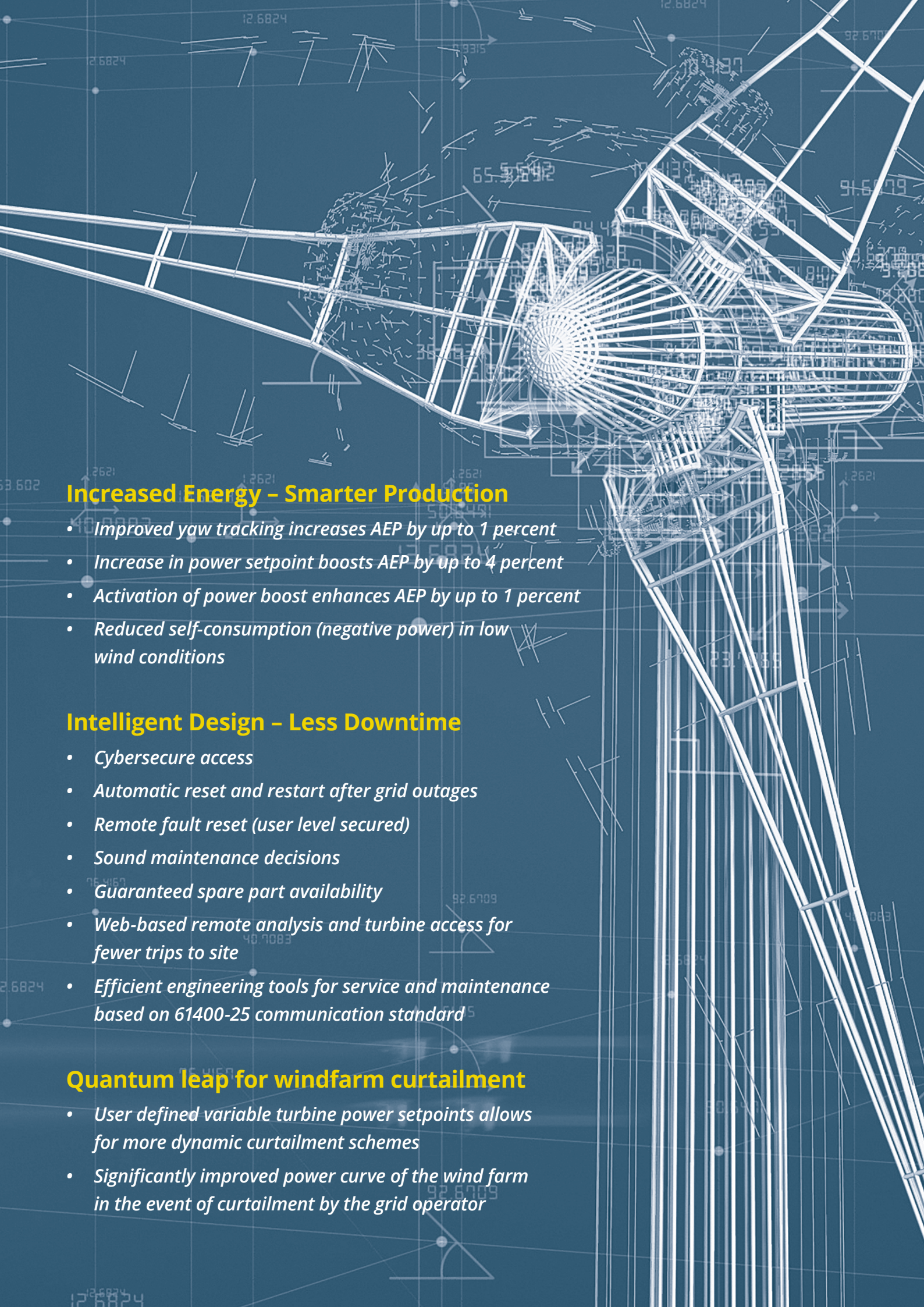
More Energy + Reduced Cost = Optimized Yield

Extend the lifespan of your wind asset



Retrofitting a wind turbine with a state of the art control system unlocks the ability to increase the yield and extend the lifespan of your wind asset.

Bachmann's turbine controller retrofit solution was awarded with the WEU O&M Excellence Award as the best technological innovation for wind turbines at Wind O&M Dallas's Wind Energy Operations & Maintenance Conference in the USA.



Increased Energy – Smarter Production

- *Improved yaw tracking increases AEP by up to 1 percent*
- *Increase in power setpoint boosts AEP by up to 4 percent*
- *Activation of power boost enhances AEP by up to 1 percent*
- *Reduced self-consumption (negative power) in low wind conditions*

Intelligent Design – Less Downtime

- *Cybersecure access*
- *Automatic reset and restart after grid outages*
- *Remote fault reset (user level secured)*
- *Sound maintenance decisions*
- *Guaranteed spare part availability*
- *Web-based remote analysis and turbine access for fewer trips to site*
- *Efficient engineering tools for service and maintenance based on 61400-25 communication standard*

Quantum leap for windfarm curtailment

- *User defined variable turbine power setpoints allows for more dynamic curtailment schemes*
- *Significantly improved power curve of the wind farm in the event of curtailment by the grid operator*

Breathe new life into your wind fleet

Ready for the future

Operating older wind turbines is both complex and expensive: failures accumulate, spare parts might be unavailable, unproductive downtimes increase. Access and parameterization options of the systems are limited. Optimizing the operation is difficult, resulting in the dilemma of increasing operating costs, and de-creasing yields. The practical retrofit solution from Bachmann solves this issue. Move forward with Bachmann's easily customized controller retrofit solution and breathe new life into your wind turbines.

Peace of mind

The Bachmann controller system is based on a robust and highly available hardware platform. The modular solution perfectly matches each individual turbine and your specific operational demands. Advanced features bring cybersecurity back on track and at the same time allow complete access to the turbine.

Smart control

With the Bachmann wind turbine retrofit solution you can analyze the operation of the turbine online and achieve unprecedented transparency. Easily adjust speed, pitch, and power setpoint to the current situation and demand thanks to remote access and parametrization. In addition, the yaw system and main shaft brake can be controlled manually. Remote reset and self-start routines automatically bring the turbine back online after a grid fault.

Ready for the future

Expand controller functionality thanks to the flexible hardware concept whenever you need it. Use additional I/O channels to implement further sensor equipment, realize even more sophisticated control algorithms, and optimize the power curve.

Top-notch condition monitoring

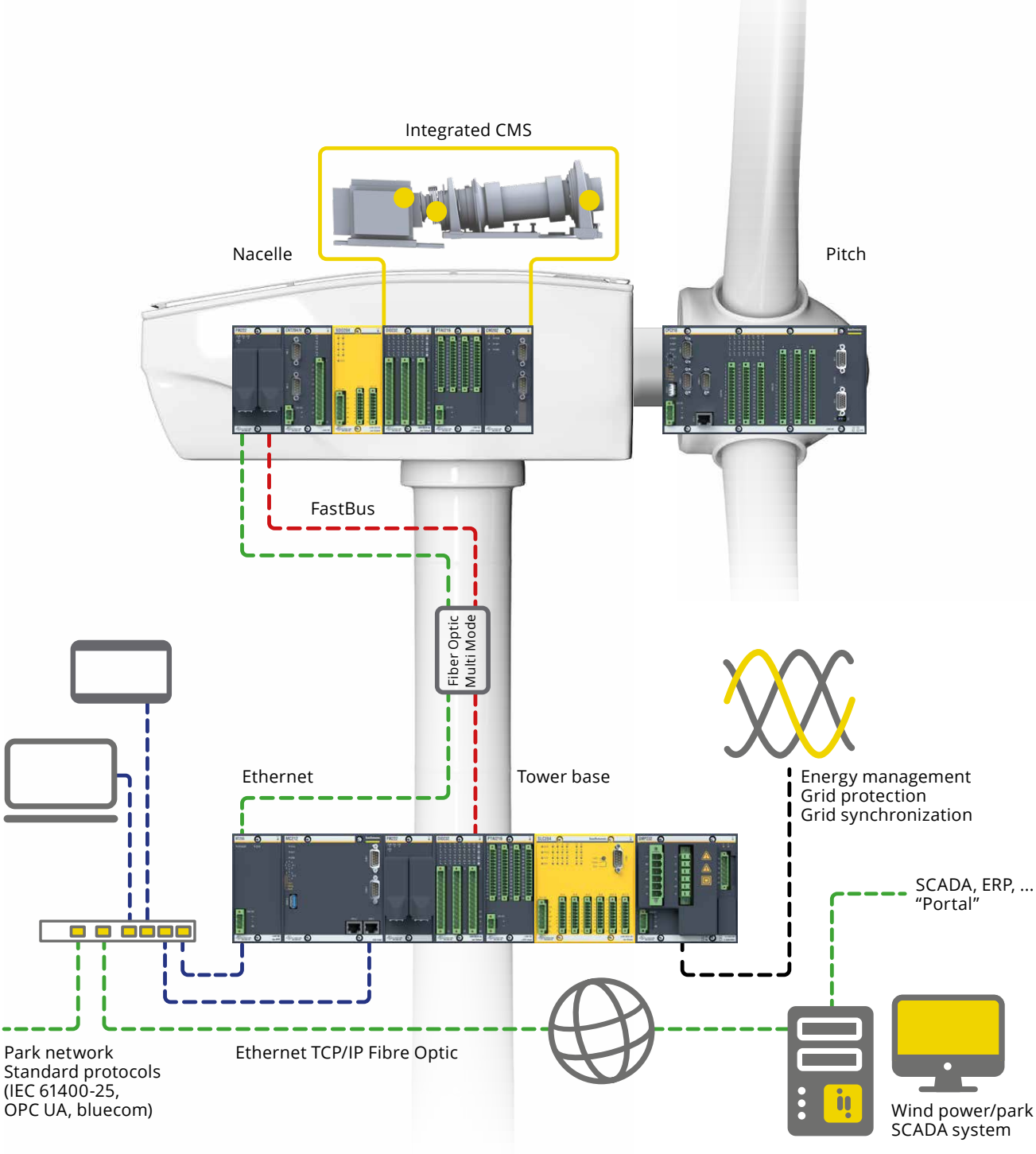
The Bachmann controller is compatible with a fully integrated Condition Monitoring System (CMS), opening the door to closed loop control. The CMS functionalities help you to extensively diagnose both turbine and the whole drive train completely online. This lets you better predict the turbine condition and brings you in the position to optimize operating and service strategies. The result is impressive: annual energy production (AEP) increases significantly.

Maximized yield

Get independent of the turbine OEM: Bachmann's open-source software clears the way for web-based turbine control and monitoring. Dedicated functions for remote and on-site services open up further potential to increase the yield of your power plant: reduced turbine load, extended service life, as well as improved performance and availability of the wind turbine.

Rapid Deployment

Installation and commissioning of the retrofit can be completed within as little as a few days. Delivered material is pre-configured and 48 hours run-in tested under the most extreme conditions. Thus, the downtime of your turbines is reduced to a minimum.



Implemented in no time: Bachmann’s retrofit solution comes with modular and scalable design. It consists of pre-developed hardware and software to easily realize the basic turbine functionality. This greatly reduces engineering efforts for site-specific adaptation.

Model Based Design

M-Target for Simulink® is used to design the dynamic control in MATLAB®/Simulink® and to verify and further optimize the functionality in the real process environment (hardware in the loop). The software can be deployed directly to the Bachmann controller.

Controls Retrofit for Mitsubishi MHI1000A turbines

Unprecedented performance

Bachmann's controls retrofit solution for the MHI1000A turbine allows for variable power setpoints for the MHI1000A wind turbine. In the event of a curtailment request from the grid operator, the output of the wind farm can be reduced to the desired value by adjusting the power output of the turbines instead of switching off individual wind energy converters. All turbines will remain in operation, and their patched feed-in of the wind farm is continuously adjusted to precisely match the requirements of the grid operator.

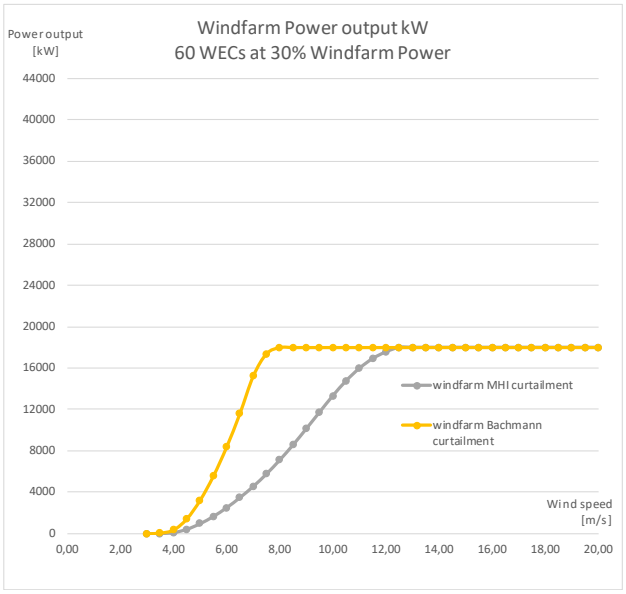


Fig. 1

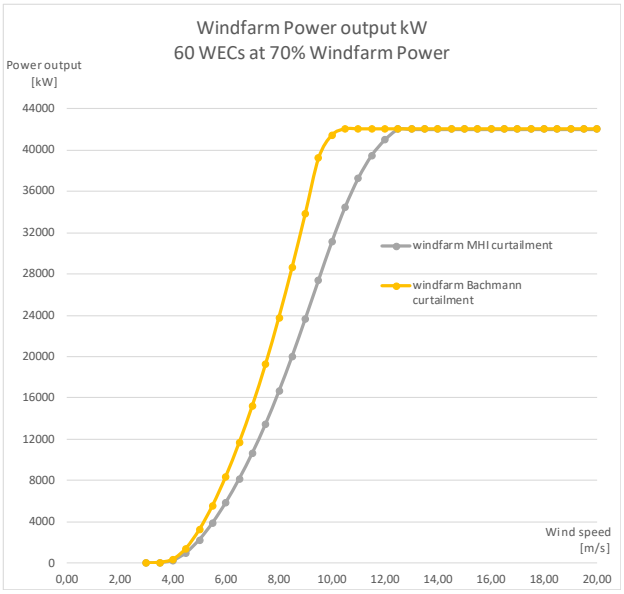


Fig. 2

The additional yield, especially in low wind conditions, is considerable: At a requested output power of 30 percent of the nominal value, the energy gain achieved is more than 44 percent.

Fig. 1 shows the output of a wind farm with 60 MHI1000A turbines running at 30 percent of rated power (yellow line, Bachmann solution) compared to shutting down 70 percent of the turbines to not exceed the maximum allowed output (gray line).

Fig. 2 shows the output at 70 percent of the rated power. More than 17 percent energy gain can be achieved.

In addition, thanks to the optimized control strategy, the power curve is less often negative even at switch-on wind speed. The result: less power consumption, more power output.

Due to the stepless cut-off, the turbines are subjected to less stress in comparison to the abrupt switching which was previously required with MHI1000A turbines.

Proven results with rapid deployment

The installation and commissioning of the MHI turbine retrofit can be completed less than 36 hours of downtime. The process benefits from both automated tools and a turbine-specific MHI1000A cable adapter set, which help to integrate the Bachmann automation system with plug and play installation into the turbine cabinets. The installation crews are guided by a smart installation application that walks crews through the process step by step while logging and documenting the progress along the way. This makes work easier, improves quality, and speeds up the re-commissioning of the plant.

Web-based visualization and control

The retrofit comes with a web-based user interface that replaces the previously required handheld GOT1000. With individually configurable dashboards, data can be aggregated, and historical data can be accessed at any time. The extensive user and rights management ensures secure access to both every individual turbine and the entire wind farm.

MORE INFORMATION

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