



PLC wind brochure

AC500 PLC

Visions for wind power
Efficient and reliable

Visions for wind power

Power and productivity for a better world



Clean energy for everyone

Wind energy already contributes significantly to reducing emissions across the globe. In 2008, wind energy saved 160 million tons of CO₂ worldwide. An estimated 680 TWh of electricity will be produced in 2012 by wind energy, saving around 400 million tons of CO₂.

Dear readers,

The IEA¹⁾ estimates that around 4,500 GW of new energy capacity needs to be installed before 2030. According to studies, the wind turbines of the future will be larger, more economical and mainly built offshore. However, offshore wind turbines require even greater quality and network opportunities than onshore wind turbines. Today's AC500 PLC family meets the requirements of tomorrow's wind turbines.

Another trend in wind power is repowering, which can help to increase the power output and reliability of previous-generation wind turbines and wind power plants. Teamwork, innovation, bold steps and endurance are required to achieve these ambitious goals.

We are here to assist you at ABB. We hope you enjoy our wind brochure.

Guenter Purin
International Marketing Manager Wind PLC

Heidelberg
Germany

¹⁾ IEA: International Energy Agency

What can ABB do for you? Have a significant impact



Protecting the environment while earning money – is this possible?

Saving energy and using renewable energy is key to protecting the environment. Wind turbines are one of the most important sources of clean and renewable energy, both today and in the future.

By the end of 2010, more than 197,000 MW ²⁾ of clean and renewable energy was produced by wind power, with the help of around 90,000 wind turbines

Wind turbine trends

By 2020, around 1,500 GW of wind power will be installed, equating to around 400,000 to 500,000 wind turbines (onshore and offshore). By 2016, sales in the wind sector will exceed EUR 60 billion. The highest growth rate will be seen in offshore wind turbines.

ABB helps you to protect the environment

ABB products give you optimal support. ABB is a major global supplier of wind turbines. In addition to control units for wind turbines, ABB also supplies components such as generators, converters, transformers, drives and switches.

ABB helps you to increase your business

Highly efficient wind turbines are an essential prerequisite for success in the market, and ensure maximum utilization of wind power over a period of more than 20 years. This places high demands on PLCs, for example regarding reliability, high performance and operation in harsh environments. PLCs from ABB offer you an optimal basis.

²⁾ Source: Bundesverband WindEnergie e.V.

Quality for you You can rely on us



We are on your side – our common goal is your success

ABB understands that quality and innovation are key factors for the success of our customers. In particular, investments such as wind turbines need to be reliable and durable, on-site service has to be ensured, and products need to be available in the long term.

XC for eXtreme Conditions

Harsh conditions require particularly robust systems. XC devices from the AC500 series are ideal for such applications. Benefits include increased operating temperatures, increased resistance to vibration, increased resistance to hazardous gases and salt mist, compliance with extended EMC standards and operation at a mean sea level of up to 4,000 m.

Integrated safety

Wind turbine safety is becoming increasingly important and is being implemented more and more. Distributed safety and non-safety modules, combined with modern data buses such as PROFINET, ensure optimal performance, reliability and availability.

Safety is seamlessly integrated into the ABB AC500 series.

Integrated mass storage

To increase quality and monitor the wind turbines, it is mandatory to track a large amount of data. The ABB AC500 PLC series (e.g. PM592-ETH) store¹⁾ of operating data in the built-in non-rotating mass storage system for up to 40 days.

¹⁾at 100 MBytes per day

Experience confidence



Lifecycle management, sustainability and global presence

Experience is an important factor when customers choose ABB for their products, systems and services. With more than 100 years of experience and collaboration with power utilities as well as the process and automation industry, ABB converts its expertise and understanding of applications into products and solutions that benefit the wind power industry. Sustainable solutions, reliability and knowledge of industry specifics have made ABB a leading partner for wind power solutions.

More than 30,000 generators, 11,000 inverters and 6,000 controllers for wind turbines confirm that customers trust ABB products.

ABB's global presence through a worldwide organization and network of selected partners provides systematic lifecycle management, with service that maximizes production, availability, reliability and performance for the wind power industry.

Training and support

A valuable advantage



Comprehensive support, worldwide

ABB – Present where you are

ABB is close to its customers wherever they are in the world. Our global presence gives customers easy access to leading engineering products, systems and service across the globe.

Training for your success

Expertly trained staff are a valuable advantage. ABB supports you with various training programs. The content is tailored to your needs, and you decide when and where training takes place. Our common goal is your success.

Professional support during all phases of your project worldwide.

Our experts support you from the initial planning phase, right through to development, installation and commissioning of the wind turbine.

Online support

Our service department assists you by phone or e-mail. You can download specific datasheets and examples of applications on our homepage.

Technical consulting

Our experts provide support, with the aim of finding the ideal solution for your wind turbine.

Engineering support

Challenges for experts. Our engineers support you during development, and advise you regarding specific topics.

On-site service

With an on-site service during commissioning or operation, the ABB technical team works for your success.

Power and productivity for a better world

Sustainable investment for tomorrow



Your advantages with ABB: a single supplier, excellent coordination

We cannot change the wind but we can help you to get the most out of the wind for a number of years to come. Reliability, long-term availability, open standards, and professional after-sales service are essential for protecting investments. Each turbine manufacturer or wind power plant operator has unique service requirements. ABB helps provide customers with the right mix with regard to service contracts.

Service contracts provide customers with improved cost control, increased operating efficiency, lower capital expenditure, reduced downtime and extended product lifespan, helping to protect your investment.

The rising demand for energy and the environmental impact of this are the defining challenges of this century. ABB is tackling these issues by providing solutions for generating and distributing clean and renewable electrical energy.

Efficient and future-proof

ABB PLC's safety is integrated and seamless

Distributed modules, combined with modern buses such as PROFINET, offer an optimal solution for your wind turbine.

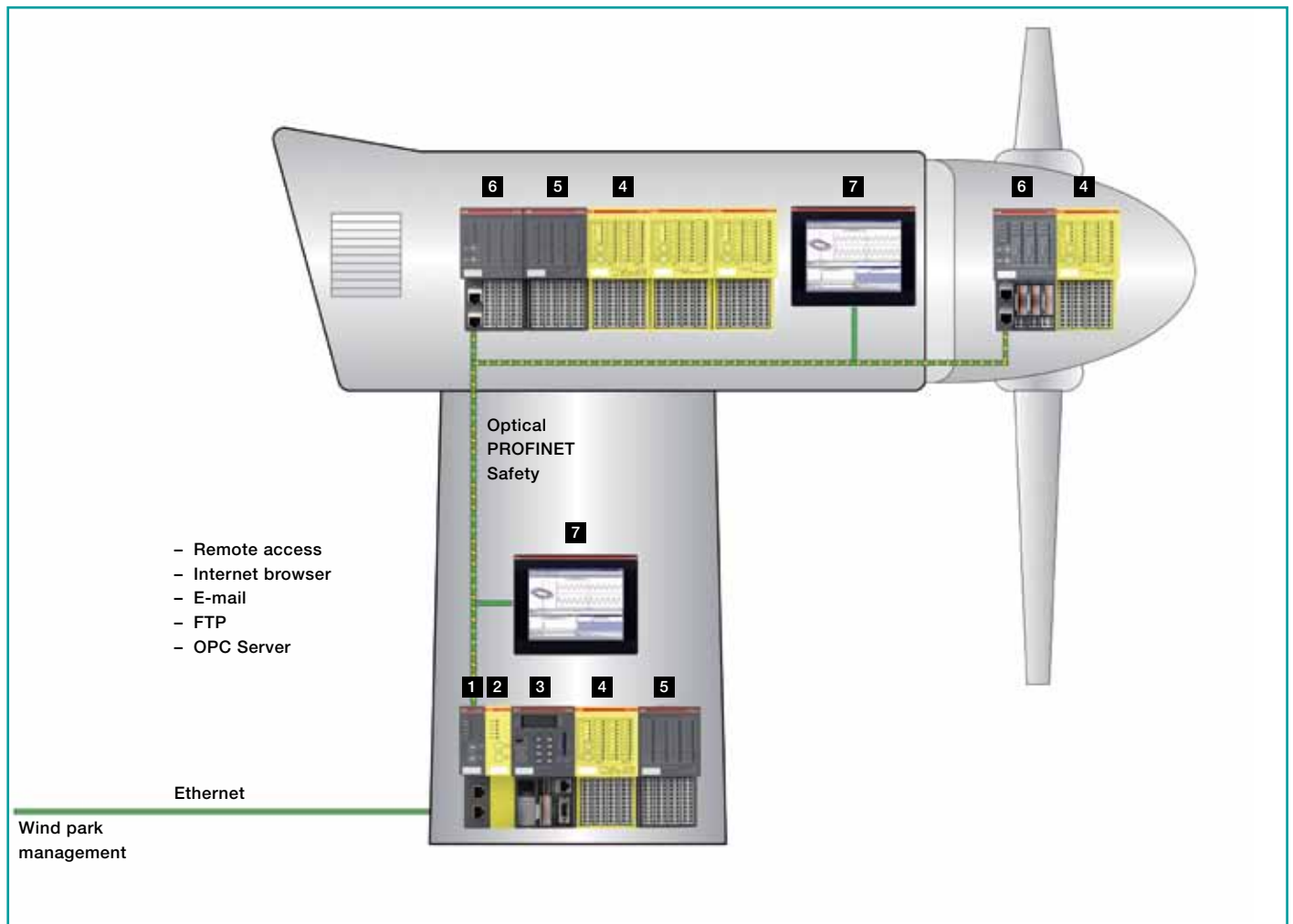
PROFINET provides maximum freedom

- Greater flexibility
- High performance
- Simple engineering
- Open standards

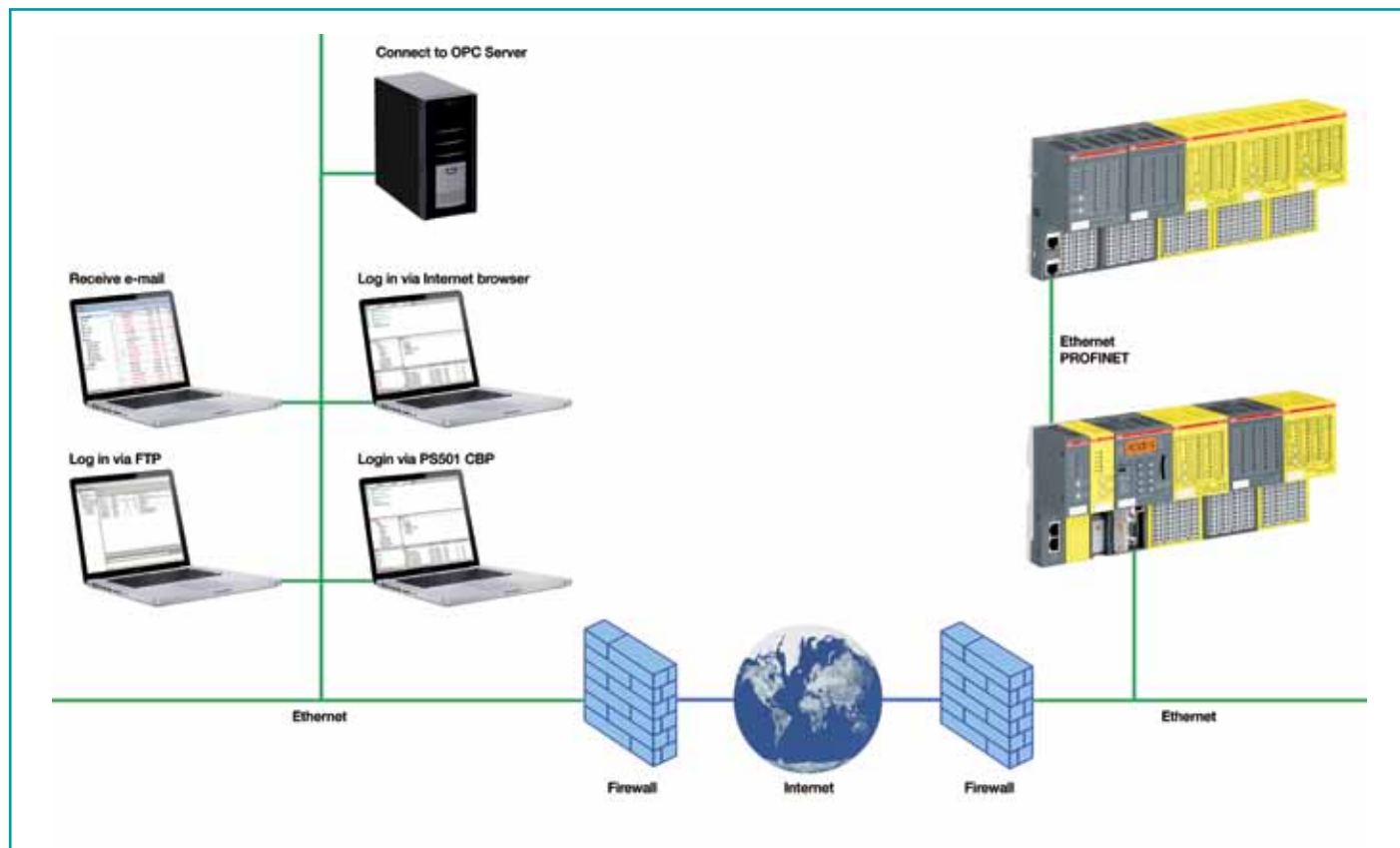
Wind turbine safety is an integrated component

- Complies with SIL-3
- One controller, one engineering tool, one bus for standard and safety-related automation
- Combination of standard and safety-related modules, central and decentralized
- Fully integrated with the ABB PS501 Control Builder Plus

- 1 PROFINET Master
- 2 Safety PLC
- 3 PLC
- 4 Safety I/O
- 5 Non Safety I/O
- 6 PROFINET Slave
- 7 HMI CP600



Stay connected



Log in using your engineering tool

Get direct access to your wind turbine with the PS501 Control Builder Plus engineering tool, including software updates, monitoring, and I/O-control.

Log in via FTP

Transfer files to and from your PLC using FTP. With your standard FTP client on your PC, you can upload and download files to and from your PLC. For example, you can download operating data that is stored on the PLC once a week.

Log in via Internet browser

Connect to the web server running on your PLC via a standard Internet browser. For example, the web pages running on the PLC provide up-to-date information regarding wind speed, torque and the wind turbine status.

Receive e-mails

Receive e-mails from your PLC. Your PLC informs you of the current status via e-mail.

Connect to the OPC Server

Handle data in real time by connecting to the integrated OPC Server.

Success story

CSR wind turbines



Interview with Mr. Yuanlin Zhang, Technical Director of CSR wind turbines

In addition to wind turbines, CSR works in several other industries including

- Rolling stock and its core components for railways and subways
- TCMS (Train controlling and Management System)
- Power semiconductors (e.g. IGBT and IGCT)
- Solar power systems
- Electrical cars

Visions for wind power: Mr. Zhang, by the end of 2010, around 86 GW of wind power was installed in Asia, primarily in China. How do you see the general development of wind power in China?

Mr. Zhang: With regard to onshore wind turbines, the count of installations was too high for the last five years, because the grid could not be updated as required. Over the next five years, the speed will be more reasonable to stay compatible with the grid connections.

In the next five years, there will be outstanding progress in the development of offshore wind turbines in China.

Visions for wind power: With regard to the next generation of wind turbines, what will be the main differences compared to the wind turbines we use today?

Mr. Zhang: The wind turbines of the future will be larger, have more rated power, greater efficiency, higher availability, more intelligence and powerful controllers, extensive monitoring and diagnostic functions such as RMS and CMS.

Visions for wind power: Please give us a short description of your current WT1650 wind turbine:

Mr. Zhang: Generator power: 1.65 MW
Hub height: 65m or 70m
Rotor diameter: 77m, 82m and 88m available
Cut-in/cut-out speed: 3m/s up to 25m/s
Weight of nacelle: 62t
Weight of rotor blades: 36t
Weight of tower: 210t

Visions for wind power: What specific precautions did you take to ensure high availability and reliability for your wind turbines?

Mr. Zhang: A key aspect was ensuring the quality of the used components for the wind turbine. It was also very important to have an excellent maintenance strategy based on extensive condition monitoring and diagnosis.

Visions for wind power: How many years of operating time are calculated and how many GWh of clean power will be produced within this time?

Mr. Zhang: Our wind turbines will operate for more than 20 years. In a year, a wind turbine will run for around 2000h~3000h at rated power.



Visions for wind power: Will you sell this wind turbine outside of China in the future, too?

Mr. Zhang: Yes we will, but the business model of the local market is very different compared with the overseas market. For example, if you want to sell your wind turbine to the overseas market, you also have to invest in wind parks.

Visions for wind power: Why did you choose the ABB AC500?

Mr. Zhang: It has several open interfaces to third-party systems, is easy to operate, highly reliable, reasonably priced, and ideally suited to ABB-related products.

Visions for wind power: What are the main tasks of the AC500 within the wind turbine?

Mr. Zhang: The AC500 performs several different tasks, for example: pitch control, torque control, state controlling for the entire wind turbine, monitoring and protecting the entire wind turbine and core components.

Visions for wind power: In your wind turbine, you use eXtreme Conditions (XC) devices from the AC500 series. What are your specific requirements for XC devices?

Mr. Zhang: For our applications, extremely low temperatures (below 20 degrees), high humidity of up to 98% and installations of up to 4000m are required. The eXtreme Condition (XC) devices from the AC500 series meet these requirements.

Visions for wind power: Your wind turbines are mainly installed in wind farms. How are they integrated into the wind park management system?

Mr. Zhang: We use a redundant fiber-optic network. All of our wind turbines are connected to the wind farm's SCADA using this network.

Visions for wind power: What are the key benefits of CSR in collaboration with ABB?

Mr. Zhang: The key benefits of CSR are a price-performance ratio, improved service and more efficient communication.

Visions for wind power: What is the aim of CSR?

Mr. Zhang: The aim of CSR is to develop more advanced and more powerful wind turbines. Our mission is to become one of the most respected suppliers of entire solutions for the wind power generation.

Visions for wind power: Mr. Zhang, thank you for your time and for the interview.



Interview with Mr. Meuser, Manager of NORDWIND Energieanlagen GmbH

NORDWIND provides modern real wind power plants with outputs of between 10 kW and 4500 kW, as well as installation, maintenance and repair, and dismantling of wind turbines.

Our systems include globally unique gearless wind power plants with two-blade rotors and hydrostatic pitch-controlled main drives. The rotor directly drives a hydraulic high-performance pump that transfers the energy flow within a closed hydraulic circuit via two hydraulic motors. They are each driven to a synchronous generator, which transforms the power into electrical energy. The systems are an expert solution for wind power technology.



Visions for wind power: Mr. Meuser, your wind energy plants are designed in a completely different way to conventional wind turbines. Could you tell us a little bit about this?

Mr. Meuser: Certainly. We use the term “wind energy plant” for all our installations as a synonym for the “Type 1 generating units” as defined in the Transmission Code 2007, the Network and System Rules of the German Transmission System Operators. The Transmission Code 2007 makes a distinction between two types of generating units: a type 1 generating unit exists if a synchronous generator is directly connected to the network. With just a few exceptions, nowadays all conventional turbines are classed as type 1 generating units. The use of synchronous generators connected directly to the grid at wind energy plants requires completely new kinds of drives, with no positive locking of the rotor and the generator (directly or indirectly), which would otherwise make it technically impossible to force upon a rotor the constant speed required to propel a synchronous generator that is directly connected to the grid. NORDWIND has solved this problem with the hydrostatic drive. Thanks to the hydrostatic drive, NORDWIND plants do not depend on a complicated pitch system. Our plant design has received various awards and the two-blade rotor provides both economical and technological benefits.

Visions for wind power: The hydrostatic drive in your wind energy plants replaces the mechanical transmission, the frequency converter and even the pitch system. Could you describe this to us in more detail?

Mr. Meuser: We have chosen a completely new system approach for our wind energy plants. We have inserted a hydrostatic drive between the grid-connected induction/synchronous generator, thus completely separating the positive-locking connection between the rotor and the generator. A mechanical transmission is no longer required and, without a frequency converter, the generator provides us with the crucial type 1 generating unit for electrical energy, for a real wind energy plant.



Visions for wind power: You have fitted all your wind energy plants with ABB controllers from the AC500 series for controlling and monitoring. What tasks do these controllers perform?

Mr. Meuser: Like any other conventional wind turbine, our wind energy plants also include operational and safety systems. Products from the AC500 series are used in both systems. The systems are planned and designed as remote controllers, and the AC500 is particularly useful for this. It permits every single control and remote control task at our wind energy plants. The AC500's modular, decentralized concept is ideal for us. The controller is located at the foot of the tower. The connection to the AC500 components in the nacelle is enabled through a fast and fail-safe CANopen bus. Sensors and actuators are also connected to this bus. For remote maintenance to the wind energy plant, AC500 has a connection to the external world via an industrial router.

Visions for wind power: What are the key benefits of the AC500, and which features are particularly important for you?

Mr. Meuser: In our previous conventional wind turbines, we successfully used a modular, extendable, and bus-compatible communications controller, which was programmed via IEC61131. In connection with the development of our new wind energy plant, it was logical to rely on a modern controller that supports this future-proof concept as much as possible. We believe that ABB's ongoing development of the AC500 will fully meet these requirements. For us, as plant manufacturers, it is vital that the producer of our controllers is available across the globe so that fast availability of controller components and support services are ensured – this is something we have experienced with ABB and we have valued this for many years.

Visions for wind power. In which market segments will you position your wind energy plants?

Mr. Meuser: The excellent and perhaps unique features of our wind energy plants make it possible to use them predominantly as remote supply solutions. Generally speaking, our target markets are particularly those where 80 percent of the world's population can use only 20 percent of the electrical energy generated worldwide.

These target markets are usually characterized by rather poor infrastructural environments with weak or entirely non-existent networks. Our wind energy plants are ideal for making a valuable contribution to solving local or even global energy issues.

Visions for wind power: Where is NORDWIND heading in the future?

Mr. Meuser: Our wind energy plants currently range from 8kW to 1100kW max. and their individual design is tailored to the different wind energy scenarios on site, so that in total we currently have some 120 variants. Larger wind energy plants would require high-performance hydro pumps that are not yet available on the market. This is why NORDWIND develops its own pump solution, which will enable us to build wind energy plants of up to 4500kW in the future. These plants rely on the same concept that includes the speed-controlled two-blade rotor, the hydrostatic drive and the grid-connected isolated induction/synchronous generator – it is definitely a fully fledged wind energy plant.

Visions for wind power: Mr. Meuser, thank you for your time and for the interview.

Success story

Norvento

Interview with Mr. Christóbal Carrión, Norvento

Mr. Carrión works at Norvento as Head of the Electrical Department.

Norvento is a pioneer in the development of renewable energies in Spain and is currently the biggest Galician energy group in terms of installed capacity, job creation, and volume of assets and profits. Today, Norvento has offices in Spain, Poland, the United States, and Brazil. Besides wind energy, Norvento is also working in several business units such as hydro, biomass, solar, geothermal, ocean, control-centre and facilities.

Visions for wind power: Mr. Carrión, please give us a short overview of the new Norvento nED100 wind turbine.

Mr. Carrión: nED100 is a 100kW wind turbine of class IIIA. It has a 22m rotor diameter and a hub height of 37m. We have developed a direct drive system for the nED100, so the wind turbine does not require a gearbox. A wind turbine without a gearbox makes the system more transparent, more effective and ensures greater operational safety. Simple maintenance, high quality and availability were the focus when developing the nED100. With the integrated variable pitch system, we can adjust the nED100 optimally to the wind speed and the load requirement. The nED100 starts working at a wind speed of 3m/s (roughly 11km/h) and works up to 52m/s (roughly 190km/h). Even at a wind speed of just 10m/s, the nED100 produces 100kW of clean electrical energy.

Visions for wind power: What about quality?

Mr. Carrión: High quality, availability and easy maintenance were our focus during development. This type of wind turbine will be used primarily in single installations and not at wind farms. There are usually no special maintenance staff on site like there are at wind farms, so it was very important for us to develop a wind turbine that is easy to maintain. For example, we do not use hydraulic systems inside the wind turbine.

We also have remote access to each nED100, and monitor the wind turbines with our SCADA system. If a parameter moves out of the operating range, we receive an alert and we can then switch off the wind turbine to avoid malfunctions, for example. The operating time of the nED100 is more than 20 years. Top quality is required in order to realize this operating time. We require our suppliers to provide high-quality development, materials, assembly, testing, and after-sales service. These are essential factors in ensuring availability and investment protection.

Visions for wind power: For your nED100 wind turbine, you chose the ABB AC500. What are the benefits of the AC500?

Mr. Carrión: There are several reasons why we use the AC500 from ABB. One reason is the state-of-the-art technology and high quality of the products. ABB is our main supplier of the nED100 wind turbine, so it is also very important for us to work with a company which has service stations all over the world. ABB meets this key requirement. We were also impressed by ABB's commitment at the start of the project. Our collaboration with ABB has always been very fruitful and professional, and we would like to thank ABB for this.



Visions for wind power: Which market segment was the nED100 developed for?

Mr. Carrión: Our customers of the nED100 include industrial plants, farms, agriculture, harbors, hotels, and many more. In short, companies that want to produce some or all of the electrical energy themselves, for example to save money. Other customer groups are power consumers in the “middle of nowhere” For example, pump stations or farms that are far away from the grid and are currently producing electrical energy with diesel generators. Emerging countries are also customers of the nED100.

Visions for wind power: What tasks does the AC500 PLC perform in the nED100?

Mr. Carrión: The AC500 PLC from ABB controls the entire wind turbine and also handles communication outside of the nED100. In short, around 100 sensors and actors are connected to the PLC, mixed digital and analog.

The PROFIBUS enables communication to the converter, security system, and the drives for the nacelle and pitch. The optional HMI and the IOs at the bottom of the tower are connected to the PLC via Ethernet.

Visions for wind power: Why did you choose PROFIBUS?

Mr. Carrión: PROFIBUS is an open standard, robust and fast bus system. Today, many companies provide high quality products such as sensors and actors with a PROFIBUS interface. To maintain high quality, it is also important for us to have a state-of-the-art system with second sources, and PROFINET meets these requirements very well.

Visions for wind power: Mr. Carrión thank you very much for your time and for this interview. I am sure you have plenty more to tell us about Norvento’s nED100.

Mr. Carrión: Yes, I could tell you much more about the nED100. For example, the integrated security system, the integrated service platform, the backup system, SCADA, and much more. If you are interested in finding out more, you can find further information on our homepage. Thank you very much, too.

Successfully implemented ideas



Standards provide protection for projects and investments

The wide range of products and the versatility of the modules help you to realize your ideas. All our products are driven by the desire to create customer benefits:

- XC for eXtreme Conditions
- Integrated safety
- Wide range of different CPUs
- Distributed I/O modules
- Distributed gateways
- State-of-the-art communication
- Industry standard
- Approved quality
- Worldwide availability

Downtime for wind turbines is expensive, especially on windy days. When developing the aC500 series, attention was paid to ensuring easy service.

- Modules can be changed without tools
- Multi-functional modules

From centralized control system structure to distributed on-site units, with PROFINET, you get the flexibility, performance and efficiency you need for your wind turbine:

- Seamless communication horizontally and vertically
- Access, service and maintenance from any location
- State-of-the-art communication technologies
- Minimize costs of installation, engineering and commissioning
- One wire for PROFINET and ETHERNET.

ABB PS501 Control Builder Plus covers all aspects of the professional engineering process.

- Intuitive and easy to use
- Comfortable editor for configuration
- Standard IEC 61131 and C programming language
- Supports different kinds of visualization
- Ready-to-use function libraries
- Convincing debug functions
- Online tracking
- Remote access

Your advantages with ABB, your success



Security and long-term assurance

Investment security

- Compatibility
- Open standard
- Long-term availability
- Wide product range
- Continuous further development

Approved quality

- Approved and tested for eXtreme Conditions
- HAL tests
- Certified by CE, cUL, C-Tick, GOST R, ABS, BV, DNV, GL, LRS, RINA, RMRS

State-of-the-art products

- Integrated safety (up to SIL-3)
- Modern field buses such as PROFINET, ETHERCAT, PROFIBUS, CAN and Serial
- Integrated communication, including web server, e-mail, FTP Master and OPC
- Fast, high-performance and modular multi-tasking PLC
- Distributed I/O modules and gateways

Service worldwide and via remote access

- Service branches all over the world
- Remote access, web server, e-mail server, FTP server

Visions for wind power



Mr. Thielker is the Head of International Marketing for PLC, based in Heidelberg, Germany

Visions for wind power: What are the strengths of a company like ABB?

Mr. Thielker: The strengths of ABB are definitely the size of the company, its history and its global footprint on the international market. The size of ABB gives the customer the security of working with a strong and reliable partner. ABB's long history attests to the durability of the company, and its global footprint ensures our customers that they can receive spare parts at short notice, virtually anywhere in the world.

Visions for wind power: What can customers expect from ABB?

Mr. Thielker: Building large machines such as wind turbines requires many components, and ABB can deliver virtually all electrical components. ABB products for wind turbines such as switchgear, generators, inverters, fire, safety, grid connections, controllers and control algorithms are factory tested and well matched. This provides additional safety for our customers, because the components work together very well.

Vision in wind: What is behind power and productivity for a better world?

Mr. Thielker: Power can be transferred directly to wind turbines to generate electrical energy. ABB can supply virtually all electro-mechanical components for the drive train, pitch control, azimuth control and grid connection. Productivity relates to state-of-the-art products and a top standard of quality, with aim of achieving high productivity for our customers. A better world refers to the activities, products and services from ABB that help customers such as wind turbine manufacturers to generate clean energy.

Visions for wind power: What is your motto for life?

Mr. Thielker: Life should be colorful and dynamic, and this is what has inspired me since my first job. This is my motto and I follow it to this day. Renewable energy is a new, colorful and fast-moving technology – for me, it is fantastic to work in this area.

Visions for wind power: Mr. Thielker, thank you for your time and for the interview.



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Please select the relevant product group from the dropdown menu to the right or from the page.

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