



Your trusted partner for wind turbine and wind farm solutions

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Life Is On

Schneider
Electric



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EcoStruxure for wind power

Secure electrical distribution with load management.
Run analytics to optimize the performance of your farm.

To sustain our own (rising) energy demand, and to bring clean, reliable energy to those who are still going without, we need to bring simplified, innovative solutions to customers at all levels of energy consumption and conservation. Wind energy is one technology that can help us achieve this goal — it is efficient, produces no greenhouse gas emissions, and is becoming increasingly popular as a renewable energy source.

Our EcoStruxure solutions bring extra value to all your wind farms as well as helping you in their efficient management.

With EcoStruxure, Schneider Electric is committed to provide the capability to monitor electrical assets by digitizing the electrical architecture, both in the design and build phase as well as in the operational and maintenance phase: from the turbine to the grid.

Standardization, fast lead times and streamlined execution are key to optimizing project delivery through design, delivery and execution.

In the design and build phase our mission is to:

- Reduce costs and time with the MV-LV pre-engineered, pre-validated architecture that are smarter to operate and to manage
- Optimize project delivery
- Share the same smart configuration and commissioning tools/systems to reduce integration and factory acceptance tests

EcoStruxure solutions will bring safer, more reliable and more efficient energy electrical distribution and control systems.

In the operational and maintenance phases, our mission is to:

- Avoid/prevent electrical fires and ensure protection and safety by detection and alarming of abnormal temperature rise alongside efficient support services
- Avoid downtime by preventing power failures, real-time management and capacity planning, as well as regular prevention tests
- Reduce the energy spend and maintenance

End-to-end wind power solutions

The performance of a wind farm and of its electrical equipment used is therefore essential to maximize the return on investment.

The Levelized Cost of Energy (LCOE) from wind energy depends on many factors and Schneider Electric offers:

- The ability to source and deploy the service expertise you need
- The right level of service continuity, tailored to your specifications in energy management
- Access to our tools and library to design your electrical function in a fast way

EcoStruxure for wind power provides an effective and complete electrical infrastructure

Our solutions for wind farms cover the full electrical needs for power generation.

- A reliable, efficient main power circuit
- Automated and enhanced control and supervision of the turbine
- MV collection with optimized equipment safety:
 - An efficient connection to the grid
 - Enhanced control and supervision
 - Digital architecture with connected devices for efficient monitoring and optimized maintenance

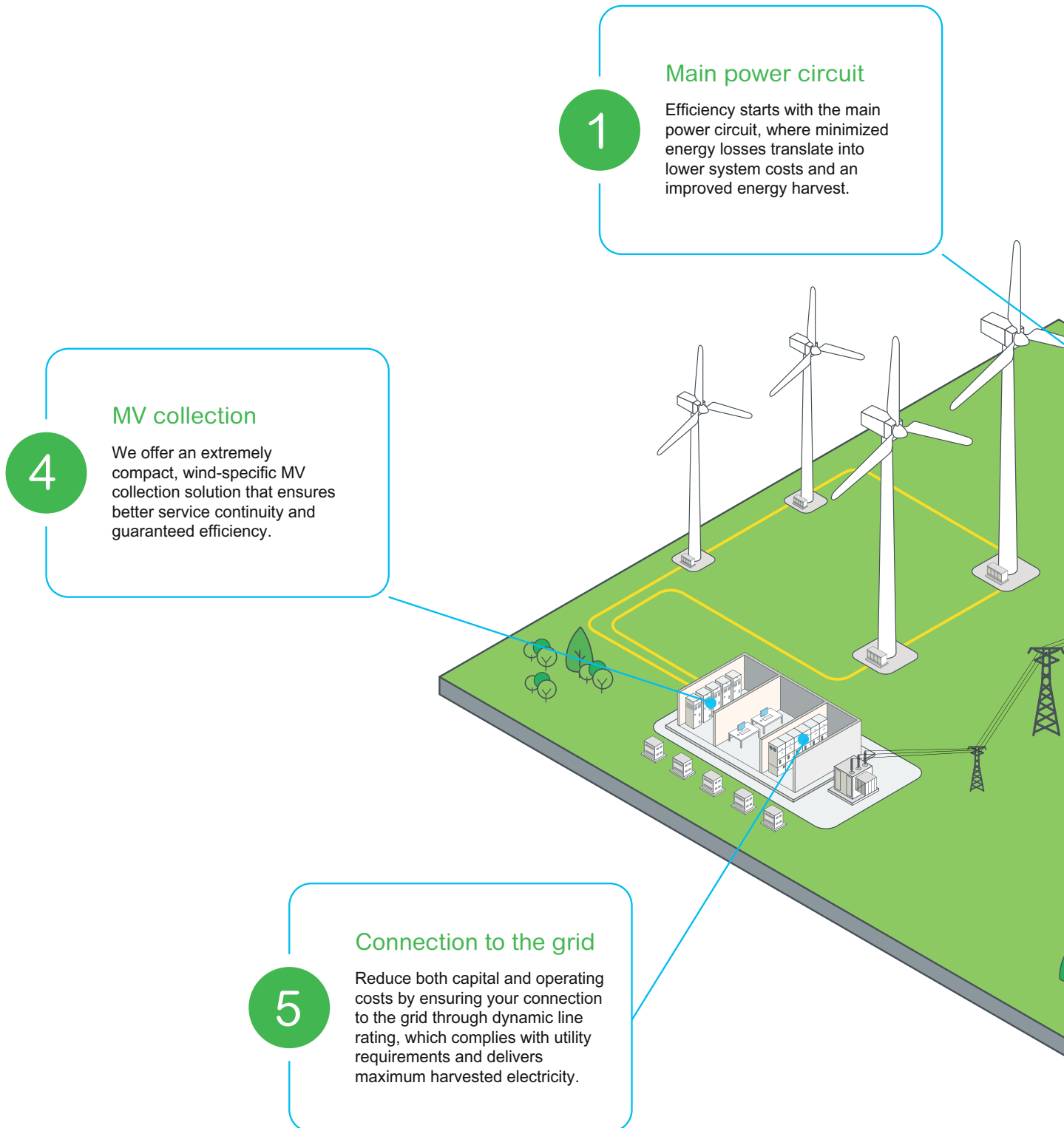
These technically integrated solutions provide you with a complete and reliable electrical infrastructure, enabling wind farm operators to ensure service continuity at a competitive cost.

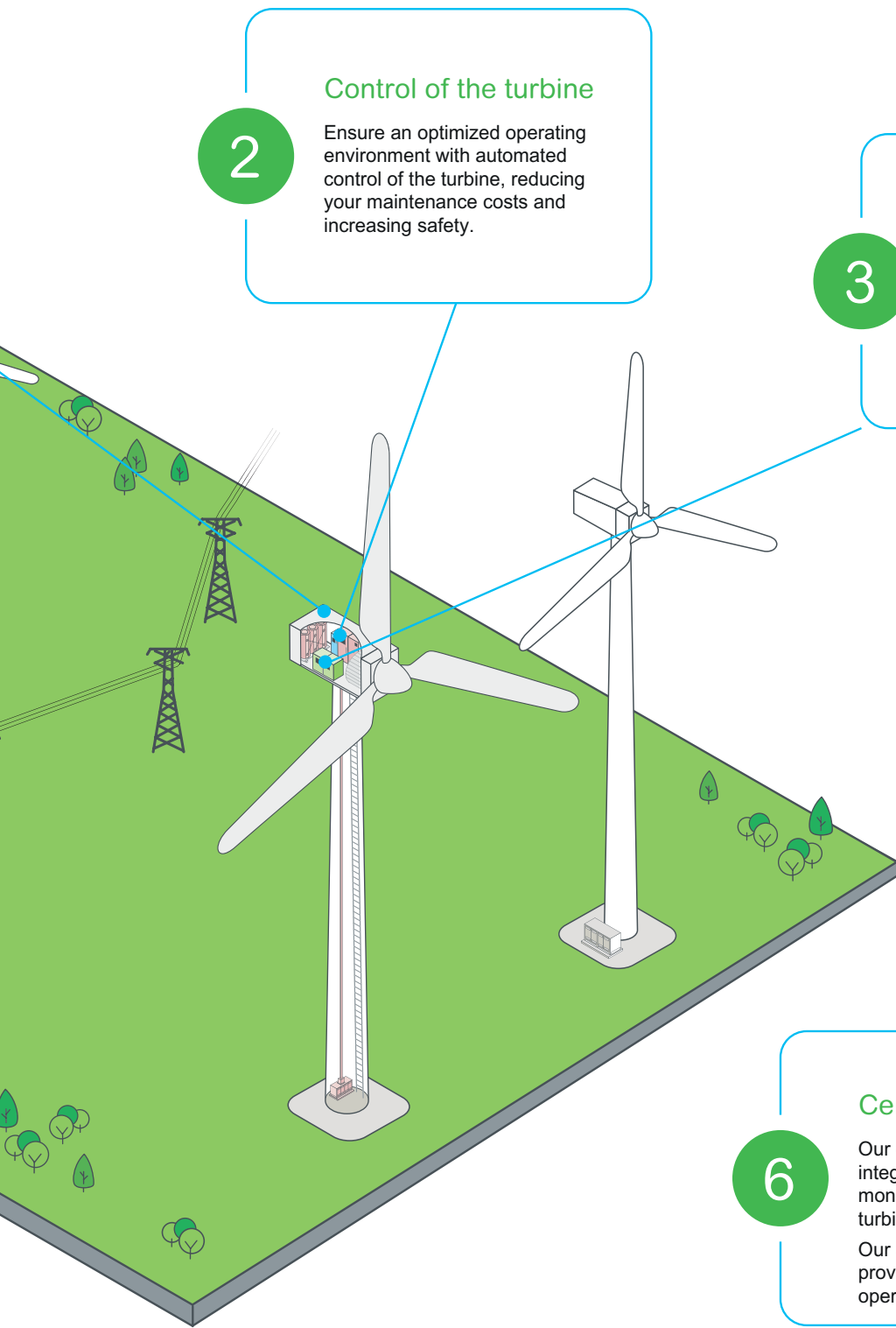
30%

the savings you can achieve with robust automation, control, and monitoring of your energy usage

Solutions overview

Ecostruxure for wind solutions is built on an open IoT architecture





2

Control of the turbine

Ensure an optimized operating environment with automated control of the turbine, reducing your maintenance costs and increasing safety.

3

Auxiliary circuits

Our expertise in automation and electrical distribution, combined with the wide breadth of our products, enables us to be the one-stop shop for your auxiliary circuits.



6

Centralized supervision

Our open IoT architecture for IT/OT integration ensures real-time power monitoring and optimization of your turbine performance.

Our supervision solution also provides information to the network operation to manage peak demand.

1. Main power circuit

Maximum efficiency to improve your energy harvest

Wind-specific products provide added reliability and safety for your main power circuit. Once your generator has produced electricity, you want to hold on to as much of that energy as possible.

Our wide product range, from low voltage Masterpact MTZ circuit breaker and TeSys F contactor to medium voltage switchgears, have been designed to withstand stringent environments such as in the nacelle of a turbine. Conditions like temperature variation, vibration and humidity are a few of the many factors that can affect your wind farm performance.

Depending on the wind turbine design, different solutions are available in order to fit not only the design needs but also to coordinate solutions with circuit breakers and contactors of type 1 or 2.




Our solutions can be installed in wind turbines up to 4000m above sea level and at a temperature range from -40 to +50° C. They comply with all the relevant standards (IEC and UL), and meet all the needs of networks up to 36 kV (IEC)/38 kV (UL).

In addition, our main power circuit solution with coordination tests will help you:

- Improve your business performance by reducing downtime and increasing the lifetime of your equipment
- Lower both your capital and operating expenses by up to 25 percent through power factor correction and harmonic mitigation
- Increase safety by continuous thermal monitoring and detection of abnormal temperature
- Achieve better service continuity and heightened safety with integrated switchgears and transformer substations.

Customized coordinated solutions for continuity of supply and reliability of operations

Harmonics mitigation for optimized power quality

Contactor	LV circuit breaker	Energy monitoring	Busway	Cable Support systems
 <p>TeSys™ F</p> <ul style="list-style-type: none"> • 1000 A to 2600 A • Compact™ size (max 382x519x251 mm) • Type 2 coordination with Masterpact™ MTZ and Compact NSX • Up to 1000 V 	 <p>Masterpact™ MTZ</p> <ul style="list-style-type: none"> • Up to 6300 A • Fixed or drawout version • Type 2 coordination with TeSys F contactor 	 <p>PM8000</p> <ul style="list-style-type: none"> • High-accuracy energy metering. IEC 62053-22 class 0.2S, IEC 61557-12 PDM-S • WAGES metering support • PQ compliance monitoring: IEC 61000-4-30 class S, IEC 62586, EN 50160, IEEE 519 • PQ analysis capabilities: Dip and swell detection, waveform capture, disturbance direction 	 <p>Canalis™/I-Line™</p> <ul style="list-style-type: none"> • Up to 5000 A • Up to 1000 V • IP55 	 <p>Wibe Cable Ladders</p> <ul style="list-style-type: none"> • High performing cable support system for demanding environments (HDG, Stainless Steel AISI 316L, Zinkpox or composites) • Dedicated solutions for Nacelle, Tower and Tower base • Compliance with standards such as: IEC 61537, UNE EN 50102

LV/MV transformer



Trihal™

- Adaptable design for door width and vibrations constraints
- F1/self-extinguishing in case of case fire
- E3/withstand 95% humidity according to IEC 60076-16
- C3/resistance to -50° C

Vegeta™ Wind with vegetable oil

- Adaptable dimensions to narrow doors
- Biodegradable and natural ester
- 360°C fire point
- Overload capability with same lifetime duration

Ring main unit



DVCAS

- 36 kV – 38 kV
- Up to 630 A
- 20 kA/3s – 25 kA/1s
- Up to 25 kA/1s IAC AFL – AFLR
- Tested for standard ambient condition, Harsh environment, Offshore Vibration and seismic

RM6



RM6

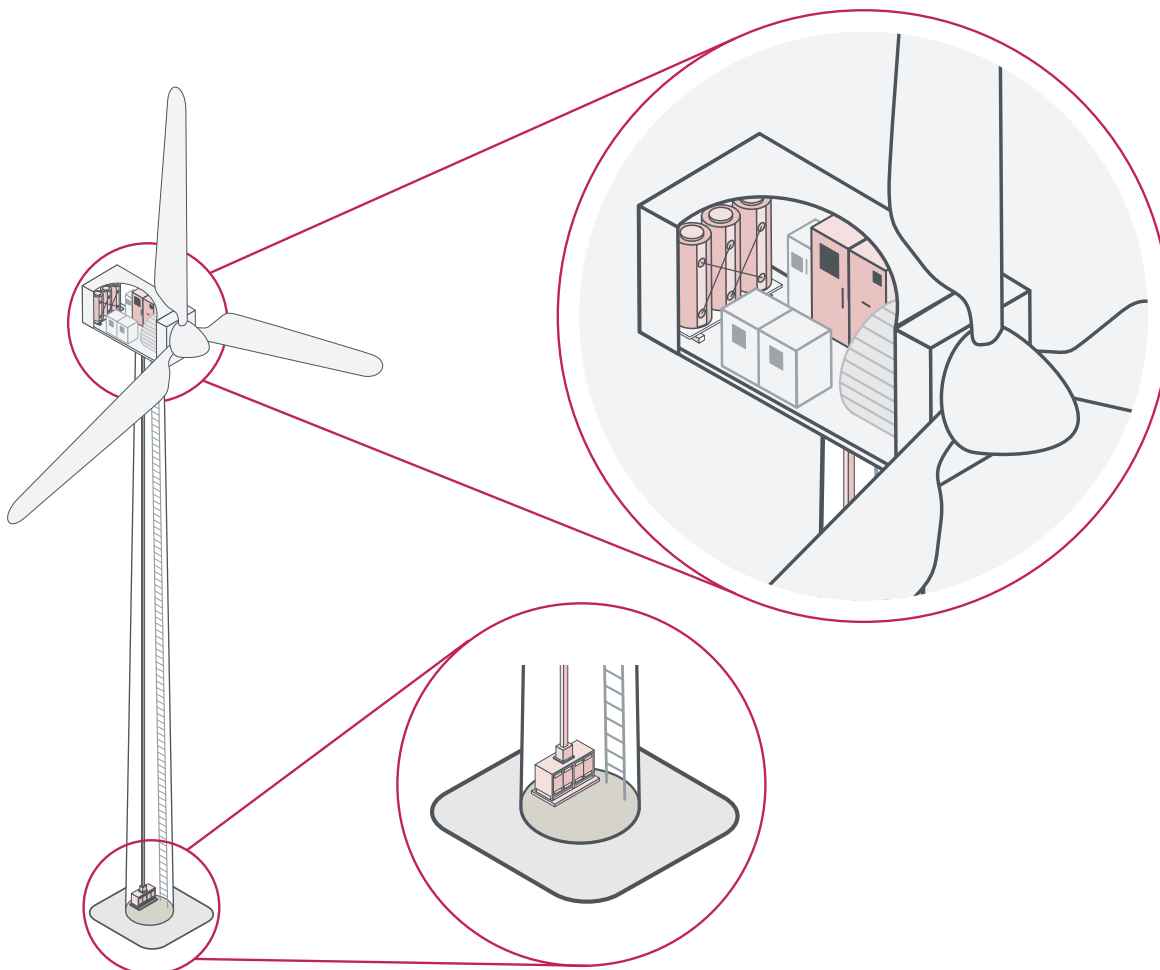
- 24 kV
- Up to 630 A
- 20 kA/1s IAC-AFRL

Active power correction



AccuSine™ PCS +

- Real-time harmonic and power factor (DPF and TPF) compensation THDi, THDy and optimized PF setpoint features
- Volt-VAR support capability
- Scalable up to 3000 A of harmonic current compensation
- Suitable for several network voltage
- Up to +45° C without derating
- EcoStruxure Power ready
- Certified for seismic and on/off-shore environment

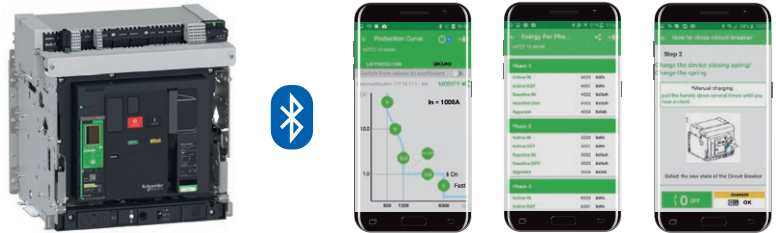


1. Main power circuit

Masterpact MTZ, our new air circuit breaker to maximize reliability of your equipment.

Masterpact MTZ circuit breakers with enhanced connectivity equips you for the future of power distribution. They are available from 630 A to 6300 A.

- Intuitive Micrologic™ X control unit
- Easy installation using established architectures
- Unprecedented withstand to stringent environments (vibrations, EMC, atmospheric stresses etc.)
- Smartphone connectivity for wireless alerts and maintenance
- Precise Class 1 power meter built in for energy monitoring
- Easy customization via digital modules



TeSys F is a series of contactors that are specifically designed for the most demanding motor and power switching applications, ensuring reliability, greater flexibility, and high performance.

- A world-class range of premium quality, high-performance 3-pole contactors for AC1 applications
- Extended rating up to 2600 A
- A high reliability, safety, and durability
- Flexible, easy installations and maximum continuity of service
- TeSys F AC1 contactors with Masterpact circuit breakers provide guaranteed electrical coordination
- Multi-standard offer: IEC, UL, CSA and CCC



Refer to technical guide “How to select coordinated main circuit breakers and TeSys F contactors” for further details:
https://www.schneider-electric.fr/fr/download/document/COMLVP75_EN/



2. Control of the wind turbine

Ensure an optimized operating environment

Gain greater control of the turbine through automation and backup power

Choosing the most efficient wind turbine is the key to success. Schneider Electric offers a fully automated wind turbine with the programmable logic controller (PLC) and a highly-reliable UPS. They have a very low power consumption, and can be easily modified or upgraded.

As such, the PLC functions as the “brain” of the wind turbine, while the UPS provides the backup power to keep the PLC working — even when no wind energy is being collected. And with this integrated system, you also enable:



- The ability to gracefully shut down the wind turbine, distribution, and/or collection monitoring and control systems

- The capturing and storing of any information related to the state or failure of the wind power system when an outage occurs
- Heavy reduction in maintenance costs, longer availability of your products, and simplification of the troubleshooting process
- Enhanced safety for the wind turbine, the power grid, and any personnel involved

Optimize efficiency with a compact and high-performance solution

With complete control of the turbine, you finally get a compact, high-performance solution that only comes from a provider with decades of expertise in automation.

PLC

		
M340 <ul style="list-style-type: none">• Compact size designed for use in reduced-space turbine environment• Robustness to vibrations (up to 3G)• Operates in harsh environment -25°C to +70°C• Embeds RTU functions (data storage, remote communications)• Flexible and modular design	M258 <ul style="list-style-type: none">• Compact and optimized• Modular, expandable and remote flexibility• High performance and openness• Data storage, web and ftp server embedded	M580 <ul style="list-style-type: none">• More powerful hardware: redundant CPU and power supply, larger memory and higher bandwidth to SCADA, Internet Protocol Security (IPsec) support, New CANopen X80 module• Enhanced Software capabilities: time-stamping extended to all variables, change configuration on the fly (CCOTF)• Greater ease in design and development: migration plans for legacy applications, more effective process development for ethernet architectures

Secure Power



Smart UPS

- Capable of supporting loads from 1 to 20 kVA in a rack/tower convertible form
- Tight voltage and frequency regulation
- Hot-swap user replaceable batteries
- New LCD interface for easy access to configuration settings and monitoring
- Smart Battery technology
- Pre-installed Network Management Card for remote monitoring



Smart UPS online

- Capable of supporting loads from 420 to 5000 VA in a rack/tower convertible form
- Battery backup power with Smart-UPS with APC SmartConnect
- Service-free cloud monitoring feature



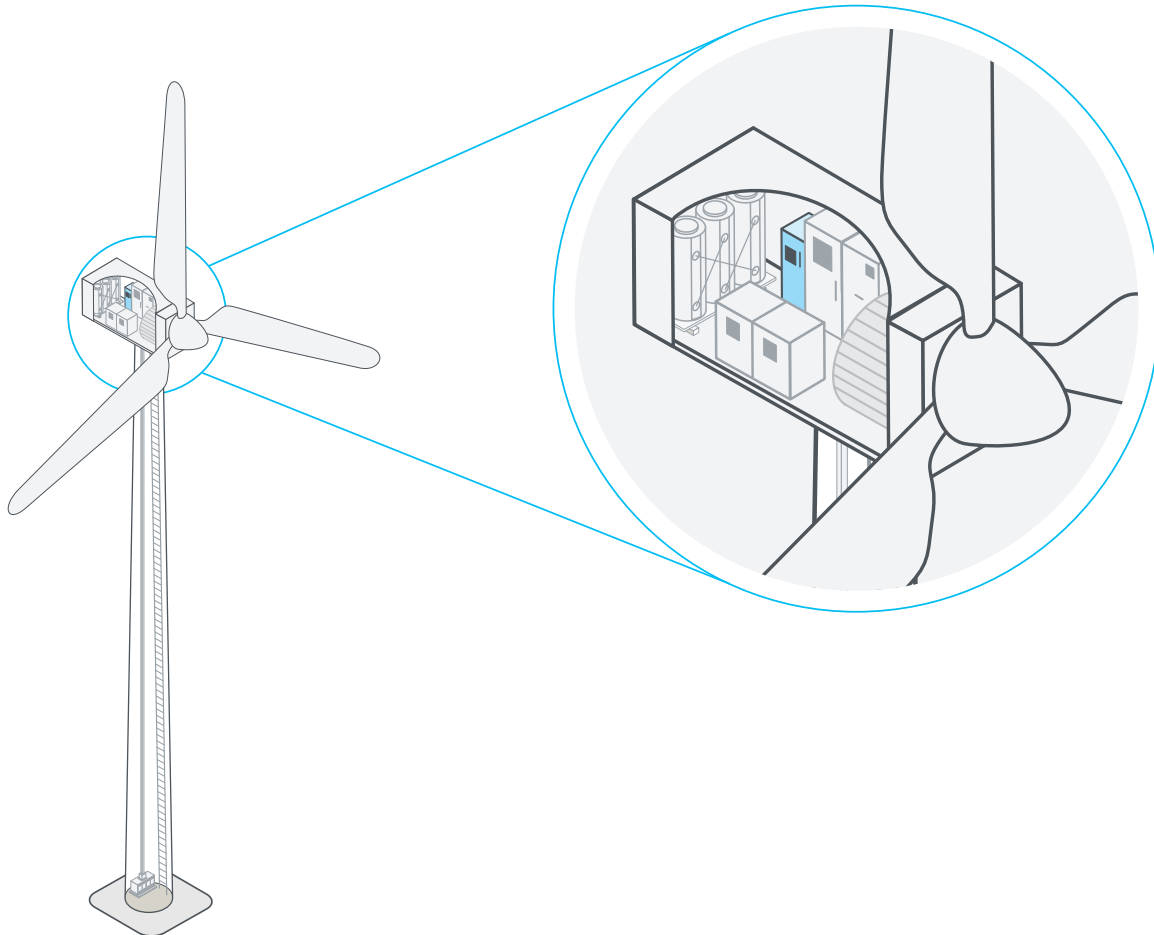
Smart UPS with Li-Ion batteries

- Doubling your UPS battery lifecycle
- Lowering your TCO by up to 35%
- Reducing battery weight by 30%
- Offering flexible remote UPS management options
- Excellent battery performance up to 40° C
- From 1000 to 1500 VA



Symmetra™ RM

- 2 to 6 kVA
- Output voltage distortion <5%
- Efficiency at full load 91%
- 50 Hz or 60 Hz



3. Auxiliary circuits

A customized solution from a single provider

In a wind turbine, a few of the environmental conditions that can affect your equipment performance are:




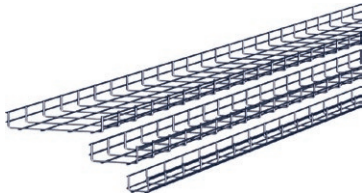
- Extreme heat
- Bitter cold
- Excessive moisture
- Lightning

Schneider Electric supplies a wide range of parts from panel boards to power surge protection guaranteed to stand up against the harsh conditions that wind turbines can face.

Part of our auxiliary circuits offer includes:

- Highly dependable panel boards that ensure installation safety and operating dependability
 - Human machine interfaces (HMIs) that provide cost-efficient operation with connectivity everywhere
 - Proven, innovative technology that is simple to use, compact, and addresses all your control and signalling needs
 - Reliable, robust surge protection against lightning to ensure safe, clean power, and optimized availability
 - Soft starters and variable speed drives (VSDs) that increase both accuracy and dependability for the control of your blades
 - Our wide portfolio and pre-engineered architectures help you deliver faster and reduce costs

Our wide portfolio and pre-engineered architectures help you deliver faster and reduce costs

Lightning protection	Variable speed drive	HMI screens	Cable support systems
 <p>Acti9 SPD</p> <ul style="list-style-type: none"> • Pluggable cartridges • Safest installation • Type 1, type 2 and telecom offers 	 <p>Altivar Machine ATV340</p> <p>Voltage/Power range: 380 – 480 V 3 Ph From 0.75 to 75 kW in Heavy duty</p> <ul style="list-style-type: none"> • Communication embedded: <ul style="list-style-type: none"> • Dual port Multi – Ethernet on Ethernet Drive, Modbus Serial • Functional safety: STO (SIL3/PlE), SS1, SS2, SOS, SLS, SMS, SBC,SDI, GDL • Harsh environment: <ul style="list-style-type: none"> • 3C3; 3S2 Up to 60° C with derating Safest installation 	 <p>Magelis GTU</p> <ul style="list-style-type: none"> • High performance modular HMI • Excellent quality image • Robust HMI with complete aluminium housing IP67, operating up to 60° C and low power supply 12/24 VDC 	 <p>Defem Mesh trays</p> <ul style="list-style-type: none"> • Flexible and kit customizable with high performance • Specially shaped mesh trays for demanding applications • Extensive range of supporting material • Finishes for all environments • Compliance with international quality standards such as IEC 61537 and E90 according to DIN 4102-12 for fire resistance

Push buttons



Harmony™

- ø 8, 10, 12 mm pilot lights
- ø 16, 22, 30 mm push-buttons, switches and pilot lights

Motor control



TeSys range

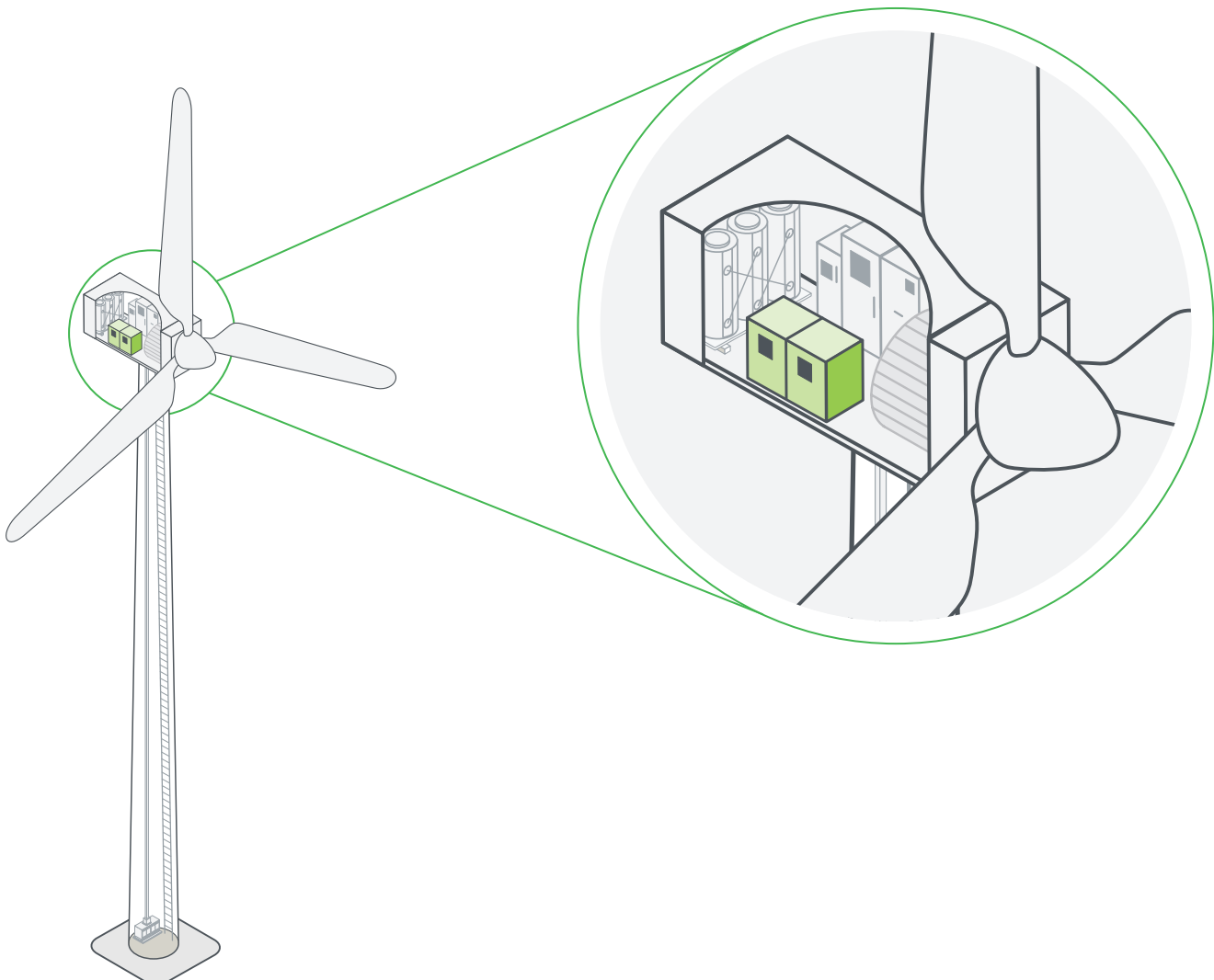
- TeSys U: all-in-one solution up to 15 kW
- TeSys GV + TeSys D/K: ready-to-use solution up to 30 kW

Panel boards



Prisma™

- Prisma Plus G/ up to 630 A
- Prisma Plus P/ up to 3200 A
- Metal enclosures
- IP 30 to IP55





4. MV collection – onshore

Protect your turbines and digitally monitor your wind farm. When dealing with more than just a single turbine, wind farm operators need to collect the harvested energy before it's brought to the power station. They need a system for MV collection that includes transformers, switchgears, and kiosks.

Schneider's customized MV-LV pre-engineered, pre-validated architecture are smarter to operate and manage. All of these products have been designed to work together, ensuring electrical, mechanical compatibility and to be all connected to the digital architecture.

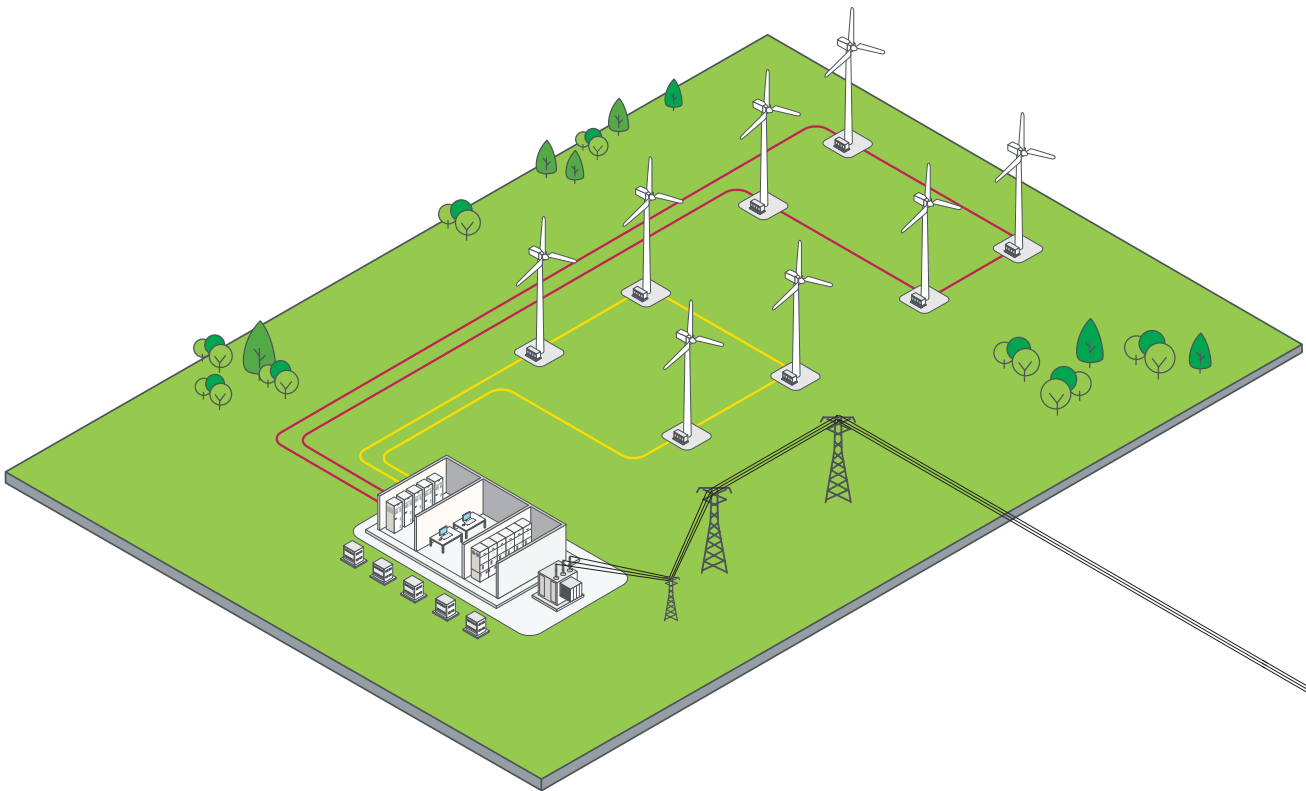
Each aspect of the solution contributes to the overall productivity of the wind farm:

- Insulated switchgears that ensure the electrical installation is optimized, have improved performance and better service continuity

- Wind-dedicated transformers that are highly efficient and proven reliable against a variety of environmental hazards
- Customized, prefabricated substations that improve network efficiency and maximize electricity production
 - A complete electrical installation that allows you to better manage your maintenance cost
 - Monitor your assets and optimize the maintenance plan

Fast design and engineering, simple to install and commission

Proactive detection through reliable data and actionable information



4. MV collection – onshore

Protection relay



Easergy P3

- Unparalleled efficiency on daily operations
- Better connectivity
- Enhanced safety (Embedded arc protection)



Easergy P5

- More security (Full cybersecurity, Arc flash, safe withdrawable design, etc.)
- Flexible and easy (withdrawable design, scalable communication interface, end-to-end digital experience, with the example of Easergy P5 SmartApp and Webserver)
- Powerful (best-in-class protection and communication performance)

LV/MV transformer



Trihal™

- F1/self-extinguishing in case of case fire
- E3/withstand 95% humidity according to IEC 60076-16
- C3/resistance to -50°C
- Adaptable design for door width and vibrations constraints



Distribution Transformer

- Oil immersed distribution/ medium power transformers up to 80 MVA/170 kV

Secondary switchgears



CBGS-0

- Up to 36 kV
- Up to 2000 A
- Up to 31.5 kA (3s)



GHA

- 40.5 kV
- 2500 A
- 20 kA/3sw



Transformer options

Cast Resin Transformers

Schneider Electric's range of transformers include cast resin, oil-filled and high fire point fluid-filled models, with real-time thermal monitoring. For example, the Trihal cast resin wind farm transformer range, sized to fit through wind turbine access doors, has 'F1' fire behavior class certification – the best fire rating available for distribution transformers and provides the ultimate in indoor fire safety, with over 2000 transformers in operation in the wind turbine sector.

Our mineral oil or high fire point fluid-filled transformer ranges include free breathing and hermetically sealed models offering applications between 160 kVA and 50 MVA in a range of configurations.

In addition, directly mounted switchgear and feeder pillars result in a reduced footprint, making it ideal for wind turbine applications where it is often essential to minimize the site's civils by having as small a substation as possible.

HV/LV connection monitoring/Real-time monitoring of HV/LV connection performance provides up-to-the-minute insight into the transformer's health, supported by alarms and warnings in case of events.

Our manufacturing plants can produce oil-filled transformers from 200 kVA to 80 MVA, cast resin transformers up to 52 kV/25 MVA and we offer a variety of options such as GRC housings, hermetically sealed tanks and close coupled MV/LV switchgear.





4. MV collection - offshore

Protect your turbines and digitally monitor your wind farm

Schneider Electric has a wealth of experience in the offshore market, with references in over 40 farms in Northern Europe alone. We have been working with offshore wind developments for 12 years and have over 2000 panels installed.

We understand the different challenges and technologies that working offshore demand and we have the skills, equipment and know-how to carry a project through from initial scoping right through to installation, commissioning and servicing.

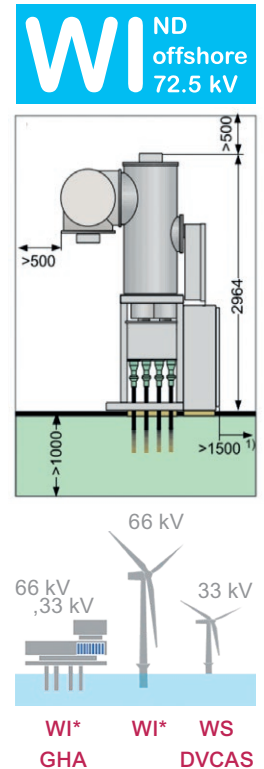
- Multi functions (Circuit breakers, switch, earthswitch, VT, CT)
- Operating reliability and operator safety
- No intervention on the gas circuit

- Innovative busbar link
- User-friendliness – intuitive operator guidance
- Low operating costs
- Environmentally friendly and easy recycling




Our comprehensive product and services offer, coupled with our focus on safety, reliability, and compliance with the toughest quality standards mean Schneider Electric can help you get the most out of your energy without the need for compromise.

References in over 100 farms

- Offshore wind developments for over 8 years
- More than 5000 panels installed



Our MV Switchgear units from 33 kV to 66 kV (service voltage)

	 WS 36 kV	 DVCAS 36 kV	 GHA 40.5 kV	 WI* 72.5 kV
Rated voltage	36 kV	36 kV	40.5 kV	72.5 kV
Rated current busbars	• 2500 A	• 630 A 1250 A	• 2500 A	• 2500 A
Rated current circuit-breaker	• 2500 A	• 630 A	• 2500 A	• 1250 A
Rated short-time current	• 31.5 kA (3s)	• 20 kA (3s) 25 kA (1s)	• 40 kA (3s)	• 25 kA (3s)
Rated peak current	• 80 kA	• 50 kA	• 100 kA	• 62.5 kA
Internal Arc IAC-A-FL IEC 62271 – 200	• 31.5 kA (1s)	• 20 kA (1s) 25 kA (1s) AFL/AFLR	• 40 kA (1s)	• 25 kA (1s)

5. Connection to the grid

Achieving power quality and reliable integration to the grid

Connecting to the power grid brings with it a unique set of challenges: surges, dips, distortions, and, of course, stringent grid code requirements. Even small shifts of power flows can trip circuit breakers, sending larger loads onto neighboring lines and causing chain reaction failures.

Fortunately, being the global specialist in energy management, we at Schneider Electric have the solution. The solution begins with SF6 insulated metal-enclosed switchgear, which is designed to ensure maximum safety in a reduced-space environment.

The grid code requirements provide the following benefits:

- Up to 25 percent reduction is commonly achievable in both capital and operational expenses
- Significant reduction in downtime
- Extended equipment lifetime
- Minimized system losses and demand power
- Reduced overloading on the electrical system, thereby releasing useable capacity
- Reduced power factor for low level harmonics
- Easy connection to grid thanks to our open IoT architecture
- Deliver clean energy with low level harmonics to optimize life of your equipment and to reduce maintenance costs

EcoStruxure power SCADA operation host devices helps to:

- Measure the energy flowing to the grid, in terms of both quantity and quality
- Measure both wind farm and wind turbine efficiency
- View the electrical to ensure grid code compliance
- See the sequence of events and the FTR to analyze and fix a PQ problem

- Obtain the PQ reporting data for IEC50160 compliance reporting at the intertie point and IEC61400-21 at the wind turbine level

Combine wind generation with energy storage to be more flexible

Maximizing the production of renewable energy while limiting variability can be achieved thanks to the combination of wind turbines, storage and the advanced energy management solution: **EcoStruxure Microgrid Advisor (EMA)**.

The EcoStruxure Microgrid Advisor (EMA) relies on three pillars: forecasting, modelling, and predictive control.

In the case of wind turbines, forecasting will provide an idea of the power generation that can be expected, typically for the next 24 hours.

Modelling, will mainly concern the storage, its capacity, rated power, and efficiency. Finally, the predictive control algorithms, will define the optimal management strategy to be implemented, in order to maximize the injection of renewable energy, while complying with specific constraints that could be imposed by grid operator.

A very simple example is to limit the power injection, in order to respect sizing constraints of the power lines. In this case, the battery is used in order to implement peak shaving and limit the power to an acceptable level.

This solution helps to optimize the share of renewables injected into the grid, while limiting the variability and complying with possible grid limitations.

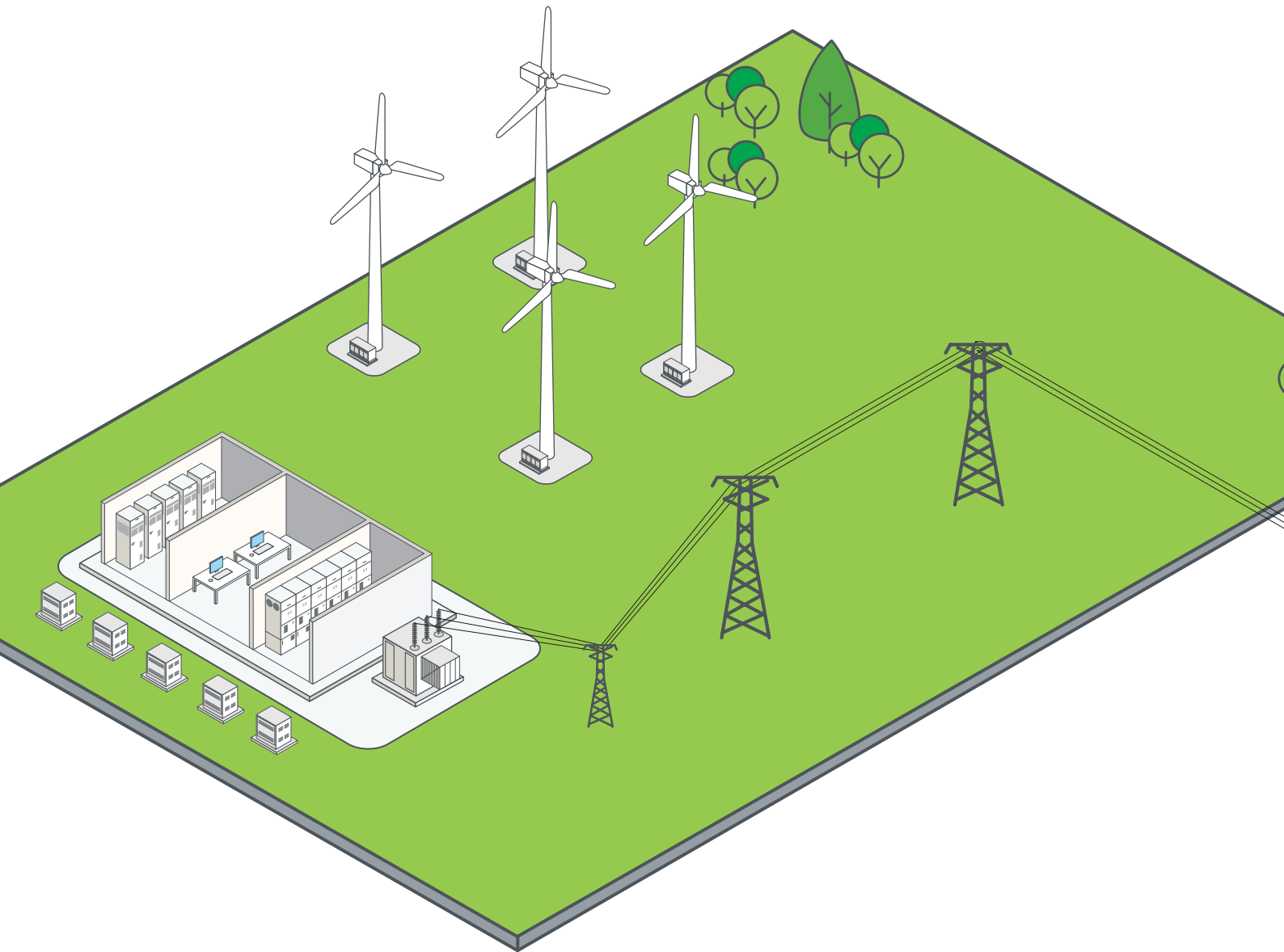
The advanced analytics deployed by EMA can be used in the design phase, in order to define the optimal size of storage to be implemented with the objective to optimize investment and operations.

Easy connection to grid thanks to our open IoT architecture

Deliver clean energy with low level harmonics to optimize life of your equipment and to reduce maintenance costs

Maximize the injection of renewable energy, while complying with specific constraints that could be imposed by grid operator.

5. Connection to the grid



Primary switchgears



Gas-insulated switchgear GHA

- IEC/ANSI Standards
- Up to 40.5 kV
- Up to 2500 A
- Up to 40 kA/1s

Reactive energy compensation



LV Compensation Varsset

- Up to 690 V
- 50 and 60 Hz
- Up to 1150 Kvar



Dynamic Compensation AccuSine™ PFV+

- Up to 10MVar with parallel connections
- LV and MV AccuSine™ (MV achieved through transformer)
- 50 and 60 HZ

Power transformers



- Up to 170 kV – 80 MVA
- Vegetable or mineral oil
- On-load or off-load tap changes
- Adaptable design for capitalization of loss

ION9000



- Third-party certified at Class 0.1S
- Robust design and selection of high precision components (-25 to +70°C and 3000m)
- IEC61000-4-30 class A, IEC62586-1/IEC62586-2
- Patented disturbance direction detection, extended waveform capture (0.5s pre-event data/2.5s event data @1024 s/c) and highspeed RMS data capture for in-depth analysis of any PQ disturbance

EcoStruxure – Edge control solutions



EcoStruxure Power Monitoring Expert

A software package for power management applications helps you collect and organize data from your facility's electrical network via intuitive web interface



EcoStruxure Power SCADA Operation

Fast data-acquisition monitoring and control software for improving the power availability of electrical distribution networks



EcoStruxure Microgrid Operation

- Reactive DER management
- Ensures Microgrid real time stability and reliability
- Manage of connect/disconnect from the grid
- Optimize energy production and use

6. Centralized supervision

Wind farms are complex installations to operate, especially when more than one site is involved. Our open IoT architecture for IT/OT integration ensures the profitability of a wind power plant, enabling:

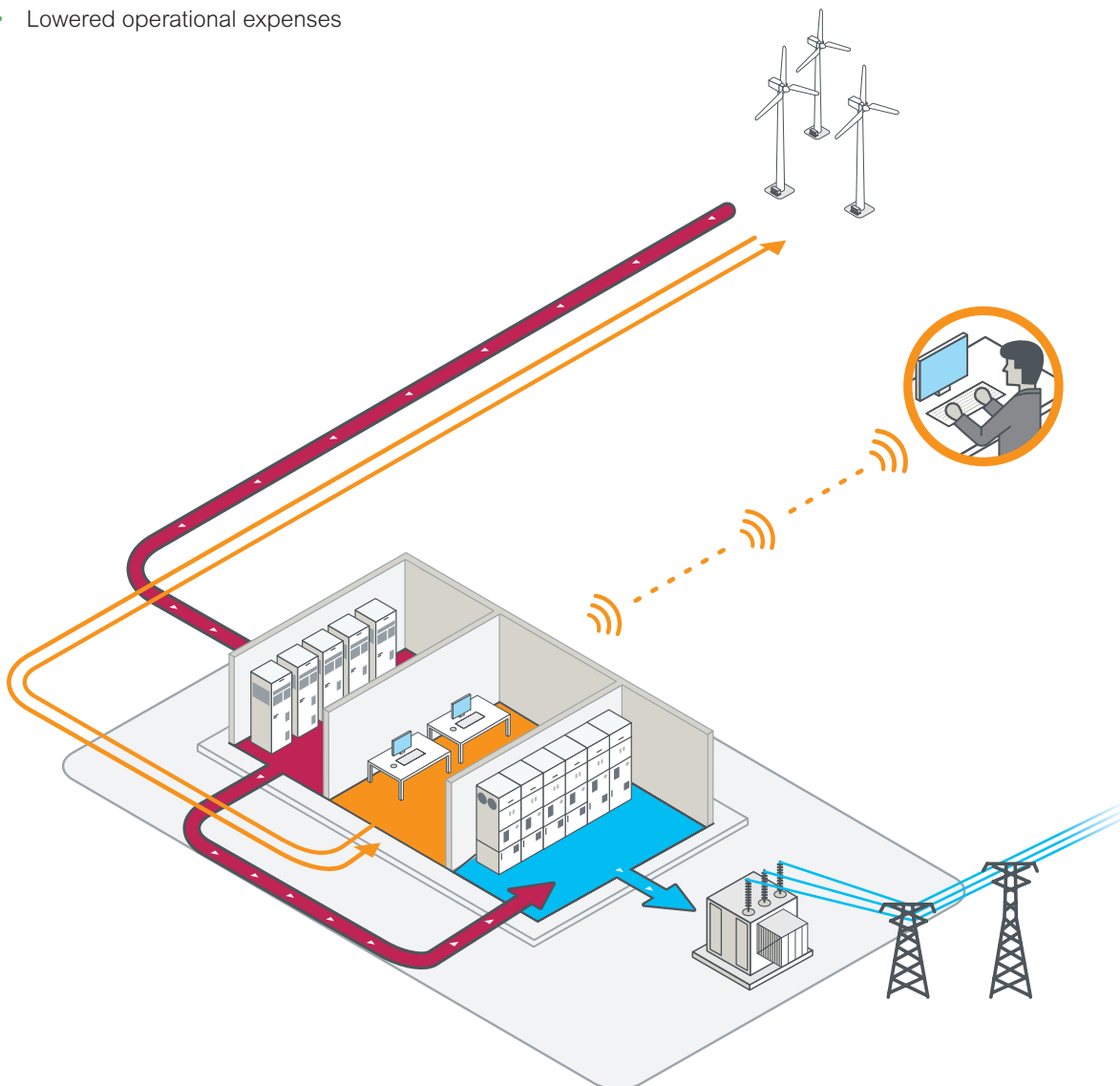
- Optimized electricity production and maintenance cost
 - Prevent power failure
 - Ensure protection of your equipment
 - Reliable electrical system and assets
- Maximized return on investment
- Reduced reaction time in case of fault on a site
- Lowered operational expenses

Real-time power monitoring and optimization of your turbine performance through our opened integrated **EcoStruxure** platforms.

The **Schneider Electric** supervision solution gives you a single view for all your wind farm needs, including energy metering that boasts the highest accuracy in the industry. Providing you with an extensive array of consultancy options and services throughout the whole life cycle of your project, Schneider will be a partner you can count on.

Centralized supervision with one open integrated IoT architecture

Real-time power monitoring and optimization of your turbine performance through our open integrated EcoStruxure platform



ION series



ION

- Class 0.2 accuracy
- 5 communication ports: Ethernet, Modem, RS0232, RS-485, front panel optical
- Metering: voltage, current, power, frequency, power factor

SCADA



I/O

- 32 I/O + extensions capacities
- Signals: digital, analog (4-20 mA, 0-10 V, PT1000)

SCADA supervisor

- Multi-protocol communications (permanent or not)
- Multiple alert support (sms, fax, relay, mail)
- SQL database

EcoStruxure – apps, analytics and services solutions



EcoStruxure Asset Advisor

Provides predictive analytics to secure electrical distribution through monitoring your critical connected products.



EcoStruxure Power Advisor

A proactive, analytics-based service for your power management system that ensures your operations run smoothly, optimizing the performance and minimizing unexpected downtime.



EcoStruxure Microgrid Advisor

An analytic for modelling rated power from different sources and injection according to constraints from grid operator.



IoT secured solutions for better energy monitoring

Monitoring made easy

Our PowerTag can monitor energy consumption, currents, power, voltage, or other important data – effortlessly. The data is sent in real time wirelessly and can be monitored online (also on tablets and smart phones) or can be integrated into a building management system. It can also be used to trigger email alarms to support remote maintenance. The compact, space-saving energy sensor fits easily into new and existing panel boards. PowerTag enables the connectivity of most Schneider Electric breakers. PowerTag can be used in all types of buildings and it is natively integrated into Schneider Electric's Acti9 Communication System.

Further information and technical specifications are available online.

Furthermore, our MV offers are the perfect choice for intelligent distribution systems. Equipped with thermal sensors for identifying performance anomalies in a connected or live system our products offer:

- 24/7 connectivity, with real-time data supporting effective decision making
- Greater reliability, with predictive maintenance helping reduce downtime
- Simplified asset management through digital features
- Compliance with environmental regulations

These products can be placed on existing installed base or on new design.

Smart IoT solutions for monitoring



PowerTag

Easily tag circuit breakers to help reduce costs and improve efficiency. PowerTag is a key part of EcoStruxure™ Power – Schneider's IoT-enabled, open, and interoperable architecture



Environment monitoring CL110

24/7 connected monitoring to highlight condensation enabling users to prevent fast aging of the transformer critical connected products



Thermal monitoring TH110

24/7 connected monitoring to highlight hotspots (for example faulty cable termination) and take preventive action



Substation monitoring service

Collects IoT data from smart sensors and provides meaningful information to the local monitoring HMI or remote connections

Cybersecurity for wind farms

Each day, more and more targeted attacks against power generations farms are being recorded.

Our Cybersecurity services are part of an ongoing continual process consisting of the following stages: Assess, Develop, Implement and Optimize. Our approach is holistic – it does not matter which manufacturers you are using in your farms. Our service offering includes:

A. Consultancy

Our vulnerability assessments are conducted by our ISA certified consultants. After the audit of your installations, you will receive a report with a list of recommendations to secure your installations.

B. Engineering

Engineering tasks will typically be performed at design stage of your farm or based on the outcome of a previously completed audit.

It includes:

- Network Segmentation
- Centralized Authentication, Authorization, and Auditing
- Centralized Backup and Restoration
- Network and System Monitoring
- Software Update Management
- Isolated Networks IEC 62443 based designs
- Patch Management
- Security Gateways with Network Intrusion Protection (NIP) and Network Anti-Virus (NAV)

C. Maintenance

Our Cybersecurity Maintenance Agreement is part of Schneider Electric's Lifecycle approach to Cybersecurity.

A prerequisite for a Security Maintenance Agreement is the completion of a vulnerability assessment, and the implementation of recommended outcomes with up-to-date support software and hardware covered under the agreement.

- It includes an annual assessment against our Security Baseline
- Regular Cybersecurity staff on-site can lead to additional work/projects – not only Cybersecurity related

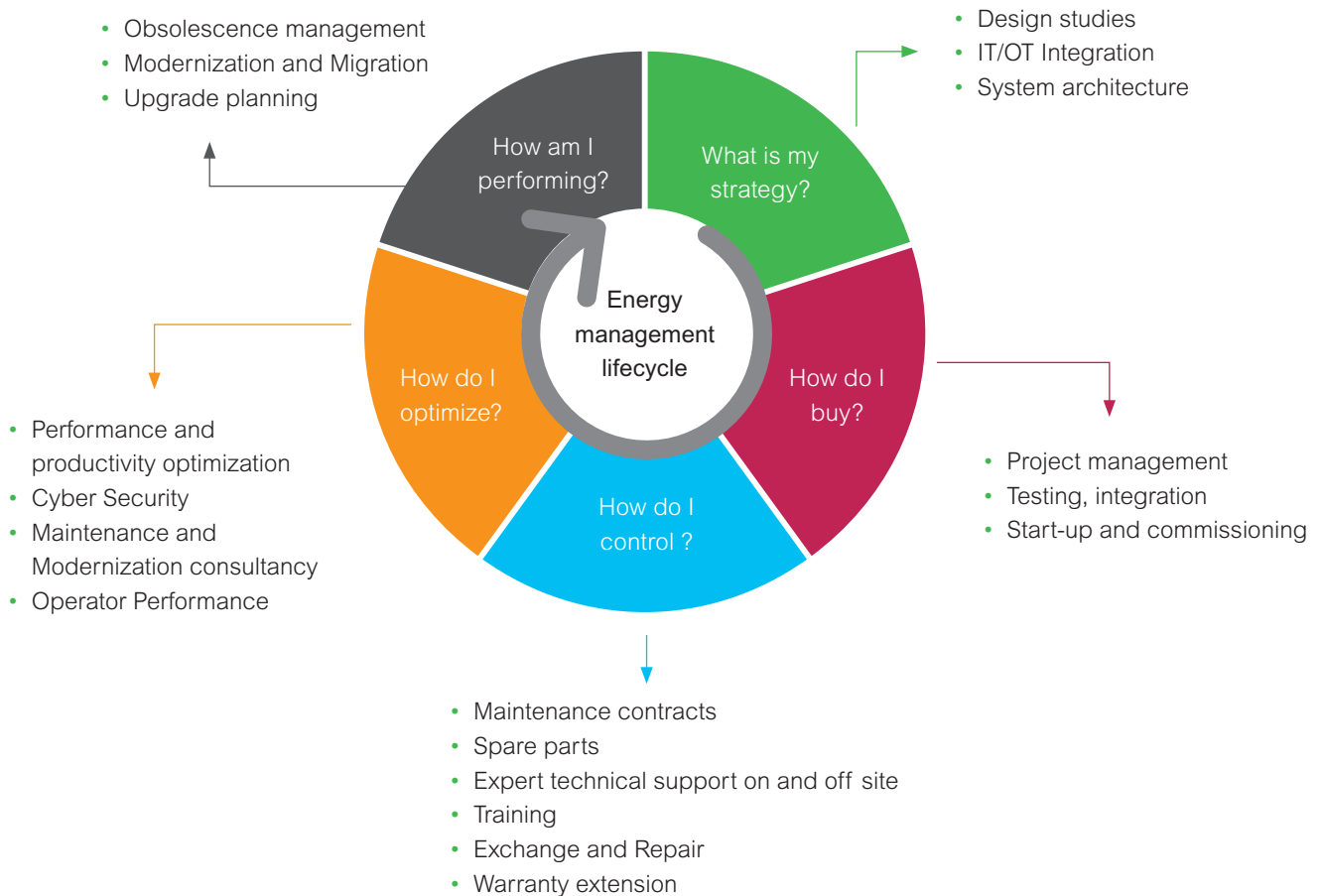
Cloud Solution

We provide a platform to gather data on a cloud. However, Schneider Electric does not own the data. If you choose so, you may give access to data in your cloud for further analytics.

The value proposition of our cloud solutions are:

- 24/7 remote access to data
- Secured data availability
- Modern interface for data analysis and Reliable and Scalable system able to follow all your extensions.

Services offer for the full lifecycle of the farm



Protect your investment with our comprehensive services offer

We service electrical distribution equipment in the main areas of a wind farm installations, on and offshore:

- MV applications: including protection relays, transformers, and secondary switchgear
- Grid connections: including primary switchgear, reactive energy compensation and power transformers, metering devices, etc.
- LV equipment including pitch systems, yaw system, control units, and converters
- Online and Offline maintenance of Apps and analytics, and Edge controls

Our services cover all automation, LV and MV applications, starting with switchgear all the way through to lighting and power equipment.

Our service team offers a comprehensive on and offshore solution that provides support packages covering the entire lifecycle of your installation.

Key benefits:

- Minimized risk of power supply disruption
- Increased asset productivity
- Improved energy efficiency through more accurate performance management
- Schneider own Service expertise for an optimized performance
- Increase availability and lifetime of your wind farm

Consultancy solutions: experience at your service

Wind farm and wind turbine solutions

Our consultancy services include:

- Electrical network design to ensure the reliability and longevity of your network through the correct design and selection of equipment and protective devices
- Protection studies to identify optimum protection settings to ensure that your personnel and electrical network are properly protected and supply availability is maximized
- Electrical installation audits for enhancing the dependability of your electrical installation, ensuring improved and lasting performance for your installation by changing system architecture and organization
- Network reliability studies to assess electrical and environmental stresses and calculate power availability to critical loads, identifying priorities for maintenance, equipment upgrades, or network changes
- Electrical contingency planning to proactively reduce the risk to your installation and minimize lost revenue through system downtime by running a detailed recovery plan
- Harmonics surveys to identify the existing supply impedance and individual harmonics, as well as reduce both electrical insulation degradation and nuisance tripping of overload
- Fault level studies to proactively manage risks by calculating peak, make, and break fault levels
- Power transformer assessments as an on-site audit of your power transformers, with measurements taken both on and offline
 - Control system design providing an overview design and specification of control system functionality

Building a competitive advantage together

- Open, scalable, flexible, secure, and future-ready digital architecture
- Improve your LCOE with our expertise on all electrical equipment of your turbines
- Fast design and engineering
- Optimize machinery performance with the assistance of our application design engineers
- Ensure grid code compliance



Life Is On



Your trusted partner for wind turbine and wind farm solutions
[schneider-electric.com](https://www.schneider-electric.com)

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