



Modular Systems wind portfolio overview

Power Collection and Grid Connection products

Modular Systems wind portfolio

Wind power - definition

A wind turbine is a device that converts kinetic energy from the wind into electrical power. Wind power, as an alternative to burning fossil fuel, is a widely distributed, clean and renewable energy source. Typically wind turbines are located in wind farms and connected to the power grid, either at distribution (low power) or transmission voltages (high power).

Typically wind turbine installations are divided into 2 groups:

- Power in the tower: Transformer and Medium Voltage protecting devices installed in the tower

- Power outside the tower: Low voltage switchboard, Step up transformer and Medium Voltage protection installed outside the tower

Wind turbines have developed rapidly over the years and wind parks are growing in size. The most common turbine ratings used today in onshore wind parks are 1,5 MW and 2,7 MW.

ABB, with its widest portfolio, is a major player in this segment.



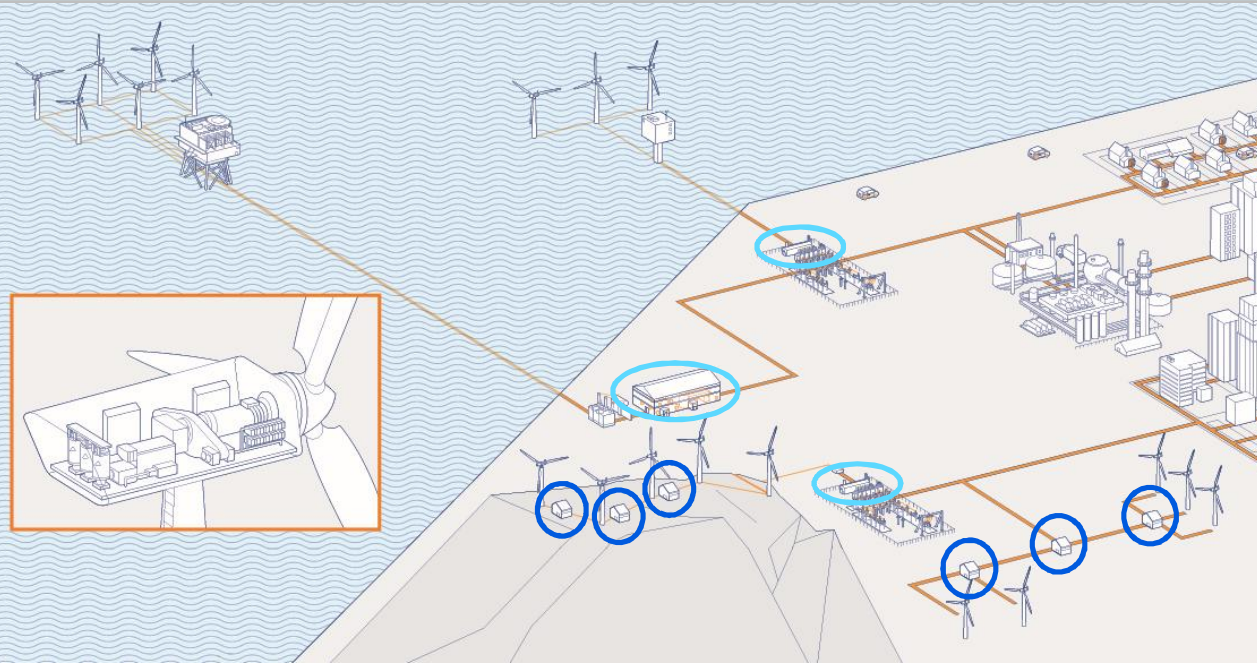
Green designs for wind power

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Wind Power Collection and Grid Connection points

Power Collection products

The Power Collection product portfolio is designed to collect power from wind turbines and transform it to suitable AC medium voltage power.



Power Collection products

Grid Connection products

Grid Connection products

The Grid Connection product portfolio is designed to collect AC power from multiple Power Collection points and connect them to the grid.

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Wind Power Collection and Grid Connection products

Power Collection products are factory assembled, routine tested and available in several layouts:

Secondary Skid Units (SSU) – Most economic solution for wind Power Collection



Secondary Enclosed Units (SEU) – Offering completely assembled solutions in an enclosed housing, including MV switchgear, transformer and LV switchboard.



Compact Secondary Substations (CSS) – Internal arc tested for highest safety levels, highly recommended for public installations



Grid Connection products are factory assembled and routine tested and available in various packages:

E-Houses – Metal enclosed buildings for safety and simple maintenance



Skid-mounted substations – An economic option with easy access to equipment



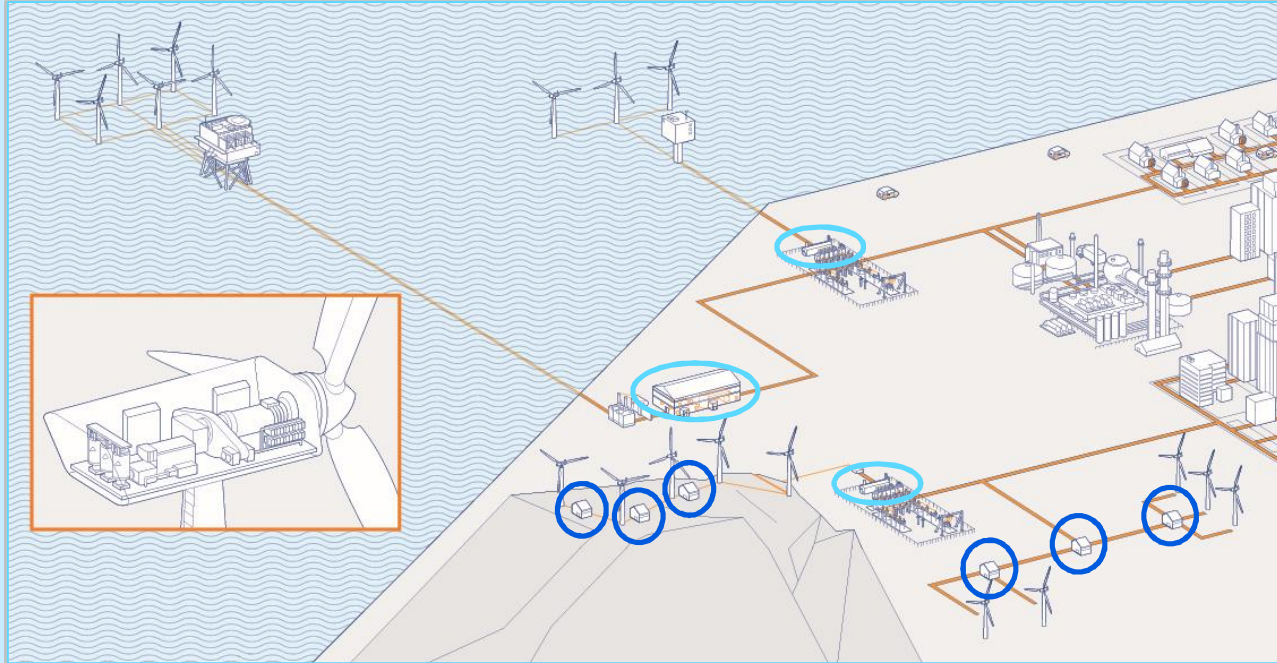
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Grid Connection products

Grid Connection products:

The Grid Connection product range is designed to collect power from the Power Collection units and connect it to the grid. Grid Connection products include MV primary switchgear; while auxiliary transformers, ancillary equipment, step up transformers and HV equipment are all options depending on the installation.



Power Collection products

Grid Connection products

Grid Connection product advantages:

- Minimized engineering time
- Lower site installation time
- Pre-assembled and tested resulting in reduced commissioning time
- Products designed specifically for the local utility applications and standards

Green designs for wind power

Grid Connection products

E-House

E-House solutions are steel buildings that house the MV switchgear, control and communication panels. This solution protects the operator from the environmental conditions as well as restricts close access to the equipment for non authorized personnel without additional fencing. The enclosure can also house auxiliary equipment, safety devices and communication equipment. A step-up transformer can be installed internally to reduce wear and simplify maintenance.

Typical equipment:

- MV switchgear
- Control and communication panels
- Oil or dry transformer (optional)

Benefits:

- High level of reliability and safety for equipment and personnel
- Simple and quick installation – pre-test units at the factory, drop in place and connect cables
- All ABB designs are green to support the environment
- Safety interlocking designs available
- SCADA ready packages available
- All equipment contained in the wind modules are type-tested according to their relevant standards
- Minimized engineering time
- Products designed specifically for the local utility applications and standards
- Restricted access to switchgear area
- Protection from environment
- Walk in solution for ease of maintenance

E-House



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Grid Connection products

Skid-mounted Substation

Skid-mounted solutions offer easily accessible MV switchgear panels in outdoor enclosures mounted on a stiff, metal, skid base. Switching operations are performed externally to provide the most compact design. The solution can also include a step up transformer mounted on the same skid base.

Typical equipment:

- MV switchgear in outdoor enclosure
- Dry or oil transformer (optional)

Benefits:

- High level of reliability and safety for equipment and personnel
- Simple and quick installation – pre-test units at the factory, drop in place and connect cables
- All ABB designs are green to support the environment
- Safety interlocking designs available
- SCADA ready packages available
- All equipment contained in the wind modules are type-tested according to their relevant standards
- Minimized engineering time
- Products designed specifically for the local utility applications and standards
- Compact footprint
- Economic solution
- Quick access reduces maintenance time

Skid-mounted substation



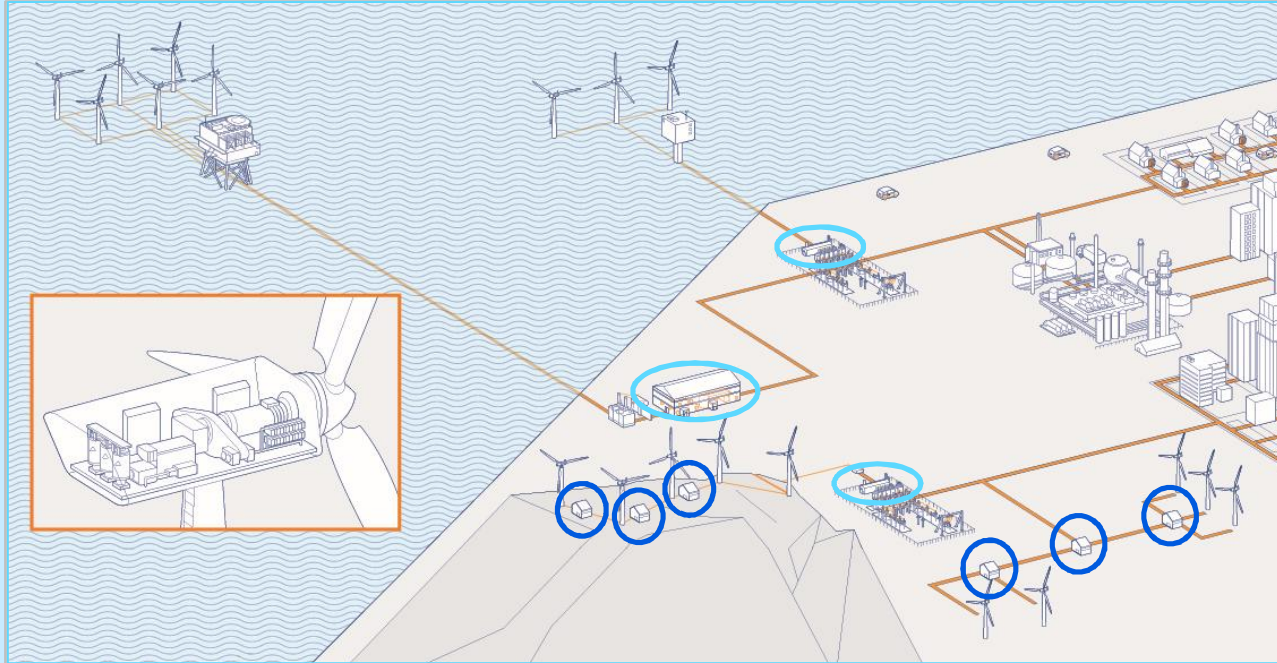
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Power Collection products

Power Collection products:

Power Collection products transform voltage and distribute it in Medium Voltage networks. Product technical features may vary due to the installation location, applicable standards and network configurations.



Power Collection products

Grid Connection products

Power Collection product advantages:

- Green and ecofriendly
- Compact footprints
- Economic solutions
- Shorter installation times
- Factory tested
- Safety oriented

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Power Collection products

Secondary Skid Unit

The SSU is a skid-mounted, compact solution. It is the most economical way to offer Power Collection and transform AC low voltage to medium voltage. Pre-assembled and factory-tested solutions assure minimized site works reducing risks and time. A popular option in the SSU is to cover the transformer with steel mesh giving efficient cooling and increased safety (SSU-P). Optionally SSU can be designed only for MV switchgear.

Typical equipment:

- SF6 or Air insulated switchgear up to 40,5 kV
- Oil or dry type transformer up to 3500 kVA

Optional equipment:

- Automation for remote monitoring and control
- Switch with fuse to reduce costs in lower rated installations
- Dry type transformer to increase safety

Benefits:

- Simple and quick installation – pre-test units at the factory, drop in place and connect cables
- Pre-engineered products to reduce time to quote and supply, while reducing risks
- Engineered for efficient cooling in order to extend the life of the equipment
- All ABB designs are green to support the environment
- No exposed live parts, more safe for operator and personnel
- SCADA ready
- All equipment contained in the wind modules are type tested according to their relevant standards
- Easy access to equipment for visual inspection and service
- Open-air cooling for maximum efficiency
- Compact and easily transportable
- Economic solution
- Locking system for MV compartment to prevent unauthorized entry

Secondary Skid Unit (SSU)



Secondary Skid Unit-P (SSU-P)



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Power Collection products

Secondary Enclosed Unit

Secondary Enclosed Units provide fully assembled solutions, including (optionally) LV switchboard, transformer and medium voltage equipment, to decrease site works and site assembly time. This product is recommended it is preferred to protect the equipment from the environment.

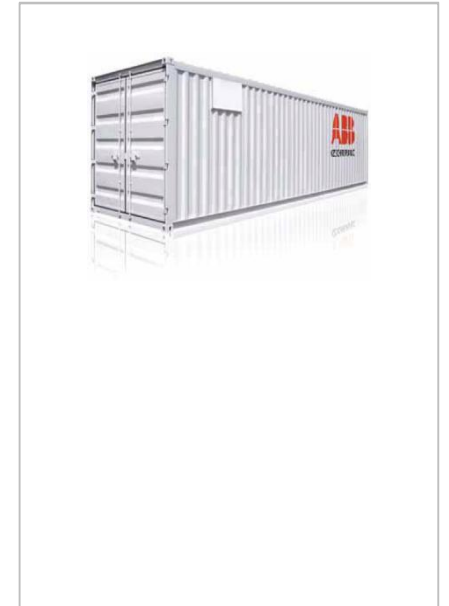
Typical equipment:

- SF6 or Air insulated switchgear up to 40,5 kV
- Oil transformer up to 3500 kVA or dry type up to 2500 kVA
- Optionally LV switchboard

Benefits:

- Simple and quick installation – pre-test units at the factory, drop in place and connect cables
- Pre-engineered products to reduce time to quote and supply, while reducing risks
- Engineered for efficient cooling in order to extend the life of the equipment
- All ABB designs are green to support the environment
- No exposed live parts, more safe for operator and personnel
- SCADA ready
- All equipment contained in the SEU are type tested according to their relevant standards
- Robust and reliable – proven components from a single source
- Compact and easily transportable
- Optional oil collection pit for environmental protection
- Internal maintenance available
- Equipment protected from environment
- Economic solution
- All doors are pad lockable to prevent unauthorized entry

Secondary Enclosed Unit (SEU)



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Power Collection products

Compact Secondary Substation

The CSS solution is IEC/AS/GB tested according to the standards for prefabricated substations IEC 62271-202 or applicable. Solutions are internal arc tested as recommended for high safety for public and service personnel. For Power Collection, they typically contain MV switchgear and a transformer, (optionally) LV switchboard. CSS-s are compartmented and electrically segregated for safety. The transformer is protected from direct environmental elements like sun radiation, snow, sand, and also from unintended entry, plus the CSS includes an oil pit to collect any leakage for an environmentally safe product.

Typical equipment:

- SF6 or Air insulated switchgear up to 40,5 kV
- Oil transformer up to 3500 kVA or Dry up to 2500 kVA

Major options:

- Walk-in for simple maintenance vs non Walk-in for compact size
- Multiple enclosure material options - see following slide

Benefits:

- Solutions for high wind conditions
- Simple and quick installation – pre-test units at the factory, drop in place and connect cables
- Pre-engineered products to reduce time to quote and supply, while reducing risks
- Engineered for efficient cooling to extend life of equipment
- All ABB designs are green to support the environment
- No exposed live parts, more safe for operator and personnel
- SCADA ready
- All equipment contained in the CSS are type tested according to their relevant standards
- High level of reliability and safety for equipment and personnel(internal arc tested IAC-AB)
- Type tested according to IEC/AS/GB standards for prefabricated substations, IEC 62271-202 or applicable
- Fully enclosed solutions
- Most enclosure materials available in industry
- All doors are pad lockable to prevent unauthorized entry
- Glass Reinforced Polyester (GRP) housings to meet demanding environmental conditions
- Enclosures are compartmented and electrically segregated for safety
- CSS designs include an oil collection pit for environmental protection in case of oil leakage
- Walk in option for ease of service
- Separate access entries to MV and transformer

Compact Secondary Substation (CSS)



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Power Collection products

Compact Secondary Substation

The CSS product portfolio has 3 different enclosure material types:

- GRP – Glass fiber Reinforced Polyester, is capable to withstand high environmental requirements. The patented double layer design keeps sun radiation impact lower than any other enclosure material, extending life of internal equipment.
- Steel – Steel portfolio is most economical solution and it is flexible to make changes in the footprint if required.
- Concrete – Concrete portfolio is robust in design. But, it has limitations in transport and layout changes.

A simple comparison between the different enclosure materials shows that remote site locations, thermal challenges and increasing ratings are proving the benefits of the GRP design.

	GRP	CONCRETE	STEEL
Corrosion resistance	++	++	-
Modularity	++	-	++
Strength	++	++	+
Weight	++	-	++
Weathering	++	+	+
Thermal properties	++	+	-
Maintenance	++	++	-

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Modular Systems wind portfolio

Power Collection products

Pre-designed solutions are available for optimized designs and quicker delivery. Power ratings are aligned with the most common inverter power ratings in the market. The solutions are equipped with medium voltage switchgear, SafeRing CCV configuration (cable loop with breaker and relay protection). The transformer includes standard integrated protection for pressure and gas. Product datasheets are available with an overview of other options available. Pre-designed solutions for power collection are shown below:

	Secondary Skid Unit		Secondary Enclosed Unit		Compact Secondary Substation				
Style number	SSU-S-1510-0CCV-4000	SSU-S-3010-0CCV-3000	SEU-S-1510-0CCV-4000	SEU-S-3010-0CCV-3000	CSS-S-1510-0CCV-4000	CSS-S-3010-0CCV-3000	CSS-G-1510-0CCV-4000	CSS-G-3010-0CCV-3000	CSS-G-0000-0CCV-4000
Enclosure type	Skid	Skid	Steel-enclosed	Steel-enclosed	Steel	Steel	GRP	GRP	GRP
Overall parameters									
Length x width x height, mm	3400 x 2550 x 2800	3400 x 2550 x 2800	6100 x 2600 x 2440	6100 x 2600 x 2440	3950 x 2200 x 2700	3950 x 2200 x 2700	4500 x 2470 x 2810	4500 x 2470 x 2810	2000 x 2470 x 2800
Est. weight (metric tons)	8	12	13.0	16.0	11.5	14.0	12.0	12.0	3
MV switchgear									
Switchgear type	SafeRing CCV		SafeRing CCV		SafeRing CCV				
Protection Relay	REJ603	REJ603	REJ 603	REJ 603	REJ603	REJ603	REJ603	REJ603	REJ603
Transformer									
Transformer type	oil immersed		oil immersed		oil immersed				N/A
Power rating, kVA	1500	3000	1500	3000	1500	3000	1500	3000	N/A
LV Voltage level, V	690	690	690	690	690	690	690	690	N/A
MV Voltage level, kV max	13.8	40.5	13.8	40.5	13.8	40.5	13.8	40.5	N/A
Standard protection	RIS		RIS		RIS				N/A



SSU



SEU



GRP



CSS

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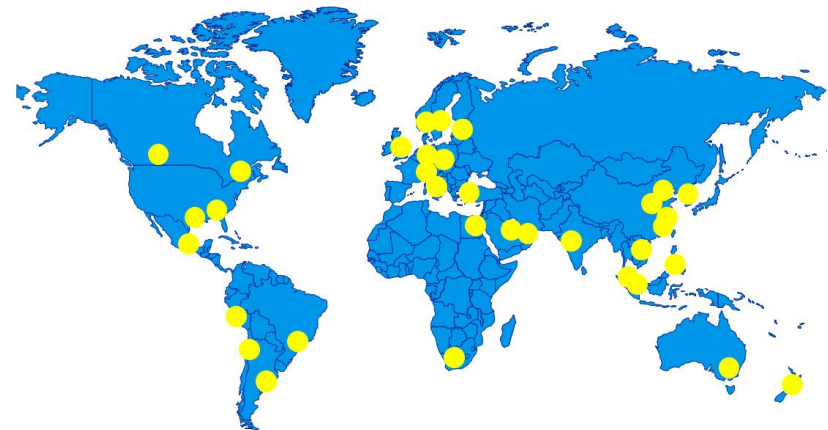
EPMV wind products

Summary

- ABB's EPMV wind portfolio is covering a wide range of applications and needs
- Pre-designed solutions are selected to fit with the most common inverter ratings in the industry
- ABB has a long experience in these products and the wind segment
- Wide footprint supports delivery to customers in an optimum way
- Service units all over the world to support with installation and commissioning and after sales service

Contact ABB for further information and to discuss your specific needs:

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