

**Vestas**<sup>®</sup>

# 3 MW PLATFORM

**Wind.** It means the world to us.<sup>™</sup>

# Are you looking for the maximum return on **your investment** in wind energy?

Wind energy means the world to us. And we want it to mean the world to our customers, too, by maximising your profits and strengthening the certainty of your investment in wind power.

That's why, together with our partners, we always strive to deliver cost-effective wind technologies, high quality products and first class services throughout the entire value chain. And it's why we put so much emphasis on the reliability, consistency and predictability of our technology.

These aren't idle words. We have over 30 years' experience in wind energy. During that time, we've delivered more than 55 GW of installed capacity and we currently monitor over 24,000 wind turbines across the globe. Tangible proof that Vestas is the right partner to help you realise the full potential of your wind site.

## **What is the 3 MW platform?**

Our 3 MW platform has been optimised to 3.3 MW. The latest editions to the 3 MW platform are based on the proven and reliable technology of the V112-3.0 MW<sup>®</sup> turbine. After only three years on the market, the V112-3.0 MW<sup>®</sup> already has an installed base of more than 1.5 GW.

## **Ideal for all wind classes**

Our 3 MW platform is designed for a range of wind conditions, onshore and offshore enabling you to mix turbines across your site or portfolio of sites, delivering industry-leading reliability, serviceability and exceptional energy capture wherever they

are located. The combination of high returns and low risk has already made the 3 MW platform an industry favourite with more than 3 GW sold since 2010.

You can choose from four turbines on the 3MW platform:

- V112-3.3 MW<sup>™</sup> - IEC IIA (Onshore)
- V112-3.3 MW<sup>™</sup> - IEC IB (Onshore and offshore)
- V117-3.3 MW<sup>™</sup> - IEC IIA (Onshore)
- V126-3.3 MW<sup>™</sup> - IEC IIIA (Onshore)

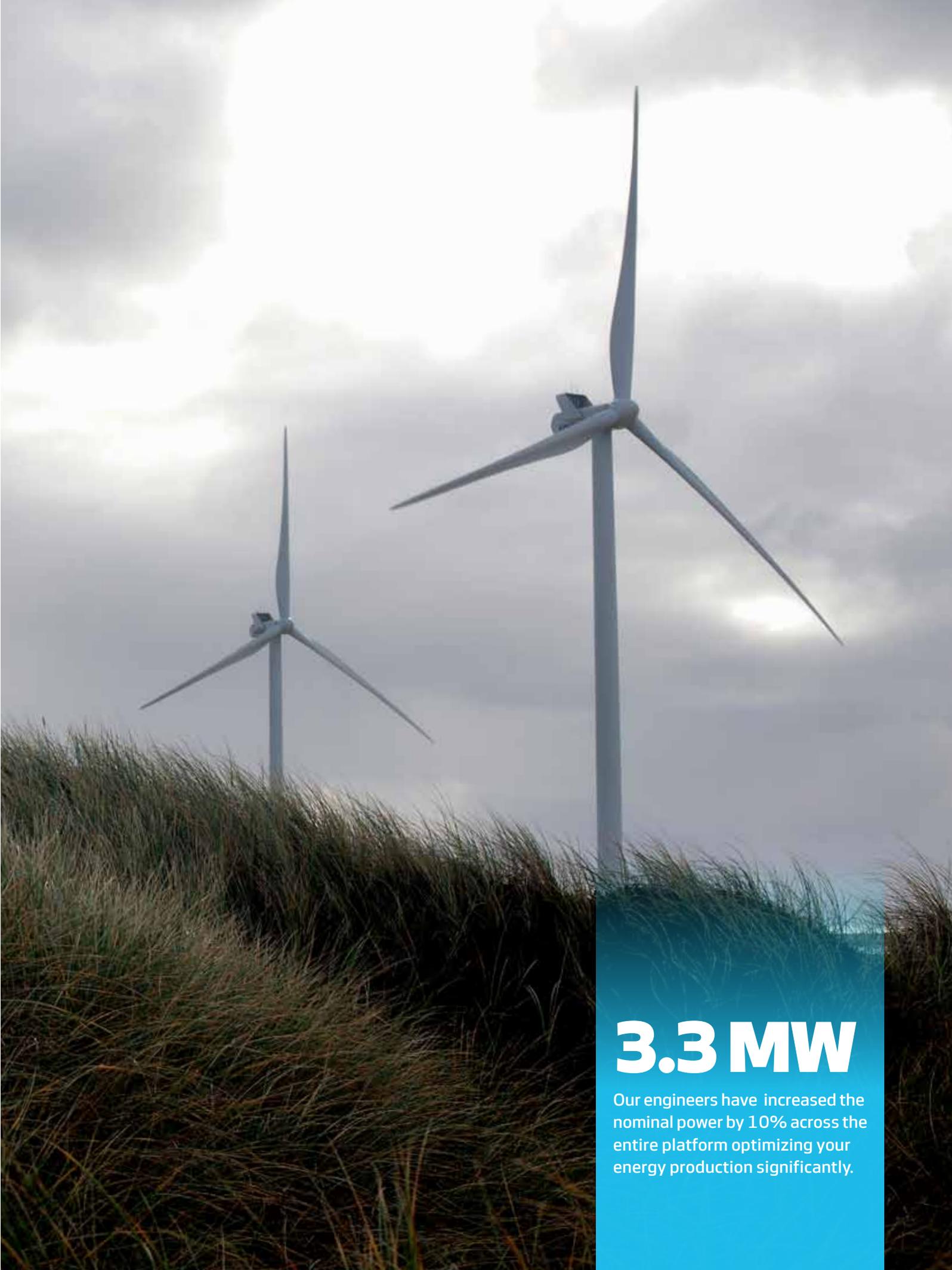
Rotor diameters range from 112 to 126 metres and the rated output power is 3300 kW. Using a number of well proven technologies, among others a full-scale converter providing excellent energy yield in all wind and weather conditions.

By adding the V117-3.3 MW<sup>®</sup> to the platform and increasing the nominal power by 10% across the entire platform, it delivers even more energy production and a stronger business case.

The 3 MW platform combines Vestas' proven track record with our continuous efforts to improve and optimise our products, making it the obvious choice for customers looking to combine reliability with performance.

Main features of the 3 MW platform:

- Power system updated to 3.3 MW
- Standard operating temperature range from -20°C to +45°C with de-rating above 30°C
- Load carrying structure, drivetrain, pitch and yaw system optimised for higher loads



# 3.3 MW

Our engineers have increased the nominal power by 10% across the entire platform optimizing your energy production significantly.

# How does our technology generate **more energy?**

## **More power for every wind site**

All turbines of the 3 MW platform have an increased nominal power and are available with several noise modes to meet most site-specific sound level restrictions with an optimised production.

The power system enables superior grid support. What's more, it is capable of maintaining production across severe drops in grid voltage, while simultaneously minimising tower and foundation loads. It also allows rapid down-rating of production to 20 per cent.

With a full-scale converter, the 3 MW platform meets even the most challenging grid requirements, in almost any corner of the world.

## **Proven technologies - from the company that invented them**

The 3MW platform is a low-risk choice. It is based on the proven technologies that underpin the +55,000 Vestas turbines installed around the world. Using the best features from across the range, as well as some of the industry's most stringently tested components and systems, the platform's reliable design minimises downtime – helping to give you the best possible return on your investment.

With an operating range that covers all wind classes, our 3 MW platform delivers unrivalled energy production. The proven blade technology from the V112-3.0 MW<sup>®</sup> is used on the new V112-3.3 MW<sup>™</sup> and on the V117-3.3 MW<sup>™</sup>. The industry known structural shell blades are used on the V126-3.3 MW<sup>™</sup>.

## **Reliable and robust**

The Vestas Test Centre is unrivalled in the wind industry. We test most nacelle components using Highly Accelerated Life Testing (HALT) to ensure reliability. For critical components, HALT identifies potential failure modes and mechanisms. Specialised test rigs ensure strength and robustness for the gearbox, generator, yaw and pitch system, lubrication system and accumulators.

Our quality-control system ensures that each component is produced to design specifications and performs at site. We systematically monitor measurement trends that are critical to quality, locating defects before they occur.

The 3 MW platform covers all wind segments enabling you to find the best turbine for your specific site.

### WINDCLASSES - IEC

TURBINE TYPE	IEC III (6.0-7.5 m/s)	IEC II (7.5-8.5 m/s)	IEC I (8.5-10.0 m/s)
<b>3 MW TURBINES</b>			
V112-3.3 MW™ IEC IB			
V112-3.3 MW™ IEC IIA			
V117-3.3 MW™ IEC IIA			
V126-3.3 MW™ IEC IIIA			

■ Turbulence level A    ■ Turbulence level B

### Options available for the 3 MW platform

An option is an extra feature that can be added to the turbine to suit a project's specific needs. By adding options to the standard turbine, we can enhance the performance of the wind power project and facilitate a shorter permitting cycle at restricted sites. The options can even be a decisive factor in realizing your specific project, and the business case certainty of the investment.

Here is a list of the options available for the 3 MW platform:

- Condition Monitoring System
- Service personnel lift
- Aviation lights
- Aviation markings on the blades
- Low temperature operation to - 30°C
- Ice detection
- Fire Suppression
- Shadow detection
- Increased Cut-In
- Obstacle Collision Avoidance System (OCAS™)

### Life testing

The Vestas Test Centre has the unique ability to test complete nacelles using technologies like Highly Accelerated Life Testing (HALT). This rigorous testing of new components ensures the reliability of the 3 MW platform.



# Would you **benefit** from uninterrupted control of wind energy production?

## **Knowledge about wind project planning is key**

Getting your wind energy project up and operating as quickly as possible is fundamental to its long-term success. One of the first and most important steps is to identify the most suitable location for your wind power plant. Vestas' SiteHunt® is an advanced analytical tool that examines a broad spectrum of wind and weather data to evaluate potential sites and establish which of them can provide optimum conditions for your project.

In addition, SiteDesign® optimises the layout of your wind power plant. SiteDesign® runs Computational Fluid Dynamics (CFD) software on our powerful in-house supercomputer Firestorm to perform simulations of the conditions on site and analyse their effects over the whole operating life of the plant. Put simply, it finds the optimal balance between the estimated ratio of annual revenue to operating costs over the lifetime of your plant, to determine your project's true potential and provide a firm basis for your investment decision.

The complexity and specific requirements of grid connections vary considerably across the globe, making the optimal design of electrical components for your wind power plant essential. By identifying grid codes early in the project phase and simulating extreme operating conditions, Electrical PreDesign provides you with an ideal way to build a grid compliant, productive and highly profitable wind power plant. It allows customised collector network cabling, substation protection and reactive power compensation, which boost the cost efficiency of your business.

## **Advanced monitoring and real-time plant control**

All our wind turbines can benefit from VestasOnline® Business, the latest Supervisory Control and Data Acquisition (SCADA) system for modern wind power plants.

This flexible system includes an extensive range of monitoring and management functions to control your wind power plant. VestasOnline® Business enables you to optimise production levels,



# +24.000

The Vestas Performance and Diagnostics Centre monitors more than 24,000 turbines worldwide. We use this information to continually develop and improve our products and services.

monitor performance and produce detailed, tailored reports from anywhere in the world. The VestasOnline® Power Plant Controller offers scalability and fast, reliable real-time control and features customisable configuration, allowing you to implement any control concept needed to meet local grid requirements.

### **Surveillance, maintenance and service**

Operating a large wind power plant calls for efficient management strategies to ensure uninterrupted power production and to control operational expenses. We offer 24/7 monitoring, performance reporting and predictive maintenance systems to improve turbine performance and availability. Predicting faults in advance is essential, helping to avoid costly emergency repairs and unscheduled interruptions to energy production.

Our Condition Monitoring System (CMS) assesses the status of the turbines by analysing vibration signals. For example, by measuring the vibration of the drive train, it can detect faults at

an early stage and monitor any damage. This information allows pre-emptive maintenance to be carried out before the component fails, reducing repair costs and production loss.

Additionally, our Active Output Management® (AOM) concept provides detailed plans and long term agreements for service and maintenance, online monitoring, optimisation and troubleshooting. It is possible to get a full scope contract, combining your turbines' state-of-the-art technology with guaranteed time or energy-based availability performance targets, thereby creating a solid base for your power plant investment. The Active Output Management® agreement provides you with long term and financial operational peace of mind for your business case.

# V112-3.3 MW™ IEC IB

## Facts & figures

### POWER REGULATION

Pitch regulated with variable speed

### OPERATING DATA

Rated power	3,300 kW
Cut-in wind speed	3 m/s
Cut-out wind speed	25 m/s
Re cut-in wind speed	23 m/s
Wind class	IEC IB
Standard operating temperature range from -20°C to +45°C with de-rating above 30°C*	

\*subject to different temperature options

### SOUND POWER

(Noise modes dependent on site and country)

### ROTOR

Rotor diameter	112 m
Swept area	9,852 m <sup>2</sup>
Air brake	full blade feathering with 3 pitch cylinders

### ELECTRICAL

Frequency	50/60 Hz
Converter	full scale

### GEARBOX

Type	two planetary stages and one helical stage
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### TOWER

Hub height	site specific
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### NACELLE DIMENSIONS

Height for transport	3.4 m
Height installed (incl. CoolerTop®)	6.8 m
Length	12.8 m
Width	4.0 m

### HUB DIMENSIONS

Max. transport height	3.74 m
Max. transport width	3.75 m
Max. transport length	5.42 m

### BLADE DIMENSIONS

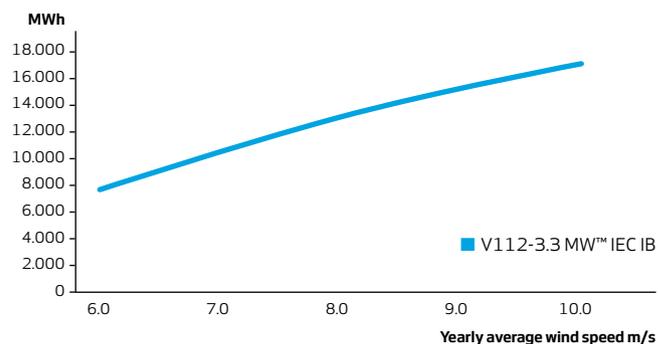
Length	54.65 m
Max. chord	4 m

Max. weight per unit for transportation	70 metric tonnes
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### TURBINE OPTIONS

- Condition Monitoring System
- Service personnel lift
- Aviation lights
- Aviation markings on the blades
- Low temperature operation to -30°C
- Ice detection
- Fire Suppression
- Shadow detection
- Increased Cut-In
- Obstacle Collision Avoidance System (OCAS™)

### ANNUAL ENERGY PRODUCTION



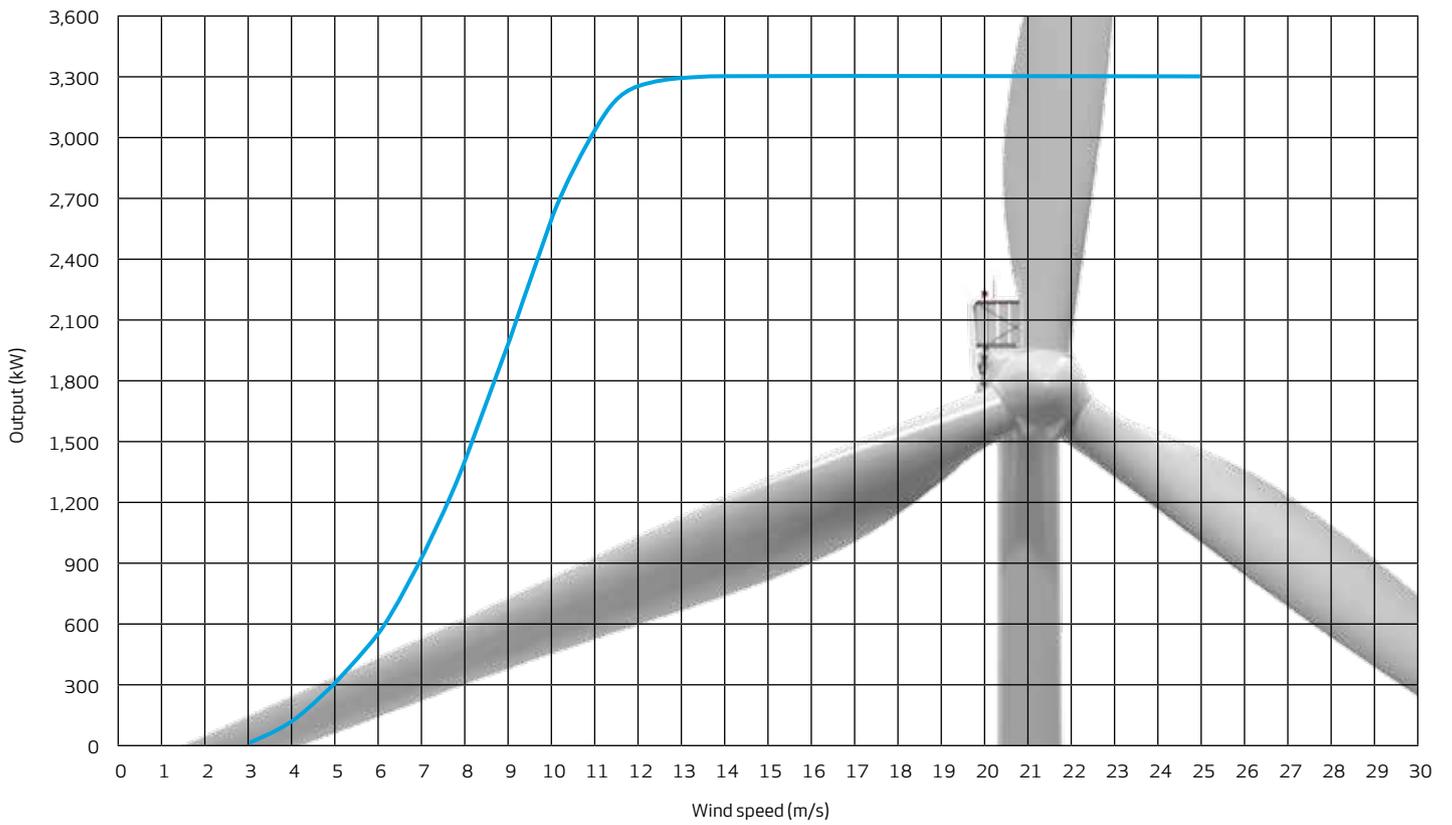
### Assumptions

One wind turbine, 100% availability, 0% losses, k factor =2, Standard air density = 1.225, wind speed at hub height

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### POWER CURVE FOR V112-3.3 MW™ IEC IB

Noise reduced sound power modes are available



# V112-3.3 MW™ IEC IIA

## Facts & figures

### POWER REGULATION

Pitch regulated with variable speed

### OPERATING DATA

Rated power	3,300 kW
Cut-in wind speed	3 m/s
Cut-out wind speed	25 m/s
Re cut-in wind speed	23 m/s
Wind class	IEC IIA/DIBt3
Standard operating temperature range from -20°C to +45°C with de-rating above 30°C*	

\*subject to different temperature options

### SOUND POWER

(Noise modes dependent on site and country)

### ROTOR

Rotor diameter	112 m
Swept area	9,852 m <sup>2</sup>
Air brake	full blade feathering with 3 pitch cylinders

### ELECTRICAL

Frequency	50/60 Hz
Converter	full scale

### GEARBOX

Type	two planetary stages and one helical stage
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### TOWER

Hub heights	84 m (IEC IIA), 94 m (IEC IIA/DIBt3), 119 m (IEC IIIA og DIBt3) and 140 m (IEC IIIA /DIBt2)
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### NACELLE DIMENSIONS

Height for transport	3.4 m
Height installed (incl. CoolerTop®)	6.8 m
Length	12.8 m
Width	4.0 m

### HUB DIMENSIONS

Max. transport height	3.74 m
Max. transport width	3.75 m
Max. transport length	5.42 m

### BLADE DIMENSIONS

Length	54.65 m
Max. chord	4 m

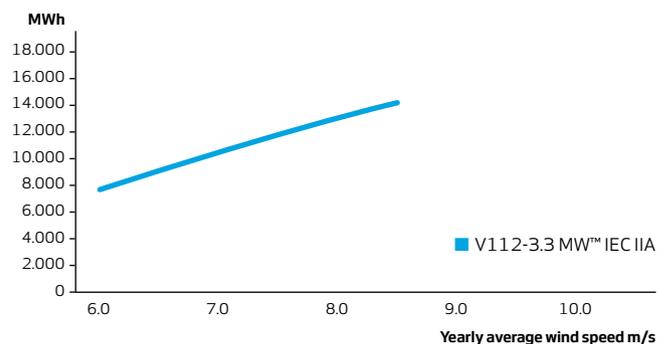
Max. weight per unit for transportation

70 metric tonnes

### TURBINE OPTIONS

- Condition Monitoring System
- Service personnel lift
- Aviation lights
- Aviation markings on the blades
- Low temperature operation to - 30°C
- Ice detection
- Fire Suppression
- Shadow detection
- Increased Cut-In
- Obstacle Collision Avoidance System (OCAS™)

### ANNUAL ENERGY PRODUCTION



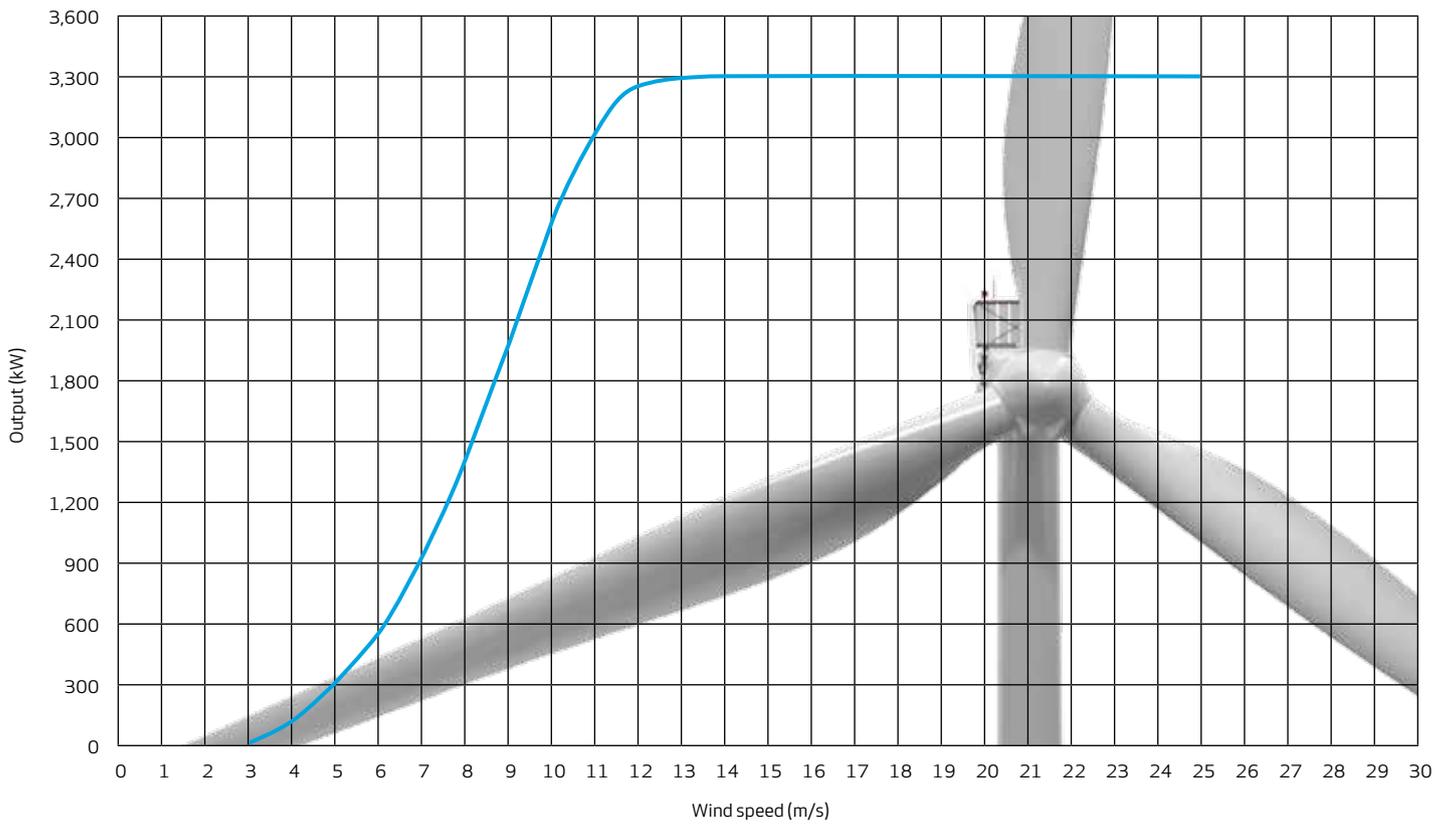
### Assumptions

One wind turbine, 100% availability, 0% losses, k factor =2, Standard air density = 1.225, wind speed at hub height

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### POWER CURVE FOR V112-3.3 MW™ IEC IIA

Noise reduced sound power modes are available



# V117-3.3 MW™ IEC IIA

## Facts & figures

### POWER REGULATION

Pitch regulated with variable speed

### OPERATING DATA

Rated power	3,300 kW
Cut-in wind speed	3 m/s
Cut-out wind speed	25 m/s
Re cut-in wind speed	23 m/s
Wind class	IEC IIA/DIBt2
Standard operating temperature range from -20°C to +45°C with de-rating above 30°C*	

\*subject to different temperature options

### SOUND POWER

(Noise modes dependent on site and country)

### ROTOR

Rotor diameter	117 m
Swept area	10,751 m <sup>2</sup>
Air brake	full blade feathering with 3 pitch cylinders

### ELECTRICAL

Frequency	50/60 Hz
Converter	full scale

### GEARBOX

Type	two planetary stages and one helical stage
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### TOWER

Hub heights	91.5 m (IEC IIA/DIBt3) 116.5 m (IEC IIA/DIBt2)
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### NACELLE DIMENSIONS

Height for transport	3.4 m
Height installed (incl. CoolerTop®)	6.8 m
Length	12.8 m
Width	4.0 m

### HUB DIMENSIONS

Max. transport height	3.74 m
Max. transport width	3.75 m
Max. transport length	5.42 m

### BLADE DIMENSIONS

Length	57.15 m
Max. chord	4 m

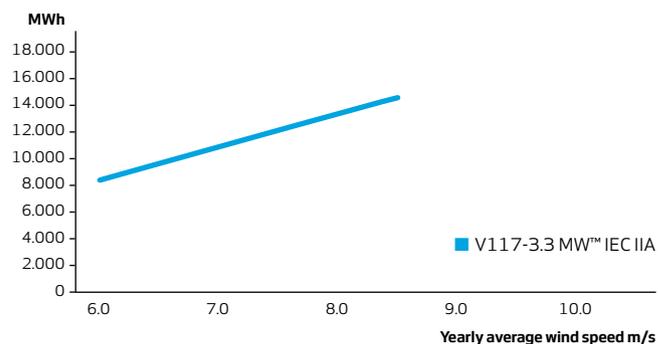
Max. weight per unit for transportation

70 metric tonnes

### TURBINE OPTIONS

- Condition Monitoring System
- Service personnel lift
- Aviation lights
- Aviation markings on the blades
- Low temperature operation to - 30°C
- Ice detection
- Fire Suppression
- Shadow detection
- Increased Cut-In
- Obstacle Collision Avoidance System (OCAS™)

### ANNUAL ENERGY PRODUCTION



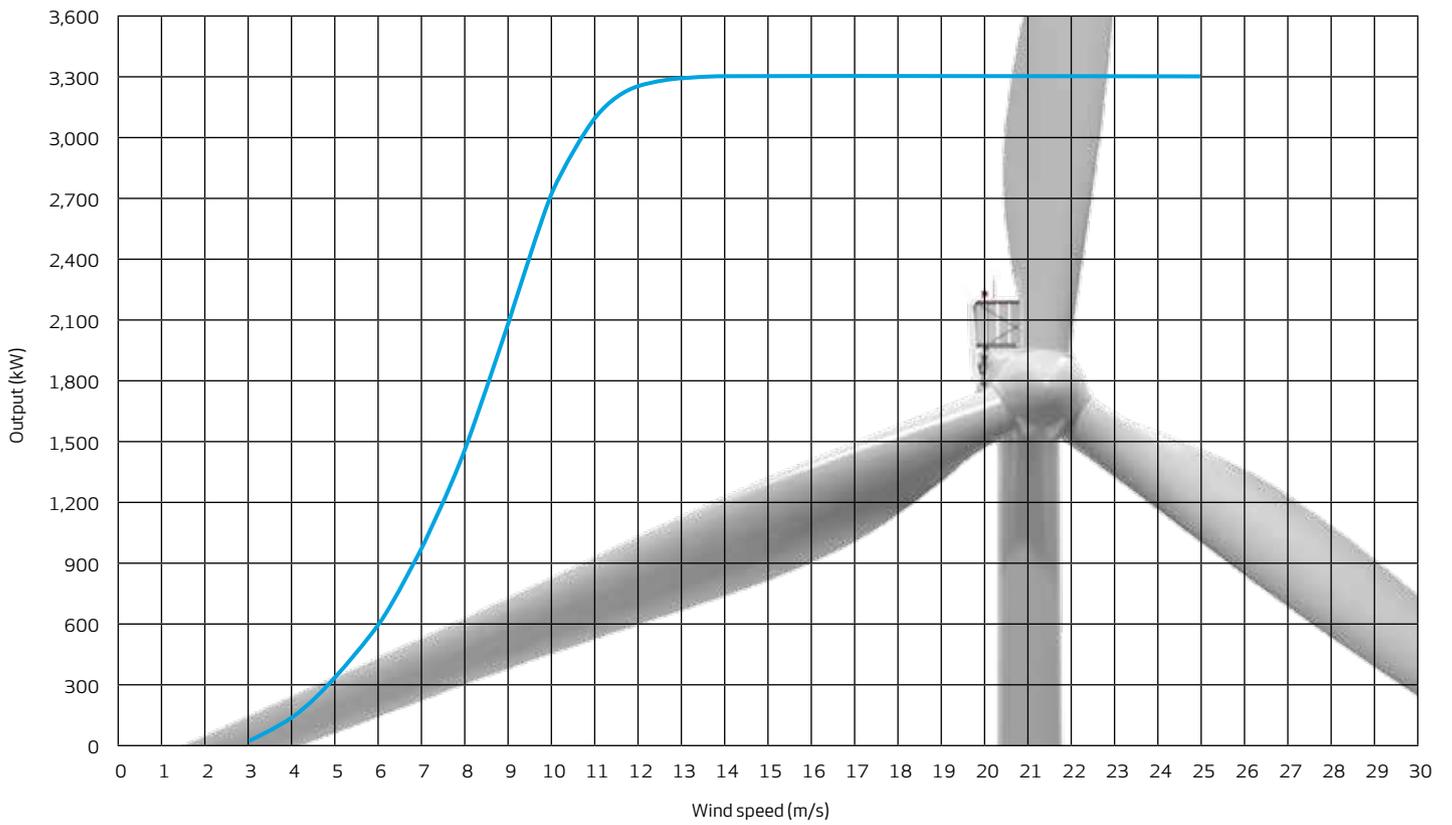
### Assumptions

One wind turbine, 100% availability, 0% losses, k factor =2, Standard air density = 1.225, wind speed at hub height

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### POWER CURVE FOR V117-3.3 MW™ IEC IIA

Noise reduced sound power modes are available



# V126-3.3 MW™ IEC IIIA

## Facts & figures

### POWER REGULATION

Pitch regulated with variable speed

### OPERATING DATA

Rated power	3,300 kW
Cut-in wind speed	3 m/s
Cut-out wind speed	22.5 m/s
Re cut-in wind speed	20 m/s
Wind class	IEC IIIA/DIBt2
Standard operating temperature range from -20°C to +45°C with de-rating above 30°C*	

\*subject to different temperature options

### SOUND POWER

(Noise modes dependent on site and country)

### ROTOR

Rotor diameter	126 m
Swept area	12,469 m <sup>2</sup>
Air brake	full blade feathering with 3 pitch cylinders

### ELECTRICAL

Frequency	50 Hz
Converter	full scale

### GEARBOX

Type	two planetary stages and one helical stage
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### TOWER

Hub heights	117 m (IEC IIIB) 137 m (IEC IIIA/DIBt2)
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### NACELLE DIMENSIONS

Height for transport	3.4 m
Height installed (incl. CoolerTop®)	6.8 m
Length	12.8 m
Width	4.0 m

### HUB DIMENSIONS

Max. transport height	3.74 m
Max. transport width	3.75 m
Max. transport length	5.42 m

### BLADE DIMENSIONS

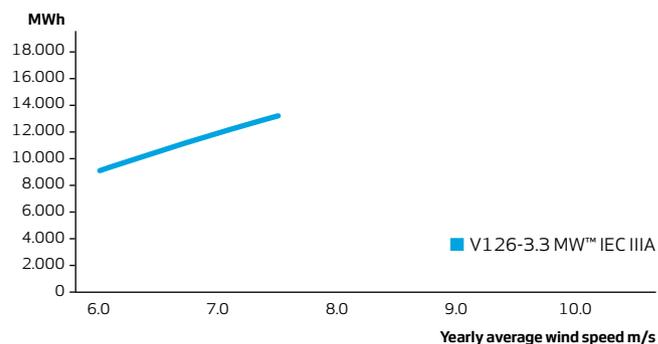
Length	62 m
Max. chord	4 m

Max. weight per unit for transportation	70 metric tonnes
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### TURBINE OPTIONS

- Condition Monitoring System
- Service personnel lift
- Aviation lights
- Aviation markings on the blades
- Low temperature operation to - 30°C
- Ice detection
- Fire Suppression
- Shadow detection
- Increased Cut-In
- Obstacle Collision Avoidance System (OCAS™)

### ANNUAL ENERGY PRODUCTION



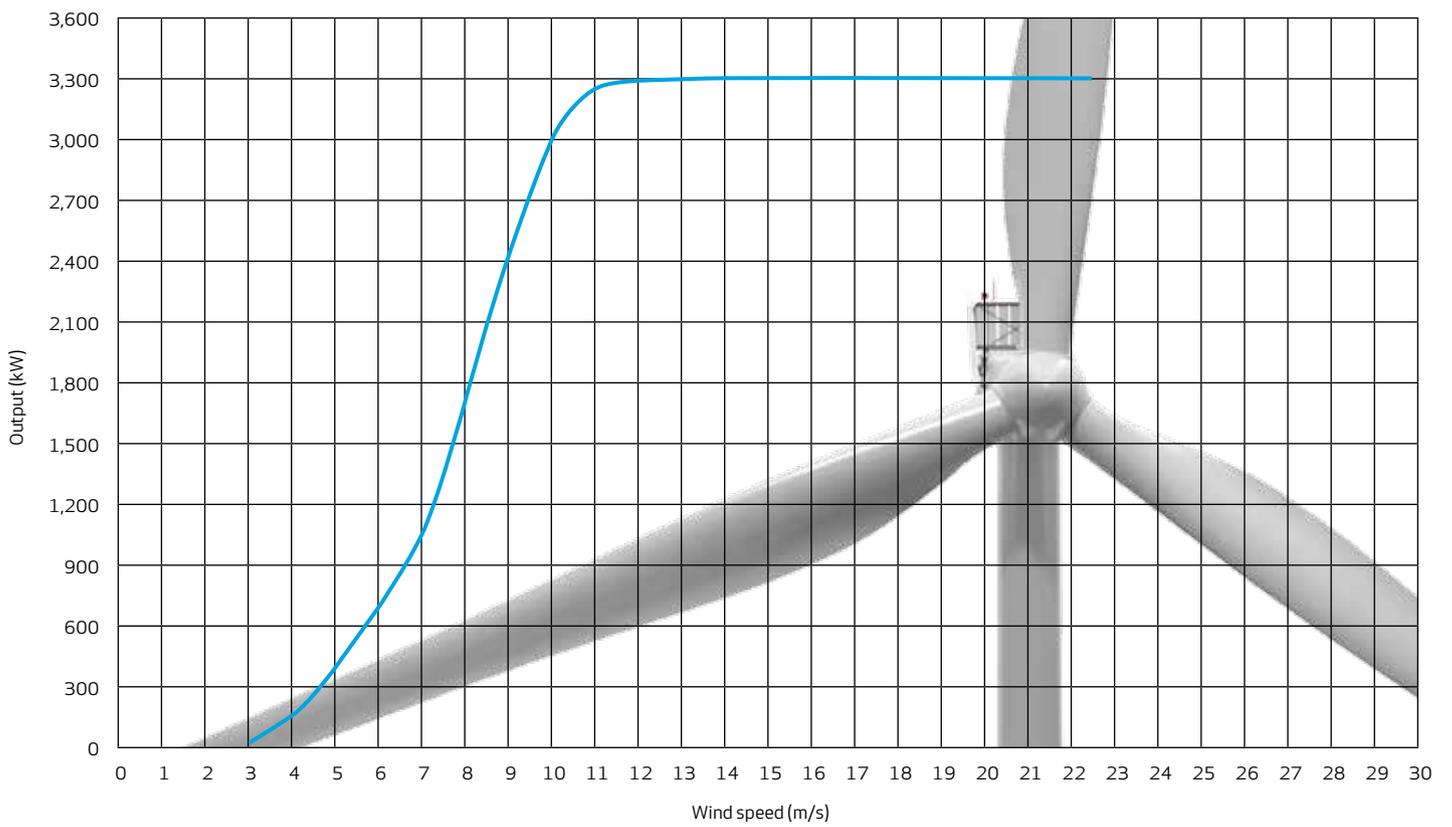
### Assumptions

One wind turbine, 100% availability, 0% losses, k factor =2, Standard air density = 1.225, wind speed at hub height

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### POWER CURVE FOR V126-3.3 MW™ IEC IIIA

Noise reduced sound power modes are available



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