ENERCON

E-175 EP5 - THE NEW ENERCON TOP MODEL

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AGENDA

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1 Product specifications

E-175 EP5 - THE NEW ENERCON TOP MODEL

MAIN SPECIFICATIONS (1/2)

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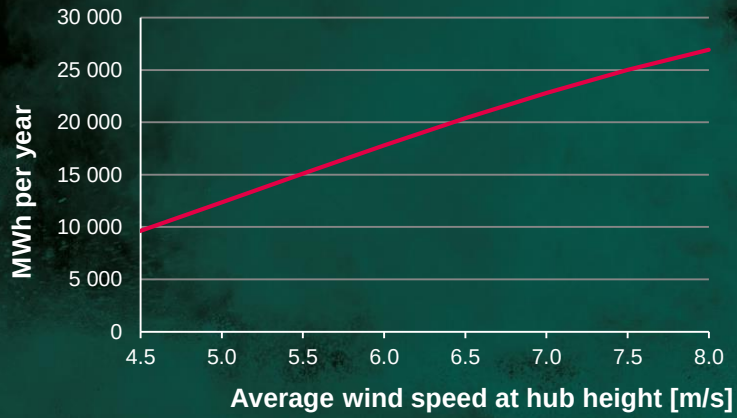
Nominal power: 6,000 kW (+flexible rating)
Rotor diameter: 175 m
Wind class (IEC): IEC S (low wind sites)
Wind zone (DIBt): WZ2
Hub height (m): 112, 132, 162, site-specific
Design lifetime: 25 years
Noise emissions: 106.5 dB(A)



E-175 EP5 - THE NEW ENERCON TOP MODEL

MAIN SPECIFICATIONS (2/2)

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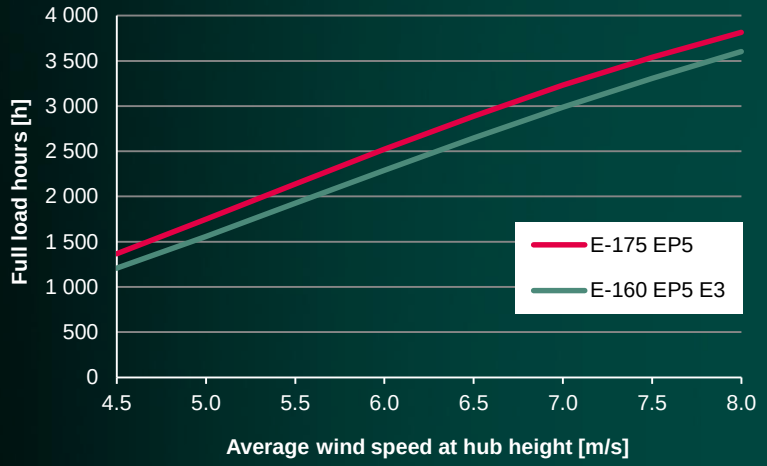
Wind class (IEC ed. 4): S
Turbulence category (IEC ed. 4): A
DIBt wind zone/terrain category: WZ 2 GKI, II (except for 162m)
50-year extreme wind speed at hub height: 40 m/s
Annual average wind speed at hub height (IEC ed. 4): 7.8 m/s
Form parameter of Weibull function k: 2

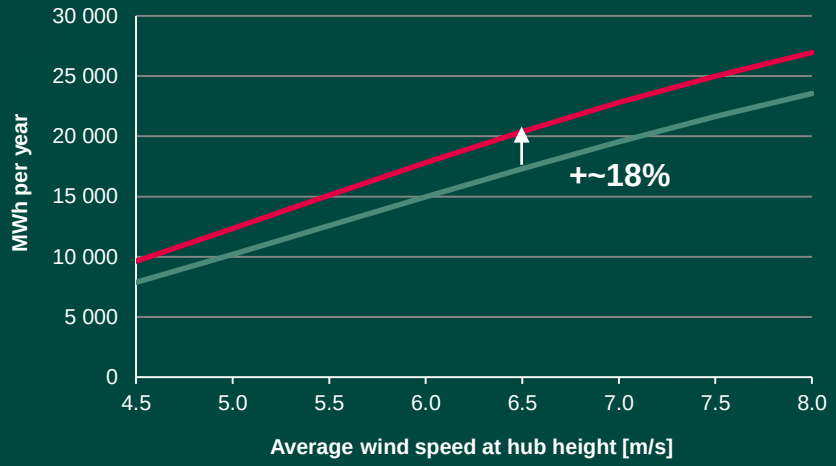
Wind shear: 0.2
Flow inclination: 8°
Relative air humidity: ≤ 95 %
Maximum solar irradiance: 1000 W/m²
Standard air density: 1.225 kg/m³
Normal temperature range: -10 °C to +40 °C
Extreme temperature range: -20 °C to +50 °C

E-175 EP5 – HIGH EFFICIENCY

VERY ATTRACTIVE FOR LOW WIND SITES

This results in more full-load hours and enables better grid integration, so less reserve capacity needed for grid regulation. Calm image through less rotations per timeframe.





Every time the wind speed is low, the E-175 EP5 continues to give powerful performance.

E-175 EP5 – HUB HEIGHTS UP TO 162 M

GOOD YIELD – ESPECIALLY AT LOW WIND INLAND SITES

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112 m
Steel tower
TH 200 m

132 m
Hybrid steel tower
TH 220 m

162 m
Hybrid tower
TH 250 m

(in green v_{Wind}= < 7,8m/s on 150m)

E-175 EP5 – TIMELINE

ON THE WAY FOR TOMORROWS PROJECTS

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21.09.2022
Early information

27 - 30.09.2022
Hamburg wind fair Announcement and promotion of the E-175 EP5

Q3 2022
Technical documentation (building permit)

From July 1st 2023
DIBt Typenprüfbericht Tower & Foundation

Q1 2024
Prototype DIBt Typen-prüfbescheid

Q4 2024
Serial production

2 | Technology details

NOISE MODES

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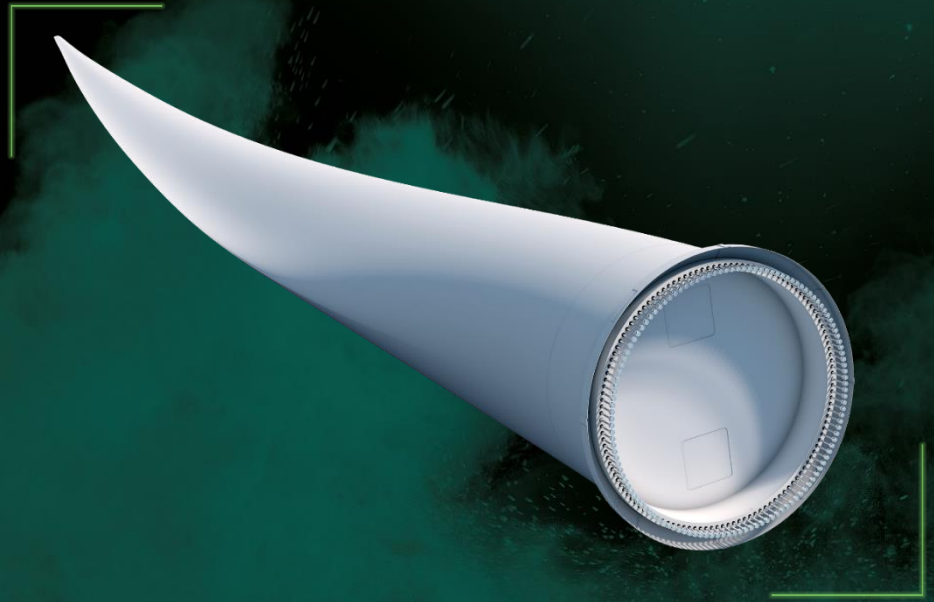
First release includes conservative curves for power and noise

Turbine	PC Rev	Mode	Power [kW]	Noise [dB(A)]
E-175 EP5	0	OM-0	6000	106,5
E-175 EP5	0	OM-NR-05	4000	102
E-175 EP5	0	OM-NR-08	2000	99

Further modes will be released once maturity level is achieved.

BLADES

E-175 EP5 will make use of internal ENERCON design.



- **Length:** 86 m
- **Swept area:** 23,848 m²
- **Unsplit Blade**
- **Material**
  - GFRP (glass-fibre reinforced plastic)
  - CFRP (carbon-fibre rein-forced plastic)
- **Trailing Edge Serrations**
- **Updated lighting protection**

GENERATOR

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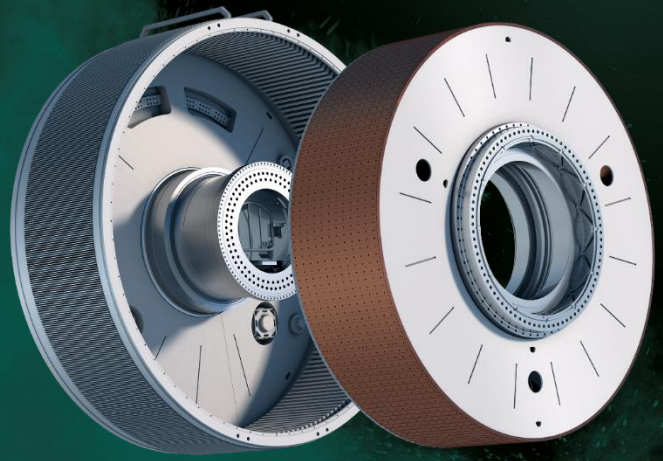
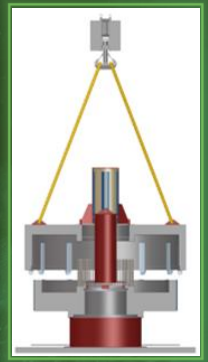
First release of E-175 EP5 will make use of HP++ generator





- **Weight:** 125 t
- **Outer diameter:** 5.9 m
- **Air gap diameter:** 5.5 m
- **Air gap:** 6 mm
- **Stator active length:** 1.5 m
- **HP+ Generator based on E-160 EP5**
- **Modified cooling concept**
- **Generator transport optimized with different options**
  1. one piece
  2. separate (rotor and stator) & combined on site

EVOLUTIONAL DEVELOPMENT

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… of Direct Drive Technology

FROM E-138 EP3 E3

1. New NG Pitch & NG Yaw system
2. New PI-CS Controller enabling future flexible modes
3. E-Nacelle concept

FROM E-160 EP5 E3 R1

1. New ENERCON Power-boost Inverter,
2. New Pitch roller-bearing for longer lifetime
3. New Steel housing (E-Nacelle)
4. New E-Brake
5. Tower technology
6. PM Generator

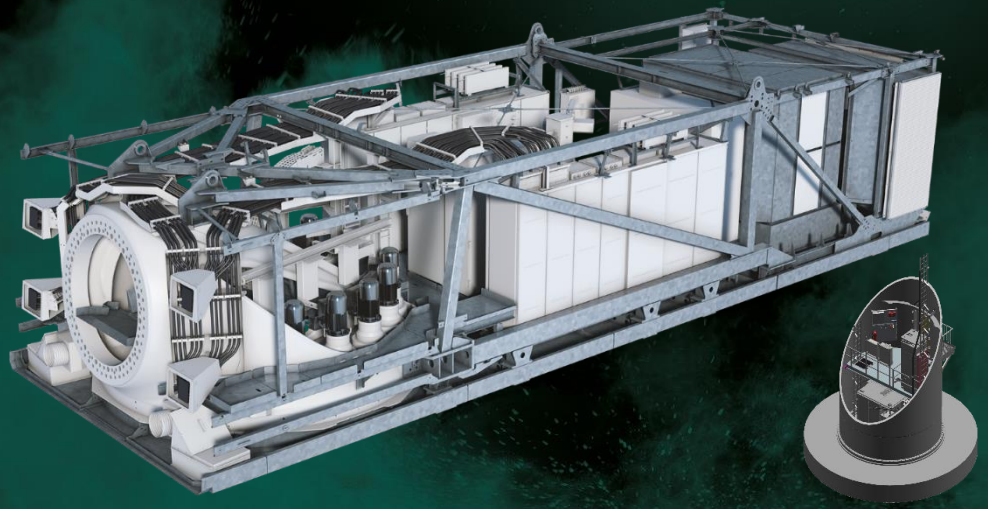
E-175 EP5

1. NG Pitch, NG Yaw
2. PI-CS Controller
3. E-Nacelle concept
4. Power-boost Inverter
5. Pitch roller-bearing
6. Steel housing (E-Nacelle)
7. E-Brake
8. Tower
9. PM Generator uprate to 6 MW

I New: ENERCON Blade
II New: Flexible rating

Low risk & better usage of our existing technologies

ESTABLISHED E-NACELLE TECHNOLOGY (1/2)



Established E- technology moved from E-Module in tower bottom into the nacelle

- Power conversion is performed at hub height
- Inverters and transformer now in the nacelle
- Transformer located directly behind generator in machine house
- Now: one medium-voltage cable to tower bottom; previous design required 48 low-voltage cables to carry the energy from the nacelle down to the E-module

ESTABLISHED E-NACELLE TECHNOLOGY (2/2)

Optimized in production, transport, installation & service

- Machine house fully plug & play enabled
- No separate transport will be required for the E-module
- Simplify cable installation in the tower
- Replacements can be performed using the familiar tools (whether of sub-components or of entire transformers)
- For servicing, the floor including the transformer can be winched down to the ground and back up

Higher Yields because of reduce cable losses

- Additional power available at grid connection point. Rated power subsequently increases from 5,560 kW to 6,000 kW

3 | SOURCING

E-175 EP5 SOURCING STRATEGY

DESIGNED AND PRODUCED IN EUROPE

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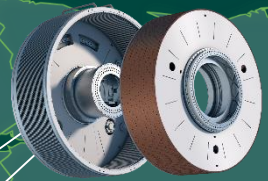
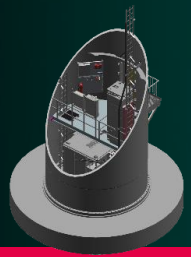
Germany (Aurich)
Hub & Nacelle



Poland / Germany (Magdeburg)
Generator



Europe & (selectively) **worldwide**
Towers

Portugal
Blades

4 | SUMMARY

CORE COMPETENCES BESIDE THE WIND TURBINE

1. **Higher Quality**
   due to direct drive, low maintenance

2. **Outstanding capability to support**
   building permit process for customers

3. **Outstanding grid performance**
   with ENERCON full converter


M+S
WIND

THANK YOU!

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