

WIND POWER

DOOSAN
DS205-8MW

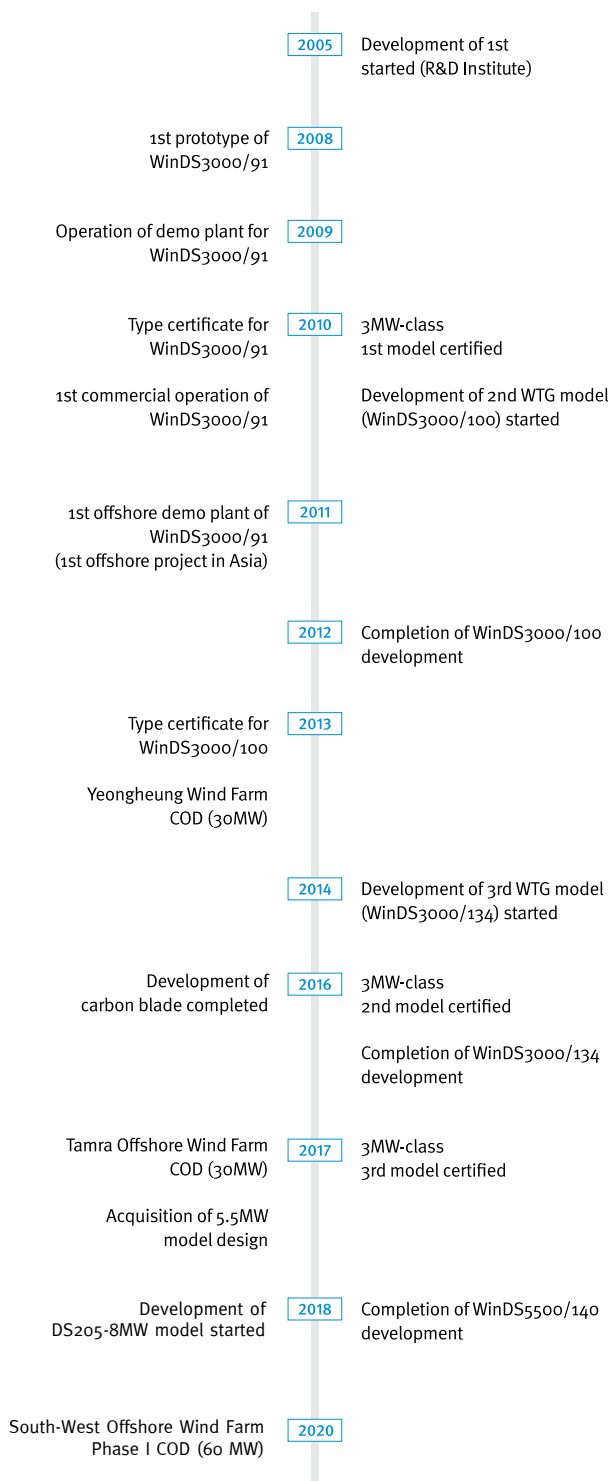
New Paradigm,

WinDS3000, 3300
WinDS5500
DS205-8MW



DOOSAN WIND POWER

DOOSAN WIND POWER HISTORY



Doosan has developed the first 3MW Class on/offshore wind turbine generator in Korea, the WinDS3000, and has won contracts using its own technologies totaling output of more than 300MW.

Doosan has extensive experiences in engineering, procurement and construction (EPC), as well as in operation for various on/offshore projects. Doosan recently launched a new model, the WinDS5500, and is developing the DS205-8MW especially for offshore wind farm projects. The DS205-8MW will help to expand the market for wind energy by making it possible for wind energy to compete with other energy source at low cost.

DOOSAN'S CORE COMPETENCIES & BENEFITS

As an original equipment manufacturer (OEM) for the wind power industry and an EPC player, Doosan is developing a full range of wind turbines that are more reliable and suitable for diverse and highly volatile environments.

SUCCESSFUL EXPERIENCE IN OFFSHORE WIND FARM

- Tamra offshore wind farm (30MW) — the first offshore wind farm EPC experience in Korea
- Total solution provider of wind farm including EPC, O&M and financing

ORIGINAL EQUIPMENT MANUFACTURER OF OFFSHORE WIND POWER SYSTEMS

- Wind turbine suitability assessment and analysis through wind source/environment
- Optimized components design including subsea foundation structure

INHERENT TECHNOLOGY FOR CONTROL LOGIC AND SOURCE CODE

- Fast trouble-shooting and product reliability
- High availability ensured by differentiated O&M services

CUSTOMIZED VALUE MAXIMIZATION PROVIDED BY AN EPC PLAYER

- Flexible business solutions ranging from equipment to EPC



TRACK RECORD

1. Yeongheung Phase I (D91) **6MW**
KOEN¹⁾
2. Yeongheung Phase II (D91) **24MW**
KOEN¹⁾
3. South-West Offshore Phase I
(D100/D134) **60MW**
KOWP²⁾
4. Gunsan Offshore (D100) **3MW**
KEPRI⁵⁾
5. WinDS3000/134 Prototype **3MW**
DHI (R&D)
6. Yeonggwang (D100) **3MW**
EWP³⁾
7. Jeonnam (D100) **42MW**
SERVEONE
8. Shinan (D91) **9MW**
POSCO ICT
9. Jangheung (D134) **18MW**
KWP⁶⁾
10. Gyewol-ri (D100) **3MW**
LG CNS

¹⁾ KOEN: Korea South-East Power Co.

²⁾ KOWP: Korea Offshore Wind Power

³⁾ EWP: Korea East-West Power Co.

⁴⁾ KOMIPO: Korea Midland Power Co.

⁵⁾ KEPRI: Korea Electric Power Research Institute

⁶⁾ KWP: Korea Western Power

● In operation
218.5MW

○ Under construction
121MW

TOTAL
339.5MW

*As of October, 2020

11. Jeju Hangwon Offshore (D91) **3MW**
Jeju Provincial Government
12. Woljeong Offshore (D91) **3MW**
DHI (R&D)
13. Woljeong Village (D100) **3MW**
LG CNS
14. Gimnyeong (D140) **5.5MW**
DHI
15. Tamra Offshore (D91) **30MW**
Tamra Offshore (SPC)
16. Sangmyeong (D91) **21MW**
KOMIPO⁴⁾
17. Buckchon Seomo (D134) **3MW**
NH Networks
18. Hanlim Offshore (D140) **100MW**
Hanlim Offshore (SPC)



Doosan Heavy Industries & Construction

RENEWABLE ENERGY SALES & MARKETING OFFICE

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WinDS3000, 3300, 5500 & DS205-8MW

Doosan has accumulated extensive know-how as a specialist in power generation facilities over the past 40 years, and has leveraged these competencies to develop the WinDS3000, 3300 and WinDS5500.

These models offer strong reliability and availability, ease of maintenance and service, and low cost of electricity production. Through system optimization, we have achieved both outstanding reliability and excellence in operational and maintenance efficiency.

NEW PARADIGM OF WIND POWER SYSTEM FOR OFFSHORE & ONSHORE

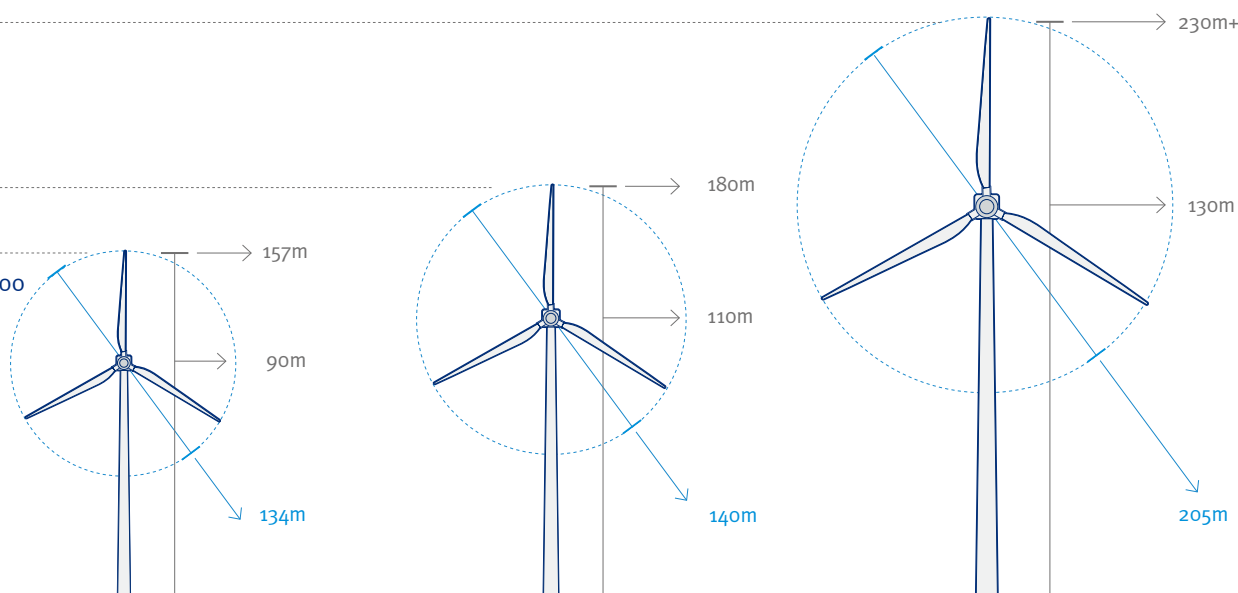
- Optimal aerodynamic design for both performance increase and load reduction
- Advanced blade materials for minimum weight
- Turbine design together with thorough component testing to prove machine life
- Innovative drive train design to improve reliability
- Low maintenance with permanent magnet generator
- Grid-friendly characteristics with full power converter

Height

DS205-8MW

WinDS5500

WinDS3000, 3300

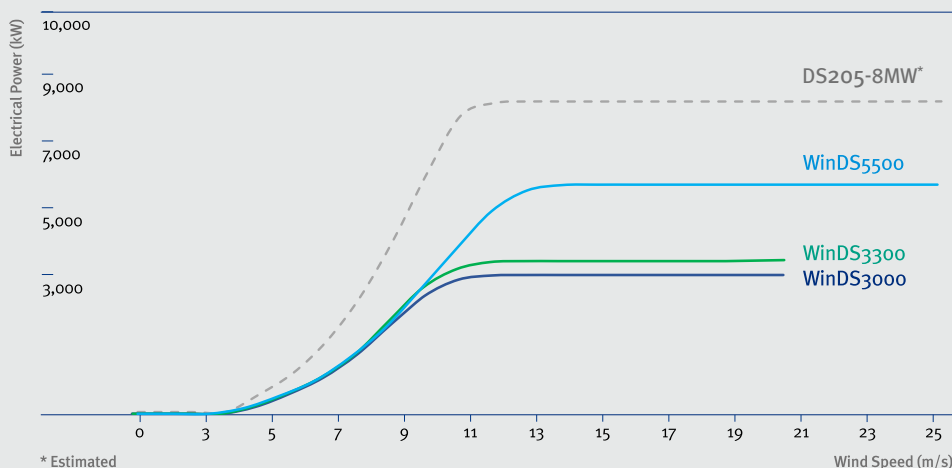


BENEFITS

- WinDS3000, 3300 are more suitable for the areas of low wind and applicable to both on/offshore
- WinDS5500 is more efficient for the areas of strong wind and specialized in offshore
- DS205-8MW is specialized in low wind areas of offshore wind farm
- Doosan's Standard Quality Program can be applied with accumulated experiences in power sector

TECHNICAL INFORMATION

Power Curve



Wind Power Total Solution Provider

As a leader in EPC, Doosan designs and manufactures complete wind turbine generator systems for offshore and onshore wind farms, and also offers comprehensive operation and maintenance (O&M) services, from setting up a wind power project to O&M throughout the project's entire life cycle.



Wind Farm Design & Engineering



Proven/Reliable
Product & Own
Technology



Quality
Management
& Production
System



Wind Farm
Project
Development



O&M Service
& Technical
Transfer



EPC Experience
in Onshore &
Offshore



Offshore Wind Farm EPC

System Specification

Model		WinDS3000	WinDS3300	WinDS5500	DS205-8MW
		(on/offshore)		(offshore)	
Operational Data	Rated Power	3,000kW	3,300kW	5,560kW	8,000kW
	Class	S	S	IB	IB
	Cut-in Wind Speed	3.5m/s	3.5m/s	4m/s	3.5m/s
	Rated Wind Speed	11m/s	11m/s	13m/s	11m/s
	Cut-out Wind Speed	20m/s	20m/s	25m/s	25m/s
	Rotor Diameter	134m	134m	140m	205m
	Extreme Survival Wind Speed	59.5m/s	59.5m/s	70m/s	70m/s
Blade	Length	65.5m	65.5m	68m	100m
Tower	Hub Height	90, 120m (Site-specific)	90, 120m (Site-specific)	Site-specific	Site-specific

Doosan Wind Turbine Operation & Maintenance

Doosan uses its own technologies to offer information and communication technology (ICT) solutions which maximize capacity and optimize both wind turbine farm operations and resource management.

Our integrated ICT monitoring system is an optimal solution for operating wind turbines. It facilitates the management of power generation, monitors the status of wind turbine operations, and diagnoses the status of major components, such as gearboxes and main bearings, in real time. In addition, it utilizes efficient inventory and fault history management to optimize operational efficiency, and thus maximize availability and capacity for wind turbine farms.

The ICT system uses wind turbine data to enhance operational efficiency, which in turn enhances customer profitability.

Benefits

- Real time prediction of defects and errors
- Optimized inventory management
- Lifetime extension of wind turbines
- Mobile monitoring and remote control
- Fast and immediate actions
- Maximization of availability and capacity factors

Site	Name	Tamra Offshore	Jeonnam	Sangmyeong
	Capacity	30MW	42MW	21MW
	Average availability (%)	99.82	98.47	99.59

Average Availability: 99.1%

(as of August 2018)



Doosan ESS Solution with Renewable Energy

Doosan delivers innovative, technology-based solutions to meet the challenges of the constantly-changing energy industry, and is embarking on initiatives to open new markets in partnership with its customers.

Output of electricity from renewable energy resources fluctuates significantly due to environmental factors such as the weather or seasonality. This makes it difficult for electric utilities to maintain a steady supply of high quality electric power. The intermittent nature of renewable energy also makes it difficult for 'energy prosumers' — end users who also produce energy themselves by capturing resources including solar energy — to save on electricity by producing and consuming electric power efficiently.

We therefore offer our customers total technology solutions that include platform-based control system software for energy storage system (ESS) and distributed generation, which helps customers turn obstacles into opportunities and also improve profitability.

ESS Configuration

