

Vestas **Refurbished Turbines**

Wind. It means the world to us.™

Upgrade your business case with **Vestas Refurbished Turbines**

Maximize return on investment while minimizing CAPEX & infrastructure requirement and reduce the carbon footprint of your wind power project with Vestas Refurbished Turbine solution.

Wind power is one of the cheapest sources of renewable energy and can enable a more profitable business case than most other sources of electricity. While wind has become a mainstream source of energy found all across the world, wind projects can still be challenging to erect in some markets. These challenges range from reduced financing, non-bankable PPAs, lack of transportation and grid infrastructure or challenging sites in mountains or deserts.

Vestas has designed a solution to meet these challenges, consisting of using Vestas turbines which have been refurbished to new condition. This solution offers a highly reliable turbines with a lower investment relative to new turbine, backed by Vestas's warranty and a full AOM (Active Output Management) service offering, to maximise your profits and strengthening the certainty of your investment in wind power.

Benefits of Vestas Refurbished Turbines

- Lower CAPEX demand
- Ease of transportation
- Lower infrastructure demand
- Ease of installation
- Vestas Warranty and full AOM service options
- Many spare parts in market
- Re-use of assets to decrease environmental impact

Availability of Vestas Refurbished Turbines

1. V27-225 KW	8. V110-2.0 MW
2. V44-600 KW	9. V112-3.0 MW
3. V47-660 KW	10.V117-3.3/4.2MW
4. V52-850 KW	11. V126-3.3 MW
5. V80-2.0 MW	12. V136-3.45/4.2/4.5 MW
6. V90-2.0/3.0 MW	13. V150-4.2/6.0 MW
7. V100-1.8/2.0/2.6 MW	

Vestas Refurbished Turbines is available for KW up to 2MW range turbines. Contact Vestas for more information.





Get in touch with us today

Vestas Refurbished Turbines offers a complete solution including supply of refurbished turbines, transportation to the site and installation. Contact your local Vestas Sales & Service office or write to **ageingfleet@vestas.com** to discover more.

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Refurbished to original, or better condition

Vestas Refurbished Turbine solution offers a variety of refurbished turbine technology from Vestas current or legacy platforms, to meet customer's business case. These platforms have been tried and tested all over the world and have proven to be resilient over decades of operational lifetime. The robust and proven design means that there are often many years left in the key components of a turbine as they approach the 25-year end of design life. Each turbine in Vestas Refurbished Turbine Sales undergoes a complete refurbishment process (certified by DNV) by Vestas' technicians in one of our global repair facilities. This process returns the components to their original, or better, working condition and appearance. The refurbishment process builds on knowledge from decades of operational experience and our quality control system ensures that each component is produced to design specifications and performs to peak potential on site. Vestas offers flexible refurbishment plans depending on the customers business case and considering lifetime expectation of use cases.

The siting and engineering for Vestas Refurbished Turbine solution is the same as a traditional new turbine sales and Vestas will offer the same scope of work including wind and site studies, selection of wind turbine type, designing the wind power project, and installing the wind farm. Vestas also offers monitoring and remote troubleshooting and servicing and maintenance throughout the turbine's service life. Ensuring compatibility at the site, Vestas has a dedicated industry-leading Siting & Loads Centre that will conduct a load and compatibility assessment of the turbines. The assessment is calculated using Vestas Site Check[®] (an in-house developed proprietary load tool certified by DNV) & other advanced load evaluation methodologies to ensure the structural integrity of the solution. The solution would be compatible with siting regulation and grid code requirements, and Vestas will fully support the customer on the permitting requirement. When turbines are refurbished to the level of new release model, by considering the remaining operational lifetime it is on-par with certification standards.

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refurbishement process inspects every component of the turbine and returns the wind turbine to a technically new condition.

The refurbishment process

The refurbishment process starts with a complete disassembling of the turbine down to its base parts. Each component is cleaned and undergoes a thorough inspection process to determine the condition. The component will subsequently be restored to a technically new condition or replaced with new parts, based on the condition and lifespan of the individual component. Refurbishment is done to every area of the turbine, ranging from rethreading bolt inserts to large and complex tasks such as the refurbishment of the blades and electrical cabinets. The refurbished components are subsequently used to rebuild the turbine which is painted to give it a fresh look so that it not only works and performs like new, but also looks the part. The final step of the refurbishment process is a simulated testing where the turbine is put through a series of tests to ensure that it performs as new.

1. Generator

- Electrical Measurement
- Bearing Regalement
- Slip Ring Upgrades
- Automatic Lubrication

2. Controller

- Damage Correction
- Software & Performance Upgrades
- 2MW Grid Compliance
- Sensor and Function Test

3. Gearbox

- Axial Play Adjustment
- Cooling & Filter Upgrades
- Load/Spin Test Gear

4. Main Shaft

- Crack Testing
- Measuring of Tolerance
- Bearing and Seal Replacement
- Bearing Pre-load Correction

5. Yaw System

- Spring Package Upgrades
- Torque Limiter
- Automatic Lubrication
- 6. Hub
- Pitch Cylinder Refurbishment
- Blade Bearing Replacement
- Automatic Bearing Lubrication
- Hydraulic Pitch and Function test

7. Tower

- Inspect Outer/Inner Flanges
- Inspect Welds
- Tower Flange Bolts Check
- Paint Job

8. Blades

- Condition Inspection
- Damage Correction
- Performance Upgrades
- Paint Job



Sub-MW

turbines can be transported in a single oversized freight cargo container. Features include nested towers and a compact style of blade transportation which allows the safe transportation of three blades at one time.

Benefits that enable **a better business case**

Vestas Refurbished Turbines is a cost-effective solution with a reduced investment cost compared to a new turbine investment, due to the reuse of refurbished turbines. This means that the customer can engage in a renewable wind project with a significantly reduced initial investment compared to a traditional new turbine sale, while maintaining the same LCOE compared to modern technology. Enabling wind as a viable solution in markets with lack of financing / non-bankable PPAs or utilities. In addition to the reduced investment costs as a result of using refurbished turbines, additional savings can be found in the transportation, installation, and maintenance of the turbines.

Reduced infrastructure requirements

80 K.P.H

> Vestas' turbines are designed for fast, easy transport by truck, barge and rail to virtually any site in the world. The weight, height and width of all parts and main components are designed in consideration of local and international limits for standard transport. Wind turbines in the KW range can be transported in a single over-sized freight cargo container and features easily transportable design that make it an ideal choice for remote

areas or sites with challenging access. The features include nested towers and a compact style of blade transportation which allows the safe transportation of three blades at one time using existing trucks and cranes. This enables access in sites with tip height restrictions where new turbine technology would be inaccessible. Furthermore, the reduced size of the sub-MW turbines also reduces the crane requirements, thus increasing the likelihood of having local crane available.

Easy maintainability and reduced maintenance costs

Vestas' turbines are among the most widespread and numerous wind turbines globally and their design has made them a workhorse proven to be resilient in every climate around the world. The key components have been rigorously tested inthe-field and across thousands of existing installations – so you can be sure of dependable and productive technology. The geographical reach and number of turbines mean that there is an abundance of spare parts readily available in the market. Additionally, maintenance is performed using tools and equipment that are standard in the installation and servicing industries, resulting in easy and inexpensive maintenance.



Reliable and long-term solution

Vestas platform provides industry-leading reliability, serviceability & availability. Durable & dependable, the platform is built on technology that has been proven in the field over more than a decade. Vestas therefore offers the same warranty as on new turbines and full scope service contracts with time or energy availability guarantees (AOM 4000 and AOM 5000, depending on platform) for up to 20 years depending on business case requirement.

Reducing the carbon footprint

Using refurbished turbines results in a significant reduction of the carbon footprint of the turbine. By refurbishing it is possible to reuse up to 70% of the materials compared to a new item. In fact, a refurbished component at Vestas saves, on average, 45% of CO₂ emissions compared to a new part, when reverse logistics are taken into account – that's the cost of bringing the item from the turbine to the factory for repairs. By refurbishing components, we can nearly halve CO₂ emissions, significantly reducing the carbon footprint of the wind project.

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