

Case Study

Jeffreys Bay Wind Farm Project

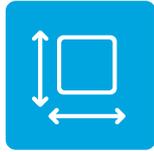




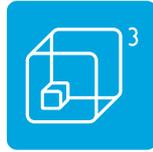
Industry
Onshore wind energy



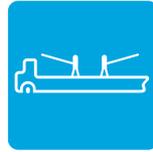
Heaviest items
60 nacelles with 86 MT each



Biggest items
180 blades with a length of 49.5 m



Volume
162,634.34 FRT, incl. a huge number of OSHL components



Chartering
17 full- and part-charter ocean freight voyages



Equipment
Purchase of 31 axle lines



A complete set of blades at the port of Ngqura, loaded and ready for on-carriage to the construction site

Case Study: Jeffreys Bay Wind Farm Project

In close collaboration between its offices in South Africa, Denmark, the USA and China, deugro successfully moved a total of 162,634.34 freight tons of wind turbine components from China, Denmark and the USA to Jeffreys Bay, South Africa. The cargo included tower sections, generators and hubs, 60 nacelles with a unit weight of 85 metric tons and 180 blades with a length of 49.5 meters.

The Jeffreys Bay Wind Farm is one of the largest and first wind farms in South Africa, generating 460,000 megawatt hours of electricity and supplying clean energy to power 100,000 households, offsetting 420,000 metric tons of carbon dioxide (CO₂)

emissions annually. The project was the result of a government initiative to approve renewable energy capacity on the high scale of 1,800 megawatts, allowing for a total of 25 wind farms to be constructed over a four-year period. At the time the initiative was approved, there

were no operational large-scale wind farms in South Africa.

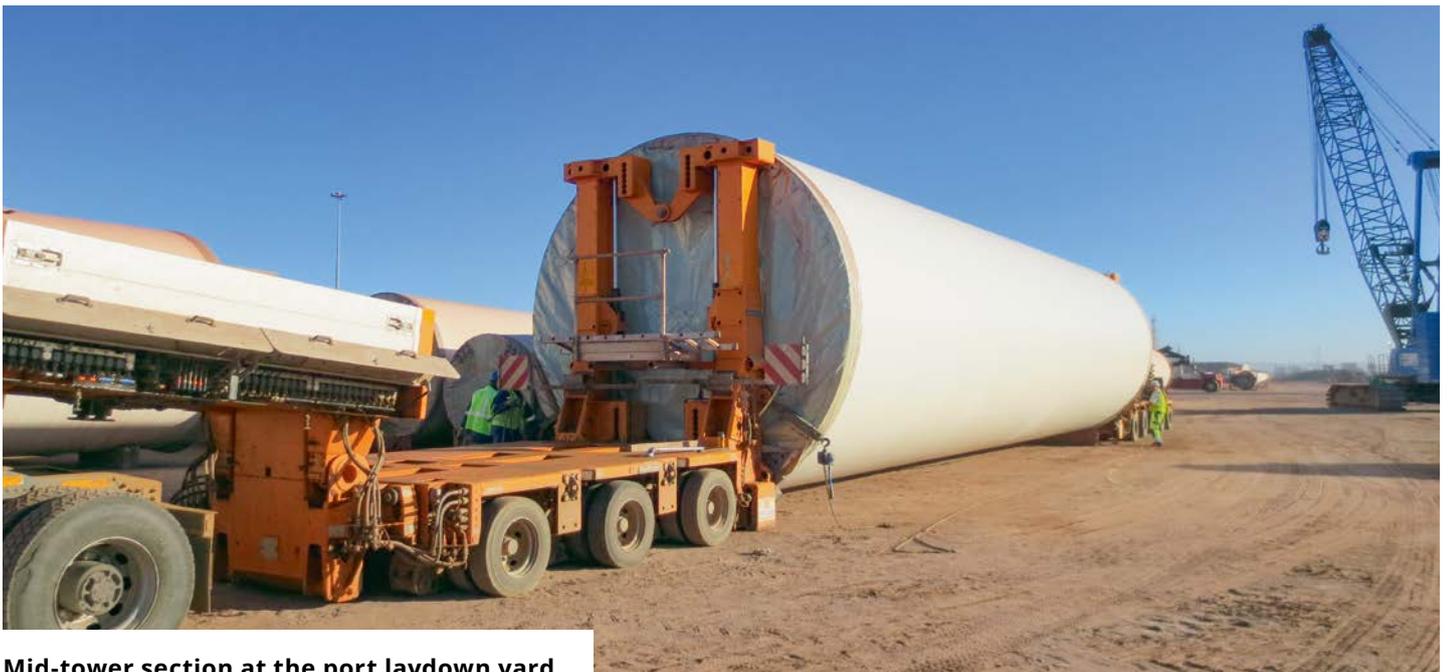
Project preparation

deugro's global scope included the collection of all wind turbine generator (WTG) components from factories in the USA, China and Denmark and the subsequent ocean voyages to the Port of Ngqura in South Africa, where the cargo was consolidated in deugro's own dedicated port marshalling yard. The scope concluded with the local on-carriage to the project's construction site in Jeffreys Bay.

To ensure the on-time installation, commissioning and transportation of the wind turbine components, the project required a high level of preparation and coordination. Therefore, personal meetings at various work locations were held with the aim to align the construction teams on site. At the same time, a wide range of analyses, technical studies,

simulations and calculations were prepared prior to the start of the project. These included evaluations of marine engineering, including stability and ballasting calculations, lifting and cargo securing calculations, mooring analyses, and the determination of truck/trailer configurations for the on-carriage.

Transport routes had to be defined based on personally executed route surveys. Furthermore, suitable transport modes, equipment, and adequate resources had to be arranged to ensure efficient delivery during periods of average and peak equipment, goods and material flow. Of critical importance was the precise planning of the delivery sequences, cargo readiness, cargo collection and transport to the construction site, including consolidation at deugro's marshalling yard at the Port of Ngqura.



Mid-tower section at the port laydown yard ready for delivery to the site, loaded using Goldhofer tower adapter sets



Transport of a top tower on an 8-axle extendable hydraulic trailer, retrofitted with tower clamps at the base to ensure transport stability

i Project challenges

- Coordination of discharge, temporary storage and on-carriage of the huge cargo volumes arriving at the Port of Ngqura on 17 vessels
- Timely provision of equipment for the on-carriage, which was not available locally
- On-carriage in a challenging infrastructure, not designed for large movements, requiring huge numbers of risk management and traffic control measures
- Site deliveries with 700+ heavy lifts and loads

Pre-carriage

The ocean transportation of the components from Lianyungang, China; Houston, USA; and Esbjerg, Denmark to the Port of Ngqura, South Africa was arranged and managed by deugro Denmark.

Seventeen ocean freight voyages, which were booked on a combination of full- or part-charter multi-purpose heavy lift vessels, were required to ship the 162,634.34 freight tons of WTG components to the Port of Ngqura. Intensive pre-planning was carried out by experienced engineers who developed customized stowage plans to ensure maximum intake, reducing the number of sailings, as well as safe loading and discharge operations.

An essential part of deugro's logistics concept was the

coordination and discharge of the 17 vessels arriving at the Port of Ngqura, the consolidation of the wind turbine components in the project laydown area at the port, and the subsequent on-carriage by road to the construction site. The 30,000-square-meter project laydown area was established by deugro South Africa and required bulk civil works so that the infrastructure would be able to handle multi-axle trailers and supply the required electricity, water and security services.



Loading operation of an 85 MT nacelle

The discharge of the incoming shipments, the individual cargo transfers to the laydown area, including cargo consolidation and inspection, as well as the on-carriage was supervised and managed by deugro's local teams. For utmost transparency, deugro liaised closely with its client and their site teams, and provided regular staging yard reports, tracking reports, an invoice register and monthly progress reports.

On-carriage

Due to the local conditions and infrastructure in South Africa, there were several challenges that had to be overcome and which required detailed preparations and

measures from the beginning. Given the size of the components and this project being the largest of its kind at the time, the local infrastructure was not geared for such large-scale movements. At the time of the project, there was a lack of availability of equipment in South Africa required to move such large cargo units. Therefore, deugro purchased, imported, registered and upgraded the required trailers according to South African specifications in time to meet the start of the project, making deugro South Africa one of the biggest trailer providers of heavy haulage equipment in the country. Due to a combination of paperwork and newly introduced rules and regulations, the registration of the trailers proved to be a challenge, but thanks to the years-long experience of the local deugro teams, everything was arranged according to schedule.

Altogether, 31 axle lines were purchased, and further axles were mobilized from the Dominican Republic and Denmark. The equipment included 4-axle, 52-meter extendable trailers for the blades and tower tops; 3-axle, drop deck trailers for the hubs and power units; 3- and 5-axle THPs for the nacelles, bottom and mid-tower sections; 8-axle, 26-meter extendable trailers for the towers; and adapters for the towers in clamps.

Two experienced local heavy haulage companies were selected as subcontractors and providers of suitable pulling units. Additionally, intense driver training programs were conducted prior to the project execution. For the duration of the project, dhaulage and dteq, both companies of the deugro group, provided experienced staff

on the ground to ensure smooth maintenance and repairs of the trailers.

» With a 70-person team and numerous risk management measures, deugro ensured the safe on-carriage to the construction site. «

The biggest challenges came from the local communities. Despite police escorts, other road users were a constant risk to the cargo, equipment, project staff and, indeed, themselves during local road transports underestimating the size of the components that were being moved on the public roads at the time. Many additional risk management measures, such

as a daily bulletin on local media platforms, were needed to minimize traffic disruptions.

Under full traffic control management, including public notices sent out daily, the on-carriage operations began, with the majority of the components covering a distance of around 180 kilometers from the port to the construction site.

Due to a unit weight of 85 metric tons and the limited load capacity of several bridges, the nacelles were moved on an alternative route of 260 kilometers to ensure safe transport.

For all deliveries to the construction site, distances of altogether 110,000 kilometers were completed, which is almost three times the circumference of the planet Earth.

Besides the organization of the corresponding transport permits, escorts and police escorts, deugro arranged for a public notification system for abnormal transports. Over 500 local commuters registered to receive weekly updates on the abnormal load transportation schedules, designed to keep road users informed. A 70-person team consisting of drivers, escorts, riggers, supervisors, fitters, auto electricians, engineers, crane operators, flaggers, and a safety and health officer was set up to ensure that operations ran safely and successfully.

The heaviest loads, the 85-metric-ton nacelles, weighed in at over 146 metric tons, including the truck and trailer. To ensure safe transportation and to keep other road users safe, the average speed was reduced to 40 kilometers



Shunting operations at the Port of Ngqura, South Africa

per hour. The delivery of all components required a total of 480 truck/trailer loads, each taking an average of 2.5 hours from the port to the construction site.

» Thorough preparation, professional engineering and deugro's long experience in handling wind energy projects ensured a successful project completion. «

progress meetings were held with the client. This ensured that an average of nine complete wind turbines could be delivered per month, as contractually agreed. The site deliveries required over 700 heavy lifts and loads.

Thanks to the smooth and excellent cooperation with the client and all subcontractors, one of the largest and first wind farm projects in South Africa was not only brought to a successful project completion, it also ensured local job creation at the same time.

To cope with the large number of freight components that arrived at the port and had to be transported to the site on schedule, weekly

