



# TRAVELLING TOWARDS BEATRICE

**The Beatrice offshore windfarm has seen the development of a new operations and maintenance base in Wick, and some of the world's biggest cranes working at four North Sea quays.**

**T**he first lifting work for the Beatrice project began more than ten years ago, in 2006-7, when Scottish heavy lift and wind energy specialist Weldex was chosen to assemble two 5MW turbines onshore as part of the Beatrice demonstrator project.

Offshore construction got underway in April 2017. The project will see 84 7MW Siemens Gamesa wind turbines built in

the Outer Moray Firth, supplying 588MW, enough for around 450,000 homes. As well as turbines, the windfarm will include two offshore transformer modules.

The turbines and transformer jackets will be mounted on 86 clusters of four piles—344 individual piles—which have been installed by Seaway Heavy Lifting's Stanislav Yudin, using its 2,500t, 110m, revolving crane. Installation of the foundation piles was

Ⓜ️ Sarens SGC-120 lifting a jacket at the Smulders Projects yard in Newcastle

completed in December.

Each massive turbine is constructed with a 154m-diameter rotor and total turbine height of 198.4m. Construction crews in this region of the North Sea will be working at sea depths reaching 55m to anchor each turbine to the seafloor.

Lifting and tailing a jacket to move it into the vertical at BiFab in Methil



The current stage of the project will see the 86 jackets, each weighing around 1,000t, installed on top of the foundation clusters. At sea, these will be installed by the heaviest offshore crane in Seaway's fleet, the Oleg Strashnov.

The jackets are being fabricated at four quays: one each in Belgium and Denmark, and two in the UK, in Fife, Scotland, and Newcastle, England.

At the two UK quays, handling of the heavy components is being carried out by Belgian-based heavy lift specialist Sarens, using their own giant SGC 120 crane, and range of heavy crawlers from companies including Liebherr and Terex.

In Scotland, Burntisland Fabrications (BiFab) is building 26 of the jackets at its Methil facility. Andrew Hunt, operations manager for Sarens, explained that each of the jackets needed to be moved around 80m in a horizontal position on self-propelled modular transporters (SPMTs). The company used 60 axle lines in total, and six power pack units. The jackets then needed to be moved upright.

Sarens supplied four large crawler cranes from Terex for this job: a Demag CC9800, a CC8800-1 BB (configured

with Terex-Demag's Boom Booster kit), and two CC2800-1s. The company also used two Liebherr LR1160 lattice boom crawlers, and three Liebherr telescopic crawlers: an LTR 1200 and two LTR1100s, as well as a selection of smaller telescopic and lattice boom cranes.

Sarens moved its two heavy lifters into BiFab Methil Quayside Facility by vessel. "The CC 9800 arrived first from a project in Rotterdam (the Netherlands) and our CC 2800-1 crane, which had already been mobilised from a project in the United Kingdom, helped to offload and rig the crane," comments Hunt. "Within approximately ten days, we had the CC 9800 rigged with its Superlift configuration, 96m main boom, 18m fixed jib, and 640t of counterweight. It then took some additional time for testing and commissioning."

Following closely behind the 1,600t capacity CC 9800 crane, the Demag CC 8800-1 arrived from a project in Bremerhaven, Germany. The CC 9800 and CC 2800-1 cranes helped to offload and rig this second 1,600t crawler crane with 90m of main boom, 18m fixed jib and Superlift configuration with 640t of

counterweight. "We had the CC 8800-1 rigged, tested and commissioned in about seven days," says Hunt.

With the crane equipment and 78 axles of SPMTs in place, Sarens was ready to lift the first of 10 jackets planned for installation in 2017. An additional 16 jackets are planned for fabrication and installation spring of 2018. The four SPMT operators transported the 1,022t load 76m to the quayside up-ending location. "This step took approximately two hours to complete," says Hunt.

As Sarens' lifting crew took over, they attached a custom-engineered spreader beam to the top of the jacket. "Both the CC 8800-1 and CC 9800 were attached to the beam, and the beam was connected to the top of the jacket platform at a single, central lifting position," offers Andrew Hunt. "This allowed the two cranes to evenly share the load."

Working at a 20m radius, both the CC 9800 and CC 8800-1 began hoisting the load in slow increments toward its final position, slewing slightly during the process. At the same time, the two tail CC



The SGC-120 shortly after its assembly in Newcastle

2800-1 cranes attached to the bottom of the jacket's legs began to hoist, slew and track toward the two main lifting cranes. "For this operation, the tail cranes were equipped with 66m of main boom and 100t of counterweight and hoisted the jacket legs at a 25m radius," comments Hunt.

As the offshore jacket transitioned to its vertical position, the load was transferred over to the main CC 8800-1 and CC 9800 cranes. The tail cranes started slewing the jacket into its final vertical position until the full 1.022t load was shared between the main lift cranes. It took four crane operators and six banksmen an hour and a half to up-end the jacket from a horizontal to a vertical position, including twenty minutes for the client to fix brackets to the jacket. Up-ending the first of many offshore jackets so quickly and efficiently impressed all who were a part of the challenging lift.

"The greatest challenge during the lifting operation was to coordinate the functioning of the two main lift cranes and two tail cranes," says Hunt.

"Coordination and communication played a vital part to ensure the lifting of the offshore jacket was completed safely."

With the lift complete, the

unpredictable weather took over for the finale: within 15 minutes of upending, fog enveloped the top of the offshore jacket and it was no longer visible from the ground.

### A BIG BOOST

For the next series of jacket handling at the harbour, Sarens' Demag CC 8800-1 will be given an extra capacity boost. The 1,600t crane will be re-rigged with the Demag Boom Booster Kit, which increases crane capacity when working at steep boom configurations. "Our Boom Booster Kit was designed specifically with such applications in mind" says Guntram Jakobs, product marketing manager for Terex Cranes. "It can increase the CC 8800-1 crane's capacity by up to 90%, allowing it to out lift some 3,000t class cranes under certain conditions."

The wedge-shaped Boom Booster's design includes 11m-long lower and upper adapters that flare out to a 10m width, nearly three times the standard boom's width, to enhance structural integrity. Up to five, 10m-long interior boom segments can be added to provide up to 72 m of lift-enhancing boom structure. "We plan on using the full 72m of the Boom Booster for

this project," says Hunt.

Hunt continues by explaining why the Demag Boom Booster Kit is required for the next phase on the project. "Jacket weights will increase to over 1,200t each, requiring the CC 9800 and CC 8800-1 to have 800t on each carrier," he says. "On top of reconfiguring the CC 8800-1 with full Boom Booster, we will add Superlift ballast to both cranes to handle the extra load".

### A GIANT ON THE QUAY

In Newcastle, Sarens worked at Smulders Projects jacket yard on load out and assembly. For this job, they again supplied a mix of Terex Demag and Liebherr crawler cranes, as well as two wheeled mobile cranes and some smaller crawlers. The star of the show though was the company's in-house designed crane, the giant 3,200t capacity SGC-120.

"Assembling a crane like this is a project in itself," says global technical solutions engineering manager Peter Huygebaert. "There's a 45m ring footprint. The boom is 130m long, so you need a place to assemble that on the ground as well. You need a decent-sized crawler crane to install the 36 counterweights, which weigh 100t each. But all that



Jackets and cranes in Newcastle

together pays off, and in the end you have a crane that has over 3,000t of capacity."

Once Sarens operators prepared and load tested the crane, it was ready for action. The SGC-120 lifted the 397t wind farm modules off the barge and set them 120m away from the load-out site. It also placed the upper jacket on top of the lower jacket, achieving a final height of about 70m.

## ONGOING DEMAND

The need for onshore logistics will not end when work is completed at the four fabrication yards. Throughout the life of the wind farm, maintenance will be required. For this, the project owners have recently signed a deal with Wick Harbour Authority to redevelop a formerly disused area of Wick Harbour in Caithness, Scotland.

The signing of the lease is the culmination of over two years of negotiations following the signing of a Memorandum of Understanding where Beatrice Offshore Windfarm Ltd (BOWL) committed to utilise Wick as the long term operational base for the wind farm.

Work is now underway on the disused area of the Harbour which will result in the

removal of the old slipway, re-profiling of the adjacent area of quayside and the installation of new pontoons which will provide berthing for the Beatrice Crew Transfer Vessels.

Willie Watt of Wick Harbour Authority said "The Board and staff at Wick Harbour are thoroughly delighted that we have now signed the Lease between Wick Harbour Authority and the Beatrice Offshore Wind Farm Ltd.

"This signing is the best news Wick Harbour has had in a hundred years and with the 25-year lease period and further options available we hope to be supporting this massive renewable infrastructure project off our coast to 2074 and beyond. Our youth of today and the children coming through school will have the opportunity to join this exciting new industry based in Caithness and benefit from long term careers.

"In addition, the choice taken by BOWL to refurbish the buildings that served Wick Harbour throughout the fishing era is the icing on the cake and will deliver a splash of colour to the harbour façade, plus add to the exciting and positive atmosphere we enjoy around the port. We very much look forward to supporting the operations associated with the Beatrice

project and thank the various teams involved for choosing Wick as their Base."

Steve Wilson, BOWL Project Manager from SSE said: "The signature of the Wick harbour lease with the Wick Harbour Authority (WHA) is the result of the collaborative relationship which BOWL has developed the WHA team since the first assessment of the harbour as a possible location for the operations and maintenance base for the wind farm in 2012.

"They have proven to be not only a committed stakeholder in the project, but have proactively worked with BOWL to ensure that the continual changes to the concept and designs for the O&M Base could be accommodated within the harbour with minimal impact to the other harbour users and our future neighbours."

The Harbour work is in addition to the redevelopment of the two adjacent 200 year old Thomas Telford buildings which will be returned to maritime use as they become the operational base for BOWL team.

The buildings, which will be home for up to 90 operational staff, are being sympathetically restored as part of the £15m redevelopment by BOWL. Work is expected to be complete by the end of 2018. ●