



# LONDON ARRAY

## POWERING THE FUTURE



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# POWERING THE FUTURE

*Project Director, Richard Rigg, discusses the journey taken by and the lessons learnt from the London Array project, the world's largest offshore wind farm*

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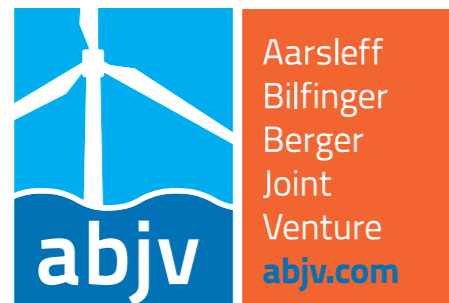
It was in July 1887 that Scottish academic James Blyth installed the world's first electricity-generating wind turbine. Although at the time considered uneconomical in the UK, electricity generating wind turbines proved to be far more cost effective in countries with widely scattered populations, a fact that saw American inventor Charles F Brush follow up Blyth's work some months later by building the first automatically operated wind turbine for electricity production in Cleveland, Ohio.

Fast forward to the 21st Century and the world finds itself in a situation where rising concerns over energy security, global warming, and eventual fossil fuel depletion have led to an expansion of interest in all available forms of renewable energy, including wind power. It was due to this interest that the fledgling commercial wind power industry began expanding at a robust growth rate of about 30 percent per year, driven by the ready availability of large wind resources, and falling costs due to improved technology and wind farm management.

Today, London Array is arguably the most widely known UK offshore wind farm and the largest of its kind found anywhere in the world. Following confirmation of the suitability of the area for construction of a wind farm site, the London Array project was officially born in 2001, with the Crown Estate providing the consortium of operators at the time, Shell WindEnergy Ltd, E.ON UK Renewables and DONG Energy, a 50 year lease for the site and cable route to shore, which was entered into in 2004.

Planning consent for the project's 1GW

## We take part in the world's largest offshore wind projects



Danish Per Aarsleff A/S and German Bilfinger Construction GmbH are cooperating in the joint venture Aarsleff BilfingerBerger Joint Venture. We have recently completed the installation of 177 foundations for the London Array Offshore Wind Farm located off the east coast of England. Currently, we are installing 80 monopile foundations for the DanTysk Offshore Wind Farm. Previously, the joint venture has installed 92 monopiles for the Horns Rev 2 Offshore Wind Farm, 91 gravity foundations for the Rødsand 2 Offshore Wind Farm, 7 gravity foundations for the Sprogø Offshore Wind Farm and 100 foundations for the Thanet Offshore Wind Farm.

## AARSLEFF BILFINGER BERGER JOINT VENTURE



Aarsleff Bilfinger Berger Joint Venture is a Danish-German joint venture between two of the world's leading contractors – Per Aarsleff A/S from Aarhus and Bilfinger Construction GmbH from Hamburg. Both companies have extensive experience in and knowledge of the execution of demanding marine construction work.

### The working relationship

From 2004 to 2013, we have implemented huge offshore foundation structures in Denmark, Germany and the UK. The clients of these projects include major energy companies looking for a business partner capable of implementing giant contracts. We have handled everything from design and construction to installation of offshore steel and concrete foundations, just as we have handled the actual installation of wind turbines.

### The world's largest offshore wind farms

The JV has executed the foundations for half of the world's largest operating offshore wind farms. Recently, it has completed the world's largest offshore wind farm, the London Array Offshore Wind Farm, and it is currently executing the DanTysk Offshore Wind Farm which will be commissioned in 2014. By then, the JV will have executed the foundations for five of the world's largest offshore wind farms.

### Specialists

Every single project is unique and poses unique challenges. Therefore, we have always

focused on finding the right equipment and the right expertise for the specific infrastructure job – also when a job required us to develop new specialist equipment and new solutions.

### Staff

Our staff has many years of experience and wide expertise within offshore activities, and they cover the whole spectrum from tendering to order acquisition, planning, design and execution.

We attach great importance to being able to execute as much of each project as possible by means of our own staff in order to build up and maintain experience and know-how in-house. This way, expertise gained is passed on from project to project thus contributing to enhancing our competitiveness.

Our skilled and dedicated staff contributes to our success on the offshore wind market.

### Equipment

Specialist equipment is required for the implementation of offshore wind projects. We spend many resources on development and investment in specialist equipment for our projects. Our purpose is to optimise the projects to the benefit of our customers. Our specialist equipment includes pile grippers, lifting yokes, upending devices, barges, sea fastenings, cage installation tools etc. All equipment is developed by in-house engineers and technicians.

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offshore wind farm was granted in 2006, with permission granted for the onshore works following in 2007. Work on Phase One started in July 2009 when building commenced on the onshore substation at Cleve Hill in Kent, whereas offshore construction started in March 2011 when the first foundation was installed. The first turbine was installed in January 2012, with first power achieved in October that year and the final turbine installed in December 2012.

“We reached the key milestone of having the 175th and final turbine

commissioned on 6 April, 2013,” states Project Director, Richard Rigg, “an event which effectively marked the culmination of the installation of the 630MW wind farm. From that point on the complete wind farm has been generating and earning revenue.”

Such is the sheer scale of London Array that it is estimated that its 175 turbines will be capable of generating enough energy to power nearly half a million homes and reduce harmful CO2 emissions by over 900,000 tonnes a year.

“When this project was first conceived,” Rigg continues,

# 175

The number of turbines  
that make up the  
wind farm

“LONDON ARRAY IS ARGUABLY THE MOST WIDELY KNOWN UK OFFSHORE WIND FARM AND THE LARGEST OF ITS KIND FOUND ANYWHERE IN THE WORLD”



Construction of a turbine

“I think it is fair to say that it was felt by many that an undertaking of this size could simply not be carried out.” Indeed at the time there wasn’t even any legislation in place that allowed for the construction of a project the size of London Array.

Nevertheless, it is with a great sense of pride that Rigg can declare that despite the considerable challenges that the consortium has encountered in the last decade or so, London Array looks set to deliver on the promises it made back at the time of its conception.

Said challenges include overcoming the obstacles that presented themselves due to the location of the project in the outer Thames Estuary. Here the water depth can range at lowest atmospheric tide from 25 metres right down to minus one metre, meaning that at various points some areas of the site actually dry out.

“As you can imagine,” Rigg highlights, “when you have to get a large vessel in to install components weighing around 650 tonnes you have to ensure that you get it in at high tide, jack it up and then await the return of higher water levels before getting it back out again. All of this adds an extra degree of complexity to the work you are doing.”

In addition to these logistical difficulties the project has been hampered by several extensive periods of bad weather, worse



Offshore substations boost the voltage to reduce transmission losses

than that anticipated and factored in by the consortium. Regardless of these setbacks the project ended up having what Rigg describes as a remarkable year in 2012. “By the end of December 2012 we had installed in the space of ten months all bar a few array cables, three of the four export cables, and 90 of the 177 foundations. That means that we finished the year installing the last turbine within a few weeks of the date we actually set back in May 2009, which I think is a fantastic achievement.”

The consortium, which now consists of DONG Energy, E.ON and Masdar, is very keen to stress that it sees London Array as being the first real industrial scale offshore wind farm, with its success being a precursor to

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the next round of wind farms due to appear off the coasts of the UK.

Where it also hopes to see the project being labelled an inspiration for future developments is in its efforts towards benefiting the environment and the local communities who reside around the site. It has long been the aim of the consortium to see London Array playing a key role in helping the UK to meet various

renewable energy targets. By reducing carbon emissions by more than 900,000 tonnes a year the project will be playing a critical role in helping to tackle the effects of climate change and global warming, this providing significant, long term environmental benefits.

“It is important to recognise that in addition to London Array there are a number of other large offshore wind farms that really are contributing to this shared goal,” Rigg explains. “The more this happens, the sooner people will recognise the scale of the contributions these projects are making. In turn they will hopefully then realise that these wind farms can generate industrial

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Continuous innovation in products, solutions and services, employee development and commitment, customer orientation and the introduction of safe industrial processes with limited environmental impact are among the key initiatives that place Nexans at the core of a sustainable future.

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“THE LESSONS LEARNT FROM LONDON ARRAY WILL PROVE INVALUABLE FOR THOSE BEHIND THE CREATION OF THE NEXT GENERATION OF WIND FARMS”

## LIFTRIG CONSULTING



Driven by a passion for safety in lifting operations, LiftRig Consulting's team of experienced engineers are leading innovators of lifting and handling solutions, cable handling and storage systems, lifting assurance and lift planning services. At LiftRig, we strive to become the leading provider of lifting engineering services and personnel to the energy sector and beyond, and we treat every engineering requirement as a unique project. Producing innovative solutions requires unique talents which are not always available from many companies. The engineering team at LiftRig has a track record of creating such innovative

solutions, which can be shown to include world-leading products and advanced solutions to modern challenges. Combining over 25 years' experience in on- and offshore engineering with the latest state-of-the-art design software, the LiftRig team is well-placed to provide solutions that are safe, practical, effective and cost-effective. Our unique design service will satisfy the needs of any organisation responsible for providing a safe system of work to its employees, installers or those of its customers.

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London Array operations & maintenance office



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amounts of electricity and play an important role in the energy mix of the future.”

While the wind turbines that make up London Array stand 20 kilometres out to sea, the project has still had a big impact of the onshore communities in the Cleve Hill and Ramsgate areas, a fact

that has not been lost on the consortium. In the early days of the project it faced natural opposition to its plans for building its Cleve Hill substation. Respecting this opposition the consortium embarked on a programme of engagement, working hard to involve local people and keeping communities informed about the progress of the project at all times.

**900,000+  
TONNES**

Of CO2 emissions that the wind farm will help reduce per year

“The relationship we have built up with the local villages of Graveney and Goodnestone is nothing short of excellent and have already proven to be mutually beneficial for all concerned,” Rigg enthuses. Examples of some of the positive results to come from

these relationships include London Array's support of a university bursary scheme, the creation of a community fund managed by an independent trust, its donations to various wildlife funds and the annual donations made to three local schools.

Equal effort has been made by the consortium in Ramsgate where it has



endeavoured, wherever possible, to employ local people to its construction and operations and maintenance teams, and to source from local suppliers, not only during the construction phase of the project but for all manner of activities related to the project, from hotels and taxis to bringing in a local company to supply the Cleve Hill substation with high speed internet access.

Now that London Array is into its operational phase the focus of the consortium turns to ensuring that it works as effectively and efficiently as possible. In doing so it is expected to produce some hugely important performance figures that its owners hope can then be used to demonstrate that wind farms have indeed become serious players in terms of today's energy mix.

Looking ahead to the future, Rigg points out that while what has already been achieved is hugely significant, there is more work to be done if mankind is to get the most out of offshore wind power. "The aim for the industry as a whole is to bring down the costs associated with offshore wind and improve the overall reliability of wind power generation. While there is still much to be done if we are to reap the full rewards that wind power has to offer there can be no doubt that the lessons learnt from London Array will prove invaluable for those behind the creation of the next generation of wind farms." **BE**

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London Array visit:  
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