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**Renewables are maturing – but profit and technology remain critical. So how can we maximise the returns on both?**

The stage is set for renewable energy with countries all over the world investing in infrastructure and technology to support its growth. Public and policy appetite is high and milestones are celebrated regularly. For example, on 26 May, National Grid reported that 24% of the UK’s power that day had been generated by solar. In Germany, the first subsidy-free offshore wind farms are in development.

But even as the potential contribution of renewable energy is increasingly recognized, so too is the need for technology advancement. “For example, new technology is required as offshore wind farms increase in scale, are sited further offshore – often in deeper waters – and employ larger turbines and components,” says Peter Davies, Principal Specialist for Renewable Energy. “Yet the sector is now established in many people’s eyes, including those poring over balance sheets. With the honeymoon over, the coming years will see mounting pressure to maximise productivity and turn a greater profit.”

Investor confidence isn’t just about profitability. As with any innovative technology, risk management and safety enhancement are key. Arve Sandve, HSES Specialist at Lloyd’s Register, comments: “Focusing now on safety will also help prevent major incidents in some of the world’s most challenging operating environments. The consequences of such an event would be catastrophic for the lives involved and damaging for a sector that is busy getting established.”

**Concentrate on construction and installation**

Given their nature, offshore wind, wave and tidal sites are located in extremely adverse environments. Operations will always be potentially hazardous.

“The window to assemble a farm or array is limited,” says Peter Davies. “Confronted with high tidal velocity, for example, it is only possible to work at slack tide. This is often no greater than 30 minutes every six hours or so. And getting to, and then on board, an offshore wind turbine is no small hurdle.”

Typically with offshore wind farm projects, most construction is performed offshore, assembling turbines, blades and transmission towers on choppy waters. Partly, this is for historical reasons: the first offshore turbines were simply onshore ones relocated and, today, onshore construction techniques are still employed offshore.

There are practical considerations too. Logic points to performing a greater number of assembly tasks on firm land, but component size makes this difficult as even the largest installation vessels can only manage one or two fully assembled turbines at a time.

“Assembling more components onshore would certainly alleviate the heavy vessel traffic picture, which is a significant consideration in the construction phase. There are lots of contractors involved on project-related and smaller support vessels, and they are all trying to manoeuvre simultaneously in a tight area. Limit the traffic and you reduce the risk of a costly collision,” says Davies.

Concentrating on construction is important because it also points back to design. Davies suggests that smarter design could help in two core areas during assembly. First, it could reduce the sheer number of lifting operations required, which for a large project could exceed 20,000. Davies explains: “Lifting operations are a key concern for the industry and it’s easy to see why with a cursory glance at independent statistics compiled on health and safety risks.”

Such operations are also not cheap to perform. How do you reduce risk and expense here? The current practice is to apply risk analysis to the existing framework, but the end result will still be lots of lifting. “Design that considers the human factors will also help limit the extent of manual labour. This is vital because deploying personnel means introducing risk. “Do hundreds of nuts and bolts really need to be tightened by hand at sea?” asks Davies. “Reconsidering the entire assembly process, from piling onwards, is a valuable exercise with great potential to streamline practices.”

**Look ahead at operations and maintenance**

Offshore wind turbines are now being designed for use offshore, rather than adapting onshore models. These turbines operate for longer than their onshore equivalents, with increased load factors and higher generator rated power outputs. There are less rotating components that are prone to failure. From a safety perspective, the risk of fire and explosion has been reduced.

Innovative asset management software could be a big part of the solution. For example, RTAMO (Real-Time Adaptive Maintenance Optimization) is a standalone cloud-based software-enabled service that is based on a 10-year development program including government funded academic research, which culminated in establishing predictive algorithms linking planned maintenance to economic and reliability outcomes. In some cases, RTAMO has been able to achieve an up to 40% reduction in operational maintenance expenditure.

“Once up and running, an offshore wind turbine is an unmanned asset, with a relatively low risk picture,” says Sandve. “It is also at its most productive. This is all reassuring until the minute personnel are mobilised to a farm or array, introducing a series of risks and potentially decreasing output. Asset integrity becomes as fundamental as risk management. If we start with a blank sheet of paper, could smart turbines diagnose faults remotely, and then fix and reset themselves without the need to deploy personnel? Bringing together asset managers and health and safety experts – currently two distinct disciplines – will be critical if a quantum leap is to be made.”

Meet our experts (including Peter Davies and Arve Sandve) at **Offshore Wind Energy 2017** event in **ExCel**, **London – UK**, **6-8 June** at **Booth #S-K20** or go online at [www.lr.org/lowcarbon](http://www.lr.org/lowcarbon) for more information.

**ENDS**

**Notes to editors**

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