We need to find a more sustainable model for supporting growth in offshore wind

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Offshore wind power will play a critical role in cleaning up the global grid, with the International Energy Agency estimating half the world's energy needs will need to be met with zero-emissions electricity by 2040. Offshore wind is being rapidly ramped up in response, with the Global Wind Energy Council projecting 235 GW of new generating capacity over the next decade alone and Europe planning to scale up capacity to 300 GW by 2050. Europe accounts for 70% of all current global offshore wind installations with Denmark soon installing the world's first energy islands.

Yet while offshore wind is creating more sustainable power sources, the current production and installation processes behind the technology are increasingly undermining its sustainable premise. It has been widely reported that retrofitting wind turbines to scale up capacity is producing environmental challenges, with a projected 43 million tonnes of hard-to-recycle wind turbine waste by 2050. What is less widely reported is that demand for ever bigger blades and platforms to accelerate offshore wind capacity will also require exponentially bigger installation fleets, facilities, tools and technologies. Without radical change, this situation risks creating greener electricity at the expense of more unsustainable materials and methods.

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A skyscraper-sized challenge

As offshore wind generating capacity is scaled up to serve booming global demand, swathes of existing wind turbines will need to be replaced with some 2 GW worth of turbines already refitted in the past two years alone. Average turbine sizes in the European market have ballooned from around 3 MW in 2010 to 8 MW in 2020, with an average turbine size of 12 MW projected by 2025. The first generation of offshore wind turbines were just 100 metres tall while leading offshore wind operators are now replacing them with 300 metre skyscraper-sized mega turbines. These machines will stand almost as high as the Shard building in London, with rotor spans the length of two football fields.

Satisfying this demand has and will require a major increase in the size and scale of wind turbine installation vessels, platforms, port facilities and other equipment such as cranes. And with it, more emissions produced through manufacturing. Unfortunately, the current wind installation fleet is becoming rapidly outdated due to the requirement for bigger crane capacity and some 14 new wind turbine installation vessels (WTIVs) are already under construction. Building a mass of bigger carbon-intensive hulls will massively increase the carbon footprint of the offshore wind industry. Alongside a mounting pile of wind turbine waste as smaller turbines are replaced, this could also entail many smaller

installation vessels and other equipment being set aside. Much like consumers stopping using a perfectly serviceable mobile phone for a shiny new upgrade, where it would be far more sustainable to install updates to expand functionality, rather than disregarding the device completely. If unchecked this could see the environmental impact of offshore wind installation growing exponentially in parallel with proliferating demand, creating a cycle of unsustainability.

The need for a circular economy in offshore wind

The challenge is ensuring sustainability is considered from initial design to implementation and, to implement, improve and re-use rather than replace, where possible. Many first-generation installation vessel fleets and equipment were not designed to consider second and third-life applications as offshore wind capacity expanded. Similarly, so far, there is still work to be done around the ability to recycle or re-use existing wind assets for new applications to progressively reduce the cost and environmental impact of installation. Crucially, the WTIV toolkit has not been standardised so that it can be seamlessly scaled up to serve larger wind power production. This means that each time we see new platform designs such as semi-submersible floating windfarms or larger turbines, the entire installation process has to be expensively retooled.

Together as an industry we should be looking for ways to re-use rather than replace existing assets. There is an opportunity for WTIV manufacturers to future-proof vessels by considering future applications at design stage or to review future applications and implement upgrades to existing assets. This could enable cranes and decks to be easily upgraded to sustain larger wind turbines or adapted for other applications such as maintenance. Adapting and upgrading existing assets could reduce costs and carbon emissions by reducing recycling waste, and the need for new fleets and equipment.

This could even be extended so that existing tools and experience from other sectors such as oil and gas could be repurposed for offshore wind, creating a circular economy of installation assets across the offshore energy industry. For example, we used our experience from working in the oil and gas sector to modify a jack-up construction vessel for an offshore wind project. The vessel's crane capacity was not sufficient enough to install the latest offshore wind equipment as the turbines for the project had increased in size. Our modification allowed the operator to reduce crane trips by a factor of three, making operations more efficient and cost effective.

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The oil and gas sector has long pioneered ways of extending the lifecycle of existing assets, and this could prove valuable to the offshore wind industry. Currently there are still drilling rigs built in the 1980s that are still in use today that are drilling more complex wells than they were originally designed for. This is a mantra of ongoing evolution and improvement rather than replacement is an alternative that should be considered as we future-proof offshore wind. For example, our Sea Swift offshore platform is modular by design and is adaptable to new applications such as offshore wind substations. This demonstrates how future-proofing offshore assets at design stage can extend their lifecycle and curb waste. We've developed the platform to use up to 30% less steel than off-the-shelf jacketed options, showing how modular, multi-purpose installation assets can also dramatically reduce material waste and emissions. We've since evolved our Sea Swift designs even further and they can now also be fully powered by renewable sources, such as wind and solar, eliminating the need for diesel generators. It's innovative engineers coming together and collaborating across the offshore energy sector that can make a big difference to the future of offshore wind.

Living up to the industry's premise

Offshore wind has the potential to help tap into an abundant natural resource, reach a global market and decarbonise much of the world's electricity. Yet a truly sustainable offshore energy industry must also consider its whole-lifecycle environmental impact through more sustainable manufacturing, materials and installation methods. As demand grows for offshore wind, it will be increasingly imperative for the industry to try to re-use existing assets from across the whole offshore energy sector, instead of retooling. Installation tools and technologies as well as the wind turbines themselves, need to be designed and future proofed with full foresight of their whole-lifecycle environmental impact. This would ensure the installation process lives up to the sustainable vision of the industry itself.

Learn more about our offshore wind offering here

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