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Blowing away economic, technical, social and environmental values? Closing the circle in the wind sector.

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Low-carbon infrastructures such as wind turbines are globally deployed and steadily growing[1]. The first generation of wind turbines are starting to reach end-of-use and operators, providers and regulators require recycling and decommissioning solutions. Current end-of-use management strategies and technologies are under-developed or still absent, while a review of mandatory offshore wind decommissioning plans revealed formulaic descriptions of recycling options and processes and gave an insight into the significant financial risks involved[2].

The offshore wind sector has made great strides towards reducing economic costs of power generation[3]. However, emerging evidence suggests that economic costs at the end-of-use have been underestimated[2,4]. In the UK, the department for Business, Energy and Industrial Strategy estimated the potential impact of decommissioning of current offshore wind on the public purse to approach £3Bn[4]. Notably, other costs were excluded from the analysis. For example, the sourcing of (near) critical materials from natural reserves results in severe social and environmental impacts, while solutions to maintain the technical value of components and materials at end-of-use (thereby alleviating impacts of raw material sourcing) are underdeveloped[5,6].

This presentation will discuss decommissioning challenges identified through stakeholder consultations led by the University of Leeds[5] and included in the technology roadmap published by the Offshore Wind Innovation Hub[6]. The roadmap offers a validated source of information on key challenges and innovation priorities in the offshore wind sector, covering R&D forecasts, stakeholders involved, technology readiness levels, strategic outcomes and benefits, potential to reduce levelised costs of electricity, and health, safety and environmental impacts. With delegate input we will discuss where the sector is now and potential solutions that are under consideration. We propose to apply circular economy principles to the design and whole lifecycle management of offshore wind energy systems.

We outline a whole system approach to meeting challenges and optimising economic, technical, social and environmental values throughout lifecycles of products, components and materials[7], and propose its application to the offshore wind sector in a collaborative manner; resulting in all windfarm infrastrucure elements being designed for durability, repairability and disassembly to enable efficient reuse, repowering, remanufacturing and recycling. This would benefit both government and industry by extending supply chains and creating opportunities for business development and clean growth[8] whilst turning negative environmental and social impacts into net-positive gains[3], and securing access to critical resources necessary for the long-term development of the wind and other low-carbon sectors[9].

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