



Circular Economy Opportunities, Barriers and Strategies for the Wind Industry

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Problem Statement

- Vast amounts of material is needed in wind developments¹.
- Threat due to resourcing and disposal issues^{2,3}.
- Circular economy tackles the take-make-use-dispose model (i.e. linear economy).
- Barrier to implementation: a lack of knowledge on options and impacts.

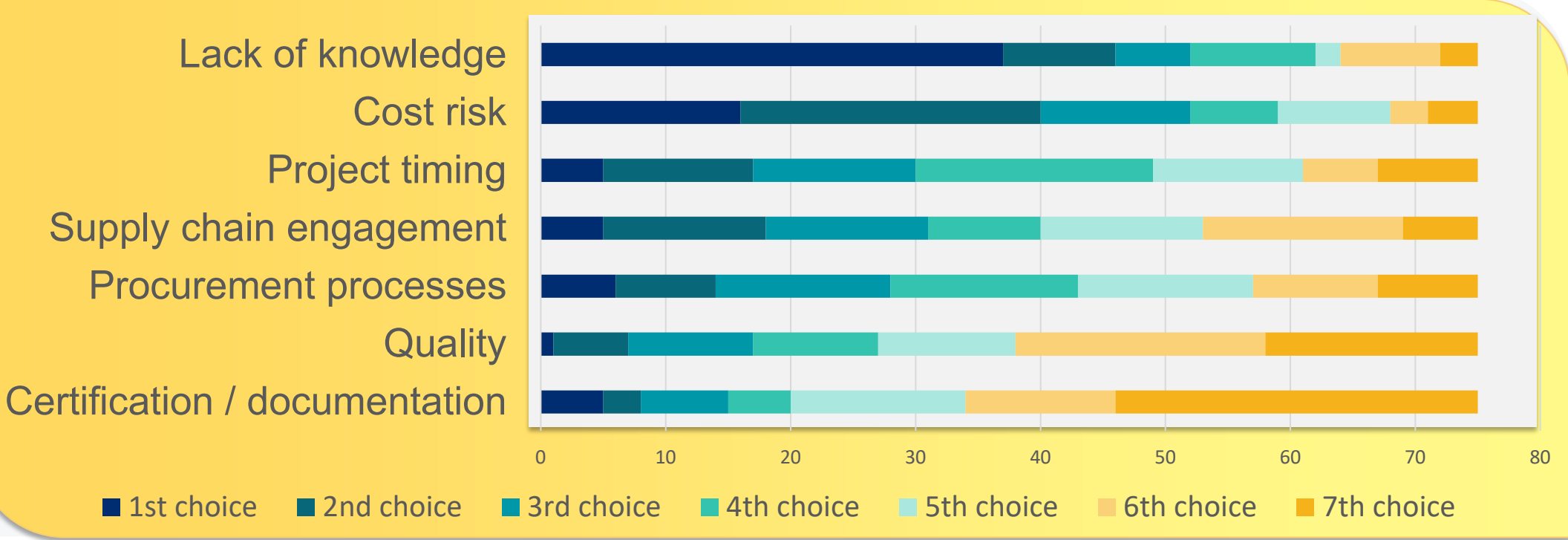


Figure 1: Responses from 75 people who ranked the barriers of implementing circular economy to the wind industry.

This Research

- First of its kind survey to wind industry and supply chain.
- 81 participants including:
 - Wind farm developers
 - Owner/operators
 - Wind turbine manufacturers
 - Remanufacturers
 - Academia
 - Research centres
 - Government advisors
- Designed to find perceived opportunities, barriers and strategies for circular economy in the wind industry.

Circularity in Wind Energy

Opportunities include:

- Design for material reduction and disassembly.
- Circular materials – greener steel and recyclable blades.
- Remanufactured parts.
- Life extension and repowering.



Figure 2: Word cloud of responses to the question, "What do you think your company needs to know more about before applying circularity principles?"

Key Findings

- Lack of knowledge ranked most prominent barrier to circular economy to wind farms
 - 92% of respondents said circular economy *should* be considered at development stage, compared to the 37% of respondents who said it was considered at this stage.
 - 62% of respondents selected lifetime extension over repowering.
 - 51% of respondents would use remanufactured components in a wind farm.

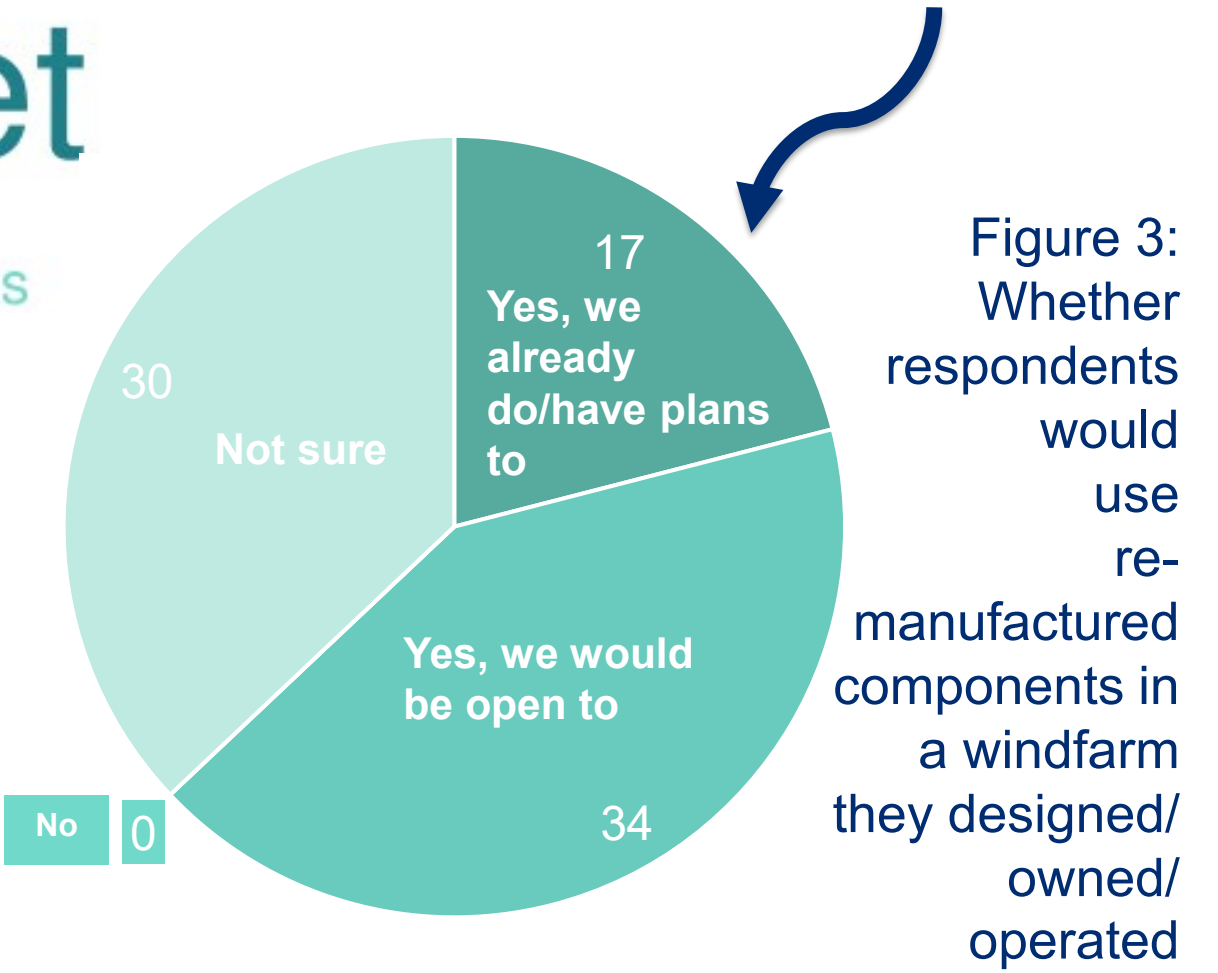


Figure 3: Whether respondents would use re-manufactured components in a windfarm they designed/owned/operated

A new metric for wind farm circularity and a decision support tool for offshore wind

Survey says:

So this research will:

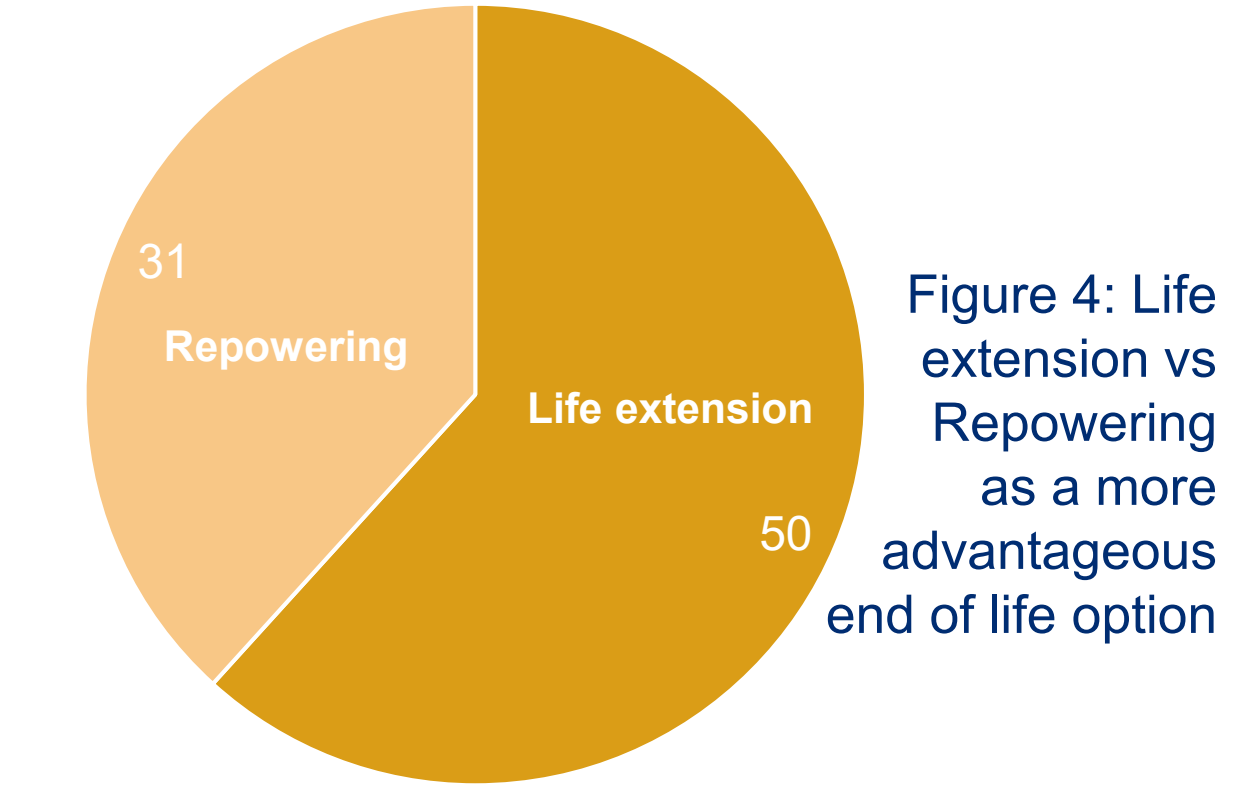
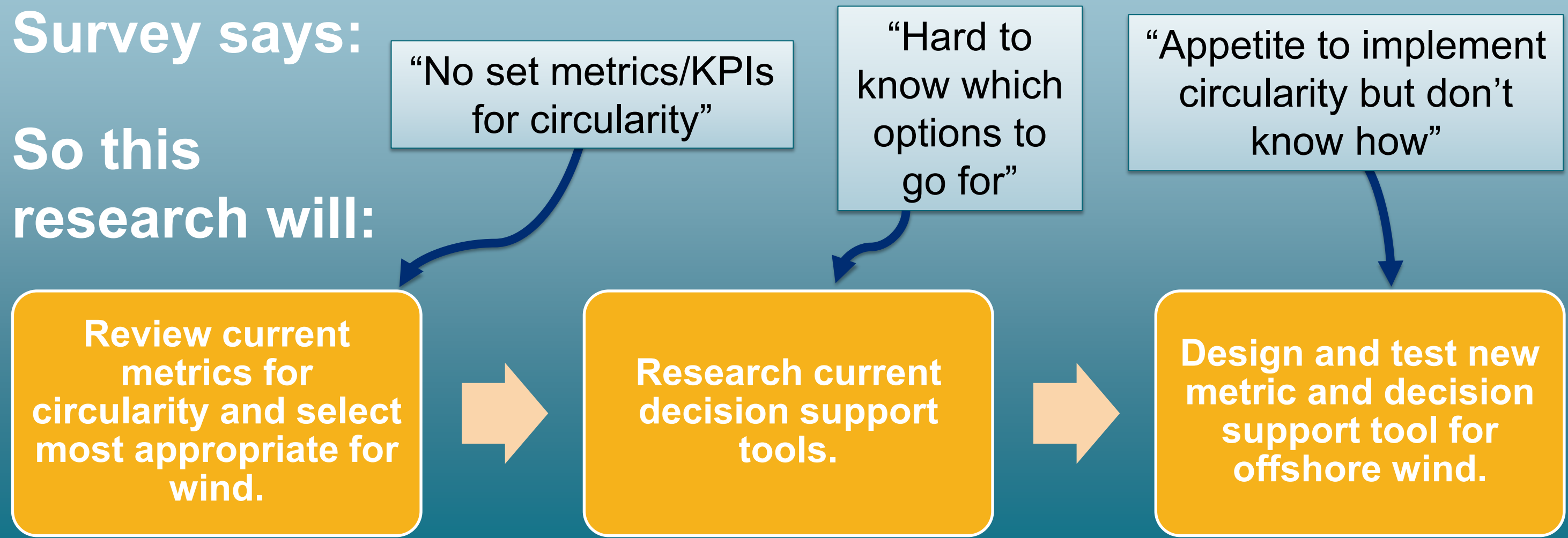


Figure 4: Life extension vs Repowering as a more advantageous end of life option

References

1. ORE Catapult (2022). End of Life Materials Mapping for Offshore Wind in Scotland
2. Liu, P. and C. Y. Barlow (2017). "Wind turbine blade waste in 2050." Waste Manag 62: 229-240.
3. Jensen, P. D., et al. (2020). "Highlighting the need to embed circular economy in low carbon infrastructure decommissioning: The case of offshore wind." Sustainable Production and Consumption 24: 266-280