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PO.010

An Update for Wind Turbine Blade Waste Inventory

Pu Liu, Claire Barlow
University of Cambridge

UNIVERSITY OF CAMBRIDGE

Abstract

The world cumulative installed wind power capacity has increased dramatically from 6,100 MW in 1998 to 364,270 MW in 2014, and continues to rise (Fig. 1). Since the blade design lifetime is about 20 years, the amount of end-of-life wind turbine blades will reflect this increase over the next two decades. Awareness of this issue is rising. There are some limited studies of the feasibility of a range of recycling and re-use processes for end-of-life blades (e.g. Larsen 2009; Falavarjani 2012), but this is an area ripe for research.

Objective

The present study aims to quantitatively assess the lifetime environmental impact of WT blades, starting with estimating the annual amount of WT blade waste for the next 20 years.

Fig. 1: Installed wind power capacity with Predictions.

Method

The three major WT blade waste sources are end-of-life waste (decommissioned blades), manufacturing waste (in-process waste, plus defective blades and blades used for testing) and service waste (from repairs and blade upgrading). This study starts by estimating the amount of blade material required per unit wind power, using data from wind energy associations and blade manufacturers. Then the total amount of WT blade materials is calculated from the wind power annual installed capacity, the average rated power of wind turbine and the material requirement per unit wind power. Using estimates for wind power growth rates, and taking into account regional variations, and the future projected scenarios, the total WT blade waste over the next 20 years can then be estimated. The end-of-life blades waste is around three times to the sum of the other waste sources. The logic flows of waste estimation and waste sources are shown in Fig. 2 and 3.

Fig. 2: Estimation logic flow.

In-process waste

Waste generated in the blade manufacturing process. (Manufacturing)

Defective blades

Blades with manufacturing defects are discarded. (Manufacturing)

Testing blades

Some blades are made for mechanical testing purposes and must be discarded. (Manufacturing)

Fig. 3: The sources of WT blade waste.

In-service waste

Materials used in routine maintenance work. (Service)

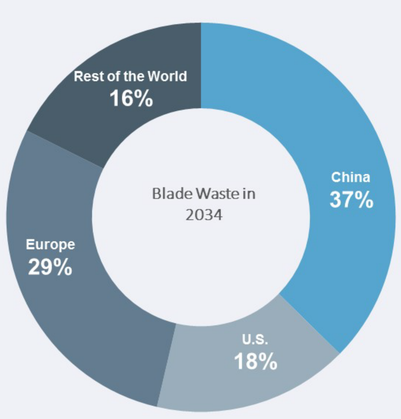
Upgrading waste

Waste generated due to replacing blades with more aerodynamically efficient blades before end-of-life. (Service)

End-of-life waste

Waste from decommissioned blades. (End-of-life)

Conclusions



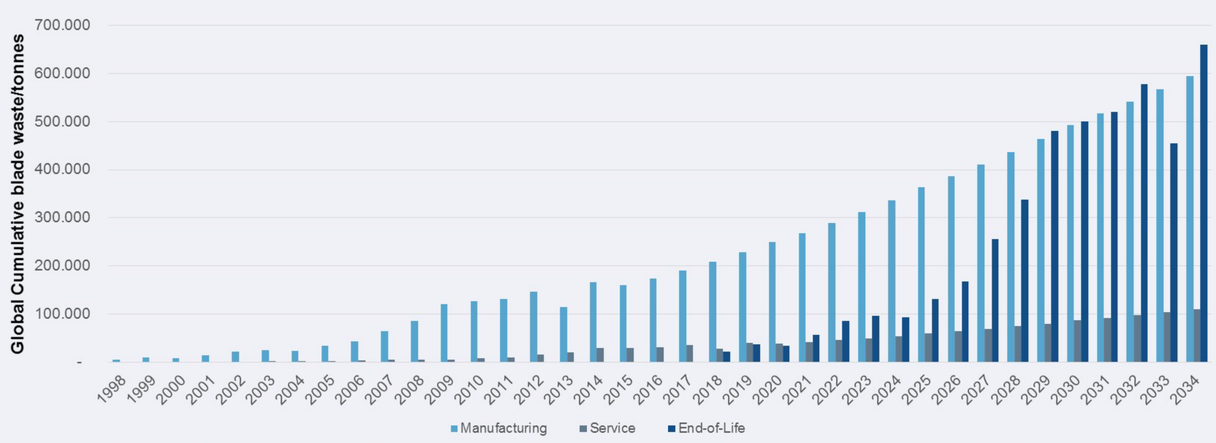


Fig. 4: Left: waste inventory in 2034 by region. Right: waste inventory by sources for 1998 to 2034.

As shown in Fig. 4, the current and projected volume of wind turbine blade waste has been estimated over the next 20 years, divided into four geographical areas. This will be used to inform the assessment of environmental impact for the next stage of the research.

References

Falavarjani, B., 2012. Feasibility of Using Wind Turbine Blades Structure as Artificial Reef. *proceedings.ewea.org*, pp.4–8.
Larsen, K., 2009. Recycling wind turbine blades. *Renewable Energy Focus*, 9(7), pp.70–73.

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Jacky Liu
pl384@cam.ac.uk
+44 (0)1223 760763