Vestas

Wind. It means the world to us.™

ETIP WIND WORKSHOP DELIVERING CIRCULARITY THROUGH INNOVATIVE MATERIALS AND RECYCLING TECHNOLOGY

ALLAN K. POULSEN

SUSTAINABILITY IN EVERYTHING WE DO

Carbon neutral company by 2030 – without using carbon offsets

Reducing CO_2 emissions in own operations by 55% by 2025, without using carbon offsets

Reducing CO₂ emissions in own operations by 100% by 2030, without using carbon offsets

Reducing CO_2 emissions in the supply chain by 45% per MWh generated by 2030 compared to 2019



Producing zero-waste wind turbines by 2040

CIRCULARITY

Hub and blade to be 50% recyclable by 2025

Hub and blade to be 55% recyclable by 2030

WE'VE HAD OUR SCIENCE-BASED TARGET APPROVED



WHY SUSTAINABILITY & CIRCULARITY?

Sustainability is future-proofing and an opportunity for value creation

REQUESTED BY OUR STAKEHOLDERS:



High sustainability awareness

Customers setting new standards for sustainability



Investors require sustainability strategies



Millennials are seeking purposeful companies



PRODUCING SUSTAINABLE WIND TURBINES

Addressing the full value chain







DecomBlades consortium awarded funding for a large, cross-sector wind turbine blade recycling project

DecomBlades partners

SIEMENS Gamesa	Vestas.	LM WIND SEE Renewrithe Energy business	Orsted		Øhjhansen		<mark>FL</mark> Smidth	
Slemens Gamesa Is a global leader In the wind power Industry, with a strong presence In off- shore, onshore and ser- vice. Slemens Gamesa will add value to the project by applying its knowledge about blade structure and design, market expectations and promotion of circu- larity in the wind sector.	As the world's largest wind energy OEM, Vestas brings an extensive level of expertise around the composition and manu- facture of turbine blades. Vestas contributes a broad spectrum of knowl- edge on the expected lifetime of a blade, its production volume, and on assessing the poten- tial for recyclability.	LM Wind Power – a GE Renewable Energy business Is a world leading blade designer and manufacturer, with more than 228,000 blades produced since 1978 corresponding to 113GW installed capacity. LM Wind Power will lead the work to establish product disposal specifications, supporting new business models for blade recycling solutions.	Ørsted Is the wor largest owner and developer of offs wind farms with r than 6.000 empl globally. For Ørst Is Important that exist sustainable cling solutions fo parts of our wind Therefore, Ørsted take the role as p lead In DecomBia	rid's d shore more loyees eed it : there e recy- or all farms. d will oroject ades.	HJHansen Recycling will be lead on the work regarding the common prereq- uisite for all three technologies: Pre- processing (cutting of blades), transpor- tation to recycling facilities and solu- tions on shredding and sorting of the blade materials.	MAKEEN Power has developed a tech- nology that enables conversion of plas- tic waste to a useful resource. MAKEEN Power's role in the project consists of designing and build- ing the pilot pyroly- sis facility to recover and reuse the blade materials.	FLSmidth is going to investigate the pos- sibilities of using shred- ded biade material and ashes from the pyrolysis process in the cement production process. The main objective of FLS- midth is to evaluate pos sible solutions on how to incorporate these materials in the cement production on a global scale.	5 9 1- 0 1- C-
	Manufa and depk	icture Syment	> 💮 '	Blade end-of-life				\bigcirc
Wind turbine blade			Wind farm		Blade shredding and transport	Pyrolysis	Co-processing	Recycling material into new products
						^	^	^
© energy Substance Energy Cluster Denmark Is the Danish Innovation cluster for the entire energy sector. Energy Cluster Denmark will dis- seminate project results and develop new research and development projects		SDU University of Southern Denmark, SDU, will conduct environmental and economic per- formance assessments of the different sup- ply chains and apply a cutting edge hybrid assessment frame based on value chain		Technical University of Denmark, DTU, will contrib- ute within the fields of material characterization, engineering, assessment of material properties of reused glass fibers, surface properties and investi-		DTU, will contrib- naracterization, rial properties of erties and investi-	/nnovation Fund I	Denmark

analysis and multi-criteria decision support.

value of fibers obtained from pyrolysis.

Innovation Fund Denmark (IFD).

DecomBlades.

HANDLING OF USED COMPOSITES – THE MAJOR ISSUE

Energy consumption





FROM RECYCLING TO CIRCULARITY

NOW

NEAR TERM FUTURE

LONG TERM FUTURE



- Recycling is downcycling
- Energy intensive (and expensive) recycling technologies
- No demand for most of recycled materials
- Landfilling and incineration



- Less energy intensive recycling technologies
- Increased demand for recycled materials
- Some companies will require recycled materials as part of new materials
- Landfill bans
- Reduced production waste through design
- Design for disassembly



- Materials designed for recycling
- Legislative requirements for recycled
 materials as part of new materials
- Zero waste wind turbine
- Zero emission steel
- Closed carbon cycle
- Legislation on landfill and recycling



THANK YOU!





