DEVELOPING ZERO WASTE WIND TURBINE BLADES WITH SUSTAINABLE MATERIALS

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By John Korsgaard, Senior Director, Engineering Excellence

LM WIND POWER
a GE Renewable Energy business

LM Wind Power

A leading blade supplier to the wind industry

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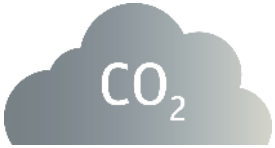
13 blade factories

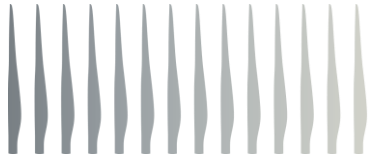
13,233 People worldwide

1/5 turbines in the world have LM Wind Power blades

Global capacity and supply chain



251 million metric tons of CO_2 mitigated



241,000 blades produced since 1978

Sustainability is about enhancing enterprise value

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Sustainability is about the planet, but it is also good business

- Drive operational excellence
- Exceed customer expectations
- Reduce costs
- Improve safety
- Differentiate our brand
- Improve reputation with key stakeholders
- Reduce risk
- Motivate and engage employees

THE GLOBAL COMPACT
WE SUPPORT

Carbon Neutral Journey…
We chose to lead, Not follow

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2010 – LM Wind Power joins UN Global Comact

2016-2018 : Four main workstreams make up our carbon neutrality program, which we continuously develop and improve

#gocarbonneutral

December 2016:
LM Wind Power pledges to become Carbon Neutral by 2018 : First for a Wind value chain company

LM Wind Power achieved Carbon Neutral status during 30 August 2018 - Four months ahead of pledged timeline

Visit ***www.lmwindpower.com/gocarbonneutral*** for ***10 steps to become a carbon neutral business***

Powering a cleaner world with green blades

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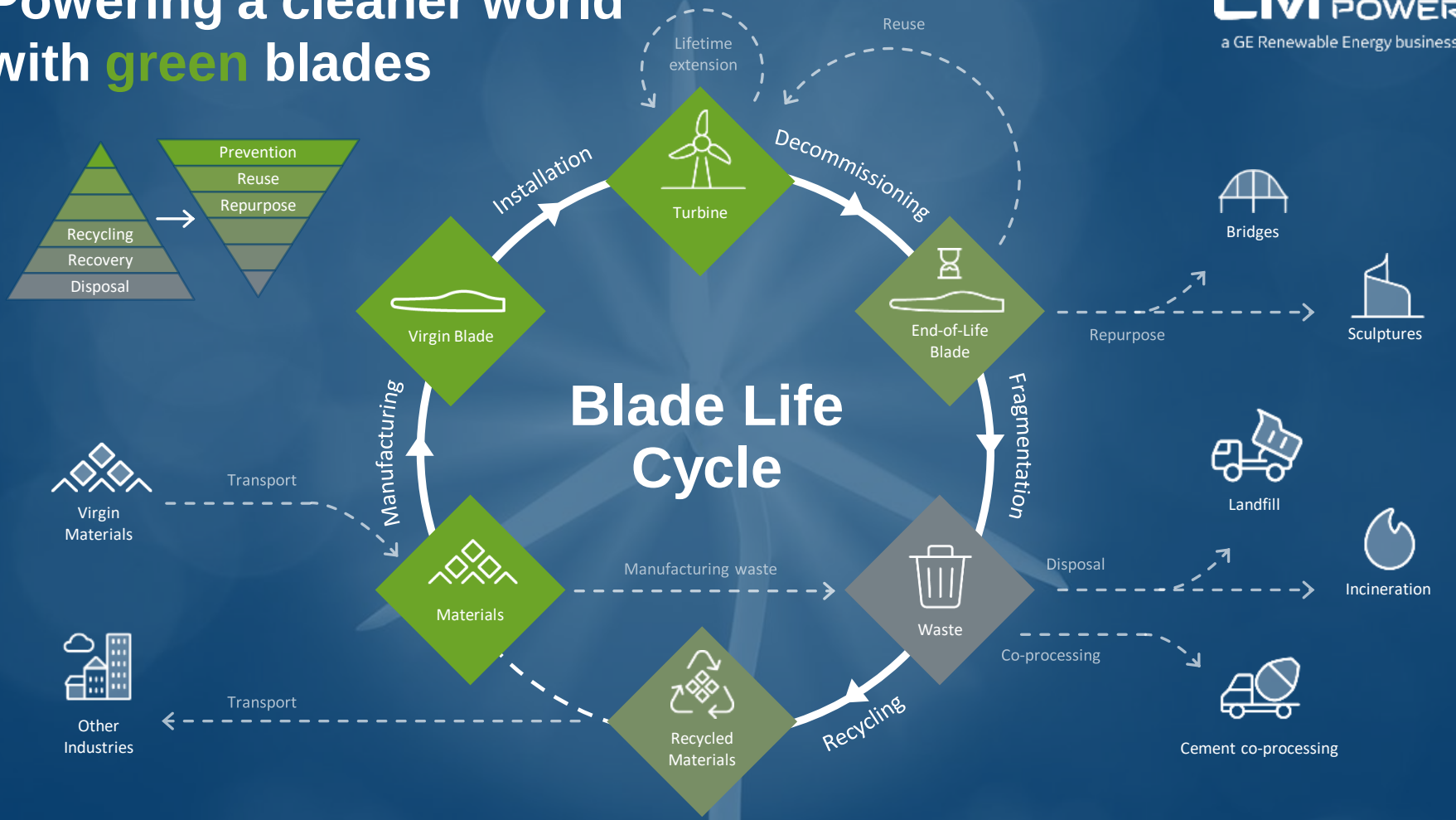

Reducing up- and downstream impacts

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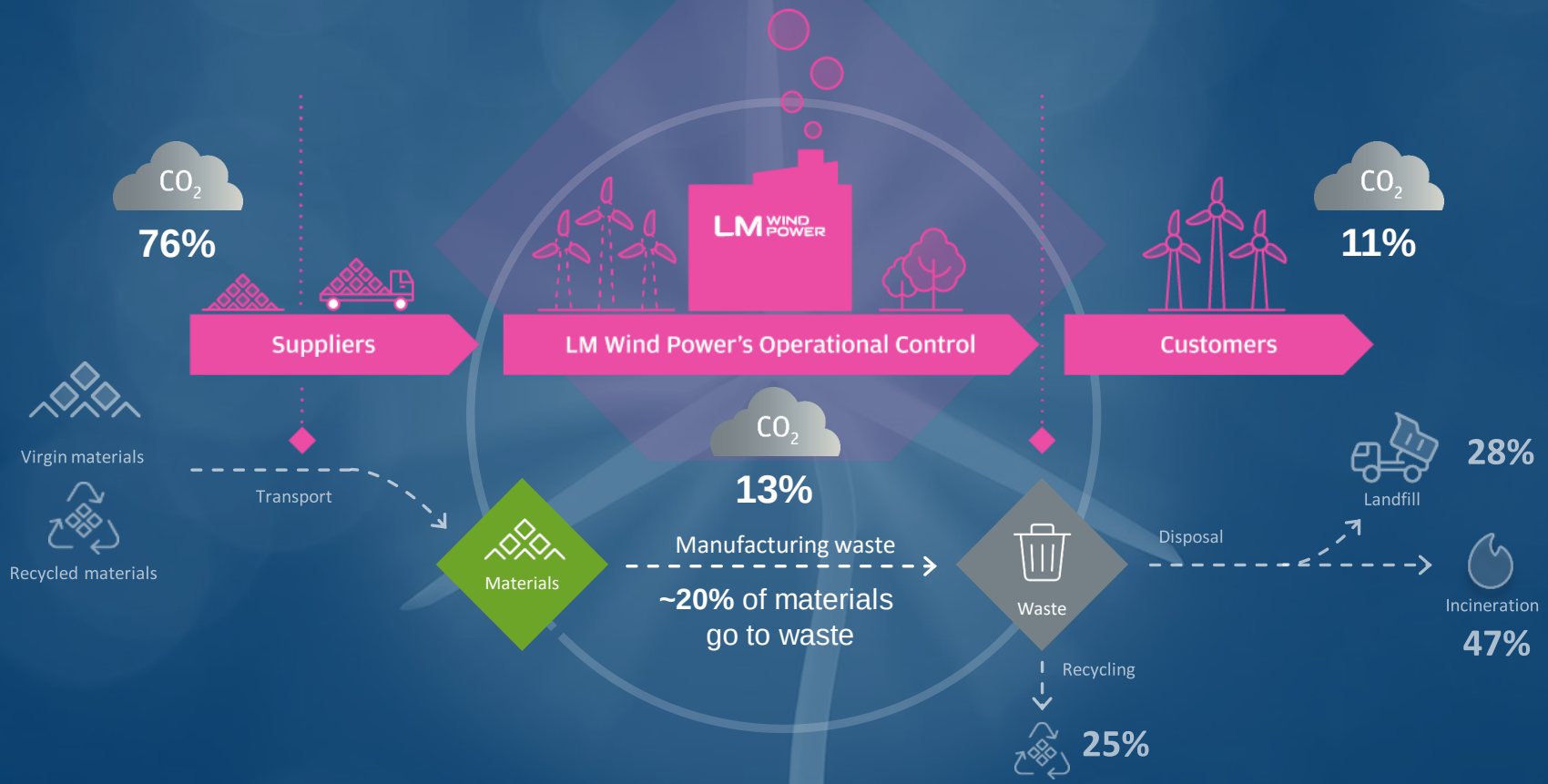

Sustainable materials at the core – From a plastic bottle to a wind turbine blade

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Developing new materials requires long-term investment in R&I and close collaboration with suppliers

Balsa wood

How can we keep the properties of balsa, without the drawbacks? (seasonality, supply chain risks, using virgin materials)

PET

2017: First 40+ meter blade with full PET foam as the core material

2020: 60% of core material in LM blades is PET

Recycled PET (R-PET)

2018: 11% R-PET

2019: 54% R-PET

2020: **79% R-PET**

*Engaging with suppliers to increase recycled content reduces risks in our supply chain **and** improves sustainability of our products*

Visit www.**lmwindpower.com** for more information

ZEBRA (Zero wastE Blade ReseArch) project – Circular economy must link the full value chain

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Cross-sector partnerships and new value chains are required to realize the potential of manufacturing and material innovations in a circular economy

ETIP Wind
EUROPEAN TECHNOLOGY & INNOVATION PLATFORM ON WIND ENERGY

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Towards a 100% sustainable wind energy sector

Recommended research actions

- Mapping and evaluation of sustainable material system potential suitable for use in manufacture of wind turbine blades.
- Development of new high-performance materials matching or outperforming current state of the art materials for wind turbine blades and securing full sustainable and easily recyclable blades at end of life.
- Demonstration of the new developed materials in sustainable design of wind turbine blades.

https://etipwind.eu/roadmap/

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Thank you for your time!

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