Recycling materials from end of life wind turbines blades

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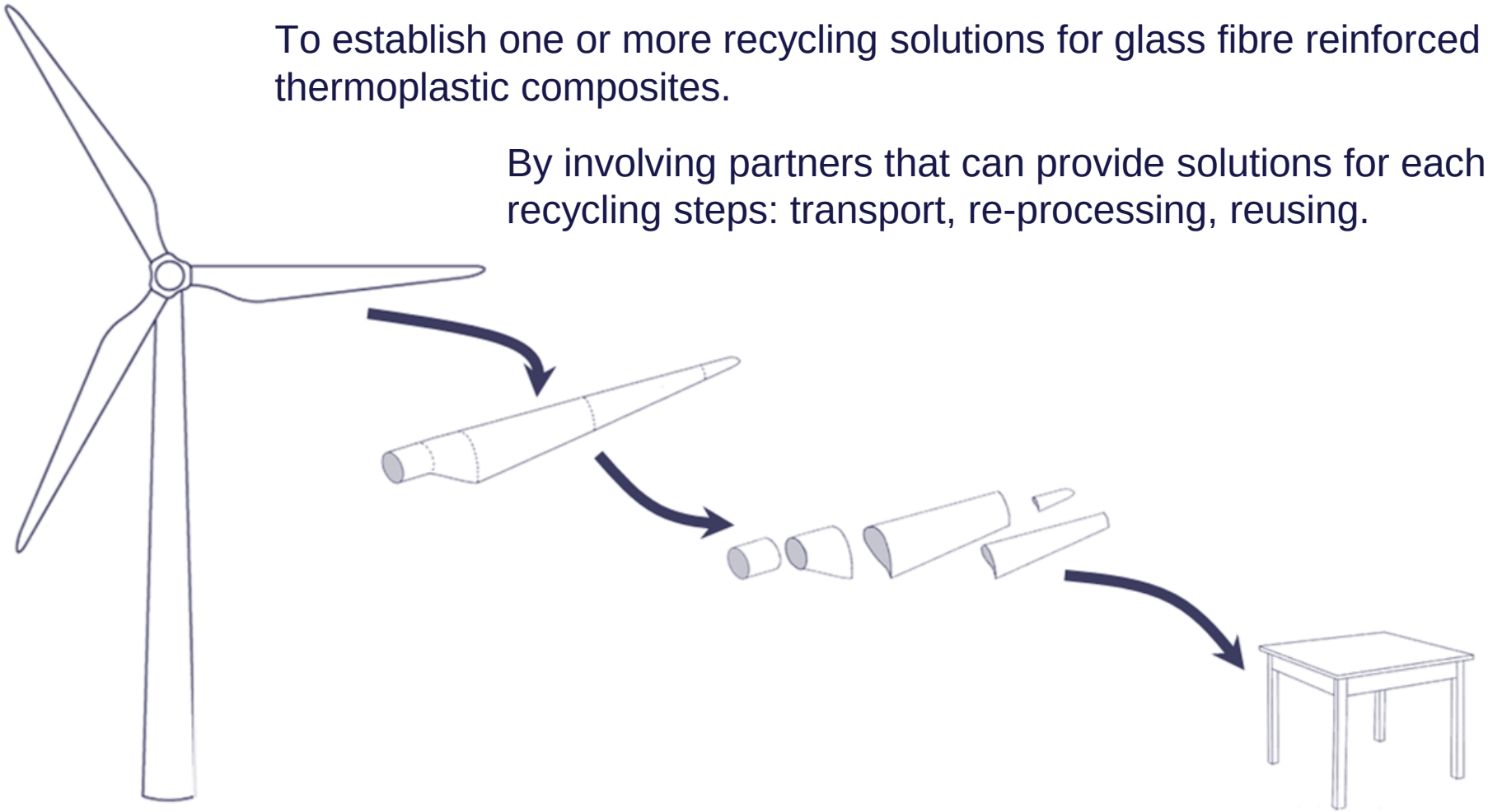
The GenVind project 2012 - 2016

To establish one or more recycling solutions for glass fibre reinforced thermoset and thermoplastic composites.

By involving partners that can provide solutions for each of the many recycling steps: transport, re-processing, reusing.



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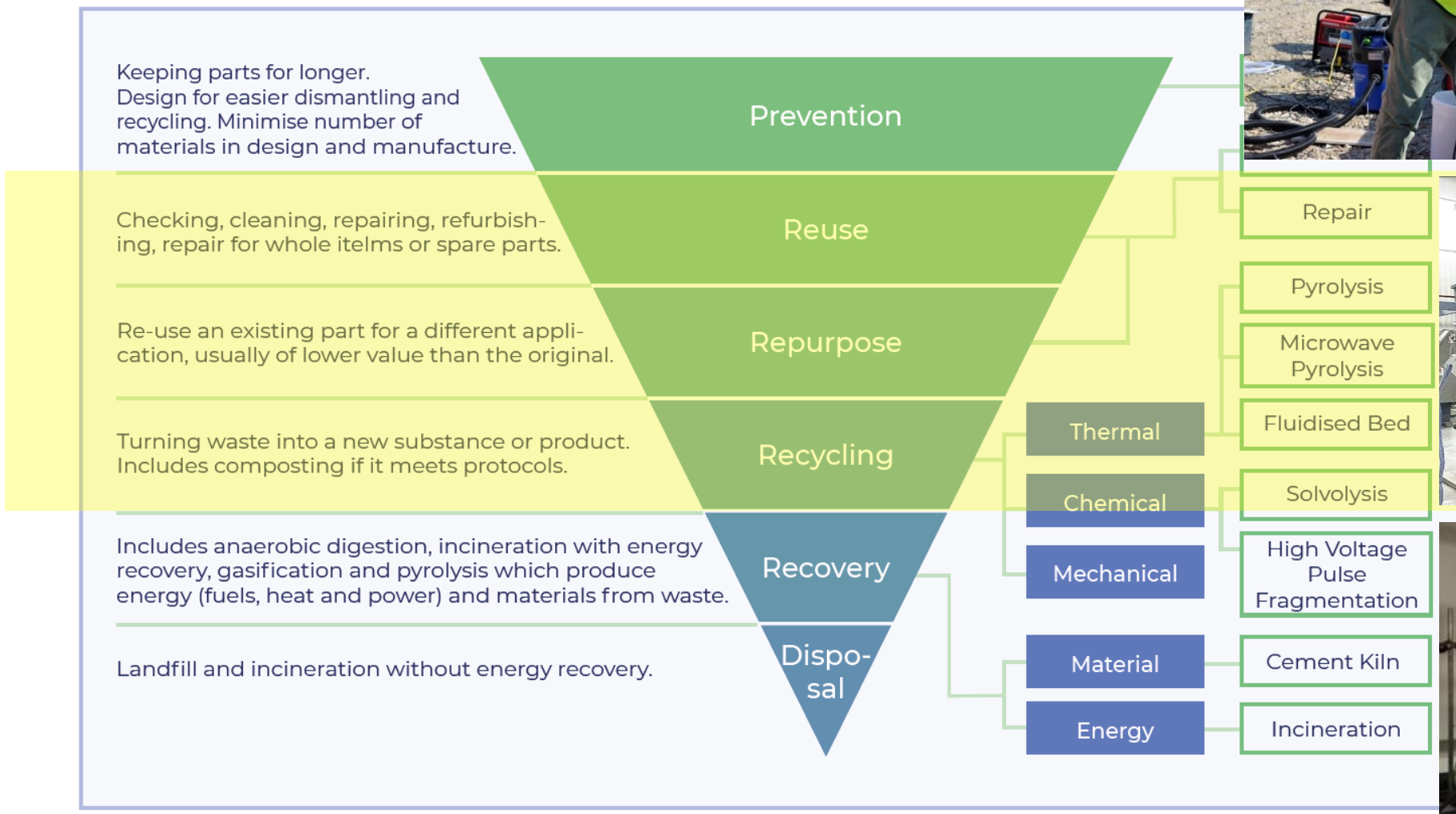
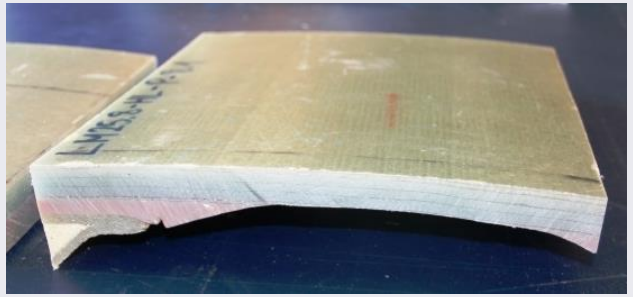


Reference: Suschem, Polymer Composites Circularity – White paper

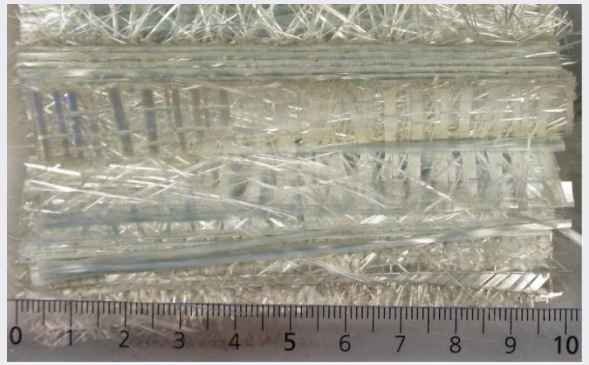
The GenVind project 2012 - 2016

Composites



Shredded composites

Fibres and resin



The GenVind project 2012 - 2016

Conclusions and learnings

1. **How much?** The industries interested in reusing /recycling materials from wind turbine blades want to know the volume of material they can count on to plan their business case.

2. **Material specification** Materials from wind turbine blades will replace a raw material in a process. The industries want to know the specification of that material, like you would expect from any other raw material. It could be: particle size, fiber content, type of matrix material used, chemical composition.

3. **Preferred solutions according to LCA and from an environmental point of view** first reuse and lifetime extension, then cement recycling solutions with energy recovery.

How much?

35.000 tons/year from 2020

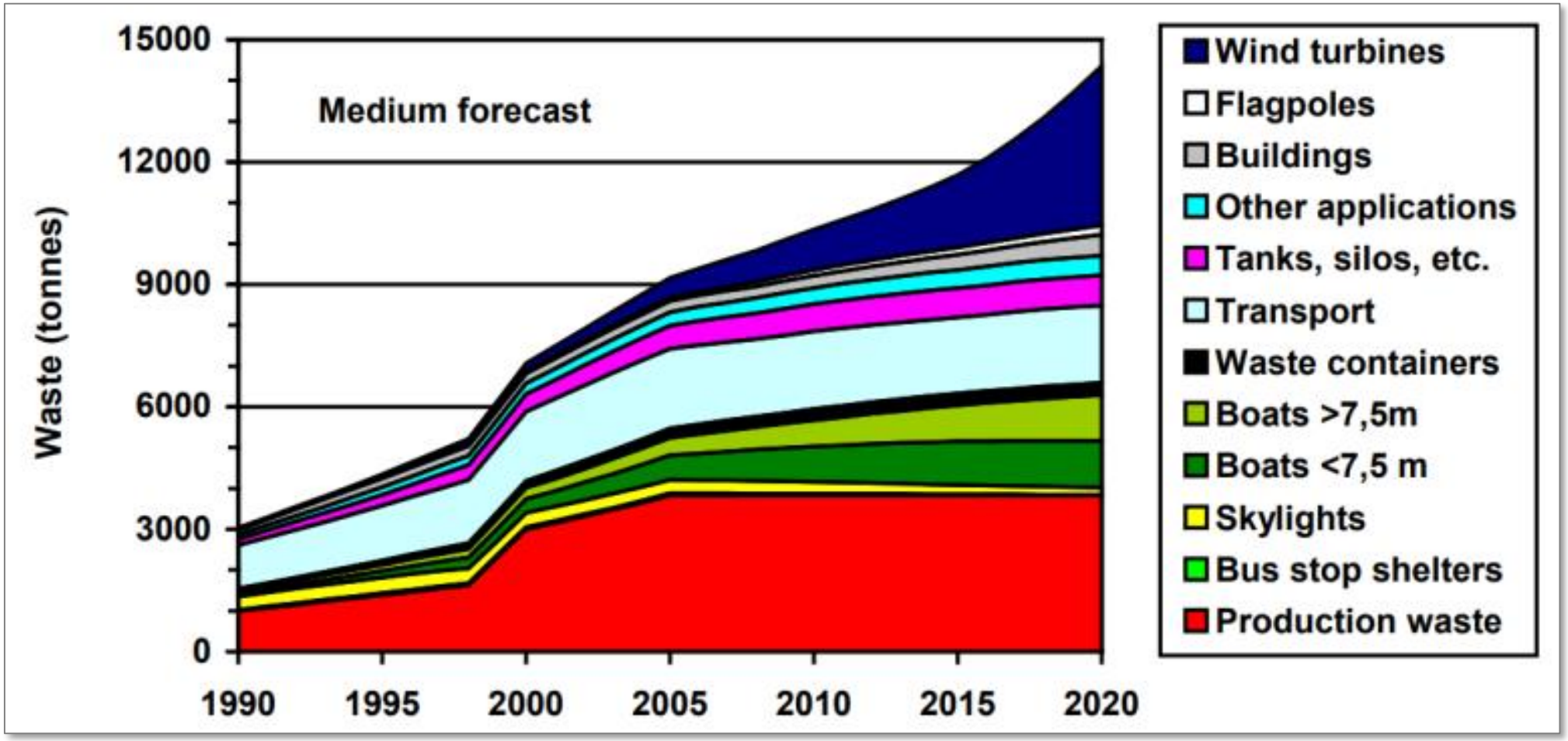
Estimation and prognosis based on:

- Bill of material;
- Tons/MW;
- Targets to be achieved;
- Lifetime of 20 years.

- ….
- How does reuse affect this number?
- How does a lifetime of 15 or 25 years affect this number?
- It’s coming from different places
- (In different conditions and shapes)

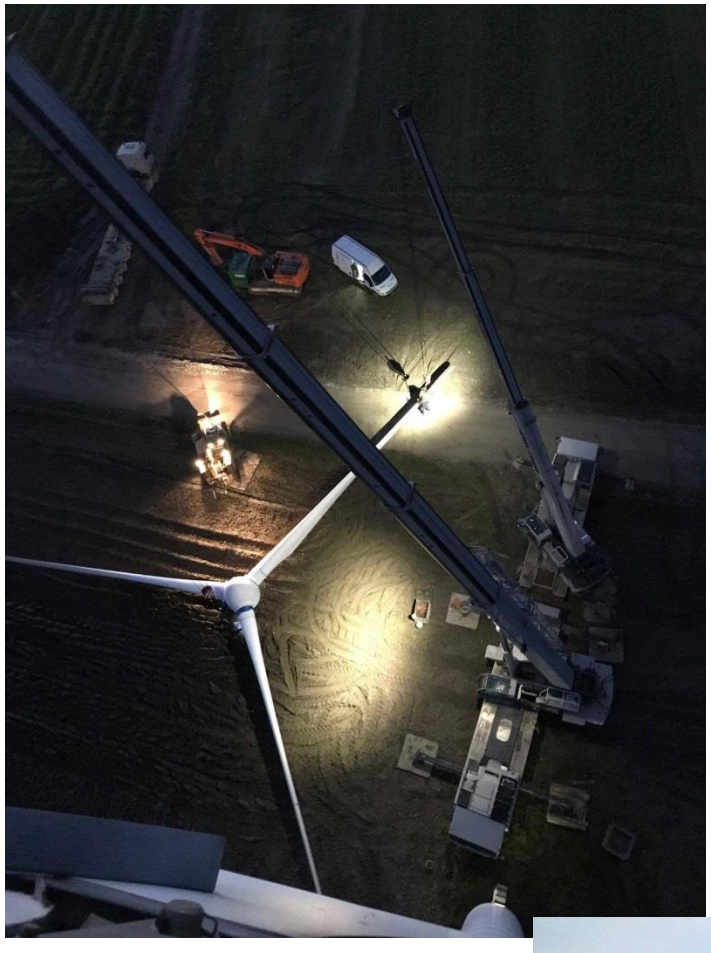
Reference: Wind Europe

How much?



Reference: C. Lassen and S. H. Jensen, Armeret epoxy- og polyesterplast - forbrug og affaldsmængder, Miljøprojekt Nr. 656, Miljøstyrelsen Miljøministeriet (2002) 79pp

J. S. Justesen and L. L. Nielsen , Danmark uden affald - Ressourceplan for affaldshåndtering 2013-2018 – Høringsudkast November 2013, Miljøstyrelsen (2013)



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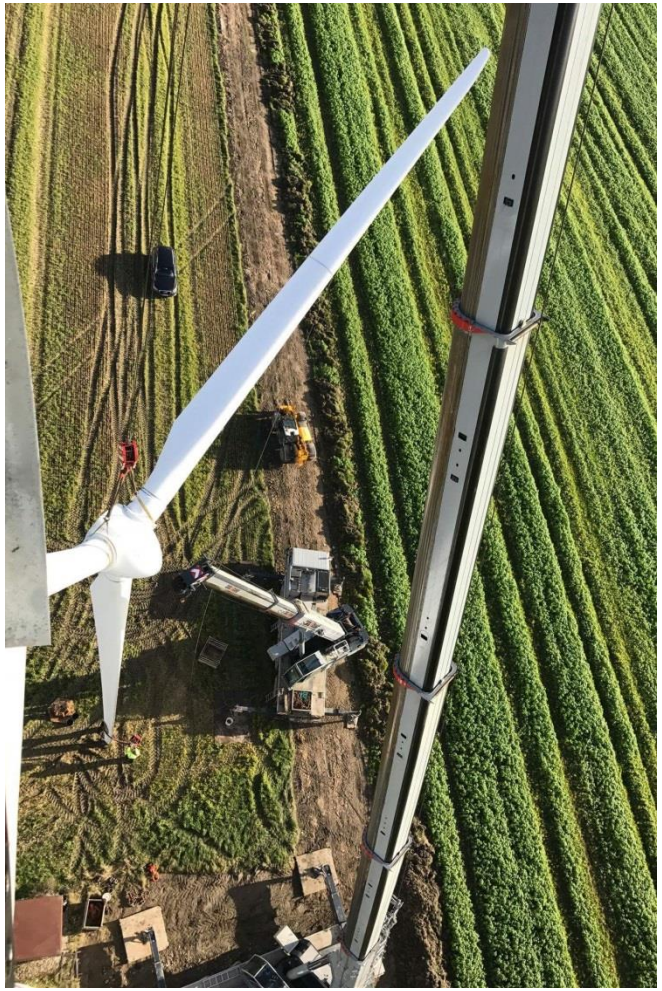

Reference: Naturlig energi Vindkraftmagasin 41 – (November-December 2018) - https://www.pjwindpower.com/da/ - http://www.windmarket.eu

Summary

What do we have?

Variable flow of material

- Volume
- Location
- Quality
- Timing

Why it does not work?

- Missing information on the flow of material.
- Glass fibres reinforced thermoset polymer cannot be melted or soften to be reshaped.
- Raw material is cheaper and of better quality.

What have we tried?

Range of (complementary) recycling techniques

How to move on now?

- Improve traceability of end of life wind turbine blades. Extended Producers Responsibility (EPR).
- Increase cost of recycling.
- Integrate recycling into design of composite products

For the future blades? Design for recycling with material selection, component design and recycling process invention.

With these end of life issues: are we sustainable? Or when are we not? Wind turbine blade lasting for ever? Whole wind turbine recycling: are the other part that easy to recycle?

Thank you for your attention!