

Powering
sustainability





Sustainability is the only way for a better future

Increasing component recyclability is high on our agenda and we are committed to producing 100% recyclable turbines by 2040

Recyclability is at Siemens Gamesa heart

While it is critical to hit net-zero targets and provide clean energy to the world, its rollout must be done in a sustainable way, actively protecting the environment and supporting a circular economy with a reduced reliance on resources. Our responsibilities to society, to the environment, to our industry and our colleagues extends beyond our core work,

however, stretching into every aspect of our activities.

And at the heart of it, we are aware of our responsibility, as one of the industry leaders, to find sustainable ways to manage turbine components at the end of their life.

Recommended practices for main material groups



Ferrous and non-ferrous metals

It is recommended to sort the metals by alloy type, when applicable, to ease recycling. The recycling destination for steel and cast iron will typically be re-melting for new steel and iron applications. Aluminum can be found at various places in the turbine e.g. as ladders, platforms or in cables and copper is used mainly in the nacelles and in the cables. Sorting aluminum and copper into clean fractions can ease recyclability. The recycling destination for aluminum and copper will typically be re-melting for new applications.



Plastics

Plastics are further separated into specific types based on their chemical composition. Polyethylene (PE), polypropylene (PP), and polyvinylchloride (PVC) for example, all belong to the recyclable thermoplastics, however, they are incompatible with each other and need to be recycled in individual fractions. The recycling destination for plastics will typically be mechanical shredding and use as feedstock for new plastic applications.



Composite materials

Composite materials can be recycled using chemical, thermal or mechanical processes. It is recommended to search for applicable recycling options, such as cement production, for the composite materials. Glass fibers can either be used as acoustics, in new panels or re-melted into new fibers (for a full recyclable solution, see Siemens Gamesa RecyclableBlade).



Oils/Grease

Oil and lubricants need to be drained before separating the components and should be contained in a leak proof container, intended for this purpose. Oil can be re refined into a base stock for lubricating oil, when cleaned of contaminants such as dirt, water, used additives, and fuel. It is recommended to deliver contained oils and lubricant at designated centers for recycling these. The recycling destination for re-refined lubricating and hydraulic oils are usually as base stock material for new lubricating and hydraulic oils.



Cables

Cables can be mechanically separated, and the individual materials can be recycled. The recycling destination cables will into the individual materials, where the metals will be re-melted and the plastics will be granulated and used for new plastic production.



Electrical and electronic equipment (EEE)

These are most often a mix of various materials, which contains precious metals of varying amounts and a mix of plastic and metals, which should be separated to the practical degree possible.



Foundation materials

Foundation materials can be recycled by crushing the concrete foundation, removing impurities from the concrete and separate into aggregates in relevant sizes. Steel and concrete should be separated. Use cases for secondary concrete are base for new asphalt, concrete aggregate, erosion barriers, and other options.

Siemens Gamesa RecyclableBlade

Siemens Gamesa is introducing the RecyclableBlade – a new pioneering blade solution that enables the blade components to be recovered and recycled and a major step towards achieving 100% recyclability of our turbines. For the first time in the industry we are able to separate and recycle the blade materials to be used in new applications, like construction, consumer goods, or the automotive industry.

It is based on a new resin technology that allows the thermo set resin to be unset upon decommissioning. Immersing the blades in a mild acidic solution at elevated temperatures, the resin dissolves, allowing the materials to be separated and recycled.

Siemens Gamesa started the process for offshore blades during 2018 and validated the new resin system through laboratory testing in 2020 - and in early 2021 the first full-scale blades using the RecyclableBlade resin were produced.

With the RecyclableBlade, Siemens Gamesa is leading the way to a sustainable future.



Recyclable turbine

As the number of installations and turbine sizes continue to increase, the call for wind circularity is becoming ever more important with some countries announcing strict requirements for wind turbine’s recyclability.

As a leading company in the wind industry, we are committed to sustainability and circularity in wind. Today, the recyclability level of Siemens Gamesa onshore turbines, including foundations, exceeds 90%.

The following tables, present multiple Siemens Gamesa turbine models, its materials composition and estimated recyclability levels.

Turbine materials and recyclability rates

Material	Recyclability rate
Ferrous and non-ferrous metals	96%
Plastics	50%
Epoxy resin	0%
Glass fiber	35%
Carbon fiber	50%
Oils/Grease	50%
Cables	80%
Electric/electronic components	50%
Glass-fiber reinforced plastics	0%
Paint	0%
Cellulose insulation	0%
Foundation material	95%



Siemens Gamesa turbines recyclability rates¹

	SG 7.0-170			SG 5.0-145 (2.0)		SG 3.4-132		
Tower height (m)	115	135	155	102.5	84	97	114	134
Turbine + foundation	96.68%	97.2%	97.4%	96.47%	95.71%			
Rotor only (blades + hub) ²	90.91%			94.81%	90.66%			

Percentage weight based.

⁽¹⁾ Values indicated are achievable recycling rates based on common recycling processes for the specific material types. The responsibility of achieving these values is by the Employer and Siemens Gamesa cannot be held accountable for them.

⁽²⁾ With RecyclableBlade.

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