

TECHNICAL SPECIFICATION

**Wind energy generation systems -
Part 28-2: Decommissioning and preparation for recycling**

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Wind energy generation systems – Part 28-2: Decommissioning and preparation for recycling

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IEC 61400-28-2 has been prepared by IEC technical committee 88: Wind energy generation systems. It is a Technical Specification.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
88/1182/DTS	88/1194/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 61400 series, published under the general title *Wind energy generation systems*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

The purpose of this document is to define the framework conditions of decommissioning and preparation for recycling of wind turbines, which includes the tasks and considerations of each of the steps of the process. The objective is to provide basic high-level information on the sustainable and efficient decommissioning and dismantling arrangements for wind turbines.

This document can be used by manufacturers, asset owners, governments, operators, recyclers and personnel involved in the decommissioning and preparation for recycling of wind turbines.

1 Scope

The scope of this part of IEC TS 61400-28-2 is the decommissioning and preparation for recycling of wind turbines.

This scope includes all the tasks and on-site considerations of the different process steps, from the beginning of the dismantling phase, material preparation and arrangement, and preparation for shipment to re-using or recycling facilities. Wind turbines in the context of this document include blades, hubs, nacelles, towers, foundations, generators, gearboxes, cables, electrical equipment, transformers, and any other equipment that can be dismantled from wind turbines and not listed before.

This document does not cover the offshore wind farms, balance of wind plants or actual re-use or recycling methods, which will be an industry on its own and driven by its own legal, environmental and economic forces. Balance of wind plants here includes roads, drainage, cabling to substation and grid, maintenance/spare part facility, civil and electrical substation or meteorological mast.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61400-1, *Wind energy generation systems - Part 1: Design requirements*

IEC TS 61400-28:2025, *Through-life management and life extension of wind power assets*

IEC TS 61400-30:2023, *Safety of wind turbine generators - General principles for design*

IEC Guide 109:2012, *Environmental aspects - Inclusion in electrotechnical product standards*

ISO 13315-1:2024, *Environmental management for concrete and concrete structures - Part 1: General principles*

ISO 13857:2019, *Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO 22450:2020, *Recycling of rare earth elements - Requirements for providing information on industrial waste and end-of-life products*

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IEC 60050-395:2014, *International Electrotechnical Vocabulary (IEV) - Part 395: Nuclear instrumentation - Physical phenomena, basic concepts, instruments, systems, equipment and detectors*

IEC 60050-903, *International Electrotechnical Vocabulary (IEV) - Part 903: Risk assessment*

ISO/IEC Guide 51:2014, *Safety aspects - Guidelines for their inclusion in standards*

IEC TS 61400-30:2023, *Wind energy generation systems - Part 30: Safety of wind turbine generators - General principles for design*

ISO 472:2013, *Plastics - Vocabulary*

ISO 6707-1:2020, *Buildings and civil engineering works - Vocabulary - Part 1: General terms*

ISO 6814:2009, *Machinery for forestry - Mobile and self-propelled machinery - Terms, definitions and classification*

ISO 8887-2:2023, *Technical product documentation - Design for manufacturing, assembling, disassembling and end-of-life processing - Part 2: Vocabulary*

ISO 10786:2025, *Space systems - Structural components and assemblies*

ISO 12749-3:2024, *Nuclear energy, nuclear technologies, and radiological protection - Vocabulary - Part 3: Nuclear installations, processes and technologies*

ISO 13824:2020, *Bases for design of structures - General principles on risk assessment of systems involving structures*

ISO 16290:2013, *Space systems - Definition of the Technology Readiness Levels (TRLs) and their criteria of assessment*

ISO/TS 22002-5:2019, *Prerequisite programmes on food safety - Part 5: Transport and storage*¹

ISO 24419-1:2023, *Mine closure and reclamation - Managing mining legacies - Part 1: Requirements and recommendations*

ISO 59004:2024, *Circular economy - Vocabulary, principles and guidance for implementation*

ISO 59020:2024, *Circular economy - Measuring and assessing circularity performance*

DIN SPEC 4866:2020-08, *Sustainable dismantling, disassembly, recycling and recovery of wind turbine*

EN 45555:2019, *General methods for assessing the recyclability and recoverability of energy-related products*

¹ Withdrawn and replaced by ISO 22002-5:2025.

WINDEUROPE: Decommissioning of Onshore Wind Turbines Industry Guidance Document [online]. Edited by Rory O'Sullivan. November 2020. Available at <https://windeurope.org/intelligence-platform/product/decommissioning-of-onshore-wind-turbines/> [viewed 2026-03-26]

IEA Wind TCP TASK 45. Deliverable 4.1: Preliminary summary of policies, legislation, guidelines and initiatives that address the end-of-life of wind turbine blades [online]. Edited by Maarten Lobregt. December 2022. Available at https://iea-wind.org/wp-content/uploads/2022/12/IEA-Task-45-WP4-Preliminary-Summary-of-Regulations-and-Policies_SHORT.pdf [viewed 2026-03-26]

CLEANPOWER: Renewable Energy Facility Decommissioning: Industry Recommendations [online]. Edited by Hilary Clark. January 2021. Available at https://cleanpower.org/wp-content/uploads/gateway/2021/01/Final_Decommissioning-Fact-Sheet_Oct21.pdf [viewed 2026-03-26]

ETIPWIND: HOW WIND IS GOING CIRCULAR blade recycling[online]. Edited by Sabina Potestio. September 2019. Available at <https://etipwind.eu/publications/> [viewed 2026-03-26]
