



Brussels, **XXX**  
[...](2025) **XXX** draft

ANNEX

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**to the**

**COMMISSION IMPLEMENTING REGULATION EU.../...**

**on laying down rules for the application of Regulation (EU) 2024/1735 of the European Parliament and of the Council as regards the list of net-zero technology final products and their main specific components for the purposes of assessing the contribution to resilience**

## ANNEX

### List of net-zero technology final products and their main specific components for the purposes of the assessment of the contribution to resilience

	Sub-categories of net-zero technologies	Final products	Main specific components
<b>Solar technologies</b>	Photovoltaic (PV) technologies	<ul style="list-style-type: none"> <li>– Solar photovoltaic (PV) systems</li> </ul>	<ul style="list-style-type: none"> <li>– PV grade polysilicon</li> <li>– PV grade silicon ingots or equivalent<sup>1</sup></li> <li>– PV wafers or equivalent<sup>1</sup></li> <li>– PV cells or equivalent<sup>1</sup></li> <li>– Solar glass</li> <li>– PV modules</li> <li>– PV inverters</li> <li>– PV trackers for large-scale plants</li> </ul>
	Solar thermal electric technologies	<ul style="list-style-type: none"> <li>– Concentrated solar power (CSP) plants</li> </ul>	<ul style="list-style-type: none"> <li>– CSP reflectors</li> <li>– CSP trackers</li> <li>– CSP receivers (point or line)</li> </ul>
	Solar thermal technologies	<ul style="list-style-type: none"> <li>– Solar thermal systems</li> </ul>	<ul style="list-style-type: none"> <li>– Solar thermal collectors (including flat-plate, evacuated tube, concentrating systems and air collectors)</li> <li>– Solar thermal absorbers</li> <li>– Solar glass</li> </ul>

<sup>1</sup> The term ‘equivalent’ refers to similar steps or key enabling technologies needed for thin-film, organic, tandem or other PV technologies.

	Sub-categories of net-zero technologies	Final products	Main specific components
			– Solar thermal trackers
	Other solar technologies		
<b>Onshore wind and offshore renewable technologies</b>	Onshore wind technologies	– Onshore wind turbines	<ul style="list-style-type: none"> <li>– Nacelles (assembly)</li> <li>– Rotor hubs</li> <li>– Direct drive generators / drivetrains and gearbox drivetrains</li> <li>– Permanent magnets of wind turbines</li> <li>– Gearboxes of wind turbines</li> <li>– Blades</li> <li>– Towers</li> </ul>
	Offshore wind technologies	– Offshore wind turbines	<ul style="list-style-type: none"> <li>– Nacelles (assembly)</li> <li>– Rotor hubs</li> <li>– Direct drive generators/drivetrains and gearbox drivetrains</li> <li>– Permanent magnets of wind turbines</li> <li>– Gearboxes of wind turbines</li> <li>– Blades</li> <li>– Towers</li> <li>– Foundations / floaters (for offshore wind)</li> </ul>

	<b>Sub-categories of net-zero technologies</b>	<b>Final products</b>	<b>Main specific components</b>
	Other offshore renewable technologies	<ul style="list-style-type: none"> <li>– Tidal stream energy technologies</li> <li>– Wave energy technologies</li> </ul>	
<b>Battery and energy storage technologies</b>	Battery technologies	<ul style="list-style-type: none"> <li>– Battery packs</li> <li>– Battery modules</li> </ul>	<ul style="list-style-type: none"> <li>– Battery packs</li> <li>– Battery modules</li> <li>– Battery cells</li> <li>– Cathode active materials</li> <li>– Anode active materials</li> <li>– Electrolytes</li> <li>– Separators</li> <li>– Current collectors (including thin copper and aluminium foils)</li> <li>– Battery management systems (BMS)</li> <li>– Battery thermal management systems (BTMS)</li> </ul>
	Energy storage technologies		
	Electrochemical storage technologies	<ul style="list-style-type: none"> <li>– Ultracapacitors / supercapacitors</li> <li>– Redox flow energy storage</li> </ul>	<ul style="list-style-type: none"> <li>– Electrolytes</li> <li>– Separators</li> <li>– Collectors</li> <li>– Electrode plates</li> </ul>

	Sub-categories of net-zero technologies	Final products	Main specific components
	Gravitational storage technologies	– Pumped hydro storage	– Reversible hydro turbines and pump runners – Distributors with adjustable / guide vanes
	Thermal energy storage technologies	– Thermal energy storage plants	– Sensible heat storage and latent heat storage mediums (including phase change materials and molten salts)
	Compressed / liquefied gas energy storage technologies		
<b>Heat pumps and geothermal energy technologies</b>	Heat pump technologies	– Heat pumps	– Heat pumps – Four-way valves – Scroll compressors
	Geothermal energy technologies	– Geothermal power plants – Geothermal direct use systems	
<b>Hydrogen technologies</b>	Electrolysers	– Alkaline electrolysers (AEL)	– Stacks – Separators (diaphragm or membranes tailored for water electrolysis) – Bipolar plates – Electrodes

	Sub-categories of net-zero technologies	Final products	Main specific components
		<ul style="list-style-type: none"> <li>– Proton exchange membrane electrolyzers (PEMEL)</li> </ul>	<ul style="list-style-type: none"> <li>– Stacks</li> <li>– Membrane electrode assemblies (3-layer) / catalyst-coated membranes</li> <li>– Porous transport layers / gas diffusion layers</li> <li>– Bipolar plates</li> </ul>
		<ul style="list-style-type: none"> <li>– Anion exchange membrane electrolyzers (AEMEL)</li> </ul>	<ul style="list-style-type: none"> <li>– Stacks</li> <li>– Membrane electrode assemblies (3-layer) / catalyst-coated membranes</li> <li>– Porous transport layers / gas diffusion layers</li> <li>– Bipolar plates</li> </ul>
		<ul style="list-style-type: none"> <li>– Solid-oxide electrolyzers (SOEL)</li> </ul>	<ul style="list-style-type: none"> <li>– Stacks</li> <li>– Electrolyte and electrodes</li> <li>– High-temperature gaskets / sealings</li> <li>– Interconnectors</li> </ul>

	Sub-categories of net-zero technologies	Final products	Main specific components
	Hydrogen fuel cells	– Proton exchange membrane fuel cells (PEMFC)	<ul style="list-style-type: none"> <li>– Stacks</li> <li>– Membrane electrode assemblies (3-layer) / Catalyst-coated membranes</li> <li>– Porous transport layer / Gas diffusion layers</li> <li>– Bipolar plates</li> </ul>
		– Solid-oxide fuel cells (SOFC)	<ul style="list-style-type: none"> <li>– Stack</li> <li>– Electrolyte and electrodes</li> <li>– High-temperature gaskets / sealings</li> <li>– Interconnectors</li> </ul>
	Other hydrogen technologies	<ul style="list-style-type: none"> <li>– Hydrogen distribution</li> <li>– Hydrogen storage</li> </ul>	<ul style="list-style-type: none"> <li>– Onboard hydrogen storage</li> <li>– Stationary (high-pressure) storage tanks</li> </ul>
<b>Sustainable biogas and biomethane technologies</b>	Sustainable biogas technologies	– Sustainable biogas plants	<ul style="list-style-type: none"> <li>– Anaerobic digesters / Fermentation tanks</li> </ul>
	Sustainable bio-methane technologies	– Sustainable biomethane plants	<ul style="list-style-type: none"> <li>– Anaerobic digesters / Fermentation tanks</li> <li>– Biomethane upgrading units</li> </ul>

	<b>Sub-categories of net-zero technologies</b>	<b>Final products</b>	<b>Main specific components</b>
<b>CCS technologies</b>	Carbon capture technologies	<ul style="list-style-type: none"> <li>- Absorption capture</li> <li>- Adsorption capture</li> <li>- Membrane capture</li> <li>- Solid cycles capture</li> <li>- Cryogenics capture</li> <li>- Direct air capture</li> </ul>	
	Carbon storage technologies		
<b>Electricity grid technologies</b>	Electricity grid technologies	<ul style="list-style-type: none"> <li>- Onshore substations</li> <li>- Offshore substations</li> </ul>	<ul style="list-style-type: none"> <li>- Cables and lines for electricity transmission and electricity distribution (overhead lines, underground and undersea cables, including HVDC and HVAC)</li> <li>- Switchgears</li> <li>- Circuit breakers</li> <li>- Protection relays</li> <li>- Power transformers</li> <li>- Disconnectors</li> <li>- Busbar systems</li> <li>- Electric cabinets</li> <li>- Offshore substations</li> </ul>



	Sub-categories of net-zero technologies	Final products	Main specific components
		<ul style="list-style-type: none"> <li>– Electricity transmission and distribution towers</li> </ul>	<ul style="list-style-type: none"> <li>– Electricity transmission and distribution towers</li> <li>– Electrical conductors, including advanced conductors and high temperature superconductors</li> <li>– Insulators</li> </ul>
		<ul style="list-style-type: none"> <li>– Cables and lines for electricity transmission and electricity distribution (overhead lines, underground and undersea cables, including HVDC and HVAC)</li> </ul>	<ul style="list-style-type: none"> <li>– Cables and lines for electricity transmission () and electricity distribution (overhead lines, underground and undersea cables, including HVDC and HVAC)</li> <li>– Electrical conductors, including advanced conductors and high temperature superconductors</li> <li>– Insulators</li> </ul>
		<ul style="list-style-type: none"> <li>– Power transformers</li> </ul>	<ul style="list-style-type: none"> <li>– Power transformers</li> <li>– Transformer cores</li> <li>– Transformer windings</li> <li>– Transformer tap changers</li> </ul>

	<b>Sub-categories of net-zero technologies</b>	<b>Final products</b>	<b>Main specific components</b>
	Electric charging technologies for transport	<ul style="list-style-type: none"> <li>– Electric vehicle supply equipment</li> <li>– Electric road system<sup>2</sup></li> <li>– Shore-side electricity supply equipment</li> <li>– Overhead contact lines</li> </ul>	<ul style="list-style-type: none"> <li>– Electric vehicle supply equipment</li> <li>– Shore-side electricity supply equipment</li> </ul>
	Technologies to digitalise the grid and other electricity grid technologies	<ul style="list-style-type: none"> <li>– High- and medium-voltage power electronics equipment and components (including DC technology)</li> <li>– Flexible alternating current transmission system (FACTS) technology</li> <li>– Smart meters / advanced metering infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>– High- and medium-voltage power electronics equipment and components (including DC technology)</li> <li>– Flexible alternating current transmission system (FACTS) technologies</li> <li>– Smart meters / advanced metering infrastructures</li> </ul>

<sup>2</sup> The term ‘electric road system’ (also known as dynamic charging) refers to equipment along the road that supplies power to vehicles while they are in motion. This final product includes both conductive and inductive charging.

	<b>Sub-categories of net-zero technologies</b>	<b>Final products</b>	<b>Main specific components</b>
<b>Nuclear fission energy technologies</b>	Nuclear fission energy technologies	– Nuclear fission power plants	<ul style="list-style-type: none"> <li>– Fuel elements</li> <li>– Reactor (pressure) vessels</li> <li>– Primary piping</li> <li>– Steam generators</li> <li>– Safety systems</li> <li>– Instrumentation and control systems</li> </ul>
	Nuclear fuel cycle technologies	– Nuclear fuel cycles	<ul style="list-style-type: none"> <li>– Centrifuges</li> <li>– Gas handling and flow control systems</li> <li>– Chemical processing equipment</li> <li>– Waste vitrification equipment</li> <li>– Storage and disposal cylinders and casks</li> </ul>

	<b>Sub-categories of net-zero technologies</b>	<b>Final products</b>	<b>Main specific components</b>
<b>Sustainable alternative fuels technologies</b>	Sustainable alternative fuels (SAF) technologies	– SAF plants	<ul style="list-style-type: none"> <li>– Thermochemical, chemical and biochemical / biological reactors to convert biomass into bio-intermediates and/or syngas</li> <li>– Reactors and post-treatment units to convert bio-intermediates and/or syngas into SAF</li> </ul>
<b>Hydropower technologies</b>	Hydropower technologies	– Hydro turbine systems	<ul style="list-style-type: none"> <li>– Hydro turbine runners</li> <li>– Distributors with adjustable / guide vanes</li> </ul>
<b>Other renewable energy technologies</b>	Osmotic energy technologies		
	Ambient energy technologies, other than heat pumps		
	Biomass technologies		
	Landfill gas technologies		
	Sewage treatment plant gas technologies		

	<b>Sub-categories of net-zero technologies</b>	<b>Final products</b>	<b>Main specific components</b>
	Other renewable energy technologies		
<b>Energy system-related energy efficiency technologies</b>	Energy system-related energy efficiency technologies	<ul style="list-style-type: none"> <li>– Energy management systems (EMS)</li> <li>– Building automation systems (BAS)</li> <li>– Automated demand responses (ADR)</li> <li>– Variable speed drives</li> </ul>	<ul style="list-style-type: none"> <li>– Energy management systems (EMS)</li> <li>– Building automation systems (BAS)</li> <li>– Automated demand responses (ADR)</li> <li>– Variable speed drives</li> </ul>
	Heat and cold grid technologies	<ul style="list-style-type: none"> <li>– Heat and cold distribution system pipework</li> </ul>	
	Other energy system-related energy efficiency technologies		
<b>Renewable fuels of non-biological origin</b>	Renewable fuels of non-biological origin (RFNBO) technologies	<ul style="list-style-type: none"> <li>– RFNBO plants</li> </ul>	<ul style="list-style-type: none"> <li>– Reactors to convert H<sub>2</sub> and CO<sub>2</sub> into syngas or alcohol</li> <li>– Reactors to convert syngas or alcohols into RFNBOs</li> </ul>

	<b>Sub-categories of net-zero technologies</b>	<b>Final products</b>	<b>Main specific components</b>
<b>Biotech and solutions</b>	<b>climate energy</b> Biotech climate and energy solutions	<ul style="list-style-type: none"> <li>– Microorganisms (such as bacteria, yeasts, microalgae, fungi, microbial strains and methanogens) that are used to pretreat and convert feedstock into biofuels, bio-based chemicals, bio-based materials and bio-based products</li> <li>– Enzymes (such as amylase and cellulase) that are used to pretreat and convert feedstock into biofuels, bio-based chemicals, bio-based materials and bio-based products</li> </ul>	<ul style="list-style-type: none"> <li>– Microorganisms (such as bacteria, yeasts, microalgae, fungi, microbial strains and methanogens) that are used to pretreat and convert feedstock into biofuels, bio-based chemicals, bio-based materials and bio-based products</li> <li>– Enzymes (such as amylase and cellulase) that are used to pretreat and convert feedstock into biofuels, bio-based chemicals, bio-based materials and bio-based products</li> </ul>

	Sub-categories of net-zero technologies	Final products	Main specific components
<b>Transformative industrial technologies for decarbonisation</b>	Transformative industrial technologies for decarbonisation	<ul style="list-style-type: none"> <li>– Electric arc furnaces</li> <li>– Hydrogen-ready direct-reduced iron shaft furnaces</li> <li>– Submerged arc furnaces</li> <li>– Open slag bath furnaces</li> <li>– Flash calciners</li> <li>– Industrial electric boilers</li> <li>– Industrial induction heaters / furnaces<sup>3</sup></li> <li>– Industrial infrared heaters / furnaces</li> <li>– Industrial microwave heaters / furnaces</li> <li>– Industrial radio-wave heaters / furnaces</li> <li>– Industrial resistive heaters / furnaces</li> </ul>	<ul style="list-style-type: none"> <li>– Graphite or carbon electrodes for electric furnaces</li> <li>– Industrial electric boilers</li> <li>– Industrial induction heaters / furnaces</li> <li>– Industrial induction coils</li> <li>– Industrial infrared heaters / furnaces</li> <li>– Industrial infrared emitters</li> <li>– Industrial microwave heaters / furnaces</li> <li>– Industrial radio-wave heaters / furnaces</li> <li>– Industrial magnetrons</li> <li>– Industrial radio-wave heaters / furnaces</li> <li>– Radio frequency generators</li> <li>– Industrial resistive heaters / furnaces</li> </ul>
<b>CO<sub>2</sub> transport and utilisation technologies</b>	CO <sub>2</sub> transport technologies		

<sup>3</sup> The term ‘heater’ refers to low (200 C) and medium (500 C) temperature applications. The term ‘furnaces’ refers to high (1000 C) and very high (1500 C) temperature applications.

	<b>Sub-categories of net-zero technologies</b>	<b>Final products</b>	<b>Main specific components</b>
	CO <sub>2</sub> utilisation technologies	<ul style="list-style-type: none"> <li>– Thermochemical utilisation</li> <li>– Electrochemical utilisation</li> </ul>	
<b>Wind and electric propulsion technologies for transport</b>	Wind propulsion technologies	<ul style="list-style-type: none"> <li>– Flettner rotors</li> <li>– Suction wing sails</li> <li>– Towing kites</li> <li>– Rigid wing sails</li> </ul>	
	Electric propulsion technologies	<ul style="list-style-type: none"> <li>– Electric propulsion systems for road transport</li> <li>– Electric propulsion systems for rail transport</li> <li>– Electric propulsion systems for waterborne transport</li> <li>– Electric propulsion systems for air transport</li> </ul>	<ul style="list-style-type: none"> <li>– Automotive traction electric motors</li> <li>– Permanent magnet of traction electric motor</li> <li>– Automotive battery packs</li> <li>– Automotive fuel cells</li> <li>– Traction inverters</li> <li>– Onboard chargers</li> <li>– Onboard hydrogen storage</li> <li>– Rail propulsion electric motors</li> <li>– Waterborne propulsion electric motors</li> </ul>



	<b>Sub-categories of net-zero technologies</b>	<b>Final products</b>	<b>Main specific components</b>
<b>Other nuclear technologies</b>	Other nuclear technologies		