2025/1463

28.7.2025

# COMMISSION DELEGATED REGULATION (EU) 2025/1463

## of 23 May 2025

## amending Regulation (EU) 2024/1735 of the European Parliament and of the Council as regards the identification of sub-categories within net-zero technologies and the list of specific components used for those technologies

**(Text with EEA relevance)**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EU) 2024/1735 of the European Parliament and of the Council of 13 June 2024 on establishing a framework of measures for strengthening Europe's net-zero technology manufacturing ecosystem and amending Regulation (EU) 2018/1724 ([1]) and in particular Article 46(7) thereof,

Whereas:

(1) Regulation (EU) 2024/1735 established a legal framework that strengthens the Union's resilience and security of supply in the field of net-zero technologies, by enhancing the Union's capacity for manufacturing, deployment and innovation in that field.

(2) The Annex to Regulation (EU) 2024/1735 sets out in a non-exhaustive manner a list of specific components considered to be primarily used for the production of net-zero technologies.

(3) Specific components and specific machinery not included in that list may still fall within the scope of Regulation (EU) 2024/1735 if the project promoter can provide evidence, for example market studies or off-take agreements, to a national competent authority showing that the specific components or machinery are primarily used for the production of net-zero technologies.

(4) A comprehensive assessment, based on a methodological analysis of the supply chains of the net-zero technologies, has been carried out by the Commission. That assessment took into account in particular the commercial availability of the components, the appropriate level of detail and developments in technology.

(5) To identify specific components considered to be primarily used for the production of net-zero technologies, four criteria were applied in the assessment, namely their specific nature; their commercial availability; the fact that they are always primarily used for that production; and their essential character. As a first step, each of the net-zero technologies and, where necessary, sub-categories were further defined using the criteria listed above and in line with the definitions of those net-zero technologies in Regulation (EU) 2024/1735. As a second step, each sub-category was analysed to identify the components fulfilling the four criteria used. Components fulfilling those criteria were considered as primarily used for the production of net-zero technologies.

(6) An additional column 'Final products' should be added in the Annex to Regulation (EU) 2024/1735 for explanatory purposes. That additional column allows to put the elements in the list of primarily used components in context and therefore enhances the comprehensibility of the Annex.

(7) Regulation (EU) 2024/1735 should therefore be amended accordingly,

([1]) OJ L, 2024/1735, 28.6.2024, ELI: http://data.europa.eu/eli/reg/2024/1735/oj.

HAS ADOPTED THIS REGULATION:

*Article 1*

The Annex to Regulation (EU) 2024/1735 is replaced by the text in the Annex to this Regulation.

*Article 2*

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 23 May 2025.

*For the Commission*
*The President*
Ursula VON DER LEYEN

*ANNEX*

**List of final products and specific components considered to be primarily used for the production of net-zero technologies**

| | Sub-categories of net-zero technologies | Final products | Components that are primarily used for net-zero technologies |
|---|---|---|---|
| **Solar technologies** | Photovoltaic (PV) technologies | — Solar PV systems | — PV grade polysilicon<br>— PV grade silicon ingots or equivalent ([1])<br>— PV wafers or equivalent ([1])<br>— PV cells or equivalent ([1])<br>— Solar glass<br>— PV encapsulants<br>— PV ribbons<br>— PV backsheets<br>— PV connectors<br>— PV junction boxes<br>— PV modules<br>— PV inverters<br>— PV trackers and their mounting structures |
| | Solar thermal electric technologies | — Concentrated solar power (CSP) plants | — CSP reflectors<br>— CSP trackers and their mounting structures<br>— CSP receivers (point or line) |
| | Solar thermal technologies | — Solar thermal systems | — Solar thermal collectors (including flat-plate, evacuated tube, concentrating systems and air collectors)<br>— Solar thermal absorbers<br>— Solar glass<br>— Solar thermal trackers and their mounting structures |
| | Other solar technologies | — PV-thermal collectors (PVT) | |
| **Onshore wind and offshore renewable technologies** | Onshore wind technologies | — Onshore wind turbines | — Nacelles (assembly)<br>— Yaw systems<br>— Pitch systems<br>— Rotor hubs<br>— Main, yaw and pitch bearings<br>— Yaw brakes<br>— Rotor brakes<br>— Direct drive drivetrains (including generator) and/or gearbox drivetrains (including generator)<br>— Permanent magnets of wind turbines<br>— Gearboxes of wind turbines<br>— Blades<br>— Towers |

| | Sub-categories of net-zero technologies | Final products | Components that are primarily used for net-zero technologies |
|---|---|---|---|
| | Offshore wind technologies | — Offshore wind turbines | — Nacelles (assembly)<br>— Yaw systems<br>— Pitch systems<br>— Rotor hubs<br>— Main, yaw and pitch bearings<br>— Yaw brakes<br>— Rotor brakes<br>— Direct drive drivetrains (including generator) and/or gearbox drivetrains (including generators)<br>— Permanent magnets of wind turbines<br>— Gearboxes of wind turbines<br>— Blades<br>— Towers<br>— Foundations / floaters |
| | Other offshore renewable technologies | — Tidal stream energy technologies<br>— Wave energy technologies | |
| **Battery and energy storage technologies** | Battery technologies | — Batteries ([2]) | — Battery packs<br>— Battery modules<br>— Battery cells<br>— Cathode active materials<br>— Anode active materials<br>— Electrolytes<br>— Separators<br>— Binders<br>— Current collectors (including thin copper, aluminium, nickel and carbon foils)<br>— Battery management systems (BMS)<br>— Battery thermal management systems (BTMS) |
| | Electrochemical storage technologies | — Ultracapacitors / supercapacitors<br>— Redox flow energy storage | — Electrolytes<br>— Separators<br>— Collectors<br>— Electrode plates |

| | Sub-categories of net-zero technologies | Final products | Components that are primarily used for net-zero technologies |
|---|---|---|---|
| | Gravitational storage technologies | — Pumped hydro storage | — Reversible hydro turbines and pump runners<br>— Distributors with guide vanes<br>— Large hydro butterfly valves<br>— Large hydro spherical valves<br>— Large hydro hollow-jet discharge valves |
| | Thermal energy storage technologies | — Thermal energy storage systems | — Sensible heat storage and latent heat storage mediums (including phase-change materials and molten salts)<br>— Thermochemical storage materials |
| | Compressed / liquefied gas energy storage technologies | — Compressed air energy storage<br>— Liquid air energy storage | |
| | Other energy storage technologies | — Flywheel energy storage | — Flywheel rotors |
| **Heat pumps and geothermal energy technologies** | Heat pump technologies | — Heat pumps | — Heat pumps<br>— Four-way valves<br>— Scroll compressors / heat pump rotary compressors |
| | Geothermal energy technologies | — Geothermal power plants<br>— Geothermal direct use systems | — Heat exchangers resistant to geothermal corrosive operating conditions<br>— Submersible pumps resistant to geothermal corrosive operating conditions<br>— Brine re-injection pumps |
| **Hydrogen technologies** | Electrolysers | — Alkaline electrolysers (AEL) | — Stacks<br>— Separators (diaphragm or membranes tailored for water electrolysis)<br>— Bipolar plates and end plates<br>— Electrodes<br>— Electrocatalysts optimised for electrolysers<br>— Frames and casing for electrolyser stacks assembly<br>— Gaskets / sealants |

| | Sub-categories of net-zero technologies | Final products | Components that are primarily used for net-zero technologies |
|---|---|---|---|
| | | — Proton exchange membrane electrolysers (PEMEL) | — Stacks<br>— Membrane electrode assemblies (3-layer) / catalyst-coated membranes<br>— Porous transport layers / gas diffusion layers<br>— Bipolar plates and end plates<br>— Electrocatalysts optimised for electrolysers<br>— Frames and casing for electrolyser stacks assembly<br>— Gaskets / sealants |
| | | — Anion exchange membrane electrolysers (AEMEL) | — Stacks<br>— Membrane electrode assemblies (3-layer) / catalyst-coated membranes<br>— Porous transport layers / gas diffusion layers<br>— Bipolar plates and end plates<br>— Electrocatalysts optimised for electrolysers<br>— Gaskets / sealants<br>— Frames and casing necessary for electrolyser stacks assembly |
| | | — Solid-oxide electrolysers (SOEL) | — Stacks<br>— Electrolytes and electrodes<br>— High-temperature gaskets / sealings<br>— Interconnectors /meshes and end plates<br>— Electrocatalysts optimised for electrolysers<br>— Contact layers<br>— Frames and casing necessary for electrolyser stacks assembly |
| | Hydrogen fuel cells | — Proton exchange membrane fuel cells (PEMFC) | — Stacks<br>— Membrane electrode assemblies (3-layer) / catalyst-coated membranes<br>— Porous transport layers / gas diffusion layers<br>— Bipolar plates and end plates<br>— Gaskets / sealants<br>— Electrocatalysts optimised for fuel cells<br>— Frames and casing necessary for fuel cell stacks assembly |

| | Sub-categories of net-zero technologies | Final products | Components that are primarily used for net-zero technologies |
|---|---|---|---|
| | | — Solid-oxide fuel cells (SOFC) | — Stacks<br>— Electrolytes and electrodes<br>— High-temperature gaskets / sealants<br>— Interconnectors /meshes and end plates<br>— Contact layers<br>— Electrocatalysts optimised for fuel cells<br>— Frames and casing necessary for fuel cell stacks assembly |
| | Other hydrogen technologies | — Hydrogen transmission and distribution networks | — Hydrogen compressors<br>— Hydrogen refuelling stations<br>— Pipelines for hydrogen transmission and distribution<br>— Hydrogen sensors<br>— Hydrogen valves |
| | | — Hydrogen storage facilities | — Onboard hydrogen storage tanks<br>— Hydrogen on-tank valves<br>— Hydrogen stationary storage tanks |
| | | — Plants for the conversion and extraction of hydrogen into and from ammonia | — Ammonia crackers |
| **Sustainable biogas and biomethane technologies** | Sustainable biogas technologies | — Sustainable biogas plants | — Anaerobic digesters / fermentation tanks<br>— Enzymes and microorganisms for sustainable biogas production<br>— Catalysts for sustainable biogas production |
| | Sustainable biomethane technologies | — Sustainable biomethane plants | — Anaerobic digesters / fermentation tanks<br>— Enzymes and microorganisms for sustainable biomethane production<br>— Biomethane upgrading units<br>— Catalysts for sustainable biomethane production |

| | Sub-categories of net-zero technologies | Final products | Components that are primarily used for net-zero technologies |
|---|---|---|---|
| **CCS technologies** | Carbon capture technologies | — Absorption capture<br>— Adsorption capture<br>— Membranes capture<br>— Solid cycles capture<br>— Cryogenics capture<br>— Direct air capture | — Solvents optimised for carbon capture<br>— Sorbents optimised for carbon capture<br>— $CO_2$ compressors |
| | Carbon storage technologies | | |
| **Electricity grid technologies** | Electricity grid technologies | — Onshore substations<br>— Offshore substations | — Cables and lines for electricity transmission and distribution, and cables connecting net-zero technologies to the electricity grid (overhead lines, underground and undersea cables, including HVDC and HVAC)<br>— Switchgears<br>— Circuit breakers<br>— Protection relays<br>— Power transformers<br>— Disconnectors<br>— Insulators<br>— Surge arrestors<br>— Capacitors<br>— Reactors<br>— Busbar systems<br>— Electric cabinets<br>— Offshore substations<br>— Inverters<br>— Converters |
| | | — Electricity transmission and distribution towers | — Electricity transmission and distribution towers<br>— Electrical conductors (including advanced conductors and high-temperature superconductors)<br>— Insulators<br>— Surge arrestors<br>— Busbar systems |

| | Sub-categories of net-zero technologies | Final products | Components that are primarily used for net-zero technologies |
|---|---|---|---|
| | | — Cables, lines, and associated accessories, for electricity transmission and distribution, and cables connecting net-zero technologies to the electricity grid (overhead lines, underground and undersea cables, including HVDC and HVAC) | — Cables and lines for electricity transmission and distribution, and cables connecting net-zero technologies to the electricity grid (overhead lines, underground and undersea cables, including HVDC and HVAC)<br>— Cable accessories, including cable joints, cable terminations and connectors<br>— Electrical conductors (including advanced conductors and high-temperature superconductors)<br>— Insulators |
| | | — Power transformers | — Power transformers<br>— Transformer cores<br>— Transformer windings<br>— Transformer tap changers |
| | Electric charging technologies for transport | — Electric vehicle supply equipment<br>— Electric road systems ([3])<br>— Shore-side electricity supply equipment<br>— Overhead contact lines<br>— Electric air transport supply equipment | — Electric vehicle supply equipment<br>— Electric vehicle charging connectors<br>— Shore-side electricity supply equipment<br>— Electric air transport supply equipment<br>— Electric air transport charging connectors |
| | Technologies to digitalise the grid and other electricity grid technologies | — High- and medium-voltage power electronics equipment and components (including DC technology)<br>— Flexible alternating current transmission system (FACTS) technologies<br>— Smart meters / advanced metering and control infrastructures | — High- and medium-voltage power electronics equipment and components (including DC technology)<br>— Flexible alternating current transmission system (FACTS) technologies<br>— Substation automation systems<br>— Smart meters / advanced metering and control infrastructures |

| | Sub-categories of net-zero technologies | Final products | Components that are primarily used for net-zero technologies |
|---|---|---|---|
| **Nuclear fission energy technologies** | Nuclear fission energy technologies | — Nuclear fission power plants | — Control rods and other neutron poison systems<br>— Core catcher<br>— Control rod drive mechanisms<br>— Fuel elements<br>— Reactor vessels<br>— Reactor internals<br>— Coolant/moderator and related purification systems<br>— Pressurisers<br>— Reactor coolant pumps / gas circulators<br>— Primary piping and valves<br>— Steam turbines<br>— Steam generators<br>— Nuclear heat exchangers<br>— Secondary system components<br>— Safety systems<br>— Monitoring, instrumentation and control systems<br>— Refuelling machines<br>— Nuclear measurement and detection systems<br>— Other components subject to the nuclear safety codes and standards |
| | Nuclear fuel cycle technologies | — Nuclear fuel cycles | — Centrifuges<br>— Gas handling and flow control systems<br>— Chemical processing equipment<br>— Waste vitrification equipment<br>— Transportation, storage and disposal cylinders, containers and casks<br>— Heavy water<br>— Safety systems<br>— Monitoring, instrumentation and control systems<br>— Other components subject to the nuclear safety codes and standards |
| **Sustainable alternative fuels technologies** | Sustainable alternative fuels technologies | — Sustainable alternative fuels plants | — Catalysts for sustainable alternative fuels production<br>— Enzymes and microorganisms for sustainable alternative fuels production |

| | Sub-categories of net-zero technologies | Final products | Components that are primarily used for net-zero technologies |
|---|---|---|---|
| | | | — Thermochemical, electrochemical, chemical, and biochemical / biological reactors to convert biomass, recycled carbon fuels into bio-intermediates and/or syngas<br>— Reactors and post-treatment units to convert bio-intermediates and/or syngas and recycled carbon fuels into sustainable alternative fuels |
| **Hydropower technologies** | Hydropower technologies | — Hydro turbine systems | — Hydro turbine runners<br>— Distributor with guide vanes<br>— Large hydro butterfly valves<br>— Large hydrospherical valves<br>— Large hydro hollow-jet discharge valves |
| **Other renewable energy technologies** | Osmotic energy technologies | | |
| | Ambient energy technologies (other than heat pumps) | | |
| | Biomass technologies | — Pellet mills<br>— Briquetting presses | — Pellet dies<br>— Briquetting compaction chambers |
| | Landfill gas technologies | | |
| | Sewage treatment plant gas technologies | | |
| | Other renewable energy technologies | | |
| **Energy system-related energy efficiency technologies** | Energy system-related energy efficiency technologies | — Energy management systems (EMS)<br>— Building automation systems (BAS)<br>— Automated demand response (ADR) | — EMS<br>— BAS<br>— ADR<br>— Variable speed drives<br>— ORC turbines |

| | Sub-categories of net-zero technologies | Final products | Components that are primarily used for net-zero technologies |
|---|---|---|---|
| | | — Variable speed drives<br>— Organic Rankine cycle (ORC) power systems | |
| | Heat and cold grid technologies | — Heating and cooling distribution system pipework | — Pipe fitters and couplers |
| | Other energy system-related energy efficiency technologies | | |
| **Renewable fuels of non-biological origin** | Renewable fuels of non-biological origin (RFNBO) technologies | — RFNBO plants | — Reactors to convert $H_2$ and $CO_2$ or $N_2$ into syngas or alcohols<br>— Reactors to convert syngas or alcohols into RFNBO<br>— Catalysts, enzymes and microorganisms for RFNBO production |
| **Biotech climate and energy solutions** | Biotech climate and energy solutions | — Microorganisms and microbial strains (including but not limited to bacteria, yeasts, microalgae, fungi, and archaea) that are used to pretreat and convert feedstock into biofuels, recycled carbon fuels and renewable fuels, bio-based and recycled carbon chemicals, biopolymers bio-based materials and bio-based products | — Microorganisms and microbial strains (including but not limited to bacteria, yeasts, microalgae, fungi, and archaea) that are used to pretreat and convert feedstock into biofuels, recycled carbon fuels and renewable fuels, bio-based and recycled carbon chemicals, biopolymers bio-based materials and bio-based products<br>— Enzymes (including but not limited to amylase and cellulase) that are used to pretreat and convert feedstock into biofuels, bio-based chemicals, bio-based materials and bio-based products, or that are used to catalyse reactions in chemical processes<br>— Biopolymers |

| | Sub-categories of net-zero technologies | Final products | Components that are primarily used for net-zero technologies |
|---|---|---|---|
| | | — Enzymes (including but not limited to amylase and cellulase) that are used to pretreat and convert feedstock into biofuels, bio-based chemicals, bio-based materials and bio-based products, or that are used to catalyse reactions in chemical processes<br>— Biopolymers | |
| **Transformative industrial technologies for decarbonisation** | Transformative industrial technologies for decarbonisation | — Electric arc furnaces<br>— Hydrogen-ready direct-reduced iron reactors<br>— Submerged arc furnaces<br>— Open slag bath furnaces<br>— Flash calciners<br>— Industrial electric boilers<br>— Industrial induction heaters / furnaces ([4])<br>— Industrial infrared heaters / furnaces<br>— Industrial microwave heaters / furnaces<br>— Industrial radio-wave heaters / furnaces<br>— Industrial resistive heaters / furnaces | — Graphite or carbon electrodes for electric furnaces<br>— Flash calciners<br>— Industrial electric boilers<br>— Industrial induction heaters / furnaces<br>— Industrial induction coils<br>— Industrial infrared heaters / furnaces<br>— Industrial infrared emitters<br>— Industrial microwave heaters / furnaces<br>— Industrial magnetrons<br>— Industrial radio-wave heaters / furnaces<br>— Radio frequency generators<br>— Industrial resistive heaters / furnaces<br>— Molybdenum electrodes for electric furnaces |

| | Sub-categories of net-zero technologies | Final products | Components that are primarily used for net-zero technologies |
|---|---|---|---|
| **$CO_2$ transport and utilisation technologies** | $CO_2$ transport technologies | — $CO_2$ transport infrastructure | — $CO_2$ compressors |
| | $CO_2$ utilisation technologies | — Thermochemical utilisation<br>— Electrochemical utilisation | — Catalysts tailored for $CO_2$ conversion processes<br>— $CO_2$ electrolysers |
| **Wind and electric propulsion technologies for transport** | Wind propulsion technologies | — Flettner rotors<br>— Suction wing sails<br>— Towing kites<br>— Rigid and semi-rigid wing sails | |
| | Electric propulsion technologies | — Electric propulsion systems for road and off-road transport<br>— Electric propulsion systems for rail transport<br>— Electric propulsion systems for waterborne transport<br>— Electric propulsion systems for air transport | — Transport propulsion electric motors<br>— Permanent magnets of transport electric motors<br>— Transport battery packs<br>— Transport fuel cells<br>— Transport inverters<br>— Electric propulsion high voltage power distribution units<br>— Onboard chargers<br>— Charge ports<br>— Onboard hydrogen storages tanks<br>— Current collectors (including pantographs) |
| **Other nuclear technologies** | Other nuclear technologies (such as nuclear fusion technologies) | | |

([1]) The term 'equivalent' refers to similar steps or key enabling technologies needed for thin-film, organic, tandem or other PV technologies.

([2]) Batteries as defined in Article 3(13), (14) and (15) of Regulation (EU) 2023/1542 of the European Parliament and of the Council of 12 July 2023 concerning batteries and waste batteries.

([3]) 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. That final product includes both conductive and inductive charging.

([4]) The term 'heater' refers to low (up to 200 °C) and medium (200 to 500 °C) temperature applications. The term 'furnace' refers to high (500 to 1 000 °C) and very high (above 1 000 °C) temperature applications.