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COMMUNICATION FROM THE COMMISSION

providing updated information to determine the shares of the European Union supply of final products and their main specific components originating in different third countries under Regulation (EU) 2024/1735 on establishing a framework of measures for strengthening Europe's net-zero technology manufacturing ecosystem (Net-Zero Industry Act).

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I. INTRODUCTION

Regulation (EU) 2024/1735 ('the NZIA Regulation') establishes a framework for ensuring that the Union has access to a secure and sustainable supply of net-zero technologies by promoting the diversification of their supply chains and enhancing the domestic manufacturing capacity of net-zero technologies[1].

Under Articles 25, 26 and 28 of the NZIA Regulation, non-price criteria - including the contribution to resilience - are to be applied in public procurement, renewable energy auctions and other forms of public intervention to develop and maintain an industrial basis for net-zero technologies, to secure the European Union's (EU) energy supply and to avoid dependencies in the supply of these technologies. For the purposes of assessing the contribution to resilience, the Commission adopted, based on Article 29(2) of the NZIA Regulation, the Commission Implementing Regulation EU …/…*[C(2025)9033 - PO please complete the reference]*[2].

In this context and on the basis of that Implementing Regulation, as required by the second sentence of Article 29(2) of the NZIA Regulation, this Communication provides updated information on the shares of the Union supply originating in different third countries in the most recent year for which data is available. It covers net-zero technology final products and their main specific components (see Section II)[3].

Article 13(1)(a)(i) of the NZIA Regulation requires Member States to recognise as net-zero strategic projects those net-zero technology manufacturing projects that increase the Union's manufacturing capacity for a net-zero technology, for which the Union depends for more than 50 % on imports coming from third countries. In this context, this Communication assists Member States in assessing the eligibility of net-zero technology manufacturing projects for recognition as net-zero strategic projects under that provision. It does so by providing updated information on the shares of the Union supply originating in all third countries in the most recent year for which data is available (see Section III).

It is currently only possible to provide data on the shares of the Union supply for 25 net-zero technology final products and their main specific components. For the remaining net-zero technologies, due to a lack of detailed statistics it is not yet possible to analyse the shares of the Union supply. Consequently, the

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

[2] 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.

[3] At the date of publication, the latest available year is 2023.

resilience contribution cannot be applied to those final products and their main specific components for which the shares of the Union supply are unavailable.

The methodology and data sources used for calculating the shares of the Union supply represent the best option available at this time. To overcome the limited statistics, the Commission is in the process of developing the additional Combined Nomenclature (CN) codes specific to net-zero technologies. These new codes will help to identify strategic dependencies in the net-zero technology sector, ultimately contributing to create a more resilient and secure supply chain. As new data becomes available, the Commission will also improve the methodology to calculate the shares of the Union supply.

The Commission will provide annually updated information on the shares of the Union supply originating in different third countries for the most recent year available through a dedicated communication. Preliminary informal data on the shares of the Union supply will be provided in the third quarter. This will be followed in the first quarter of the subsequent year by the adoption of the communication with the official data on the shares of the Union supply originating in different third countries referred to in Article 29(2) of the NZIA Regulation. This communication constitutes the source of official information for the determination of the origin in a third country of a specific net-zero technology or its main specific components as stated in Article 25 of the NZIA Regulation and in Article 7 of Commission Implementing Regulation EU…/…*[C(2025)2900 - PO please complete the reference]*[4]. Annual updates of the shares of Union supply are needed in order to reflect the dynamic nature of global supply chains and the evolving shares of the Union supply impacted by factors such as changes in manufacturing capacity, shifts in trade patterns, geopolitical developments, and market dynamics.

This Communication is structured as follows:

- Section II provides the shares of the Union supply originating in different third countries (relevant to Articles 25, 26 and 28 of the NZIA Regulation);
- Section III outlines the shares of the Union supply originating in all third countries (relevant to Article 13(1)(a)(i) of the NZIA Regulation);
- Section IV details the methodology used to calculate the shares of the Union supply.

[4] Commission Implementing Regulation EU …/... specifying the pre-qualification and award criteria for auctions for the deployment of energy from renewable sources.

II. SHARES OF THE UNION SUPPLY ORIGINATING IN DIFFERENT THIRD COUNTRIES

Table 1 details the shares of the Union supply from the three third countries of origin that account for the highest value of imports to the Union. It covers as many net-zero technology final products and their main specific components as possible from those listed in the Commission Implementing Regulation EU …/…*[C(2025)9033 - PO please complete the reference]*.

Table 1 – Shares of the Union supply from the three third countries of origin with the highest value of imports, 2023

Sub-category of net-zero technology	Final product	Main specific component	Share from top third country supplier [country]	Share from second-largest third country supplier [country]	Share from third-largest third country supplier [country]	Methodology
PV technologies	**Solar PV systems**		**79% [China]**	1% [Japan]		**Combination of CN codes**
PV technologies		**PV modules + PV cells or equivalent[4]**	**94% [China]**			**CN codes**
PV technologies		**PV inverters**	**50% [China]**	3% [Japan]	2% [United Kingdom]	**CN codes**
PV technologies		**PV wafers or equivalent[5]**	**79% [China]**	6% [United States]	6% [Taiwan]	**TARIC codes**
Solar thermal technologies	Solar thermal systems		2% [China]			CN codes
Onshore wind technologies, Offshore wind technologies	Onshore wind turbines; Offshore wind turbines[6]		2% [India]			CN codes

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

[6] The current and projected global and Union's supply and demand trends for onshore/offshore technologies, combined with the fact that China's production capacity exceeds 50% of global production (International Energy Agency, Energy Technology Perspectives 2024) and that China's projected production significantly exceeds its domestic targets and

Onshore wind technologies, Offshore wind technologies		Towers	9% [Türkiye]			TARIC codes
Onshore wind technologies, Offshore wind technologies		**Permanent magnets of wind turbines**	**93% [China]**	6% [Japan]		**ERMA**
Battery technologies	**Battery packs; battery modules; battery cells**	**Battery packs; battery modules; battery cells**	**50% [China]**	4% [Korea]	1% [Japan]	**CN codes**
Battery technologies		Separators	19% [Korea]	17% [China]	10% [United Kingdom]	CN codes
Battery technologies		**Anode active materials**	**81% [China]**	18% [Korea]		**IEA**
Gravitational storage technologies	Pumped hydro storage		1% [China]			CN codes
Heat pump technologies	Heat pumps		11% [China]	2% [Japan]	2% [Switzerland]	CN codes
Electricity grid technologies	Onshore substations ; Offshore substations		31% [China]	3% [Türkiye]	2% [Switzerland]	CN codes
Electricity grid technologies		Cables and lines for electricity transmission and distribution, and cables connecting net-zero technologies to the electricity grid (overhead lines, underground and undersea	4% [Türkiye]	3% [Switzerland]	2% [China]	CN codes

foreseeable demand suggest that for onshore/offshore technologies there is a significant risk of increased dependency on imports from China, although this is not yet reflected in the 2023 shares of the Union supply shown in Table 1.

		cables, including HVDC and HVAC) + Electrical conductors (including advanced conductors and high temperature superconductors)				
Electricity grid technologies	Power transformers	Power transformers	9% [Türkiye]	6% [China]	2% [Switzerland]	CN codes
Electricity grid technologies		Switchgears; Electric cabinets; Busbar systems	5% [Norway]	5% [China]	5% [Türkiye]	CN codes
Electricity grid technologies		Circuit breakers	5% [Switzerland]	5% [China]	5% [United Kingdom]	CN codes
Electricity grid technologies		Insulators	14% [China]	3% [Switzerland]	2% [United States]	CN codes
Electricity grid technologies		Disconnectors	7% [Switzerland]	2% [Korea]		CN codes
Nuclear fuel cycle technologies		Centrifuges	2% [Switzerland]			CN codes
Hydropower technologies	Hydro turbine systems		1% [China]			CN codes
Hydropower technologies		Hydro turbine runners + Distributors with guide vanes	4% [Türkiye]	2% [India]	1% [Switzerland]	CN codes
Transformative industrial technologies for decarbonisation	Industrial induction heaters / furnaces	Industrial induction heaters / furnaces	4% [United Kingdom]	2% [Korea]	1% [Türkiye]	CN codes
Transformative industrial		Graphite or carbon	15% [China]	8% [India]	2% [Japan]	CN codes

technologies for decarbonisation		electrodes for electric furnaces				

***Notes**:*

- Columns 4-6 indicate the shares of Union supply. The values indicated are rounded to the nearest integer number.
- Shares below 1% are not indicated.
- In bold with light orange shading: net-zero technologies with a share of the Union supply of over 50% or over 40% and having increased by at least 10 percentage points on average for two consecutive years.
- Net-zero technology final products that are the output of a factory fulfil the criteria to be considered main specific components, thus they are included in both columns.
- When a cell in Table 1 includes multiple net-zero technologies separated by ';' it means that the share applies to each net-zero technology. The '+' symbol indicates that the share applies to all net-zero technologies combined.
- The 'CN codes' methodology refers to the use of the Combined Nomenclature codes as indicated in Section IV '*Main data sources'*.
- The 'TARIC codes' methodology refers to the use of TARIC codes as indicated in Section IV '*Other data sources to use in the absence of specific CN codes'*.
- The 'Combination of CN codes' methodology refers to the combination of multiple CN codes associated with several components, as described in Section IV *'Variations in the calculation of 'shares of Union supply''* subsections (i) and (ii).
- The 'IEA' methodology refers to the use of the results of the International Energy Agency's analysis as indicated in Section IV *'Other data sources to use in the absence of specific CN codes'*.
- The 'ERMA' methodology refers to the results of European Raw Materials Alliance analysis as indicated in Section IV *'Other data sources to use in the absence of specific CN codes'*.
- PV = photovoltaic, HVDC = high voltage direct current, HVAC = high voltage alternating current.
- China = People's Republic of China.

III. SHARES OF THE UNION SUPPLY ORIGINATING IN ALL THIRD COUNTRIES

Table 2 provides information on the shares of the Union supply from all third countries of origin of as many net-zero technology final products and main specific components as possible from those listed in the Commission Implementing Regulation EU …/…*[C(2025)9033 - PO please complete the reference]*. The purpose is to support Member States in the process of selecting net-zero strategic projects as specified in Article 13(1)(a)(i) of the NZIA Regulation.

Table 2 – Shares of the Union supply from all third countries of origin for net-zero technology final products and main specific components, 2023

Sub-category of net-zero technology	Final product	Main specific component	Share of Union supply from third countries	Methodology
PV technologies	**Solar PV systems**		**85%**	**Combination of CN codes**
PV technologies		**PV modules + PV cells or equivalent[5]**	**96%**	**CN codes**
PV technologies		**PV inverters**	**62%**	**CN codes**
PV technologies		**PV wafers or equivalent[7]**	**100%**	**TARIC codes**
Solar thermal technologies	Solar thermal systems		2%	CN codes
Onshore wind technologies, Offshore wind technologies	Onshore wind turbines; Offshore wind turbines		3%	CN codes
Onshore wind technologies, Offshore wind technologies		Towers	10%	TARIC codes
Onshore wind technologies, Offshore wind technologies		**Permanent magnets of wind turbines**	**99%**	**ERMA**
Battery technologies	**Battery packs;**	**Battery packs; battery modules; battery cells**	**59%**	**CN codes**

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

	battery modules; battery cells			
Battery technologies		Separators	46%	CN codes
Battery technologies		**Anode active materials**	**100%**	**IEA**
Gravitational storage technologies	Pumped hydro storage		2%	CN codes
Heat pump technologies	Heat pumps		22%	CN codes
Electricity grid technologies	**Onshore substations; Offshore substations**		**52%**	**CN codes**
Electricity grid technologies		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) + Electrical conductors (including advanced conductors and high temperature superconductors)	16%	CN codes
Electricity grid technologies	Power transformers	Power transformers	22%	CN codes
Electricity grid technologies		Switchgears; Electric cabinets; Busbar systems	20%	CN codes
Electricity grid technologies		Circuit breakers	25%	CN codes
Electricity grid technologies		Insulators	27%	CN codes
Electricity grid technologies		Disconnectors	12%	CN codes
Nuclear fuel cycle technologies		Centrifuges	3%	CN codes
Hydropower technologies	Hydro turbine systems		2%	CN codes
Hydropower technologies		Hydro turbine runners + Distributors with guide vanes	10%	CN codes

Transformative industrial technologies for decarbonisation	Industrial induction heaters / furnaces	Industrial induction heaters / furnaces	11%	CN codes
Transformative industrial technologies for decarbonisation		Graphite or carbon electrodes for electric furnaces	29%	CN codes

***Notes**:*

- Columns 4-6 indicate the shares of Union supply. The values indicated are rounded to the nearest integer number.
- Shares below 1% are not indicated.
- In bold with light orange shading: net-zero technologies with a share of the Union supply of over 50% or over 40% and having increased by at least 10 percentage points on average for two consecutive years.
- Net-zero technology final products that are the output of a factory fulfil the criteria to be considered main specific components, thus they are included in both columns.
- When a cell in Table 2 includes multiple net-zero technologies separated by ';' it means that the share applies to each net-zero technology. The '+' symbol indicates that the share applies to all net-zero technologies combined.
- The 'CN codes' methodology refers to the use of the Combined Nomenclature codes as indicated in Section IV '*Main data sources'*.
- The 'TARIC codes' methodology refers to the use of TARIC codes as indicated in Section IV '*Other data sources to use in the absence of specific Combined Nomenclature codes'*.
- The 'Combination of CN codes' methodology refers to the combination of multiple CN codes associated with several components, as described in Section IV *'Variations in the calculation of 'shares of Union supply''* subsections (i) and (ii).
- The 'IEA' methodology refers to the use of the results of the International Energy Agency's analysis as indicated in Section IV *'Other data sources to use in the absence of specific CN codes'*.
- The 'ERMA' methodology refers to the results of European Raw Materials Alliance analysis as indicated in Section IV *'Other data sources to use in the absence of specific CN codes'*.
- PV = photovoltaic, HVDC = high voltage direct current, HVAC = high voltage alternating current.
- China = People's Republic of China.

IV. METHODOLOGY FOR EVALUATING THE SHARES OF THE UNION SUPPLY

a. 'Union supply'

To evaluate the shares of the Union supply of net-zero technologies, the 'Union supply' for a given year is calculated as defined in Equation 1:

Equation 1

$$Union\ supply = Production + Imports - Exports$$

where:

- $Production$ is the value of production within the Union;
- $Imports$ is the value of imports to the Union from all third countries;
- $Exports$ is the value of exports from the Union to all third countries.

This approach corresponds to the 'available supply' concept, which takes into account the total value of a product available in the Union, including domestic production and imports and subtracting exports[8]. This formulation is widely used in economic literature and has been chosen for the purposes of this Communication due to its relevance in the context of long-term contracts, which are common in the industries concerned. Specifically, the assumption underlying this approach is that imports and exports are interdependent, and that any disruption to imports would also impact exports. The Union's role as a transit region, where certain goods are imported and then re-exported to other countries, also explains the decision to include both imports and exports in the calculation of supply. By considering both, this approach provides a more accurate representation of domestic demand.

b. 'Shares of the Union supply'

To evaluate the shares of the Union supply of net-zero technologies **originating in all third countries**, the 'share of the Union supply' is generally defined as the ratio between the value imported from all third-country suppliers and the Union supply, as illustrated in Equation 2a:

Equation 2a

[8] Whenever data is available, changes in inventories should also be considered in the calculation of the Union supply.

$$Share\ of\ the\ Union\ supply_{all} = \frac{Imports}{Union\ supply} * 100$$

where:

- $Share\ of\ the\ Union\ supply_{all}$ is the share of the Union supply from all third countries.
- $Imports$ is as defined in Equation 1;
- $Union\ supply$ is as defined in Equation 1.

The shares of the Union supply of net-zero technologies **originating in different third countries** are generally calculated as the ratio between the value of imports to the Union originating in a specific third country and the Union supply, as illustrated in Equation 2b. In particular, the shares of the Union supply originating in different third countries have been calculated for the three third countries with the highest value of imports to the Union.

Equation 2b

$$Share\ of\ the\ Union\ supply_{n-largest\ third\ country\ supplier} = \frac{Imports_{n-largest\ third\ country\ supplier}}{Union\ supply} * 100$$

where:

- $Share\ of\ the\ Union\ supply_{n-largest\ third\ country\ supplier}$ is the share of the Union supply from the n-largest third country supplier.
- $Imports_{n-largest\ third\ country\ supplier}$ is the value of imports to the Union originating in the third country with the n-largest value of imports to the Union;
- $Union\ supply$ is as defined in Equation 1.

However, in some cases it is necessary to apply alternative formulations of Equations 2a,b – please see Section IV.d for alternative equations.

c. Main data sources

Article 29(2) of the NZIA Regulation states that for net-zero technology final products and their main specific components the country of origin shall be determined in accordance with Regulation (EU) No

952/2013[9]. According to that provision, the shares of the Union supply provided in Sections II and III have been calculated - whenever feasible – based on the following:

- **Combined Nomenclature (CN) codes** for import and export statistics, using the COMEXT database[10,11,12].
- **PRODCOM classification** for production statistics, using the PRODCOM database[13, 14].

The COMEXT and PRODCOM databases, which are official, reliable, and publicly available statistical sources, are considered the most suitable tools for calculating the shares of the Union supply originating in third countries. These databases provide a comprehensive and accurate overview of trade flows and production data, ensuring a robust and precise analysis for calculating the shares of the Union supply.

CN codes are the primary method used to calculate the shares of supply and are used as a source of evidence by default. However, not every net-zero technology final product or main specific component has a specific CN and PRODCOM code (see Table 3 for the list of CN and PRODCOM codes that have been used to determine the shares of the Union supply). This limitation is evident when comparing the list of net-zero technologies for which the shares of supply can be identified via CN codes (see Table 1 and Table 2) with the list of net-zero technology final products and main specific components in the Commission Implementing Regulation EU …/…*[C(2025)9033 - PO please complete the reference]*. Although this includes a list of 230 net-zero technology final products and main specific components, the shares of the Union supply can be calculated for just 21 net-zero technologies if the calculation is based solely on CN codes. To expand the use of the CN code methodology, the Commission is introducing new CN codes specific to net-zero technologies. The Commission is also increasing the level of detail of PRODCOM codes with the aim of achieving one-to-one correspondence between PRODCOM codes and CN codes for net-zero technologies. While it will take time for these improvements to become operational, they are expected to deliver substantial benefits in the medium and long term.

[9] Regulation (EU) No 952/2013 of the European Parliament and of the Council of 9 October 2013 laying down the Union Customs Code (recast), https://eur-lex.europa.eu/eli/reg/2013/952/oj/eng .

[10] https://taxation-customs.ec.europa.eu/customs-4/calculation-customs-duties/customs-tariff/combined-nomenclature_en

[11] https://ec.europa.eu/eurostat/comext/newxtweb/

[12] Imports and exports statistics used to calculate the shares of the Union supply are based on the 'normal' statistical procedure. This approach excludes inward processing, outward processing, re-exportation of processed goods and re-importation of processed goods, as outlined in the 2020 edition of EUROSTAT's User guide on European statistics on international trade in goods.

[13] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Industrial_production_statistics_introduced_-_PRODCOM.

[14] https://ec.europa.eu/eurostat/web/prodcom/database.

If the CN code methodology cannot be used for the above reason, other data sources are used to calculate the shares of the Union supply of other net-zero technology final products and main specific components.

d. Other data sources to use in the absence of specific CN codes

When the shares of the Union supply of net-zero technology final products and their main specific components cannot be calculated solely by using CN codes, additional reliable data sources are used. For net-zero technologies that lack a specific CN code, the TARIC (Integrated Tariff of the European Union) database is consulted to check whether a specific TARIC code exists. Where available, those TARIC codes may provide valuable data on imports via the Commission's Directorate-General for Taxation and Customs Union's (TAXUD) surveillance database (see Table 4)[15].

As TARIC codes focus on import statistics, two considerations need to be borne in mind in using them:

- Exclusion of export statistics: for net-zero technologies that only have associated TARIC code, export statistics are not tracked. This method of calculating the Union supply shares therefore excludes exports, meaning that the calculation gives a more conservative result.
- Estimation of production statistics: PRODCOM codes, which provide production statistics, are primarily developed for products with associated CN codes. Therefore, for net-zero technologies that only have an associated TARIC code, production data is estimated based on manufacturing capacities. Manufacturing capacity data collected by the Commission to monitor progress in meeting the benchmarks referred to in Article 5 of the NZIA Regulation (see NZIA Article 42(1)) is used as a proxy for production. Where needed, an appropriate conversion from quantity to value of production can be applied. Since production is lower than full manufacturing capacity, to assume that production equals manufacturing capacity means that this also represents a conservative approach to evaluating the shares of the Union supply.

The resulting equation for the conservative approach to evaluate the shares of the Union supply of net-zero technologies that only have associated TARIC codes is as follows:

Equation 3a,b

$$Share\ of\ the\ Union\ supply_{all} = \frac{Imports}{Manufacturing\ capacity + Imports} * 100$$

[15] In the last column of Table 1 and Table 2, 'TARIC codes' indicates when the shares of Union supply are calculated using data associated to the TARIC codes.

$$Share\ of\ the\ Union\ supply_{n-largest\ third\ country\ supplier} = \frac{Imports_{n-largest\ third\ country\ supplier}}{Manufacturing\ capacity + Imports} * 100$$

where:

- $Imports$ is as defined in Equation 1;
- $Manufacturing\ capacity$ is the value of manufacturing capacity within the Union;
- $Import_{n-largest\ third\ country\ supplier}$ is as defined in equation 2b.

When the shares of the Union supply of net-zero technology final products and their main specific components could not be calculated using CN codes or TARIC codes, the Commission has temporarily relied on other data sources. In those cases, data from the International Energy Agency's (IEA) *Energy Technology Perspectives 2024* report and the European Raw Materials Alliance's (ERMA) *Rare Earth Magnets and Motors: A European Call for Action* report are key references[16,17,18].

The IEA's *Energy Technology Perspectives 2024* report provides 2023 data on Union production, exports and imports from different third countries (i.e. those with the largest values of imports) and from all third countries, which are used to calculate the shares of the Union supply as per Equations 2a and 2b. These figures are underpinned by the IEA's manufacturing and trade (MaT) model, which provides a dynamic picture of global supply chains by offering insights on production levels, manufacturing capacity, and bilateral trade flows for six net-zero technologies' final products and their key components. The MaT model integrates regional demands and applies a least-cost optimization approach to assess the annual cost-optimal balance between domestic manufacturing and imports, considering factors such as manufacturing capacities, production costs, trade costs, regional industrial and trade policies, and investment trends in emerging markets[19].

ERMA's *Rare Earth Magnets and Motors: A European Call for Action* report leverages industry-based data to offer a detailed overview of supply chain dynamics of net-zero technologies. Through collaboration with market actors and stakeholders, ERMA grounds its assessment in direct industry knowledge and market

[16] IEA (2024) Energy Technology Perspectives 2024, https://www.iea.org/reports/energy-technology-perspectives-2024.
[17] In the last column of Table 1 and Table 2, "IEA" indicates when the shares of Union supply are determined using the results from IEA's Energy Technology perspectives 2024 report.
[18] Gauß R., Burkhardt C, Carencotte F, Gasparon M, Gutfleisch O, Higgins I, et al. (2021) Rare Earth Magnets and Motors: A European Call for Action. A report by the Rare Earth Magnets and Motors Cluster of the European Raw Materials Alliance, https://eitrawmaterials.eu/sites/default/files/2024-11/2021_07-13_REE%20Cluster%20Report.pdf.
[19] IEA (2024) Energy Technology Perspectives 2024 – Annex, https://iea.blob.core.windows.net/assets/168cbd7d-deeb-4678-8578-4f9e0de73b4d/EnergyTechnologyPerspectives2024Annex.pdf.

dynamics, ensuring accuracy and reliability. Their comprehensive analytical framework considers sourcing strategies, material substitutions, and technological innovations, providing a thorough overview of supply dependencies. Though the analysis refers to 2021, leading market actors have consistently confirmed that the situation has not changed since then.

Both the IEA's and ERMA's reports are highly credible and robust, based on official data and authoritative sources that have been validated with key market actors in the relevant value chains. Their rigorous methodologies ensure alignment with verified trade and production figures, making them reliable complements to information derived from CN codes and TARIC codes when assessing the shares of the Union supply for net-zero technologies.

e. Variations in the calculation of 'shares of the Union supply'

As pointed out in Section IV (a) '*Union supply'*, the calculation of the shares of Union supply may feature minor variations between net-zero technologies due to differences in the availability of statistics and data sources. These slight variations are consistent and underscore the importance of using flexible yet rigorous evaluation methods tailored to the specific availability of CN codes, PRODCOM codes, TARIC codes and additional data sources related to net-zero technology final products and main specific components. In the following cases, the alternative equations below are applicable:

(i) Final products defined as 'systems'

When a final product is defined as a 'system' (e.g. *solar photovoltaic systems*), it is not generally possible to identify a CN code associated with it. For these products, the shares of the Union supply must be evaluated on the basis of the statistics for the system's underlying components, which are listed in the annex of the Commission Delegated Regulation EU… / …*[C(2025)2901 - PO please complete the reference]*[20]. For final products defined as 'systems', the shares of the Union supply **originating in all third countries** must be calculated on the basis of the cumulative value imported to the Union of all the components making up the final product, and the cumulative supply of all the components making up the final product, using Equation 4a. Similarly, the shares of the Union supply **originating in the third countries with the highest value of imports to the Union** must be calculated on the basis of the total value imported to the Union

[20] Commission Delegated Regulation EU …/... 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.

originating in the third countries with the highest overall import of all the components constituting the final product, and the cumulative supply of all the components constituting the system, using Equation 4b.

Equation 4a,b

$$Share\ of\ the\ Union\ supply_{all} = \frac{\sum_{All\ components} Imports}{\sum_{All\ components} Production + \sum_{All\ components} Imports - \sum_{All\ components} Exports} * 100$$

$$Share\ of\ the\ Union\ supply_{n-largest\ third\ country\ supplier} = \frac{Import_{n-largest\ third\ country\ supplier,across\ components}}{\sum_{All\ components} Production + \sum_{All\ components} Imports - \sum_{All\ components} Exports} * 100$$

where:

- $\sum_{All\ components} Imports$ is the cumulative value of the imports to the Union of the components making up the final product defined as a 'system';
- $\sum_{All\ components} Production$ is the cumulative value of the production within the Union of all the components making up the final product defined as a 'system';
- $\sum_{All\ components} Exports$ is the cumulative value of the exports from the Union to third countries of all the components making up the final product defined as a 'system';
- $Import_{n-largest\ third\ country\ supplier,across\ components}$ is the total value imported to the Union from the third country of origin with the n-largest overall import of all the components making up the final product defined as a 'system'.

However, due to the limited availability of CN codes specific to net-zero technologies, ensuring that the results of Equation 4a,b are representative depends on certain conditions. The shares of the Union supply of final products calculated using this approach are only considered valid if specific CN codes are available for the main specific components that, combined, account for more than 50% of the final product's value, in line with Tables 5-9.

(ii) Final products that lack specific CN codes

If a final product is not defined as a 'system' and still lacks a specific CN code, its share of the Union supply can be evaluated by applying Equation 4a,b to the final product's Tier 1 main specific components[21]. To ensure that the results are representative, this approach can be used provided that the main specific components for which specific CN codes are available account for more than 50% of the final product's value, in line with Tables 5-9. If specific CN codes are not available for any Tier 1 component, the methodology may be applied to Tier 2 components.

(iii) Net-zero technologies linked to a PRODCOM code matching multiple CN codes

The level of granularity differs between PRODCOM codes and CN codes, meaning that a direct one-to-one correspondence between these classifications is not always possible. In some cases, multiple CN codes, each associated with different net-zero technologies, may correspond to the same PRODCOM code. In these cases, the net-zero technology shares of the Union supply must be evaluated as an aggregate of the net-zero technologies associated with the PRODCOM code. This aggregation is necessary because the limited granularity of PRODCOM codes does not allow for differentiation between the individual net-zero technologies they cover.

In these cases, Equation 5 is used to evaluate the shares of the Union supply, which takes account of the fact that the terms related to imports and exports are more than those related to production. Specifically, the shares of the Union supply **originating in all third countries** must be calculated by taking as the numerator the cumulative value imported to the Union of all net-zero technologies associated with the shared PRODCOM code, and as the denominator the value of production within the Union linked to that single PROCOM code, plus the cumulative value imported to the Union across all net-zero technologies associated with it, minus the cumulative value exported from the Union across all net-zero technologies associated to that PRODCOM code, using Equation 5a.

Similarly, the shares of the Union supply **originating in the third country with the highest value of imports to the Union** must be calculated by taking as the numerator the total value imported to the Union from the third country of origin with the highest overall value of imports across all net-zero technologies associated with the shared PRODCOM code, and as the denominator the value of production within the Union linked to it, plus the cumulative value imported to the Union across all net-zero technologies associated with that code, minus the cumulative value exported from the Union across all net-zero technologies associated with it, using Equation 5b.

[21] Tier 1 components are those that assembled make up the final product.

Equation 5a,b

$$Share\ of\ the\ Union\ supply_{all} = \frac{\sum_{All\ components} Imports}{Production + \sum_{All\ components} Imports - \sum_{All\ components} Exports} * 100$$

$$Share\ of\ the\ Union\ supply_{n-largest\ third\ country\ supplier} = \frac{Import_{n-largest\ third\ country\ supplier, across\ components}}{Production + \sum_{All\ components} Imports - \sum_{All\ components} Exports} * 100$$

where:

- $\sum_{All\ components} Imports$ is the cumulative value of the imports to the Union of all the net-zero technologies associated with the shared PRODCOM code;
- $Production$ is the value of production within the Union associated with the single PRODCOM code;
- $\sum_{All\ components} Exports$ is the cumulative value of the exports from the Union to third countries of all net-zero technologies associated with the shared PRODCOM code;
- $Import_{n-largest\ third\ country\ supplier, across\ components}$ is the total value imported to the Union from the third country of origin with the n-largest value of imports to the Union of all the net-zero technologies associated with the shared PRODCOM code.

(iv) Net-zero technologies linked to a CN code matching multiple PRODCOM codes

Since the level of granularity between PRODCOM codes and CN codes differs, in some cases multiple PRODCOM codes may correspond to the same CN code. In these cases, the net-zero technology's shares of the Union supply must be evaluated as an aggregate of all the net-zero technologies associated with the 'shared' CN code. This is similar to the approach outlined in subsection (iii). The main difference is that, in this case, the same net-zero technology is associated with more PRODCOM codes than CN codes.

In these cases, Equation 6 is used to evaluate the shares of the Union supply, which takes account of the fact that the terms related to production are more numerous than those related to imports and exports. Specifically, the shares of the Union supply **originating in all third countries** must be calculated by taking as the numerator the value imported to the Union of the net-zero technology associated with the shared CN code, and as the denominator the cumulative value of production within the Union of all net-zero technologies associated with that CN code, plus the value imported to the Union for the net-zero technology

associated with the shared CN code and minus the value exported from the Union for the net-zero technology associated with it, using Equation 6a.

Similarly, the shares of the Union supply **originating in the third country with the highest value of imports to the Union** must be calculated by taking as the numerator the value imported from the third country of origin with the highest value of imports to the Union for the net-zero technology associated with the shared CN code, and as the denominator the cumulative value of production within the Union across all net-zero technologies associated to it, plus the value imported to the Union for the net-zero technology linked to the shared CN code and minus the value exported from the Union for the net-zero technology linked to it, using Equation 6b.

Equation 6a,b

$$Share\ of\ the\ Union\ supply_{all} = \frac{Imports}{\sum_{All\ components} Production + Imports - Exports} * 100$$

$$Share\ of\ the\ Union\ supply_{n-largest\ third\ country\ supplier} = \frac{Imports_{n-largest\ third\ country\ supplier}}{\sum_{All\ components} Production + Imports - Exports} * 100$$

where:

- $Imports$ is the value of imports to the Union from third countries;
- $\sum_{All\ components} Production$ is the cumulative value of production within the Union of all the net-zero technologies associated with the shared CN code;
- $Exports$ is the value of exports from the Union to third countries for all net-zero technologies associated with the shared CN code.
- $Imports_{n-largest\ third\ country\ supplier}$ is the value of imports to the Union from the third country of origin with the n-largest value of imports to the Union among all third country suppliers for all the net-zero technologies associated with the shared CN code.

(v) Net-zero technologies with multiple associated CN codes

In some cases, multiple CN codes are associated with a single net-zero technology. In these cases, Equation 7a,b is used to evaluate the shares of the Union supply taking into consideration all relevant CN codes.

Specifically, the shares of the Union supply **originating in all third countries** must be calculated by taking as the numerator the cumulative value imported to the Union across the multiple CN codes associated with

the net-zero technology, and as the denominator the cumulative value of production within the Union linked to all the PRODCOM codes associated with the multiple CN codes, plus the cumulative value imported to the Union across the multiple CN codes associated with the net-zero technology, minus the cumulative value exported from the Union across the multiple CN codes associated with the net-zero technology, using Equation 7a.

Similarly, the shares of the Union supply **originating in the third country with the highest value of imports to the Union** must be calculated by taking as the numerator the total value imported to the Union from the third country of origin with the highest overall import across the multiple CN codes associated with the net-zero technology, and as the denominator the cumulative value of production within the Union linked to all the PRODCOM codes associated with the multiple CN codes, plus the cumulative value imported to the Union across the multiple CN codes associated with the net-zero technology, minus the cumulative value exported from the Union across the multiple CN codes associated with the net-zero technology, using Equation 7b.

Equation 7a,b

$$Share\ of\ the\ Union\ supply_{all} = \frac{\sum_{All\ components} Imports}{\sum_{All\ components} Production + \sum_{All\ components} Imports - \sum_{All\ components} Exports} * 100$$

$$Share\ of\ the\ Union\ supply_{n-largest\ third\ country\ supplier} = \frac{Import_{n-largest\ third\ country\ supplier, across\ components}}{\sum_{All\ components} Production + \sum_{All\ components} Imports - \sum_{All\ components} Exports} * 100$$

V. BACKGROUND TABLES

Table 3

Table 3 provides an overview of the CN codes and PRODCOM codes specific to net-zero technologies that have been used to calculate the shares of the Union supply originating in the third countries of origin with

the highest value of imports to the Union and in all third countries, as indicated in Table 1 and Table 2 respectively.

Table 3 – List of CN product description, CN codes and PRODCOM codes specific to net-zero technology final products and their main specific components, 2025

Sub-category of net-zero technology	Final product / main specific component	CN product description	CN code	PRC code
PV technologies	PV modules; PV cells	PV cells not assembled in modules or made up into panels; PV cells assembled in modules or made up into panels	8541 42 00, 8541 43 00	26112240
PV technologies	PV inverters	Inverters having a power handling capacity not exceeding 7.5 kVA and exceeding 7.5 kVA	8504 40 85, 8504 40 86	27904153, 27904155
Solar thermal technologies	Solar thermal systems	Solar water heaters	8419 12 00	27521400
Onshore wind technologies; Offshore wind technologies	Onshore wind turbines; Offshore wind turbines	Wind-powered generating sets	8502 31 00	28112400
Battery technologies	Battery packs; Battery modules; Battery cells	Lithium-ion electric accumulators.	8507 60 00	27202350
Battery technologies	Separators	Separators for electric accumulators, whether or not rectangular (including square)	8507 90 30	27202410
Gravitational storage technologies; Hydropower technologies	Pumped hydro storage; Hydro turbine systems	Hydraulic turbines and water wheels	8410 11 00, 8410 12 00, 8410 13 00	28112200
Heat pump technologies	Heat pumps	Heat pumps other than air conditioning machines of heading 8415	8418 61 00	28251380
Electricity grid technologies	Onshore substations; Offshore substations	Liquid dielectric transformers and other transformers having a power handling capacity exceeding 1 kVA;	8504 21 00, 8504 22 10, 8504 22 90, 8504 23 00, 8504 32 00,	27114120, 27114150, 27114180, 27114260, 27114330,

		Inverters and other static converters, excluding accumulator chargers and rectifiers; Fuses and automatic circuit breakers for a voltage exceeding 1 000 V; Isolating switches and make-and-break switches for a voltage exceeding 1 000V; Boards, panels, consoles, desks, cabinets and other bases, for electric control or the distribution of electricity for a voltage exceeding 1 000 V; Insulated wire, cable and other insulated electric conductors, whether or not fitted with connectors for a voltage exceeding 1 000 V, excluding winding wire, coaxial cable, coaxial electric conductors, ignition wiring sets and other wiring sets	8504 33 00, 8504 34 00, 8504 40 85, 8504 40 86, 8504 40 95, 8535 10 00, 8535 21 00, 8535 29 00, 8535 30 10, 8535 30 90, 8537 20 91, 8537 20 99, 8544 60 10, 8544 60 90	27114380, 27904153, 27904155, 27904170, 27121010, 27121020, 27121030, 27123203, 27123205, 27321400
Electricity grid technologies	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); Electrical conductors (including advanced	Insulated wire, cable and other insulated electric conductors, whether or not fitted with connectors for a voltage exceeding 1 000 V, excluding winding wire, coaxial cable, coaxial electric conductors, ignition wiring sets and other wiring sets	8544 60 10, 8544 60 90	27321400

	conductors and high temperature superconductors)			
Electricity grid technologies	Power transformers	Liquid dielectric transformers and other transformers having a power handling capacity exceeding 1 kVA	8504 21 00, 8504 22 10, 8504 22 90, 8504 23 00, 8504 32 00, 8504 33 00, 8504 34 00	27114120, 27114150, 27114180, 27114260, 27114330, 27114380
Electricity grid technologies	Switchgears; Electric cabinets; Busbar systems	Boards, panels, consoles, desks, cabinets and other bases, for electric control or the distribution of electricity for a voltage exceeding 1 000 V	8537 20 91, 8537 20 99	27123203, 27123205
Electricity grid technologies	Circuit breakers	Fuses and automatic circuit breakers for a voltage exceeding 1 000 V	8535 10 00, 8535 21 00, 8535 29 00	27121010, 27121020
Electricity grid technologies	Disconnectors	Isolating switches and make-and-break switches for a voltage exceeding 1 000 V	8535 30 10, 8535 30 90	27121030
Electricity grid technologies	Insulators	Electrical insulators of any material	8546 10 00, 8546 20 00, 8546 90 10, 8546 90 90	23192500, 23431030, 27901230
Nuclear fuel cycle technologies	Centrifuges	Machinery and apparatus for isotopic separation and parts thereof	8401 20 00	28993910
Hydropower technologies	Hydro turbine runners; Distributors with guide vanes	Parts of hydraulic turbines and water wheels including regulators	8410 90 00	28113200
Transformative industrial technologies for decarbonisation	Industrial induction heaters / furnaces	Induction furnaces and ovens	8514 20 10	28211353
Transformative industrial technologies for decarbonisation	Graphite or carbon electrodes for electric furnaces	Carbon electrodes, carbon brushes, lamp carbons, battery carbons and other articles of graphite or other carbon with or	8545 11 00	27901330

		without metal, of a kind used for furnaces		

Notes: CN = Combined Nomenclature[22], PRC = PRODCOM[23]. CN code and its product description refers to the CN 2025 classification[24].

Table 4

Table 4 provides a list of the TARIC codes specific to net-zero technologies used to calculate the shares of the Union supply originating in the third countries of origin with the highest value of imports to the Union and in all third countries, as indicated in Table 1 and Table 2 respectively.

Table 4 – List of TARIC product description and TARIC codes specific to net-zero technology main specific components, 2025

Sub-category of net-zero technology	Final product / main specific component	TARIC product description	TARIC code
PV technologies	PV wafers or equivalent	Wafers of the type used in crystalline silicon photovoltaic modules or panels	3818 00 10 11, 3818 00 10 19
Onshore wind technologies; Offshore wind technologies	Towers	Utility scale tubular steel wind towers	7308 20 00 11

Tables 5-9

Tables 5-9 show the shares of the main specific components in the final product's value (i.e. the sum of the value of the underlying components) for the following nine sub-categories of net-zero technologies: photovoltaic (PV) technologies, solar thermal technologies, onshore wind technologies, offshore wind technologies, battery technologies, electrochemical storage technologies, heat pump technologies, electrolysers and hydrogen fuel cells.

These tables serve as a basis for calculating the shares of the Union supply of final products defined as 'systems' and of final products without specific CN codes. This is done by verifying whether CN codes

[22] https://taxation-customs.ec.europa.eu/customs-4/calculation-customs-duties/customs-tariff/combined-nomenclature_en.

[23] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Industrial_production_statistics_introduced_-_PRODCOM.

[24] Commission Implementing Regulation (EU) 2024/2522 of 23 September 2024 amending Annex I to Council Regulation (EEC) No 2658/87 on the tariff and statistical nomenclature and on the Common Customs Tariff, https://taxation-customs.ec.europa.eu/news/customs-commission-publishes-2025-version-combined-nomenclature-2024-10-31_en.

exist for the main specific components that, when combined, account for more than 50% of the final product's value. Given that the components' contribution to the final product's overall value can vary depending on project-specific factors and market conditions, Tables 5-9 provide approximate reference values for 2023 estimated by the Joint Research Centre[25]. These figures are intended solely for the purpose outlined above and should not be interpreted as general cost breakdowns.

Each component's share is expressed as a percentage of the total final product's value, reflecting not only the transformation costs from one Tier to the next but also the cumulative value of all underlying components. This means, for instance, that the share of battery cells includes not only the assembly of its underlying components, but also the entire value embedded within cathode active materials, anode active materials, electrolytes, separators and current collectors. Simply summing the shares of all main specific components could lead to a total exceeding 100% due to overlapping value contributions, whereas the shares of Tier 1 components should always be less than or equal to 100%. Where the sum of the shares of value totals less than 100%, the difference represents the value of other components that are not classified as main specific components.

Table 5 – Cost distribution of the main specific components in solar technologies' final products

Sub-categories of net-zero technologies	Final products	Main specific components	Shares of value (%)
Photovoltaic (PV) technologies	Solar PV systems[26]	PV grade polysilicon	5
		PV grade silicon ingots or equivalent	9
		PV wafers or equivalent	15
		PV cells or equivalent	28
		Solar glass	6
		PV modules	58
		PV inverters	13
		PV trackers and their specific mounting structures	19

[25] More details regarding the Union supply of net-zero technologies will be available in the Clean Energy Technology Observatory reports to be issues in the last quarter of 2025.

[26] The shares of the final product's value by main specific components refer to a solar PV system with trackers. Where there are no trackers, the shares are as follows: PV grade polysilicon 5%, PV grade silicon ingots or equivalent 10%, PV wafers or equivalent 17%, PV cells or equivalent 32%, Solar glass 7%, PV modules 67%, PV inverters 15%.

Solar thermal technologies	Solar thermal systems	Solar thermal collectors (including flat-plate, evacuated tube, concentrating systems and air collectors)	35
		Solar thermal absorbers	20
		Solar glass	10

Table 6 – Cost distribution of the main specific components in onshore wind and offshore renewable technologies' final products

Sub-categories of net-zero technologies	Final products	Main specific components	Shares of value (%)
Onshore wind technologies	Onshore wind turbines[27]	Nacelles (assembly)	44
		Rotor hubs	5
		Main, yaw and pitch bearings	5
		Direct drive drivetrains (including generator) and/or gearbox drivetrains (including generator)	25
		Permanent magnets of wind turbines	1
		Gearboxes of wind turbines	7
		Blades	26
		Towers	25
Offshore wind technologies	Offshore wind turbines[28]	Nacelles (assembly)	40
		Rotor hubs	6
		Main, yaw and pitch bearings	5
		Direct drive drivetrains (including generator) and/or gearbox drivetrains (including generator)	24
		Permanent magnets of wind turbines	6

[27] The cost distribution for onshore wind turbines is based on the assumption that they utilise a gearbox drivetrain.
[28] The cost distribution for offshore wind turbines assumes a direct drive configuration.

		Gearboxes of wind turbines	0
		Blades	13
		Towers	7
		Foundations / floaters	34

Table 7 – Cost distribution of the main specific components in battery technologies' final products and energy storage technologies' final products

Sub-categories of net-zero technologies	Final products	Main specific components	Shares of value (%)
Battery technologies	Batteries	Battery packs	100
		Battery modules	80
		Battery cells	70
		Cathode active materials	25
		Anode active materials	15
		Electrolytes	10
		Separators	10
		Current collectors (including thin copper, aluminium, nickel and carbon foils)	7
		Battery management systems (BMS)	5
		Battery thermal management systems (BTMS)	5
Electrochemical storage technologies	Ultracapacitors / supercapacitors	Electrolytes	60
	Redox flow energy storage	Separators	15
		Collectors	15
		Electrode plates	10

Note: the shares of final product's values are expressed relative to the battery pack.

Table 8 – Cost distribution of the main specific components in heat pump technologies' final products

Sub-categories of net-zero technologies	Final products	Main specific components	Shares of value (%)
Heat pump technologies	Heat pumps	Heat pumps	100
		Four-way valves	3
		Scroll compressors / heat pump rotary compressors	25

Table 9 – Cost distribution of the main specific components in hydrogen technologies' final products

Sub-categories of net-zero technologies	Final products	Main specific components	Shares of value (%)
Electrolysers	Alkaline electrolysers (AEL)	Stacks	43
		Separators (diaphragm or membranes tailored for water electrolysis)	4
		Bipolar plates and end plates	9
		Electrodes	18
	Proton exchange membrane electrolysers (PEMEL)	Stacks	40
		Membrane electrode assemblies (3-layer) / catalyst-coated membranes	14
		Porous transport layers / gas diffusion layers	10
		Bipolar plates and end plates	9
	Solid-oxide electrolysers (SOEL)	Stacks	14
		Electrolytes and electrodes	4
		Interconnectors / meshes and end plates	9
Hydrogen fuel cells	Proton exchange membrane fuel cells (PEMFC)	Stacks	62
		Membrane electrode assemblies (3-layer) / catalyst-coated membranes	40
		Porous transport layers / gas diffusion layers	6
		Bipolar plates and end plates	6
	Solid-oxide fuel cells (SOFC)	Stacks	21
		Electrolytes and electrodes	4
		Interconnectors / meshes and end plates	8