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1.0	5/06/26	First draft	Ed Eyton, Amy Nicholson
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3.0	4/09/26	Third draft, addressing comments from ACEA and its members.	

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1. Executive summary

The European Union (EU) has recently proposed local content requirements (LCRs) for public procurement and public support schemes for electric vehicles through its Industrial Accelerator Act (IAA). These are similar to those in place for EU-UK trade in electric vehicles through the trade and co-operation agreement (TCA).

ACEA commissioned Ricardo to investigate the implications of these LCRs for specific listed components of medium and heavy trucks produced in the EU. This study aimed to answer three main research questions through a mixed methods approach, combining literature review with insights from ACEA's membership of truck OEMs gathered via interview:

[1] What is the current European content of components used by European HDV manufacturers?
[2] How is this expected to develop in future in the absence of further policy intervention?
[3] What are the implications of [1] and [2] for likely compliance with the IAA and the TCA?

Key findings on current practices were as follows, also summarised in Table 1 below.

- The evidence available for the assessment was mixed across the three main areas covered in this report. In some areas the larger evidence gaps make it difficult to draw strong conclusions for European content of HDVs – particularly for low carbon metals, and electronic components, and to a lesser degree on some sub-cell battery components. Consultation with OEMs indicates that they may need to start tracking their EU content share in with greater detail/consistency – particular in these latter areas, and that further research is needed to substantiate this evidence base. The below conclusions can be drawn from the evidence available, but their robustness is only moderate.
- For **batteries**, Ricardo estimate that less than 5% of battery cell components can come from Europe or its non-China trading partners (cathode and anode active materials, other cell sub-components), with around 2/3 of the fleet utilising NMC chemistries. Future prospects for the ability to source content locally rely heavily on using NMC – many European OEMs seem to be heading towards LFP, which has very limited production capacity outside China.
- For **metals** it's not currently possible to assess the share of European-produced green steel and low-carbon aluminium, which is also hampered by a lack of official definitions. Many OEMs are uncertain on total volumes of low-carbon metals used in HDVs as well as their origin. Future use will depend highly on the cost differential to conventional metals and EU production capacity.
- For **electronic components** (excluding batteries), at first glance, Europe's trade surplus in automotive parts indicates it could be sourcing the majority locally, potentially higher when FTA partners are considered. However, this varies part group by part group and notably (a) has fallen for all products since 2019, and (b) in deficit for most e-powertrain components. This reflects OEM sentiments to reduce cost differentials with Chinese-produced vehicles by sourcing components from China, and for some components very limited European production capacity exists.

Table 1: Summary assessment for the current and future expected EU content of EU HDVs

HDV component	Current EU content	Future EU content	Robustness
Batteries			
Pack / module assembly	<60%	→	
B(T)MS (battery (thermal) management sensor)			
Cell	<50%	→ / ↓*	
CAM (cathode active material)	<5%		
AAM (anode active material)	<5%		
Other sub-cell components	<5%		
Metals			
Green Steel	Not possible to assess**	→	
Low carbon aluminium		→	
Electronic components			
E-powertrain components	<50%	↓	
Main electronic components	>50%	↓	

Source: Ricardo analysis. *Notes:* (*) Assuming a continued shift to LFP chemistries. There are greater prospects for localisation of NMC CAM. (**) There is a limited amount of green steel used by some OEMs, but it is not possible to quantify this due to limited data and uncertainty from OEMs regarding the proportion of low-carbon metals in HDVs.

The policy implications of the above findings are as follows:

- **In 2027, less than 5% of battery cells used in European HDVs are expected to contain CAM produced in the UK or EU.** Findings from Ricardo's analysis of global battery supply chains and related interviews with European OEMs align with evidence from a survey of ACEA's members in October 2025, which highlight that only 4% of all battery cells used in European HDVs are expected in 2027 to contain CAM originating in the UK or the EU. Notably, all 'originating' cells all expected to be of NMC chemistry (10% within NMC).
- **Consequently, under TCA requirements in January 2027, a large proportion of European HDVs could face tariffs when exported to the UK.** This is because they need to either (a) assemble in UK or EU and use local CAM, or (b) have local content exceeding 70% of the battery pack and 65% of the battery cell. Given less than 5% of cells used in EU-made HDVs contain originating CAM, it is not clear that OEMs could 'make up' the EU content in other parts of the battery given China's dominance in battery supply chains. ACEA's October 2025 survey found that batteries with compliant local content are expected to be targeted to the UK market, with a lower expected vehicle non-compliance rate at around 71%. This would face competing demand if the IAA LCRs were introduced concurrently. Regardless, the implication of this non-compliance is that

the EU would then face a 10% tariff on its largest export market for trucks (€3.2 billion in 2025, or 24.1% of total exports) [1] which would significantly impact price competitiveness.

- **Three years after entry into force of the IAA, a similar proportion of European trucks would not be considered compliant based on a requirement to use union-origin CAM.** Prospects to diversify LFP battery sourcing from outside China are growing but are expected to be limited and face significant competing demand, based on independent capacity projections and OEM sentiments on how quickly battery capacity outside China could scale. Again, metals and other electronic components could be a further limiting factor, but the evidence is too limited to draw strong conclusions on this.
- **Even under current requirements (TCA in force already, IAA if ratified today), up to 40% of EU-made trucks may face tariffs when exporting to the UK**, **and around half of the medium and heavy trucks produced in Europe would not meet LCRs for European public procurement and subsidy programmes.** This is because around half of the battery cells originate from China, and most of these are assembled outside the EU, with cells listed are a key component as needing to be of EU (or UK) origin. For the TCA, trucks may be able to meet the vehicle-level content threshold instead, but this will be challenging given the high share the battery comprises of a BEV. For the IAA, LCRs on metals and electronic components could be a further prohibiting factor for remaining vehicles, but this is less likely for electronic components based on available evidence.
- **It is unclear to what extent the "opt-out" clause for public procurement would impact the application of the LCRs. If unchanged this has the potential to limit the effectiveness of the IIA, for cases where LCRs can't be met.** Cost differences of 25% for public procurement and 30% for public support schemes are deemed 'disproportionate' and could enable public authorities to bypass union origin rules. Batteries produced in EU are already >30% more expensive than those produced in China, so it wouldn't take many more components to meet this threshold.
- **However, application of the IAA LCRs to other policy areas (CO_2 Regulations, Corporate Fleets, etc.) could increase the scope of impact to more vehicles in future.** These policy initiatives are already explicitly linked for LDVs, so extension to HDVs is possible.

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[1] ACEA (2026), *Economic and Market Report: Global and EU auto industry, Full year 2025.* Available at: https://www.acea.auto/files/Economic_and_Market_Report-Full_year_2025.pdf

2. Introduction

Local content requirements (LCRs) are policies that favour domestic industry over foreign competition, requiring entities to use domestically-produced goods or services as inputs to benefit.[2] These policies are closely linked to rules of origin in customs law, where 'preferential origin' enables goods to be offered lower or even zero tariff rates if they meet certain origin requirements.[3]

In December 2025, the EU's Automotive Package introduced minimum EU content requirements in a variety of policy areas affecting production of light duty vehicles (LDVs) without detail on the specific rules that would enable these goods to qualify as being of EU origin.[4] These details were released in February 2026 as part of a proposed Industrial Accelerator Act (IAA). The IAA is a policy initiative aiming to strengthen European production capacity, reduce strategic dependencies, and support decarbonisation by introducing LCRs in public procurement and public support schemes across selected strategic sectors, including automotive. Public procurement comprises around 70% of EU bus demand and 10% of EU truck demand.[5,6] Table 2 below outlines the key requirements for electric vehicles, placing restrictions on the origin of vehicle assembly and specific vehicle components that strengthen over time.

Table 2: Key IAA requirements for pure electric, plug-in hybrid, and fuel cell vehicles

Category	EU Origin requirements*	
	On entry into force	3 years later
Assembly	Yes	Yes
Vehicle components	>=70% by value**	>=70% by value**
Traction battery	<u>Three</u> components[7], including battery cell	<u>Five</u> components, including battery cell, CAM (cathode active material), and BMS (battery management system).
Aluminium	>=25% of aluminium, by mass	>=25% of aluminium, by mass
Steel	No (but >=25% must be low carbon, by mass)	N (but >=25% must be low carbon, by mass)
E-powertrain components[8]	N/A	>= 50%, by value**
Main electronic systems[9]	N/A	>= 50%, by value**

Source: European Commission[10]. *Notes*: (*) EU-27 or specific other approved third countries (further detail provided below) (**) 'ex-works price'

[2] OECD (2019) '*Trade policy brief: Local content requirements*'. Available at: https://www.oecd.org/content/dam/oecd/en/publications/reports/2019/12/local-content-requirements_0aaec8f0/5b1c38d5-en.pdf

[3] European Commission (n.d.) *Rules of origin for goods*. Available at: https://taxation-customs.ec.europa.eu/customs/rules-origin-goods_en

[4] European Commission (2025) *Automotive package.* Available at: https://transport.ec.europa.eu/transport-themes/action-plan-future-automotive-sector/automotive-package_en

[5] EAFO (n.d.) *The Clean Vehicles Directive.* Available at: https://alternative-fuels-observatory.ec.europa.eu/markets-and-policy/policy-insights/clean-vehicles-directive

[6] Volvo (2026) *How can the public sector help decarbonize truck transport?* Available at: https://www.volvotrucks.com/en-en/news-stories/stories/2026/mar/how-can-the-public-sector-help-decarbonize-truck-transport-.html

[7] From a list of 'main specific components', as listed in the Annex to Commission Implementing Regulation 2025/1178: Battery packs, Battery modules, Battery cells, Cathode active materials, Anode active materials, Electrolytes, Separators, Current collectors (including thin copper, aluminium, nickel and carbon foils), Battery management systems (BMS), Battery thermal management systems (BTMS)

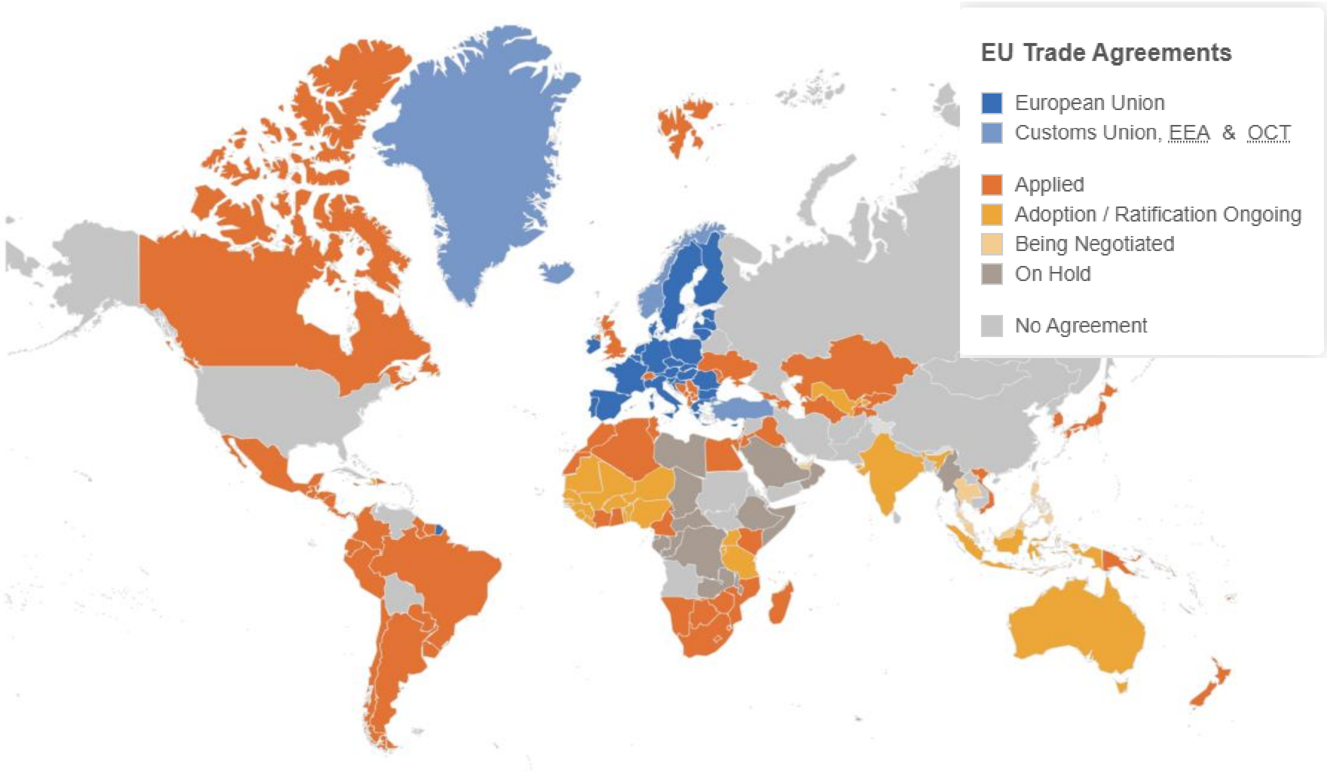
[8] Power electronics, transport propulsion electric motors and e-axles and their components, rotors and stators

[9] Advanced driver assistance systems (including lidars, radars, sensors, cameras, ECUs and integration platforms), central computing units, wireless access systems, in-vehicle infotainment head units and chassis electronics.

[10] European Commission (2026) *Proposal for a Regulation on establishing a framework of measures for accelerating industrial capacity and decarbonisation in strategic sectors (Industrial Accelerator Act).* Available at: https://single-market-economy.ec.europa.eu/publications/industrial-accelerator-act_en

An important provision in the IAA is an 'escape clause' allows contracting authorities or public support schemes to disregard the Union-origin requirements where complying with them would lead to a cost increase exceeding 25% compared to alternative offers.[11] Moreover, goods do not necessarily need to have been produced within the EU-27 to be considered of EU origin. In this proposal, an extension of EU-origin equivalence has been granted to partners covered by Free Trade Agreements (FTA) and the Government Procurement Agreement (GPA). Under Articles 8, 11, and 12, this equivalence applies to approximately 40 partner countries, including the United Kingdom, Japan, South Korea, and Turkey (see Figure 1 below). Notable exceptions are China, accounting for more than 70% of global electric car production[12] and well over 80% of global lithium-ion batteries[13], and the United States, although a separate trade agreement is in place[14] which may qualify it for equivalence of EU origin.

Figure 1: Free Trade Agreements held with the EU (status 1 May 2026)



Source: European Commission[15]

LCRs are already in place between the EU and the UK under the Trade and Cooperation Agreement (TCA), where tariff-free trade depends on demonstrating a minimum share of UK/EU originating value in vehicles and, for EVs, batteries - otherwise a 10% tariff can apply. These minimum shares started at 40% and 30% respectively and were set to increase over time (see Table 3 below). The first increase in thresholds for domestic content were supposed to apply from 1 January 2024. In the run-up to the deadline, EU and UK carmakers issued numerous warnings signalling that they could not meet the heightened

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[11] CLEPA, the European Association of Automotive Suppliers, note that this threshold risks being insufficient to effectively support European production https://www.clepa.eu/wp-content/uploads/2026/04/IndustryAcceleratorAct_Position-Paper.pdf

[12] IEA (2025) *Global EV Outlook 2025*. Available at: https://www.iea.org/reports/global-ev-outlook-2025/trends-in-the-electric-car-industry-3

[13] IEA (2026) '*Global battery markets are growing strongly – and so are the supply risks*'. *Available at https://www.iea.org/commentaries/global-battery-markets-are-growing-strongly-and-so-are-the-supply-risks*

[14] European Commission (2025) *The EU-US trade deal: Restoring stability and predictability*. Available at: https://commission.europa.eu/topics/trade/eu-us-trade-deal_en

[15] European Commission (2025) *Trade agreements map*. Available at: https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/negotiations-and-agreements/trade-agreements-map_en

requirements[16], and that higher EV prices would likely benefit China who were already experiencing significant growth in market shares. A one-off extension was granted until 31 December 2026 on first set of rules of origin featuring the lowest thresholds. However stricter requirements will come into force on 1 January 2027, with notable new requirements on the source of battery CAM (cathode active material).

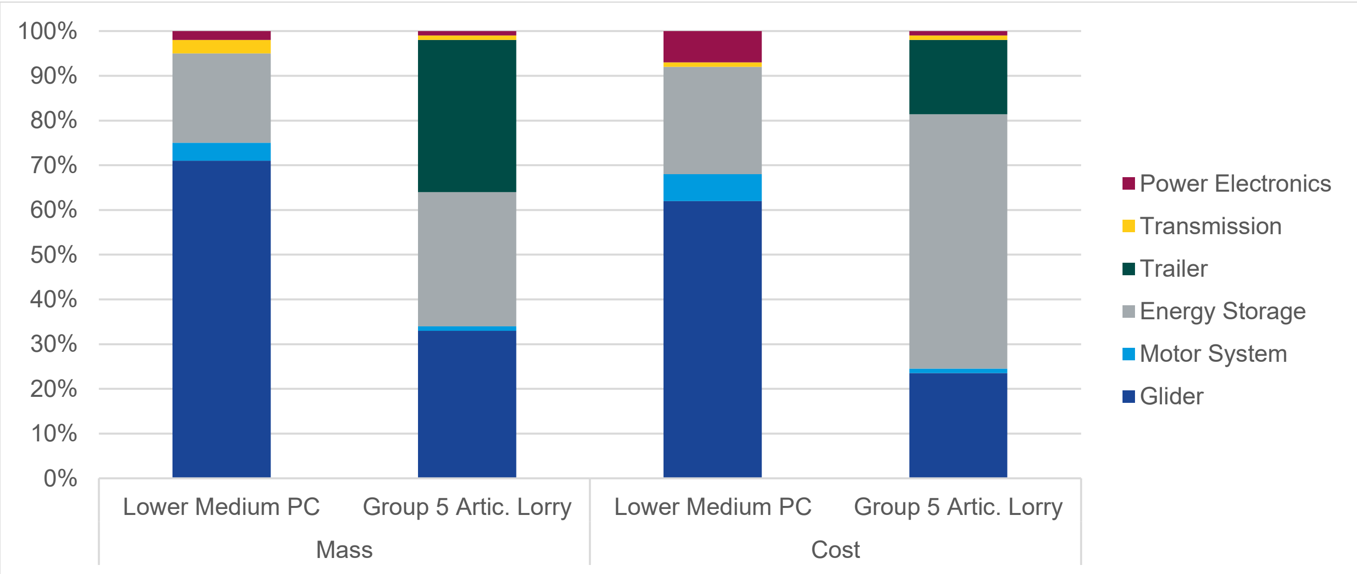
Table 3: Key TCA requirements for electric and (plug-in) hybrid vehicles

Category	UK/EU Origin requirements* by value**	
	1 May 2021	1 January 2027
Vehicle components	40%	55%, + local battery pack
Battery pack	30%	70%, or local assembly (but CAM must be local)
Battery cell	30%	65%, or local assembly (but CAM must be local)

Source: UK Government[17,18]. *Notes:* (*) UK or EU-27 only (**) 'ex-works price'

The LCRs introduced via the TCA and the proposed IAA would apply to both light- and heavy-duty vehicles uniformly. These two sets of vehicles have very different material and value chain compositions (see Figure 2 below for comparison between a passenger car (PC) and a heavy articulated (Artic.) lorry). It is therefore important to consider whether these rules would have different implications for LDVs and heavy duty vehicles (HDVs).

Figure 2: Difference in the estimated breakdown in mass and cost composition for a battery electric lower medium passenger car and a battery electric articulated lorry (2030)



Source: Ricardo analysis (2026)

[16] The European Automobile Manufacturers' Association (ACEA) estimated that a 10 % tariff could cost the industry €4.3 billion, potentially reducing EV production by nearly 500 000 units. Source: ACEA (2023) *Inaction on EU-UK electric vehicle trade could cost €4.3bn and hit production, EU auto makers warn*. Available at: https://www.acea.auto/press-release/inaction-on-eu-uk-electric-vehicle-trade-could-cost-e4-3bn-and-hit-production-eu-auto-makers-warn/

[17] UK Government (2020) *Trade and Cooperation Agreement between the United Kingdom of Great Britain and Northern Ireland, of the one part, and the European Union and the European Atomic Energy Community, of the other part*. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/982648/TS_8.2021_UK_EU_EAEC_Trade_and_Cooperation_Agreement.pdf

[18] UK Government (2023) *Decision No 1/2023 of the Partnership Council established by the Trade and Cooperation Agreement between the European Union and the European Atomic Energy Community, of the one part, and the United Kingdom of Great Britain and Northern Ireland, of the other part.*. Available at: https://www.gov.uk/government/publications/trade-and-cooperation-agreement-partnership-council-decision-number-1-2023-electric-vehicle-rules-of-origin/trade-and-cooperation-agreement-partnership-council-decision-1-for-2023-21-december-2023

This study therefore sets out to answer three main research questions:

1. What is the **current European content** of components used by European truck manufacturers?
2. How is this expected to develop **in future** in the absence of further policy intervention?
3. What are the **implications** of [1] and [2] for implementation of the proposed IAA and the TCA?

The scope of this study is confined to medium and heavy-duty trucks, with discussion of primarily BEV models given the LCRs for batteries. Other HDVs (bus, trailer, special purpose vehicles) have not been considered.

The rest of the report is structured as follows:

- **Section 3: Methodology.** The methods employed to compile the evidence base
- **Section 4: Findings on local content**. Each section starts with a brief summary of findings, and then outlines the detailed analysis behind each of the key material groups with LCRs defined via the IAA:
    - Section 4.1: Batteries
    - Section 4.2: Metals
    - Section 4.3: Electronic components
- **Section 5: Conclusions**. A summary of findings on component benchmarks and resulting implications for the proposed IAA and the existing TCA.

3. Methodology

This study used a mixed qualitative methodology, combining a structured literature review with semi-structured interviews with European MHDV (medium- and heavy-duty vehicle) OEMs.

The **literature review** covered policy documents, industry position papers, trade and rules-of-origin frameworks, company disclosures and relevant market studies on automotive supply chains. Literature was identified through key-word search. This review was used to establish the analytical framework, identify relevant definitions of “local content” and the components they apply to, and gather evidence on the extent to which components are sourced from the EU and its free trade partners.

Primary evidence was collected through **interviews** with the six OEMs in ACEA’s membership that manufacture or assemble medium and heavy trucks in the EU: TRATON Group (MAN & Scania), VOLVO Group (Volvo & Renault), Daimler Truck (Mercedes & Daimler), PACCAR (DAF), IVECO, and Ford Otosan. These OEMs provide strong coverage of the EU manufacturing landscape (89% of EU HDV sales in 2025) but notably do not capture every supplier or niche vehicle segment. Interviews were conducted on a confidential basis to encourage detailed responses on sourcing strategies, supplier location, production footprint, localisation constraints and expected changes under potential local-content requirements. A semi-structured interview guide was used to ensure consistency across respondents while allowing OEMs to provide vehicle- and powertrain-specific detail. Topics included current EU content by component, drivers behind procurement decision-making, expectations of how local content might change in future, and practical views on the proposed IAA.

The analysis then triangulated interview evidence with findings from the literature review and publicly available data. Attention was given to areas where OEM responses converged or diverged, including the treatment of UK, EU, and other partner-country inputs. To support comparability, the study adopted a common benchmarking framework based on broad value-chain modules rather than individual part numbers. Local content was assessed primarily at component level, with additional qualitative assessment of specific parts or sub-components as available from interviews or literature. Since precise figures were generally not available, conclusions were coded qualitatively a red-amber-green scoring system, with clear indications of the robustness of each assessment.

Several **limitations** should be noted. Interview evidence was self-reported and was provided as ranges or directional assessments applicable to the majority of their fleet rather than detailed data by segment. The study therefore does not present a definitive compliance assessment for individual models. Instead, it provides a structured benchmark of local-content patterns, key dependencies and implementation issues relevant to the design and assessment of local-content requirements for trucks made in the EU.

4. Findings on local content

4.1 Batteries

4.1.1 Summary

Information on origin of batteries and related subcomponents is limited in the public domain, mainly related to announced partnerships between OEMs and battery suppliers (with no guarantee that this relationship extends to the OEM's entire fleet). Ricardo has derived high-level conclusions mainly based on interviews with OEMs', in particular through understanding how they procure their batteries and what chemistry or chemistries they use. Independent literature on global supply chains was then used to draw conclusions at a sub-component level, but this relies on the validity on the underlying statements from OEMs.

Noting these caveats, **Ricardo estimate based on OEM interviews that roughly 50% of the truck fleet produced in Europe currently source battery cells from China, with around 2/3 of the fleet utilising NMC chemistries.** All OEMs indicating that they buy batteries at either pack or cell level, thereby limiting their visibility of where underlying components are sourced. Since China dominates global supply for battery subcomponents for chemistries used in heavy-duty vehicles (particularly LFP CAM and AAM – anode active material), it is highly likely that cell suppliers outside of China - notably Japan and Korea (who have FTAs with the EU) - would also use Chinese inputs, limiting their ability to be considered of EU origin when LCRs would be introduced on these sub-cell components in future.

Prospects for the ability to source content locally relies heavily on battery chemistry selection. Importantly, several OEMs have already started integrating LFP chemistries into some models, while others are strongly considering it for use in future models. If this shift in battery chemistry were to continue, this has important implications for local content requirements since global capacity to produce LFP cells outside of China is limited, especially in Europe. Without significant increases in this capacity or policy intervention, local content of batteries could fall in future, also considering strong competing demand from LDVs. However, if use of NMC batteries were to continue, local content could increase given current projections on capacity of NMC components and precursors outside of China.

If the IAA proposal were to be ratified today, it is highly likely that around half of the medium and heavy trucks produced in Europe would be disqualified from European public procurement and subsidy programmes because the battery cells originate from China (even if they assemble the packs within the EU and using EU-origin BMS and BTMS). Three years after entry into force, and assuming current sourcing decisions do not change, this fraction could fall to below 5% based on a requirement to use union-origin CAM. Prospects to diversify LFP battery sourcing from outside China are growing but are expected to be limited and face significant competing demand, based on independent capacity projections and OEM sentiments on how quickly battery capacity outside China could scale.

Table 4: 'EU' share of battery components, current and future (in absence of policy intervention)

Traction battery component	Current (% vehicles)	Robustness	Future
Pack / module assembly	<60%	OEM interviews only (maximum based on OEMs assembling at least some of their packs in Europe)	→
BMS / BTMS			
Cell	<50%	OEM interviews only (maximum based on OEMs buying cells from within EU-27 or FTA partner)	→ / ↓*
CAM (cathode active material)	<5%	Assumptions based on cell origin/manufacturer and independent literature on global battery supply chains	
AAM (anode active material)	<5%		
Other sub-cell (electrolytes, separators, current collectors, etc.)	<5%		

Source: Ricardo analysis based on OEM interviews and literature review. *Notes*: All future assessments are based on OEM interviews and speculative, with all OEMs indicating battery sourcing strategies are highly dependent on policy direction. (*) Assuming a continued shift to LFP chemistries. There is greater prospects for localisation of NMC CAM.

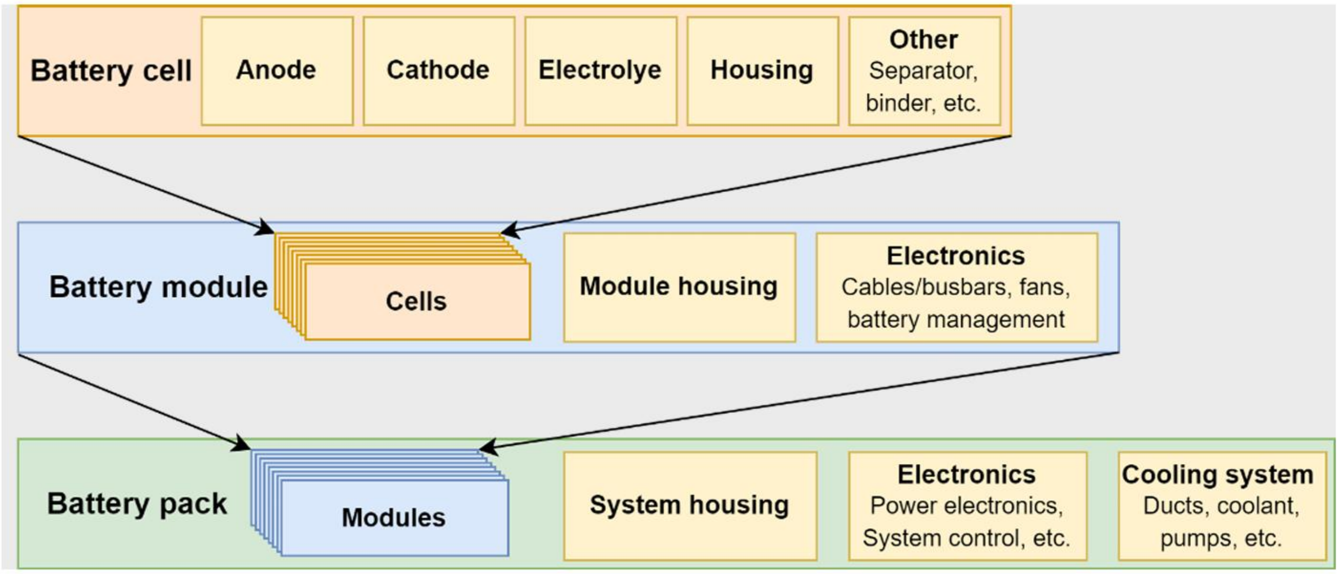
4.1.2 Current sourcing strategies

The APC estimate that European battery demand from HDVs was around 5GWh in 2025, compared to over 250 GWh for LDVs[19], making HDV demand modest but facing intense competing demand both from the wider automotive sector and other industries.

With relevance to LCRs, there are two key considerations in battery sourcing decisions that determine where its components come from – the battery chemistry (determining which active materials are required and other supporting battery architecture), and the battery production stage the OEM enters at (determining whether they have any control over sourcing each battery component). Figure 3 below shows a typical schematic of a battery used for automotive purposes. This highlights that only the OEMs buying battery cells and assembling the packs themselves have any degree of control to differentiate the origin of the BMS, BTMS, housing, or supporting electronics, from the origin of the cell itself.

[19] APC (2025) *'Automotive industry demand forecast: Q4 2025'*. Available at https://www.apcuk.co.uk/wp-content/uploads/2026/03/Q4-2025-Quarterly-Demand-Report-March-2026.pdf

Figure 3: Schematic of typical electric vehicle battery system components*



Source: JRC (2023)[20]. *Notes*: * In cell-to-pack architectures, which are increasingly being used, the manufacturing approach does not include intermediate modules and integrates individual cells directly into the final battery casing.

In interviews, all OEMs confirmed using one or both of NMC or LFP[21] lithium-ion battery chemistries for most of their fleets produced in Europe (highlighted in Figure 4 below)**.** This is unsurprising given that these chemistries offer sufficient energy density and cycle life relative to their cost in HDV use cases[22]. While NMC has been the dominant battery chemistry choice for the electric vehicle industry over the past decade - particularly for light-duty vehicles (LDVs) - LFP is emerging as a favoured alternative[23] driven by improvements in energy density, better cost-effectiveness relative to nickel-rich cathodes, better thermal runaway characteristics, and better durability and suitability for standardised heavy-duty cycles (where lifetime mileage requirements are much higher than for LDVs).[24,25]

Despite preferences for NMC batteries to date, OEM strategies indicate a gradual transition towards LFP. Only one OEM stated that they currently use NMC for their entire fleet and didn't foresee any change in the near future. However, OEM strategies indicate a gradual shift towards LFP as several other OEMs (i.e. representing approximately 35% of the market) who currently use NMC for their fleets are considering switching to LFP battery chemistry for future models with plans to progressively phase out NMC. Meanwhile OEMs accounting for around 26% of the market already deploy a dual-chemistry approach, selecting between NMC and LFP based on vehicle use case, performance requirements and model specifications. Only one OEM has already fully committed to LFP for its entire truck product line. Based on these insights, Ricardo estimate that roughly two-thirds of the medium and heavy truck market currently employ NMC batteries, with the remainder using LFP.

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[20] JRC (2023) '*Science for Policy report: Rules for the calculation of the Carbon Footprint of Electric Vehicle Batteries (CFB EV)*'. Available at https://eplca.jrc.ec.europa.eu/permalink/battery/GRB-CBF_CarbonFootprintRules-EV_June_2023.pdf

[21] NMC = Nickel / Manganese / Cobalt; LFP = Lithium iron (Fe) phosphate.

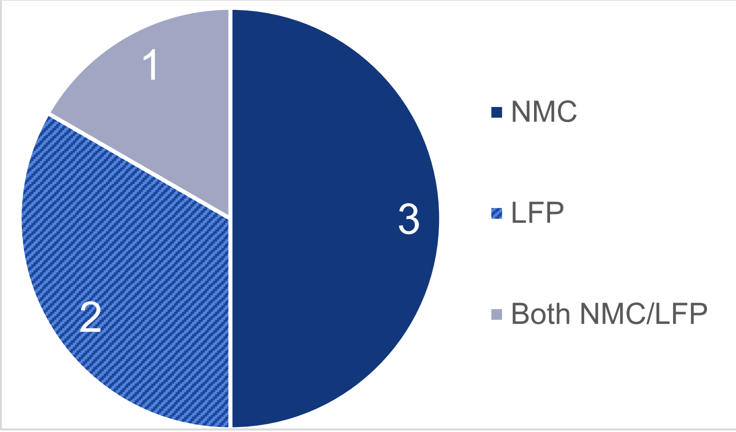
[22] UNCTAD (2025) '*Changing battery chemistries and implications for critical minerals supply chains*' , available at https://unctad.org/system/files/official-document/ditccom2025d1_en.pdf

[23] https://www.volvotrucks.com/en-en/news-stories/insights/articles/2025/feb/new-trends-and-innovations-in-battery-technology.html

[24] XOS (2026) Why LFP batteries are superior for commercial electric vehicles. Available at: https://www.xostrucks.com/blog/why-lfp-batteries-are-superior-for-commercial-electric-vehicles

[25] https://www.apcuk.co.uk/wp-content/uploads/2025/02/APC-LFP-Report-v08.pdf

Figure 4: Distribution of current main battery chemistries among interviewed OEMs of medium and heavy trucks produced in Europe



Source: Ricardo, based on OEM interviews.

Several OEMs (i.e. responsible for around 60% of the market) buy the battery cells directly from a supplier and then assemble their battery pack in Europe. In other cases, the sourcing of cells is more varied. For example, Volvo sources its battery cells from Samsung SDI as they have a long-standing strategic partnership with Samsung SDI[26], and which manufactures and supplies NMC battery cells globally from factories in Europe, China and South Korea. However, Volvo operates its own module assembly facilities and assembles the battery packs in Volvo's manufacturing plants in Europe (Belgium, France, Sweden)[27]. **The remainder of European OEMs buy batteries directly at pack or module level, meaning the battery supplier maintains complete control over all the components used in the battery**. Many of the OEMs (i.e. responsible for around 37% of the market) source their battery packs from CATL, a Chinese battery supplier who are the largest EV battery supplier in the commercial vehicle market[28]. The main reasons given for this was the supplier's strong technical expertise and track record, and it being significantly cheaper than sourcing batteries from a non-Chinese supplier. CATL has multiple production sites across China, Indonesia and Germany[29]. Additionally, in May 2025 CATL began construction of Europe's largest battery cell plant in Hungary with a potential capacity of 100 GWh/year[30]. The LFP battery chemistry is also dominated by Chinese suppliers, whereas NMC cells have a more diverse sourcing base including suppliers in Japan, South Korea and the US. One OEM commented that the majority of the top ten suppliers are Chinese and they don't expect this to change over the next 5-10 years. Indeed, the IEA estimate that batteries produced in China are over 30% cheaper than those produced in Europe, for a combination of reasons.[31] However, another OEM already purchases its batteries from a European supplier which has production sites in Germany.

It is reasonable to assume that **any battery produced in China is likely to use Chinese components, particularly for LFP chemistries:** China produces the vast majority of the midstream and downstream battery supply chain for battery chemistries relevant for HDV applications: in 2024, they produced 98% of

[26] Volvo (2026) Collaborative Approach. https://www.volvogroup.com/en/sustainable-transportation/collaborative-approach.html

[27] Volvo (2019) Volvo Group and Samsung SDI enter strategic alliance for electromobility. https://www.volvogroup.com/en/news-and-media/news/2019/jul/news-3365888.html

[28] PR Newswire (2021) Daimler Truck AG and CATL expand global partnership: joint development of sophisticated truck-focused batteries and supply agreed beyond 2030. Available at: https://www.prnewswire.co.uk/news-releases/daimler-truck-ag-and-catl-expand-global-partnership-joint-development-of-sophisticated-truck-focused-batteries-and-supply-agreed-beyond-2030-867905836.html?utm_source=chatgpt.com

[29] CATL (2023) *Environmental Social and Governance (ESG) Report*. Available at Juge, M et al. (2025) 'Europe has a solid basis for battery and electric vehicle manufacturing growth. Available at: https://www.bruegel.org/analysis/europe-has-solid-basis-battery-and-electric-vehicle-manufacturing-growth.

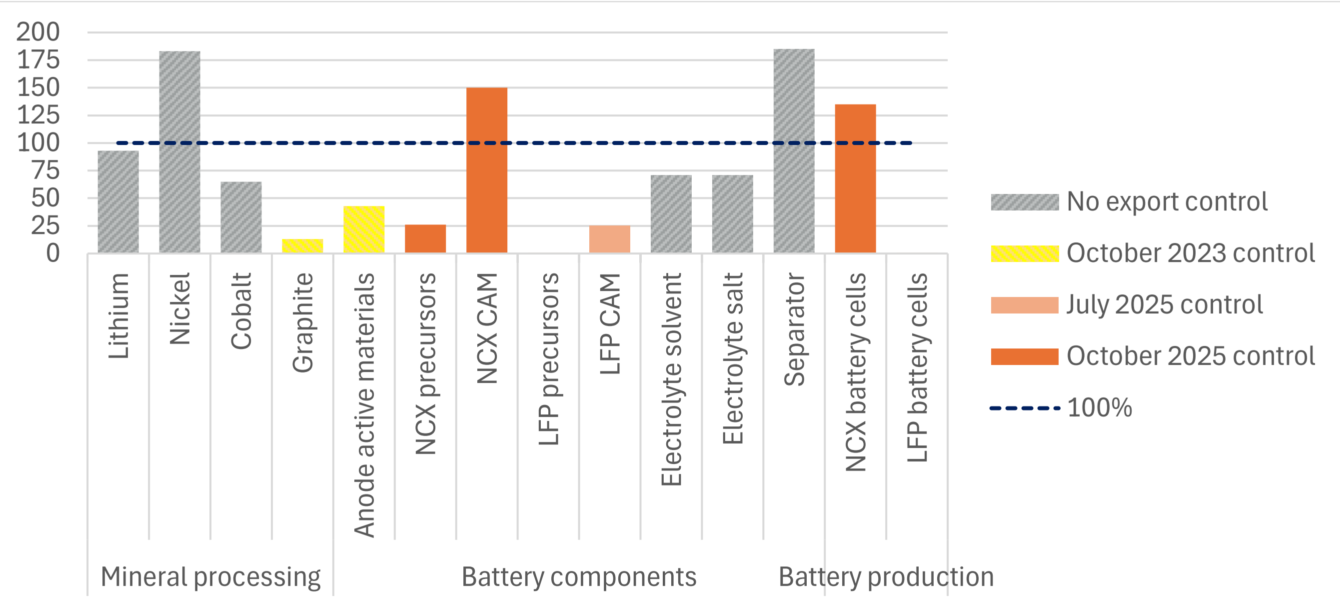
[30] Juge, M et al. (2025) 'Europe has a solid basis for battery and electric vehicle manufacturing growth. Available at: https://www.bruegel.org/analysis/europe-has-solid-basis-battery-and-electric-vehicle-manufacturing-growth

[31] IEA (2026) *Energy Technology Perspectives 2026*. Available at: https://www.iea.org/reports/energy-technology-perspectives-2026/supply-chain-risks-and-industrial-competitiveness

LFP components, 65% of NMC components, and 93% of anodes.[32] Local sourcing would minimise logistics costs and leverage the existing manufacturing cost advantage that Chinese companies enjoy over international competitors.

According to the IEA (2026)[33], **any EV battery produced outside of China is still also heavily reliant on Chinese components**, making those supply chains very susceptible to Chinese export controls. Reportedly, over 70% of all electric vehicles produced outside China rely on batteries or components from China. Installed capacity of battery cell manufacturing outside China in 2024 was a little over ~500GWh, with the same again in Ni-based CAM and ~250GWh for AAM. LFP CAM capacity outside of China is extremely limited. On 9 October 2025, export controls were extended beyond previous controls on rare earth elements to their related products, equipment and technologies, including battery cells and packs for high-performance applications, cathode precursors, an expanded scope of anode materials, a broader coverage of lithium iron phosphate (LFP) cathode materials. These export controls are currently suspended, but Figure 4 shows the results of IEA analysis comparing demand for batteries in four wheelers outside China with global capacity outside China in 2024 if all announced export controls were in place. The results show that **capacity outside China is sufficient to meet global demand for NMX cells (135%) and NMX CAM (150%), but is insufficient to meet global demand for LFP cells (1%), LFP CAM (25%), and AAM (43%).** Ricardo estimates suggest that current European demand for LFP CAM is already at ~2 GWh and demand for AAM is <0.5 GWh. While both are expected to grow in future, the quantity of competing demand is therefore much greater and faces limited global supply.

Figure 3: Share of lithium-ion battery deployment (for four wheelers) outside China that could be met without supply from China if export controls are in place, 2024



Source: IEA (2026)[34]

Overall, Ricardo estimate based on OEM statements in interviews and supporting literature that roughly 50% of the batteries used in European electric medium and heavy trucks are made in China, whether as

[32] IEA (2026) '*With new export controls on critical minerals, supply concentration risks become reality*'. *Available at* https://www.iea.org/commentaries/with-new-export-controls-on-critical-minerals-supply-concentration-risks-become-reality

[33] IEA (2026) '*Global battery markets are growing strongly – and so are the supply risks*'. *Available at* *https://www.iea.org/commentaries/global-battery-markets-are-growing-strongly-and-so-are-the-supply-risks*

[34] IEA (2026) '*Global battery markets are growing strongly – and so are the supply risks*'. *Available at* *https://www.iea.org/commentaries/global-battery-markets-are-growing-strongly-and-so-are-the-supply-risks*

complete packs or as cells (i.e. including the most critical components), meaning that they would not comply with LCRs introduced as part of the IAA if it were to enter into force in 2026. Even where cells are procured from other geographies, it is highly that many battery subcomponents/precursor materials would originate from China, some of which may be relevant when it comes to meeting IAA criteria or not.

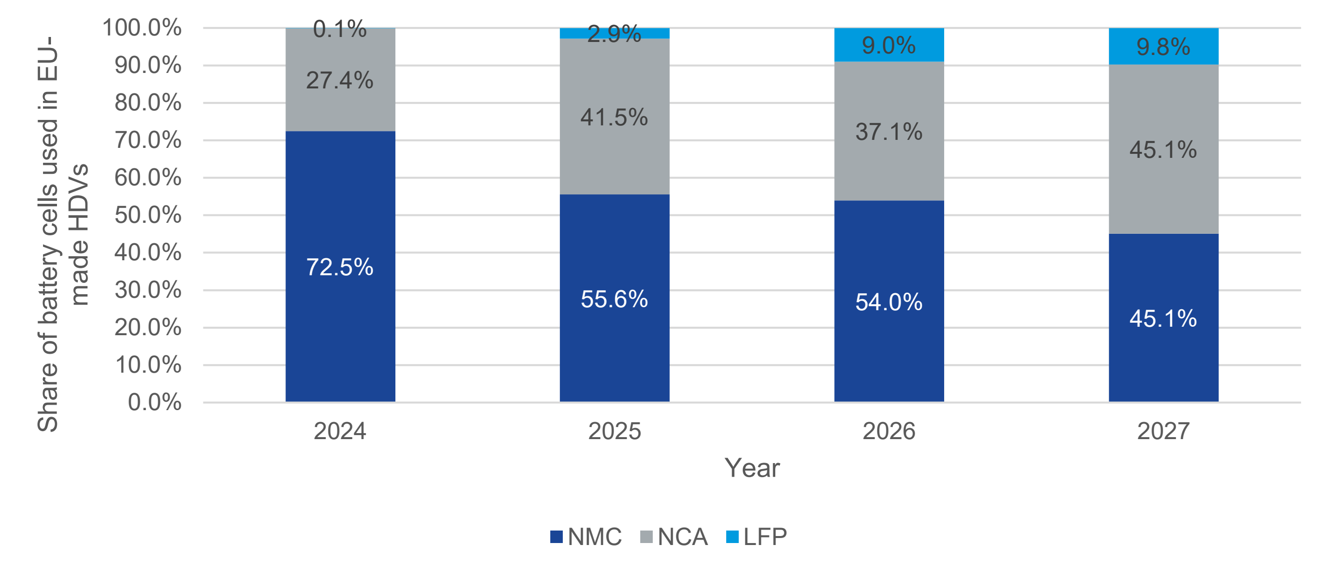
4.1.3 Future sourcing strategies

In interviews, **several OEMs indicated that they are unlikely to change their battery sourcing strategy over the next 5-10 years in the absence of localisation incentives**. One OEM highlighted that they would prefer to continue with their current supplier for as long as the supplier provides a competitive advantage and battery packs are available at a competitive price. Several other OEMs noted that if they change supplier, this would be done on a project (i.e. vehicle model line) basis. A number of OEMs emphasised that switching suppliers is a complex decision, with selection driven by a combination of technological capability, price competitiveness and alignment with internal timelines. From a timing perspective it was noted by several OEMs that it would take up to four years of lead time to approve a new supplier and complete the necessary testing meaning that 2030 would be too early to switch suppliers. Additionally, a vehicle life cycle typically lasts around 8-9 years which must also be factored into supplier decisions.

Price was highlighted as a critical factor by several OEMs when assessing future battery suppliers as OEMs must consider the margins they can afford including how much customers are willing to pay. **It was also noted that even if a European supplier were technically capable of producing a suitable battery, it would take several years to reach mass-scale production and achieve cost competitiveness**. As a result several OEMs indicated they are unlikely to switch suppliers for the foreseeable near-term future, given that alternatives outside of China remain more expensive as well as the fact that Chinese suppliers have a significant technological advantage. For example, it was noted that **Chinese suppliers are at an advantage with their track record as they've been producing LFP batteries for longer.** Furthermore, the OEMs indicated that they do not see a clear competitive alternative to Chinese suppliers as South Korean and European manufacturers are not yet meeting the required performance and cost thresholds. According to OEMs, some of these suppliers are reportedly around 5-6 years behind in terms of IP and therefore would need to not only catch up with Chinese suppliers but also surpass them to become viable alternatives, requiring significant investment to meet their needs.

Current strategies indicate that the share of NMC batteries in HDVs produced in Europe will fall, to be replaced by NCA and LFP. Figure 5 below shows the aggregated views of ACEA's membership (producing HDVs) on their expected battery cell composition as of October 2025. While slightly outdated, this shows a clear reduction in NMC share from 72% in 2024 to 45% in 2027. By contrast, over the same time period NCA's share was expected to grow from 27% to 45%, while LFP's share would grow from 0% to 10%. This same survey also investigated what share of these batteries would use CAM originating in the EU or the UK (as relevant to the new requirements from January 2027). **Importantly, only NMC chemistries were expected to have CAM originating in the EU or UK in 2027, at around 10% of NMC battery cells or 4% of all battery cells.** The growth of NCA and LFP chemistries may therefore make it more difficult to source battery subcomponents from within the EU or UK. Survey findings suggest that vehicles with originating content are being targeted for export to the UK market in order to comply the TCA requirements, but even so only 29% of HDVs exported to the UK would be able to avoid the tariff.

Figure 5: Outlook on battery chemistry sourcing for European HDVs (Truck, bus, coach) produced by ACEA's membership



Source: Survey of ACEA's members, October 2025

This aligns with evidence from the global perspective on the availability of battery subcomponents outside of China. The IEA estimate that European battery cell production will reach in ~900GWh by 2030.[35] In addition, Europe will produce ~300GWh of Ni-based CAM, but capacity for LFP CAM and AAM is expected to be much more limited. Assuming Europe is a self-sustaining bloc with no imports or exports, the UK APC compared this expected European capacity vs its own demand (LDV only) and found that by 2035 significant deficits should be expected for battery cells, CAM, AAM, and Separators.[36] Factoring in European demand related to HDVs would increase battery cell demand by a further ~80GWh. With relevance to the IAA, many countries including United States, Japan, Korea have an FTA with EU, and so can be considered of EU origin. The IEA expect that global capacity for battery cells across these countries could reach ~2,300GWh by 2030, including ~500GWh of AAM, ~1,200GWh of Ni-based CAM, and ~150GWh of LFP CAM.[37] Assuming OEMs can navigate competing demand, it's therefore likely European OEMs could source their batteries outside of China, but meeting IAA requirements 3 years after entry into force will depend on whether those non-China suppliers are able to diversify their components inputs away from China.

4.2 Metals

4.2.1 Summary

Steel is an essential material within the automotive industry, for both light- and heavy-duty vehicles, and is the second-largest consumer of steel in Europe, after the construction sector[38]. There are various definitions of **green steel** which results in a wide range of interpretations. These can include novel processes to produce virgin/primary material, or production steel made without using coke during

[35] Accounting for 2024 installed capacity plus projects that are under construction or that reached final investment decision, with completion due before 2030.
[36] APC (2026) *Automotive industry demand forecast: Q4 2025.* Available at https://www.apcuk.co.uk/wp-content/uploads/2026/03/Q4-2025-Quarterly-Demand-Report-March-2026.pdf
[37] IEA (2026) '*With new export controls on critical minerals, supply concentration risks become reality'. Available at* https://www.iea.org/commentaries/with-new-export-controls-on-critical-minerals-supply-concentration-risks-become-reality
[38] Ricardo (2024) *The use of green steel in the automotive industry. Available at: https://www.transportenvironment.org/articles/cleaning-up-steel-in-cars-why-and-how*

production and using recycled scrap steel processed in electric arc furnaces (EAF)[39] with renewable electricity. For this study, green steel is defined as being produced by H_2 DRI and EAF[40] only, meaning that green steel is limited to primary material production achieving minimum defined saving versus conventional primary production. Europe is one of the leaders in developing green steel as over half of near-zero emissions steel projects which are currently included in the global Green Steel Tracker are in the EU[41]. As of February 2025, 33 near-zero emissions steel projects have been announced but very few have been progressing as scheduled.

There is also no universal definition of **low carbon aluminium** either, which could include recycled aluminium, virgin/primary production by conventional processes using 100% renewable electricity, or novel processes also adding/using inert anode technology (e.g. ELYSIS/ALCOA, 2025[42]) which are only just being introduced into the market. For this study low-carbon aluminium is defined as being produced by using at least 100% renewable electricity. Likewise with green steel, low carbon aluminium is limited to primary material production achieving a minimum defined saving versus conventional primary production.

Information on OEM sourcing decisions for green steel and low carbon aluminium is limited in the public domain. Individual supplier relationships are generally not disclosed for confidentiality reasons. Nonetheless, Ricardo consulted all major OEMs producing in Europe, collected relevant trade data, reviewed available literature and press releases. However, many of the OEMs (i.e. responsible for around 64% of the market) don't use green steel or low-carbon aluminium for their trucks and had the same reason reasoning for both metal types. Overall, information is limited on low-carbon aluminium so it's difficult to assess the full impact of the IAA.

Based on interviews with OEMs it's not currently possible to assess the share of European-produced green steel and low-carbon aluminium due to significant uncertainty over the total volume of low-carbon metals used in HDVs as well as the proportion of these metals within an HDV. In addition, a substantial reduction is necessary in the cost of European green steel at least (and potentially some types of low carbon aluminium) to incentivise their use, as high costs remain a key barrier to widespread adoption by OEMs.

Table 5: 'EU' share of low carbon metals, current and future (in absence of policy intervention)

<table>
<tr><th>Component</th><th>Current</th><th>Robustness of current assessment</th><th>Future</th></tr>
<tr><td>Green steel</td><td rowspan="2">Limited - not possible to assess quantitatively from available information.</td><td rowspan="2">OEM interviews and literature</td><td>→</td></tr>
<tr><td>Low carbon aluminium</td><td>→</td></tr>
</table>

Source: Ricardo analysis.

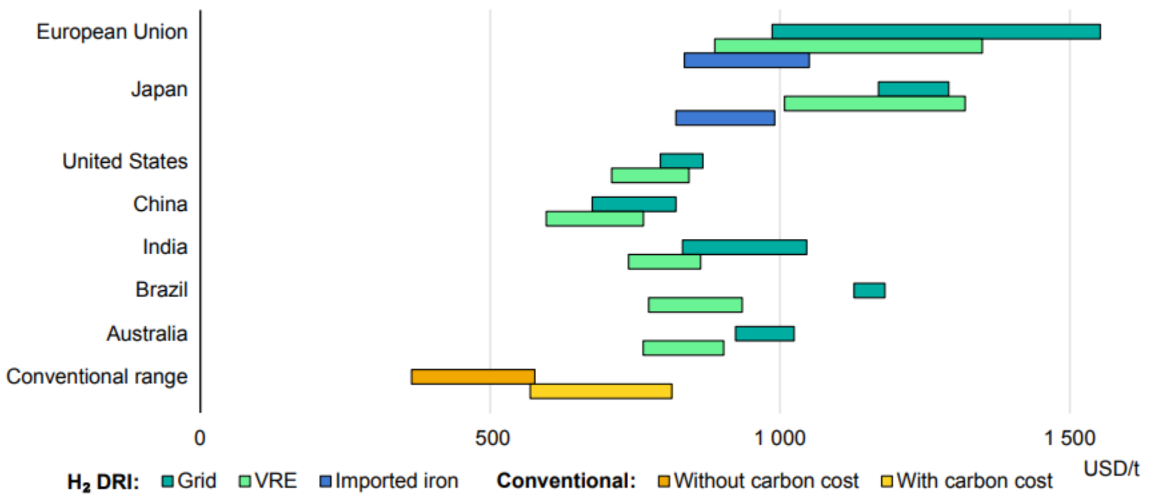
[39] Ricardo (2024) *The use of green steel in the automotive industry.* https://www.transportenvironment.org/articles/cleaning-up-steel-in-cars-why-and-how
[40] H2 DRI = Hydrogen direct reduction of iron, using renewable hydrogen. EAF = Electric Arc Furnace, commonly used for recycling scrap steel, but also can be used in combination with H2 DRI to produce virgin 'green' steel.
[41] European Environmental Bureau (2025) *The state of the European Steel Transition.* Available at: https://eeb.org/wp-content/uploads/2025/03/State-of-Steel-Report.pdf
[42] ALCOA (2025) *"The world's first carbon-free smelting technology".* Available at: https://www.alcoa.com/products/elysis ; ELSIS (2025) "What is ELYSIS?". Available at: https://elysis.com/en/what-is-elysis#carbon-free-smelting

4.2.2 Current sourcing strategies

In interviews, many of the OEMs (responsible for around 64% of the market) do not explicitly use green steel or low-carbon aluminium for their trucks and cited several reasons for this. By way of explanation, multiple OEMs (58% of the market) noted that there is no official definition either for both green steel or for low carbon aluminium. They highlighted the need for a clear official definition for green steel so that procurement teams can clearly understand the requirements for producing green steel. Similarly, the same OEMs emphasised that currently there is no official threshold on low-carbon materials which makes it difficult for procurement teams to know what to look for when sourcing low-carbon aluminium.

Additionally, OEMs (comprising around 43% of the market) highlighted that they don't use green steel or low carbon aluminium for their trucks as customers are not willing to pay the additional costs associated with these materials. These comments are reinforced by findings from the IEA (2026) [43], which notes that as commercialisation of green steel is still at an early stage, competitiveness remains a key issue. As production of green steel relies on very large supplies of low-cost low-carbon electricity regions including China, which are rich in affordable renewable energy such as hydropower, solar and wind, can produce green steel at a low production cost and have competitive prices. Whereas countries including the EU have limited renewable energy and relatively expensive electricity, so have production costs that are 50-80% higher than China for green steel. The 50-80% differences in green steel production costs are significantly higher than current regional differences for conventional steel production (around 25-50%), which is illustrated in Figure 6. One OEM emphasised that a **reduction in the cost of European-produced green steel is necessary to incentivise its use.**

Figure 6: Levelised cost of steel production via hydrogen-based direct reduced iron in the Stated Policies Scenario, 2035



Source: IEA (2026)[44]

However, some OEMs interviewed do currently source green steel within the EU-27 (i.e. approximately 36% of the market). For example, Volvo Group has a partnership with Stegra (formerly HS2 green steel) for low-carbon steel from Stegra's new plant in Boden Sweden, with deliveries expected to start in mid

[43] IEA (2026) *Energy Technology Perspectives 2026 - Supply chain risks and industrial competitiveness.* Available at: https://www.iea.org/reports/energy-technology-perspectives-2026/supply-chain-risks-and-industrial-competitiveness

[44] IEA (2026) *Energy Technology Perspectives 2026 - Supply chain risks and industrial competitiveness.* Available at: https://www.iea.org/reports/energy-technology-perspectives-2026/supply-chain-risks-and-industrial-competitiveness

2026[45]. However, Volvo noted that this is not necessarily fully green steel which highlights that there is **significant uncertainty among OEMs regarding both the total volume of green steel used in heavy-duty vehicles (HDVs) and its composition, including the proportion of steel that is conventional versus green and its' origin.**

Several OEMs (i.e. approximately 46% of the market) are aware of the production of low-carbon aluminium in Scandinavia as Norway has substantial resources for producing low-carbon aluminium due to its use of renewable energy. For example, Volvo has a strategic partnership with Hydro in Norway[46] to accelerate the use of low-carbon aluminium and aims to develop near-zero low-carbon aluminium by around 2030. However, Volvo does not currently have full visibility on the exact proportion of low-carbon aluminium used across its portfolio, highlighting wider uncertainty among OEMs regarding both the origins of aluminium and the proportion of low-carbon aluminium used in HDVs.

4.2.3 Future sourcing strategies

In interviews, some OEMs are uncertain that European suppliers will have the capacity needed to meet the green steel volume requirements for HDV production. According to 2026 data from the Green Steel Tracker, 20 projects have been announced which are estimated to produce nearly 25 million tonnes of green steel per year (see Figure 7 below). However, several planned projects have stalled, meaning that 80% of the projected capacity has not progressed beyond the announcement stage[47]. Ricardo has conducted analysis and calculated the projected total steel demand for the production of HDVs in Europe[48]. It is estimated that in 2030 approximately 4.5 million tonnes of steel per year will be needed for truck production and this demand is expected to increase to over 5 million tonnes of steel by 2035. Therefore, in theory if all announced projects go ahead then EU production could meet HDV demand, but (a) not all of this steel will be off sufficient quality for HDV purposes, and (b) it's likely that European MHDV OEMs will face strong competition from both LDV production, as well as other sectors such as construction. This analysis reinforces interview findings with OEMs as some OEMS believe that if European green steel and low-carbon aluminium capacity does not increase, OEMs will need to source these metals from outside of Europe to meet their emissions-reduction goals.

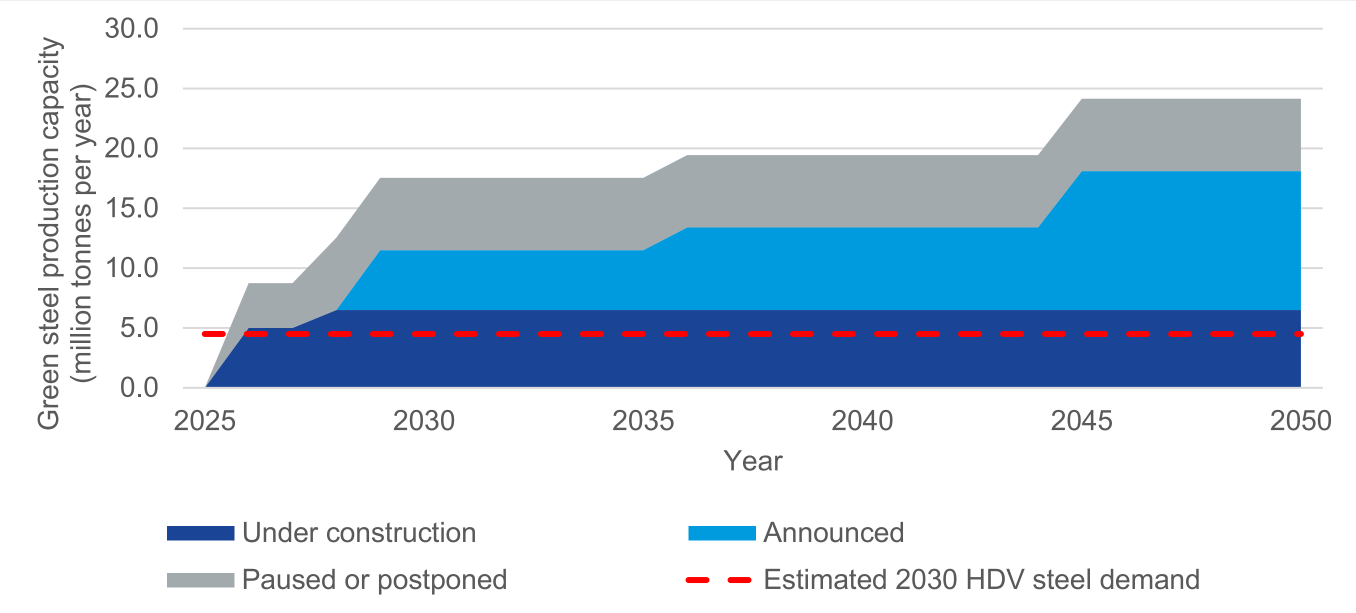
[45] 3 Volvo (2023) Volvo Group secures increased volumes of near zero emissions steel through collaboration with H2 Green Steel. Available at: https://www.volvogroup.com/en/news-and-media/news/2023/sep/volvo-group-secures-increased-volumes-of-near-zero-emissions-steel-through-collaboration-with-h2-green-steel.html

[46] Hydro (2023) *Hydro and Volvo Group join forces to accelerate net zero transportation.* Available at: https://www.hydro.com/en/global/media/news/2023/hydro-and-volvo-group-join-forces-to-accelerate-net-zero-transportation/

[47] European Environmental Bureau (2025) *The state of the European Steel Transition.* Available at: https://eeb.org/wp-content/uploads/2025/03/State-of-Steel-Report.pdf

[48] Ricardo (2024) *The use of green steel in the automotive industry.*

Figure 7: Cumulative expected EU green steel production capacity by current project status



Source: Green Steel Tracker[49] *Notes*: includes 'qualified' green steel projects only (i.e. only projects that meet the 'green' definition), where capacity information is available. Excludes cancelled projects.

4.3 Electronic components

4.3.1 Summary

Even compared to batteries, information on OEM sourcing decisions for electronic components – defined here in line with the IAA as the combination of 'e-powertrain components' and 'main electronic systems' – is limited in the public domain. Individual supplier relationships are generally not disclosed for confidentiality reasons. Nonetheless, Ricardo consulted all major OEMs producing MHDVs in Europe, collected relevant trade data, reviewed available literature and press releases, and attempted (unsuccessfully) to speak with European associations focusing on automotive parts supply. Consulting directly with suppliers was out of scope of this project. Ricardo was therefore able to identify some conclusions based on directional comments from OEM interviews and analysis of independent data and literature.

Based purely on trade data in the value of parts supplied to HDV OEMs, Europe is exporting more electronic components on aggregate (by value) than it is importing, suggesting that it could be sourcing more than 50% components from Europe. Including FTA partners could extend this fraction further. However, it is very difficult to develop a good understanding of which specific components are being sourced from outside 'Europe'. This is an important finding, since a lack of clarity on the consequences of these proposed IAA provisions could lead to unintended consequences. In future, OEM interviews suggest that the European share of these components may fall in future due to rising cost pressures.

[49] Leadership Group for Industry Transition (2026) *Green Steel Tracker.* Available at: https://www.industrytransition.org/trackers/green-steel-tracker/

Table 6: 'EU' share of non-battery electronic components, current and future (in absence of policy intervention)

Component	Current (% value)	Robustness of current assessment	Future
E-powertrain components	>50%	OEM interviews and limited literature, generally at a very aggregated level of components	↓
Main electronic components	>50%		↓

4.3.2 Current sourcing strategies

In interviews, many of the OEMs could not comment on their suppliers for specific electronic components for confidentiality reasons, emphasising instead that they undertake unbiased procurement processes with outcomes varying by component, generally driven by price (impacting TCO, a key metric for truck buyers) and product quality. Moreover, they expressed it is difficult to comment on the origin of individual components, given that trucks are comprised of hundreds if not thousands of such components with decisions made across global supply chains.

Some OEMs buy complete systems from one supplier and have an announced partnership, for example for ADAS, but noted that they have limited visibility of where the underlying components of those systems come from. These partnerships shed some light on current practices, but do not guarantee that OEMs source all such parts from one supplier. For example, Volvo highlighted their partnership with Aurora, with public announcements noting that initial production of the Aurora Driver system (SAE L4) will take place in Virginia, USA, and full-scale production will being carried out by Continental (location undisclosed).[50] In general, Mordor Intelligence (2026) note that legacy Tier-1's such as Continental, Bosch, and ZF Friedrichshafen comprise the 'bulk' of the global ADAS market by bundling radar, camera, and domain controllers, but smaller players are also emerging. Daimler also noted their investment in Torc Robotics to develop an L4 system for trial in the US, where the underlying LiDAR are being provided by Innoviz Technologies[51] and Aeva[52]. Other OEMs including TRATON[53] and IVECO[54] are developing software solutions in partnership technology providers, but do not disclose the origin of any related hardware. If these solutions include LiDAR technologies, it's highly likely that these will be procured from China given that Chinese LiDAR suppliers account for 93% of the passenger car LiDAR market and 89% of the total LiDAR market, with HDV therefore comprising a relatively small share of global demand.[55] However, not all ADAS will utilise LiDAR - several OEMs noted that this would be too expensive for their product offerings, with unit costs exceeding four figures relative to short-range radar which can reportedly cost less than US$50.[56]

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[50] Volvo (2025), *Volvo Autonomous Solutions and Aurora: A partnership primed to scale with safety built-in*. Available at: https://www.volvoautonomoussolutions.com/en-en/news-and-insights/insights/articles/2025/apr/vas-and-aurora-a-partnership-primed-to-scale-with-safety-built-in.html
[51] https://torc.ai/torc-innoviz-technologies-lidar-partner-daimler-truck/
[52] https://www.aeva.com/press/daimler-truck-and-torc-robotics-select-aeva-to-supply-advanced-4d-lidar-technology-for-series-production-autonomous-trucks/
[53] https://traton.com/en/newsroom/press-releases/the-traton-group-and-applied-intuition-announce-strategic-partnership-on-vehicle-software.html
[54] https://www.ivecogroup.com/media/corporate_press_releases/2026/january/iveco_and_plus_ai_launch_new_level_4_autonomous_driving_programme_in_spain
[55] China takes the lead in automotive LiDAR: A market set to quadruple by 2030
[56] https://www.mordorintelligence.com/industry-reports/commercial-vehicle-adas-market

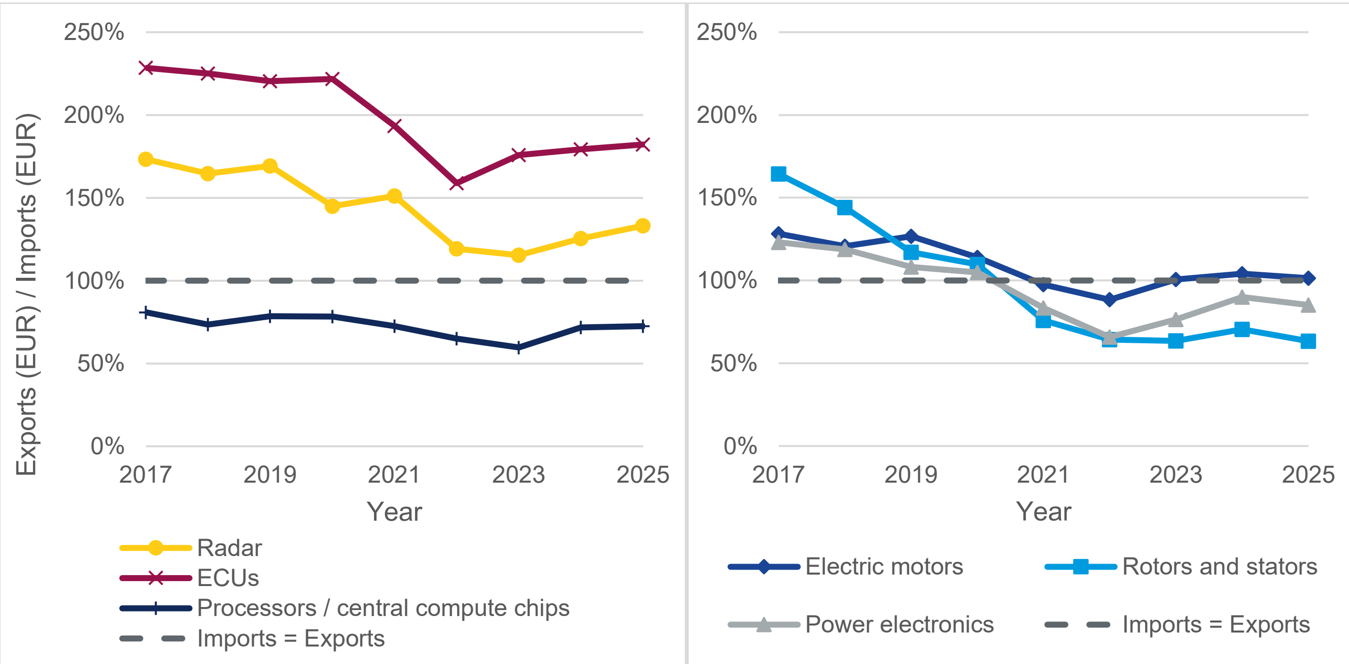
Table 7: Truck ADAS partnerships and associated suppliers (non-exhaustive)

OEM	Partner	Partnership scope	Hardware supplier	Hardware origin*
Volvo	Aurora	L4 system	Continental (processor, sensors, other auxiliary hardware)	EU, US, China
Daimler	Torc Robotics**	L4 system	Innoviz (short range LiDAR) Aeva (long range LiDAR)	Germany, Israel Thailand, US
TRATON	Applied Intuition	Software only	N/A	N/A
IVECO	Plus AI	Software only	N/A	N/A

Source: OEM announcements. *Notes*: (*) this lists all manufacturing sites for the hardware supplier rather than specific known production sites for the OEM (**) Torc is a subsidiary of Daimler rather than a partner.

For the remaining components, a data-driven approach was taken to investigate current European content. Figure 8 below shows the trade balance for the electrical components listed in the proposed IAA legislation, or the closest sector headings that represent those components (see Table 9 in Appendix for further commentary). The trade balance is defined here as exports out of the EU-27 divided by imports into the EU-27. Figures above 100% indicate a positive trade balance, i.e. that production capacity outweighs domestic demand, and a greater share of component value is being sourced from outside of Europe compared to from inside Europe. Likewise, values less than 100% signify a negative trade balance. Importantly, all headings include products that are sold to light duty automotive manufacturing and even non-automotive sectors. The experience within the HDV manufacturing sector may therefore be very different. Moreover, if countries that have FTAs with the EU were considered as EU origin, then the trade balance for all components would likely be more positive (potentially significantly so).

Figure 8: Trade balance for select main electronic systems (left) and e-powertrain components (right) used in HDV, EU-27 (2017-2025).



Source: Eurostat (ds-059341). *Notes*: Assumed product codes for each component are listed in Appendix Table 9. Excludes production within a Member State being sold within the same Member State.

The data points to a shift to greater reliance on non-EU parts for e-powertrain components relative to main electronic systems and indeed other automotive parts. For general automotive parts used in HDVs, the trade balance has consistently been positive since 2017, suggesting that European OEMs are sourcing most of their components (by value) from within Europe. This aligns with sentiments in the light duty sector: Roland Berger analysis for CLEPA (2025) suggests the EV powertrain and 'electronics' together (excluding batteries) comprise 25% of a passenger car's value, with survey data suggesting that 70% of the former and 50% of the latter come from within the EU (by value).[57] For trucks the ICCT (2022) estimate that the value share of powertrain and electronics is higher at 29-37%[58], meaning that these origins are even more important when it comes to defining the EU share of the total value of the vehicle. However, looking at specific subheadings of electrical components reveals heterogeneity. While radars and ECUs also show a significant trade surplus, a marginal surplus is present for electric motors, and other e-powertrain components show trade deficits (power electronics, rotors and stators). Indeed, one OEM indicated that for specific components like electronic rear mirrors, there is no European market and vehicle manufacturers must look elsewhere. Major Western Tier 1 suppliers such as Bosch[59], Cummins[60] and Dana[61] are localising R&D, manufacturing and commercial vehicle operations in China. Recent investments in Chinese e-axle production, electric motor manufacturing, commercial vehicle headquarters and local partnerships suggest a shift towards production in China.

Notably, trade balances for all components have either fallen further into deficit or remained stable. This aligns with trends in the broader automotive sector (including LDV) - CLEPA report that the trade balance for 'auto parts, batteries and electronics' in the EU fell from a surplus of over €5 billion in H1 2022 to a deficit €1.4 billion in H1 2025.[62]

4.3.3 Future sourcing strategies

The historic data in the previous section may confirm sentiments from OEM interviews that, even if electronic components currently come from Europe, the direction of travel is to source more and more components from Asia because they are cheaper, and pressure to compete with Chinese OEMs on price are rising (one OEM noted that they are able to undercut EU vehicle prices by around 30%). In the absence of further information, it may therefore be reasonable to assume that the share of local content in electrical components may fall further in future, in the absence of policy intervention.

[57] CLEPA (2025), *Automotive component - Driving EU competitiveness and value creation*. Available at: https://www.clepa.eu/wp-content/uploads/2025/09/2025.09.29_CLEPA_Value-add-Strategy_FinalReport.pdf
[58] ICCT (2022), *A meta-study of purchase costs for zero-emission trucks*. Available at: https://theicct.org/wp-content/uploads/2022/02/purchase-cost-ze-trucks-feb22-1.pdf
[59] IMRA (2026), *Germany's Bosch to launch strategic commercial vehicle project in China*. Available at: http://infaia.org/news/shownews.php?id=888
[60] Truck and Bus Builder (2026), *XCMG and Cummins agree to strengthen collaboration*. Available at: https://truckandbusbuilder.com/article/2026/03/30/xcmg-and-cummins-agree-to-strengthen-collaboration
[61] Dana (2026), *Dana in China.* Available at: https://www.dana.com/china
[62] CLEPA (2025), CLEPA Data Digest #22: *Jobs lost, trade in the red: Will Europe's auto future be made elsewhere?* Available at: https://www.clepa.eu/insights-updates/data-digests/jobs-lost-trade-in-the-red-will-europes-auto-future-be-made-elsewhere/

5. Conclusions

This study aimed to answer three main research questions through a mixed methods approach, combining literature review with insights from ACEA's membership of truck OEMs gathered via interview:

[4] What is the current European content of components used by European HDV manufacturers?
[5] How is this expected to develop in future in the absence of further policy intervention?
[6] What are the implications of [1] and [2] for likely compliance with the IAA and the TCA?

Answers to the first two research questions are summarised in Table 8 below.

- For **batteries**, Ricardo estimate that less than 5% of battery cell components can come from Europe or its non-China trading partners (cathode and anode active materials, other cell sub-components), with around 2/3 of the fleet utilising NMC chemistries. Future prospects for the ability to source content locally rely heavily on using NMC – many European OEMs seem to be heading towards LFP, which has very limited production capacity outside China.
- For **metals** it's not currently possible to assess the share of European-produced green steel and low-carbon aluminium, which is also hampered by a lack of official definitions. Many OEMs are uncertain on total volumes of low-carbon metals used in HDVs as well as their origin. Future use will depend highly on the cost differential to conventional metals and EU production capacity.
- For **electronic components** (excluding batteries), at first glance, Europe's trade surplus in automotive parts indicates it could be sourcing the majority locally, potentially higher when FTA partners are considered. However, this varies part group by part group and notably (a) has fallen for all products since 2019, and (b) in deficit for most e-powertrain components. This reflects OEM sentiments to reduce cost differentials with Chinese-produced vehicles by sourcing components from China, and for some components very limited European production capacity exists.

Table 8: Summary assessment for the current and future expected EU content of EU HDVs

<table>
<tr><th>HDV component</th><th>Current EU content</th><th>Future EU content</th><th>Robustness</th></tr>
<tr><td colspan="4">Batteries</td></tr>
<tr><td>Pack / module assembly</td><td rowspan="2"><60%</td><td rowspan="2">→</td><td></td></tr>
<tr><td>BMS / BTMS</td><td></td></tr>
<tr><td>Cell</td><td><50%</td><td rowspan="4">→ / ↓*</td><td></td></tr>
<tr><td>CAM (cathode active material)</td><td><5%</td><td></td></tr>
<tr><td>AAM (anode active material)</td><td><5%</td><td></td></tr>
<tr><td>Other sub-cell components</td><td><5%</td><td></td></tr>
<tr><td colspan="4">Metals</td></tr>
<tr><td>Green Steel</td><td rowspan="2">Not possible to assess**</td><td>→</td><td rowspan="2"></td></tr>
<tr><td>Low carbon aluminium</td><td>→</td></tr>
<tr><td colspan="4">Electronic components</td></tr>
<tr><td>E-powertrain components</td><td><50%</td><td>↓</td><td></td></tr>
<tr><td>Main electronic components</td><td>>50%</td><td>↓</td><td></td></tr>
</table>

Source: Ricardo analysis. *Notes:* (*) Assuming a continued shift to LFP chemistries. There are greater prospects for localisation of NMC CAM. (**) There is a limited amount of green steel used by some OEMs, but it is not possible to quantify this due to limited data and uncertainty from OEMs regarding the proportion of low-carbon metals in HDVs.

The policy implications of the above findings are as follows:

- **In 2027, less than 5% of battery cells used in European HDVs are expected to contain CAM produced in the UK or EU.** Findings from Ricardo's analysis of global battery supply chains and related interviews with European OEMs align with evidence from a survey of ACEA's members in October 2025, which highlight that only 4% of all battery cells used in European HDVs are expected in 2027 to contain CAM originating in the UK or the EU. Notably, all 'originating' cells all expected to be of NMC chemistry (10% within NMC).
- **Consequently, under TCA requirements in January 2027, a large proportion of European HDVs could face tariffs when exported to the UK.** This is because they need to either (a) assemble in UK or EU and use local CAM, or (b) have local content exceeding 70% of the battery pack and 65% of the battery cell. Given less than 5% of cells used in EU-made HDVs contain originating CAM, it is not clear that OEMs could 'make up' the EU content in other parts of the battery given China's dominance in battery supply chains. ACEA's October 2025 survey found that batteries with compliant local content are expected to be targeted to the UK market, with a lower expected vehicle non-compliance rate at around 71%. This would face competing demand if the IAA LCRs were introduced concurrently. Regardless, the implication of this non-compliance is that the EU would then face a 10% tariff on its largest export market for trucks (€3.2 billion in 2025, or 24.1% of total exports) [63] which would significantly impact price competitiveness.
- **Three years after entry into force of the IAA, a similar proportion of European trucks would not be considered compliant based on a requirement to use union-origin CAM.** Prospects to diversify LFP battery sourcing from outside China are growing but are expected to be limited and face significant competing demand, based on independent capacity projections and OEM sentiments on how quickly battery capacity outside China could scale. Again, metals and other electronic components could be a further limiting factor, but the evidence is too limited to draw strong conclusions on this.
- **Even under current requirements (TCA in force already, IAA if ratified today), up to 40% of EU-made trucks may face tariffs when exporting to the UK, and around half of the medium and heavy trucks produced in Europe would not meet LCRs for European public procurement and subsidy programmes.** This is because around half of the battery cells originate from China, and most of these are assembled outside the EU, with cells listed are a key component as needing to be of EU (or UK) origin. For the TCA, trucks may be able to meet the vehicle-level content threshold instead, but this will be challenging given the high share the battery comprises of a BEV. For the IAA, LCRs on metals and electronic components could be a further prohibiting factor for remaining vehicles, but this is less likely for electronic components based on available evidence.
- **It is unclear to what extent the "opt-out" clause for public procurement would impact the application of the LCRs. If unchanged this has the potential to limit the effectiveness of the IIA, for cases where LCRs can't be met.** Cost differences of 25% for public procurement and 30% for public support schemes are deemed 'disproportionate' and could enable public authorities to bypass union origin rules. Batteries produced in EU are already >30% more expensive than those produced in China, so it wouldn't take many more components to meet this threshold.

[63] ACEA (2026), *Economic and Market Report: Global and EU auto industry, Full year 2025.* Available at: https://www.acea.auto/files/Economic_and_Market_Report-Full_year_2025.pdf

- **However, application of the IAA LCRs to other policy areas (CO_2 Regulations, Corporate Fleets, etc.) could increase the scope of impact to more vehicles in future.** These policy initiatives are already explicitly linked for LDVs, so extension to HDVs is possible.

In summary, it is important to note that the likelihood of compliance is different between LDVs and HDVs and could require separate consideration for the setting of LCRs. Large evidence gaps make it difficult to draw strong conclusions for HDVs right now. Consultation with OEMs indicates that they will need to start tracking their EU content share, particularly on sub-cell battery components, low carbon metals, and electronic components, and further research is needed in general to substantiate this evidence base.

Appendix A: Assumptions

Table 9: HS product codes used in Eurostat trade data extraction

Component	Selected product code (HS)	Comment
Power electronics	**8504** Electrical transformers, static converters, e.g. rectifiers, and inductors; parts thereof	Not automotive-specific
Electric motors and their components	**8501** Electric motors and generators (excl. generating sets)	Not automotive-specific - contains traction motors, but also other motors
E-axles and their components	**8708** Parts and accessories for tractors, motor vehicles for the transport of ten or more persons, motor cars and other motor vehicles principally designed for the transport of persons, motor vehicles for the transport of goods and special purpose motor vehicles of heading 8701 to 8705	No specific product code found – therefore assumed within **8708**, which is automotive and HDV specific
Rotors and stators	**8503** Parts suitable for use solely or principally with electric motors and generators, electric generating sets and rotary converters	Not automotive-specific
Lidars	N/A	No specific product code found – therefore assumed within **8708**
Radars	**8526** Radar apparatus, radio navigational aid apparatus and radio remote control apparatus	Not automotive-specific
Sensors	N/A	Too generic to find suitable product code – could be contained within **8708**
Cameras	**8525** - Transmission apparatus for radio-broadcasting or television, whether or not incorporating reception apparatus or sound recording or reproducing apparatus; television cameras, digital cameras and video camera recorders	Questionable whether cameras for automotive use for fall under this heading (which is not automotive-specific)
ECUs	**8537 -** Boards, panels, consoles, desks, cabinets and other bases, equipped with two or more apparatus of heading 8535 or 8536, for electric control or the distribution of electricity, incl. those incorporating instruments or apparatus of chapter 90, and numerical control apparatus (excl. switching apparatus for line telephony or line telegraphy)	TARIC examples include electronic suspension control units and hybrid system controllers for Chapter 87 goods. Not automotive specific.

Component	Selected product code (HS)		Comment
Integration platforms	N/A		No specific product code found – therefore assumed within **8708**
Central computing units	**8542**	Electronic integrated circuits; parts thereof	Not automotive-specific
Wireless access systems	N/A		No specific product code found – therefore assumed within **8708**
Infotainment head units	N/A		No specific product code found – therefore assumed within **8708**
Chassis electronics	N/A		No specific product code found – therefore assumed within **8708**

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