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From production to deployment: Strengthening Ukraine's electric public transport value chain

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EXECUTIVE SUMMARY

Ukraine's reconstruction will determine not only how cities restore urban mobility, but also whether these investments utilise domestically produced public transportation solutions or primarily finance imported equipment. Electric public transport manufacturing sector sits at the intersection of three priorities for the country's economic and industrial trajectory: industrial diversification toward higher value-added activity in a future-oriented segment, decarbonisation aligned with Ukraine's climate commitments and energy transition goals, and deepening integration with EU markets and standards as the country advances toward EU accession. Sustained domestic procurement of electric buses, trolleybuses and trams would give domestic manufacturers the volumes needed to scale their manufacturing activities, invest in their own production standards, and align more closely with EU technical and certification norms, all of which are necessary in a sector where European demand is itself moving rapidly toward zero-emission solutions.

Ukraine has a functioning industrial base across all relevant segments: diesel buses, trolleybuses and trams, alongside a nascent but emerging electric bus segment. Trolleybus production is the most established, with several serial producers and a wide installed base of operating systems across Ukrainian cities. Tram manufacturing retains active production capacity and has experience of prior international deliveries. Electric bus production is the least developed segment, with serial output beginning to emerge from a longer industrial history in diesel bus manufacturing. Ukrainian producers retain price competitiveness and deep operational experience that is directly relevant both for domestic and EU markets. At the same time, the sector faces real and overlapping gaps in scale, financing access, R&D coordination, and certification readiness that currently limit both export outcomes and the pace at which domestic rolling stock can be renewed and expanded.

What this base could deliver, if catalysed by a sustained procurement programme, is significant. If the Government's draft public investment programme on the development of electric public transport sector were to be fully implemented at the targeted volumes (Best-case scenario), Ukraine's domestic public transport manufacturing sector and related infrastructure projects would generate EUR 387 million annually in domestic gross value added for the Ukrainian economy; of which EUR 162 million would be generated from direct manufacturing activities, EUR 142 million across the domestic supply chain, and EUR 83 million from infrastructure works. This economic value creation would also be reflected in employment effects across the wider electric public transport value chain, from vehicle manufacturing through to the supply chain, infrastructure, maintenance, and vehicle operation as fleets expand. Additionally, the uptake of electric buses instead of diesel ones would bring around EUR 9-15 million cost savings per year in avoided diesel imports. There would also be environmental benefits, as increased uptake of electric public transport would reduce greenhouse gas emissions. The deployment of electric buses, trolleybuses and modern trams in Ukraine would deliver around 49,000 tCO_2e annually in greenhouse gas savings. To put these amounts in relative scale, continued procurement at the current pace (Status quo scenario) would only generate around EUR 45 million gross value added annually for the economy (12% of Best-case scenario), and emissions savings would be limited to roughly 9,000 tCO_2e, with proportionally smaller economic savings from diesel imports.

Several structural barriers explain why this potential is not being realised on its own. Vehicles are produced to order, so without secured offtake manufacturers cannot commit to scale-up investment. Much of the underlying urban transport infrastructure, such as substations, catenary, depots, track, is in degraded condition, and rolling stock procurement onto unmodernised networks brings lower vehicle performance and lifecycle economics. Public financing reaches manufacturers late in the production cycle, leaving working capital largely uncovered. Public service obligation contracting does not yet provide operators with a stable revenue base from which to plan and finance procurement. On the export side, EU type approval is costly and

time-intensive, Ukrainian producers lack an export credit and buyer-finance architecture comparable to those available in competing EU economies, and after-sales infrastructure in target EU markets remains limited. R&D activity also remains diffuse across firms, with limited mechanisms for shared learning or cost reduction.

Two reinforcing dynamics make the current period particularly important. Domestically, the Government's investment programme represents an opportunity to convert reconstruction spending into durable industrial capacity, but only if the structural barriers identified in this report are addressed before procurement cycles lock in imported solutions for the decade ahead. Externally, EU accession negotiations, the procurement provisions of the Industrial Accelerator Act, and European fleet replacement cycle concentrated in the late 2020s and early 2030s create a time-limited opening for Ukrainian manufacturers to establish themselves in target export markets. Neither dynamic will remain open indefinitely, and the two are mutually reinforcing: domestic scale-up is a prerequisite for competitive export positioning, and export revenue in turn supports the investment needed to meet EU technical standards.

To support this potential, several areas of policy action stand out across the supply side, the demand side, and external markets. On the supply side, the immediate priorities are working-capital guarantees sized to production-contract cycles, more active grant-based R&D support, and a consolidation of fragmented R&D and provide a shared anchor for certification, skills, and research cooperation. On the demand side, infrastructure rehabilitation should be sequenced ahead of large-scale fleet procurement, municipal orders should be aggregated into pooled tenders where feasible, and public service obligation contracting should be reformed in line with EU Regulation 1370/2007. On exports, a dedicated certification grant fund covering EU type-approval costs, an export credit architecture for public transport vehicles developed with interim IFI guarantee support, and consortium and partnership models with EU OEMs would together address the most binding constraints.

The choices made in the coming years will shape whether Ukraine's electric public transport sector continues to operate well below its potential or develops into a more durable pillar of industrial recovery and EU integration. With sequenced and adequately resourced public support, the same investment volumes could build domestic productive capacity, deliver measurable emissions reductions, and position Ukrainian manufacturers within the European urban transport value chain over the coming decade.

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LIST OF ABBREVIATIONS

ACAA	Agreement on Conformity Assessment and Acceptance of Industrial Products
AFIR	Alternative Fuels Infrastructure Regulation
CEE	Central and Eastern Europe
DCFTA	Deep and Comprehensive Free Trade Area
DFI	Development Finance Institution
EBRD	European Bank for Reconstruction and Development
ECA	Export Credit Agency
EIB	European Investment Bank
EU	European Union
IAA	Industrial Accelerator Act
ICE	Internal combustion engine
IFI	International Financial Institution
IMC	In-motion charging
LFP	Lithium Iron Phosphate
MFN	Most-Favoured Nation
OEM	Original equipment manufacturer
PPA	Power Purchase Agreement
TCO	Total cost of ownership
UITP	International Association of Public Transport
UPTF	Ukraine Public Transport Framework
UUPTFL	Ukraine Urban Public Transport Framework Loan

1. INTRODUCTION

The expansion of public transportation networks and decarbonisation of the rolling stock are seen as key objectives to decrease greenhouse gas emissions stemming from the global transportation sector.[1] The last few decades have seen significant developments in the public transportation sector, with large-scale deployment of electric public transport, especially in parts of East Asia and Europe, but with increasing penetration across all geographies.[2] More and more countries globally are introducing decarbonisation targets for their public transport systems, driven by climate policies but also the rapidly decreasing costs and increasing quality of electric public transportation solutions.

Ukraine has a long and rich history of large-scale public transportation networks but also hosts a wide range of manufacturers of these solutions, including of city buses, trolleybuses and trams.[3] Importantly, capacities already exist to manufacture electric and battery versions of all of these modes of transport, with significant expertise, research and development and local content already present in Ukraine. With strong demand projections for additional production capacities needed both domestically and throughout Europe as the transition to electric public transport progresses, opportunities may arise for Ukraine's manufacturers to further expand their production. Nonetheless, the Ukrainian public transportation manufacturing sector, but also domestic deployment, suffers from a wide range of issues that need to be addressed to help bolster both the supply and demand sides.

Now well into the fourth year of Russia's illegal invasion of Ukraine, economic recovery and industrial development are high up on the agenda of priorities, but green growth and "build back better" are both also fundamental principles that need to be adhered to ensure a sustainable and long-term growth strategy.[4] As a key manufacturing sector with potential for both growth and domestic and EU decarbonisation, public transport manufacturing, including electric buses, trolleybuses and trams, could potentially constitute a key pillar in Ukraine's recovery, fuelling industrial recovery, creating jobs, and acting as a driver of further integration with EU supply chains.

This report is the first to provide a comprehensive assessment of the Ukrainian electric public transport sector from both supply (manufacturing) and demand (adoption) side. The goal is 1) to assess the existing electric public transport manufacturing base and identify opportunities to scale up production, 2) to assess the current state of domestic electric public transport adoption, fleet conditions, and the barriers and drivers shaping future demand, and 3) to investigate export opportunities and further integration within EU value chains. Following a similar approach to a previous study on green value chain manufacturing potential in Ukraine,[5] the current study was written following multiple requests from stakeholders within Ukraine. Key policymakers have expressed interest in an assessment of the potential of green public transport manufacturing and the development of a sectoral strategy and roadmap for expansion. The report takes a holistic approach, assessing all key factors impacting the sector, including challenges and risks, but also opportunities and potential.

The analysis presented in this report stems from a mix of quantitative and qualitative methods that include both primary and secondary research, interviews and various site visits at key manufacturing plants. Through discussions with policy-makers, private sector actors and non-governmental organ-

1. IPCC. (2023). Sixth Assessment Report. https://www.ipcc.ch/assessment-report/ar6/
2. IEA (2025), Global EV Outlook 2025, IEA, Paris https://www.iea.org/reports/global-ev-outlook-2025, Licence: CC BY 4.0
3. Federation of Employers of Ukraine. (2024). Made in Ukraine Catalog of manufacturers: Ukrainian machinery and equipment. https://catalog-madeinua.com.ua/wp-content/uploads/2024/06/catalog-en.pdf
4. International Institute for Sustainable Development. (2025). Building Forward Better: Review of sustainable recovery frameworks and lessons for Ukraine. https://www.iisd.org/publications/brief/building-forward-better-sustainable-recovery-ukraine
5. Bilek, P., Tahmisoğlu, Y., Vlasiuk, V., Povazhniuk, S., Romanenko, I., & Weser, H. (2025). Green Tech Made in Ukraine: Assessing the potential of green value chain manufacturing localisation in Ukraine. https://berlin-economics.com/wp-content/uploads/2025/10/Report_Green-value-chains_final-2.pdf

isations and thinktanks both in Ukraine and the EU, this report aims to provide a first comprehensive analytical and data-driven assessment that will support the development of the sector and aims to elicit conversations about how existing gaps can be bridged, what support is needed, and how Ukraine's public transportation manufacturing sector can position itself as the country proceeds with accession to the European Union. Ultimately, the goal of this report is both to feed into policy-making processes to further help catalyse sectoral development, but also to serve as a document to help generate new investment into the sector.

The report proceeds in five main sections. Chapter 2 provides an overview of the broader global and EU-specific landscape for electric public transportation, including its relevance, anticipated demand, the manufacturing landscape and key legislation and regulations. After this, Chapter 3 presents the key rationale for further developing the electric public transportation manufacturing sector in Ukraine, focusing on economic and industrial development, domestic decarbonisation and deeper integration with the EU through value chain integration. Chapter 4 forms the core of the report, with three main sub-sections focusing on the development of electric public transportation manufacturing, domestic deployment, and export opportunities, respectively. Each sub-section assesses the current state of play, key conditions, regulatory aspects, and then presents an assessment of the possibilities. Chapter 5 provides a quantitative assessment of potential economic and environmental benefits to Ukraine. Chapter 6 concludes by summarising the key findings and presenting policy recommendations.

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2

Global public transportation sector

2.1. Transportation and decarbonisation

The transportation sector is one of the largest and fastest-growing sources of greenhouse gas (GHG) emissions worldwide, recording above-average emissions growth of more than 2.5% year-on-year. In 2023, the sector accounted for 8.4 $GtCO_2e$ of global emissions, the second largest sectoral share after only the power sector.[6] Transport accounts for approximately 23% of annual global energy-related CO_2 emissions, with road transport alone contributing 69% of the sector's total.[7] Compared to 2019, demand for passenger transport is projected to increase by 79% and freight to roughly double by 2050 under a current policy trajectory, underscoring the urgency of a structural transition rather than incremental efficiency improvement.[8]

Unlike the power sector where the shift to renewables is already delivering measurable emissions reductions in many markets, transport decarbonisation has proved structurally harder, particularly for heavy-duty and public transport segments. The sector remains overwhelmingly dependent on fossil fuels, and the inertia of long-lived vehicle fleets, infrastructure investments, and institutional procurement cycles creates significant path dependency which is hard to break. Achieving the deep reductions needed to align the sector with Paris Agreement objectives therefore requires a combination of demand-side interventions, modal shift, and the accelerated replacement of fossil-fuel fleets with zero-emission alternatives. Transport sector decarbonisation is embedded in virtually all Nationally Determined Contributions (NDCs) and long-term strategies submitted under the Paris framework. This reflects countries recognising both the scale of sectoral emissions and the co-benefits of clean transport, including reduced urban air pollution, improved public health, and enhanced energy security.

The Global Memorandum of Understanding on Zero-Emission Medium- and Heavy-Duty Vehicles has meanwhile grown to over 40 national government signatories (including Ukraine) with the ambition of reaching 30% zero-emission vehicle sales in the truck and bus segment by 2030 and 100% by 2040.[9] The broader SDG architecture also reinforces the transition: SDG 11 (Sustainable Cities and Communities) explicitly calls for sustainable transport systems, while SDG 13 (Climate Action) provides the overarching emissions reduction imperative.[10] Taken together, these commitments continue to create a policy signal reshaping procurement, investment and industrial strategy across the global transport sector, but results have so far been mixed.

Nonetheless, within the broader transport decarbonisation agenda, electrified public transport occupies a particularly favourable position. Buses, trams and trolleybuses combine high passenger capacity with short route cycles and predictable return-to-depot patterns: characteristics that make them well-suited to electrification and that allow the operational economics of battery-electric vehicles to be optimised from relatively early in the technology adoption curve. A single electric city bus can replace tens of private vehicles per journey cycle, delivering disproportionate emissions reductions per vehicle procured and per unit of public investment.

The importance of public transport in urban decarbonisation has been repeatedly underscored in international assessment frameworks. The IPCC's Sixth Assessment Report identifies a shift towards mass transit as one of the highest-impact mitigation strategies available to urban planners, estimating that a balanced application of "Avoid, Shift and Improve" measures across all transport modes could deliver a reduction of approximately 2.4 $GtCO_2e$ by 2030 and nearly 5.7 $GtCO_2e$ by 2050.[11] Trams, trolleybuses and electric buses on high-frequency routes represents the "Improve" pillar of this framework applied at scale, and its integration with land-use planning and modal shift policies can compound the climate benefit significantly.

6. United Nations Environment Programme (2024). Emissions Gap Report 2024: No more hot air … please! With a massive gap between rhetoric and reality, countries draft new climate commitments. Nairobi. https://doi.org/10.59117/20.500.11822/46404
7. IPCC. (2023). Sixth Assessment Report. https://www.ipcc.ch/assessment-report/ar6/
8. International Transport Forum. (2023). ITF transport outlook 2023. OECD Publishing. https://doi.org/10.1787/b6cc9ad5-en
9. CALSTART (2025): Drive to Zero's Zero-Emission Technology Inventory Data Explorer. Version 3.1. https://globaldrivetozero.org/zeti-data-explorer/
10. United Nations. (n.d.). The 17 Sustainable Development Goals. https://sdgs.un.org/goals
11. IPCC. (2023). Sixth Assessment Report. https://www.ipcc.ch/assessment-report/ar6/

2.2. Technological shifts

The technological shift in the public transport segment over the last few decades has been highly significant, with a rapid move toward fully electric solutions. The total cost of ownership (TCO) of electric buses and trucks is projected by the IEA to be lower than diesel counterparts across nearly all medium- and heavy-duty segments in Europe, the United States and China by 2030, driven by declining battery costs, lower fuel expenditure, and reduced maintenance requirements.[12] In many European cities, this TCO parity is already being reached for city buses operating on intensive urban duty cycles.

The decreases in costs have been driven by the rapid maturation and commercialisation of lithium-ion battery technologies, which has been the single most important enabler of electric public transport adoption. Battery costs for electric vehicles fell by approximately 90% between 2010 and 2023, and lithium iron phosphate (LFP) chemistries, which are now dominant in the bus segment due to their superior thermal stability and cycle life have continued to improve in energy density[13] Average operational range for battery-electric buses improved over 300 km by 2024, with leading products from Solaris and BYD now demonstrating ranges around 600 km under favourable conditions.[14,15] Solid-state batteries and improved cell-to-pack configurations are expected to push range and cost-competitiveness further over the coming decade, although these technologies are not yet fully commercialised.[16]

Charging infrastructure has also evolved substantially. Overnight depot charging remains the primary configuration for urban bus fleets, allowing operators to manage grid connection costs and minimise downtime, but opportunity charging using pantograph or induction systems at terminal stops has expanded route flexibility significantly. Trolleybus networks have benefited from the development of in-motion charging (IMC) and on-board battery storage, which allow off-wire operation and enable route extensions beyond electrified corridors at comparatively low capital cost. For tram networks, energy recovery systems and modern traction substations have improved operational efficiency, reducing energy consumption per vehicle-kilometre.

2.3. Global market evolution

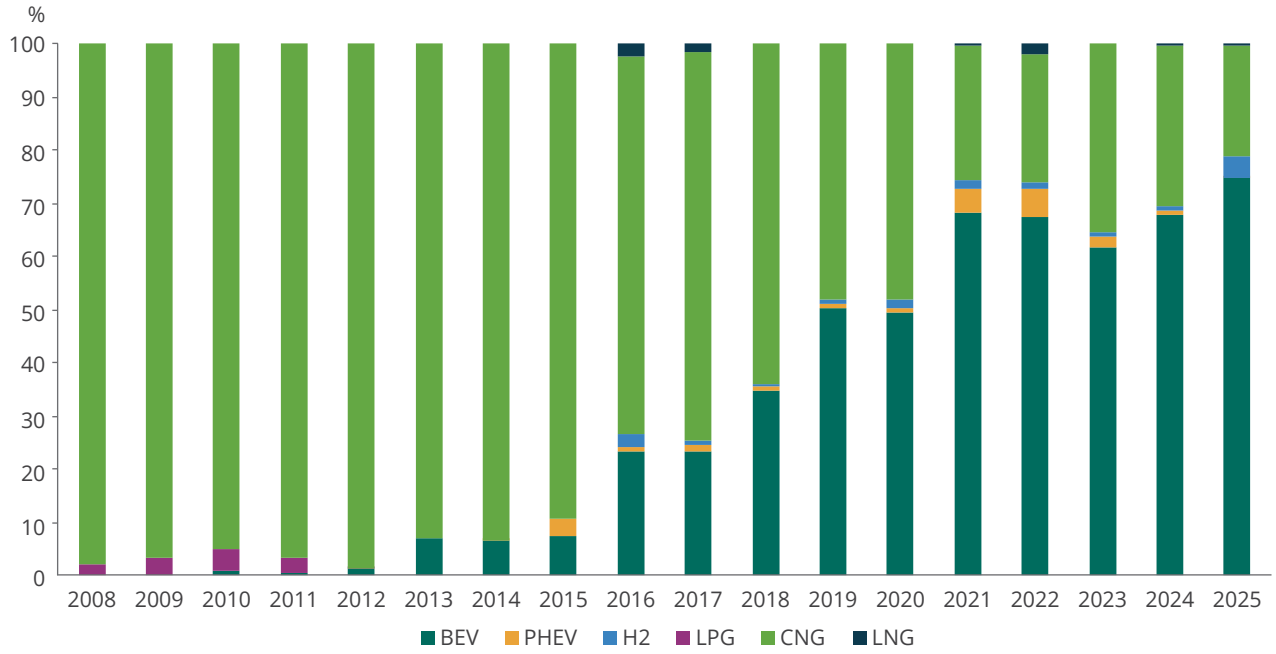
The global electric bus market has grown rapidly and is projected to continue doing so through the end of the decade and beyond. Market size estimates vary across sources reflecting differing scope and methodology, but the directional consensus is clear: the market is large, growing at double-digit rates, and dominated by the Asia-Pacific region.

As of 2024, the global electric bus fleet exceeded 670,000 units, with China accounting for approximately 77% of the total stock, a reflection of the country's early and sustained policy commitment to public fleet electrification, which saw cities such as Shenzhen fully electrify their entire fleet of over 16,000 buses as early as 2017.[17] Multiple market research estimates place the global electric bus market) in the range of USD 17-64 billion in 2024 (by revenue), reflecting variation in scope; on a volume basis, the market trajectory is more consistent. The IEA's Global EV Outlook projects electric bus sales to increase fourteen-fold from 2023 levels to approximately half a million vehicles per year by 2035 in the Stated Policies Scenario, reaching a stock of 4.5 million vehicles, equivalent to around 20% of the global bus fleet.[18]

12. IEA (2025), Global EV Outlook 2025, IEA, Paris https://www.iea.org/reports/global-ev-outlook-2025, Licence: CC BY 4.0
13. BloombergNEF. (2025). New Record Lows for Battery Prices. https://about.bnef.com/insights/clean-transport/new-record-lows-for-battery-prices/
14. Solaris. (n.d.). Urbino 12 Electric with Modular Drive. https://www.solarisbus.com/en/urbino-12-electric-with-modular-drive
15. BYD. (n.d.). BYD eBus B12.b. https://www.bydeurope.com/byd-ebus-b12
16. Fraunhofer Institute for Systems and Innovation Research ISI. (2022, May 16). What will solid-state batteries be like in the future? [Press release]. https://www.isi.fraunhofer.de/en/presse/2022/presseinfo-12-Roadmap-Feststoffbatterien.html
17. Mao, S., Qu, Z., Rodriguez, F. (2025). Zero-emission medium- and heavy-duty vehicle market in China, H1 2025. The International Council on Clean Transportation. https://theicct.org/wp-content/uploads/2025/09/ID-463-–-China-ZE-MHDVs-H1-2025_market-spotlight_final-1.pdf
18. IEA (2025), Global EV Outlook 2025, IEA, Paris https://www.iea.org/reports/global-ev-outlook-2025, Licence: CC BY 4.0

In 2024, zero-emission vehicles accounted for 50% of all new city bus registrations in the EU-27, representing a threshold that would have seemed implausible a decade ago, and up from just 15% in 2020. Registrations of electric buses across Europe (EU27, UK, Norway and Switzerland) reached 7,779 units in 2024, a 22% increase on 2023, which had itself seen a 53% rise over the prior year. In 2025, 60% of all new city bus registrations were zero-emission (primarily electric), with a target of reaching 100% of new sales by 2027.[19]

Figure 1. Share of newly registered alternative fuelled (BEV, PHEV, H2, LPG, CNG, LNG) buses (M2&M3)



Source: Own visualisation based on data from European Commission, Directorate-General for Mobility and Transport (2026).
Note: BEV = battery electric vehicle; PHEV = plug-in hybrid electric vehicle; H2 = hydrogen; LPG = liquefied petroleum gas; CNG = compressed natural gas; LNG = liquefied natural gas.[20]

The trolleybus market is considerably smaller, valued at approximately USD 1.35 billion globally in 2024, with a projected compound annual growth rate (CAGR) of around 3.2% through 2034.[21] Trolleybuses nonetheless remain a niche segment globally. As of December 2024, there were about 260 trolleybus systems operating across the world, with a total fleet of 22,137 trolleybuses. The EU, Switzerland and Norway accounted for 85 systems with 5,390 trolleybuses.[22] Modern trolleybuses, particularly battery-equipped "bi-mode" variants capable of off-wire operation, are experiencing renewed interest as cities look for flexible electric traction solutions that leverage existing catenary investments.[23] For example, in the EU alone these battery trolleybuses now account for 38% of the total number of trolleybuses. Of 372 new trolleybuses that went into service in 2024, only 12 units were without a battery.[24]

The global trams and light rail vehicle (LRV) market is characterised by steady structural growth, driven by sustained investment in urban rail modernisa-

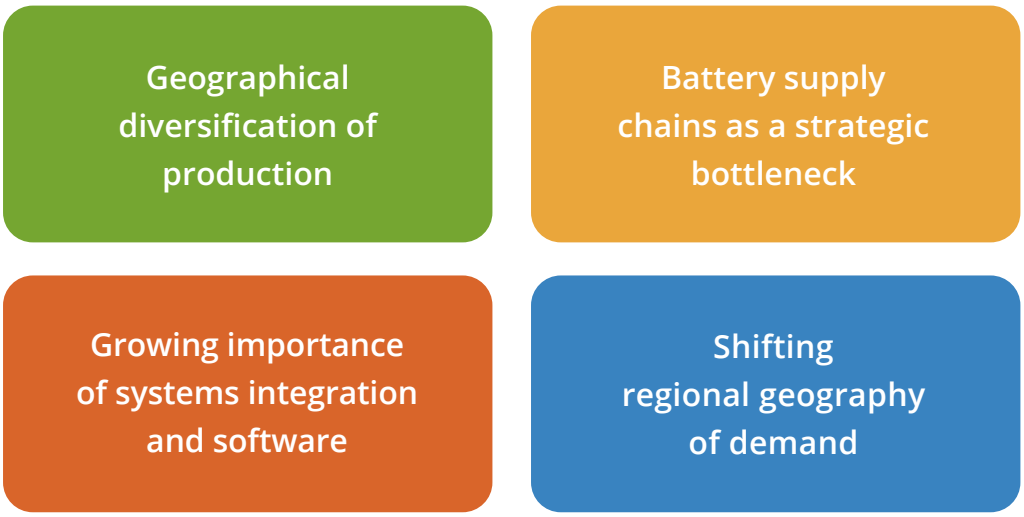
19. Sustainable Bus. (2026). Zero-emission buses reach 60% of EU city bus market in 2025. https://www.sustainable-bus.com/news/electric-buses-city-2025-europe-transport-environment/
20. European Commission, Directorate-General for Mobility and Transport. (2026). Vehicles and fleet [Webpage]. European Alternative Fuels Observatory. https://alternative-fuels-observatory.ec.europa.eu/transport-mode/road/european-union-eu27/vehicles-and-fleet
21. Research & Markets. (2025). Trolley Bus Market Opportunity, Growth Drivers, Industry Trend Analysis, and Forecast 2025-2034. https://www.researchandmarkets.com/reports/6097094/trolley-bus-market-opportunity-growth-drivers
22. UITP. (2025). Global Trolleybus Figures: Statistics Brief. https://www.uitp.org/wp-content/uploads/sites/7/2025/08/20250523_Global-Trolleybus-Figures_Statistics-Brief_WEB.pdf
23. Barnard, M. (2025). Why Modern Cities Are Embracing Trolleybuses Again. CleanTechnica. https://cleantechnica.com/2025/05/14/why-modern-cities-are-embracing-trolleybuses-again/
24. Ibid.

tion and new network construction across Europe, the Middle East and Asia. The rolling stock segment of the global trams market was valued at approximately USD 1.5-1.8 billion in 2024, with growth projected at a CAGR of approximately 4-4.4% through 2034. When infrastructure, signalling and systems integration are included, the broader light rail market is estimated at USD 16 billion in 2024, growing at a CAGR of approximately 4.4% to reach over USD 20 billion by 2030. Unlike buses, trams and light rail vehicles are already almost entirely electrified, and market growth is driven primarily by new network construction and fleet renewal rather than electrification per se. The Asia-Pacific region leads in tram market expansion, while Europe – which is home to some of the world's most extensive tram networks – continues to invest heavily in fleet modernisation and network extension.[25]

2.4. Electric transport manufacturing landscape

The electric public transport manufacturing sector has undergone a structural transformation over the past decade. What was until the mid-2010s a specialised and heavily subsidised niche concentrated in a handful of Chinese cities and a small number of European pilot programmes, has become a mainstream industrial activity, with dedicated production lines, integrated supply chains, and competitive procurement markets spanning multiple continents. This shift has been driven by a combination of policy mandates, technology maturity, scale-driven cost reductions, and the strategic industrial choices of a set of major original equipment manufacturers (OEMs) that have invested heavily in dedicated electric platforms. Several structural trends are reshaping the global manufacturing landscape for electric public transport vehicles and are directly relevant to the opportunities and constraints facing Ukraine.

Figure 2. Global trends shaping the electric public transport manufacturing landscape



Source: Own visualisation

Within the segment, there is a clear trend towards geographical diversification of production away from single-country concentration. Chinese manufacturers, having established their domestic base, are building or partnering in assembly facilities in Hungary, Azerbaijan, Mexico and other markets. This is done to both navigate tariff barriers, but also to meet local content requirements in public procurement tenders, an increasingly relevant factors as industrial policy returns globally.[26] European and North American

25. DataBridge Market Research. (2021). Global Trams Market Size, Share and Trends Analysis Report – Industry Overview and Forecast to 2033. https://www.databridgemarketresearch.com/reports/global-trams-market
26. Tu, A. C. (2025). Chinese automakers accelerate overseas vehicle manufacturing amid tariff pressures. S&P Global Mobility. https://www.spglobal.com/automotive-insights/en/blogs/2025/11/chinese-oems-advance-overseas-vehicle-manufacturing

manufacturers are similarly investing in distributed production footprints. This diversification creates openings for countries with relevant manufacturing capabilities, geographic proximity to demand centres, and competitive labour costs to position themselves as production locations, which may open new opportunities for countries such as Ukraine.

Battery supply chains remain a critical bottleneck and a source of strategic competition. European and North American electric bus manufacturers still rely heavily on Asian battery suppliers, in particular CATL (China), which produces most lithium iron phosphate battery packs used in globally sold buses.[27] This dependence has prompted significant policy and industrial responses, including the European Battery Alliance and the Net-Zero Industry Act's targets for expanding EU battery cell manufacturing to cover at least 40% of annual deployment needs.

Systems integration and software are increasingly differentiating factors in competitiveness. Modern electric buses and trams are complex systems integrating traction electronics, battery management, depot charging, fleet telematics and passenger information systems. Manufacturers that can offer integrated solutions, including vehicle, charging infrastructure, energy management and maintenance services under a single commercial framework are gaining a competitive advantage in public procurement markets where public transport operators seek to minimise transaction costs and lifecycle risk.

Most fundamentally, the regional geography of demand is shifting. While China will remain the largest single market for electric buses by volume for the foreseeable future, the highest marginal growth in demand in the next decade is expected to come from the EU (driven by regulatory mandates and fleet renewal), India, and increasingly from Latin America and the Middle East. For Ukraine, the EU and Central Asian/post-Soviet markets are the most immediately relevant demand pools, and understanding the competitive dynamics in these geographies is essential to assessing Ukraine's export potential.

2.4.1. Electric buses

China occupies a structurally dominant position in global electric bus manufacturing. Chinese OEMs accounted for approximately 60% of all commercially available electric bus and truck models globally in 2022, and more than 80% of global electric bus sales volumes continue to originate from Chinese manufacturers, primarily BYD, Yutong, King Long, Zhongtong, Higer and Foton.[28] This dominance is rooted in a decade of sustained state support, including purchase subsidies, local content requirements, and large-scale public procurement, that allowed Chinese manufacturers to achieve unprecedented economies of scale and drive battery costs down the cost curve faster than their international competitors.

Crucially, Chinese manufacturers are no longer confined to their domestic market. Yutong has delivered over 150,000 electric buses globally as of 2024 and surged to a 14% market share in Europe in 2024, making it the top-selling electric bus brand on the continent with 1,092 registrations.[29] BYD, meanwhile, pursued a strategy of establishing local assembly: it operates a manufacturing plant in Komárom, Hungary, and opened a new production facility in Baku, Azerbaijan, in July 2024 targeting Central Asian and Eastern European markets. In 2023, the city of Tashkent, Uzbekistan, signed a purchase agreement for 2,000 BYD buses, underscoring active Chinese penetration of post-Soviet urban transport markets.[30] Chinese companies grew their combined share of EU electric bus sales from approximately 10% in 2017 to around 30% in 2023,[31] and this trajectory has contributed to the EU's broader reassessment of its trade and industrial policy in the clean technology sector.

27. IEA (2023), Trends in electric heavy-duty vehicles, in Global EV Outlook 2023, IEA, Paris, https://www.iea.org/reports/global-ev-outlook-2023/trends-in-electric-heavy-duty-vehicles, Licence: CC BY 4.0
28. IEA (2024), Global EV Outlook 2024, IEA, Paris, https://www.iea.org/reports/global-ev-outlook-2024, Licence: CC BY 4.0
29. Sustainable Bus. (2025). Electric bus market 2024 in Europe: Yutong, Mercedes, Iveco Bus and VDL see triple-digit growth. https://www.sustainable-bus.com/news/electric-bus-market-europe-2024-figures/
30. BYD. (2023). BYD and Tashkent Municipality, Uzbekistan Sign Purchase Agreement for 2,000 Electric Buses. https://www.bydeurope.com/article/460
31. World Resources Institute, analysis of ACEA and company data, 2024. The 10% figure refers to 2017 Chinese share of EU electric bus sales; the 30% figure refers to 2023.

European OEMs do however retain significant strengths in both trolleybus and bus segment, although the competitive dynamics are evolving rapidly. In the electric-only segment, Yutong's lead was followed by Daimler at 11.8% and Iveco Bus at 10.6%. Solaris Bus & Coach (Poland, part of CAF Spain) fell to fourth after a 36.6% decline in battery-electric registrations. However, it still delivered 544 electric buses and 180 trolleybuses in 2024, and its cumulative zero-emission deliveries exceed 3,000 units across 33 countries. VDL recorded exceptional growth of 271% in electric registrations. Volvo, Daimler and MAN have launched dedicated modular electric bus chassis, and IVECO Bus has partnered with Škoda Electric on a new generation of trolleybus products. Turkish manufacturer Otokar registered a 3% share of all EU bus sales, signalling competitive pressure from outside the traditional European and Chinese supplier base.

2.4.2. Trolleybuses

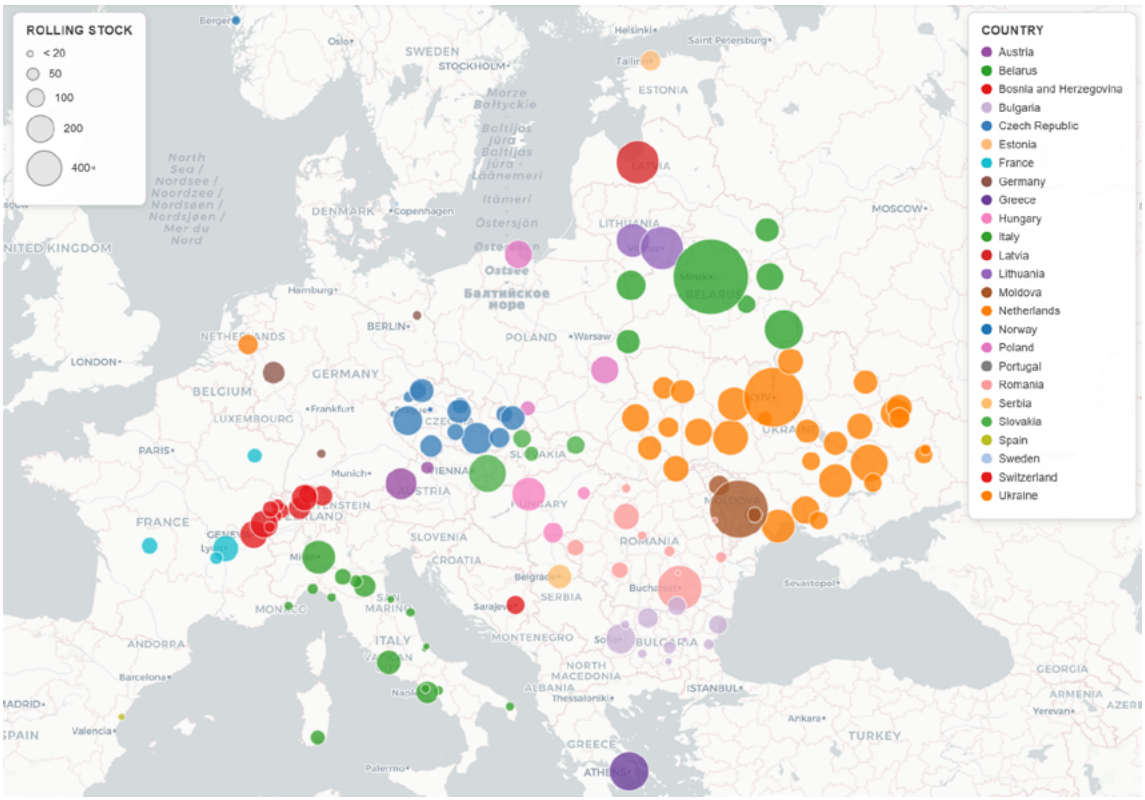
Trolleybuses, long regarded as a declining legacy technology constrained by overhead wire dependency, are experiencing a meaningful revival driven by battery In-Motion Charging (IMC) technology. Modern battery trolleybuses can operate off-wire, for 15 to 25 kilometres, which enables operators to serve routes beyond catenary coverage and dramatically improving operational flexibility.[32] It also provides an alternative for cities to introduce electrified bus services instead of internal combustion engine (ICE) buses by building trolleybus catenary only on a part of the route network. The city of Prague in the Czech Republic followed this approach between 2018 and 2024,building catenary only on part of its route network to launch high capacity and high-speed service between the city centre and the airport.[33] This technological evolution has renewed the investment case for further electrification of public transport in cities that already possess trolleybus wire infrastructure by replacing ICE buses with IMT e-buses with limited or no investment in energy lines and charging infrastructure.

Trolleybuses are modular vehicles assembled from subsystems supplied by different companies. The bus body can be equipped with various traction systems, namely ICE, battery electric, IMC, or hydrogen. Leading European body manufacturers include Solaris (Poland), SOR Libchavy (Czech Republic), Hess (Switzerland), Iveco Bus (Italy) and Bozankaya (Turkey); key electric systems suppliers are Škoda Electric (Czech Republic), Kiepe (Germany) and Medcom (Poland). Škoda Electric and Solaris are strategic partners rather than rivals: Solaris supplies bodies to Škoda, Škoda supplies electric systems to Solaris, and production capacities are sometimes shared.

The broader European trolleybus landscape shows a clear trend toward network retention and renewal rather than closure. Approximately 257 cities across Europe and Central Asia operate trolleybus systems, with Ukraine alone accounting for 35 active or recently active systems, the largest national concentration, followed by Italy (17 cities), Czech Republic (14), Switzerland (12), Romania (10) and Bulgaria (10). According to the International Association of Public Transport's (UITP) Bus Fleet Survey 2023, battery trolleybuses in Europe are projected to nearly double to close to 1,000 vehicles by 2030, with Central and Eastern Europe expected to host approximately 65% of Europe's total trolleybus fleet.[34] This concentration of trolleybus infrastructure in the CEE region, and the associated procurement demand for fleet renewal, is directly relevant to Ukraine's export potential as a manufacturer with long-standing trolleybus production capabilities.

32. Sustainable Bus. (2024). Trolleybus: a growing demand thanks to zero emission operations. https://www.sustainable-bus.com/trolleybus-tramway/trolleybus-market-zero-emissions/
33. UITP. (2024). In Motion Charging Trolleybus Systems. https://www.uitp.org/wp-content/uploads/sites/7/2025/09/20250923_Policy-Brief_In-Motion-Charging-Trolleybus_WEB.pdf
34. UITP. (2023). The Future of Buses in Europe: Results of Europe Bus Fleet Survey 2023. https://www.uitp.org/news/the-future-of-buses-in-europe-results-of-europe-bus-fleet-survey-2023/. Note: Ukraine city count based on data from UITP Trolleybus World Report and operator websites; includes cities with systems that are currently suspended or disrupted.

Figure 3. Trolleybus networks in Europe, fleet size by city



Source: Own visualisation based on data compiled by author from transport operator websites and publicly available fleet records. Note: Bubble size reflects the number of trolleybuses in operation per city, colours indicate country.

2.4.3.Trams

The European and global tram manufacturing landscape is dominated by Alstom (France), which significantly strengthened its market position through the 2021 acquisition of Bombardier Transportation. This consolidation brought together two of the world's most widely operated tram families, the Citadis platform (over 3,000 vehicles delivered globally) and the Flexity platform (over 3,500 vehicles), and gave Alstom an unrivalled installed base and after-sales ecosystem. Siemens Mobility (Germany) and Stadler Rail (Switzerland) are the other principal European players; Stadler in particular holds the broadest geographic tram presence across Europe and a growing order book in CEE networks. CAF (Spain) through its Urbos platform and Hitachi Rail (Italy) complete the tier of established multinational suppliers. Among Central and Eastern European manufacturers, Škoda Group (Czech Republic) and PESA (Poland) are the main players. Škoda Group holds a framework contract for up to 200 ForCity Plus 52T trams for Prague, with 71 ordered by early 2025. PESA is increasingly successful in the Romanian and Baltic markets and has previously supplied trams to Kyiv. Astra Vagoane (Romania) and Končar (Croatia) are further regional producers of note.

New entrants are reshaping competitive dynamics in ways directly relevant to Ukraine. Turkish manufacturer Bozankaya has emerged as a competitive force in Romanian tenders, having delivered 40 battery trams to Timișoara and won a further 10-vehicle order in 2024-25. This showed that manufacturers from neighbouring markets can penetrate CEE procurement. CRRC Corporation (China), already the world's largest rail rolling stock manufacturer by revenue, is actively pursuing European urban rail contracts and competing against Alstom in international LRV tenders.

Tram procurements are typically long-cycle events, with framework contracts spanning 5-15 years and rolling option exercises. This creates strong advantages for established suppliers with proven homologation in a given national network, but also presents substantial entry barriers that any Ukrainian export strategy would need to address through standards compliance and certification pathways.

2.5. EU market dynamics and policy drivers

The European Union has increasingly made progress in transport sector decarbonisation, owing to an expanding set of climate, mobility, and industrial policy instruments that are collectively accelerating the move away from the use of fossil fuels in transport. This policy environment is directly relevant to Ukraine in two ways. First, EU regulatory targets and procurement requirements define the market that Ukrainian manufacturers could seek to supply. Second, as Ukraine moves towards accession, its domestic frameworks will need to align with EU norms. The EU's regulatory direction therefore matters not only for export strategy but for Ukraine's own transport and industrial policy choices. This policy architecture spans economy-wide climate targets, sector-specific regulatory measures, public procurement requirements, and investment programmes designed to scale both demand for and supply of low- and zero-emission vehicles. This section therefore reviews the key market dynamics and policy drivers shaping the EU's electrified public transport transition.

Climate targets and transport decarbonisation regulations

Under the European Green Deal (2019), the EU has adopted a climate-neutrality objective for 2050 alongside an intermediate target of reducing greenhouse gas emissions by at least 50% by 2030 relative to 1990 levels.[35] Transport, which accounts for roughly a quarter of EU GHG emissions, is explicitly expected to deliver very deep reductions by mid-century, with the wider Green Deal agenda framed around a 90% reduction in transport emissions by 2050.[36] To operationalise these commitments, the EU introduced the "Fit for 55" package in 2021, which bundles multiple legislative reforms that, taken together, aim to tighten emissions constraints, accelerate technology deployment, and strengthen enabling infrastructure.[37] Within road transport, a key inflection point was the adoption of stricter CO_2 standards for light-duty vehicles, including a 100% CO_2 reduction target for new cars and vans from 2035 onwards.[38] In parallel, the European Commission proposed more ambitious CO_2 standards for heavy-duty vehicles including buses, with provisions that, if adopted as proposed, would require all new urban buses to be zero-emission by 2030 and would impose a 90% emissions reduction requirement for new heavy-duty motor vehicles by 2040.[39] This would amount to a regulatory phase-out horizon for diesel urban buses within the next decade, which creates a clear signal for manufacturers and fleet operators regarding the direction of technology investment and procurement planning.

These vehicle standards are complemented by parallel infrastructure and urban policy frameworks. The Alternative Fuels Infra-structure Regulation (AFIR), adopted in 2023, obliges Member States to deploy charging and refuelling infrastructure for electricity and hydrogen along major transport corridors and within urban nodes, with minimum coverage requirements set against milestones in 2025 and 2030, including along the TEN-T network.[40] In parallel, the EU Urban Mobility Framework (2021) advances a strategic approach to urban transport decarbonisation through the development of Sustainable Urban Mobility Plans (SUMPs) and the prioritisation of public transport, active mobility, and zero-emission solutions.[41] Revisions to the TEN T framework strengthen the role of urban nodes by requiring the 431 designated cities to adopt SUMP that are supported by regularly collected data on urban mobility indicators and aligned with TEN T

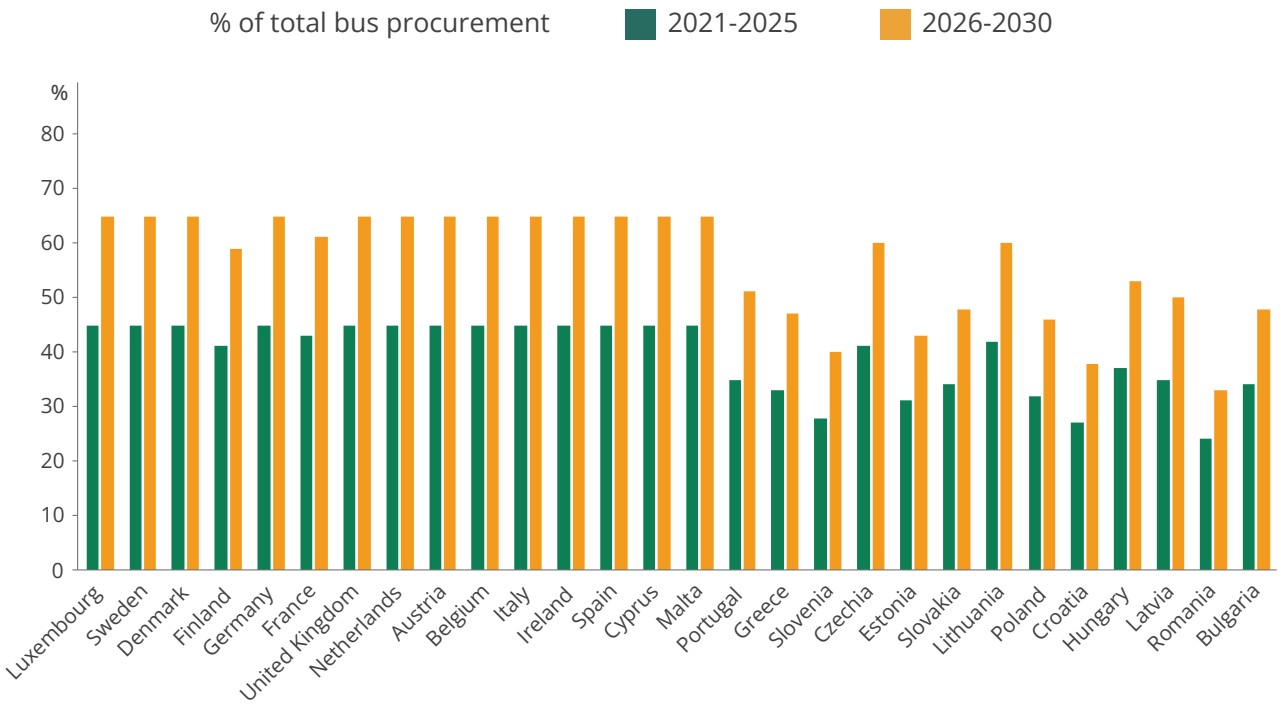
35. European Commission. (n.d.). European Climate Law. https://climate.ec.europa.eu/eu-action/european-climate-law_en
36. European Commission. (n.d.). Transport and the Green Deal. https://commission.europa.eu/topics/transport-and-tourism/transport-and-green-deal_en
37. European Commission. (n.d.). Delivering the European Green Deal. https://commission.europa.eu/topics/climate-action/delivering-european-green-deal_en
38. European Commission. (n.d.). Cars and vans. https://climate.ec.europa.eu/eu-action/transport-decarbonisation/road-transport/cars-and-vans_en
39. European Commission. (2023). Proposal for a Regulation on CO_2 emission standards for heavy-duty vehicles. https://climate.ec.europa.eu/system/files/2023-02/policy_transport_hdv_20230214_proposal_en_0.pdf
40. European Parliament and Council of the European Union. (2023). Regulation (EU) 2023/1804 on the deployment of alternative fuels infrastructure. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023R1804
41. European Commission. (2021). The new EU urban mobility framework (COM(2021) 811 final). https://transport.ec.europa.eu/system/files/2021-12/com_2021_811_the-new-eu-urban-mobility.pdf

priorities for reducing transport related emissions.[42] Taken together, these instruments provide a multi-layered approach that regulates vehicle supply through emissions standards, reduces adoption barriers by supporting infrastructure deployment, and stimulates local implementation through urban planning requirements, thereby creating an increasingly predictable and investment-relevant trajectory for zero-emission public transport across the EU.

Public procurement rules as a demand driver

The acceleration of electric bus deployment in Europe is also strongly shaped by procurement rules, as public authorities play a central role in financing and purchasing urban buses. The Clean Vehicles Directive (Directive (EU) 2019/1161) is a core instrument in this regard, as it sets binding national targets for the procurement of "clean" road transport vehicles by public bodies and certain operators.[43] In the case of buses, the Directive recognises a broad category of "clean" buses, including those running on electricity, hydrogen, biofuels and certain gaseous fuels, while also distinguishing a "zero-emission bus" category that is largely comprised of battery-electric and fuel-cell buses. The Directive requires that, across two reference periods (2021-2025 and 2026-2030), a minimum share of new buses procured by public authorities must be "clean", with target ranges that differ by Member State but broadly fall between 24% and 45% by 2025 and 33% to 65% by 2030, and with at least half of the required shares met through zero-emission buses in each period.[44] This architecture effectively institutionalises demand for zero-emission buses within public procurement markets and, by doing so, reduces uncertainty for suppliers and strengthens the pipeline for scale-up in manufacturing.

Figure 4. Minimum procurement targets for clean buses as a share of total buses covered by contracts in EU Member States



Source: Own visualisation based on data from European Parliament and Council of the European Union (2019).[45]

42. European Commission. (2024). Sustainable urban mobility planning and monitoring. https://transport.ec.europa.eu/transport-themes/urban-transport/sustainable-urban-mobility-planning-and-monitoring_en
43. European Parliament and Council of the European Union. (2019). Directive (EU) 2019/1161 on the promotion of clean and energy-efficient road transport vehicles. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX%3A32019L1161&
44. Ibid.
45. European Parliament and Council of the European Union. (2023). Regulation (EU) 2023/1804 on the deployment of alternative fuels infrastructure. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023R1804

EU and national level funding support for fleet electrification

In parallel to regulatory procurement requirements, EU and national funding mechanisms have further strengthened market uptake by easing financing constraints for municipalities and operators. EU-level instruments such as the Connecting Europe Facility and cohesion policy funds have supported the procurement of clean vehicles and related infrastructure in a range of cities. The European Investment Bank (EIB), for example, has been providing project loans that bundle vehicle procurement with charging and depot infrastructure which allow operators to finance the full transition package through a single facility rather than securing separate funding streams for each component.

Beyond the EIB, Recovery and Resilience Facility (RRF) resources have also been channelled into urban fleet renewal, with several Member States directing allocations from their National Recovery and Resilience Plans toward zero-emission bus procurement and tram network expansion. National programmes have complemented these EU-level instruments by covering part of the incremental cost of clean vehicles. Grant-based schemes in Germany and Poland, for example, provide subsidy rates of up to 80% of additional investment costs, helping reduce the financial barrier for smaller operators and mid-sized cities that lack the scale to negotiate favourable financing independently. The table below sets out selected examples across both instrument types.

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Table 1. Selected EU and national funding examples for zero-emission fleet procurement

Location	Beneficiary	Instrument	Amount, EUR	Scope	Year
Madrid, Spain	EMT Madrid	EIB project loan	50 m	250 electric + 10 hydrogen buses; charging infrastructure	2024
Valencia, Spain	EMT Valencia	EIB project loan	69 m	145 electric buses; depot upgrades	2024
Verona, Italy	Comune di Verona / ATV	EIB project loan	62 m	4 zero-emission trolleybus lines; 39 trolleybuses; new depot and maintenance facility	2023
Rouen, France	Métropole Rouen Normandie	EIB project loan	50 m	114 electric + 14 hydrogen buses; electric retrofit of 29 buses and 20 school coaches	2024
Italy (national)	Municipal and regional authorities	RRF / National Recovery and Resilience Plan	208.5 m	~3,000 zero-emission buses; ~1,000 charging stations	2021-26
Tallinn, Estonia	City of Tallinn / tram operator	RRF	36.5m	Tram network extension; track, substations, and new rolling stock	2021-26
Germany (national)	Municipal operators	Federal Ministry for Digital and Transport grant scheme	Up to 80% of incremental cost; max EUR 15 m/project	Battery-electric or hydrogen buses, associated charging/refuelling infrastructure	Ongoing
Poland (national)	Municipalities >100,000 pop.	National Fund for Environmental Protection (Green Public Transport)	Up to 80% of vehicle cost	Electric buses, trolleybuses, hydrogen buses, and charging infrastructure	Ongoing
Vilnius, Lithuania	Vilnius public transport company	EBRD Green Cities + Nordic Investment Bank co-loan	38.2 m + 56.2 m	91 low-floor trolleybuses + infrastructure; 73 additional vehicles	2023-24

Source: Compiled by the authors from EIB (2024),[46] EIB (2024),[47] EIB (2023),[48] EIB (2024),[49] European Commission (n.d.),[50] European Commission (2025),[51] European Commission (2025),[52] EAFO (n.d.),[53] LRT (2023),[54] and LRT (2024)[55].

Alongside these formal instruments, city-level commitments have in some cases reinforced procurement momentum; for example, as part of the C40 Green and Healthy Streets Declaration, mayors of five cities (Amsterdam, Netherlands; Austin, USA; Berlin, Germany; Jakarta, Indonesia; Liverpool, UK) made voluntary pledges to procure only zero-emission buses from 2025.[56]

46. European Investment Bank. (2024). EIB and EMT Madrid sign €50 million loan to expand zero-emissions urban bus fleet. https://www.eib.org/en/press/all/2024-238-eib-and-emt-madrid-sign-eur50-million-loan-to-expand-zero-emissions-urban-bus-fleet
47. European Investment Bank. (2024). EIB and EMT Valencia sign €69 million loan to grow zero-emissions urban bus fleet. https://www.eib.org/en/press/all/2024-528-eib-and-emt-valencia-sign-eur69-million-loan-to-grow-zero-emissions-urban-bus-fleet
48. European Investment Bank. (2023). Italia: €62 million from the EIB for the development of sustainable mobility in Verona. https://www.eib.org/en/press/all/2023-257-italia-62-milioni-di-euro-dalla-bei-per-lo-sviluppo-della-mobilita-sostenibile-a-verona
49. European Investment Bank. (2024). France: EIB provides €50 million in financing to Métropole Rouen Normandie to overhaul its bus fleet. https://www.eib.org/en/press/all/2024-152-la-bei-finance-a-hauteur-de-50-meur-la-metropole-rouen-normandie-pour-le-renouvellement-de-sa-flotte-de-bus
50. European Commission. (n.d.). Full green electric buses. https://reforms-investments.ec.europa.eu/projects/full-green-electric-buses_en
51. European Commission. (2025). Making connections: New tram line at Tallinn's Old Port. https://next-generation-eu.europa.eu/making-connections-new-tram-line-tallinns-old-port-2025-05-20_en
52. European Commission. (2025). Germany reopens funding for zero-emission buses. https://urban-mobility-observatory.transport.ec.europa.eu/news-events/news/germany-reopens-funding-zero-emission-buses-2025-08-01_en
53. European Alternative Fuels Observatory. (n.d.). Incentives and legislation: Poland. https://alternative-fuels-observatory.ec.europa.eu/transport-mode/road/poland/incentives-legislations
54. LRT. (2023). Vilnius signs €38m deal to purchase new trolleybuses. https://www.lrt.lt/en/news-in-english/19/1965070/vilnius-signs-eur38m-deal-to-purchase-new-trolleybuses
55. LRT. (2024). Vilnius buys 73 new trolleybuses from Poland's Solaris. https://www.lrt.lt/en/news-in-english/19/2605852/vilnius-buys-73-new-trolleybuses-from-poland-s-solaris
56. C40 Cities. (2019). Green and healthy streets. https://www.c40.org/news/green-healthy-streets-september

Implications for trams and trolleybuses

While electric buses are the most visible and rapidly scaling segment, analogous dynamics also affect trams and trolleybuses. Urban mobility investment supported by EU funds continues to prioritise high-capacity electric public transport as a structural measure to reduce car dependency. For example, in 2024, Warsaw Trams signed a contract to receive EU funds in supporting major projects in Warsaw's public transport system, including construction of a tramway route to Wilanów, and a tram depot with 152 trams capacity.[57] Trolleybuses are also relevant in this context, particularly where they are embedded in existing electrified networks and where hybridisation with IMC enables off-wireoperation and greater route flexibility; in procurement terms, trolleybuses fall under the clean vehicle definitions (provided that they run only on electricity or that they use only a zero-emission powertrain when they are not connected),[58] which allows to contribute to public procurement targets in cities where trolleybus systems are part of the fleet strategy.

Industrial policy, supply chains, and regional manufacturing integration

Beyond shaping EU domestic demand, the EU's evolving regulatory and procurement framework landscape, combined with its industrial strategy, also has strategic implications for neighbouring countries and supply partners by strengthening resilient and reliable supply chains for green technologies. This dimension is explicit in the EU's Green Deal Industrial Plan (including its pillar on "open trade for resilient supply chains") and in the Net-Zero Industry Act's objective to expand EU manufacturing capacity for strategic net-zero technologies towards at least 40% of annual deployment needs by 2030, alongside the EU's parallel push to secure critical raw materials supply.[59,60]

Developments in Eastern Europe also illustrate this broader trend in the transport manufacturing space. The region is already part of this emerging supply landscape, with established and expanding production footprints for zero-emission buses and electric traction technologies across the region. Ukraine is not absent from these value chains either. Its manufacturing base has demonstrated practical integration into EU industrial supply chains, and the policy architecture is moving in the same direction. The Deep and Comprehensive Free Trade Areas (DCFTA), the EU-Ukraine Strategic Partnership on raw materials and batteries, the Ukraine Facility, and the opening of EU accession negotiations all reinforce the trajectory toward deeper industrial integration. Together, these dynamics help set the stage for considering where Ukraine could fit into emerging European clean-transport value chains.

Against this backdrop, Chapter 3 turns to Ukraine's specific rationale: how reconstruction-driven domestic demand, industrial recovery as part of broader economic recovery, and export-oriented opportunities could align with EU policy-driven market pull and ongoing reconfiguration of European value chains.

Photo: Daryna Kurinna. Used with permission. All rights reserved.

57. CUTP. (2024). Over PLN 2 billion from European funds for Warsaw public transport. https://www.cupt.gov.pl/en/aktualnosc/feniks-en/over-pln-2-billion-from-european-funds-for-warsaw-public-transport/
58. European Parliament and Council of the European Union. (2019). Directive (EU) 2019/1161 on the promotion of clean and energy-efficient road transport vehicles. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX%3A32019L1161&
59. European Commission. (n.d.). Net-Zero Industry Act. https://commission.europa.eu/topics/competitiveness/green-deal-industrial-plan/net-zero-industry-act_en
60. European Commission. (n.d.). European Critical Raw Materials Act. https://commission.europa.eu/topics/competitiveness/green-deal-industrial-plan/european-critical-raw-materials-act_en

3

The case for electric public transport manufacturing in Ukraine

This chapter continues the rationale introduced in the global and EU context by focusing on Ukraine's specific circumstances and opportunities for developing its electric public transport manufacturing sector. It highlights how localisation of production can contribute to Ukraine's green reconstruction, industrial revitalisation, and integration into European value chains.

Ukraine's case for further developing its electric public transport value chain rests on three mutually reinforcing drivers: supporting economic recovery through industrial value added; meeting large domestic needs for rebuilding and modernising urban mobility and its infrastructure; and leveraging geographical proximity to a rapidly electrifying European market. While the strategic focus on trams and trolleybuses reflect Ukraine's past manufacturing experience and existing urban transport footprint, battery-electric buses open new paths for Ukraine, with all these modes of transport showing a strong alignment with climate and energy transition goals of Ukraine and the "build back better" framework.

Figure 5. Ukraine's case for further developing its electric public transport value chain

Source: Own illustration

3.1. Supporting economic recovery through industrial value added

The war has severely disrupted Ukraine's economy, with a sharp contraction in 2022 and particularly acute impacts on industry. Manufacturing has been hit by the destruction of facilities, disruptions to power supply and logistics, and the loss and displacement of skilled workers, all of which have weakened productive capacity and reduced the ability of firms to plan and invest. At the same time, the scale and urgency of reconstruction have created a near-term investment cycle that will shape Ukraine's economic structure for years. This creates a narrow window in which investment choices will materially influence the structure of Ukraine's post-war economy: whether reconstruction spending primarily imports capital goods, or also builds durable domestic capabilities in manufacturing, engineering services, and maintenance ecosystems.

Historically, manufacturing has been a key engine of economic growth in emerging economies, supporting higher productivity, economies of scale, learning effects, and more complex supply chains.[61] In Ukraine's context, rebuilding and modernising industrial activity in future-oriented segments could support recovery

61. Lavopa, A., & Riccio, F. (2024). IID Policy Brief 15: Manufacturing-led growth: driving and sustaining economies. UNIDO. https://www.unido.org/sites/default/files/unido-publications/2024-11/IID%20Policy%20Brief%2015%20-%20Manufacturing-led%20growth.pdf

while contributing to structural economic upgrading. Electric public transport manufacturing represents one important pillar within a broader industrial recovery strategy, sitting at the intersection of reconstruction needs and the longer-term European transition towards zero-emission mobility. While no single sector can by itself diversify the economy beyond traditional commodity and agricultural dependence, this segment has the potential to act as a catalyst: driving innovation, generating linkages into adjacent industries, and contributing to the creation of more stable, higher value-added employment across the wider economy.

Electric public transport value chains also have strong linkages to Ukraine's existing industrial capabilities. Rolling stock and bus production draw on metallurgical inputs, welding and machining, electrical equipment, and systems integration, and the electrification component increases the importance of power electronics, traction systems, digital control systems, battery assembly and innovation capabilities, including cell integration and battery management software. Strengthening domestic capabilities in these areas can support broader industrial modernisation, including through spillovers into adjacent sectors such as electrical machinery, batteries and energy storage components, grid equipment, and potentially industrial automation. Cross-sector linkages with the automotive industry are also relevant. Ukraine has an established, if modest, automotive supply base with experience in components manufacturing, metalworking, and assembly, which are capabilities that overlap with those required for electric bus and rolling stock production. Deeper integration between electric public transport manufacturing and the automotive supply chain could allow shared investment in tooling, testing, and supplier development, and could help Ukraine position itself within the broader European automotive transition, where demand for electrified drivetrains and associated components is growing. The sector's service ecosystem, which include maintenance, refurbishment, depot equipment, driver and technician training, can further deepen domestic value creation and help retain skilled labour. Over time, closer integration with science and education systems is also relevant, as product quality, reliability, and certification readiness increasingly depend on applied R&D, testing capacity, and specialised workforce training.

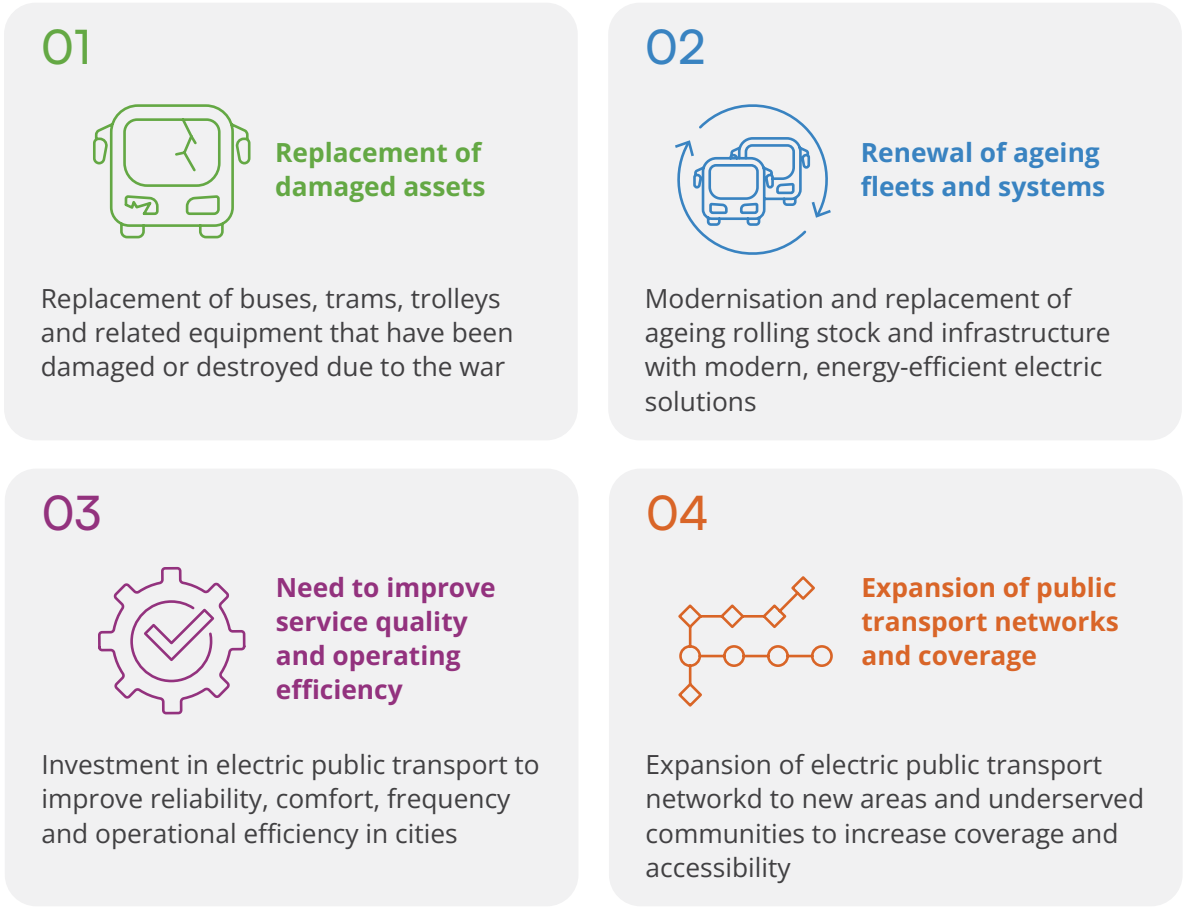
Recent Ukrainian climate policy framing also links decarbonisation with recovery and industrial strategy. Ukraine's Second Nationally Determined Contribution (NDC2), approved in October 2025, explicitly positions green reconstruction and green jobs as part of the post-war recovery approach.[62] This linkage matters for industrial policy: it provides an overarching rationale to prioritise investment programmes that simultaneously rebuild essential services and strengthen domestic productive capacity, rather than treating climate and recovery as separate tracks.

3.2. Domestic fleet renewal and reconstruction-driven demand

Domestic demand for electric public transport in Ukraine will likely be shaped by four different channels: replacement of damaged assets, renewal of ageing fleets and systems, need to improve service quality and operating efficiency in cities, and the expansion of public transport networks and coverage. Earlier assessments of Ukraine's urban mobility investment gap point to the scale of required system upgrades, including renovation works on tram tracks, trolleybus catenary, rolling stock, depots, and wider public transport infrastructure.[63] The Fifth Rapid Damage and Needs Assessment reinforces this picture from the financing side: among 2026 priority needs identified under Ukraine's Single Project Pipeline, an unfunded gap of approximately USD 0.42 billion is attributed specifically to public transport.[64]

62. Cabinet of Ministers of Ukraine. (2025). Second nationally determined contribution (NDC2) of Ukraine to the Paris Agreement (Resolution No. 1172 of 29 October 2025). United Nations Framework Convention on Climate Change (UNFCCC). https://unfccc.int/sites/default/files/2025-11/2%20Ukraine%20NDC2_adj_v2.pdf
63. Vision Zero NGO. (2025). Assessment of the cost of modernisation measures for urban electric transport in Ukraine. https://visionzero.org.ua/images/b05f9d29a1c1404aa119bcec351dfede.pdf
64. World Bank, Government of Ukraine, European Union, & United Nations. (2026). Ukraine Fifth rapid damage and needs assessment (RDNA5). Main Report. February 2022-December 2025. World Bank. https://documents1.worldbank.org/curated/en/099022026094036395/pdf/P514499-22f93f3a-4278-42bc-b907-db9553d12069.pdf

Figure 6. Domestic demand drivers for electric public transport manufacturing sector in Ukraine



Source: Own illustration

In urban contexts, the binding constraints are often not limited to vehicle procurement; they also include the condition of infrastructure (e.g. tracks, overhead lines, substations, depots) and the institutional capacity to plan and implement integrated modernisation programmes. The implication for demand-side planning is straightforward: procurement pipelines for vehicles (trolleybuses, trams, e-buses) will be most effective when paired with infrastructure and depot modernisation, grid upgrades where relevant, and maintenance arrangements. This is also where industrial and service-market development can reinforce each other: consistent fleet renewal supports production scale-up, and local maintenance and refurbishment capability reduces lifecycle costs and downtime.

Policy alignment can further strengthen domestic demand. Ukraine's NDC2 sets an economy-wide target to reduce greenhouse gas emissions by more than 65% by 2035 relative to 1990 levels and frames reconstruction as an opportunity to embed climate-oriented approaches into recovery.[65] This strategic direction is reinforced by the updated NECP, which introduces concrete sectoral measures for transport electrification. In particular, the NECP requires that in cities with more than 250,000 inhabitants at least 25% of municipal bus fleets must consist of low-carbon vehicles by 2030 and 50% by 2033, with a full transition to electric, biomethane or hydrogen buses on regular urban routes by 2036. It also foresees a substantial increase in renewable energy use in transport by 2030, including 4.8 TWh (409 thousand toe) of renewable electricity consumption and 13.2 TWh (1,138 thousand toe) of total renewable energy in the sector.[66] While this does not, by itself, determine municipal procurement choices, it provides a strategic basis

65. Cabinet of Ministers of Ukraine. (2025). Second nationally determined contribution (NDC2) of Ukraine to the Paris Agreement (Resolution No. 1172 of 29 October 2025). United Nations Framework Convention on Climate Change (UNFCCC). https://unfccc.int/sites/default/files/2025-11/2%20Ukraine%20NDC2_adj_v2.pdf
66. Cabinet of Ministers of Ukraine. (2024). National Energy and Climate Plan for the period until 2030. https://me.gov.ua/download/2cad4803-661e-4ae9-9748-3006d6eb3e1c/file.pdf

for national programmes and donor/ International Financial Institution (IFI) financing to prioritise electrified urban fleets and associated infrastructure as part of "build back better" investment packages. The Government of Ukraine has already drafted a national public investment programme titled "Development of Public Electric Transport and Infrastructure", setting out modernisation and procurement targets for the sector for 2026-2035.[67]

3.3. European market integration and export opportunities

Beyond domestic demand, the export case is most immediately visible in segments where European demand growth is policy-driven and where production can scale in modular steps, particularly for battery-electric city buses and, to a lesser extent, trolleybuses for cities that maintain or expand overhead networks. The European market for zero-emission city buses is already moving rapidly. The European market for zero-emission city buses is already moving rapidly (as set out in Chapter 2.5), nearly half of new city buses procured in the EU in 2024 were zero-emission, and binding CO_2 standards and Clean Vehicles Directive targets are set to sustain this trajectory through 2030 and beyond. Together, these measures increase the likelihood that EU cities and operators will continue shifting procurement towards zero-emission options, with corresponding needs for vehicles, components, and aftersales support.

Ukraine's deeper integration with the EU can, over time, reduce barriers to participating in these value chains. The EU opened accession negotiations with Ukraine in June 2024, a process expected to accelerate regulatory alignment with the EU acquis.[68] Separately, the EU-Ukraine DCFTA foresees an Agreement on Conformity Assessment and Acceptance of Industrial Products (ACAA, also referred to as the "industrial visa-free regime"), designed to enable mutual recognition of conformity assessment in covered sectors once legislative and institutional alignment conditions are met.[69] The initial priority sectors are low-voltage electrical equipment, electromagnetic compatibility and machinery, with possible later extension to other sectors. Ukraine has already adopted key technical-regulation legislation, aligned technical regulations and standards in these priority areas, and established relevant standardisation, accreditation and conformity-assessment infrastructure.[70] Ukraine has not yet obtained the mandate to formally conclude the ACAA, and motor vehicles are not in the initial Priority I scope (i.e. bus, trolleybus, and tram manufacturers will not directly benefit from ACAA in its first phase). Extension to additional sectors is envisaged once the initial scope is operational, which over the medium term could create a pathway to mutual recognition for vehicle-related technical regulations. While rolling stock and buses have their own technical and procurement-specific requirements, convergence in standards, testing and certification systems can lower transaction costs and improve export readiness, particularly for component suppliers seeking to integrate into EU supply chains. European OEMs are under growing pressure to diversify and regionalise supply chains for key components such as traction motors, inverters, battery packs, pantographs, and Ukrainian suppliers with existing electromechanical and precision manufacturing capabilities are plausibly positioned to serve these needs. Suppliers that develop to EU technical standards from the outset will be better placed to attract off-take agreements and contract manufacturing arrangements, and targeted policy support could actively accelerate this process.

67. Government of Ukraine. (2025). Development of public electric transport and infrastructure (Draft national public investment programme). DREAM. https://dream.gov.ua/public-program/DREAM-UA-060825-ABA4E71D?fromUri=/spp-pipeline
68. European Commission. (2024). EU opens accession negotiations with Ukraine. https://enlargement.ec.europa.eu/news/eu-opens-accession-negotiations-ukraine-2024-06-25_en
69. European Commission. (n.d.). EU-Ukraine deep and comprehensive free trade area. https://trade.ec.europa.eu/access-to-markets/en/content/eu-ukraine-deep-and-comprehensive-free-trade-area
70. Ministry of Economy of Ukraine. (2023, August 10). Information regarding the conclusion of the Agreement on Conformity Assessment and Acceptance of Industrial Products (Agreement on Conformity Assessment and Acceptance of Industrial Products, ACAA Agreement, "Industrial visa-free"). https://me.gov.ua/Documents/Detail/ab43d8de-43ac-a1ac-87e0cb2c-cf4a?lang=en-GB

4.

Analysis of Ukraine's electric public transport value chain: status quo and development potential

The development potential of Ukraine's electric public transport value chain depends not on a single factor, but on the interaction between industrial capabilities, domestic market formation, and access to external markets. On the supply side, Ukraine retains a manufacturing base in buses, trolleybuses, trams, and related equipment, but this base operates under conditions of wartime disruption, constrained investment, and uneven technological modernisation. On the demand side, the pace and direction of fleet renewal, infrastructure expansion, municipal procurement, and access to financing will shape the extent to which domestic producers can scale in the home market. At the same time, longer-term sector development will also depend on whether Ukrainian firms can position themselves within wider European value chains as the EU market for electric public transport expands. Against this backdrop, this chapter examines the current state of the sector and the main conditions that will shape its future development.

4.1. Ukraine's public transport vehicle manufacturing sector

Ukraine's public transport vehicle manufacturing sector has roots in urban transport and retains a number of active domestic producers and engineering capacities. Most production is built around internal combustion engine vehicles, with battery-assisted and electric drivetrain variants gradually introduced into trolleybus and bus platforms. War, fragmented demand, and limited investment have all constrained development.

This sub-chapter examines how Ukraine's domestic manufacturing sector for electric public transport vehicles can be made more competitive, scaled, and modernised. It maps the current industrial landscape across electric buses, trolleybuses (including battery types), and trams/LRT – covering key manufacturers, production capacities, and technologies – and identifies the enablers needed to build a competitive sector: manufacturing capacities, technology and R&D, access to finance, workforce, and policy framework.

Photo: Magnific (Freepik). Commercial License (Premium AI Image)

4.1.1. Current manufacturing landscape

A useful starting point is the current composition of the manufacturing base across vehicle segments. Ukraine's public transport manufacturing base spans several vehicle segments: trams, trolleybuses, diesel buses, and battery-electric buses, which are summarised below.

Table 2. Ukrainian public transport vehicle manufacturers

	BUS		TROLLEYBUS	TRAM
	Diesel	Electric		
Concern Electron (Lviv)	✓	✓	✓	✓
Etalon Chernihiv Autozavod LLC (Chernihiv)	✓	✓ (prototype)	✓	✓ (only one)
PTS Politechnoservice (Brovary)		⊙ (future plans)	✓	
Tatra-Yug (Odesa, Dnipro)				✓
Cherkasy Bus JSC (Cherkasy)	✓			
TD Litan (Dnipro)			✓	
ZAZ Automobile Plant (Zaporizhzhia)	✓			
Bus Motor LLC (Lutsk)	✓		✓	

Source: Compiled by the authors from Federation of Employers of Ukraine (2024),[71] company materials, and interviews with company representatives.

City bus manufacturing

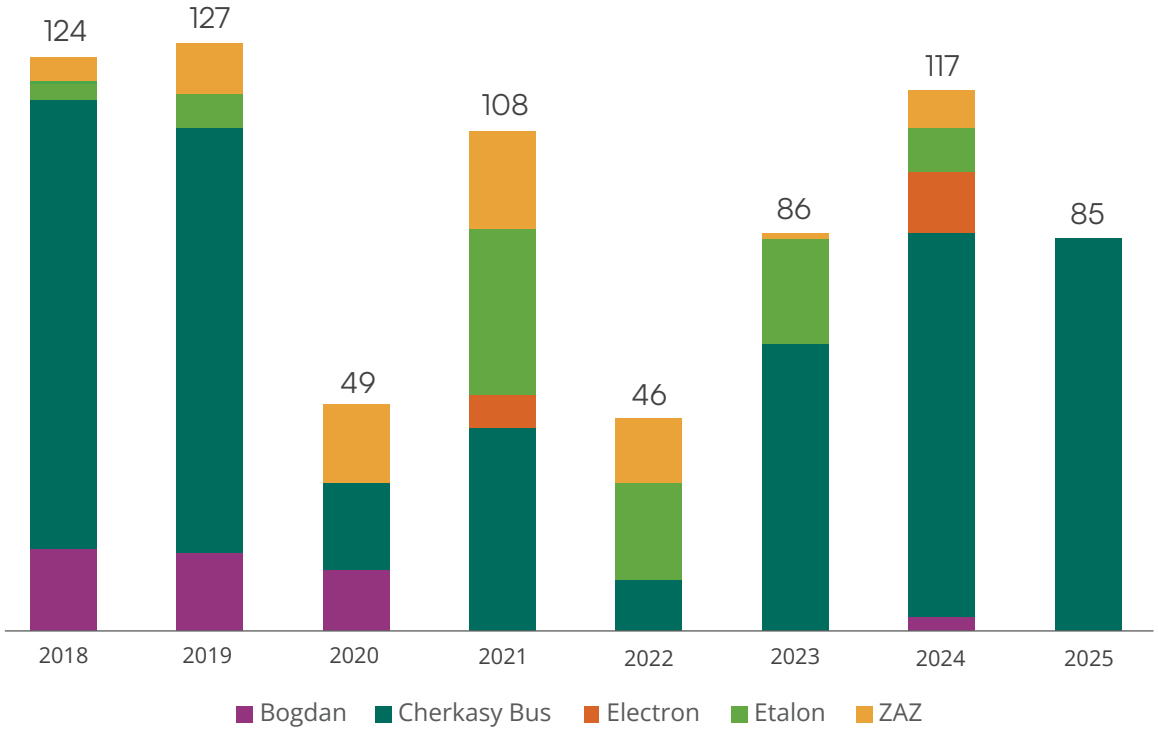
Ukraine's bus manufacturing industry covers a wide range of vehicle types. Beyond the large urban bus formats that are the focus of this section, domestic producers also manufacture minibuses, midi-buses, marshrutkas, and school buses. While some producers have made initial steps toward electric powertrains, and future plans for expanded electric production, serial electric bus manufacturing does not yet exist.

Diesel bus segment

The diesel city bus segment constitutes the largest and most commercially active component of Ukraine's public transport vehicle manufacturing industry. It forms an important part of Ukraine's wider public transport vehicle industry and provides much of the industrial legacy from which newer electric vehicle production is now emerging. Compared with the tram and trolleybus segments, the diesel bus segment has historically been broader in terms of the number of producers, production volumes, and model variety. It has included a mix of larger manufacturers with mass-production capabilities and smaller or more specialised producers, which makes the diesel bus segment relevant not only in its own right, but also as the main industrial base from which parts of Ukraine's transition towards battery-electric bus manufacturing are likely to develop.

71. Federation of Employers of Ukraine. (2024). Made in Ukraine: Catalog of Ukrainian Machinery and Equipment. https://catalog-madeinua.com.ua/wp-content/uploads/2024/06/catalog-en.pdf

Figure 7. Ukrainian diesel city bus production, annual units by company



Source: Own visualisation based on data from Alltransua (2026).[72] Note: Figures may differ slightly as the data are self-reported and no official statistics are available. Excluding mini/midibus and school bus segments.

In terms of vehicle types, Ukraine's diesel city bus manufacturing base covers several vehicle formats, including large 12-metre low-floor platforms, medium-capacity low-entry buses, and smaller low-floor or low-entry urban buses. Production, however, is heavily concentrated in smaller marshrutka-style buses, while 12-metre buses account for a limited share, as demand comes mainly from municipal authorities rather than private operators. Producers range from those operating a fully integrated production cycle, encompassing bodywork, assembly, painting, and aftersales, to those focused primarily on domestic assembly and systems integration aroundexternally sourced components. Localisation rates also vary between producers, ranging from 41% to 70%. However, key components, including diesel engines, transmissions and axles, are not currently produced in Ukraine, despite some earlier attempts in engine and gearbox production. The bus manufacturing segment has also been directly affected by the war. Etalon's production base in Chernihiv suffered direct hits during the Russian attacks to the city in February-March 2022, with 50-70% of its plant structures destroyed and damage estimated at approximately EUR 30 million.[73]

72. Alltransua. (2026). Database. https://alltransua.com/database.
73. Interfax-Ukraine. (2024). Etalon Corporation to begin construction of new production facility in 2025. https://en.interfax.com.ua/news/press-conference/1035305.html

Table 3. Ukrainian diesel and electric city bus models and key specifications

Manufacturer	Model	Vehicle class	Length (m)	Floor type	Passenger capacity	Localisation rate, %	Emission standard
Concern Electron	A185	Large	12.1	100% low floor	102	43	Euro 5
Bus Motor (Bogdan)	A70132	Large	11.96	Low floor	106	51	Euro 5
Etalon	A12221	Large	12.0	100% low floor	102	42-56	Euro 6
Etalon	A08621	Medium	10.0	Low entry	72	42-56	Euro 5
Etalon	A08128	Medium	10.0	Low entry	70	42-56	Euro 5
ZAZ	A10C3G	Small	8.27	Low floor	60	41-44	Euro 6
Cherkasy Bus (Ataman)	A092H6	Small	8.22	Low floor	60	64-70	Euro 5
Cherkasy Bus (Ataman)	A092G6	Small	8.22	Low floor	52	64-70	Euro 5
Concern Electron	E19101	Electric large	12.1	100% low floor	98	40-44	Zero emission
Concern Electron	E181	Electric large	10.2	100% low floor	60	~40	Zero emission
Etalon	A08611	Electric large	9.5	Low floor	63	40-60	Zero emission

Source: Compiled by the authors from Federation of Employers of Ukraine (2024),[74] and company materials.

Electric bus segment

Electric bus manufacturing remains at a very early stage in Ukraine and is not yet comparable in scale to the tram, trolleybus, or diesel bus segments. Unlike those segments, electric bus production has so far been limited to isolated model development and prototype-level activity.

Domestic bus producers already have experience in body production, low-floor urban platforms, final assembly, and selected electrical and electronic systems, but this has so far translated only marginally into battery-electric bus manufacturing. In practice, the electric bus segment remains much less developed than trolleybus manufacturing where battery-supported operation is already part of the product offer.

Three concrete cases of domestic electric bus production currently exist in Ukraine. Electron's E19101, first produced in 2014, is a 100% low-floor 12.1-metre bus with a range of around 200 km using LFP battery chemistry, fast-charging capability, and regenerative energy recovery. In September 2025, Electron launched serial production of a second model, the E181, after securing a domestic contract for nine units for Uzhhorod under an EIB-financed procurement worth EUR 3.9 million.[75] The contract

74. Federation of Employers of Ukraine. (2024). Made in Ukraine: Catalog of Ukrainian Machinery and Equipment. https://catalog-madeinua.com.ua/wp-content/uploads/2024/06/catalog-en.pdf
75. Kasiyan, V. (2025). Electric public transport will appear in Uzhhorod: Contract signed – photo. LIGA.net. https://biz.liga.net/ua/all/transport/novosti/v-uzhhorodi-ziavytsia-elektrychnyy-hromadskyy-transport-pidpysano-kontrakt-foto

includes a charging station, spare parts, maintenance and repair, staff training and technical support during the warranty period (two years for the vehicle, 15 years against body corrosion and five years for the battery). The new model is a compact 10.2-metre bus carrying up to 90 passengers, with a range of 300-350 km, a charge time of up to five hours, regenerative braking, and localisation exceeding 40% across approximately 250 Ukrainian component suppliers. This marks a new step towards progressing beyond the existing narrow base. Meanwhile, Etalon's electric bus remains at prototype stage. It is a 9.5-metre model with around 200 km range and 2-3 hour charging time, with localisation estimated at 40-60% depending on order volumes and component choices. Bogdan adds a separate legacy case. Before its bankruptcy in 2021, they supplied 12-metre e-bus bodies to France's Bluebus and had earlier cooperated on the Bogdan A70100 electric bus operating in Poland.[76] This shows a relevant body-manufacturing and subcontracting experience for Western European e-bus value chains. Currently, its successor company Bus Motor LLC acts as a distribution of Chinese Zonson/Granton vehicles in the e-bus segment, with reported possible future plans of assembling the vehicles in Ukraine.

Some shortcomings that continue in this segment are product quality, battery supply chain, and after-sales experience. Operators reported technical deficits linked to non-certified Chinese batteries, delays in repairs when imported components require OEM support, and faster corrosion or deterioration in some vehicles due to weaker material standards (across all segments, including trolleybuses and trams).

Electron E19101
Photo: Akdi. Wikimedia Commons, licensed under CC BY-SA 4.0.

Etalon A08611
Photo: Etalon. Used with permission. All rights reserved.

Source: (left) Wikimedia Commons (2017);[77] (right) Centre for Transport Strategy (2024).[78]

76. Bogdan Corporation. (2019). Bogdan's new international contract with a French company in 2019. https://bogdan.ua/en/news/bogdan-s-new-international-contract-with-a-french-company-in-2019/
77. Wikimedia Commons. (2017). Electron E19101. Photo by Akdi. https://commons.wikimedia.org/wiki/Category:Electron_E19101#
78. Centre for Transport Strategy. (2024). https://cfts.org.ua/news/2024/12/20/korporatsiya_etalon_prezentuvala_sviy_pershiy_elektrobus_81483

SHIFTING FROM DIESEL BUS TO E-BUS MANUFACTURING

Ukraine's existing manufacturing base for integrated diesel bus production provides a strong base from which electric bus production could develop. Several plans to scale e-bus manufacturing already existed before the full-scale war but were halted or delayed. Importantly, the transition from ICE bus to electric bus manufacturing involves many components and skills that can be re-used or repurposed, while others, particularly those tied to ICE engine assembly, may see declining demand as the fleet electrifies.

The most transferable capabilities are bodywork, chassis fabrication, doors, heating systems, painting, electrical connections and final assembly, where many components can be sourced locally. The main capability shift concerns batteries, electric drivetrains, high-voltage systems, regenerative braking, charging interfaces, diagnostics and software (see below). Some capabilities will be needed much less (e.g. diesel engine assembly, fuel and exhaust systems, and the supplier base around them) which will have negative effects for parts of the existing workforce and supply chain network.

Table 4. Transferability of diesel bus manufacturing capabilities to e-bus production

Manufacturing capabilities (diesel buses)	Transferable assets to e-bus manufacturing
Structural fabrication (e.g. welding, bodywork, frame assembly, painting, interior fit-out)	Fully. Components stay essentially the same.
Suspension and wheel-end assembly	Partially. Core skills transfer. E-buses are heavier, require recalibrated specifications.
Braking systems	Partially. Mechanical brakes stay, but regenerative braking adds an electric layer that requires new components and integration with the drivetrain.
Final assembly workflow	Partially. Overall sequencing transfers (chassis -> body -> systems -> finishing); the order of operations changes around battery and high-voltage installation.
Powertrain installation	Partially. Diesel-specific tooling replaced. Workforce can transfer to motor and battery installation with retraining.
Electrical and high-voltage systems assembly	Partially. New tools and safety protocols required. Existing electrical workers can be upskilled.
Powertrain testing and quality control	Partially. New test equipment needed for battery and motor systems. Existing workforce can be upskilled.

Source: Own elaboration based on interviews with company representatives. Note: Transferability is lower for marshrutka-style producers relying on light-truck chassis and pre-configured ICE component packages, especially where no electric chassis equivalent exists.

Ukraine already has developed capacities in some of these segments. PTS has battery assembly, testing, and integration experience from trolleybus applications. Electron operates one e-bus made in 2014 (E19101) and has recently started production of a new model (E181). Etalon has developed an early e-bus prototype. These do not yet amount to a mature serial production base, but they show that the transition is technically feasible and can be scaled. In addition to the experience from diesel buses, existing know-how in trolleybus electronics, off-wire battery operation, traction systems, motor assembly and vehicle wiring is directly applicable to e-buses, especially if combined with capacities from the automotive, rail, electronics and defence sectors.

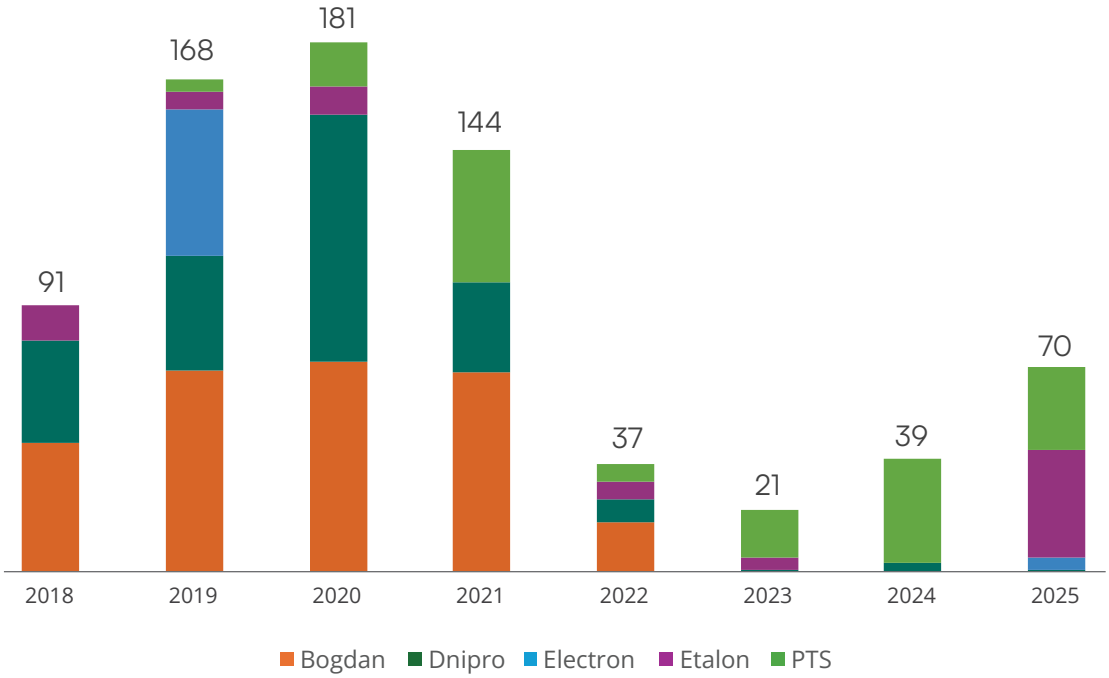
City bus manufacturing – assessment:

Overall, Ukrainian city bus manufacturing is a broad-based segment with a strong diesel foundation and an e-bus capability that, at present, is limited to isolated prototypes and small early-series contracts. The diesel sub-segment has the largest established industrial footprint among urban transport segments in Ukraine with multiple producers and mass-production capacity. This existing base is what makes a domestic transition to e-bus production technically realistic. Much of the bodywork, chassis, and final-assembly capability is transferable; however, batteries, electric drivetrains, high-voltage systems, and diagnostics require targeted investment and supplier development. These are the areas where Ukrainian producers will need to build new capabilities or deepen partnerships in order to narrow the gap with European and Chinese manufacturers, with which they compete in both domestic and export markets.

Trolleybus manufacturing

Trolleybus manufacturing remains one of the most established segments of Ukraine's electric public transport industry with a longstanding industrial base. Unlike tram production, which is concentrated in a small number of specialised firms, trolleybus manufacturing has historically involved a broader set of producers, including Concern Electron, Etalon, PTS Politechnoservice, Dnipro Makarov Machine Building Plant, and Bus Motor LLC.

Figure 8. Ukrainian trolleybus production, annual units by company



Source: Own analysis based on data from Alltransua (2026).[79] Note: Figures may differ slightly as the data are self-reported and no official statistics are available.

Ukrainian trolleybus manufacturers have progressively moved toward low-floor and semi-low-floor designs compatible with European standards for accessibility and passenger comfort. Ukrainian producers manufacture standard 12-metre trolleybuses, articulated high-capacity vehicles (i.e. longer trolleybuses with two connected sections), and 100% low-floor platforms, and also battery-supported off-wire operation. Battery-extended range capability – allowing vehicles to operate for limited distances without overhead wire – has become an increasingly important product feature, particularly given the vulnerability of overhead wire infrastructure to disruption. Depending on the model, autonomous range can vary from short off-wire operation (for emergency cases and manoeuvres inside the depot) to longer ranges of 20-30 km that enable route extensions beyond the electrified infrastructure.[80]

79. Alltransua. (2026). Database. https://alltransua.com/database.
80. Interviews with company representatives, December 2025.

Table 5. Ukrainian trolleybus models and key specifications

Manufacturer	Model	Vehicle class	Length (m)	Floor type	Passenger capacity	Off-wire range	Localisation rate
Bus Motor LLC (formerly Bogdan)	T70117	Standard city trolleybus	11.96	100% low floor	105	0.5 km	52%
Bus Motor LLC (formerly Bogdan)	T90117	Articulated city trolleybus	18.75	100% low floor	184	0.5 km	52%
Concern Electron	T191	Standard city trolleybus	12.1	100% low floor	106	Up to 3 km	52-61%
PTS Politechnoservice	T123	Standard city trolleybus	12.0	100% low floor	80-110	Up to 30 km	40-70%
Etalon (Chernihiv Autozavod)	T12210/40	Standard city trolleybus	12.0	100% low floor	102	Up to 1 km	42-56%
Etalon (Chernihiv Autozavod)	T12220/30	Trolleybus with dynamic recharging	12.0	100% low floor	90	Up to 20 km	42-56%

Source: Compiled by the author from Federation of Employers of Ukraine (2024).[81]

The trolleybus segment is also characterised by a mix of manufacturing models. Some producers emphasise a relatively integrated production process, including body production, assembly, painting, and service support, while others operate more as engineering-led integrators combining in-house electrical systems with externally sourced bodies and imported components. Etalon, for example, presents trolleybus production as part of a complete in-house technological cycle, whereas PTS Politechnoservice combines trolleybus assembly with the in-house development of traction control and electronic systems.

Localisation rates in the trolleybus segment range from around 40% to 70% depending on producer, model, and component mix. At the same time, all major manufacturers rely to some extent on foreign suppliers for bodies, components, or specialised subsystems. International cooperation therefore forms an integral part of the sector's production model. In the case of PTS, this includes cooperation with suppliers from Turkey, Slovakia, China, and the Czech Republic, and a shift over time from Belarusian to Turkish-made bodies. Electron and Etalon also combine domestic manufacturing with imported components and systems.[82]

Another important feature of the sector is the continued role of engineering and electrical systems capabilities. In trolleybus manufacturing, real value is created upstream of final assembly in traction equipment, control systems, battery integration, and the management of off-grid operation. This is especially evident in the case of PTS with their own traction drive control system and in-house production of electronic and electrical components, but it is also reflected more broadly in the technical profiles of other manufacturers. These engineering capabilities are relevant to battery-electric bus development, where similar electrical system competencies apply.[83]

Trolleybus manufacturing – assessment:

Ukrainian trolleybus manufacturing is a competitive domestic industry with established capabilities across assembly, electric traction, battery integration, and off-wire operations. Real value sits upstream of final assembly, and the standard product portfolio (low-floor, articulated, 20-30 km off-wire range) is broadly aligned with European norms. Localisation rates of 40-70% show significant domestic value creation potential. Labour and material costs are significantly lower than

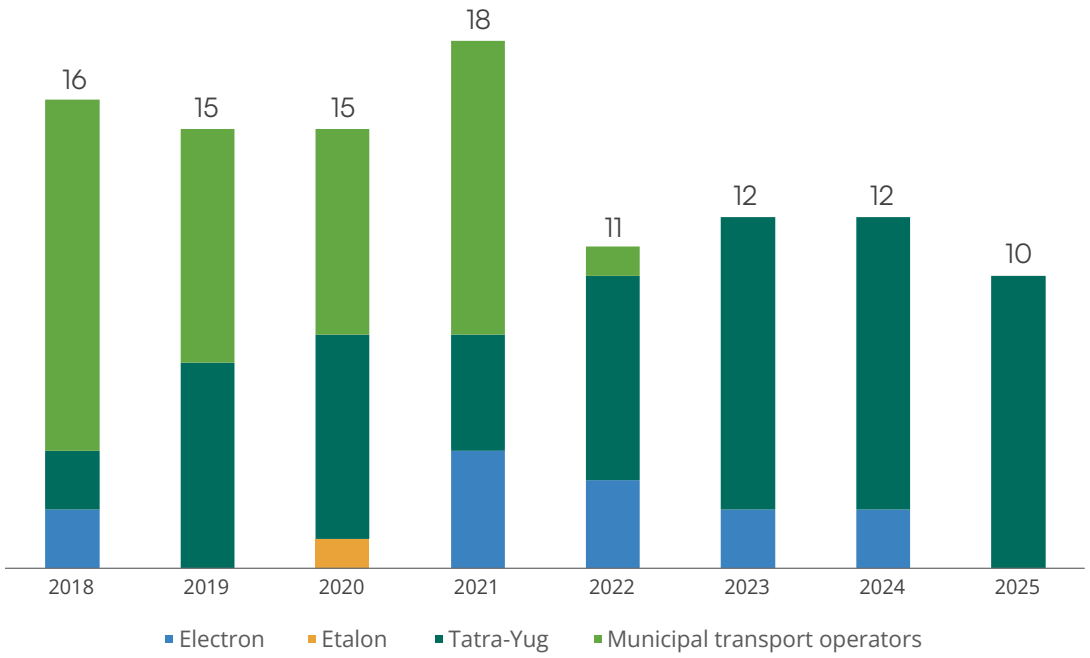
81. Federation of Employers of Ukraine. (2024). Made in Ukraine: Catalog of Ukrainian Machinery and Equipment. https://catalog-madeinua.com.ua/wp-content/uploads/2024/06/catalog-en.pdf
82. Interviews with policymakers and company representatives, December 2025.
83. Interviews with company representatives, December 2025.

in Europe, making products price-competitive, although lower material quality has been linked to faster deterioration. The sector's development potential depends primarily on the predictability of the domestic order pipeline. Recent production volumes have fluctuated significantly, which shows the exposure of manufacturers to procurement timing and the disbursement cycles of IFI-funded contracts, which have been the principal source of orders. Without a more stable demand base, investment in the tooling, certification, testing, and after-sales capabilities needed to be competitive is unlikely to materialise.

Tram manufacturing

Tram manufacturing remains one of the most distinctive segments of Ukraine's public transport vehicle industry. It builds on a long industrial and engineering tradition linked to railway and urban electric transport. In product terms, Ukraine's tram manufacturers cover several vehicle types. These include single-section and multi-section trams, high-floor, partially low-floor, and fully low-floor designs, and vehicles adapted to different track gauges. Compared with buses and trolleybuses, the number of active producers is more limited, with production concentrated mainly in Tatra-Yug and Concern Electron.

Figure 9. Ukrainian tram production, annual units by company



Source: Own analysis based on data from Alltransua (2026).[84] Note: Figures may differ slightly as the data are self-reported and no official statistics are available

Tatra-Yug is Ukraine's longest-established dedicated tram manufacturer. Founded as a joint venture with Czech manufacturer CKD Tatra and building on that technical and design knowledge, the company produces modular high-floor and low-floor tramcars. The company states that it adapts tram specifications to customer requirements and local operating conditions. Its platforms can be adjusted by increasing the number of sections, allowing flexibility in tram length and capacity. Their manufacturing capacity is around 100 units per year, while the localisation rate is at 60-95%, depending on the model and component mix. Tatra-Yug also cooperates with a range of foreign component suppliers in brake systems, lighting products, gearboxes, electromechanical products, and electrical and electronic safety components.[85]

84. Alltransua. (2026). Database. https://alltransua.com/database
85. Federation of Employers of Ukraine. (2024). Made in Ukraine Catalog of manufacturers: Ukrainian machinery and equipment. https://catalog-madeinua.com.ua/wp-content/uploads/2024/06/catalog-en.pdf

Table 6. Ukrainian tram models and key specifications

Manufacturer	Model	Vehicle class	Length (m)	Track gauge (mm)	Floor type	Passenger capacity	Localisation rate, %
Concern Electron	T5L641	Five-section	30.2	1,000	Low	250	48
Concern Electron	T5B641	Five-section	30.2	1,524	Low	287	48
Tatra-Yug	K1T	Three-section	26.92	1,524	Low	254	60-95
Tatra-Yug	K1M6	Three-section	26.80	1,540	Partial low	267	60-95
Tatra-Yug	K1M	Single-section	15.64	1,524	Partial low	160	60-95
Tatra-Yug	K1E6	Two-section	22.0	1,435	High	206	60-95
VTK Vinnytsia	T4UA VinWay	Single-section	16.0	1,000	Partial low	100	-
VTK Vinnytsia	KT4MB VinWay	Two-section	20.0	1,000	Partial low	200	-
VTK Vinnytsia	KT4UA VinWay	Three-section	31.0	1,000	Low	300	-

Source: Compiled by the author from Federation of Employers of Ukraine (2024),[86] VinWay (n.d.).[87]

Concern Electron, operating through its Electron-trans joint venture established in 2011 with a German engineering firm, is the second main active tram producer in Ukraine. As part of the Electron group in Lviv, it manufactures a wider range of urban electric transport, including trams. In the tram segment, its product range includes low-floor models designed for 1000 mm, 1435 mm, and 1524 mm gauges. The company offers two-, three-, five-, and seven-section tram platforms, including metre-gauge and broad-gauge variants. Reported manufacturing capacity is around 100 units per year, with a localisation rate of 48%. Electron trams can also operate without catenary using onboard accumulator batteries for up to 1 km at a speed of 5 km/h, with the possibility of extending this capability through additional batteries. In production, the company imports much of the components and subsystems from foreign manufacturers. Electron's tram production is closely associated with deliveries to Lviv (21 vehicles) and Kyiv (10 vehicles). Etalon attempted to enter tram manufacturing with the single-section TR3100, developed and assembled at the Chernihiv Automobile Plant. The vehicle used a new body manufactured in-house combined with rebuilt Tatra bogies. The prototype was tested in Kyiv and later operated on a trial basis in Odesa. The company has indicated future plans for three-section tram production, but as of the writing of this study, no prototype has been built.[88]

Alongside these dedicated manufacturers, some municipal transport operators and depot-based workshops are involved in tram renewal, mainly through deep rebuilds rather than production of new vehicles. Vinnytsia Transport Company's (VTK) VinWay trams are a good example: since 2015, they rebuilt decommissioned Tatra KT4 vehicles into low-floor tramcars, outsourcing new bodiesand

86. Federation of Employers of Ukraine. (2024). Made in Ukraine Catalog of manufacturers: Ukrainian machinery and equipment. https://catalog-madeinua.com.ua/wp-content/uploads/2024/06/catalog-en.pdf
87. VinWay. (n.d.). https://uk.wikipedia.org/wiki/VinWay
88. Interview with company representatives, December 2025.

retaining legacy elements like bogies. Similar approaches exist in Kyiv, Odesa, Zaporizhzhia and other cities, where operators have used new or substantially modified tram bodies, often combined with new electrical and control systems. This type of activity sits in a grey area between depot-led modernisation and vehicle manufacturing: it offers a lower-cost route to fleet renewal, but should be distinguished from serial production of entirely new tram vehicles.

Tram manufacturing in Ukraine also includes selected capabilities beyond final vehicle assembly. The sector retains experience in selected electrical and traction-related systems and is linked to wider urban electric transport infrastructure such as substations and associated power equipment. This is relevant because tram procurement is often tied to broader municipal investment in depots, substations, and network rehabilitation.

Tram manufacturing - assessment

Taken together, Ukrainian tram manufacturing builds on a long industrial and engineering tradition, with established producers active in car body manufacturing, low-floor design, final assembly, and selected electrical and traction systems. High localisation rates reflect a deep domestic industrial base. A distinctive feature of the segment is the role of municipal transport operators, which have supported fleet renewal through in-house refurbishment of older vehicles and developed related capabilities. As in the trolleybus and bus segments, the key constraint is the demand-side. This weakens producers' ability to invest consistently in industrial capacity and product modernisation. The fleet renewal need is substantial, given the age of the existing fleet (see Chapter 4.2), but its conversion into orders depends on municipal budgets and IFI procurement decisions that remain neither predictable nor well sequenced. For the segment to realise its potential, the priority is a stable domestic order pipeline anchored in fleet renewal across larger urban systems.

Ancillary components manufacturing

Vehicle manufacturing does not stand alone in the electric public transport value chain. Trams, trolleybuses and electric buses also require a wider infrastructure layer: traction substations, overhead contact systems, charging infrastructure, structural metal hardware, wiring, control equipment and spare parts. Ukraine already has domestic production capability across several of these ancillary segments.

In traction power supply, Pluton in Lviv manufactures DC equipment packages for urban electric transport substations and has supplied projects in Ukraine, Sweden, Romania and several metro systems. At component level, Elektrotyazhmash in Kharkiv has produced traction motors and electrical machines used in trolleybus manufacturing; for example, the Electron T19 trolleybus uses their traction motor. However, this domestic supply-chain link has weakened: these motors faced operational issues, saw limited uptake, and production reportedly stopped after 2020-2021. Recent Ukrainian trolleybuses therefore rely mainly on foreign traction motors, often from Riga-based suppliers.[89] In catenary hardware, KS in Dnipro supplies specialised metal parts for overhead contact systems, while Ukraine's broader metalworking and precision fabrication base can provide additional infrastructure components. There are also several depot-based catenary production facilities, including in-house capabilities at Kyivpastrans and Ternopilelectrotrans, but these often follow obsolete designs, requiring very low speeds at turnouts and crossings. This ancillary segment could therefore become an important growth area within Ukraine's electric public transport value chain. Domestic fleet expansion and infrastructure renewal will require not only rolling stock, but also substations, overhead systems, charging equipment, motors, metal structures and maintenance parts.

The segment also offers a realistic path for EU value-chain integration. Full vehicle exports face high entry barriers, but components for substations, overhead systems, charging infrastructure, metal supports, wiring, spare parts and selected electrical equipment could enter European supply chains

89. Interviews with sectoral experts, December 2025.

more gradually. Cooperation could take the form of subcontracting, joint production, licensed manufacturing or participation in EU-funded reconstruction projects, building on Ukraine's cost advantage and existing engineering base.

The EV charging segment's relevance to electric bus fleet deployment deserves a specific note. The charging hardware and software capabilities built up in the passenger EV market, including power electronics, charge management systems, grid integration, can be transferable to the depot-level charging infrastructure that electric buses require, though the hardware specifications and power levels would differ. No Ukrainian producer currently manufactures depot charging systems purpose-built for e-bus fleets, but the engineering base to develop such products domestically exists. These include Ecofactor, manufacturing in Odesa and Poland with a charge point management platform, UGV Chargers and TOKA, both producing hardware domestically and operating their own charging networks, Eveus, focused on AC chargers engineered for Ukrainian grid conditions, Go To-U, a software-only charging management platform, and Octa Energy, producing certified AC/DC hardware with its own UCP control system. Together the segment spans hardware manufacture, software platforms, and network operations.

4.1.2. Enablers for competitive manufacturing sector

Access to finance

The financing landscape for Ukraine's public transport vehicle manufacturers is structured primarily around demand-side intermediation: international financial institutions lend to municipal operators, who then procure vehicles through competitive tenders. Manufacturers receive revenue through contracts rather than through direct investment or production grants and have no standing access to IFI credit facilities in their own right. They rely primarily on contract revenues, subsidised domestic bank lending where available, retained earnings, and selective access to guarantee-backed credit. This matters because investment needs in the sector go beyond working capital and include machinery, tooling, certification, plant reconstruction, tender guarantees, and product development.

The main state instrument directly available to manufacturers is the Affordable Loans 5-7-9% programme. For manufacturing companies, the investment ceiling is UAH 150 million (approx. EUR 3 million), and the limit for working-capital loans was reduced to UAH 5 million in 2024.[90] Another state instrument, The Significant Investment programme, offers state support of up to 30% of CAPEX in the form of tax, VAT, and customs duty exemptions, but only for projects above EUR 12 million.[91]

According to information shared in interviews, both ceilings sit below the financing profile of public transport manufacturing. In municipal contracts, significant share of production cost, including imported components paid for at order, has to be financed before delivery, while public buyers pay on milestones or completion. This creates a financing gap in the middle: the 5-7-9% working capital threshold is too small to cover working capital for a large municipal contract, while the Significant Investment programme threshold (EUR 12 million) is above the typical investment project size of public transport manufacturers in Ukraine. The 5-7-9% programme remains useful for smaller upgrades, selected investments, and some war-damage repair, but does not match the financing needs of a manufacturer preparing to deliver a large municipal order or scale toward export-grade production. Commercial bank credit is not a viable substitute either, with wartime risk pushing average lending rates to around 18% which makes credit unaffordable for producers.

On the IFI/ Development Finance Institution (DFI) side, the EBRD's Ukraine Public Trans-port Framework (UPTF) and the EIB's Ukraine Urban Public Transport Framework Loan (UUPTFL) have been the main vehicles through which rolling-stock demand has been financed. Neither instrument directs lending to manufacturers; both lend to municipal enterprises. The EBRD's portfolio risk-sharing

90. UkraineInvest. (2024). The government has modernised the «5-7-9% Affordable Loans» programme to refocus this type of state support on investment lending. https://ukraineinvest.gov.ua/en/news/the-government-has-modernised-the-5-7-9-affordable-loansprogramme-to-refocus-this-type-of-state-support-on-investment-lending/
91. UkraineInvest. (nd). State support for investment initiatives. https://ukraineinvest.gov.ua/en/news/government-support-for-investment-initiatives/

facilities with PrivatBank and Ukrgasbank do not target rolling-stock producers specifically, but they are open to sub-borrowers in sectors including manufacturing and transport and logistics. This means that Ukrainian public transport manufacturers can in principle benefit, provided they meet bankability, size, and eligibility criteria set by the partner banks. Likewise, the EIB Group's EU4Business Guarantee Facility is not transport-specific but is designed to improve lending terms for (micro,) small, and medium-sized enterprise (MSMEs/SMEs) in eligible sectors through partner banks by reducing collateral requirements and easing access to credit.[92,93,94,95]

The central structural weakness of the current financing landscape is that it is almost entirely demand-side focused: IFI instruments reach manufacturers only indirectly through operator procurement, and no mechanism exists to support producers directly in financing production, plant reconstruction, or product development. The domestic instruments that do reach manufacturers are calibrated for SMEs and fall well below the scale required for a public transport vehicle producer executing a large order. Complementing the demand-side intermediation with instruments that reach manufacturers directly is needed: working-capital guarantees sized to production contract cycles, concessional reconstruction financing, and tender-guarantee facilities that allow domestic producers to compete for larger orders. The EBRD's risk-sharing facilities and EIF guarantee instruments are potentially relevant channels but would require deliberate targeting that is not currently in place.

R&D and innovation

There is no dedicated state R&D programme for transport manufacturing or rolling stock engineering in Ukraine. Public spending on science and technology has historically gone to legacy block-funded research institutes rather than to industry. Since 2022, what little industrial innovation spending remains has been pulled almost entirely into defence and related technologies. Public transport manufacturing is not a priority in this environment.

In practice, product development happens inside the companies themselves, is funded from operating revenues, and relies on foreign technical partnerships to fill gaps in local engineering capability. Companies retain a fairly broad set of vehicle integration capabilities across buses, trolleybuses and trams, but rely on foreign partners for many of the most technology-intensive subsystems. Domestic firms cover body design and fabrication, final assembly, interior fit-out, low-floor platform integration, traction-system integration, and adaptation of vehicles to different gauges, route conditions and customer requirements. In trolleybuses and trams in particular, several firms also show capabilities in electrical integration, battery-assisted off-wire operation, diagnostics, and control systems. Meanwhile, the most technology-intensive subsystems are almost entirely sourced from abroad: drivelines, transmissions, axles and braking systems from established Western suppliers such as ZF, Allison and Knorr-Bremse; diesel engines from a mix of Western and Asian manufacturers including Cummins and Weichai; and traction motors, power electronics and batteries from a combination of European and Chinese sources.[96] Domestic alternatives exist for some of these subsystems including traction motors, gears, transformers, and parts of the driveline but are used less than they could be. Interviewees pointed to outdated designs, the absence of serial production, quality issues reported by operators, and a customer preference for European components on both quality and brand grounds.

At the same time, the sector still shows some capacity for continued product development where firms have the resources to sustain it. One example is PTS, which continues in-house engineering work on new technologies, including a bus prototype equipped with a hydrogen fuel-cell battery. The company also assembles lithium-ion battery packs from imported cells, adapts them for different vehicle configurations, produces traction motor control systems and traction batteries for electric vehicles, and carries out testing in its own certified laboratory. More broadly, its cooperation

92. European Investment Bank. (2025). EU4BUSINESS GUARANTEE FACILITY II. https://www.eib.org/en/projects/all/20250149
93. European Investment Bank. (2025). PRIVATBANK GUARANTEE FACILITY. https://www.eib.org/en/projects/all/20250150
94. European Investment Bank. (2025). UKRGASBANK guarantee facility III. https://www.eib.org/en/projects/all/20250279
95. European Investment Bank. (2026). EIB Group provides EU-backed guarantees to expand finance for war-affected businesses in Ukraine. https://www.eib.org/en/press/all/2026-009-eib-group-provides-eu-backed-guarantees-to-expand-finance-for-war-affected-businesses-in-ukraine
96. Federation of Employers of Ukraine. (2024). Made in Ukraine Catalog of manufacturers: Ukrainian machinery and equipment. https://catalog-madeinua.com.ua/wp-content/uploads/2024/06/catalog-en.pdf

with Ukrainian technical and research institutions points to an R&D model centred on applied engineering and product adaptation. This includes work with the Igor Sikorsky Kyiv Polytechnic Institute on traction drive improvement, shift from asynchronous to synchronous motors, vector control and software upgrades, and the use of silicon carbide-based components; and with State Enterprise DerzhavtotransNIIproekt, Ukrmetrteststandart, and the National Accreditation Agency of Ukraine on certification, metrology, testing methods, and alignment with EU and UNECE requirements.[97]

Overall, Ukraine's public transport manufacturing sector functions more as an adaptive engineering and systems-integration base than as a frontier R&D ecosystem. Firms retain useful vehicle-integration capabilities, but the absence of stable, targeted innovation funding limits movement into higher-value subsystems.

At present, R&D efforts are confined to individual company initiatives; there is no coordinated, sector-wide innovation agenda. This contrasts with EU producers, which benefit from dedicated public R&D programmes at national and EU level, combining grants, demonstrators, public-private partnerships (e.g. Poland's INNOTABOR programme, which provided ~EUR 45 million in R&D grants for rolling-stock manufacturers; the EU's Clean Hydrogen Partnership funding hydrogen bus commercialisation; ZeEUS and ASSURED projects, which supported electric bus and charging infrastructure demonstrations across Europe).[98,99,100,101] Ukrainian producers have no equivalent access to structured, co-funded R&D programmes. The fiscal incentives introduced domestically – a temporary CIT exemption until 2035 for producers of electric motors, lithium-ion batteries, chargers and electric vehicles, including trams and metro cars, with tax savings reinvested in R&D, re-equipment or expansion, plus VAT/customs-duty relief on imported production equipment until 2031 – are meaningful signals, but they are passive instruments that benefit only firms already generating taxable profits and investing in expansion.[102] They do not substitute for the active, grant-based R&D support that has allowed European competitors to develop and de-risk new technologies at public expense.

A broader vision that positions public transport manufacturing within a wider industrial strategy encompassing rail, automotive, and clean mobility is needed. Structured access to EU research and innovation funds, as Ukraine's integration deepens, could be transformative, but requires programmes with clear strategic direction and sufficient absorptive capacity. Technology transfers from established EU OEMs and the formation of joint ventures are key levers which would offer a faster route to higher-value subsystems than building domestic R&D from scratch.

Workforce and skills

Ukraine's public transport manufacturing sector has an experienced industrial workforce in vehicle assembly, welding, electrical integration, machining, painting, and maintenance. Firms have stable core teams of qualified specialists, with periodic training and knowledge testing for selected staff. At the same time, labour shortages due to war have become a constraint. Manufacturers operate with leaner teams because of mobilisation and displacement, and place increasing emphasis on cross-training, retention, and preserving key production staff. A related issue is wartime reservation of personnel. Stakeholders noted that the ability to reserve key workers is important for maintaining production, and some manufacturers indicated that, as critical enterprises, they are able in practice to reserve around half of conscription-age staff. Around one third of Ukrainian transport employers reported recruitment problems in 2024, with shortages especially in drivers, mechanics, electro-mechanics and repair technicians.[103]

97. Interview with company representatives, December 2025.
98. Narodowe Centrum Badań i Rozwoju. (2016). INNOTABOR – PLN 196 million to support Polish rolling stock. https://archiwum.ncbr.gov.pl/o-centrum/aktualnosci/szczegoly-aktualnosci/news/innotabor-pln-196-million-to-support-polish-rolling-stock-39157/
99. Clean Hydrogen Partnership. (2025). Joint Initiative for hydrogen Vehicles across Europe 2 (JIVE 2). European Commission. https://www.clean-hydrogen.europa.eu/projects-dashboard/projects-repository/jive-2_en
100. ASSURED. (2022). ASSURED project. https://assured-project.eu
101. UITP. (2019). ZeEUS - Zero Emission Urban Bus System. https://zeeus.eu
102. UkraineInvest. (n.d.). Production of eco-vehicles and its components. https://ukraineinvest.gov.ua/en/incentives/eco-transport/
103. Kurshitashvili, Nato; Lungu, Elena; Hoftijzer, Margo; Vazhnenko, Anna; Bespalov, Dmytro; Myroshnychenko, Oksana; Hanushevych, Inna. 2025. On the Road to Recovery: Addressing Ukraine's Transport Labor Shortages. World Bank. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099121325144510117

Skills needs apply to both infrastructure deployment and rolling stock manufacturing and adoption. New capacity will be needed for charging systems, depot upgrades, power supply, batteries, electric drives, diagnostics, software, safety testing and maintenance. But this does not mean Ukraine would need a new workforce from scratch. Existing manufacturing workers can move into new electric vehicle and battery-related roles where production is co-located and skills are matched through training.[104] Reskilling, upskilling, formal training and recognition of on-the-job skills are effective ways to build an adaptable workforce.[105]

The skills pipeline depends heavily on vocational colleges and technical institutes, but manufacturers emphasise that practical experience and on-the-job training remain essential for production quality and scale-up. Ukraine already has relevant education and skills programmes. National Transport University in Kyiv is a key transport education institution and cooperates with PTS on technical specifications and staff training. Although not targeted for public transport manufacturing or deployment related skills, EU-backed programmes such as Skills4Recovery also support vocational education, retraining and employer-led skills development with a focus on veterans, internally displaced people and other groups.

Current shortcomings include fragmented skills training ecosystem, with weak links between manufacturers, vocational colleges and universities. Employers still need to do much of the practical training themselves. Retraining and upskilling should therefore be central. Ukraine could also scale up from adjacent sectors, including defence production, electronics, metalworking and battery assembly, where workers may already have relevant practical skills.

PROPOSAL: UKRAINIAN BATTERY INSTITUTE

Given energy transition requirements, but also electromobility and military uses, Ukraine is increasingly integrating large amounts of battery storage across a variety of applications. Given these demand-side forces, alongside ongoing plans to use domestic critical minerals and add value to them within Ukraine, having a dedicated institution dedicated to batteries might merit attention from policymakers. Crucially, this type of centre should feature several functions that will be crucial as Ukraine's battery economy expands.

Most clearly, providing R&D support and financing for the sector is key to spur innovation in the space, with provisions to enable diffusion of these learnings to key stakeholders, including electric public transport manufacturers looking to integrate batteries into new electric buses or trolleybuses with a higher driving range. This may also involve a pilot line to help scale-up production and mitigate risk to individual producers. Importantly, the institute should however also focus on skills and training of battery assembly and engineers, and help with battery certification processes. The model exists in Europe (e.g.), which links battery research to pilot-scale production, industry partnerships, and structured training programmes.

Other countries have taken similar steps, including the launching of the UK Battery Industrialisation Centre, Fraunhofer's Research Fab Battery Cell (FFB) in Germany or even the National Battery Research Institute in Indonesia - all examples which may provide an organisational and operational template for Ukraine.

104. Chen, Z., Kuehn, Z., Lashkaripour, A., & Tong, L. (2024). The transition to electrified vehicles: Evaluating the labor demand of manufacturing conventional versus battery electric vehicle powertrains. Energy Policy, 188, 140644. https://doi.org/10.1016/j.enpol.2024.140644

105. International Labour Organization. (2024). Navigating transformational changes and transitions: The skills development and employment landscape in Thailand's automotive manufacturing sector. International Labour Office. https://www.ilo.org/publications/navigating-transformational-changes-and-transitions-thailands-automotive

A Ukrainian Battery Institute would address several gaps at once:

- Provide a domestic skills pipeline for battery integration, electric drives, and safety testing
- Operate a shared pilot line for Ukrainian producers (PTS, Electron, and others working on domestic battery assembly) to test and certify cells and packs without each firm building this capacity in-house
- Serve as an institutional anchor for cooperation with European battery research networks, opening a route into the EU value chain on R&D and standards rather than only on finished products

Financing would be key to the set-up of this institution given existing budgetary constraints, but could be supported with a combination of EU instruments (Horizon Europe, the Ukraine Facility) as well as bilateral donor support, and EBRD/EIB co-financing for the pilot production component. Once Ukraine becomes a full EU member, other instruments such as the Innovation Fund could become a funding option as well alongside other instruments.

Such an institute would accelerate the workforce, certification, and supplier-ecosystem development and help Ukraine leapfrog into higher value-added production segments.

Overview of key parts of Ukraine's current regulatory and policy framework for electric public transport manufacturing

Ukraine's policy framework for electric public transport manufacturing is shaped less by a single sector-specific strategy than by a combination of industrial support, procurement rules, and gradual alignment with EU technical requirements. For domestic manufacturers, the most relevant elements are the broader Made in Ukraine agenda, localisation rules in public procurement, state support for industrial investment, and the regulatory framework governing low- and zero-emission transport.

The Made in Ukraine policy, launched in 2024, is the main umbrella initiative to support domestic producers. It combines several instruments rather than operating as a standalone programme. For manufacturers, the most relevant include subsidised lending, support for industrial parks and investment projects, and a programme compensating 15% of the cost of Ukrainian-made machinery and equipment purchased by businesses and, since 2025, municipal enterprises. To qualify under that compensation scheme, producers must meet a domestic-content requirement of at least 40%.[106]

A second important instrument is the public procurement localisation regime introduced by Law No. 1977-IX, which entered into force in July 2022. The law established a special procurement regime for selected industrial goods over a ten-year period and explicitly covers buses, trams, and trolleybuses. It requires a minimum share of Ukrainian value added in eligible products, starting at 10% in 2022 and rising gradually to 40% by 2028. Suppliers participating in covered tenders must demonstrate compliance with these thresholds. In practice, this creates an advantage for domestic producers, or for foreign firms willing to localise production in Ukraine, in procurements financed from the state or local budgets. The law explicitly excludes 47 countries party to the WTO Government Procurement Agreement (GPA) from these requirements, preserving Ukraine's commitments under the EU-Ukraine Association Agreement, and it does not cover IFI-financed tenders, which follow donor procurement rules.[107]

The main risk is that localisation rules alone do not build a competitive supply chain. Ukrainian manufacturers will still need imported components, especially for key components which are not yet widely

106. Cabinet of Ministers of Ukraine. (2025). Compensation of 15% of the cost of Ukrainian-made industrial equipment: One year of the program's operation. Ministry of Economy, Environment and Agriculture of Ukraine. https://www.kmu.gov.ua/en/news/kompensatsiia-15-vartosti-ukrainskoi-promyslovoi-tekhniky-rik-dii-prohramy

107. The Kyiv Independent. (2022). New localization law seeks to revive decayed machine building industry. https://kyivindependent.com/new-localization-law-seeks-to-revive-decayed-machine-building-industry/

available from domestic suppliers. If local-content requirements are applied too rigidly, they could raise costs and reduce access. Strategic support and technical assistance are therefore needed. This could include help with EU technical standards, certification, supplier development, quality control, testing facilities and access to finance.

On trade policy, a strategic mapping should be done to identify which components can realistically be produced locally, and which must be imported in the short to medium term. Import duties should be set strategically to support local suppliers where capacity exists but reduced or removed for critical components that Ukrainian firms cannot yet produce at scale. Ukraine has already used targeted VAT and customs-duty relief for some energy equipment, which shows that selective import treatment is possible.

UKRAINE'S PUBLIC TRANSPORT VEHICLE MANUFACTURING SECTOR ASSESSMENT

Ukraine has a functioning manufacturing base across all three segments. Trolleybus production is the most established, with multiple serial producers operating at high localisation rates across different platforms (low-floor, articulated, battery-extended) and capabilities in traction systems, control electronics, and battery integration. Tram manufacturing is narrower but builds on an established domestic supply base, with experience in carbody fabrication, low-floor design, and electrical systems integration. Electric bus production is nascent, though the existing diesel bus and trolleybus production base provides transferable capabilities in bodywork, chassis, and assembly; the gaps are in batteries, electric drivetrains, and high-voltage systems. Beyond rolling stock, Ukraine also produces ancillary components that extend the domestic value chain. The cross-cutting supply-side weaknesses are consistent across segments: no dedicated R&D or innovation funding, financing programmes designed for SMEs that the public transport manufacturers cannot benefit from, and a skills ecosystem with weak links between manufacturers and training institutions. Firms operate primarily as systems integrators, with product development limited to self-funded efforts and often reliant on foreign partnerships for the most technology-intensive subsystems. These are addressable gaps, but they require targeted instruments.

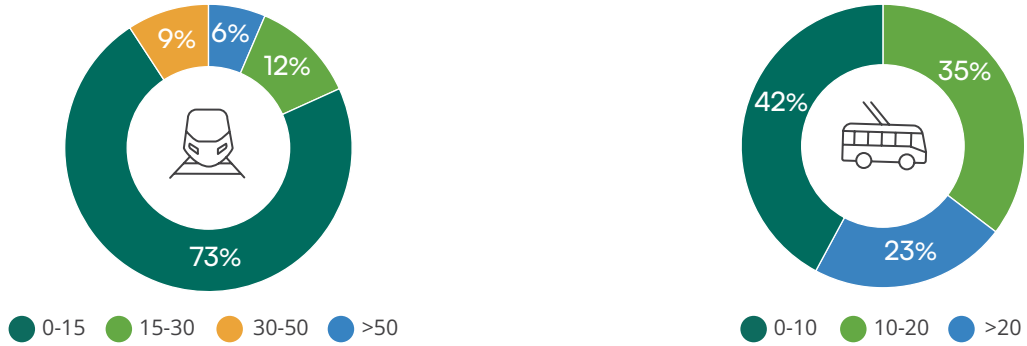
4.2. Domestic adoption of public transport

The development of Ukraine's public transport manufacturing base cannot be separated from conditions in the domestic market. Fleet renewal, procurement volumes, and the operational state of urban transport systems determine whether domestic producers can count on a stable and growing home market, or whether demand remains fragmented and unpredictable. The policy question – how to expand the role of electric public transport in Ukraine – takes a different form in each segment. For electric buses, it is a matter of uptake from a near-zero base. For trams and trolleybuses, the more immediate task is to reverse a prolonged decline: networks have been contracting, fleets have aged well beyond their service lives, and renewal has not kept pace with retirement. Despite a high-level political commitment to modernisation, the sector is currently characterised by negative overall trends where systems are actively shrinking, resulting in fewer operational lines, a reduced number of vehicles in service, and a declining workforce. This section reviews the current state of domestic adoption, infrastructure capacity, and the relevant policy framework, and examines the scope to scale up domestic procurement of electric public transport.

4.2.1. Overview of electric public transport fleet and infrastructure

Ukraine's domestic public transport market is shaped by three linked features: an extensive legacy electric transport system, a very old fleet, and irregular renewal. The country still has one of the largest tram and trolleybus networks in Europe, but most of the rolling stock has exceeded its service life and replacement has long lagged behind system needs. As of 1 January 2021, the average age of a tramcar was 36 years, with 73% of the fleet in the 30-50-year range and a further 9% older than 50 years. The average trolleybus age was 18 years, with 42% of the fleet older than 20 years. This aging fleet is supported by infrastructure that is often fully deteriorated, while operators suffer from a systemic lack of financial sustainability and a critical inability to attract and retain personnel, with the average age of technical specialists often exceeding 60 years. In practice, the main domestic market driver is therefore not first-time electrification, but large-scale fleet renewal within a fragile institutional and physical environment.[108]

Figure 10. Age of tramcars (left) and trolleybuses (right) in Ukrainian cities, as of 01.01.2021



Source: Ukrelektrotrans(nd).[109] Note: 2021 is the latest year for which data are available at the time of writing.

This replacement need sits within an already extensive electric transport system. As of 1 January 2025, Ukrainian cities had around 1,366 km of tram network, and 3,178 km of trolleybus catenary (Table 7). Trolleybus systems are geographically more widespread than tram systems, while tram networks remain concentrated in a smaller number of larger cities such as Kyiv, Kharkiv, Odesa, Dnipro, and Lviv. The domestic market is therefore shaped by a dual reality: a large inherited system and a very large backlog of replacement and rehabilitation needs. Current institutional and infrastructure capacity is often insufficient to support new fleets; for instance, new trams deployed on outdated tracks in cities like Kyiv deteriorate rapidly. Operational capacity presents a separate constraint, where new trolleybuses are underutilised due to a shortage of drivers. Furthermore, Ukrainian transport experts express concern that government investment programme significantly underestimates the actual scale and cost of the necessary infrastructure projects, such as the capital requirements for line and depots.[110]

108. Assessment of sectoral experts, based on interviews with municipal and transport operator representatives, December 2025.
109. Ukrelektrotrans. (n.d.). Urban electric transport facilities. https://www.korpmet.org.ua/?page_id=67
110. Assessment of sectoral experts, based on interviews with municipal and transport operator representatives, December 2025.

Table 7. Tram and trolleybus networks of Ukrainian cities, as of 01.01.2025

№	City	Population (2020)	Electric public transport networks (km)		
			Trolleybus	Tram	Metro
1	Kyiv	2 967 360	505.10	231.00	67.6
2	Kharkiv	1 443 207	263.40	217.20	38
3	Odesa	1 017 699	150.50	197.63	
4	Dnipro	990 724	188.50	172.00	7
5	Zaporizhzhia	731 922	188.40	99.30	
6	Lviv	724 314	132.60	81.80	
7	Kryvyi Rih	619 278	262.20	131.50	
8	Mykolayiv	480 080	61.20	69.60	
9	Vinnytsia	370 707	88.90	44.00	
10	Kherson	286 958	97.20		
11	Chernihiv	286 899	110.50		
12	Poltava	286 649	73.00		
13	Cherkasy	274 672	127.20		
14	Khmelnytskyi	273 713	99.70		
15	Chernivtsi	267 060	86.80		
16	Zhytomyr	263 318	109.00	17.50	
17	Sumy	262 119	103.10		
18	Rivne	246 003	60.80		
19	Ivano-Frankivsk	237 686	65.90		
20	Kamianske	231 915		77.20	
21	Kropyvnytskyi	225 339	52.50		
22	Ternopil	223 462	86.30		
23	Kremenchuk	219 022	64.70		
24	Lutsk	217 315	109.15		
25	Bila Tserkva	209 238	44.00		
26	Kramatorsk	152 120	48.10		
27	Konotop	85 603		27.80	
	TOTAL	**13 594 382**	**3 178.75**	**1 366.53**	**112.60**

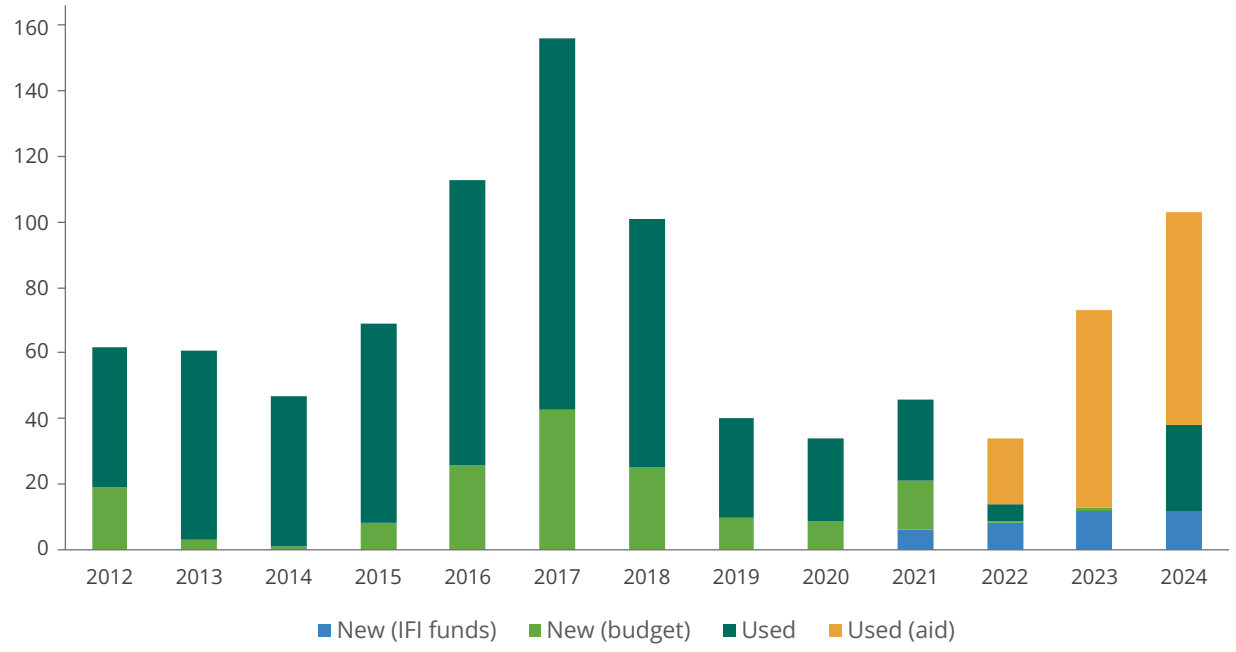
Source: Data compiled and provided by NGO Vision Zero. Note: Table does not include systems located in temporary occupied territories of Ukraine and those that halted operations.

Current uptake of electric public transport

As noted before, Ukraine's high share of electric public transport is driven overwhelmingly by legacy tram and trolleybus systems rather than battery-electric buses. Electric bus adoption remains marginal, though early serial production is emerging: in September 2025, Electron secured a domestic contract for nine E181 units for Uzhhorod (a city without a legacy tram or trolleybus system) under an EIB-financed procurement. This structure is reflected in recent procurement trends. For trams, deliveries before 2022 relied heavily on used vehicles, with smaller volumes of new rolling stock financed from budgets and IFI-supported projects. The case of Vinnytsia illustrates this situation most clearly: Since 2007, the city has been taking in used trams from Zurich under a Swiss government programme, starting with around 90 vehicles delivered between 2007 and 2011, and a further 35 agreed in 2020. The programme continued throughout the war, with the first of the 2020 batch arriving in March 2023. The same approach is now being used in Lviv, which is receiving 11 used low-floor trams from Bern and 25 tram cars from Basel-Country.[111] Since 2022, procurement has continued, but at lower volumes and under much tighter fiscal and operational constraints, with used vehicles donated as aid played a large role instead.

111. Centre for Transport Strategies. (2025). Which trams from the EU Ukrainian cities have received in recent years. https://cfts.org.ua/articles/tramvayna_ekzotika_yaki_vagoni_z_es_otrimali_ukranski_mista_protyagom_ostannikh_rokiv_2127

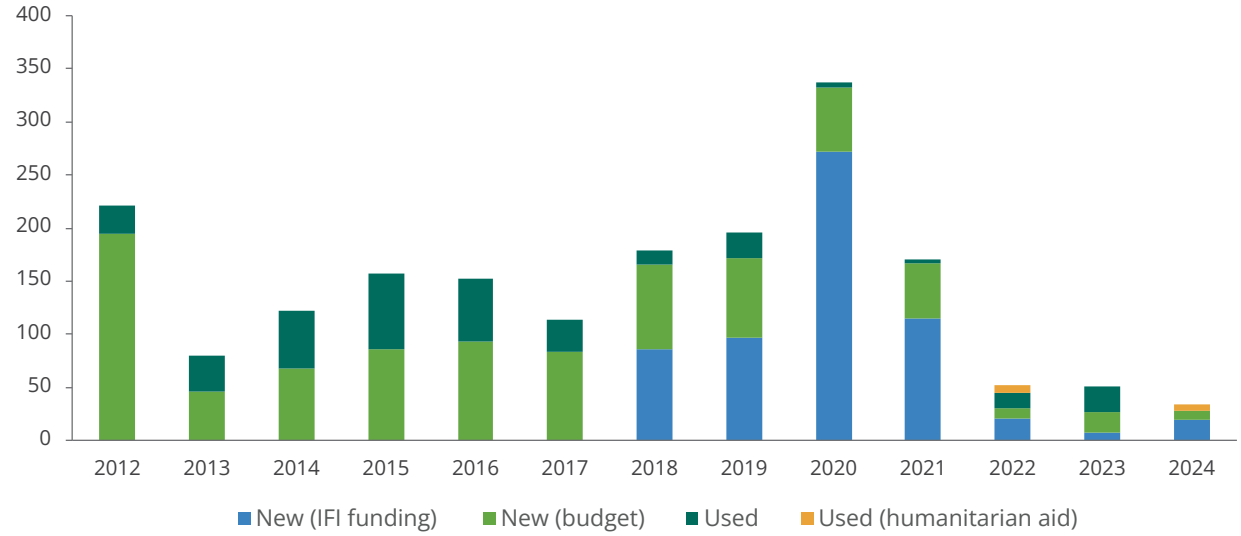
Figure 11. Number of tram vehicles delivered to Ukrainian cities, per year



Source: Own visualisation based on data from Alltransua (2026).[112]

'Trolleybus procurement followed a different pattern. Before the full-scale invasion, deliveries were dominated by new vehicles, financed through municipal budgets and IFI funding, with a clear peak in 2020-2021. After 2022, volumes fell sharply due to war related financial constraints. Procurement did not stop but became more fragmented and more dependent on a mix of IFI-supported new vehicles, budget purchases, and some humanitarian transfers of used stock.

Figure 12. Number of trolleybuses delivered to Ukrainian cities, per year



Source: Own visualisation based on data from Alltransua (2026).[113]

Infrastructure capacity

Ukraine's urban electric transport networks are powered by traction substations that were mostly built between the 1960s and the 1980s, most of which are operating well past their intended design life. No systematic national programme of substation replacement has been implemented in the post-Soviet period. In Chernihiv, all substations

112. Alltransua. (2026). Database. https://alltransua.com/database
113. Ibid

were built between 1964 and 1992, but none has been replaced and their condition now undermines the reliability of power supply to rolling stock on the line.[114] The contact network carries wear levels above 50%, with cable networks at over 70% worn, resulting in higher energy consumption, frequent wire breaks, and unplanned service interruptions.[115] In Khmelnytskyi, the pattern is similar: most traction substations use outdated oil-circuit-breakers and large-scale converters that predate modern automation standards, and 83 km of cable networks have an average age exceeding 40 years.[116]

Depot infrastructure is in comparably poor condition. Maintenance facilities in most cities were built for the vehicle types operated in the 1970s and 1980s and have not been systematically modernised. The charging infrastructure required for battery-electric bus operation (high-power depot chargers, terminus pantograph systems, grid connection capacity) does not exist at meaningful scale in any Ukrainian city. Lviv's 2023 E-Mobility Plan identified the installation of charging infrastructure for battery electric buses as requiring new depot construction and significant grid reinforcement and modelled the potential for rooftop solar on depot facilities as a partial offset to energy costs.[117] These are capital investments that lie well beyond the current fiscal capacity of most municipal operators.

To illustrate the relationship: a new trolleybus delivered to a city with a 1970s substation and a 50%-worn contact network will underperform and break down more frequently than the same vehicle operating on a modernised grid. This interaction between rolling stock age and infrastructure condition is not always made explicit in procurement programmes, but it is central to understanding why fleet renewal has produced limited-service quality improvements even in cities that have received new vehicles.

Additionally, Ukraine's electric public transport is still governed largely by Soviet-era State Building Standards (DBN) and State Standards (DSTU), most notably DBN V.2.3-18:2007. These rely on a prescriptive approach that fixes exact distances, radii, and design templates, for example, a 20-metre minimum gap between tram lines and residential buildings, a 200-metre minimum curve radius for light rail (against 40 metres in Italy), and a 600 V traction voltage retained from Soviet-era standards despite EN 50163 permitting 750 V as the recommended system for new infrastructure and higher voltages beyond that. The result is a regulatory environment that prohibits solutions widely deployed in EU member states and inflates project costs through over-engineering. Reforming this body of norms is therefore a precondition for any meaningful modernisation or post-war reconstruction of urban electric transport and also addresses the internal contradiction with Ukraine's Law on Construction Norms (No. 1704-VII, 2014), which already gives preference to parametric and target methods.[118]

114. Chernihiv City Council. (2025). Programme of electric transport development of Chernihiv 2026-2028. https://chernigiv-rada.gov.ua/storage/files/07/04/29/22/5a7d11b8376321e86200979006171bec.pdf
115. Ibid
116. Khmelnytskyi City Council. (2025). Programme of electric transport development of Khmelnytskyi municipal territorial community 2026-2030 https://www.khm.gov.ua/uk/node/69048
117. Lviv City Council. (2023). Plan for the Development of E-Mobility of the Lviv City Territorial Community. Transformative Mobility. https://transformative-mobility.org/wp-content/uploads/2024/06/240422_Lviv_E-Mobility_Plan-2s.pdf
118. Zagreba, V., & Hagen, A. (2025). Comparative analysis of legislative and technical standards for electric public transport in Ukraine and EU countries: Analytical study. https://visionzero.org.ua/en/new-research-about-technical-standards-presented2025/

POTENTIAL SCENARIOS FOR UKRAINE'S ELECTRIC PUBLIC TRANSPORT DEVELOPMENT

The trajectory of Ukraine's electric public transport uptake will depend heavily on the scale and quality of public investment, the success of institutional reforms, and the availability of international financing. Three scenarios illustrate the possible range of outcomes over the coming decade:

1. **Status quo scenario:** Further decay of the sector; only select cities manage to maintain current operations. Procurement of 20-100 vehicles/year. 2-5 infrastructure projects/year. Reforms limited to marginal changes. Systems and services continue shrinking rapidly. Manufacturers survive in a small market; bankruptcies possible.
2. **Optimistic scenario:** Wider city engagement in modernisation, with substantial investment in infrastructure alongside rolling stock. New financing programmes available as co-funding, not only loans. Procurement of 100-400 vehicles/year. 6-20 infrastructure projects/year. At least partial policy reform success. Systems still shrinking but at a slower pace; some closures likely in smaller or poorer cities. Industry expands production, invests in technology, and builds EU supply chains. Adjacent subsectors benefit (e.g. energy, track, and catenary components). EU players may open production facilities in Ukraine.
3. **Best-case scenario:** All electric transport systems preserved. Reforms fully implemented. Procurement of 400+ vehicles/year. 20+ infrastructure projects/year. Systems stabilise and return to growth. Industrial boom: expansion, new assembly facilities, multiplication effect, international competitiveness, and integration with the European market.

4.2.2. Enablers for increased adoption

Access to finance

A basic element of the financing model for urban electric transport in Ukraine has long been state subsidies to municipal urban electric transport enterprises to partially compensate for the cost of transporting concession-fare passengers. The Ministry of Finance acts as the primary distributor of these subventions, which are then allocated through local authority budgets. These subventions provide baseline revenue to the municipal operators that are the principal customers of tram and trolleybus manufacturers. Their adequacy and predictability directly influence operators' financial capacity to place procurement orders, making them an indirect demand-side financing mechanism for manufacturers. Chronic underfunding, already a defining structural problem pre-war, has been deepened by wartime conditions.

The second strand of the financing model is the own revenue of local communities. The decentralisation reform, completed in 2020, gave each hromada (local self-government units in Ukraine) a 60% share of personal income tax collected in their jurisdiction (raised to 64% in 2022), together with control over local infrastructure and the authority to procure rolling stock directly through the Prozorro system (Ukraine's centralised public e-procurement platform). For a period, this increased the fiscal base for fleet renewal and reduced operators' dependence on central transfers. Since 2022, the position has partially reversed. A share of local revenues has been redirected to defence needs, and from November 2023 personal income tax paid by military personnel has been transferred in full to the state budget for the duration of martial law. Restoring the fiscal capacity of local communities would potentially support the demand side of fleet renewal, though procurement is likely to remain dependent on central transfers and international financing.

The third source of financing for urban transport is the IFIs. Beyond their role as lenders, the IFIs have been the principal drivers of sector reform: their lending conditionalities have pushed cities to

adopt Sustainable Urban Mobility Plans and procure through open tendering on Prozorro or under EBRD rules, and move operators towards more transparent contracting and asset management. In this sense, IFI engagement has shaped not only the size of the domestic market for rolling stock but also the procedural environment in which that market operates.

EBRD has been the principal multilateral financier of urban public transport infrastructure in Ukraine since the early 2010s. Its Ukraine Public Transport Framework (UPTF), operates as a rolling framework of sub-project loans to municipal public transport operators across Ukrainian cities, covering the acquisition of new vehicles and associated depot and infrastructure modernisation.[119] The operator receives the loan, and then procures from the manufacturer through Prozorro or EBRD procurement rules. Manufacturers receive payment from the operator out of IFI-sourced funds, not directly from the IFI. UPTF I and II together reached a total volume of EUR 350 million, with twelve cities signed for trolleybus fleet renewal and infrastructure modernisation, plus a Kyiv sub-project under UPTF II financing the procurement of 50 metro cars.

The EIB has played a similar role through the Ukraine Urban Public Transport Framework Loan (UUPT FL), working alongside the EBRD. The second phase (UUPTP FL II), a EUR 200 million loan ratified in February 2022, earmarked funds for 20 trams, 264 trolleybuses, 65 electric buses, metro cars and infrastructure modernisation across cities including Cherkasy, Bila Tserkva, Kamianske, Dnipro, Lviv, Kremenchuk, and Zaporizhzhia. The project is managed by Ukraine's Ministry for Communities, Territories and Infrastructure Development.[120] One of the first completed deliveries under the EIB framework during wartime was Lviv's acquisition of ten new Electron T5L64 trams, which entered service in April 2024.[121] After the full-scale invasion, the EIB also used its Ukraine Solidarity Urgent Response package to rapidly channel financing to Ukraine's infrastructure. In December 2024, two tranches totalling EUR 33.75 million were allocated for fleet renewal across Kyiv, Odesa, Sumy, Mykolaiv, and Ivano-Frankivsk, covering buses, trolleybuses, and trams, with the second tranche backed by an EU guarantee.[122]

Municipal access to finance is the binding constraint on the demand side. Almost every Ukrainian city outside Kyiv relies on external financing for new rolling stock, and without IFI lending, they cannot place orders. Wartime has made this financing harder to access: interest rates have risen, municipal debt servicing capacity has weakened, and several cities have already hit their borrowing limits. The processing side adds to the problem. Interviewees in Ukraine's public transport sector described IFI disbursement timelines extending up to nine months for a first tranche, an absence of fixed deadlines for evaluation and acceptance, and total tender-to-delivery cycles of around four years. Some cities have refused IFI loans because they could not meet co-financing requirements; or hold pre-existing debt that disqualifies them from new lending. What this means for manufacturers is that the volume, timing and predictability of domestic orders depend less on actual transport needs and more on the capacity of cities to navigate IFI procedures and mobilise the fiscal resources, both of which have weakened since 2022.

Overview of policy and regulatory environment

The main instrument in Ukraine's policy and legal architecture for urban electric transport is the Law of Ukraine on Municipal Electric Transport (No. 1914-IV, 2004), which governs the legal and organisational basis for tram and trolleybus operation.[123] Under this law, transport services are provided under contract between municipal carriers

119. European Bank for Reconstruction and Development. (2018). Ukraine Public Transport Framework 2. https://www.ebrd.com/work-with-us/projects/psd/ukraine-public-transport-framework-2.html
120. Cabinet of Ministers of Ukraine / Ministry of Finance. (2022). Ukraine Will Receive EUR 200 Million for the Development of Urban Electric Transport. https://www.kmu.gov.ua/en/news/minfin-ukrayina-otrimaye-200-mln-yevro-na-rozvitok-miskogo-gromadskogo-elektro-transportu
121. European Investment Bank. (2024). Ukraine: Lviv Rolls Out Ten New Trams with EIB Support. https://www.eib.org/en/press/all/2024-148-lviv-rolls-out-ten-new-trams-with-eib-support
122. European Investment Bank. (2024). Ukraine: EIB Provides over €60 Million to Support Road Reconstruction and Urban Transport Renewal. https://www.eib.org/en/press/all/2024-492-eib-provides-over-eur60-million-to-support-road-reconstruction-and-urban-transport-renewal-in-ukraine
123. Verkhovna Rada of Ukraine. (2004). Law of Ukraine on Municipal Electric Transport (No. 1914-IV, as amended to 2024). https://zakon.rada.gov.ua/laws/show/en/1914-15/print

and local authorities as customers, tariffs that do not cover operating costs must be compensated from the relevant budget, and rolling stock renewal is explicitly funded from state and local budgets and other sources. The law also enshrines support for domestic manufacturers of rolling stock as a stated principle of public policy. In practice, however, the tariff compensation mechanism has been chronically underfunded. Municipal operators across Ukraine have operated at a structural loss for years, with the gap between actual fares and cost-covering tariffs imperfectly offset by local budgets.This fiscal fragility is the primary reason why most carriers cannot self-finance fleet renewal or infrastructure modernisation, making them entirely dependent on either municipal budget allocations, which themselves constrained by wartime spending pressures, or IFI lending intermediated through municipal and state guarantees.

CLOSING THE FUNDING GAP: PSO REFORM

Implementation of EU Regulation 1370/2007, which establishes the PSO framework for public passenger transport, is a binding obligation under the EU-Ukraine Association Agreement, originally due by 2022 but not yet transposed.[124]

A common assumption in Ukraine is that public transport should generate profit and that operators should run as commercially viable enterprises. The reality is different. Public transport is a loss-making service by nature, and the relevant question is how to fund it in a stable way.

This is the role of public service obligation (PSO) contracts. Under a properly designed PSO framework:

- The city defines the level of service it wants (routes, frequencies, accessibility standards, vehicle types) and pays the operator the difference between fare revenues and the costs to deliver that service
- This gives operators balanced revenue streams, raises service standards, and creates the conditions for investment in personnel, operations, and new rolling stock.
- Compensation arrangements should follow the EU Altmark criteria, which define when public service payments do not constitute state aid and establish that compensation must be transparent, capped at actual costs plus reasonable profit, and benchmarked to a well-run operator.[125]
- A working PSO framework also underpins the procurement of zero-emission fleets: under EU Directive 2009/33 (Clean Vehicles Directive) and Ukrainian Law No. 2956-IX, cities above 250,000 inhabitants must ensure at least 25% e-buses by 2027 and 50% by 2030, targets that depend on a functioning PSO mechanism to finance.[126]

HOW A WORKING PSO LOOKS: EXAMPLE FROM CHERNIHIV'S QUASI-PSO REFORM

Under Regulation 1370/2007, contracts below EUR 1 million in average annual value can be directly awarded to a domestic carrier without competitive tender, giving smaller cities flexibility in implementation.[127]

124. Vision Zero NGO & Association «Energy-Efficient Cities of Ukraine». (2024). Public Service Obligations (PSO Model) as Part of Ukraine's European Integration: Analytical Review. https://enefcities.org.ua/en/news/the-public-service-obligation-pso-model-as-part-of-ukraines-european-integration/
125. Center for Environmental Initiatives Ecoaction & European Federation for Transport and Environment AISBL (2025). Recommendations on implementation of Public Service Obligation Law in transport. https://en.ecoaction.org.ua/wp-content/uploads/2025/06/paper-t-e-recomend-public-services-transport2025.pdf
126. Ibid. Note: Law 2956-IX defines «zero-emission» more narrowly than Directive 2019/1161, which classifies battery-powered trolleybuses as zero-emission. Harmonising the definitions is a low-cost fix that would also benefit Ukraine's trolleybus manufacturing segment.
127. Regulation (EC) No 1370/2007 of the European Parliament and of the Council of 23 October 2007 on public passenger transport services by rail and by road, Art. 5(4). EUR-Lex. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX-%3A32007R1370

Chernihiv's Department of Transport, Transport Infrastructure and Communications restructured local public transport in line with Regulation 1370/2007 and introduced a new route network and additional payments to carriers for performing transport work according to agreed schedules.

To qualify for these payments, a carrier must meet specific conditions: 94% compliance with timetables, accessibility for low-mobility passengers, and a working electronic ticketing system. The e-ticket requirement also gives the city the revenue data needed to calculate the subsidy correctly and verify that the operator is delivering what was contracted. If any condition is not met, no surcharge is paid.

The early results showed significant improvement. Increased schedule compliance of 98-99% (from 65-70%); carriers began purchasing low-floor buses with capacity above 60 passengers.

FARE COLLECTION AS A LEVER INSIDE THE PSO FRAMEWORK

Low fares are socially protective but create investment pressure. They help low-income riders, pensioners, students, and daily commuters who depend on the service. The trade-off is that the operator receives less direct revenue for vehicle renewal, staff wages, cleaning, maintenance, accessibility upgrades, and service frequency, unless the city budget reliably covers the gap.

Once a PSO mechanism is in place, cities can set low fares to protect lower-income riders, but only if the PSO payment reliably covers the resulting gap. Without that mechanism, low fares translate into deferred maintenance, frozen wages, ageing fleets, and shrinking service.

Ukrainian cities have some of the lowest single fares in Europe, yet relatively high fare-to-income ratios. This limits the scope for tariff increases as a financing solution and leaves a much larger share of operating costs dependent on municipal support, with deferred maintenance and long-term underfunding as the visible consequences.

Table 8. Urban public transport single fares in selected European cities, 2026

City	Single Fare (EUR)	Monthly Pass (EUR)	Monthly pass / income ratio
Lviv	0.5	17.5	2.8%
Kyiv	0.6	20.7-92.6	3.3 - 15%
Warsaw	0.8	25.9	1.2%
Sofia	0.8	31.7	2.3%
Budapest	1.4	24.8	1.1%
Prague	1.5	22.6	1.0%
Vienna	3.2	65.2	1.5%
Berlin	4.0	113.0	2.3%

Sources: Authors' compilation and analysis based on official city transport operator websites and World Bank.[128] Local-currency fares were converted into EUR. Note: Kyiv monthly pass shows the announced cost range between the 46-trip and unlimited monthly pass, based on the new tariffs to be introduced from 15 July 2026. GDP per capita is used as income proxy.

128. World Bank. (n.d.). GDP per capita [Data set]. World Development Indicators. https://data.worldbank.org/indicator/NY.GDP.PCAP.CD

The more recent legislative step is the Law No. 2956-IX, signed by President Zelenskyy in February 2023, which establishes Ukraine's first binding electrification mandates for urban bus services.[129] For cities with populations exceeding 250,000, the law requires that at least 25% of buses on urban public routes be electric, gas-powered, or hydrogen-fuelled by 1 January 2030, rising to 50% by 1 January 2033. Procurement of conventional ICE buses is progressively phased out, with full prohibition from 2030 in larger cities and from 2036 nationwide. Local councils retain flexibility to adjust these thresholds and deadlines (by up to half and up to two years, respectively).

Several cities have gone beyond the national framework with their own strategic plans. Lviv's E-Mobility Plan, adopted in March 2024, sets targets of 100 modern trolleybuses and 400 electric or battery-hybrid buses by 2035, full rehabilitation of 20 traction substations, and an electric modal share of 40% in urban transport.[130] For example, Chernihiv and Khmelnytskyi have adopted similar multi-year programmes covering rolling stock, infrastructure, and depot reconstruction.[131,132] But these cases remain exceptions. Most Ukrainian cities do not operate under a Sustainable Urban Mobility Plan or equivalent strategic framework, and fleet and infrastructure renewal is therefore typically tied to specific procurement decisions or IFI loans rather than to a coherent view of how urban transport should develop and integrate with national networks. This weakens the demand signal that manufacturers receive and makes domestic procurement less predictable than it could be.

The broader national policy architecture for urban electric transport is at the intersection of several instruments, none of which is specifically designed for the sector. The National Transport Strategy of Ukraine to 2030, originally adopted in May 2018 and revised by the Cabinet of Ministers on December 2024, remains the principal sectoral document.[133] It demonstrates a political commitment at a national level to support modernisation, a goal mirrored in the draft national public investment programme "Development of public electric transport and infrastructure" which sets an ambitious plan to procure more than 8,000 electric public transport vehicles over the next decade.[134] It targets a 75% share of electric transport and electric vehicles in domestic traffic and calls for charging infrastructure development, but its set at a high level and does not set binding financial or procurement commitments for rolling stock renewal.[135] Two further layers shape the operating environment. First, the Ukraine Plan under the EU's Ukraine Facility, which channels EU financing over 2024-2027 against an agreed reform agenda (predominantly as budget support, with a smaller envelope available for investment) and includes transport-sector commitments on TEN-T alignment, digitalisation, and procurement reform, though not specifically on urban public transport fleet renewal. Second, the 2024 revision of the TEN-T Regulation extended the network to Ukraine and brings the country within reach of Connecting Europe Facility funds for infrastructure investments along four corridors.[136] These instruments collectively align Ukrainian transport policy with the EU acquis, but the translation from framework alignment to dedicated support for the urban electric transport sector partial. The result is that national policy provides direction and, increasingly, legal commitment, but the financing, procurement, and planning tools that would turn those commitments into a predictable domestic market for Ukrainian manufacturers still sit primarily with individual municipalities and IFI programmes.

129. Verkhovna Rada of Ukraine. (2023). Law of Ukraine No. 2956-IX on certain issues of the use of vehicles equipped with electric motors, and amendments to certain laws of Ukraine regarding overcoming fuel dependence and developing electric charging infrastructure and electric vehicles (as amended by Law No. 3220-IX of 30 June 2023). https://zakon.rada.gov.ua/laws/show/2956-20/print
130. Lviv City Council. (2023). Plan for the Development of E-Mobility of the Lviv City Territorial Community. Transformative Mobility. https://transformative-mobility.org/wp-content/uploads/2024/06/240422_Lviv_E-Mobility_Plan-2s.pdf
131. Chernihiv City Council. (2025). Programme of electric transport development of Chernihiv 2026-2028. https://chernigiv-rada.gov.ua/storage/files/07/04/29/22/5a7d11b8376321e86200979006171bec.pdf
132. Khmelnytskyi City Council. (2025). Programme of electric transport development of Khmelnytskyi municipal territorial community 2026-2030.
133. Cabinet of Ministers of Ukraine. (2018). National Transport Strategy of Ukraine to 2030 (Order No. 430-r, 30 May 2018). https://zakon.rada.gov.ua/laws/show/430-2018-%D1%80#Text
134. Government of Ukraine. (2025). Development of public electric transport and infrastructure (Draft national public investment programme). DREAM. https://dream.gov.ua/public-program/DREAM-UA-060825-ABA4E71D?fromUri=/spp-pipeline
135. Ibid
136. ISPI. (2025). Rebuilding connections: Ukraine's transport infrastructure and the road to EU integration. https://www.ispionline.it/en/publication/rebuilding-connections-ukraines-transport-infrastructure-and-the-road-to-eu-integration-210910

ASSESSMENT OF DOMESTIC ADOPTION OF ELECTRIC PUBLIC TRANSPORT

At the national level, political commitment to modernizing electric public transport is visible in two places. The National Transport Strategy sets the overall policy direction, and the Investment Program on the Development of Public Electric Transport and Infrastructure declares ambitious procurement targets (more than 8,000 electric public transport vehicles over the next decade).

On the ground the picture is different. Urban transport systems are closing, and those still operating are shrinking on every dimension: fewer lines, fewer vehicles, fewer employees. The infrastructure and institutional capacity needed to absorb large new procurements is not there. Dozens of new trams placed on old, unmaintained tracks break down quickly, as it is the case in Kyiv. New vehicles also sit unused due to lack of drivers.

Therefore, increasing the uptake of electric public transport with a procurement push at this scale cannot succeed without first addressing the underlying problems:

- Infrastructure is often 100% deteriorated and physically incapable of supporting new fleets. Government investment plans regarding infrastructure investment seems to underestimate the actual scale, complexity and cost of projects needed.
- Operators lack a sustainable balance between revenues and expenditures.
- The workforce is shrinking and ageing, with average personnel age frequently 60+ across drivers, technicians, and other specialists.

The recovery of the sector is further hindered by the slow pace of normative reforms needed to align Ukrainian policies with the EU acquis, specifically regarding Public Service Obligation (PSO) reform and the shift from old Soviet-era technical standards, while the likelihood that massive projected investments will be actually financed remains very small given current fiscal constraints.

4.3. Export assessment for Ukrainian electric public transport vehicles

While the Ukrainian domestic market provides ample economic opportunities for Ukrainian manufacturers under a variety of growth scenarios, building up a competitive export sector could bring significant benefits and help catalyse the sector's growth. Nonetheless, so far, the domestic successes of the manufacturers have not translated into exports and this requires a deeper diagnostic.

This sub-chapter assesses Ukraine's export potentials in electric public transport vehicles by reviewing the historical record and analysing the competitive landscape, the importance of the European Union, some non-EU markets and key trade-related aspects needed for a future ramp-up of exports of Ukraine's electric public transport vehicles.

4.3.1. The export record

In the decade between 2014 and 2024, Ukraine's export record in the public transport segment was mixed. Assessing the export destinations is key as most past sales were very targeted to a single buyer or country.

Exports of diesel passenger vehicles of ten or more seats have been somewhat successful, with a total export volume of USD 30 million,[137] which were mainly exported to Poland (USD 13.7 million), to Russia prior to 2022 (USD 8.9 million), and to Georgia (USD 3.6 million). Nonetheless, according to interviews with industry representatives, these

137. Measured using HS6 code 870210 - Vehicles; public transport type (carries 10 or more passengers), compression-ignition internal combustion piston engine (diesel or semi-diesel).

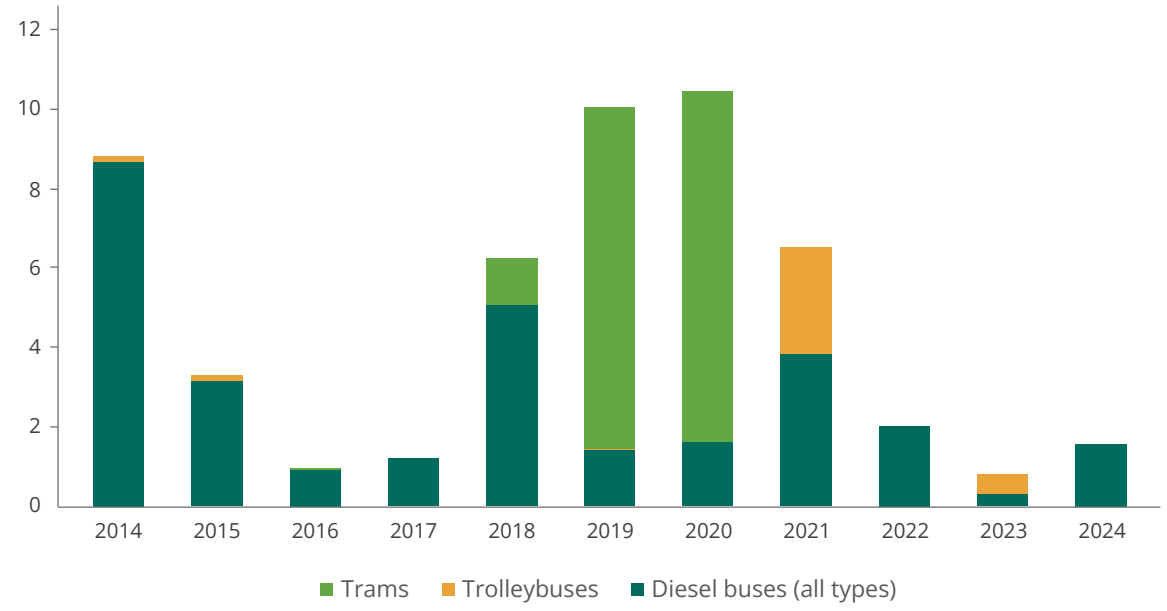
vehicles have primarily been small urban buses rather than large low-floor urban public buses or long-distance coaches.

Exports of electric public transport vehicles were lower than for diesel buses. Ukraine exported USD 18.7 million worth of trams,[138] almost all of which were Tatra-Yug's deliveries to the Alexandria Passenger Transport Authority in Egypt between 2018 and 2020 which is the only recorded major exports deal related to Ukrainian trams in the last decade.[139] In the trolleybus segment, exports were only a fraction of this, totalling only USD 3.4 million in the same period, with Moldova accounting for almost the entire volume (USD 2.9 million).[140] This is striking given that Ukraine has the world's largest concentration of trolleybus systems, with 35 active or recently active city networks, as well as several manufacturers with production capacities that exceed domestic absorption. Importantly, this is not a war-related effect as the broader pattern predates 2022. Ukraine has, in practice, never developed a commercial trolleybus export relationship with any market, including the CEE cities whose overhead infrastructure and operational conditions most closely resemble its own.

Given the limited production capacity of electric buses prior to 2026 (one bus made by Electron and a prototype made by Etalon), it is not surprising that no real electric bus exports exist. However, Electron's recent supply contract of nine electric buses to Uzhhorod in early 2025 and the setting up of a dedicated production line creates opportunities in the future.[141] Concurrently, the somewhat successful and sustained experience with exporting smaller buses to Poland may offer interesting learnings for building similar commercial relationships including on certification (discussed later in this chapter).

Adding all categories, total public transport vehicle exports over the eleven-year period come to approximately USD 52 million or just under USD 5 million per year.

Figure 13. Ukraine's public transport vehicle exports by category (USD, m)



Source: Own visualisation based on data from UN Comtrade (2026).[142] Note: Trolleybuses and electric buses cannot be adequately disaggregated from the trade data. No electric bus exports were registered during the reference period. Diesel buses included ZAZ-type minibuses, which cannot be separated from larger buses (both city and long-distance).

138. Measured using HS6 code 860310 - Railway or tramway coaches, vans and trucks; self-propelled, powered from an external source of electricity (excluding those of heading no. 8604)
139. Tatra-Yug. (2020). Deliveries of 15 tram units by Tatra-Yug under the Egyptian contract have been successfully completed. https://tatra-yug.com.ua/en/deliveries-of-15-tram-units-by-tatra-yug-under-the-egyptian-contract-have-been-successfully-completed/
140. Measures using HS6 code 870240 - Vehicles; public transport type (carries 10 or more persons, including driver), with only electric motor for propulsion, new or used and HS6 code 870290 - Vehicles; public transport type (carries 10 or more passengers), other than compression-ignition internal combustion piston engine (diesel or semi-diesel)
141. Kasiyan, V. (2025). Electric public transport will appear in Uzhhorod: Contract signed – photo. LIGA.net. https://biz.liga.net/ua/all/transport/novosti/v-uzhhorodi-ziavytsia-elektrychnyy-hromadskyy-transport-pidpysano-kontrakt-foto
142. UN Comtrade. (2026). Trade flow database. https://comtradeplus.un.org/TradeFlow

4.3.2. Competitive positioning

While Ukraine's export record in the public transportation segment has been limited so far, the wide range of product offerings and proven track record in the domestic market and selected markets indicates that there is some expansion potential.

However, competition across the various electric public transport segments has been increasingly fierce in the last few years globally as the market expanded and new entrants have innovated and released cost-competitive products. Ukrainian manufacturers are competing against the established EU manufacturers, especially in terms of potential exports to the EU, and increasingly also against the Turkish and Chinese manufacturers, where the Chinese are leading the market in terms of battery innovation and supported by access to affordable financing.

Table 9. Comparative positioning of Ukrainian public transport manufacturers against key international competitors

Dimension	Ukrainian manufacturers	EU leaders (Solaris, Škoda)	Turkish (Bozankaya, Karsan)	Chinese (BYD, Yutong)
Unit price vs. EU equivalent	~50-70% of EU price	Reference (100%)	~75-85% of EU price	~65-80% of EU price
Battery technology	Limited; imported cells	Advanced; premium cell supply chains	Moderate	World-leading; in-house integration
EU type approval	None/Limited for trams/trolleybuses; limited for buses	Full portfolio	Growing; emerging CEE presence	Expanding; BYD approved in several markets
After-service in EU markets	None established	Extensive depot and service networks	Limited but developing	Limited but growing via local assembly (e.g. Hungary)
Export financing	Weak; no export credit agency (ECA) products for public transport vehicles	Strong (Hermes, EGAP, KUKE)	Moderate	Strong, with policy bank and CDB support
EU procurement track record	Near-zero	Extensive	Emerging	Growing

Sources: Compiled by the authors from Sustainable Bus[143] manufacturer interviews, and company reports.

Ukrainian products are price competitive across all three vehicle segments, even vis-à-vis Turkish and Chinese producers, driven by lower labour costs and established production processes, but also through lower-grade components, technologies, and input materials used.[144] While this has not traditionally been a major issue in the Ukrainian market (except for some anecdotal evidences by municipal operators on the quick deterioration of the vehicles) durability and lifecycle costs are increasingly important both in EU and Ukrainian procurement. A corresponding improvement in quality is therefore needed to keep pace.

A structural constraint cutting across all three vehicle segments is total cost of ownership (TCO). Warranty coverage offered by Ukrainian manufacturers typically runs to two years while leading European OEMs routinely offer five-to-seven-year packages with dedicated in-market service networks.[145] Since EU municipal procurement increasingly scores on whole-life cost rather than purchase price alone, the unit price advantage that Ukrainian vehicles hold matter less at the procurement decision stage: a procurer calculating maintenance liabilities, parts availability, and residual value over the vehicle life will find the apparent cost advantage narrowing considerably.

143. Sustainable Bus. (2025, January 24). 70 new trolleybuses for Prague, by Bozankaya. https://www.sustainable-bus.com/news/70-new-trolleybuses-for-prague-by-bozankaya/; Sustainable Bus. (2025, April 15). Karsan results 2024: profit up 28%, electric bus sales reach 540 units. https://www.sustainable-bus.com/news/karsan-results-2024-target-2025/; Sustainable Bus. (2025, October 4). BYD enters European intercity high-floor e-bus market with new models at Busworld Europe 2025. https://www.sustainable-bus.com/news/byd-busworld-europe-2025-intercity-electric-bus-b12-b-hf/; Sustainable Bus. (2026, March 19). European electric bus market grew nearly 50% to 11,607 units in 2025 as MAN and BYD more than triple volumes. https://www.sustainable-bus.com/news/electric-bus-market-europe-2025/
144. Interviews with sectoral experts, December 2025.
145. Interviews with company representatives, December 2025.

No Ukrainian manufacturer currently maintains after-service infrastructure in any EU export market, which is unsurprising given the absence of sustained exports. Concurrently, any real export efforts will require additional investment in establishing an after-sales infrastructure that can support customers. Closing this gap requires either establishing a service presence in target markets, partnering with EU service providers under a consortium structure, or developing extended warranty products backed by adequate financial reserves, none of which Ukrainian manufacturers currently offer at scale. Certification and export finance are discussed in more depth later on in this chapter.

Electric bus

Ukrainian electric bus manufacturing is still at an early stage despite the strength of the ICE bus segment. Currently, Ukrainian manufacturers can produce vehicles at approximately 50–70% of the unit cost of comparable European models, driven primarily by lower labour costs and domestic material inputs. Interview evidence indicates that bus body fabrication costs run roughly 40% below Western European equivalents. This price advantage is commercially significant in fiscally constrained procurement environments, which describes most CEE municipalities and virtually all post-Soviet urban operators.

Against Chinese competition the cost advantage is less favourable. BYD and Yutong offer comparable or lower unit prices in most non-EU markets, with superior integrated battery technology, government-backed export financing, and increasingly local assembly facilities that provide domestic content advantages. Ukrainian manufacturers rely on imported LFP cells with limited systems integration capability, while Chinese OEMs have deep in-house battery supply chains. This is the segment where market entry on price grounds alone is narrowing fastest, particularly in Central Asian markets where Chinese manufacturers are locking in long-term supply relationships.

Table 10. Comparative assessment of an EU- vs UKR-made electric bus

Metric	Solaris Urbino 12 Electric (4th gen, 2020-present)	Electron E19101 (2014)	Comparison
	Poland	Ukraine	
Maturity & scale	Established serial production; widely deployed across European cities	1 unit in operation (Lviv); never serially produced	Solaris
Vehicle format	12-metre low-floor urban e-bus	12-metre low-floor urban e-bus	Comparable
Passenger capacity	Up to ~94; 41 seated	Up to ~98; 36 seated	Comparable
Range & speed	Up to 600 km (max config); 75 km/h	200-225 km; 70 km/h	Solaris
Motor power	160-250 kW across configurations	230 kW traction motor	Comparable
Battery system	NMC (ICPT-Poland) or LFP (CATL-China) since 2022; 300-600+ kWh; modular; upgradeable	LFP (Winston, China); fixed capacity in the ~200 kWh class	Solaris wins on capacity & upgradeability; Electron cheaper cost but shorter range
Charging	Up to 260 kW (plug-in) and up to 450 kW (pantograph)	~40 kW onboard plug-in; catenary-compatible (600 V DC trolleybus wire)	Technically Solaris; Electron's catenary charging is advantage for UKR cities
Onboard features	CO_2 heat pump A/C	A/C + diesel heater	Solaris
Certifications	GSR2 and R66 compliance; EU-market product	No EU type approval reported	Solaris
Price	~EUR 500-750 thousand	~EUR 180-200 thousand	Electron
Lifecycle support	Mature EU supply chain; global service network; 15-20 yr design life	Single unit; lifecycle not specified	Solaris

Source: Own assessment based on information compiled from company materials.

When comparing a Solaris Urbano 12 with the now quite dated Electron e-bus from 2014, it is clear that Solaris dominates most aspects, a reflection of both the strength of the model, but also the rapid pace of progress in the sector. Nonetheless, the very low price of production is potentially interesting, especially if adequate demand is secured to allow for a ramp-up in domestic production. This could yield further quality and technological improvements, especially given the overlap with trolleybus technologies and potential economies of scale.

Trolleybus

Ukraine's deepest and most distinctive public transport manufacturing capability sits with its trolleybus sector, as it has a uniquely large domestic trolleybus base and manufacturing capacity that exceeds domestic demand. In the specific niche of battery trolleybuses with in-motion charging, Chinese OEMs do not yet have equivalent depth. In addition, European procurement criteria often tend to require established references, allowing Ukraine to hold its most technically distinctive product position.

Nonetheless, European players have significantly ramped up their product offering in the space in recent years as well. However, when comparing Ukraine's Etalon-made trolleybus with Poland's Solaris Trollino, the gap between the technologies is not that wide.

Table 11. Comparative assessment of an EU- vs UKR-made trolleybus

Metric	Solaris Trollino 12 (IMC)	Etalon T12220/30	Comparison
	Poland	Ukraine	
Maturity & scale	1,800+ units; 17 countries; serial production	Active production; high share of Ukrainian trolleybus deliveries; hundreds of units in service	Ukrainian manufacturers could scale-up production
Passenger capacity	80-90 total; 25-29 seated	Up to 90; 37 seated	Comparable
Powertrain	160 kW; 3 supplier options (Škoda, Medcom, Kiepe); independent front suspension	180 kW; single supplier (Riga); dependent front axle	Solaris; but Etalon higher motor power
Braking & safety	EBS + ABS + ASR + optional ESC	ABS; pneumatic dual-circuit; spring-accumulator parking	Solaris
Battery (IMC)	58-60 kWh LTO; 7-yr unlimited-cycle warranty; ICPT (EU); recharges in ~15-25 min	~55 kWh LFP (Winston, China); no warranty stated; 45 min recharge	Comparable power; Solaris faster recharge
Autonomous range	~20 km	Up to 20 km (≤60 km/h)	Comparable
Certifications	EU market/type approval; safety-system compliance; cybersecurity and software-update compliance	Ukrainian national cert only; no EU type approval	Solaris
Price	~EUR 500-600 thousand	~EUR 300-440 thousand	Etalon ~30-50% cheaper
Lifecycle support	Mature EU supply chain; global service network	Mix of Ukrainian, EU, and Asian components; service network less mature	Solaris

Source: Own assessment based on information compiled from company materials.

Etalon has a similar passenger capacity and autonomous (off-wire) range, with a similar battery capacity. However, Solaris has a better battery in terms of charging time and warranty, and a better braking and safety system key for certification. Etalon's trolleybus is meanwhile significantly more cost-competitive, but the lack of both EU certification as well as after-care and lifecycle support presents the clearest downsides that are preventing further export growth in the space.

The most significant near-miss in this segment is Ukrainian manufacturer Bogdan (now called Bus Motor LLC), whose participation in a major Czech trolleybus tender came close to winning before the procurement was re-run under circumstances that excluded the Ukrainian manufacturer.[146] This episode demonstrates that Ukrainian trolleybus manufacturers can be technically and commercially competitive in EU-level procurement when allowed to participate on standard terms. Past cooperation between Bogdan and Polish Ursus on trolleybuses for the city of Lublin also shows that partnership-based entry into EU-adjacent markets is possible. That said, translating this capability into actual export contracts has proven difficult and it predates the war entirely. Certification, after-sales services and export financing are key areas of improvement to help improve competitiveness.

Tram

The tram segment presents Ukraine's most clearly established export track record alongside its most complex market entry challenge. Tatra-Yug's deliveries to the Alexandria Passenger Transport Authority in Egypt (USD 18.7 million, 2018–2020) represent the only real sustained Ukrainian rolling stock export relationship. Beyond direct revenue, the case demonstrates that a Ukrainian tram manufacturer can manage multi-year delivery schedules with an infrastructure operator in a non-EU market and hold a commercial reference usable in subsequent tender bids.

Table 12. Comparative assessment of an EU- vs UKR-made tram

Metric	Alstom Citadis	Tatra-Yug K1T	Comparison
	France	Ukraine	
Maturity & scale	3,000+ sold to 70 cities since 2000	Serial production since 2021; 41 units total in Ukraine	Alstom longer track record; but both serial production products
Floor	100% low floor	100% low floor	Comparable
Powertrain and speed	Permanent Magnet Motors; 80 km/h	105 kW traction motors; 75 km/h	Alstom higher efficiency
Track gauge	Configurable 1,000 / 1,435 / 1,524 mm	Configurable 1,000 / 1,435 / 1,524 mm	Comparable
Certifications	Full EU type approval	Ukraine certification; no EU type approval	Alstom
Price/unit	~EUR 3.0-3.8 m (indicative)	~EUR 1.5-2.6 m	Tatra-Yug cheaper
Lifecycle support	Global service network	Domestic only; no EU MRO base	Alstom

Source: Own assessment based on information compiled from company materials. Note: MRO= Maintenance, Repair, and Overhaul.

When comparing the Tatra-Yug with a popular European model, the Alstom Citadis, there are a few key differences that stand out. Firstly, Tatra-Yug can produce trams that could serve the same

146. Interviews with company representatives, December 2025. The Czech tender outcome was described as a re-run of the procurement after the initial process produced a result that was not accepted; the subsequent process was won by a consortium involving established European suppliers.

markets, both in terms of track gauge and the low floor typology. While Alstom's model has a higher efficiency powertrain, Tatra-Yug's model is significantly cheaper, which may off-set Alstom's better performance. The decisive gaps are EU certification, which Ukrainian producers currently lack, and after-sales and lifecycle support, which is not yet established in any target market.

At the same time, it is important to note that Concern Electron, another Ukrainian key tram manufacturer, has won competitive tenders for tram deliveries to Poland and Romania before the full-scale invasion but the deliveries were blocked by operational constraints arising from the war, not by competitive or technical failure.[147] This near-miss establishes that Ukrainian tram manufacturers can be competitive in EU procurement on merits.

Nonetheless, a single successful tender primarily delivers revenue but does not build the certification track record, after-service infrastructure, or buyer confidence that sustains market access over time. In the medium term, the most realistic route into EU tram markets may be a partnership or consortium structure with an EU system integrator who already holds national homologation, with Ukrainian manufacturing providing the cost advantage.

Broader value chain

Ukraine's most immediately viable path into European public transport value chains may not run through finished vehicle exports but rather components. Ukraine already produces a wide variety of components in the broader automotive sector and specifically for public transport manufacturing, which could offer some opportunities.

The wire harness example is an interesting one. European automotive suppliers have built substantial wire-harness production in western Ukraine, which was Ukraine's most critical automotive component export to the EU with around 7% of all import into EU coming from Ukraine in 2020,[148] and has persisted despite the war, reaching USD 56 million in 2024.[149] This establishes a working model that is more achievable in the near term than full vehicle certification for most manufacturers. Wire harnesses are the extreme end of the integration spectrum, a component where cost competitiveness is essentially the only purchasing factor. The relevant question is which further components or sub-systems in public transport vehicle production could follow a similar path at higher value-add.

Bus body fabrication is one candidate: Solaris and other EU OEMs source body shells from CEE fabricators, and Ukrainian fabrication costs run roughly 40% below Western European equivalents. At the same time, issues with Ukrainian steel quality have been reported and would need to be adjusted.[150]

Electrical integration sub-systems, specialised traction components, and tram bogies are further possibilities, depending on the capability profile of individual manufacturers. OEM supplier qualification standards, although less strict than full vehicle type approval, are still demanding. Meeting them requires quality management certification, sustained delivery performance, and willingness to accept OEM specification authority. Meeting these conditions require investment and commercial development efforts that take time and effort.

Nonetheless, many Ukrainian bus OEMs already produce a variety of components in-house that could be scaled up relatively easily if demand existed. Eletrkovazhmash in Kharkiv has an existing motor production base, and some Ukrainian producers are planning to develop NMC battery assembly and regenerative braking configurations; but both need greater standardisation, scale, and certification before they are competitive export products.

Stronger commercial interaction between Ukrainian and EU manufacturers is needed, including more formal partnerships that can support collaboration and integration into EU value chains. This pathway is significant because it can help build the supply-chain relationships, quality infrastructure, and familiarity with EU manufacturers that may later enable Ukrainian firms with sufficient scale and certification capacity to transition towards finished vehicle supply.

147. Interviews with Concern Electron representatives, December 2025. The tender wins in Poland and Romania were confirmed; deliveries were prevented by logistical and operational constraints arising from the full-scale invasion of February 2022.
148. Euronews. (2022). Ukraine invasion hampers wire harness supplies for carmakers. https://www.euronews.com/next/2022/03/02/autos-ukraine-suppliers
149. HS6 code 854442 - Insulated electric conductors; for a voltage not exceeding 1000 volts, fitted with connectors
150. Interview with Ukrainian company representatives, December 2025

4.3.3. Key challenges

As shown above, Ukrainian manufacturers are price-competitive in product terms, but several structural barriers stand between capability and export outcome. Given the primary focus on the EU within this report as a key target market, the challenges are mostly assessed vis-à-vis the EU.

Standards, certification and market entry

Certification is the single most important bottleneck for EU market entry and forms a long-standing issue for Ukrainian manufacturers. EU type approval for public transport vehicles is strict, trolleybuses require additional national-level homologation that varies across member states and trams require both technical homologation and network compatibility certification covering catenary voltage, signalling, track geometry, and gauge configurations. The complexity increases non-linearly with the number of target markets, since each national variant may require some separate testing and documentation.

The cost and timeline are prohibitive at Ukrainian manufacturer scale. Obtaining EU type approval for a single vehicle type costs approximately EUR 1 million and requires one to two years of testing and documentation.[151] Ukrainian public transport manufacturers operate on very tight margins and often do not have dedicated certification budgets and no direct access to IFI or DFI credit facilities, which further prevents additional certification investment.[152] Self-funding a single type approval would require diverting operating surplus from multiple production years and as such certifying a meaningful portfolio of models lies well beyond any individual manufacturer's current financial capacity. While the investments may be rational given the potential return, the capital is currently not available. Nonetheless questions remain regarding the scale of realistic export potential and whether they justify the upfront certification costs.

This produces a well-documented problem as manufacturers will not invest in certification without guaranteed forward orders from EU procurers, and EU procurers will not commit to unverified vehicles without an established EU track record.[153] The dynamic is not unique to Ukraine, and it has constrained new entrants in European procurement for decades. Nonetheless, it is particularly acute here as Ukrainian manufacturers lack the intermediary mechanisms that have allowed other recent entrants, including Turkish manufacturers, to break in, most notably export credit agency (ECA)-backed export financing. This improves the offer to procurers, helps create EU industrial partnership arrangements that provide a track record by proxy, and form bilateral procurement preferences that create entry points outside fully open competition. None of these mechanisms currently exists for Ukrainian public transport manufacturers in the EU context.

For trams specifically, the certification challenge is compounded by infrastructure diversity. A tram certified for one CEE network may require substantial re-engineering for another, because catenary specifications, track geometry standards, and signalling integration requirements differ system by system. This is not an insurmountable barrier and Škoda and Solaris have navigated it across dozens of European networks, but it pushes Ukrainian tram manufacturers towards partnership models with established EU system integrators or operators who already hold relevant national homologation, rather than standalone export. The Poland tender-win of Electron which was blocked by the start of the war points to a partnership or consortium structure as the realistic entry model for EU tram markets in the medium term. This means replicating that approach with an EU partner willing to carry the certification relationship, with Ukrainian manufacturing providing the lower-cost production base.

The medium-term structural pathway for the certification barrier lies in the EU-Ukraine DCFTA's Agreement on Conformity Assess-ment and Acceptance (ACAA) framework, which foresees mutual recognition of conformity assessment for

151. Interviews with various Ukrainian company representatives, December 2025. The EUR 1 million figure represents the estimated cost of obtaining EU type approval for a single vehicle type; actual costs vary by vehicle category and scope of testing. The 1–2 year timeline reflects the documentation and testing phases.
152. Interviews with various Ukrainian company representatives, December 2025.
153. Interviews with manufacturer representatives, December 2025. The formulation 'if they have orders they'll invest in certification' was used explicitly by one interviewee. It describes a rational individual response to uncertainty that is nonetheless collectively self-defeating: no individual manufacturer can break the cycle unilaterally, and absent a coordinating intervention it persists indefinitely.

covered industrial products once Ukraine completes alignment with the relevant EU acquis. The formal opening of EU accession negotiations in June 2024 has started this process, with an institutional timeline for this alignment, but even under an accelerated accession scenario, completion of the ACAA for transport equipment will take several years, and it does not resolve the near-term problem facing manufacturers seeking EU market entry now. The practical bridge between the current position and the ACAA outcome is a dedicated public instrument covering type approval costs for priority manufacturer-model combinations. This could take the form of a grant fund designed to break the certification impasse that no individual manufacturer can resolve on its own.

Trade policy and export financing

The tariff environment is better for Ukrainian exporters than is often assumed when it comes to exports to the EU. Under the EU-Ukraine DCFTA, Ukrainian originating goods access EU markets at zero tariff, against the standard Most Favored Nation (MFN) rate of 6.5% for motor vehicles.[154,155] Since 2022, the EU has additionally suspended all remaining import duties on Ukrainian goods through autonomous trade measures. This suspension provides a quantifiable competitive advantage relative to Chinese manufacturers facing the standard MFN rate and potentially additional anti-subsidy instruments, and relative to Turkish competitors. This trade advantage exists, but only materialises once a Ukrainian vehicle reaches a competitive procurement process, which requires resolving the certification barrier first.

Rules of Origin (RoOs) represent a practically important qualification that receives insufficient attention. Preferential tariff treatment under the DCFTA is conditional on compliance with the Protocol on Rules of Origin, which for motor vehicles requires that sufficient originating content be produced in Ukraine.[156] Ukrainian manufacturers' reported localisation rates of 40–60% are broadly in the relevant range, but the specific components matter: components systematically imported, such as drivetrains, batteries and traction motors may affect whether specific vehicle models satisfy the originating threshold on a product-by-product basis. Manufacturers pursuing EU export tenders will need to verify Rules of Origin compliance for specific models in advance of bid submission. However as mentioned in some of the interviews, awareness of this requirement is currently limited among domestic producers, and an incorrect assumption of eligibility at the bid stage could void the tariff preference at the border.

The most consequential structural disadvantage in international competition is export financing. Export credit financing institutions provide buyer credit, supplier credit, and guarantee products that allow exporters to offer deferred payment terms to public sector purchasers in foreign markets. Germany's Euler Hermes, the Czech Export Bank (ČEB) and Export Guarantee and Insurance Corporation (EGAP) as well as Poland's Export Credit Insurance Corporation (KUKE), allow manufacturers from these countries to offer municipal buyers competitive deferred payment terms.[157,158,159,160] This ECA-backed package is integral to the competitive offer in public procurement markets where total financing cost, not vehicle price alone, shapes the procurement decision: a European OEM offering a five-year buyer credit at concessional rates is presenting a fundamentally different commercial proposition than a Ukrainian manufacturer offering payment-on-delivery at a lower unit price.

Ukraine's Export Credit Agency exists but operates at a scale and with a product range that does not extend to public transport vehicle exports.[161]

154. European Commission. (n.d.). EU-Ukraine deep and comprehensive free trade area. https://trade.ec.europa.eu/access-to-markets/en/content/eu-ukraine-deep-and-comprehensive-free-trade-area
155. The standard EU MFN applied tariff for motor vehicles for the transport of persons (HS 8702) is 6.5%. DCFTA preferential rates have been progressively reduced to zero for Ukrainian originating goods; autonomous trade measures adopted since 2022 have additionally suspended all remaining import duties on Ukrainian goods.
156. European Commission. (n.d.). Protocol I concerning the definition of the concept of 'originating products' and methods of administrative cooperation. Annex to the EU–Ukraine Association Agreement. Rules of Origin for motor vehicles under HS 8702 require that non-originating materials do not exceed a defined value threshold. Manufacturers should verify compliance on a product-specific basis prior to submitting tenders for EU-market contracts.
157. Allianz Trade. (2025). Export credit and investment insurance. https://www.allianz-trade.com
158. Česká exportní banka. (2024). Annual report 2023. https://www.ceb.cz/en/
159. Exportní garanční a pojišťovací společnost (EGAP). (2024). Annual report 2023. https://www.egap.cz/en/
160. Korporacja Ubezpieczeń Kredytów Eksportowych (KUKE). (2024). Annual report 2023. https://www.kuke.com.pl/en/
161. Export Credit Agency of Ukraine. (2025). About the agency. https://eca.gov.ua/en/

Ukrainian manufacturers therefore compete not on specifications and price alone, but rather on an unequal financial basis in which the European OEM's full package, which includes the vehicle plus long-term concessional financing, is materially more valuable than the Ukrainian offer. Developing an ECA product specifically designed for public transport vehicle exports, potentially capitalised with IFI guarantee support as an interim measure, would address one of the most practically significant competitive disadvantages that manufacturers currently face.

Taken together, the trade policy assessment points to a pattern that recurs across multiple dimensions of the export environment. Notably the structural conditions for Ukrainian public transport vehicle exports are better than manufacturers' current market position implies, but each enabling condition is either locked behind a prerequisite that has not been met (certification before tariff preferences are accessible; ECA capacity before financing parity is achievable) or operates at a scale insufficient for the investment required (state finance programmes calibrated for working capital, not type approval). Ultimately, it is not that these barriers are insurmountable, but rather that they are mutually reinforcing in a way that requires coordinated public intervention rather than incremental commercial effort by individual manufacturers.

4.3.4. Export markets

The European Union

The European Union represents the most significant medium-term potential demand source for Ukrainian electric public transport vehicle exports, with a significant upward trajectory (as shown in Chapter 2). The market will continue to grow, and various analysts assert that there will be ample demand that can be filled by non-European players, including potentially Ukraine.[162]

Within the EU, Central and Eastern Europe is the region most immediately relevant to Ukrainian manufacturers. CEE member states share a historical infrastructure legacy with Ukraine including trolleybus catenary, broad-gauge tram networks, as well as large publicly owned transport enterprises. UITP's Bus Fleet Survey projects that the European battery trolleybus fleet will approach 1,000 vehicles by 2030, with approximately 65% of that stock concentrated in CEE.[163,164] This creates an opportunity for Ukrainian manufacturers as the geographic and technical capabilities (including infrastructure specifications) of Ukrainian trolleybus manufacturers map well onto the CEE landscape.

More broadly however, it is EU accession that represents the most significant shift in the conditions facing Ukrainian public transport manufacturers. EU membership gives manufacturers full standing in EU public procurement directives, removing national preferences that implicitly favour established EU suppliers. Concurrently, EU Cohesion and Structural Funds will be very helpful for the boosting of domestic public transport investments in Ukraine (as the acceding state), which will help create larger and more regular order books that give manufacturers the financial stability to invest in certification and after-service infrastructure.

EU accession however also imposes a binding and comprehensive obligation to align with the full EU acquis, replacing the sector-by-sector voluntary alignment path under the existing DCFTA. This matters for certification because it creates a legally enforceable timeline for completing the acquis alignment that underpins mutual recognition under the ACAA framework, rather than leaving the pace of alignment to political discretion. In practice, accession countries have consistently completed this alignment faster and more completely than non-members operating under association agreements alone. This will inevitably put more pressure on Ukrainian manufacturers. While many already produce vehicles that comply with EU environmental and performance regulations, additional mechanisms will need to be developed to ensure alignment and that existing manufacturers can bear the costs of adjustment.

162. Interviews with sectoral experts, December 2025.
163. UITP. (2023). The Future of Buses in Europe: Results of Europe Bus Fleet Survey 2023. https://www.uitp.org/news/the-future-of-buses-in-europe-results-of-europe-bus-fleet-survey-2023/
164. The projection of approximately 1,000 battery trolleybuses in Europe by 2030 is drawn from the survey's scenario analysis; the 65% CEE share reflects current concentration of trolleybus infrastructure in Central and Eastern Europe.

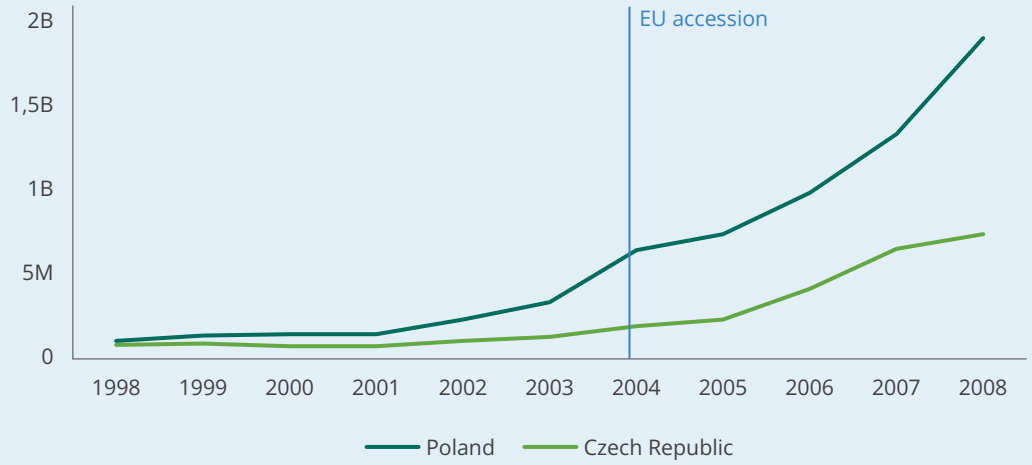
BOX: EU ACCESSION AND THE EXPORT EXPERIENCE OF POLAND AND THE CZECH REPUBLIC

The experience of Poland and the Czech Republic following EU accession in 2004 illustrates what membership can mean structurally for domestic public transport manufacturers. Both countries had active industries before accession with Solaris Bus & Coach in Poland and Škoda Transportation in the Czech Republic. Additionally, some exports to neighbouring markets already existed, but on a much more limited and episodic basis, much like Ukraine.

Accession changed the structural conditions simultaneously from two directions. EU Cohesion Funds substantially raised investment in urban transport across CEE, creating large domestic procurement waves that provided order-book depth and a reference base. Full standing in EU public procurement directives removed the tender-by-tender eligibility uncertainty that characterises non-EU market entry.

The consequences of EU accession were notable in both countries. Solaris won the largest bus tender in Europe in 2004 with 260 vehicles for Berlin's BVG (in the year of the accession), and subsequently expanded to over 34 countries.[165] Škoda Transportation, reorganised and renamed in 2004, developed into a pan-European tram and trolleybus supplier, with Germany becoming its second-largest market by 2020.[166]

Figure 14. Poland and Czech Republic bus, trolleybus and tram exports, USD



Source: Own visualisation based on data from UN Comtrade (2026).[167]

Both companies broadly benefited from the same effects. EU funding raised domestic volume, which provided financial stability and production scale; procurement rules provided export market access on equal terms; and certification equivalence removed the most significant barrier to cross-border tendering.

Ukraine's manufacturers start from a position of greater isolation and face a more competitive landscape than their CEE counterparts did in 2004. Nonetheless, the structural mechanisms embedded in the accession process, which create a simultaneous demand and market-access multipliers, are still relevant to Ukraine's accession.

165. Solaris Bus & Coach. (2024). Company history and milestones. https://www.solarisbus.com/en/about-us/history
166. Škoda Group. (2021). Annual report 2020. Škoda Group a.s. https://cdn.skoda-storyboard.com/2021/03/210324-10-00_Annual_Report_2020.pdf
167. UN Comtrade. (2026). Trade flow database. https://comtradeplus.un.org/TradeFlow

A more immediate development is the European Commission's proposed Industrial Accelerator Act (IAA), which is currently under legislative negotiation with a target adoption by the end of 2026. The IAA introduces "Made in EU" origin and low-carbon requirements for public procurement and public support schemes in strategic sectors, including motor vehicles, with effect from 1 January 2029. For vehicles, the proposed origin requirements would require at least 70% of vehicle component value (excluding the battery) to originate in the European Union. Critically for Ukraine, the IAA defines "Union origin" by reference to the EU Customs Code non-preferential rules and extends equivalence to third countries that have concluded a free trade agreement with the EU, a category that includes Ukraine under the DCFTA. If this equivalence survives the legislative process unchanged, Ukrainian-manufactured vehicles could qualify as "Made in EU" for purposes of public procurement preference even before full accession. The Commission retains the power to exclude specific third countries via delegated act, but the IAA as it currently stands creates a plausible near-term pathway for Ukrainian manufacturers to benefit from EU procurement preferences, provided that certification barriers are separately resolved and supply chain origin thresholds are met.

Non-EU markets

Beyond the EU, the most accessible near-term export markets are those with lower certification barriers and greater price sensitivity. These include Moldova, Georgia, Armenia, the Balkans and Central Asian countries. These destinations are not strategically equivalent to the EU in terms of volumes, but they are commercially relevant in the near term and analytically important because they reveal where Ukrainian manufacturers are competitive when the certification barrier is removed.

Table 13. Qualitative export potential assessment

Market	Electric Bus	Trolleybus	Tram
IMMEDIATE NEIGHBOURHOOD			
Moldova	Medium	High	N/A
Georgia	Medium	Medium	N/A
Armenia	Low	Medium	N/A
Azerbaijan	Low	Low	Low
CENTRAL ASIA			
Uzbekistan	Medium	Low	N/A
Kazakhstan	Medium	Low	Medium
Kyrgyzstan / Tajikistan	Low	Low	N/A
WESTERN BALKANS			
Serbia	Medium	Low	Medium
Bosnia & Herzegovina	Low	Medium	Medium
North Macedonia	Low	Medium	N/A
MIDDLE EAST & NORTH AFRICA			
Egypt	Medium	Low	High
Morocco	Low	Low	Medium
Jordan	Medium	Low	N/A

Source: Authors' assessment

Moldova may represent an interesting market given previous exports and a rising demand, although domestic manufacturing capacity in the trolleybus sector is currently being scaled up.[168] At the same time, the lack of Chinese competition and lower standards may make this a very interesting opportunity, with significant amounts of development financing available. Georgia presents a similar profile, with demonstrated prior commercial relationships (USD 3.6 million of diesel bus exports in 2018) and active public transport modernisation demand which could push up the demand for Ukrainian public transport vehicles. Armenia is also modernising its public transportation fleet, and both Caucasus countries would have development financing possibilities that could enable Ukrainian producers.

The Central Asian markets (especially Uzbekistan, Kazakhstan and to an extent Kyrgyzstan) will also offer larger potential demand volumes but are increasingly dominated by Chinese manufacturers. BYD signed a purchase agreement for 2,000 electric buses with Tashkent in early 2025,[169] illustrating the pace at which Chinese OEMs are locking in post-Soviet urban transport markets. Against fierce Chinese competition, Ukraine's price advantage over European manufacturers narrows considerably, and without matching battery technology or export financing capacity (both of which China clearly leads in), Central Asian tenders may be much harder to win on purely commercial terms. The window for Central Asian market entry on price-competitiveness grounds is also likely narrower than it appears, especially considering all other factors, including the commercial presence and established relations across multiple other segments but also aftersales service. Concurrently, the trolleybus segment in Central Asia has declined significantly in the last decades and is unlikely to play a major role going forward.

Egypt represents Ukraine's one established tram export relationship, built on Tatra-Yug's multi-year deliveries to Alexandria. Its strategic relevance lies in showing that a Ukrainian tram manufacturer can maintain a long-term supply relationship, manage multi-year deliveries, and build a commercial reference for future tenders. Tatra-Yug's multi-gauge capability, which covers the 1000 mm, 1435 mm, and 1524 mm track widths is directly relevant to the diverse infrastructure configurations across the MENA region and constitutes one of the more distinctive technical differentiators in Ukraine's current export portfolio. The Egypt model may therefore be replicable, although so far it has simply not been replicated across other markets.

Photo: Nadin Nandin. Unsplash License

168. Moldova1. (2025). Moldova to produce its first trolleybuses. https://moldova1.md/p/54902/moldova-to-produce-its-first-electric-trolleybuses
169. BYD Europe B.V. (2023). BYD and Tashkent Municipality, Uzbekistan Sign Purchase Agreement for 2,000 Electric Buses. https://www.bydeurope.com/article/460

EXPORT ASSESSMENT FOR UKRAINIAN ELECTRIC PUBLIC TRANSPORT VEHICLES

Taken together, the analysis in this chapter points to a consistent finding. Ukraine's electric public transport manufacturers are not entirely uncompetitive:

- they hold genuine price advantages,
- technically viable products, and
- in the trolleybus and tram segments, deep domestic operational experience that is directly relevant to priority export markets.

The gap between these capabilities and the near-zero export outcomes of the past decade is explained less by product weakness than by a set of structural barriers, including:

- certification costs,
- total cost of ownership (TCO) gaps,
- the absence of export credit agency (ECA) support; and
- Rules of Origin constraints.

These barriers are mutually reinforcing and difficult for individual firms to overcome:

- no single manufacturer can resolve the certification impasse without forward orders;
- no procurer is likely to commit without a certified track record; and
- no export financing architecture currently exists to bridge either gap.

The window created by EU accession negotiations, the IAA procurement framework, and the ongoing CEE fleet replacement cycle may however provide an opportunity. Capturing it will nonetheless require significant coordinated public intervention, including through support at the level of certification financing, export credit architecture, and partnership facilitation. No individual manufacturer can do this alone, and support is needed to overcome these structural barriers.

5

Potential economic and environmental impacts of increased domestic manufacturing and deployment of electric public transport in Ukraine

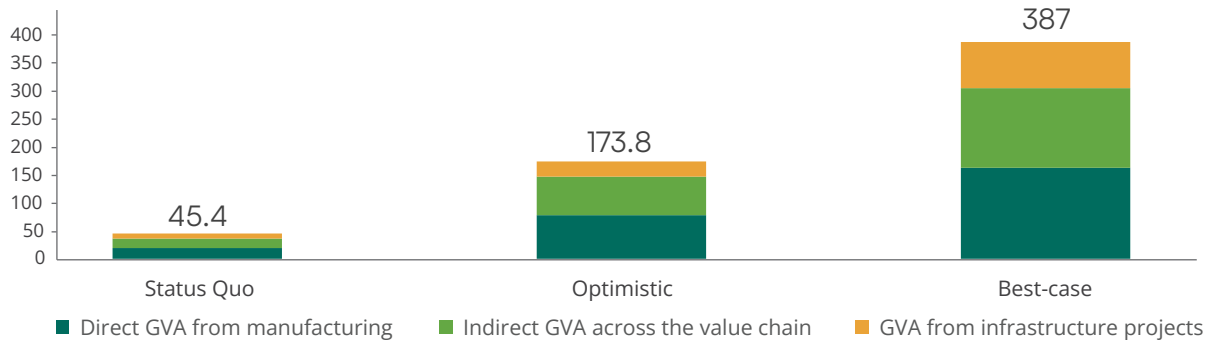
This section quantifies what scaled-up deployment of electric public transport and the associated domestic manufacturing activity would mean for Ukraine in economic and environmental terms. We model three scenarios based on the national public investment programme's rolling-stock procurement and infrastructure project targets[170]: a Status quo scenario, in which procurement continues at its currently weak pace (~20-100 vehicles per year); an Optimistic scenario, which assumes a meaningful scale-up to ~100-400 vehicles per year); and a Best-case scenario, in which the planned rolling stock procurements and infrastructure projects are fully implemented at the volumes targeted in the investment programme.

Economic impact

The deployment of electric public transport, and crucially the domestic manufacturing of trams, trolleybuses and electric buses, would generate significant value added for the Ukrainian economy. In the Best-case scenario, the combined procurement and infrastructure pipeline could generate an estimated EUR 387 million in gross value added annually. Of this, EUR 162.4 million comes directly from domestic public transport manufacturing, a further EUR 141.9 million is generated indirectly across the domestic supply chain (e.g. steel, electrical components, other input materials), and an additional EUR 82.7 million from the implementation of the associated infrastructure projects (e.g. depot, substations, catenary, track, charging) (Figure 15).

The Optimistic scenario generates around EUR 173.8 million annually in total GVA, which is a significant uplift relative to today. To put this in context: under the Status quo, where implementation continues at its current slow pace, domestic value generation from the sector would be limited to roughly EUR 45.4 million per year. The gap between scenarios is directly related to how much rolling stock and infrastructure Ukraine actually procures, and how much of that procurement is filled by domestic manufacturers rather than imports. A high localisation rate of the public transport manufacturing sector also contributes to a large indirect GVA share because Ukrainian manufacturers source a substantial portion of their inputs domestically. This is the channel through which a rolling stock order generates value not just at the plant, but at steel mills, cable producers, electrical equipment suppliers, and across the wider domestic industrial base. This value creation would also create employment throughout the sector, both in the manufacturing plants, and also among domestic input suppliers, in the construction and upgrading of infrastructure, and in the longer-term operation and maintenance of expanding fleets.

Figure 15. Annual estimated gross value added from domestic manufacturing and deployment of electric public transport in Ukraine (m EUR)



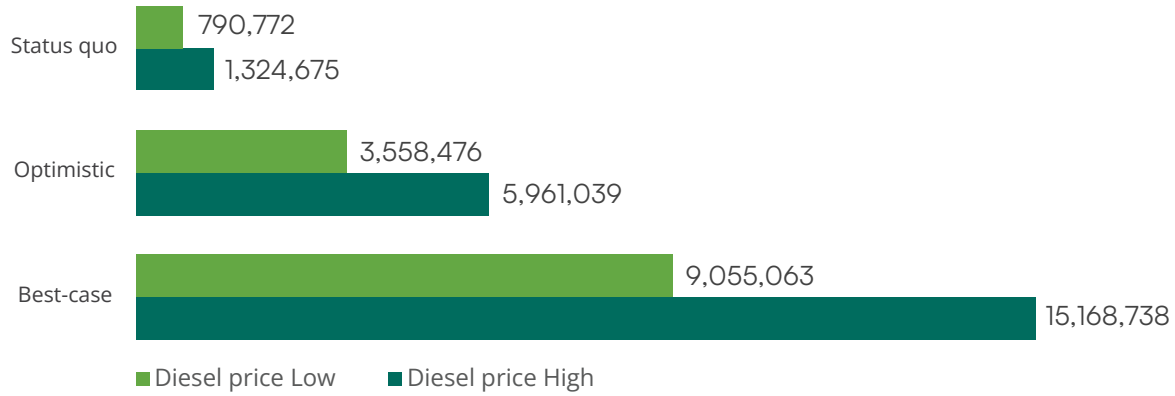
Source: Own estimations based on data from state investment programme on developing electric public transport and infrastructure

Additionally, switching from diesel to electric buses would also reduce Ukraine's imported diesel consumption in the public transport segment. Each diesel bus-kilometre replaced by an electric one therefore translates into foreign currency saved as diesel imports are reduced. In the Best-case scenario, the avoided cost of imported diesel reaches between EUR 9.1 million and EUR 15.2 million per

170. Government of Ukraine. (2025). Development of public electric transport and infrastructure (Draft national public investment programme). DREAM. https://dream.gov.ua/public-program/DREAM-UA-060825-ABA4E71D?fromUri=/spp-pipeline

year. The Optimistic scenario delivers between EUR 3.6 million and EUR 6.0 million annually, while the Status quo is limited to under EUR 1.3 million per year (Figure 16). The range within each scenario reflects the exposure to international price volatility. Given Ukraine's high diesel import dependence, that volatility is itself an argument for accelerating the shift: the more of the public transport fleet that runs on electricity, the less the operating cost base is exposed to fuel price swings driven by international markets and geopolitical events.

Figure 16. Avoided annual cost of diesel consumption from imports, EUR



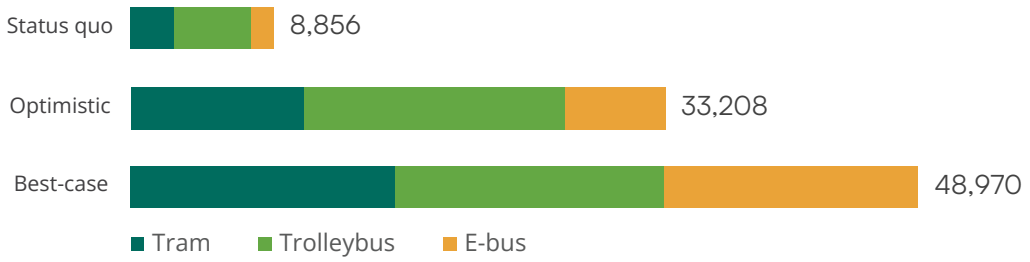
Source: Own estimations based on data from state investment programme on developing electric public transport and infrastructure

Environmental impact

Beyond the economic impact, replacing diesel buses with electric buses and modernising the tram and trolleybus fleet with new modern vehicles delivers significant GHG reductions across all three scenarios. In the Best-case scenario, the system avoids roughly 49,000 tCO_2e per year on average. In the Optimistic scenario, average annual savings are at around 33,000 tCO_2e, while the Status quo delivers savings of only around 9,000 tCO_2e per year, which shows how much is foregone if the implementation of electric public transport continues at the current slow pace (Figure 17).

It should be noted that these figures are conservative for two reasons. First, they reflect only direct fleet substitution: no modal shift is assumed. If expanded electric public transport draws passengers away from private cars or from Ukraine's large informal diesel minibus (marshrutka) sector (both plausible outcomes) the GHG reduction would be larger than what is estimated here. Second, a systemic decarbonisation of Ukraine's power sector would lower the operating footprint of every electric bus, tram and trolleybus on the network. As an indicative scale, a more decarbonised grid could deliver a further reduction of up to ~4,700 tCO_2e per year from electric bus operations alone, on top of the savings shown in Figure 17.

Figure 17. Average annual GHG reduction potential, tCO_2e



Source: Own estimations based on data from state investment programme on developing electric public transport and infrastructure.
Note: Environmental impacts are estimated against a counterfactual. For buses: continued diesel bus purchases, with savings from displaced diesel consumption. For trams and trolleybuses: continued operation of the existing ageing fleet, with savings from the efficiency gain of new vehicles replacing retired ones, based on assumed retirement rates and the efficiency differential between new and old rolling stock.

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Conclusions and policy recommendations

Ukraine's electric public transport manufacturing sector has real potential, but significant barriers still must be overcome. Across electric buses, trolleybuses and trams, a viable industrial base exists, with established production capabilities, significant local sourcing, and localisation rates that reflect genuine domestic value-added. The trolleybus sector is the most mature with significant production; the tram segment has a proven, if narrow, export track record; and electric buses, while still nascent, are beginning to develop, with recent domestic contracts marking a first step toward serial production.

The Ukrainian public transport manufacturing sector features significant capabilities, skills and innovation that have been underappreciated. The transferable capabilities from diesel bus and trolleybus manufacturing provide a credible springboard for electric bus scale-up, and bottom-up innovation, such as PTS's battery assembly operations and in-house battery management systems are a highly positive signal. Research & Development efforts however remain diffuse, with no real coordination mechanism to reduce costs and share learning across the sector. Closing this gap, including through a potential Battery Institute, would allow capabilities to consolidate rather than duplicate.

The sector's trajectory is ultimately determined by the demand-supply sequencing. Secured offtake has to come first as vehicles are mostly produced to order. Domestic demand is therefore not just a market opportunity but rather a precondition for manufacturing scale-up. Realising it however requires addressing a variety of linked problems. Infrastructure is a key factor as new vehicles deployed onto degraded substations and worn catenary systems will underperform regardless of quality, making network rehabilitation a prerequisite rather than a parallel workstream. Institutional reform is also key as PSO-based contracting is needed to give operators the stable revenue base from which to plan and finance procurement. The financing architecture needs to change as well as funds currently arrive too late in the procurement cycle, leaving manufacturers to absorb production costs without working capital. Working-capital guarantees and earlier disbursement mechanisms are as important as any supply-side intervention.

On exports, the obstacles are well-defined with high certification costs and absent export credit financing. Neither of these is insurmountable, but they require coordinated public intervention to support producers. EU accession and Ukraine's DCFTA-standing under the proposed Industrial Accelerator Act create a plausible medium-term pathway to EU procurement markets. Realising this, however, will require investment in standards alignment, certification support, and after-sales infrastructure, with producers likely to need support from IFIs and the EU. Ukrainian producers have already demonstrated that such competitiveness is achievable, having won contracts in EU countries across multiple segments before the war. With the right support, they could do so again. Considering additional avenues and options for further integration with EU supply chains, including partnerships, joint ventures and component supply agreements with European OEMs may also offer a near-term pathway. This is because selling into EU value chains builds the supplier relationships and certification familiarity that exports of complete vehicles will require later. All of these factors will become increasingly important as Ukraine moves towards EU accession and its manufacturers gain deeper integration and improved access to new markets.

The future for Ukraine's public transportation sector can be bright: the industrial base exists, the market demand is substantial, and the policy direction is broadly aligned. Realising this potential, however, will require the structural barriers identified throughout this report to be addressed sequentially, deliberately, and with adequate support. The recommendations below are addressed primarily to the Government of Ukraine, while recognising that effective implementation will require coordination with municipalities, manufacturers, international financial institutions, and donors.

Table 14. Policy recommendations to develop Ukraine's electric public transport sector

Supply side (Strengthening the manufacturing base)
1. Establish financing support mechanism for manufacturers that provide working-capital guarantees sized to production-contract cycles.
2. Introduce an active grant-based R&D support, and help Ukrainian producers access European innovation funds such as Horizon Europe, the Innovation Fund.
3. Launch a Ukrainian Battery Institute to provide a shared pilot line, certification support, skills pipeline, and an institutional anchor for cooperation with EU battery research networks.
4. Pair localisation requirements with a strategic component-mapping exercise: identify which inputs Ukraine can realistically produce, set targeted import-duty relief for components that cannot yet be made domestically, and fund supplier development for those that can.
5. Build a structured technology-transfer and joint-venture facilitation programme with EU OEMs as a faster route to higher-value subsystems than building domestic R&D from scratch.
6. Address the workforce constraint through a coordinated reskilling programme linking vocational colleges, manufacturers, and adjacent sectors (defence, electronics, metalworking).
Demand side (Building domestic demand and uptake)
7. Sequence investment to prioritise substation, catenary, depot, and track rehabilitation before large-scale fleet procurement; treat infrastructure as a prerequisite, not a parallel workstream.
8. Work with donors and IFIs to improve fund disbursement process to enable manufacturers to access capital sooner. This will decrease their production costs and improve deliveries.
9. Pilot aggregated procurement across multiple cities to pool orders into single tenders for shared rolling stock specifications. Larger volumes justify producer investment in serial production, and risk spread across multiple municipalities makes IFI financing easier to structure.
10. Introduce a PSO contracting framework based on EU Regulation 1370/2007, with payments tied to service-quality conditions (timetable compliance, accessibility, e-ticketing), and reform tariff and subvention mechanisms so fares stay socially protective only where the PSO payment reliably and predictably covers the gap.
11. Align Ukraine's Law 2956-IX on the promotion of electric public transport with the EU Clean Vehicles Directive (2019/1161), particularly on enforceability of zero-emission procurement targets, monitoring mechanisms, and quota feasibility. This would add support enforcement to the current law's directional ambition and strengthen its function as a demand signal to manufacturers.
12. Strengthen corporate governance of municipal electric transport enterprises, including through independent supervisory boards covering strategic planning, financing oversight, and protection of community interests.
13. Mandate SUMPs (or equivalent multi-year mobility plans) for all cities above a population threshold as a condition for IFI co-financing, to convert one-off procurement into a predictable demand pipeline for manufacturers.
14. Integrate urban electric transport infrastructure (substations, catenary, depots) into municipal energy and resilience strategies as critical infrastructure, ensure its modernisation is sequenced alongside broader energy system planning.
15. Address the workforce shortage by lowering the minimum driver age to 18 (in line with the EU Directive 2006/126/EC revision), simplifying cross-licensing between bus and trolleybus categories, and funding technical-specialist recruitment.
16. Modernise infrastructure norms by transitioning from prescriptive Soviet-era standards to parametric, EU-aligned engineering norms; this lowers cost and unlocks "build back better" solutions.
17. Enable distributed generation and energy recovery at depots, using rooftop solar, regenerative braking storage, and similar technologies, to reduce operating costs, support grid balancing during peak loads, and create new revenue streams for operators. Complement this with legal pathways for power purchase agreements (PPAs) between transport operators and renewable energy producers, providing a route to verifiable green electricity supply and supporting further sectoral decarbonisation.

External markets (Enabling access to export markets)
18. Create a dedicated certification grant fund covering EU type-approval costs to help producers break into EU markets. 19. Develop a roadmap for Ukraine's transition to EU vehicle type approval, identifying standards already aligned, those requiring harmonisation, and the sequencing of mutual recognition mechanisms. 20. Build an export credit architecture for public transport vehicles: develop a dedicated export credit agency (ECA) product (capitalised with IFI guarantee support as an interim measure) so Ukrainian producers can offer buyer credit comparable to Hermes, EGAP, or KUKE. 21. Support the establishment of after-sales service infrastructure in target markets (joint depots, partnered service contracts, extended-warranty products) bundled into export financing to close the TCO gap that limits Ukraine's price advantage in EU procurement. This would likely require a combination of ECA-backed export contracts and IFI co-investment in physical service infrastructure. 22. Run a Rules-of-Origin compliance programme to verify DCFTA preferential treatment on a model-by-model basis, with technical assistance to manufacturers ahead of EU bid submissions. 23. Facilitate consortium and partnership models with EU OEMs and operators that already hold national homologation, particularly for trams, where infrastructure diversity makes standalone entry difficult.