



Social Dialogue on the Deployment of Clean Buses in Europe.

Analysis of current practices, added value and recommendations

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LIST OF ABBREVIATIONS

AC	Alternating Current
AKT	Finnish Workers' Transport Union
ALT	Employers' Federation of Road Transport (Finland)
BIM	Building Information Modelling
BVG	Berliner Verkehrsbetriebe
CAPEX	Capital expenditure
CBEP	Clean Bus Europe Platform
CBT	Clean Bus Technology
CNG	Compressed Natural Gas
DC	Direct Current
EAD	Metropolitan Autotransport Sofia
EMT	Empresa Municipal de Transportes de Madrid
ETF	European Transport Workers' Federation
EU	European Union
FTTUB	Federation of Transport Trade Unions in Bulgaria
GIZ	German Society for International Cooperation
GVB	Public transport provider Amsterdam
ICCT	International Council on Clean Transition
ICT	Information and Communication Technologies
IT	Information Technologies
JSC	Public Bus Transport Company in Sofia
LNG	Liquefied Natural gas
OEM	Original Equipment Manufacturer
OPEX	Operational expenditure
OSH	Occupational Safety and Health
RATP	Régie autonome des transports Parisiens
TMB	Transports Metropolitans de Barcelona
TOC	Total costs of ownership
UITP	International Association of Public Transport
UK	United Kingdom
UPT	Urban Public Transport
VDV	Association of German Transport Companies
VET	Vocational Education and Training
ZEB	Zero Emission Buses

1 INTRODUCTION AND METHODOLOGY

1.1 Context of the project and main objectives

In recent years, the EU and Member States have set ambitious targets to tackle the problems of air pollution and climate change. Building on the Paris Agreement's goal of limiting global temperature rise to well below 2°C, the European Commission has proposed to achieve climate neutrality by 2050 as part of the European Green Deal. While cities across Europe are implementing measures to achieve ambitious environmental strategies, the transport sector is under pressure to reduce carbon emissions as quickly as possible. The use of clean, zero-emission urban transport solutions, such as electric buses (e-buses) or other clean technologies, is key to a sustainable transport system and is the solution chosen by many authorities.

The European Green Deal is a comprehensive and ambitious project and vision of ecological transformation and modernisation of the economy and society. The President of the EU Commission, Ursula von der Leyen, presented the plan in a speech to the European Parliament in December 2019, comparing the associated ecological and economic structural change with the challenges of flying to the moon in the 1960s. The central goal of the Green Deal is to make Europe the first "climate-neutral" continent with no net greenhouse gas emissions by 2050.

In 2021, with the "Fit for 55" package, the European Commission adopted a set of proposals to make the EU's climate, energy, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels.

Urban transport and mobility play an important role when it comes to the reduction of greenhouse gas emissions: A large majority of European citizens live in an urban environment, with over 60% living in urban areas of over 10,000 inhabitants according to Eurostat figures. As highlighted by the European Commission, urban mobility accounts for 40% of all CO₂ emissions of road transport and up to 70% of other pollutants from transport.¹

In this light, local and regional authorities and stakeholders have a key role in cutting carbon emissions by upgrading our transport systems making them cleaner, more energy efficient and more sustainable. Clean, alternatively fuelled buses (electric, hydrogen or natural-

¹ European Commission: Urban Mobility. https://transport.ec.europa.eu/transport-themes/clean-transport-urban-transport/urban-mobility_en.

bio-, methane-gas) improve air quality and reduce noise levels, besides the decarbonisation of transport.

The Clean Bus Europe Platform (CBEP) – launched in 2019 and managed by a consortium led by UITP – is an initiative under the European Commission’s Clean Bus Deployment Initiative that aims to support the deployment of clean bus technologies across Europe. The initiative has already been signed by a large number of cities, OEMs and organisations from across Europe and beyond.²

Part of the activities carried out by UITP in the frame of the CBEP related to encourage dialogue with Social Partners about the impact of the transition to clean bus technologies (CBT) on the workforce. To achieve a smooth introduction and deployment of clean technologies, it is important that public transport operators, workers representatives and trade unions, engage in a proactive way to accompany the transformation process. An analysis of the impact on workers and working conditions in urban public transport is therefore of high importance in this context.

Against this, in cooperation with the European Transport Workers Federation (ETF)³, UITP implemented a joint activity to explore the impact of clean bus technology and deployment on labour and working conditions, and foster dialogue with relevant social partners on these topics.

More concretely, the project had the following objectives:

- To analyse the impact of clean bus deployment on employment, skills and working conditions across Europe by gathering evidence and experiences from urban areas and public transport bus operators.
- Assessing and investigating the role of social dialogue in addressing the issue of clean bus deployment from, taking into account the linkage between different levels of social dialogue and collective bargaining from the workplace to the national level.
- Learning from good practice examples, drawing conclusions and providing policy recommendations as regards principles that should be taken into account in the deployment of clean buses.
- Elaborating general training materials on the basis of these principles, including a list of Do’s and Don’ts of good clean bus deployment.

² You can find more information about the Clean Bus Deployment Initiative here: https://ec.europa.eu/transport/themes/urban/cleanbus_en and visit the Clean Bus website here: <https://www.uitp.org/clean-bus-europe-platform>

³ ETF is the principle European partner when it comes to social dialogue. UITP cooperates with ETF within the European Sectoral Social Dialogue Committee for Road Transport and the working group of Urban Public Transport.

1.2 Methodology of this report

The methodology applied consisted of the following elements that were implemented in close cooperation with the UITP and ETF and the members of the advisory group established for the purpose of the project and the research:

- **Desk research and gathering data on clean bus deployment** based on available information at European and national level – selection of 10 city cases of so-called 'host' cities involved in the CBEP
- **Analysing experiences of city cases** that already have some maturity in deployment clean buses based on interviews with management representatives as well as representatives of trade unions and company level workers representatives / shop stewards

It is worth mentioning that the COVID pandemic in 2020 and 2021 posed a challenge to schedule and carry out interviews with the social partners at the level of public transport operators. Likewise, a further challenge was to identify and carry out interviews with workers representatives at this level. While in some cases it proved impossible to match management discussions also with interviews on the employee side, i.e. staff representation bodies or workshop staff in other cases the lack of language skills proved to be a barrier.

Against this, a flexible approach needed to be adopted: Whereas possible, interviews were covered the company and workplace level, but in other cases interviews were carried out at national level with trade union and sometimes employer associations in urban public transport (UPT).

The practice concerning the introduction of the clean technologies was analysed also from the human resources and workforce planning point of view. Particular attention was devoted to changes in job profiles and skills, working conditions, (working hours, health and safety, wage components and other benefits, etc.), and the need for training.

The following analytical steps were carried out:

- **Analysing the impact of the transition towards clean buses on the local economy and the labour market**

The implementation of this task was based on the evaluation of existing literature on the topic and assessments gathered by stakeholders and social partners in the sector.

- **Presentation and discussion of interim results of the research**

Interim results were presented in several meetings of the CBEP Advisory Board as well as in the context meetings of the European Sectoral Social Dialogue Committee for the road

transport sector (Urban Public Transport Working Group). The project was also presented in meetings of the UITP Business and Human Resources Management Committee.

➤ **Elaboration of recommendations for the introduction of clean bus technologies**

Based on the results of the research and stakeholder consultation, recommendations for the introduction of clean bus technologies have been elaborated and are presented in this final report. The recommendations aim to make use of good practices of social dialogue in this context and encourage stakeholders at company and/or national level to use social dialogue as an important element of the transition and transformation process towards clean bus fleets.

1.3 Structure of this report

This report is structured into eight chapters:

Chapter 1 provides an introduction to the CBEP project, the background, methodology applied, and the structure of the report.

Chapter 2 provides an overview of the current state of clean bus deployment in the EU, focussing on a comparative overview of progress against European, national and local targets.

Chapter 3 analyses the impact of clean bus deployment on different domains of urban public bus transport, i.e. procurement and investment decisions, operation, traffic management and infrastructure as well as maintenance and safety and security.

Chapter 4 reflects on the impact of clean buses and decarbonisation of urban bus transport on local economies and employment from the perspective of clean bus producers.

Chapter 5 focuses on the impact of clean bus technology, operation and infrastructure on employment, staff and skill needs of employees as well as new emerging job profiles and tasks, including related needs for training and reskilling.

Chapter 6 analyses the impact on the work environment and working conditions, working time and work organisation and health and safety.

Chapter 7 summarises key findings of the research in relation of the role of social dialogue in the context of clean bus deployment, paying special attention to the role and added value of social dialogue in the context of anticipation and planning of changes, investment decisions and during the deployment of clean buses.

The final chapter 8 draws key conclusions from the research perspective and gathers policy recommendations for European and national social partners as well as policy makers from the perspective of research results.

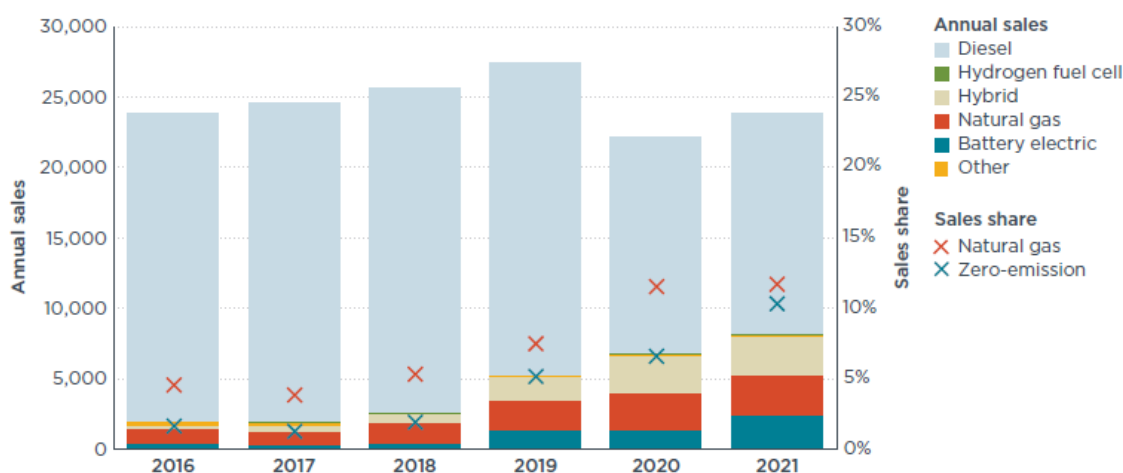
2 DEPLOYMENT OF CLEAN BUS TECHNOLOGIES: EVOLUTION AND CURRENT STATE

2.1 Comparative overview of the transition and deployment in the European Union

The sales of zero-emission buses have been rapidly increasing in the EU-27. Over the last five years, the sale has increased over six-fold from only 400 in 2016 to 2,500 in 2021, when fully electric buses represented 10% of all sales (see Figure 1 below). This share exceeded the same share in passenger cars in that year.

The deployment of clean buses however is more diverse. Shares of natural gas buses have sharply been on the rise, increasing from a 5% share of sales in 2016 to 12% in 2021, although plateauing since 2020. By the end of 2021, the bus fleet of nearly 700,000 in the EU-27 was comprised of over 9,000 electric and 20,000 natural gas buses.

Figure 1: Annual sales (bars, left axis) and sales shares (cross, right axes) of buses by fuel-type in the EU-27, 2016-2021



Source: International Council on Clean Transition: *The rapid deployment of zero-emission buses in Europe*, ICCT September 2022.

However, while the overall trends are promising, a different picture is evident at the country level (see Figure 2 below). Some Member States had little to no deployment of electric buses (for example Greece, Portugal, and Ireland with a share in electric buses of less than 1%). By contrast, zero emission buses are already close to achieving market dominance when it comes to bus purchase in Finland (78% of sales share) or make up around half of all sales at national level in the Netherlands (59%) and Denmark (46%).

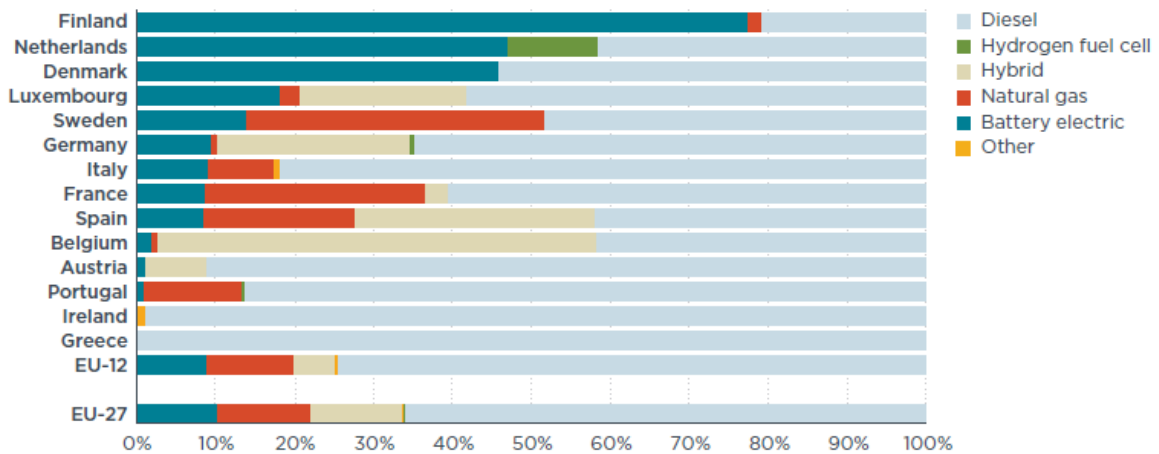
There is also national diversity in the selection of clean fuel types: While the Netherlands was the only country to have a significant share of hydrogen fuel cell vehicles representing 11% of total buses sold, the largest share in national annual sales between 2016 and 2021

in countries such as Luxembourg, Germany, Spain or Belgium was contributed by hybrid buses. Natural gas fuelled bus sales played the most important role in Sweden, France and Portugal.

In relation to national targets of clean bus deployment, the Netherlands and Denmark have set ambitious phase-out targets for the sale of fossil-fuelled buses by 2025, while no national plans are in place for Finland, despite its leading role. In the EU-27, the three main fuel-types were battery electric, natural gas and hybrid with share of around 1/3 each.

As noted in an overview of clean bus deployment and illustrated in Figure 2 below, some EU Member States had little or no deployment of electric buses and the overall share of electric buses in annual sales 2016 – 2021 in the EU-27 was only around 10% and even slightly lower in the EU-12.

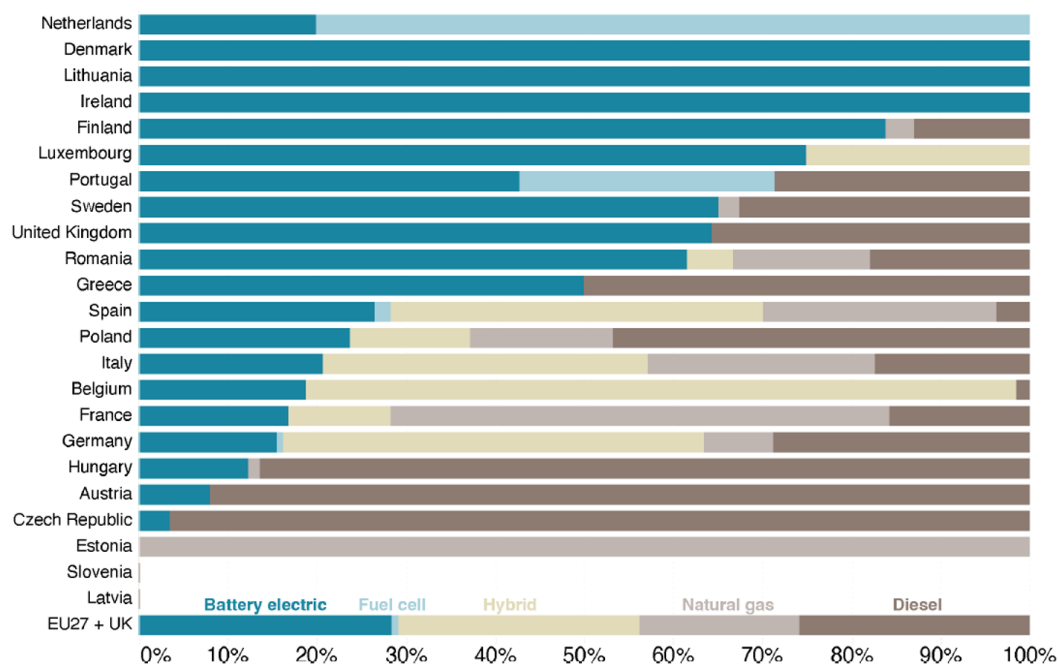
Figure 2: Share of buses by fuel type in EU by Member States (annual sales 2016-2021)



Source: International Council on Clean Transition: *The rapid deployment of zero-emission buses in Europe*, ICCT September 2022.

While the figure above indicates the share of different fuel types in annual sales of all buses in the respective countries, the share of clean technologies in city bus sales is much higher. This is illustrated by the following figures provided by the ICCT (International Council on Clean Transition) for the 1st Quarter 2023 (Figure 3):

Figure 3: Sales share of city buses by country, Q1 2023



Source: ICCT - Chatrou CME Solutions

2.2 Clean bus technologies

Public bus transport operators have a range of technology options when it comes to the procurement of clean buses as shown in the following Table 1. In any case, decisions to focus on one specific type or a combination of several technologies will consider the specific urban requirements and needs as well as infrastructure (e.g. an already existing trolleybus system that can be adjusted).

As highlighted in a policy paper published by the European Bank for Reconstruction and Development, in cooperation with UITP and GIZ (German Society for International Cooperation), technology choices are an important strategic decision that will influence the timeline of deployment, investment costs, planning approval, affect planning as well as daily operating costs.

As most clean bus technologies today have moved beyond experimental stage, cities and bus operators are able to select from a range of mature technologies in large-scale use. These should be assessed against the transport policy and operational characteristics of each urban area. Key factors include:

- > route lengths
- > kilometres operated per bus per day
- > timetable and commercial speed

- charging/refuelling time
- economics of AC (alternating current) versus DC (direct current) charging⁴
- availability of trolleybus catenary networks
- geographical and climate conditions.

Table 1: Clean bus technology options

Diesel or clean gas	Hybrid diesel or CNG	Plug-in hybrid	Battery electric	Hybrid or electric trolleybus	Trolleybus	Fuel cell hydrogen
Meets latest Euro VI standards No electric transmission Diesel HVO 100 per cent fossil-free diesel CNG bus as mature alternative technology Biogas – using recycled or bespoke fuel	On-board diesel generator battery pack to allow balancing of engine load No plug-in capability	Able to operate on battery for substantial period Can be recharged externally as well as by on-board diesel engine	No on-board generator All power sourced from on-board batteries	Battery bus charged by trolley wires	No or limited battery pack Batteries used for short distance manoeuvring in depots and at terminals only	Electric bus with power generated on board by fuel cell Unconstrained daily range More experimental technology Bus fuelled at depot hydrogen station

Source: European Bank for Reconstruction and Development 2021: *Going electric. A pathway to zero-emission buses. Policy paper, in cooperation with UITP and GIZ, p. 17.*

2.3 Demand side: The Clean Vehicle Directive and national transition targets

Unlike passenger cars and heavy trucks, bus manufacturers in the EU-27 are not currently subject to CO₂ emission standards. As there is no regulatory obligation on manufacturers to yet limit their CO₂ emissions, the technology transition is primarily driven by demand-side measures from public institutions to improve the air quality of urban areas, tackle climate change, or comply with the EU's Clean Vehicles Directive.

⁴ The main difference between AC and DC charging is where the AC power (from the grid) is converted to DC power (used to charge the batteries). With AC charging, the conversion takes place in the bus itself. Electric vehicles have a built-in converter, a so-called on-board charger (OBC), which absorbs the alternating current and converts it into direct current via several converters. When charging at a DC, the OBC can be skipped because there is a current converter in the charging station itself.

The Directive was adopted in 2019 and requires a portion of all publicly procured buses to be fuelled by either zero-emission technologies, low carbon fuels, or through alternative fossil fuels such as natural gas.⁵ In accordance with the Directive, all EU Member States have set targets for the public procurement of alternatively fuelled buses.

As shown in Figure 4 below, for the first phase, from August 2021 to December 2025, the procurement targets for alternatively fuelled buses range from 24% to 45% of new purchases. In the second phase, from January 2026 to December 2030, the targets range from 33% to 65%.

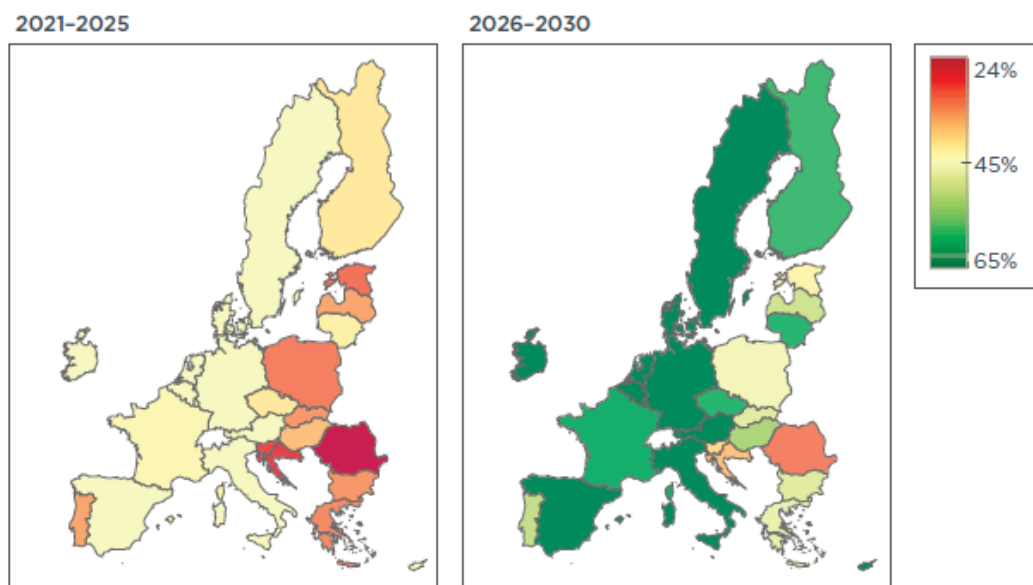
The targets vary by Member State, whereby Member States in Eastern Europe are subject to lower targets. However, by 2030, at least half of the procurement must be zero emission buses.

Several EU Member States (Austria, Belgium, Croatia, Denmark, Finland, Ireland, Lithuania, Luxembourg, Netherlands, Portugal) plus Norway, Switzerland and the UK have also been signatories of the “*Global Memorandum of Understanding on zero-emission medium and heavy-duty Vehicles*” in which the ambition was defined to accelerate the deployment of zero-emission buses and trucks as well as vehicles and related infrastructure. The objectives are to reach 30% of newly procured trucks and buses by 2030, enable a full transition in new fleets by 2040, and to facilitate the achievement of net-zero carbon emissions by 2050.⁶

⁵ Definitions provided in the Clean Vehicles Directive (EU Directive 2019/11610): A clean bus is fuelled by electricity, hydrogen, natural gas (CNG, LNG), most biofuels not blended with conventional fossil fuels, synthetic and paraffinic fuels not blended with conventional fossil ones, or liquefied petroleum gas (LPG). A zero-emission (tailpipe) bus is a vehicle without an internal combustion engine or with an internal combustion engine emitting less than 1g CO₂/kWh or less than 1g CO₂/km.

⁶ <https://globaldrivetozero.org/mou-nations/>.

Figure 4: Targets for the public procurement of clean vehicles under the Clean Vehicles Directive by Member States



Source: International Council on Clean Transition: *The rapid deployment of zero-emission buses in Europe*, ICCT September 2022.

By the end of 2022, five EU Member States had phase-out targets for conventionally fuelled buses in the EU-27: The Netherlands, Denmark, Austria, France, and Ireland.

The Netherlands currently has one of the most ambitious national targets in the world for the phase-out of internal combustion engine buses. In the Netherlands funds for public transport stock and infrastructure are allocated by the Ministry of Transport. The procurement process gives a single operator sole right to the entire public transport network in each concession, usually for a period of ten years. The Green Deal Zero Emission Bus Transport (2012) was confirmed in 2016 by national government, ensuring that: from 2025, all newly procured buses must be zero emissions, and, from 2030, all buses in use must be zero emissions.

Denmark holds a similar target, albeit only applicable to urban buses. In 2018, the Danish Ministry of Energy, Supply and Climate Change established targets through its climate and air initiative, which stipulates that in 2020 new buses must be CO₂ neutral; by 2025, new buses in cities must be zero-emission, and from 2030, all city buses in operation must be zero-emission.

France adopted the Energy Transition for the Green Growth Act in 2015, establishing that only low- and zero-emission buses can be procured for public transport services from 2025

onwards. However, the definition of low emission is not defined within this act and could potentially include natural gas as a low-emission vehicle.

Also, **Austria** and **Ireland** have set goals for the phasing in of zero-emission fleets. While the Irish government in the context of the Climate Action Plan has set the target to sell only zero-emission buses from 2030 and to have a fully electric fleet by 2035, the Austrian government has set the target of all registrations of new buses to be zero-emission from 2032.

It should be noted that both Austria and Ireland in 2021 were amongst those EU Member States with the lowest shares of zero-emission bus sales (see Figure 2 above).

2.4 Zero-emission bus targets large European cities

The procurement of public vehicles is generally conducted by local transport authorities rather than at the national level. As such, the rate of technology transition for bus fleets is usually most apparent by considering what is happening in major cities.

Table 2 provides an overview of cities that have been analysed in the context of this project by gathering data from existing sources or own research.

Table 2: Targets for the public procurement of clean vehicles under the Clean Vehicles Directive in selected European cities (fleet size data for 2021/22)

City	Fleet size	Electric	Natural Gas	Other	Zero-emission fleet target*
Amsterdam (GVB)	216	44	0	0	100% by 2025
Barcelona (TMB)	1,135	30	363	391 Hybrid plus few Hydrogen	65% of purchase by 2025
Berlin (BVG)	1,549	138	0	0	33% by 2030
Cagliari (CMT)	279	3	0	6 Battery Trolley 26 Trolley	No info
Copenhagen*	1,185	119	41	1 Hydrogen	100% by 2030
Gothenburg*	244	2	124	29 Hybrid 90 Biodiesel	100% by 2030
Hamburg (Hochbahn)	1,100	99	0	35 Hybrid 2 Hydrogen	100% by 2030
Helsinki*	1,400	164	22	0	30% by 2025
London (TfL)	8,973	728	0	3,859 Hybrid 22 Hydrogen	100% by 2034
Madrid (EMT)	2,081	124	1,634	44 Hybrid	33% by 2027
Paris (RTP)	4,000	400	600	1,100 (Hybrid)	66% by 2025
Rome*	2,036	0	51	0	25% by 2025

City	Fleet size	Electric	Natural Gas	Other	Zero-emission fleet target*
Sofia*	720 plus 120 trolleybuses	45	334	0	100% by 2030
Stockholm*	2,200	14	330	0	100% by 2035
Turin (GTT)	753	96	213	0	No info

Sources: UITP ASSURED Clean Bus Report 2022 and (*) ICCT Briefing Paper 2022 or own research.

The overview shows that the targets set for zero-emission fleets in most capital and other larger cities are much more ambitious than the national targets.

Most of the cities intend to convert either the entire fleet or a significant portion to zero-emission vehicles within the next 15 years.

Some examples:

- In **Paris**, the public transport provider RATP (*Régie autonome des transports Parisiens*) committed already in 2014 to a major technological and ecological transformation with the aim of converting most of its bus depots to electricity by 2025 committed in 2014 to a major technological and ecological transformation (*2025 Bus Plan*). RATP aims at a 100% ecologically-friendly fleet by 2025 in the Paris region, featuring fully electrically-powered buses (2/3 of the fleet) and buses powered by biogas and hybrid energy sources (1/3 of the fleet) .
- **Amsterdam** with the public transport provider *GVB* has one of the most ambitious targets for zero-emission buses in Europe which is to have a fully zero-emission bus fleet by 2025.
- In **Hamburg**, *Hamburger Hochbahn* intends to have deployed the whole fleet of 1,100 buses by emission-free engines, in particular battery-electric by the beginning of the 2030s.⁷ Already since 2020, the public urban transport provide purchases only emission free buses.⁸
- In **Barcelona**, *TMB (Transports Metropolitans de Barcelona)* according to the *TMB 2025 Strategic Plan* is going to renew and environmentally update the urban buses of Barcelona and the metropolitan area, in agreement with the Metropolitan Transport Authority (ATM). TMB's commitment to reducing emissions and decarbonising will mean that by 2030 more than half of the buses will be electric.⁹
- **Copenhagen** matches this ambition by also planning for a fully zero-emission bus fleet by 2025. This complements the City's plan to become carbon neutral by the same year.

⁷ <https://www.hochbahn.de/de/projekte/e-busse-fuer-hamburg>

⁸ <https://www.hochbahn.de/de/betrieb/fahrzeuge-und-technik/busse>

⁹ <https://cleanbusplatform.eu/news-and-events/news/from-now-on-barcelona-plans-to-carry-out-100-of-the-renewal-of-the-bus-fleet-with-clean-vehicles>

- **Berlin** plans for a fully emission free bus fleet to be in place by 2030. In 2021, only 9% of the entire fleet was electric but the transition towards a clean fleet is expected to accelerate in the coming years also due to public funds provided by the Federal Ministry of Transport.
- Though also **Madrid** in 2021 had 4% of its 2,100 buses fully powered by electricity, representing, there already has been a mass substitution of the diesel buses by new CNG buses with the plan to have all diesel buses substituted by the end of 2022.
- **Sofia**, with a fleet size of 720 (+ 120 trolley buses), the clean fleet in 2021 consisted of 45 e-buses and 334 natural gas engine buses. The city has the target of having a zero-emission fleet by 2030. This is in line with the Bulgaria's Integrated Transport Strategy 2030 that includes the goal of CO₂-free urban logistics by 2030.

It should be noted that in France and Spain, the phasing out of diesel buses and the transition towards zero-emission buses is done by the bridge solution of CNG buses. In Madrid, perhaps the single largest operator of CNG buses across the EU, 80% of the bus fleets run on natural gas and all remaining diesel buses are going to be replaced with CNG vehicles. High shares of CNG fuelled buses exist also in other cities, for example Barcelona.

France also uses CNG fuelled buses as a bridge solution towards zero-emission bus transport. At national level, France is by far the largest market for natural gas vehicles in Europe, with CNG bus sales between 2016 – 2021 showing the largest growth rate in the clean bus segment.¹⁰ Also in Paris, CNG fuelled buses play an important role – in 2021 about 10% of the total fleet of RATP are CNG fuelled and the plan is to increase the share to about 1/3 in the context of the Bus2025 Plan.¹¹

2.5 Challenges in the transition towards clean buses

The transition to clean fleets poses a challenge to cities and operators: cities have political will but might lack the capabilities and know-how. The CBEP project has been fundamental in addressing this issue, by fostering knowledge and experience sharing, ensuring capacity building and knowledge transfer between experienced and learning.

Major issues and challenges are summarised in the Table 3 below.

¹⁰ International Council on Clean Transition: The rapid deployment of zero-emission buses in Europe, ICCT September 2022, p. 15.

¹¹ <https://www.ratp.fr/sites/default/files/inline-files/RATP%202025%20Bus%20Plan%20Press%20Kit.pdf>

Table 3: Major issues and challenges related to the deployment of clean buses

Policy & procurement targets	Financial constraints	Introduction of new technology	Fulfil operational requirements	People, workforce and passengers
<ul style="list-style-type: none"> • Mandatory targets by 2025 and 2030 • For some cities, even more ambitious 	<ul style="list-style-type: none"> • Decreased revenue • CAPEX (Capital Expenditure) investment (vehicles, charging/refuelling infrastructure, depot upgrades) is high 	<ul style="list-style-type: none"> • Energy transition plan's timeline • New business models • e-bus ecosystem: new actors, new roles 	<ul style="list-style-type: none"> • Range • Timetable • Trainings • Safety 	<ul style="list-style-type: none"> • Finding and retaining talent • New profiles, more skilled and diverse • Attract new passengers • Recover ridership

Source: UITP.

Furthermore, local decision makers, public transport authorities and operators are faced with a range of challenges when they introduce clean buses in municipality fleets:

- Higher initial investments as regards procurement of vehicle, developing infrastructure and depot adaptations.
- Planning of operations, including the the possible need to adjust routes due to shorter ranges, depot and/or opportunity charging, etc.
- Training and new skill development of staff accross all domains of urban bus transport.
- Questions and concerns for decision-making as well as cooperation among stakeholders.

In the following chapter of this report, concrete practices of and experiences of clean bus deployment and addressing the various tasks and challenges mentioned above are described in more detail.

3 IMPACTS OF CLEAN BUS DEPLOYMENT ON BUS PROCUREMENT AND OPERATIONS

3.1 Procurement and investments

As highlighted by interview partners in the context of this project, the selection of concrete solutions for the deployment of clean buses needs to consider various factors related to local conditions and requirements in terms of operation and infrastructure, as each local context differs from site to site in terms of operational requirements and local conditions (service area, topography, lines length, frequency of service, density of the population, etc.).

While this will shape the decision in favour of one or more clean bus technologies, other questions will be related to infrastructure and depot adaptation and development, availability of power capacity and/or fuel, charging and/or refuelling strategy, etc.

In the City of Amsterdam for example, GVB, its public transport operator, evaluated various technologies before investment and procurement decisions were taken, assessing the operational context and service needs against the capabilities of each technology to fulfil these requirements.

According to GVB, the most suitable solution was battery electric with opportunity charging via pantograph, as this solution fitted best into the city's bus network (comparable short length of routes) and is also based on already good experience in other Dutch cities. Overnight charging was discarded due to the city's needs for longer lines and wintertime conditions. Hydrogen and battery trolleybuses were as well considered; however, these technologies did not offer the performance required at the available timeline and budget in terms of implementation time, maturity of the technology, availability of green/renewable fuel, availability suppliers, etc. This example shows that each city must consider a variety of factors before deciding for a specific drive technology (or a mix of different technologies).

In addition, according to interview partners, ensuring favourable and enabling framework conditions for investments, and securing the support by local leaders and stakeholders from early stages is essential for the successful introduction of these technologies.

Challenges of clean bus deployment in Spain

"One problem for buses / routes that go from the centre to the outskirts or from the outskirts to other places, is that the batteries do not have the range they need. It is all still evolving – so there will be solutions, but for the moment, it is still a concern.

The main challenge for companies is the cost of building up a fleet of clean buses. Clean buses are attractive – but they are expensive. It only works with financial aids. José Antonio thinks that the transition would be very difficult if there were no financial aids. The companies mainly talk about this."

Source: Interview with trade union representative, Madrid

The deployment of clean buses and the decarbonisation of urban transport will require significant investment, but most importantly, careful analysis and thorough economic and operational feasibility studies. When entering these reflections, it is essential to make a clear distinction between CAPEX (capital expenditures) and OPEX (operational expenditures), both determining the final total costs of ownership (TOC) and thus the economic feasibility of the project.

According to an exemplary calculation published by VDV in 2020¹², even under favourable framework conditions (e.g., availability of connection to high voltage grid, and no need to build additional depots), the investments to deploy electric fleets are significantly higher.

Taking as a baseline a fleet of 115 Euro-6 buses, VDV estimates that investments for such an electric fleet will be at least threefold, based on the higher purchase costs of electric buses compared to diesel buses, the additional costs related to the construction of charging infrastructure, the connection to high voltage grid, the forecasted need to change the batteries after approx. 6-8 years, the need to purchase additional buses due to the lower range as compared to diesel buses, the adjustment of the routing concept, construction of new lines that allow for a higher range and extension/adaptation of depots and workshops.

This model calculation has been reviewed critically by experts involved in the research (mainly because it mixes one-time investment costs (charging infrastructure and adaption of depots and workshops) and recurrent operational costs and does not consider the expected reduction of running costs due to lower operational costs).

However, all stakeholders involved in the research agreed that the transition towards clean bus fleets requires strong public funding. Without public support provided by national and/or local governments it would not be possible to purchase clean vehicles and manage the adaptation of infrastructure to the needs and requirements of electric mobility as well as qualify operational and other personnel.

3.2 Operations

As mentioned above, in particular electric bus fleets require adjustments of operations and related processes. Depending on the selected charging strategy (opportunity charging, depot charging), the operational processes will need to be adapted. Also, the deployment of clean – here again particular electric – buses may – depending on the specific urban conditions – correspond to the redesign of lines and the construction of fast lanes for buses

¹² VDV 2020: Zwischenbilanz Elektrobusse im ÖPNV. Pressekonferenz zur VDV-Elektrobuskonferenz und Fachmesse, Berlin, 4 February 2020.

to increase the range of the bus as some stakeholders have mentioned in the context of the research.

Interviewees have also highlighted that electric fleets may require additional driving personnel for activities such as moving buses to the depot for depot charging (BVG Berlin).

Of course, the deployment of clean buses and new technology require further training of drivers and other staff (charging, maintenance, safety and security). This is discussed in more detail in the following chapters 5 and 6.

Several bus operators' representatives (GVB Amsterdam, RATP Paris and Sofia Public Bus Transport Company JSC) have highlighted a positive indirect element of the deployment of clean buses: As these are highly digitalized, this allows the gathering of real time data which is very helpful for traffic management control as well for traffic planning purposes.

3.3 Infrastructure and energy supply

As highlighted by the interviewees/operators, the transition to electric buses has significant impacts on infrastructure, as it requires the adjustment of existing or the development of new operational areas for charging and maintenance.

When it comes to energy supply, operators will have to secure access to the to the high-voltage grid and to install transformer stations to ensure the required power supply. It is worth mentioning that access to the high-voltage grid can be challenging, especially in densely populated inner-city areas.

Interviewees also highlighted the time factor for infrastructure and energy supply development. **Hamburger Hochbahn** and **Berliner Verkehrsbetriebe** (BVG) remarked that the administrative approval procedures for connecting a depot to the high voltage grid, transformer stations or a hydrogen facility may take several years.

As for **Paris**, the **RATP** expert interviewed in the context of the research highlighted the following experiences and needs when it comes to energy supply:

- *Connection of bus depots to electricity and biogas distribution grids:* RATP conducted studies with major energy operators to connect their grids and test feasibility, costs and timeframes. Partnership agreements were signed with operators of electricity and gas to facilitate the connection of bus depots of the public electricity grid for recharging electric buses on the RATP network.
- *Installation of an electricity transformer or compressor station:* The electricity or biogas provided cannot be used directly. It has to be transformed or compressed (biogas) for the use of the buses.

- *Charging and refuelling:* Each parking slot can be equipped with a charging station for overnight charging. As for biogas buses, when required, quick fueling stations were installed.

3.4 Maintenance

According to interview partners at **RATP Paris**, the following adjustment needs are related to the introduction of electric and biogas engine buses when it comes to depots and maintenance:

- *Upgrade bus depots to comply with regulations for the specific technology:* Here, the need to anticipate and closely cooperate on relevant issues related to energy, environment and safety are necessary, including the RATP, relevant government authorities, and the fire brigade in order to approve all measures related to depot development and refurbishment.



- *Adapt maintenance workshops:* An electric or biogas-fuelled bus has specific features. For example its batteries or gas tanks are/can be located primarily on the roof. This specific feature requires workshops that allow works at height, with the specific safety equipment, and fully compliant with the safety regulations. Staff assigned to bus maintenance are duly trained in new electric and biogas maintenance.



3.5 Safety

Electric powertrains imply a transition from mechanical components to electrical and electronic components, involving high voltage elements.

The application of these and other elements, together with the switch to new modes of production, affects working conditions and can also lead to new risks.

Electric drive technology also directly affects areas such as maintenance and repair workshops, servicing, and recycling and disposal. When performing maintenance tasks workshops at the depot need to comply with all necessary requirements to ensure safe working conditions for staff. This may result in the need to adapt engineering, repair and maintenance work activities in a way that specific activities such as working with high voltage or working at height are carried out in dedicated areas.

According to stakeholders involved in the research, the following elements need to be considered for the operation and maintenance of clean buses and here in particular electric buses:

- › When operating electric buses drivers and other staff groups need to understand and be aware of any safety impacts of battery breakdowns or depleted batteries.
- › Engineering and staff involved in maintenance, repair and charging need to be trained on safe handling and isolation of high voltage systems and the use of personal protection equipment.
- › High voltage certification is required and charging infrastructure requires repair and maintenance work carried out by trained electricians holding such certifications.
- › Mechanics and engineers need to be trained in safety procedures as well as how to handle emergency situations and respective procedures such as quarantining buses and supporting first responders access the site.
- › Safety procedures when working at height, to access batteries or pantographs, etc.
- › Relevant personal protection equipment, devices and tools
- › Safety impacts of hot work operations like welding, etc.
- › Automatic detection and extinction system: smoke detectors and sprinklers, fire alarm
- › Quarantine area for vehicles with battery issues / breakdown

To anticipate and avoid safety risks related to electric bus operation, depot and charging infrastructure, interviewees highlighted the need of measures related to the design of depots (security distance between buses or separate parking boxes, charging areas, installation of heat- and smoke detectors, etc.).

Interviewees also stressed the need of close and continuous exchange with bus suppliers, first responders (firefighters, police) for the development of safety and risk prevention measures as well as security and rescue guidelines.

A recent publication of UITP has listed key elements of a comprehensive and efficient safety and risk prevention strategy when deploying battery electric fleets.

Identifying and minimising risk potentials when deploying battery electric fleets

“Operating and handling battery buses requires the introduction of a completely new process to protect staff, passengers or contractors. This will imply the development of a comprehensive safety plan, before, during and after infrastructure works, including an ongoing method of charging and maintaining the buses that is only undertaken by certified personnel (and not drivers).

Operational safety procedures need to be implemented that help staff deal with issues that could be encountered - for instance what to do/who to contact in a vehicle Road and Transport Authority. For instance, in the case of road calls and/or breakdowns, develop proper response and towing.

Fire suppression system will need to be a different specification to the one fitted to a typical diesel vehicle - fire is a hazard due to electrical faults/battery thermal runaway.

Risk assessment should also consider arc flash, fall from height (workers on the platform), and battery end of life and proper disposal. Based on it, update of plans in case of fire, spills, hazardous materials, emergency response and any other facility plan need to be considered.

SAFETY REGULATIONS AND STANDARDS

Operating battery electric buses implies compliance with regulations and standards in order to first obtain the necessary permits and approvals to run operations, and second, to do so in a safely and healthy manner that protect staff and the general public from potential risks.

Common risks associated to bus operation are risk of accident, explosion, fire, electric shock/electrocution (staff) and must be minimised and duly mitigated. Risk contingency plans are mostly developed under the company strategy.”

Source: UITP: Factsheet Depot Adaptations for Clean Bus Technologies. Factsheet, January 2023, p. 22/23

4 IMPACT OF DECARBONISATION OF URBAN BUS TRANSPORT FROM THE PERSPECTIVE OF CLEAN BUS SUPPLIERS

The following section is included in this report in order to provide a brief picture of the clean bus deployment and decarbonisation from the perspective of clean bus suppliers and OEMs.

While the first section is based on data and information taken from the latest annual report of the ICCT on market developments in Europe, the second section is based on two interviews and exchange with clean bus suppliers / OEMS and one additional interview with the managing editor of the Sustainable Bus Journal.¹³

4.1 Suppliers of clean buses: Growing diversity

The bus market in Europe is less consolidated than the truck market. According to figures from the ICCT, in the truck sector, seven manufacturers comprised 97% of sales in 2021, while the top seven bus manufacturers were responsible for 74% of the sales. Four groups – Daimler Truck, Traton Group, Iveco N.V., and CAF – were responsible for 75% of all bus sales in 2021.¹⁴

¹³ <https://www.sustainable-bus.com/about-us/>

¹⁴ Figures according to International Council on Clean Transition: The rapid deployment of zero-emission buses in Europe, ICCT September 2022, p. 5-7.

Despite this high market share of all buses sold held by legacy manufacturers, they were only responsible for 45% of electric bus sales in 2021. Meanwhile, a significant share of the electric bus market in the EU-27 is being driven by the emergence of historically less-dominant manufacturers, particularly from China.

Of the 2,500 electric buses sold in the EU-27 in 2021, Chinese manufacturers were responsible for 17%, most notably Yutong, BYD, and Golden Dragon. The remaining 38% of bus sales were made up of smaller manufacturers (in descending order of total sales): VDL Bus & Coach, Irizar, Volvo trucks, Ebusco, SOR, Caetano Bus, Karsan, and Autosan.

BYD, the fourth largest manufacturer of zero-emission buses in the EU-27, has been ramping up their deployment of zero-emission buses in Europe. In 2019, they opened a manufacturing plant in Hungary and announced plans to expand in 2023. Since 2015, BYD has also been engaged with the UK-based Alexander Dennis Ltd. which has been steadily providing ZEBs to the British market. While CAF, Iveco Group N.V., and Daimler Truck, are still the top three ranked manufacturers of electric buses in terms of total sales, the increasing demand for ZEBs combined with the growing number of smaller manufacturers focusing solely on ZEB production risk these major manufacturers losing their foothold in the market.

Where smaller manufacturers have been ramping up their production of zero-emission buses, the major bus manufacturers in the EU-27 have been increasing investments into natural gas vehicles, accounting for 92% of all natural gas buses sold in 2021. Notably, Iveco Group N.V. and Traton Group were market leaders in natural gas sales, accounting for 71% of the market in the same year. Manufacturers falling outside these four major parent organizations were responsible for just 8% of total natural gas bus sales in 2021, over half of which came from the Italian based manufacturer, BredaMenarinibus.

Major bus suppliers have set notable targets for the rollout of zero-emission buses: In the Traton Group, MAN plans for half of their buses sold to be equipped with an electric drive by 2025 (which may include hybrid or hydrogen fuel cell vehicles), while Scania intends for electric vehicles to make up around 10% of their sales in the same year, albeit including trucks. Daimler aims to phase out the sale of internal combustion engine city buses from 2030 and plans to only offer a battery or hydrogen technology in every bus segment by then. As such, they do not plan to invest in technologies for buses to comply with the upcoming Euro VII emission standards for heavy-duty vehicles. Iveco has plans to release a range of fully electric buses by 2023.

Several manufacturers have also pledged to increase ZEB sales. Volvo Group intends to reduce the CO₂ emissions of its fleet by 40% by 2030 relative to 2019, although it is unclear the portion that will be met through electrification or efficiency improvements to its internal

combustion engine. Isuzu has pledged to strengthen their efforts to electrify buses to achieve carbon neutrality by 2050. TEMSA intends for half of their buses sold to be electric by 2025.

4.2 Impacts of clean bus production on local employment and economies from the supplier's perspective

The interviews held with representatives of suppliers of clean buses showed that, in particular, the deployment of electric buses has a huge impact on the manufacturer and suppliers of these technologies.

In terms of impacts on local economies and labour markets, the development and production of e-buses require staff with new qualifications and competences and companies need to invest in the necessary adjustment processes, including staff development, recruitment of specialists but also developing new cooperations along value chain with new suppliers.

The deployment of clean buses and in particular modernisation and move from diesel to electric bus fleets create new opportunities for expansion and additional activities.

The following general trends and challenges have been reported in the context of market developments and its impact on suppliers and workforces involved in the production and other related activities of clean buses.

Generally, the deployment of clean buses has created new opportunities for suppliers to expand production and services with positive effects on employment, business and career opportunities.

Moving to new drive technologies, in particular battery electric engines and powertrains require significant investments in skills developments of own staff as well as new types of cooperation along the supply chain.

Depending on the business model and core activities of suppliers and OEMs, the move towards clean technologies brings the opportunity to develop new activities, e.g. providing consultancy and support services for the operators of urban bus fleets during different stages of the deployment and the transformation process. Such services and expertise provision may include advice on specific clean technologies, infrastructure and charging requirements and development and/or services in depot adjustments/developments.

In this context suppliers and OEMs play also an important role in the initial and further training of staff in bus operating companies. Besides bus drivers, groups such as mechanics and electricians were highlighted but also general training on security and safety issues.

While the deployment of clean buses and in particular e-buses is regarded as offering new opportunities, representatives of bus producers and experts have also highlighted concerns and potentials risks.

Compared to combustion engines, electric power systems are less complex to develop and easier to maintain and repair. This opens new opportunities for new market entrants and competitors that already have gathered know-how and competences in the field of electric drives and battery-driven buses.

According to interview partners the bus market and in particular the market of e-buses production is very dynamic and overall has become more diverse in terms of suppliers, OEMs as well as component and service providers of key components of e-buses.

With new market entrants countries such as China, the market has become more competitive also, putting pressure on traditional bus manufacturers in Europe to reduce costs, for example by outsourcing of activities or strategic cooperations with partners in some cases.

According to expert assessments, new market entrants and a stronger competitive market has led to a situation where main legacy producer have developed new strategies of aiming at cost reductions and efficiency, in particular by outsourcing business areas and activities that are not regarded as “core competences” of business activities.

To sum up, the transition to clean buses and in particular the electrification of urban bus fleets supported by public funding has created new demands for clean buses and investments in charging and other infrastructures. This of course has been and still is a positive development from the perspective of bus producers, but also from the perspective of labour demands.

However, the change towards clean and particularly e-buses has also resulted in a growing diversity of market players and more competition based not only on quality but also on costs.

It remains to be seen how coming phases of consolidation will affect European producers and employment in Europe.

5 IMPACT ON EMPLOYMENT, STAFF AND SKILLS NEEDS

5.1 Employment impacts of clean bus deployment

Assessing the employment impact of clean bus deployment and the transition to clean bus fleets in urban public transport needs to consider several factors in different fields such as operation, infrastructure development or future projections of the number of passengers in urban public transport.

Therefore, it would be necessary to analyse different categories of workers and employees in relation to impacts of the transition towards clean buses. This not only includes direct employees (bus drivers, infrastructure and maintenance staff in particular) but also external workers that are engaged on local infrastructure and other construction work at local level.

So far, no quantitative studies on the impact of clean bus deployment but only projections at the level of individual urban public transport operators exists as well as surveys on future employment demands based on surveys of public transport associations. For example, the most recent survey on staff demands of the Association of German Transport Companies, VDV highlights the overlapping of several factors that contribute to an increase in labour demand in coming years:

“The goal is that by 2030, a third more buses and trains will be on the road than today and a quarter more freight traffic will run by rail. On the other hand, the shortage of skilled workers continues to grow: By 2030, around 80,000 employees (“baby boomers”) will retire in the entire sector - and bus and rail companies have a particularly high proportion of boomers, as the sector has hardly been able to recruit any new blood over the years due to political austerity measures. For the transport turnaround, 110,000 new employees must be hired by 2030.”¹⁵

The results of the VDV survey on employment demands in urban public transport corresponds to the experience of local operators that are confronted with severe driver shortage and a lack of attractiveness of jobs in maintenance and infrastructure development in urban public transport.

The employment challenge is happening in the context of clear expansion strategies in the context of decarbonisation and the political aim to expand local public transport massively.

¹⁵ VDV 2023: Personal und Fachkräftebedarf im ÖPNV. <https://www.vdv.de/personal-und-fachkraeftebedarf-im-oepnv.aspx>. Own translation.

According to an interview with a worker representative and trade union member at the BVG in Berlin, the number of passengers in local public transport must be approximately doubled by 2030. Otherwise, the climate targets set by politicians will probably not be achieved. This means that the entire BVG is facing a profound reorganisation of the current workforce of 15,000 including a significant increase of the number of employees due to more vehicles, expansion and modernisation of the network, new depots and workshops, etc.

RATP: Increased demand for specialists in the context of transition to electric fleets

The transition to electric fleets at RATP has resulted in additional demands for specialists in the field of engineering project management, IT and in other fields. During the last years, about 35 employees have been recruited for this purpose. According to the RATP management, it is important to retain such employees and their knowledge in the company also in a longer-term perspective in order to maintain the knowledge within the company for future transition and adaptation in operation and infrastructure. This is also important because there is a high demand and labour shortage of such specialists. This, however, would require providing them with a perspective within RATP that goes beyond the currently limited engagement for the transition period.

Source: Interview with RATP management representative

As regards different employment groups, quantitative data or estimations do not exist so far. However, the following qualitative assessments were made by interviewees as regards specific occupational and functional groups:

- › As highlighted by several urban public transport management representatives, electrification of the bus fleets requires at least in the medium term perspective less staff in **maintenance and workshops** because electric engines and powertrains are expected to require much less maintenance than mechanical ones¹⁶. However, for the current phase of transition it is necessary to master both technologies and therefore additional competent staff or competence (delivered by further training) is required.
- › The training needs, pay and working conditions of vehicle maintenance workers and technicians need to be taken into account irrespective of how these services are delivered. These services can sometimes be outsourced by transport operating company to the bus manufacturer or another company responsible for the maintenance of the fleet.

¹⁶ While this was the assessment of most interview partners, there were also reports from UPT experts stating that electric engines may also break down.

BVG: What happens to my job when all buses are electric?

“The employees do not have to worry about their job security. The company has promised that no one will be made redundant as a result of the transformation. Nevertheless, irritations remain: There is a rumour going around that we will have about 70 fewer people in the workshops in 2030. Just saying no one will be laid off is therefore not enough. People are wondering what will become of their jobs when only e-buses are running. Will they still work as locksmiths or mechatronic technicians? Or will they only be good enough for unskilled work, which will then also be paid less? Until now, there was no one to answer these questions before the joint project for ecological transformation at BVG was launched.”

Source: Interview with BVG workers representative

- › According to interview partners, the current transition to clean buses involves significant **engineering and planning expertise** in infrastructure, charging and depot works. As this often is done inhouse, management representatives report an increased recruitment of engineers, planners and specialists as well as project managers in this field.
- › An extended demand of staff has also been reported in the field of **procurement and contract management**, also due to the increasing diversity of suppliers and required expertise in different clean bus technologies.

To summarise, the deployment of clean buses is taking place in a broader context of employment expansion in urban bus transport and both trends are difficult to separate respective employment effects. However, related to clean bus technologies, additional infrastructure development and construction works, it is clear that the deployment of clean buses relates to employment increase rather than decrease. It should also be noted that employment growth takes place for groups at medium and higher qualification level, i.e. electric and energy engineering, technicians and IT specialists.

5.2 Current skillset and new emerging skill needs

An important result of our research and interviews with management and trade unions representatives is that the deployment of clean buses in connection with changes in infrastructure and maintenance will make urban bus transport more complex and demanding from the perspective of individual workers and employees across occupational profiles in the different domains.

This means that skill requirements both in the field of fundamental, technological, and soft skills will increase and there will be the need of upskilling and continuous refreshment of the skill base in most occupations, but in those occupations that already today require a higher qualification, e.g. maintenance technicians, infrastructure planners and engineers, and managerial positions.

Upskilling needs in the context of clean bus deployment

“For mechanics, many things change. They must be much more specialised. The occupational profile of mechanics changes a lot. Either they receive qualifications or new staff with different qualifications will be hired.”

Source: Interview with trade union representative, Madrid

New skill needs for the occupational groups mentioned above as well as operational staff such as bus drivers according to interviewees are also emerging in the field of ICT skills as well as the need to improve transversal skills such as problem solving, handling emergencies, team-working and communication skills.

Interviewees have also highlighted the specificity of the current situation of transition, i.e., the co-existence of legacy as well as new technologies. This implies the need to maintain knowledge as well as openness for the acquisition of new and additional expertise and knowledge by urban public transport staff in operation, infrastructure and maintenance.

Thus, and as a general trend, it emerges that work in the domains of urban bus transport is becoming more demanding from the perspective of different occupational groups. This is also illustrated by the fact that interviewees have referred to the trend that workers carry out additional tasks, e.g. bus drivers becoming engaged in charging the buses at the depot.¹⁷

5.3 New emerging job/occupational profiles

In general, interviewees reported that existing occupational profiles in the context of clean bus deployment are adapted to the requirements of the new technologies rather than new profiles being introduced.

Some interviewees also referred to the development of new job or task profiles to accompany and facilitate the transition towards clean bus fleets. Such an example has been the nomination of ‘caretakers’ in depots by *Hamburger Hochbahn*:

Hamburger Hochbahn: ‘Caretakers’

In order to facilitate the introduction of new tasks and to help employees handling new situations and providing answers and advice to bus drivers and maintenance staff, Hamburger Hochbahn created the position of ‘Caretakers’. “Caretakers” are experienced staff or former bus drivers supervising all processes related to e-buses, e.g. the process of recharging or monitoring the range achieved by those buses in real

¹⁷ As mentioned by some experts the impact might also be different depending on the bus drivers task description. There are companies where the refuelling and/or charging via plug are done by certified trained staff; however, in others these tasks are performed by the driver.

traffic. Furthermore, they provide support and advice to colleagues who are not that experienced on operational issues.

Source: Interview with management representative, Hamburger Hochbahn

In some operators in urban public transport, new specialised positions such as charging staff and technicians have been created at depots. In other cases, and related to specific new emerging needs, employees that formerly were bus drivers have been re-engaged to drive empty buses to and from depots for charging.

Interviewees also referred to new emerging profiles in the field of electricity and energy management and planning, such as 'system integrators' in the field of bus technologies and maintenance to identify the sources of malfunctions, 'charging process technicians' and new or adjusted emerging profiles in the field of electric infrastructure maintenance, engineering.

Generally, according to both management and trade union interviewees, there is also an increasing demand for specialists in the field of IT in terms of monitoring and evaluating the increased amount of data that is gathered in the context of electrification and digitalisation of bus technology. Here, there are of course interlinkages between clean buses and other major technological trends such as predictive maintenance systems, BIM (Building Information Modelling) in infrastructure development¹⁸ or digital control centres.

5.4 Training needs and reskilling

The deployment of clean buses results in major changes in the operation of public bus transport as well as supportive activities in the maintenance of buses, infrastructure and depots.¹⁹ Therefore, further training needs and the acquisition of new skills and knowledge is required in all domains of urban bus transport according to stakeholders involved in the research.

As regards the most numerous groups of workers, i.e. bus drivers, interviewees referred to the experience that further training for driving a clean bus does not differ much from the previous training that is provided for drivers when new buses are deployed. Driving an

¹⁸ For example, Hamburger Hochbahn is a partner in a BIM consortium that has been established in the City of Hamburg.

¹⁹ On the adaptation of depots and related training needs see also the UITP Factsheet "Depot Adaptations for Clean Bus Technologies", January 2023. <https://www.uitp.org/publications/depot-adaptations-for-clean-bus-technologies/>

electric bus is different to diesel or gas fuelled buses in terms of acceleration and other aspects of the driving experience and some bus drivers may find the idea of driving an electric bus stressful. Therefore, most transport operators – often in cooperation with the bus suppliers – have developed short training courses for driving electric buses that address issues such as how to drive an electric bus and how to do this as efficiently as possible, charging the bus and dealing with high voltage elements, learning how the dashboard works and other things.

Interviewees from different operators in urban public transport have highlighted that eco-driving has already been an issue of drivers training before the introduction of clean buses. However, this topic has become more important to make the most of the battery range. This makes efficient driving and eco-driving awareness more important than in the past.

EMT Madrid: Safety training for bus drivers

“For 4-5 years already, bus drivers receive special “fire safety” trainings. Trainings are not limited to a specific technology but encompass general fire safety and special issues related to buses fuelled with gas, electricity or other alternative fuels.”

Source: Interview with trade union representative

High voltage training has also been highlighted as an important element of further training for maintenance personnel in depots and workshops. Working with electric buses, high battery capacity and therefore high voltage can be very dangerous. Therefore, this training that often is carried out in cooperation with the bus suppliers, is an essential part further training when electric buses are introduced.

Generally, interviewees highlighted that the need to adjust and further develop skills and knowledge is most evident in the workshops and depots, i.e. the maintenance, repair and charging of electric buses. For mechanics and technicians, the introduction of clean buses requires further specialisation and upskilling courses and training. In cases where very specialised activities are carried out in-house, there is also the need to hire additional qualified personnel.

However, it has been stated by stakeholders that also operational staff and personnel engaged in traffic management or scheduling need to develop new skills and adapt their knowledge. The need to understand the constraint of the range of electric vehicles and to monitor battery state of charge and state of health to minimise breakdowns and other inconveniences from depleted batteries. For instance, dispatchers and floor managers need to understand state of charge for buses on the road or being selected for a pull-out of operation.

When it comes to drivers, stakeholders highlighted in particular the need of (further) training for the new tasks and the handling of the vehicle type, for instance, on safety

aspects as well as energy efficiency driving training will be required, especially when it comes to acceleration and braking.

All in all, further training and qualification in the context of the introduction of clean buses according to stakeholder interviews with management as well as workers representatives works quite well and smoothly. This positive assessment is also related to a good functioning social dialogue between the social partners at workplace and company level in operators of urban public transport analysed in the context of this research. Further details of this are presented and discussed in the chapter 7 below.

6 IMPACT ON WORK ENVIRONMENTS AND WORKING CONDITIONS

6.1 The driver perspective

In the context of the research, some interviews and exchange were carried out with bus drivers from Sweden, the UK and Spain. According to their experience and assessments, driving a low- or zero-emissions bus is a positive experience overall disregarding the technology, and the deployment of clean buses follows in general the same routine as in other fleet renewal processes.

However, drivers and worker representatives also reported about issues and problems related for example to ergonomics (e.g. adjusting steering wheels), functionality and driver friendliness of dashboards or heating/cooling systems when buses from new suppliers are deployed. Such issues however are not necessarily related to the technology but generally to the growing diversity of bus types, suppliers as well as costs and quality.



In relation to electric buses, it was also highlighted by some drivers and worker representatives that driving an electric bus in extreme cold weather might be challenging due to potential sliding issues. This has created cases in Sweden or Finland for example where certain bus stops or routes could not be served in case of icy roads.

From the perspective of management representatives, young drivers in general tend to be more interested in new technologies, including new design elements or functionalities. By contrast, older drivers may find it more difficult and uncomfortable to move from decades of riding diesel buses to new technologies such as electric buses. To tackle this, some company representatives reported that new technology buses are tested or driven by younger drivers.

To conclude, bus drivers not experienced with electric buses can experience range anxiety until they get familiar with the technology. Eco-driving trainings are in this sense very relevant to first help drivers confident on the technology and second optimise energy consumption.

When it comes to the design, management representatives also reported that for a smooth transition from diesel to electric or hydrogen buses the practice has been that the driver cabin should contain as few changes as possible from the perspective of the driver.

Generally, both management and trade unions have stressed that it is important to inform or even involve drivers or their representatives as early as possible in the planning and decisions about the procurement of new buses and technologies.

To conclude, the interviews and exchange carried out in the context of the project showed that in relation to drivers' tasks besides driving (e.g., fuelling, preparation of the bus, checking oil levels etc.) the situation can differ considerably between countries and operators. While in some cases drivers may be supported by maintenance staff, they must carry out such tasks in other transport companies. When it comes to the transition to clean buses, for example electric buses, there are cases where drivers have the task to plug the bus themselves after the working day in the depot while in other companies this is carried out by certified trained staff.

6.2 Work organisation and working time

According to interviewees, the impact of clean bus deployment on work organisation and working time is marginal. However, at least in relation to electric buses there are some changes in the organisational routine related to driving: For the driver, opportunity charging inevitable leads to breaks or interruptions. According to management representatives of companies and operators of urban public transport there are also considerations to change the company practice of spending so-called "turnaround breaks" (i.e. at the end of a route) on the bus because e-buses are such a large investment.

According to interview partners both from management and trade unions, the existing agreements and arrangements of work organisation and working time work well also in relation to the transition towards clean fleets.

However, when it comes to electric buses, the shorter range may result in the need to change some of the work organisation and working time routine as the examples above on opportunity charging and breaks show.

6.3 Working conditions and work environment

According to stakeholders and social partners the introduction of clean buses has not resulted in significant challenges or negative impacts on working conditions and the work environment. Both management and trade unions representatives agree that the renewal of fleets and the deployment of clean buses is contributing to improvements of working conditions.

“The renewal of the vehicle fleet leads to an improvement of working conditions. Working with a new vehicle and with more advanced technologies makes the performance of the task easier and prevents workplace accidents both related to the road network and to attacks by customers against the driver (as new vehicles all have the drivers’ seat isolated from the customers). Therefore, the workload is less tiring and stressful.”

Source: Interview with Italian trade union representative

Interviewees however have stressed that the deployment of clean technologies and the green transition in bus transport is happening at the same time as the digital and automation transition in urban transport. Both are triggering a larger transformation process that is characterised by opportunities and risks for working conditions and the workplace environment: The fast process of automated driving²⁰, the emergence of new modes of mobility services such as on-demand mini-buses or taxis managed via online platforms.

Clean and electric buses are a part of a parallel green and digital transition in mobility. Here, trade union representatives have highlighted the need to maintain the overall good working conditions in the urban public transport sector and address new emerging issues,

²⁰ Interviewees in Finland and Germany have referred in this context of pilot projects with automated shuttle buses in the Harbour area of Hamburg and the launch of robot busses in regular public transport in Tampere.

for example the increased potentials for performance monitoring and surveillance at work or the gathering of personnel data.²¹

Trade union representatives in Spain and Italy as well as Germany highlighted a general challenge of working conditions in urban public bus transport that not directly is related to the deployment of clean buses. Public transport companies have huge problems to recruit because the profession is not attractive.

What adds to the problem is that a large share of drivers will retire in the coming years and the access to the occupation is restricted in terms of age (e.g. 24 years in Spain). To cope with the driver shortage, companies in countries such as Spain are hiring drivers from non-EU countries (e.g. Latin America).

However, according to trade union representatives their qualifications are not fully recognised, and they are paid less which is strongly opposed by trade unions. Trade unions in Spain as well as Italy are also concerned about a general trend of a worsening of working conditions and pay for younger workers, despite being better educated and qualified than in the past.

Thus, according to stakeholders in urban public transport and trade unions, there is an urgent need to for companies to make working conditions more attractive to the younger generation, especially targeting women, in order not only to cope with current labour shortage but also the expected expansion of urban public transport as a key element of the green transition goals.

6.4 Health and safety

As mentioned above, stakeholders and social partners have stressed that in line with existing health and safety legislation effective and sufficient safety measures need to be applied in accordance to the law.

Drivers as well as workers in depots and workshops need to be informed and properly trained, as well as to be well aware of potential risks of working with high-voltage, and how to behave in case of incidents like thermal runaways.

²¹ See here also the results of the joint UITP and ETF project on the impact of digitalisation on urban public transport: Voss, Eckhard; Vitols, Katrin 2020: Digital Transformation and Social Dialogue in Urban Public Transport. Final Report for UITP and ETF, Brussels. <https://cms.uitp.org/wp/wp-content/uploads/2020/10/Final-report-Digital-transformation-and-social-dialogue-in-urban-public-transport-EN.pdf>

Occupational health and safety risks of electromobility and preventive measures according to the European Agency for Safety and Health at Work

Electric mobility brings with it a variety of OSH risks which must be considered. Yet, the market for electrically powered vehicles is only small. Consequently, experience gained so far is correspondingly limited and estimations on future developments and potentially associated hazards are vague. At the same time however, the situation offers the chance for the course to be set for adequate consideration to be given to OSH issues from the outset. In this regard, OSH engagement faces three main areas of responsibility:

- First, new developments must be closely monitored to permit a timely response to emerging risks.
- Second, qualification, training and ongoing education of workers must be stepped up in all areas along the life cycle of electric vehicles.
- Third, the existing OSH requirements must be applied diligently and refined in consideration of new technical expertise. New standards should preferably be established Europe-wide or even on a global scale since the automotive industry is largely global.

Together, these activities form the basis of safe work with electric vehicles at all workplaces throughout their life cycle.

Source: European Agency for Safety and Health at Work: *Electromobility*.
<https://oshwiki.osha.europa.eu/en/themes/electromobility>.

Representatives of the Swedish trade unions have highlighted several risks related to electric buses both in case of traffic accidents, maintenance works (e.g. damaging batteries when changing tyres or change of brake pads) or in the context of overheating and the risk of self-combust of lithium-ion batteries during the charging process, referring also to incidents in Germany in 2021.²²

²² See also the News about a fire in Stuttgart, published on 8 October 2021: "Charging electric bus could have triggered a major fire in Stuttgart bus depot". <https://marketresearchtelecast.com/charging-electric-bus-could-have-triggered-a-major-fire-in-stuttgart-bus-depot/174355/>. Earlier, fires have broken out at bus depots in Hanover and Düsseldorf, whereby in both cases it was not possible to detect the exact cause of the fire and whether it was an e-bus or a diesel bus. See: "Depotbrände verunsichern Verkehrsbetriebe", article published 21 October 2021: <https://www.tagesschau.de/wirtschaft/technologie/elektrobusse-depotbrand-101.html> and "Wenn E-Fahrzeuge in Flammen stehen", an article published on 1 October 2021 <https://www.swr.de/swraktuell/baden-wuerttemberg/brandgefahr-e-autos-100.html>. All accessed in May 2023.

Therefore, according to the trade unions in Sweden and other countries it is essential that the deployment of clean buses is accompanied by measures of safety training, awareness raising amongst workers and special trainings for workers' health and safety.

Trade unions as well as company representatives have also highlighted that there is a need for close cooperation with specialised institutes and local firefighting and rescue/emergency services to identifying potential risks and addressing them by appropriate risk reduction measures in case of accidents or hazards. Such measures should include risk-reduction measures by design when planning charging depots, active and passive fire protection systems, guidance for maintenance and cleaning procedures and training plans of firefighters, rescue personnel as well as bus drivers and workers in depots and workshops.

7 THE ROLE OF SOCIAL DIALOGUE IN THE CONTEXT OF CLEAN BUS DEPLOYMENT

In the following sections, main results as well as examples of good practices in relation to the role of social dialogue in the context of clean bus deployment are presented and discussed. The chapter is structured as follows:

Section 7.1 sheds a light on similarities but also differences between the ten countries addressed in this project (Bulgaria, Denmark, Germany, Finland, France, Italy, the Netherlands, Spain, Sweden and UK). This relates mainly to organisational strength of social partners at local/company and national level, the role of collective bargaining and other forms of social dialogue and forms of workplace workers participation as they are regulated in the different legal and voluntary frameworks at national level.

Section 7.2. provides an overview of the overall picture, i.e. how important is the issue of clean bus deployment for social partners and social dialogue and how it has been addressed in local and national practices so far.

Section 7.3 highlights issues of joint concern of employers and employees / trade unions in relation to the deployment of clean buses. This aspect seems important as the specific topic of our research needs to be contextualised in a broader context of transition, major trends in the labour market and other issues.

Section 7.4 highlights experiences and good practices for the deployment of clean buses, in relation to those topics that have been discussed in chapters 5 and 6 of this report. The chapter also reflects different phases of clean bus deployment, from anticipation and early planning to implementation and to continuous monitoring and evaluation.

7.1 Clean bus deployment is not a dedicated topic of social dialogue

The analysis of experiences of clean bus deployment in the ten countries and operators included in this research shows that the issues have not been addressed as such by social dialogue but rather in a broader context.

These are the energy transition and the digital transformation process, and their impact on public transport financing, employment and skills needs, changes in working conditions and occupational profiles, as well as issues related to data privacy .

According to the stakeholders consulted in this research, clean bus deployment has been and is addressed in the context of existing routine of information and consultation processes, negotiations and agreements for the introduction of new technologies, fleet renewal, training or changes in work organisation. The topic is therefore embedded in 'normal' procedures of interaction of social partners at company and workplace level.

"There are no real problems in terms of working time or working conditions. It is all regulated by collective bargaining agreements in Spain. Since most bus operators are large companies, the workers are covered by collective bargaining. Qualification is also regulated in collective bargaining. Staff receive the training they need if their tasks are changing. In some cases, they might also earn more money once they are more qualified or more specialised. It is all included in the agreements. For 4-5 years already, e-bus drivers also get special fire safety trainings. Trainings do not focus on one special technology but encompass general fire safety and special issues related to "gas buses" or electric buses."

Source: Interview with trade union representative in Spain

According to the knowledge of interviewees and the trade unions involved, clean bus deployment so far has not resulted in any impacts that would need to be addressed in the context of collective bargaining such as workforce reduction (e.g. in maintenance, workshops), changes in wage group structures or other significant changes. In this context the deployment of clean buses is gradually evolving over a longer period of time, whereby parts of the bus fleet are renewed every 12-15 years.

However, interview partners highlighted the close linkage of the deployment of clean buses – here in particular electric buses – and the introduction of other new technological changes, e.g. digital real time traffic control, stronger automation of processes, the development of new mobility services for customers, etc. in the context of the twin energy and digital transition.

And it is in this context where social dialogue in urban public transport has made some remarkable achievements of good practices that touch upon joint interests of employers and employees. This is described and presented in the following sections.

7.2 Joint interests and issues of concern of employers and employees in the context of clean bus deployment

A key topic of joint interest of workers, bus transport operators and social partners at national level is financing. As highlighted in all interviews, the energy transition and the massive deployment of clean buses will only be possible if there is sufficient public financing.

“Municipalities as main public transport operators and trade unions are allies when it comes to lobbying the government for sufficient financing of clean bus deployment and the necessary investments in vehicles, infrastructure and depots.”

Source: Interview with Bulgarian trade union representative and management representative of EAD, the public transport provider in Sofia.

In this context, trade unions in different countries referred also to joint initiatives with employers in favour of a stable and long-term financial commitment for public funding for public transport in urban as well as other areas. In Bulgaria for example a memorandum of understanding of the trade union FTTUB and the municipalities was signed in 2014, followed by a joint agreement in 2019, highlighting a stable financial basis and high standards of training as key conditions for the transition towards green and sustainable local public transport. Similar activities have been reported in Spain and most of the other countries covered by the research.

“The main challenge for companies is the cost of building up a fleet of clean buses. Clean buses are attractive – but they are expensive. It only works with financial aids. This topic is also very important for the employers / bus companies. There is active dialogue between unions and employers on new technologies – very often it is because the employers need the support / backing of the unions for putting pressure on the administration (financing issues).”

Source: Interview with trade union representative in Spain

7.3 Social dialogue provides added value at different level and different stages in time

In the context of the research it became evident that social dialogue contributes to building trust and confidence amongst workers in time of transformation, initiates suitable measures for adaptation of skills and qualifications both in the field of working conditions and work organisation, and is a forum of exchange and development of joint understanding about general challenges and needs for clean bus deployment, including planning,

investments and procurement.²³

According to management as well as trade union representatives, the deployment of clean buses differs from 'normal' fleet renewal processes. While in the past, fleets were renewed because the life cycle of a bus has ended, the decision to invest in clean buses often follows the political decision to decarbonise urban bus transport. For the workers in urban public transport, according to interview partners, this has sometimes resulted in irritations and a feeling of insecurity as the following quote illustrates:

"The mood at the depots was correspondingly bad. Amongst workers and drivers, there was a lot of resentment: 'This is crap,' was the tenor of many. Electric instead of diesel – 'What's the point? Our diesel buses are cost-effective and reliable.' The mood was very difficult also for the management. Some workers even think we're going to have an eco-dictatorship here now."

Source: Interview with a workers' representatives at BVG in Germany

An important conclusion of this research is that the deployment of clean buses as a major part of a wider transformation process will only be successful if workers and their representative organisations are on board and committed. As one management representative put it, *"If decisions are only made top-down and employees are presented with accomplished facts, the risk is high that projects fail or will not be implemented successfully."*

Therefore, anticipation, early involvement and gaining the active support of workers' representatives and trade unions is essential. Therefore, a continuous dialogue, starting as early as possible between management and labour is key in order to address concerns and fears of workers and employees. It also shows that management is taking care and to receive their support.

The way such dialogue is organised and implemented may differ from one country to another, depending on the national as well as local framework conditions and cultures of social dialogue. In our research, we found that in most urban public transport operators, there are arrangements in place of continuous exchange and dialogue, for example of operators of urban public transport in Bulgaria, Finland, Sweden as well as in France and Spain. However, some trade unions also commented that establishing a joint position on the anticipation of change either has been a more difficult process (e.g. Germany) or is not

²³ According to the interviews with social partners and examples of practices at different level of social dialogue and collective bargaining (nationwide sector agreements, company-wide social dialogue and workplace/occupation related measures).

regarded as sufficient when it comes to the usual practice of operators of urban public transport (UK, Italy).

Here, national collective agreements providing for a sector-wide practice have been very helpful. A good example for this is the case of Finland, where a sector-wide agreement of the social partners in urban public transport on managing the twin transition of greening/decarbonisation and digitalisation was concluded in March 2023. With this agreement, a trade unions and employers' working group was formed to successfully manage the transition as well as other challenges, the UPT sector is facing:

Collective Bargaining Agreement between the Employers' Federation of Road Transport (ALT) and the Transport Workers' Union (AKT) 2023

In the 2023 collective agreement, a new working group was formed:

- The objective is to develop the bus industry strategically and long-term while considering the needs and perspectives of both the Employers' Federation of Road Transport (ALT) and the Transport Workers' Union (AKT) during the term of new collective agreement (3 March 2023 – 31 January 2025).
- The parties recognize that the energy transition, blurring of industry boundaries, changes in customer needs, digitalization, automation, robotics, artificial intelligence and regulation are powerfully reshaping bus industry work and workplaces.
- The working group will examine the changing tasks and overall structures in the bus industry, as well as the resulting new skill requirements, changes in work practices, diversification of the workplace and new forms of work.
- Together with industry companies and personnel, the parties aim to develop a shared understanding of the effects of various change factors on workplaces and collective bargaining.
- The parties will create a shared action plan that improves the attractiveness of the bus industry, especially among young people.

Source: Summary of the 2023 agreement provided by ALT and AKT

Another example of good practice of early anticipation, exchange of views and continuous dialogue is Bulgaria: Here the trade union FTTUB reported about monthly meetings with the municipality and public transport services provider of Sofia to exchange on policy developments and progress of managing the transition process, including clean bus deployment.

To sum up, this kind of exchange according to interview partners is very important to develop a joint understanding not only on needs in the context of clean bus deployment but also on (political) framework conditions, including national or local (financial) constrains.

7.4 Similarities and differences of framework conditions and practices of social dialogue

Public transport is one sector where both employers as well as workers are likely to be organised in employer organisations and trade unions and represented in firm and effective structures of social dialogue. This attribute characterises all countries that have been addressed in this research from Bulgaria to France and from Spain and Italy to Sweden. All countries are characterised but comparatively high membership rates in trade unions as well as strong employer organisations.

However, differences and diversity exist in relation to the role of different levels of collective bargaining and social dialogue, i.e., whether there are nationwide sectoral collective negotiations and agreements (as in Sweden, Denmark, Finland, France, Spain and Italy) or whether collective bargaining and social dialogue is more important at the territorial or local level as in Bulgaria or Germany. There are also differences when it comes to the linkage between the different levels of bargaining and negotiations that exist in all ten countries: Which functional role does each level play? What is the most important level?

Besides the differences in the various levels of bargaining, negotiations on salary and working conditions, there are differences between countries in the role and influence of social dialogue. Whereas in some countries collective agreements play the most important role of regulating employment and work (as in the Nordic countries), there are legal frameworks of workers participation and even of co-determination of shop stewards, trade union committees or works councils at the workplace and company level when it comes to issues such health and safety, the introduction of new work organisation measures, staff schedules or rosters or further training plans.

These differences are important because they explain differences in practices of social dialogue not only from the perspective of inter country comparison but also intra country diversity: In strongly regionalised countries such as Italy and Germany with several hundreds of local public transport operators it makes a significant difference if there is a national collective agreement (as in Italy) or not (as in Germany).

However, despite these differences between countries and even within countries in relation to social dialogue and its outcomes in relation to clean bus deployment, an important result of our research is that in all cases, trade unions, works councils and other types of workers representation bodies are actively involved in shaping employment and working conditions.

Therefore, in terms of social dialogue, the urban public transport sector can be regarded as a showcase of the added value of social dialogue in relation to addressing issues in the context of clean bus deployment (and beyond). This is illustrated in the following sections.

7.4.1 Planning and investment decisions

In line with national traditions and legal frameworks, the role of social dialogue and the involvement of workers and trade unions varies significantly in specific planning and investment decisions in certain types of clean bus technologies, procurement of new buses and investments in infrastructure and depots.

The main reason for this is related to legal labour law provisions as well as national cultures of social dialogue. While in European law there is no obligation of employers to inform, consult or even negotiate on economic/financial decisions, national practices and cultures of social dialogue may go beyond that.

This is closely related to the representation of workers and employees at the level of supervisory or management boards, which exists in most European countries including those countries covered in this research, except for Bulgaria, the UK and Italy.²⁴

In this sense, it should also be noted that irrespectively of the existence of workers representation at management board level of UPT operators and companies, social dialogue and consultation on investment decisions and planning of clean bus deployment are a common feature of the different national and urban examples studied. It could be in monthly meetings and informal exchange as in the case of Bulgaria, strong positions of staff representation councils as in Germany or guaranteed by binding sector-wide collective agreements as in Sweden or Italy.

In Sweden, there is a strong involvement of workers representatives / shop stewards that is guaranteed by the binding sectoral collective agreement. Shop stewards are actively involved in the planning and investments decisions considered by urban public transport operators”.

“In Italy, there is a single national agreement applied by all companies that carry out urban public transport services, the CCNL. The agreement regulates basic standards of employment and work (e.g., working time) for the whole sector. However, it delegates to company level actors and bargaining everything that is related to the organisation of work and the distribution of productivity as well as decisions on issues such as fleet renewal or investments as this fall within the contractual competence of the company. In companies with a high rate of unionisation, the workers’ representatives at least by consultation are involved in matters such as the purchase of new buses.”

²⁴ See the overview of national systems at the website on workers’ representation in the EU: <https://www.worker-participation.eu/National-Industrial-Relations/Across-Europe/Board-level-Representation2>.

Source: Interviews with representatives of trade union representatives, in Sweden and Italy

Besides formalised social dialogue and information and consultation practices, interview partners from the management of urban public transport operators have highlighted that it is important to involve staff representatives at an early stage when it comes to decisions of ordering new buses or when taking decisions about the design of the driver cabin for example.

The same relates to changes in work organisation in the context of the extension or building of new depots. According to management representatives, early consultation and dialogue with bus drivers and depot staff provides trust and confidence in the changes and contributes positively to the quality and effectiveness of decisions and implementation process.

7.4.2 Added value during the deployment of clean buses

According to both management and labour representatives, social dialogue, consultation and negotiations at the level of the whole undertaking as well as at the level of different branches and workplaces provides clear added value for the management and implement of transformation process such as clean bus deployment.

According to interviewees, social dialogue and good relations between management and staff contributes to a joint understanding of the reasons for change and transformation and strengthens the confidence and trust in planned measures and practices.

“At the beginning, when first clean buses were ordered and measures planned, the staff and staff councils have not been sufficiently involved in the process. This has resulted in mistrust and problems in relationship between management and workers with a negative effect on implementing plans, but now we have initiated an intensive dialogue so that the ideas, but also the concerns and fears of the employees are not forgotten.”

Source: Interview with staff representative and trade union member at BVG, Germany.

Trade unions and workers representatives in urban public transport companies are also active promoters of practices that support workers with the acquisition of new required skills and knowledges and further training in the context of the introduction of new technologies.

In all national and company level cases studied by the research project, local unions, shop stewards or works councils are actively involved in the adjustments of training plans, the development of new occupational profiles or positions, and their implementation. The lively

dialogue on skills and training is also valued positively by the management, not only because it favours active commitment and support amongst the staff, but also because training and career development becomes more important in a situation of accelerated technological, social and demographic change, and a tight labour market and labour shortage.

As the following quote illustrates, trade unions and workers representatives also highlight challenges and risks in this context.

“As far as maintenance is concerned, for a certain period in which the vehicles are under warranty, it does not impact on the staff within the company because maintenance is carried out by the supplier of new buses. Subsequently, targeted training is not carried out for maintenance technicians and mechanics. There is the fear that the introduction of these new technologies could lead to a problem of occupational sustainability for maintenance workers and mechanics in general.”

Source: Interview with representative of trade union, Italy

Stakeholders representing workers and management in urban transport operations have highlighted the added value of social dialogue in relation to develop adequate measures of new skills acquisition, of managing change processes in work organisation work routines and – if necessary – in the field of work schedules. Similarly, measures in the field of health and safety and related risk presentation and awareness raising measures were highlighted as an important field where social dialogue and consultation provided added value.

In this context, trade union stakeholders not only stressed the importance of health and safety representatives, but also own initiatives taken in the context of risk identification and the development of risk prevention measures.

For example, the Swedish trade unions have initiated own measures of training and awareness raising activities for workers’ representatives in local and urban transport on risks and preventive measures in relation to battery or gas buses.

In Finland, the social partners have been actively addressing the issue of health and safety in the workplace and related risk prevention link measures. They have developed an interactive online tool that supports local social partners at company level with the elaboration of an effective risk assessment in relation to battery and gas buses.²⁵

At BVG Berlin, staff representatives supported by the trade union have initiated several activities to

accompany the change processes in operation as well as infrastructure in maintenance in the company:

BVG workers representatives are involved in a project that aims at improving workers involvement in the twin transformation process of digitalisation and decarbonisation in the public transport. The project is financed by the German trade union related Hans-Boeckler Foundation and has already resulted in concrete improvements of practices and processes of improving social dialogue with the management, including concrete ideas to make sure that all 14,800 BVG workers and employee are taken on board, leaving nobody behind.

Initiatives of the BVG staff council to consult staff on the transformation process

“The staff councils are now taking the initiative themselves much more frequently. For example, they have vehemently lobbied for a transformation workshop of the ver.di trade union shop stewards. There are enough questions from colleagues - now the shop stewards will be better able to answer them. Furthermore, a small travelling exhibition will go on tour to the depots and introduce the employees to the topic of e-mobility at BVG in the break rooms – also an idea of the staff council.”

²⁵ This tool is available on the website of the European Agency for Safety and Health at Work and has been updated in 2022 for electric and gas buses. See: <https://oiraproject.eu/>

Source: Hans-Boeckler Foundation article on the project "The role of company level workers participation in the social and ecological transformation of companies in the mobility sector". Summary and own translation of an article in 'Die Mitbestimmung 04/2022.

As a further concrete result of the project there has been the agreement with the company's management to elaborate a joint concept for more information and involvement of the BVG staff in the ecological transformation process.

This example illustrates that though social dialogue in public transport companies is working well and is efficient, there still are needs to improve outcomes that address still existing challenges, e.g. leaving no worker or employee alone and having the ambition to get everybody on board as a motivated actor in the transformation process.

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions from the research perspective

The deployment of clean buses in urban public transport is a major element of the fight against climate change, the implementation of the Green Deal and the goals of the sustainable and smart mobility strategy.

This research has shown that since the adoption of the Clean Vehicles Directive 2019, urban public transport operators and major European cities have made remarkable progress in the deployment of clean bus fleets. They also have set targets that are more ambitious than those set by the Directive. Though still a small part of urban bus fleets, the deployment has gained speed in recent years and has moved from pilot and testing phases to more maturity and proficiency, making available a significant amount of use cases, knowledge and expertise.

From the workers perspective, the deployment of clean buses appears to be not particularly disruptive and could even be seen as one further step in the modernisation of bus fleets and the application of new, more resource efficient and greener technologies.

Certainly, this is true to a good extent, but as was shown in this report and highlighted by stakeholders involved in the research, the deployment of clean buses is part of a broader change process that is much more fundamental. It is related to the transformation of urban mobility by a massive shift from car-based mobility towards public transport that will require significant investments in the expansion of services, infrastructure and vehicles. All this will add to the financing the procurement of clean bus technologies and developing the

respected infrastructure, depots and workshops that can be very significant, particularly when it comes to electric buses.

As highlighted likewise by management representatives or urban public transport operators, sectoral trade unions and company level workers representatives, the ecological transformation process will only succeed if workers and employees are part of it and actively involved. Like digitalisation and other profound change projects, there is a high risk of failure if decisions are made only in a top-down way and workers are suddenly confronted with the results and left alone with their fears and questions. In this context, it is also worth mentioning that such a failure in the current times of labour shortage in all transport modes would be a fatal development.

This research has shown that social dialogue provides significant added value in such transformation projects for several reasons. Social dialogue in particular,

- › provides workers representatives and trade unions with relevant information that are necessary to engage in meaningful consultation and negotiation in relation to managing change, maintaining good working conditions and developing suitable measures and practices for skills development, further training, work organisation adjustments or other social and employment related measures;
- › facilitates trust and confidence amongst the workforce by taking seriously any questions, doubts or concerns and fears of workers in relation to job and employment security as well as individual employability;
- › can also facilitate innovative and creative solutions that may have not been considered so far by the management of the UPT company as illustrated by some of the examples of good practices initiated by trade unions;

Against this background, it proves to be important to involve workers representatives and trade unions as early as possible in the procurement and discussions with suppliers on the design and interior of new buses or the planning of constructing or extending bus depots.

As shown in the examples in this report, another particularly important area where active involvement and participation of workers and unions is providing clear added value is health and safety at the workplace and risk preventions in relation to electric or gas buses.

As the analysis of practice cases in ten European countries has shown, social dialogue, irrespective of the differences in national systems of industrial relations and concrete workers participation rights, works well due to high membership rates and strong organisations of workers as well as employers.

Thanks to the social partners at operator level in urban public transport, sectoral social dialogue has been able to provide important added value and concrete results in relation to the following aspects and themes relate to the deployment of clean bus fleets:

- › Transparency in information and consultation

- › Anticipation and building mutual trust and confidence about the change process and future development
- › Involving workers in design and change processes
- › Developing concepts for the acquisition of new skills and (further) training
- › Co-shaping of new emerging occupational profiles and functions
- › Identification and assessment of health and safety risks as well as developing guidance and tools for prevention
- › Tailoring solutions to company-specific, local and national framework conditions
- › Joint lobbying for sustainable and long-term public financing the deployment of clean buses and related investments in infrastructure, depots and maintenance
- › Accompanying measures of dialogue and exchange of good practices at national level by trade union and/or employer projects, shop-steward or employer conferences as well as joint activities

Finally, social dialogue is also important when the enormous challenges are considered that will also impact on the future of mobility: Here, just to mention the severe effects of the COVID crisis years, the Russian war in Ukraine, the rapid increase in energy prices or disruptions in global supply chains and the high inflation rates. At the same time and as made abundantly clear by the droughts in parts of southern Europe with historic temperature records in southern Spain and the terrible floodings in northern Italy in spring 2023, climate change will be a constant challenge in the future.

The report has shown that mastering crises and managing challenges in urban public transport work better, when workers, trade unions and employers as well as their organisations act jointly and in an atmosphere of trust, openness and transparency.

Based on these results, the following section concludes this report with recommendations for European and national level social partners and social dialogues.

8.2 Recommendations for European and national level social partners and policymakers

To promote the social dialogue in the context of clean bus deployment as well as the energy transition in urban public transport, the following recommendations for European and national level social partners and policymakers should be considered:

- (1) Social dialogue should be regarded as an indispensable tool for clean bus deployment and sustainable and smart mobility in urban public transport**

Social dialogue is not only a legal requirement for information and consultation in exceptional circumstances but much more: In particular in phases of rapid change, corporate and sectoral restructuring and other forms of transformation, it provides clear added value for workers as well as employers.

This value at least partly has been recognised in the EU Sustainable and Smart Mobility Strategy where it has been highlighted for the transport sector that *“the sector’s most valuable asset by far is its people and the sustainable and smart transition will not be possible without the support and buy-in of transport workers.”*²⁶

While social dialogue between workers and trade unions and employers at different level is essential develop understanding, support and “buy-in” of workers in urban public transport, there is much more in it.

As shown in this report, social dialogue at the company level guarantees the development of practices, concepts and measures that contribute to successful adaptation of the work environment, the acquisition of skills or in the field of health and safety. Furthermore, at sector level social dialogue and negotiations between social partners have resulted in collective agreements that set sector-wide frameworks and standards which provide support and guidance for stakeholders in urban public transport. Such sectoral agreements should be regarded as good practices that should be more openly promoted by policymakers at national and EU level.

(2) Fostering the anticipation of change and a joint understanding of needs and requirements at company and sector level

The examples presented and discussed in this report show that social dialogue and the involvement of workers, staff representation bodies and shop stewards already at an early stage of clean bus deployment has an important positive effect, not only for taking all workers on board, trust building and creating confidence in the transition process but also in terms of efficiency and effectiveness of the measures. Drivers, mechanics, and maintenance staff have expert level working knowledge of different types of clean buses, and it makes business sense to engage them in planning and tendering processes and get their views on the types of clean buses best suited to their own areas geography, climate, depot infrastructure, routing etc.

Therefore, social partners at company and sector level should engage in joint activities of anticipation of changes in the short and medium-term perspective. Such activities should be complemented and supported by concrete measures such as topic specific joint working groups, annual events and other measures that contribute positively to transformation and effective and just transition.

²⁶ EU Commission 2021: Sustainable and Smart Mobility Strategy. Putting European Transport on Track for the Future, p. 17-19: “Flagship 9: Making Mobility Fair and Just for All”.

(3) Social partners' initiatives at local and national level to speed up sustainable financing the transition process

When it comes to the deployment of clean buses and making progress of the green transformation process in urban public transport in general, there are several joint interests of transport operators and employees and their representative organisations. One major joint interest is the demand for sufficient and reliable framework conditions, including secure longer-term investment and financing plans. Solid financing should not only take into account capital investments but also foresee sufficient resources for skills development, reskilling and further training of workers. In addition there is a need to invest in the recruitment of new personnel with specific expertise that so far is not or not sufficiently available in the company.

Against this, social partners should join forces and develop more common initiatives at national level to identify challenges, exchange on good practices as well as lobby governments for a better financing of the transformation.

At the same time, unilateral practices of social partners should be intensified on the issue of clean bus deployment and related issues. As noted during the research, there have only been few countries, where thematic fora of exchange and opportunities for the development of expertise and know-how have been initiated so far by employer organisations and trade unions in urban public transport. This kind of activities have been highlighted by stakeholder interviews with trade union as well as employer representatives as very valuable and should be disseminated further to more Member States.

(4) Securing good working conditions and functioning of social dialogue at the workplace and at sector level

The urban public transport sector and in particular bigger operators that are covered by strong social dialogue and collective bargaining practices and provisions are characterised by good working conditions. This needs to be maintained or even strengthened during the current period of green and digital transition which often is resulting in fears of workers about the future of the own job, the feeling of not having the right hard and soft skills and questions about certain technologies, including their impact on safety and security. Also here, social partners at workplace, company and sector level should aim at providing guidance, support and practical offers to workers, employees as well as middle level managers in order to strengthen confidence and motivation to be part of the transition.

During the research it became also clear that in those countries where this is common practice - trade unions themselves should build up own competences and expertise in order to improve and adapt the training of workers' representatives (works councils or shop steward committees) that play a key role at local level social dialogue. Also here, the exchange of good practices of building trade union competences on all the various clean buses options and the future of urban mobility should be facilitated at national but also European level.

(5) Using the opportunity of linking the green and digital transition with making the urban public transport sector attractive for younger generations and other groups

Good working conditions, job and task contents, occupational capability and the respect of worker's needs, concerns and wishes (e.g., in relation to work-life balance over the life course) are crucial factors that contribute to intrinsic and extrinsic job satisfaction and motivation.

The deployment of clean bus fleets and the broader context of the green and digital transition should be regarded by social partners as a historic transition period that includes many opportunities for improved working environment and quality jobs that can make the urban public transport sector more attractive to young generations and people that so far are underrepresented in the workforce (in terms of gender, migration background, disabilities, etc.).

Against the huge challenge of labour shortage and lack of attractiveness of the urban public transport sector in many EU Member States but also against the expectation that the workforce will grow significantly up to 2030 and beyond, there is an urgent need to improve the image and make work more attractive.

The modernisation and transition towards green fleets and the digitalisation of urban public transport should be regarded as an opportunity to improve the image of the sector as an employer providing attractive workplaces and career options. Here, not only financial incentives must be considered but also innovative solutions and practices.

(6) Developing skills intelligence and prioritising skills development and training, leaving nobody behind

To maintain employability and manage the deployment of clean buses successfully, skills development and prioritisation of skills formation is a key element.

Against this, potential risks for urban public transport workers as arising from digitalisation, automation and the transition towards clean bus fleets should be carefully analysed and addressed by preventive measures. Furthermore, workers in low-and

medium skilled positions whose jobs may be at risk due to automation and moves towards electrification (e.g., in maintenance) should be supported by career-reorientation and reskilling offers that are attractive for them.

In this field of developing skills intelligence, sectoral social partners as well as national and regional level governments should play a more pro-active role of promoting innovative tools and programmes.

Studies have shown that involving workers from the beginning in the design of their training programs results in better outcomes. Social dialogue can play a key role here in tailoring training to the future needs of workers and the organisation.

(7) Strengthening the role of European Social Dialogue on clean bus deployment and lobbying at EU level

During the implementation of the UITP and ETF project and the presentation and discussion of interim and pre-final results in the European Road Sector Social Dialogue Committee with trade unions and employer organisations, it became clear that social partners at national level still have a lot of questions and concerns on the issue of clean bus deployment. There are not only large differences and gaps between European countries in relation to the speed of the deployment process, public financing and other issues but also in relation to skills development, further training and good practices.

Against this, there seems to be a strong interest in more exchange of practices and experiences as well as the elaboration and provision of European guidance and tools for expertise development for national level social partners.

In this context concrete ideas and suggestions have been brought forward on issues such as health and safety to provide urban public transport operators as well as worker representatives and trade unions with knowledge and tools of risk prevention related to clean bus technologies (in particular battery electric).

Furthermore, training courses on digital and green technologies affecting different domains of urban public transport were suggested in order to develop competences and knowledges of social partners in urban public transport company and national level.

From the perspective of social dialogue, such activities certainly would contribute positively not only to the development of capacities and know of trade unions and employers as regards clean bus deployment and related issues but also would strengthen the social dialogue and developing joint understanding and trust.

ANNEX

CBEP Advisory Board Members

	Country	Name
	EU	Aida Abdulah
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	The Netherlands	Peter Buisman
	Sweden	Susanne Gällhagen Astrid König
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