D4.4: Fuel Cell Bus Implementation Plan – Report on remaining barriers and proposed solutions

March 2025

ZERO EMISSION

JIVEs / MEHRLIN projects



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Clean Hydrogen Partnership

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Abbreviations

Term	Explanation
BEB	Battery Electric Bus
BEV	Battery Electric Vehicle
EU	European Union
EC	European Commission
FCB	Fuel Cell Bus
HRS	Hydrogen Refuelling Station
JIVE	Joint Initiative for hydrogen Vehicles across Europe
OEM	Original Equipment Manufacturer
PTO	Public Transport Operator
PTA	Public Transport Authority
TCO	Total Cost of Ownership

1. Introduction

The JIVE and JIVE 2 projects are flagship fuel cell bus projects deploying ~290 buses at 16 sites across 7 European countries[1]. The core objectives of the initiatives are to validate fuel cell technology through the deployment and operation of large fleets and stimulate the further uptake of fuel cell buses (FCBs) in Europe. The JIVE and JIVE 2 projects began in 2017 and 2018, respectively. JIVE concluded in June 2024, and the JIVE 2 project will be concluding in June 2025. As of February 2025, both projects have successfully demonstrated the technological capabilities of FCBs in diverse operational environments.

This study, conducted under the JIVE 2 project, assesses whether the initial barriers to FCB deployment—identified in past EU-funded projects and at the outset of the initiative—remain significant challenges for public transport authorities (PTAs), public transport operators (PTOs), and bus original equipment manufacturers (OEMs). This deliverable is part of a series of publications from the JIVE projects, addressing key issues and barriers encountered throughout the initiatives while proposing potential solutions and recommendations. A key project report tackling these topics is the "*JIVE and JIVE 2 Best Practice Report 2024*", developed by Sphera and PLANET. This study collects all the lessons learned from the projects and documents the challenges encountered and the best practice solutions. The information was broken down into project Stages: Project Conceptualisation, Financing and Planning, Procurement and Deployment and Operations. Additionally, the report "*Fuel cell bus deployment in the UK – lessons from JIVE and next steps*", written by ERM, focuses more specifically on what has occurred in the United Kingdom across the four sites involved in the projects. Key barriers and potential solutions linked to hydrogen supply and infrastructure and vehicles were highlighted.

In this study, targeted groups were OEMs, PTAs, and PTOs from Germany, the Netherlands and Scandinavia. These locations were chosen based on the results of the report "*D3.36: The potential for hydrogen buses in Europe: Results from the bulk analysis of passenger schedules*", written by ERM and published in July 2024, which identified the most promising countries / regions for further FCB deployment. The analysis quantified bus routes across Europe that are challenging to decarbonise with battery electric buses (BEBs), considering FCBs as a potential solution.

In this report, PTOs and PTAs participated in an online survey, responding to closed questions on twelve key areas previously identified in reports and projects as influencing their decisions on the (further) deployment of fuel cell buses (see Appendix for full questionnaire).

Twenty PTOs and PTAs were identified and contacted, of which nine responded. The nine respondents comprised four experienced PTOs, one experienced PTA and four new entrants[2]. Regarding the OEMs, interviews were conducted with three European fuel cell bus manufacturers.

The discussions with OEMs and survey responses from PTOs/PTAs confirmed that the main barriers to further FCB deployment in Europe remain largely unchanged from those previously identified.

However, it is worth noting that the global market context and expectations have evolved since the first major FCB projects were launched. On the one hand, the deployment of hydrogen technology in mobility, and in public transportation, has greatly grown, especially with JIVE and JIVE 2 which were the first large-scale projects with 20+ fuel cell bus fleets being deployed. Previous projects such as

[1] France, Spain, Italy, the United Kingdom, the Netherlands, Germany, and Latvia.
[2] Experienced PTOs and PTA are those currently operating FCBs as part of their fleet while the new entrants are those planning to integrate FCBs into their fleet.

High V.LO City (2012 – 2019) or **3Emotion** (2015 – 2022) only deployed 14 and 29 FCBs respectively, with the biggest fleets being of 10 buses.

Furthermore, the number of OEMs investing in FCB technology has increased, with established manufacturers expanding their product lines and new entrants focusing exclusively on zero-emission buses. Both groups have continuously upgraded first-generation models to enhance vehicle reliability. FCBs have proved themselves in real-world duty operations, offering excellent operational flexibility (e.g. high driving range and low refuelling times) needed by operators to decarbonise their most challenging routes.

Regarding policies, while the urgency to transition road transport (including public transportation) to low-carbon technologies has long been highlighted by the scientific community, the past six years have seen significant progress in EU legislation. Notably, the Clean Vehicle Directive, adopted in 2019 (with national transposition by August 2021), sets targets for the procurement of low and zero emission vehicles by public bodies. Other regulations, such as the CO_2 emission standards first introduced in 2019, have also driven changes in the heavy-duty vehicle sector, including trucks.

Lastly, when focusing on the level of investment required to deploy FCBs, there have been positive evolutions with regards to bus prices which saw a decrease between the previous EU-funded projects and JIVE. For instance, in 3Emotion, the target bus price was set at €850,000 whereas in JIVE 2 this target decreased to €625,000. Nevertheless, as will be highlighted in the next sections, the level of these bus prices is still too high for mass adoption by bus operators, and further reductions will be needed to avoid a continuing dependence on project-based public funding.

On the other hand, several external events during the JIVE projects have significantly impacted the hydrogen industry and other markets. Firstly, the COVID-19 crisis in 2020 disrupted industries worldwide, causing supply chain interruptions and market tensions over the availability of key components and materials. This led to significant delays in manufacturing and the implementation of local FCB projects. Secondly, the invasion of Ukraine in February 2022 caused a sharp rise in energy prices, which in turn drove up hydrogen costs, further affecting the sector.

Operating costs, including hydrogen costs, had already been identified as one of the key barriers to ensuring faster scale-up of FCB deployments in Europe. This event added on to the pre-existing challenge experienced by project partners and other operators involved in deploying fuel cell buses. The JIVE projects aimed to reach hydrogen prices of €9/kg of hydrogen. Nevertheless, the market prices have not yet reached this level, with average hydrogen prices at the pump at €14.98/kg of hydrogen in France in 2024[3] and €12.85 at H2 MOBILITY public stations in Germany[4]*.

Additionally, despite the growing number of OEMs entering the fuel cell bus market, the sector has faced setbacks, notably the bankruptcy of Van Hool, which impacted overall market confidence. Furthermore, the broader hydrogen mobility market—including light- and heavy-duty vehicles—has grown at a slower pace than anticipated. This slower-than-expected growth has contributed to the persistence of previously identified barriers, such as the limited development of HRS networks and hydrogen production infrastructure.

Given the general market context as the JIVE 2 project enters its final 6 months, the main objectives of this report are to:

[3] Source: Couts_carburants_0.xlsx
[4] Source: h2live
*NB: Some bus operators have set up specific contracts with public HRS operators achieving lower prices of hydrogen compared to the prices at the pump. Nevertheless, the prices are rarely below 9€/kg.

- Identify market barriers specific to the PTOs and PTA, drawing insights from both experienced PTOs and PTA and new entrants.
- Identify market barriers specific to OEMs.
- Identify common/overlapping market barriers, and the perspectives of the OEMs as well as PTOs and PTAs regarding these challenges.
- Provide actionable recommendations to overcome the barriers to facilitate deployment.

The report is structured in line with these objectives.

2. Outcome of survey and interviews – Understanding remaining barriers

2.1 Common/Overlapping market barriers for PTOs, PTAs and OEMs

Based on the results of the online survey conducted with PTOs and PTAs and the interviews conducted with European OEMs, this section highlights the common market barriers encountered by these stakeholders and the conditions under which further scale-up of FCBs is possible. The barriers are ranked according to their importance and the level of concern expressed by the respondents.

- **Hydrogen refuelling infrastructure**: The majority of the experienced PTOs and PTA surveyed highlighted that the current challenges with hydrogen refuelling station (HRS) reliability have significantly impacted the deployment of FCBs in their regions. Among the interviewed OEMs, the limited deployment of HRS poses a significant challenge, hindering market expansion. The strategic location of the HRS and their reliability plays a key role in increasing the market attractiveness of FCBs and mitigating operational challenges. For example, the scarcity of HRS was one of the major obstacles for FCBs uptake in Sweden. While some of the surveyed new entrants raised concerns about the reliability of HRS technology to consistently support their fleet operations, others expressed confidence that the technology would meet their operational requirements.

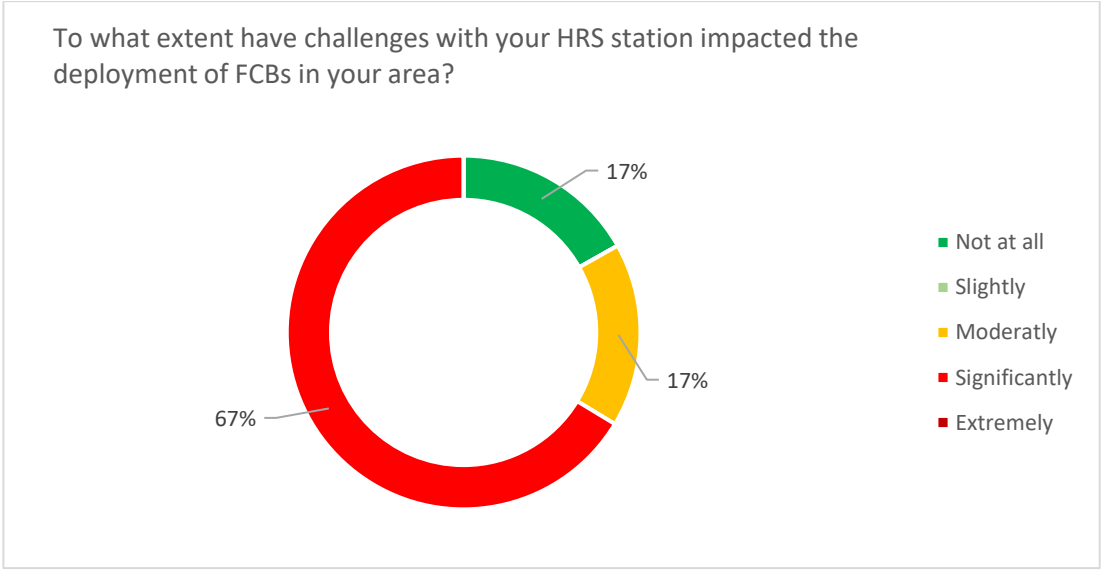


Figure 1: Survey Results on the Impact of HRS Challenges on FCB Deployment (Experienced PTO/PTAs)

- **Hydrogen price**: The medium to long-term price of hydrogen is a major concern among the interviewed OEMs and surveyed PTOs and PTA. The high cost of hydrogen, largely driven by limited supply, production capacity and increased cost of electricity, significantly impacts the total cost of ownership (TCO) for FCBs. A high TCO limits economic attractiveness to PTOs and PTAs, which leads to decreased sales and market expansion for OEMs. Without future price reduction of hydrogen, the deployment and widespread adoption of FCBs will face significant challenges. Innovative pricing and contract structures, such as take-or-pay agreement, can temporarily help achieve lower hydrogen costs by providing certainty of demand to hydrogen producers/retailers, making FCBs more appealing for public transport operations. In the medium term, greatly increased production scales, alongside emerging policy support mechanisms (for example hydrogen auctions/opex mechanisms at a European or Member State level), will be needed to bring hydrogen prices closer to those of diesel or natural gas buses.

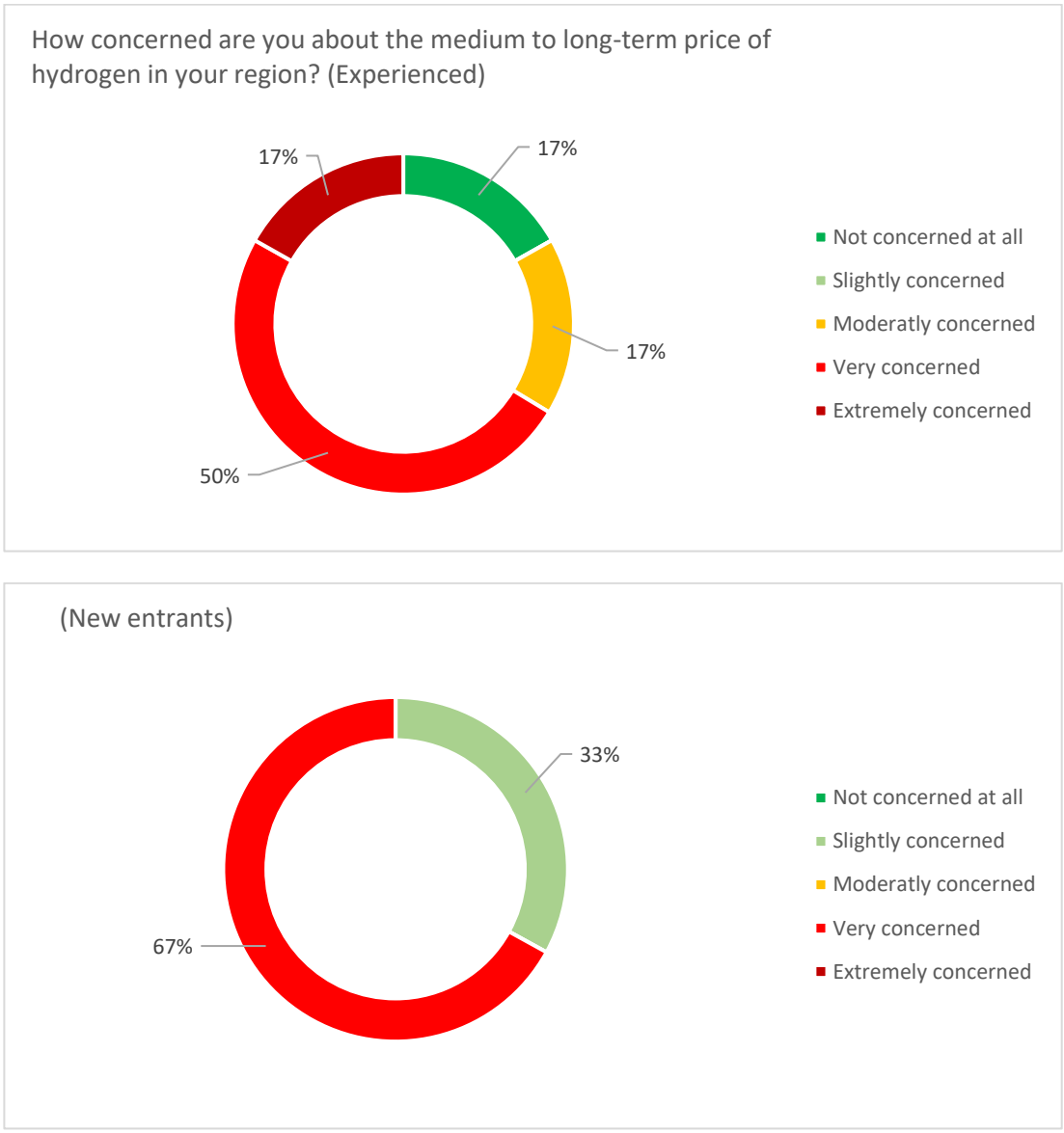


Figure 2: Survey results on the medium to long-term price of hydrogen in the region

- **Policy support**: Financing FCB deployment projects remains a significant challenge for PTOs and PTAs. Clear and consistent government policies, including grants and incentive schemes, remain important tools to strengthen the business case for FCB deployment and play a key

role in influencing procurement decisions. Looking ahead, funding availability is expected to remain a pressing concern. To address this, stakeholders stressed the importance of public funding covering both CAPEX and OPEX to drive greater interest and investment in FCB deployment. Interviewed OEMs are directly impacted by the PTOs' and PTAs' interest in procuring FCBs, highlighting that weak or unstable government policies significantly impact their potential market expansion. For instance, although Germany has seen the highest deployment of FCBs in Europe, the reduction in federal subsidies has hindered further market expansion, as operators have put on hold their procurement processes, becoming more cautious in transitioning their fleets.



Figure 3: Survey results on financing for hydrogen bus deployment projects

2.2 PTOs' and PTAs' specific market barriers

Following the overview of the common market barriers, this section focuses on the key market challenges faced by the majority of experienced PTOs and PTA, as well as new entrants, in the deployment of FCBs in the three regions of interest: Germany, the Netherlands and Scandinavia. The

analysis and discussion presented is based on the result of the online survey and are ranked according to their importance and the level of concern expressed by the respondents.

- **Hydrogen supply**: Green hydrogen supply issues, particularly regarding its availability, have been encountered in these regions, leading to uncertainty about the medium to long-term availability of hydrogen for some operators. This concern is also observed among the new entrants surveyed. However, experienced PTOs and PTA that have not faced hydrogen supply issues are more confident about its future availability. The study did not explore supplier-related technical or commercial challenges associated with hydrogen transportation when the fuel is available across a region.

- **Maintenance and workshop certification**: Increases in maintenance cost after three years of operation was observed among some operators, primarily due to high replacement or refurbishment costs of specific FCB components, including fuel cell, hydrogen compressor (particularly its hydraulic components) and crash/panel systems. The high maintenance cost associated with FCBs limits the interest of many of surveyed PTOs and PTAs in their deployment. Furthermore, limited availability of spare parts, along with requirement for workshops to obtain certifications to carry out certain repairs, poses significant challenges to FCB maintenance.

- **Depot Modification**: Depot modification in terms of cost and logistics have impacted ability and interest of surveyed PTOs and PTA in accommodating FCBs. Depot preparation for the integration of FCBs into fleets include a variety of activities such as risk assessments, installation of hydrogen sensors and ventilation system, development of emergency procedures, employee engagement, trainings and HRS installation (assuming depot-based refuelling is the preferred option). While these measures are crucial for ensuring safety standards and mitigating technology-specific risks, their implementation may pose challenges due to associated cost and logistical complexities. Moreover, depot modification regulations, that ensure safety protocols are implemented, remain underdeveloped across the European Union (EU).

- **Technology maturity and availability**: The FCB market is believed to be in its early stages of development compared to the more established diesel and battery electric vehicle (BEV) market. The current FCB technology meets key operational requirements of operators, such as range and fuel efficiency. However, some limitations remain, including the limited availability of green hydrogen and the still maturing FCB supply chain. Insights from the JIVE projects reveal that most downtimes are not solely due to fuel cell or hydrogen-related components but are often caused by peripheral mechanical parts, electrical components, or issues with the high-voltage battery, contributing to bus unavailability. It was also highlighted that the limited variety of FCB models significantly affects procurement decisions, even though OEM proposals are generally clear and responsive. While most of experienced PTOs and PTA surveyed believe that expanding the product range and suppliers' option is unlikely to increase their interest in investing in FCBs, new entrants view this expansion, particularly for intercity and coach FCBs, as an opportunity to drive investment.

- **Awareness and training**: Increasing awareness and training is important for the successful deployment of FCBs. The successful awareness raised through the JIVE projects played a role in stimulating interest in the technology from PTOs and PTAs beyond the project and positive acceptance of FCBs by the public. In various deployment cities, a lack of appropriate training for key groups, including drivers, refuelling staff, depot staff, maintenance technicians and first responders, has been observed. This gap in training can hinder operational effectiveness and safety of FCBs.

- **Assurance and warranty**: There is uncertainty regarding the parts warranty packages offered by FCB suppliers, which would provide assurance against key components failure and offer more certainty over lifecycle running costs. However, the absence of these warranty packages is not considered a decisive factor influencing the willingness of surveyed PTOs and PTAs to invest in FCBs.

2.3 OEMs specific market barriers

The findings presented in this section highlight the challenges encountered by OEMs specifically in scaling up FCBs in the three identified regions. The analysis is based on insights gathered from the interview conducted with 3 key European market OEMs and are ranked according to their importance and the level of concern expressed by the respondents.

- **Competition with low- or zero- emission technologies**: One of the interviewed OEMs pointed out that the technological maturity and fewer barriers associated with alternative low- or zero- emission technologies are posing challenges to FCB deployment. For example, there is limited interest in FCBs in Sweden and Norway due to the advanced technological and infrastructure readiness for biogas and battery electric technology.

- **Bus type demand**: OEMs are interested in large-scale production of a specific bus type to leverage economies of scale. However, the need for customised FCBs by various operators, combined with the low demand for these specific buses, poses a significant challenge to the scaling and commercialisation of FCBs. This limited demand creates a cycle where per unit costs remain high, and opportunities to achieve economies of scale are limited.

- **Limited supply chain**: One of the interviewed OEMs pointed out that the current FCB supply chain will need to become more diversified to meet future increase in demand for FCBs. Currently, FCB supply chain is limited to a few dominant players, with for instance 90% of OEMs relying on a single fuel cell supplier. This lack of supplier diversity creates risks for scalability, resilience and cost competitiveness, especially as demand grows. Furthermore, hydrogen storage tank suppliers encounter challenges with homologation and lifespan, resulting in limited options for ensuring availability and safety.

3. Recommended actions to overcome barriers to accelerate deployment

With BEBs becoming increasingly cost-competitive and capable of meeting similar operational requirements, they are well-positioned to dominate the European market. However, there are still regions (as depicted in *D3.36: The potential for hydrogen buses in Europe: Results from the bulk analysis of passenger schedules*)) where BEBs face significant limitations, such as challenges in operating on long routes, extreme weather conditions, or areas with constrained grid capacity. In these more demanding scenarios, FCBs have demonstrated their effectiveness as a viable solution.

Despite this, several barriers to FCB deployment remain in these regions and the recommendations below aim to address these obstacles to facilitate the broader adoption of FCBs in areas where they deliver the greatest value.

Furthermore, these recommendations should be integrated into national-level strategies that identify regions with high FCB potential while fostering synergies with other hydrogen applications to create a cohesive and impactful decarbonisation pathway.

Barriers	Proposed recommendations	Addressed to
Hydrogen refuelling infrastructure	Prioritise planning and the expansion of the HRS network to support the operational needs of FCBs. This includes identifying opportunities for shared infrastructure e.g., HRS accessible to buses and other vehicle types, where bus fleet sizes or space constraints do not allow dedicated depot-based HRS to be deployed.	National/Regional Government, EC, HRS Providers[5], Hydrogen Suppliers
	Develop and implement standardised frameworks for HRS design to reduce delays in construction, permitting and commissioning.	National/Regional Government, EC
	Improve HRS uptime/reliability. This could include component redundancy, improved designs, local provision of spare parts and technical support to allow for more rapid interventions in the event of downtime.	HRS Providers
	Leverage synergies with large-scale hydrogen projects, allowing HRS for buses to benefit from lower H2 prices from very large electrolysers serving industrial and other mobility demands.	Hydrogen Suppliers
	Provide more support for hydrogen infrastructure development through provision of subsidies for HRS construction and incentives for companies investing in hydrogen technology to enable market growth.	National/Regional Government, EC
Hydrogen price	Develop innovative pricing mechanisms and contract structures, such as take-or-pay agreements or long-term offtake contracts, to reduce cost volatility and provide demand certainty to hydrogen suppliers.	Hydrogen Suppliers, PTO, PTA
	Secure access to low-cost renewable energy sources, e.g., through long-term power purchase agreements (PPAs) to reduce further hydrogen production cost at scale.	Hydrogen Suppliers
Policy support for FCBs	Ensure stable and long-term policy support schemes. This could include capex/opex support for FCB deployments in the medium-term to continue to drive FCBs down their cost-volume curve.	National/Regional Government, EC
	Consider other non-financial mechanisms to support FCB deployments, such as public procurement of zero-emission buses wherever viable.	National/Regional Government
Hydrogen supply / production	Provide policy certainty and stable support regimes for the production of renewable/low-carbon hydrogen, for example through national/EU-level opex support mechanisms, similar to Contracts for Difference successfully used in the renewable electricity sector.	National/Regional Government, EC
	Enhance collaboration between governments, industry players and R&D institutions, through knowledge sharing programs, to improve expertise in hydrogen production, distribution and storage technologies.	National/Regional Government, EC
	Establish long-term supply contracts with hydrogen producers to secure availability and reduce uncertainty, providing mutual benefits for hydrogen customers and suppliers.	Hydrogen Suppliers, PTO, PTA

[5] Incl. HRS system integrators, HRS manufacturers, etc.

Maintenance and Workshop certification	Enhance support provided by OEM to ensure spare parts availability and rapid technical support for FCB repair and maintenance. OEMs should also develop.	OEM
	OEMs need to work with their supply chain to ensure rapid access to spare parts.	OEM
	Operators' technicians can undergo periodic (re)training to stay updated on the latest technological advancements, enabling them to address and resolve emerging maintenance issues effectively.	PTO
	Streamline workshop certification processes to reduce delays and costs for operators.	National/Regional Government, EC
Depot modifications	Provide financial incentives or funding schemes to offset depot modification costs.	National/Regional Government, EC
	Encourage knowledge sharing between Member States on standards and best practices for depot modification and investigate the potential to harmonise standards.	National/Regional Government, EC
Technology maturity and availability	Support investment in R&D to enhance the reliability and efficiency of FCB components.	EC, National/Regional Government, OEM
	Continue the successful 'reliability campaigns' to identify root causes of bus downtime and develop strategies to address these in current and future FCBs.	OEM, PTO, PTA
Awareness and training	Increase awareness campaigns to highlight FCB benefits for operators and the public, including sharing case studies from the most successful deployments to date.	National/Regional Government, PTO, PTA
	Provide targeted training programmes for drivers, maintenance technicians, refuelling staff, and first responders.	National/Regional Government, PTO, PTA
Competition with low -or zero- emission technologies	Differentiate FCBs by emphasising their suitability for long-range operations and high passenger capacity.	PTO, PTA
	Promote hydrogen-specific policies to ensure a level playing field among all zero-emission technologies until technology maturity, i.e., reflecting the fact that FCBs and battery electric buses are not at the same point in their respective commercialisations.	National/Regional Government, EC
Bus type demand	Facilitate joint procurement schemes to aggregate demand for specific bus types, enabling economies of scale.	PTO, PTA
	Collaborate closely with operators to standardize designs and specifications where feasible, enabling OEMs to scale production and lower manufacturing costs.	OEM, PTO, PTA
Supply chain	Diversify the fuel cell and hydrogen storage tank supplier base to reduce dependency on single suppliers and encourage cost reduction	OEM
	Invest in homologation processes and improve supplier capacity to support scalability and cost competitiveness.	OEM, National/Regional Government, EC

	Continue to fund research, development and deployment activities on FCB components (e.g., fuel cell systems, hydrogen tanks) to encourage further performance improvements and cost reductions, and the entry of new suppliers to the market.	National/Regional Government, EC

4. Conclusion

Since 2017, the JIVE and JIVE 2 projects have significantly contributed to stimulating the FCB market in Europe. As of February 2025, these projects successfully have 242 buses deployed in real world operations in 15 cities with another 48 to start operations by the end of June 2025. Now that the fundamental bus and refuelling technologies are well-proven, attention must turn to the subsequent scale up beyond the current wave of demonstrator cities. Although there are now more than six hundred of FCBs on Europe's roads, they account for only 3% of the new EU urban buses in 2024[6], even with their clear advantages in long-range operations and faster refuelling time. This is however a faster-than-expected growth of the FCB market. This study identified the remaining barriers to the wider deployment of FCBs, focusing on Europe's most promising regions - Germany, the Netherlands and Scandinavia - by gaining valuable insights into these challenges from key OEMs, PTOs, and PTAs in these regions.

The analysis of the online survey answered by PTOs and PTAs, along with the outcomes from the interviews with OEMs, revealed common barriers to FCB deployment. These include continuing limited reliability and availability of hydrogen infrastructure despite strong improvements during the JIVE projects, high hydrogen prices, and insufficient supporting policies to finance FCB projects beyond demonstration activities. Addressing these hurdles, through expansion of HRS network, innovative pricing structures and long-term policy frameworks, is crucial to unlocking the potential for stakeholders to adopt FCBs as an effective decarbonisation solution for public transportation—particularly for bus routes that are difficult to electrify with BEBs.

Furthermore, operators have highlighted barriers specific to their operations, including hydrogen supply interruptions, high maintenance and depot modification costs, a limited choice of FCB models, and training requirements for technicians and other staff. These challenges not only hinder their ability to deploy FCBs but also have a cascading impact on OEMs, affecting overall market growth. Overcoming these challenges would require the establishment of long-term supply contract with hydrogen suppliers, additional public funding to cover capital and operational costs and the enhancement of technical support from OEMs.

OEMs face challenges in efficiently scaling FCB production without strong and consistent interest from operators. Higher demand for FCBs is essential to make large-scale production commercially viable. Achieving this will require the development of standardised products that can streamline the implementation of joint procurement schemes already active in some Member States.

Further OEM hurdles are related to the current supply chain, as well as competition with more technologically mature low- or zero- emission alternatives. To address these challenges and expand the FCB market, diversification of suppliers and inclusive policies that provide equal support for hydrogen technologies alongside other low- or zero-emission solutions are critical.

Despite these barriers, FCBs present significant potential as a decarbonisation solution for public transportation. As the technology continues to evolve, the relative impact of these barriers is likely to shift. Unlocking the full potential of FCBs will require a collaborative effort from all stakeholders, including policymakers, manufacturers, operators, and the public. This collective effort will allow fuel cell buses to play a critical role in decarbonising the bus sector alongside battery electric buses, particularly for the most challenging bus routes and depots.

[6] T&E (Max Molliere) (March 2, 2025) Half of new EU city buses were zero-emission in 2024

5. Appendix

Survey questions

The different colours in the survey below represent the target audience for each question:

- *Experienced PTO/PTA*
- *Experienced PTO/PTA and New Entrant*

1. **Hydrogen Refuelling Station (HRS) Location:**
   - **Question:** To what extent have challenges with your hydrogen refuelling station impacted the deployment of FCBs in your area?
     - **Scale:** Not at all | Slightly | Moderately | Significantly | Extremely
   - **Question:** Are you concerned that HRS technology may not be reliable enough to deliver optimal service for your fleet?
     - **Answer:** Yes | No
2. **Hydrogen Supply Issues:**
   - **Question:** Have you experienced any issues with the availability of hydrogen in the region?
     - **Answer:** Yes | No
   - **Question:** How concerned are you about the medium to long-term availability and price of hydrogen in your region?
     - **Scale (availability of hydrogen):** Not concerned at all | Slightly concerned | Moderately concerned | Very concerned | Extremely concerned
     - **Scale (price of hydrogen):** Not concerned at all | Slightly concerned | Moderately concerned | Very concerned | Extremely concerned
3. **Depot Modification:**
   - **Question:** To what extent did depot modifications (in terms of cost and logistics) affect your ability and interest in accommodating FCBs?
     - **Scale:** No impact | Minimal impact | Moderate impact | Significant impact | Critical impact
4. **Funding Opportunities:**
   - **Question:** Is financing the project a key barrier to date?
     - **Answer:** Yes | No
   - **Question:** To what extent does the availability of public funding impact your decision-making regarding the implementation of FCBs in your region?

- **Scale:** No impact | Minimal impact | Moderate impact | Significant impact | Critical impact

- **Question:** Do you foresee the availability of funding to be a concern in the future?
  - **Answer:** Yes | No
- **Question:** What should public funding cover to increase the interest in FCBs implementation?
  - **Multiple answer:** CAPEX | OPEX (hydrogen prices etc.) | Both

5. **High Maintenance Costs:**
   - **Question:** Have you observed significant increases in maintenance costs after three years of operation?
     - **Answer:** Yes | No
   - **Question:** Which components or systems have been the most problematic?
   - **Question:** Will the high maintenance costs impact your decision to implement FCBs?
     - **Scale:** No (it shouldn't be a concern) | Yes (this will limit my interest in deploying hydrogen buses)
6. **Assurance / Insurance Packages:**
   - **Question:** To what extent do you agree with the following statement?
     "Suitable parts assurance packages are available from FCB suppliers to meet my specific needs"
     - **Scale:** Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strong agree.
   - **Question:** To what extent do you agree with the following statement?
     "The lack of insurance packages is affecting the willingness to invest in hydrogen buses"
     - **Scale:** Not at all | Slightly | Moderately | Significantly | Extremely
7. **Market Maturity:**
   - **Question:** Do you believe that the hydrogen fuel cell bus sector has matured to the point where you can consider purchasing FCBs as a direct replacement for diesel buses
     - **Answer:** Yes | No
8. **Limited Choice of Fuel Cell Buses and Coaches:**
   - **Question:** To what extent has the limited selection of FCBs affected your procurement decisions?
     - **Scale:** No impact | Minimal impact | Moderate impact | Significant impact | Critical impact

- **Question:** Will more options and suppliers offering products increase your interest in investing in hydrogen buses?
    - **Answer:** Yes | No

9. **Supplier Responsiveness and Proposal Clarity:**
    - **Question:** How satisfied are you with the clarity and responsiveness of proposals received from FCB suppliers?
        - **Scale:** Very dissatisfied | Dissatisfied | Neutral | Satisfied | Very satisfied
10. **Technology Mismatch:**
    - **Question:** How well does the current FCB technology meet your operational requirements?
        - **Scale:** Does not meet at all | Slightly meets | Moderately meets | Significantly meets | Completely meets
11. **Awareness Raising and Training:**
    - **Question:** How important is increased awareness and training for the successful deployment of FCBs in your region?
        - **Scale:** Not important at all | Slightly important | Moderately important | Very important | Extremely important
    - **Question:** To what extent is the general public accepting FCBs?
        - **Scale:** Complete Rejection | Strong Resistance | Neutral Acceptance | Growing Acceptance | Full Acceptance
12. **Support and Maintenance:**
    - **Question:** How satisfied are you with the level of support provided by OEMs for FCB maintenance?
        - **Scale:** Very dissatisfied | Dissatisfied | Neutral | Satisfied | Very satisfied.

Project coordination:

ERM

Project dissemination:

Hydrogen Europe

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