

JIVE/JIVE2/MEHRLIN

D4.21 - Key learnings and impacts from the 2nd JIVE 2 CEE Bus Roadshow



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EXECUTIVE SUMMARY

Following the success and the positive results of the 1st JIVE 2 CEE (Central Eastern Europe) roadshow which has taken place in Slovenia, Croatia, Hungary, Slovakia and the Czech Republic from mid-November 2022 to end of January 2023, and considering that the uptake of FCBs has been significantly higher in Western Europe, JIVE 2 proposed a side activity in the form of a bus roadshow across carefully selected cities throughout Poland and the Baltic states. The aim of the proposal is to provide an opportunity to showcase the technology and allow cities to experience and test it, with the possibility to place orders at the end of the tour.

The roadshow commenced in Poland on the 4th of September 2023, followed by a stop in Lithuania from the 9th to the 18th of September. Subsequently, the journey proceeded to Latvia, spanning from the 19th of September to the 2nd of October. The final leg of the tour concluded in Estonia, where the bus underwent testing from the 2nd to the 6th of October. The roadshow included a total of 19 events, including national workshops, student events, professional events and media events that were attended by over 970 participants. The different events reached out to a wide range of stakeholders, including government representatives, operators and local authorities, students, and members of the academic world, thus ensuring that the roadshow had the largest possible impact. In addition to this, extensive media coverage including physical and digital newspapers, TV, radio and social media allowed to reach over 3,6 million people. This has allowed to disseminate knowledge and increase public awareness about hydrogen in transport. It has also helped to reduce preconceived ideas around the safety and environmental performance of hydrogen buses. Indeed, in Poland, an opinion poll organised showed that people feel safe or indifferent while on the hydrogen driven bus (more than 60% of answers).

Furthermore, another of the main aims of the roadshow, namely for all participants (cities/operators) to announce public commitments to deploy FCBs by 2025-2030 and developing the regional capacity to deploy FCBs is considered to have been reached. All of the cities that trial the technology have announced a formal interest in deploying FCBs after the roadshow. In total, it is expected that 159 hydrogen buses will be deployed in the region over the next years, and some cities have developed or are in the process of developing plans related to FCB deployment. Poland emerges as the focal point of demand, with plans to acquire 132 buses, driven by its conducive regulatory environment, supported by the Polish Hydrogen Strategy promoting hydrogen bus deployment nationwide. Furthermore, concurrent with the roadshow trials, Poland is actively conducting hydrogen bus trials in various cities, including Solaris, Nesobus, and Arthur buses, underscoring the market's potential and advancing maturity within the country.

The good performance of the bus during the roadshow, leading to high satisfaction of operators/authorities that trialed it, had a direct impact on strengthening their FCB plan. Indeed, the bus drove across 4 countries traveling a total distance of 1 450 km and consuming approximately 71 kg of H₂, with an average consumption across the four countries of 5.04 kg/100km. It is important to understand that some of the trials were done with normal spring temperatures which helped to have lower consumptions. At the same time some of the tests registered important mileage during the tests which helped to explain consumptions that were balanced. The bus has been tested in different landscapes, including both relatively flat routes as well as mountainous contexts, with important elevation gains. The bus has performed well consistently with drivers and passengers satisfied by the experience and appreciative of the efficiency and comfortable ride provided by the bus.

A short summary of the impact of the roadshow in each country can be found below.

POLAND

The introduction of a hydrogen-powered bus in Gdynia, Poland, showcased its potential through a series of impactful events. It began with a press conference unveiling, allowing local media representatives and guests to experience test rides. Following the initial event, a subsequent workshop convened representatives from local bus operators and politicians, fostering discussions on the hydrogen technology landscape, its performance and relevance, and potential deployment strategies. Attendees were also provided with the opportunity to examine the bus up close and witness a demonstration of hydrogen refueling. After the participation of their representatives on the workshop, the City of Białystok decided to develop its own strategy for using hydrogen buses in public transport. Despite legal restrictions on passenger trials, successful testing in Gdynia's terrain garnered positive driver feedback. Challenges remain regarding insurance and hydrogen availability, yet the collaboration between MESSER Group and CaetanoBus sparked interest in local hydrogen production. Encouragingly, other Polish cities are initiating tests with domestically produced hydrogen buses, signaling a broader shift towards zero-emission transportation solutions in the country.

LITHUANIA

The H2 Bus Roadshow took place in Kaunas and Vilnius, where local operators conducted successful trials spanning 4 days. The operators expressed satisfaction and positivity toward the hydrogen bus, acknowledging its potential as a viable fleet alternative despite economic considerations favoring diesel or hybrid options. Additionally, the workshop in Vilnius with 120+ attendees, including government officials and industry experts, emphasized the potential of hydrogen technologies for Lithuania's energy and transport sectors and contributed to the sector's promotion and development prospects in Lithuania. The media's keen interest highlighted growing awareness and understanding of hydrogen-based transport solutions in the country. The city of Vilnius has announced its intention to buy 16 FCB (Fuel Cell buses).

LATVIA

The JIVE 2 CEE Hydrogen bus Roadshow in Latvia marked the debut of a hydrogen-powered bus in diverse city and airport settings. Indeed, the roadshow allowed, for the 1st time, test trials of a hydrogen bus in an Airport in Eastern Europe. The test successfully took place in the Riga airport with great commitment and enthusiasm from drivers. It showcased the bus's smooth operation, generating public interest in hydrogen technology for transportation. Though clear government strategies and funding support for hydrogen adoption are lacking, the roadshow highlighted hydrogen's promising role in public transport. Stakeholders emphasized the need for proactive maintenance and open communication, expressing interest in similar testing opportunities for future vehicles. Following the roadshow, the Jelgava municipality announced its interest and is ready to make practical steps in introducing FCBs in their fleet.

ESTONIA

Tallinn and its suburbs hosted the JIVE 2 CEE Hydrogen bus Roadshow tests along Route 16, showcasing commendable performance despite tough weather conditions; the bus showcased great fuel efficiency, notably surpassing the performance of current CNG buses. This testing, executed during peak hours with continuous passenger loads, emphasized the bus's reliability under demanding conditions. Additionally, a comprehensive workshop united industry stakeholder, discussing technical aspects, funding opportunities, and the bus's role in achieving

carbon neutrality. However, regulatory uncertainties and economic priorities in procurement regulations pose significant hurdles to the widespread deployment of fuel cell buses, despite growing interest in alternative transport fuels and technologies. The city of Tartu has announced it will deploy one FCB in 2024 as part of the JIVE 2 project.

INTRODUCTION

As the uptake of FCBs has been significantly higher in Western Europe, JIVE 2 is proposing a side activity in organising a bus roadshow proposal across carefully selected cities throughout Central and Eastern Europe (CEE). The aim of the proposal is to allow for the opportunity to showcase the technology and allow for cities to familiarise themselves and test the technology, with potential for orders post roadshow. By the end of the roadshow, the **end aim is for all participants (cities/operators) to announce public commitments to deploy FCBs by 2025-2030** and develop the regional capacity to deploy FCBs. **The proposal also aims to increase public awareness to the technology.**

The roadshows are a global proposition covering three geographically distinct regions in CEE (Central Eastern Europe). Alongside a hydrogen bus, a mobile refuelling station follows the bus roadshow to be able to refuel the bus when needed. Each city stop is expected to last approx. less than one week, including transportation and installation/deinstallation of the infrastructures. There will be a national workshop held in each country whilst the roadshow is occurring.

The first roadshow covered Slovenia/Croatia/Czechia/Slovakia/Hungary and included a total of 13 events, including national workshops, student events, professional events and media events that were attended by over 900 participants. The 1st JIVE 2 CEE roadshow took place between the end of 2022 and beginning of 2023. It allowed to disseminate knowledge and increase public awareness about hydrogen in transports. Most of the cities that trialed the technology (over 90%) have announced a formal interest in deploying FCBs after the roadshow. In total, over 150 hydrogen buses will be deployed in the region over the next years, and some cities have developed or are in the process of developing plans related to FCB deployment.

This second roadshow covered Poland/Baltic region and started from end of August, finishing beginning of October 2023.

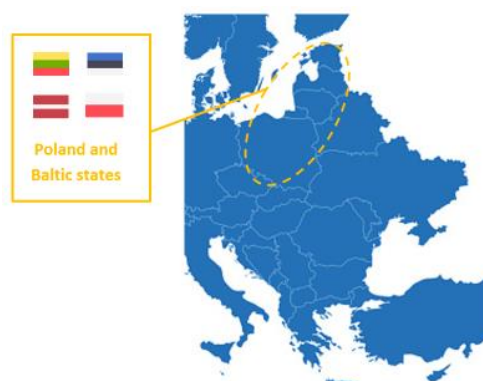


Figure 1: Map of the 2nd Roadshow

The FCB (Fuel Cell Bus) has been provided by Caetano (H2 City.Gold) and the mobile refuelling station by Messer. Each city stop lasted approximately one week, including transportation and

installation/deinstallation of the station. A national workshop was held in each country whilst the roadshow was occurring. The national workshop program always included discussions on available european funding mechanisms for FCBs and associated infrastructures, presentation of the JIVE and JIVE 2 projects early results and presentation of the results of the test trials.



Figure 1: The Caetano bus in Jelgava, Latvia



Figure 2: HRS in Viimsi, Estonia



PURPOSE OF THE DELIVERABLE

This deliverable (D4.21) “Key learnings and impacts from the 2nd JIVE 2 CEE Bus Roadshow” has been developed by ERM thanks to the inputs of the **reports from the national coordinators** (Tomasz Pelc, NEXUS Consultants sp. z o.o. (Poland); Sarunas Varnagiris, Lithuanian hydrogen energy association; Aivars Starikovs, Latvian Hydrogen Association; Ain Laidoja, Estonian Association of Hydrogen Technologies) describing the course of the roadshow and associated events, results of the test trails and discussions and the lessons learnt/impacts of the roadshow in their area, and inputs from Hydrogen Europe, H2LV and the infrastructure providers – Caetano and Messer.

The aim of the deliverable is:

- **Analyse the data collected** during the roadshow with the **aim of proving the relevance of the technology in the area.**

- Summarize the **key learnings, opportunities, and barriers to the deployment of FCBs and associated infrastructures** in Poland, Lithuania, Latvia and Estonia - from the discussions, workshops and events held during the roadshow linked to the deployment of FCBs and associated infrastructures.
- **Analyse the impact the 2nd JIVE 2 CEE Bus Roadshow had on the FCB demand** on the area but also on the **wider audience**.
- **Gather the lessons learnt from the organization of this 2nd JIVE 2 CEE Bus Roadshow**

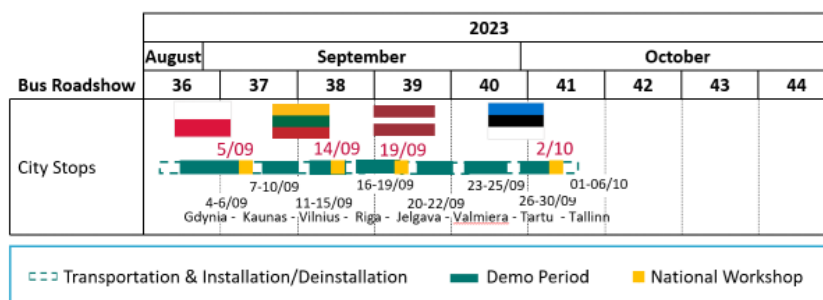


Figure 4: Course of the roadshow

KEY LEARNINGS AND RESULTS

1. Course of the 2nd JIVE 2 CEE Bus Roadshow

The roadshow started in Gdynia, Poland on the 4th of September where it remained in trial until the 6th of September. The bus underwent testing without passengers due to legal restrictions in Poland. The Polish national workshop was held in Gdynia on the 5th of September.

The 2nd stop of the roadshow was in Lithuania. The hydrogen bus was tested in Kaunas between the 9th and the 10th of September and in Vilnius between the 13th and 14th of September. Local bus tests were conducted without regular passengers. The Lithuanian national workshop of the 2nd JIVE 2 CEE (Central Eastern Europe) bus roadshow, allowing to share the results of the bus tests, was held in Vilnius on the 9th of September.

After Lithuania, the bus continued its itinerary in Latvia where it was tested in the SJSC Riga International Airport on the 18th of September. It was then tested in Jelgava between the 20th and the 22nd of September, Valmiera on the 23rd and 24th of September and for one and a half day in the city of Most. The national workshop was held in Riga on the 19th of September.

The final stop took place in Estonia, between the 2nd and 6th of October, in the city of Tallinn. The bus also serviced a small agglomeration village a few kilometres from Tallinn during the trial. The Official Workshop was organized in Tallinn, on the 2nd of October.

The course of event, and the number of participants to each national workshop are summarised in the table below.

| | POLAND | LITHUANIA | LATVIA | ESTONIA |
|-----------------------------|-----------------------|--|--|----------------------|
| Roadshow event (date, town) | Gdynia, 4-6 September | Kaunas, 9-10 September Vilnius, 13-14 September | SJSC Riga International Airport, 18 September Jelgava, 20-22 September Valmiera, 23-24 September | Tallinn, 2-6 October |

| | | | | |
|----------------------------------|--|--|--|--|
| Number of participants in events | <p>National workshop Gdynia, 5 September 65</p> <p>Media event Press conference, Gdynia 15</p> <p>Others School visits/workshops >165</p> | <p>National workshop Vilnius, 20 September 120</p> <p>Media event Kaunas, 11 September 30</p> <p>Vilnius, 12 September 20</p> | <p>National workshop Riga, 19 September 130</p> <p>Media event Riga International Airport, 18 September 5</p> <p>Riga, Workshop/Forum, 19 September 5</p> <p>Jelgava, 20 September 2</p> <p>Jelgava, 20 September 30</p> <p>Valmiera, 25 September 3</p> <p>Others Riga International Airport, Drivers' training seminar, 18th September 14</p> <p>10</p> | <p>National workshop Tallinn, 2 October 70</p> <p>Media events Tallinn, 2 October 70</p> <p>Others Estonian Hydrogen Day University workshop >230</p> |
|----------------------------------|--|--|--|--|

The 2nd JIVE 2 CEE Bus Roadshow attracted over 970 participants, who participated to various events such as national workshops, student events, professional events and media events. The different events reached out to a wide range of stakeholders, including government representatives, operators and local authorities' students and members of the academic world, thus ensuring that the roadshow had the largest possible impact.

Below a selection of pictures showing the diversity of the roadshow activities:

POLAND



Figure 5: National workshop in Gdynia, Poland



Figure 6: Student event in Gdynia, Poland



Figure 7: Bus in the city of Gdynia, Poland



Figure 8: Media event in Gdynia, Poland

LITHUANIA



Figure 9: Bus in Lithuania



Figure 10: Driver in Lithuania



Figure 11: National workshop in Vilnius, Lithuania



Figure 12: HRS in Lithuania

LATVIA



Figure 13: Media event at the Riga airport



Figure 14: Student event at Riga Technical University



Figure 15: Bus in Jelgava, Latvia



Figure 16: National workshop, Riga, Latvia

ESTONIA



Figure 17: Bus, Tallinn, Estonia



Figure 18: Passengers during trials in Tallinn



Figure 19: Tartu University Hydrogen Day, Tartu, Estonia



Figure 20: Students of the Technical University, Tallinn, Estonia

2. Results from the test drives of the Fuel Cell Bus (FCB)

The bus drove across 4 countries traveling a total distance of **1 450 km** with a delivery of **71 kg of H₂**, resulting in an average consumption of **5.04 kg/100km¹**. It is important to understand that some of the trials were done with normal spring temperatures which helped to have lower consumptions. At the same time some of the tests registered important mileage during the tests which helped to explain consumptions that were balanced.

A table outlining the bus's performance in different countries can be found on the next page.

¹ This outcome is derived from calculating the arithmetic average of individual consumptions within each country.

The 2nd JIVE 2 CEE bus roadshow showed to participating cities that fuel-cell buses and their associated refuelling infrastructures are ready for deployment in their area. Bus operators, drivers, passengers, and politicians were able to test the technology for themselves during the roadshow. In some cases, the cities were able to trial tests with passengers on bus lines. For example, in Tallinn, the FCB was tested along bus route number 16 which serves passengers during the morning and evening peak hours. The choice of this specific route was intentional, designed to assess the bus's performance under conditions of continuous passenger load throughout the workday, avoiding scenarios with only a handful of passengers. Nevertheless, in some cases this was not possible due to legal reasons. This was the case in Poland due to legal restrictions, as test drivers are not allowed to carry passengers unless the bus has a national license plate.

- **Drivers' experiences**

The drivers were overall very satisfied with their driving experience of the FCB. In Lithuania, the drivers noted several positive aspects of the FCB, including its fast acceleration compared to conventional buses. They also appreciated the smooth, silent, and pleasant ride that the FCB offered. In Latvia, most of the drivers have had previous experience in driving battery electric buses. This proved to be useful, as they did not require too much adjustment in their driving style.

- **Passengers' experience**

Overall, all passengers appreciated the quiet, comfortable, and smooth ride on the bus. In Tallinn, Estonia the rainy weather allowed tested the bus's ability to maintain the driver's visibility in foggy conditions caused by humidity and the presence of passengers with wet clothing and umbrellas in the passenger area. In Poland, the bus's very efficient air conditioning was underlined. This is very important because very often in public transport in Poland, to reduce fuel consumption, air conditioning is not turned on. This is one of the advantages of using hydrogen buses as it provides greater comfort for passengers, especially in the summer.

- **Bus performance**

The bus has been tested in different landscapes, including both relatively flat routes as well as mountainous contexts, with significant elevation gains. The bus has performed well consistently.

Overall, all operators who tested the technology were very satisfied with it.

The 2nd JIVE 2 Central and Eastern Europe (CEE) Roadshow demonstrated to Gdynia City in Poland, that fuel-cell buses and their associated refuelling infrastructure are ready for deployment. This is significant because a hydrogen refuelling station is set to open in Gdynia by the end of the year.

The operator in Vilnius (Lithuania) expressed great satisfaction with the test trials of the hydrogen bus. They were not only pleased with the opportunity to conduct these trials but also found the results to be promising. The operator's comments indicate that they view the hydrogen-powered bus as a viable alternative for their fleet. The PTO in Vilnius (Lithuania), Vilniaus viešasis transportas was very satisfied with the performance of the bus. D. Aleknavičius, the CEO of "Vilniaus viešasis transportas", said: "In Vilnius city, the hydrogen bus can be used for long-distance routes. For example, for our two-shift routes where we cover about 250-300 kilometers per day, and possibly even more". Although tests were conducted without

passengers, both operators from Kaunas and Vilnius were pleasantly surprised by the relatively low hydrogen consumption, as they had anticipated higher consumption levels.

In Latvia, the bus performed well with an average consumption of 4,88 kg/100 km. Gints Burks, the Chairman of the board of the Jelgava city public transport operator mentioned ahead of the test trials “We are excited to be part of the JIVE 2nd Roadshow and look forward to testing the bus for a few days to give our employees and passengers a glimpse into our zero-emission future. It is important to assess FCEB technical performance as well as operating models for bus fleets and the associated refuelling infrastructure before deploying FCEB on streets.”

Tallinn City Transport Company compared the results of the trial tests with prior testing of various battery/electric buses and underlined that the hydrogen/electric bus stands out. Indeed, most of the electric bus manufacturers couldn't achieve the goal of working in two shifts. In contrast, the hydrogen/electric bus tested during the roadshow exhibited the ability to:

- Operate in two shifts without concerns of running out of hydrogen fuel by the end of the day.
- Run on routes with intermittent working hours for two or even three consecutive workdays without needing hydrogen refuelling.
- Achieve quick refuelling, taking only 10 to 15 minutes, as opposed to the lengthy 5 to 8 hours required for battery/electric buses.

“In Vilnius city, the hydrogen bus can be used for long-distance routes. For example, for our two-shift routes where we cover about 250-300 kilometers per day, and possibly even more.”

D. Aleknavičius, the CEO of "Vilniaus viešasis transportas"

- **Station performance**

There were no problems with the hydrogen refueling of the bus, nor with any of the refueling equipment encountered during the roadshow. A professional representative from Messer performed the hydrogen refueling, but the driver was always on site and could observe and learn about the refueling process.

Hydrogen refueling was done by Messer with a technology allowing the transfer of the gas from the trailer (with working pressure of around 200 bars) to the tanks of the fuel cell bus. This resulted in approx. 20 kilograms of hydrogen being refueled to the bus giving it a range of approx. 200 kilometers.

Table outlining the bus's performance across the 4 countries.

| During the FCBs trial | POLAND | LITHUANIA | LATVIA | ESTONIA | TOTAL/AVERAGE |
|-----------------------------------|----------------|-------------------------------|----------------|------------------|-------------------------|
| Bus KPI | | | | | |
| Total Distance Travelled | 125,4 km | 551,5 km | 518,5 km | 253,2 km | 1448,6 km (total) |
| Average Hydrogen Consumption data | 5,16 kg/100 km | 4,4 kg/100 km | 4,88 kg/100 km | 5,72 kg/100km | 5,04 kg/100km (average) |
| Average outside temperature | 25°C | 25°C | 16 °C | 9°C ² | 19.7°C (average) |
| Landscape | Hilly terrain | Flat routes around the cities | Flat routes | Flat routes | NA |
| Average speed | 27,7 km/h | 28,2 km/h | 29 km/h | 26,9 km/h | 27,9 km/h (average) |
| Station KPI | | | | | |
| Total Kg of H2 delivered | 6,5 kg | 23,9 kg | 26,19 kg | 14,7 kg | 71.3 kg (total) |

² Estimation of the average outside temperature derived from the testing dates.

Pictures of test drives in the different countries



POLAND



LITHUANIA



LATVIA



ESTONIA



3. Key learnings from national workshops and identified barriers to the deployment of FCBs in the area

During each stop a national workshop took place. The national workshop program included interventions from:

- The **Clean Hydrogen Partnership** and **Hydrogen Europe** to talk about the European funding mechanisms available for FCBs and associated infrastructures.
- A **representative from the JIVE and JIVE 2 projects** (ERM in Poland and Estonia and UITP in Lithuania and Latvia) to present the learnings and early results of the projects – JIVE and JIVE 2 deploying 300 FCBs (Fuel Cell Buses) and 16 HRs (Hydrogen Refuelling station).
- **Representative from the industry** – Messer and Caetano were present during the workshop to talk about their experience and performance of the technology.
- **High-level national, regional and local authorities** were present to talk about their future plans related to FCBs (Fuel Cell Buses) but also the wider ecosystem. Representatives from ministries were also present in some of the workshops – for example representatives of the Transport Ministry and of Energy were present.
- **Operators that tested the technology** to talk about their experience with the FCB thanks to the 2nd JIVE 2 CEE bus roadshow
- **Local industries**



Figure 21: National workshop Vilnius, Lithuania



Figure 22: Press conference Gdynia, Poland

Throughout the various workshops and events held during this roadshow, various discussions took place. Please find below some key learnings from the discussions:

- European support programmes and funding are available for hydrogen buses and stations - PDA (Project Development Assistance), CEF (Connecting Europe Facilities), EU Hydrogen Valleys, Modernisation Fund, Just Transition Fund.
- Great potential for Hydrogen Valleys has been identified.
- The roadshow has been pivotal to initiate local value chain discussions and demonstrate the benefits of hydrogen mobility. Main conclusion from the operators that tested the bus is that the technology is ready, adapted to their local routes and performed particularly well with low H₂/kg consumption.
- Local partners have confirmed their interest in deploying hydrogen buses and wider H₂ ecosystems in the near future.

It is important to highlight the very high interest in the technology from cities partners of the roadshow but also other cities/areas (non-partner of the roadshow) that attended the workshop and participated to the discussions.

During the different workshops the aim was also to discuss the ongoing barriers to the deployment of FCBs in the area. The main barriers identified are:

1) The price of hydrogen and of the buses.

The **cost of the technology itself** as well as the associated infrastructure. Indeed, currently the CAPEX of the technology is higher than the one of diesel buses.

In Lithuania, the key barriers to the deployment of Fuel Cell Buses (FCBs) are the price of the technology and the infrastructure. The Vilnius bus operator announced its intention to purchase 16 FCBs; however, they have received support from the Vilnius government. The Kaunas bus operator emphasized that, currently, buses along with the required infrastructure are too expensive.

2) The lack of funding allowing to cover the high costs associated with hydrogen technology .

One of the reasons why cities in Latvia are reluctant to purchase FCBs is the fact that it is not clear whether the Latvian government will provide support for the acquisition of hydrogen buses and hydrogen refuelling stations (HRS) through its funding programs. In Kaunas, Lithuania, FCBs could only be considered for purchase with the financial support of the city, the state, or the EU.

3) Hydrogen availability. One of the primary obstacles to the advancement of Fuel Cell Buses (FCBs) in Poland is the availability of hydrogen. In fact, the hydrogen market is still in its early stages, and the collaboration between MESSER Group and Caetano to procure a fleet of hydrogen buses along with local hydrogen production has generated significant interest. The availability of hydrogen was also mentioned as an important barrier to the deployment of FCBs by the Latvian National coordinator.

4) Regulatory barriers to the deployment of hydrogen buses. It was indeed mentioned by the Estonian national coordinator that regulatory uncertainties pose a challenge to the deployment of FCBs. Furthermore, it was underlined that economic considerations take precedence over climate concerns in national procurement regulations.

The roadshow played a key role in overcoming some of the barriers mentioned above. Indeed, in all the national workshops, it was ensured that the topic of funding and procurement was central. The presentations focused on giving a concrete and comprehensive overview of the European funding tools available to deploy FCBs - the hydrogen valleys were identified as a key element, as there is usually a desire to build a complete H2 ecosystem in the region where the bus stopped. Moreover, there are specific funds for the Countries targeted by the roadshow such as the Modernisation fund and the Just Transition fund that can be used to implement green mobility projects. Most of the questions asked at the workshops related to these different funding and support mechanisms. The roadshow also improved the general knowledge of the technology for key stakeholders, such as high-level policy makers. The results of the FCBs field tests as well as the results of the JIVE and JIVE 2 projects showed that the technology is ready. It was also pointed out that the roadshow helped to reduce preconceptions about the safety of the technology.

4. Impacts of the roadshow

The roadshow successfully generated much interest amongst the cities involved as well as across the region. Press coverage, citizens' and drivers' experience with the buses, as well as operators' impressions of the vehicles, was extremely positive. Several cities are now actively considering their next steps towards the emissions-free public transport that will be required if Europe is to achieve its decarbonisation objectives.

- **Dissemination of the technology**

The roadshow in Poland and Baltic countries was promoted through the fuel cell bus website and social media platforms.

For promotional activities, the focus was on leveraging popular social media platforms such as Twitter, LinkedIn, and Instagram to effectively reach the target audience and maximize visibility, together with the Fuel Cell Bus Website.

The roadshow resulted in many positive responses to the test drives, a strong interest in the vehicle itself, and a lot of media attention, as evidenced by the numerous TV and online articles referring to the latter. A total of over 200 media articles, TV and radio programmes discussed the roadshow and the bus's performance, resulting in a reach of over 3.6 million people. The fact that diverse media supply was used allowed to reach and thereby spread awareness about hydrogen transport across a variety of audiences.

- **Announcements during or following the roadshow**

Several countries have reported that important stakeholders such as representatives of Ministries and mayors have expressed their support and willingness to further develop the use of hydrogen in public transportation.

In Poland, the mayor of Gdynia confirmed the city's interest in deploying hydrogen buses in the nearest future – up to 2025. The local government is seeking the most effective solutions and is eager to exchange with other stakeholders who have already trialed the bus. Therefore, the debate organised during the workshop was of high value.

In Lithuania, as Vilnius is going to purchase hydrogen-powered buses (the roadshow coincided with the announcement of the bus purchase), the CEO of "Vilniaus viešasis transportas" said that the new buses - of which the municipality intends to purchase - will be able to be used for longer routes.

In Latvia, the city of Jelgava announced that it will take a step forward and is launching an initiative to acquire a minimum of five (optimal 10) hydrogen-powered buses within the next year. Furthermore, Liepāja City imposed the task on the Public transport agency to assess the feasibility of transitioning the entire city bus fleet (34 buses) to hydrogen.

- **Contributions of the roadshow to the development and deployment of FCB in cities**

In all cities where the bus was tested, local authorities are keen to further explore the possibility of deploying hydrogen buses in their city. In countries or cities that were already engaged in hydrogen activities, the JIVE2 CEE roadshow and the bus testing was an opportunity for relevant authorities to confirm that the deployment of hydrogen buses is an advantageous and interesting option. The roadshow also contributed to the creation or strengthening of collaboration between various stakeholders. A table describing the impacts in each country can be found at the end of the section.

Following the roadshows Messer and CaetanoBus proposed a joint offer to the cities that trailed their technology during the roadshow. This is one of the most important and concrete impact of the roadshows as it is a key next step to the deployment of FCBs in the area by providing a unique package **comprising all the equipment examined and tested during the roadshow, at**

scale and at feasible costs. By implementing this proposal for ‘mobility as a service’ in two or more cities across the roadshow, the partners (Messer/Caetano) are **confident that they can deliver full costs over the contract duration which are equivalent or below those for new diesel buses.**

The proposal will also deliver substantial emissions savings as well as additional social and economic benefits for the cities and regions who choose to go ahead.

The offer is applicable to all European carriers, particularly those who have undergone testing. It was initially introduced during the first roadshow and has been reaffirmed after the second roadshow.

‘One stop shop’:

Turnkey solution - “Starter Set” - including:

- 20+ H2City Gold fuel-cell electric buses per city fleet, with standard base configuration (Toyota/CaetanoBus);
- A scalable, full-function, hydrogen refuelling station with cryogenic cooling for maximum reliability (Messer);
- Reliable hydrogen supplies, based on on-site production and/or hydrogen trailers (Messer);
- A financing package incorporating EU financial support, to be established based on your commitment to proceed;
- A service package, ensuring that all vehicles (Caetano) and hydrogen infrastructure (Messer) are maintained and operational;
- An all-in pricing option based on a single, 10-year, largely fixed price per km driven (Toyota Tsusho / Messer).

POLAND

| City | Roadshow participant ? | Interest in the technology ? | Comment – | Timeline for deployment (expected date for FCB deployment?) | Number of hydrogen buses expected to be deployed | Comments |
|---------------------|------------------------|------------------------------|---|---|--|--|
| Poznań | YES | YES | | 2023 | 20 | Deliveries of the first buses began and HRS was launched |
| Piła | YES | YES | | 2025 | 5 | |
| Białystok | YES | YES | A decision was made to develop a feasibility study of own hydrogen production for FCB | 2025 | n/a | |
| Szczecin | YES | YES | | 2025 | n/a | Tests of the first buses |
| Rybnik | NO | YES | | 2023 | 20 | Deliveries of the first buses began and HRS was launched |
| Wejherowo | YES | YES | | 2023 | 6 | Deliveries of the first buses began and HRS was launched |
| Kraków | NO | YES | | 2023 | 10 | Deliveries of the first buses began and HRS was launched |
| Gorzów Wielkopolski | YES | YES | | n/a | 5 | |

| | | | | | | |
|---|-----|-----|--|------|----|--|
| Łomża | YES | YES | | 2025 | 4 | |
| Częstochowa | NO | YES | | 2025 | 11 | Tests of the first buses |
| Lublin | NO | YES | | 2025 | 20 | Tests of the first buses |
| Piotrków Trybunalski | NO | YES | | 2025 | 11 | |
| Konin | YES | YES | | 2022 | 10 | Annual bus test, interest confirmed following the roadshow |
| Gdańsk | YES | YES | | 2024 | 10 | |
| In Poland, 132 buses are expected to be acquired across 12 different cities by the year 2025. | | | | | | |

In Poland, a considerable number of cities (12) have expressed their interest in acquiring hydrogen buses. Among these cities, Konin, Gdańsk, Białystok, Kraków, and Lublin have announced an expedited decision-making process, indicating an acceleration in their procurement plans. In cities like Poznań and Kraków, deliveries of the initial buses have commenced, along with the launch of HRS.

LITHUANIA

| City | Roadshow participant ? | Interest in the technology ? | Comment – | Timeline for deployment (expected date for FCB deployment?) | Number of hydrogen buses expected to be deployed | Comments |
|---------|------------------------|------------------------------|---|--|--|---|
| Kaunas | YES | YES | The Kaunas bus fleet is delighted to have the chance to trial environmentally-friendly buses. However, the deployment of FCB is not planned in the near future. | - | - | According to CEO of “Kauno autobusai” they would not be able to purchase hydrogen-powered buses with their own funds. Such vehicles could only be considered for purchase with the support of the city, the state or the EU. |
| Vilnius | YES | YES | Vilnius public transportation intends to acquire FCB buses, utilizing green hydrogen as their fuel source. The entire project will cost 8 million. 5.6 million euros of funding will be provided by the Ministry of Energy, the rest by the municipality itself. | The tender for the procurement of the 16 hydrogen buses is scheduled to be announced next year (2024). | 16 | The company Vilnius Silumos Tinklai has secured a project and received funding to install an electrolyzer and a hydrogen (H2) filling station. Meanwhile, Vilniaus Viesasis Transportas is set to purchase H2 buses as part of this initiative. |

A total of 16 buses are expected to be acquired by the operator Vilnius Viesasis Transportas.

In Vilnius, where the bus underwent testing, plans are underway to acquire 16 buses in the coming year(s). Although Kaunas also tested the bus and welcomed the opportunity to trial environmentally-friendly buses, no purchases have been announced due to economic constraints. Procuring such vehicles would require support from the city, state, or EU.

LATVIA

| City | Roadshow participant ? | Interest in the technology ? | Comment – | Timeline for deployment (expected date for FCB deployment?) | Number of hydrogen buses expected to be deployed | Comments |
|--------------|------------------------|------------------------------|---|---|--|---|
| Riga Airport | YES | YES | Was very interested in testing however due to the average distance travelled recognised that BE buses might be more appropriate | n/a | n/a | Would like to continue assessing the technology |
| Jelgava | YES | YES | This was their second trial of FCEB. Very much welcomed the detail report provided by CaetanoBus on H2 consumption and kWh | n/a | 5-10 | Elements of context or additional information |

| | | | | | | |
|---|-----|-----|---|-----|-----|--|
| Valmiera | YES | YES | Incident with the air compressor system | n/a | n/a | Would like to continue assessing the technology |
| Liepaja | NO | YES | Following the trials in Latvia would be interested to test the bus themselves | n/a | n/a | Will look for possibilities to apply for support funding and carry out extended trials |
| A total of 5 to 10 buses are expected to be acquired in the upcoming year(s). | | | | | | |

In Latvia, after successful trials, the city of Jelgava has announced its intention to purchase 5-10 buses. Other participants in the roadshow are interested in further evaluating the technology. Additionally, the roadshow garnered the attention of the city of Liepaja, which, although not part of the initial trial, will explore options to secure funding support for extended trials.

ESTONIA

| City | Roadshow participant ? | Interest in the technology ? | Comment – | Timeline for deployment (expected date for FCB deployment?) | Number of hydrogen buses expected to be deployed | Comments |
|-------|------------------------|------------------------------|----------------------|---|--|---|
| Tartu | YES | YES | Ongoing negotiations | 2024 | 1 | Preparing for next period of bus procurements |

| | | | | | | |
|---|-----|-----|--|--|--|-----------------------|
| Tallinn | YES | YES | | | | Trials on BEB ongoing |
| Viimsi | YES | YES | | | | HRS missing |
| Pärnu | YES | YES | | | | HRS missing |
| 1 bus is expected to be deployed in Estonia by the end of 2024. | | | | | | |

After successful trials in Estonia, Tartu has declared its intent to purchase a hydrogen bus in 2024. While other cities show interest in the technology, they lack the necessary infrastructure (HRS) to procure buses at present.

A collective of 159 buses is expected to be procured following the trials conducted during the 2nd Roadshow. Poland emerges as the focal point of demand, with plans to acquire 132 buses, driven by its conducive regulatory environment, supported by the Polish Hydrogen Strategy promoting hydrogen bus deployment nationwide. Furthermore, concurrent with the roadshow trials, Poland is actively conducting hydrogen bus trials in various cities, including Solaris, Nesobus, and Arthur buses, underscoring the market's potential and advancing maturity within the country.

KPIs

- Quantitative

| | POLAND | LITHUANIA | LATVIA | ESTONIA | TOTAL |
|--|-----------|-----------|-----------|---------|-----------|
| Number of events organised. | 2 | 1 | 9 | 7 | 19 |
| Number of participants in the stakeholder events | 230 | 120 | 170 | +300 | +820 |
| Number of participants in the media events | 15 | 50 | 15 | 70 | 150 |
| Number of media articles, TV and radio programmes | 12 | 40 | 114 | 34 | 200 |
| Reach of the media articles, TV and radio programmes | 600 000 | 100 000 | 2 064 918 | 800 000 | 3 564 918 |
| Number of social media posts | 10 | 25 | 9 | 10 | 54 |
| Reach of the social media posts | 2 500 (+) | 50 000 | 10 520 | 500 | 63 520 |

As showed in the table below, there have been a high number of events organized during the roadshow with over 970 participants. A particularly interesting and unique feature of this roadshow is the wide variety of organized events – national/technical workshops, media events, students’ event, professional events – which allowed it to reach a large audience – from a technical one to the general public.

| | |
|---|------|
| Number of events organised. | 19 |
| Number of participants in the stakeholder events | +820 |
| Number of participants in the media events | 150 |
| Number of media articles, TV and radio programmes | 200 |

Table 1: Summary of quantitative KPIs

- Qualitative

| | |
|--|--|
| <p>The number of hydrogen-powered vehicles in the partner country and Central and Eastern Europe is, in general, increasing</p> | <p>Yes, for all countries:</p> <ul style="list-style-type: none"> • In Poland, the number of buses is increasing, and several cities have announced their commitment to purchase FCBs in the upcoming years. • In Lithuania, there are plans to increase the number of hydrogen buses in the next few years. • In Latvia, there are already 10 trolleybuses with FC range extender. The number of FCB buses is expected to increase in the next years. • There are currently 5 FCEV in the Estonian registry, and their number is expected to increase, starting with the deployment of an FCB in Tartu in 2024, following the trials. |
| <p>Stakeholders convinced that hydrogen power is the future of public transportation and ready to take practical steps to introduce it</p> | <p>Yes, in all countries:</p> <ul style="list-style-type: none"> • In Poland, after the participation of their representatives on the workshop, the City of Białystok decided to develop its own strategy for using hydrogen buses in public transport. • In Lithuania, the Vilnius city mayor, V. Benkuskas, mentioned that “the city and its heat networks are engaging in a competitive struggle with other European capitals and cities to obtain hydrogen technologies. The demand is substantial, and the trend is moving in that direction. Therefore, the timing to secure both the buses and all the related technologies is of utmost importance.” • In Latvia, stakeholders are convinced that hydrogen power is the future of public transportation. However, they are awaiting the Latvian Hydrogen strategy and general direction from the government. • In Estonia, hydrogen power is envisioned as a strong option for the future of public transportation. However, alternatives are still under discussion and evaluation. |

| | |
|--|---|
| <p>General public is convinced that hydrogen power is safe, and it is the future of public transportation</p> | <p>Yes, in most countries:</p> <ul style="list-style-type: none"> • In Poland, the opinion poll organised by trojmiasto.pl showed that people feel safe or indifferent while on the hydrogen driven bus (more than 60% of answers). • In Latvia, the public provided positive feedback. However safety issues are still mentioned during conversations. |
| <p>Following the trial, the municipalities who tested the buses have announced a formal interest in the hydrogen-power technology</p> | <p>Yes, for all countries:</p> <ul style="list-style-type: none"> • In Poland, Gdynia announced interest and is looking for best solution hence the willingness to participate in the trial during the roadshow. • In Lithuania, the city of Vilnius has announced its intention to buy 16 FCH buses. • Yes, the Jelgava municipality announced its interest and is ready to make practical steps in introducing FCBs in their fleet. • Following the trial, the city of Tartu will deploy one FCB in 2024. |
| <p>Local politicians and public transport operators have made announcements regarding commitment for hydrogen-power technology procurement in the future</p> | <p>Yes, in all countries (details are provided in the section above).</p> |
| <p>National government or national politicians have made announcements regarding hydrogen power technology plans for the country</p> | <p>Yes, in most countries (details are provided in the section above).</p> |

5. Lessons learned from the second roadshow

Overall, the roadshow received very positive feedback from local partners and stakeholders.

The H2 Bus Roadshow initiative in Lithuania was seen as a potential game-changer by various stakeholders, as its successful implementation could significantly advance the growth of the hydrogen economy sector.

Some countries that could not operate the bus in normal conditions mentioned that it is important that the FCBs are **tested on regular routes with regular users**. With this regard more time is also needed due to delays in obtaining certain permits required from authorities.

It has also been mentioned that would be beneficial to arrange a presentation by the Roadshow organizers for national associations during the initial online meeting. This presentation should outline how the Roadshow will be structured, what will be provided, the objectives to be achieved, and the allocation of responsibilities. This would provide a clearer understanding of communication strategies and general tasks to be accomplished.

6. Impact on dissemination activities of the JIVE 2 project

The focus was on leveraging popular social media platforms such as Twitter, LinkedIn, and Instagram to effectively reach the target audience and maximize visibility, together with the Fuel Cell Bus Website.

Twitter emerged as a pivotal platform in the comprehensive dissemination strategy for the JIVE/JIVE2 2nd Roadshow initiative. Its dynamic nature and real-time capabilities were harnessed to conduct campaigns and share highlights, making it a central player in the overall promotional efforts.

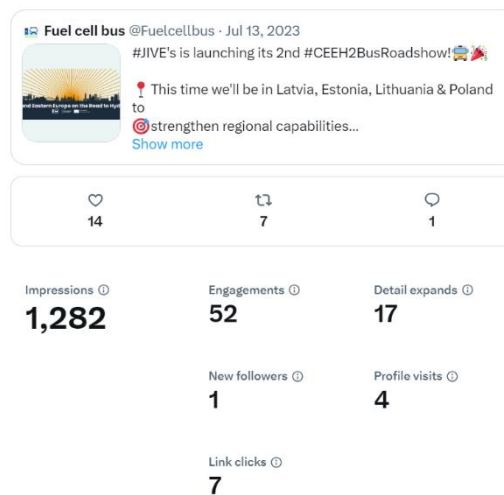


Figure 23: First Twitter post from the fuel cell bus account

LinkedIn being a professional networking platform, emerged as the ideal medium for tagging and recognizing the key participants of the JIVE/JIVE2 2nd Roadshow initiative. Its features and business-focused audience made it well-suited for creating a broader narrative around the Roadshow.

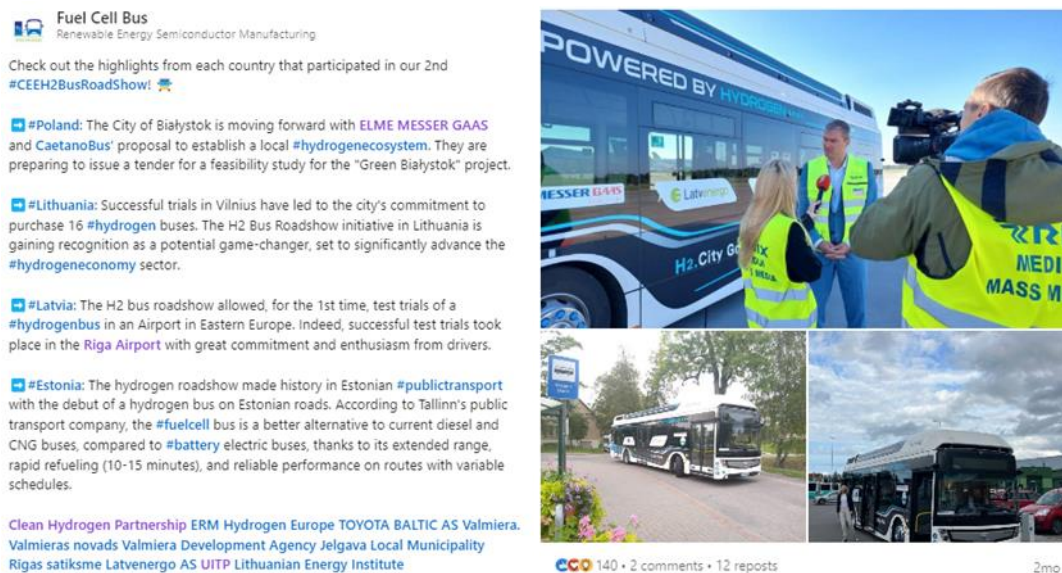


Figure 23: Summary post from the LinkedIn fuel cell bus account

Instagram served as a dynamic and visually appealing platform for the dissemination of key success stories and achievements during the JIVE/JIVE2 2nd Roadshow initiative. The primary focus was on sharing visually captivating content to effectively communicate the Outreach Award post and the roadshow accomplishments specific to each country.

The Fuel Cell Bus Website played a crucial role, witnessing an 86.6% growth in the user base (1.7K new users) post-press release. Direct traffic of 508 users indicated the press release's impact.

Social media growth during the second Roadshow reflected increased followers: Twitter gained 69, LinkedIn surged by 233, and Instagram saw an increase of 32 followers. This growth extended beyond the roadshow period.

The table below illustrates the social media outreach metrics for the JIVE/JIVE2 2nd Roadshow across three major platforms: Twitter, LinkedIn, and Instagram, showcasing the diverse engagement strategies employed.

| Social Media Platform | Number of Posts | Average Impressions/Reach |
|-----------------------|-----------------|---------------------------|
| Twitter | 11 | 7,021 |
| LinkedIn | 7 | 15,259 |
| Instagram | 4 | 627 |

Project coordination:



Project dissemination:



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