JIVE - D4.12 - Key learnings and impacts from the 3rd JIVE CEE Bus Roadshow

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Clean Hydrogen Partnership

Co-funded by the European Union

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Dissemination status: Final
Dissemination level: Public

Approval process

Steps	**Status**
Work Package Leader	Approved
Coordinator	Approved
Clean Hydrogen Partnership	Pending

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EXECUTIVE SUMMARY

Following the success of the first two roadshows carried out in the JIVE 2 project, a 3rd Roadshow was organized under the JIVE project. Aligned with the objectives of previous roadshows, this initiative aims to promote hydrogen mobility, educate citizens and road transport operators about the technology, and bring together a wide range of stakeholders including regional/local authorities, decision-makers, academics, , and representatives from industry. The roadshow covered 4 countries during the summer of 2024: Romania, Bosnia-Herzegovina, Greece and Bulgaria.

One of the main aims of the roadshow was for the participating countries / cities to announce public commitments to deploy FCBs by 2025-2030 and to observe clear engagements to further develop the regions' hydrogen ecosystem. All the cities that trialed the technology have announced a formal interest in deploying FCBs after the roadshow.

In Romania both participating cities, Cluj-Napoca and Galati, have committed to the deployment of hydrogen buses in the near future, in addition to hydrogen production infrastructure. Athens and Thessaloniki (Greece) are expected to deploy 50-100 FCBs in total by 2028, facilitated in part by ongoing trials (e.g. TRIERES project, cofounded by CH JU). In Bosnia-Herzegovina, Sarajevo intends to deploy 2 buses in the near term, while the Bulgarian cities of Sofia and Stara Zagora are expected to deploy 20-50 buses together. In total, it is expected that over 200 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.

The good performance of the bus during the roadshow, leading to the high satisfaction of operators/authorities that trialed it, had a direct impact on strengthening their FCB plan. The bus was demonstrated across 4 countries travelling a total distance of 2,813.50 km and consuming approximatively 166.4 kg of H2, resulting in an average consumption of 5.92 kg/100km. It's crucial to note that certain trials were conducted under typical spring temperatures or without any passengers, two factors contributing to lower consumption rates. Simultaneously, some tests recorded significant mileage (>200 km), contributing to a more balanced understanding of consumptions. The bus was tested in different landscapes, including both relatively flat routes as well as mountainous contexts, with important elevation gains. In most countries drivers and passengers were satisfied by the experience and have appreciated 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.

Romania

The roadshow in Romania passed through Cluj-Napoca for test trials and the national workshop and continued to Galati where further trials took place. Both participating cities have committed to the deployment of FCBs (67 in total) and hydrogen production stations, indicating a keen interest in the creation of hydrogen ecosystems and hydrogen valleys.

Greece

In Greece, the roadshow began in Thessaloniki, where the bus demonstration occurred alongside the International Trade Fair. The bus subsequently travelled to Kozani for a regional workshop coinciding with the Balkan Energy Forum, after which the bus travelled to Athens for further testing and a national workshop. Finally, in Patras, the bus concluded its demonstartion at the Patras ECOFORUM 2024. In Greece, the bus unfortunately could not carry passengers due to legislative restrictions. Greece emerges as the market with the furthest developed existing plans, with a number of trials ongoing and a target to deploy up to 100 FCBs in the near-term.

Bosnia-Herzegovina

The roadshow in Bosnia-Herzegovina passed through Sarajevo and the Jahorina ski resort where the national workshop was held. The city of Sarajevo intends to deploy 2 FCBs in the near future and widespread interest in the technology was made clear throughout the event.

Bulgaria

The roadshow in Bulgaria passed through Sofia, Stara Zagora and Pazardzhik. Testing was carried out in Sofia, followed by a demonstration activity in Pazardzhik and a national workshop in Stara Zagora. Bulgaria has committed to 120 FCEVs across the country, of which 10-30 are expected to be deployed in Sofia, and 10 in Stara Zagora.

INTRODUCTION

Following the success and the positive outcomes of the 1st JIVE 2 CEE (Central Eastern Europe) roadshow covering Slovenia Croatia, Hungary, Slovakia and the Czech Republic from mid-November 2022 to end of January 2023 and of the 2nd JIVE 2 CEE roadshow in Poland, Latvia, Estonia, and Lithuania from mid-September 2023 to beginning October 2023, a 3rd roadshow focused on the Balkans was proposed and carried out as part of the JIVE project prior to the conclusion of the project. The selected countries were Romania, Greece, Bosnia-Herzegovina, and Bulgaria.

The aim of this roadshow is to pursue the momentum gained with the previous events across other regions where the deployment of fuel cell buses (FCBs) is still limited to give the opportunity to interested cities to experience and test the technology with the perspective of stimulating future sector-related announcements.

The roadshow included a total of 15 events, including national workshops, student events, professional events and media events that were attended by over 2,000 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 and industry, 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 4 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.

PURPOSE OF THE DELIVERABLE

This deliverable (D4.12) "Key learnings and impacts from the 3rd JIVE CEE Bus Roadshow" has been developed by ERM thanks to the inputs of the **reports from the national coordinators** from energy42 (Romania), CluBE (Greece), Skodex (Bosnia-Herzegovina), and BGH2A (Bulgaria) 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 Motor Oil | Coral Gas.

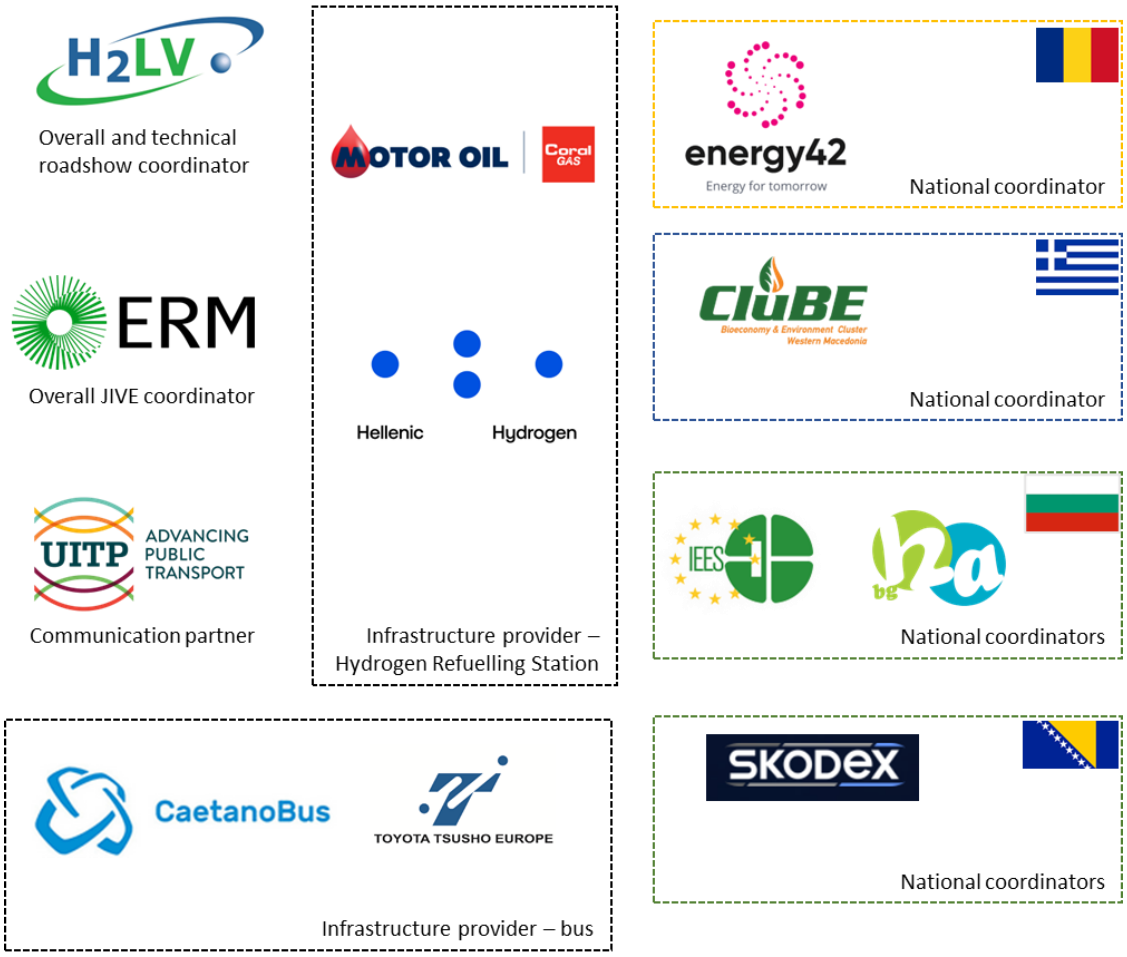


Figure 1: Overview of the involved partners in the 3rd JIVE CEE fuel cell bus roadshow

The aims of the deliverable are to:

- **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 Romania, Greece, Bosnia-Herzegovina, and Bulgaria - from the discussions, workshops and events held during the roadshow linked to the deployment of FCBs and associated infrastructures.

- **Analyse the impact the 3rd JIVE 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 3rd JIVE CEE Bus Roadshow**

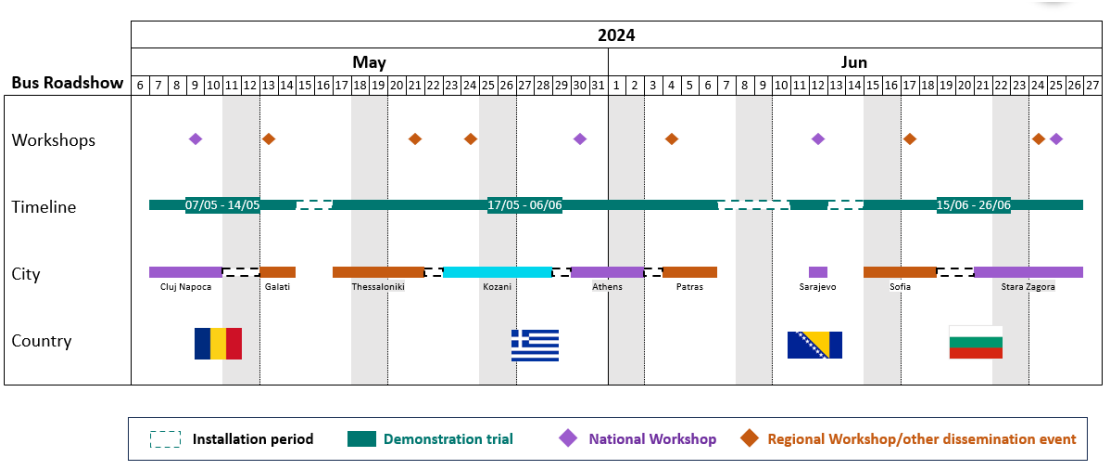


Figure 2: Timeline of the 3rd JIVE CEE Roadshow

KEY LEARNINGS AND RESULTS

1. Course of the 3rd JIVE CEE Bus Roadshow

The roadshow started in Cluj-Napoca (Romania) on the 6th of May, with the arrival of the bus and infrastructure. The first trials occurred on the 8th of May, with the national workshop taking place on the 9th of May. This was followed by one further day of testing on 10th May. The bus was then transported to Galati (Romania) for testing on 11th to 14th May.

The roadshow then continued in Greece, starting in Thessaloniki between 18th and 22nd May, where a bus demonstration took place at the Thessaloniki International Fair (TIF) happening concurrently. The "Hydrogen Mobility Info Day" regional workshop occurred on the 21st of May. The bus then travelled to Kozani, where it was demonstrated and tested between 23rd and 27th May to coincide with the Balkan Energy Forum, where the regional workshop took place between 23rd and 25th May. The bus then made its way south to Athens for further testing between 29th May and 2nd June, with the national workshop hosted there on the 30th of May. The bus then travelled to Patras for another session of testing on local roads between the 4th and 6th June, and the regional workshop "ECOFORUM 2024" supported by its own media event on the 5th of June.

The bus was then transported to Bosnia-Herzegovina for testing from Sarajevo to the Jahorina ski resort between 10th and 12th June, where the national workshop happened on the 12th of June.

Finally, the bus was transported to Sofia to begin its testing in the last country of the tour, Bulgaria, with testing days on 17th to the 20th of June in Sofia. A demonstration activity took place on the 21st of June in Pazarzhik as the bus travelled to its final stop of the roadshow, Stara

Zagora for local testing on 24th to 26th June. Bulgaria's national workshop took place in Stara Zagora on the 25th of June.

	Romania	**Greece**	**Bosnia-Herzegovina**	**Bulgaria**
Roadshow event (date, town)	Cluj-Napoca 6-10 May Galati 11-14 May	Thessaloniki 18-22 May Kozani 23-27 May Athens 29 May – 2 June Patras 4-6 June	Jahorina Ski Resort 10-12 June	Sofia 17-20 June Stara Zagora 24-26 June
Number of participants in events	**National workshop** Cluj Napoca 9 May **Participants: 180** **Media events** Press conference, Cluj Napoca **Participants: 150** Press conference, Galati **Participants: 10**	**National workshop** Athens 30 May **Participants: 120** **Regional workshops** Thessaloniki 21 May **Participants: 140** Kozani 24 May **Participants: 1420** Patras 5 June **Participants: 75**	**National workshop** Jahorina 12 June **Participants: 70**	**National workshop** Stara Zagora 25 June **Participants: 97** **Regional workshops** Sofia Opening and round table discussion **Participants: 200** **Media events** Press conference Sofia **Participants: 17** Press conference Pazardzhik **Participants: 3** Press conference Stara Zagora **Participants: 9**

Figure 3: Overview of main Roadshow events and dates

The **3rd JIVE CEE Bus Roadshow** attracted **~2,400 participants** who participated to various events such as national workshops, student events, professional events and media events. This includes

1,400 participants who were counted at the Balkan Energy Forum in Kozani. 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, mass media and industry representatives thus ensuring that the roadshow had the largest possible impact.

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

Romania



Figure 4: National workshop in Cluj-Napoca



Figure 5: Bus starting its operation in the Cluj-Napoca bus depot



Figure 6: Bus demonstration with key stakeholders before the national workshop



Figure 7: Bus in operation on bus lines in Cluj-Napoca

Greece



Figure 8: National workshop in Athens



Figure 9:"Balkan Energy Forum" at the Exhibition Center of Western Macedonia



Figure 10: Refuelling of the bus in Thessaloniki



Figure 11: Thessaloniki International Fair

Bosnia-Herzegovina



Figure 12: Bus in front of "City of east Sarajevo" preparing the ride, with Local Coordinator Mr. Dejan Škorić



Figure 13: Arrival of the bus at the 1984 Olympic Mountain Jahorina Ski Resort



Figure 14: Minister Mr. Staša Košarace, of the Ministry of Foreign Trade and Economic Relations

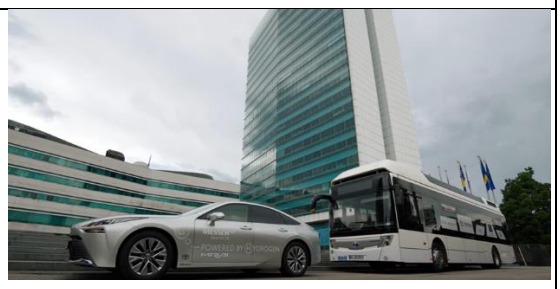


Figure 15: First two H2 vehicles in Bosnia and Hercegovina, with "The Council of Minsters" in the background

Bulgaria



Figure 16: The hydrogen bus in the news



Figure 17: Bus branding: targeting the general public, utilizing the hydrogen-related colours and shapes of the Roadshow, easy to read and comprehend – "powered by hydrogen", "electric", "I produce 0 emissions", "I refuel for 9 mins", "My range is 400km", hydrogen



Figure 18: 16 June 2024: Driver training and media event



Figure 19: Hydrogen bus demonstration and working meeting with the Mayor, Pazadzhik, 21 June 2024

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

The bus was driven across 4 countries, traveling a total distance of **2,813.5 km** during Roadshow activities. The roadshow allowed the bus to be tested for at least 100 km in all 9 cities. The distribution of distance travelled per city is shown in Figure 20.

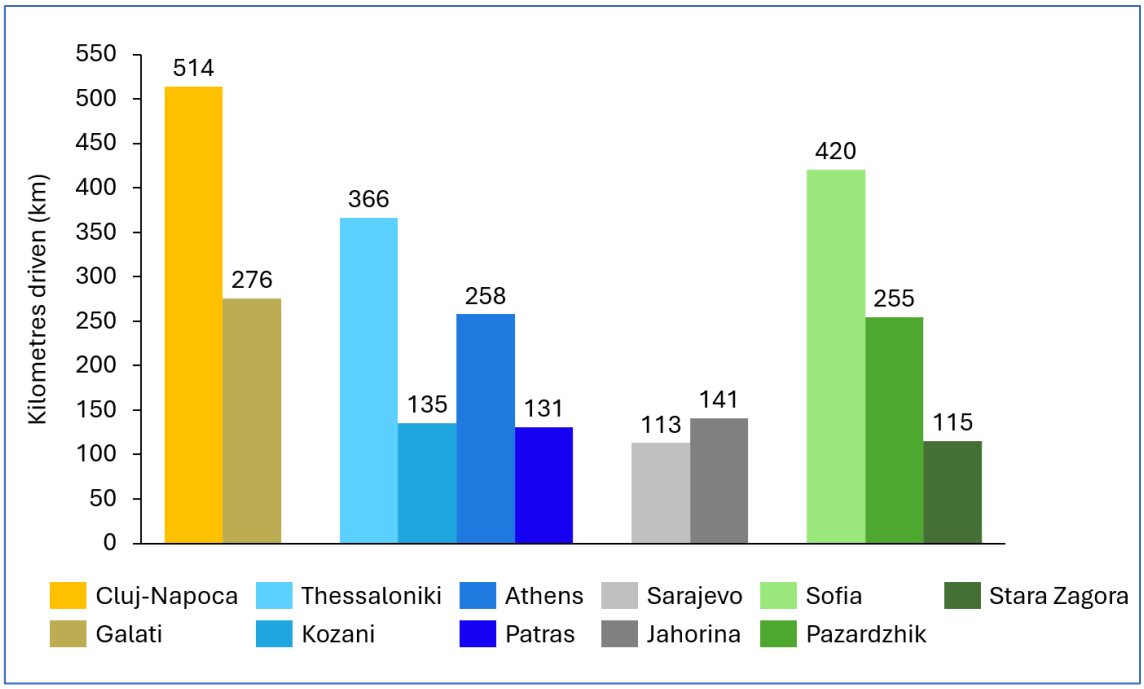


Figure 20: Total kilometres driven for each city in the Roadshow

The bus consumed **166.4 kg** of hydrogen, resulting in an average consumption of **5.92 kg/100 km**. This is lower than the expected consumption of 6 - 9 kg/100km but higher than the second Roadshow's 5.04 kg/100km. The breakdown of efficiency per city is shown in Figure 21.

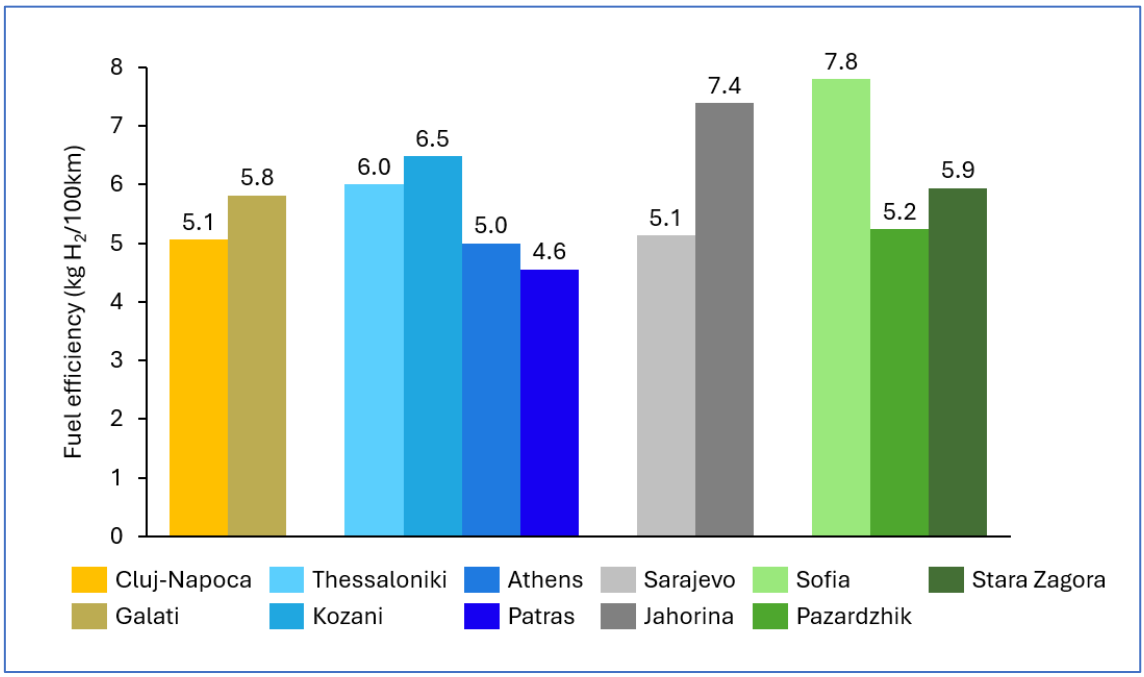


Figure 21: Fuel efficiency for each city in the Roadshow

There were many factors affecting the bus's fuel efficiency, which changed from city to city:

- **Temperature.** Warm to hot temperatures were mostly experienced throughout the Roadshow, especially in Greece and Bulgaria. This meant the bus was consuming more power for AC, reducing fuel efficiency.

- **Terrain.** A mix of flat and hilly terrain was experienced, and this changed significantly from city to city as well as between routes in a single city (such as in Cluj-Napoca). The bus was also tested in mountainous terrain in the Jahorina ski resort. Higher inclines tend to mean lower regeneration rates, reducing fuel efficiency.
- **Passengers.** When buses are in operation with passengers, the added weight tends to increase the energy requirements of the bus, lowering fuel efficiency. In some cities, trials with passengers were not possible, such as in Greece and Sarajevo, Bosnia-Herzegovina.
- **Driver experience.** The local bus drivers selected to take part in the trials tended to have experience driving buses with regeneration, such as battery electric buses. This driving skill increases the fuel efficiency.

The 3rd JIVE 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 Galati, Romania, the FCB was tested on the busiest bus route, 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 Greece due to legal restrictions, as test drivers are not allowed to carry passengers unless the bus has a national license plate.

- **Drivers' and passengers' experiences**

The feedback from the bus drivers in Romania highlights several positive aspects of the bus, including its quiet operation, ease of driving, and smooth handling. The drivers appreciate its energy recovery system, which significantly reduces energy consumption, especially on downhill routes. They noted that the bus performs well on uphill routes without issues, distinguishing it from other buses, including battery electric ones. Additionally, they mentioned a good driving range of 600-700 km, which can vary depending on driving style. Overall, the drivers described it as a different and enjoyable driving experience. Passenger feedback was also collected during the trials conducted in Cluj-Napoca and Galați. Everyone who used the hydrogen bus noted the vehicle's quietness and appreciated the reduction in noise pollution. They emphasized the importance of breathing cleaner air in their cities by adopting such non-polluting means of transport. In Galați, a bus ride even turned into an educational experience for some students returning home after class. They discussed what hydrogen is and how it's used in transport, highlighting that this roadshow carries a significant educational component alongside its commercial and awareness objectives.

In Greece, the feedback indicates that drivers prefer hydrogen buses over conventional diesel and battery electric buses due to their ease of driving, comfort, and advanced technology. Compared to electric buses, hydrogen buses offer quicker refuelling, longer range, and higher power generation, while electric buses have longer charging times and less range. Drivers also

favour hydrogen buses over diesel buses because of their lower environmental and noise pollution. They praised the fast acceleration, silent operation, and smooth, pleasant ride of the hydrogen bus, describing the overall driving experience as superior.

In Sarajevo, Bosnia and Herzegovina, the trials proved successful in an urban environment with drivers mentioning similar feedback. However, the road up to the Jahorina ski resort, where the National Workshop was held, was a long and steep road for which the set-up of the bus used for the roadshow (i.e., fuel cell and battery capacity) was not adapted to meet the power requirements of the bus. As such, the last part of climb was completed at a "safe mode" with reduced speed, highlighting that operators must take into consideration their route types prior to purchasing hydrogen bus to ensure that they are designed to optimally operate in the local conditions.

In Bulgaria, feedback from passengers was also collected from a survey targeting trial participants. The passenger feedback from the survey was generally positive, with most respondents appreciating the hydrogen bus trials for raising awareness about hydrogen mobility's benefits, such as reduced air pollution, lower fossil fuel dependence, and decreased noise pollution. Concerns highlighted included the high cost of fuel cell electric vehicles (FCEVs), slow infrastructure development, and the need for appropriate legislation and training. While some comments pointed out initial issues with the air conditioning, this was later resolved and recognized as a benefit. Notably, negative feedback mainly came from those who had not actually used the hydrogen bus.

- **Bus performance**

The bus has been tested in different landscapes, including both relatively flat routes as well as mountainous contexts, with significant elevation gains. In all urban contexts, the bus performed extremely well, with reliable operation on existing routes and, in Romania and Bulgaria, with passengers on the bus. The combined benefits of regenerative breaking and lower weight compared to BEB buses gave it lower than expected efficiency figures throughout the Roadshow. The bus was reliable throughout the Roadshow, with no incidents declared while it was operating or refuelling.

While the bus mostly performed well within its intended setting, routes with the most and longest-lasting inclines highlighted the limitations of bus operation. Long climbs, for example from Sarajevo to Jahorina, were the most challenging to complete compared to hilly but undulating terrain, as seen on some routes in Cluj Napoca. This is because, although the total gross elevation gain may be the same in both routes, undulating routes give the bus the opportunity to recover some of its gravitational potential energy and allow the fuel cell to charge the battery for the next climb.

Overall, all operators who tested the technology were very satisfied with it. In Romania, drivers reported that the bus was easy to drive – more responsive and agile than diesel and battery electric vehicles – and that it offered increased comfort to passengers and drivers alike. Drivers also noted the ease of refuelling and high-power generation capacity while driving, which results

in a long range. During peak hours, some issues were reported surrounding the transport capacity, which is lower than that of the existing fleet. Lack of refuelling infrastructure was also seen as an issue, since Romania currently has no refuelling stations.

In Greece, the 3rd JIVE Hydrogen Bus Roadshow demonstrated to several cities (Thessaloniki, Kozani, Athens and Patras) that fuel cell buses ran more efficiently than conventional diesel or battery electric buses. Drivers commented on the good performance, emphasising very good acceleration skills, and again noting the ease of refuelling, and high-power generation capacity. However, some barriers were identified by operators, such as high costs and lack of infrastructure which may constrain uptake in the near term.

In Bosnia and Herzegovina, the city drives showed no major issues, and the handling of the bus was complimented. However, the long climbs presented a considerable challenge and highlighted that the energy management system that was configured for urban driving did not fare well in this context.

In Bulgaria, most passengers reported positive feedback, particularly regarding the reduced air and noise pollution. Some noted that the high cost of FCEVs, slow pace of infrastructure development, and the requirement for legislation and training need to be considered.

Overall, most bus operators indicated that hydrogen buses were viewed as an alternative solution for their bus fleet and that they would be eager to include FCB in their fleet in the short-term future.

"After evaluating the TOYOTA CAETANO hydrogen bus under real operating conditions, we were highly impressed with its performance. Given that the fuel cell electric bus is environmentally friendly, our management team unanimously agreed that its positive assessment warrants its integration into the public transport system of Stara Zagora."
Mr. Georgi Stanchev, CEO, Trolleybus and Bus Services, Stara Zagora

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- **Station performance**

There were no problems with the hydrogen refuelling of the bus, nor with any of the refuelling equipment encountered during the roadshow. Some operators noted that the current lack of refuelling infrastructure could present a barrier to FCB uptake. The mobile refuelling station was provided and operated by Coral Gas, subsidiary company of the Motor Oil Group. In Bosnia and Herzegovina, the mobile refuelling station was not used due to import constraints. In Bulgaria, the bus was refuelled using the country's first refuelling station, provided by HITMOBIL.

Table 1: Outline of the bus's performance across the 4 countries

During the FCBs trial	ROMANIA	GREECE	BOSNIA-HERZEGOVINA	BULGARIA	TOTAL/AVERAGE
Bus KPI					
Total Distance Travelled	789,9 km	980,1 km	254,0 km	789,5 km	2813,5 km (total)
Average Hydrogen Consumption data	5,32 kg/100 km	5,64 kg/100 km	6,39 kg/100 km	6,70 kg/100km	5,92 kg/100km (average)
Average outside temperature	13-30°C	22-35°C	13-23°C	29-36°C	19-31°C (average)
Landscape	Mixed including hilly routes in Cluj-Napoca, flat in Galati	Mixed landscape consisting of mostly flat routes, with some sections with increased inclination (e.g. in Kozani)	Both urban and mountainous (500-1500m)	Urban, some inclines, mountainous highway	NA
Average speed	30,0 km/h	23,3 km/h	30,1 km/h	26,3 km/h	27,4 km/h (average)
Station KPI					
Total Kg of H2 delivered	42,1 kg	55,3 kg	16,2 kg	52,9 kg	166,4 kg (total)



Figure 22: Pictures of test drives in the different countries

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:

- **High-level national, regional and local authorities** to talk about their future plans related to FCBs (Fuel Cell Buses) but also the wider ecosystem. These included diplomats such as the British Ambassador to Romania, government ministers such as Yiannis Xifaras, Secretary General of the Ministry of Infrastructure and Transport, and mayors from various large communities
- **Academic Experts** who provided insights into ongoing research into FCB technology
- A **representative from the JIVE and JIVE 2 projects**. Eva Baker presented "The JIVE projects, flagship hydrogen bus projects in Europe: results and lessons learned" in Romania and Greece
- **Representatives from the industry**. Companies such as Messer, Toyota Tsusho Europe, Logan Energy, and Wolftank Iberia shared valuable insights on their experiences, tools, approaches, and mechanisms
- The **Clean Hydrogen Parternship**: Representatives Mirela Atanasiu and Nikolaos Lymperopoulos were present to share insights into activities conducted by their organisation



Figure 23: National workshop Stara Zagora, Bulgaria

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

- A key takeaway was the clear consensus that **FCEVs already are a mature technology** with a stable market presence and extensive testing experience — crucial selling points for countries which begin to adopt these technologies.
- There are already **several projects for hydrogen production submitted by both the private sector and local authorities**. There are more and more local authorities

considering the opportunity to purchase hydrogen buses or use hydrogen for the district heating system.

- The **funding opportunities for hydrogen projects are numerous**, both at European and national level.
- There is appetite to develop "**hydrogen valleys**" that focus on production of hydrogen from renewable sources to decarbonize not only local public transport, but also industry, trains, airports, planes, district heating. In Bulgaria, there are ongoing feasibility studies for two potential Hydrogen Valleys — Trakia Industrial Zone and the Historical Mountain Narrow Gauge, with support from Messer Group, Toyota Tsusho Europe, and ZERObus. Advanced "hydrogen valleys" projects are present in Romania as well. Both Cluj-Napoca and Galați municipalities have submitted projects in advanced stages. In Cluj, the local authorities have already given the green light for the construction of the necessary infrastructure for hydrogen production and supply, and Galați has already begun construction on the photovoltaic power plant that will supply the hydrogen generation facility with green energy.

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. **Lack of infrastructure**

Many of the host countries had few or no refuelling infrastructure and it was acknowledged that this is a clear pre-requisite for the widespread uptake of the technology. It was also noted that there is a current lack of operators prepared to make major investments in this new technology through the construction of factories and filling stations.

2. **Economic case for FCBs**

A central topic throughout the discussions were the financial challenges associated with the high costs of FCEVs and HRSs. A significant point discussed was the strategy of combining multiple financial sources and the importance of beginning projects with accurate TCO analyses, with Toyota supplying a useful tool for this. To overcome the high costs of buses and hydrogen fuel, attendees proposed a more wholistic development of the entire value chain, considering generation, distribution, fuelling, and consumption through the advancement of hydrogen valleys.

It was also noted that implementation of zero-emission vehicles in low-income countries may also present challenges. It will be critical to find the best possible location and business case for the first pilot program, attracting both local and international funding for such a project. Further, battery electric buses (BEBs) remain a strong competitor to FCBs, with more available products on the market.

3. **Legislation and training**

Other critical barriers, that require large-scale initiatives, particularly in countries like Bulgaria, were identified in the areas of legislation, education, and training. Local officials in Bulgaria emphasized that extending the test trials of hydrogen buses to 1-4 months, especially in cities like Sofia, Stara Zagora, and Plovdiv, would help overcome some of these barriers and fast-track the deployment of hydrogen technologies in public transport.

The roadshow played a key role in overcoming some of the barriers mentioned above. The test trials clearly demonstrated the efficacy of the technology and the ease of use to a wide range of local residents, bus operators, industrial representatives, academics, and government authorities. There was an acknowledgement that the economic case for FCBs is currently challenging, but much discussion surrounding mechanisms to tackle this and procure funding – the hydrogen valleys were identified as a key element, as there is usually a desire to build a complete H_2 ecosystem in the region where the bus stopped. Overall, the workshop demonstrated that there is a widespread engagement with hydrogen fuel cell technology and an eagerness across all sectors and industries to progress further development.

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 all 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 600 media articles, TV and radio programmes discussed the roadshow and the bus's performance, resulting in a reach of over 4.1 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 Romania, the Ministry of European Funds and Cluj Napoca City Hall representative stated their ambitions to purchase 25 hydrogen buses and build a hydrogen production station with a production capacity of 1t / day. The Ministry of Transport further commented on plans to deploy hydrogen trains in Romania in the near future. In Galati, the City Manager stated that there were plans to purchase 42 hydrogen buses in addition to a new hydrogen plant.

In Greece, the Ministry of Transport have announced plans to deploy 50-100 hydrogen buses that will be rolled out gradually between 2026 and 2028. A hydrogen refuelling station is also expected to be deployed in a depot of OSY, Road Transport Operator for Athens Metropolitan area, located at Thriasio – Attiki.

In Bosnia and Herzegovina, the Minister of Foreign Trade and Economic Relations emphasised that the forum would help define policies and projects through coordination between ministries in Srpska and FBiH.

In Bulgaria, Dimitar Nedyalkov, Deputy Minister of Transport and Communications stated: "The Ministry of Transport and Communications supports the development and implementation of hydrogen technologies in the transport sector. Hydrogen-electric transport can advance rapidly with strong institutional support."

- **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 JIVE 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.

ROMANIA

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
Cluj-Napoca	**YES**	**YES**	Local authorities expressed their intention to open the tender for the purchase of hydrogen buses. It is one of the steps envisaged in a larger project to build a hydrogen valley that includes the production plant, filing stations and hydrogen buses.	2026-2027	25	More information was requested about the bus's performance during the tests, without response from the manufacturer.
Galati	**YES**	**YES**	Local authorities expressed their intention to open the tender for the purchase of hydrogen buses. It is one of the steps envisaged in a larger project to build a hydrogen valley that includes the production plant, charging stations and hydrogen buses.	2027 - 2028	42	More information was requested about the bus's performance during the tests, without response from the manufacturer. Authorities have shown interest in Caetano's offer.
In Romania, there are plans to purchase 67 hydrogen buses in the near future.						

The city of Galati has plans to purchase 42 hydrogen buses in addition to the construction of a hydrogen plant. The city of Cluj-Napoca intends to purchase 25 buses and create a hydrogen production station with a capacity of 1t / day. There is also interest in creating a wider hydrogen ecosystem and hydrogen valleys within these cities and it was noted that Romania has some potential for underground hydrogen storage.

GREECE

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
Thessaloniki	**YES**	**YES**	Local authorities and bus operators expressed their interest for this technology, and they showed acceptance towards it.	n/a	n/a	Would like to continue assessing the technology.

Kozani	**YES**	**YES**	Local bus operators discussed with local authorities about the leasing of FCBs in the short-term future.	n/a	n/a	Would like to continue assessing the technology. Will look for further possibilities to apply this technology.
Athens	**YES**	**YES**	The local Road Urban Transport Operator, OSY, offered its depot to host the event and valorised new knowledge generated through EU innovative hydrogen projects such as TRIERES (co-funded by Clean Hydrogen JU) and REAH3 (co-funded by CEF-Transport). These aim to investigate pathways to develop FCB fleets and HRS with the ultimate goal of deploying 50-100 buses in Athens by 2028.	TRIERES: Estimated 2025 – 2026 Future strategic plan: 2026 - 2028	TRIERES: 2 FCBs with co-funding through TRIERES project Future strategic plan: The Greek Ministry of Transport announced that in the future it will examine the possibility for a tender launch for the supply of 50-100 FC EV buses to be used in Athens and Thessaloniki.	The future tender launch for 50-100 FC EV buses announced by the Greek Ministry is part of a wider plan to decarbonise urban road transport, which includes 1300 new vehicles with anti-pollution technology. The overall intention of both the Ministry and OSY is to renew the existing fleet at a rate of more than 60% by next summer

						2025 and 100% within the next 2 to 3 years.
Patras	**YES**	**YES**	The local authorities and the Port of Patras were very interested in assessing this technology, but they showed some concerns about the necessary measures and steps towards the implementation of this technology.	n/a	n/a	Would like to continue assessing the technology.
A total of 50-100 buses are expected to be deployed according to plans announced by the Greek Ministry of Transport. In Athens, the ongoing TRIERES[1] project aims to realise the deployment of two FCEV buses operated by OSY between the years 2025 and 2026. In the medium term, the REAH3[2] project aims to build upon this and deliver upon the target set by the Greek Ministry of Transport to deploy 50-100 buses between 2026 and 2028.						

[1] TRIERES project is supported by the Clean Hydrogen Partnership and its members Hydrogen Europe and Hydrogen Europe Research under Grant Agreement No. 101112056.
[2] REAH3 project has received funding from the Connecting Europe Facility – Transport programme under Grant Agreement No 101165972.

BOSNIA-HERZEGOVINA

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
Sarajevo	**YES**	**YES**	Interest in the technology was evident. However, the first potential purchases will take 2-3 yrs.	2027	2	BiH is a low GDP country. Only the largest municipalities and resorts can afford such technologies.

A total of 2 buses are expected to be acquired in the upcoming year(s).

In Bosnia-Herzegovina, there is interest to purchase a small number of FCBs in the short- to medium-term. Economic constraints were cited as the main reason for the more limited uptake compared with other countries.

BULGARIA

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
Sofia	YES	YES	Sofia Municipality has a PDA project on deployment of FCE buses and announced an investment program for 1 billion BGN for 500 new vehicles.	Next 3 years	10-30	-
Stara Zagora	YES	YES	10 FCE buses in the frames of ZAHYR Hydrogen Valley project.	Next 3 years	10	-
Pazardzhik	YES	YES	Manifestation of interest.	n/a	n/a	-
Plovdiv (Economic Zone)	YES	YES	Manifestation of interest.	n/a	n/a	-
Bulgaria plans to purchase 120 FCEVs in the coming years.						

In Stara Zagora, plans are in place for the purchase of Bulgaria's first 10 FCE buses in addition to the construction of a refuelling station. Further to this, the city of Sofia has announced an intention to deploy 10-30 hydrogen buses within the next three years.

A collective of **200+ buses** is expected to be procured following the trials conducted during the JIVE 3rd Roadshow. Greece emerges as the market with the furthest developed existing plans, with a number of trials ongoing and a target to deploy up to 100 FCBs in the near-term. Bulgaria and Romania have also demonstrated a strong commitment to developing hydrogen transport with similarly ambitious targets and much interest in the creation of hydrogen ecosystems and hydrogen valleys. Bosnia and Herzegovina also indicated a considerable interest in the technology and anticipate the deployment of a more limited number of FCEVs.

KPIs

- Quantitative

Table 2: Overview of events and dissemination events during the 3rd FCB Roadshow

	ROMANIA	GREECE	BOSNIA-HERZEGOVINA	BULGARIA	TOTAL
Number of events organised.	3	7	1	4	14
Number of participants in the stakeholder events	150	1750	100	405	2 405
Number of participants in the media events	150	41	70	30	291
Number of media articles, TV and radio programmes	350	136	10	120	616
Reach of the media articles, TV and radio programmes	2 500 000	n/a*	n/a*	1 638 548	+4 138 548
Number of social media posts	100	51	5	43	199
Reach of the social media posts	1 500 000	1831	n/a*	178 449	1 680 280 +

*The reach of the media articles, TV and radio programmes can not be easily measured/extracted.

As showed in the table below, there have been a high number of events organized during the roadshow with over 2,400 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	14
Number of participants in the stakeholder events	2 405
Number of participants in the media events	291
Number of media articles, TV and radio programmes	616

Table 3: Summary of quantitative KPIs

- Qualitative

The number of hydrogen-powered vehicles in the partner country and Central and Eastern Europe is, in general, increasing	Yes, in most countries: • Romania: No H_2 vehicles yet, but high interest for them. • Greece: There are no hydrogen vehicles deployed yet, but there is high interest for them. • Bosnia-Herzegovina: Just starting with the introduction of the technology. • Bulgaria: Yes - Bulgaria already has one vehicle (car) and a mobile refuelling station.
Stakeholders convinced that hydrogen power is the future of public transportation and ready to take practical steps to introduce it	Yes, in all countries: • Romania: Stakeholders highly interested in the technology and in knowing more about it. • Greece: Stakeholders expressed significant interest in the technology and were eager to learn more about it. • Bosnia-Herzegovina: Yes

	• Bulgaria: Yes - various stakeholders who participated in the events expressed significant interest in the adoption of hydrogen technology. Notably, two municipalities and one region have already initiated steps and measures to integrate hydrogen mobility into their transportation systems.
General public is convinced that hydrogen power is safe, and it is the future of public transportation	Yes, in most countries: • Romania: General public is more and more aware about the technology and its benefits. • Greece: General public is becoming more aware about the FCB technology and its environmental benefits. • Bosnia-Herzegovina: n/a • Bulgaria: Yes - the roadshow effectively demonstrated the safety and comfort of hydrogen-powered vehicles. Positive feedback from passengers, opinions from drivers, and the results of an online survey all reflect a generally favourable public opinion towards hydrogen as a future transportation solution. However, sceptics always remain.
Following the trial, the municipalities who tested the buses have announced a formal interest in the hydrogen-power technology	Yes, for all countries: • Romania: Yes – See the statements above. • Greece: They expressed interest in evaluating the technology and exploring further possibilities for its application. • Bosnia-Herzegovina: Yes • Bulgaria: The interviews with the Vice Mayors of Sofia and Stara Zagora confirmed the interest of the municipalities towards introduction of FCE buses in the city transport.

Local politicians and public transport operators have made announcements regarding commitment for hydrogen-power technology procurement in the future	Yes, for all countries: • Romania: Yes – See the statements above. • Greece: Yes. They expressed their interest to continue investigating the technology and to formulate plans for the implementation of this technology. • Bosnia-Herzegovina: Yes • Bulgaria: Local politicians and public transport operators have expressed a strong commitment to future procurement of hydrogen-powered technology. Their supportive statements during the opening events underline this commitment.
National government or national politicians have made announcements regarding hydrogen power technology plans for the country	Yes, for all countries: • Romania: Yes – a strategy on hydrogen is about to be adopted. • Greece: They expressed their interest in assessing the technology and look for further possibilities to apply it. • Bosnia-Herzegovina: Yes • Bulgaria: Senior government officials, including Ministers and Deputy Ministers, participated in the opening of the Hydrogen Mobility Days and the Round Table discussion. During these events, they expressed support for the integration of hydrogen technologies into the country's transportation plans.

5. Lessons learned from the third roadshow

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

In Romania, although hydrogen buses have been tested before in the region, this was the first true roadshow in the country, with a bus that was integrated into the fleet of public transport companies and transported passengers daily. It was the first time that key authorities – people who are writing the hydrogen strategy and, therefore, Romania's roadmap related to this technology – saw what a hydrogen bus means, how the fuelling process is carried out and what are the advantages for the population, cities, and country.

It was pointed out that some aspects of the communication processes could have been improved, such as clarifying when the bus would be available and ensuring effective dialogue with infrastructure providers. Importantly, it was noted that local administration needed more time to comply with national regulations and allow the bus on the road.

In Greece, the roadshow clearly demonstrated that hydrogen fuel cell technology is a viable option for public transport, presenting a promising alternative to conventional fossil fuels. There was also interest in hosting more press conferences and extending the roadshow to more cities, in particular those with universities and industrial hubs.

In Bosnia and Herzegovina, the roadshow was acknowledged to have been extremely valuable and to have had a very significant impact on the development of hydrogen-based technologies in the country. More time was requested for the preparation of future events and it some commented that prepayments were not sufficient to cover expenses.

In Bulgaria, the roadshow was seen as a useful means for renewing focus on the National Hydrogen Roadmap and helped to underscore the importance of strong collaboration at the municipal and company levels.

6. Impact on dissemination activities of the JIVE 2 project

The 3rd Roadshow was promoted by leveraging popular social media platforms such as Twitter, LinkedIn, and Instagram as well as by redirecting the targeted audience to the fuelcellbus website where press releases were shared and where further documentation on the JIVE and JIVE 2 projects are available.

Below are the links to the social media posts done across the different platforms during the 3rd Roadshow:

- Stop in Cluj-Napoca, Romania - LinkedIn and Twitter
- Stop in Galati, Romania – LinkedIn (video post), Twitter and Instagram (video post)
- Stop in Athens – LinkedIn (national workshop), Twitter , and Instagram
- Stop in Bosnia and Herzegovina – LinkedIn, Twitter and Instagram

The various posts had a significant outreach, with LinkedIn post impressions as high as 4,570. An overview of the campaign results a month after the publications is highlighted below.

3rd H2 Bus RoadShow Announcement / Social media and website



Figure 24: Launch of the JIVE 3rd Roadshow (social media post)

- LinkedIn post: 2,388 Impressions, 136 Engagements, 19 reposts
- Twitter post: 954 Impressions, 11 Likes, 4 reposts

3rd H2 Bus RoadShow – Cluj - Napoca Social media



Figure 25: JIVE 3rd Roadshow - Cluj-Napoca stop (Social media post)

- LinkedIn post: 4,570 Impressions, 700 Engagements, 528 clicks, 9 reposts
- Twitter post: 398 Impressions, 13 Likes, 4 reposts

3rd H2 Bus RoadShow – Galati Social media



Figure 26: JIVE 3rd Roadshow - Galati stop (Social media post)

- LinkedIn post: 1,362 views, 1,505 impressions, 130 engagements, 54 clicks
- Twitter post: 201 Impressions, 3 Likes, 1 reposts

Instagram continued to be used as a communication channel enabling key success stories and achievements to be communicated in dynamic and visually appealing way during the JIVE 3rd Roadshow initiative. The results of the different campaigns are outlined below:

- **Stop in Galati, Romania** –Instagram (video post): 9 likes, 134 accounts reached in total (of which 85,1% are followers accounts reached and 14,9% non-followers), 219 plays of the video, 65 replays.
- **Stop in Athens** - (national workshop) - Instagram 7 likes, 106 accounts reached (of which 80,2% followers and 19,8% non-followers), 135 impressions (which 110 are form home page, 11 from hashtags, 11 from profile, 3 other not specified)
- **Stop in Bosnia and Herzegovina** – Instagram 12 likes, 104 accounts reached (of which 73,3 % are followers and 26,7% non-followers), 116 impressions (of which 88 are from home page, 21 from hashtags, 6 profile and 1 as other).

Additionally, National Coordinators were also asked to communicate about the Roadshow activities via their social media channels. These were then reposted by the project's profile, enabling an increased outreach of the initiative.



Figure 27: Social Media Post from Greek National Coordinator (CluBE) reposted by FuelCellBus

Project coordination:

ERM

Project dissemination:

Hydrogen Europe

The **JIVE and JIVE2 projects** have received funding from the Clean Hydrogen Partnership (formerly known as FCH JU) under Grant Agreement No 735582 and 779563.

This Joint Undertaking receives support from the **European Union's Horizon 2020** research and innovation programme, Hydrogen Europe and Hydrogen Europe Research.

The **MEHRLIN project** is co-financed by the **European Union's Connecting Europe Facility.**

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Co-funded by the European Union