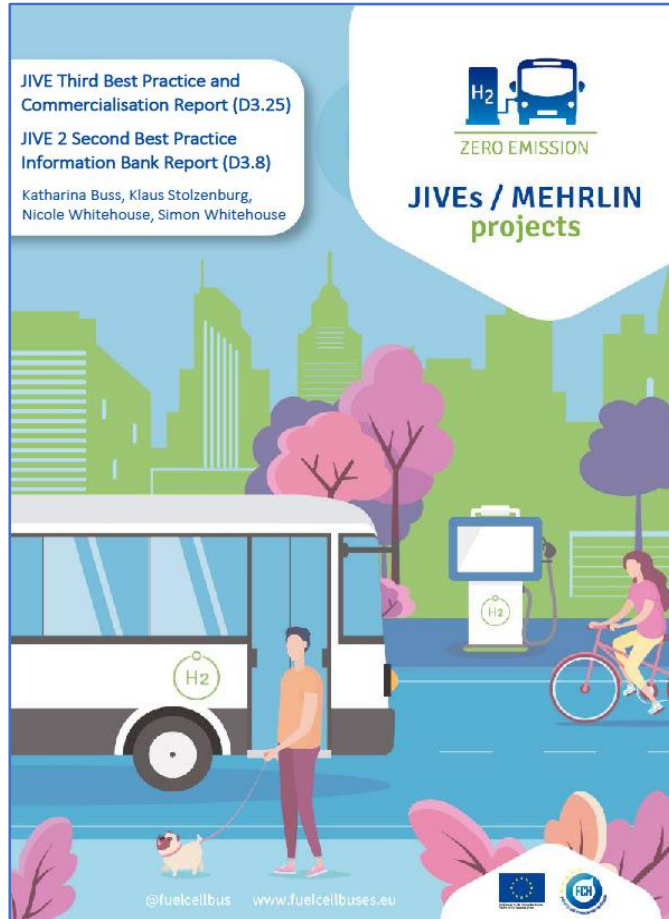


Best Practice Report 2022: Focus on Challenges & Solutions



Full Report Available:

<https://fuelcellbuses.eu/public-transport-hydrogen/jive-third-best-practice-and-commercialisation-report-jive-2-second-best>

About the 2022 Report

Structure of the Information: Stages of FC Bus Implementation

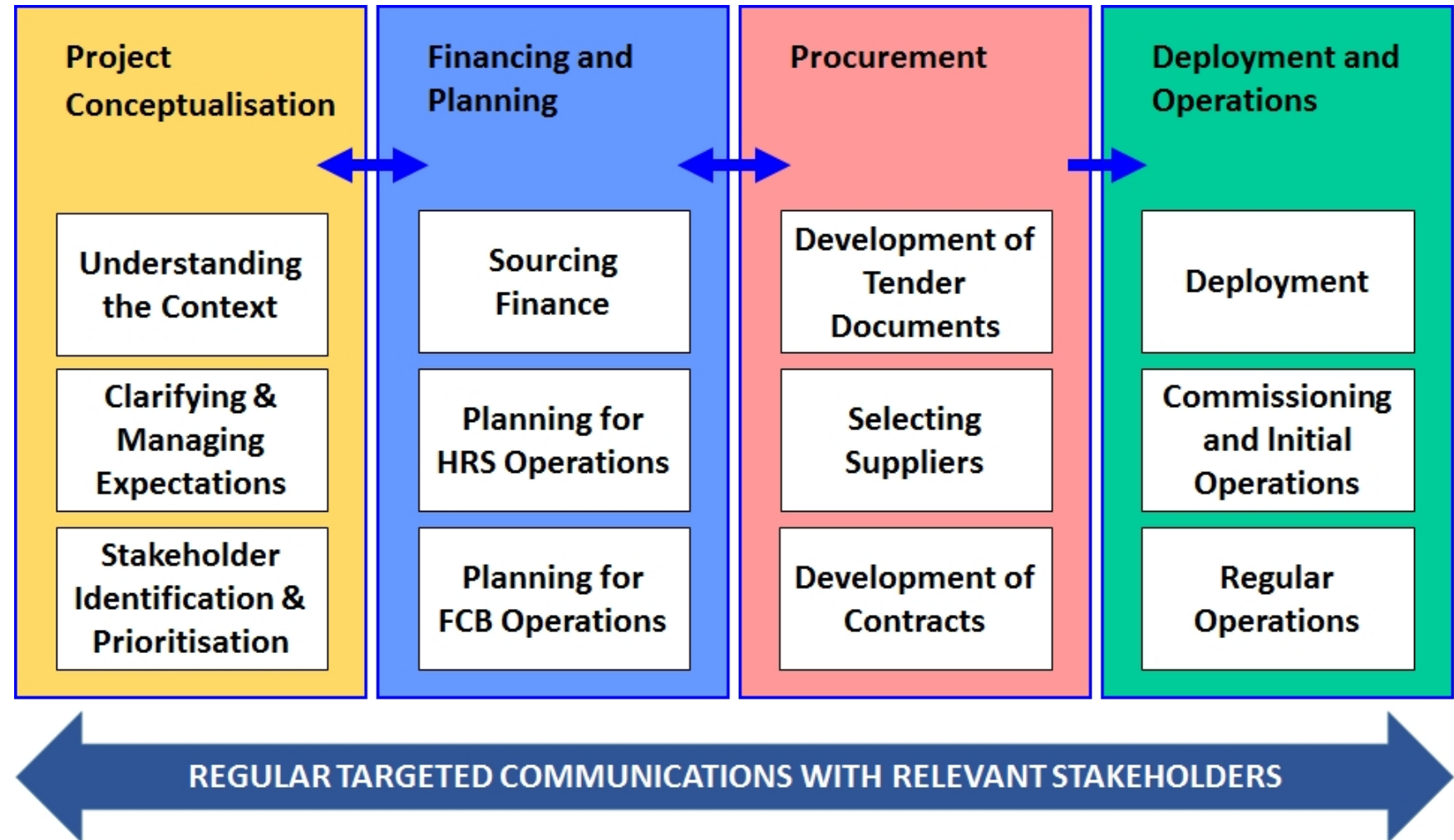


Based on Project Stages

Developed to ensure a coherent structure within which information gathered could be framed.

Builds on 2020 Report

Some tweaking of earlier report plus a new Stage covered



About the 2022 Report

Information is organised within tables along sub-stages



Challenges and Solutions

Within the framework of the Project Stages Chart:

The BP Report clearly articulates

- Challenges, and
- matches them with Solutions that were realistic and had worked.

These are all presented in tabular form (10 in all) →

Table 2-5: Planning for HRS Operations – Challenges and Best Practice Solutions.

Challenges	Best Practice Solutions
<ul style="list-style-type: none">• <u>Risk</u>: Determining risk sharing among the local partners can be difficult because you need to specify the equipment and its capabilities to know the risk and you need to know risk to specify• <u>Determining Size</u>: Optimising size (not too big not too small); forecasting size of hydrogen storage required now and in the future as well as planning for seasonal fluctuations in usage can lead to specifying unnecessary capacity resulting in additional cost; suppliers may offer equipment with “locked specifications”, so no scale up is available later on• <u>Design and Location of HRS</u>: Identifying the right location that meets the operator requirements; siting determines the HRS planning and HRS and FCB operational constraints and costs• <u>Numbers and Complexity of Decisions</u>: Most PTOs and PTAs lack experience with HRS hardware and H₂ fuel supply, especially with location /permitting/regulations issues; setting HRS supply contract terms & conditions is complex; technical planning can be affected by changing national regulations	<ul style="list-style-type: none">• <u>Specify for Local Needs</u>: As part of the dialogue among local stakeholders, review and refresh local needs such as HRS ideal location(s); be aware that a HRS requires a considerable area of a bus depot if that is where it is to be located; work out supply chains for H₂, including back up• <u>Inform yourself of the Legal Framework</u> in which the HRS will operate, certification and permit requirements for the new technology and fuel; be prepared for lack of knowledge among regulators• <u>Use Pre-Tender Processes</u> such as Requests for Information; the limited and non-standardised market means that you will not be overwhelmed with information, but early necessary decisions will become clearer; try to get technical concepts from more than one potential supplier in the pre-tender stage• <u>H₂ Supply</u>: All H₂ supplied must be ‘green’ to fully address climate issues in particular; definitions of Green H₂ are still developing and in the short term green supply may not be possible (see Table 3-3); consider all supply pathways offered and source well to wheel investigations of emissions - there are quite a few available that may be adaptable to your context; encourage the industry to provide the solution i.e. make it an industry problem not an operator problem; make sure you understand the pros and cons of on-site and off-site production of the hydrogen; think about the need for redundancy (back up supply)• <u>Make early Decisions</u>: Define “must haves” to guide decisions; decide on scale; know permitting requirements; develop strategies to address TCO (price of the H₂ can be pivotal here); note any imperatives for location and design• <u>Options</u>: Consider turnkey suppliers to buy a HRS from OR simply tender for a H₂ per kg price at the nozzle with the HRS built and operated by a contractor• <u>Involve an Expert</u> who supports you with their experience and know-how• <u>Plan for the Future</u>: Scalability and flexibility of the HRS is important for growing fleets and, possibly, for joint use with other vehicles

About the 2022 Report




Summary Chapter A 'Perfect World' Case Study



- Each Stage of a FC Bus Project up to early regular operations addressed with key points pointed out in summary boxes (See green box below)
- Up to and including Procurement Stage has been translated into 8 additional European Languages (See right hand box)

Further important points to note from the story:

1. **Rigorous planning** (including contingency planning) and contractual comprehensiveness will avoid or mitigate most of the typical challenges experienced in the Deployment and Operations phase
2. Unexpected challenges will be easier to handle by building buffer into your timeline for starting operations. **You must expect delays.**
3. **Have back-ups in place:** both for the buses and for the HRS. While buses are very reliable by the standard of new technology, they will likely have teething issues as will the HRS.
4. **Good Training and Maintenance = SAFE Operations**
5. **Leverage the buses** for showing the public you will be meeting European emission standards. It will encourage the use of public transport and be a source of pride for the municipality and region.



➤ SZAKMAI ISMERTETŐ

ÜZEMANYAGCELLÁS BUSZOK: BEVÁLT MÓDSZEREK ÉS A KERESKEDELMI BEVEZETÉS MEGKÖZELÍTÉSEI

JÚLIUS | 2020

BEVEZETÉS

Avárosvezetésekre egyenlőre kevésbé várható, hogy közelítsenek a Párizsi Megállapodás céljaihoz és a légszennyezési problémák megoldásához, és az üzemanyagcellás busz a tömegközlekedési eszközök között a kis számú, valóban zero kibocsátású megoldások egyike. A már hosszú évek óta egyre nagyobb lendülettel fejlesztett üzemanyagcellás buszok rövid üzemanyag-feltöltési idejükkel és nagy hatótávolságukkal életképes lehetőséget kínálnak a tömegközlekedési hálózatok széndioxid-kibocsátásának csökkentéséhez.


A hidrogéncellás járművek európai elterjesztését célzó, uniós finanszírozású JIVE és JIVE 2 programok a MEHRLIN projekttel együtt új üzemanyagcellásbusz-flottákat és kapcsolódó hidrogénfeltöltő infrastruktúrát tesznek elérhetővé

Európa számos városában és régiójában. Az UITP ezekben a projekteken partnerként működik közre. Ez a szakmai ismertető egy fiktív esettanulmány¹ mutat be a JIVE és a JIVE 2 bevált gyakorlatainak 2020-as jelentéséből, amely arról számol be, hogyan végezheti el egy új programrésztevő az üzemanyagcellásbusz-flotta integrálását. Ennek a rövid ismertetőnek az a célja, hogy az olvasók lépésről lépésre alaposan megértsék a folyamatot az elejétől a végéig, és közben megismerjék a bevált módszereket is. További ténybeli és technológiai információkat a teljes projektjelentésben talál².

A JIVE ÉS A JIVE 2

A JIVE és a JIVE 2 projektek alapvető célja az, hogy támogassák az üzemanyagcellás buszok bevezetésének népszerűsítését az európai tömegközlekedési hatóságok és üzemeltetők körében. Ezért a JIVE és a JIVE 2 projektek arra koncentrálnak, hogy előkészítsék a piacot az üzemanyagcellás buszok szélesebb körű bevezetésére. Ez magában foglalja az ágazat számos fontos kihívásának kezelését, például a járművek tulajdonosi költségeinek csökkentését, a hidrogéncellás buszmodellek választékának növelését és az üzemanyagcellás buszokból álló nagy járműflották üzemeltethetőségének bizonyítását.

Az üzemanyagcellás buszokra való áttérés következő fázisaként a JIVE és a JIVE 2 projektek keretében mintegy



1 A fiktív esettanulmány, bár fiktív, a JIVE és a JIVE 2 projektek számos valós forgatókönyvére támaszkodik. 2 A teljes jelentés az érhető el: <https://fuelcellbuses.eu/publications>

What have we learnt so far?

Keys to Success



Keys to success within the JIVE Projects have been:

- FC Bus projects which have been established as part of a broad energy system e.g. Pau /Groningen
- FC Bus projects which establish and communicate realistic project expectations
- FC Bus projects that have the 'right' people – champions for the technology, expert planners etc

What have we learnt so far?

Challenges remaining for FC Buses



Challenges for Suppliers (Buses & HRS)

- Standardising components to provide certainty of TCO for purchasers
- Providing ready supply of parts
- Decreasing the timeframe for production – increased involvement from major bus suppliers

Note: There appears to be an increasing desire to purchase buses and their refuelling infrastructure from a single supplier – need for partnerships between Bus OEMs and HRS OEMS/ Gas suppliers

Challenges for Operators

- Understanding this is a major step change from running diesel buses and that finding expertise is essential
- Being prepared to ask and learn from others
- Working collaboratively with Suppliers and Government to make the FC Bus System viable for a commercial enterprise.

Challenges for Governments (Local, National & Supra-National)

- Providing certainty for Operators by providing the right frameworks: regulation and permitting
- Providing commercial certainty for operators by de-risking their investment e.g. guaranteed demand for H2; providing expertise; financial investment
- Leveraging the FC buses to integrate Hydrogen into the regional energy system

Best Practice Report 2022

The Facts



The Future for City Buses

- Zero emission buses are the only future – a legal requirement
- Zero emission bus technology is here and it works (see Pau Buses below)
- There will be a choice of solutions – FC Buses; Battery Electric Buses; Trolley Buses



Photos by permission of SMTU Pau, France

Thank you for your attention

Project coordination:

elementenergy

Project dissemination:



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