





The way forward to clean bus fleets: A look to CBEP and JIVE/JIVE2

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UITP is the only worldwide network to bring together all public transport stakeholders and all sustainable transport modes.

OUR MISSIONS: every day we make a difference for our members and for the wider sustainable transport community.



ADVOCACY & OUTREACH

We engage with decisionmakers, international organisations, key stakeholders



KNOWLEDGE

We generate cuttingedge knowledge and expertise



NETWORK & BUSINESS

We bring people together to exchange ideas, share best practice and forge partnerships



Clean Vehicle Directive: Accelerates the deployment of clean and energy efficient city buses with procurement quotas





Technologies at a glance

Technology	Type (ref. to CVD)	Autonomy (range)	Charging /refuelling infrastructure (investment & effort)	Impact on operation	Impact urban landscape
Battery electric	ZE	Limited	High	High	Moderate (OC) Low (ON)
Plug-in hybrid	Clean	Limited	Low	Moderate	Low
Natural gas	Clean	Comparable to diesel	Moderate	Low	Low
Fuel cells	ZE	Comparable to diesel	High	High	Low
IMC trolleybus	ZE	Unlimited	Moderate	Moderate	Moderate

• For diesel buses, range depends on fuel consumption. A standard 12 m city bus can have a range of up to 700 km. To date, diesel buses herewith still are the benchmark



Industry view on CBTs penetration

- Diesel will be replaced by BEBs and FCBs
- In terms of market deployment forecast by 2030, some key trends:
 - BEBs to take the lead
 - PHEB, CNG/bio-gas to stabilise as transition technology
 - CNG/bio-gas has different market penetration across MS
 - Fuel Cell Hydrogen Bus technology is consolidated as viable ZE solution



Source: ZeEUS & UITP VEI Committee (2017). All rights reserved



The Clean Bus Europe Platform

- Network of stakeholders related to CBD across EU Members States
 - PTOs, PTAs and city authorities
 - Industry: bus OEMs, charging/refuelling suppliers, energy grid operators...
 - Funding and financing institutions
 - Other associations
- Twinning approach: Host (experienced) & Target (learning) Cities
 - Amsterdam, Eindhoven are Host Cities
 - Dijon is Target City
 - Caetano Bus is industry member
- Dedicated work plan to support cities and operators pursuing their plans
 - Knowledge & expertise exchange (study visits, webinars..)
 - Technical support (planning, tendering..)
 - Matching supply & demand (market places to meet PTO/PTA, industry..)
- Technologies (linked to CVD)
 - Battery electric, Plug-in hybrid, Fuel cells & hydrogen, Natural gas, Inmotion-charging trolleybuses

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CBEP is an initiative of the European Commission. It is implemented with a service contract by UITP and its consortium.



Market Monitoring clean bus technologies

- Clean Bus Toolkit section:
 - Market Monitoring
 - Cooperation CBEP-SB
 - European buses (tenders, orders, in service).
 - Library
 - Knowledge material related to clean bus deployment, including guidelines, publications, legislative documentation, and webinars



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ABOUT - JOIN THE PLATFORM CLEAN BUS TOOLKIT - NEWS & EVENTS - PARTNERS CONTACT

The road to sustainable cities

The CBEP Library provides material related to clean bus deployment, including guidelines, publications, legislative documentation, and webinars. All material is categorised according to the four stages of clean bus deployment: "if", "how", "what" and "when".

Fuel Cell Electric Bus Deployment Data in Europe (Feb 2021) Material related to first stages of clean

26 February 2021

IF - KNOW & DECIDE

framework

FINANCE

etc.

DEPLOY

vehicle deployment, incl. identification & engagement of bus system actors, and

identification of legislative and policy

WHEN - PLAN, REGULATE,

schemes, ensuring support from authorities, setting up project governance.

WHAT – SPECIFY, PROCURE

Material related to the procurement

arneess, developing partnershi

Material related to funding & financing

Info-factsheet

This document provides the snapshot projections about the number of FCBs which are in full commercial operation today (as of February 2021) as well as future deployments in the coming 18 months thanks to the bus order announcements by various European cities.

ive-fcb-deployment-data-in-europe-as-of-feb-2021.pdf

Form to sign Clean Bus Declaration

C ec.europa.eu

MEMBERS' AREA

The JIVE projects are the flagship fuel cell bus projects in Europe aiming to deploy over 300 buses by the end of 2022



Objectives:

- Deploy 310 fuel cell buses in 18 cities & regions across Europe
- Validate large scale fleets in operation and commercialize the FCB technology
- Stimulate the FCB market
- Achieve a maximum price of €650k (JIVE) and €625k (JIVE 2) for a standard fuel cell bus
- Exercising joint procurement methods to access economies of scale



- Deploy 18 Hydrogen Refueling Stations
- Enable new cities & regions to trial hydrogen technologies
- Demonstrate routes to low cost renewable H2
- Stimulate further large-scale uptake of fuel cell vehicles with deployed HRSs







To date, 17 cities and regions have placed bus orders, from 6 different suppliers. This totals 274 buses and some are operational:

Project	City	Country	Number of Buses	Bus Supplier	Size	Decks	Operational Status	Type of H2 Supply
JIVE + JIVE 2	Cologne	Germany	35 + 15	Van Hool + Solaris	12m	Single	35/50 Operational	Tube trailer – by-product H ₂
	Wuppertal		10 + 10	Van Hool + Solaris	12m	Single	10/20 Operational	Waste-to-energy power electrolysis
JIVE	Aberdeen	UK	25	Wrightbus	12m	Double	15/25 Operational	Green – on-site electrolysis
	Birmingham		20	Wrightbus	12m	Double	Buses in manufacture	Green – on-site electrolysis
	London		20	Wrightbus	12m	Double	100% Operational	Green – on-site electrolysis
	Bolzano	Italy	12	Solaris	12m	Single	Buses in delivery	Green – on-site electrolysis
	Gelderland	Netherlands	10	Solaris	12m	Single	Buses in manufacture	Green – on-site electrolysis
	Wiesbaden	Germany	10	Caetano	10.7m	Single	Buses in manufacture	Green – on-site electrolysis
JIVE 2	Auxerre	France	5	Safra	12m	Single	Near operation	Green – on-site electrolysis
	Pau		10	Van Hool	18m	Single	100% Operational	Green – on-site electrolysis
	Toulouse		5	Safra	12m	Single	Near operation	Green – on-site electrolysis
	Dundee	UK	12	Optare	12m	Double	Buses in manufacture	Green – on-site electrolysis
	Brighton		22	Wrightbus	12m	Double	Buses in manufacture	Green – on-site electrolysis
	Emmen	Netherlands	20	Wrightbus	12m	Double	Buses in manufacture	Green – on-site electrolysis
	Groningen		8	Van Hool	12m	Single	Near operation	Green – on-site electrolysis
	South Holland		20	Solaris	12m	Single	Buses in manufacture	Green – on-site electrolysis
	Barcelona	Spain	8	Caetano	10.7m	Single	Buses in manufacture	Green – on-site electrolysis

Fuel cell buses: What's next?





- **1. Results from JIVE demonstration**: information on total cost of ownership (& associated variables), technology reliability, performance analysis.
- 2. Supply side diversification: new model options (articulated; coaches); scaled multi-use infrastructure.

- **3.** Scaled systems: large individual city fleets (100+ buses), and cheaper green H_2 .
- **4. Integrated hydrogen energy systems**: reinforcing the additional benefits of hydrogen for city/regional-scale decarbonisation.



Best Practice Knowledge – Lessons Learned by the JIVE / JIVE 2 Projects

- In July 2020, UITP published a Knowledge Brief: "Fuel Cell Buses: Best Practices and Commercialisation Approaches" based on JIVEs learnings
- The brief provides guidance for cities with limited fuel cell/hydrogen experience by breaking down the process of fuel cell bus deployment into stages:



- Content of this report has also been translated into 8
 European languages.
- These can be downloaded from <u>www.uitp.org</u>.
- Also available on the fuel cell bus website <u>www.fuelcellbuses.eu</u>



ZERO EMISSION

Thank you for your attention



Project coordination: elementenergy

Project dissemination:



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