Presentation of the JIVE Projects:
Joint initiative for hydrogen vehicles across Europe
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Agenda

- Background & context
- JIVE – overview & progress to date
- Lessons learnt
Local political commitments could create a market for thousands of new zero emission buses per year across Europe from the 2020s.

**Norway (15,600):**
- All new buses procured from 2025 to be ZE

**London (9,500):**
- From 2020
  - All new single deck buses to be ZE
  - All single deck buses in central London to be ZE
- From 2025
  - All new single and double deck buses to be ZE

**Hamburg (1,000):**
- All buses procured from 2020 must be ZE

**Paris (6,850):**
- All new buses procured from 2025 to be ZE

**Barcelona (1,100):**
- Only ZE buses to be procured from 2025

**Milan (1,200):**
- Only ZE buses to be procured from 2025

**Riga (560):**
- All buses to be ZE 2025

**The Netherlands (10,000):**
- All new buses procured from 2025 to be ZE

**Cologne region (500):**
- All new buses procured from 2030 to be ZE

**Denmark:**
- 6 largest Danish municipalities to only buy ZE buses from 2021

ZE = zero emission; approximate urban bus fleet size indicated in brackets ( )
Relevant legislation at European level

• The **Directive on Alternative Fuels Infrastructure** (2014/94/EU): mandatory targets for alternative fuels infrastructure deployment (but hydrogen infrastructure targets are optional. Review expected in Q1 2021.

• The **Clean Vehicle Directive** (2019/1161): incl. min. public procurement targets per Member State for ‘clean’ buses:
  • Between 24-45% from 2021-2025;
  • Between 33-65% from 2025-2030.

→ Half of the minimum target for the share of clean buses must be fulfilled by procuring zero-emission buses
Hydrogen momentum at European level

• Targets for renewable hydrogen production in Europe:
  • 6 GW by 2024; 40GW by 2030.
• On mobility: Local city fuel cell buses are seen as key for the uptake of hydrogen in ‘Phase 1’ (2020-2024).

“Next Generation EU should invest in Hydrogen.”
Ursula von der Leyen @State of Union speech, September 2020

“H2 rocks, and I am committed to making it a success!”
Frans Timmermans- Executive Vice-President for the European Green Deal
### Hydrogen plans at national level – 2030 investment plans

<table>
<thead>
<tr>
<th>Country</th>
<th>Investment</th>
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<tbody>
<tr>
<td>Germany</td>
<td>€7bn (+ €2bn external partnerships)</td>
</tr>
<tr>
<td>Spain</td>
<td>€8.9bn</td>
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<tr>
<td>France</td>
<td>€7.2bn</td>
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<tr>
<td>Portugal</td>
<td>€1bn</td>
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<tr>
<td>Italy</td>
<td>€4bn</td>
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<tr>
<td>Austria</td>
<td>€2bn</td>
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JIVE projects: deployment sites and objectives

DEPLOYMENT SITES

- Aberdeens, UK
- Annaba, FR
- Barcelona, SP
- Birmingham, UK
- Bolzano, IT
- Brighton, UK
- Charleroi, BE
- Cologne, DE
- Danderyd, SE
- Den Haag, NL
- Grimsby, UK
- London, UK
- Pau, FR
- Thessaloniki, GR
- Valenza, NL
- Whistler, UK

Objectives:

- **Deploy nearly 300 buses & associated infrastructure**
- **Stimulate the market for FC buses** in Europe by creating demand for hundreds of vehicles
- **Lower the prices** of fuel cell buses using joint procurement and economies of scale
- **Demonstrate routes to achieve low cost renewable hydrogen**
CAPEX fuel cell buses over the different years

Capital costs of fuel cell buses ordered in different years (non-articulated single deck buses)

- JIVE projects
- H2BUS Europe project end aim

Range indicated by certain OEMs considering commercial roll-out <€375k per bus, assuming >100 buses per year and continuity of demand

Year of bus order & relevant project

- 2009
- 2012
- 2014
- 2017/18
- 2020
- 2023

10’s of buses
100’s of buses
Each local project within the JIVE programme relies on funding from multiple sources

- Funding for a large-scale FC bus project was made available under the FCH JU’s 2016 Annual Work Plan.
- The FC bus topic included a price ceiling (€650k for standard buses and €1m for articulated vehicles), and a cap on funding: “The funding per vehicle cannot exceed €200k per standard bus (12/13.5 m), €250k per articulated bus (>18m), provided they are equipped with a full power FC system of at least 50kW”.
- Projects had to secure additional funding from other sources to give good leveraging of EU funding.

In addition, on the HRS side, 6 locations were awarded Connecting Europe Facility (CEF) funding (MEHLIN project)
OEMs in Europe are responding to the growing demand for FC buses and preparing to offer new solutions.

European bus OEMs with fuel cell buses demonstrators / offering fuel cell buses for sale:

- CastanoBus
- ebeEUROPA
- Daimler EvoBus
- Optare
- Rampini
- Safra
- Škoda
- Solaris
- VDL Bus & Coach
- WightBus
- Van Hool

Non European OEMs active in the fuel cell bus sector:

- Foton
- Yutong
- Tata
- Toyota
- Hyundai
- Hyundai Motors
- New Flyer

Source: Element Energy (based on public announcements). Note: lists are not exhaustive.
Joint procurements strategies

UK

• The aim of the **Joint Procurement Framework** is to create a buying option for vehicles with a common specification (including tailoring according to specific needs)

• The effect is to create **standardisation and economies of scale** – consolidated call off orders can be placed.

• Additionally this allows a mechanism for **rapid purchase** of FC buses (as standard terms are set).

• The framework is live for four years from 2018.

Germany

• **Joint procurement strategy within the German cluster:** joint technical specifications for the two sites were identified.

• **Aggregating demand:** there is now interest for 500 buses by 2023, fuelled by support from NOW through the *HyLand* national funding programme.
Emerging conclusions/lessons learnt

- **Joint procurement**: effective in **stimulating markets**: FCB below the JIVE / JIVE 2 target prices now available (provided volumes)
- **Multiple sources of funding** – means well leveraged FCH 2 JU funding, but adds complexity and timescale challenges
- **Need to procure HRS / H$_2$ supplies in parallel with buses** – fuel costs: a critical element of the TCO
- **Early engagement** with operators/OEMs key
- H2: possibility to obtain a **long-term contract for hydrogen supplies**
- HRS: Buyers should not expect HRS suppliers to understand the constraints of operating a bus depot → **Site visits** with potential suppliers are crucial
- Challenge to commit to ordering large fleets without full certainty over lifetime costs – “all-in” offers may be attractive to early adopters
Thank you for your attention

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