



FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

Hydrogen mobility solutions for buses, garbage trucks and taxi fleet

Lionel BOILLOT

Covenant of Mayors

Brussels, 19 February 2020



Session organisation

Hydrogen mobility solutions for buses, garbage trucks and taxi fleet



Speakers

- Cars / taxi fleets Lionel BOILLOT FCH2 JU
- Garbage trucks André BEUKERS E-Trucks
- Buses Andreas MEYER WSW mobil GmbH



Panel discussion and questions from audience

- 15 min

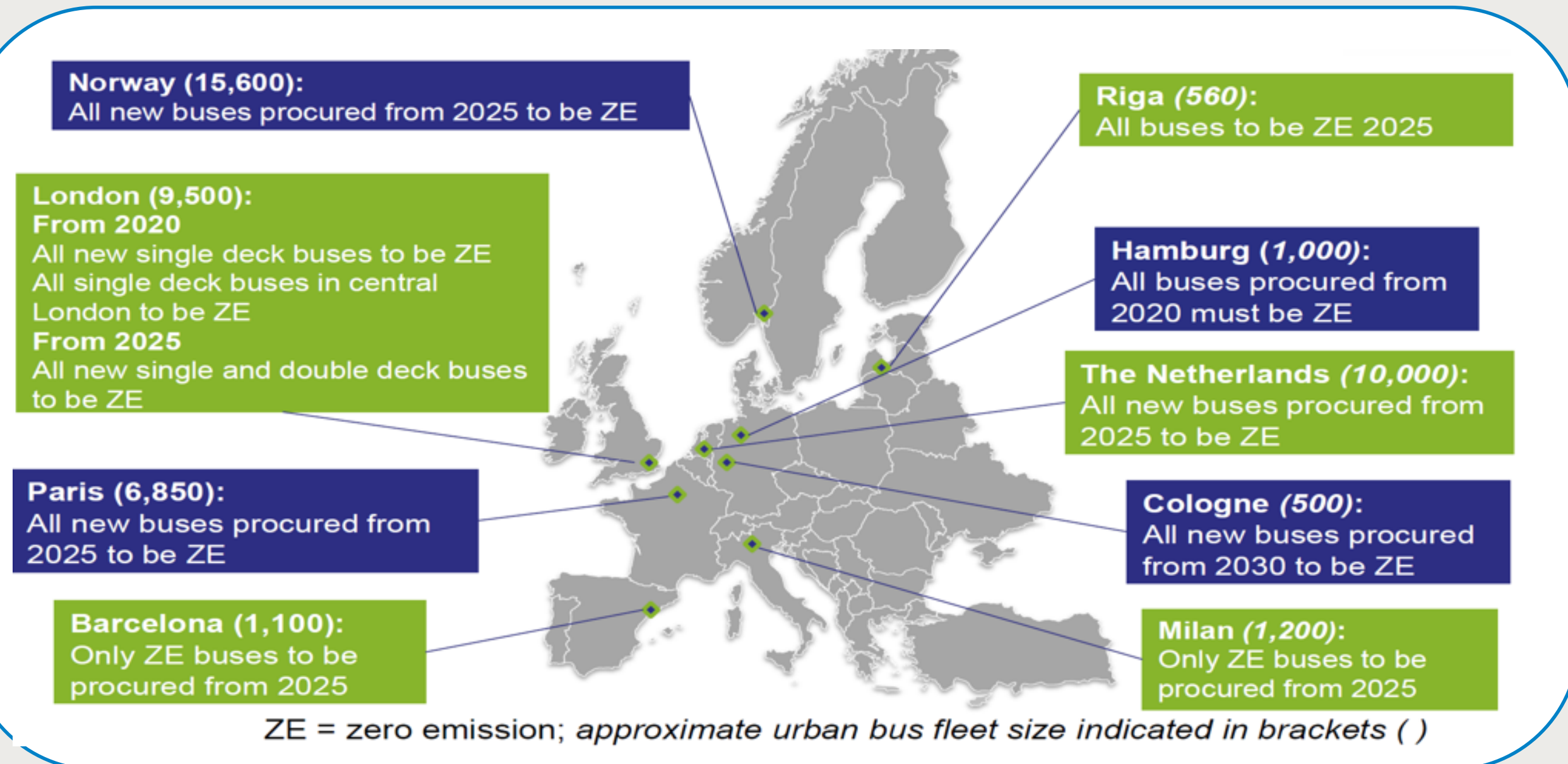


Current emissions regulations in EU countries

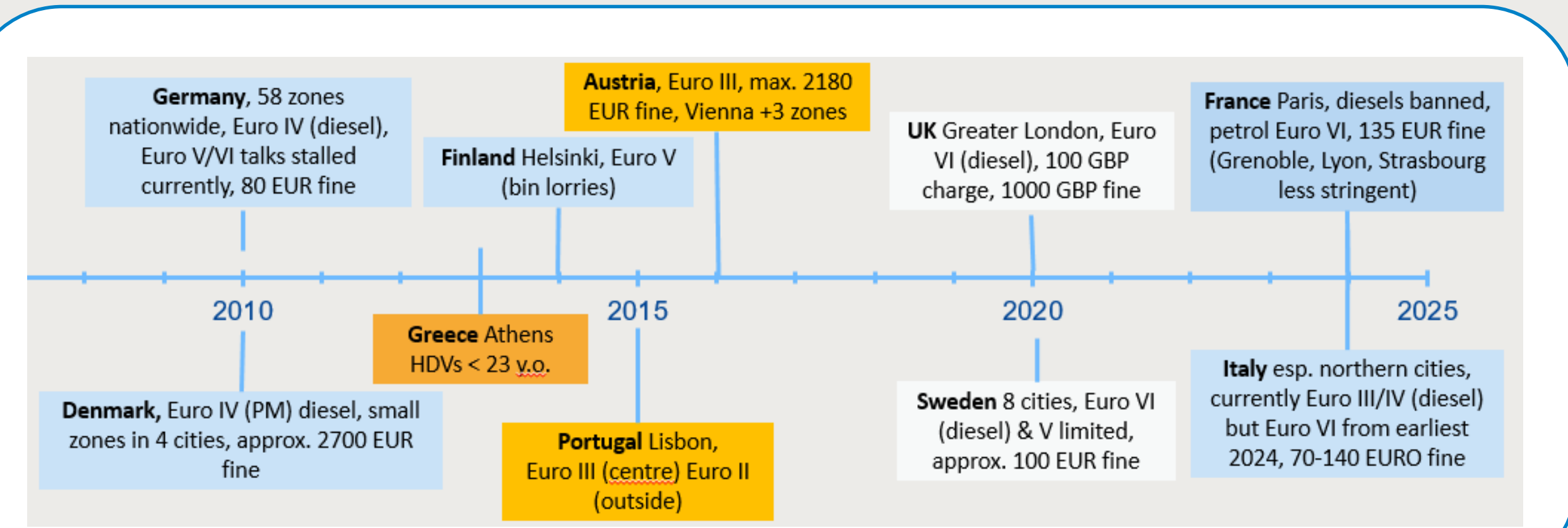
European cities and regions are taking measures for clean air and zero-emission transport



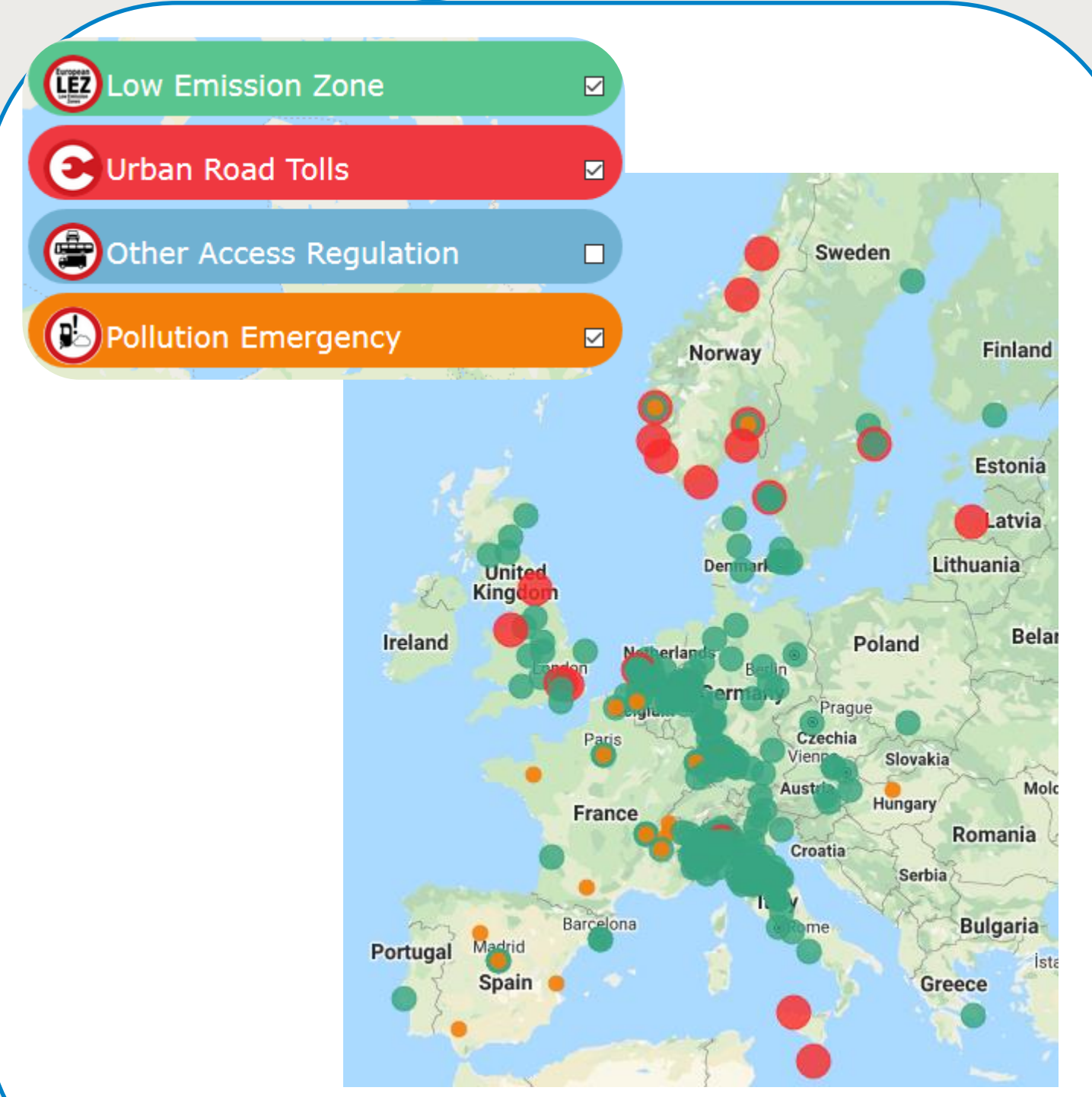
Buses



Trucks

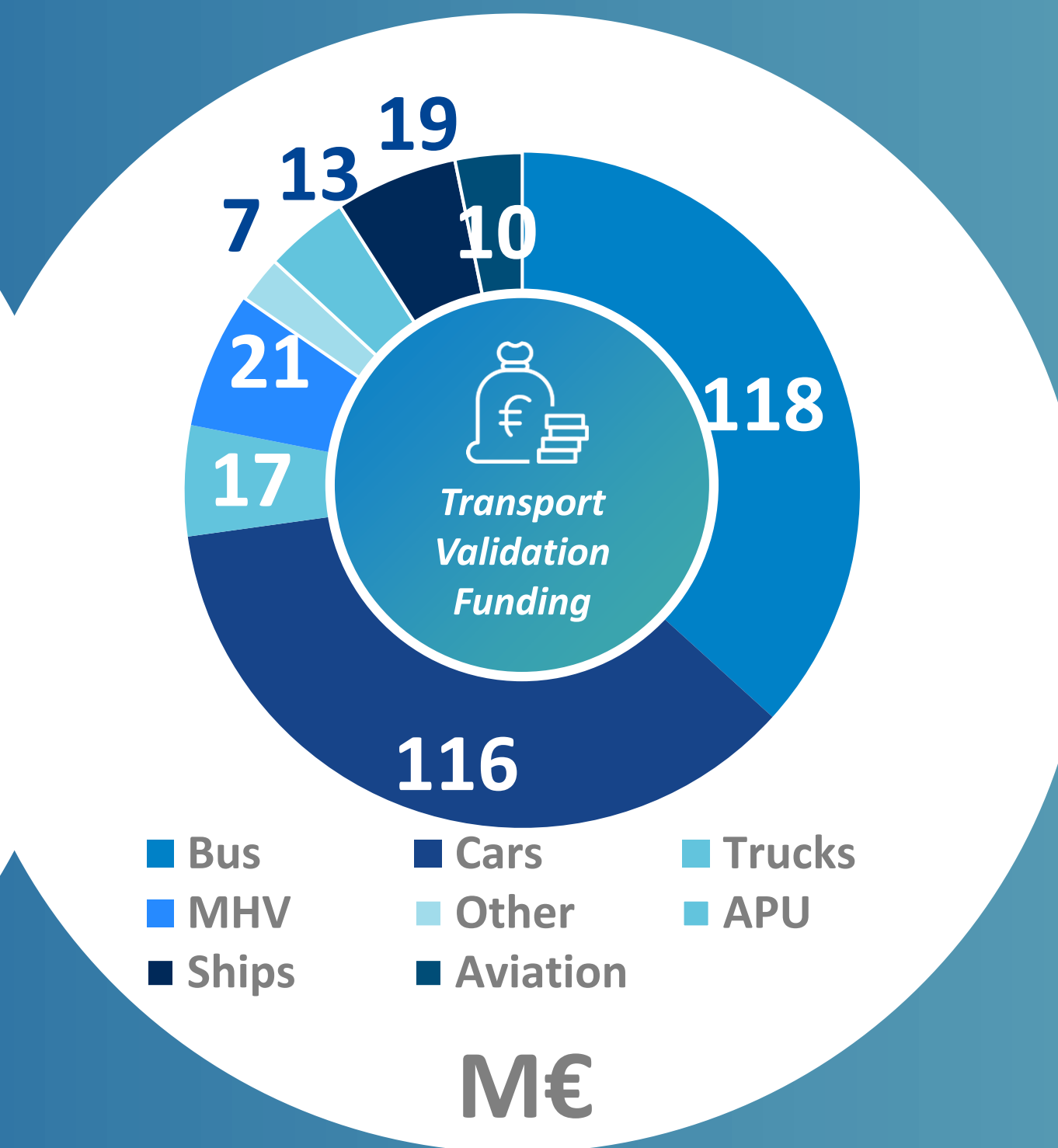


Cars



On the road to widespread deployment

27 projects – 792 M€



Extending the European network



Consolidating as market alternative



Exploring heavy-duty segments

DEPLOYING:

- 103** HRS
- 2000+** cars
- 360** buses
- 273** MHV
- 31** trucks
- 4** ships



* Other resources including private and national/regional funding

How does a fuel cell work? Example of a bus

Flexible and performant: one-to-one replacement of diesel bus



As **clean** as an electric bus

As **flexible** as a diesel bus



- Hydrogen tanks on the roof
- Fuel cell at the back

- Quiet
- No pollution (SOx, NOx, PM)
- Zero emission with green H2
- Refuelling times < 10 min
- Range > 300 km

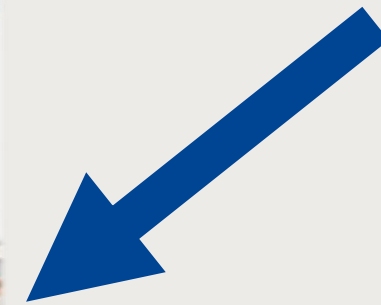


Hydrogen fuel cells bus (FCB) and hydrogen refuelling station (HRS)

The case of Aberdeen (UK)



Fuel cell bus



Hydrogen station



Case study – environmental benefits:

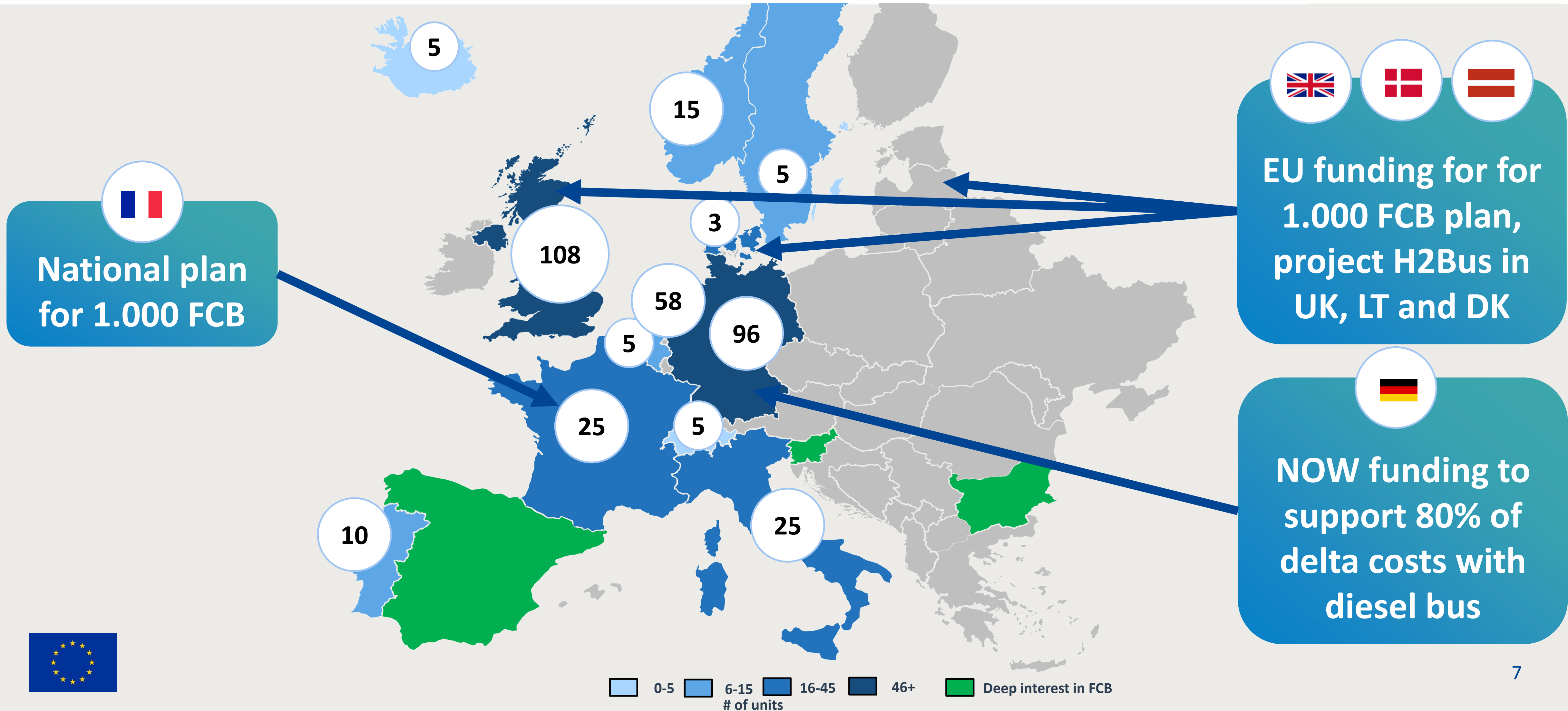
- 6 FCB (out of 10 FCB fleet)
- 1.2 million km travelled between March 2015 and September 2018
- The buses are powered by green H2

**1.000 tons of CO2 abated ⇔ 396.000 litres of diesel
in comparison with diesel EURO VI buses**



FC buses deployment in EU

FCH2 JU supports 360 FCB in EU, other national /European plans exist



More cities, larger fleets, more suppliers: approaching market stage

80 buses ordered in 2018-19, most of them for operation imminently



Bus of the Year 2019



Flexible bus design and lengths

New business and financing models

- Joint procurements
- Central purchase office
- Special Purpose Vehicle
- Leasing



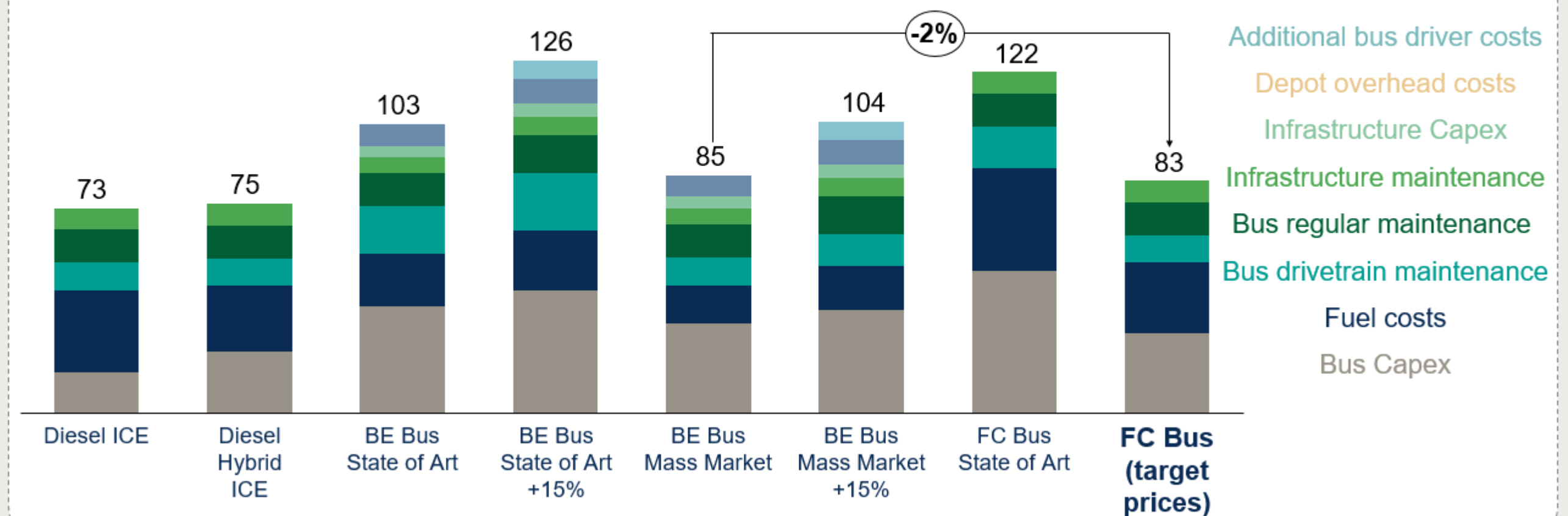
See for your self

EUROPEAN
ZERO EMISSION BUS
CONFERENCE

Paris 07-08 april 2020

<https://zeroemissionbusconference.eu>

Single-deck urban bus annuitised total cost of ownership '000€/bus/year



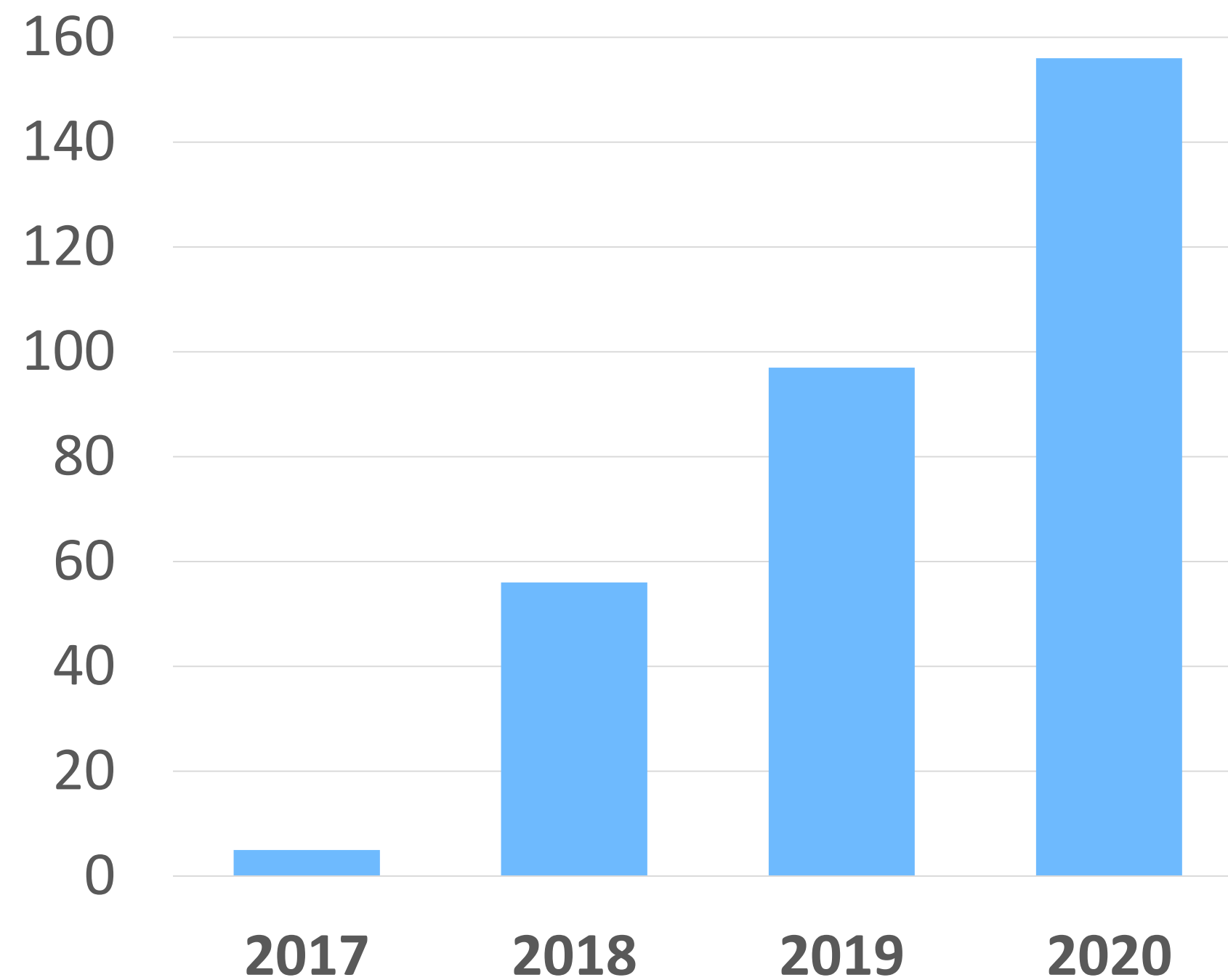
Horizon: large FCB orders and integration in H2 ecosystems

Recent trends in FCB market



FCB market is increasing

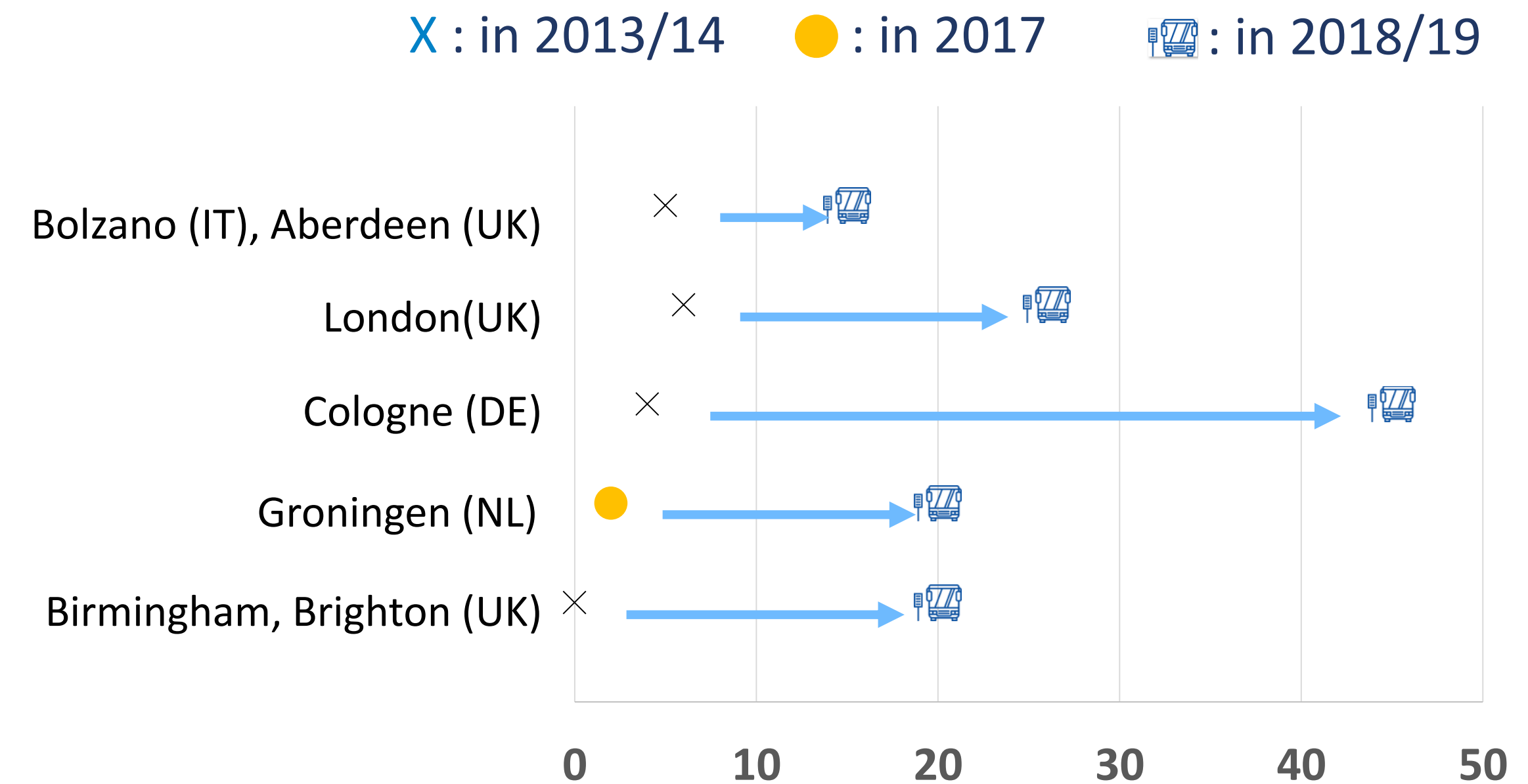
Chronology of bus orders in JIVE projects



50 FCB on the road

Cities order fleet of buses

Increase of scale of bus orders



Zero-emission tenders

H2 valleys

Waste to wheel

Hydrogen garbage trucks



Zero emission garbage trucks for cities, various EC programmes



Circular economy, « waste to wheel » and garbage truck leasing model

Life N'Grab Hy - Life



- Phase 1 (yellow)
 - Eindhoven
 - Veldhoven
- Phase 2 (green)
 - Cologne
 - Antwerp
 - Rotterdam
- Phase 3 (red)
 - Aberdeen
 - Bolzano *
 - Merano *
 - Bruneco *
 - Düsseldorf/Herten
- Additional interested locations:
 - Seville
 - Oslo
 - Copenhagen

*Possible synergy by combining one abroad demonstration in 3 neighbouring cities in Italy

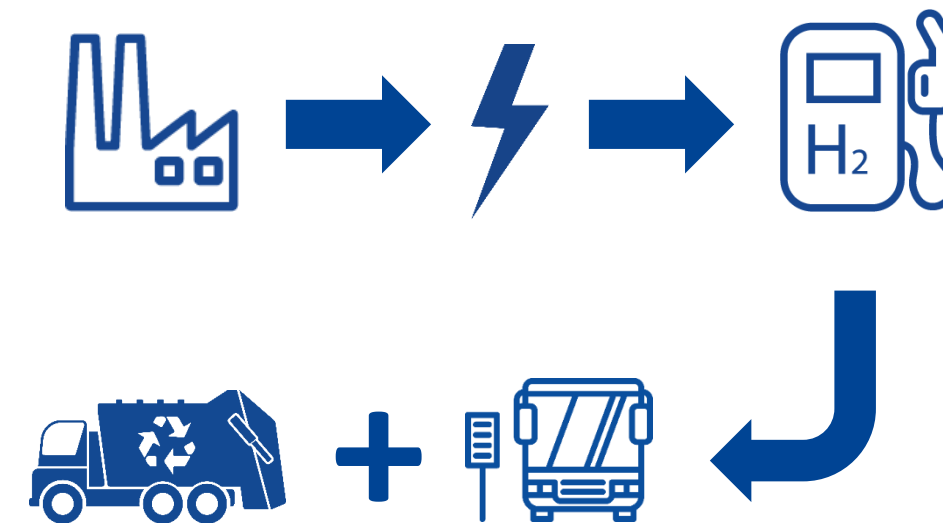
2 trucks



Source: www.lifeandgrabhy.eu

Revive – FCH2 JU

“Waste to wheel”, from waste incineration to hydrogen for mobility



15 trucks



Source: <https://h2revive.eu/>

Hector - Interreg



15 trucks



Source: www.nweurope.eu/hector

Fleets of hydrogen cars – taxi and other mobility solutions



Corporate, functional and municipal fleets

Hydrogen vehicles have demonstrated their performance in various operations



France, 2017

La Poste (FR)



Firefighters (FR)



London, March 2018 and Hamburg, Oct. 2019

- 21 cars
- 250.000 miles



- 1 car



Fleet examples

Paris, May 2018

- 50 vans HyKangoo
- Utility company
- Leased by Alphabet
- Loaded with tools and material
- 4 H2 stations



Lausanne, June 2019

- International Olympic Committee
- 8 cars
- 1 hydrogen station



Taxi / Car Sharing / Ridesharing, company lease and functional fleets

Uncompromised operations, creation of new mobility services



Cities in DE, Sept. 2017

- 45 cars
- 2,2 millions km
- 567,000 passengers
- Hambourg, Munich and Stuttgart (DE)
- 12 H2 stations



CleverShuttle

Paris, July 2018

- 100 taxis
- 600 taxis by end 2020
- > 5 millions km
- 4 H2 stations
- ~6.000km/taxi/month



Fleet examples

London, April 2018

- 50 cars
- > One million miles
- Saving 7.6 tonnes of CO2
- 80.000 passengers
- 5 H2 stations



greentomatocars

Rotterdam, July 2019

- 35 taxis
- New services
- 1 H2 station



Noot
voor het hele koor



Fleet operation – main contributor for H2 mobility experience

Demonstrating the efficiency of the technology – Vehicles and HRS pushed to intensive conditions



Taxi fleet (STEP) in Paris

- International visibility
- Same price as conventional taxis
- Booking via phone App
- Taxi drivers are employees
- Up to 24/7 operation

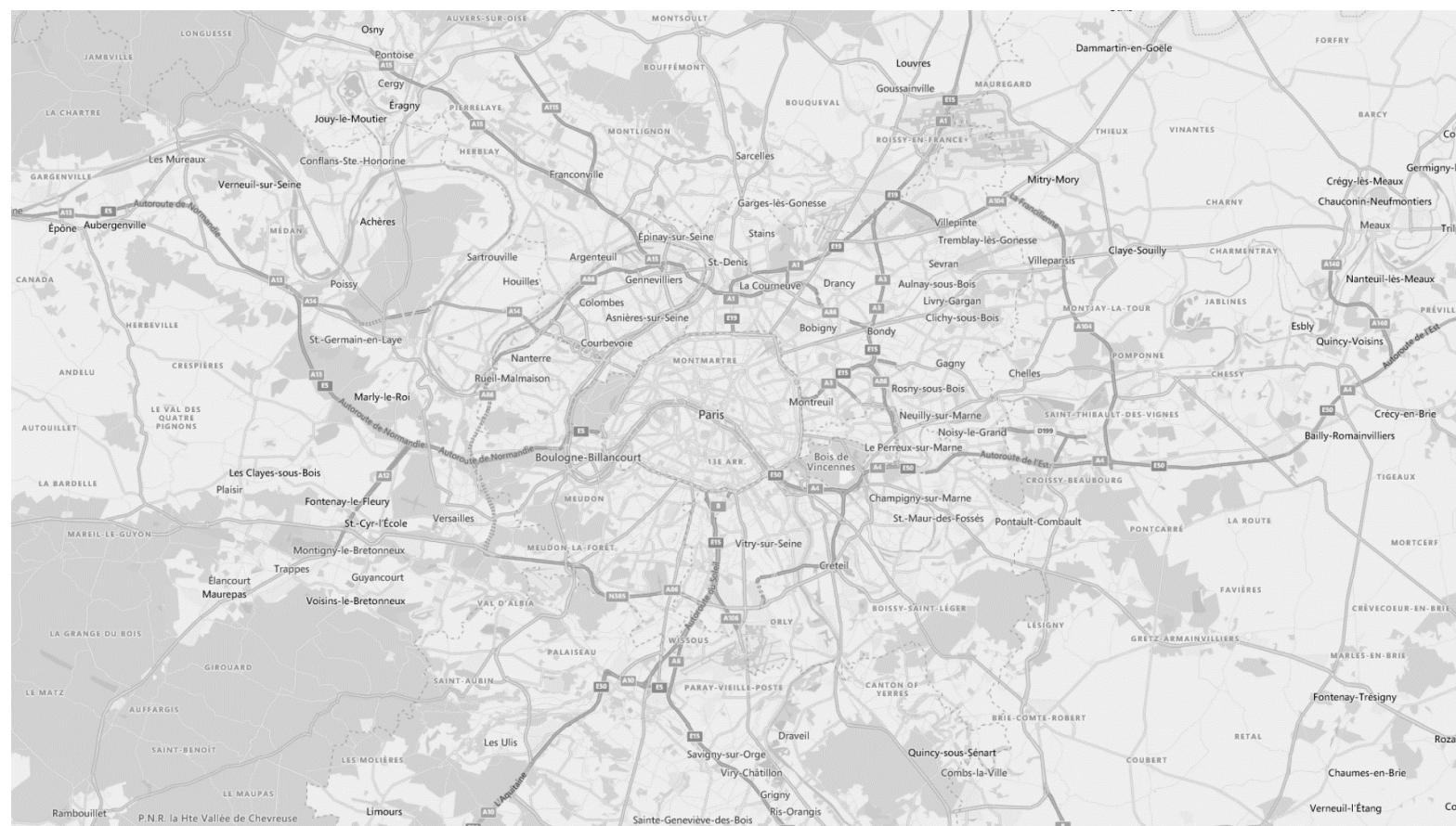
Typical day in a hydrogen taxi in Paris

- 500 km distance
- 3 refuels
- 6kg of hydrogen refuelled

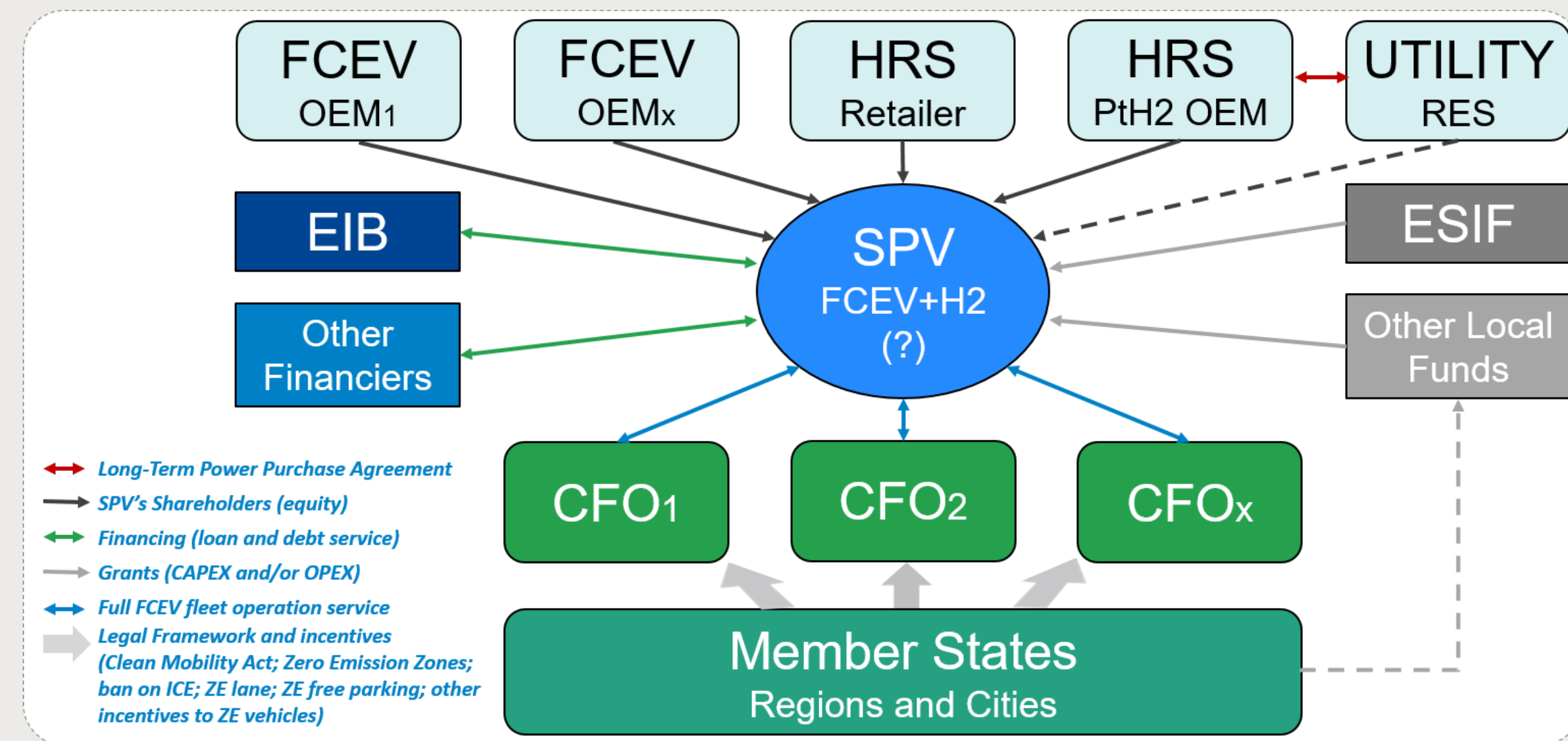
Financing model: Special Purpose Vehicle (SPV) with:

- STEP (taxi)
- Toyota (cars)
- AirLiquide (H2)
- Kouros and IDEX (funds)

Geographical coverage of a taxi in Paris



94%
low carbon
hydrogen



FCH 2 JU initiatives for regions and cities

Supporting the market deployment and reinforcing the European competitive strengths



FCH Regions Initiative

Supporting 92 regions and cities in assessing various FCH applications for transport and energy

- Technology Introduction Dossiers
- Preliminary Business Cases

Link to documents: [here](#)



S3P – Hydrogen

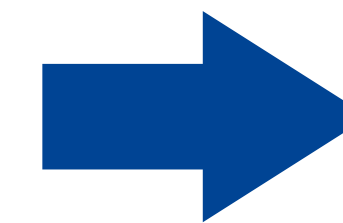
- Facilitate **match-making** and **co-investment** between European regions
- Strengthen the value chain for FCH technologies via interregional cooperation
- Be an active stakeholder on EU policy making on hydrogen

Link to partnership: [here](#)



Project Development

Concept



Plan

- Detailed project budgets
- Detailed project plans
- Financing and funding plans
- Strategies and best practices for procuring
- Deadline: 27 February 2020

Link to PDA: [here](#)





FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

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FCH JU

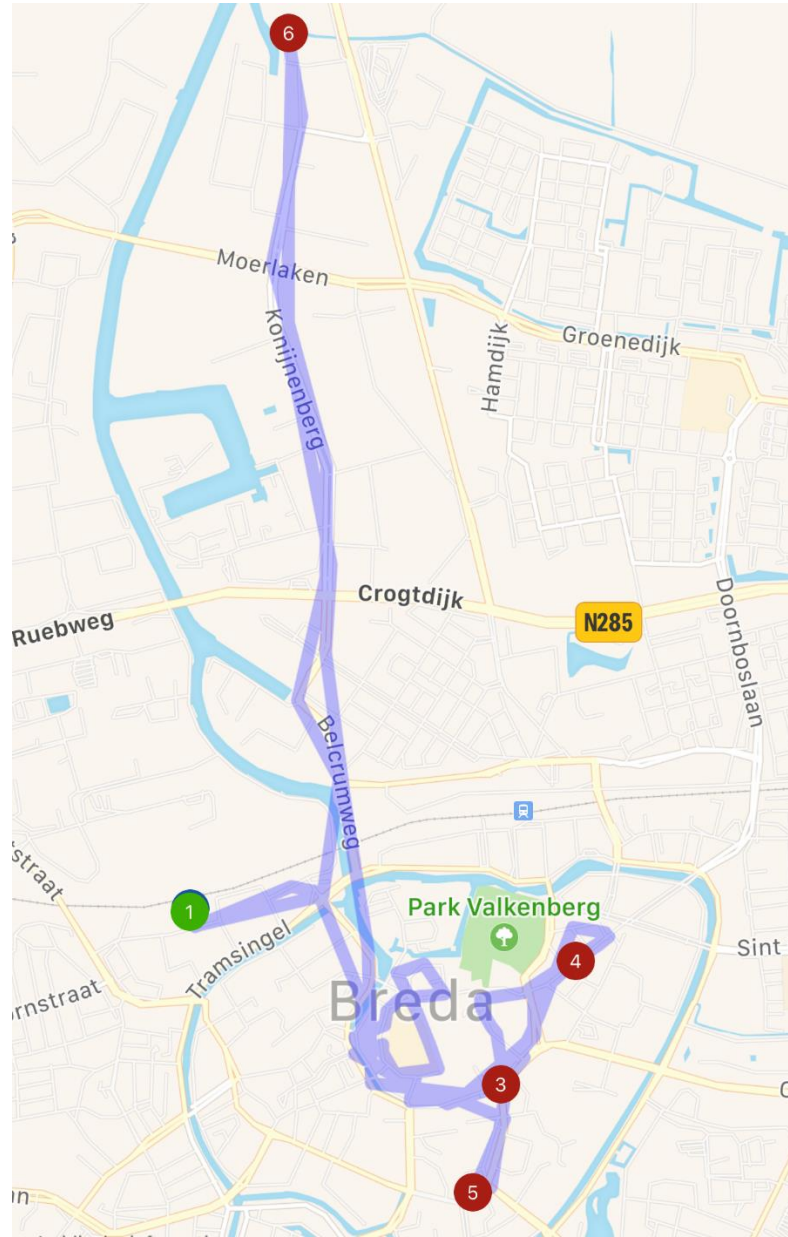
Zero emission garbage trucks

André Beukers

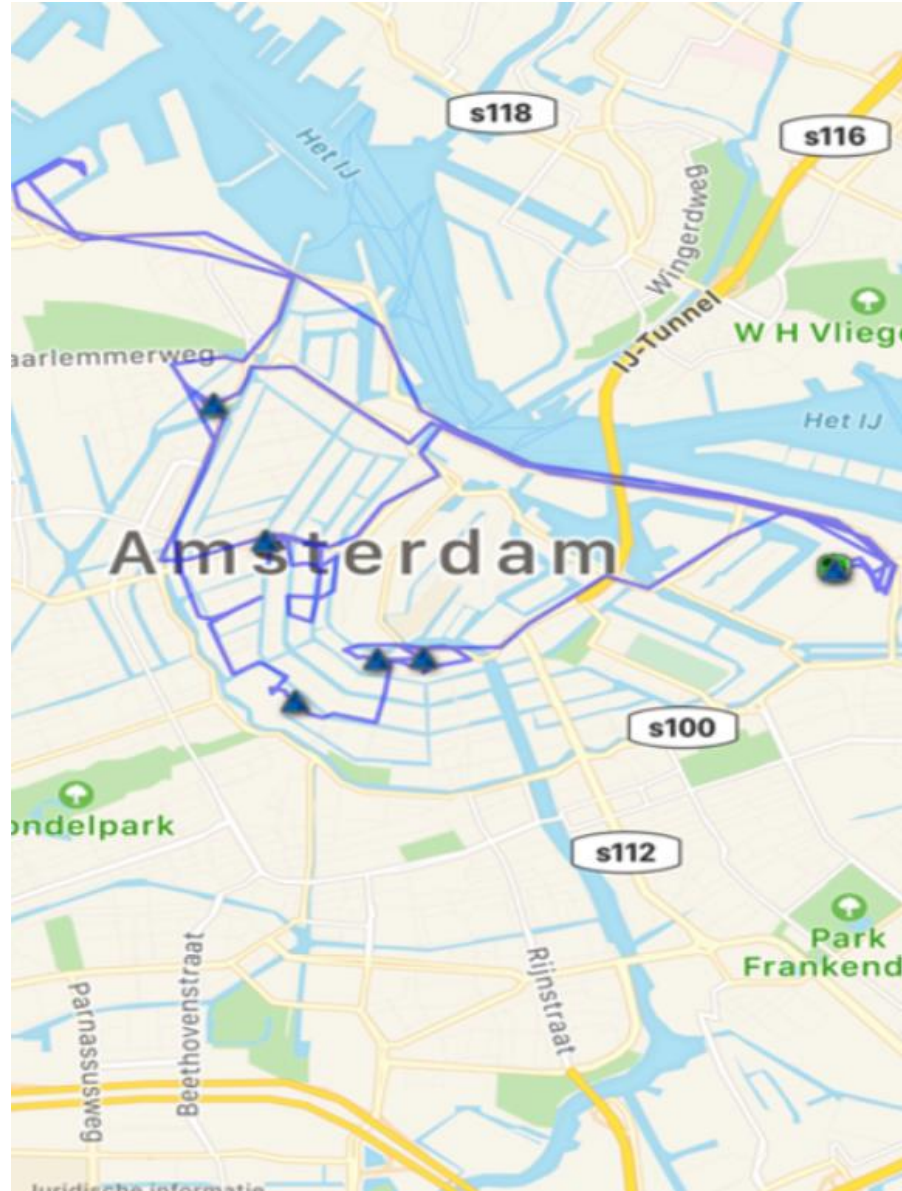
- E-Trucks Europe since 2010,
- Sites in Lommel (B), Westerhoven (NL)







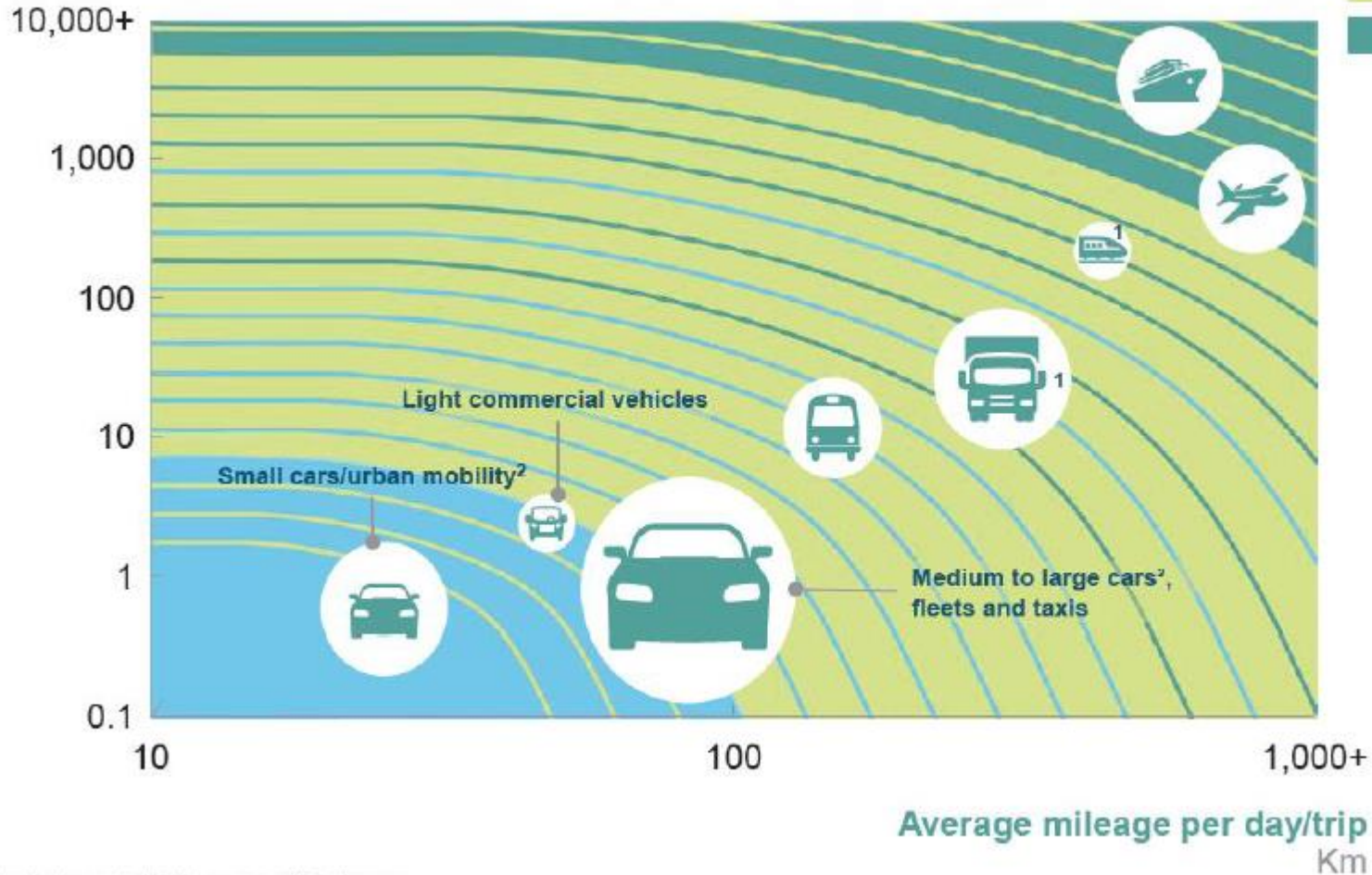




Weight
Tons

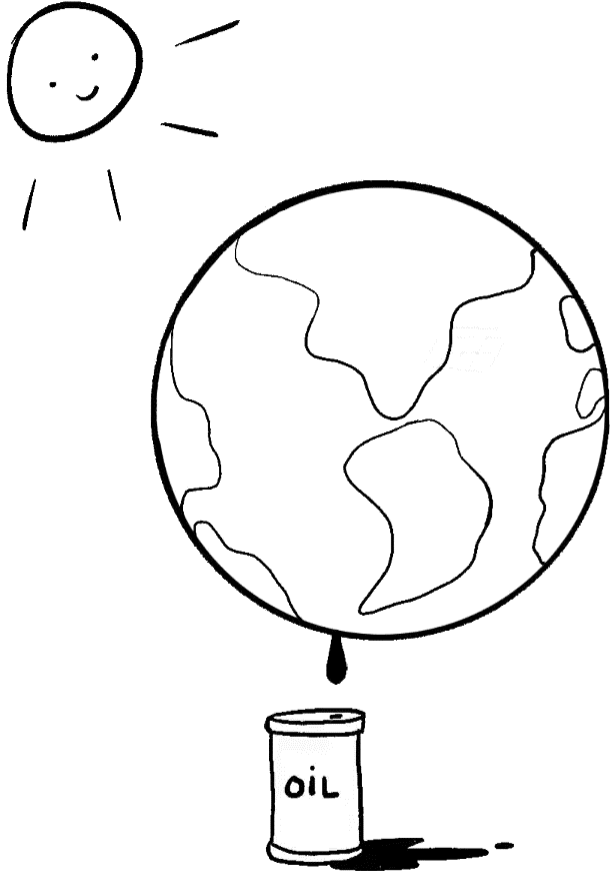
○ Bubble size representing the relative annual energy consumption of this vehicle type in 2013

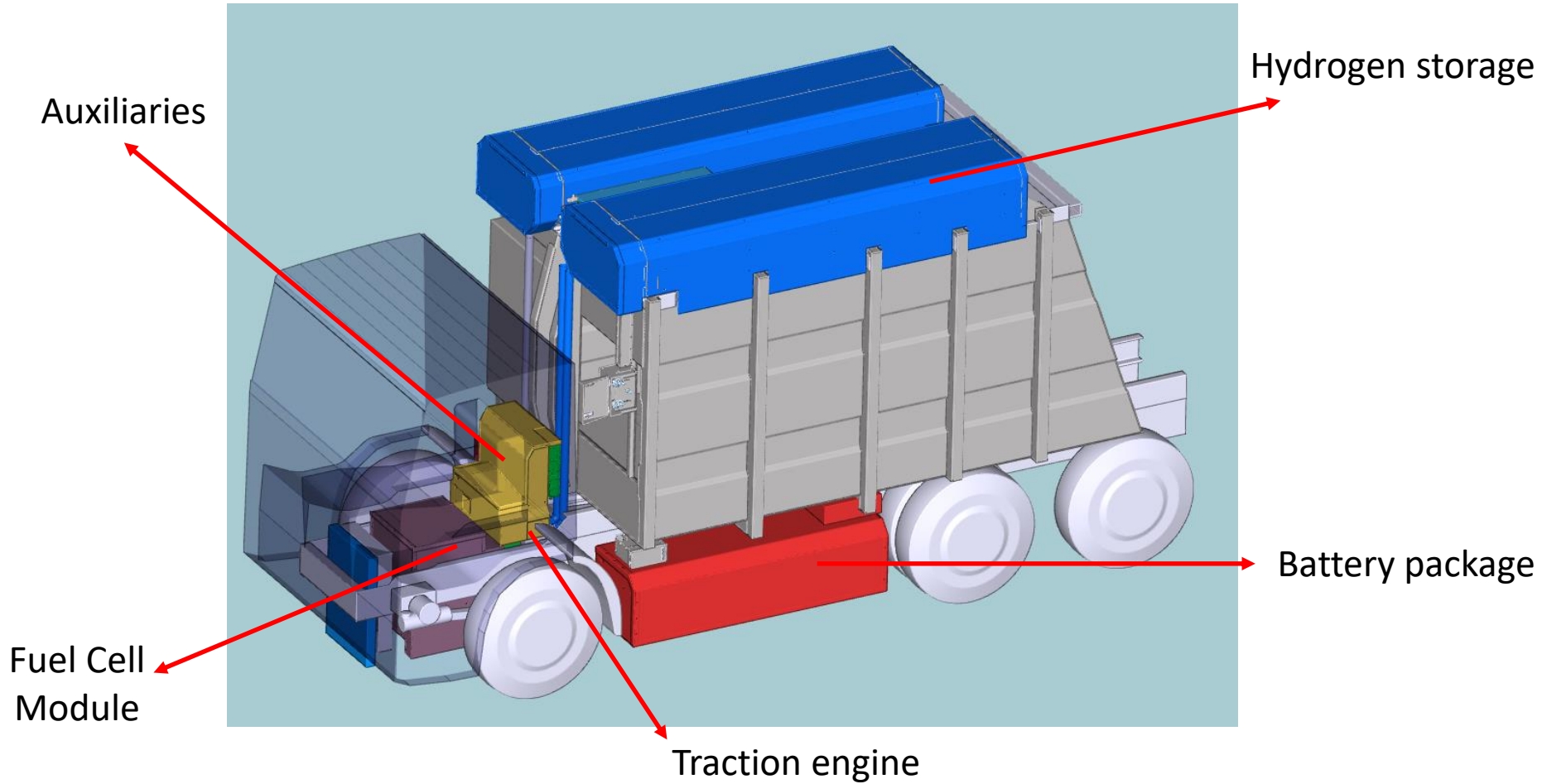
- BEV
- FCEV
- Bio- and (H₂-based) synthetic fuels



1 Battery-hydrogen hybrid to ensure sufficient power

2 Split in A- and B-segment LDVs (small cars) and C+-segment LDVs (medium to large cars) based on a 30% market share of A/B-segment cars and a 50% less energy demand



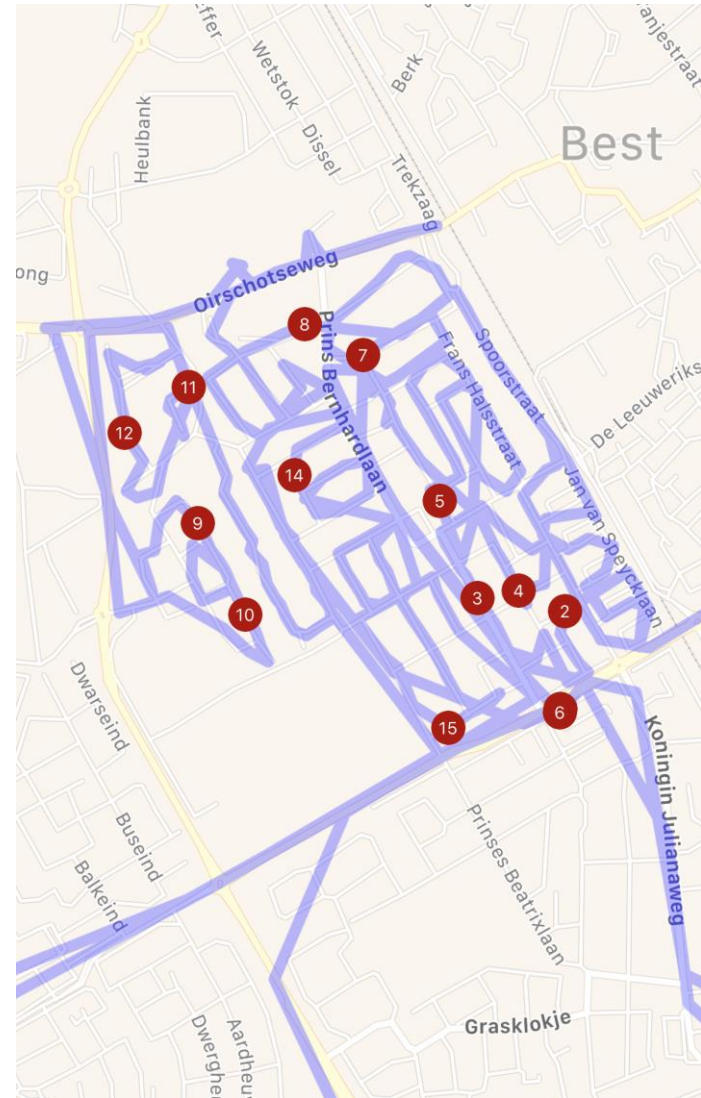
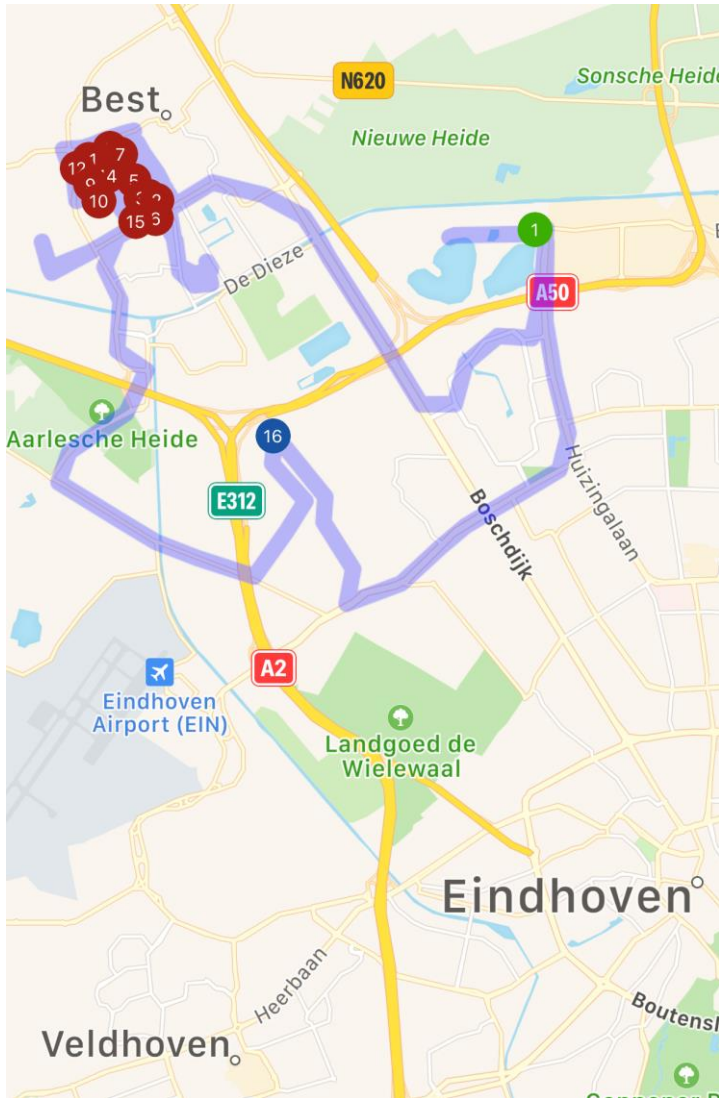










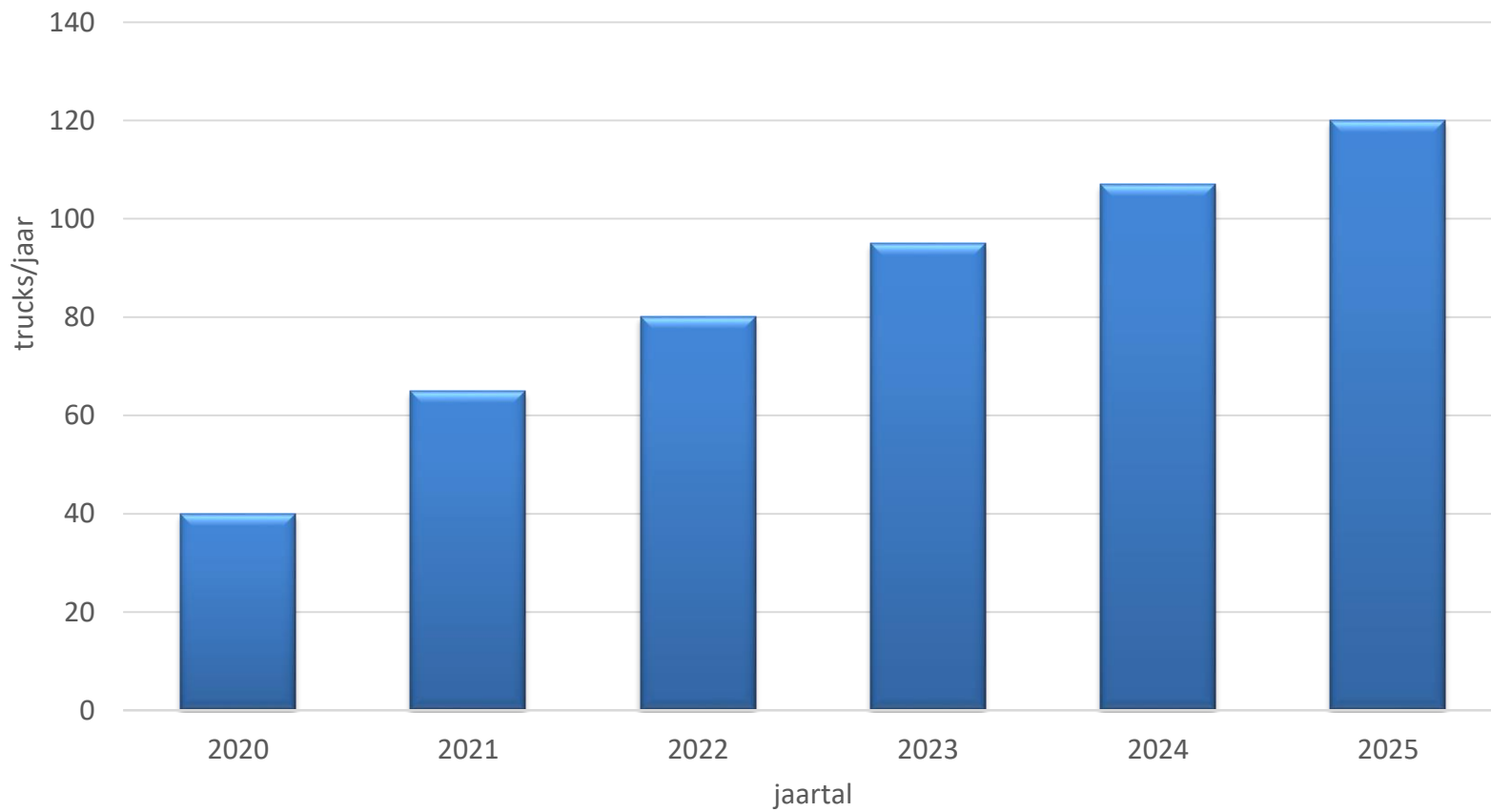






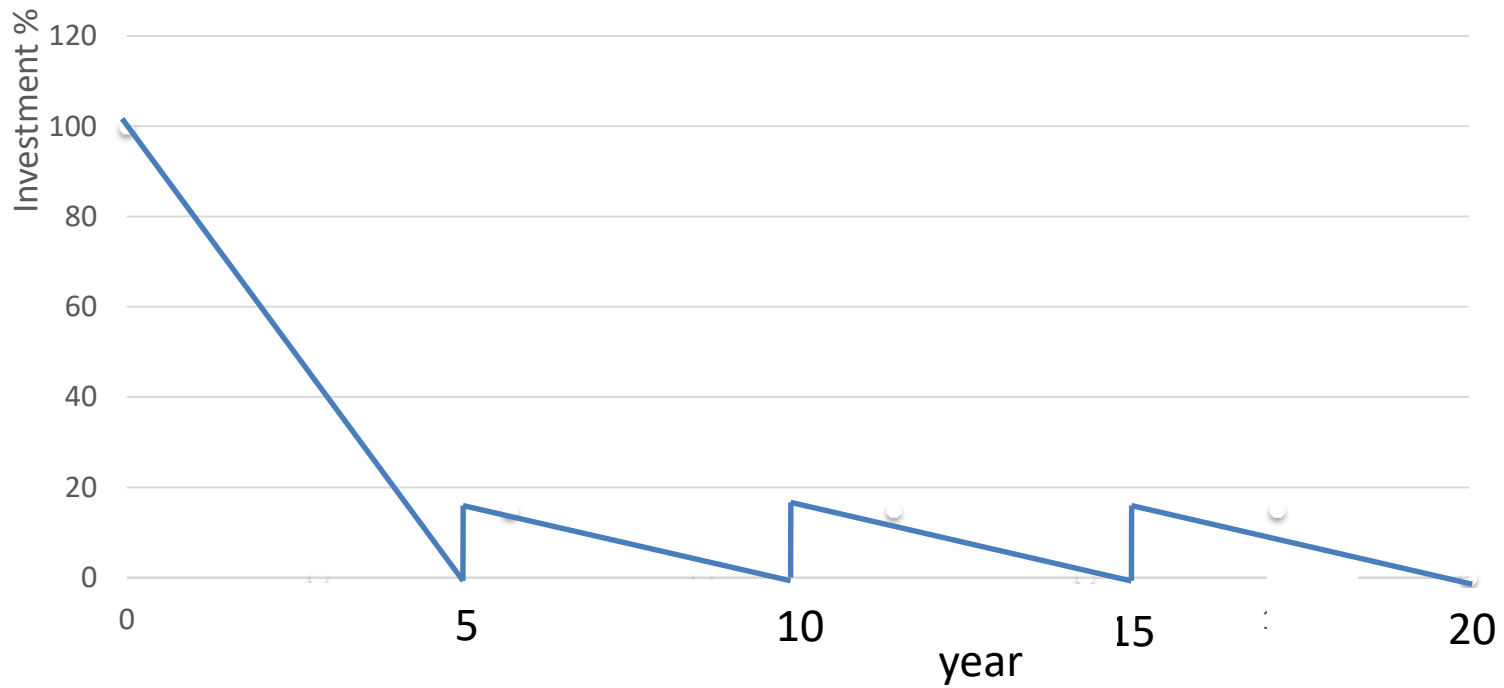
Hydrogen refueling stations

ROADMAP 2020-2025





Investment / vehicle





More information:

www.e-truckseurope.com

andre@e-truckseurope.com

Joint Procurement German-Buscluster

Andreas Meyer
WSW mobil GmbH

Joint procurement of hydrogen fuel cell buses

A decorative graphic at the bottom of the slide, featuring a light blue wavy shape on the left and a large red circle on the right.

Agenda

- ▶ Overview of the JIVE Project
 - ▶ Joint Procurement JIVE
 - ▶ Summary / lessons learned

- ▶ Overview of the JIVE 2 Project
 - ▶ Joint Procurement JIVE 2
 - ▶ Summary / lessons learned



JIVE – Joint Initiative for hydrogen Vehicles across Europe

- ▶ January 2017 – December 2022
- ▶ 139 fuel cell buses and associated refuelling infrastructure across five countries
- ▶ 32 million euro grant from the FCH JU (Fuel Cells and Hydrogen Joint Undertaking) under the European Union Horizon 2020 framework programme for research and innovation



Joint Procurement German-Buscluster

- ▶ Merger of one northern Italian- and five German cities with an order volume of 63 fuel cell buses with 6 lots
- ▶ **Tender process:**
 - Call for competition
 - Three international bus manufacturer who has declared an interest at the first step of the tender process
 - Submission of tenders
 - Only one Manufacturer has given up an offer
 - (One Manufacturer has send a letter of regret and the other one did not fulfilled the criteria)
 - Evaluation of offer
 - Manufacturer has given up an offer for 2 of the 6 lots
 - (Justification: Realisation of economics of scale only at 2 lots whose specifications are quite identic, order of 40 buses and geographical closeness of the two bus operators)
 - Commissioning
 - Individual commissioning
 - Further procedure
 - The other 4 cluster-partners where in the situation for a direct award

Summary / Lessons learned

- ▶ Contract over 40 fuel cell buses from Van Hool
- ▶ Joint procurement for this new drive technology was a time-consuming procedure
- ▶ Great support within the cluster
- ▶ Ongoing delivery time of more than one year
- ▶ Lower output regarding:
 - contract conclusions (2 of 5 cities)
 - economies of scale (fixed price limit of 650,000 € did not undercut)

JIVE 2 – Joint Initiative for hydrogen Vehicles across Europe

- ▶ January 2018 – December 2023
- ▶ 152 fuel cell buses and associated refuelling infrastructure across 14 European cities
- ▶ 25 million euro grant from the FCH JU (Fuel Cells and Hydrogen Joint Undertaking) under the European Union Horizon 2020 framework programme for research and innovation



Joint Procurement RVK and WSW mobil

- ▶ Merger of RVK GmbH (Cologne) and WSW mobil GmbH (Wuppertal) – both bus operators in North-Rhine-Westphalia
- ▶ 25 fuel cell buses with 2 lots for articulated buses and 2 further optional lots for 12m buses
- ▶ **Tender process:**
 - Call for competition
 - Five international bus manufacturer who has declared an interest at the first step of the tender process
 - Submission of tenders
 - All Manufacturer has given up an offer – all for 12m buses
 - Evaluation of offer
 - Three of the five offers has fulfilled the tender criteria
 - One manufacturer has get the contract for both cities
 - Commissioning
 - Individual commissioning

Summary / Lessons learned

- ▶ Contract over 25 fuel cell buses from Solaris
- ▶ Joint procurement was less time-consuming on the basis of experiences of JIVE and the fact that only two cities has build an merger
- ▶ Sharing of know-how
- ▶ Satisfying trend regarding:
 - contract conclusions (2 of 2 cities)
 - economies of scale (fixed price limit of 625,000 € did undercut)
- ▶ 10 months between contract conclusion and beginning of delivery
- ▶ Planed delivery time of less than one year



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