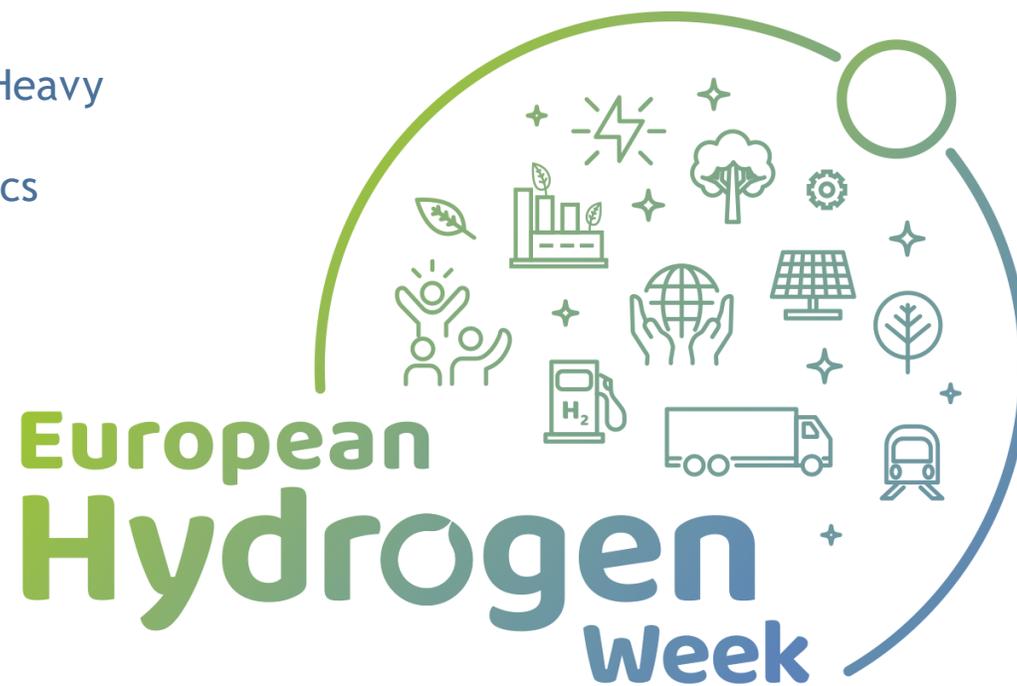




Hydrogen Fuel Cell Trucks for Heavy
Duty Zero Emissions Logistics



Mike Dolman
Element Energy

Ivan Calaon
IVECO

Ruud Bouwman
VDL



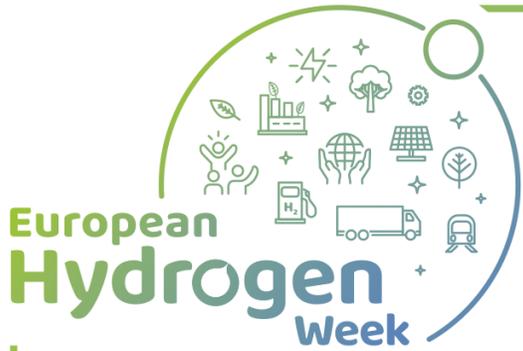
www.h2haul.eu



info@h2haul.eu

#PRD2020
#CleanHydrogen





Project Overview - H2Haul

- Call year: 2018
- Call topic: FCH-01-1-2018 - Large Scale Demonstration of H2 fueled HD Trucks with High Capacity Hydrogen Refueling Stations (HRS)
- Project dates: February 2019 - January 2024
- Total project budget: € 28,033,073
- FCH JU max. contribution: € 12,000,000



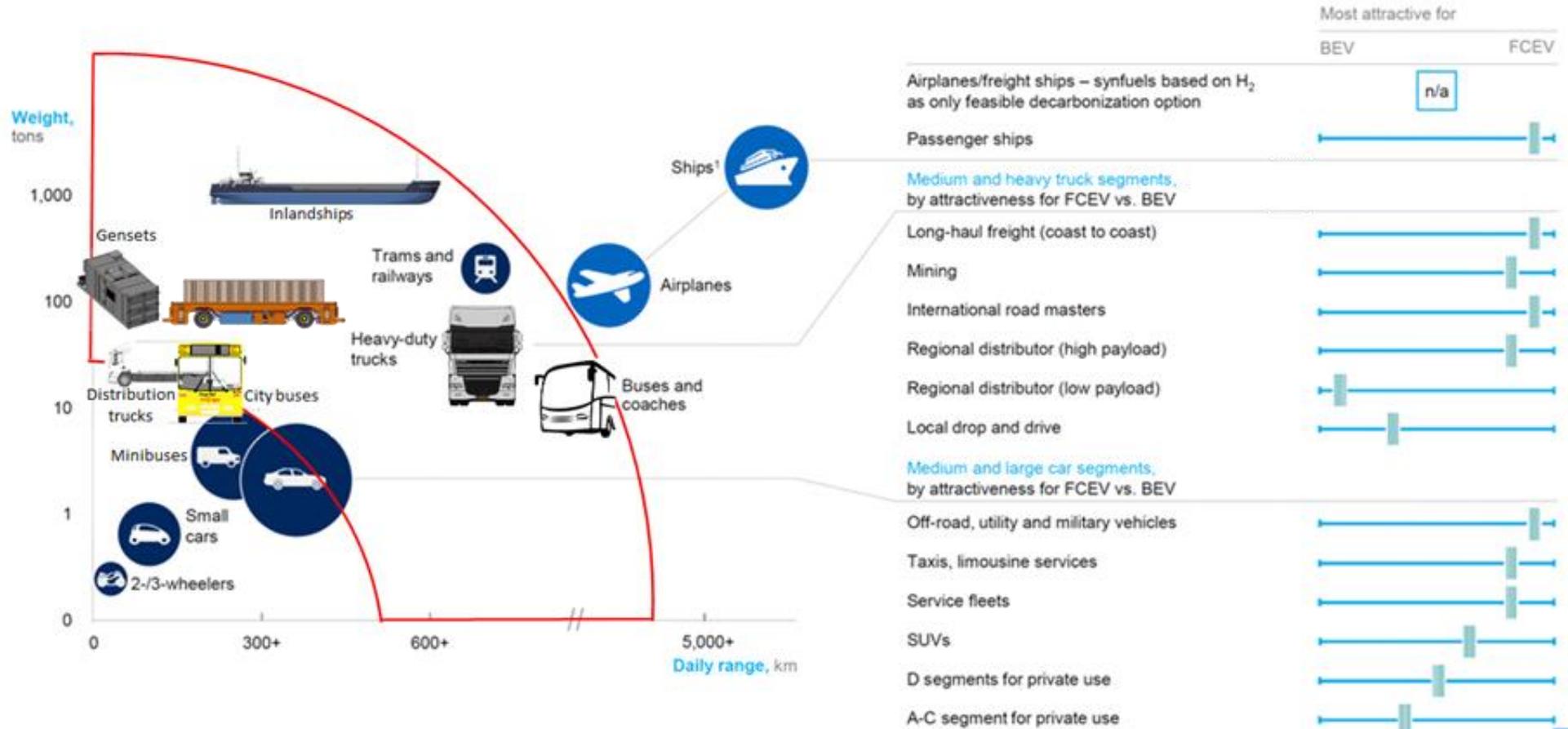


ZERO-EMISSION VEHICLES VDL



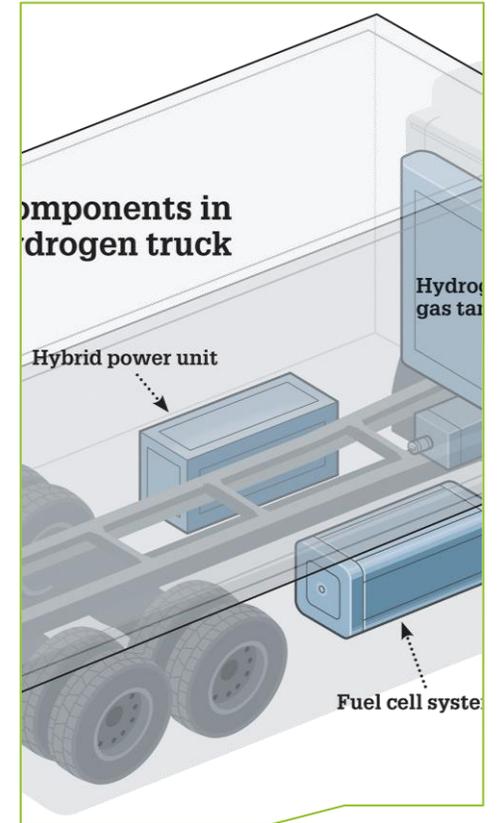
ZE-Energy (Hydrogen) Use in Transport (EU reports) and VDL Hydrogen Markets

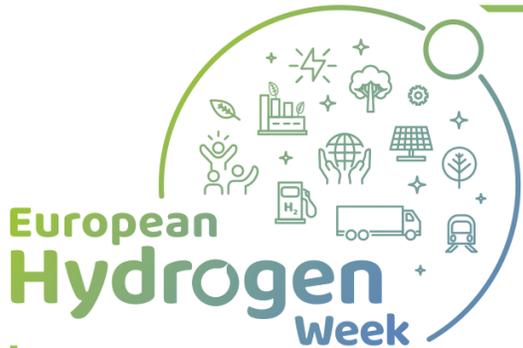
Bubble color representing FCEV or synfuel application of H₂ Bubble size roughly representing the annual energy consumption of this vehicle type in 2050



VDL Hydrogen Strategy

- Modular System - for all heavy duty applications
- Hydrogen as Range Extender
- Hydrogen for Heavy Duty (>3.5ton) and Long Range/Haul
 - Regional Bus and Coach
 - Long Haul Truck
 - GenSet (Multi-Purpose (f.e. Ship, AGV,))
- Hydrogen TCO comparable with current TCOs
 - (Euro/kW, Euro/kgH₂ and H₂kg/m³)
- VDL as FC system assembler and integrator





VDL Zero Emission Hydrogen RE products

Hydrogen Range Extender for Regional Transport, Coaches, Long Haul Transport ...



Regional ZE-Bus



ZE-Coach (Future)



Long-Haul ZE-Truck



Energy Storage Systems (kWh) (Future)



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Interreg North-West Europe

H2-Share

European Regional Development Fund

European Regional Development Fund



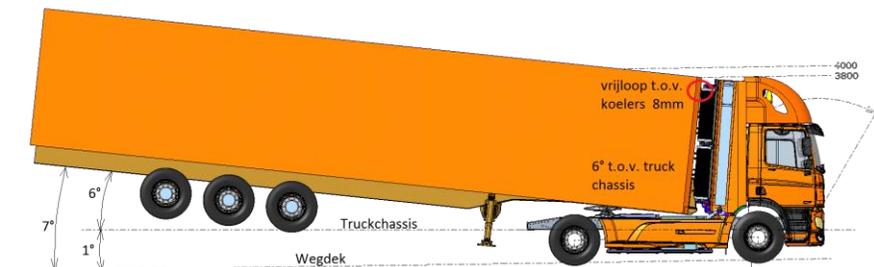
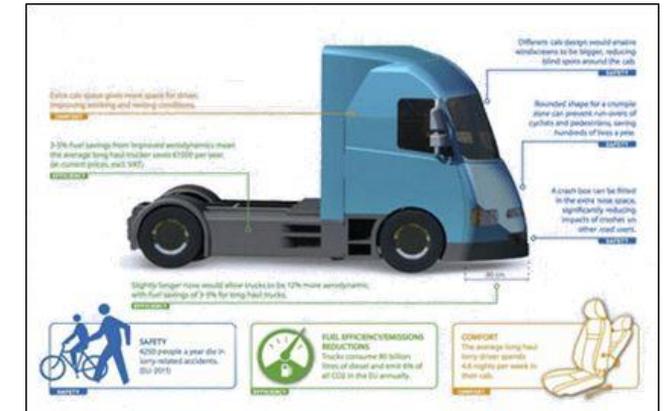
H2Haul: 44ton, 16.5m, DayCab, >450km, 350bar, standard trailer

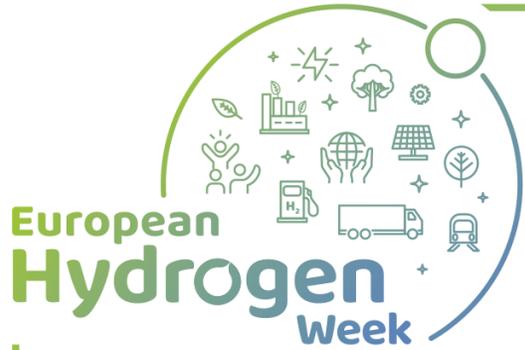
VDL H2Haul status

1. Start build of first 2 electric trucks is started week 41 by VDL-BCH.
 - Delivery to VDL-ETS week 50 for building Hydrogen part.
2. The delivery of 4 A-sample fuel cells from ElringKlinger
 - Delivery to VDL week 50.
3. Preparation for Belgian truck homologation.

Development challenges:

- Hydrogen vehicles are heavier and need more space for driving same distance
- Integration Components within regulations:
 - Hydrogen Storage (12x (350bar), 8x (700bar) or 5x (Liquid) volume of diesel)
 - Cooling (2x volume of diesel)
 - FC module + E-Traction (≈same volume as diesel)





H2Haul IVECO Artic 6x2 - Batch 1

GVC 42 tons

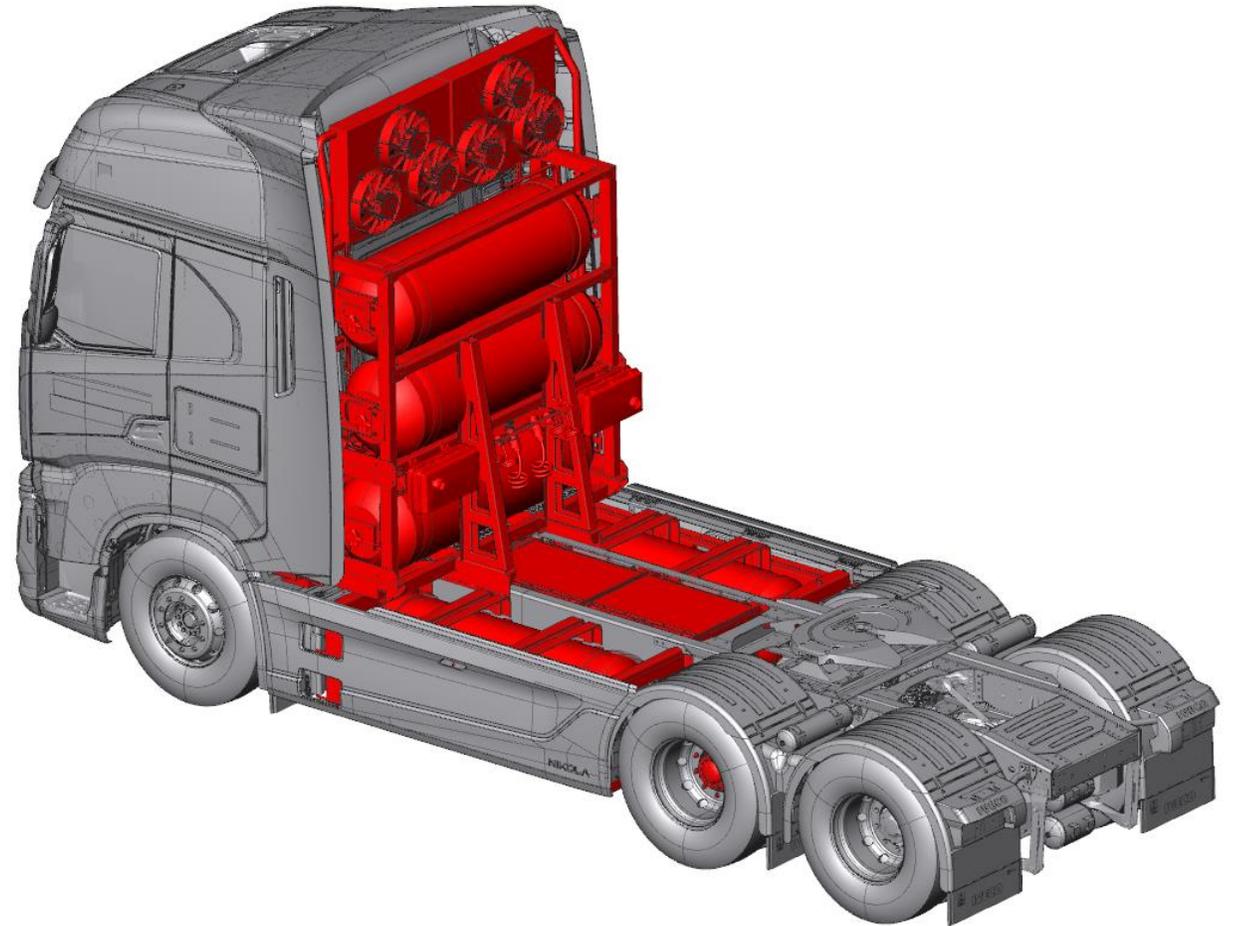
2 Stacks 100kW

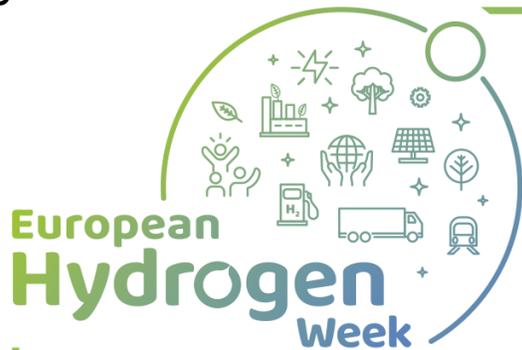
2 battery module 80kWh

eAxle - 480 kW continuous

5 tanks @700bar

65 kg of H₂





H2Haul IVECO - Vehicle Deployment



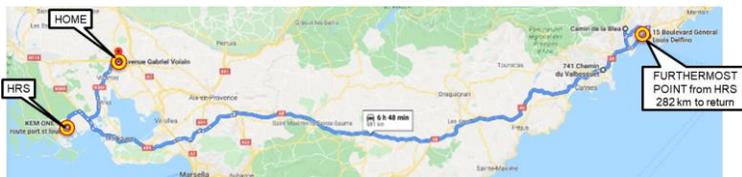
700 bar



Artic / Rigid + Trailer



foods delivery / refrigerated
around 600 km
3 to 5 drop off



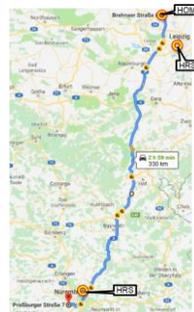
700 bar



Artic



automotive logistics
around 350 km
end to end



700 bar



Artic

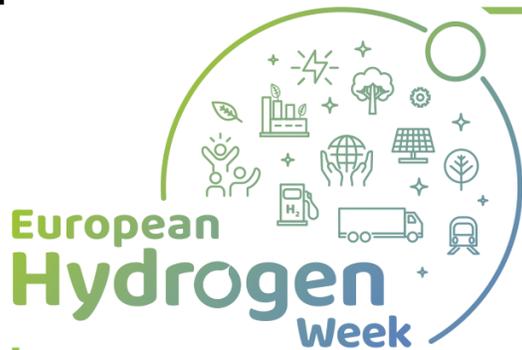


Foods delivery
250 to 400 km
3 to 10 drop off

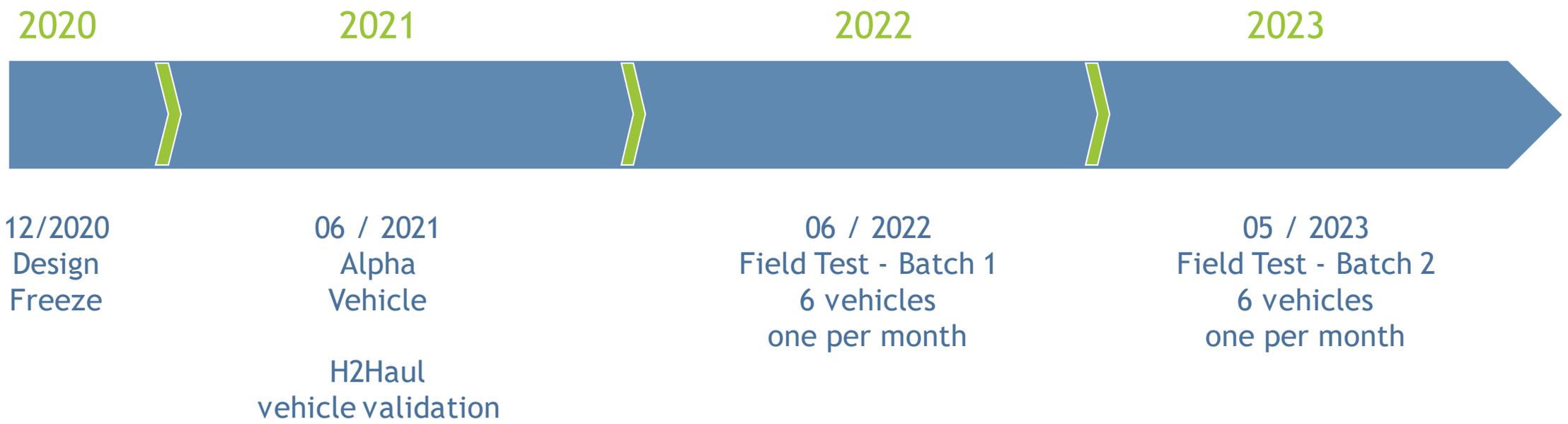


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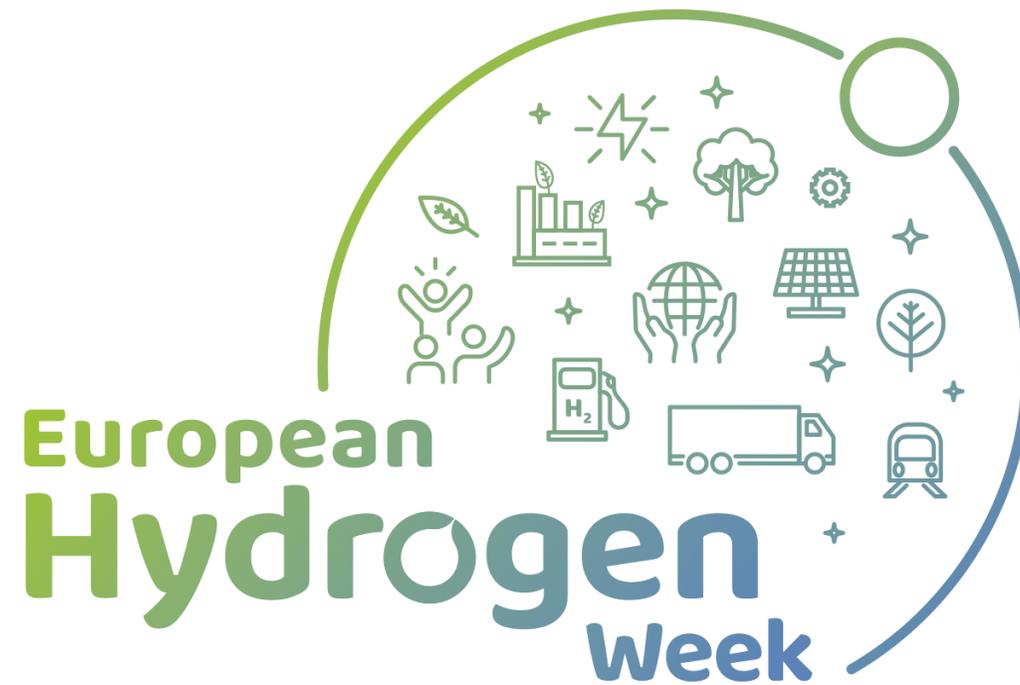


H2Haul IVECO - Timeline



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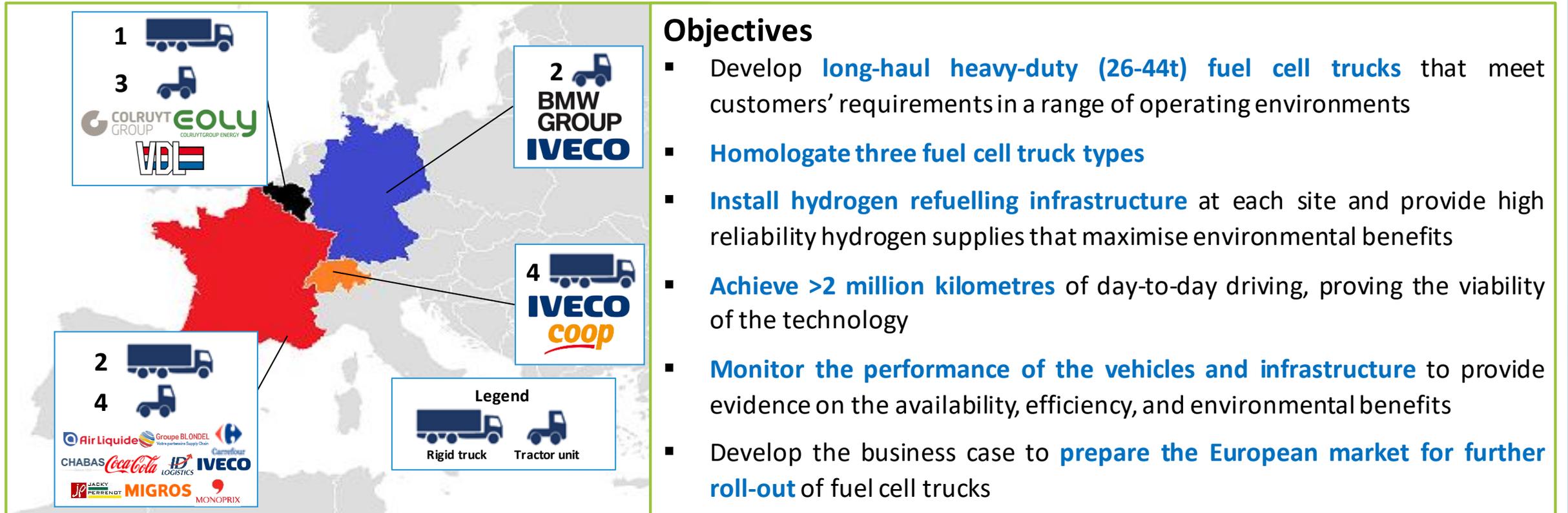


European
Hydrogen
Week

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Appendix: H2Haul Objectives



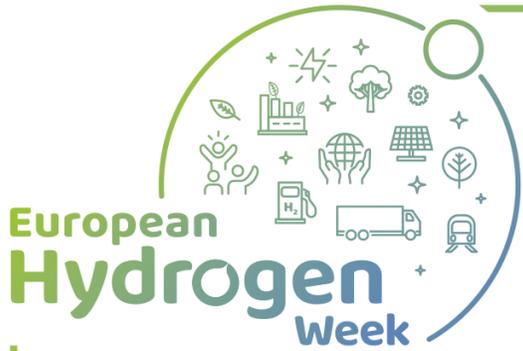
The map shows four regions with callouts:

- Region 1 (Black):** 1 Rigid truck, 3 Tractor units. Partners: COLRUYT GROUP, EOLY, VDE.
- Region 2 (Blue):** 2 Tractor units. Partners: BMW GROUP, IVECO.
- Region 3 (Red):** 2 Rigid trucks, 4 Tractor units. Partners: Air Liquide, Groupe BLONDEL, CHABAS, Coca-Cola LOGISTICS, IVECO, JACKY FERRENDOT, MIGROS, MONOPRIX.
- Region 4 (Orange):** 4 Rigid trucks. Partners: IVECO, coop.

Legend: Rigid truck (Truck icon), Tractor unit (Tractor icon).

Objectives

- Develop **long-haul heavy-duty (26-44t) fuel cell trucks** that meet customers' requirements in a range of operating environments
- **Homologate three fuel cell truck types**
- **Install hydrogen refuelling infrastructure** at each site and provide high reliability hydrogen supplies that maximise environmental benefits
- **Achieve >2 million kilometres** of day-to-day driving, proving the viability of the technology
- **Monitor the performance of the vehicles and infrastructure** to provide evidence on the availability, efficiency, and environmental benefits
- Develop the business case to **prepare the European market for further roll-out** of fuel cell trucks



Appendix: H2Haul Delivery Phases



Specification of **truck requirements** and customisation or **build of vehicles**.



Assessment of proposed HRS sites. **Preparation** or expansion of **HRS**.



Launch of hydrogen fuel cell vehicles. Commence **real world operations** and maintenance. Scale-up of tests to **challenge performance** capabilities.



Continuous **collection, monitoring** and **analysis** of operational data, controlled in line with the **data management** principles.



Evaluation of performance and results. **Sharing of information** to consortium partners and selected end users throughout the project to leverage **learnings and best practices** to influence future developments.