

# Fuel Cell Electric Trucks

## Demonstrations and developments

GREEN  
REGIONS  
WITH ALTERNATIVE  
TA FUELS FOR  
TRANSPORT

HyER

Seminar: “Decarbonising heavy-duty road transport”

Brussels, January 31, 2018

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 @waterstofnet

# WaterstofNet

- non-profit based in The Netherlands & Belgium
- project development & realisation
- roadmapping & implementation
- cooperating with industry, governments & knowledge institutes
- member industry association Hydrogen Europe  
>100 members
- hands-on experience (5y operation & maintenance H2 refuelling station, demonstration projects)



WaterstofNet

Helmond  
(The Netherlands)



Turnhout  
(Belgium-Flanders region)

## Why Fuel Cell Electric Trucks?

- Freight transport contributes 25% of total CO<sub>2</sub> transport emissions
- Cities suffer from poor air quality and affects quality of life
- Electric drivetrains are key elements of **low carbon** transport
- High mileage & heavy weights are typical operational characteristics of heavy duty trucks (batteries alone not sufficient)
- Fuel cell technology is necessary to complement batteries to realise **deep decarbonisation** with green hydrogen from renewable electricity
- Fuel cell & batteries could offer the same (or better) convenience vs diesel ICE
- Fuel cells & batteries are not competing technologies but complementary

## But...

- Not much experience (not the case for bus & passenger cars)
- Lacking large scale infrastructure
- Costs of components still too high (are decreasing)
- Hydrogen nowadays mainly from fossil origin

## So, what do we need?

- Built up experience around strict operational requirements of transport operators (proof fast refueling/range/flexibility/reliability/cost decrease)
- Demonstration projects, roadmap & policies/incentives for large scale implementation (start commercialisation around 2022)
- Hydrogen refueling stations on strategic locations along major highways
- Sector coupling to realise **deep decarbonization** (mobility system<>energy system)



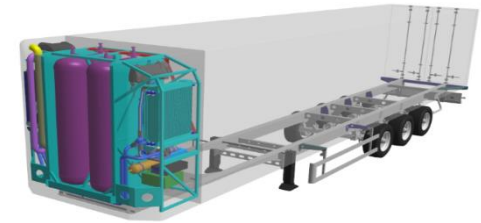
# WaterstofNet demonstration projects



# 44 ton heavy duty truck



- H<sub>2</sub> range extended truck + plug-in (modulair approach)
- Battery capac. 72 kWh
- Fuel cell (88 kW)
- Hydrogen storage (30 kg H<sub>2</sub>)
- TRL 3 > 6 (techn.developm.> demo)
- Basis DAF CF FT 4x2 44 ton
- Expected range approx. 350 km (to be demonstrated 2018/2019)
- Aim is serial production VDL Bus & Chassis Eindhoven (The Netherlands)



# Refuse trucks: project Life 'N GrabHy



1st generation garbage vehicle (2012-2014)



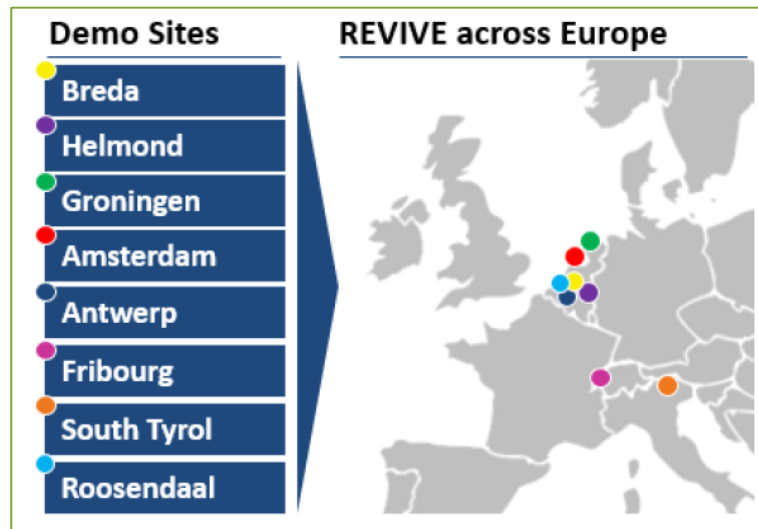
2nd generation project Life & GrabHy



<http://www.lifeandgrabhy.eu/>

# Refuse trucks: project ReVive

- 15 garbage vehicles tested in 8 cities
- **Timeline:** Jan.2018 – Dec. 2021
- **Budget:** €8.7 million
- **Funding FCH JU:** €4.9 million
- **Partners:** Tractebel Engineering (Be), Servizi Energia Ambiente Bolzano (It), Azienda Servizi Municipalizzati di Merano (It), SUEZ Nederland Holding (NL), Gemeente Groningen (NL), Gemeente Breda (NL), Stad Antwerpen (NL), Gemeente Amsterdam (NL), Element Energy Limited (UK), CEA (Fr), WaterstofNet (Be), SymbioFCCell (Fr), E-Trucks Europe (Be), Swiss Hydrogen (CH), Saver (NL).





# Heavy duty truck (1/2)

Project H2-Share: 28 ton heavy duty truck + mobile refueler

- **H2-Share = Hydrogen Solutions for Heavy-duty transport Aimed at Reduction of Emissions in North-West Europe’.**)
- **Total budget: € 3.52 M**
- **EU funding: € 1.69 M**
- **Timeline: March 2017 – March 2020**



**Partners**



**Associated partners**



**Subpartners**



# Heavy duty truck (2/2)

## 28 ton heavy duty truck + mobile refueler

- Basis DAF CF FAN 6x2 28 ton
- Battery 72 kWh
- Power fuel cell 88 kW
- Hydrogen storage (30 kg H<sub>2</sub>)
- Pressure level 350 bar
- Power 210 kW
- Torque 2.000 Nm
- TRL 5 > 7
- Range approx. 400 km (to be demonstrated)
- Demo's expecting to start in 2019 in Belgium, Germany, France and The Netherlands



# Other fuel cell heavy duty projects



**GVW:** ?  
**Manufact.:** GM  
**Operator(s):** ?  
**Power:** ?  
**Fuel Cell:** ?  
**H2:** ?  
**Battery:** ?  
**Range:** 640 km

**GVW:** class8  
**Manufact.:** Kenworth  
**Operator(s):** ?  
**Power:** 565 hp  
**Fuel Cell:** 85 kW (Ballard)  
**H2:** ?  
**Battery:** ?  
**Range:** 240 km

**GVW:** 39T  
**Manufact.:** Nikola  
**Operator(s):** ?  
**Power:** 1.000 kW  
**Fuel Cell:** 300 kW (Powercell)  
**H2:** ?  
**Battery:** 320 kWh  
**Range:** 1930 km

**GVW:** 36T  
**Manufact.:** Toyota/Kenworth  
**Operator:** ?  
**Power:** 670 kW  
**Fuel Cell:** 226 kW  
**H2:** ?  
**Battery:** 12 kWh  
**Range:** ?

**GVW:** 27T  
**Manufact.:** Scania  
**Operator:** Asko  
**Power:** 390 kW  
**Fuel Cell:** 90 kW (Hydrogenics)  
**H2:** 33 kg  
**Battery:** 56 kWh  
**Range:** 500 km

**GVW:** 34T  
**Manufact.:** ESORO  
**Operator:** COOP  
**Power:** 340 kW  
**Fuel Cell:** 100 kW (Swiss Hydrogen)  
**H2:** 31 kg  
**Battery:** 120 kWh  
**Range:** 375-400 km

**GVW:** ?  
**Manufact.:** Freightliner  
**Operator:** ?  
**Power:** ?  
**Fuel Cell:** Hydrogenics  
**H2:** ?  
**Battery:** ?  
**Range:** ?



Partners planning 2,000 commercial vehicles on the road in next 3 years.



Toyota and 7-eleven study to use FC

# Thank you for your attention



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