

Infosessie 'Rijden op waterstof'

April 3, 2019, Toyota Zaventem



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Program

- 13h00 Long term strategy and vision of the Brussels Government on a low emission city
(*Youssef Bady, Cabinet of the Brussels Minister for Environment, Energy & Housing*)
- 13h15 Developments & perspectives for hydrogen mobility (*WaterstofNet*)
- 13h45 Present status and outlook on fuel cell vehicles at Toyota (*Vincent Mattelaer, Toyota Motor Europe*)
- 14h00 Waste collecting vehicles on hydrogen (*Ben Cornelis, E-Trucks Europe*)
- 14h30 Guided tour at hydrogen refueling station (*Air Liquide*)
- 15h00 Questions - test drives - networking
- 16h00 End of program

Outline

- WaterstofNet organisation
- Hydrogen, how does it work?
- Mobility on H2: present status
- Infrastructure for H2 in Europe
 - Project H2 Benelux
 - Project H2ME



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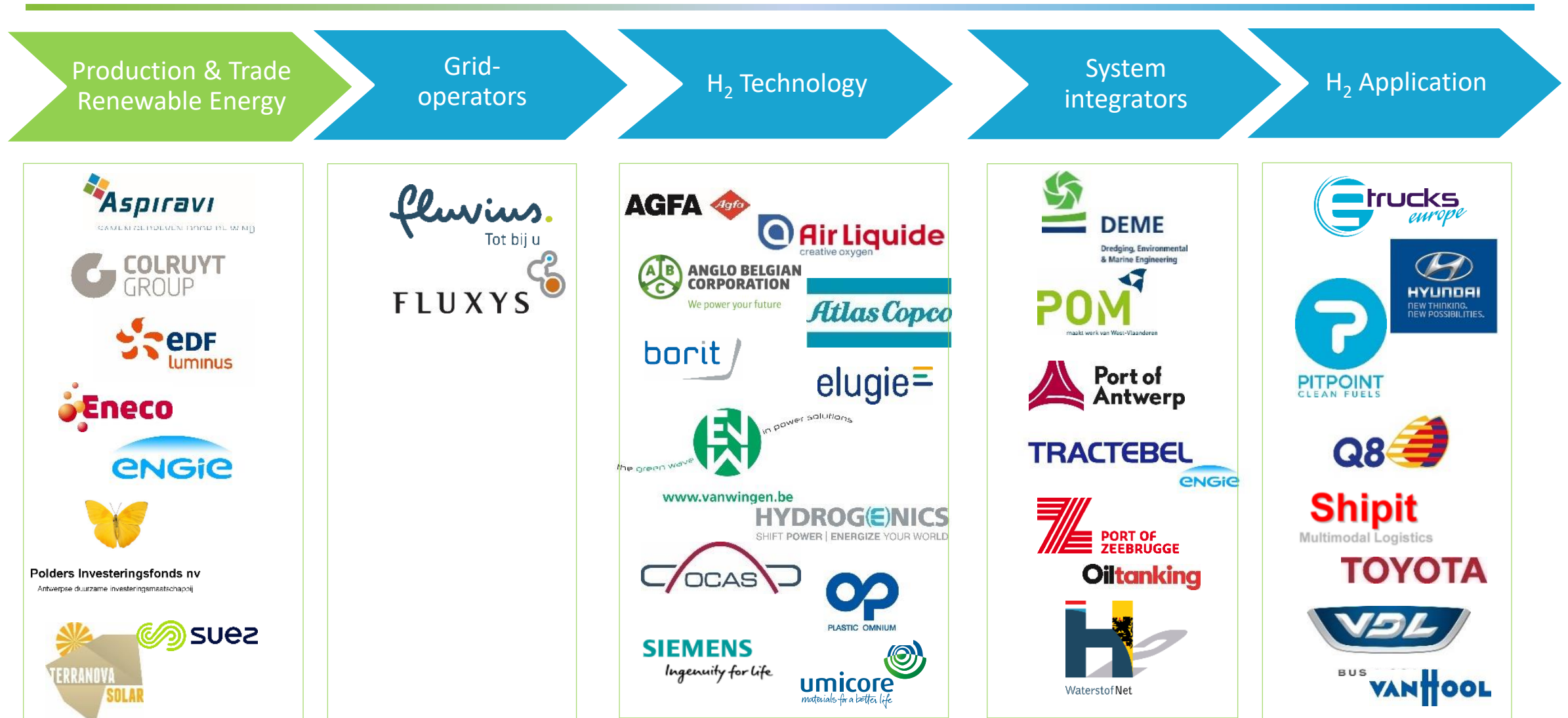
- Started in 2009
- Project organisation located in Turnhout and Helmond
- Focus on projects and roadmaps:
 - zero-emission mobility
 - energy storage
- Development, management, realisation, communication
- Cooperation with companies, authorities and knowledge institutes
- Hands-on experience (5y exploitation & maintenance of H2 refuelling station in Helmond & various demonstration projects).



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IBN POWER-TO-GAS – VALUE CHAIN (COORDINATED BY WATERSTOFNET)



Hydrogen, what is it?

- More than 90% of all atoms on earth
- Nearly always bound to oxygen (water) or carbon (natural gas, oil..)
- Liquid at -253°C

- High energy-content per unit of mass (compared to e.g. batteries)
- Low energy-content per unit of volume (store at high pressure (200-700bar))

- Safety:
 - 14 x lighter than air
 - Specific handling, expertise needed (ignition)



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Why vehicles on hydrogen?



Lower
well to wheel
efficiency

*Electrolysis : 70% efficiency (improve to 80%?)
Fuel cell: 50% efficiency (improve to 70%?)*



Large autonomy

500 km - 5 kg - 5 minutes fuelling

Fuelling speed

Independent of
ambient temperature

No harmful emissions

Silent

Possible on renewable
energy



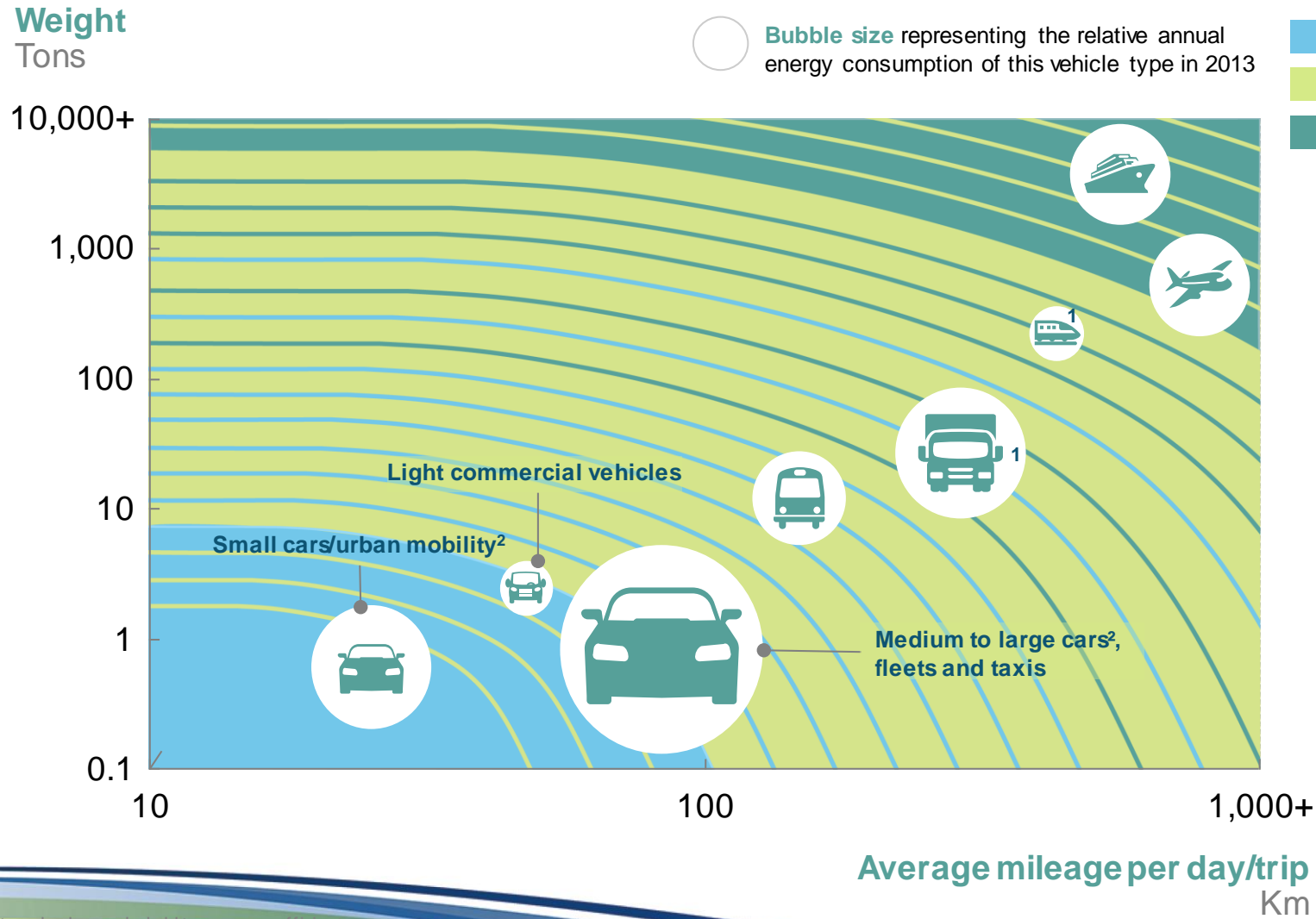
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Similar to
Battery
Electric
vehicles



Which segment for H2?



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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 fuelling infrastructure in Belgium



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+ planned 2019-2020:

- Antwerpen
- Gent
- Leuven
- Luik



The first public H2 station in Belgium

Air Liquide Zaventem



Dats24 Halle



Colruyt Halle, voor heftrucks



Haven Antwerpen, voor bussen

Private cars

- 2018: Toyota & Hyundai
- 30 cars in Belgium
- BMW, Mercedes announced

Buses

- Van Hool- 5 buses in Antwerp

Waste collecting vehicles

- E-trucks, production Lommel
- First demo in Eindhoven 2013
- Demonstrations 2019 in BE

Trucks

- VDL (NL)
- Demonstrations 2019 in BE

Schips

- 2018: Hydroville, CMB
- Prototype developments

Status vehicles H₂ in Belgium



H2BeNeLux

“A real life trial preparing hydrogen mobility along the TEN-T corridors in Belgium, the Netherlands and Luxembourg”

Project information:

Project ID: 2016-EU-TM-0175-S

Maximum grant: 7.2 M€

Total budget: 17.4 M€

Co-funding: European Unions' Connecting Europe Facilities (CEF)
Demonstratieregeling Klimaattechnologieën en -
innovaties in transport (DKTI Transport) van de
Rijksdienst voor Ondernemend Nederland

End date: 31 December 2020



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Main objective

Initiate the roll out of a basic network of hydrogen refuelling stations in the BeNeLux through the deployment of...

- **8 hydrogen refuelling stations**
- **80 fuel cell electric vehicles**

...in 2020 along the BeNeLux sections of the Trans-European Transport (TEN-T) Network Corridors, thereby interconnecting the neighbouring hydrogen refuelling station networks (Germany, United Kingdom, France) to enable the creation of a sufficiently covered, European wide network of hydrogen refuelling stations.



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Partners



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Rijkswaterstaat
*Ministry of Infrastructure and the
Environment*



Locations



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- H2Benelux 70 MPa hydrogen refuelling stations
- Existing 70 MPa hydrogen refuelling stations



H2Benelux will as well...



- ... assess the techno-economic performance of the stations under daily utilization
- ... assess the environmental performance of the use of hydrogen produced from conventional energy sources: trucked in or on-site produced from renewable sources
- ... monitor and improve the technical viability and operational efficiency of the stations
- ... optimise business client relationship to prepare the basis for the roll-out in the market
- ... develop a business case for each station using a demand-led business model to further boost the deployment of hydrogen as alternative fuel in the BeNeLux and to finance the future roll out of the stations
- and ...

H2Benelux will as well...

... identify and incorporate focus groups of end-users in order to accommodate for the 10 fuel cell electric vehicles per station

Therefore, we would like that those serious end-users, who are interested in acquiring a fuel cell electric vehicle, knowing that a hydrogen station will be opened in 2020, to make themselves known to us, so that we can follow-up on your interest



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Project H2ME outside BENELUX



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H2ME initiative (2015 – 2022)

Project overview



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New hydrogen refuelling stations:

- ❖ 20 - 700bar HRS in Germany
- ❖ 11 - 350bar and 700bar HRS in France
- ❖ 11 - 700bar HRS in Scandinavia
- ❖ 6 – 350bar and 700bar HRS in the UK
- ❖ 1 - 700bar HRS in NL

Fuel cell vehicles:

- ❖ 500 OEM* FCEVs
- ❖ 900 fuel cell RE-EV vans

Hydrogen rollout areas:

- ❖ Scandinavia, Germany, France, UK, The Netherlands

Observer coalitions:

- ❖ Belgium, Luxembourg, and Italy

Industry observer partners:

- ❖ Audi, BMW, Nissan, Renault, Renault Trucks, AGA, OMV

HRS: Hydrogen Refuelling Station
 FCEV: Fuel Cell Electric Vehicle
 RE-EV : Range-Extended Electric Vehicle

Proposed HRS locations under H2ME-1 ●
 Proposed HRS locations under H2ME-2 ●

*OEM refers to original equipment manufacturer



Vehicles deployed under H2ME initiative

Deployment of partner models



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Daimler B-Class F-CELL

- ❖ 700 bar hydrogen tank
- ❖ 40 already deployed



Daimler GLC F-CELL

- ❖ 700 bar hydrogen tank
- ❖ 150 being deployed



Toyota Mirai

- ❖ 700 bar hydrogen tank
- ❖ 100 being deployed



Honda Clarity Fuel Cell

- ❖ 700bar hydrogen tank
- ❖ 10 already deployed



Renault Kangoo ZE RE H2

- ❖ 5kW fuel cell module with 350-bar
- ❖ >900 being deployed



Symbio 3.1t light commercial vehicle

- ❖ 350bar hydrogen tank
- ❖ 3 being deployed

Other vehicles procured



300 other vehicles will be procured by project partners e.g. in Paris and in Hamburg



Deployment of HRS to date H2ME initiative



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15 HRS and 360 vehicles have been deployed to date:

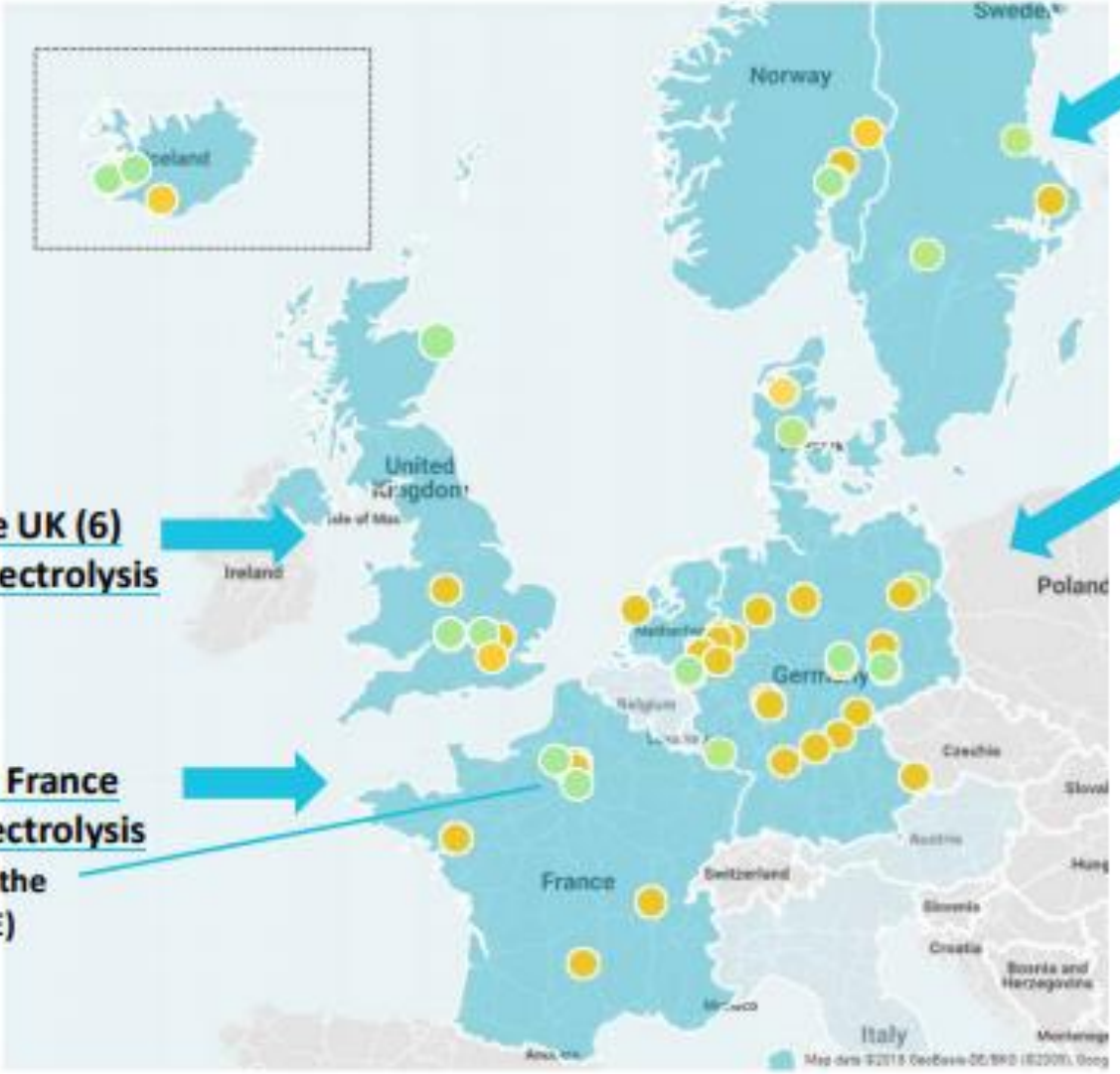
- ❖ 170 Renault Kangoo vans
- ❖ 40 B Class F-CELL
- ❖ 80 Toyota Mirai
- ❖ 10 Honda Clarity
- ❖ 60 vehicles procured by project partners

3 HRS operational in the UK (6) including 2 with on-site electrolysis

3 HRS operational (11) in France including 1 with on-site electrolysis (7 HRS planned in total for the Paris region within H2ME)

6 HRS operational in Scandinavia (11) including 3 with on-site electrolysis

3 HRS operational (20) in Germany



*Numbers in brackets () denote the total number of HRS planned for deployment under the H2ME initiative
 **Significant HRS and Vehicle deployment is taking place outside of the H2ME initiative



- Amsterdam
- Amsterdam
- Utrecht
- Breda
- Helmond
- Gent
- Antwerpen
- Leuven
- Luik
- Luxemburg

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