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clean cities, clean air



Ben Cornelis, business developer

**Webinar:  
Experiences and perspectives for  
garbage trucks on hydrogen**

**Experiences, plans, upscaling**

A project co-funded by the Life Programme under the Grant agreement nr. LIFE14 ENV/BE/000415



# Topics



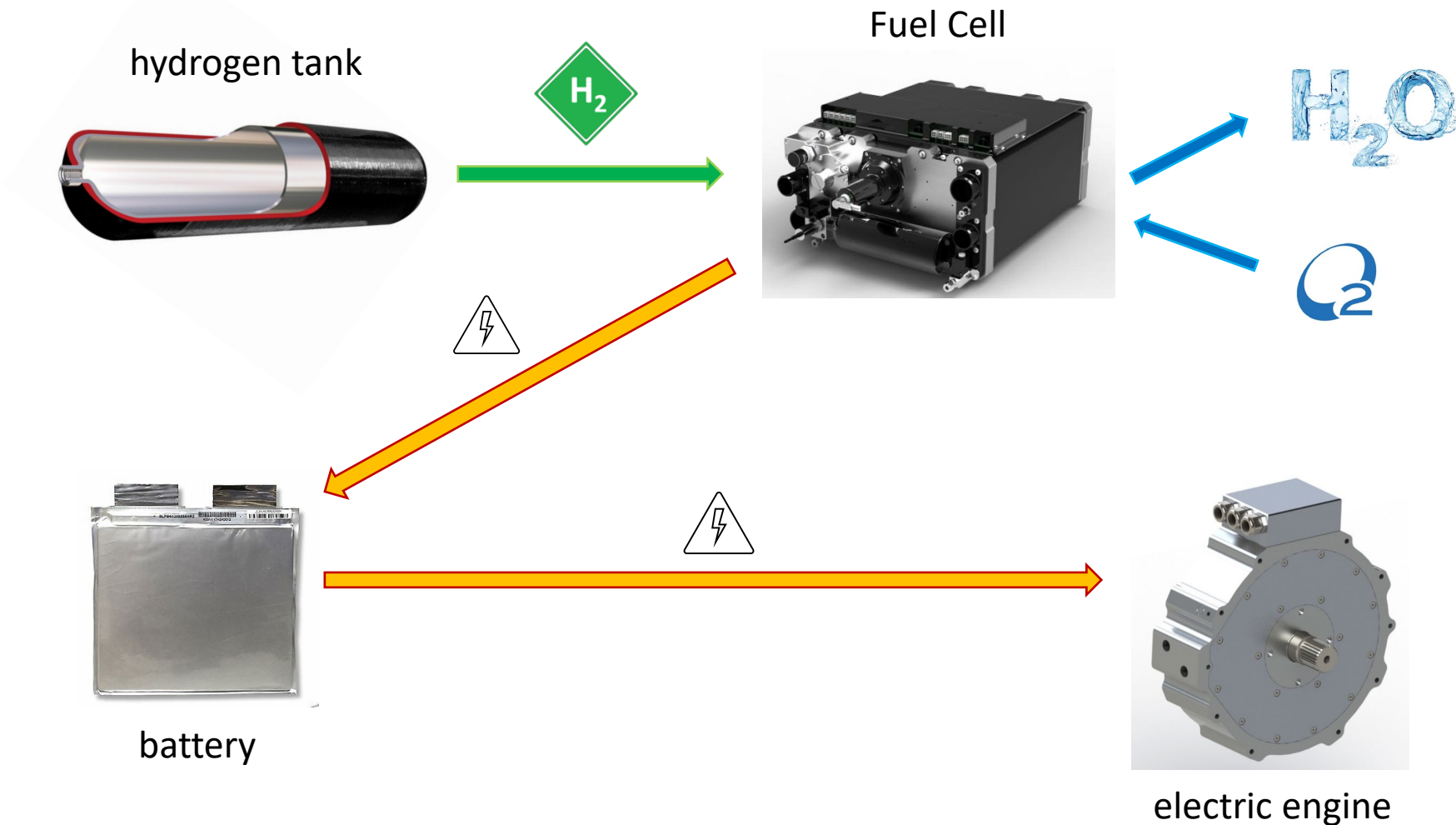
- Experiences
- Plans = scaling up!



# Experiences: work on base vehicles (2017 / 2018)



# Experiences: integration of hydrogen-electric system & homologation (2018 / 2019)



# Experiences: presentation of the Baetsen & Cure truck for municipality boards of the Metropolitan Region Eindhoven (11<sup>th</sup> of april, 2019)



# Experiences: Cure-02, first EU hydrogen sideloader with license plates



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# Experiences: Cure-O2, demonstration in Woensel-Noord, the City of Eindhoven

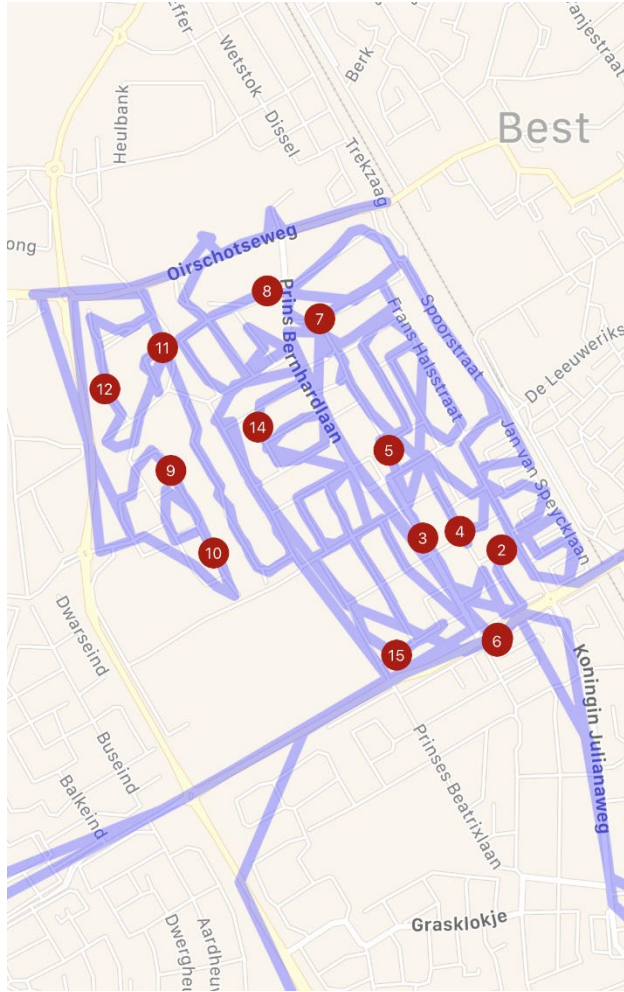
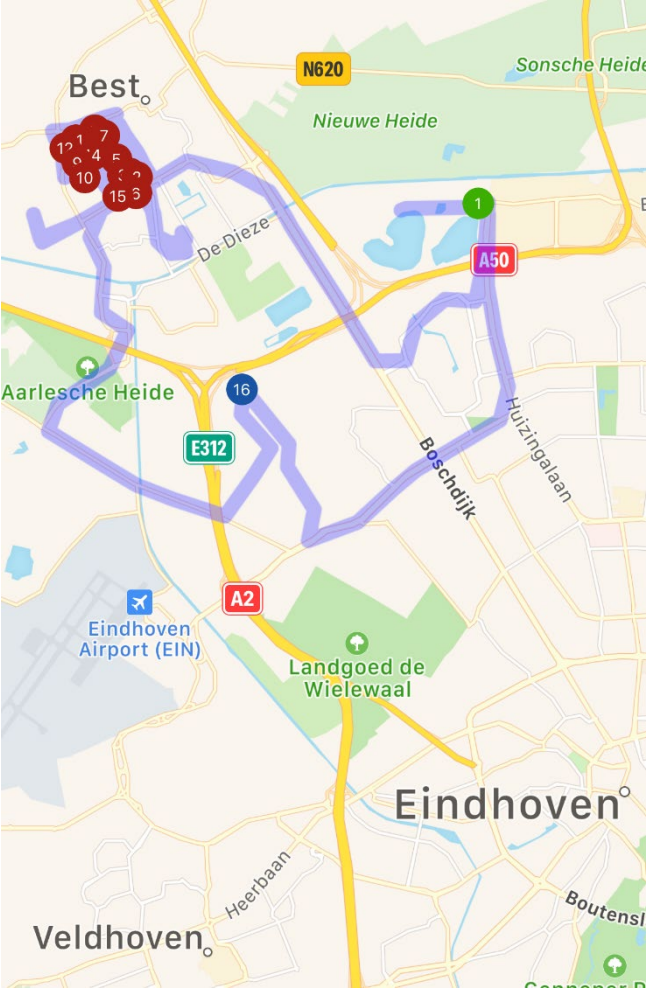


# Experiences: Baetsen-02, first EU hydrogen rearloader with license plates

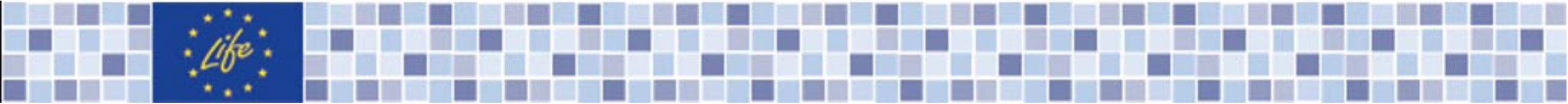




# Experiences: Baetsen-02, demonstration in the City of Best



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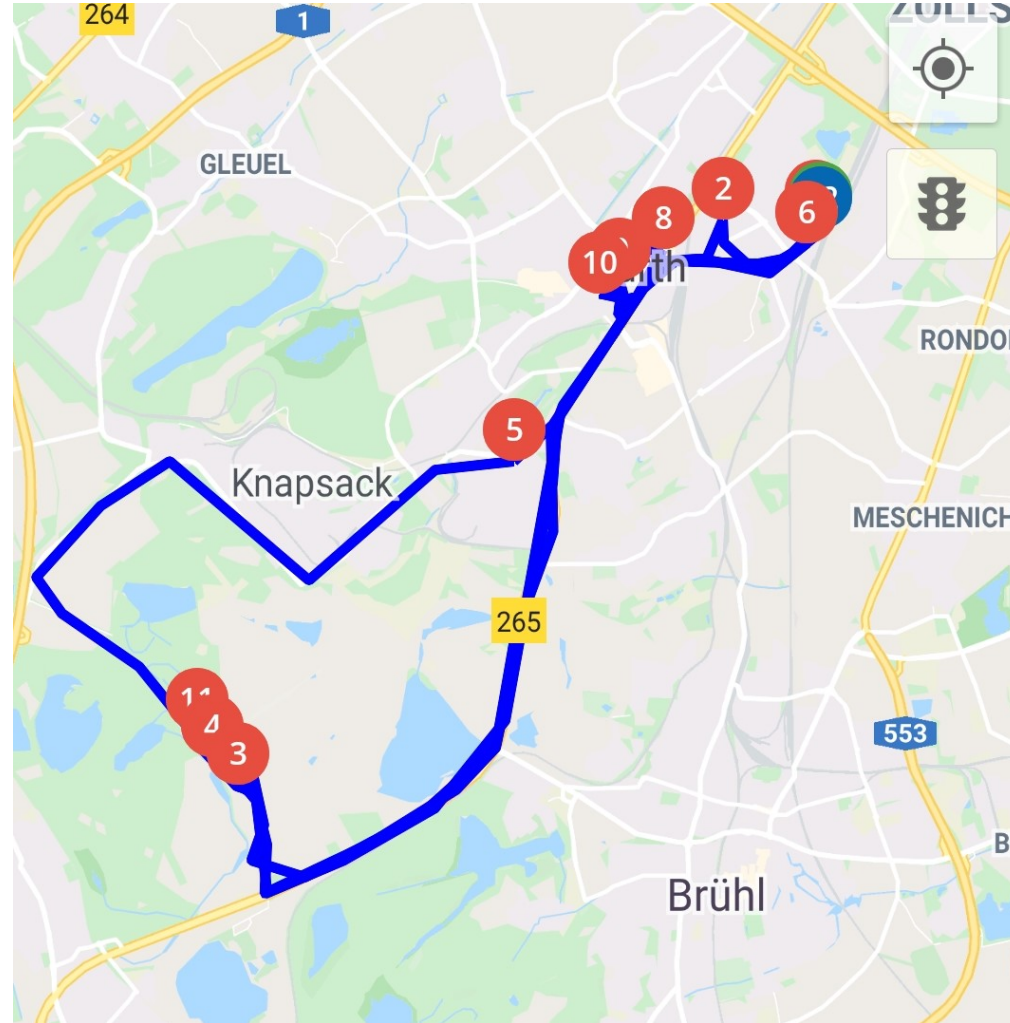
Experiences: start demonstration at Stadtwerke Hürth  
with mayor, fleet manager and staff (January 15, 2020)



# Experiences: refueling at station of Stadtwerke Hürth



# Experiences: Baetsen-02, demonstration in Hürth



## Experiences: side effects demonstrations

- high demand for presentations, demonstrations at our own location, visits at the waste collection in Eindhoven & Best and test drives
- demand for the exchange of technical knowledge and experiences
- demand for cooperation in the chain and other networks (energy consuming trucks can make the business model for a hydrogen refueling station feasible)
- to use the acquired knowledge to further develop the product and services



## Experiences: lessons learned during demonstrations

- the technique has proven reliable
- instruction and guidance of users on the floor is very important
- the driving characteristics are experienced as pleasant compared to diesel
- the public and interested parties are positive about the noise level and the lack of odor, particulate matter and gas emissions
- users are less positive about the use of an old base vehicle, which means that the comparison with a new diesel vehicle is not fair
- the capacity of the electric motor (150 kW) and fuel cell (30 kW) are sufficient in the city center and flat terrain, but are insufficient for use when more energy is required



## Plans: scaling up!



The project allowed and allows to scale up:

- interest and orders from waste collecting parties from all over the EU
- participation in larger projects such as REVIVE, HECTOR and national subsidy projects in NL, B, D, F, I, among others
- the realization of two own new sites (Q1: 2019)
- the establishment of a Hydrogen Experience Center (2020)
- setting up our own rental fleet in order to introduce even more users to hydrogen waste collection (2021 / 2022)
- approximately 30 orders in portfolio (Q1 2021)



## Scaling up: presentations and driving experience for interested parties



### Interested areas a.o.:

Alkmaar, Amsterdam, Antwerpen, Arnhem, Baskenland, Barcelona, Bayern, Beringen, Best, Bolzano, Breda, Brussel, Cyprus, Kopenhagen, Doetinchem, Dijon, Duinkerke, Düsseldorf, Eindhoven, Glasgow, Genk, Gent, Goes, Groningen, Helmond, Herten, Hürth, Leuven, Le Mans, Machelen, Metz, Madrid, Merano, Nijmegen, Noordenveld, Terneuzen, Tilburg, Pesse, Barendrecht, Albrandswaard en Ridderkerk, Rotterdam, Utrecht, Oslo, Parijs, Pau, Pesse, Roesselare, Roosendaal, Santander, St. Gilles, Stavanger, Terneuzen, Texel, Touraine Vallée, Trondheim, Utrecht, Veldhoven, Versailles, Unna, Wenen, Wiesbaden, Zeebrugge.





## Scaling up: cooperation with chain parties and networks



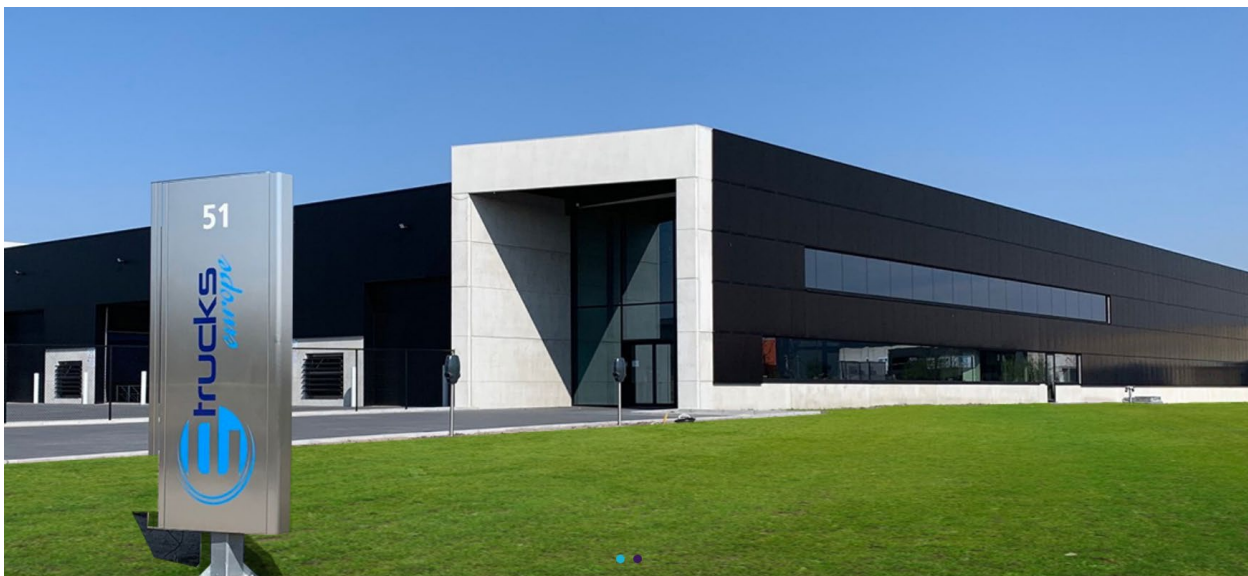
- European Clean Hydrogen Alliance (EU)
- FCH-JU (EU)
- WaterstofNet (B / NL)
- Waterstof-Industrie-Cluster (B/NL)
- Cleantech Flanders (B)
- Hydrogen Society Genk (B)
- Waterstofplatform (NL)
- RAI vereniging (NL)
- FOCWA / AAS (NL)
- Energieagentur NRW (D)
- Kompetenzregion DRW (D)



# Scaling up: new sites E-Trucks Europe in Lommel and Westerhoven



## Lommel (B)



## Westerhoven (NL)



## Scaling up: ecological foodprint



### Examples measures:

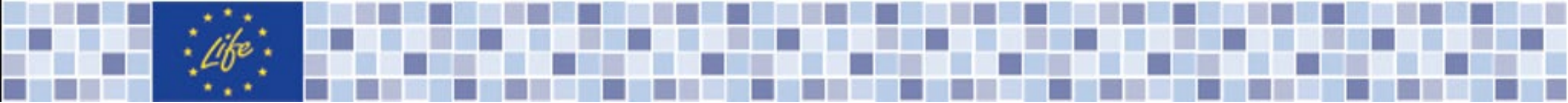
- Products: regeneration brake energy
- Service: distant guidance trouble shooting & maintenance
- Processes: waste prevention, energy and water saving and separate rainwater drainage
- Sustainable energy supply buildings: over 760 MWh/year by solar panels of which over 430 supplied to the electricity network (supply for over 100 families)
- Warming by heat pumps and over 90.000 liters of warm water in storage tanks
- Person transport f.e. Hyundai Nexo (hydrogen), electric and hybrid cars



# Scaling up: production site Lommel



# Scaling up: Hydrogen Experience Center



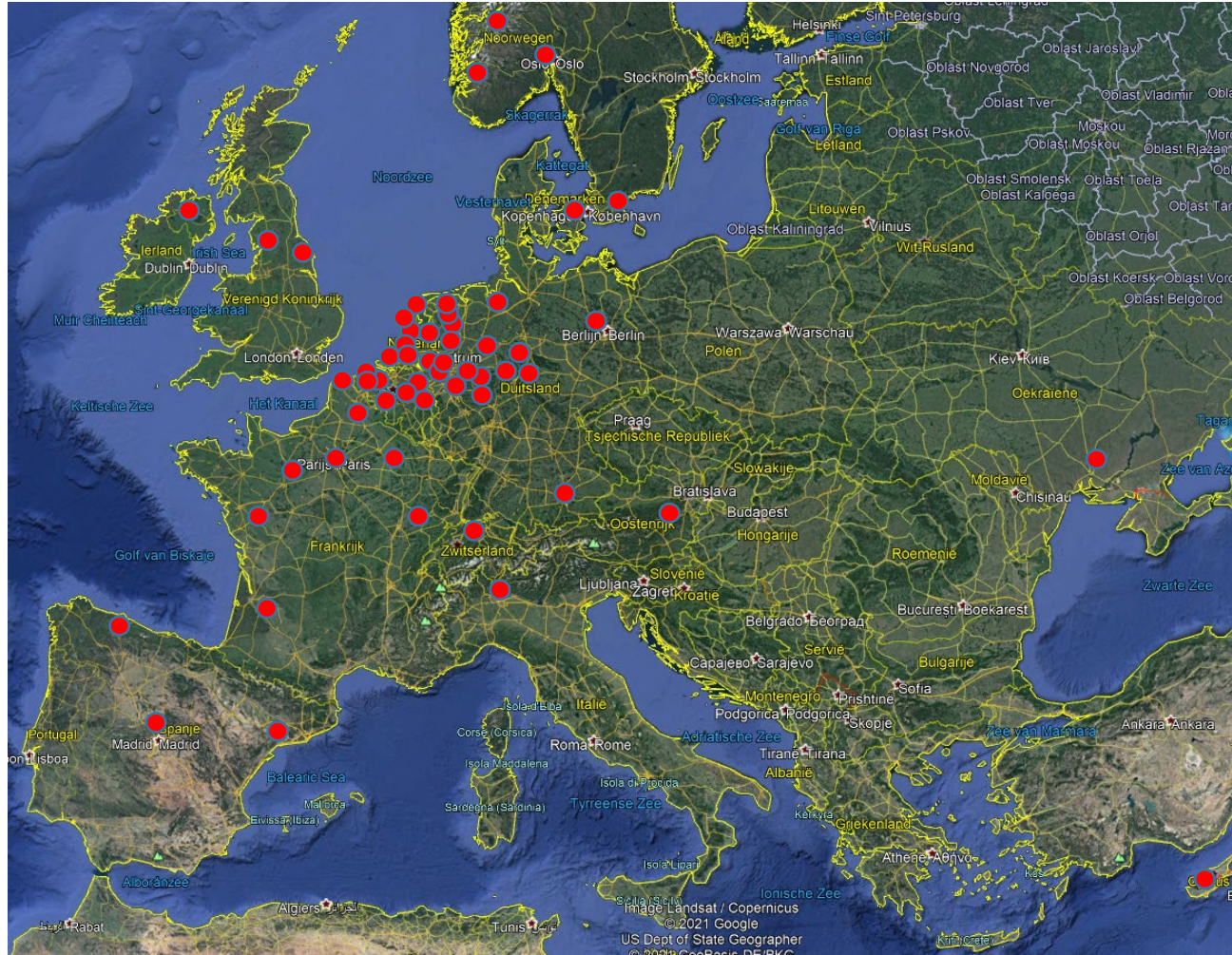
# Scaling up: portfolio of 30 hydrogen garbage trucks (Q1 2021)



# Scaling up: interest for hydrogen garbage trucks (Q1 2021)



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## Process development after the lessons learned:

- standardization of production
- auxiliary equipment in standard prefab boxes
- production battery packs in advance
- fixed workstation around each truck
- each truck its own project manager







## Product development after the lessons learned:

- diversification: rear, side en front loading garbage trucks
- upgrade electric engine from 150 towards 300 kW standard
- upgrade fuel cell from 30 tot 45 kW standard
- ratio lenghts battery packs side loaders not 1:1 but 1:3



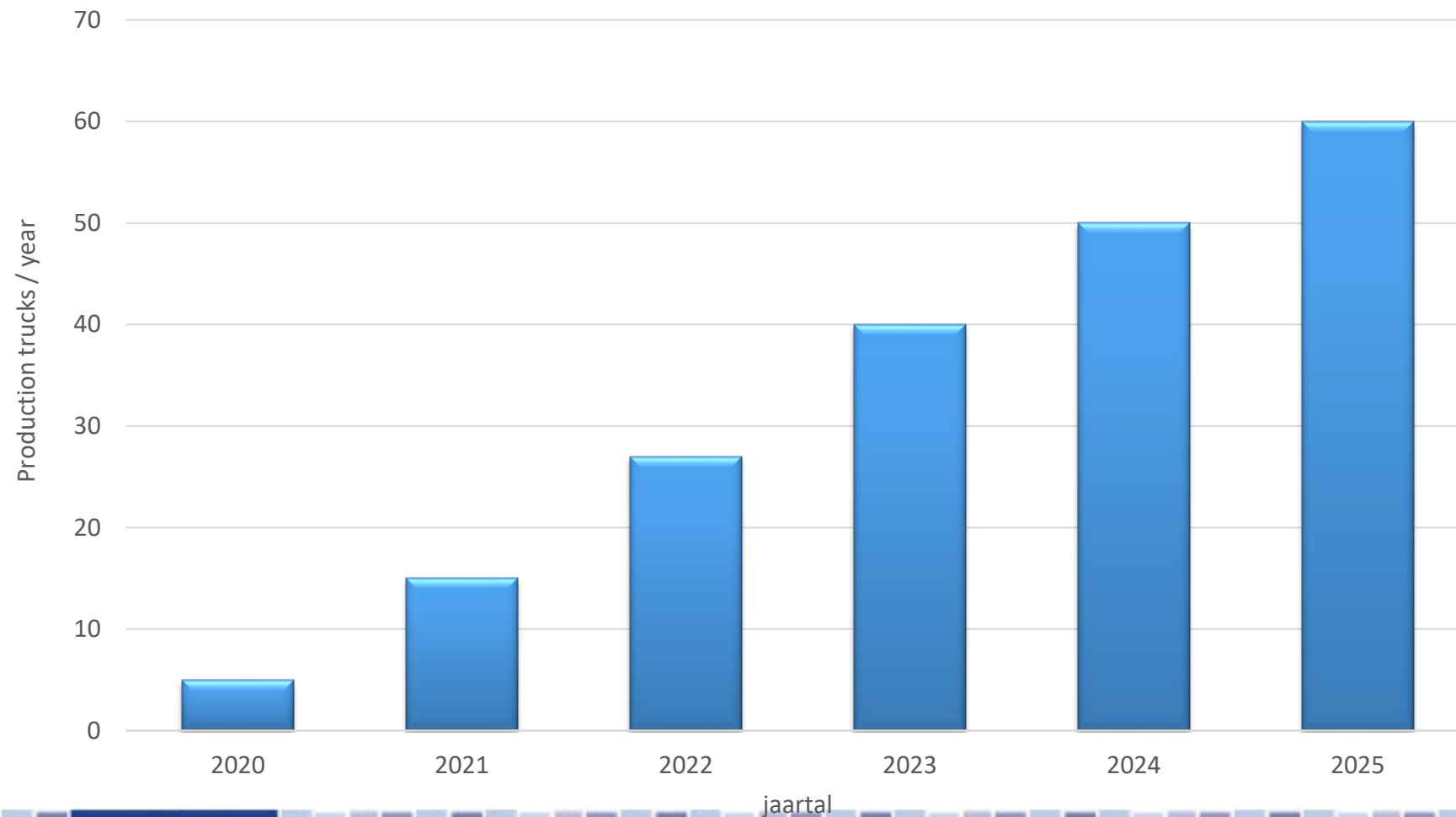


### **After sales service development after the lessons learned:**

- instruction and guidance users on the floor standard
- offer training “how to work with hydrogen-electric vehicles”
- account managers by country



# Plans: scaling up!: roadmap 2020 - 2025



## Scaling up: employment



### Employment development:

#### 2015

Permanent: fulltime 1 (mechanic), parttime 0,4 (engineer)

External service: parttimers 0,2 (accountmanager (NL), development support)

#### 2021 (Q1)

Permanent: fulltime 6 (manager, mechanics), parttime 0,4 (engineer)

External service: parttimers 2 fte (accountmanagers (NL, D, F, B/rest), business developer, engineer, communication manager, hrm)

#### 2025

Permanent: fulltime 25

External service: parttimers 5 fte





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