Waste incinerator or flexible energy provider?

From power to wheels…

Olivier Opsomer, Manager Production and Maintenance - ISVAG

Power-to-Gas conference, Antwerp, 7 May 2018

- Founded in 1975
- Non-recyclable residual waste
- >1 mio citizens
- 140 KT + 40 KT
- Operational since 1980
- Permit until 2020
- Electricity for >25.000 households

Even in a circular economy, we need a sink to remove contaminated and non-recyclable materials

Extensive research confirmed that a state-of-the-art waste-to-energy plant is the only available proven technology to treat residual waste

Minimal emissions, maximize energy output

- Electricity for >35.000 households
- District heating for >40.000 households

+ HYDROGEN

Evolving energy landscape

- Security of supply
- From base-load to flexible peak-load
- Communicating vessels: electricity, district heating, hydrogen

- EFRO project
- Electricity from ISVAG
- DATS24 fuel station
- H2-powered refuse trucks city of Antwerp
  (REVIVE project with E-truck)

Challenges?

- Cold water fear
- Expertise
- NIMBY – acceptance
- Regulatory framework

Questions?

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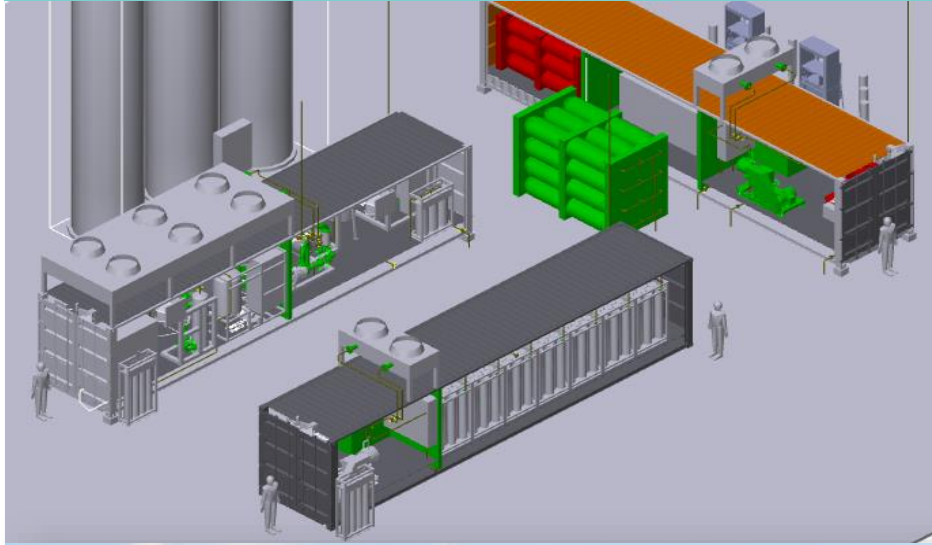
ENGIE



Etrucks europe

WASTE-to-WHEELS (W2W)

A disruptive Solution for waste management

The Ambition for Waste to Wheels

Green H_2 @ acceptable cost

Zero Emission Mobility for Refuse Trucks

For

Improved Fleet Operation @ Acceptable TCO

Based on

Green Electricity for H_2 production
Hybrid Fuel Cell Electric Vehicles (H-FCEV)

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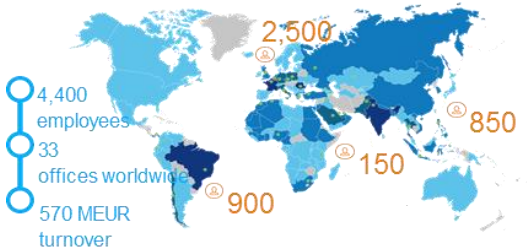
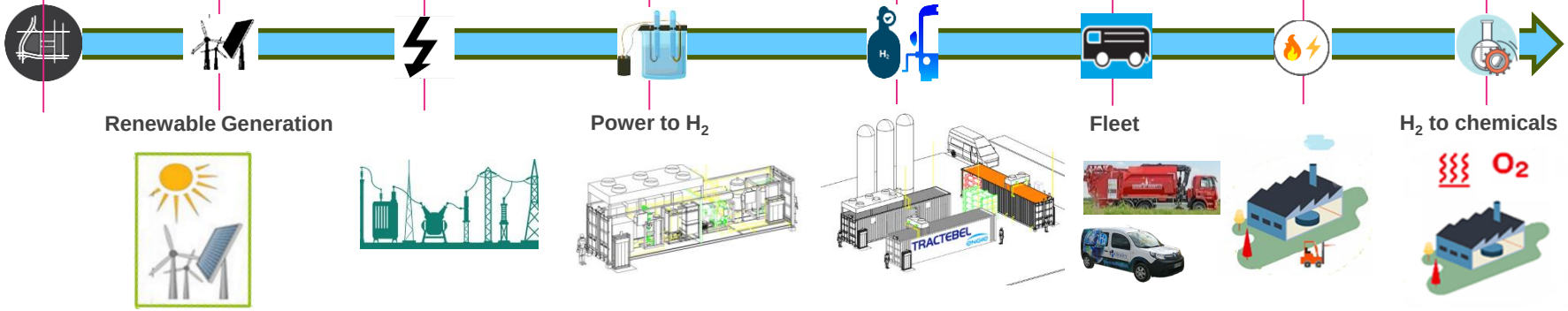
INFRA WATER ENERGY



We build integrated solutions, covering the whole value chain

Master plan | Renewable Generation | T&D | Power to H_2 | Storage and dispensers | Fleet | H_2 to Power & heat | H_2 to chemicals



Project inception
- Digital Tools
- Master Plans - mobility, energy and infrastructure
- Site redevelopment strategy
- Power sourcing & usage optimization
- TCO* – infrastructures & fleets
- Technology & Regulatory Consultancy

Pre-Investment
- Pre-Feasibility & Feasibility Studies
- Conceptual Design
- Environmental Impact Assessment & Licensing
- Power System Development

Design & Realization
- *Soil remediation*
- *Front-End Engineering Design*
- *Basic & Detailed Design*
- *Procurement support*
- *EPC & EPC-Management*
- *Owner's or Lender's Engineering*

Integrated Customer Services
- *Industrial Supply*
- *O&M solutions and support*
- *Lifetime extensions*
- *Simulators & Training*
- *Power System Operation & Control*
- *Waste management & decommissioning*

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The Waste to Wheel model

Zero Emission waste collection

Waste to Green Power

Base Load

NEW
H-FCEV

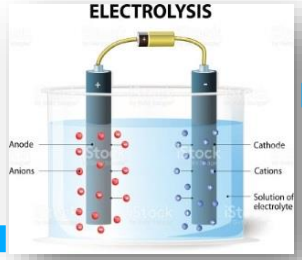
Tank station

Process

Methanation

Methanol

Refuelling network



Power to H2

Grid Support (Flex)

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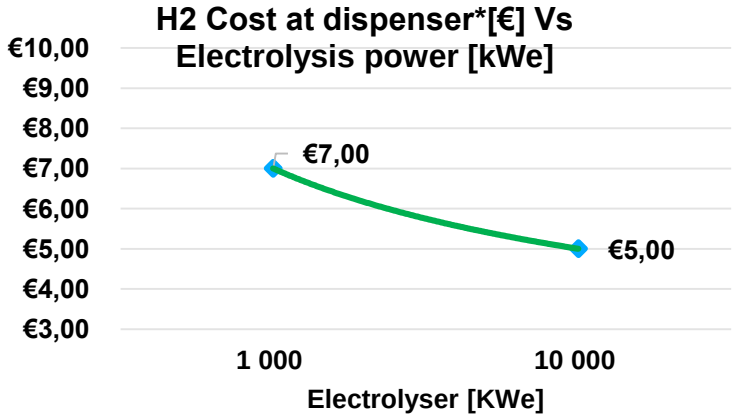
Cost of Green H_2

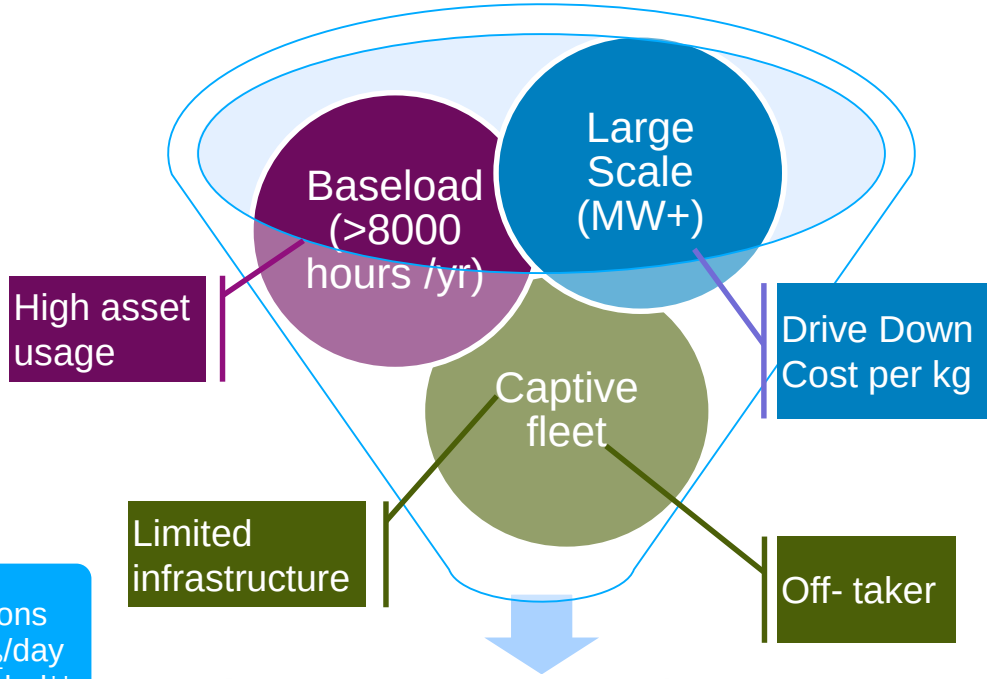


*Preliminary estimates, dispenser @ production site

1MWe → 400 kg H_2/day → Refuelling's / day : 30 Refuse Trucks or 12 Busses or 90 cars → 6 tons CO_2/day avoided**

**1kg H_2 = 5 litres Diesel @ 2.7kg of CO_2 per litre

Incinerators



Good combination for low H_2 cost.

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First step : REVIVE (Refuse Vehicle Innovation and Validation in Europe)

- First deployment of F-CEV refuse trucks in Europe ➔ bridge gap in maturity for Trucks Vs. Buses & Cars

- Continuous monitoring of performances

Project Role	Partner logo
Coordinators	TRACTEBEL ENGIE; WaterstofNet
Vehicle operators	Gemeente Breda; Gemeente Groningen; saver; suez; City of Amsterdam
Data collection and analysis	TRACTEBEL elementenergy ENGIE; cea
Manufacturers	SWISS HYDROGEN; Symbio; E-trucks europe
Dissemination partners	elementenergy; WaterstofNet

- Key figures
  - Up to 15 demonstration trucks
  - Project Duration: 48 months
  - Grant FCH2-JU: 5 000 k€

Demo Sites

- Breda
- Helmond
- Groningen
- Amsterdam
- Antwerp
- South Tyrol
- Roosendaal

REVIVE across Europe

This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 779589. This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation program, Hydrogen Europe and Hydrogen Europe research

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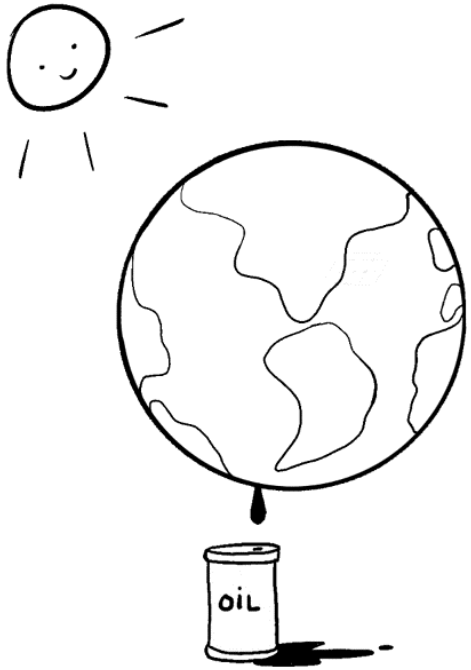
E-Trucks Europe



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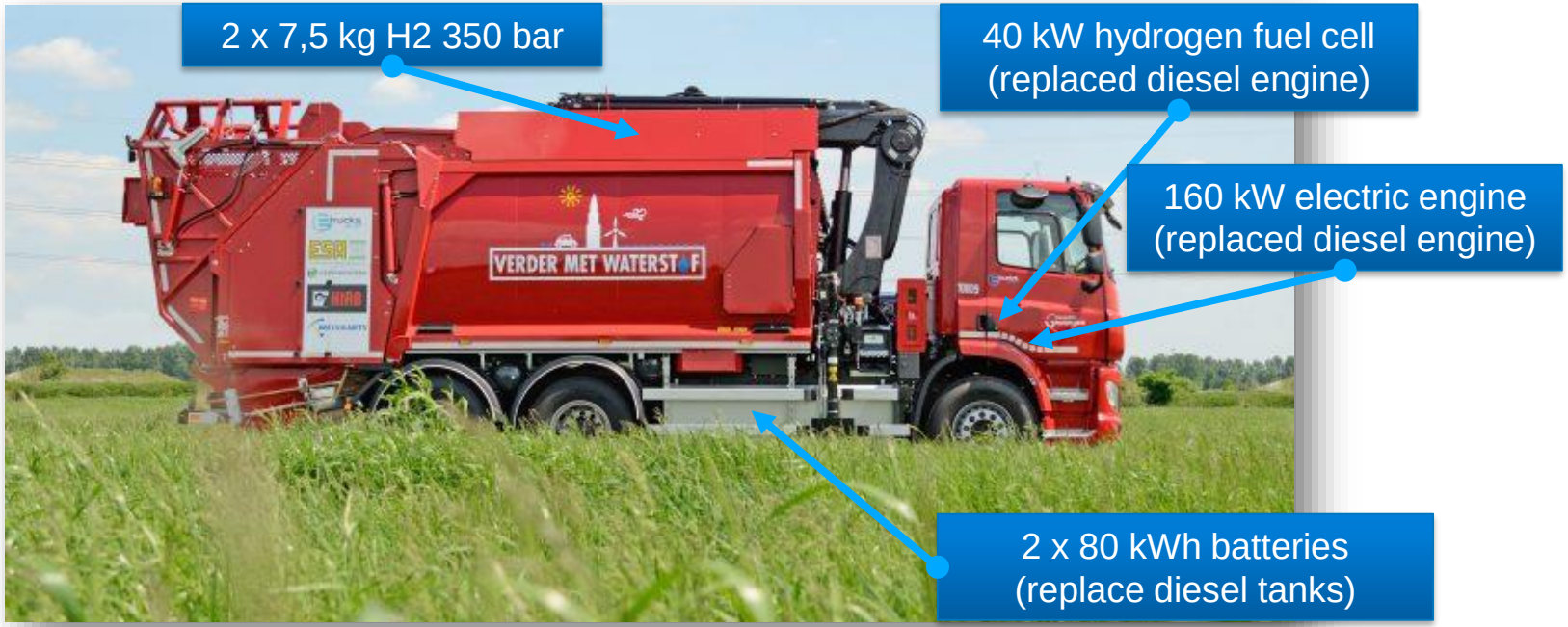
Hybrid Fuel Cell Electric Vehicles (H-FCEV)

100% electric



Technology demonstrated
(TRL7 – several trucks in construction)

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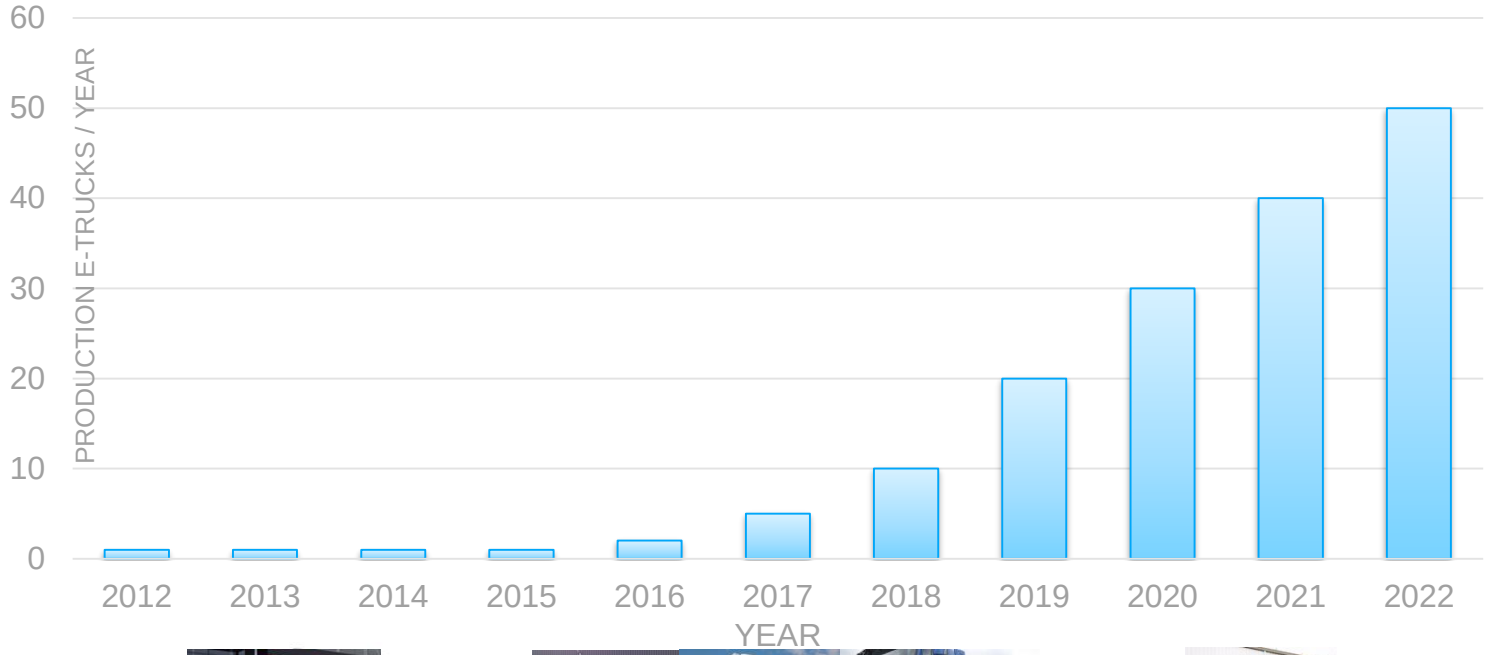
ROADMAP 2017-2022



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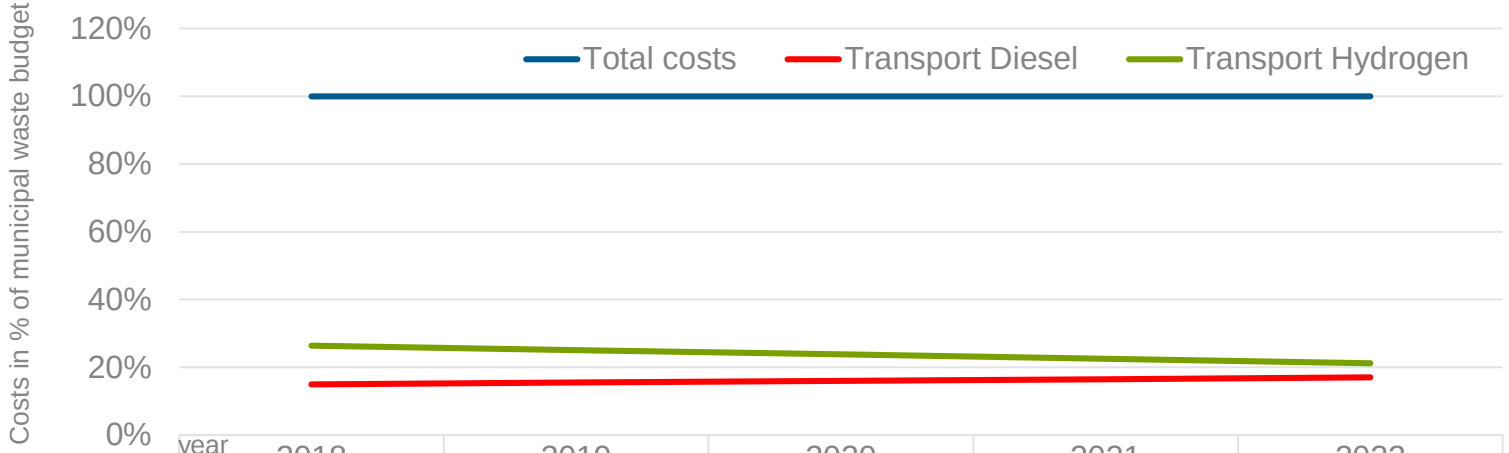
Transport costs as part of municipal waste budget



year	2018	2019	2020	2021	2022
Total costs	100%	100%	100%	100%	100%
Transport Diesel	15%	16%	16%	17%	17%
Transport Hydrogen	26%	25%	24%	23%	21%

Sources (2018): 'Budget 2018', CURE Afvalbeheer
'Integration project HI: MVO', University of Antwerp
Expected decrease of costs for hydrogen and electric system components (fuel cell, storage tanks, battery packs, hydrogen etc.) in 5 years: 50%

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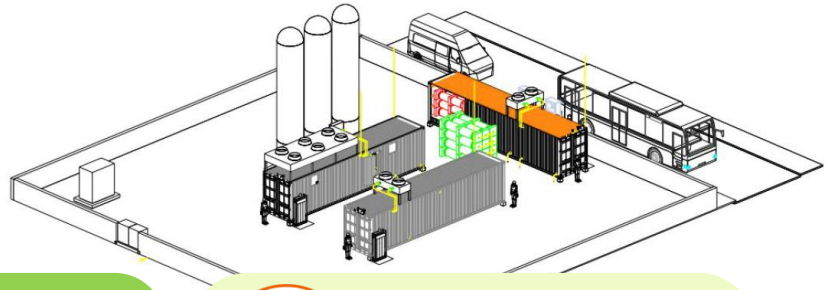
The benefits



Economical

Fuel Production
Reduced OPEX + Re-sale

Flexibility
Demand Side Management

H2 - as base product
- for industry (Ammonia …)
- for other fuels (Methanation-CNG, Methanol)

O_2
commercial gas

Social

Green H_2 as Fuel
- Reduce Armful Emissions
- Reduce Noise Pollution

strong sensitivity in cities

Increase local content - fuel production
- Better commercial balance
- Increase employment

Leverage green H_2 Mobility
start HRS network

Operational

O_2
Improved combustion in the incinerator

Higher acceptance of Refuse Trucks
Possible increase of the operational time window in cities

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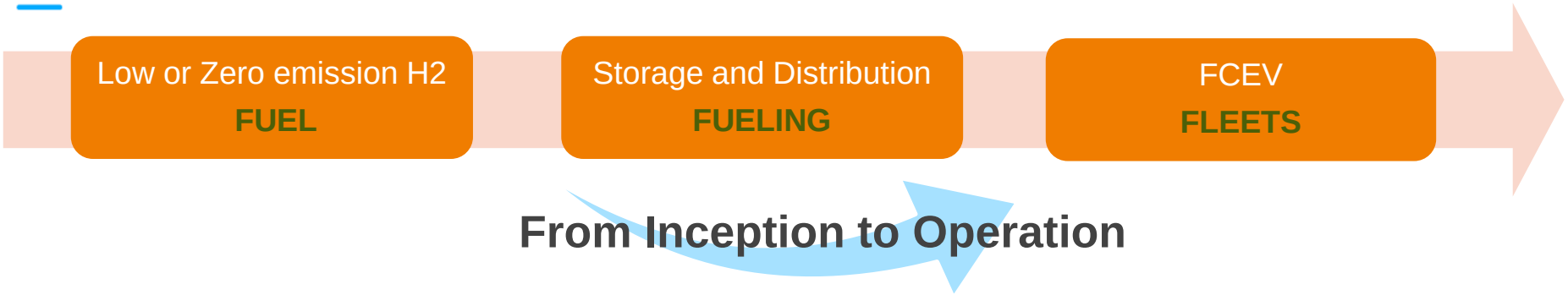
W2W - Innovative "3F" Solutions, Adaptive Business Models*



- Large potential for BeNeLux ➔ Launch of H_2 mass mobility?

Green Power Capacity	Captive Fleets	CO_2 impact
• Belgium -18 Incinerators • Netherlands - 12 Incinerators	• 5500 Refuse Trucks in BeNeLux • 2250 Busses – De Lijn (670 for STIB & 2500 for TEC)	• If 20 sites of 5 Mwe ➔ 100 Mwe ➔ 14 000 tons H_2/yr. • 210 000 tons of CO_2 avoided!

* Business Models based on existing Waste-to-Power.
Tractebel can also secure the development of a Green Field W2E projects.

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More information

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