

# HYGEN

Home & Office Superchargers for G-Mobility

# Team

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**Mario Pirraglia**  
CEO

Former **Vice President at FuelMaker Corp**, former president at SAFE North America, VP of Sales at FuelMaker, more than 20 years experience in the field.



**Alex Safronov**  
Co-Founder & CTO

Technical & entrepreneurial background, 15 years experience in the industry. **Chairman of the EU Standardization Committee** developing standards for small scale CNG fueling.



**Robert Strods**  
Co-Founder & COO

Corporate finance & entrepreneurial background, 8 years experience in the industry. Raised > € 35 Mln via government and EU funding programs.



**Jens Andersen**  
Board Advisor

Former Head of Group Technology Strategy & Group Officer **CNG Mobility at VW Group**. Over 27 years in the automotive industry.



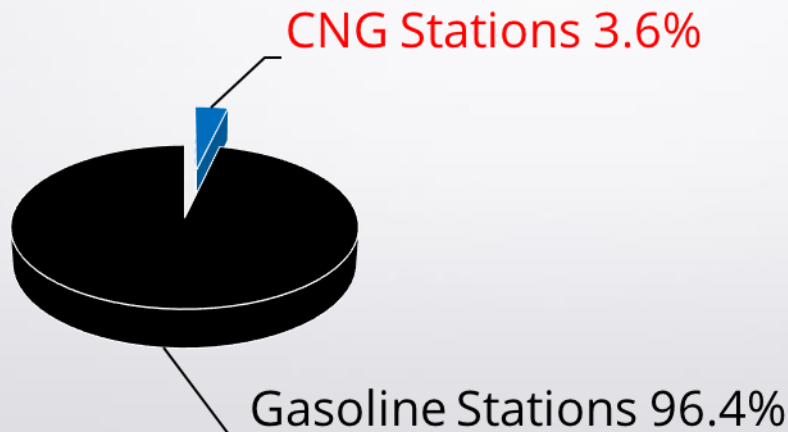
EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

# G-Mobility

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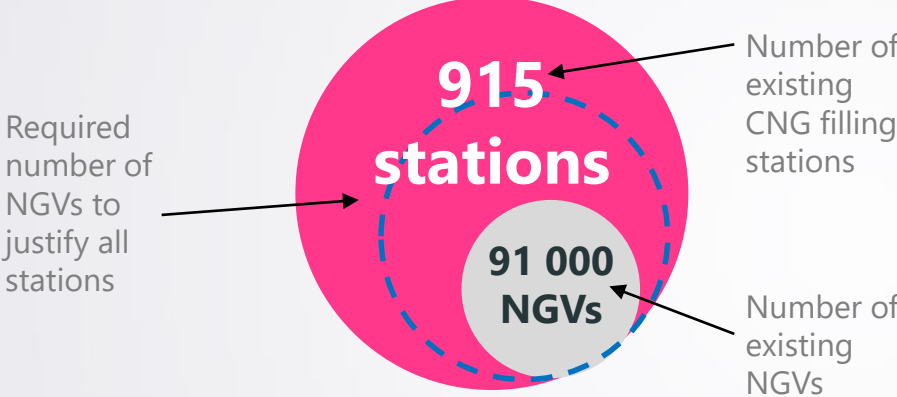
- **Cheaper to operate:** 40% - 60% compared to gasoline vehicles
- **Cleaner:** up to 95% reduction in local pollution
- **Greener:** if biomethane is used it cuts greenhouse gases by up to 300%
- **Proven & Practical compared to EVs:** over 26 million NGVs on the road and more than 70 NGV vehicle models available, majority are bi-fuel (gas & gasoline)
- **Growing market:** 3M NGVs sold or converted annually worldwide
- **Huge untapped retrofit market:** most of conventional fuel powered vehicles can be easily retrofitted to NGV

**PROBLEM:** Lack of fueling infrastructure for NGVs



# Centralized VS Decentralized

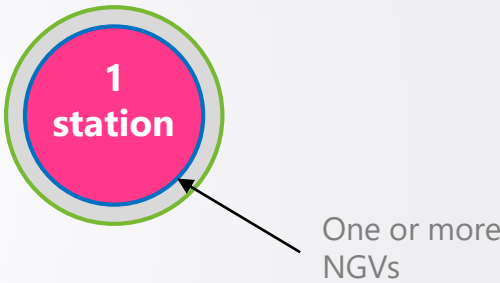
## Public Refueling Example: Germany



**Required Ratio - 400**  
**Actual Ratio - 100**

**No predictability in ROI**

## Personal Refueling

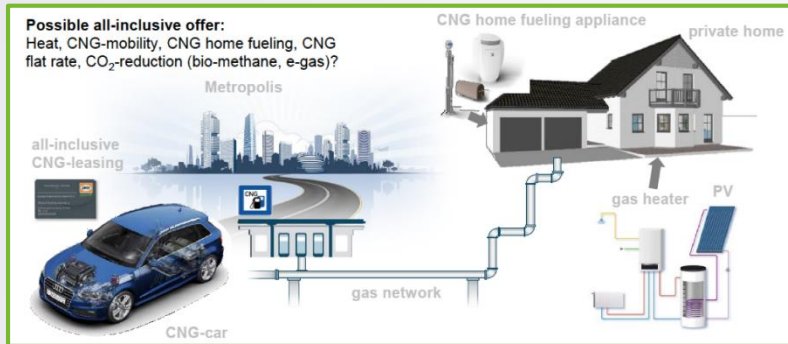


**Required Ratio - 1**  
**Actual Ratio - 1 or higher**

**100% predictable ROI**

# Decentralized Model

## SECTOR COUPLING: HEAT & MOBILITY



- Gas Retailer: increase gas sales
- Year around volume increase (Not seasonal)
- Helps win and lock in new customers
- TSO & DSO: increase utilisation of existing assets
- Known and predictable customer acquisition costs
- Way to decarbonize the grid with biomethane or syngas

## REPLICATING EV MODEL



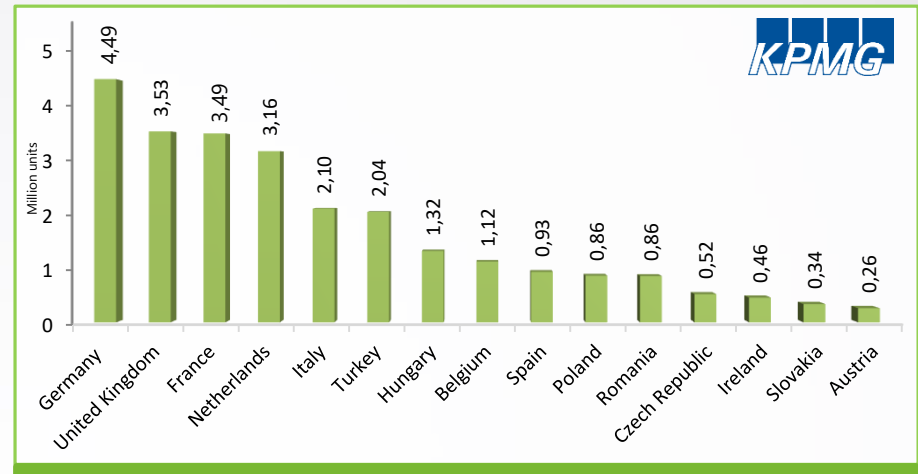
- Load the network might be a problem for EVs, but it's not a problem for NGVs

### Bonus:

Reduce carbon footprint by 23%.  
When using biomethane from waste, emissions even fall to the level of electric vehicles powered by renewable energy.

# Solution: Leverage Existing Grid

- **26,1 million** detached houses connected to gas grid in Europe (KPGM & HYGEM estim.)
- 97,5% of the houses are located in just 15 EU states
- **Germany** – the largest market in the EU (4,5M houses connected to grid), **Italy** – 2,1M



Worldwide  
potential  
of 200 million  
homes and offices



# Home & Office Supercharger

**NATURAL GAS VEHICLE**

**FUEL DISPENSER**  
(LOCATED AT YOUR CONVENIENCE)

**ONE HOME – ONE FUELING STATION**

**GASDROID – CNG HOME FUELING APPLIANCE**

**COMPRESSED NATURAL GAS (CNG)**

**RESIDENTIAL NATURAL GAS SUPPLY LINE**

- **State of the product:** CE certified appliance
- **Compression flow rate:** 1.2 GLE\*/h (1.1 m3/h)
- **Gas outlet pressure, max.:** 200 bar
- **Storage capacity:** 24 GLE at 200 bar (22 m3)
- **Fueling time:** 3 min (approx. 13 GLE/12 m3)
- **Electrical:** motor, 2,2 kW, max. 8,5 amps
- **Electricity consumption:** 0.45 kWh/GLE (0.5 kWh/m3)
- **Power supply line:** 220 V (single phase)
- **Gas inlet pressure:** 17-25 mbar, 3 bar and above (opt.)
- **Dimensions, L x W x H:** 110 x 60 x 165 cm
- **Service life:** 20 years

\*GLE – Gasoline Liter Equivalent

# Small Business Fueling Solution



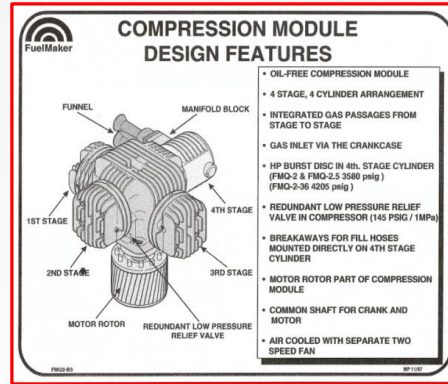
- **State of the product:** Functional prototype
- **Compression flow rate:** 4.8 GLE\*/h (4.4 m<sup>3</sup>/h)
- **Gas outlet pressure, max.:** 200 bar
- **Storage capacity:** 96 GLE at 200 bar (88 m<sup>3</sup>)
- **Fueling time:** up to 15 min (66 GLE/60 m<sup>3</sup>)
- **Electrical:** 2 x motors, 4 kW, max. 7,9 amps
- **Electricity consumption:** 0.45 kWh/GLE (0.5 kWh/m<sup>3</sup>)
- **Power supply line:** 380 V (three phase)
- **Gas inlet pressure:** 17-25 mbar, 3 bar and above (opt.)
- **Dimensions, L x W x H:** 120 x 100 x 170 cm
- **Service life:** 20 years

\*GLE – Gasoline Liter Equivalent

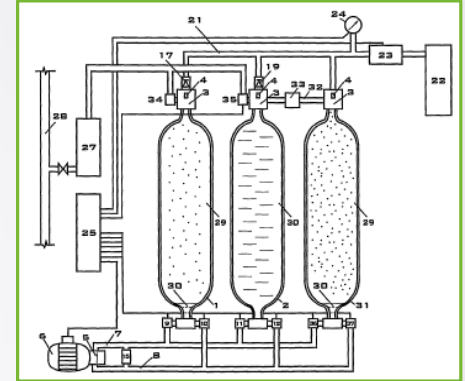


# Direct Competition

Traditional gas  
compression technology  
VS  
HYGEN's patented liquid  
piston gas compression  
technology



Patent: US8899279B2

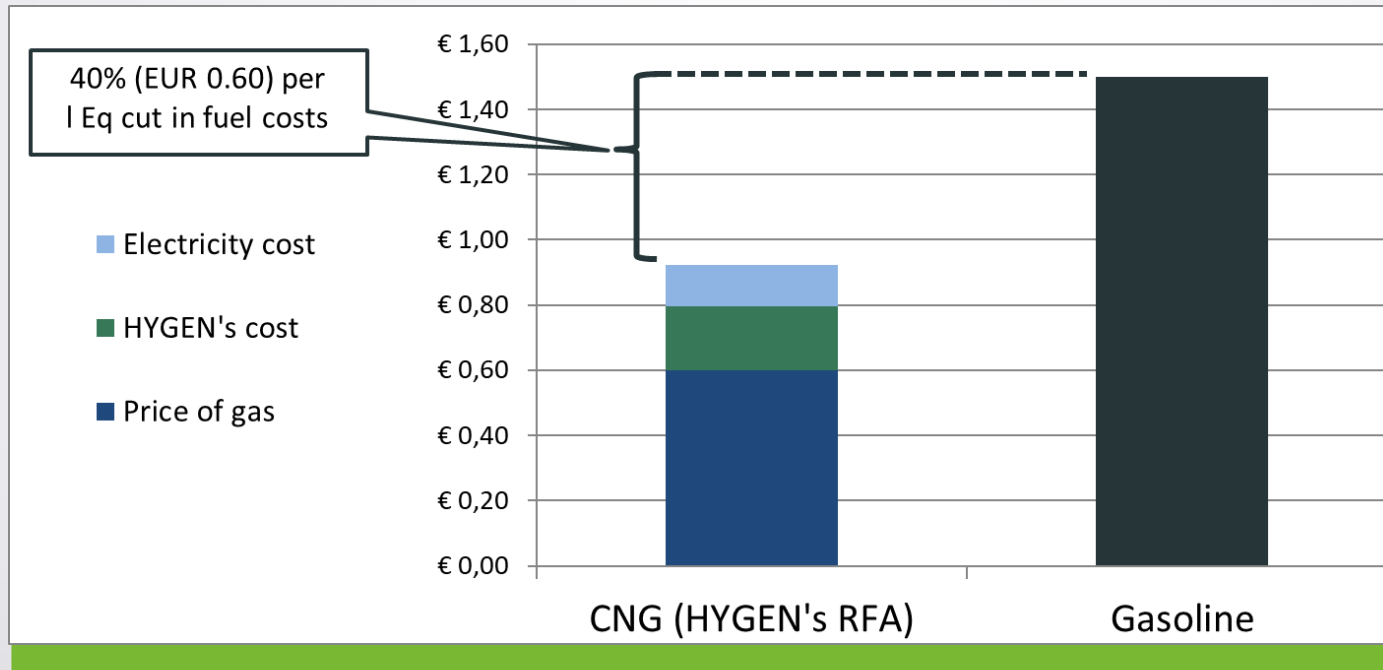


	<b>PHILL</b>	<b>GASDROID</b>
1. Compressor Service Life	~2 years	20 years
2. Fueling time	6 - 8 h	3 min
3. Cars fueled per day	1 car	2 cars

- Substantial reduction in total cost of ownership
- Fast at home fueling
- No moving parts in HYGEN's compression technology

# I. Value Proposition. End-user

- **40% reduction** in fuel costs
- **1,5 - 2 years payback** on incremental price of NGV **vs** gasoline car
- Unique customers experience of **3 min at home/office fueling**
- **Emission reduction**



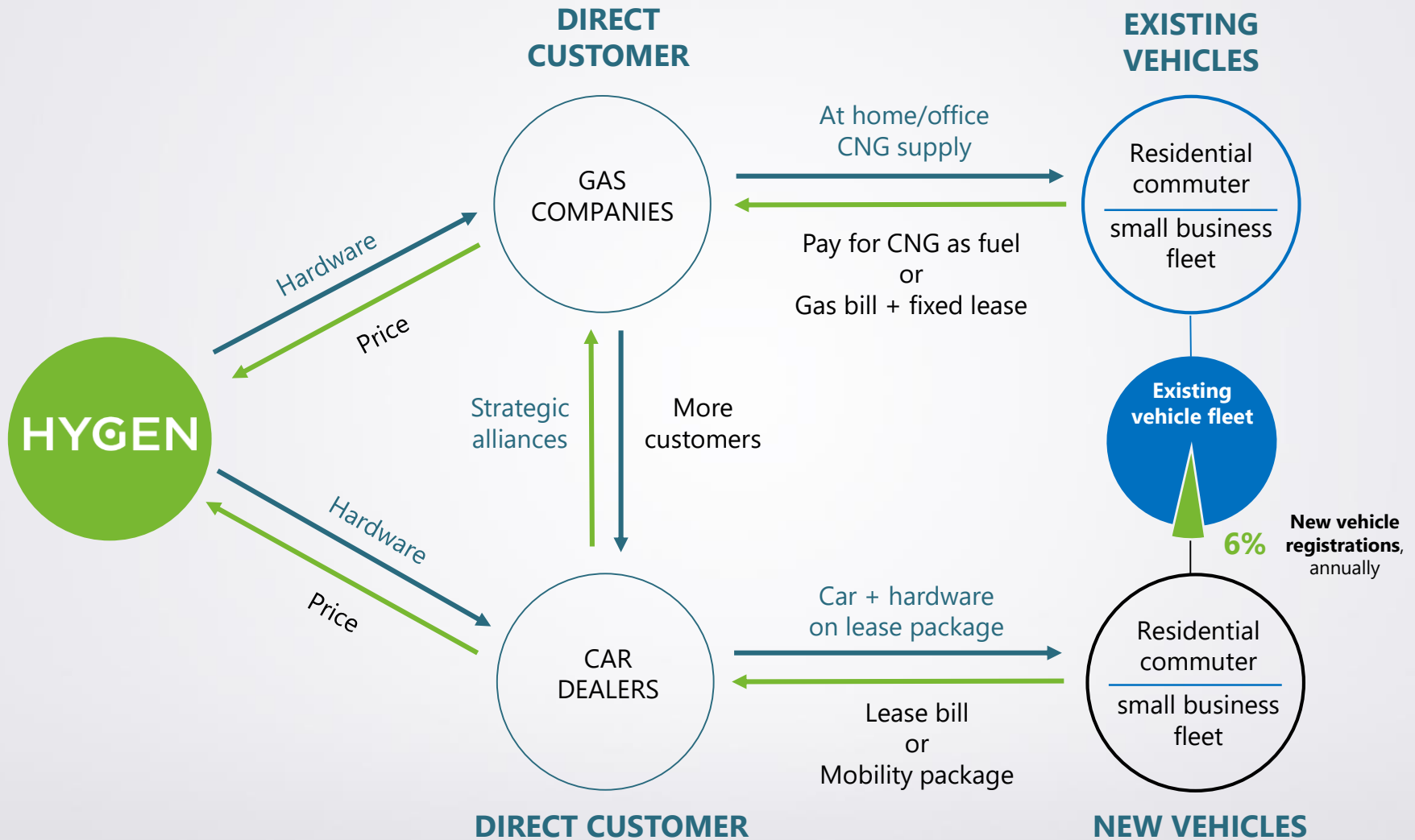
*\*Gasoline = 1.50 EUR/l, Natural Gas for household consumer = 0.60 EUR m/gasoline liter equivalent, TCO of HYGEN = 0,30 EUR/gasoline liter equivalent*

# II. Value Proposition. End-user

	EV	NGV+HYGEN
<b>Economics</b>		
Average incremental costs of the car (vs gasoline)	9 000 EUR	<b>2 200 EUR</b>
Energy cost per 100 km	<b>2.80 EUR</b>	4.25 EUR
Payback vs gasoline car	7 years (210k km)	<b>2,5 years (77k km)</b>
<b>Convenience</b>		
At-home fueling time	4 - 8 h	<b>3 min</b>
Driving extension (refueling options)	Expensive supercharger network	<b>Existing gasoline stations</b> (all NGVs are bi-fuel cars)
<b>Market</b>		
Conversion of gasoline vehicle	NO	<b>YES</b> , widely available
Proven market traction	3M vehicles, last 5 years	<b>26M vehicles</b> , last 20 years
GHG emissions in CO2 g/km	5 g (wind/solar)	5 g (P2G, biomethane)

- Volkswagen India bets on CNG over electric (11.2018)
- Israel's Ministry of Energy plans Transition to CNG (12.2018)

# Business Model

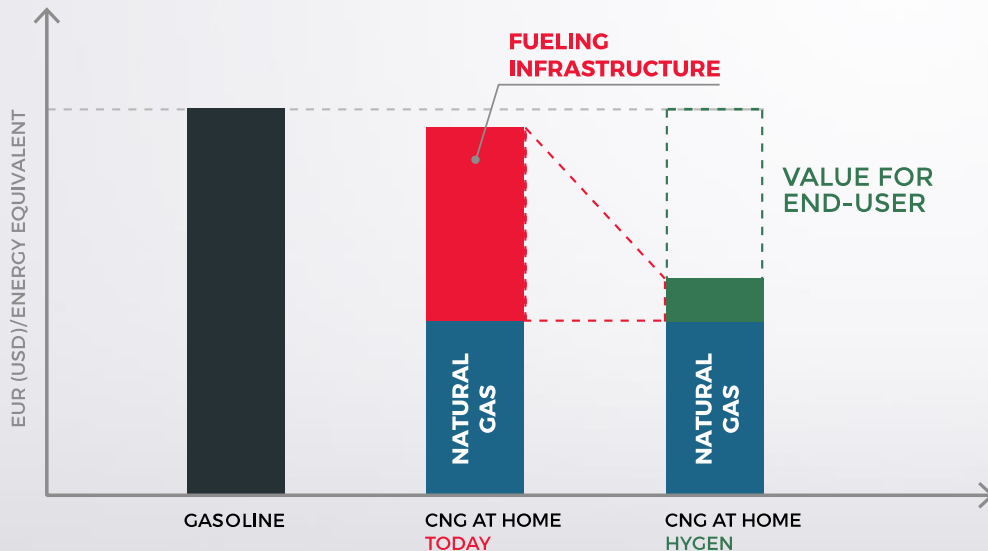


# Sales to Gas Companies

## TODAY:

- Losing market in residential heating sector
- Losing war to electric companies in decarbonization of the grids
- Losing market share in mobility market of the future

## WITH HYGEN:



### • New market

5x gas sales to existing customers as motor vehicle fuel 40% cheaper than gasoline

### • New image

Replicating success of electric companies with EVs

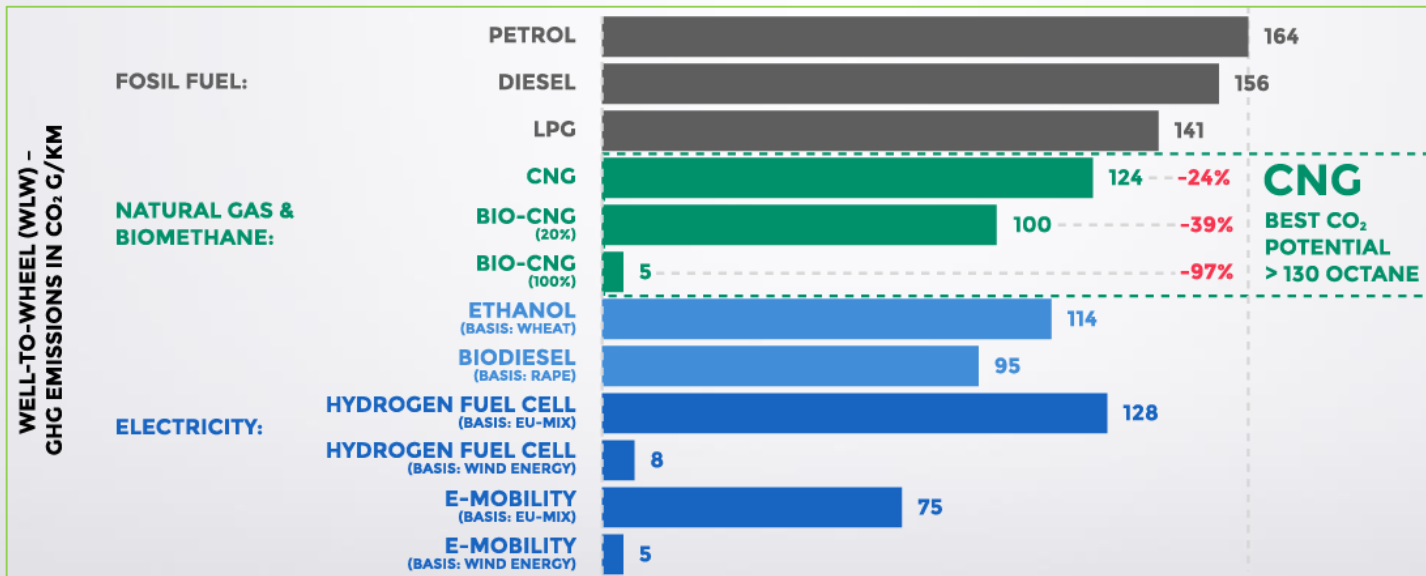
### • New opportunity

Decarbonizing grid via biomethane and synthetic gas (P2G) by selling it at higher price as motor vehicle fuel



# Sales to Car Dealers & OEMs

- Modern solution to boost NGV sales  
*(58% of EVs are bought with a home charger package attached)*
- Enabler for mobility package business models
- Enabler for unique customer experience of at home/office fueling
- Practical way to decrease emissions right away
- Utilize biomethane at home/office in the future



Source: Natural Gas Vehicle Association of Europe

# Product Roadmap

CNG Home  
Vehicle  
Fueling  
Appliance -  
**GasDroid**



CNG



**2019**

Small business  
Fleet CNG Fueling  
Appliance



**2020**

Off-pipeline  
CNG Filling  
Station



**2020**

Virtual Pipeline/  
Mobile CNG  
Filling Station

HYDROGEN



**2019**

20% H2 blend  
Vehicle  
Fuel Appliance



**2020**

100% H2  
Vehicle Fueling Appliance



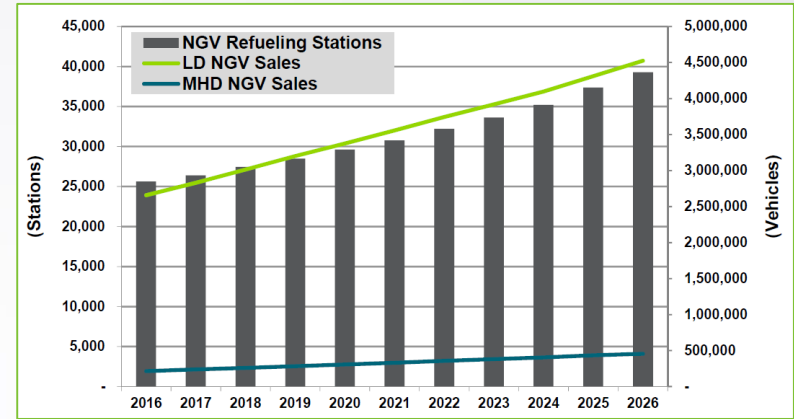
**2021**

Mobile H2  
Filling Station

# Identified Market

## NGV fueling infrastructure market:

- ~ 1500 NG stations/y, ~ €1,0M CAPEX per station
- **TAM = € 1,5B and growing**
- Examples of dedicated budgets for NGVs:
  - ENGIE 100M EUR
  - TOTAL 200M EUR
  - SNAM 150M EUR
  - Indian gas companies 5B EUR
  - German Industrial consortium CNG 1,1B EUR
  - Mobility (VW, SNAM and more, [www.discover-cng.com](http://www.discover-cng.com))



Total NGV stations & NGV sales worldwide (Source: Navigant research)

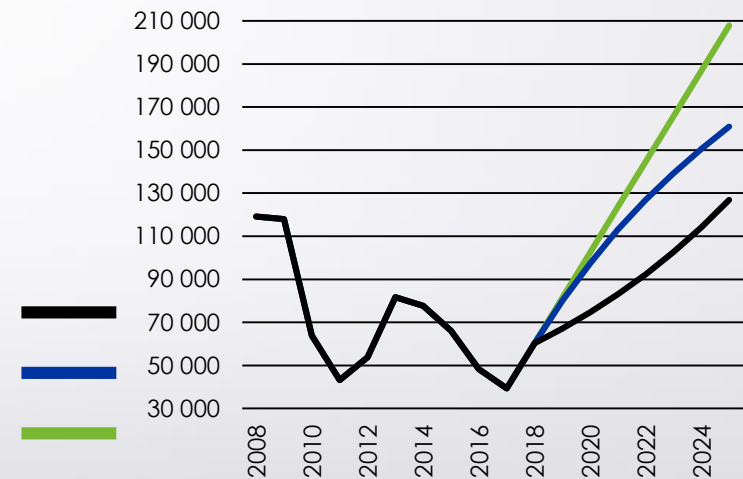
## Potential market enabling NGV sales and conversion:

- **VW Group alone** sells ~ 60k NGVs/y in the EU today
- Market in the EU: 50 000 units/y by 2024 = **€ 175M**
- TAM Worldwide: **€ 1B** (EU is 16% from global)

Estimated sales with existing stations: 130k NGVs/y

Estimated sales with additional stations: 160k NGVs/y

Estimated sales with fueling appliances (HYGEN): 210k NGVs/y



# Market Access Strategy

Pilot for Car Dealers at VW Headquarters  
(Wolfsburg, Germany)



Pilot for Gas Companies at  
Gas Technology Institute  
(Chicago, USA)



**VOLKSWAGEN**  
GROUP



**gti**

**Target customer:**  
car dealers



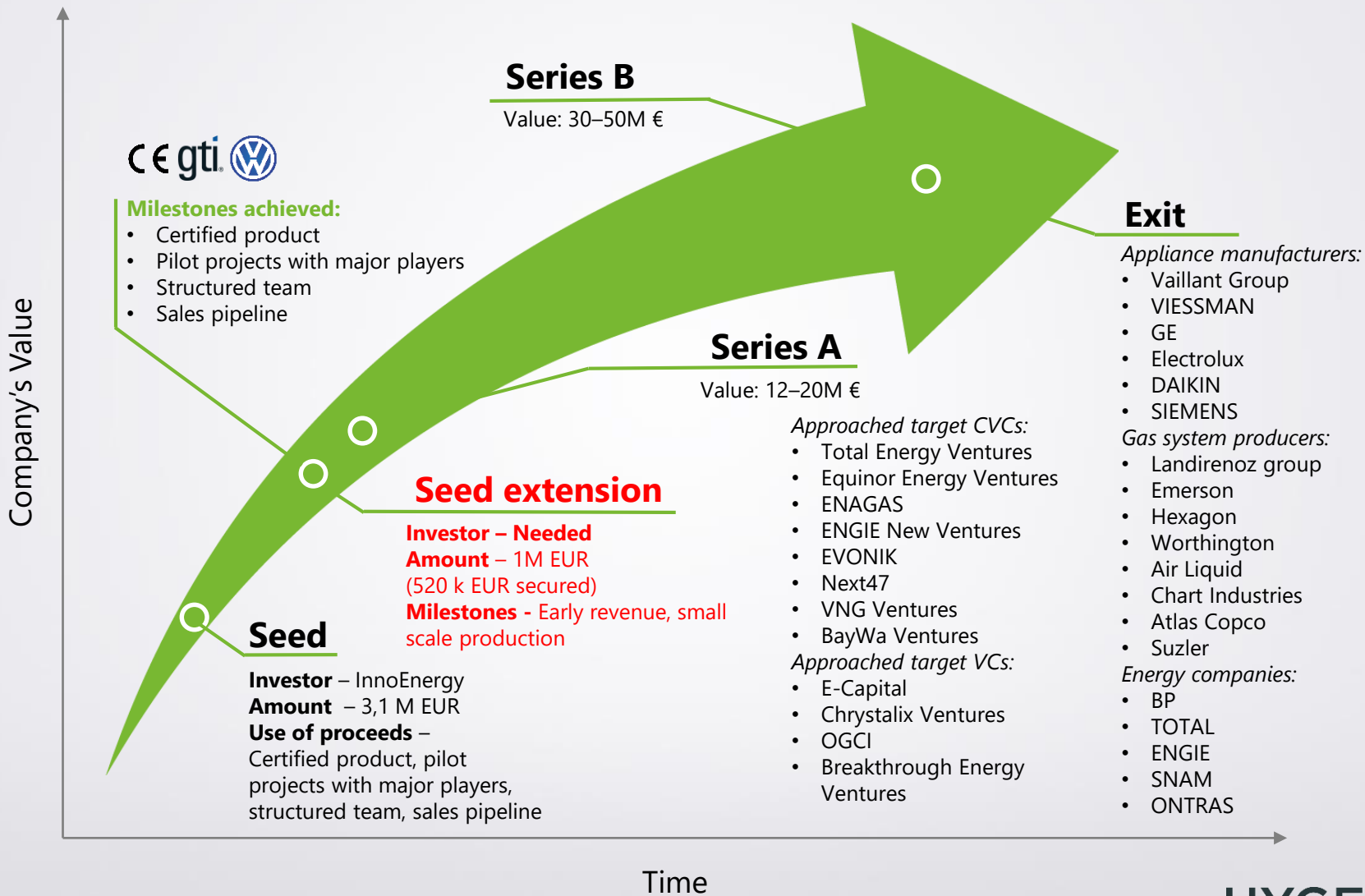
**Target customer:** gas companies



**Target end-users:**

Residential commuters and small business fleets

# Status and Strategic Plan





# Takeaways and Ask

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- Experienced Team
- Global Partnerships & Scalable Business Model
- € 2,5B+ Identified Market & €30B+ Potential Market
- Unmatched Technology & Untapped Market
- Excellent Timing
- **ASK: € 480k out of € 1M seed extension financing round for 9-12 month additional runway**
- **MILESTONES: Multiple pilots concluded, small scale assembly, early sales ~1M EUR**

## Contact:

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