

Biomethane in the transport sector

The French case



Fuels of the future
21 January - Berlin

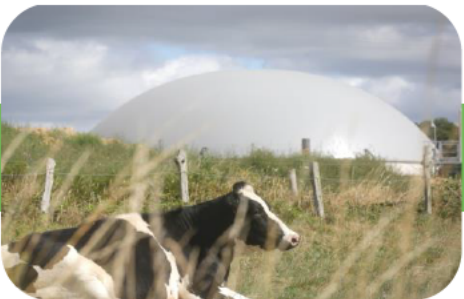
GRDF, main French natural gas distribution operator



200,000 km
of network



11 million
delivery points in France



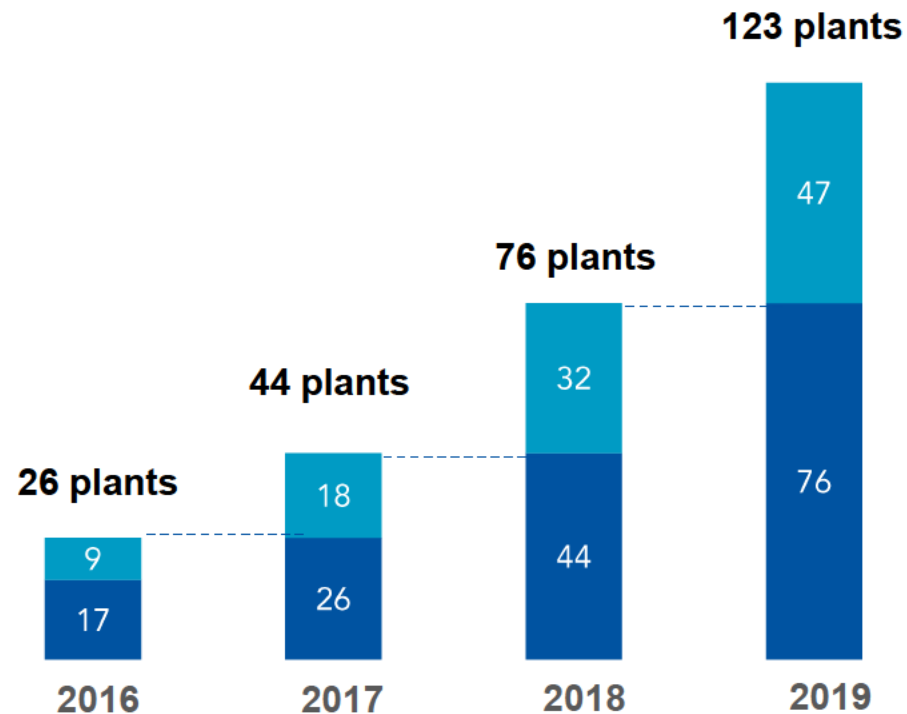
A grid operator
committed to the development of
biomethane and bioNGV

» A rapidly growing biomethane sector

123

Biomethane sites injecting in the French gas grid
Total capacity of 2.1 TWh/year

1 new biomethane plant per week in 2019



**2023 goal
12 TWh**

**Capacity
register

1,000
projects
= 21 TWh**

» Long-term development in France

FEEDSTOCKS

- Urban waste
- Agricultural and agro-food industry effluents
- Non-hazardous waste
- Sewage sludge

PROCESS



Fermentation of organic matter

TECHNOLOGY MATURITY

2010 2020 2030 2035

Anaerobic digestion

140 TWh

- Wood residues (ligneous biomass)
- Ultimate waste



Combustion

Gasification

180 TWh

- Renewable power



Hydrogen production (electrolysis of water) and methane production (methanation)

Power-to-gas
Methanation

140 TWh

460 TWh

Theoretical potential for renewable gas in France in 2050

276 to 361 TWh

Gas demand in 2050 according to four scenarios

3 technologies:

- Anaerobic Digestion
- Gasification
- Power-to-H2/CH4

» A biomethane sector dedicated to sustainable development

15%

Producers cannot use more than 15% of energy crops in their anaerobic digesters

**23.4
gCO₂eq/kWh**

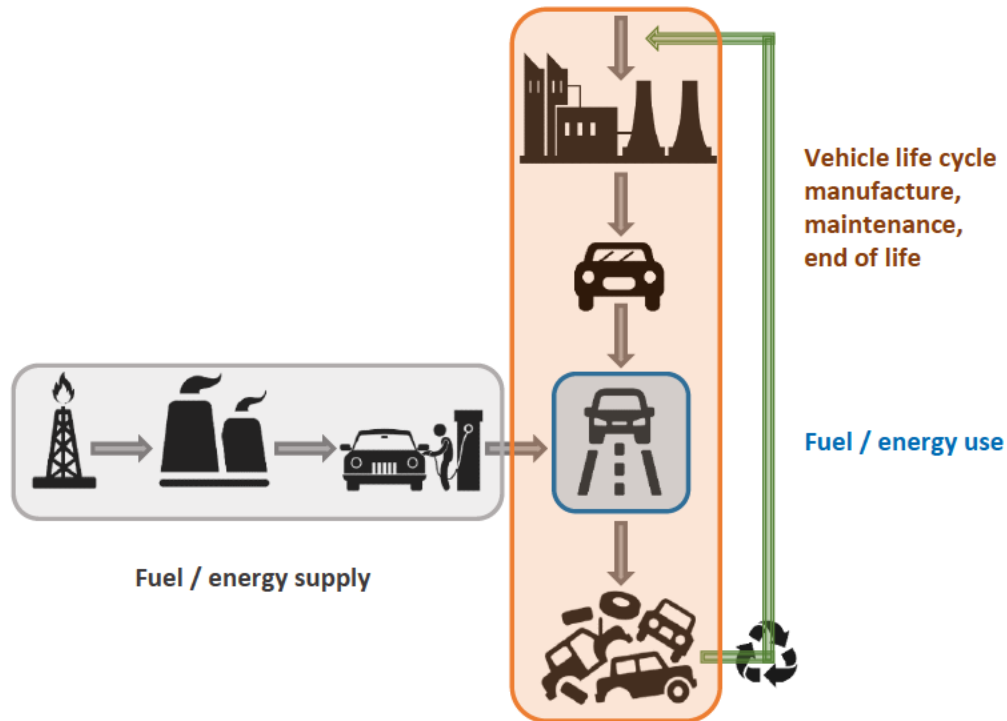
Average carbon footprint for 1 kWh of biomethane in France

**40 to 70
€/MWh**

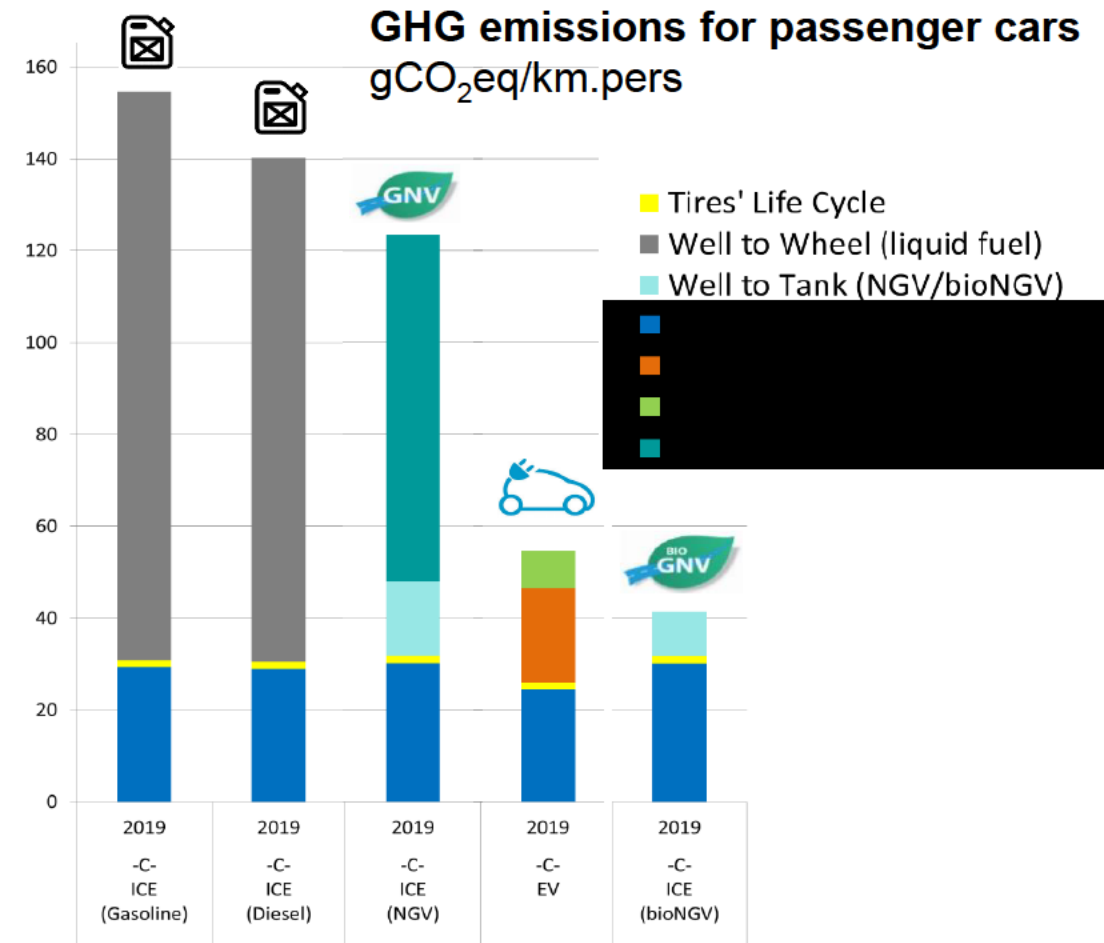
The value of positive externalities generated by biomethane according to ENEA and the French Regulator CRE (prospective committee)

» Biomethane: a carbon neutral fuel

BioNGV could present lower carbon emissions than EV in Life Cycle Analysis



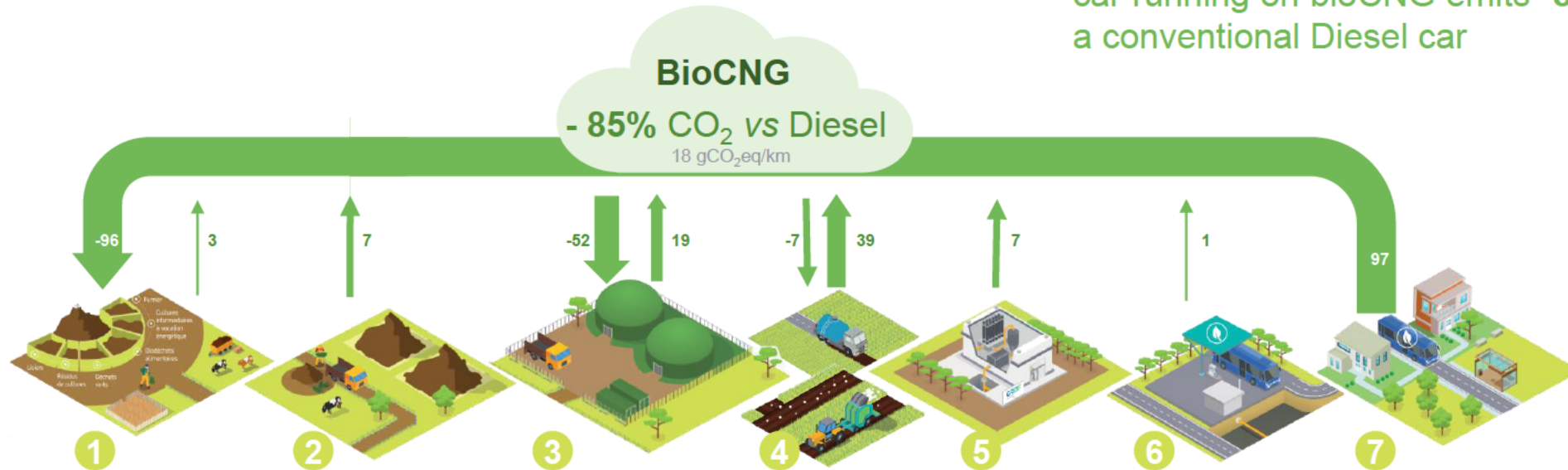
Source: IFPEN - bioCNG LCA Study – Sept.2019
Download here : http://bit.ly/LCA_study_bioCNG



» Biomethane: a carbon neutral fuel

GreenHouse Gas Emission in « Waste to Wheel » analysis

Considering the fuel life cycle, a passenger car running on bioCNG emits **-85% CO₂** than a conventional Diesel car



Carbon capture

CO₂ is captured during plants' growth and stored in the resulting organic waste.

Waste collection

Organic waste is collected and transported locally to the biogas production site, then stored for a few days before entering the digester.

Anaerobic digestion

The organic waste is introduced into an anaerobic digestion plant to be transformed into biogas and digestate. This process avoids the direct methane emissions of waste during their decomposition.

Spreading digestate

The digestate is stored and transported for use as fertilizer. This avoids the industrial production of mineral fertilizers, thus avoiding associated greenhouse gas emissions.

Biogas upgrading

The biogas produced is upgraded to biomethane so that its composition meets the quality required to be injected into the gas grid.

Distribution

The biomethane is transported via the gas grid to a BioCNG station. It is then compressed at 200 bar to be stored in the vehicle tank.

Use as fuel

BioCNG is consumed by the vehicle engine. The biogenic CO₂ emitted at the vehicle's exhaust was originally captured from the organic materials used for the methanation (Step 1), it is therefore climate neutral.

» A “low tech” solution to improve air quality

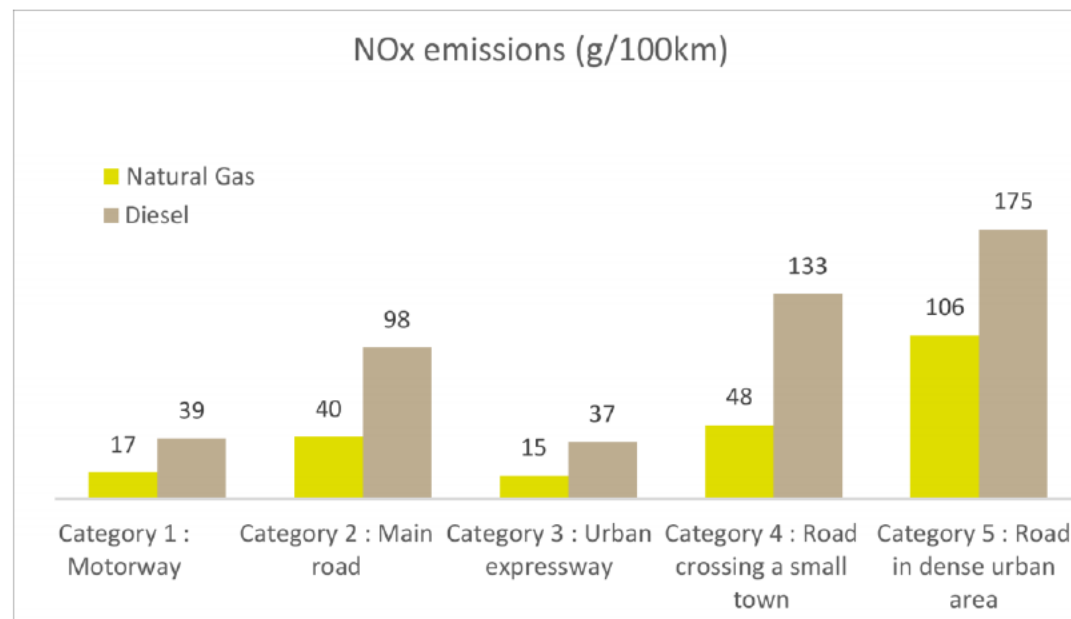
50% less NOx emissions for natural gas than Euro VI Diesel in real drive conditions

“Equilibre project”

Fuel consumption, CO₂ and NOx emissions measured on 12 Heavy Duty Vehicles (Diesel and Natural Gas)

1 million kilometers over 2 years in real life conditions.

40 to 64 % less NOx emission than Diesel without a complex depollution system



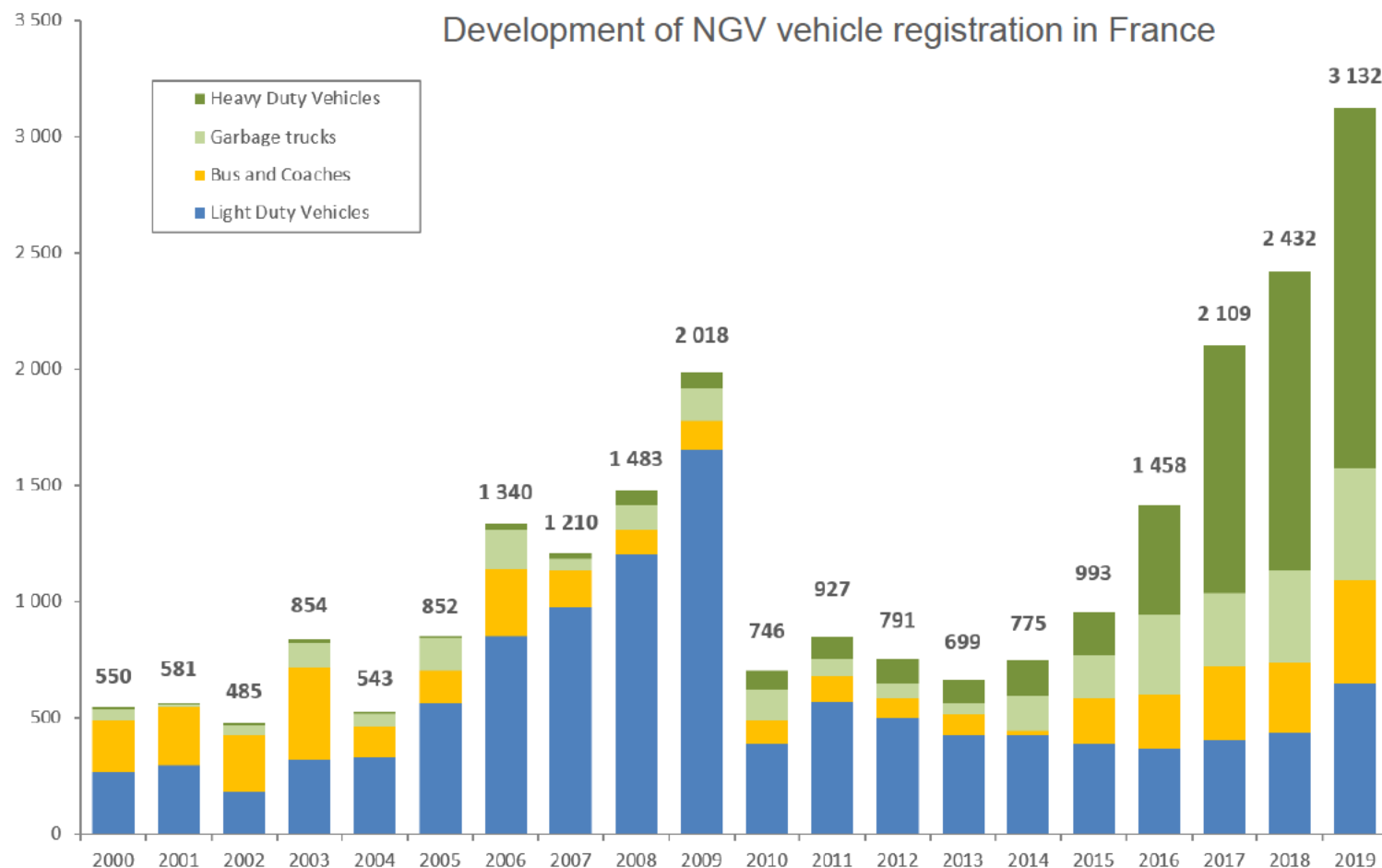
» CNG/bioCNG development in France

A market driven by Heavy Duty Vehicles

20,000
NG vehicles in France, half of them are
Heavy Duty

12 %
of city buses are running on CNG
(3,350 buses)

10 %
of garbage trucks running on CNG
(1,870 trucks)



» CNG/bioCNG development in France

Refuelling infrastructure:

150 public stations
today (CNG + LNG)



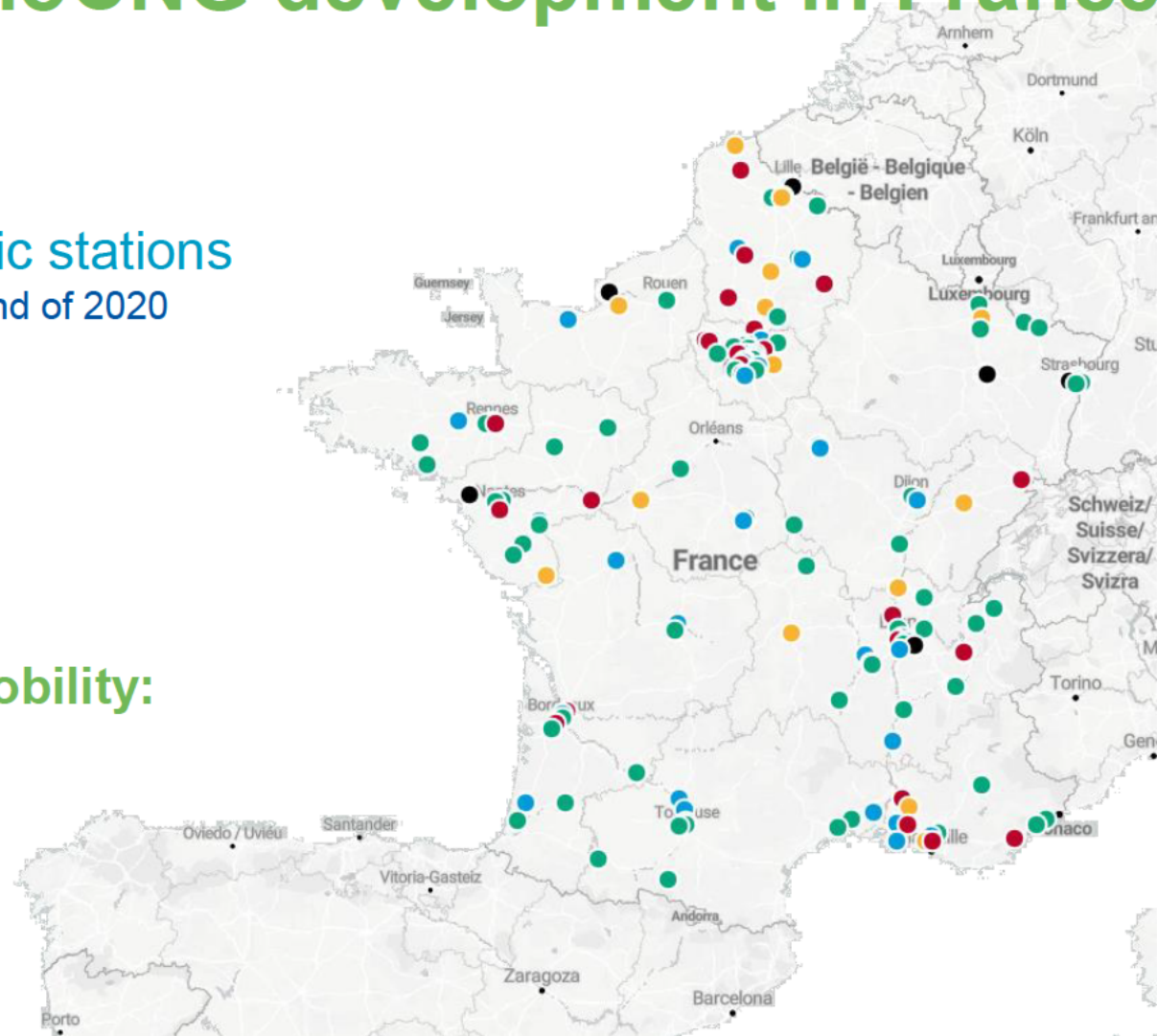
250 public stations
by the end of 2020

+

200 private stations
for captive fleets

A growing share of biomethane in mobility:

Biomethane share in CNG
12%
(160 GWh)



Official map :
https://gnv-grtgaz.opendatasoft.com/pages/dashboard_v3/

Conclusion: past, present and future of Gas Industry in France

Manufactured gas
Local production and distribution

Lighting Cooking



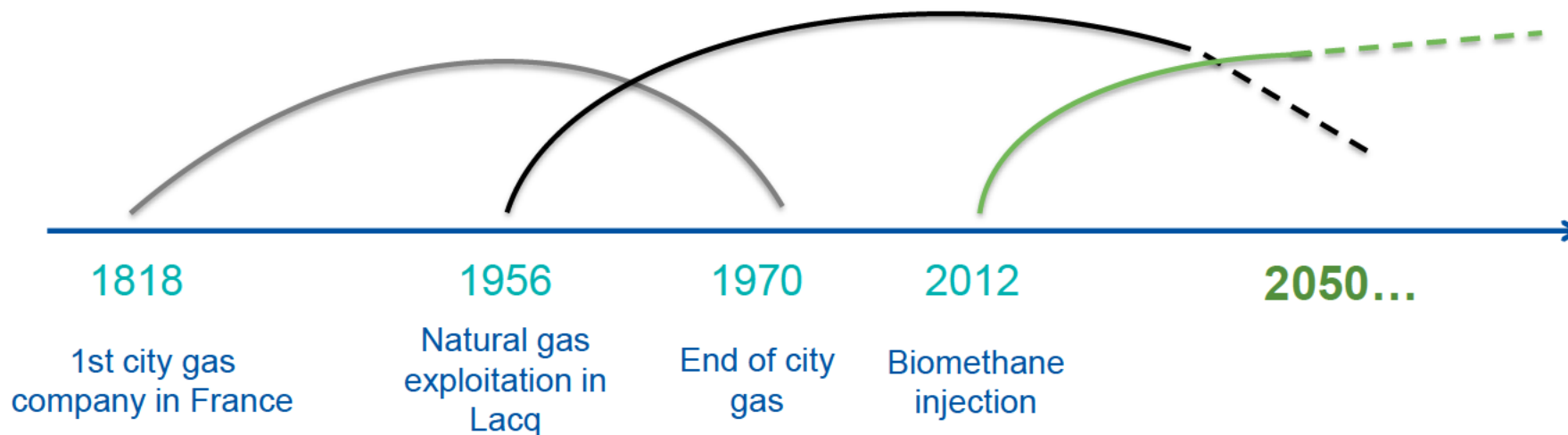
Natural gas
Centralised infrastructures

... Heating, Hot water...



Renewable gas
Decentralised and interconnected infrastructures

... Mobility, Power to gas, Fuel Cells...





Thank you for your attention

Contact details

