



SYMBIO APPROACH TO HYDROGEN MOBILITY : HYDROGEN RANGE-EXTENDED ELECTRIC VEHICLE



ZERO conference – OSLO - 4th of Mai 2017



Contact : pierre.dodu@symbiofcell.com / +33 7 62 38 90 42



WHO IS SYMBIOFCCELL?

SYMBIO FCELL owns its own Fuel Cell technology

SYMBIO FCELL offers to the market:

- a) Its own Fuel Cell technology
- b) The KANGOO ZE H2



SIGNIFICANT STOCKHOLDERS



SYMBIO FCELL is a French privately owned company.



WHO IS SYMBIOFCELL?

RENAULT “KANGOO ZE”

SYMBIO Fuel Cell system



“KANGOO ZE H2”

KANGOO ZE H2 is a dual energy vehicle (Electric and H2).



WHO IS SYMBIOFCCELL?

The Hydrogen kits from SYMBIO FCELL are manufactured in respect of automotive industry standards by a subsidiary of MICHELIN group

The Hydrogen kits are then integrated in the original KANGOO ZE in respect of the automotive industry standards by RENAULT TECH, a subsidiary of RENAULT.



Somewhere in Asia?



WELCOME IN PARIS!

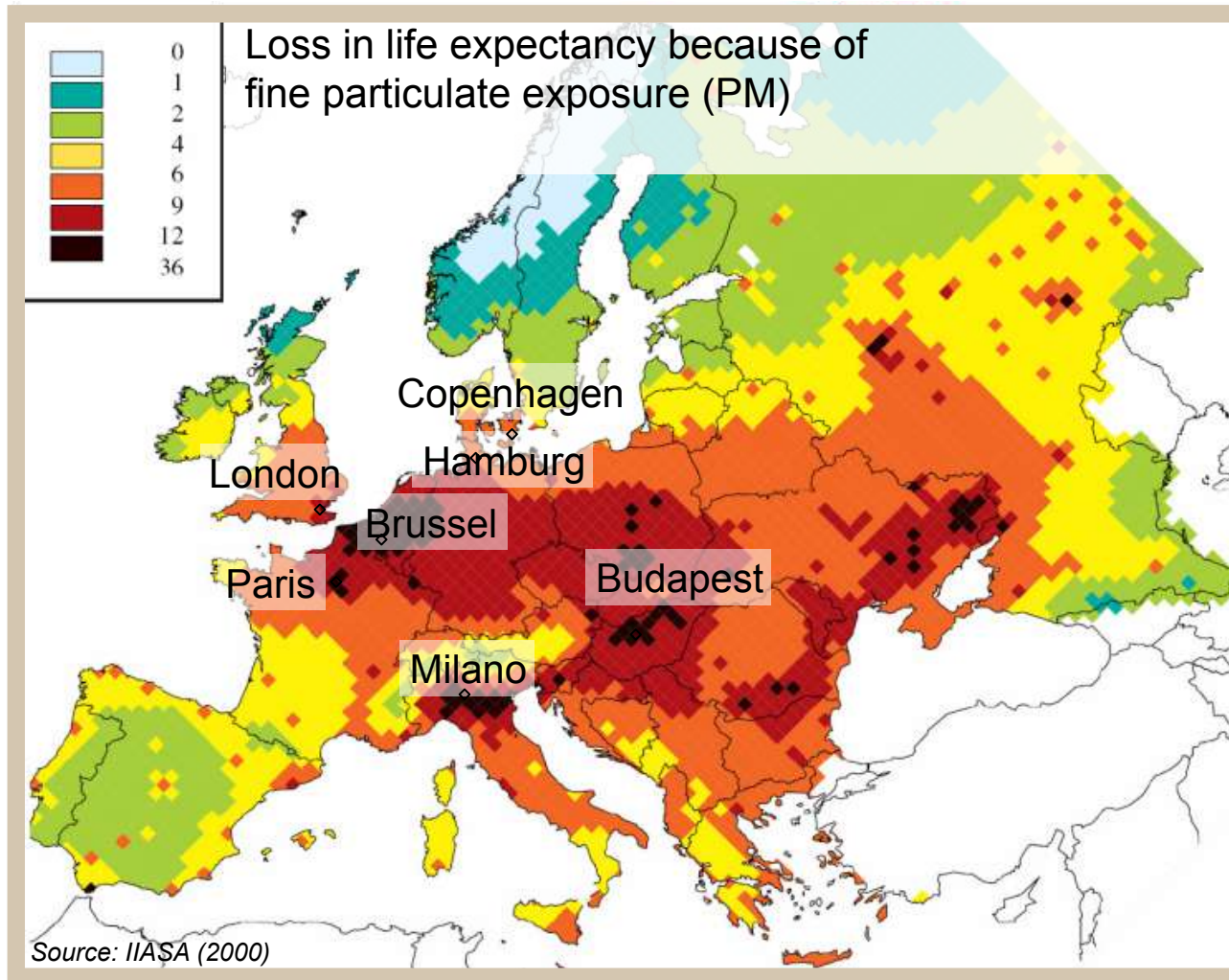


THE ENTRY OF FREIGHT VEHICLES IN THE CITIES CENTERS IS MORE AND MORE RESTRICTED



A real Headache for delivery and other services companies

MAJOR CITIES IN EUROPE CANNOT IGNORE CITIZEN'S NEED FOR BETTER AIR QUALITY



Fines particulates¹ are only one item among many others like: Ozone, Nox, Sox, CO...

Those pollutants increase the cancers risks², asthma, emphysema, heart diseases, stroke...

(1) PM: Particulate Matter

(2) IARC: Diesel Engine Exhaust is Carcinogenic (June 12, 2012)



WITH RANGE EXTENSION, SYMBIO H₂ KIT ENABLES TO MORE THAN DOUBLE VEHICLE MILEAGE, WITH NO « WINTER » EFFECT

700 bar

52 kWh Electricity, 24 kWh Heat

- 30 kWh of power provided by the Fuel Cell + 22kWh provided by the batteries
- In cold weather, heat produced in the Fuel Cell is diverted to vehicle cockpit : no impact of cold conditions on comfort or range



No climate effect on Hydrogen Electric Vehicle, as shown with real life “Mail delivery” cycles in urban areas (Poste office)



20 °C

Kangoo ZE

Kangoo ZE + Kit H2



5 °C

Kangoo ZE

Kangoo ZE + Kit H2



-5 °C

Kangoo ZE

Kangoo ZE + Kit H2





THE 3 AVANTAGES OF THE KANGOO ZE H2



3 Advantages

- Range : 100 km → 300 km
- Heating without hurting the range
- Refuelling within about 4 mn

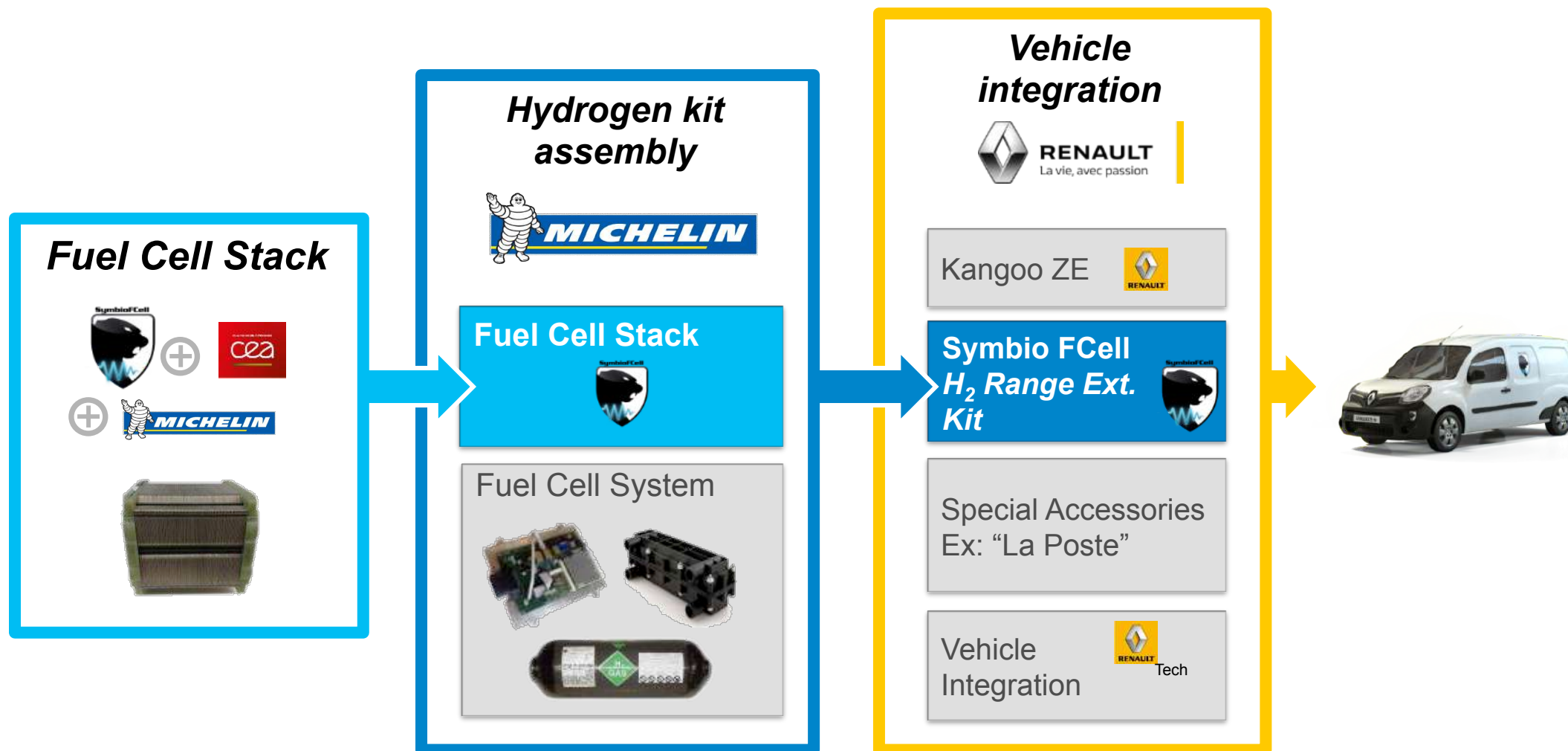
Symbio



SYMBIO AND ITS PARTNERS



TECHNICAL SUPPORT OF OUR PARTNERS LED TO A ROBUST AND COMPETITIVE SOLUTION





CURRENT SITUATION

- City of 100 000 inhabitants → 100 LCV = 1 500 kg CO₂ /day

PROPOSED ACTION

- ~~20 ICE (Internal Combustion Engine) Vehicles~~ → 20 clean vehicles
- Makes $20 \times 261 \text{ days}^* \times 15 \text{ kg} = \mathbf{78 \text{ Tons CO}_2 \text{ spared each year}}$

(*) 1 year = 261 working days



25 Zero Emission vehicles operating daily



WARRANTY & MAINTENANCE

KANGOO ZE H2 remains a dual energy vehicle
KANGOO ZE H2 is a connected device → Diagnosis

* Non Hydrogen problem →



Renault takes in charge

* Hydrogen problem →



Symbio takes in charge

The SymbioFCell Hydrogen kit has a warranty of 2 years. Warranty extension possible



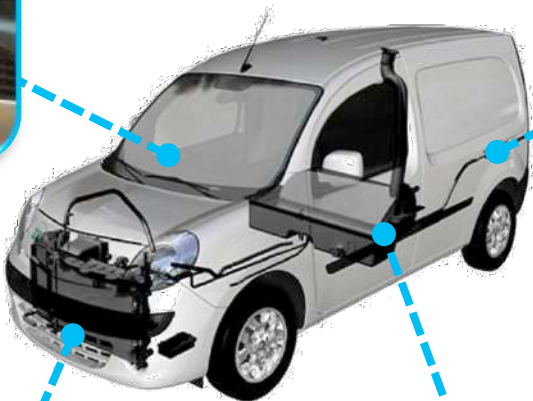
TECHNICAL FEATURES OF OUR VEHICLES ARE THE SAME AS THOSE OF KANGOO ZE, HYDROGEN FUNCTIONALITIES ON TOP OF IT



Dashboard
=> Display of H₂ Range



H2 Refilling interface
=> Full energy load in 5 min



Facelift
=> Unchanged architecture

Installation of the Hydrogen kit is 100% reversible
=> Retrofit to « Kangoo ZE » remains possible
=> Residual value of the « Kangoo ZE » preserved



Cargo area integration
=> Limited impact

Kangoo H2 Datasheet

Delivery features

- Payload = 650 kg – 105 kg
- Volume capacity = 4,6 m³ – 0,1 m³
- Driver interface type Kangoo ZE + Fuel Cell & H₂ activity Display

Energy onboard

- « plug-in hybrid H₂ » vehicle
- Original electric battery = 22 kWh
- H₂ tank = 26 kWh (1.78 kg) [350 bar]
- H₂ tank = 30 kWh (2.03 kg) [700 bar]
- « Bonus »: Heat provided by the Fuel Cell: 26 to 30 kWh

Legend

XXX = Features of the original electric vehicle

XXX = Impact of the H₂ Kit



SECURITY OF PASSENGERS AS WELL AS THE ONE OF THE VEHICLE ARE THE SAME ONE FIND IN A REGULAR VEHICLE

Firemen are now using « Kangoos ZE H2 » for service





HERE ARE SOME OF OUR CUSTOMERS
THEY ARE INVOLVED IN THE ZERO EMISSION MODEL AND ARE ACTING TODAY.





LAST BUT NOT LEAST!



SKEDSMO KOMMUNE Car



SKEDSMO KOMMUNE





THANKS FOR YOUR ATTENTION...