



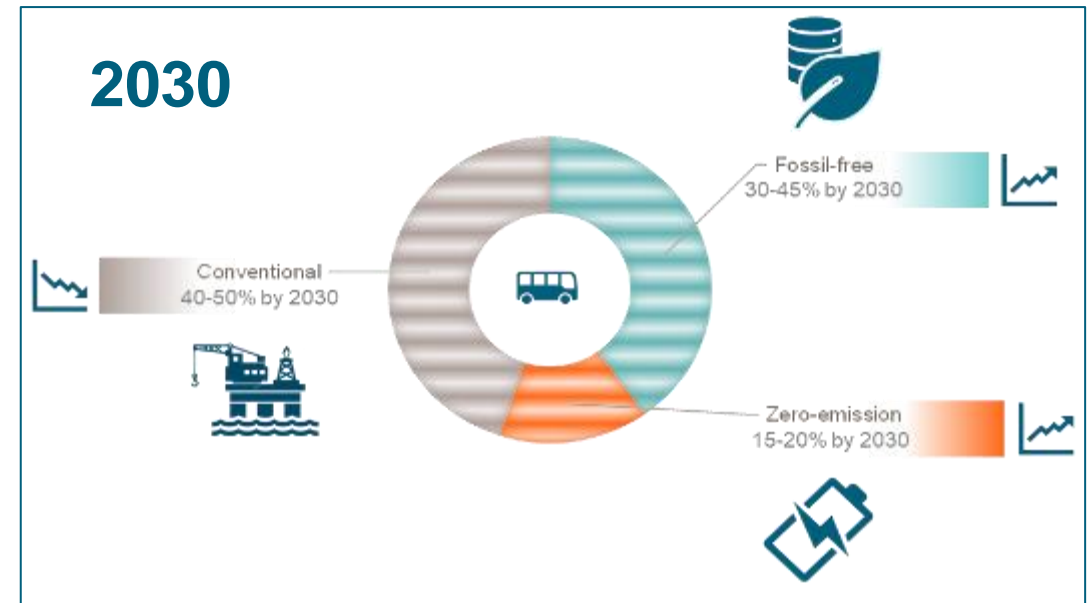
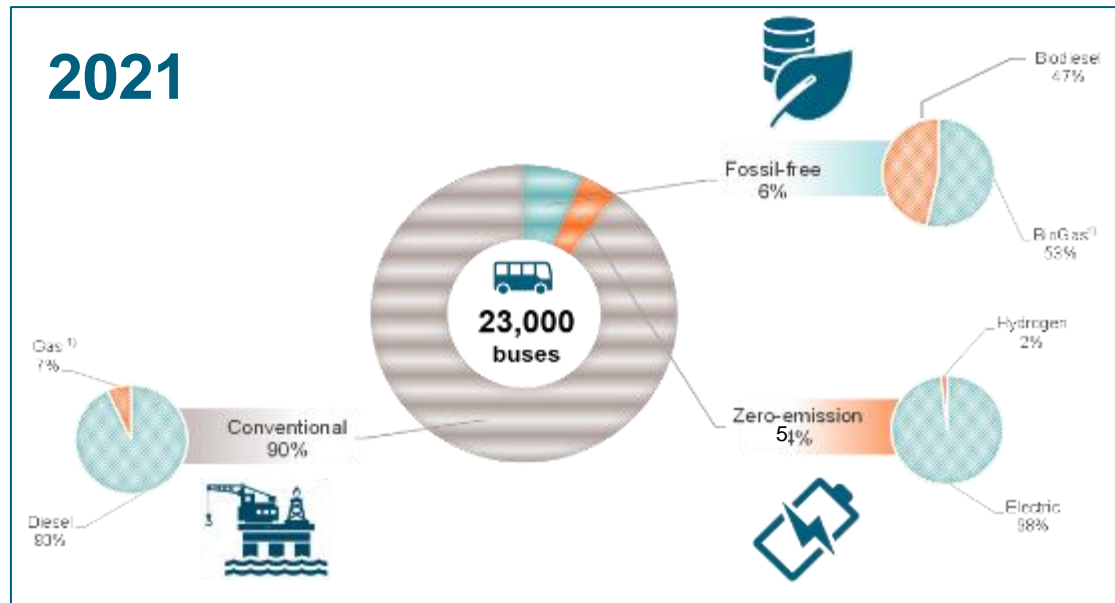
# THE ROLE OF BUS OPERATORS IN THE NEW E-BUS ECOSYSTEM

Bruno Lapeyrie – Head of Energy Transition

# Keolis energy mix from 2021 to 2030

*50% of our 23,500 bus fleet will be carbon-free by 2030*

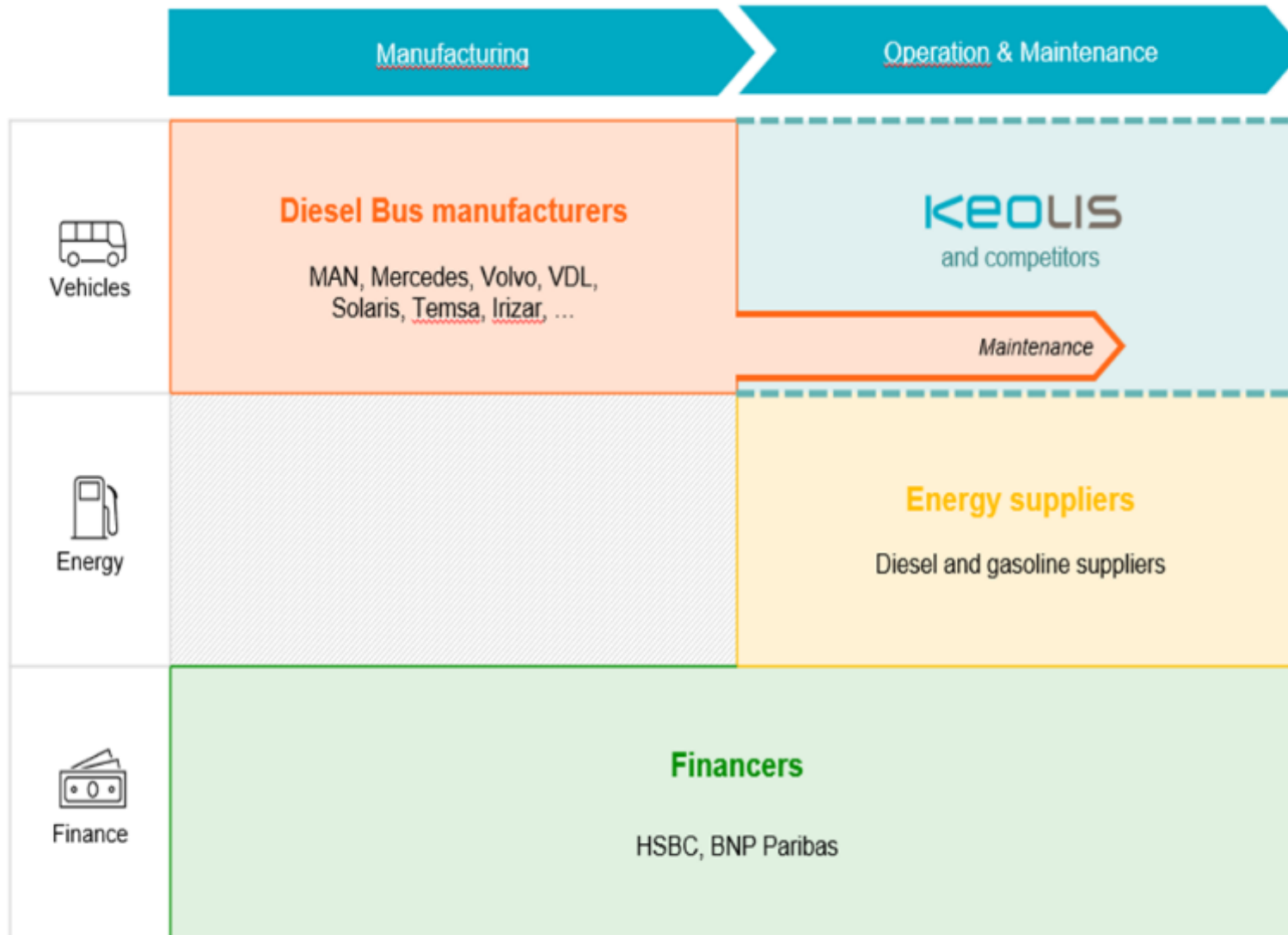
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# A new ecosystem

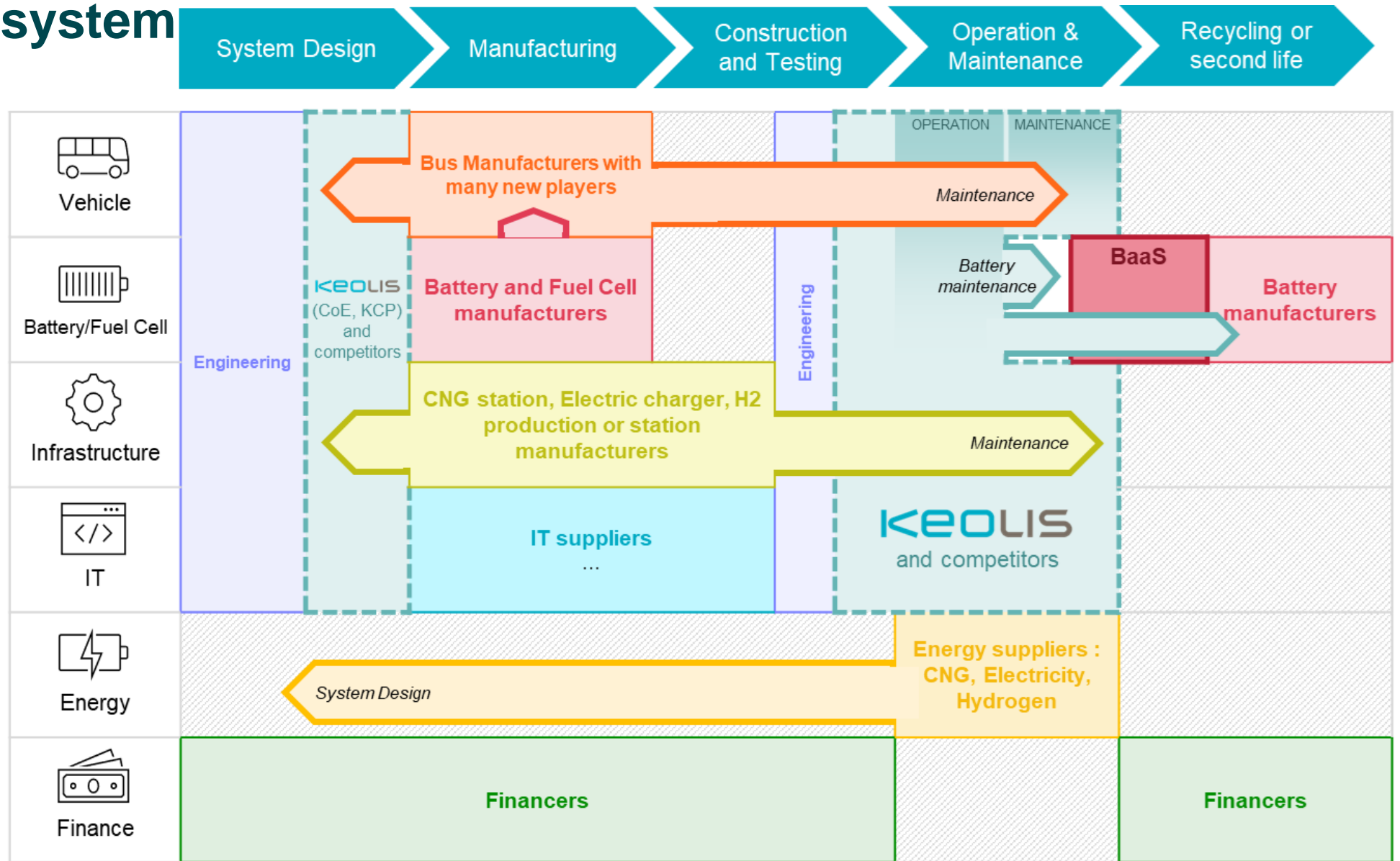
# A new ecosystem

*Diesel Value chain*



# A new ecosystem

ZEB Value Chain



Major movements of players on the value chain and across modes

System integrators

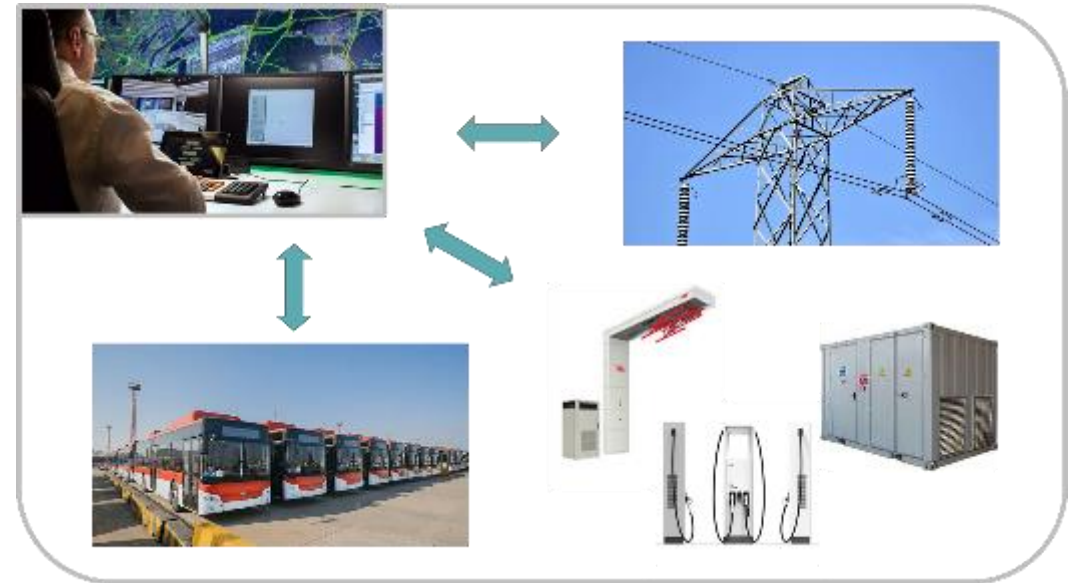
# Industry relationship



# Industry relationship

→ Catch the opportunities

→ Avoid risky adventures



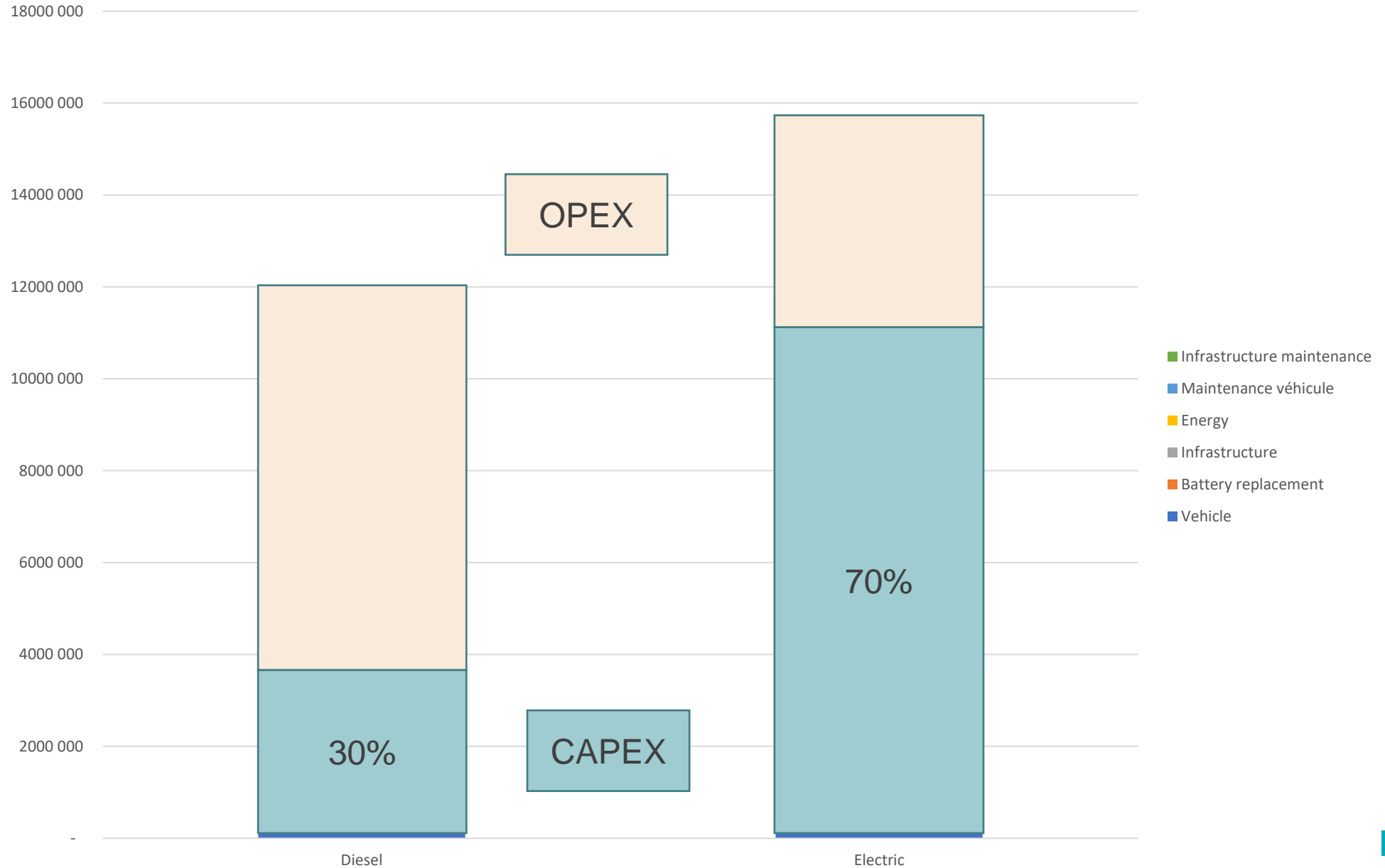
**« We don't buy buses, we buy reliable and available kilometers »**

A large iceberg floating in the ocean. The tip of the iceberg is visible above the water surface, while the much larger, jagged base is submerged underwater. The sky is blue with scattered white clouds. The water is a deep blue, and the overall scene is a metaphor for hidden costs or risks.

# Economic model and TCO



# TCO (15 vehicles/15 years)

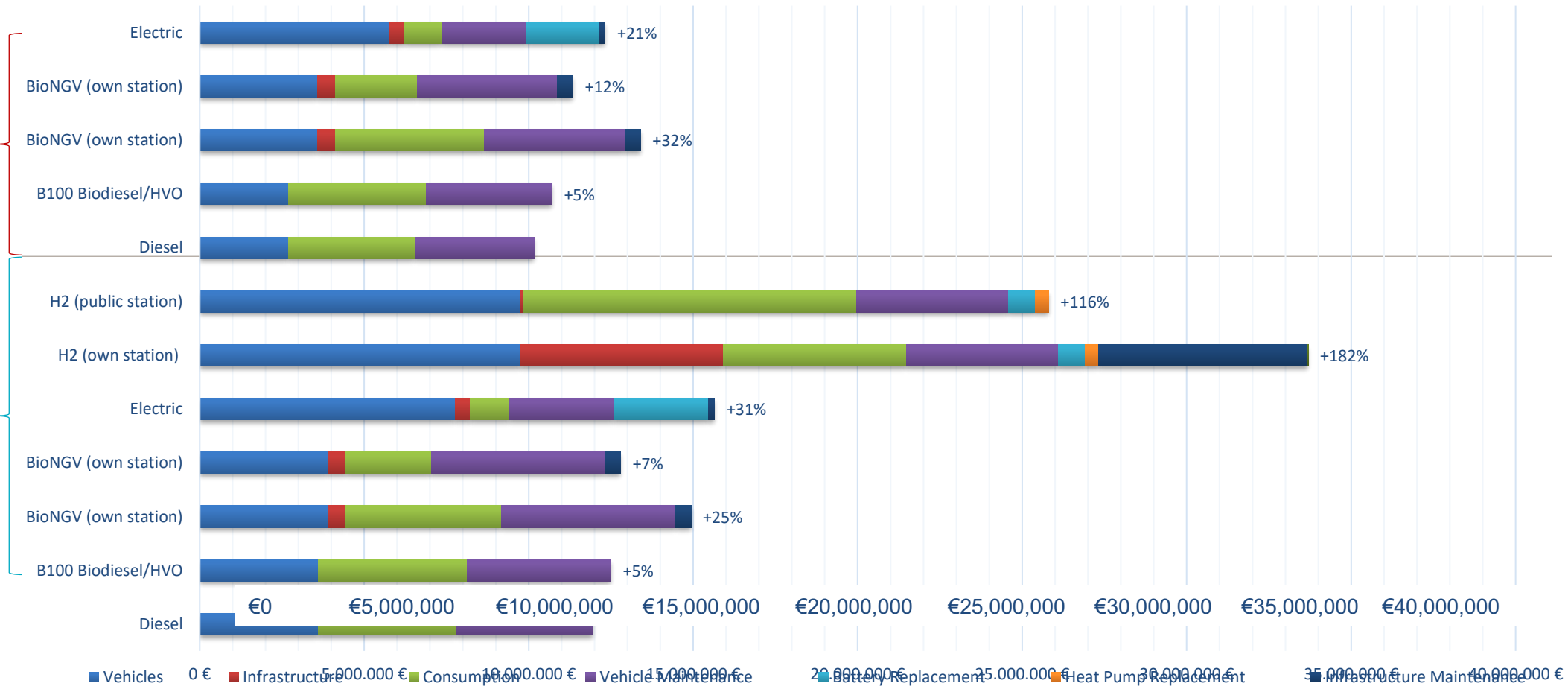


# TCO comparison

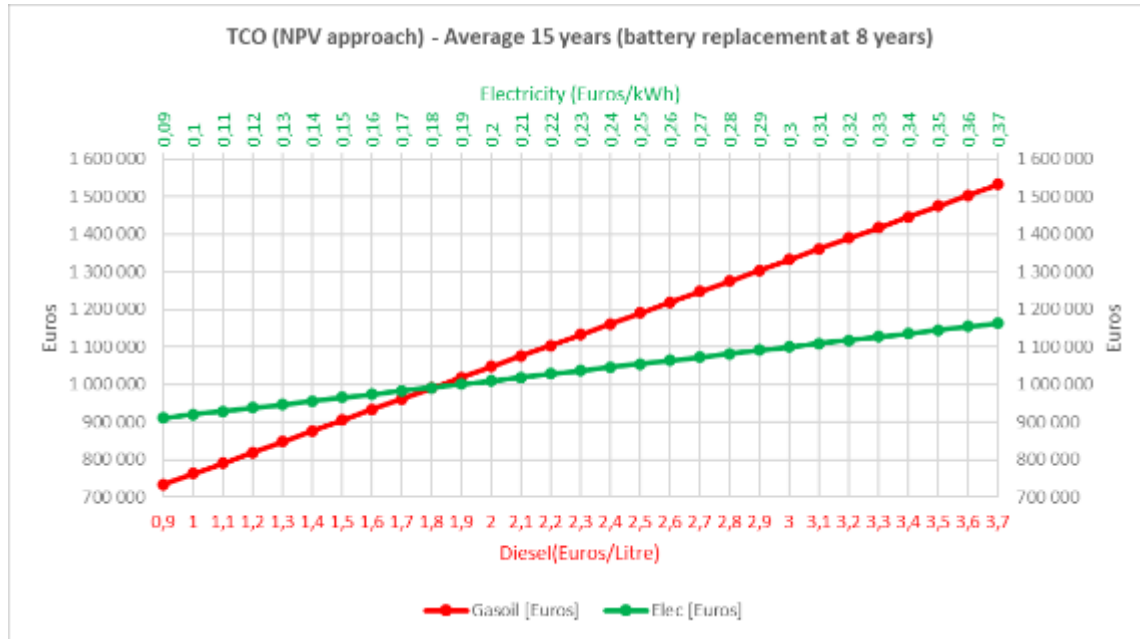
## TCO comparison of the fleet (15 vehicles; 15 years)

Coach

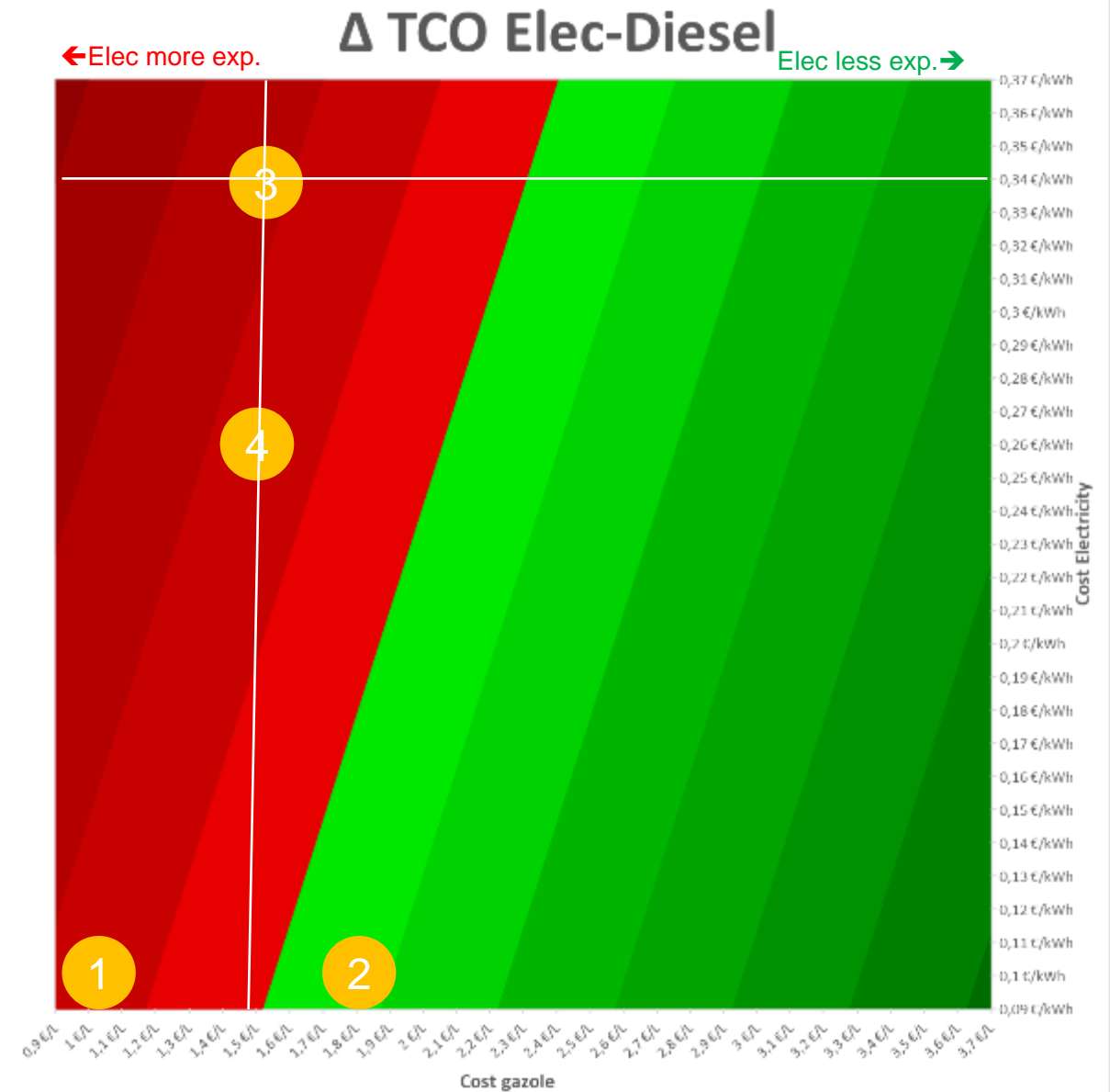
Bus



# TCO Elec vs diesel (France)



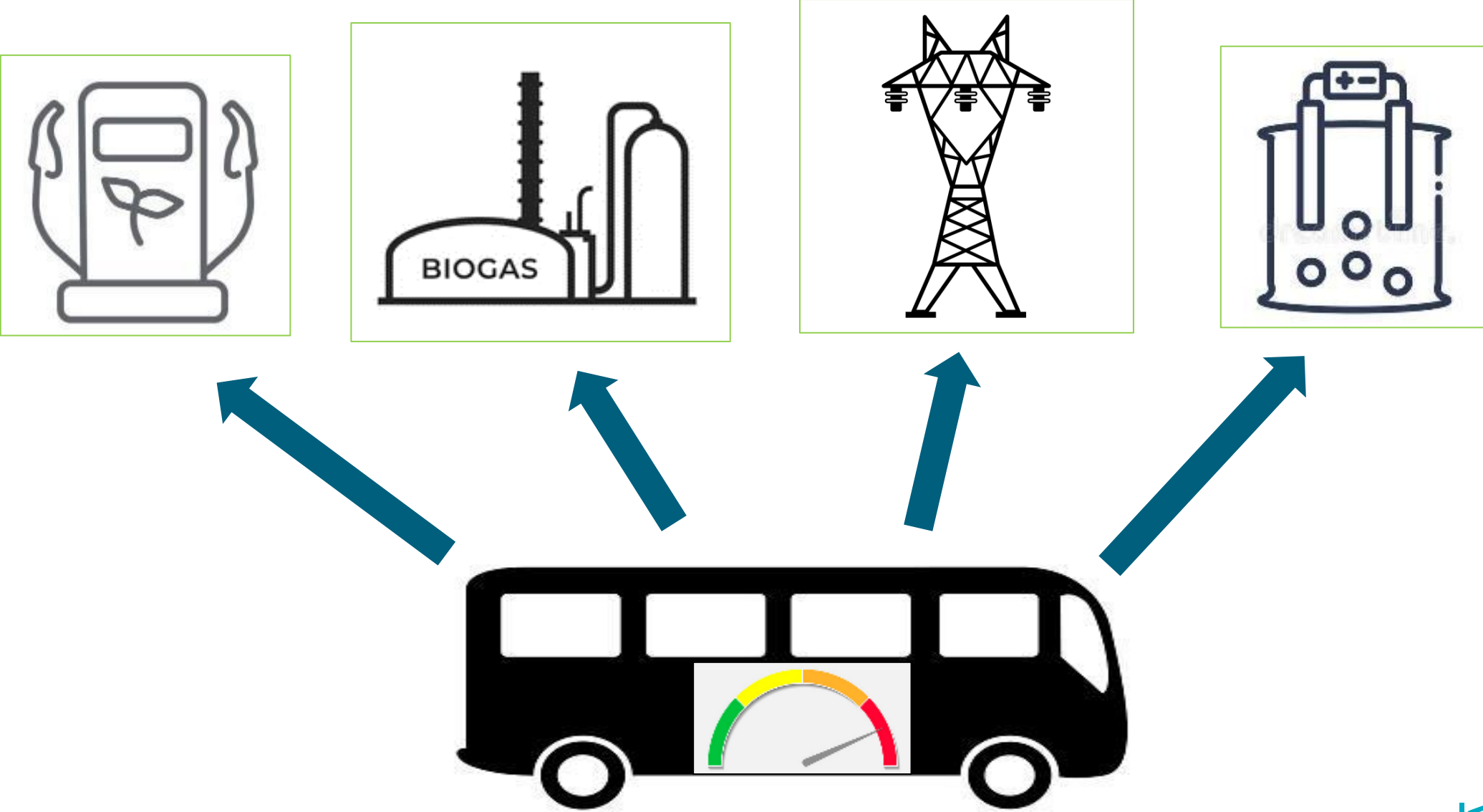
- 1 Before crisis
- 2 2022
- 3 Today
- 4 2024?



# Energy as a resource



# A simple cost becoming a resource



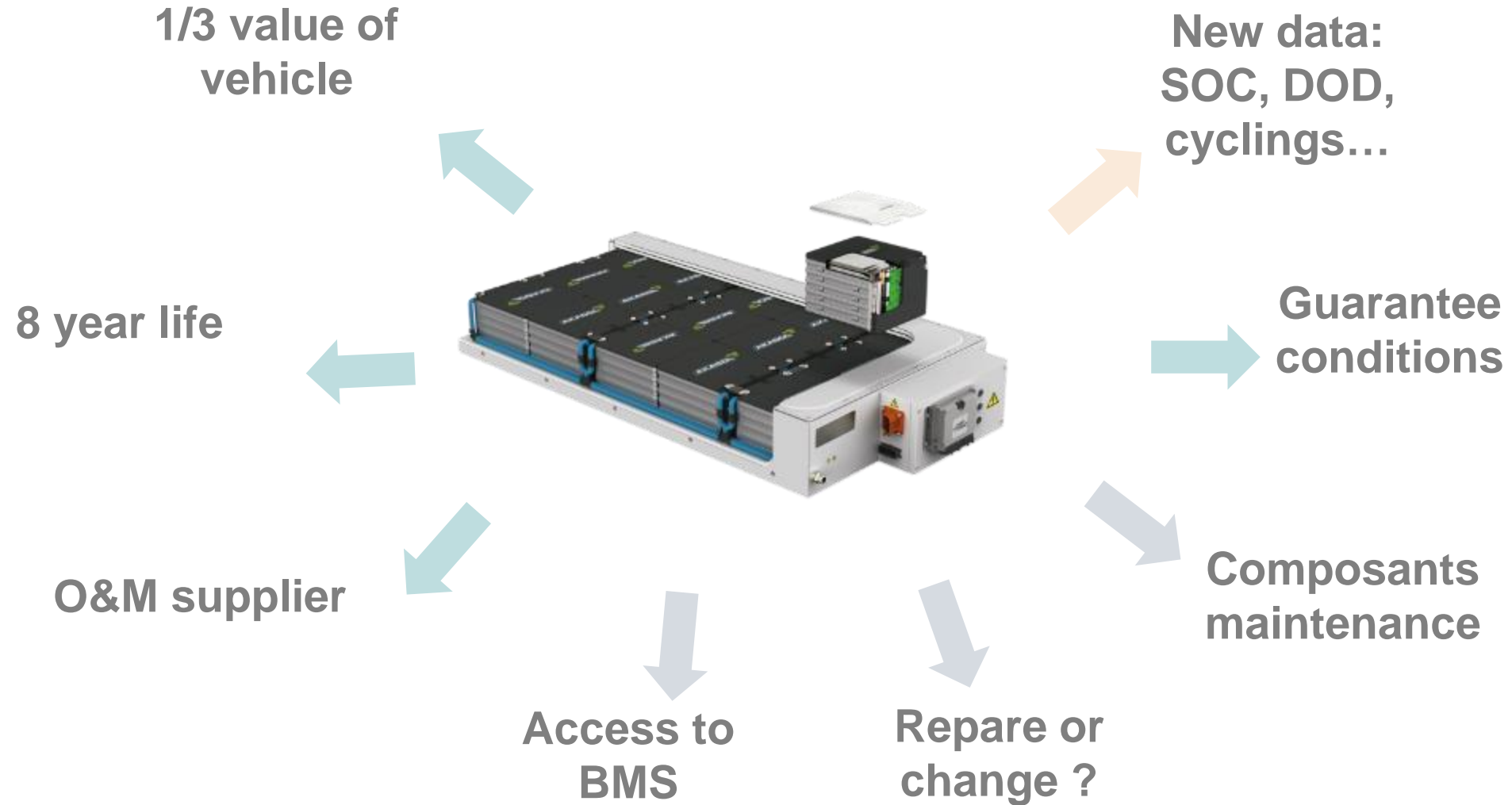
# IT and Data



# Why ITS systems for e-Buses?

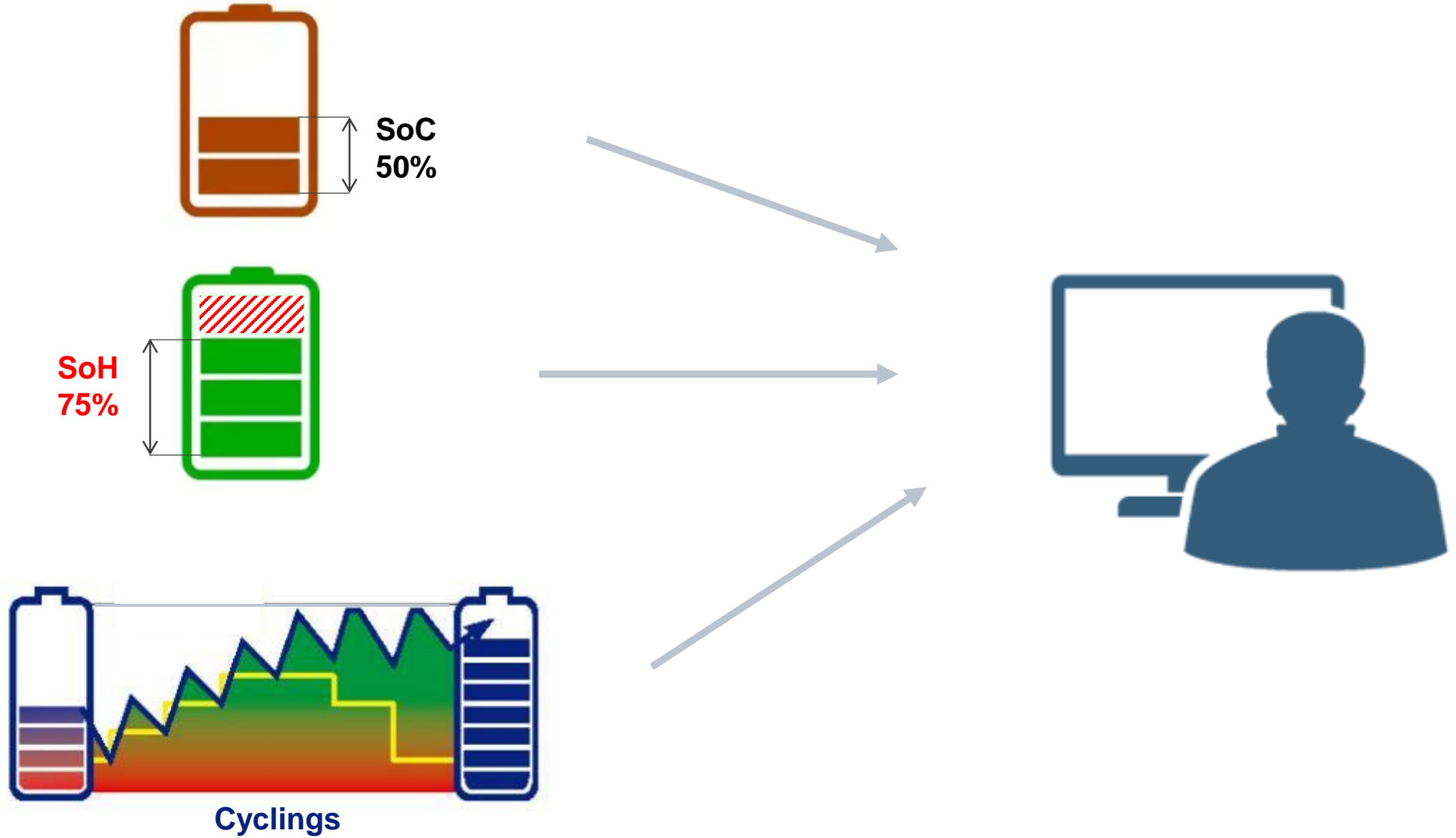
- **Where is parked my vehicle in the depot?**
- **Will my vehicle ready for its block start time?**
- **Can I limit the instantaneous power peak in the depot?**
- **Will my vehicle be able to finish its block and come back to the depot?**
- **Is there any safety risk regarding the battery health?**
- **How to manage the variations of consumption? Weather, driver, battery ageing lifetime**

# Battery: our new border





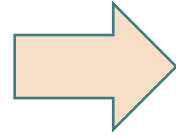
# Battery: data generation



# Environment?

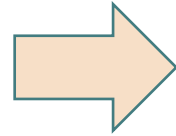
CO2

# Environmental stakes



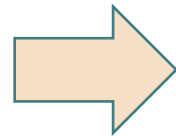
PM  
NOX

ZERO EMISSION



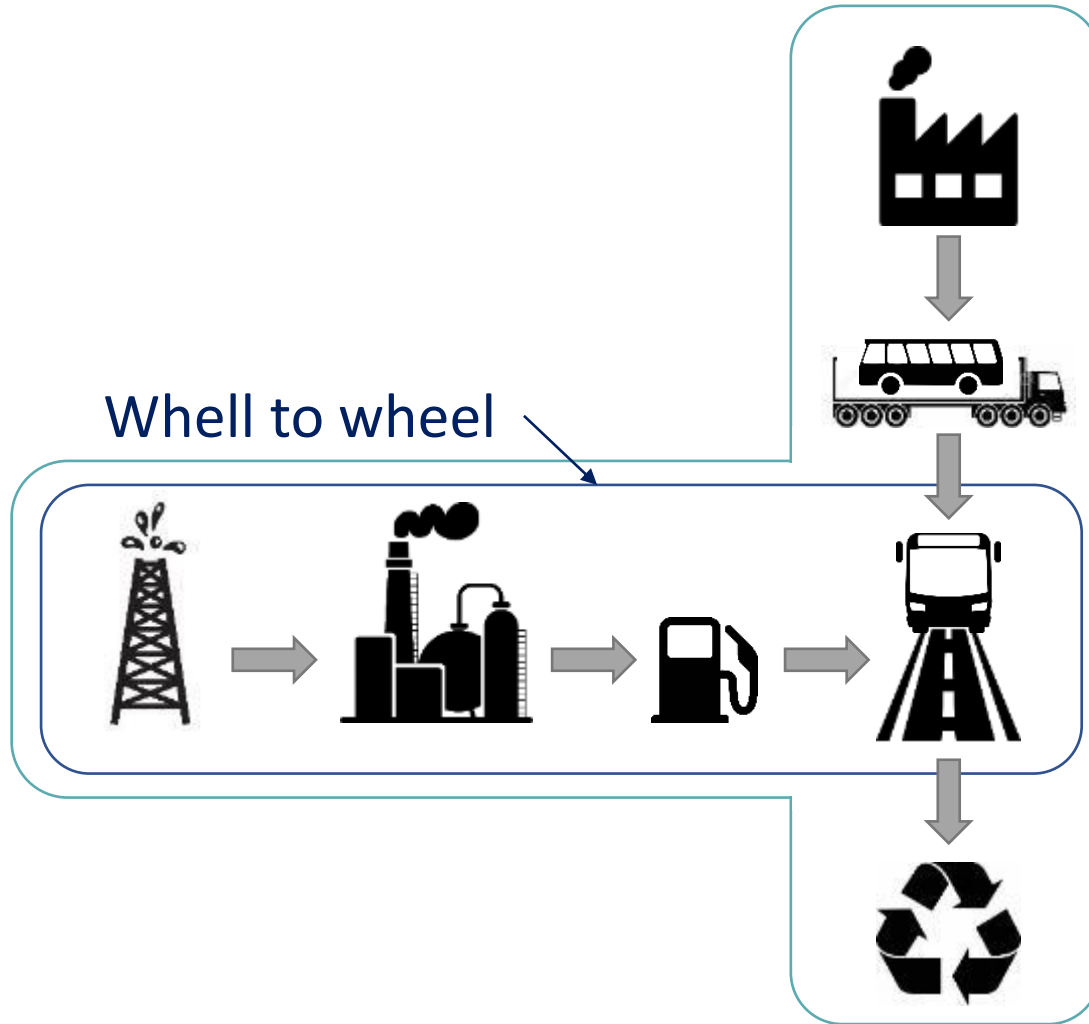
CO2

DECARBONATED



RENEWABLE AND LOCAL

# Life cycle analysis

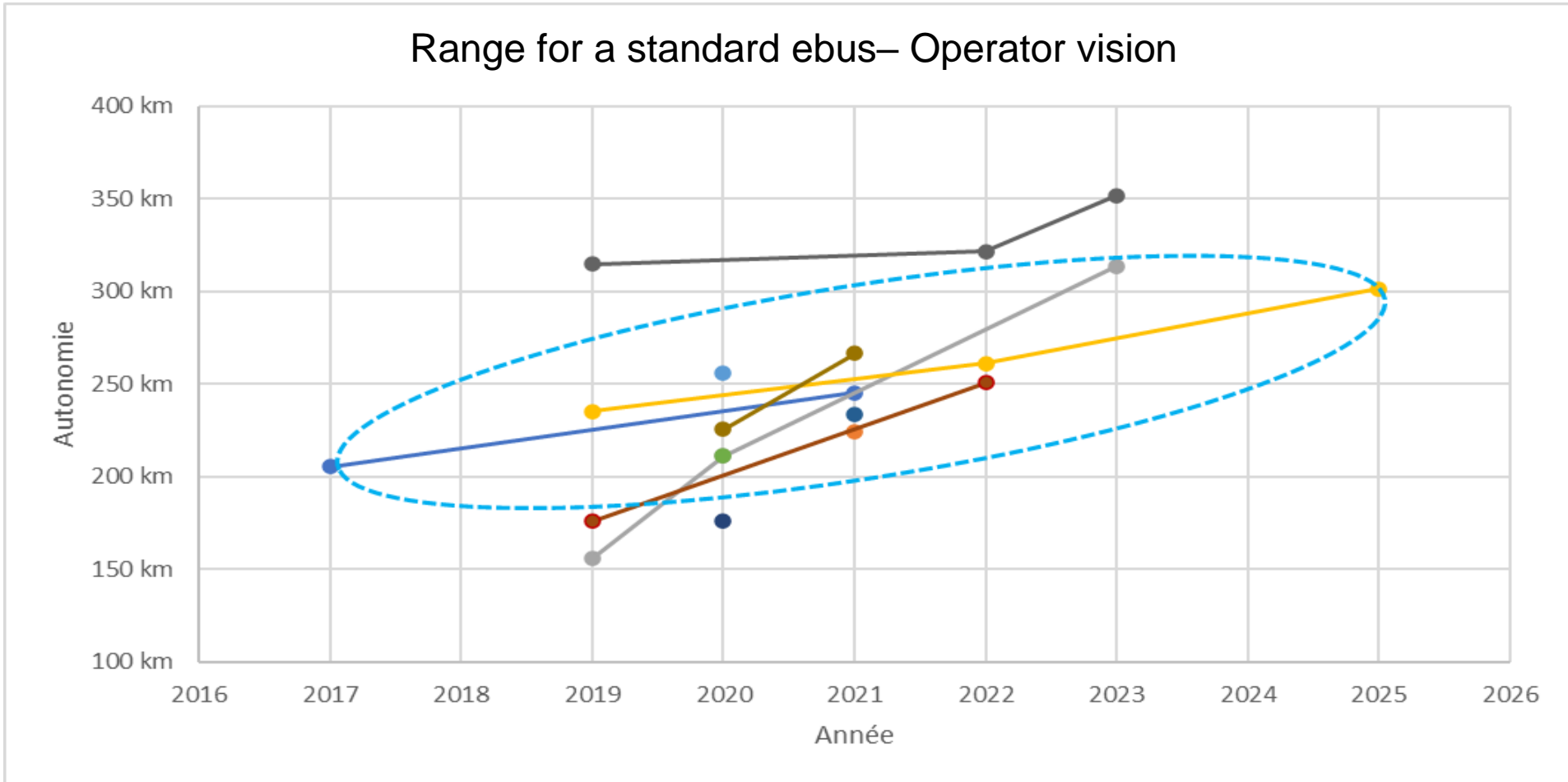


DIESEL	ELECTRIC
g CO <sub>2</sub> /km	
117	166
<b>1 427</b>	63
9	10

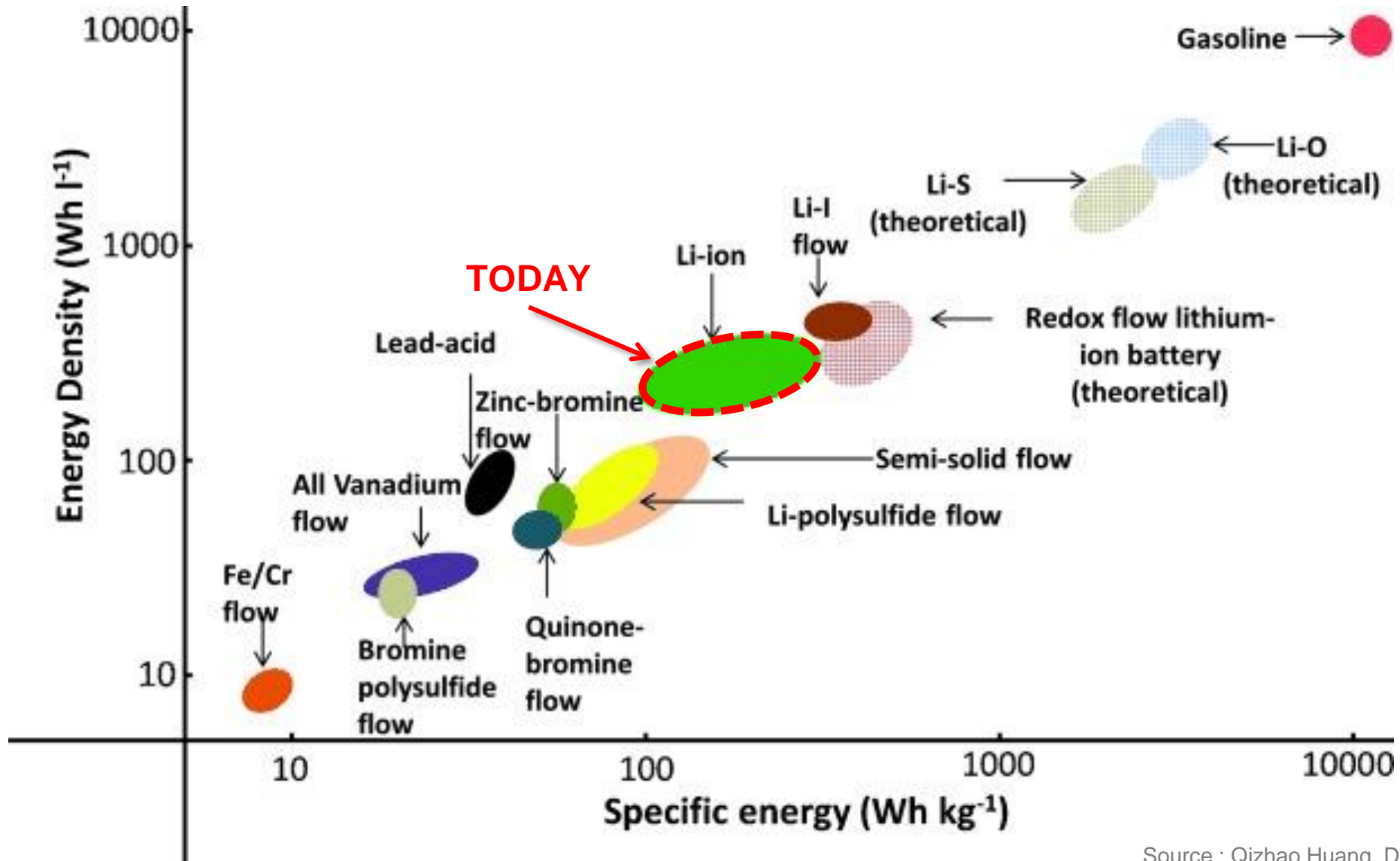
# Disruptions



# The range



# Battery improvement



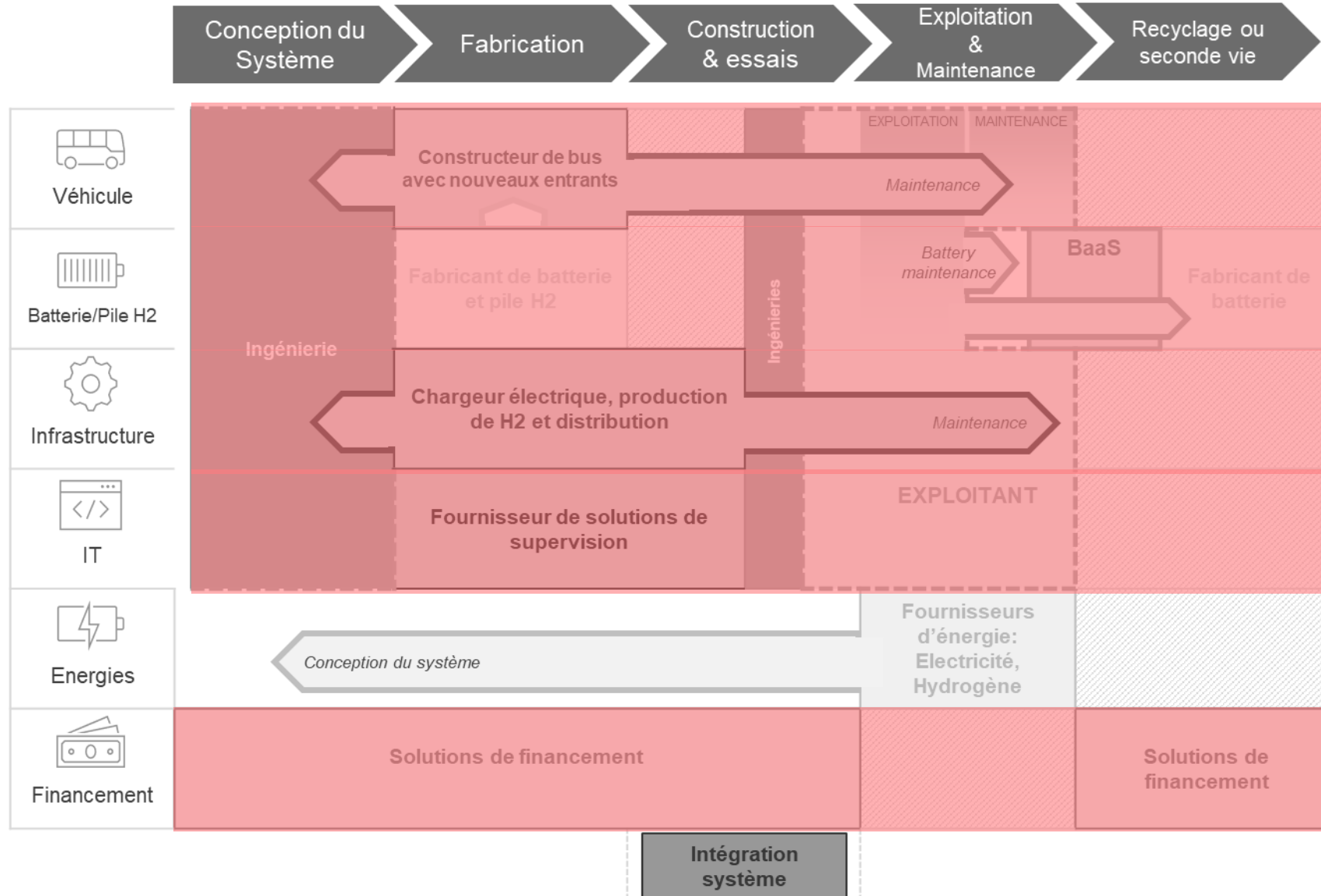
Source : Qizhao Huang, Dr. Qing Wang

# Weight chasing





# Value chain



# The PTA/PTO tandem

