



A dream team for the green dream
#LikeABosch

Bosch Energy Technology Innovation for Sustainable Development

10th German-Brazilian Dialogue on
Science, Research and Innovation
“Sustainable Energy Transition”

São Paulo, 16th of May 2023



Global perspective

Building a future towards a carbon neutral society



Our current challenges

Meeting climate targets and transcending to the future

Energy supply + Transition

Raw material shortage

Supply chains



Political crises

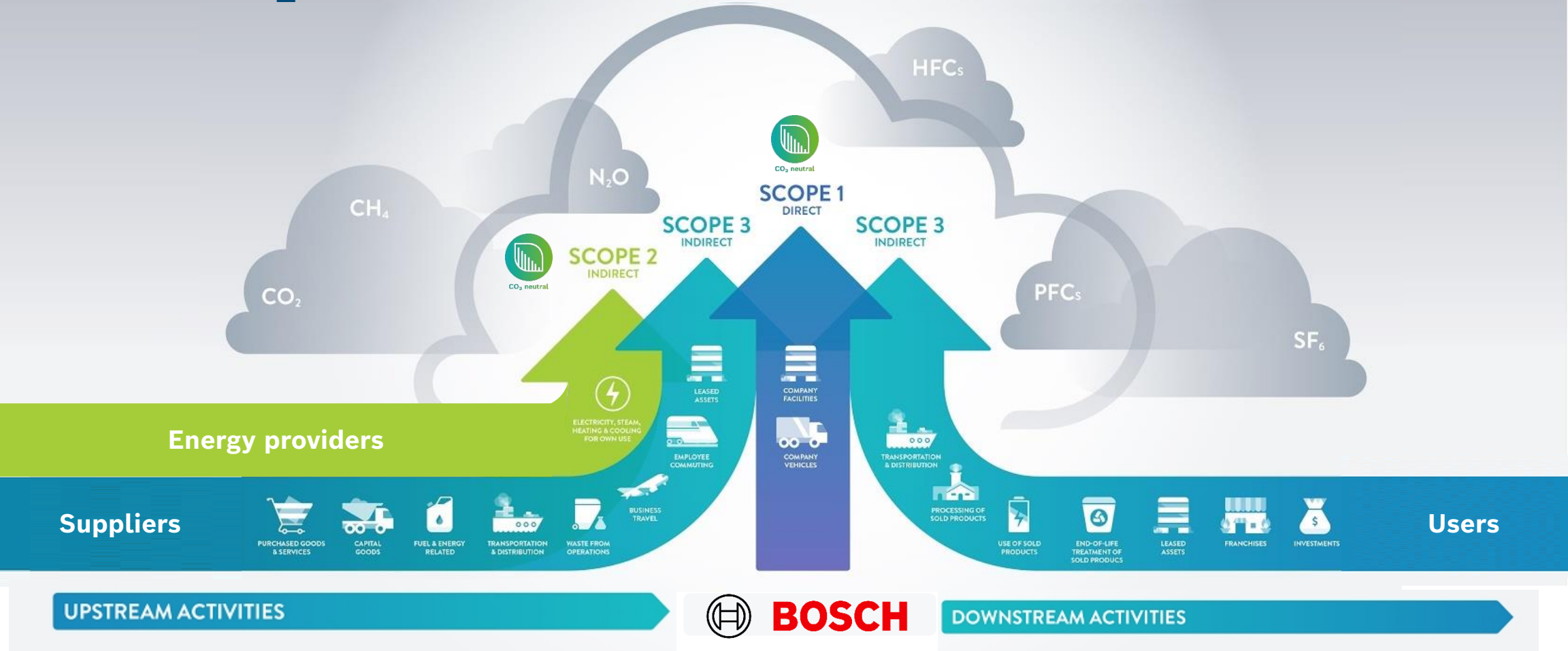
Economic development

Semiconductor industries

WORLD is CHANGING

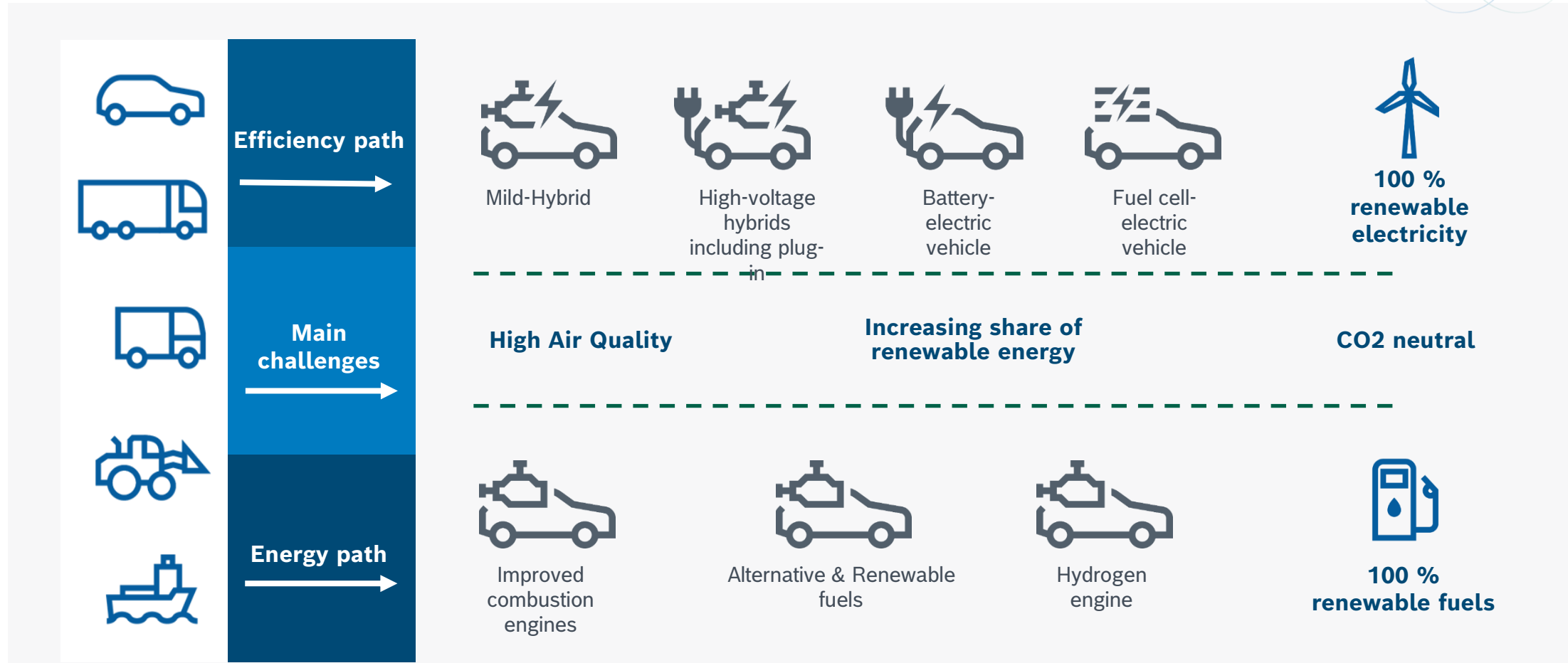
Sustainability & GHG Footprint Challenges

Bosch CO₂ neutral since 2020 | Scope 1 & 2



Technology neutrality in the mobility sector

Addressing different demands focusing on renewable energy



Social & economy electrification outlook

Governments tie auto industry stimulus packages to CO₂ neutral mobility

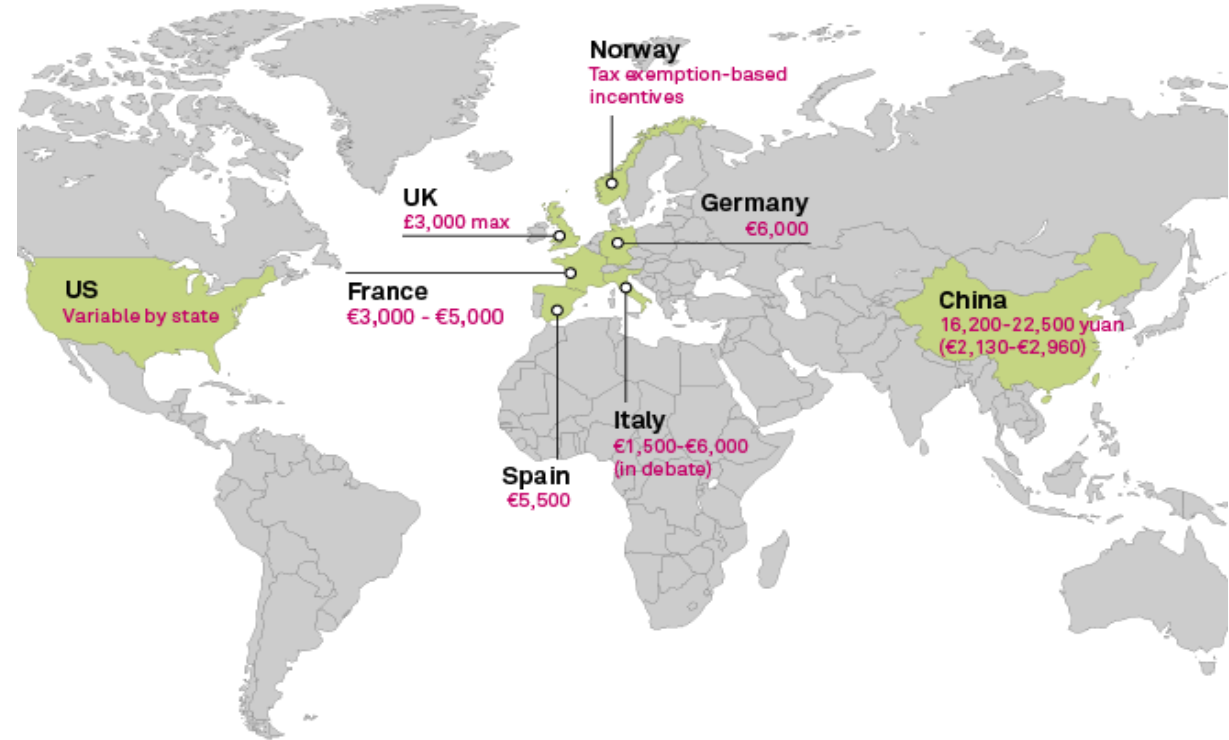
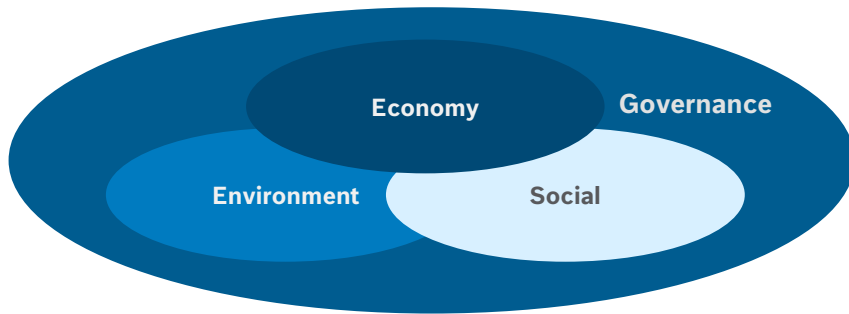


Subsidies governments offering toward the purchase of new

hybrid and electric cars



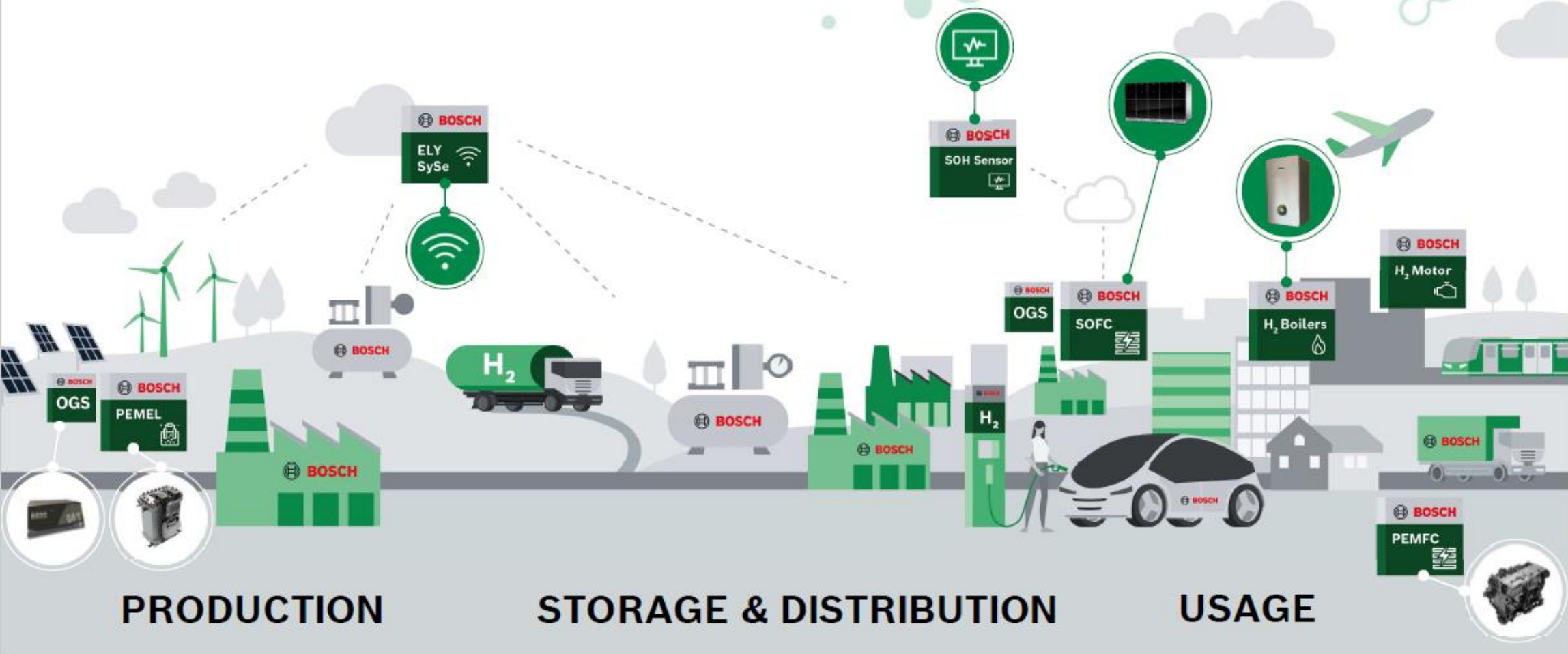
What is sustainability for Bosch?



Created June 15, 2020. | Credit: Zain Ullah
Sources: Governments; national automobile manufacturers associations; local media

Green H2 – one of the key levers for a carbon neutral society

Bosch and the hydrogen economy



Regional perspective

How to connect with our regional requirements, but continuously supporting global strategies



Ethanol & Flex Fuel

Importance of a regional DNA

ETHANOL

- **Energy security** for Brazil since the **late 1970s**
- Fuel choice **flexibility for the user**
- Lever for mobility **decarbonization**, incl. running fleet

In this presentation we will bring highlights of development and usage of **Flex Fuel systems**.



Fuel Supply
Module



Fuel
Injector



FlexStart
Fuel Rail



Engine
Control Unit



Flex Fuel
Software



Invented and developed in RBLA

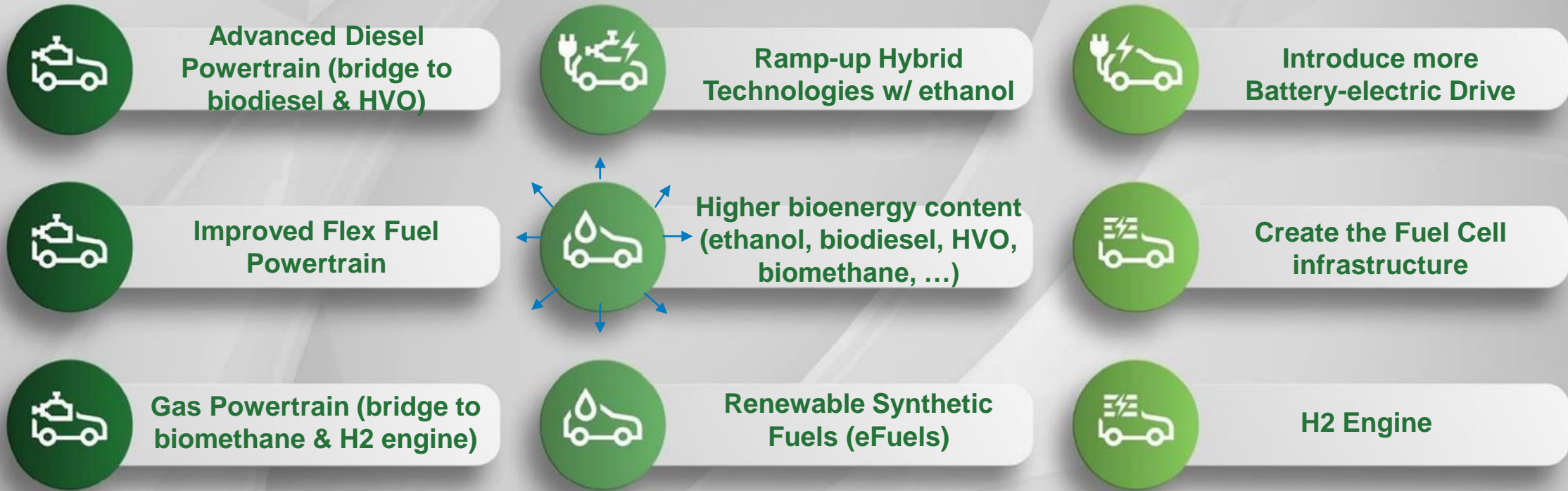


SAE Brazil/USA 1994:
1994-11-01
Flexible Ethanol Otto Engine
Management System 942400

In 2023 we celebrate
30 yrs. of **Concept car**
and **20 yrs.** of **Market introduction**

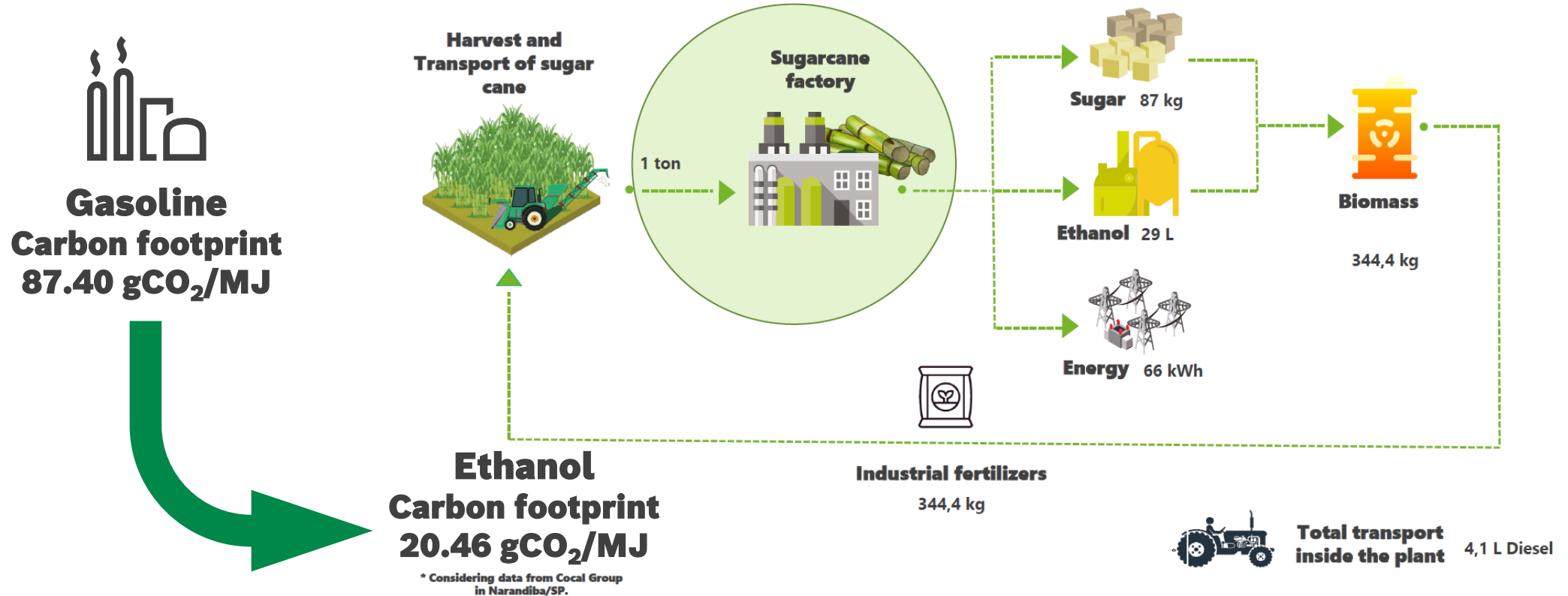
Technology mix for mobility

Our primary focus for innovation



The ethanol use case

Less than ¼ of gasoline (E27) footprint

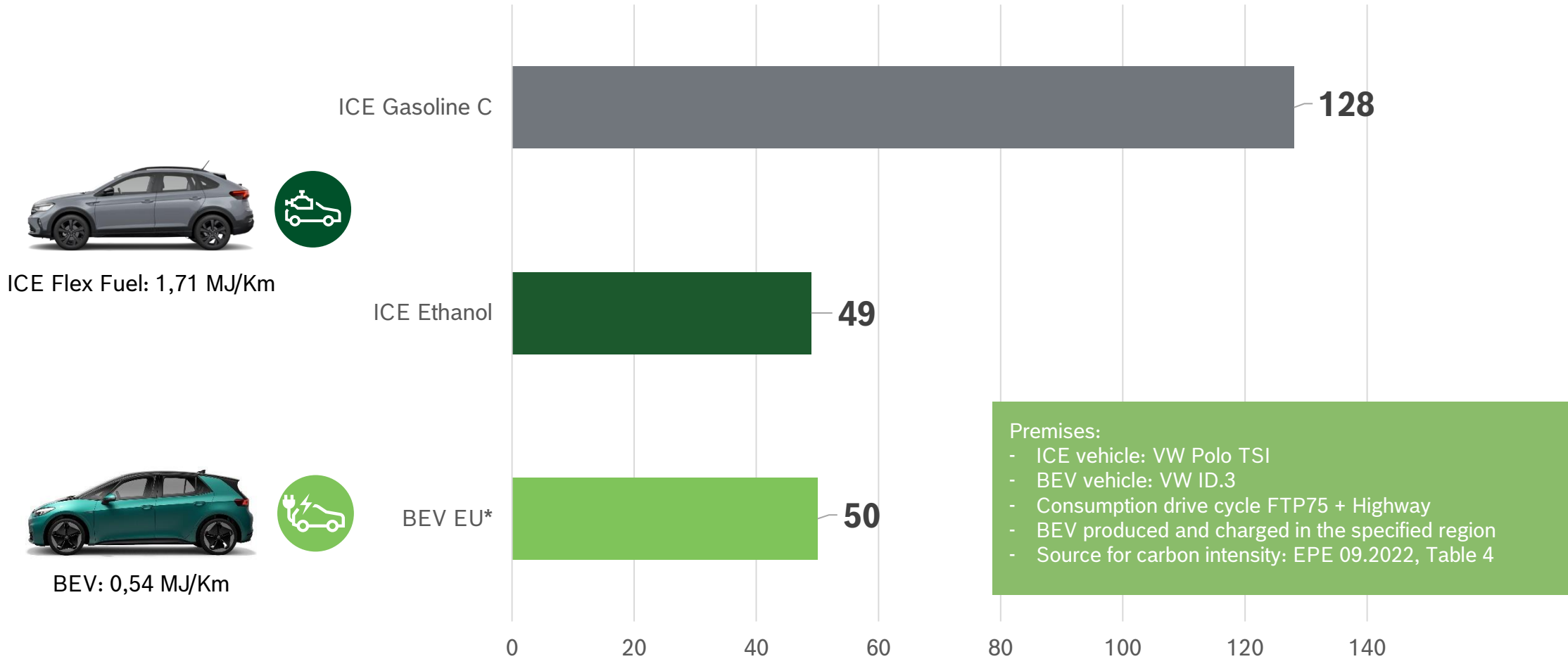


Footprint can be further reduced to **near to Zero** by adding Biogas Plant and Biofertilizers booster

Well-to-Wheel approach

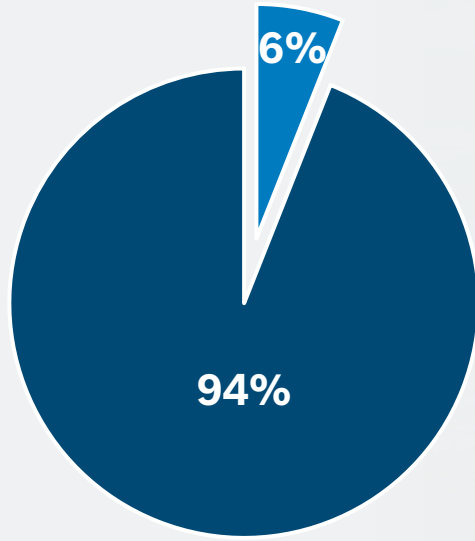
Different powertrain & energy sources

gCO₂eq/km




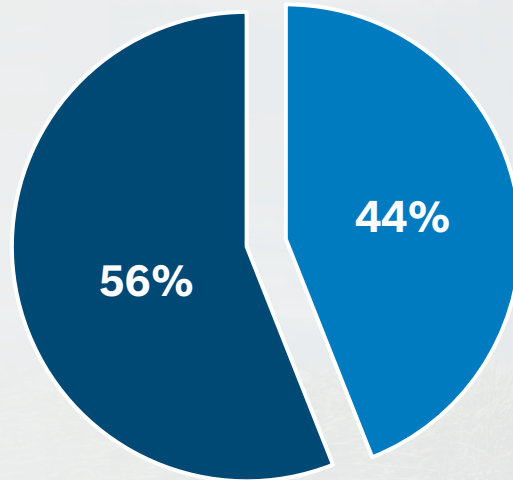
Biofuel path to decarbonization

Ethanol is not yet a 1st choice in Brazil




WORLD

 Ethanol



BRAZIL

 Gasoline



Mobility Digital Transformation

Our adjacent innovation focus – CO₂ Tracking (scope 3)



Fuel Carbon Intensity

[gCO₂e/MJ]



Gasoline
(75,07*)



Ethanol
(28,52*)



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*Source: EPE Sept 2022, ref 2020



Real Drive ethanol
usage monitoring



Motivates
Ethanol usage



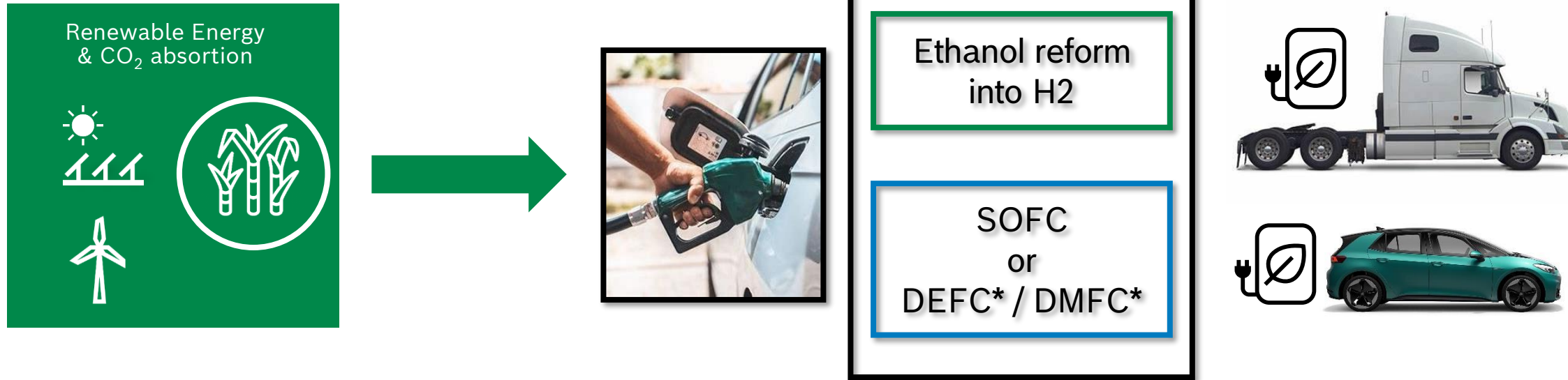
Supports
CO₂ neutrality



BOSCH

Our regional focus in the long term future

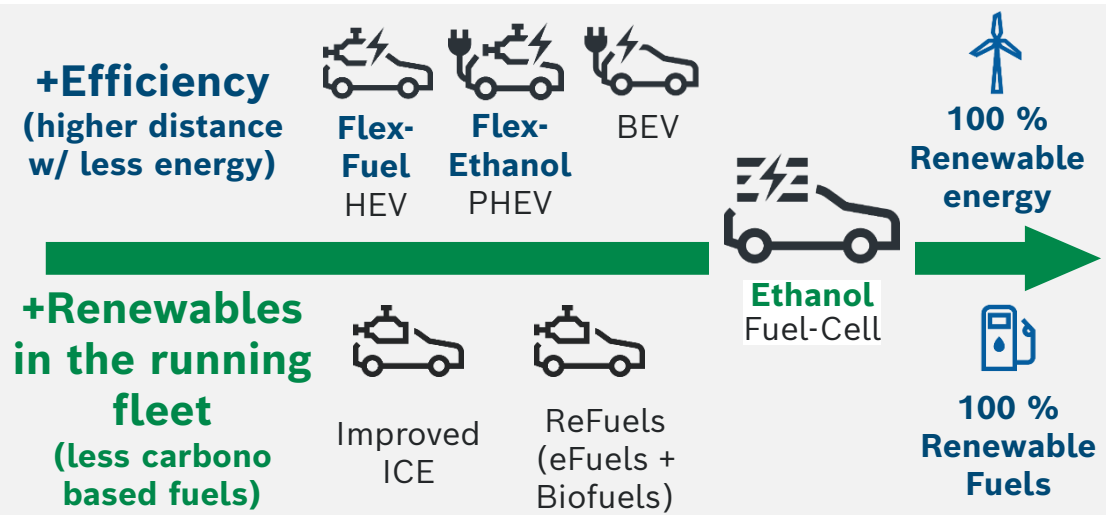
Best of both worlds



Combining the bioenergy + high efficiency powertrain + less storage issues + infrastructure available

Bioelectrification motivation

Potential for Brazil and other markets



The local pollutant emissions challenges are in place and will be tighter



Until when the E/E architectures from an ICE will be kept attractive?



- ✓ **Countries should collaborate towards a common CO₂ target, based on existent opportunities**
- ✓ **There is no “golden” solution – the best alternatives depend on each segment needs and must be based on the renewable energy available**
- ✓ **Bosch supports the powertrain mix with dedicated solutions, exploring connected, automated and electrified innovations**



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Thank you!



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