

The future of mobility

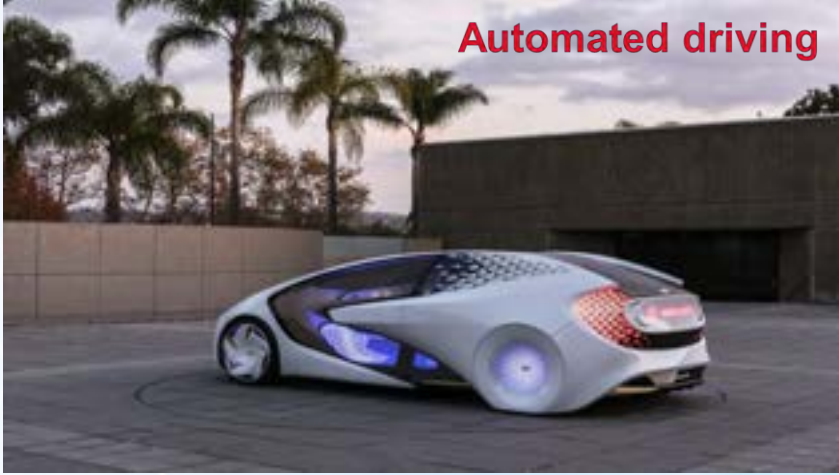
The 10th IEA-IEF-OPEC Symposium on Energy Outlooks
Riyadh, February 19th, 2020

Dr. Stephan Herbst
Technical General Manager
Toyota Motor Europe

The mobility system is changing rapidly

This is a once in a lifetime challenge

Automated driving



Connectivity



Shared mobility



Electrification



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90% CO₂ reduction*

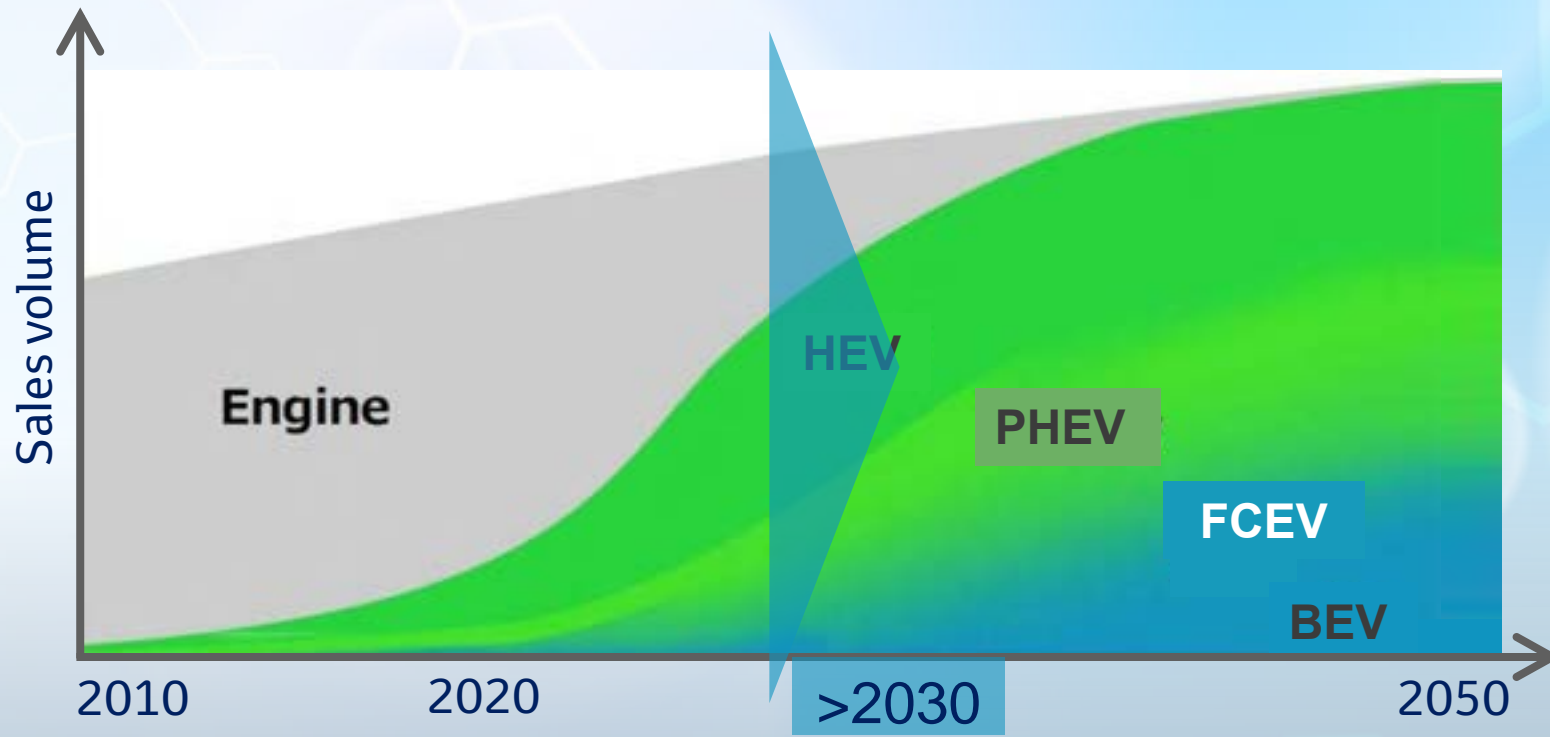


*90% reduction of new vehicle CO₂ / KM emissions by 2050 compared to 2010

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Electrification will dramatically increase early 2020

Mix of powertrains required to achieve 90% CO2 reduction



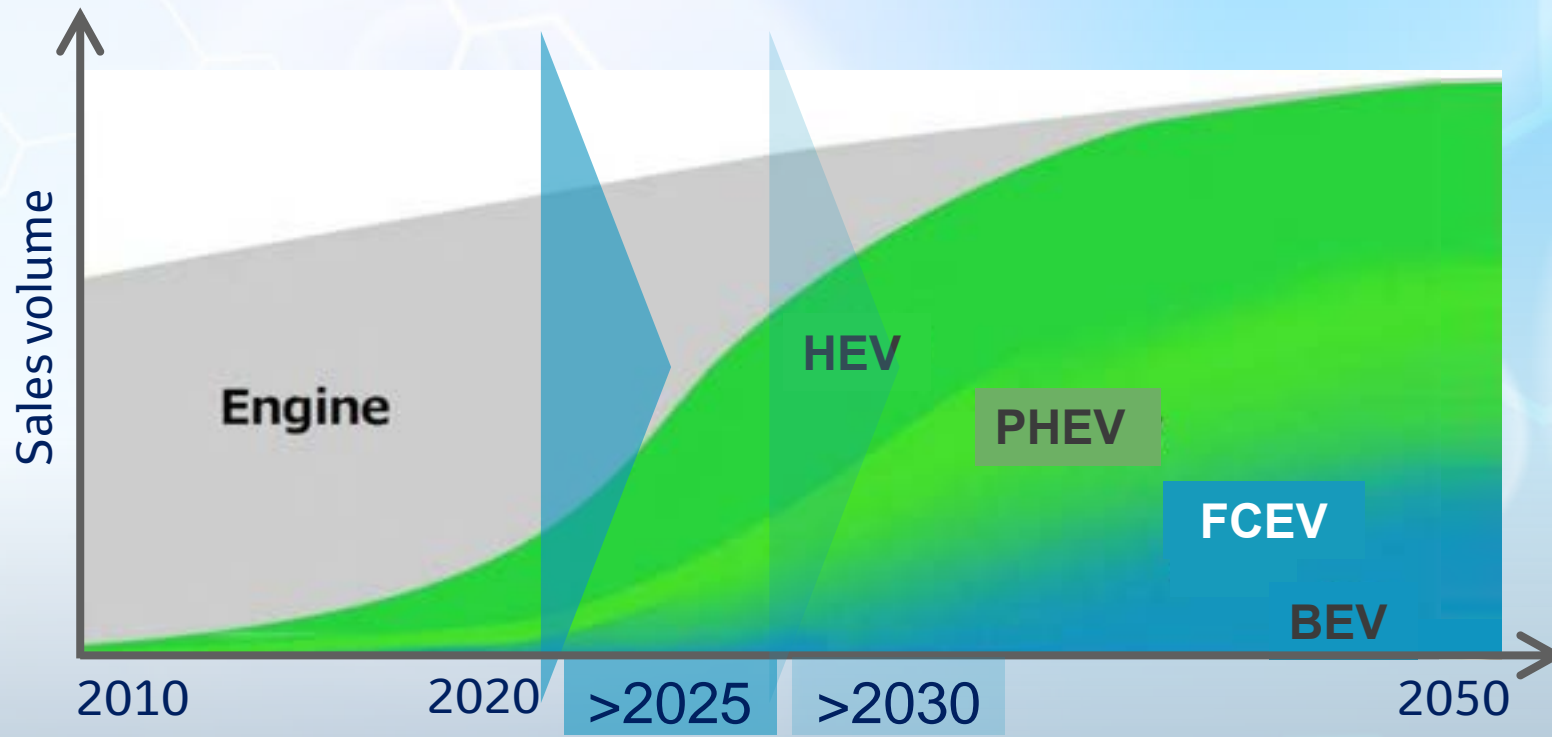
2030 Sales target
>5,5 million
electrified vehicles,
including 1 million ZEVs
(BEVs, FCEVs)



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Electrification will dramatically increase early 2020

Mix of powertrains required to achieve 90% CO2 reduction

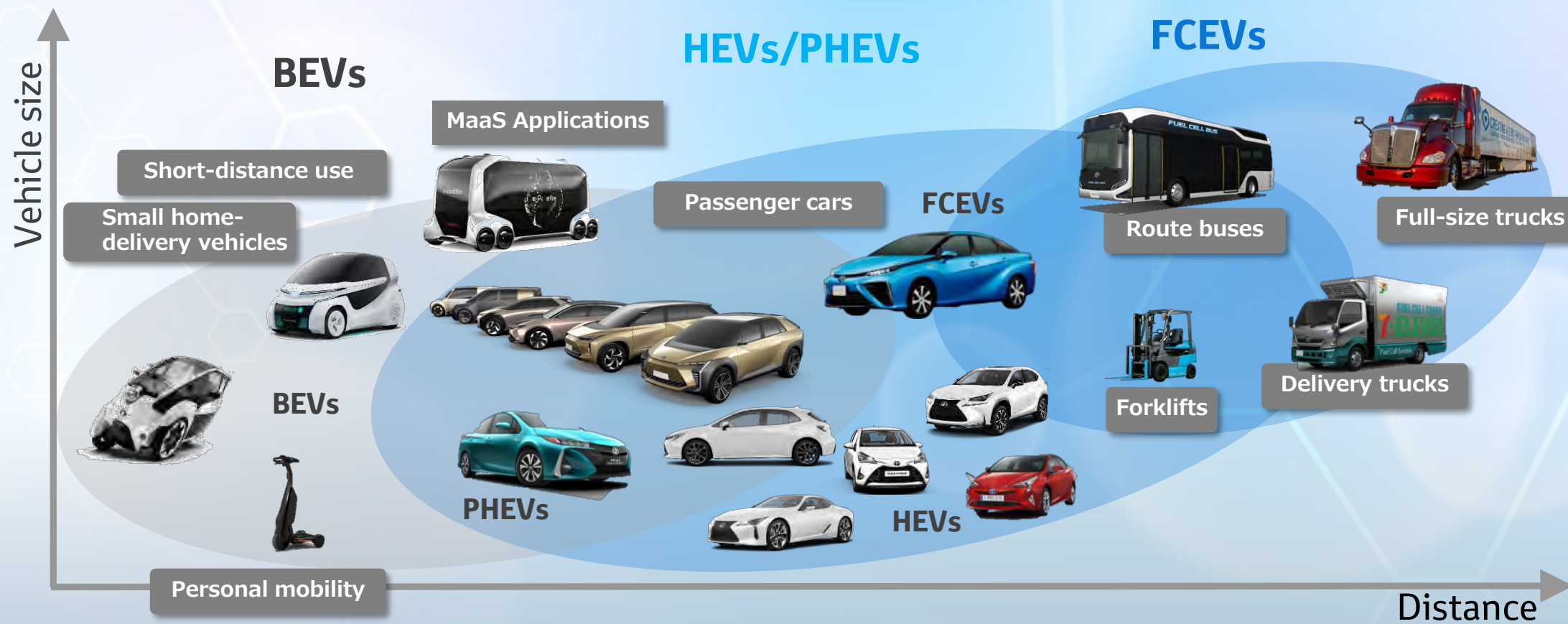


2025 Sales target
>5,5 million
electrified vehicles,



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Diversification of HEV, PEHV, BEV, and FCEV



More than 20 years of Hybrid EVs leadership



Kyoto Protocol



Prius concept @ 1995 Tokyo Motor Show

~15 1997

Million Hybrid EVs
sold since 1997

>36 >90

Hybrid EV models

Countries & Regions

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HEV: In Zero Emission

Rome Study Results with 4th Generation Toyota Prius HEV

37km in sub-urban and urban traffic

Average trip duration 95min

60 trips (AM, midday, PM)

20drivers (M/F, <35y/>35y,
HEV experience Y/N)

Urban drive in zero emissions
mode

79.4% TIME

76.3% DISTANCE

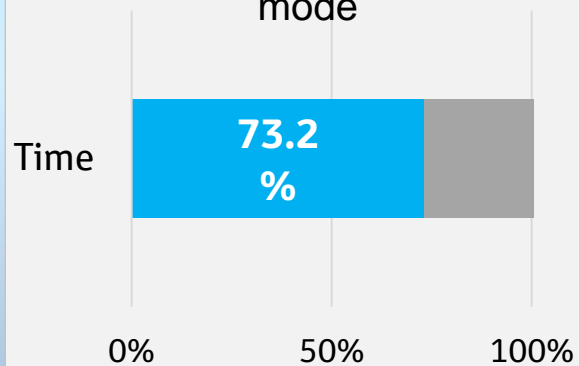
Total journey - drive in
zero emissions mode

73.2% TIME

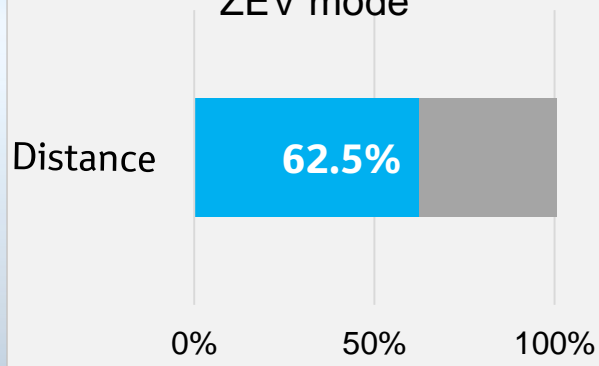
62.5% DISTANCE

ENEA

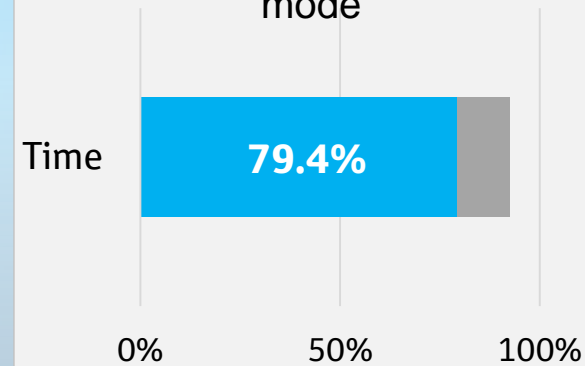
Total journey **time** in ZEV
mode



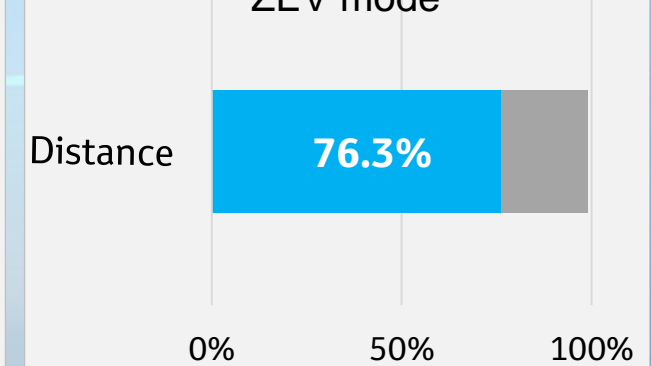
Total journey **distance** in
ZEV mode



Urban area **time** in ZEV
mode



Urban area **distance** in
ZEV mode



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Main zero-emission vehicles

〈Including development concept, driving demonstrations, and system provision〉

← Passenger vehicles →



FCEVs

Commercial vehicles



Lunar Rover



MaaS



BEVs



← Walking area →



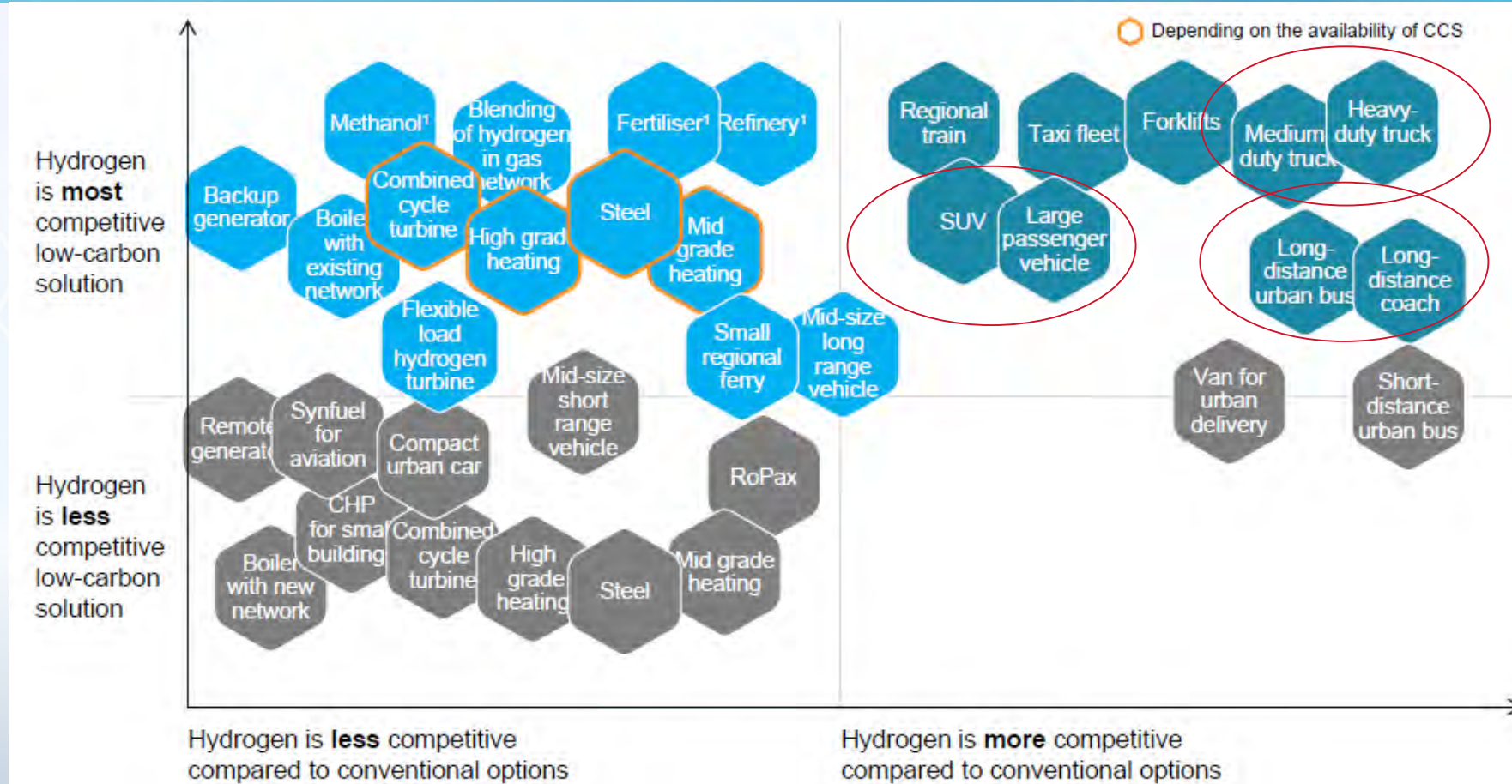
Ultra-compact



Compact and midsize

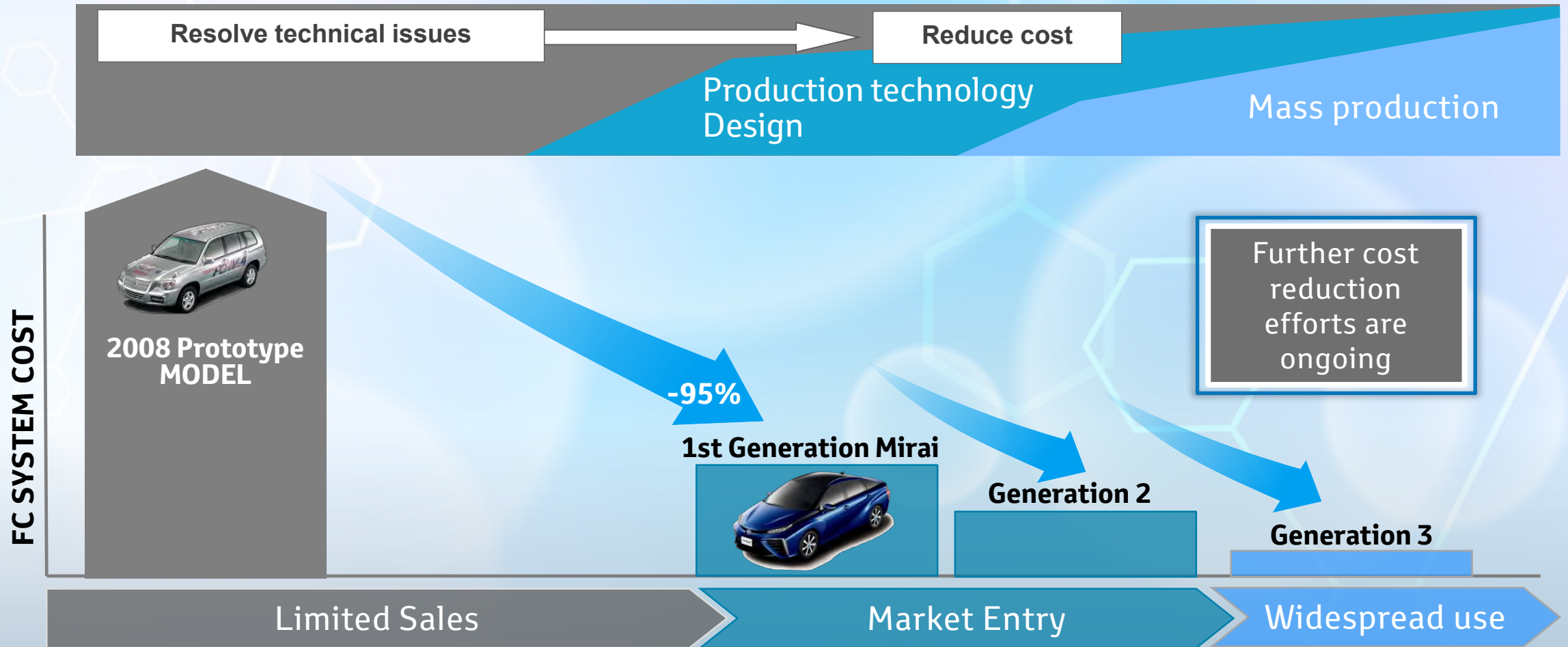


Hydrogen a cost competitive option by 2030



1. Hydrogen is the only alternative and low-carbon/renewable hydrogen competing with grey (optimal renewable or low-carbon shown)

FC system: further cost reduction



MIRAI: first mass-production Fuel Cell sedan

>9500
sold
globally

>600
sold in
EU



Launch in
Japan

2014

Launch in
US and
Europe

2015

2,000
Mirai/year

2016

3,000
Mirai/year

2017

30,000
FC stacks
/year

2020+

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FCEV growth through diversification

Passenger Vehicles



Performance improvement
and cost reduction

FC technologies



Increase
demand



Contribution to
infrastructure development

Commercial Vehicles



Substantial hydrogen
consumption

Industrial use



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CaetanoBus is first FC system customer in Europe



CAETANO BUS
GRUPO SALVADOR CAETANO

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Small Trucks & Stationary fuel cells in Japan



Zero Emission Truck prototype in US



Feasibility Study: Toyota Project Portal Hydrogen Fuel Cell Truck

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And we're even going to the moon



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Energy Observer



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Cost of H2 production & distribution is critical success factor esp. for heavy-duty

Cost breakdown of hydrogen applications
Percentage of total cost 2020

**Cost drop
2020-30,
Percent**

Heavy-duty
trucks

-50%

Large
passenger
vehicle

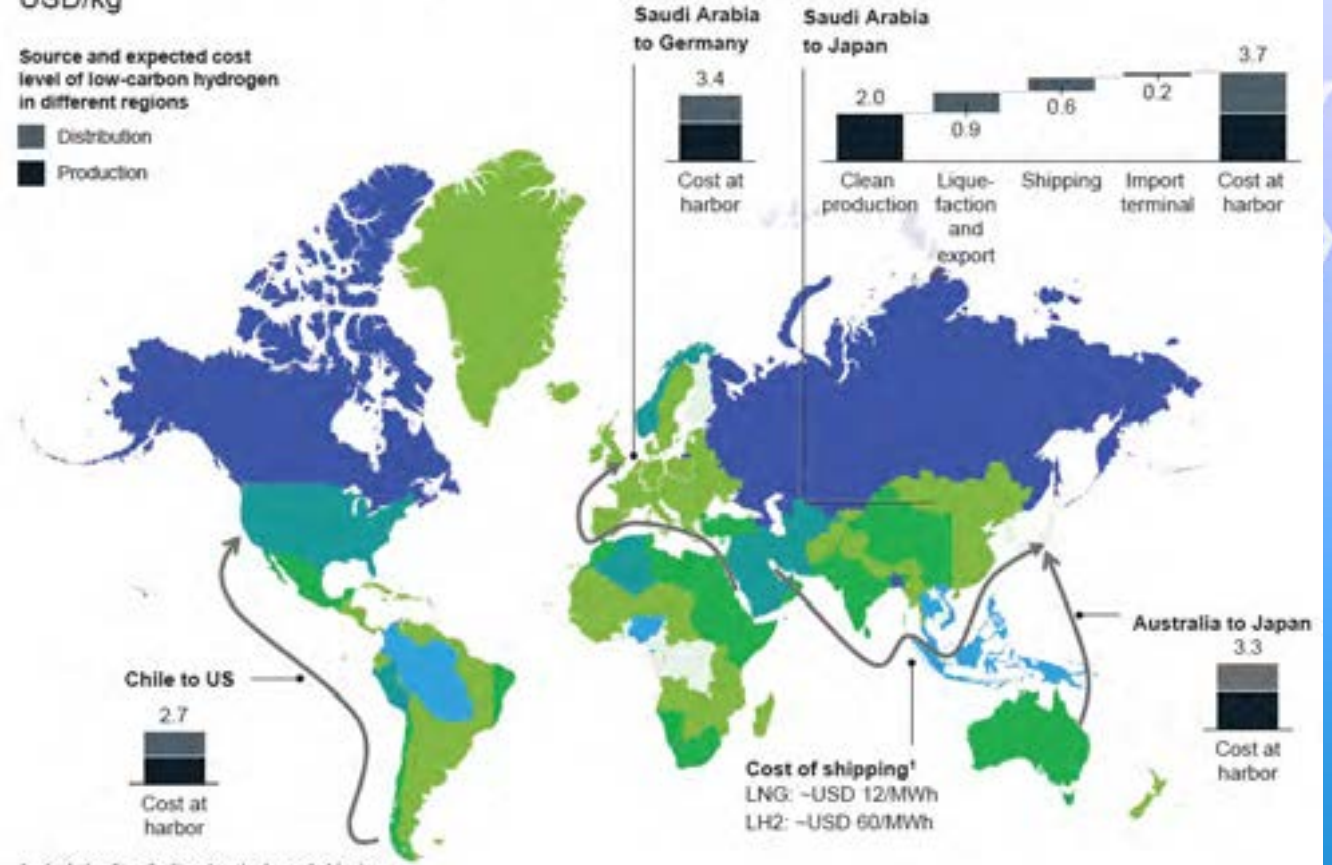
-45%

■ Hydrogen production¹ ■ Equipment capex
■ Hydrogen distribution ■ Other opex

Cost of shipping liquid hydrogen across regions, 2030
USD/kg

Source and expected cost
level of low-carbon hydrogen
in different regions

■ Distribution
■ Production



1. Includes liquefaction, terminals, and shipping
SOURCE: McKinsey Energy Insights

80 year's of Toyota history

From looms to mobility for all

Looms



Cars



Mobility for all



**MOBILITY
TEAMMATE
CONCEPT**
Automated Driving Tech.



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