H_2: Our path to a sustainable society

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Background of the Challenge

Increase in global resource consumption

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Toyota 2050 challenge

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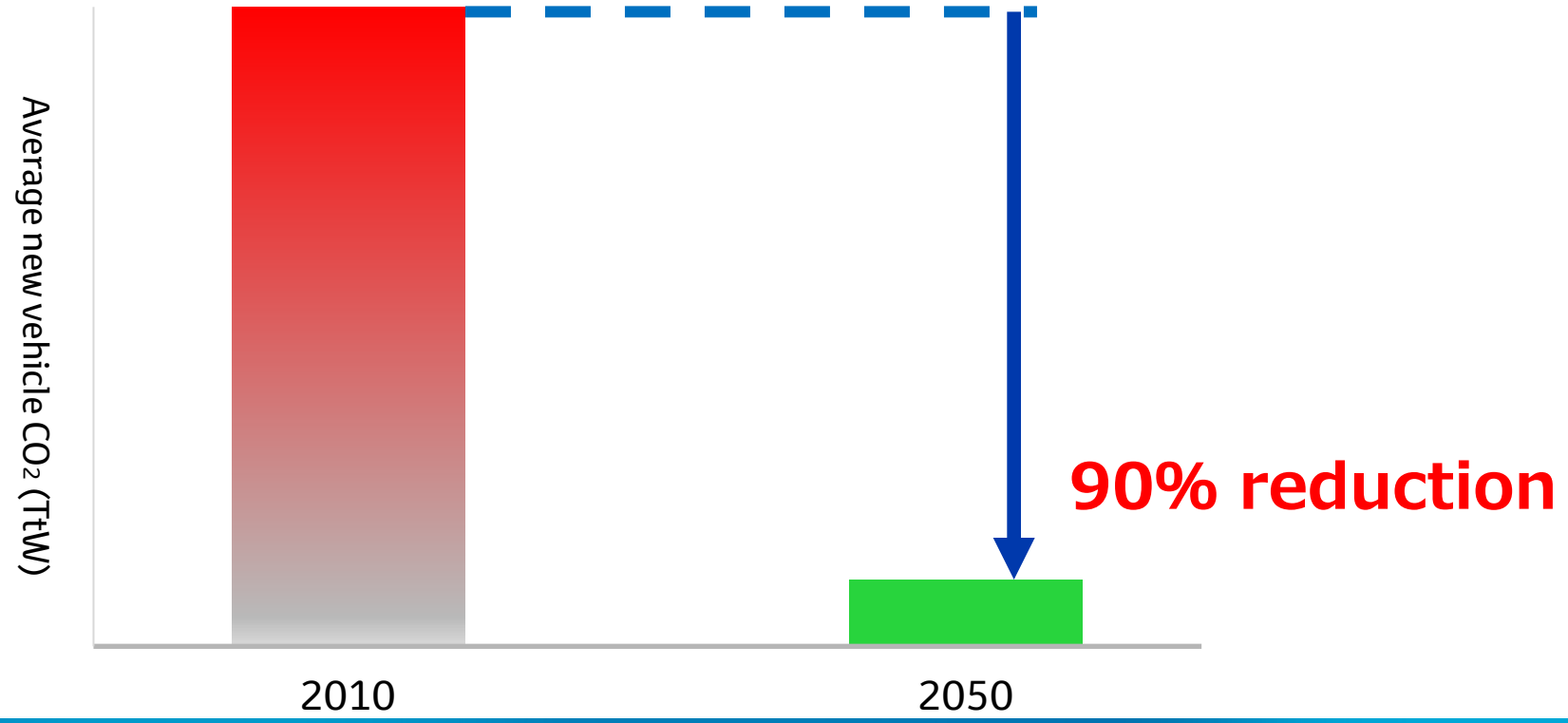
Toyota Challenge : New Vehicle Zero CO2 Emissions Challenge



90% reduction of new vehicle CO_2 / KM emissions by 2050 compared to 2010

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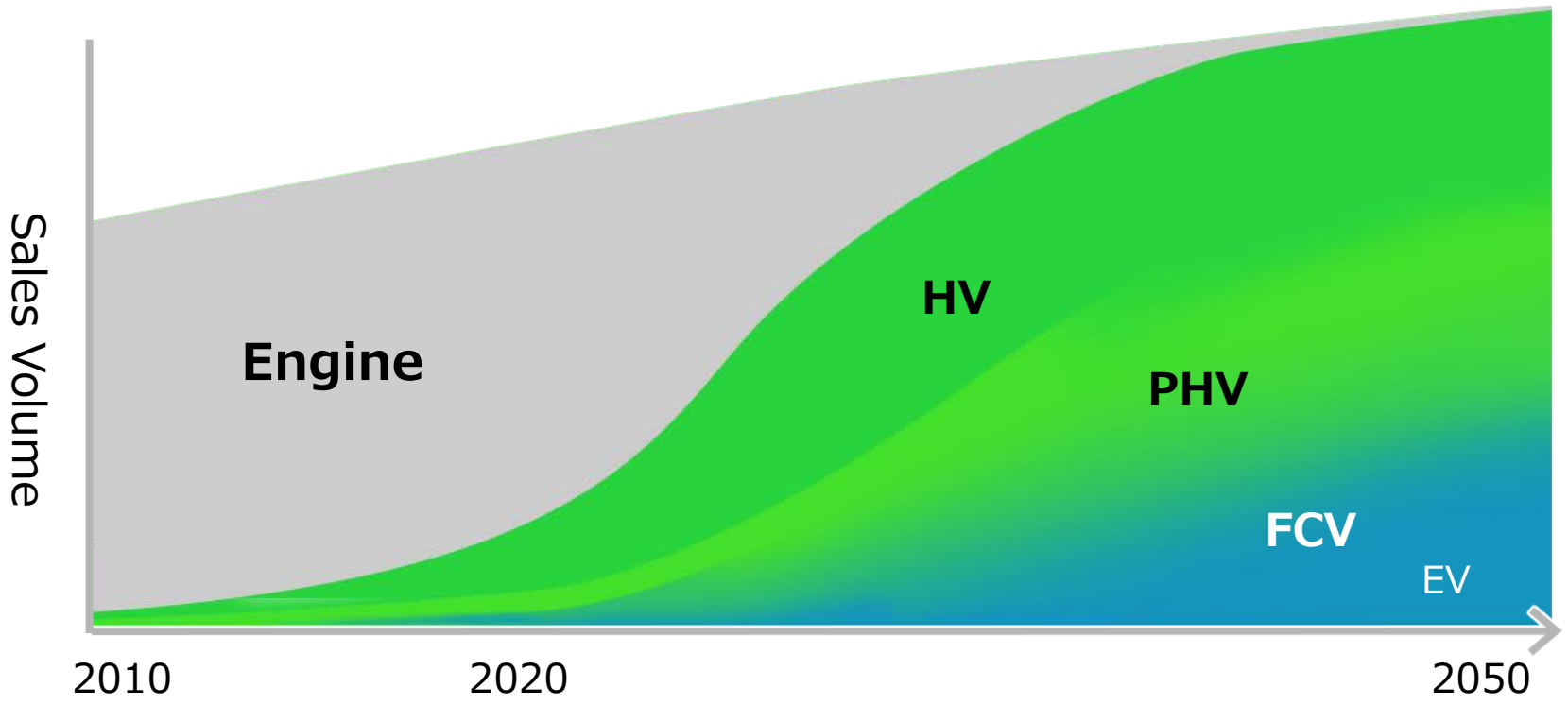
Development of Next Generation Vehicles



Next generation vehicles to accelerate technological development to follow market expansion of HV

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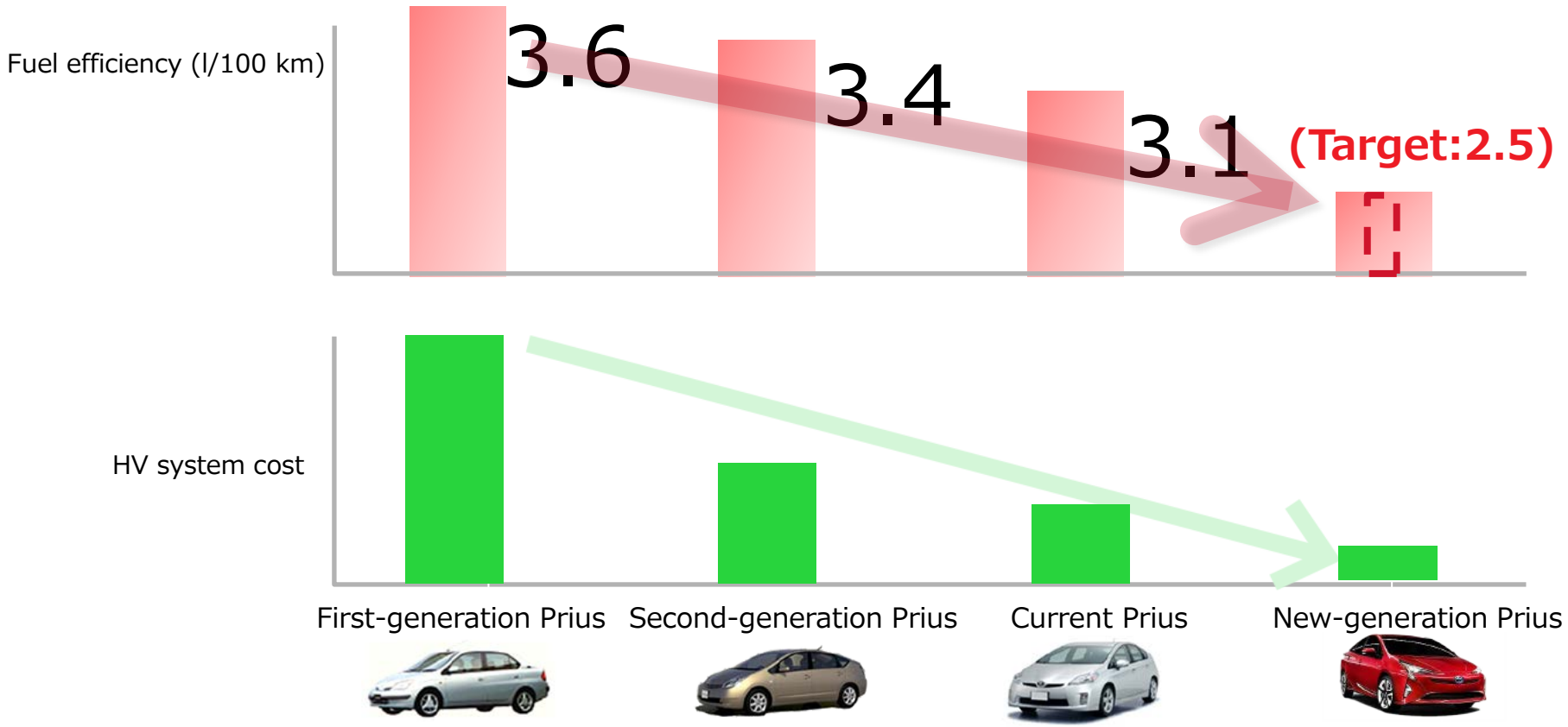
Hybrid Technology Evolution



Hybrid Vehicles technology significantly evolved in fuel efficiency with reduced cost

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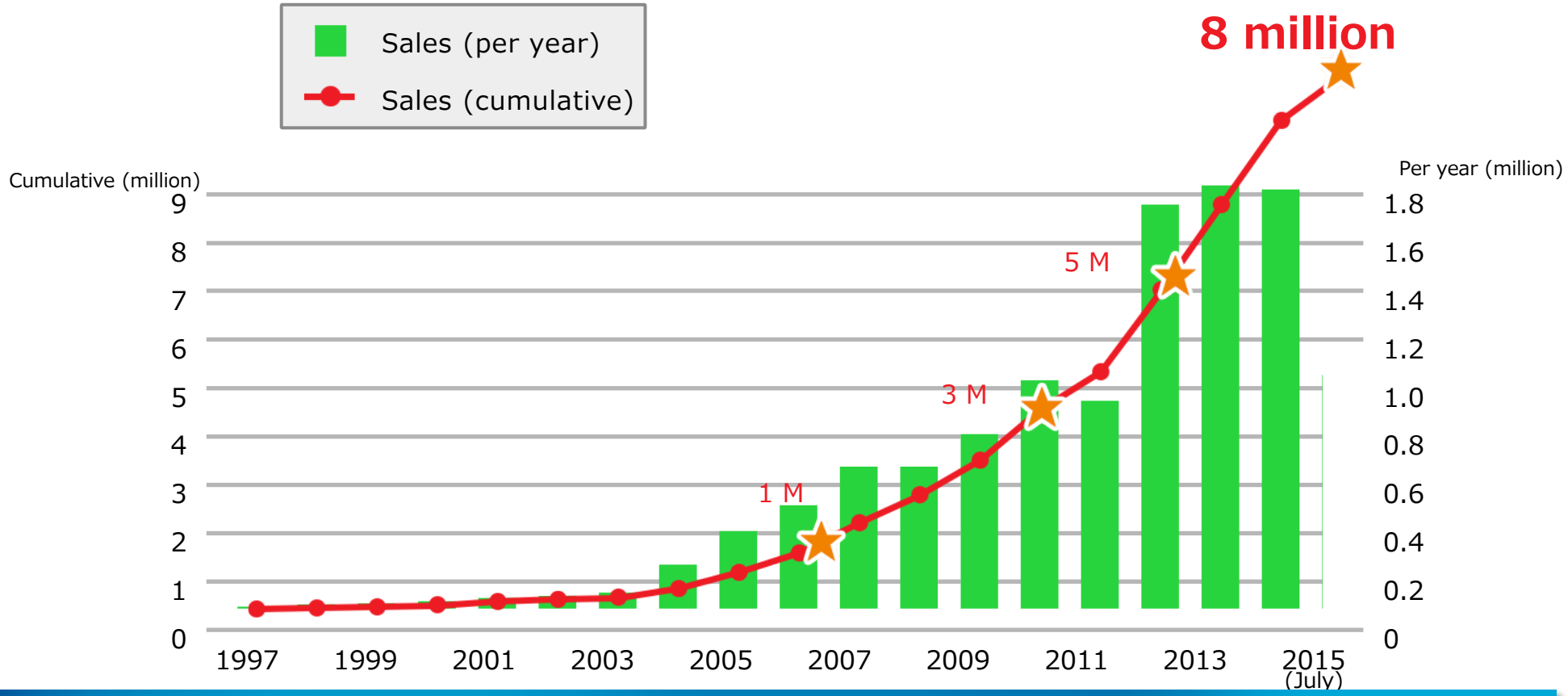
HV sales



More than 8 million HVs
in world wide cumulative sales in 2015

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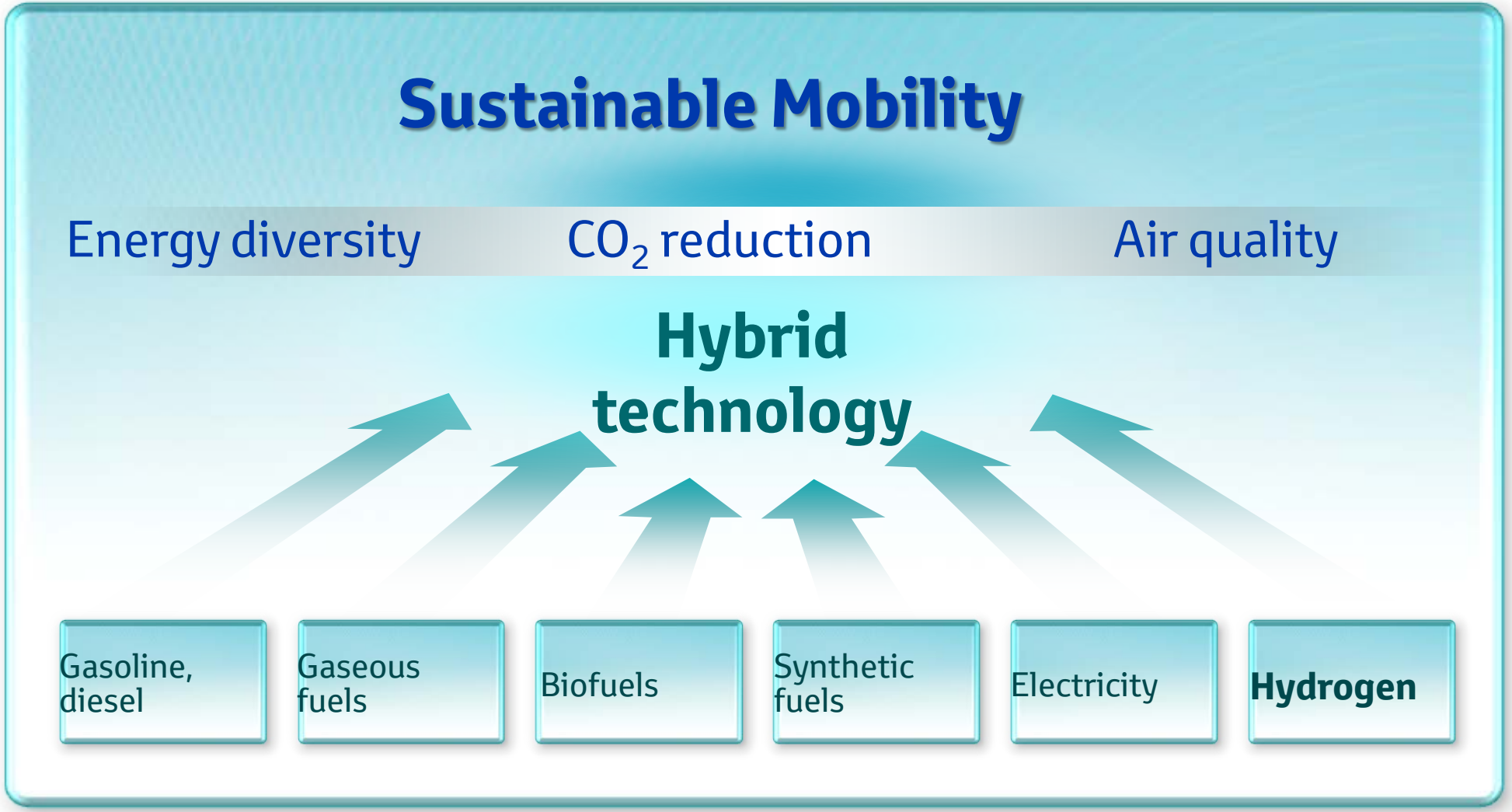
Hybrid is Central



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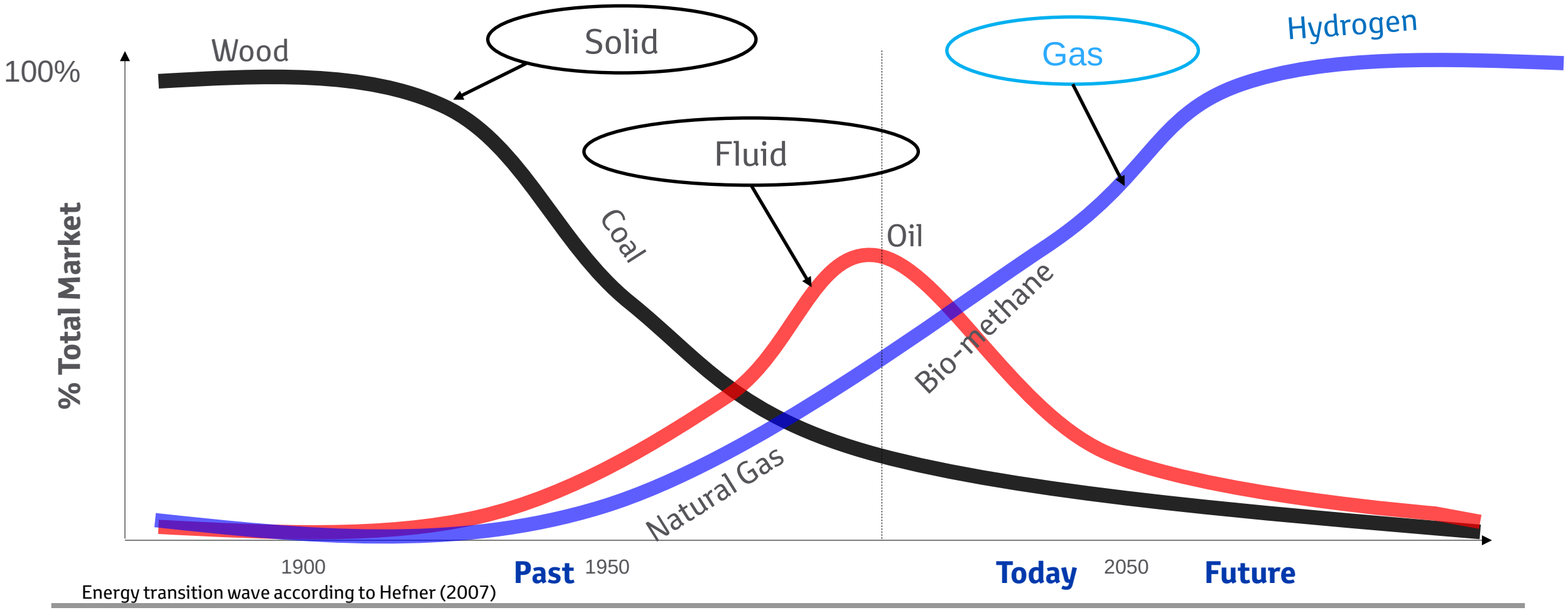
Renewable Gases : An Energy Transition



Energy transition wave according to Hefner (2007)

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Advantages of FCV

Energy diversity

- Hydrogen sourced from a wide variety of primary energy

Zero emissions

- Zero tailpipe CO_2

Fun to drive

- Electric motor enables smooth, quiet driving
- Excellent acceleration at start to low/mid speed

Usage

- Range (gasoline equivalent
- Refueling (about 3 minutes)

Power supply

- High capacity

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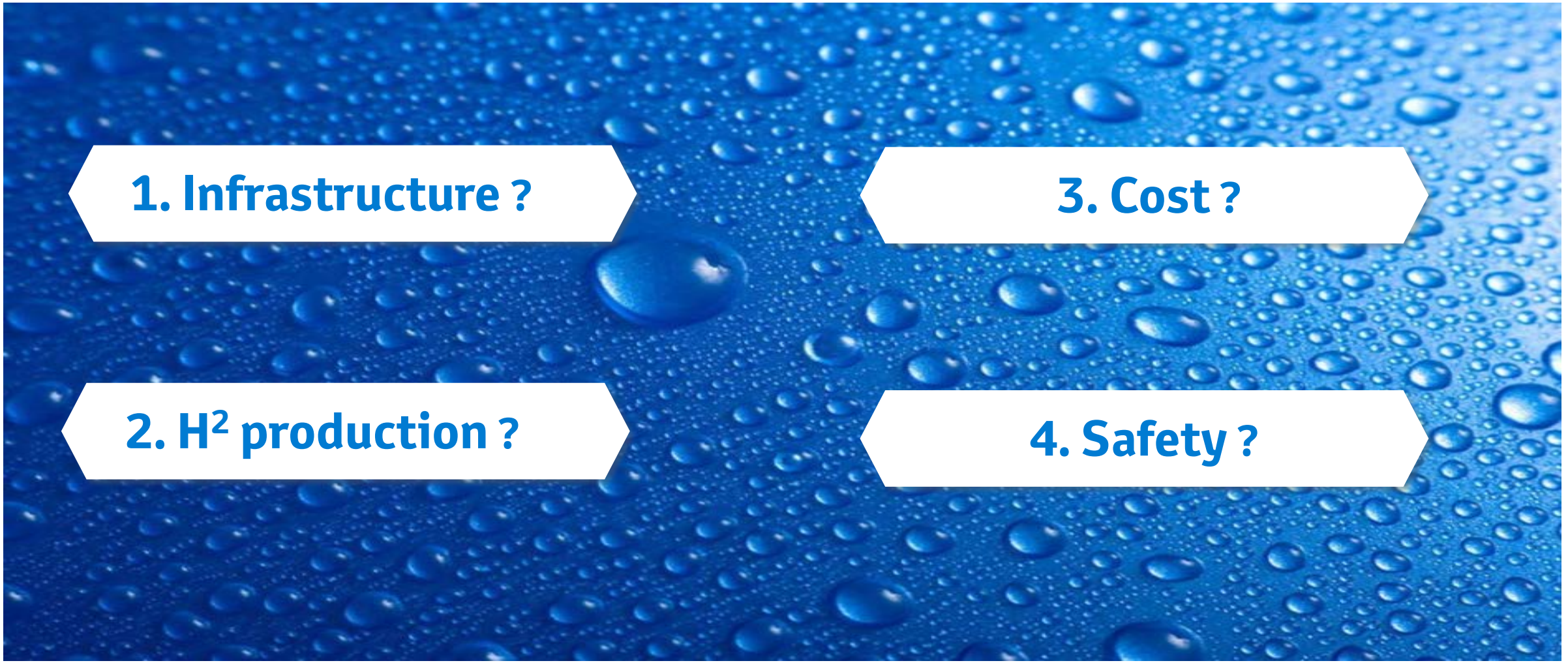
Frequently Asked Questions



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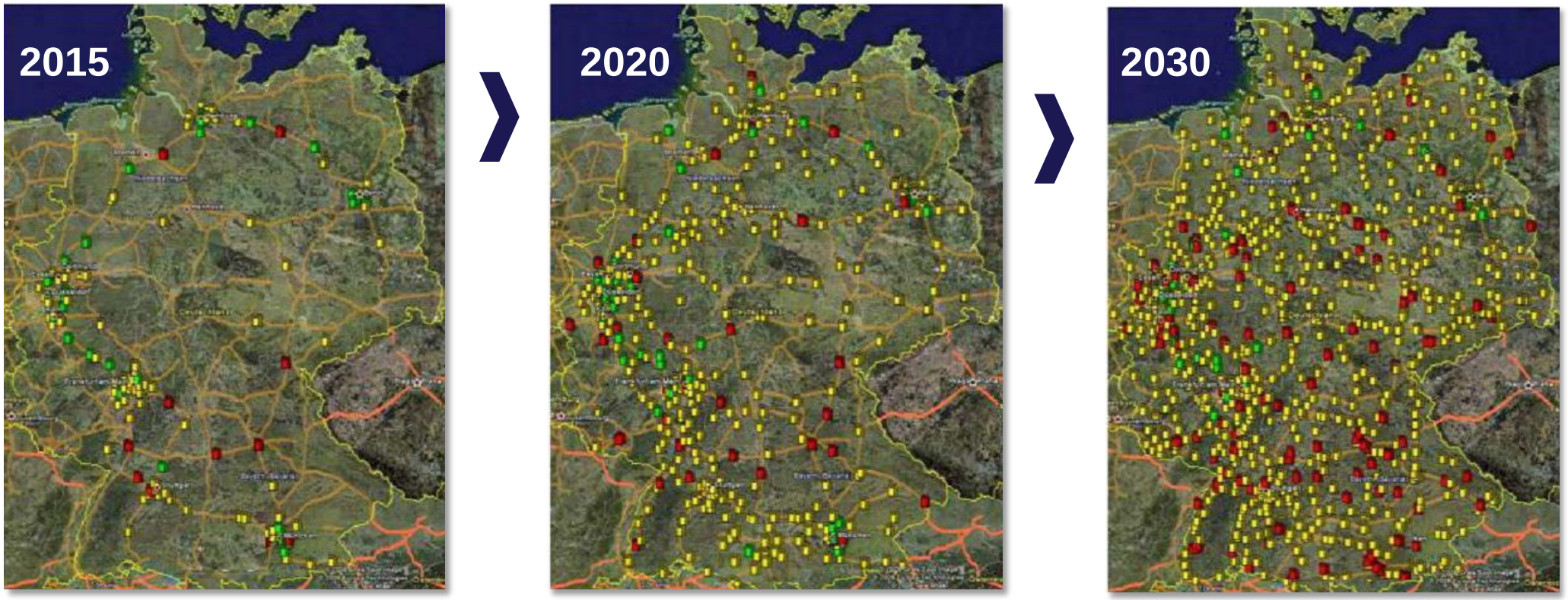
1. Clean Energy Partnership ⟨Germany⟩

- Initiative gathering the German government and industrial companies and focusing on technology
- 400 hydrogen refuelling stations by 2023, distributed all over the country



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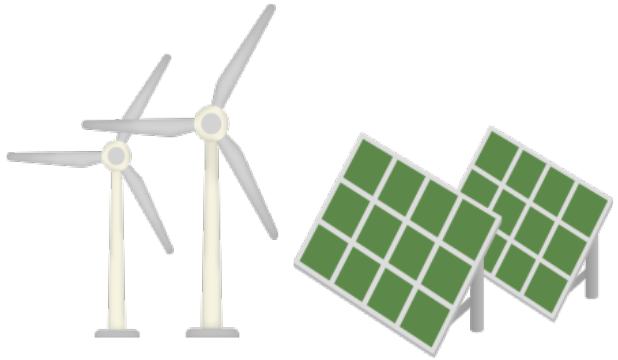
2. H_2 Production ?

Renewable energy use

Direct use of solar power generation
and wind-power generation



Renewable energy

electricity

Hydrogen energy use

Power generation from CO2-free hydrogen
Use of liquid hydrogen evaporation heat air conditioning
Use hydrogen combustion in the production process

CO_2-free hydrogen

Liquid hydrogen tank

Cold heat & combustion

electricity

Hydrogen power generation etc.

Filling

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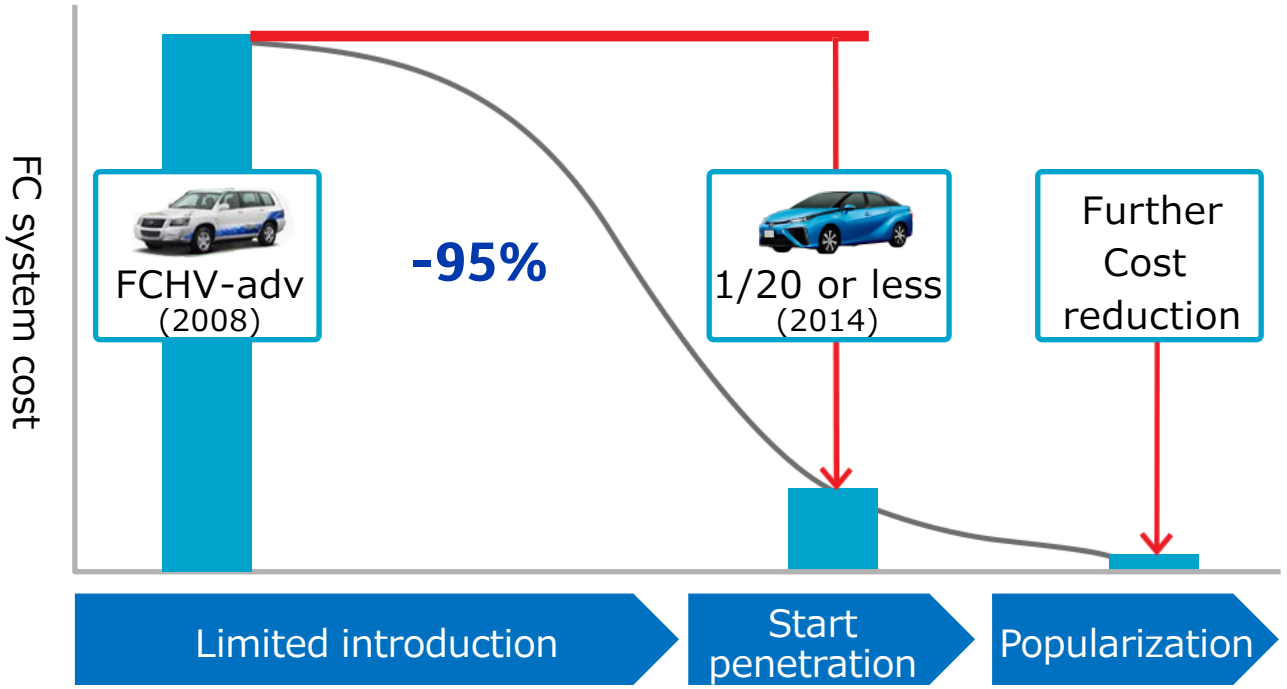
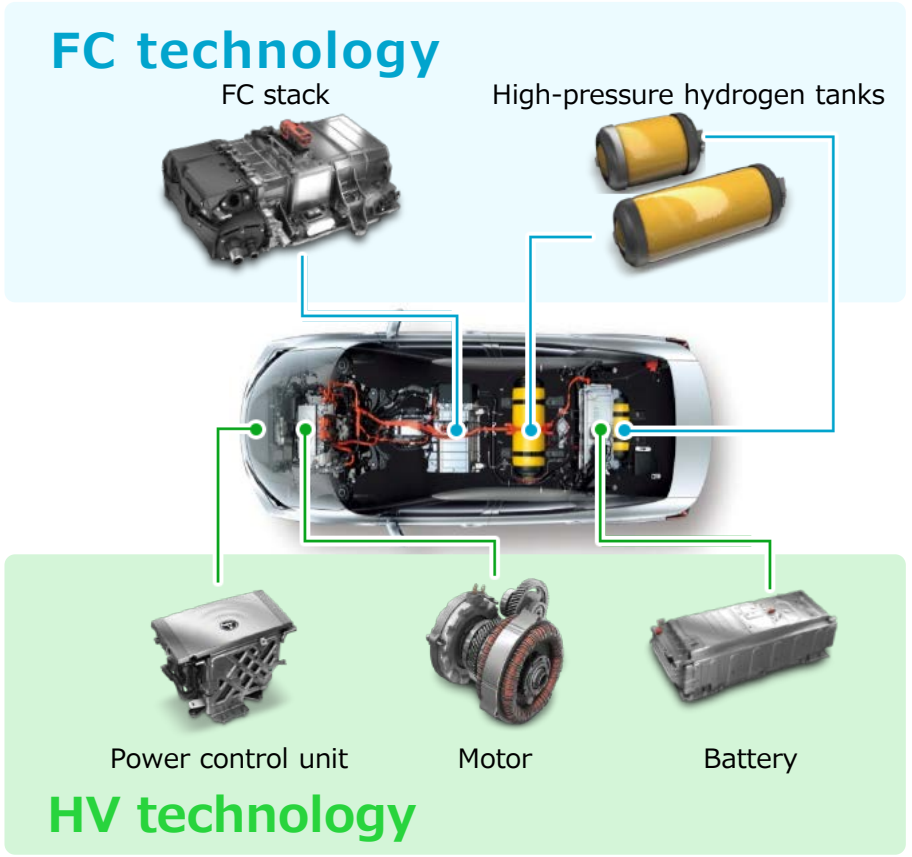
3. Cost ?





Apply HV technology to accelerate cost reduction

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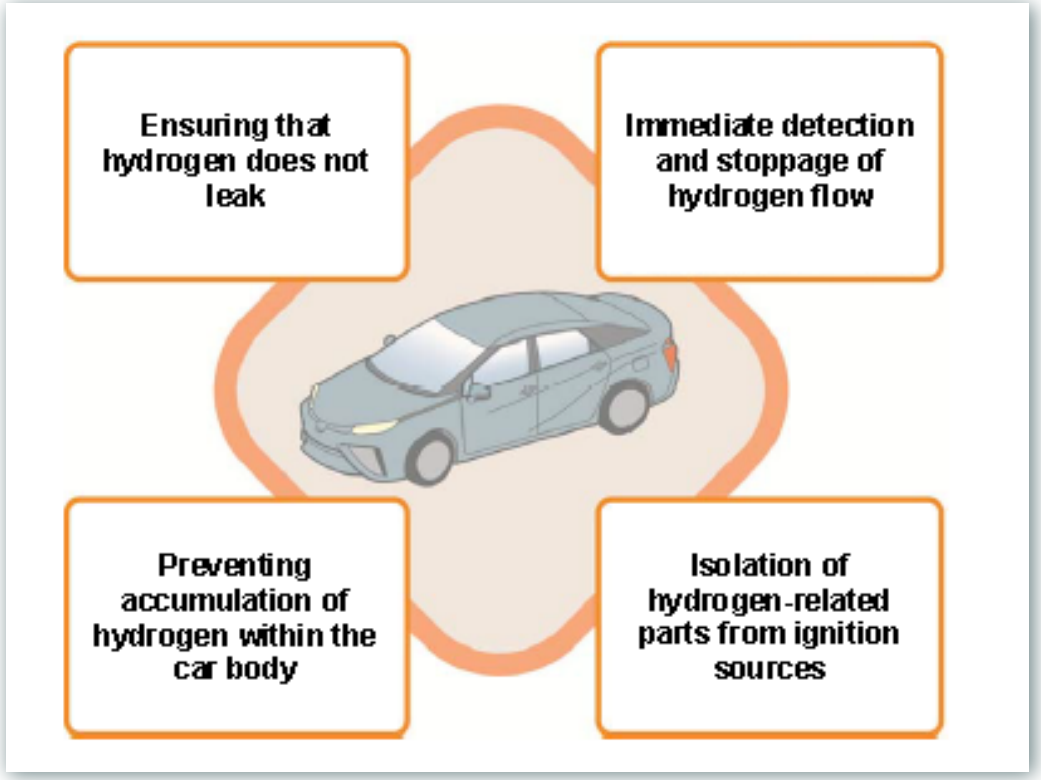
4. Safety ?

A 4-fold comprehensive strategy to handle Hydrogen safely in any scenario

- No Hydrogen permeation
- Robust Carbon-fiber body
- Certification to stringent regulations
- Collision-safe body

- All hydrogen-related parts (FC stack, hydrogen pipes, tanks located outside of the cabin.



- Hydrogen detectors located in strategic spots
- If necessary, the valve on the tank is closed to automatically shut off the fuel line.

Source: Toyota's Safety Guidance manual 2015.

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Fuel Cell Vehicles Sales Plan @2020 and later

Global : More than 30,000/year

Japan : Approx. 1,000/month

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Importance of Other Brands : FCV market Penetration Initiatives

About 5,680 FCV related Toyota patent

Item	Number of patents to be free	Free use period
FC stack	Approx. 1,970	Until the end of 2020
High-pressure hydrogen tanks	Approx. 290	
FC system control	Approx. 3,350	
Hydrogen station	Approx. 70	No expiration

Announcement at CES on January 6
by TMS SVP Bob Carter

Toyota share all patents for free to accelerate the spread of FCV

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Other Applications : Various Approches of Toyota Group

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FCV

HINO
FC bus

Toyota Auto Loom
folk lift

Aisin Seiki
Household fuel cell system

Not only FCV but also Toyota group activities to promote hydrogen use

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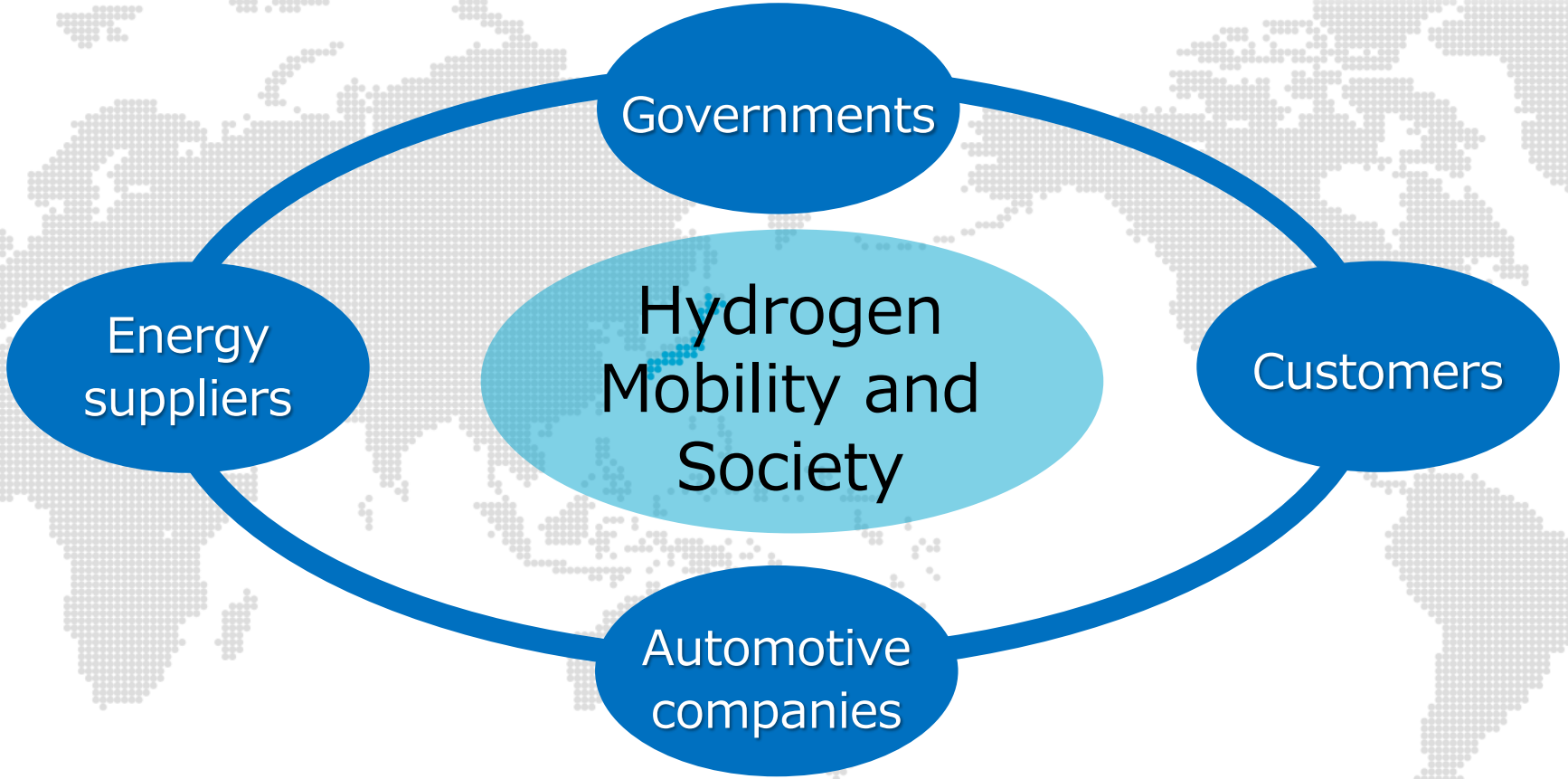
Importance of Cooperation of all stakeholders



New Vehicle Zero CO_2 Challenge in cooperation with stakeholders

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Thank you for your attention