

Toyota's Initiatives for Realizing Sustainable Mobility

August 28, 2008

Toyota Motor Corporation

Executive Vice President

Masatami Takimoto

Recognizing Challenges

1 . Reducing Oil Consumption
and Promoting Wide Use of Alternative Energies

2 . Reducing CO₂ (for preventing global warming)

3 . Prevention of Air Pollution

Initiatives for Reducing Size and Weight of Vehicles

【 Six methods by which world's most compact vehicle was achieved 】



Differential gear reverse placement



Center take-off gearbox



Placement of ultra-thin fuel tank under floor



Slimmed seat backs



Compact air conditioning unit



Asymmetric installment panel



Size and weight reduction is crucial to energy conservation and lower CO₂ emissions

Advanced Gasoline Engine Technology

Complete upgrading all of engine series from L3 1.0 through V8



L3
1.0



Newly-
developed
L4
1.3
New Start &
Stop system



L4
1.8
2.0
Valvematic
system



Newly-
developed
L4
2.5
2.7



V6
2.5
3.0
3.5
4.0



V8
4.6
5.0
5.7

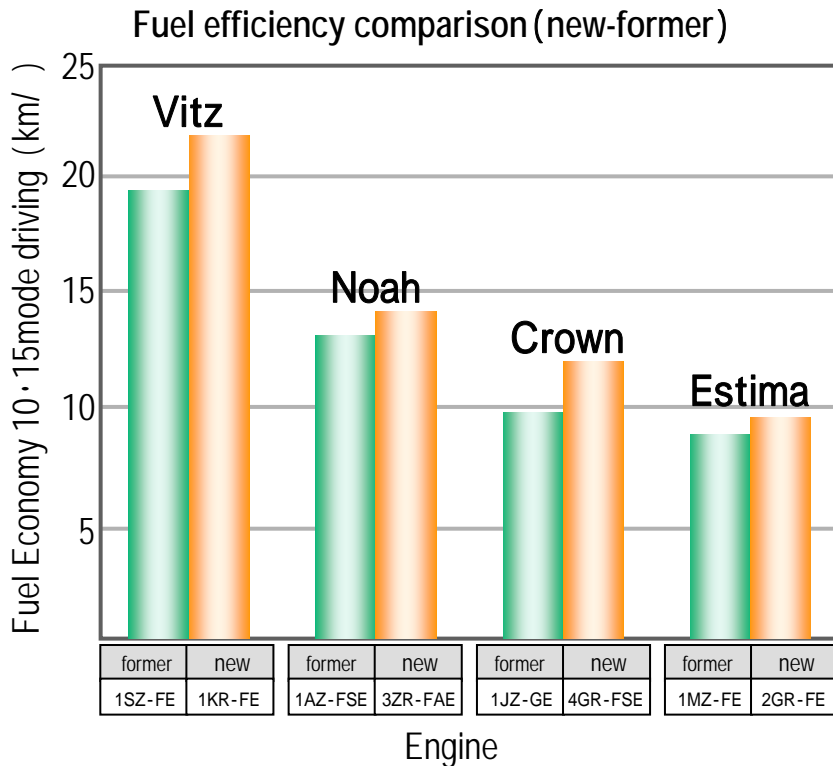
- Promote and expand valvematic system and new start & stop system
- Add variations of fuel-efficient engines

TOYOTA

Advanced Gasoline Engine Technology

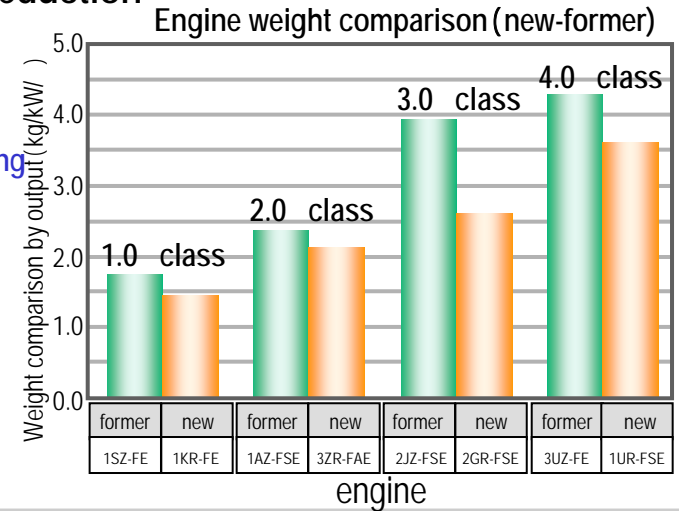
< Improvement of fuel efficiency >

Achieved improvement in fuel efficiency by introducing new engines



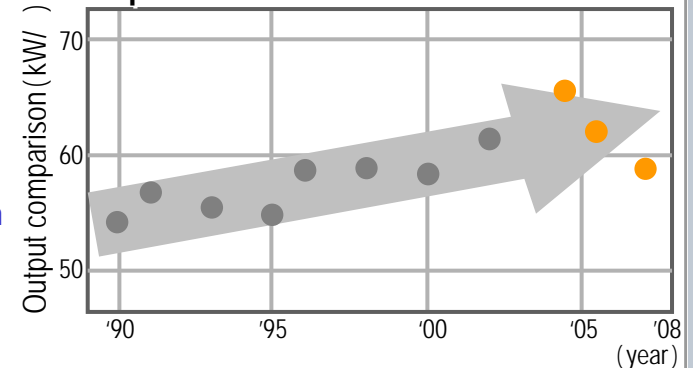
< Weight reduction >

Reduced weight by using aluminum material, and modularized parts.



< Improvement of performance >

Performance improved by introducing D-4S, high compression ratio, and lowering friction.



Achieved improvement in fuel efficiency and in performance, and reducing weight at the same time

Diesel Engines Lineup

1.4 liter



1.6 liter class

Debut scheduled
in 2012

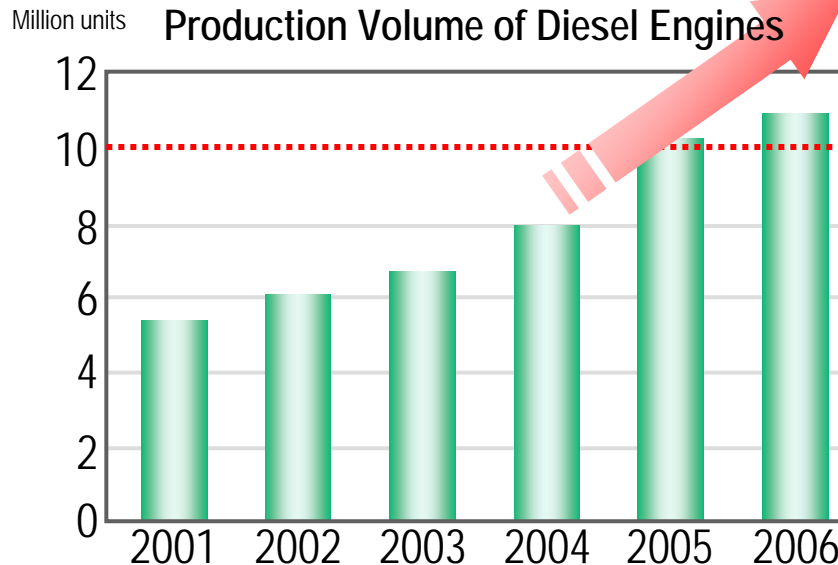
2.0-2.2 liter



2.5-3.0 liter



V8 4.5 liter



Total number
of production
volume has
reached
20 million

Wide variation lineup and production volume of Diesel Engines

Encouraging "Eco Driving"

Eco Driving Indicator



Momentary
FE
11.4km/L

Instantaneous fuel
consumption display

ECO

Eco drive status indicator

Eco Driving Mode Switch

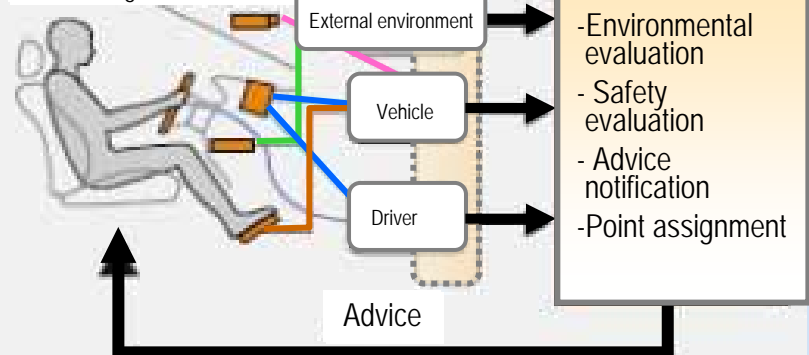


Eco Driving Mode Switch

< Examples of Eco Driving >
 Avoid sudden acceleration
 Set higher temperature in summer
 Set lower temperature in winter

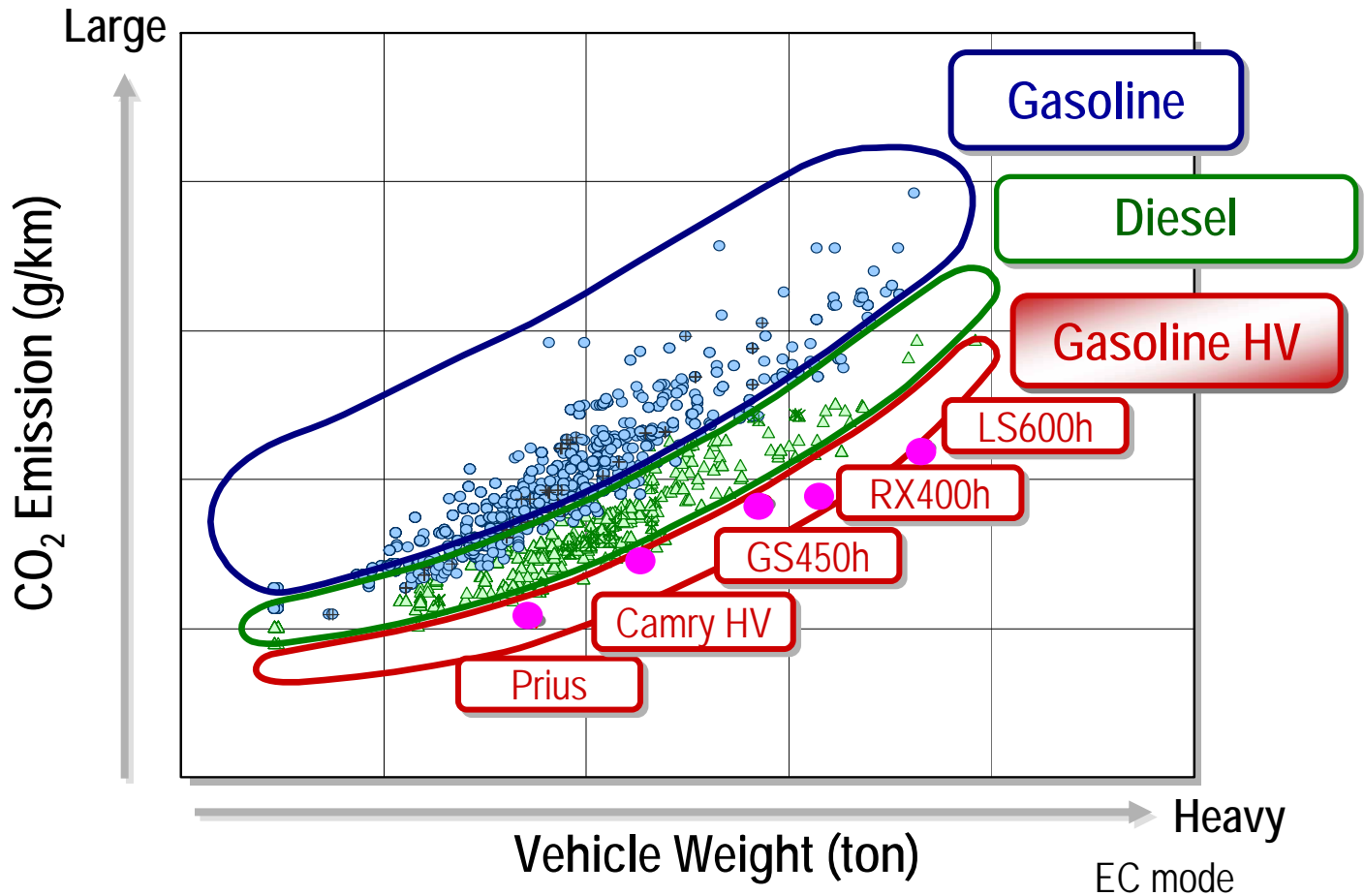
New Eco Driving Support System

- Environmentally considerate driving
- Safe driving



Encouraging "eco driving" reduced CO₂ emissions volume

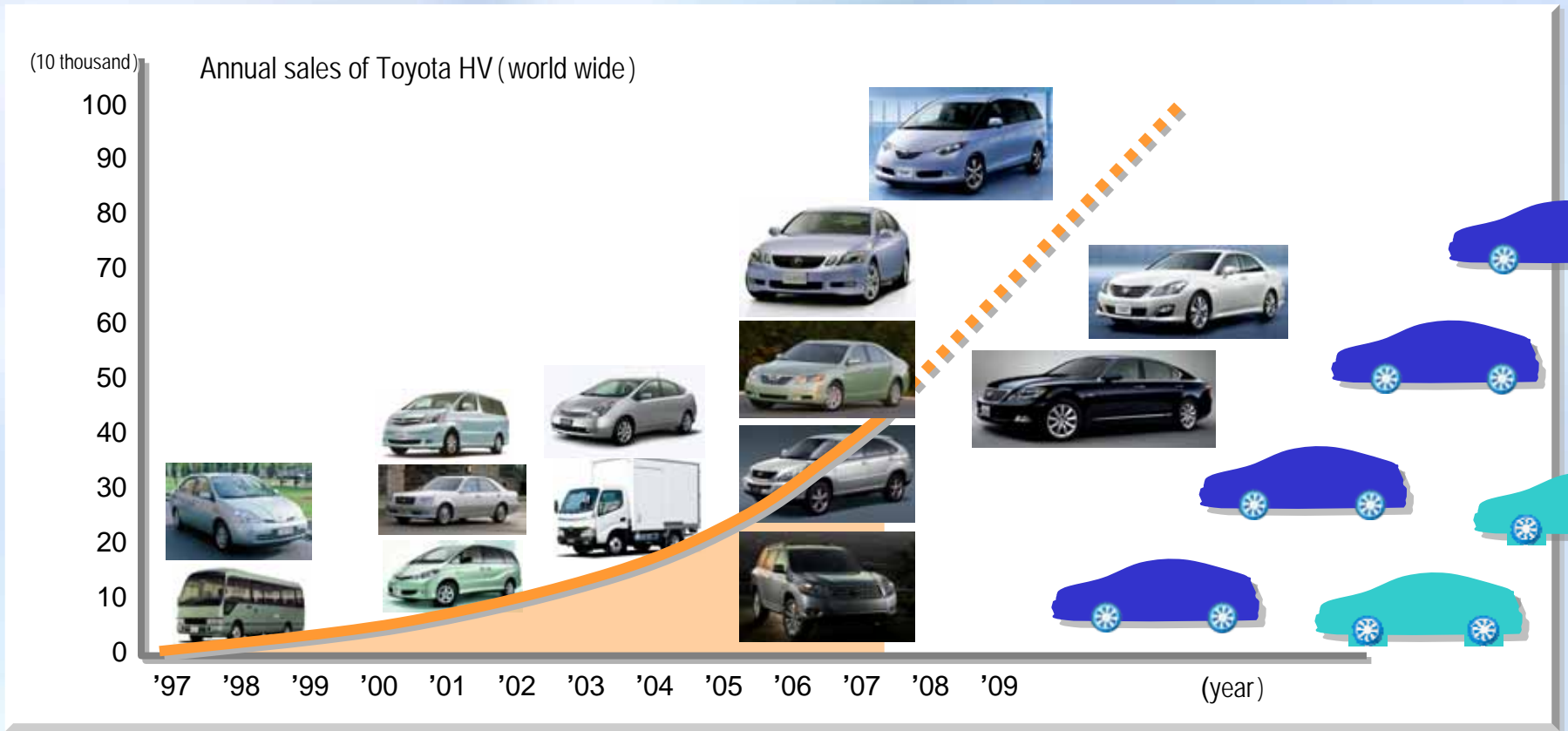
Environmental Superiority of Hybrid Vehicles (HV)



HVs contribute to reduced CO₂ emissions

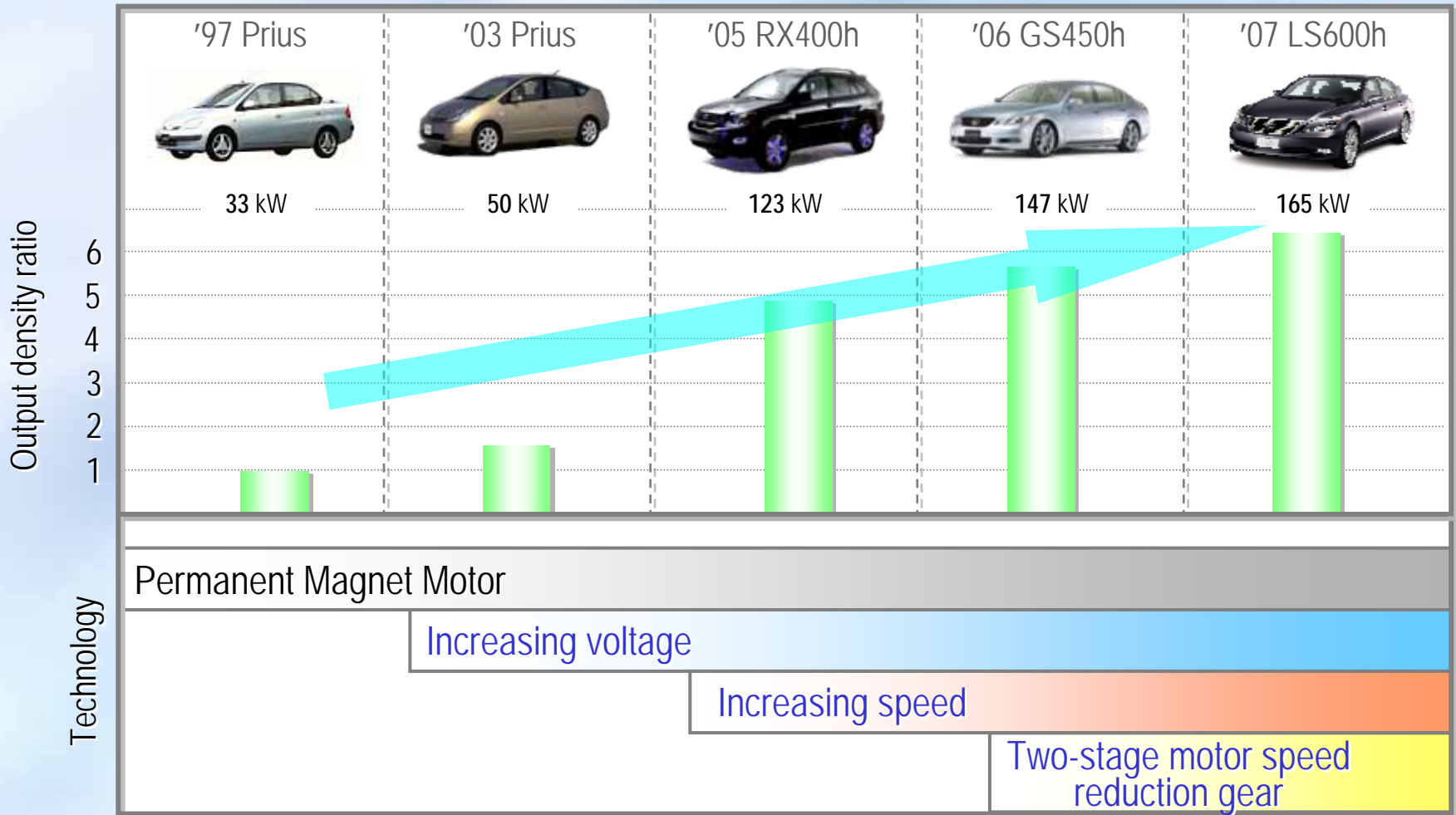
TOYOTA

Expansion of HV Introduction



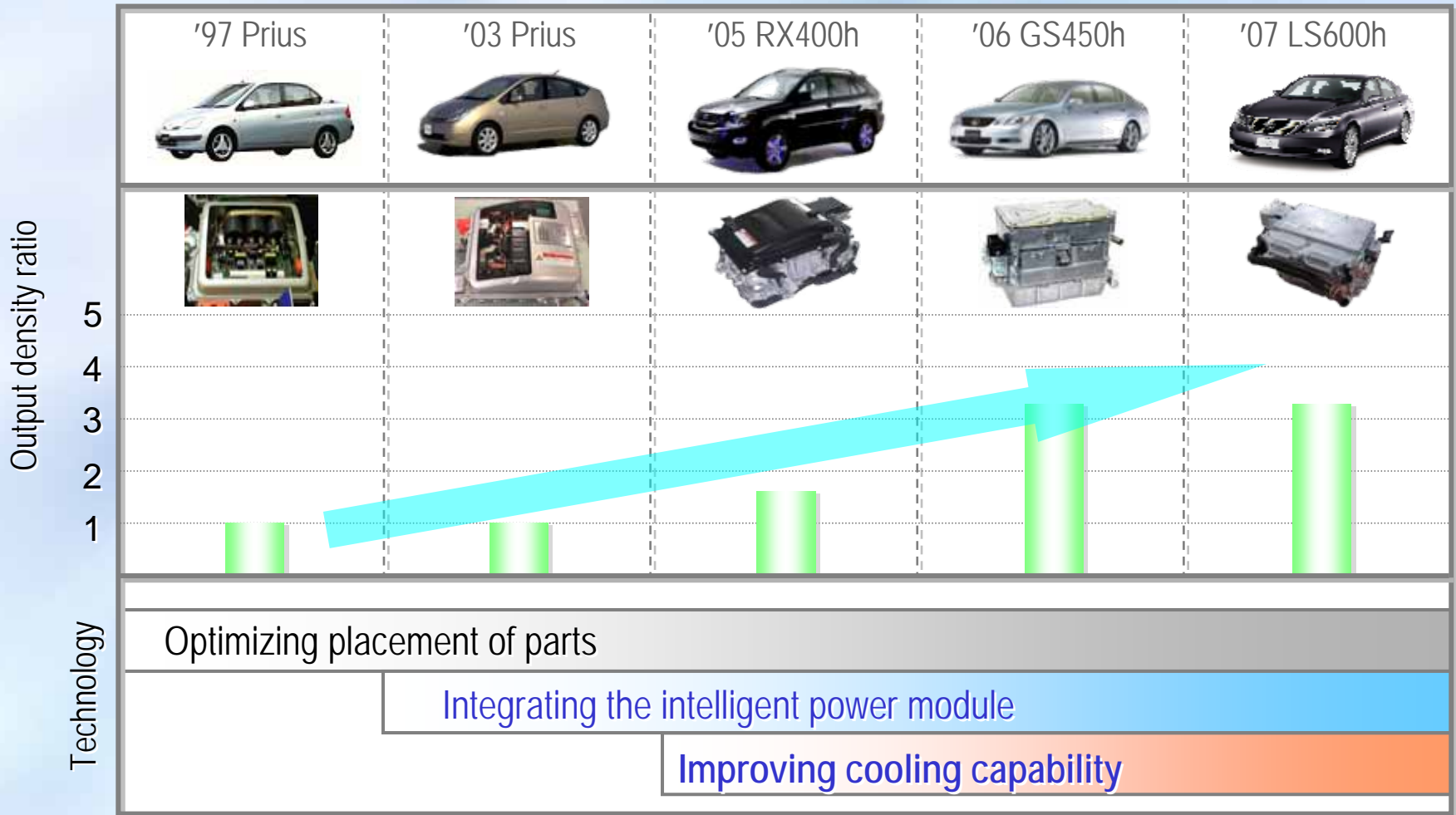
Accelerate introducing hybrid models to meet market demand

Evolution of Electric Motors for Hybrid Vehicles



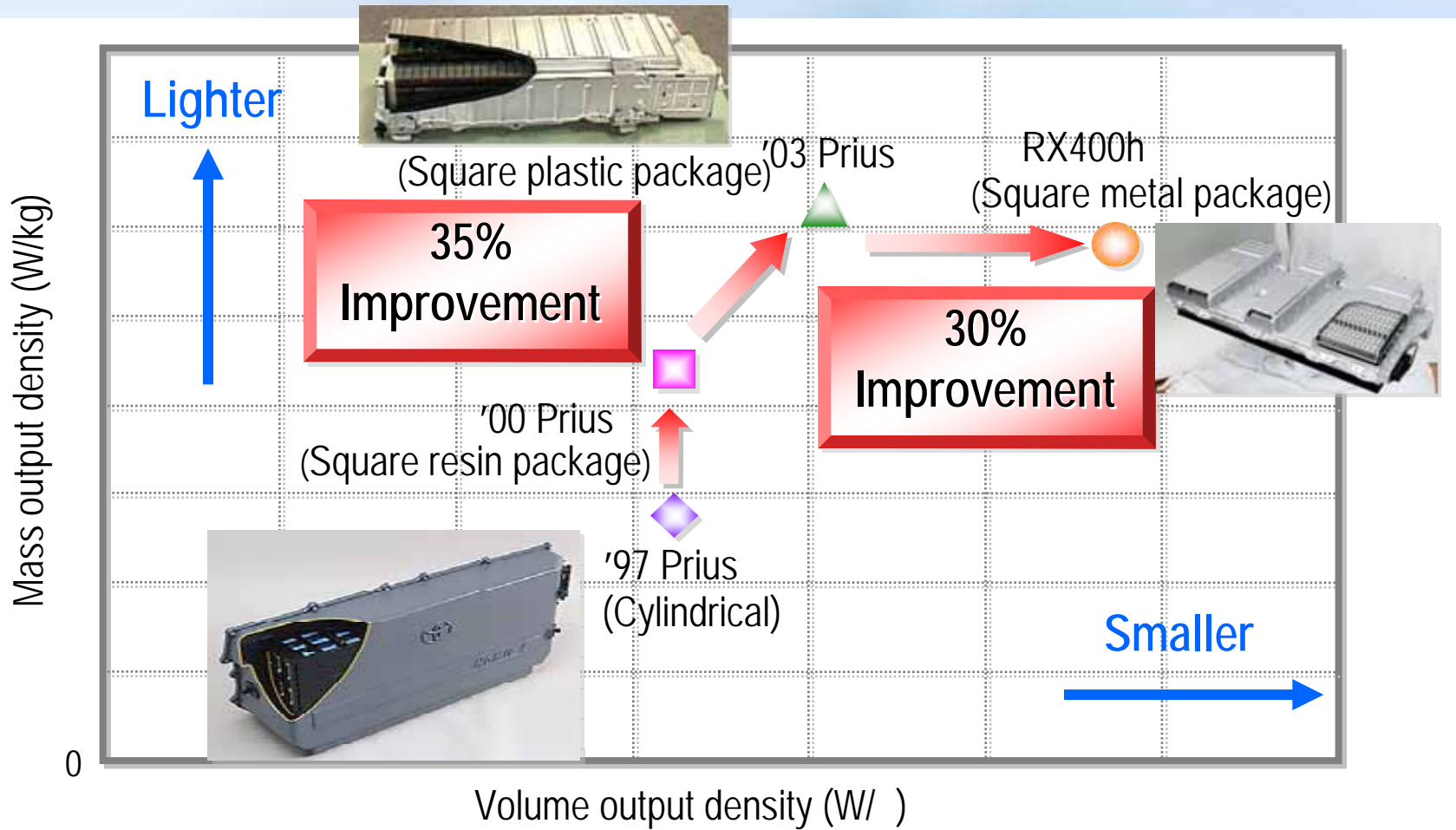
Reducing size and weight by increasing output density

Evolution of Inverter for Hybrid Vehicles



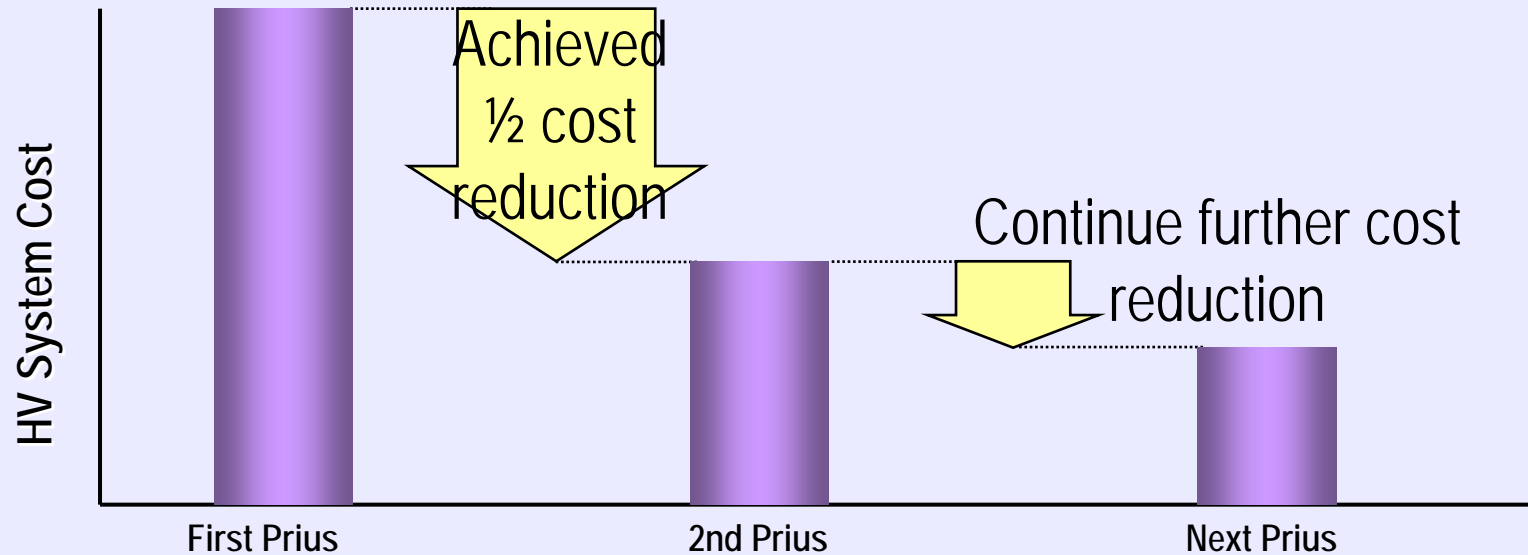
Reducing size and weight by increasing output density

Evolution of Batteries for Hybrid Vehicles



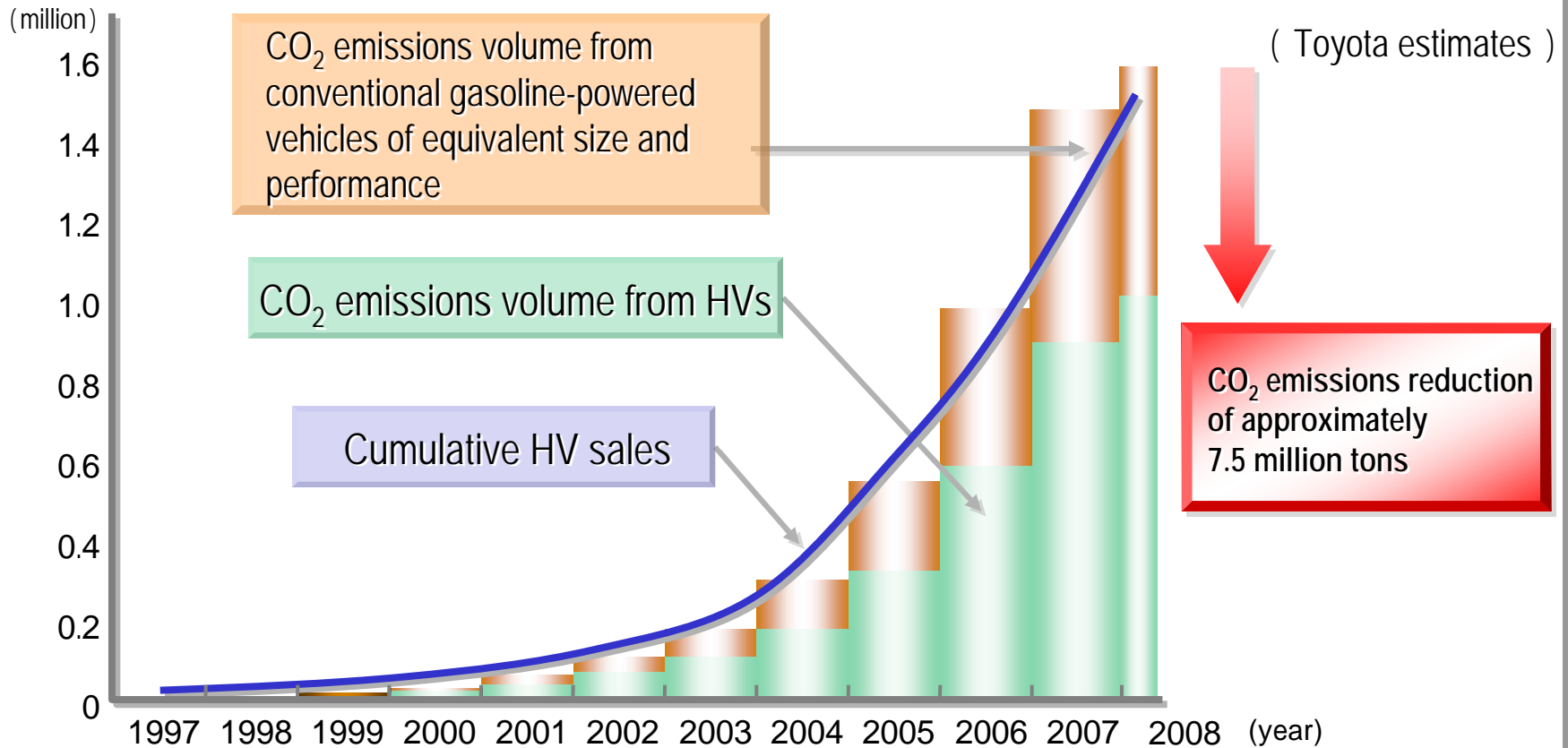
Decreasing size and weight by increasing output density

Evolution of Cost Reduction of Hybrid Vehicles



- Realized to cut HV system cost in half over the 1st Prius
- Continue to work for further reduction

Effect on CO₂ Emissions Reduction by Introducing HV

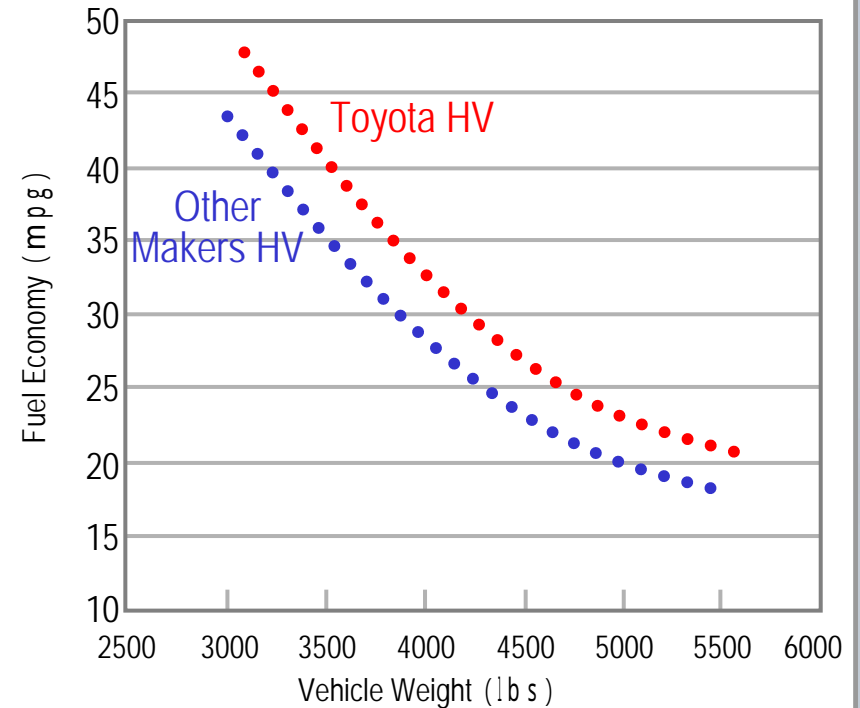
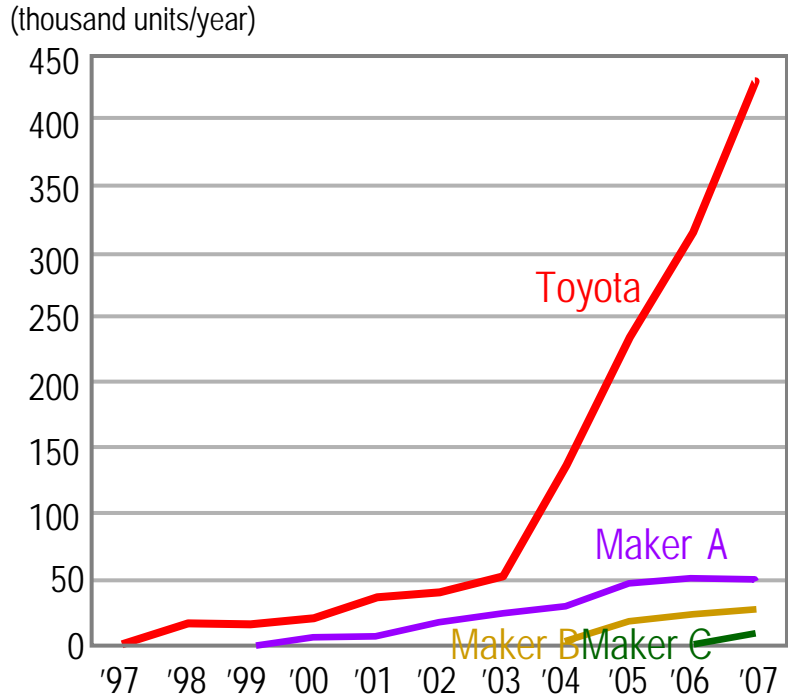


Cumulative CO₂ emissions volume = No. vehicles sold × driving distance × fuel efficiency × CO₂ emissions factor

**CO₂ emissions reduced by approximately 7.5 million tons
due to sales of 1.6 million HVs**

TOYOTA

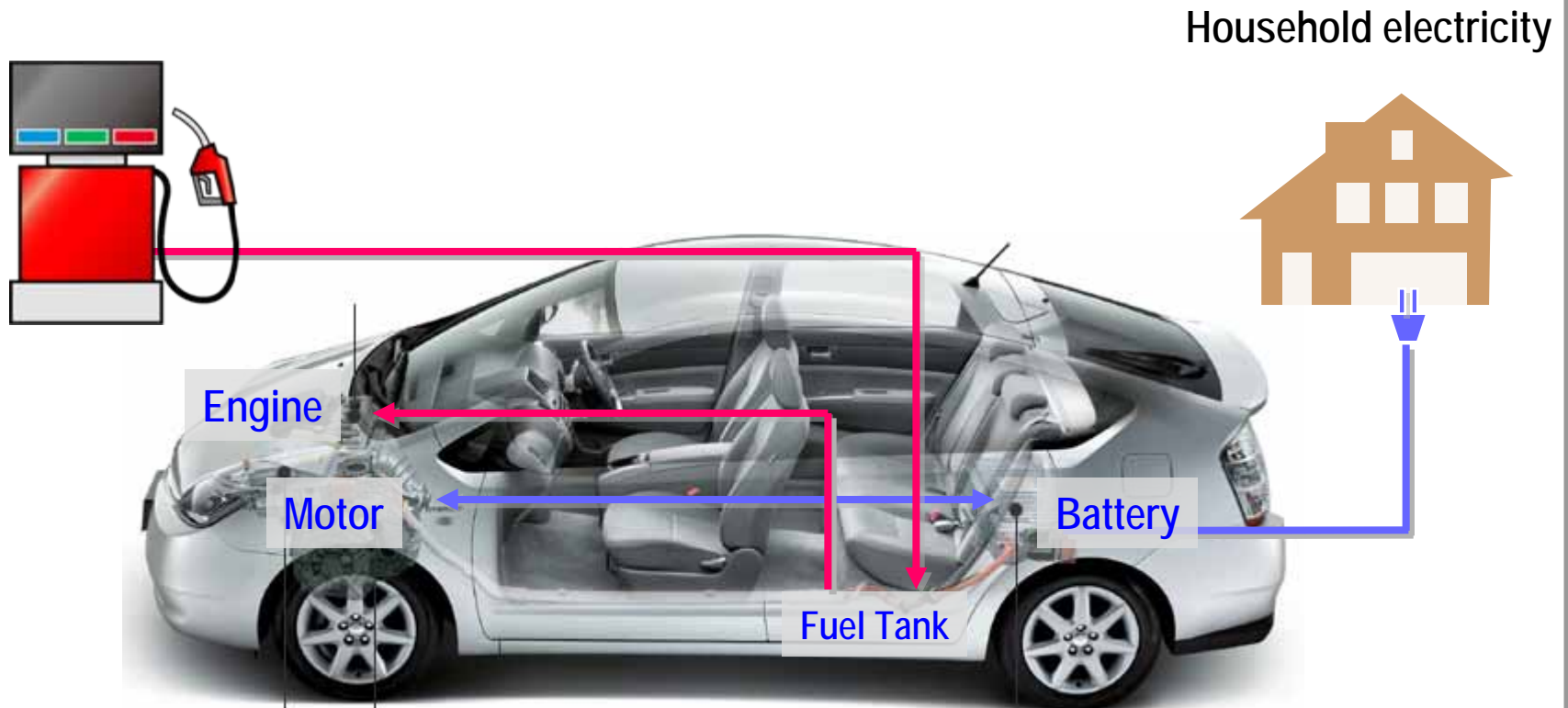
HV Competitiveness of HV With Other Car Makers



- Toyota overcomes other car makers in HV sales
- Toyota HV superiors other makers' HV in fuel efficiency

Plug-In Hybrid Vehicle

Recharging battery using an external power source
Short distance:EV, Long distance:HV

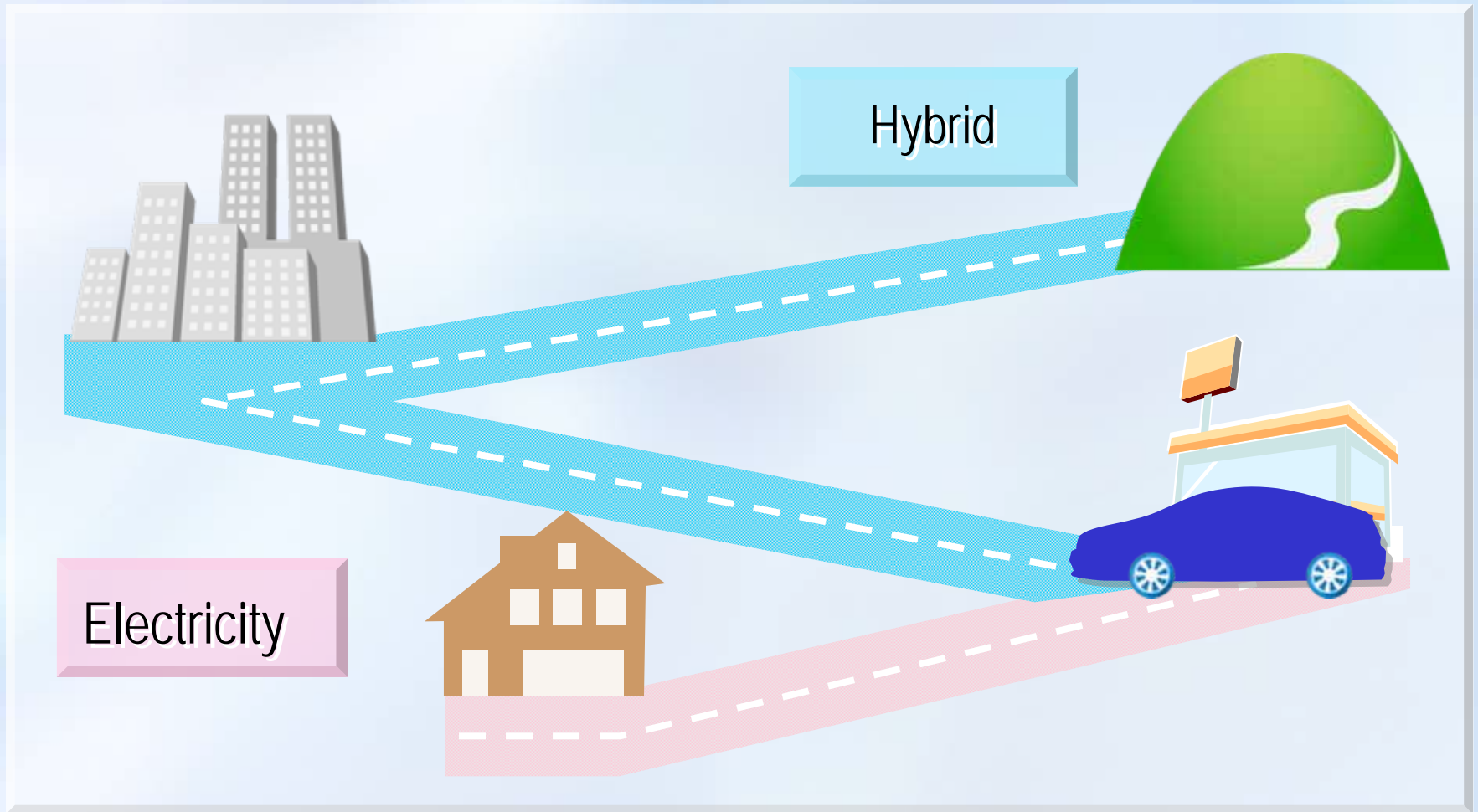


TOYOTA

What is Plug-In Hybrid Vehicle?

Short distance: EV

Long distance: HV



TOYOTA

Results of Verification Testing for Plug-in Hybrid Vehicles



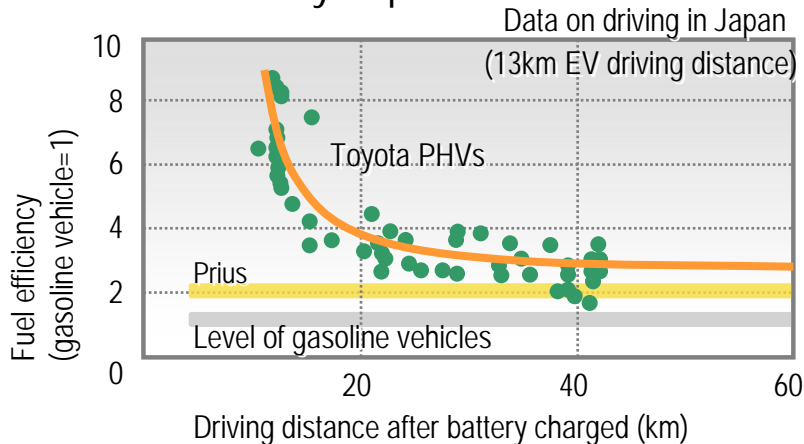
Partner: EDF



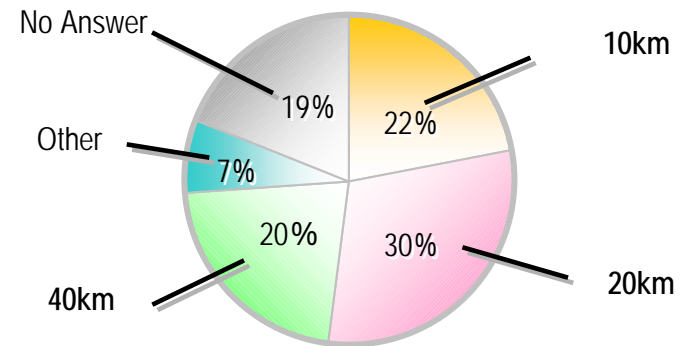
Partner :
University of California
Berkeley, Irvine



< Fuel Efficiency Improvement >



< Expected Values for EV Driving Distance > (Result of the user questionnaires)



**Verification testing is underway in Japan, Europe and the USA
confirmation of improved fuel efficiency for plug-in hybrid vehicles**

Battery of a Bio-fuel Compatible PHV Charged Using a Solar Power Generation System



Biofuel compatible plug-in hybrid vehicle + Solar power generation system
→ Well to Wheel CO₂ emissions can be reduced to zero

TOYOTA

EV Initiatives

Toyota RAV4 EV



Toyota e-com



Accelerate R&D of
new generation EV
(in early 2010s)

Challenges for EV:

- 1) Cruising range, 2) cost, 3) charging time, 4) dedicated charging infrastructure
- ➔ For the time being, a realistic option as compact commuter vehicles

Alternative Fuels Initiatives (Bio Fuels, Natural Gas, Hydrogen)

Bio Fuels

- Research for cellulose ethanol manufacture
- Completed all models to adopted to E10
- Development of vehicles like FFV or BDF-vehicles to satisfy regional demand

FFV



Natural Gas

- Introducing CNG vehicle

FCHV

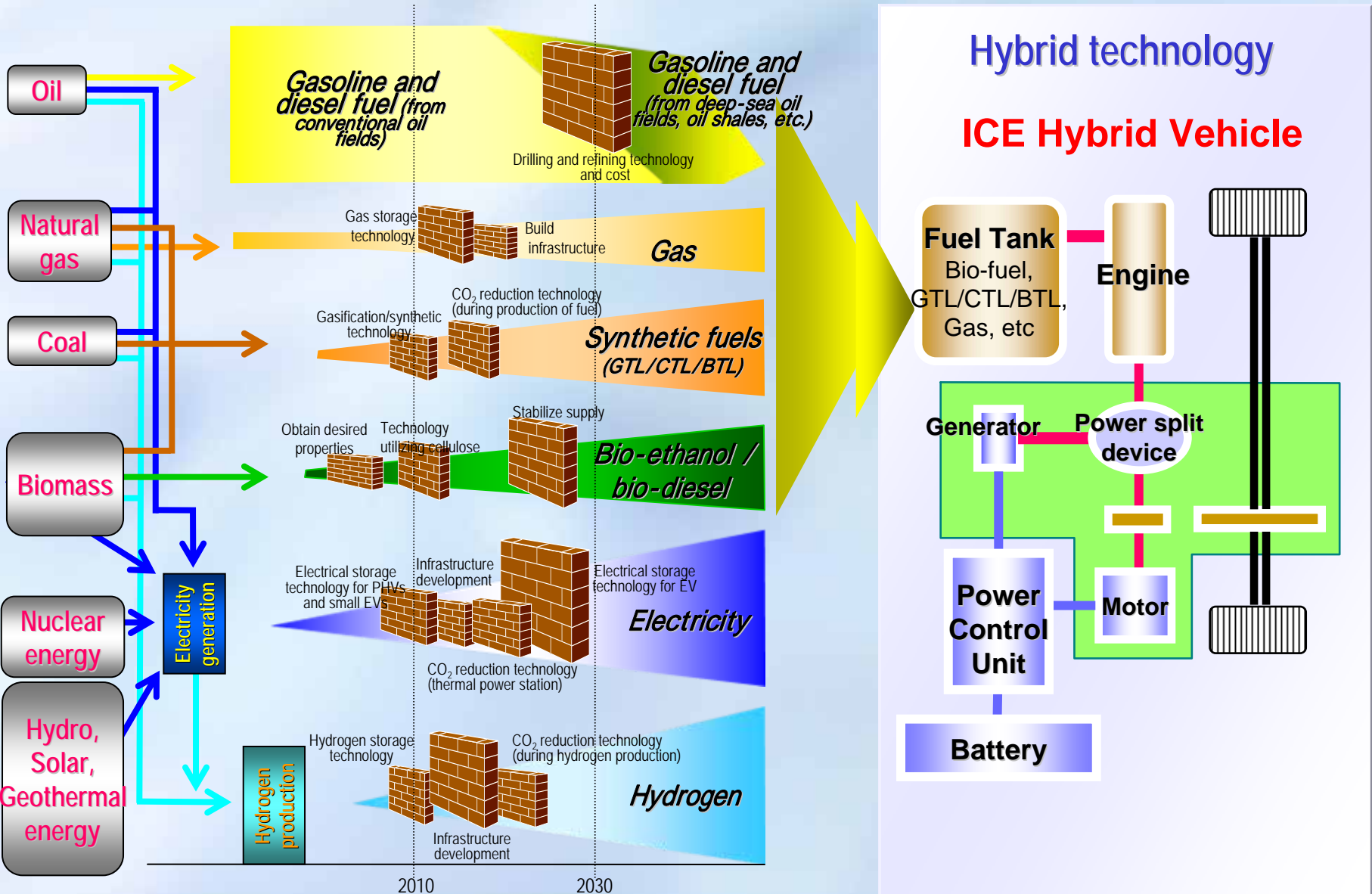


Hydrogen

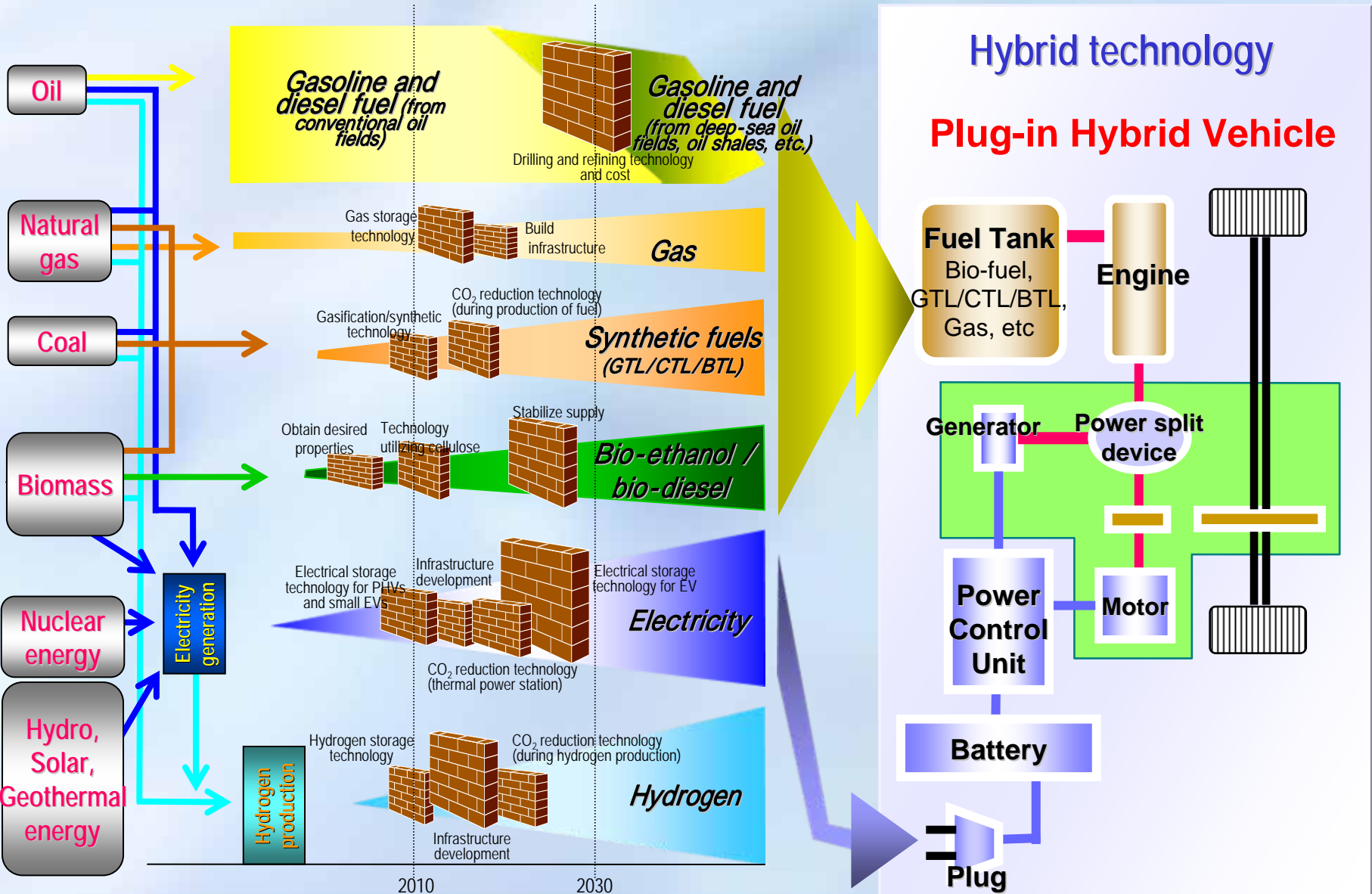
- Steady advances in FC vehicle technology

Place HV and PHV as core technologies, Toyota develops and offers items based on the concept "right vehicle for the right place at the right time"

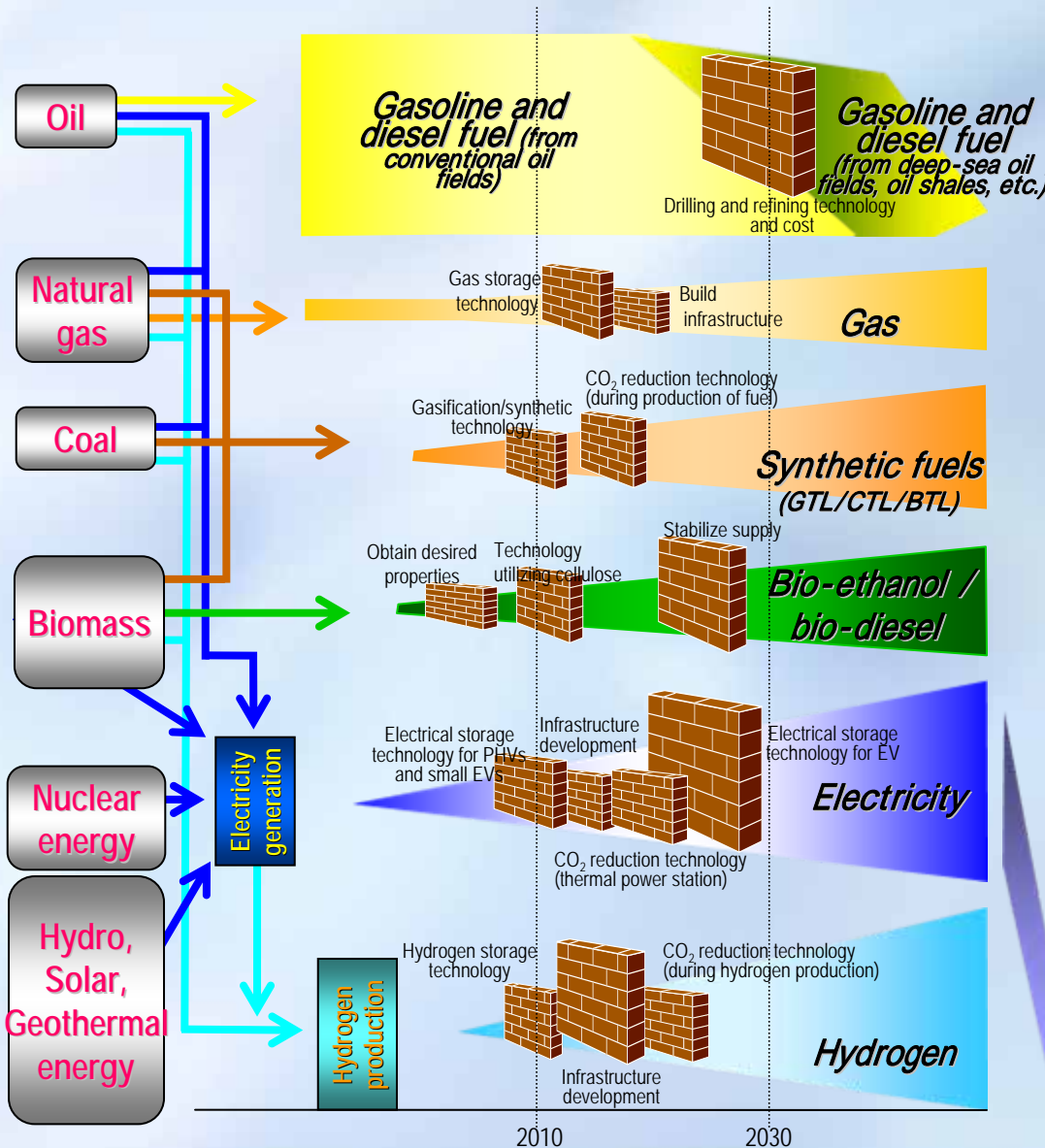
Scenarios for Response to Environment and Energy Issues



Scenarios for Response to Environment and Energy Issues

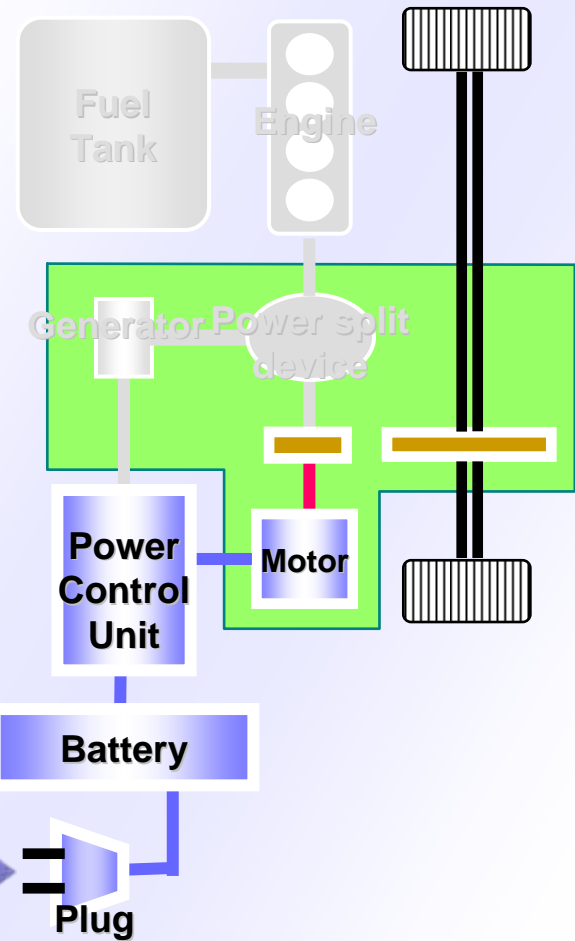


Scenarios for Response to Environment and Energy Issues

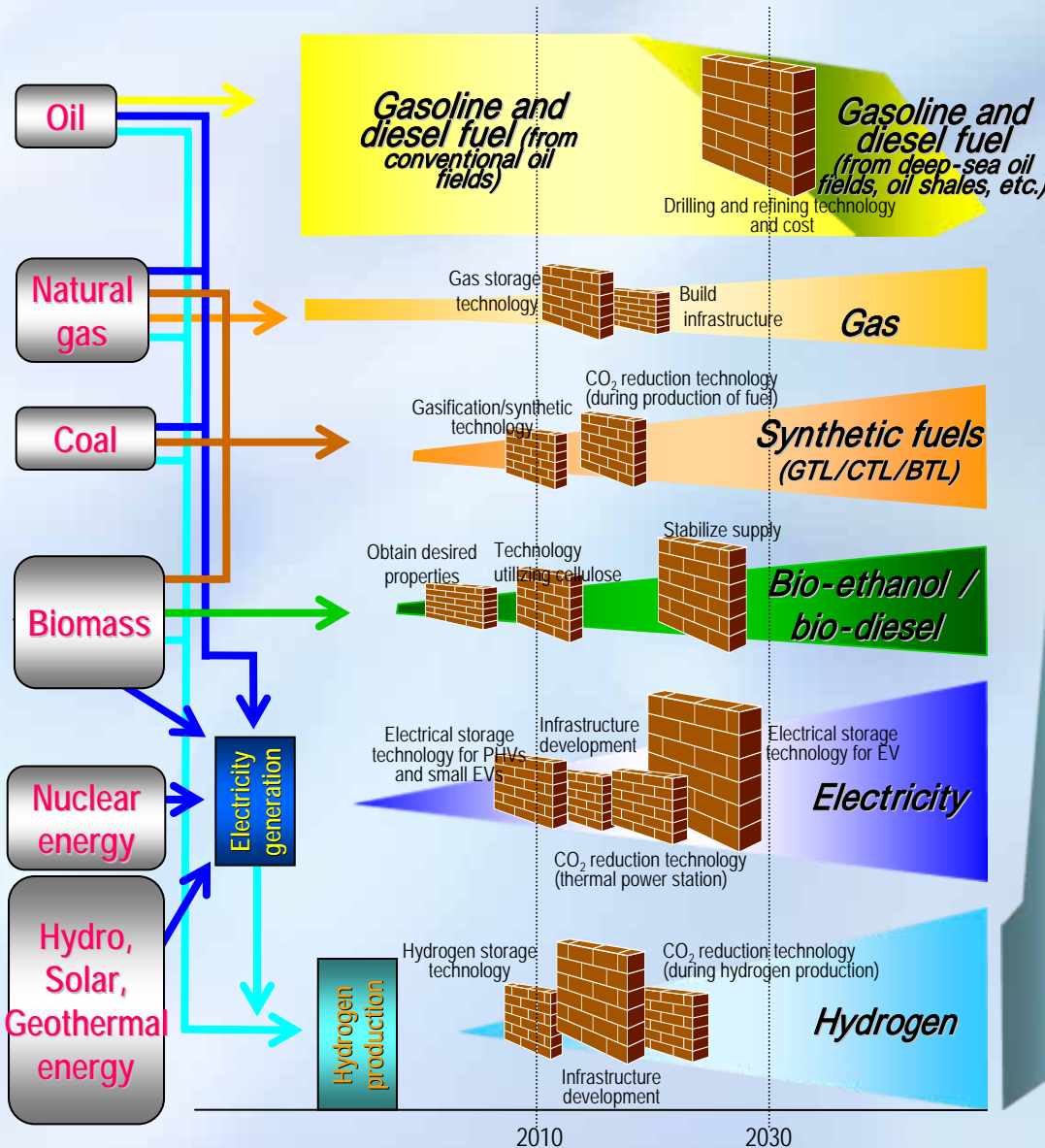


Hybrid technology

Electric Vehicle

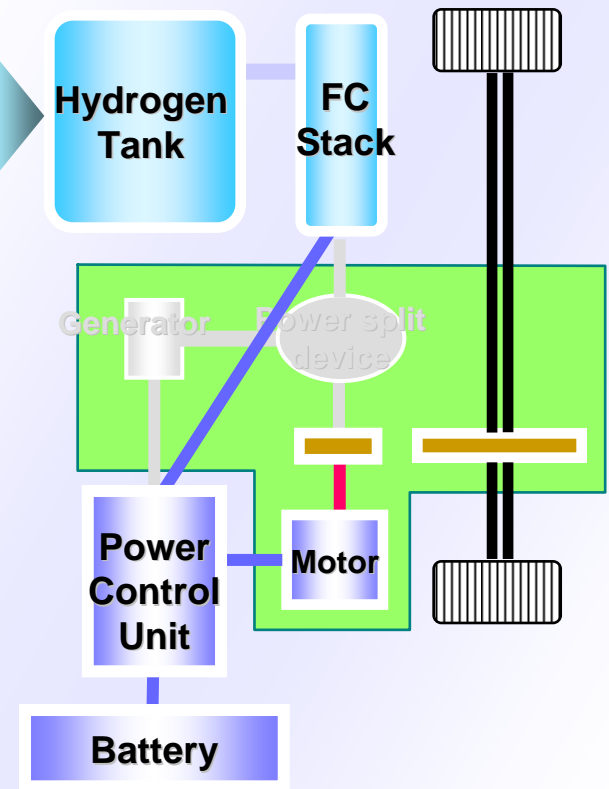


Scenarios for Response to Environment and Energy Issues

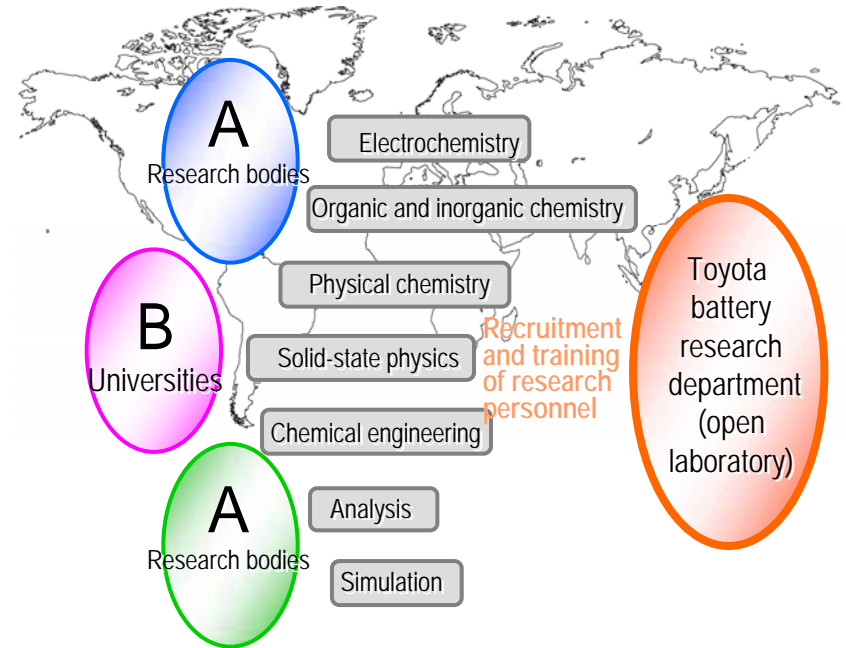
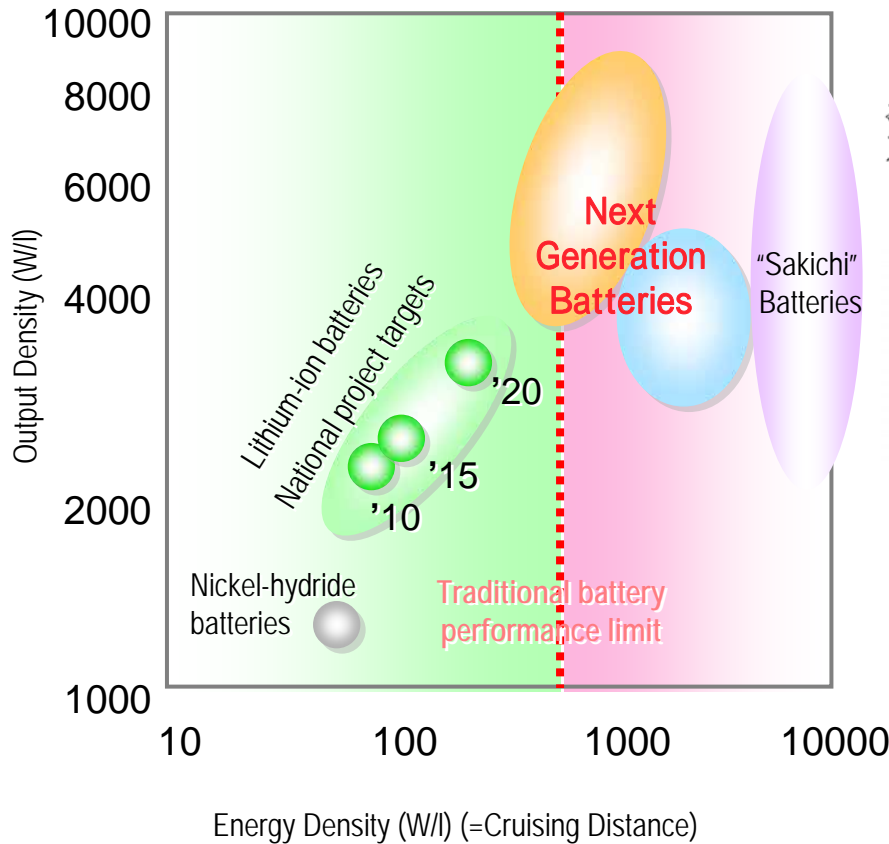


Hybrid technology

Fuel-Cell Hybrid Vehicle (FCHV)



Research Organization for Next-generation Batteries



New battery research department to be established as part of efforts to accelerate R&D for a next generation battery

Global R&D Centers

North America



South East Asia



Japan



North America Research Center (TRI-NA) is newly-organized

Europe



Australia



TOYOTA



TODAY for TOMORROW

TOYOTA