

進化するハイブリッド技術と次世代自動車社会への次の一歩

The Hybrid Vehicle -Challenge for Sustainable Mobility-

Toshifumi Takaoka

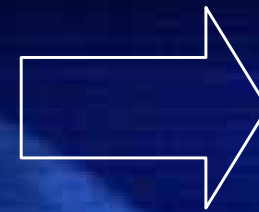
Toyota Motor Corporation

Warning from Nature

1910

Tschierva Europe

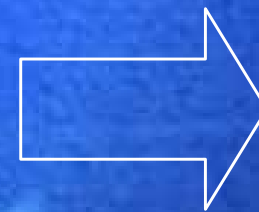
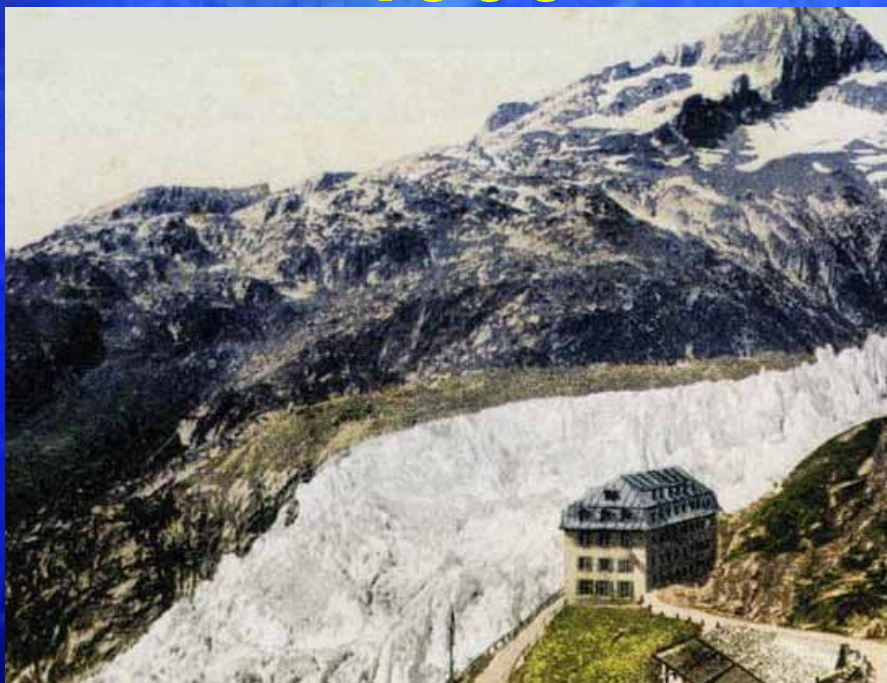
2001



1906

Rhone

2002



Source: An Inconvenient Truth

Contents

1. What's the Issues for Automobile?

2. Are Conventional Vehicles Sufficient?

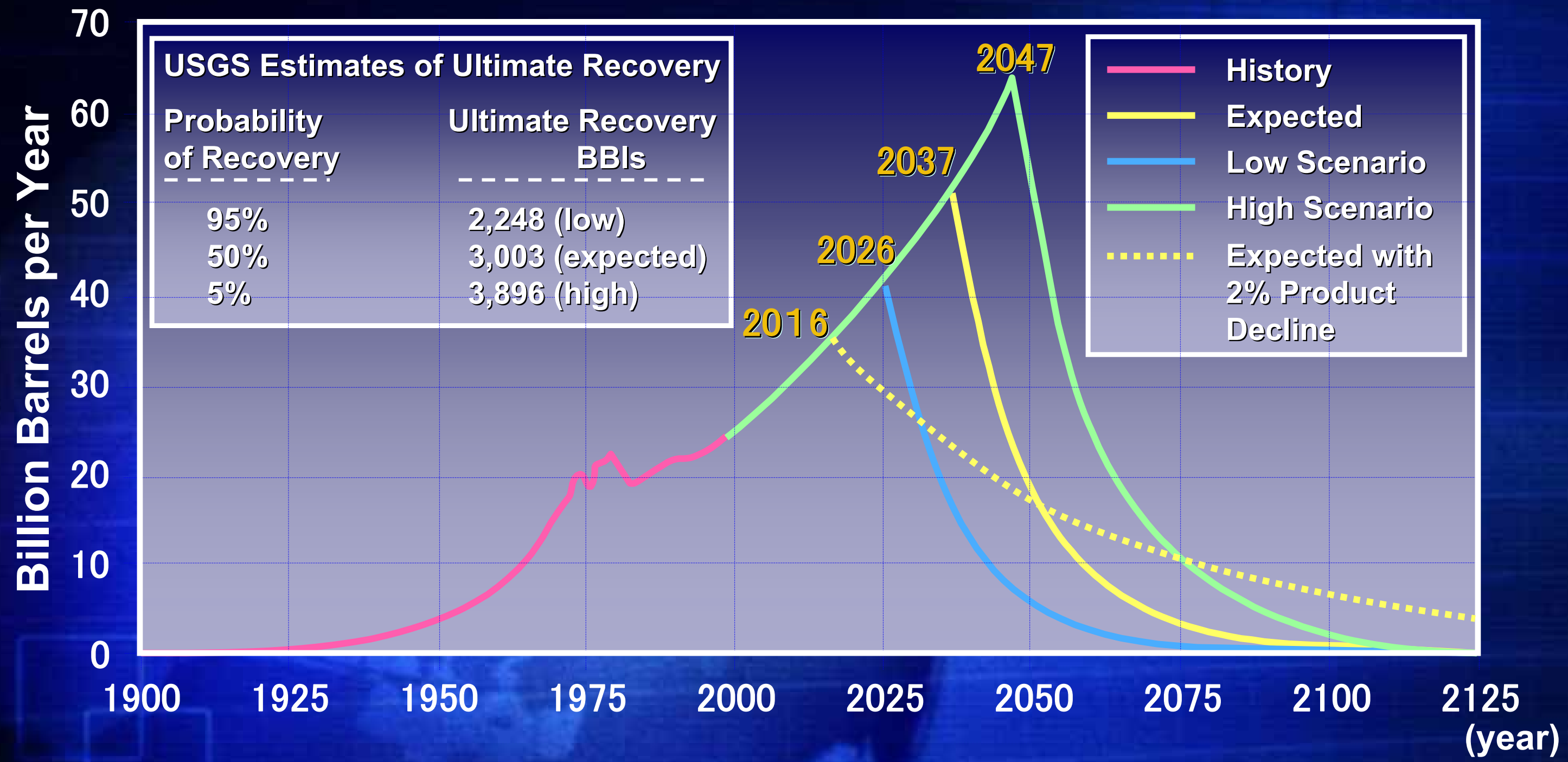
3. Why Hybrid Vehicle?

4. Toyota Hybrid Vehicle

5. Future Prospects

Oil Production Scenario

•When will Crude Oil run dry ? 20xx ?

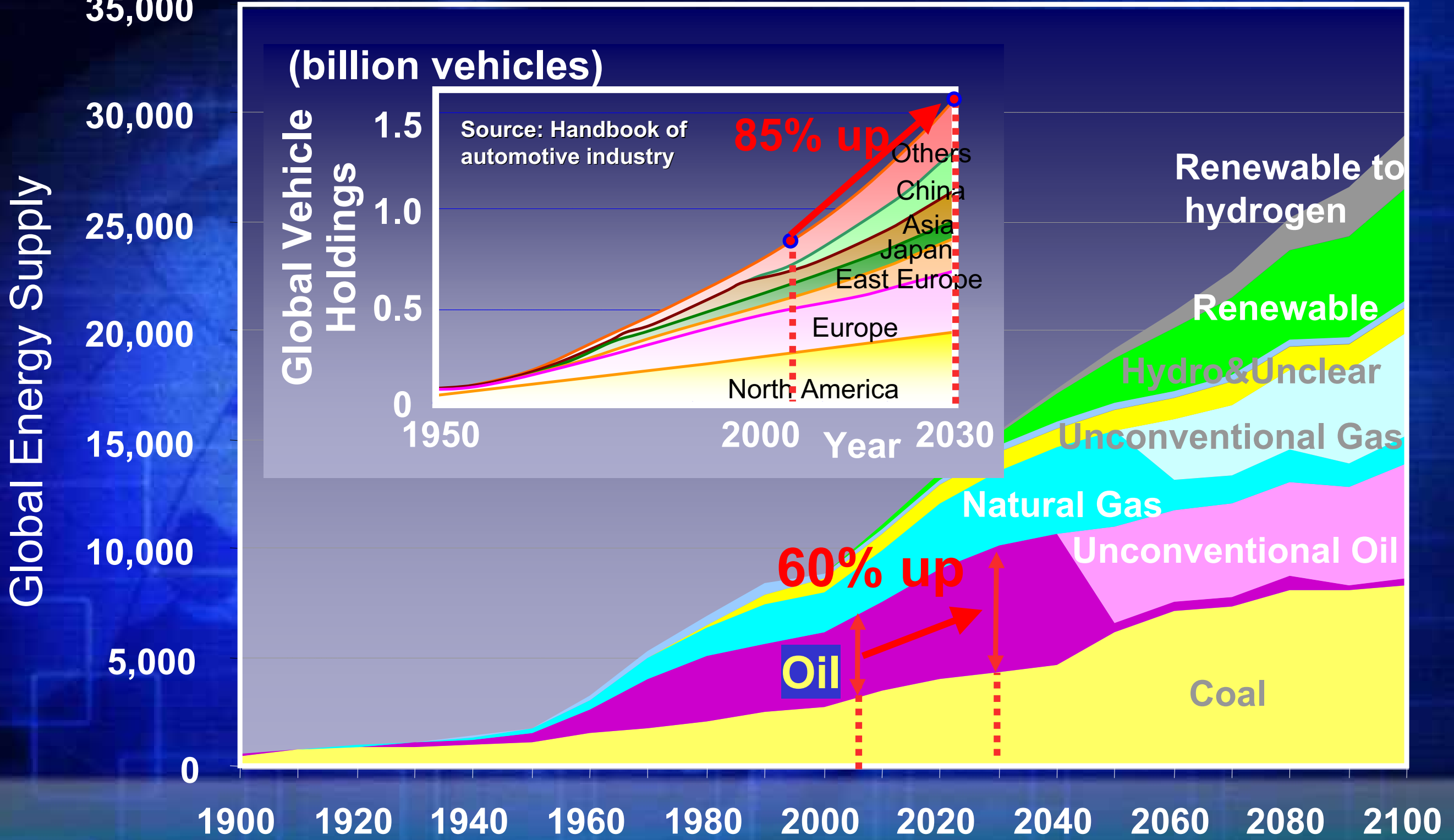


Notes: U.S. volumes were added to the USGS foreign volumes to obtain world totals.
 Assumption: Growth rate of oil demand: 2%/year

Energy Security

- Oil supply will not keep up with increased vehicle ownership.
- Alternative energy is required for automobiles.

[million ton Oil equivalence]
35,000

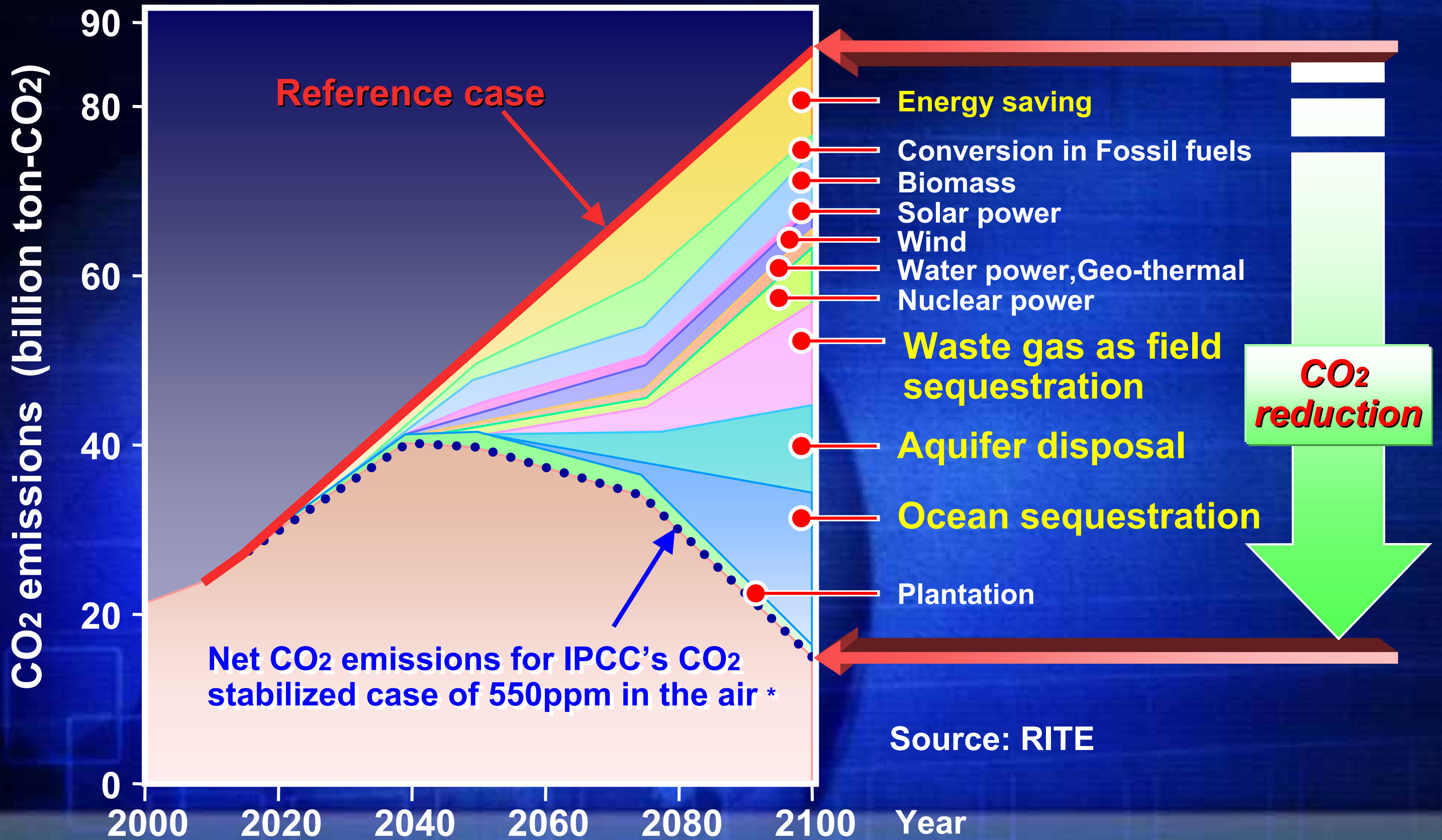


Source: The Institute of Energy Economics, Japan

year



CO2 Scenario



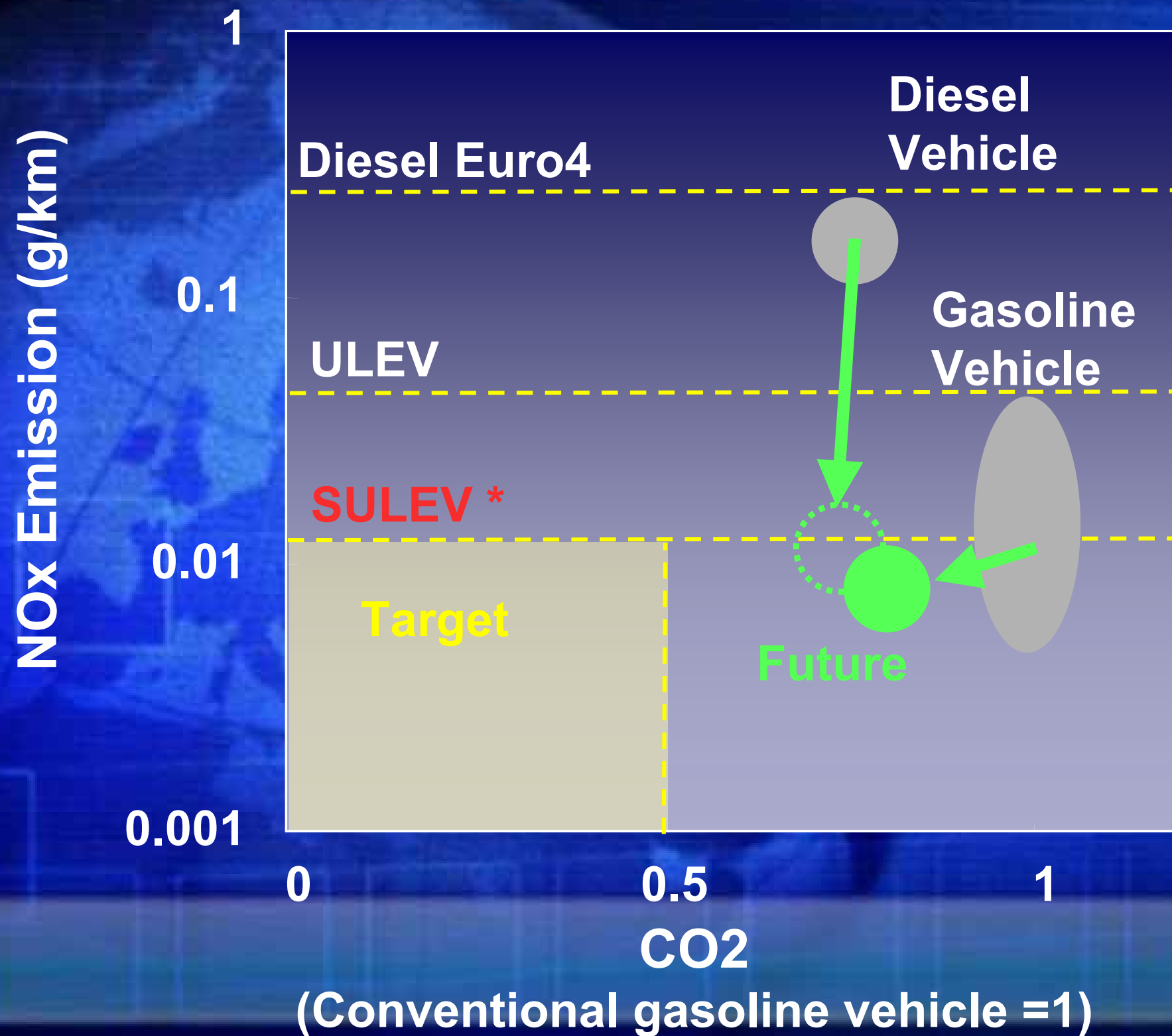
Net CO2 emissions for IPCC's CO2 stabilized case of 550ppm in the air *

Source: RITE

* IPCC: Intergovernmental Panel for Climate Change

Compatibility of Emission and CO2

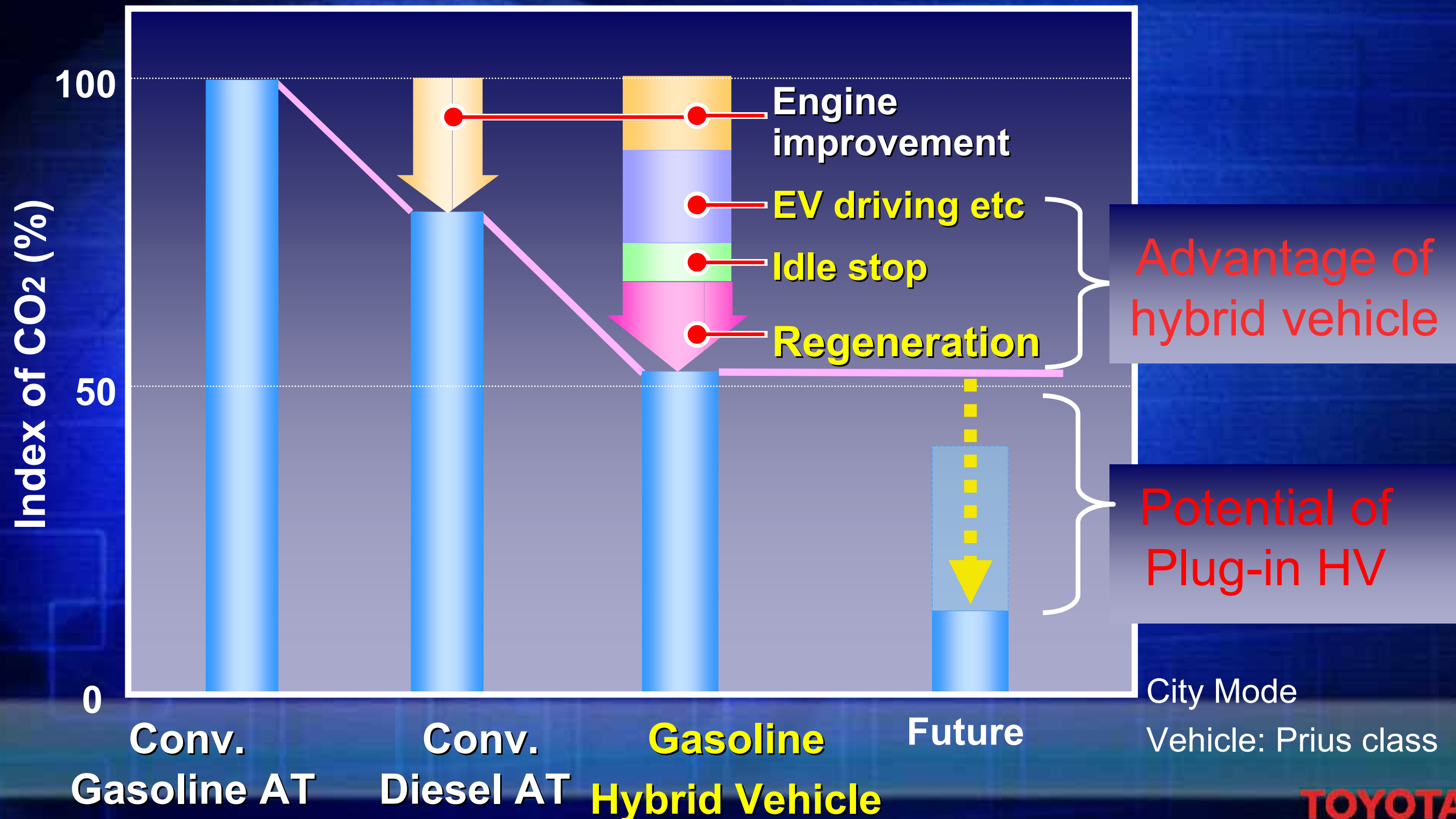
- Compatibility of SULEV and CO2 reduction is difficult for both conventional gasoline and diesel vehicles



*Super Ultra Low
Emission Vehicle

Why Hybrid vehicle? -CO2 Advantage-

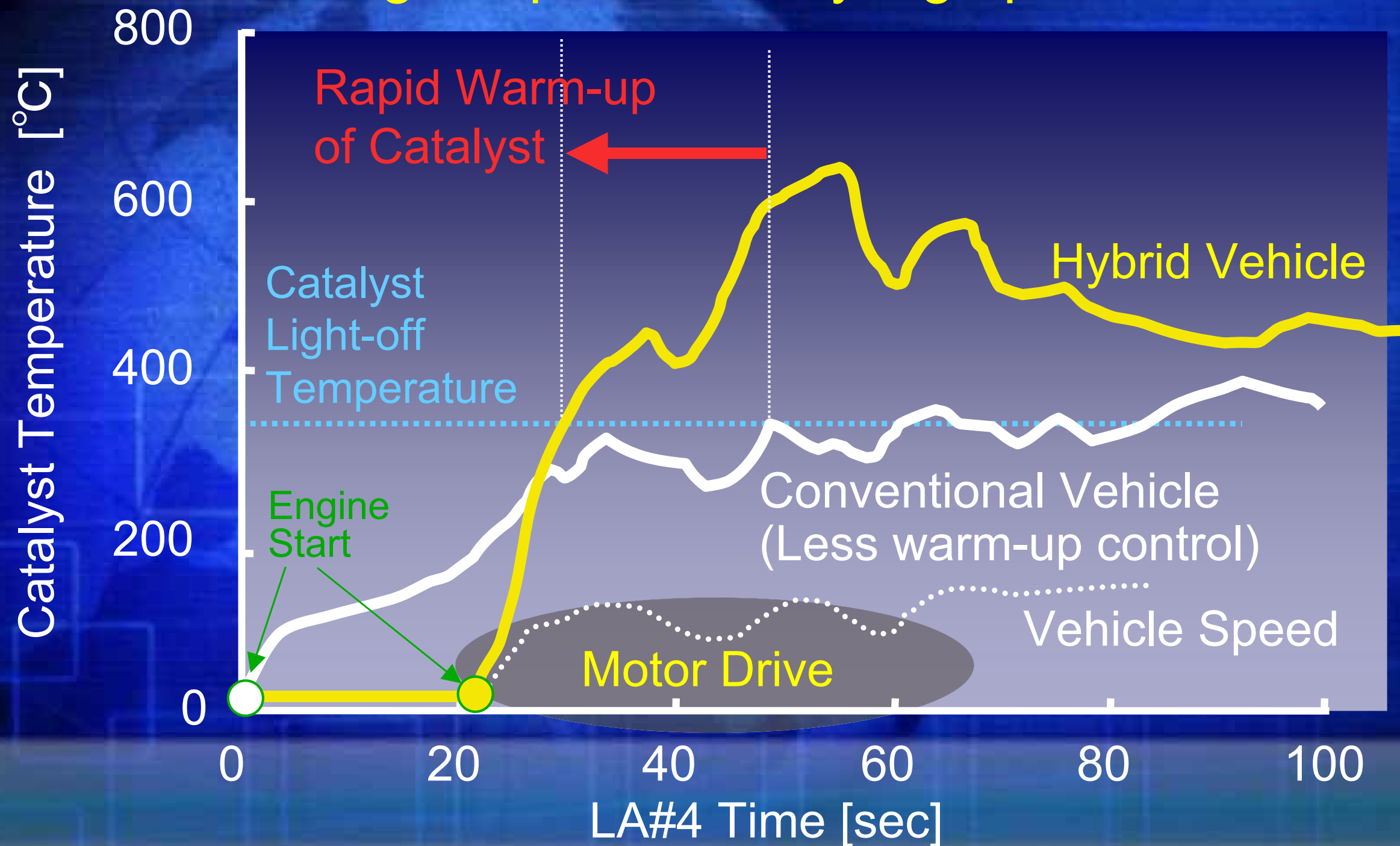
- Hybrid Vehicle has advantages to recover and minimize energy loss
- 50% reduction of CO2 and improved fuel efficiency can be achieved
- Plug-in HV has further potential to reduce CO2



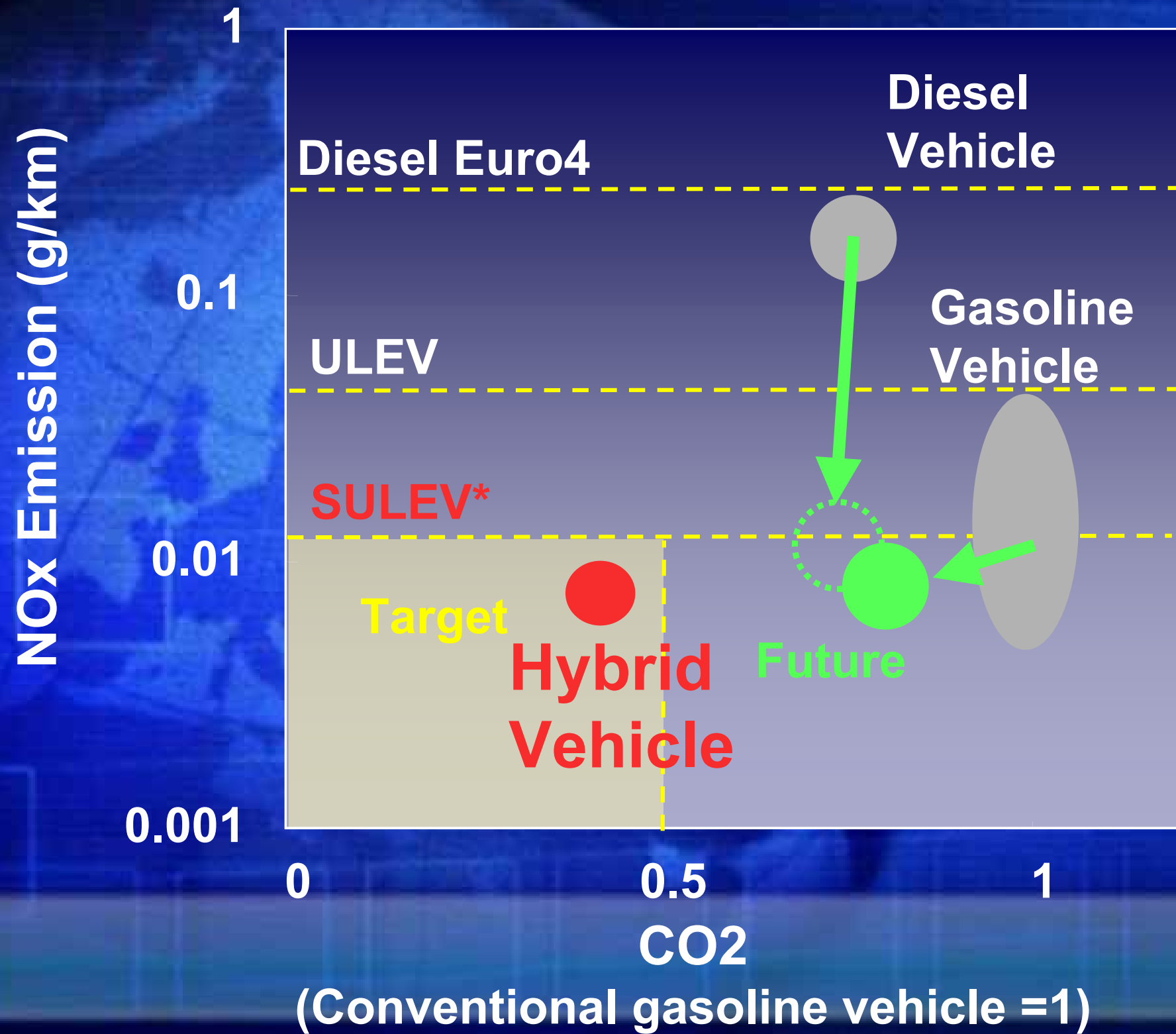
Why Hybrid vehicle? -Emission Advantage-

Advantages of Hybrid Vehicle

- Motor drive at cold start
- Power assist by motor at acceleration
- Engine quick-start by high power motor

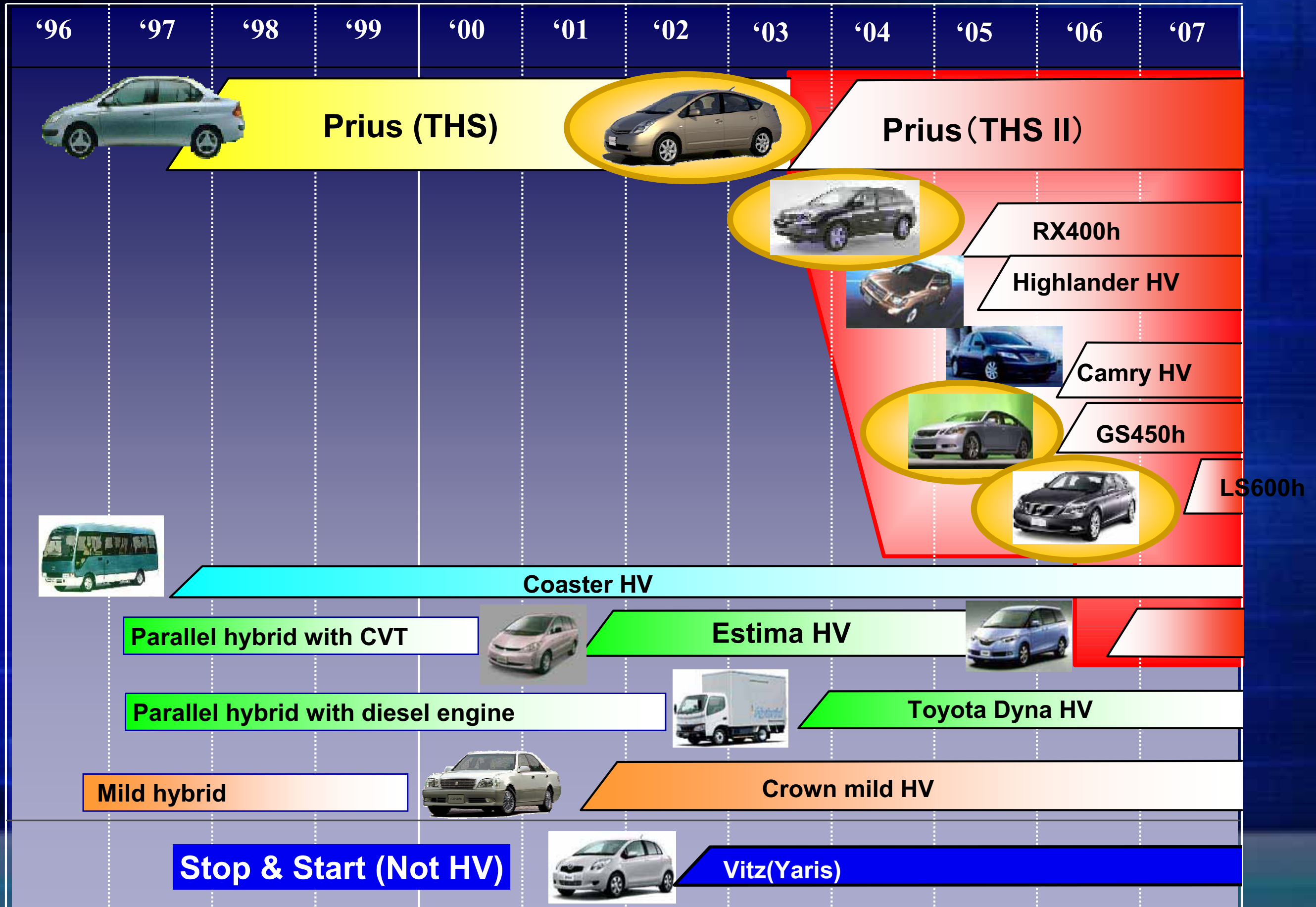


Compatibility of Emission and CO2

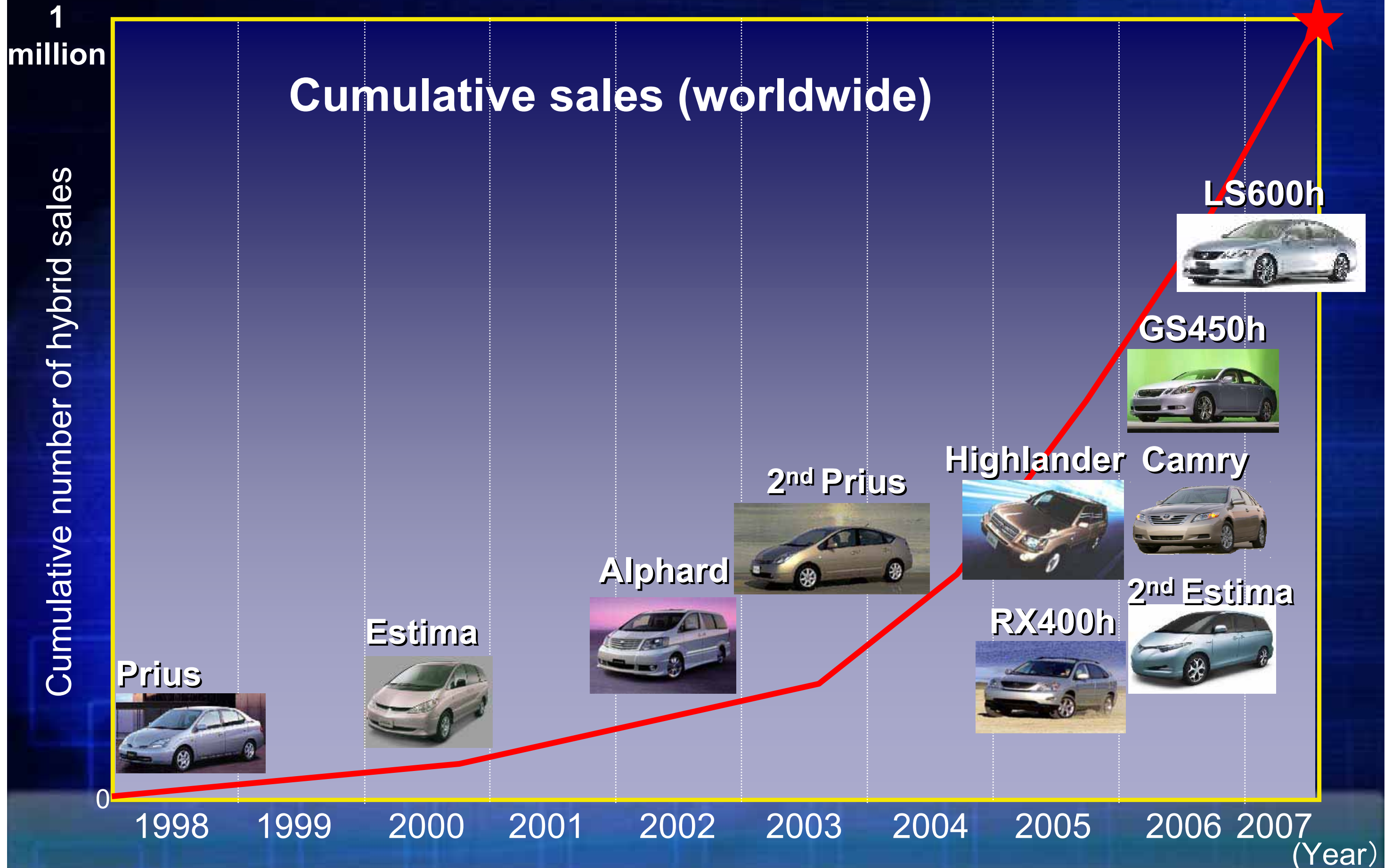


*Super Ultra Low Emission Vehicle

History of Toyota's HV Development



HV Market



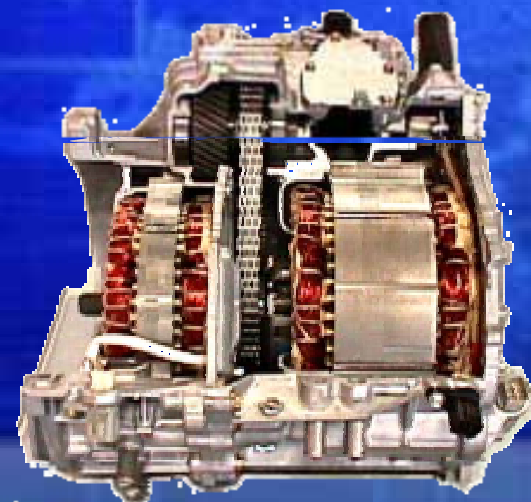
Evolution of HV Units

- Continuous improvements for cost, performance, size and weight

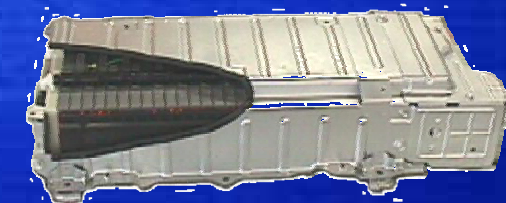
Main hybrid system units



Inverter



Traction Motor
Generator



Battery

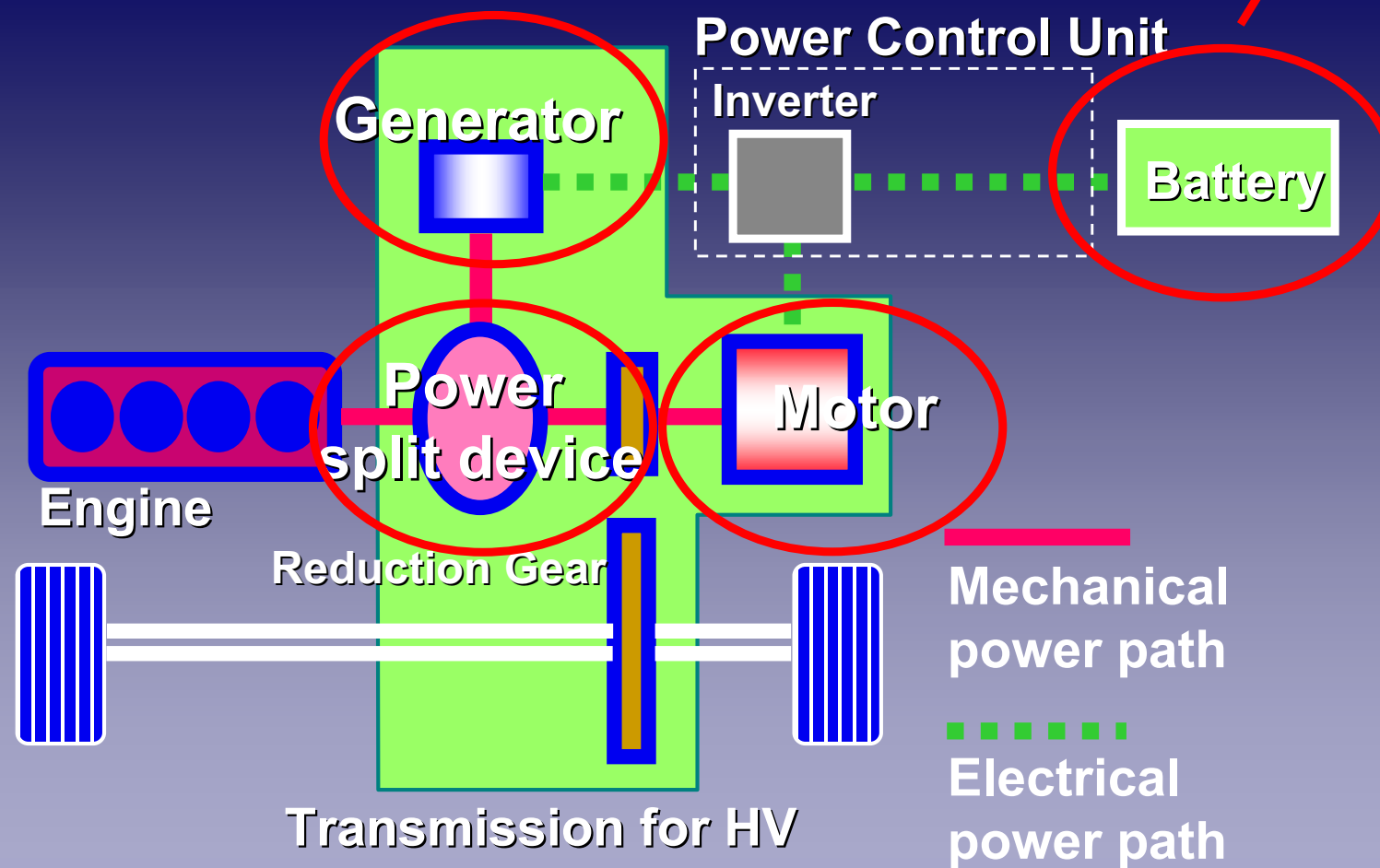
Evolution of Toyota Hybrid System

Prius (THS) 1997~2003



Features of System

1. Two electric motors
2. Ni-MH battery
3. Power split device



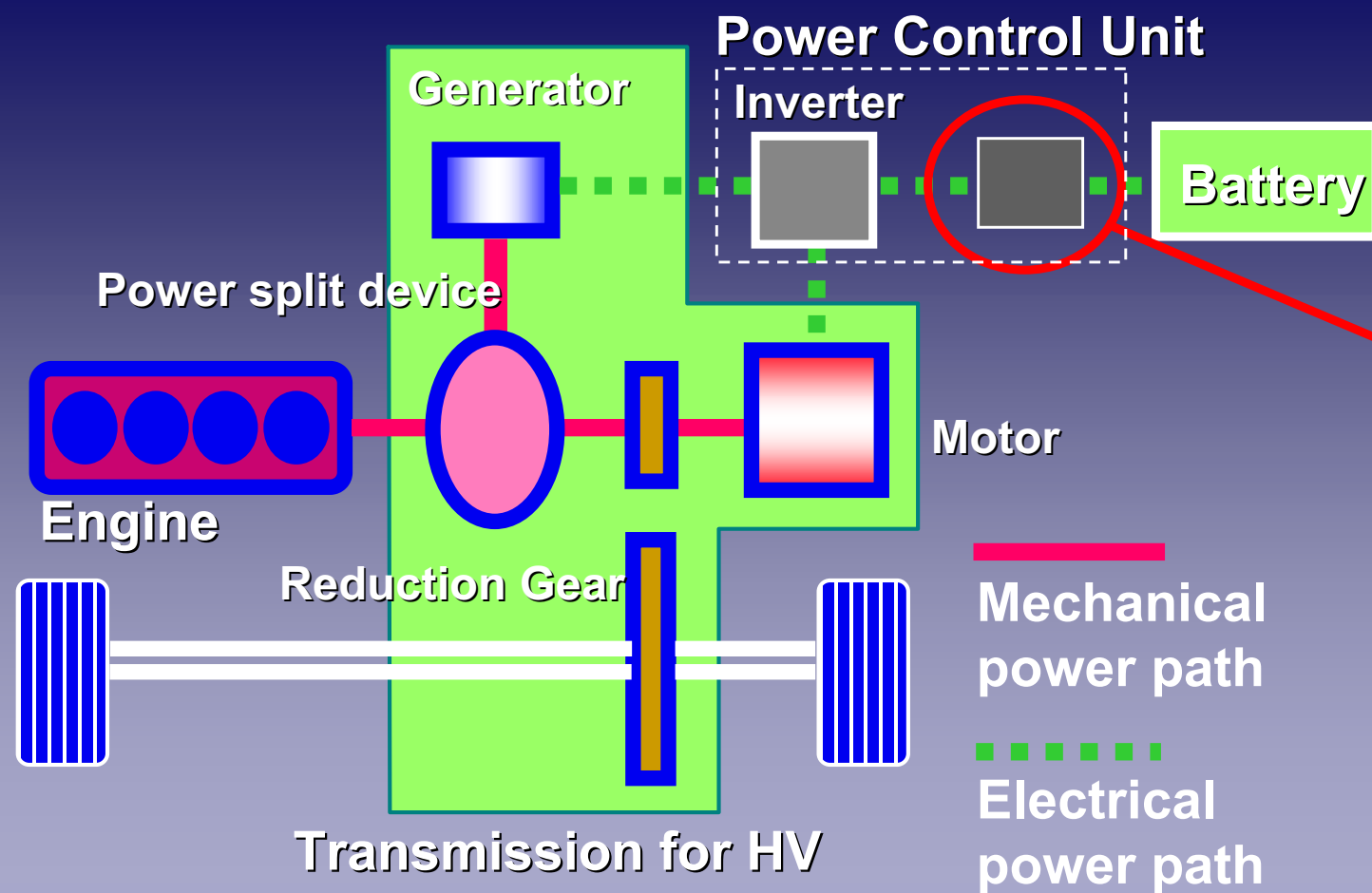
Evolution of Toyota Hybrid System

Prius (THSII) 2003~



Features of System

1. Two electric motors
2. Ni-MH battery
3. Power split device



High-voltage boost circuit

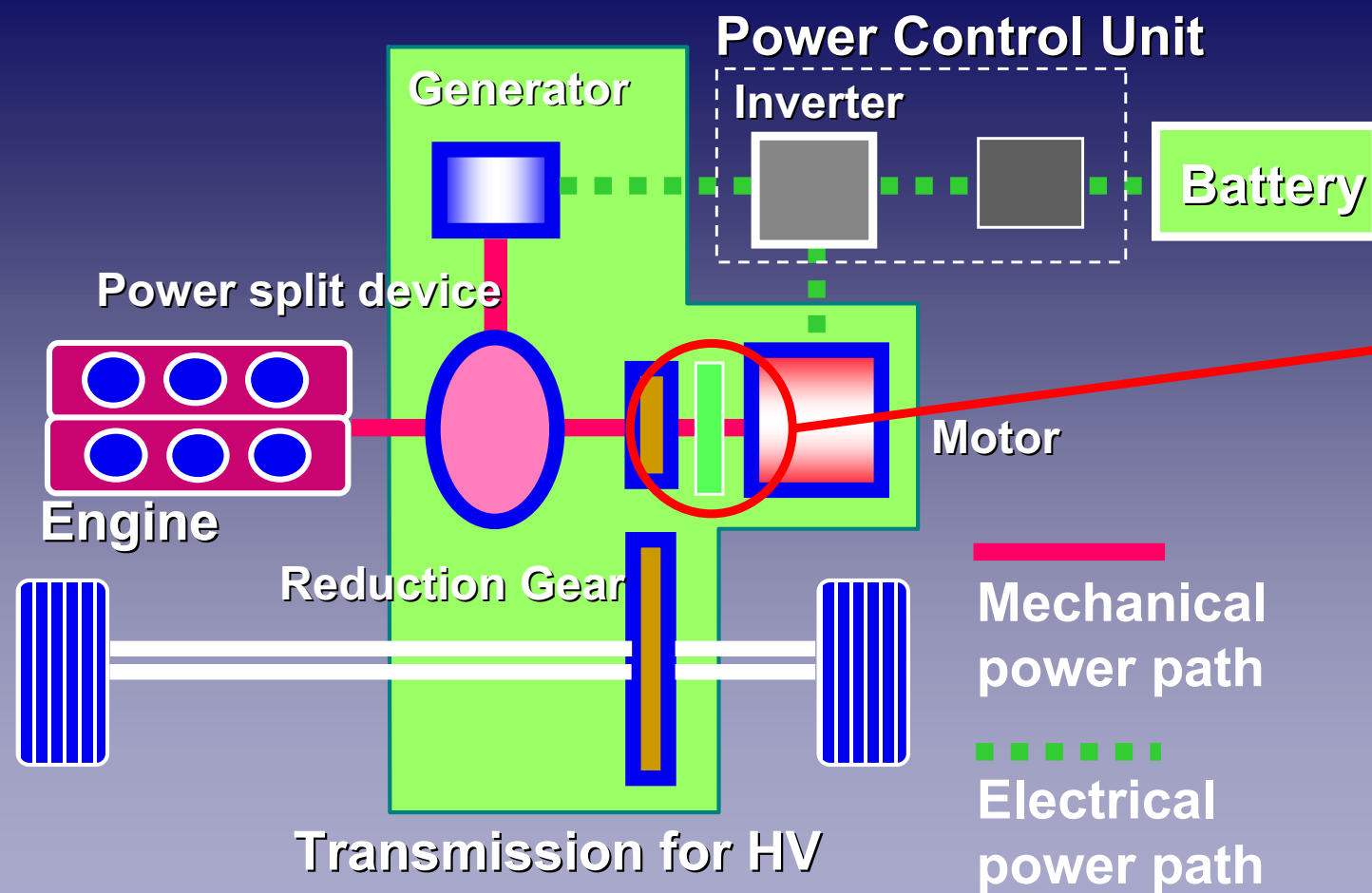
Evolution of Toyota Hybrid System

RX400h (THSII) 2005~



Features of System

1. Two electric motors
2. Ni-MH battery
3. Power split device
4. High-voltage boost circuit



**Motor speed
reduction device**

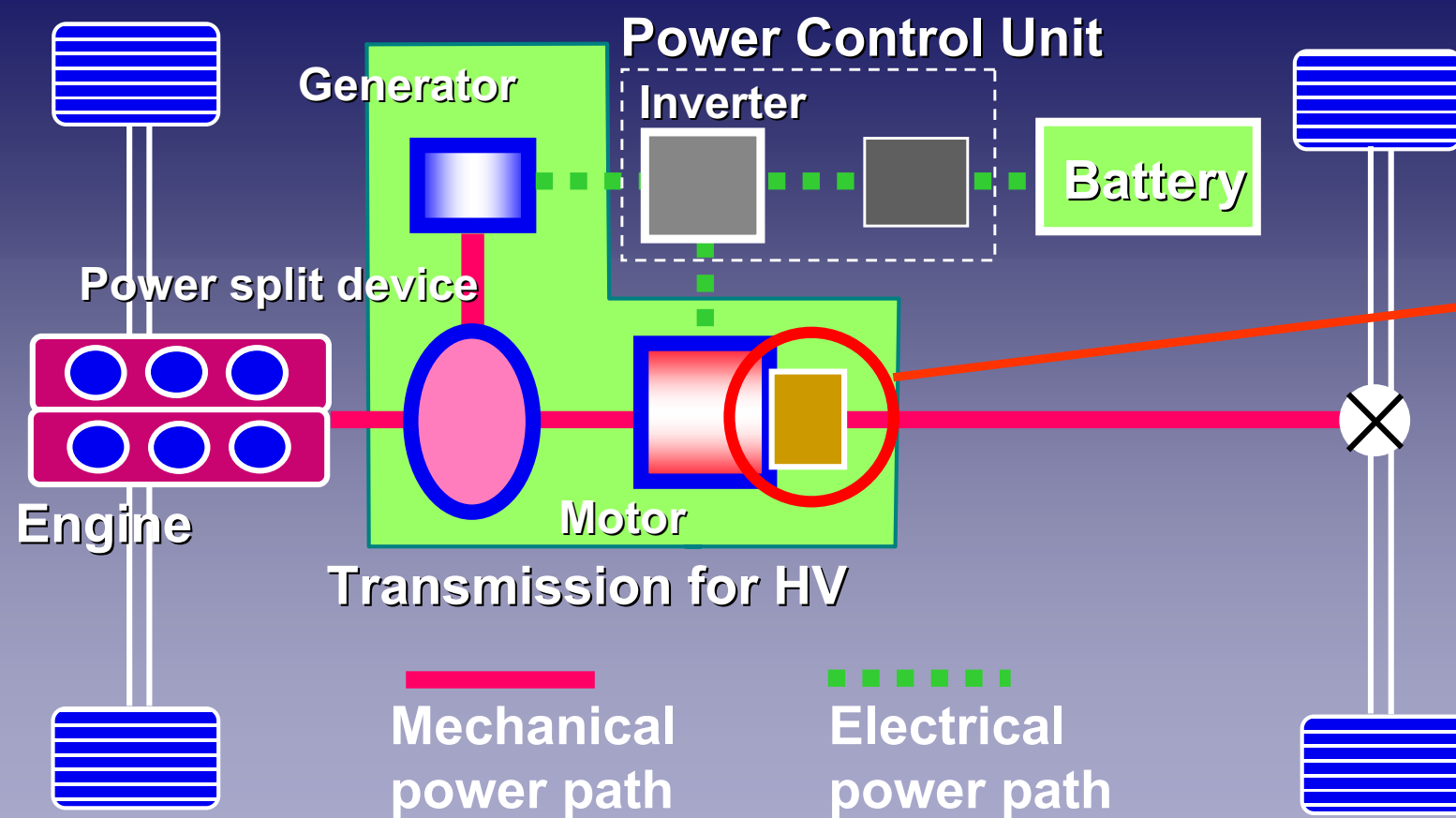
Evolution of Toyota Hybrid System

GS450h (THSII) 2006~



Features of System

1. Two electric motors
2. Ni-MH battery
3. Power split device
4. High-voltage boost circuit
5. Motor speed reduction device



2-stage motor speed reduction device

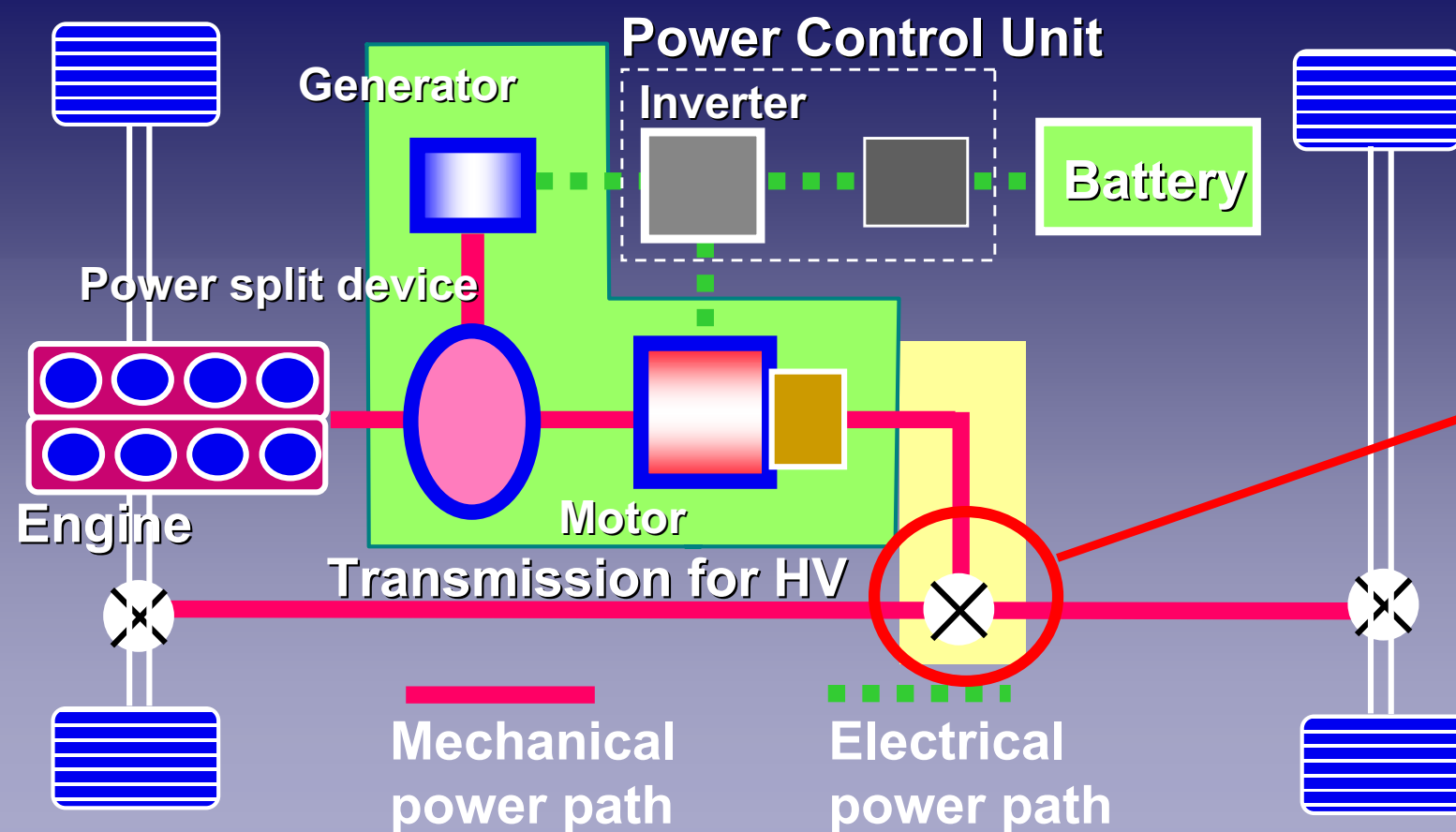
Evolution of Toyota Hybrid System

LS600h (THSII) 2007~



Features of System

1. Two electric motors
2. Ni-MH battery
3. Power split device
4. High-voltage boost circuit
5. 2-stage motor speed reduction device



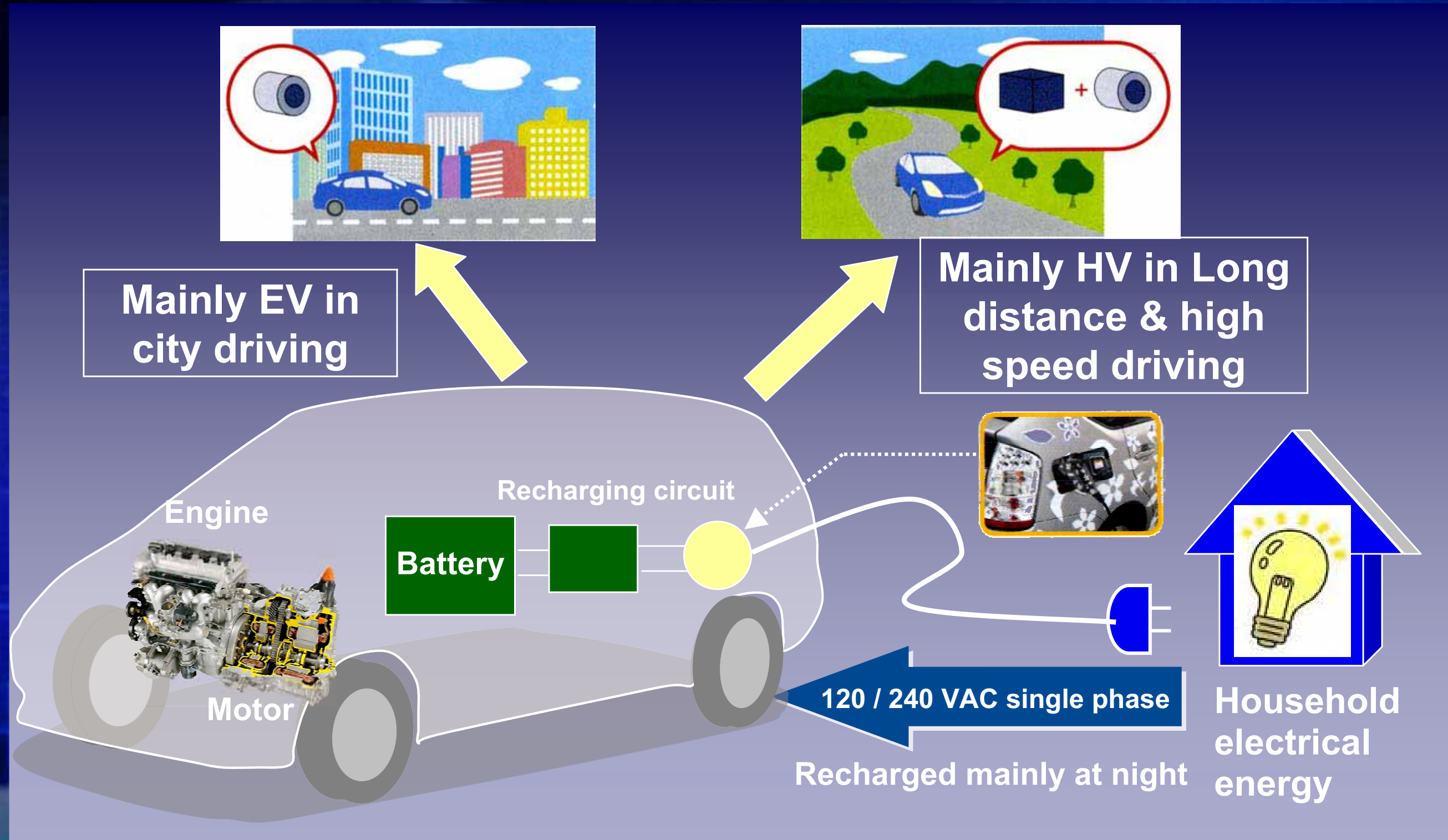
Mechanical 4WD

Plug-in Hybrid Vehicle (PHV)

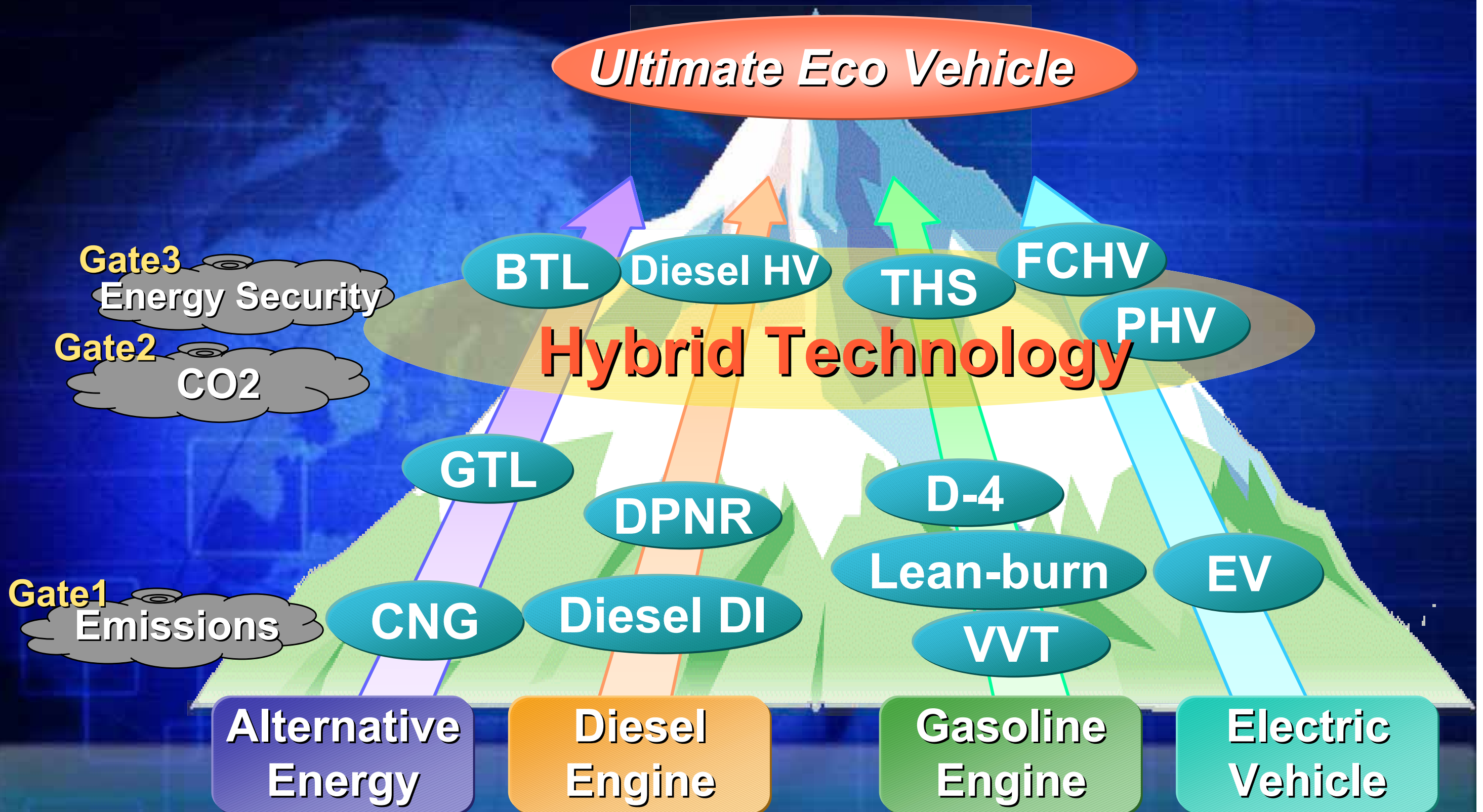


Plug-in Hybrid Vehicle (PHV)

- Plug-in hybrids are expected as a new style of electricity utilization



Toyota's Approach toward the Ultimate Eco-vehicle

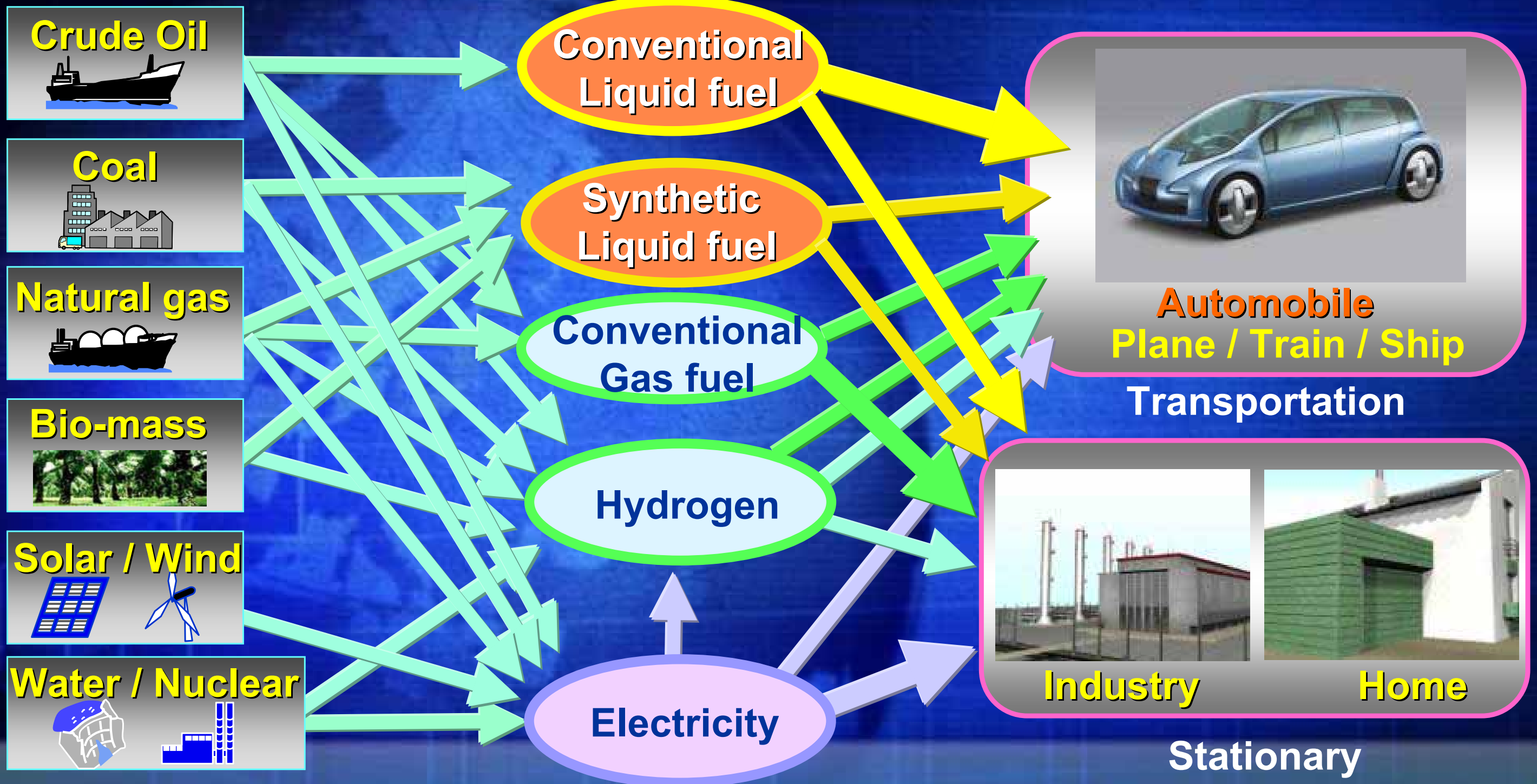


Future Energy for Automobiles

Primary energy

Secondary energy

Utilization field





Today for Tomorrow