

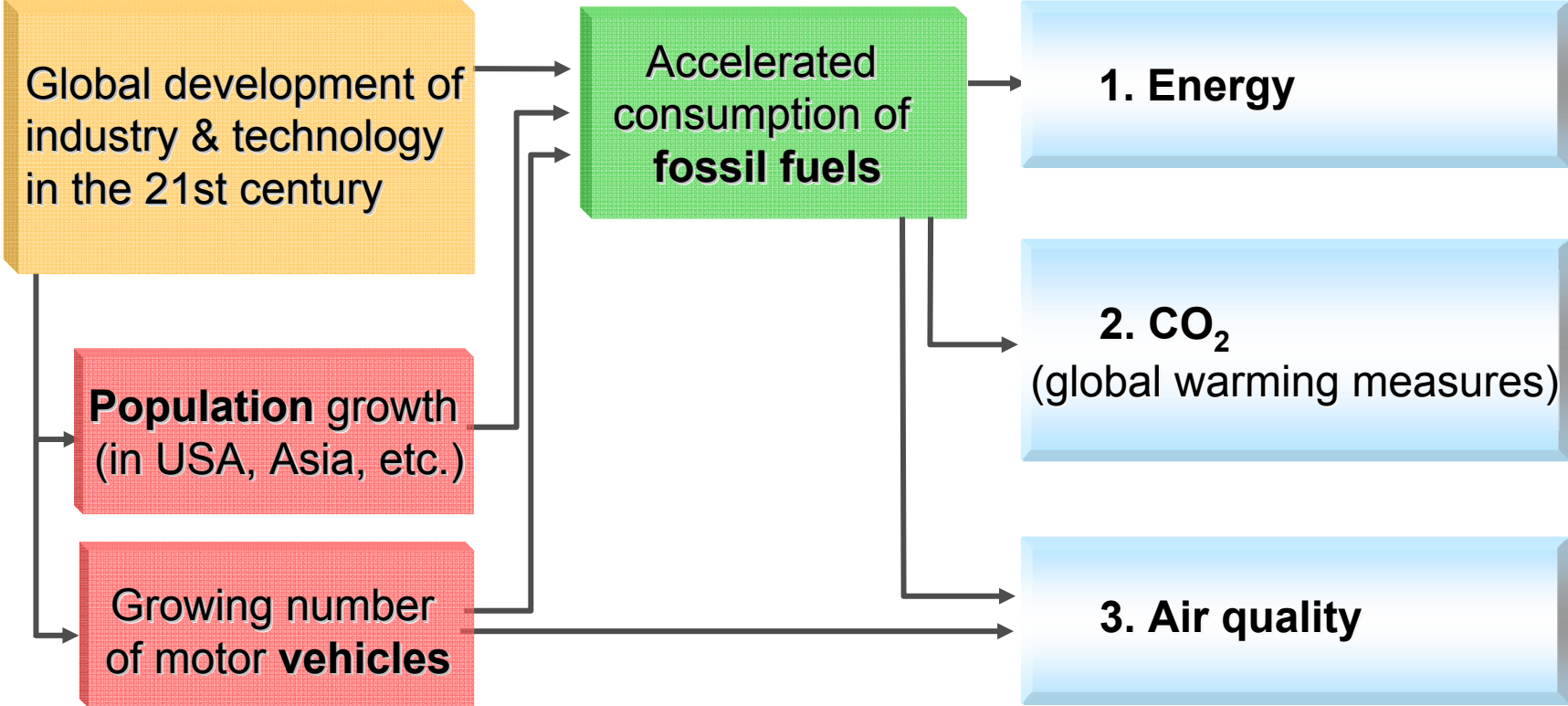
aim: zero  
emissions



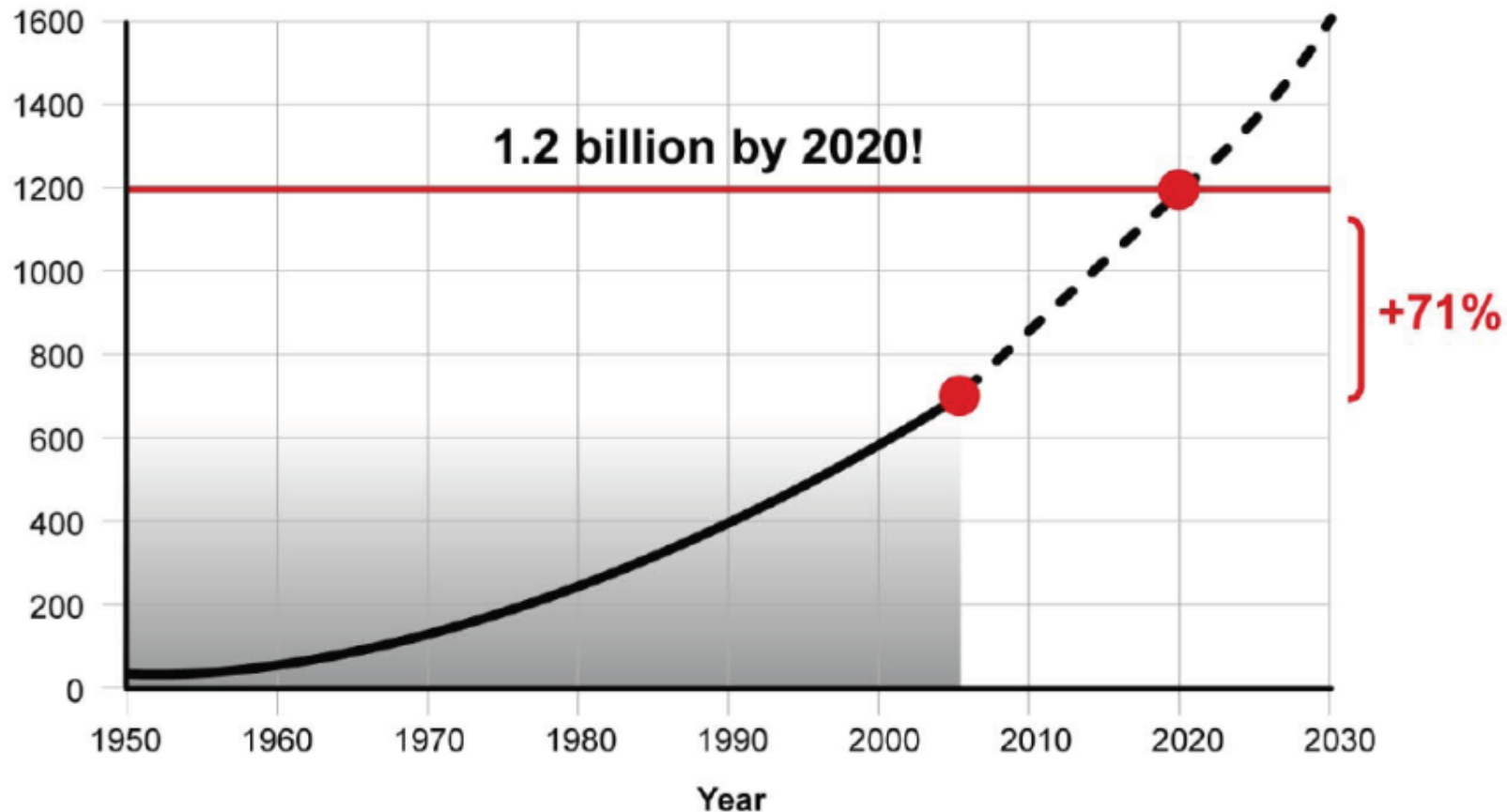
[www.aimzeroemissions.eu](http://www.aimzeroemissions.eu)

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# Three Major Issues



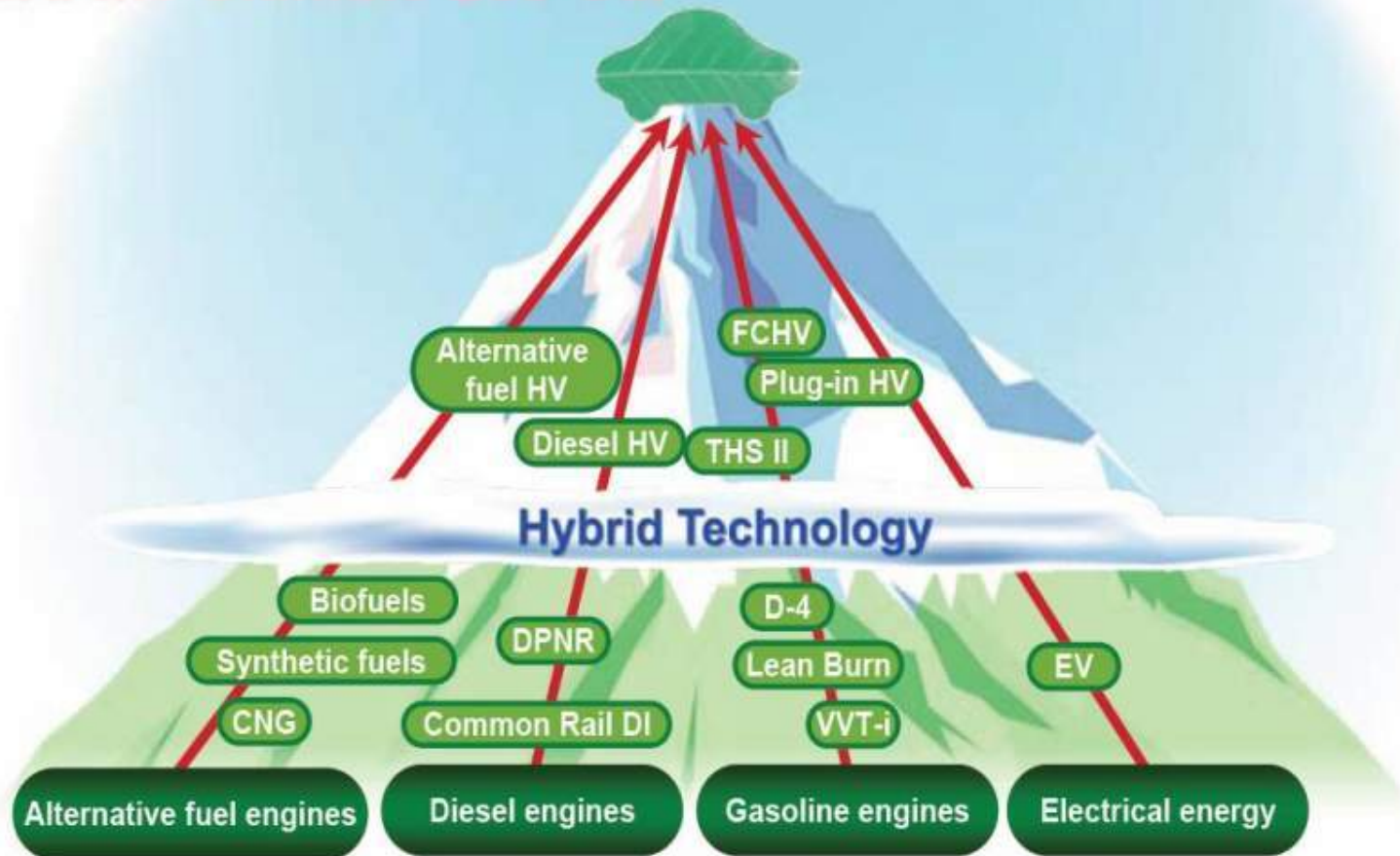
# Global increase in vehicles



Source: Handbook of automotive industry 1999

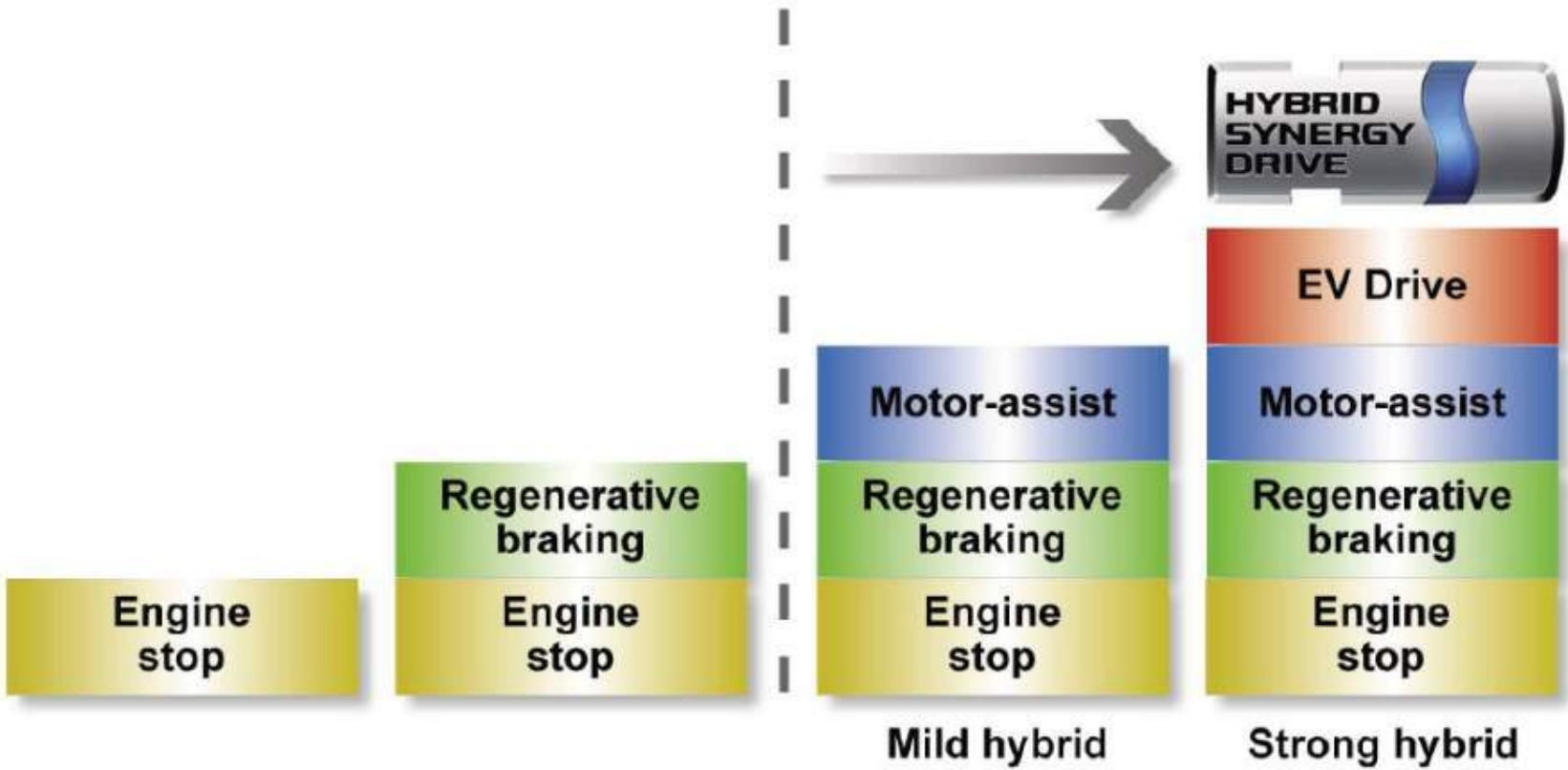
# Multiple pathways

toward the Ultimate Eco-Car

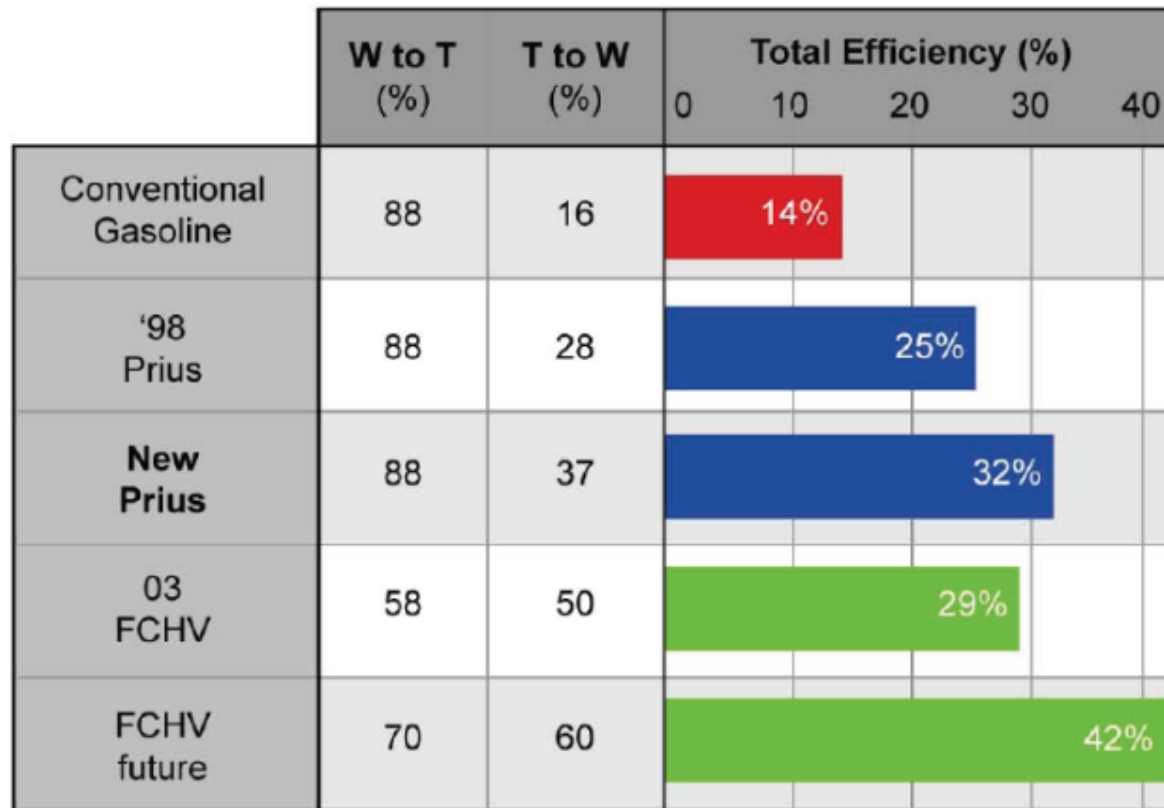


Hybrid technology boosts performance for all powertrain systems

# What is hybrid?



# Prius - Well to Wheel total efficiency



(Toyota Data: 10-15 mode)



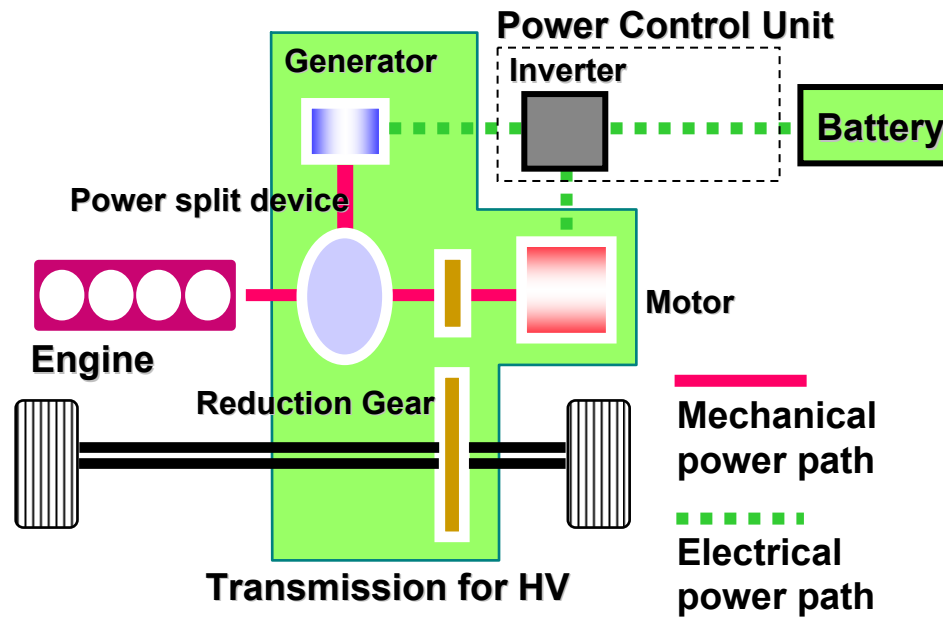
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# Prius (THS) 1997~2003



## Features of System

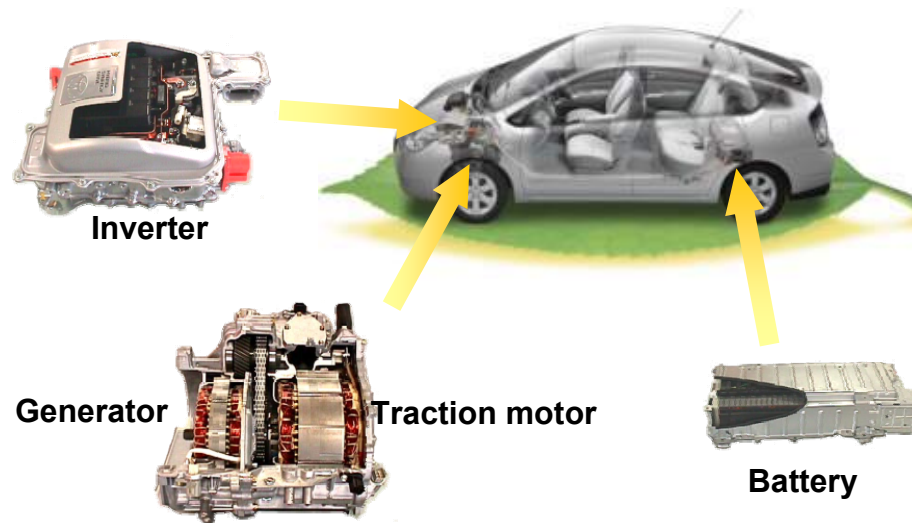
- 1 □ Two electric motors
- 2 □ Ni-MH battery
- 3 □ Power split device



# Evolution of Hybrid Units

- Continuous improvements (KAIZEN)
- The challenge to achieve higher performance
- Smaller, lighter units with improved output

**Main hybrid  
system units**

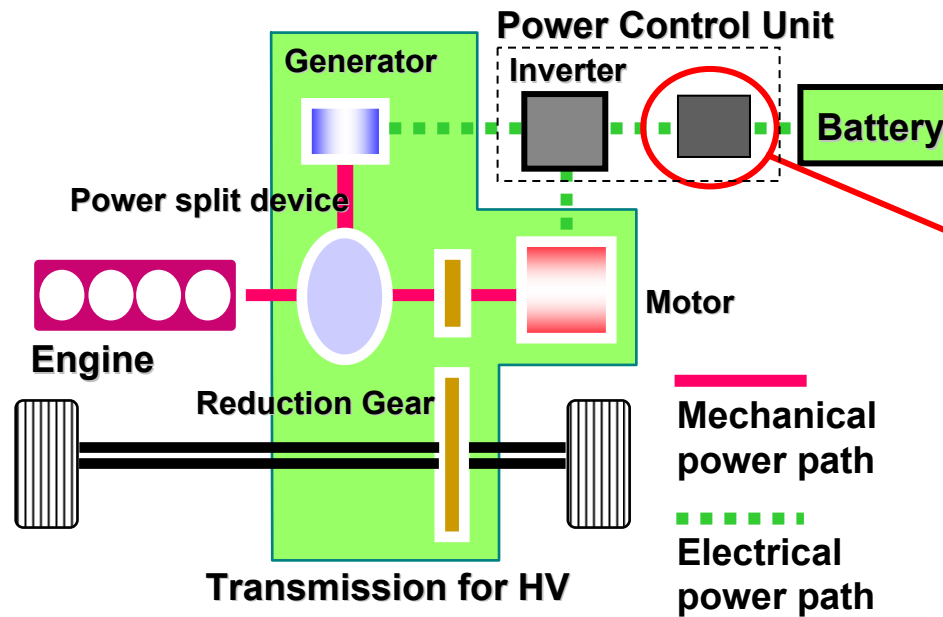


# Prius (THSII) 2003~



## Features of System

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

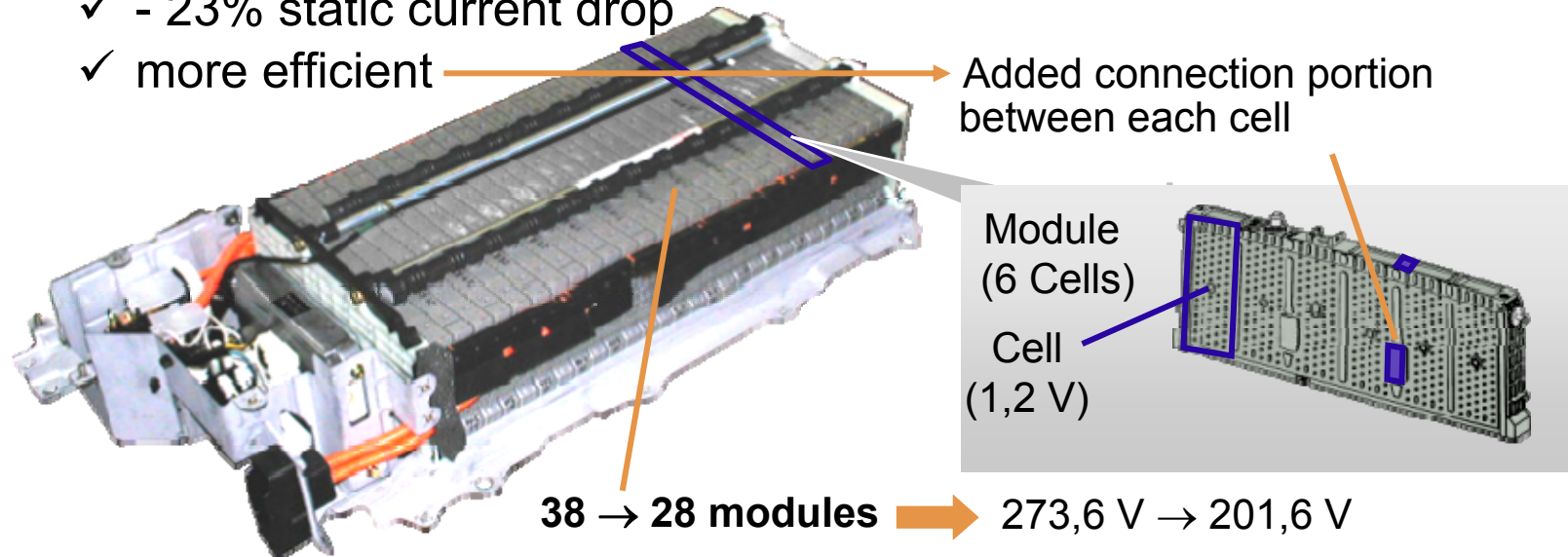


**High-voltage boost circuit**

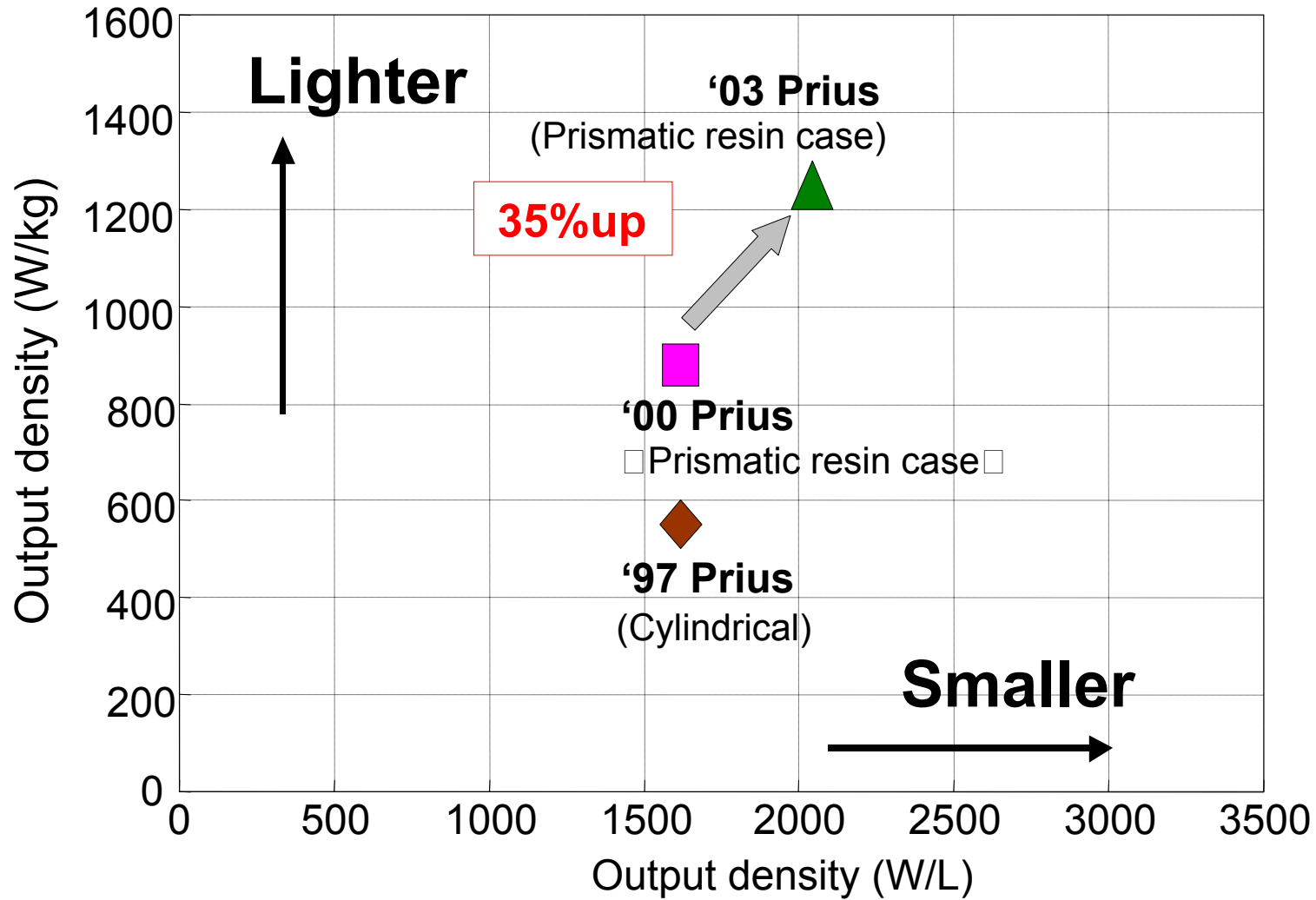
# Basic components Toyota Hybrid Synergy Drive®

HV battery Pack improvements:

- ✓ - 26% Modules (38 → 28 modules)
- ✓ - 30% weight (56 kg → 39 kg)
- ✓ - 15 % volume (- 6 l)
- ✓ - 23% static current drop
- ✓ more efficient



# Battery



# Toyota Hybrid Synergy Drive®

## Improvements Toyota Hybrid Synergy Drive® vs. THS:

+ 8% petrol power: 53 kW → 57 kW

+ 50% electric power: 33 kW → 50 kW

+ 14 % electric torque: 350 Nm → 400 Nm over a 3 x wider range

Substantial increase in **contribution of electric motor**

**Higher voltage** to electric motor/generator: **273,6 V → 500 V**

- superior power
- minimised electrical losses

**Enhanced charging capacity of generator:** more power and speed

- 33,8 kW → 37,8 kW
- 6,500 → 10,000 rpm

Newly developed **battery pack**

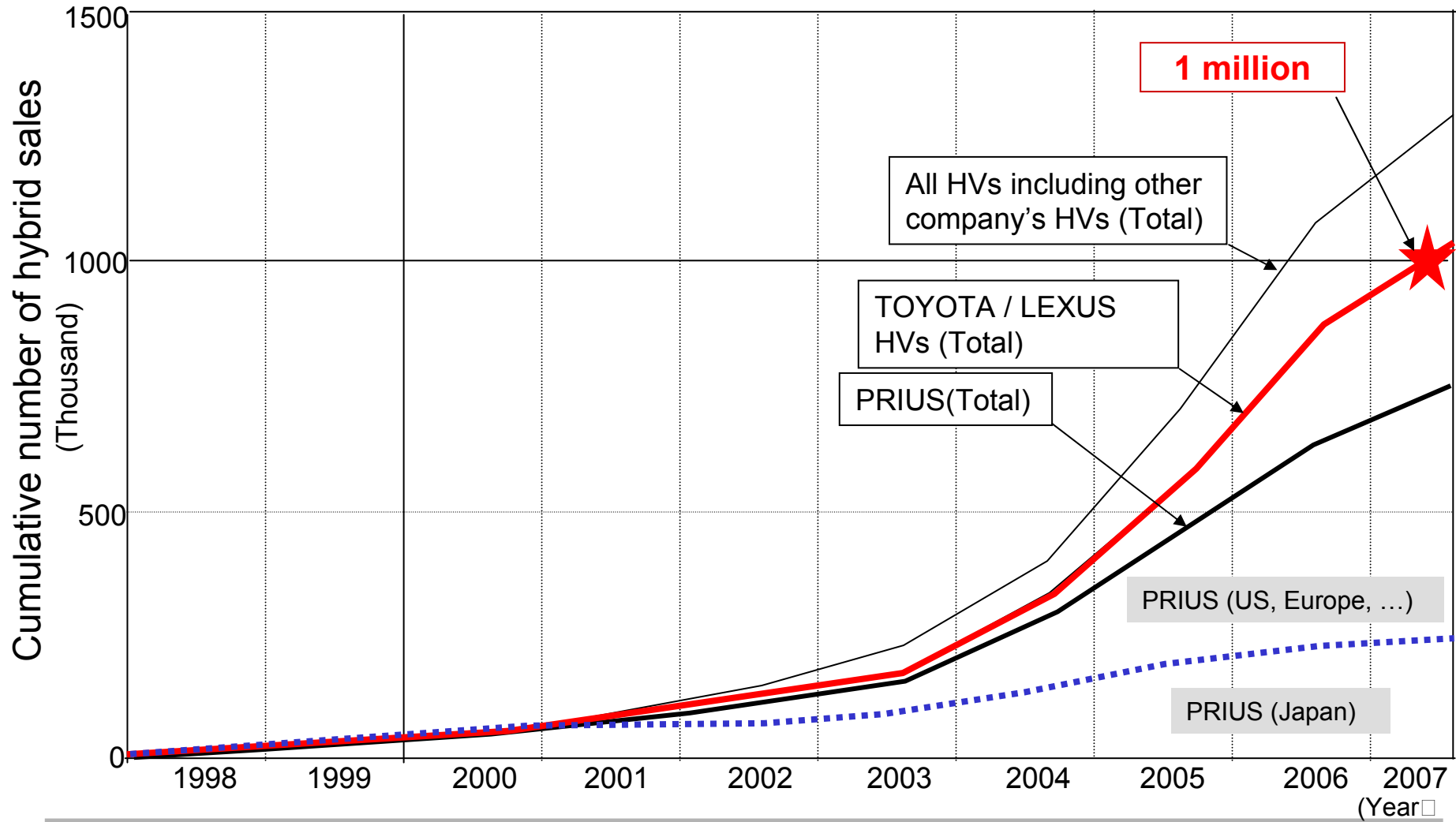
- more **compact** and **lighter** (-30%)
- superior **output density**
- improved **charge and discharge** capacity

**Aluminium** High voltage wire harness (weight reduction)



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# HV Market: Cumulative sales (worldwide)



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# Irish Market Experience

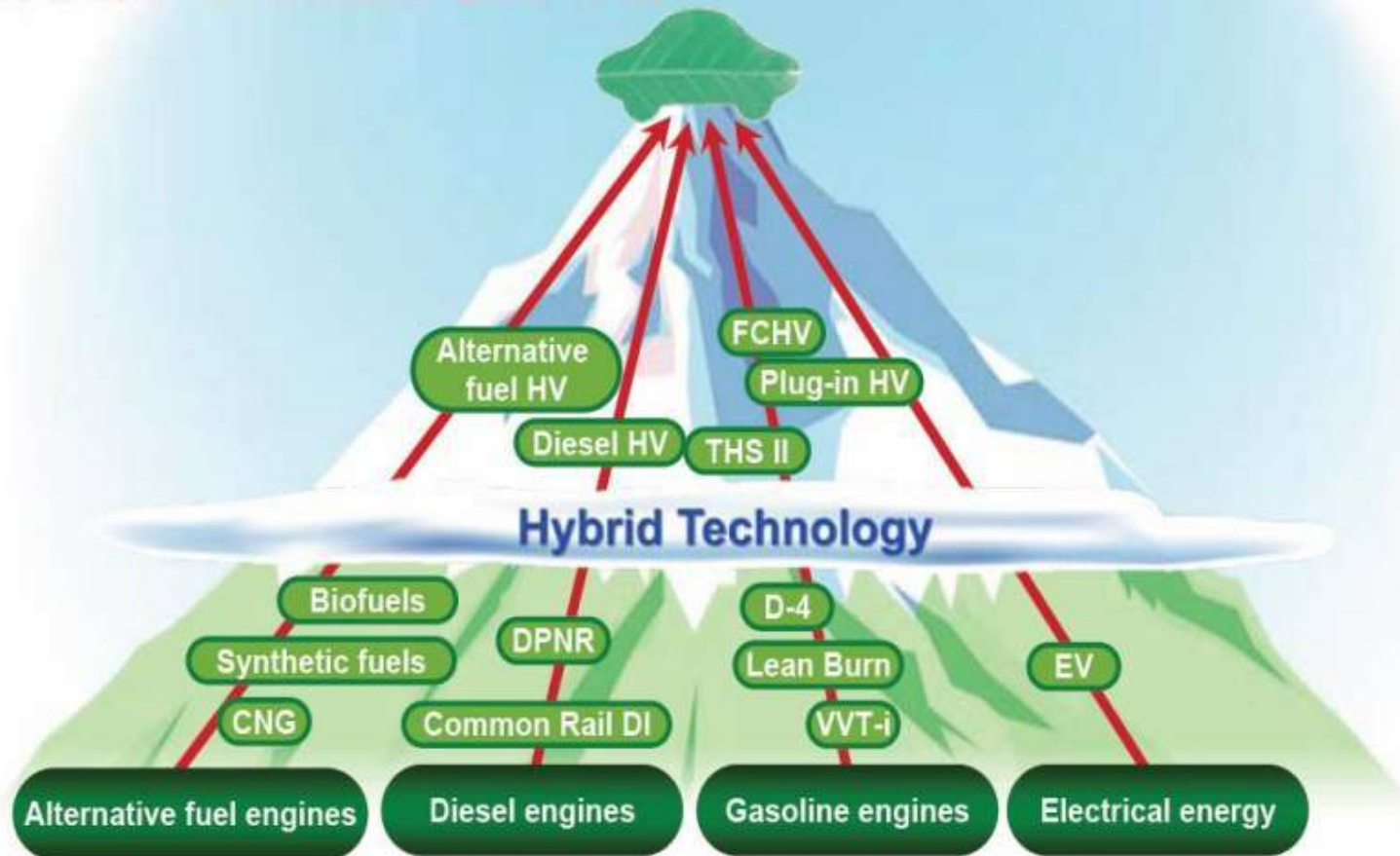
- Hybrid sales exceeded 2,500 at end of 2008
- Mainly private buyers
- Toyota Ireland role in promoting Hybrid
- No.1 in customer satisfaction J.D. Power
- Resale value is very strong
- Appeal of Hybrid reaching a wider customer base



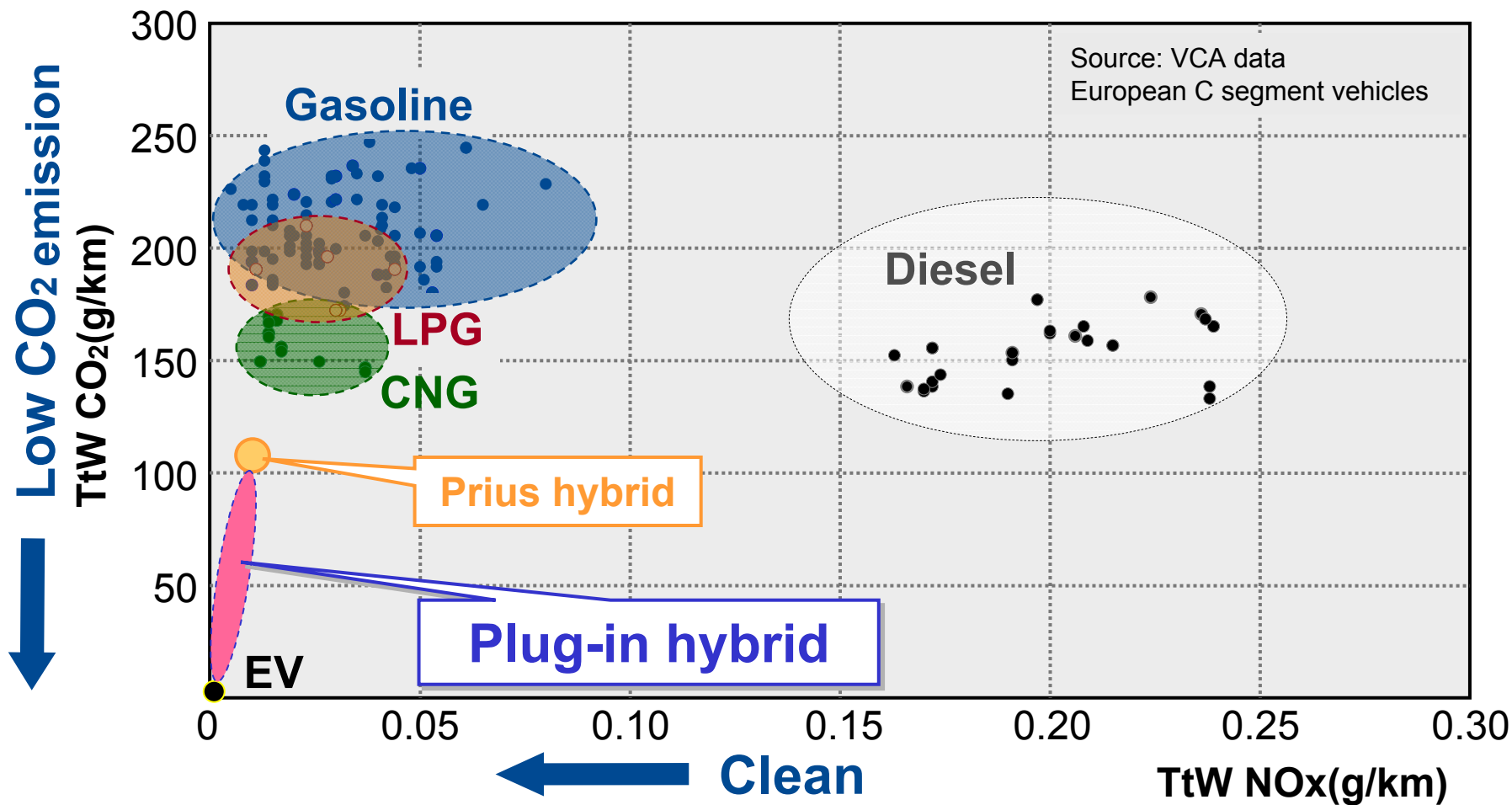
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# Multiple pathways

toward the Ultimate Eco-Car



Hybrid technology boosts performance for all powertrain systems



Plug-in technology can further enhance the environmental performance of hybrids both in CO<sub>2</sub> & pollutant emissions



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# Fuel Cell Hybrid Vehicle (FCHV)



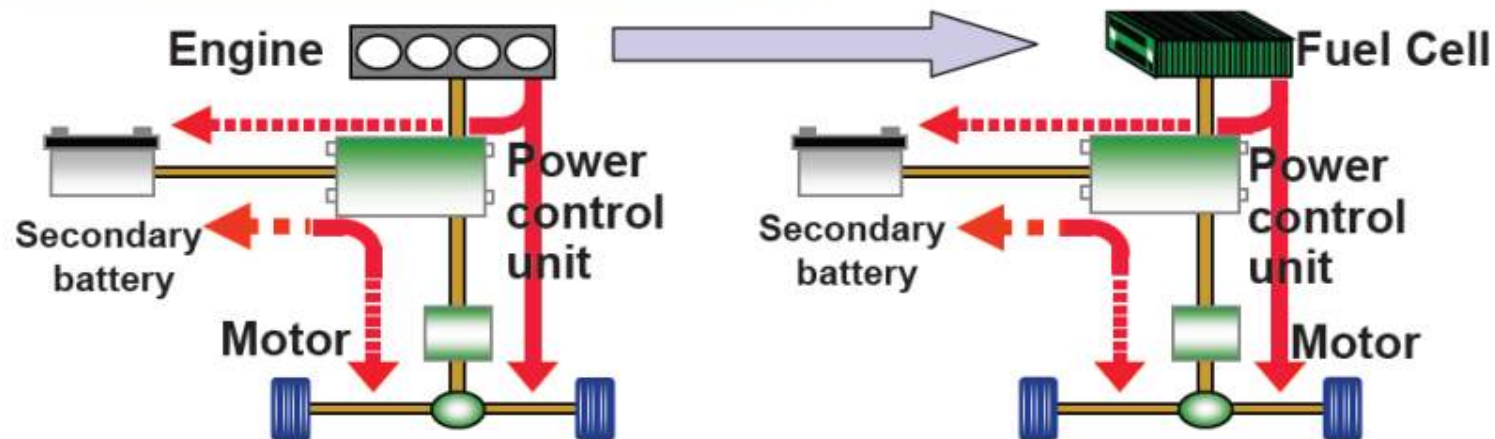
- Travelled 560 km between Osaka and Tokyo without refuelling
- Seeking improvements toward future commercialisation

# Toyota's Fuel Cell Technology

Prius



FINE-X



# Downsizing and Weight Reduction

## New Technologies: Toyota iQ = 860 kg



Less than 100 g/km CO<sub>2</sub>



The six space-saving engineering innovations:

- 1 Differential
- 2 Flat under-floor fuel tank
- 3 Smaller heater/air conditioning unit
- 4 Asymmetric dashboard
- 5 Centre take-off steering gear
- 6 Slim seat design

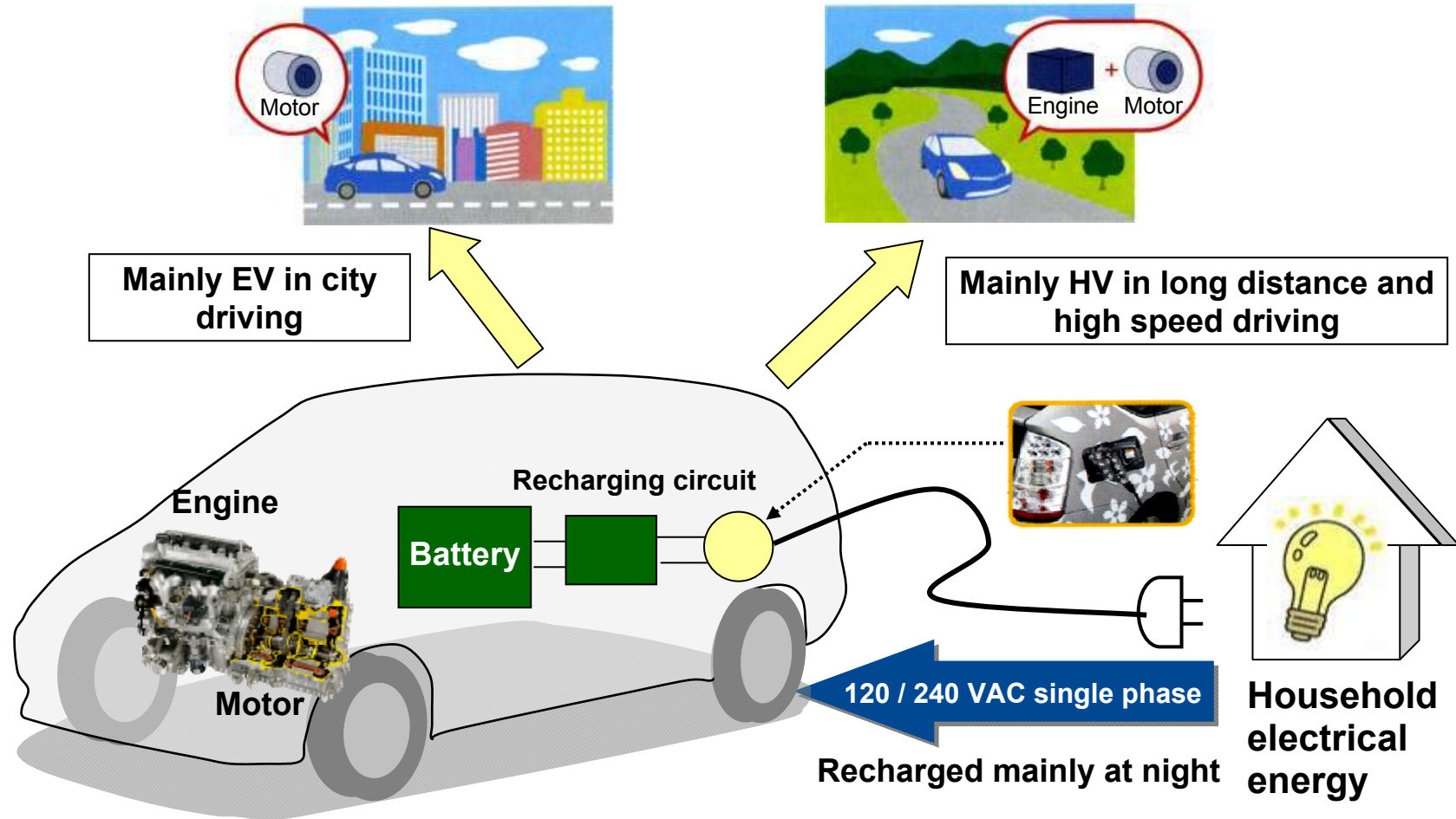
# FT-EV Concept



# Plug-in Hybrid



# Plug-in Hybrid Vehicle



Plug-in hybrids : A new style of electricity utilization



*The power to move forward*

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