Strategy in Chaotic Energy Environment

TOYOTA MOTOR CORPORATION
3rd December 2014
Basic strategy for long-term energy challenge

**Efficiency**
- Energy per (person, km)
  - Fuel economy of car
  - Traffic flow
  - Modal mix

**Energy Diversification**
- Carbon content
- External dependence for country
  - Biofuels, Natural gas
  - Electricity, Hydrogen

- Attractiveness
- Economy
- Policy support

Get consumers’ choice

Rewarded with a smile
Vehicle efficiency improvement by all measures

**Powertrain**
- Engine
- Transmission

**Vehicle**
- Aerodynamics
- Light weight

**Hybrid transmission**

**Real world economy**

**Encouragement of eco-driving**

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Selecting proper technology and combination with transmission for each segment of vehicles

- **Slower combustion to prevent knocking**
- **Exhaust loss at high-rev & high-end torque**
- **Cooling loss at lower-end speed**
- **Friction loss at higher-end rev.**
- **Pumping loss at low-load**
Hybrid: Applied to all power sources

- HV (Hybrid Vehicle)
- EV (Electric Vehicle)
- PHV (Plug-in Hybrid Vehicle)
- FCV (Fuel Cell Vehicle)
<Milestones for Global Sales of Toyota Hybrids>
- 2012: Exceeding 1 million units for annual sales
- 2014: Exceeding 7 million units for cumulative sales

As of September 2014

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Energy diversification

Crude

Natural Gas

Coal

Biomass

Nuclear

Other renewables

Gasoline

Diesel

Compressed gas

Synthetic liquid

Biofuels

Electricity

Hydrogen

Internal Combustion Engine (with or without Hybrid)

short/mid-term priority

PHV

BEV

FCV

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PHV with small battery: Practical solution for low carbon travel

- EV for short travel, HV for long travel
- No range anxiety
- High voltage charging not required

Home charging

Short distance drive

Long distance drive

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• Sales will start **within 2014 FY in Japan** (Expected to start in **US and Europe from summer 2015**)

• Introduction to the specific region where hydrogen infrastructure will be developed— **4 large cities in Japan** (Tokyo, Chukyo, Kansai and Fukuoka area)

• Expected price: **around 7 million JPY**