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June 16~18, 2009*



Challenge to Sustainable Mobility with Hyundai Blue Drive Technologies

Sunghwan Cho, Ph. D.

Powertrain R&D Center, Hyundai Motor Company

1. Introduction

2. Strategies and Technologies

- Green Car Strategy with Blue Drive
- Competitive Small Engines
- Fuel Economy Improvement

3. Summary



1. Introduction

2. Strategies and Technologies

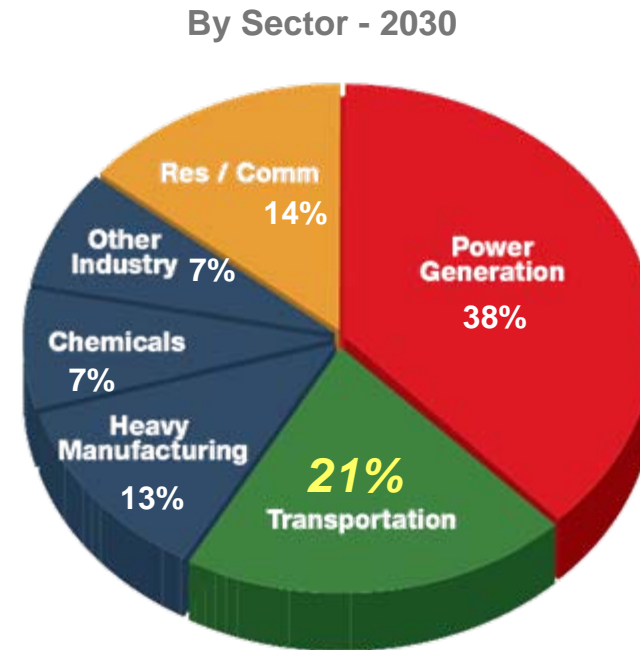
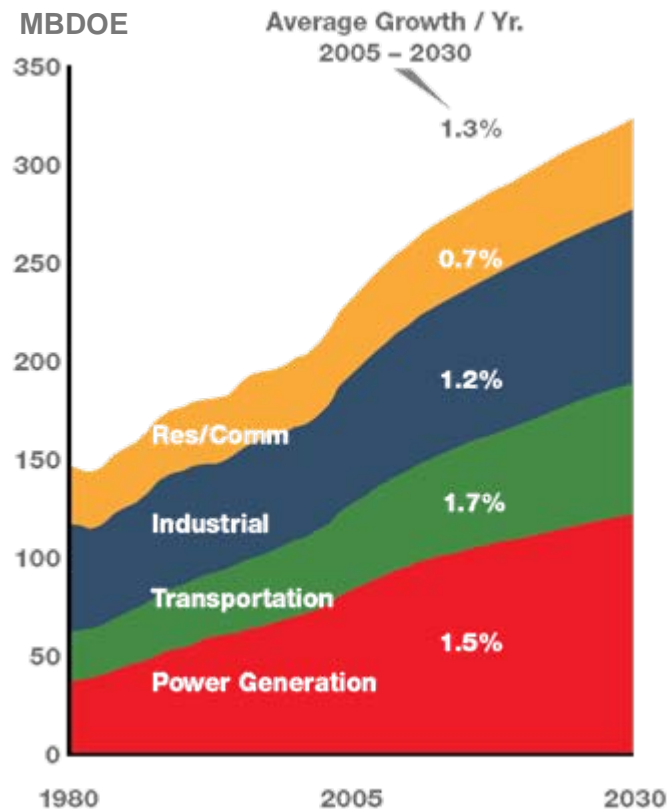
- Green Car Strategy with Blue Drive
- Competitive Small Engines
- Fuel Economy Improvement

3. Summary



World Energy Demand to 2030

- Energy demand in 2030 is expected to reach 325 MBDOE (**40% increase** compared with 2005)
- Fastest-growing sector – and the most important to oil demand – is **Transportation**

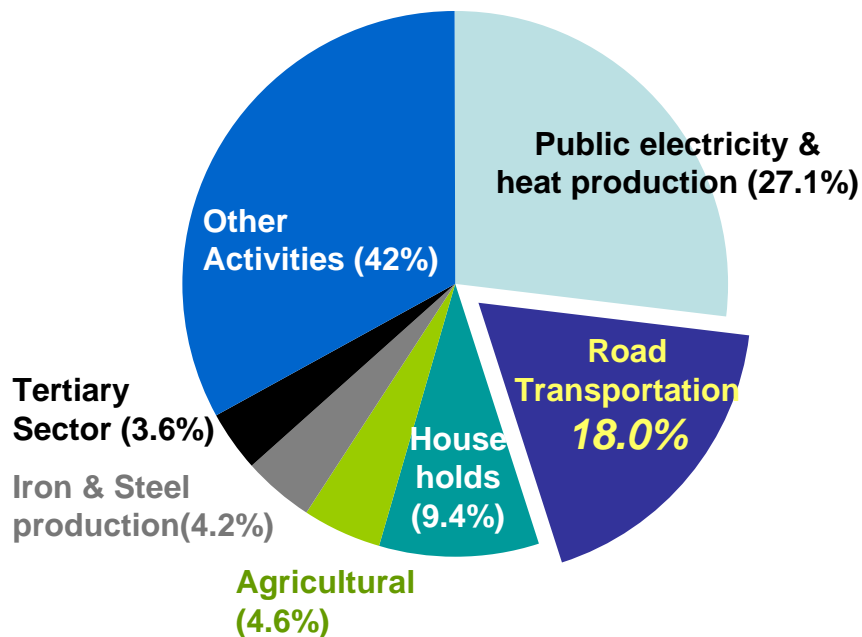


* Source : ExxonMobil (2007)

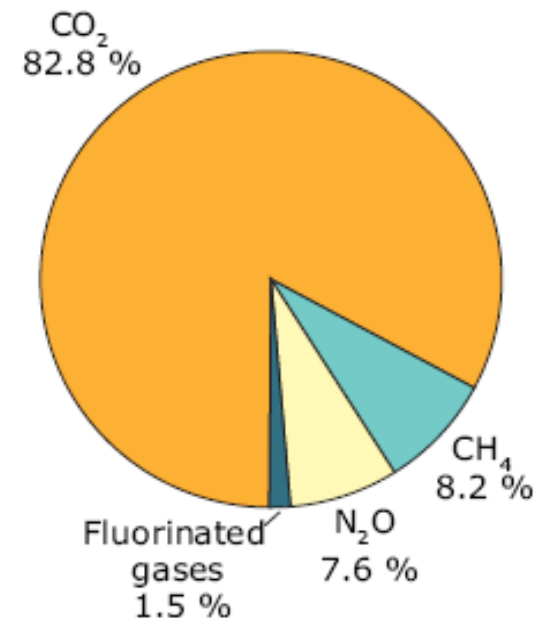
Greenhouse Gas Emissions from Road Transportation Sector

- **18 percent** of EU-27 GHG Emissions from **Road Transportation** in 2006 (926 Mt CO₂ Eq.)
- **CO₂** plays a predominant role in EU-27 GHG emissions, accounting for **83%**

< GHG Emissions in EU-27 (2006) >

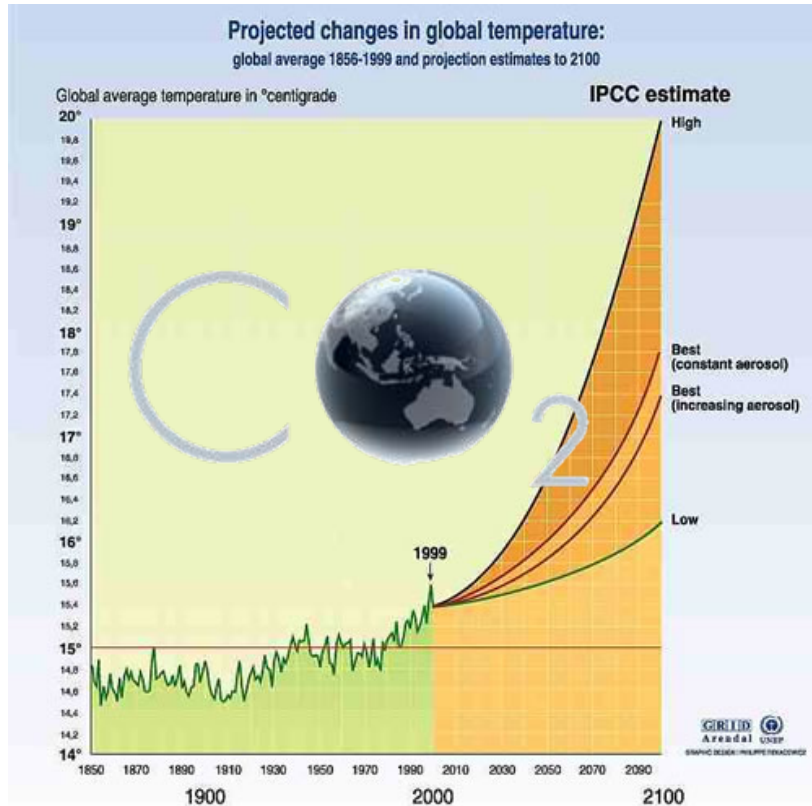


< Share of EU-27 GHG Emission by Gas (2006) >



* Source: EEA (European Environment Agency) Report 2008

● Global Climate Change

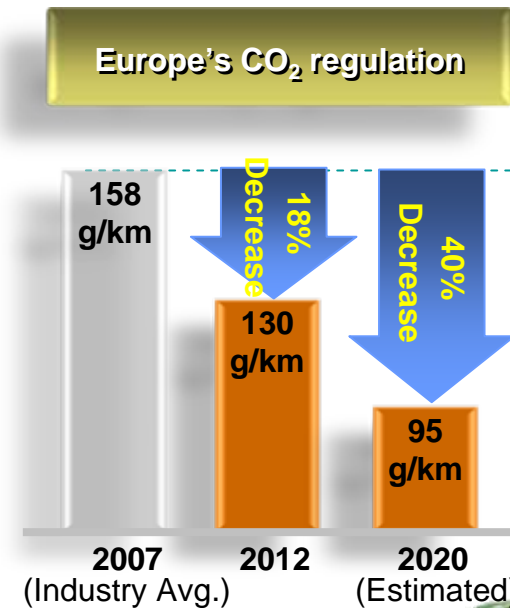


Actual global temperatures are plotted on the graph for years 1856-1999 and IPCC estimates of temperature are plotted for years 1999-2100. Different lines on the graph between 1999 and 2100 indicate high, low, and best estimates of future temperature.

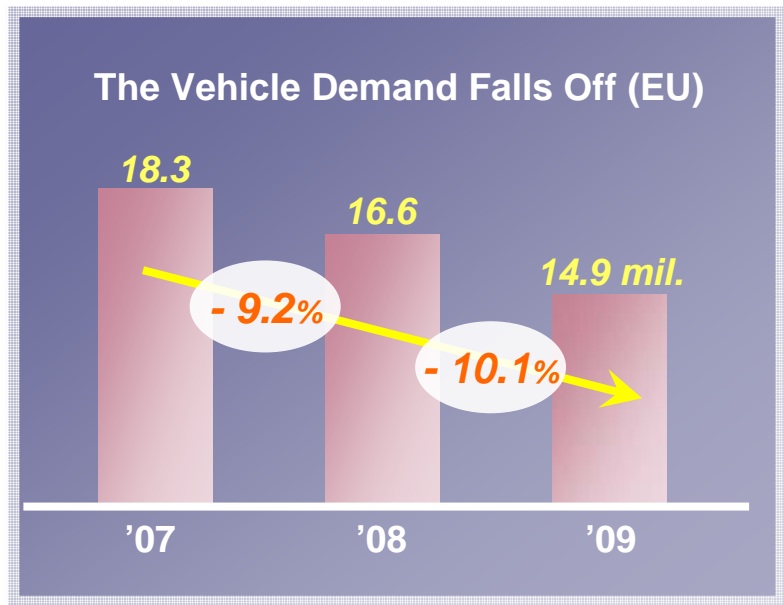
Courtesy GRID/UNEP

* Source : IPCC
(the Intergovernmental Panel on Climate Change)

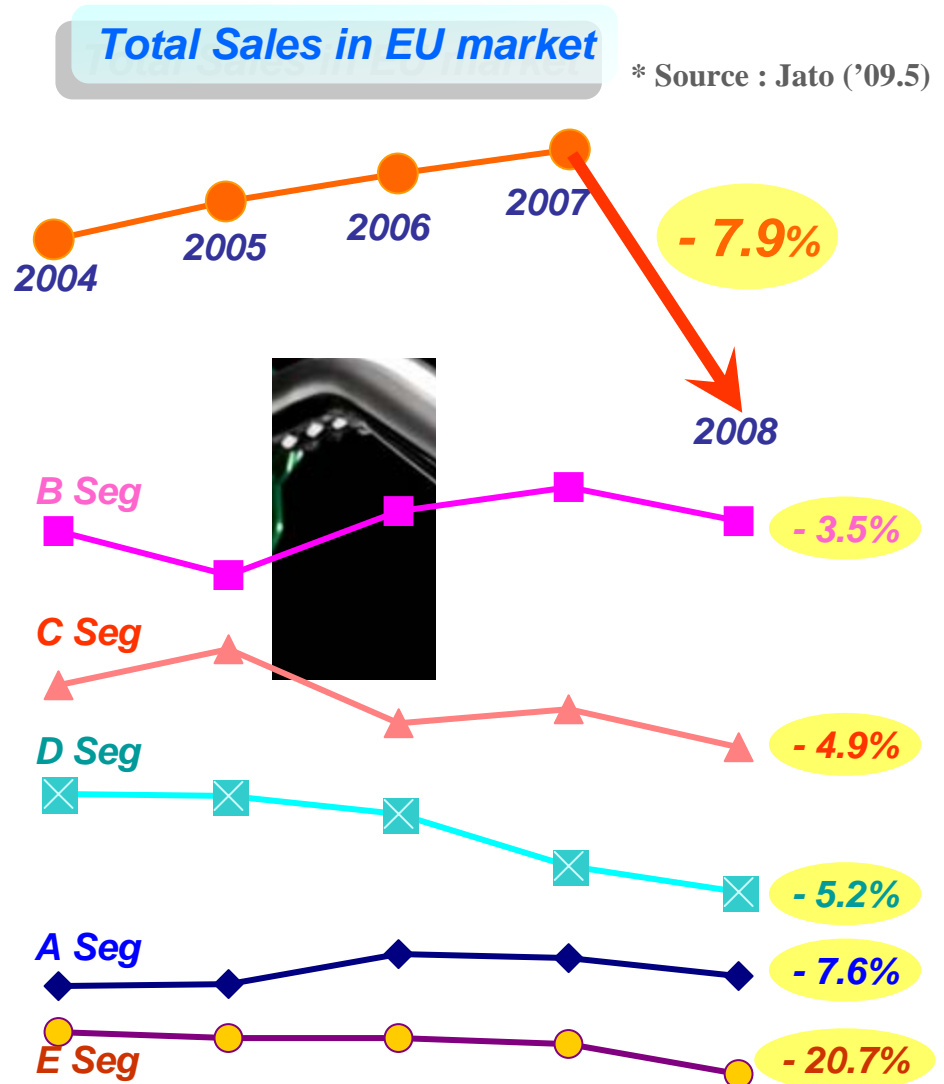
- New Energy Economics
- Rigorous Emission Standards



- Economic Slump
- Decrease of Consumption



* Source : KARI (Korea Automotive Research Institute)



Contents

1. Introduction

2. *Strategies and Technologies*

- *Green Car Strategy with Blue Drive*
- *Competitive Small Engines*
- *Fuel Economy Improvement*

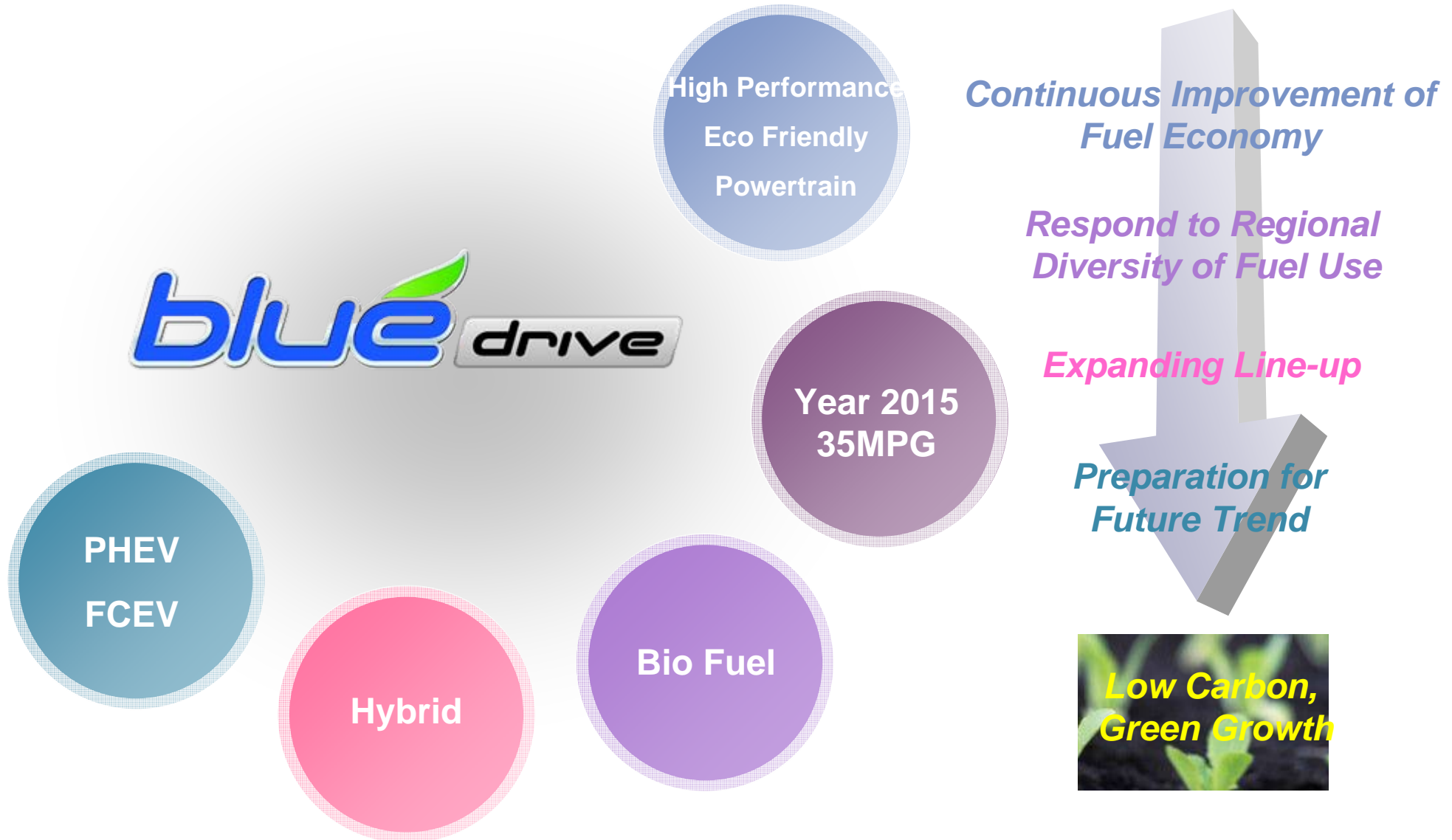
3. Summary



● Extending Eco-label Application



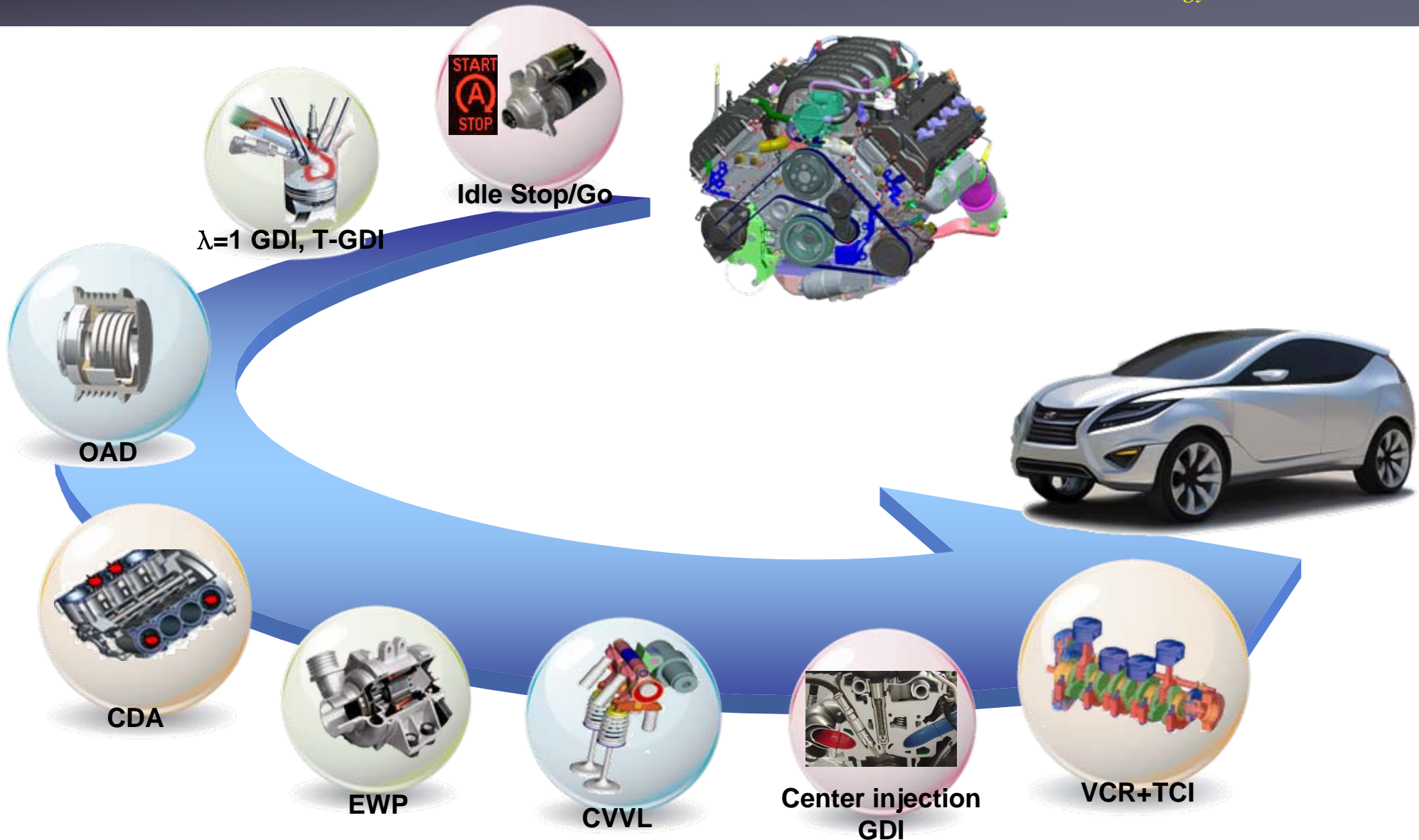
Harmonious Growth of
Environment,
Society and
Human



New Technologies for SI Engine

2. Strategies and Technologies

Green Car Strategy with Blue Drive



New Technologies for CI Engine

2. Strategies and Technologies

Green Car Strategy with Blue Drive



● Bio-Ethanol Engine Development

- E85 engine developed(3.3 L V6 engine)
- E100 engine under development(1.0/1.6/2.0 L I4 engine)
- Fleet Test completed

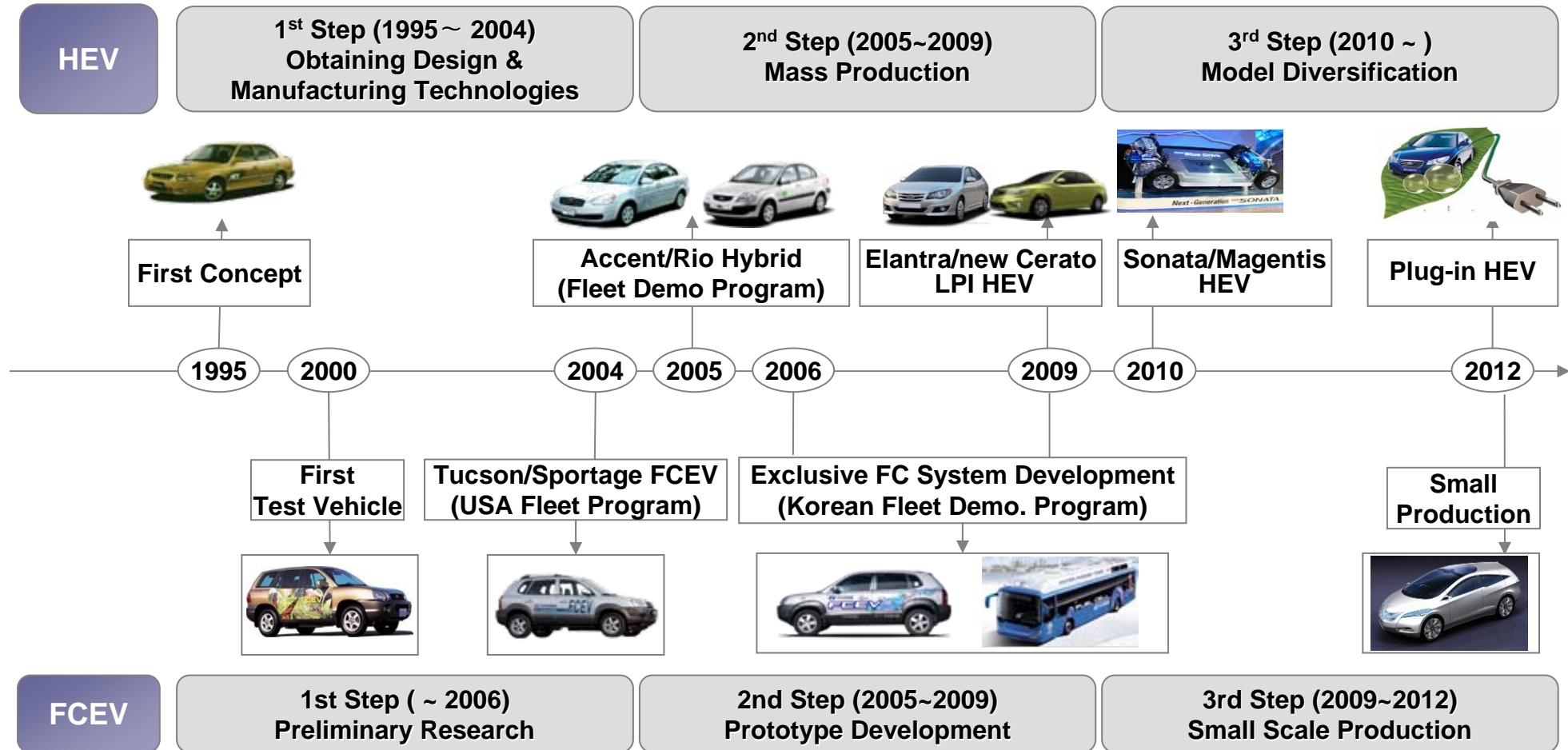


● Bio-Diesel Engine Development

- Successful validation of B5/B10
- B30 under development for passenger cars
- Pilot production of B30 vehicles planned from 2011



Technology Roadmap



● Elantra LPI Hybrid (SOP: '09.7)

● First to Adopt Advanced Lithium Polymer Batteries, Powered by LPG

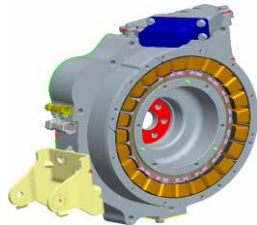


Max.Speed	182 km/h
Fuel Economy	17.7 km/ℓ (CO ₂ : 99g/km) 22.7 km/ℓ (gasoline equivalent)
Emission	SULEV
Powertrain	Gamma1.6 LPi+15kW motor +CVT
Battery	Li-PB (180 Volts)

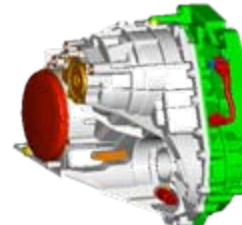
Engine



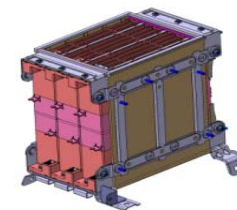
Motor



CVT

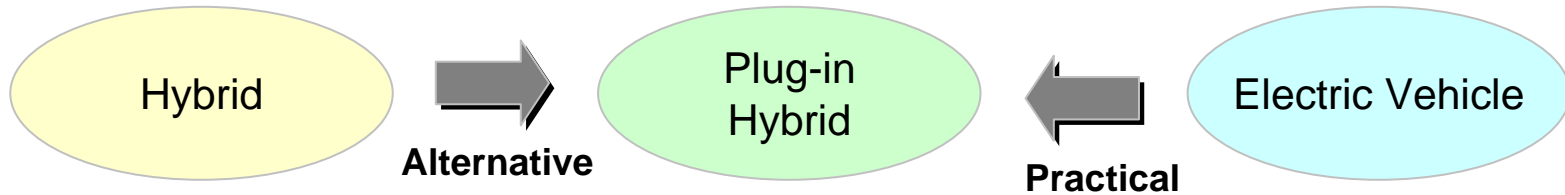


Battery

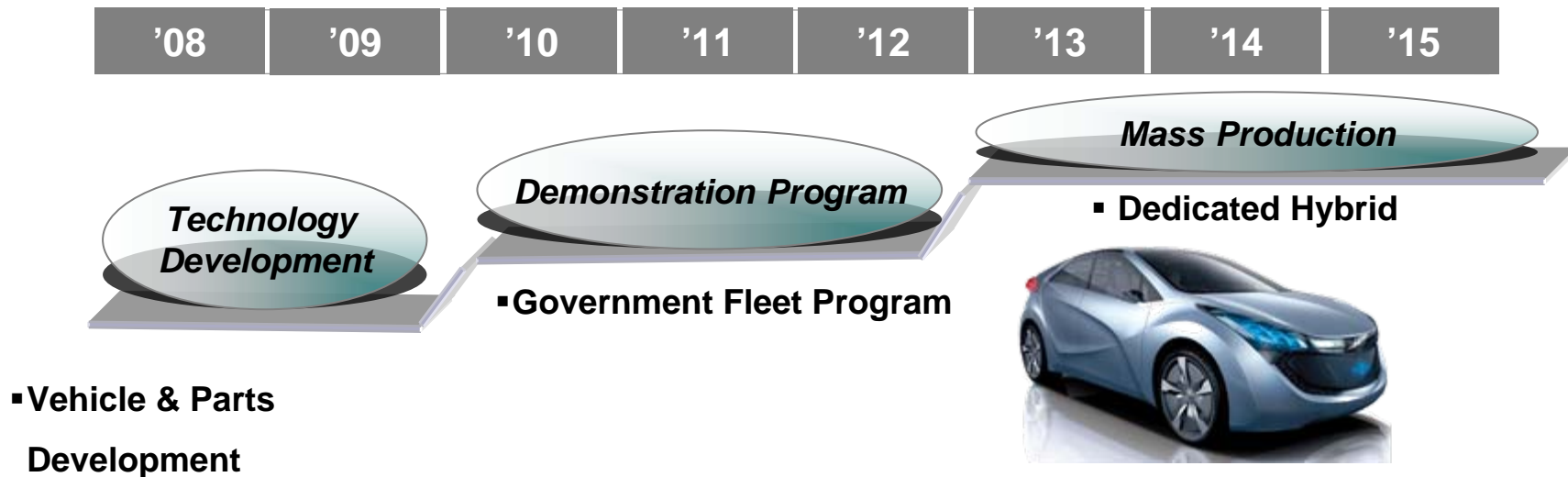


■ PHEV could be a Practical Alternative to Reduce CO2 Near Future

■ Solution to Alternative Energy and CO2 Problem



→ *Hyundai Kia will launch PHEV at the end of 2012*

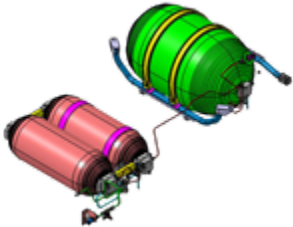


- Mohave Fuel Cell Vehicle (2008)
- From San Francisco to L.A. with Single Charge

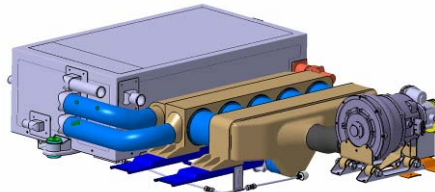


Driving Range	754 km
Max. Speed	160 km/h
Fuel Cell Power	115 kW
Aux. Power	Supercap. 100kW
Hydrogen Tank	700 Bar (7.9kg)

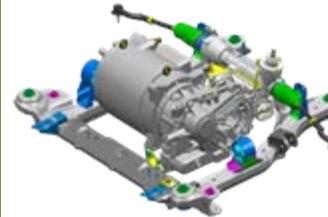
H2 Storage



Fuel Cell System



e-D/T System



Gasoline Engine



Passenger Diesel Engine



● Performance and General Specifications of Kappa 1.2 Engine



Engine Type	In-line 4-Cylinder
Valvetrain	4-Valve DOHC
Displacement Volume	1,248 cc
Bore x Stroke	71.0 mm x 78.8 mm
Power	57.4 kW (78 PS)
Torque	118.7 Nm (12.1 kgm)
Compression Ratio	10.5 : 1
EMS System	BOSCH
Emission	Euro 4/Euro 5 (2010)

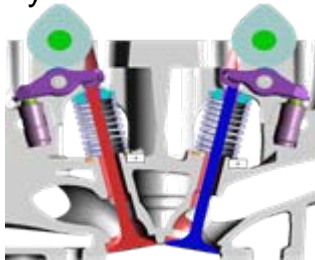
New KAPPA Gasoline Engine (i10 & i20)

2. Strategies and Technologies

Competitive Small Engines

Roller Swing Arm with Hydraulic Lash Adjuster

- Improved fuel economy and NVH



PVD coated Oil-Ring

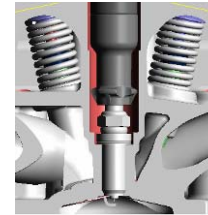
- Reduced friction



MoS2 coated Piston

- Reduced friction

M12



Long Reach Spark Plugs

- Larger valve size and stable cooling
- Performance increase
- Reduced fuel consumption

HPDC Aluminum Block & Ladder Flame

- Light weight
- Increased stiffness of powertrain
- Improved NVH



Offset Crankshaft



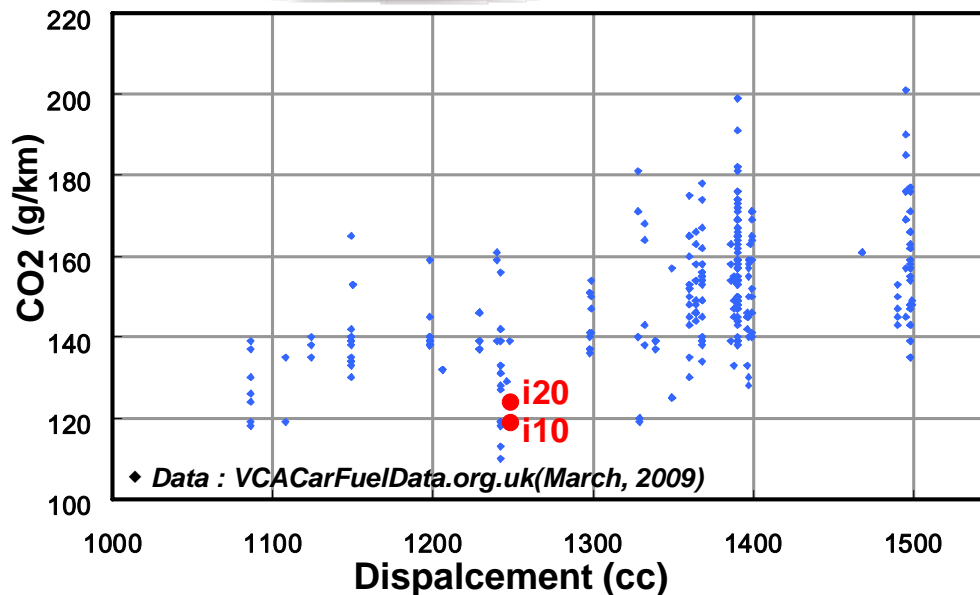
New KAPPA Gasoline Engine (i20)

2. Strategies and Technologies

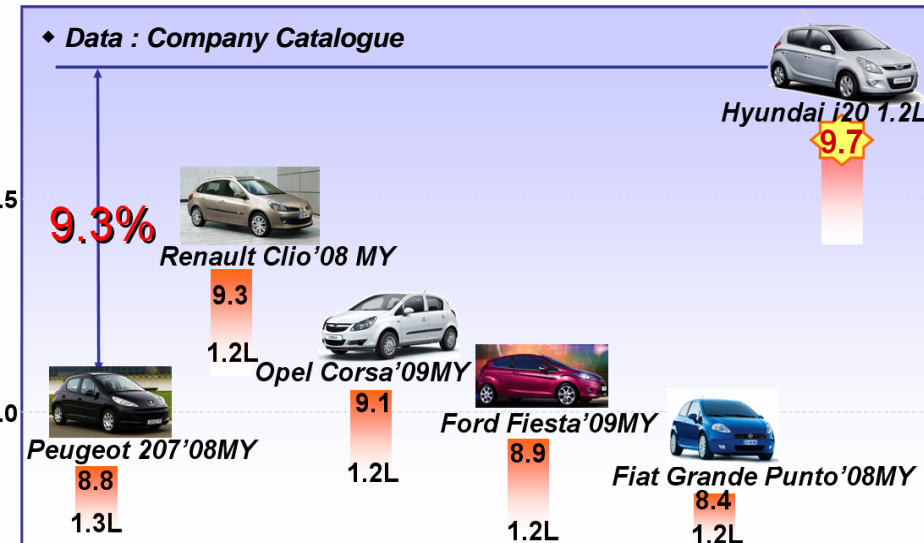
Competitive Small Engines

Performance

- High torque at low and medium engine speed for driveability
- Light weight and compact design



Specific Torque (kg.m/L)



Fuel Consumption

- 124 g/km CO₂, 5.2 L/100 km (i20)
- “Fuel economy and emissions are also very good, so it'll cost you peanuts to run.”

-by WHAT CAR? (Jan 2009 issue)

● Performance and General Specifications of Gamma 1.6 Engine



Engine Type	In-line 4-Cylinder
Valvetrain	4-Valve DOHC
Displacement Volume	1,591 cc
Bore x Stroke	77.0 mm x 85.44 mm
Power	92.7 kW (126 PS)
Torque	156.8 Nm (16.0 kgm)
Compression Ratio	10.5 : 1
EMS System	BOSCH
Emission	Euro 4/Euro 5 (2010)

Gamma Gasoline Engine (i20 & i30)

2. Strategies and Technologies

Competitive Small Engines

Solid Type Valve Train - Lash Adjusterless Type

- Decreased Inertia Mass
- Maintenance Free



MoS2 coated Piston

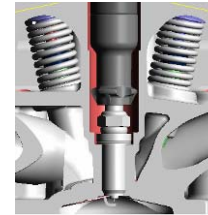
- Reduced friction



Offset Crankshaft



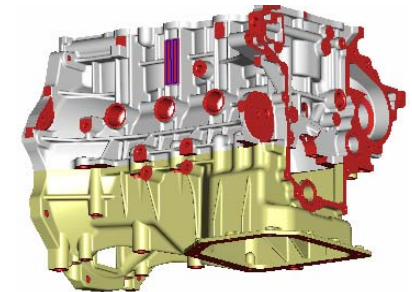
M12



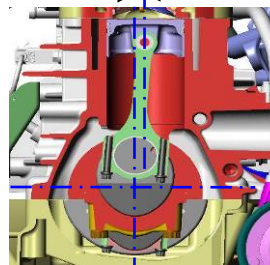
M12 Long Reach Spark Plugs

- Larger valve size and stable cooling
- Performance increase
- Reduced fuel consumption

HPDC Aluminum Block & Ladder Flame

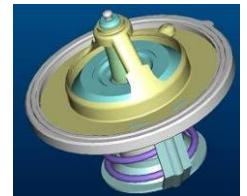


Offset



Non By-Pass Type Inlet Control Thermostat

- Simplified cooling circuit
- Improved fuel efficiency



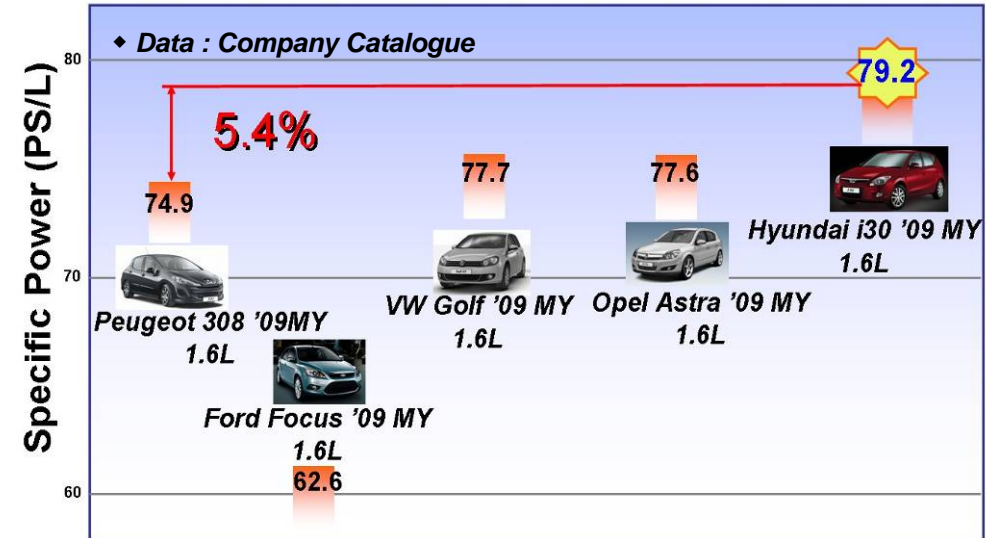
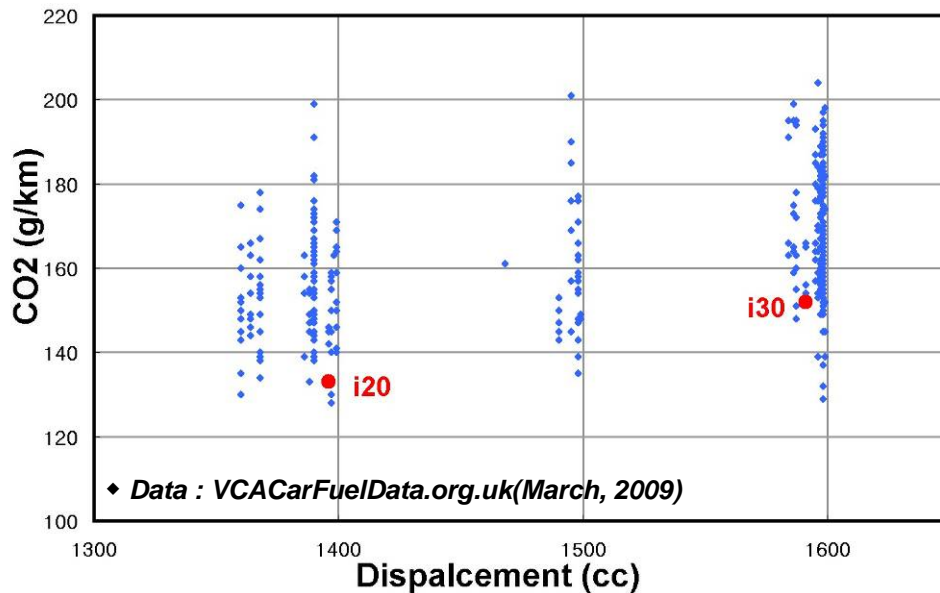
Gamma Gasoline Engine (i20 & i30)

2. Strategies and Technologies

Competitive Small Engines

Performance

- Class leading power output
- High engine torque at medium speed range



Fuel Consumption

- 152 g/km CO₂, 6.2 L/100 km (i30)
- 142 g/km CO₂, 5.9 L/100 km (i30 ISG)
- Optimized thermal control

New U2 1.6 L Diesel Engine (i20, i30)

2. Strategies and Technologies

Competitive Small Engines

● Performance and General Specifications of U2 1.6 L Engine



Engine Type	In-line 4-Cylinder
Valvetrain	4-Valve DOHC
Displacement Volume	1,582 cc
Bore x Stroke	77.2 mm x 84.5 mm
Power	94 kW (128 PS)
Torque	260 Nm (26.5 kgm)
Compression Ratio	17.3 : 1
FIE System	BOSCH CRI 2.2 Solenoid
Emission	Euro 5

New U2 1.6 L Diesel Engine (i20, i30)

2. Strategies and Technologies

Competitive Small Engines

2nd Generation CR System

Electronically Controlled EGR & Cooling

Variable Geometry T/C

Optimized Port/Combustion Chamber

- High power and low emission
- Better fuel consumption
- Smooth operation for better NVH

Diesel Particulate Filter

- AT (Aluminum Titanate)

Variable Swirl Control System

Battery Management System

- Low fuel consumption

Bed Plate Type Lower Crank Case

- Better NVH characteristics

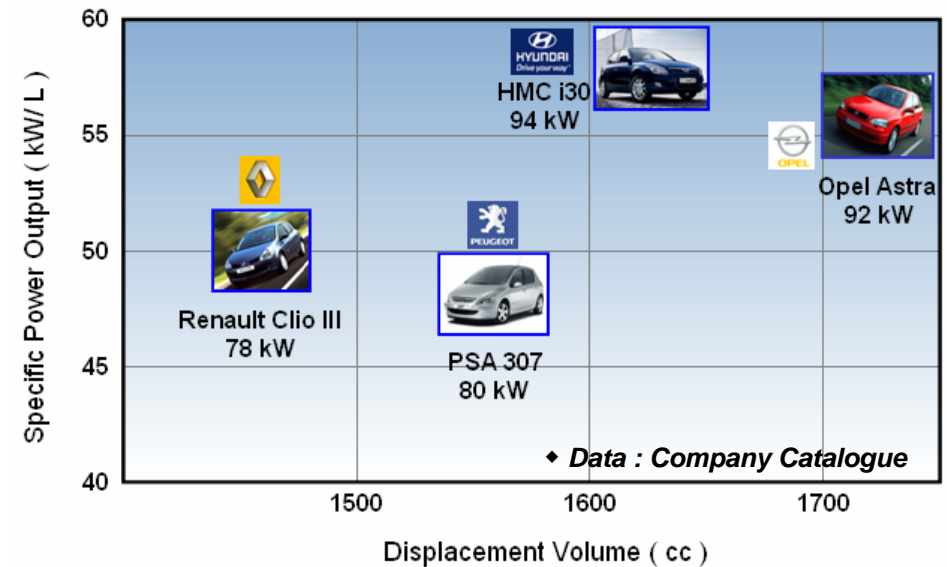
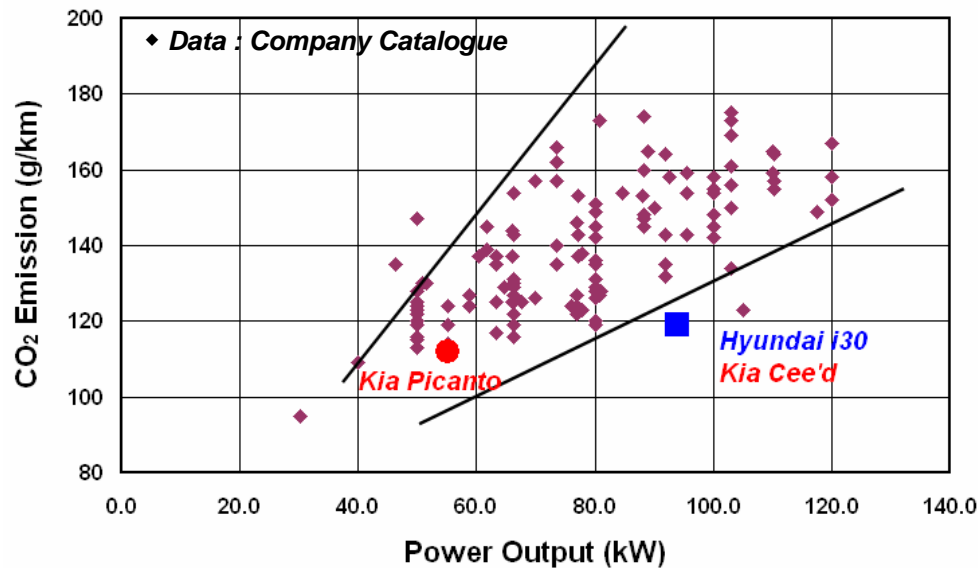
New U2 1.6 L Diesel Engine (i20, i30)

2. Strategies and Technologies

Competitive Small Engines

Performance

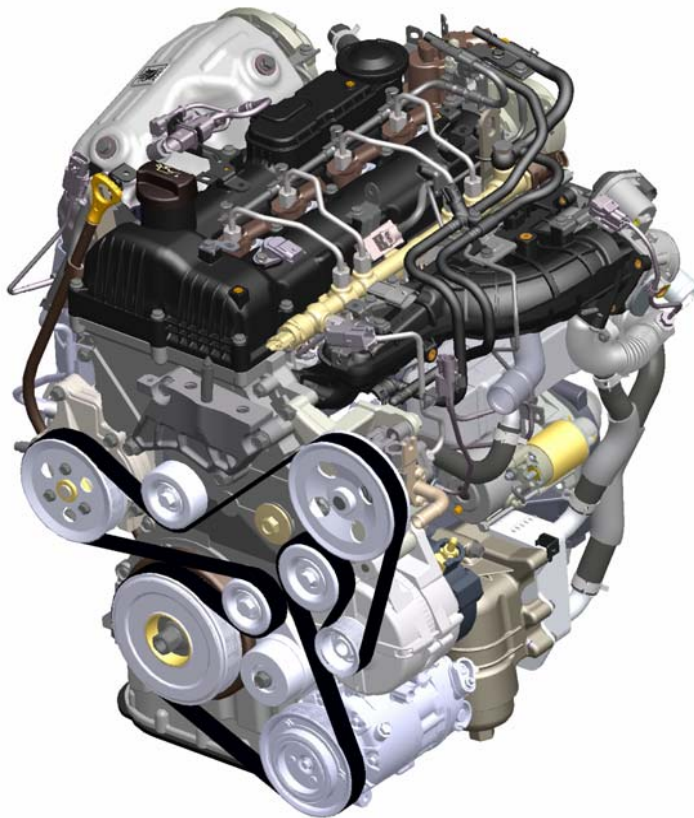
- Class leading power output delivering 94 kW (59.4 kW/L)
- Flat torque 260 Nm at 1900~2750 rpm



Fuel Consumption

- 119 g/km CO₂, 4.5 L/100 km
- Refined calibration and braking energy recuperation system

● Performance and General Specifications of R 2.2 L Engine



Engine Type	In-line 4-Cylinder
Valvetrain	4-Valve DOHC
Displacement Volume	2,199 cc
Bore x Stroke	85.4 mm x 96 mm
Power	145 kW (197 PS)
Torque	436 Nm (44.5 kgm)
Compression Ratio	16.0 : 1
FIE System	BOSCH CRI 3.2 Piezo
Emission	Euro 5

Eco-Friendly R 2.2 L Diesel Engine

2. Strategies and Technologies

Competitive Small Engines

E-VGT and Close Coupled DPF



- VGT with electrical actuator
- Integrated DOC and DPF

16:1 Compression Ratio

- Lower NOx emission
- Higher power density



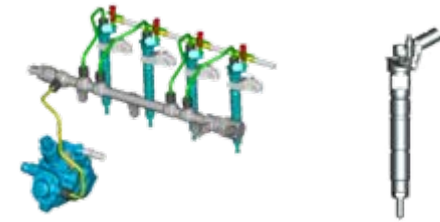
Optimized Air Circulation

- Uniform air distribution
- Optimized swirl, charging port, valve timing and intake manifold



3rd Generation CR System

- Piezo common rail system (1800 bar)



Enhanced EGR System & Control

- Highly efficient U-flow type EGR cooler with by-pass valve



Battery Management System

- Low fuel consumption

Eco-Friendly R 2.2 L Diesel Engine

2. Strategies and Technologies

Competitive Small Engines

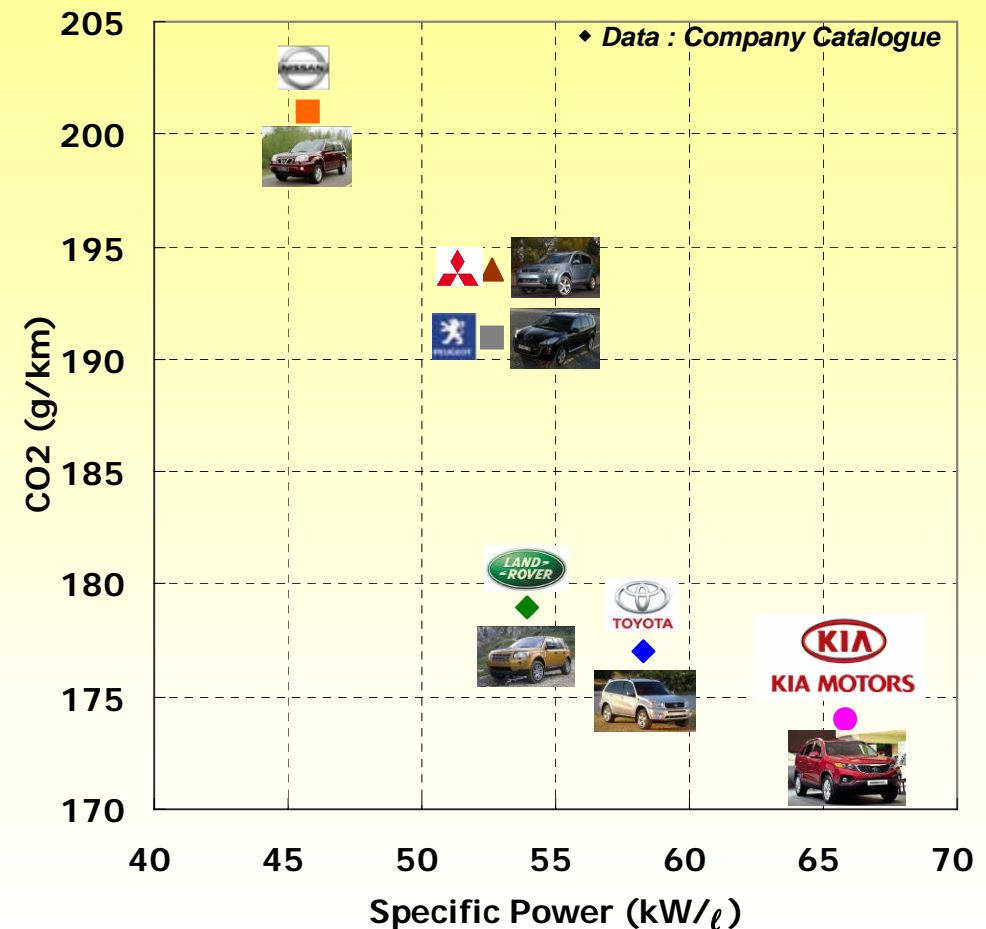
Performance

- Class leading power output with single VGT, 145 kW (65.9 kW/L)
- Excellent take-off acceleration 15.6sec (0 → 130 kph)

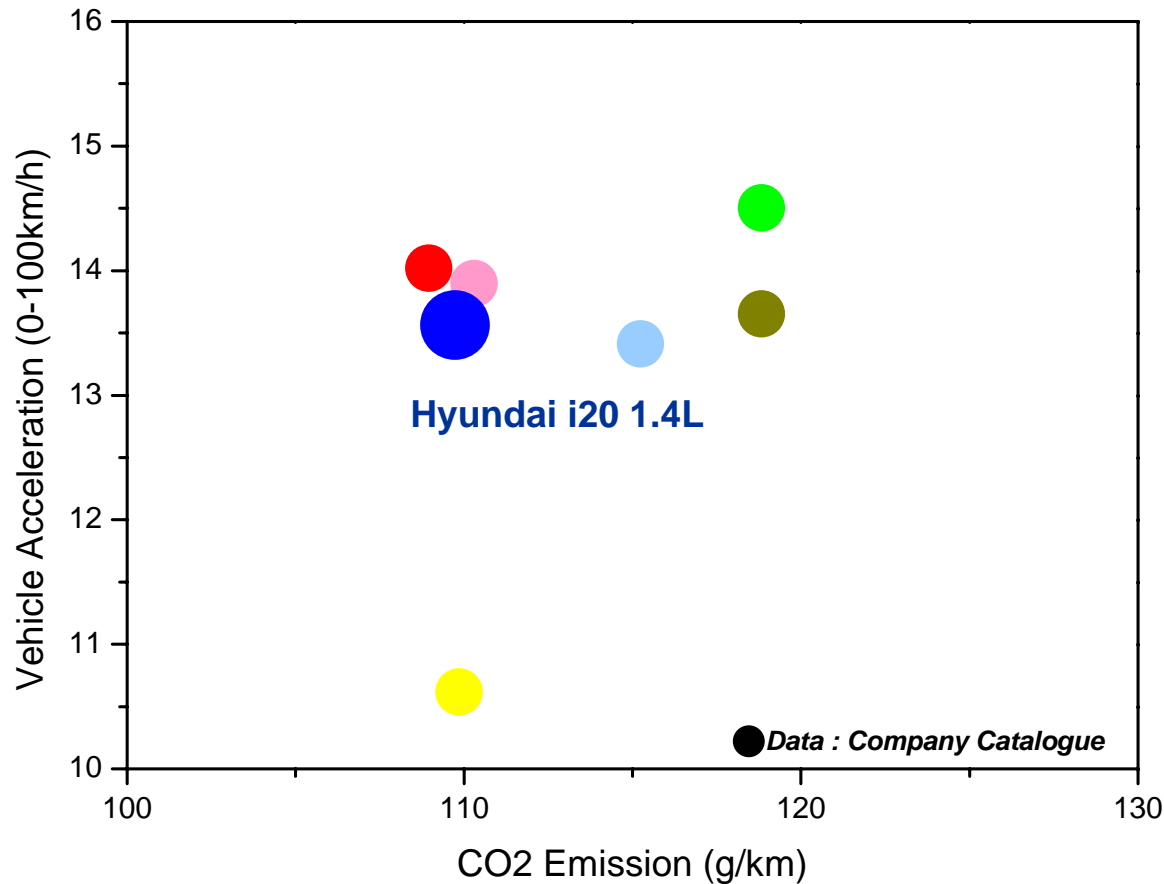
Fuel Consumption

- 174 g/km CO₂, 6.6 L/100 km
- Optimized calibration and braking energy recuperation system

2.2L SUV Seg Vehicle Comparison



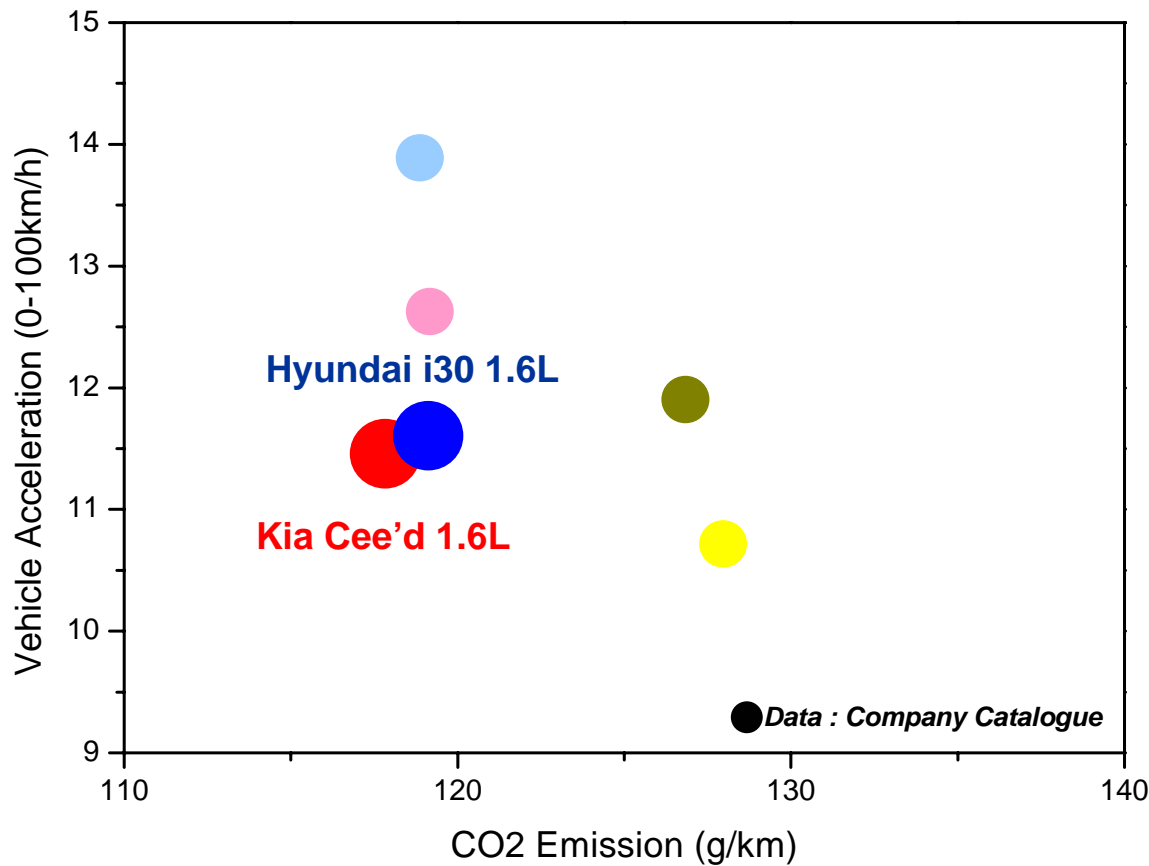
Hyundai i20 (B-Segment, Diesel)



Hyundai i20

- Low Rolling Resistance Tire
- Electric Power Steering
- Aerodynamic Drag Reduction

Hyundai i30 / Kia Cee'd (C-Segment, Diesel)



Hyundai i30



Kia Cee'd

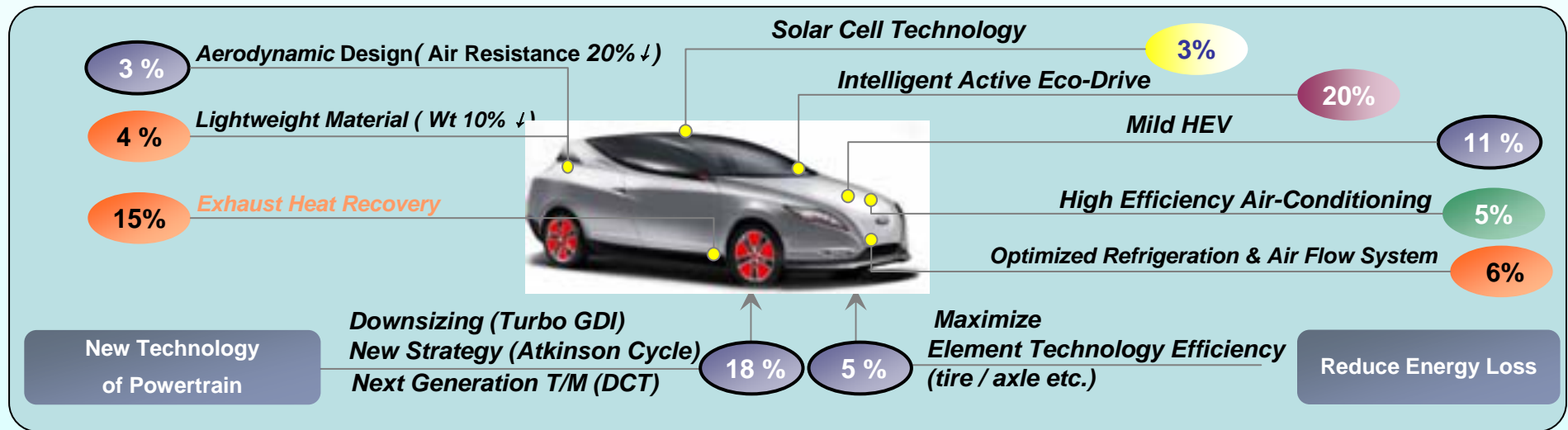
- Low Rolling Resistance Tire
- Electric Power Steering
- Alternator Control

Fuel Economy Improvement Technologies

2. Strategies and Technologies

Fuel Economy Improvement

- 1 Improve Energy Generation Efficiency → Gasoline: Direct Injection, Downsizing, CVVT etc.
Diesel: 2 Stage Turbo, LP-EGR etc.
- 2 Improve Energy Transmission Efficiency → 6~8 A/T, CVT, DCT etc.
- 3 Reduce Energy Loss → Lightweight Material, Aerodynamic Design etc.
- 4 Recover Renewable Energy → Exhaust Heat Recovery, Solar Cell, Brake Regeneration etc.



1. Introduction

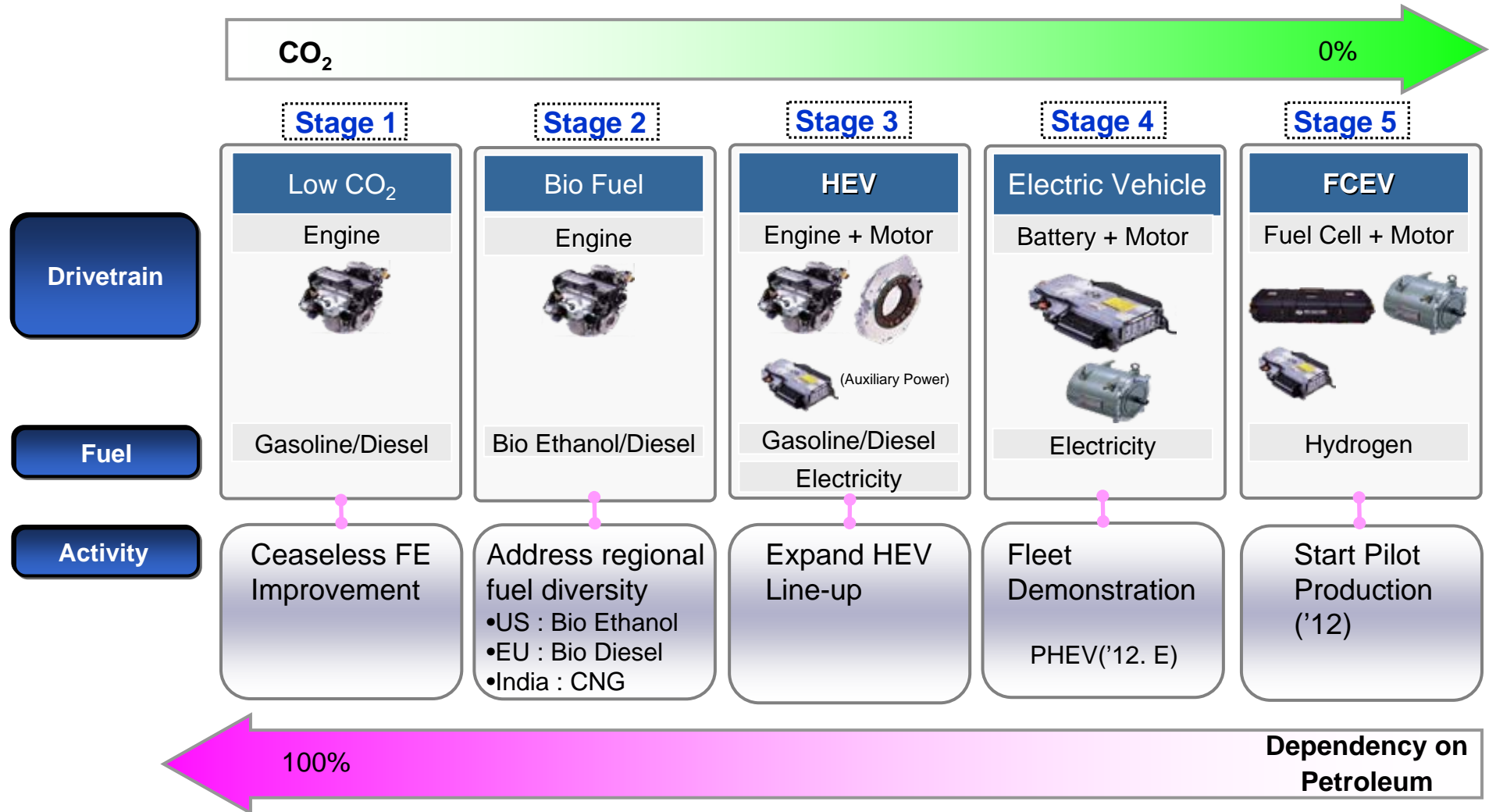
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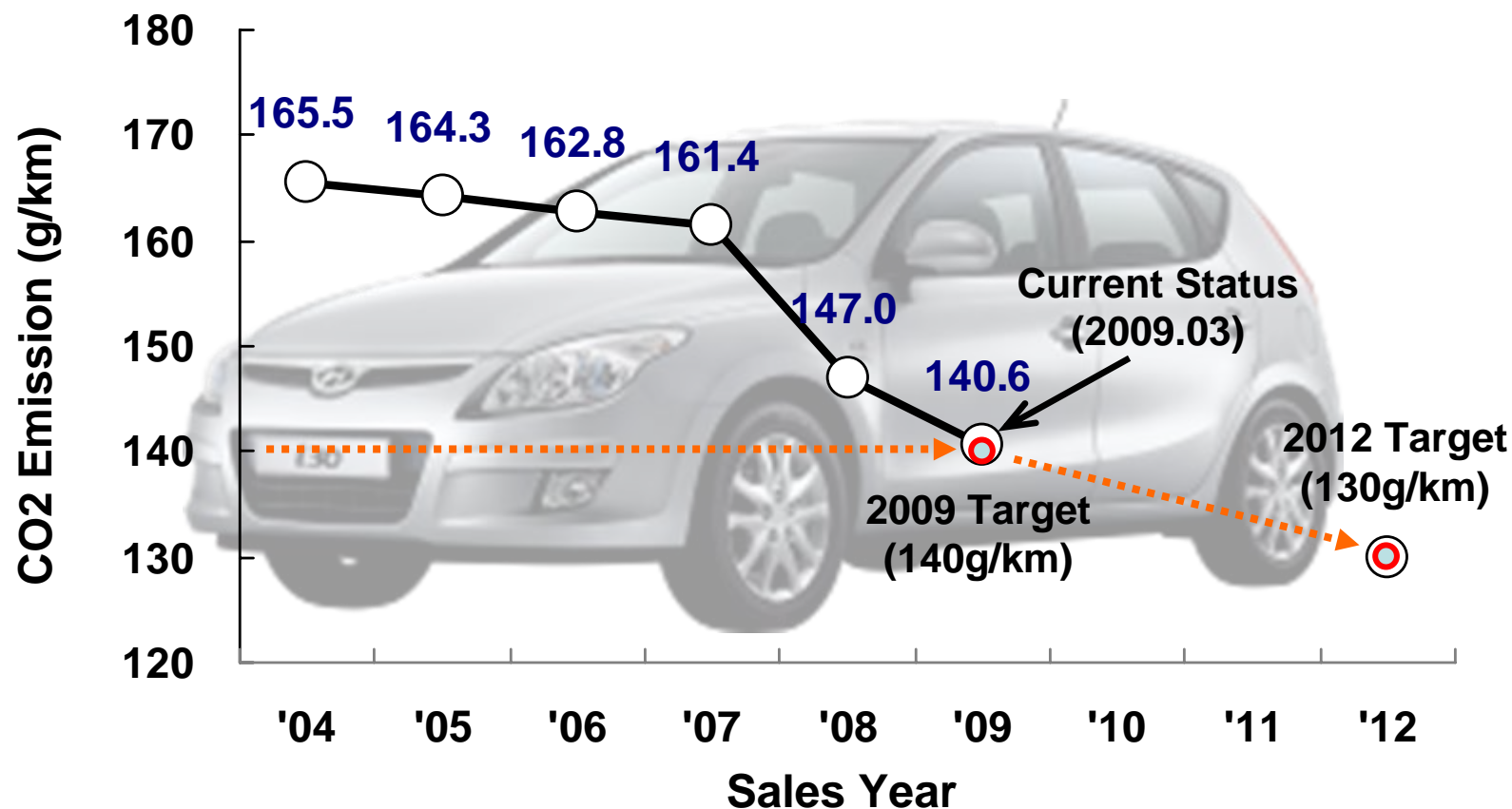
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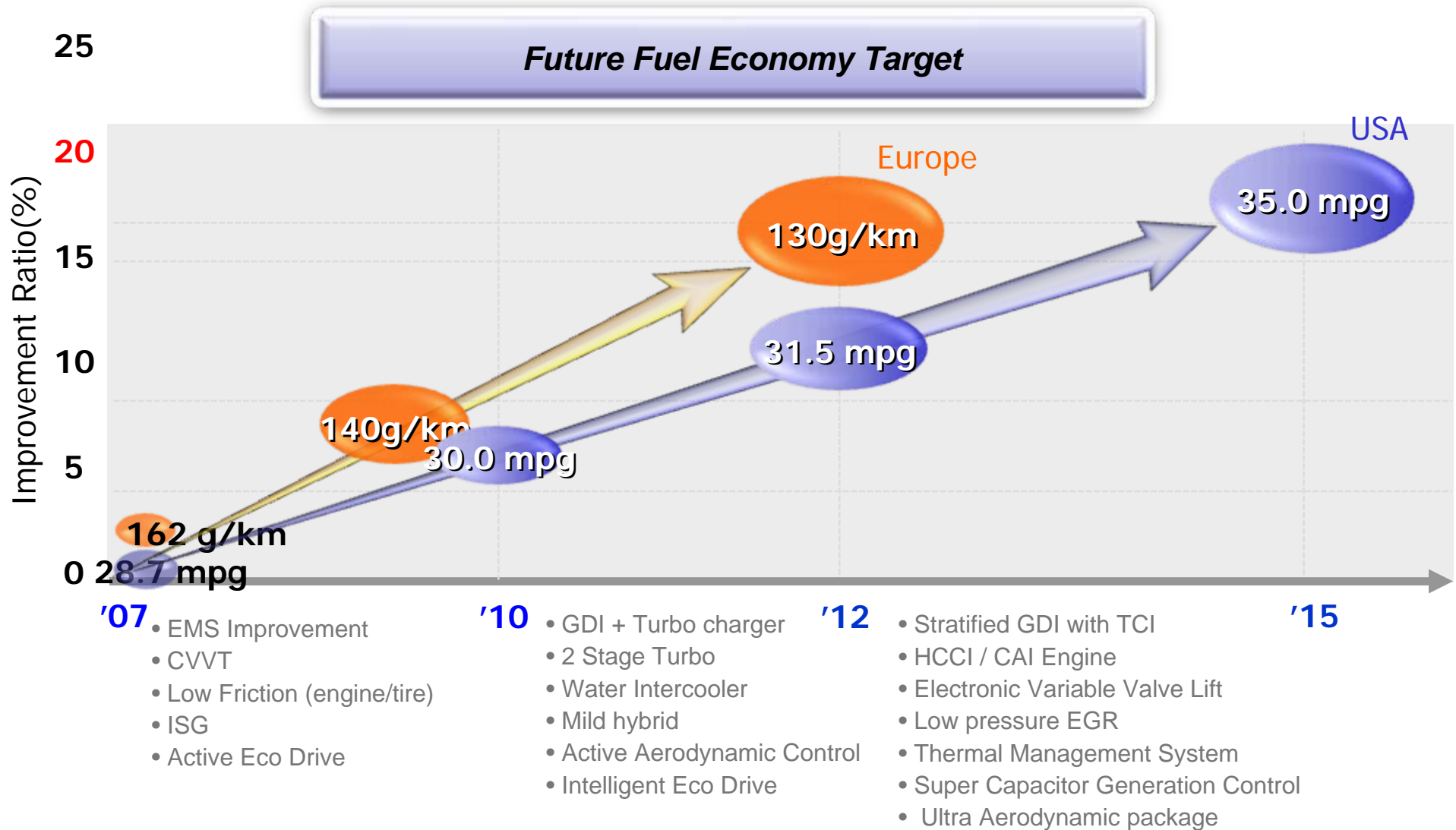


To be industry leading for “Green Growth”





- Expected to achieve the 2009 target of 140 g/km
- Continuous improvement of powertrain with vehicle optimization and changes in product mix



Thank you for your attention !!

