PwC Automotive Institute

Powered by AUTOFACTS®

Analyst Briefing

Gasoline Engine Downsizing

EngineExpo 2006 – Open Technology Forum

Stuttgart, 10 May2006

Agenda

Introduction

Downsizing in action

Overview of market drivers

Conclusion and recommendations

Introduction

The CO_2 reduction imperative

PRICEWATERHOUSECOOPERS

Worldwide mission to reduce greenhouse gases

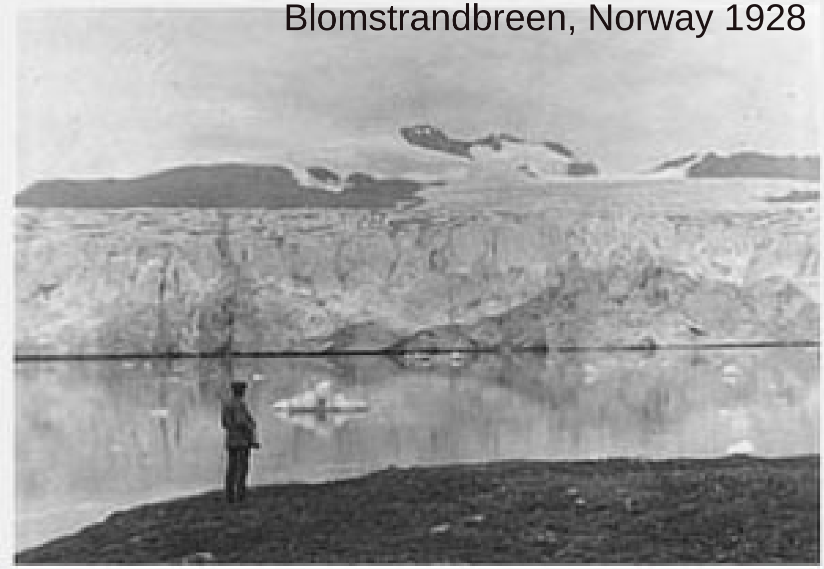
- CO_2 is main constituent accounting for around 56%

Slow global warming

- Potentially devastating to the environment
  - The Blomstrandbreen glacier retreat

Gasoline downsizing is powertrain Act III

- After diesel and transmission development



Blomstrandbreen, Norway 1928

Blomstrandbreen, Norway 2002

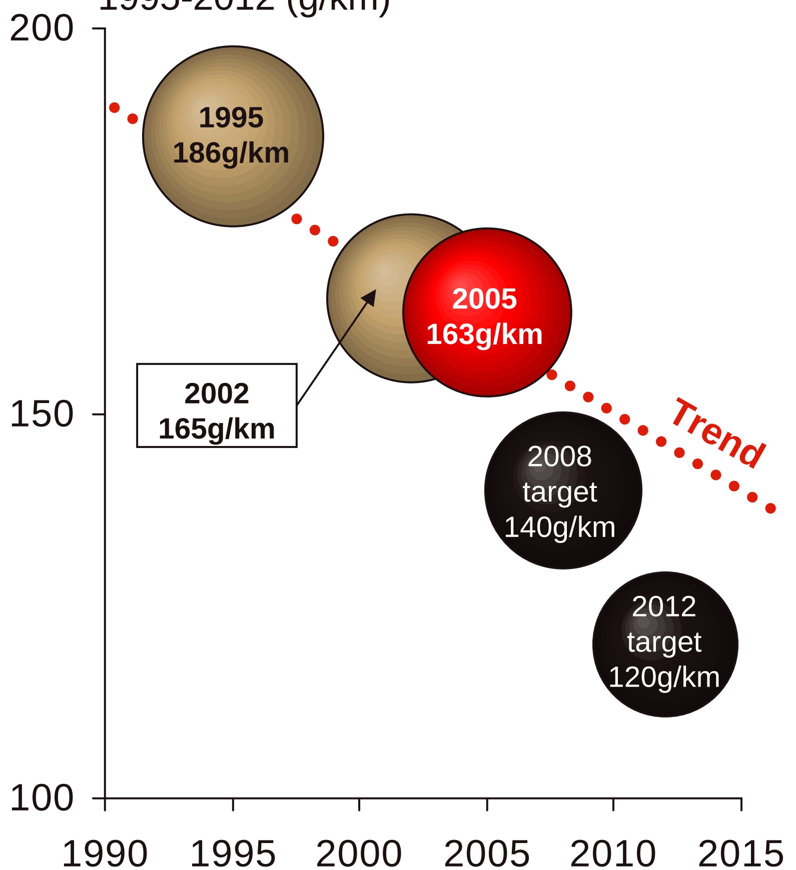
Introduction

The CO_2 reduction imperative

PRICEWATERHOUSECOOPERS

- ACEA set in place a voluntary agreement in 1998
  - 140g/km CO_2 for new vehicle fleets by 2008
  - 120g/km CO_2 tentatively set for 2012
  - A pre-emptive move to avoid EC mandate
- Current rate of progress is not sufficient
  - Even with escalating diesel market share

ACEA CO_2 Emission Targets
1995-2012 (g/km)



Market developments and regulations are running counter to CO_2 reduction and compounding the target deficit.

A silk purse from a sow's ear

PRICEWATERHOUSECOOPERS

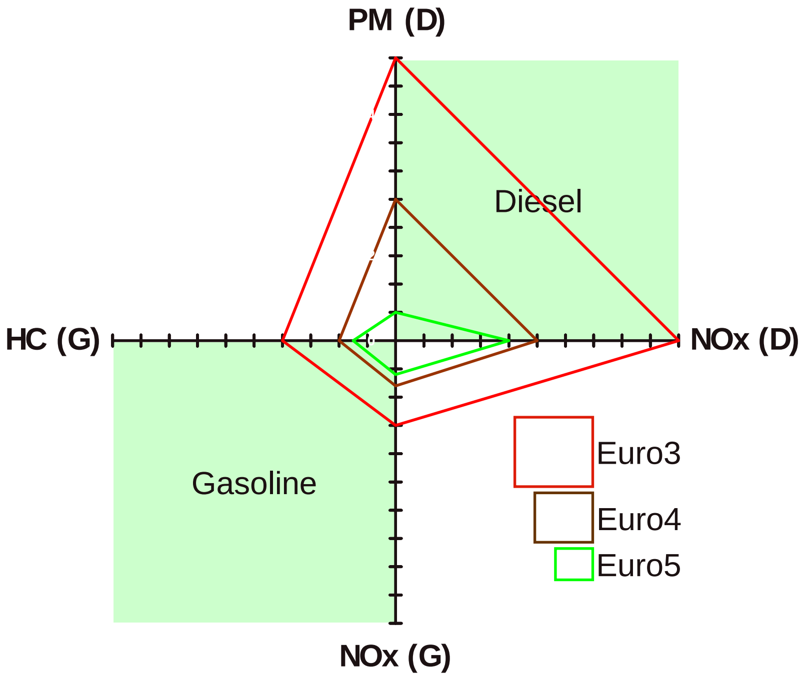
Regulations

- Vehicle weight
- Pedestrian safety
- EC's End-of-Life Vehicles directive
- Emission regulations

Market trends

- Generational increases
- SUVs
- Premium vehicle market growth
- Increasing specifications

European Vehicle Emission Standards
Euro3/4/5 2000/2005/2010*



* Euro5 draft proposals

Even with the rise of diesel, CO_2 reduction is missing the target. The need now is to look at the gasoline side of the equation.

Downsizing in Action

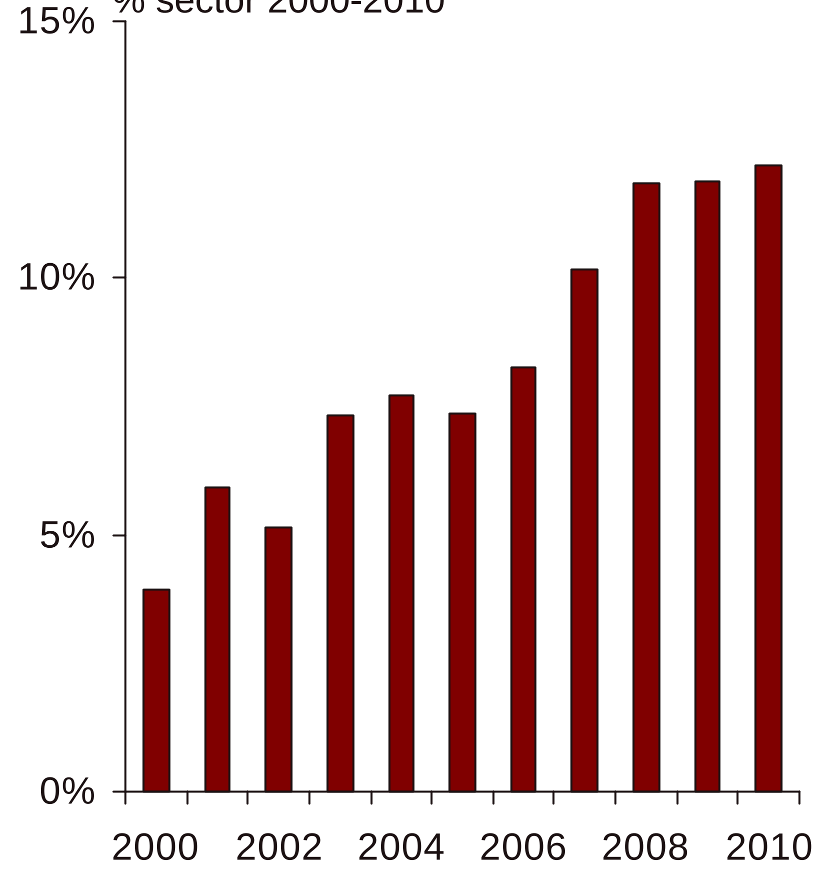
Turbocharger business to be boosted?

PRICEWATERHOUSECOOPERS

- Engine downsizing
  - Less fuel, less pumping losses
  - Forced induction required
- Turbocharger suppliers optimistic over market prospects
  - Honeywell: current levels more than doubled
  - BorgWarner: 25% of gas engines by 2010

EU Turbocharged Petrol Engines

% sector 2000-2010



In light of known programs this seems optimistic and flows through to our prognosis for displacement trends in the market

Downsizing in action

Present and future downsizing programs

PRICEWATERHOUSECOOPERS

VW

BMW/PSA

GM

Renault

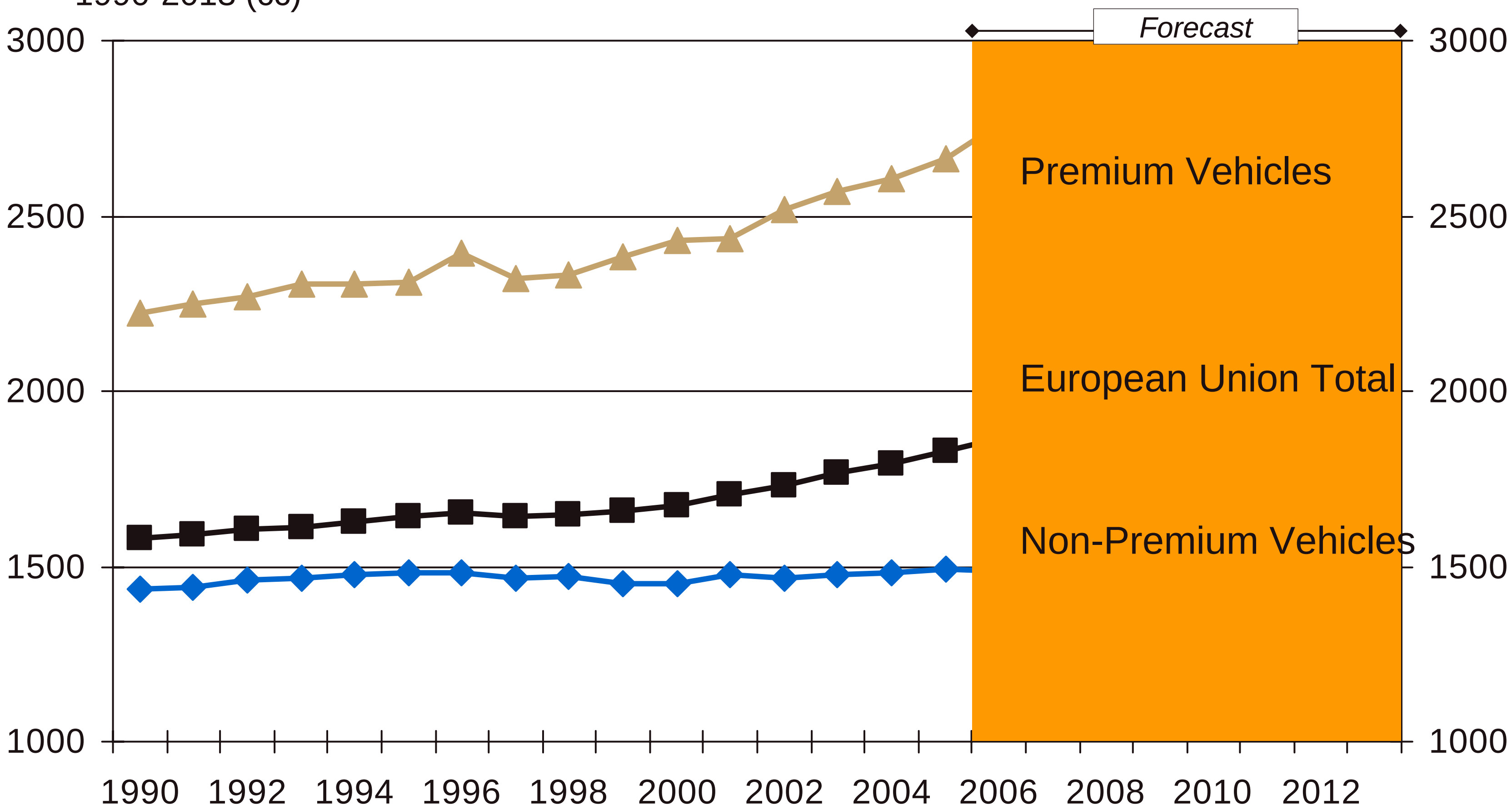
Fiat

Ford

Despite the forecast raft of new models, none so far will be real volume sellers within the vehicle ranges. Part of the issue is the number of engine variants on offer in European vehicle ranges, makes it difficult to see the value proposition.

Downsizing in action
The bottom line

European Union Average Gasoline Engine Displacement*
1990-2013 (cc)



*Average displacement weighted to consumption history/forecast

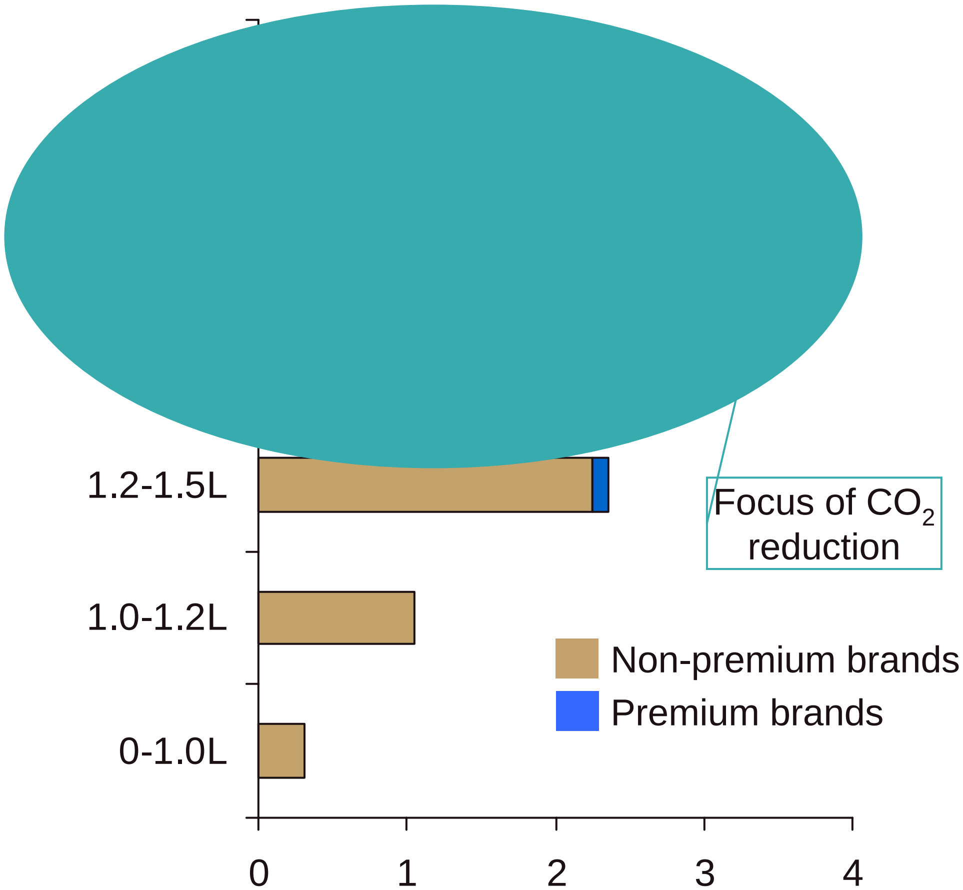
Downsizing in action

The market is skewed against downsizing

- Principle problem for the volume manufacturers
  - Majority of their petrol output already emitting on or under 140g/km
  - Above 1.5L as rule of thumb
- Area of attack is too small to make significant difference
  - Displacement trends largely unaffected by downsizing programs in place
  - New vehicle fleet emissions will struggle
- Issue more vexing for premium brands
  - Vast majority of petrol-engined output exceeds 1.5L displacement
  - How to entice those customers out of their cars?

EU Gas Engine Consumption by cc band

2005



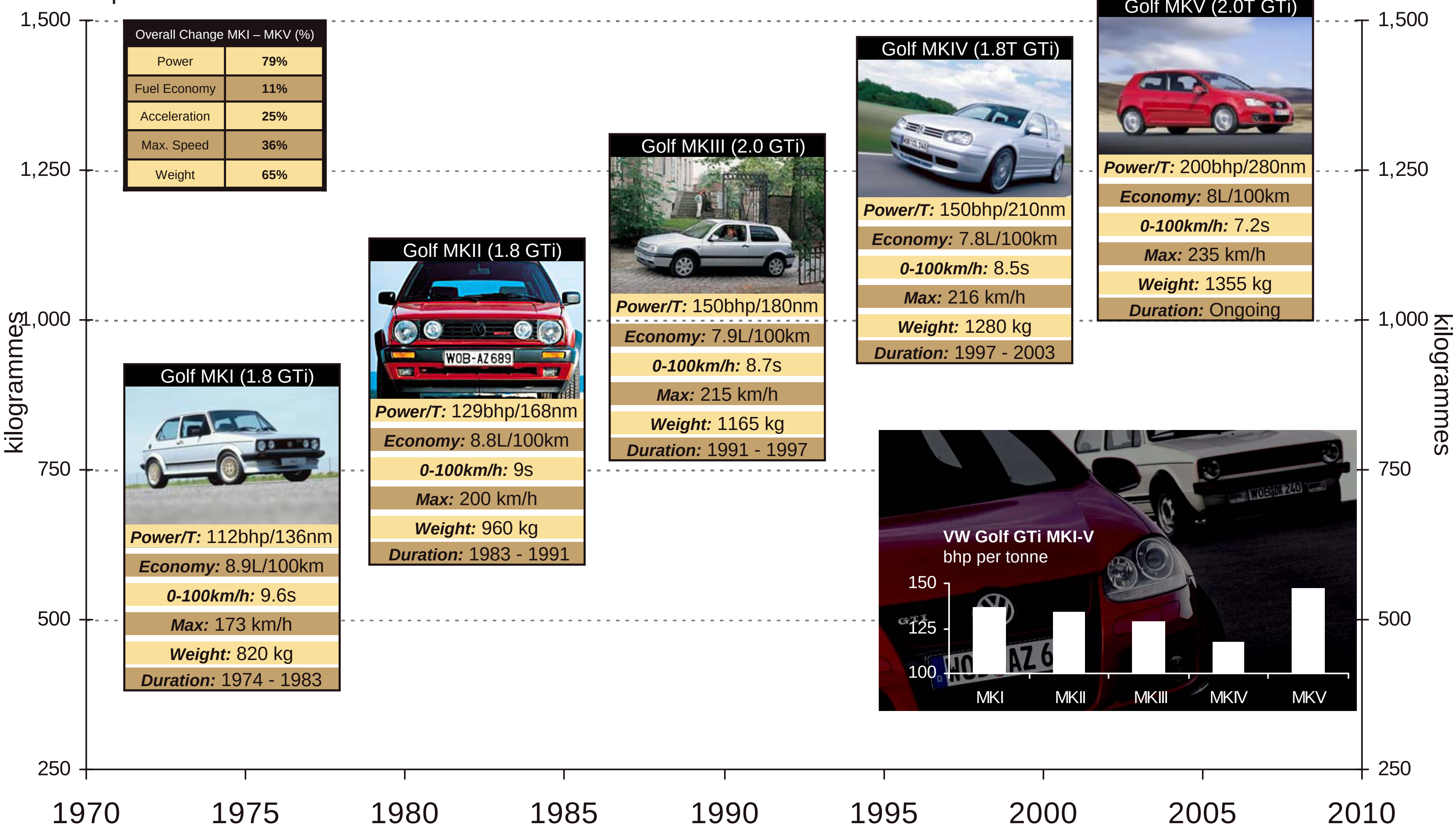
Downsizing in action

The Golf GTi runs to keep still

PRICEWATERHOUSECOOPERS

Volkswagen Golf GTi MKI-V
Specifications

Overall Change MKI – MKV (%)	
Power	79%
Fuel Economy	11%
Acceleration	25%
Max. Speed	36%
Weight	65%



Overview of market drivers

Summary

PRICEWATERHOUSECOOPERS

+

OEM desire and risk reduction	ACEA resolve for CO_2 reduction. Hedge against competitive advantage.
Market trends add pressure	Weight gains: safety; ELV; SUV/MPV growth; equipment
OEM synergies	Scale possibilities. Optimise engine and tune with turbo (cf. M271)

-

Consumer perception	Counter to culture and wealth effects
Vehicle weight	Negating efficiency gains of smaller engines…
Diesel focus	Development focussed on diesel; now part of the consumer mindset.
Costs	Forced induction high-cost options or marketed as high-end options.
No “quantum leap”	170bhp TSI demonstrates possibilities, but no option in volume heartland

Conclusion

PRICEWATERHOUSECOOPERS

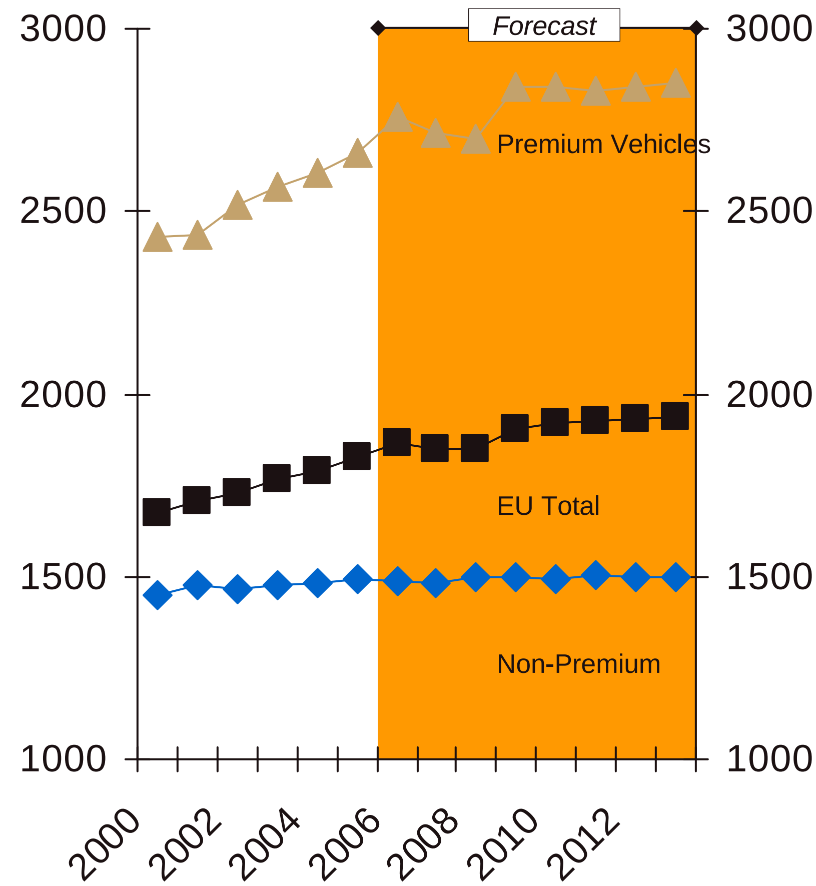
Ceteris paribus it is difficult to see much change beyond the base forecast

- CO_2 commitment is **voluntary** so not mandated

Demand for downsizing dependent on:

- Attractiveness versus substitute goods
  - **Efficiency**
  - **Performance and appeal**
  - **Costs**
- Beneficial legislation:
  - **Fiscal**
  - **Emissions**

EU Average Gasoline Engine Displacement*
2000-2013 (cc)



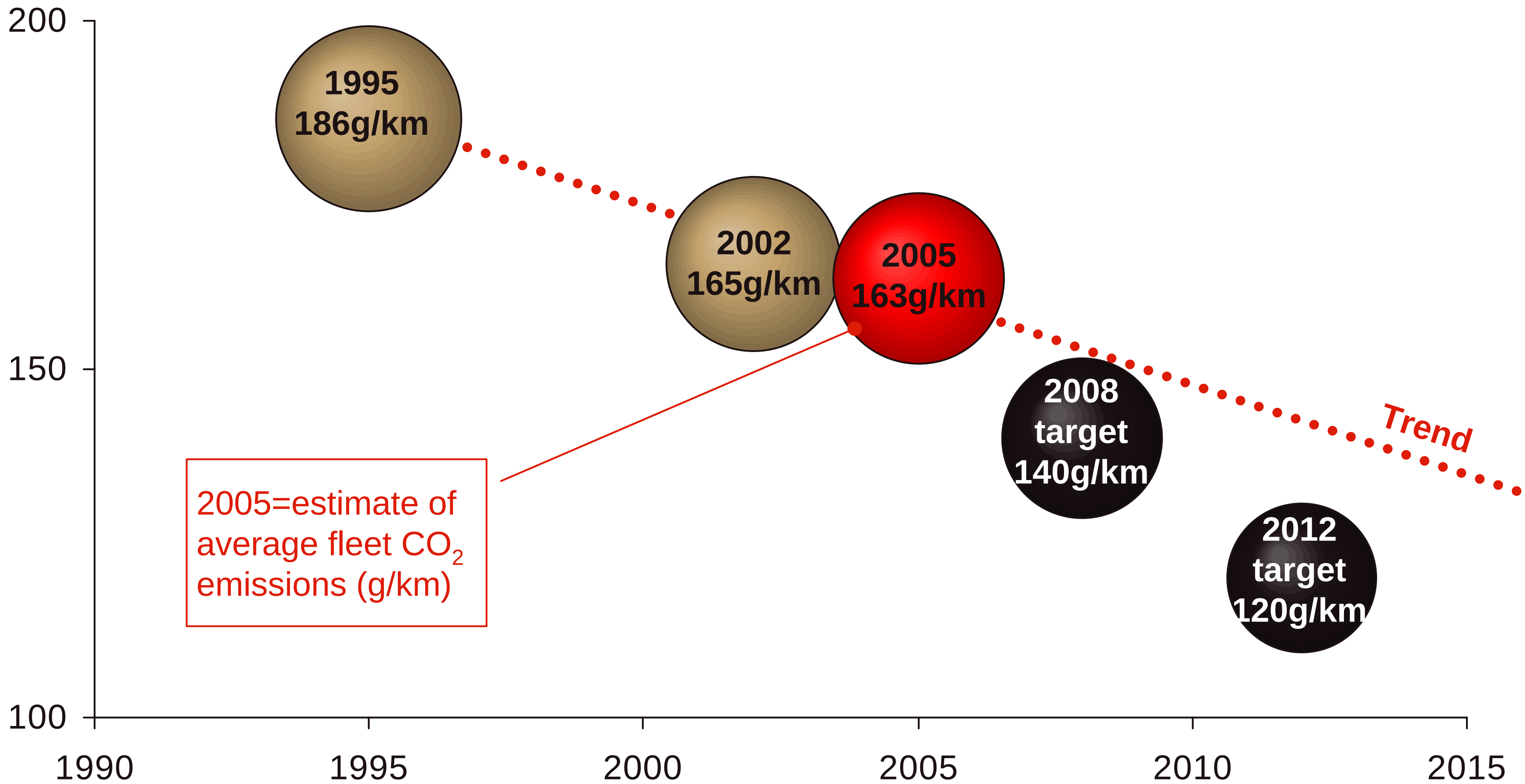
*Average displacement weighted to consumption history/forecast

Conclusion and recommendations

The conclusion that really matters…

PRICEWATERHOUSECOOPERS

ACEA CO_2 Emission Targets
1995-2012 (g/km)



Conclusion and recommendations

Recommendations

PRICEWATERHOUSECOOPERS

Stop making it a one-way street on CO_2

- Holistic planning required
- CO_2 reduction tacked onto the bottom of a laundry list

Fiscal harmonisation

- cm^3 taxes, minus impunities
- Incentivize consumers

Supply-side changes

- Fix segmentations; offer fiscal incentives to vehicles fitting bounds that aid CO_2 reduction
- Similar to Kei-car segment in Japan

Change emphasis of vehicle safety

- Move towards active safety

Educate consumers

- Consequence of their actions

Without supply-side mandates, or demand-side incentives, the market currently lacks the impetus to downsize.

PRICEWATERHOUSECOOPERS

PwC Automotive Institute

Capabilities

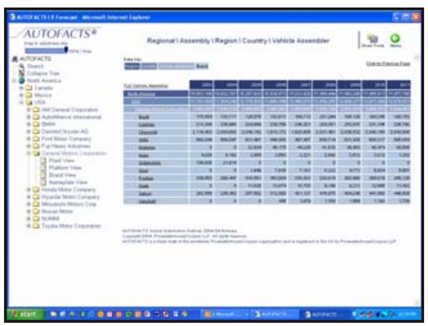
06Q2

AUTOFACTS®

Synchronous Forecasting
Integrated Data & Analysis
Online Client Access

Providing clients with convenient, web-based access to class-leading detailed planning data and analysis on the global light vehicle sector:

- Assembly Forecasting
- Capacity Forecasting
- Powertrain Forecasting

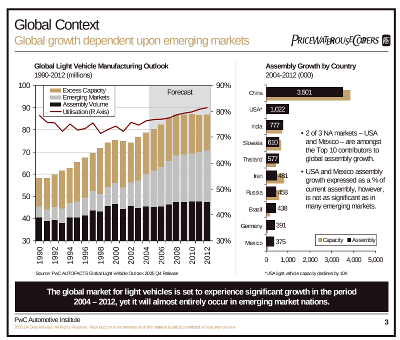


Analyst Briefings

Issues-Based POV Analysis
Regional Market Analysis
Strategic OEM Profiles

Providing a differentiated point of view on the key market issues facing companies operating in the global automotive sector:

- Deep Regional Insights
- Global OEM Analysis
- Powertrain Technology Trends

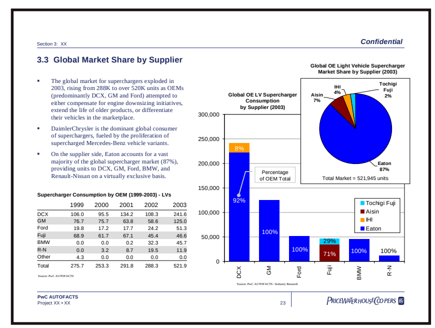


Proprietary Advisory

Risk Management
Decision Support
Business Planning

Providing knowledge-driven benefits to automotive executives through proprietary projects addressing client-specific needs:

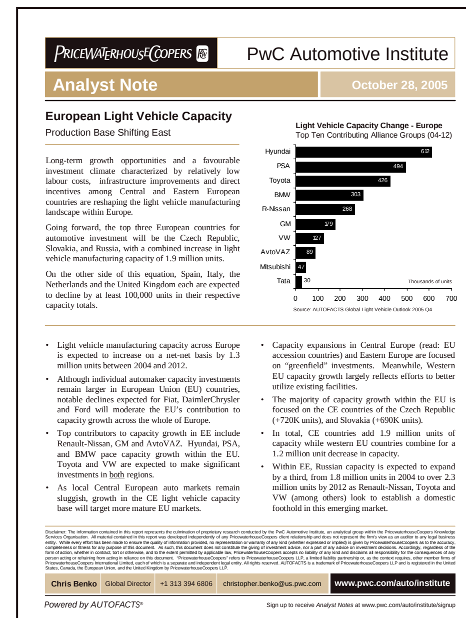
- M&A Valuation Support
- Portfolio Risk Assessment
- Commercial Due Diligence



Analyst Notes

- Bi-weekly distribution
- Engaging point of view
- Easily digestible format
- Free registration

www.pwc.com/auto/institute/signup



Key Client Benefits

- An independent, unbiased global perspective
- A differentiating & refined industry PoV
- Proactive & informed dialogue with executives
- Access to sector specialists with deep knowledge
- Fully integrated with PwC Global Auto Practice
- “C-Suite” advisement & decision support
- Risk management assessment & strategy
- The embodiment of *connectedthinking

Contact: | **Calum MacRae** | Manager | +44 (0)1603 883240 | calum.j.macrae”uk.pwc.com

www.pwc.com/auto/institute

PRICEWATERHOUSECOOPERS

www.pwc.com/auto/institute

Calum MacRae +44 (0)1603 883240 calum.j.macrae@uk.pwc.com