Meeting the Challenge
EU CO2 Outlook

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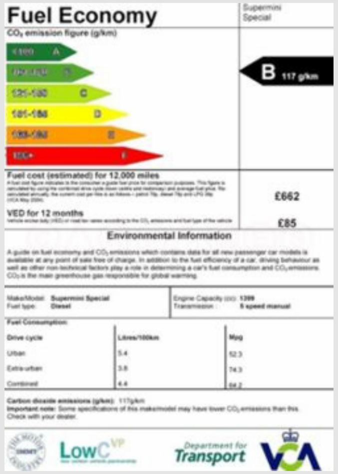
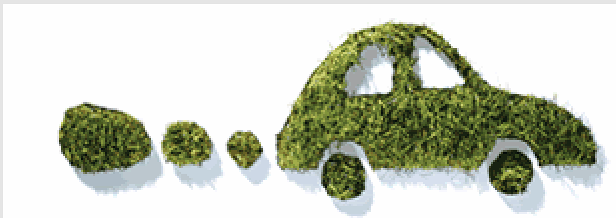
Environmental Awareness At An All-Time High





Environmental Awareness in Europe

- 2007 will be remembered in the European automotive industry as the year that 'put CO_2 on the map'.

- Now in 2008 the 'real' challenge will start…

Meeting the CO_2 Challenge : EU Style

- The first few months of 2007 created a new worldwide paradigm, with focus on Emissions, CO_2, and Fuel Efficiency.

- The EU started taking a leading role in reducing the effects of car use on the environment, particularly in relation to global warming and CO_2 emissions.

  – In late January '07, the European Commission set out its intention to force through mandatory targets for average CO_2 output—sticking to a figure of 120g/km by 2012.

  – For OEMs, the effective target actually became 130g/km, due to "*complementary measures*" factored in, contributing to further cuts of up to 10g/km.

  – With the initial strategy set, a new Regulation proposal was presented on December 19th 2007.

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Meeting the CO_2 Challenge : EU Style

- According to the new draft Regulation all new vehicles registered in the EU after 2012 – whether produced domestically or imported – will have to respect a "limit value curve of permitted emissions of CO_2", based on their weight.

- This means that cars weighing more than two tonnes would still be allowed to emit more than average, while emissions from lighter cars would have to be better then average.

- Nevertheless, the calculation method used in the Regulation ensures that manufacturers of larger cars will have to make proportionally bigger cuts than producers of smaller vehicles, according to the Commission.

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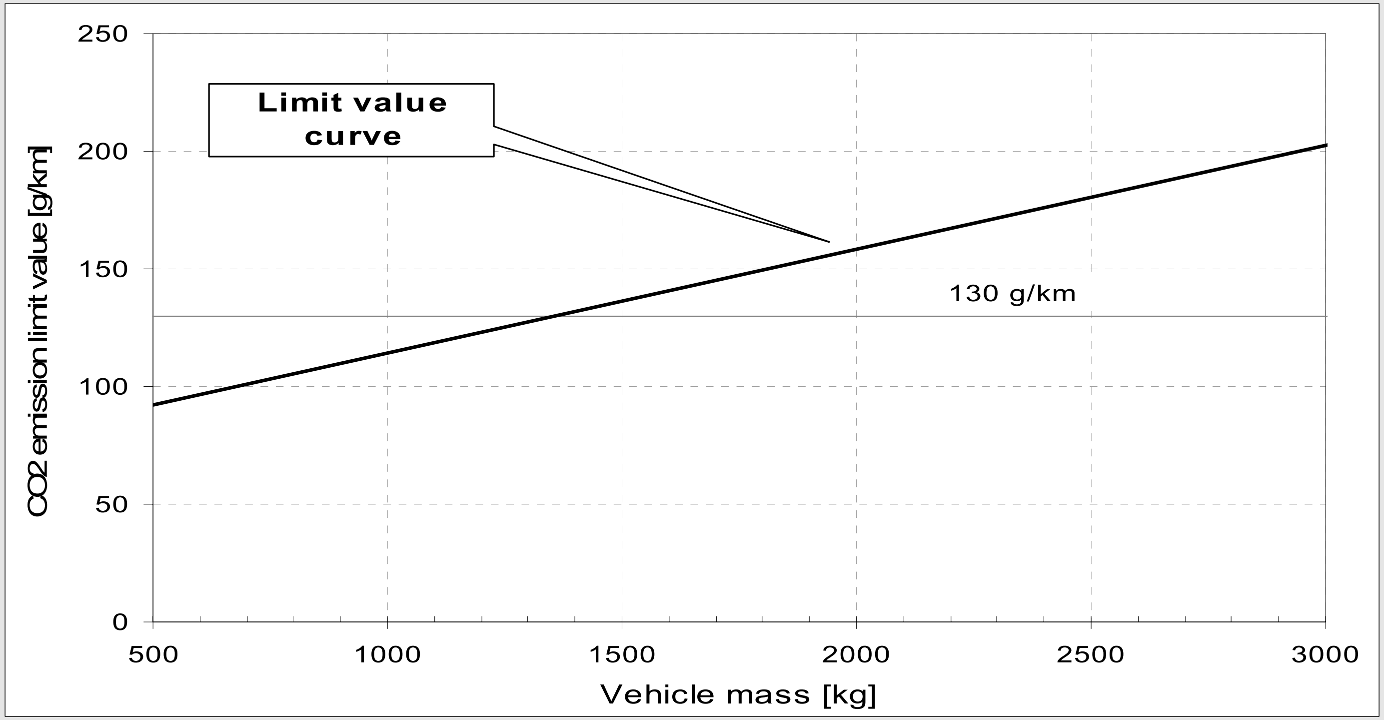
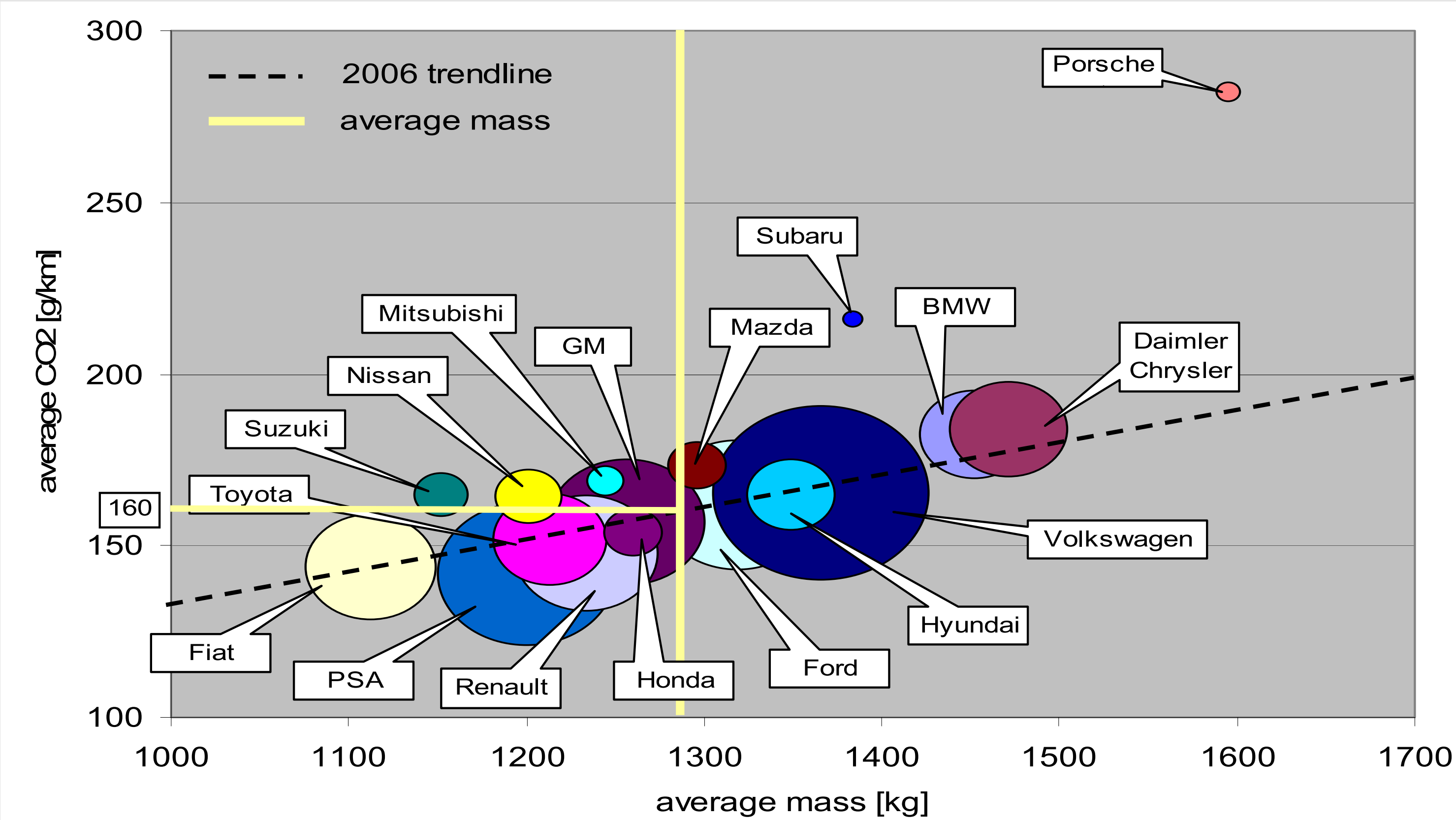
Draft Regulation : Explained

- The draft regulation defines a limit value curve of permitted emissions of CO_2 for new vehicles according to the mass of the vehicle.
  - The curve is set in such a way that a fleet average for all new cars of 130 grams of CO_2 per kilometre is achieved.



Draft Regulation : Explained

- How are the manufacturers placed in relation to the target?
  - The chart below shows the actual position of the various car manufacturers in terms of the average CO_2 emissions of the new cars they manufactured in 2006.



Draft Regulation : Issues & Challenges

- Major debate about the 'slope' of the curve
  - In other words…"which OEMs will bear the cost burden?"
    - A steep slope of 80% would favour heavy (large) cars, while a narrow slope of 30% would favor lighter (smaller) cars
- Potential Loopholes
  - Special purpose vehicles
    - Wheel-chair access is exempted
- Overall industry challenge remains

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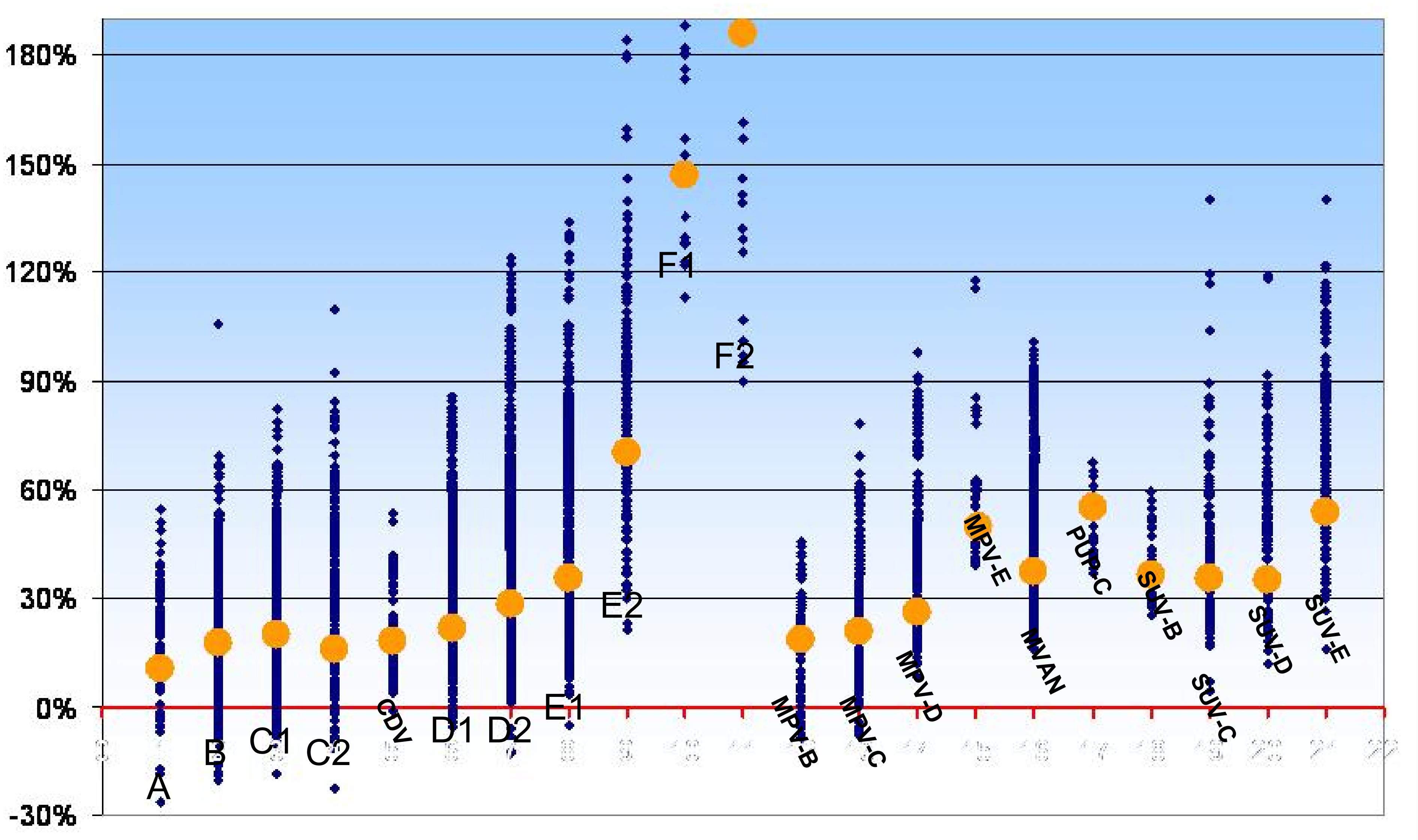
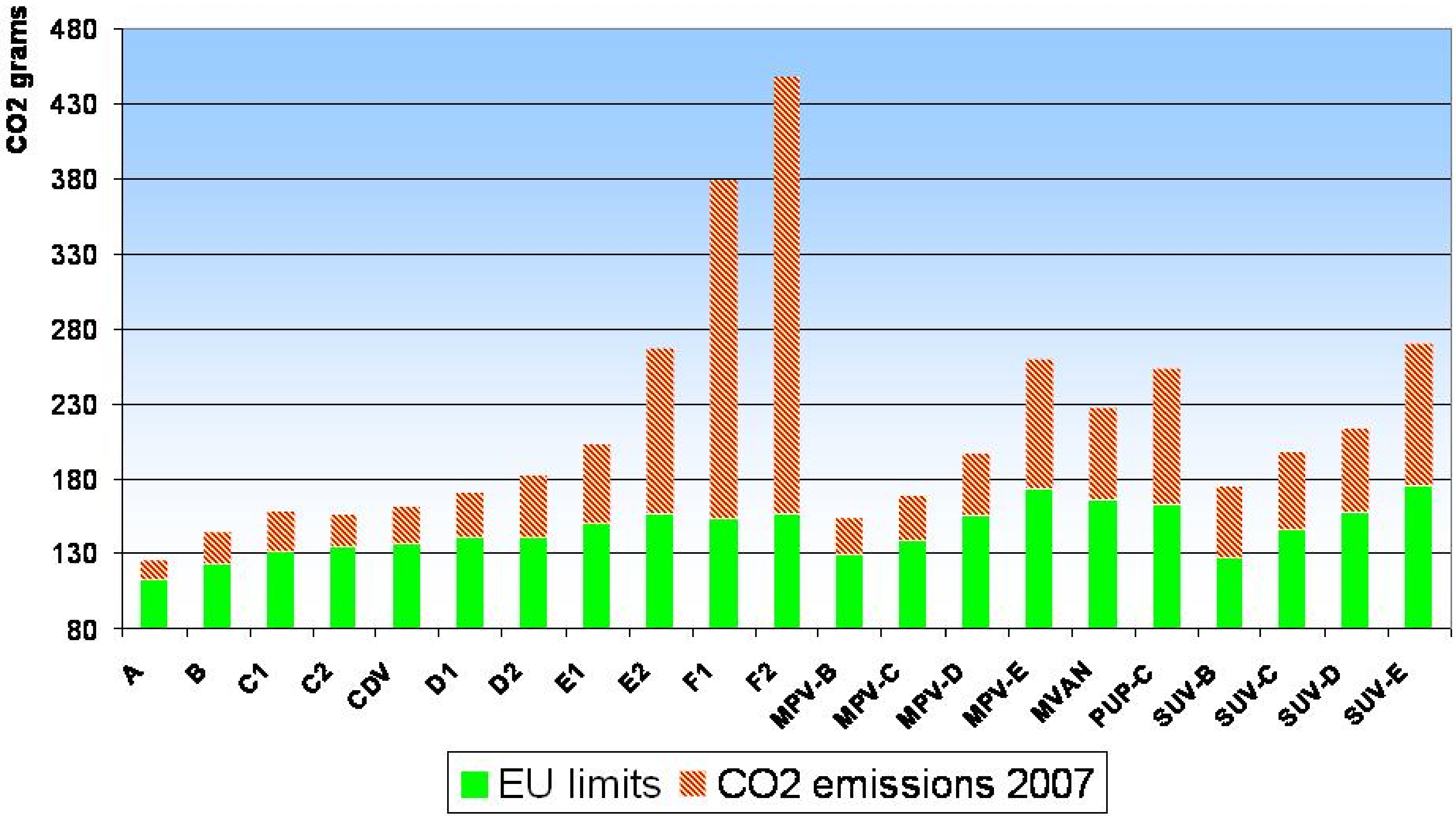
The Industry Challenge : Germany



The Industry Challenge : Germany



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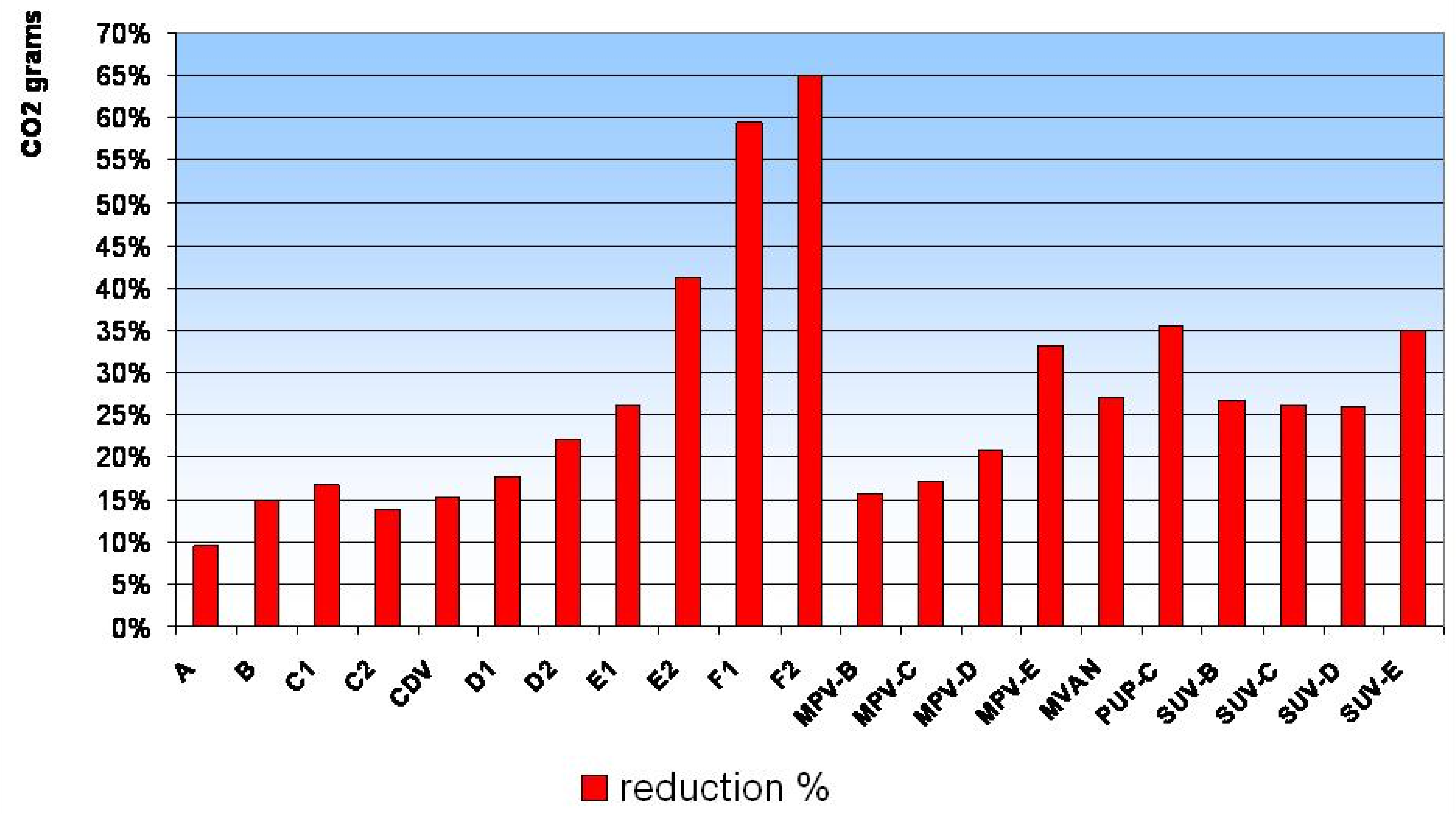
The Industry Challenge : Germany



CO_2 Forecast Methodology

Existing Vehicle:

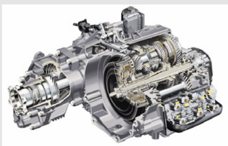
-Specifications

-CO2 Performance

124g/km

2012 Forecast Vehicle:

-Specifications



Sample vehicles selected with either same spec as 2012 or segment average spec

Forecast 2012 Vehicle Mass

1385 kg

Reference Value Calculation:

Using multiple regression, create a relationship between CC, KW, KG and 2007 CO2 of each **sampled** vehicle. Then interpolate between known values using above relationship to calculate **reference CO2** value

Technology Efficiency Assumptions: applied to reference CO2 value when Forecast vehicle spec different to Sample vehicle spec

2008 CO2 for **Forecast** vehicle

119g/km

Continuous Improvement Adjustments

&

Segment Effectiveness Adjustments

(non-model specific)

111g/km

2012 **Forecast** vehicle

CO2

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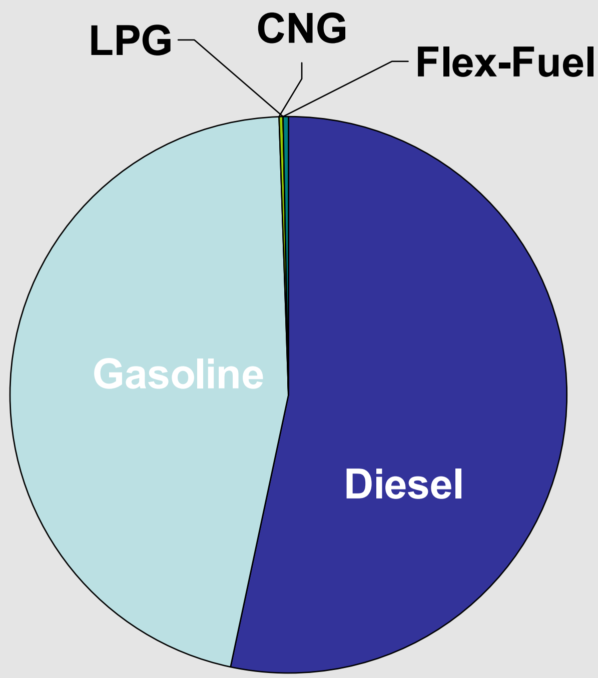
CO_2 Forecast Scenario: 2007

2007

Current Situation

- Europe: EU25
- Passenger Cars only
- Production Based (not sales)
- Alternative fuels not making a major impact



162 g/km

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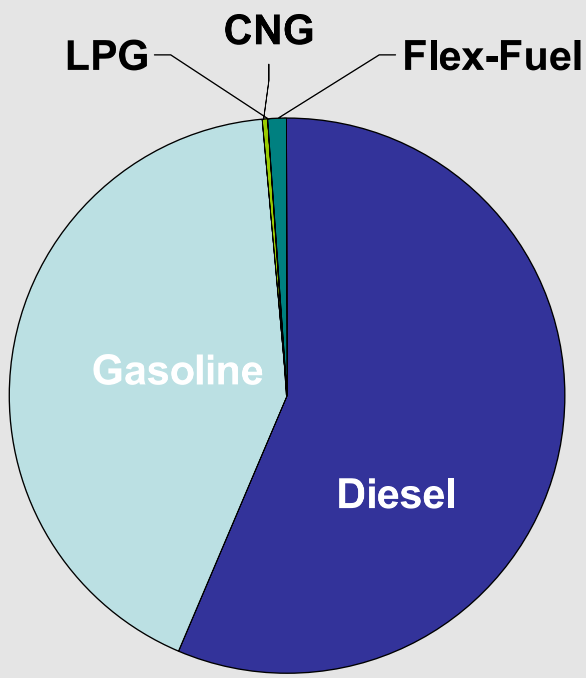
CO_2 Forecast Scenario: 2012

2012

Future Situation

- Diesel share rises 3% points as Euro 5 cost hurdles are overcome & CO_2 taxation expanded across Europe
- Flex-fuel capable vehicle production triples
- CNG constant
- **19g/km decrease**
- **Technology based improvement**



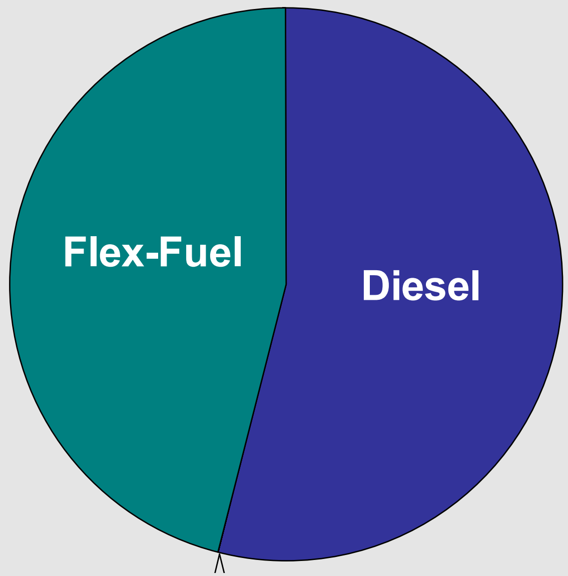
143 g/km

CO_2 Forecast Alternative Scenario: 2012 - Flex-Fuel

2012

Flex-Fuel

- Substitute Gasoline share for Flex-fuel
- Massive increase in Bio-Ethanol capacity required
- Sustainability standards require agreement
- 1g/km deterioration from base forecast
- **Well-to-Wheel (WTW) basis:**
  - **126g/km weighted average emission**
  - **Assumed 30% emissions reduction on Bio-ethanol component (1st Generation production)***



144 g/km

*Concawe, 2007

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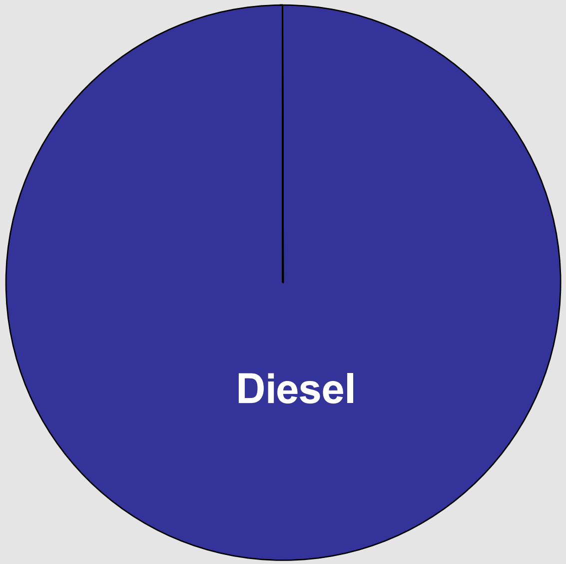
CO_2 Forecast Alternative Scenario: 2012 - Diesel

2012

Diesel

- Refining capacity constraints
- Euro6 looming, buys time to develop solutions rather than paying additional EU penalties
- 7g/km / 8% improvement from base forecast
- **Still misses EU target, but close!**
- Known technology & infrastructure, low risk



136 g/km

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CO_2 Challenge : In summary…

- For now, we still don't know the exact rules of the game
  - We do know that it will be challenging
- There will be no single-solution technology available
  - Opportunities for all involved!
- Overall, the major contributors will be:
  - Technology
  - Consumers

Thank you

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