

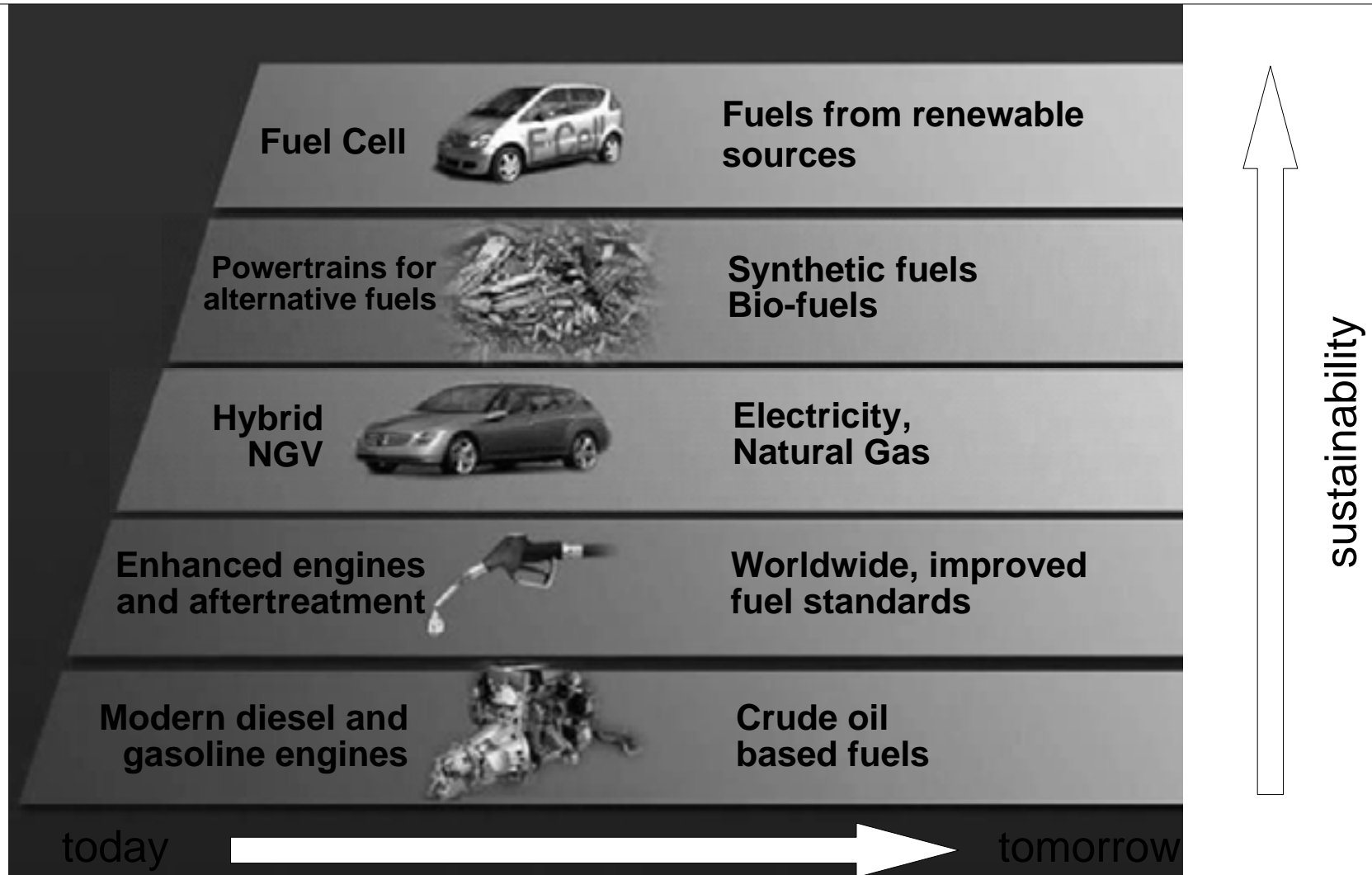
DAIMLERCHRYSLER

**Clean Diesel - Important Building Block of
Future Powertrain Strategies**

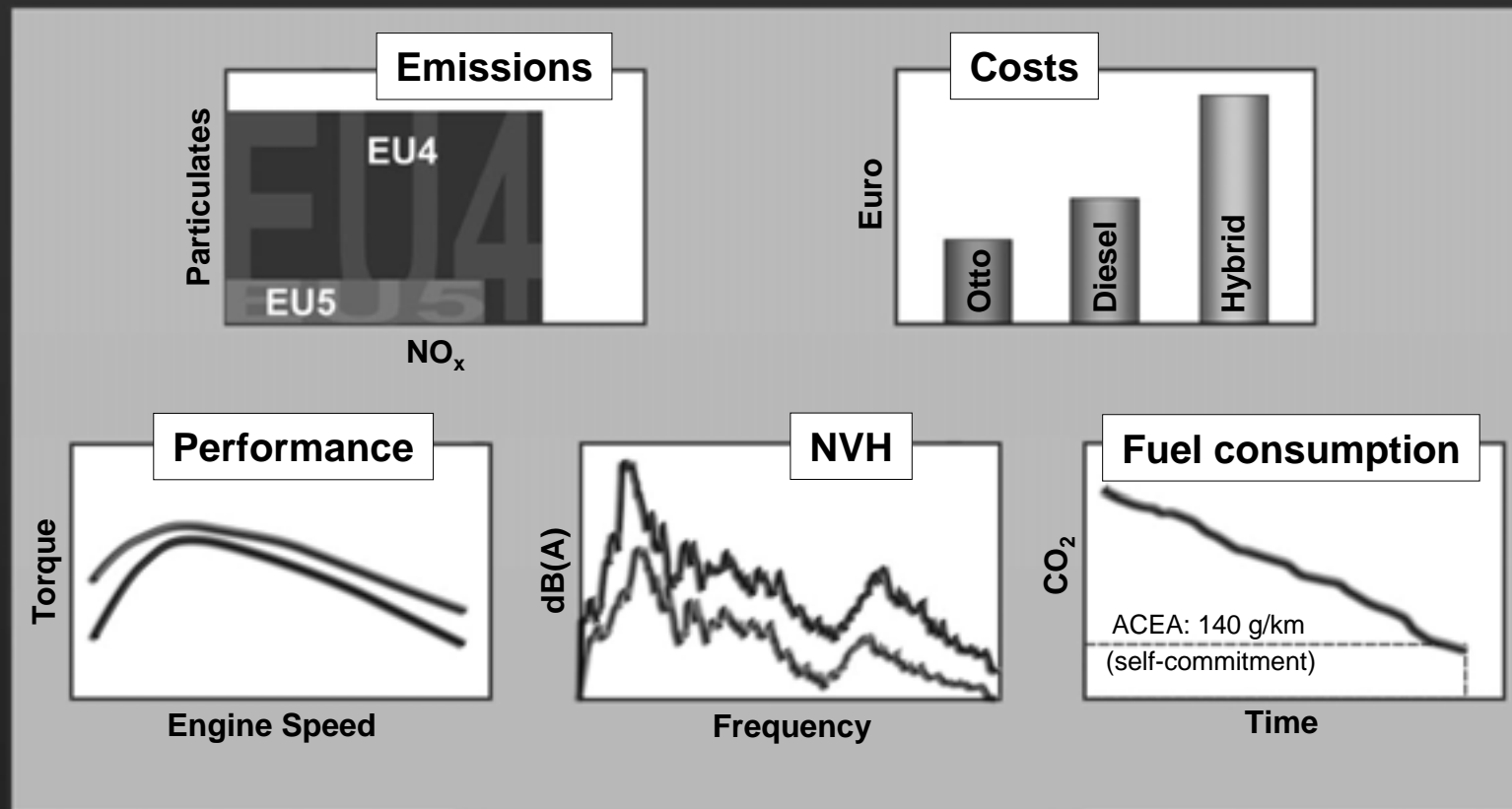
Content

- **Challenges for future powertrains**
- Why is the Diesel engine so attractive?
- Bluetec - a global emission strategy
- Diesel in the USA - a strong revival?
- Diesel contra Hybrid - winner on three continents
- The future of Diesel fuel
- Mercedes Diesel - ready for a global market

Mercedes „Five Step“ approach to future personal mobility



Requirements for future diesel engines



Future Challenges for the Diesel Engines

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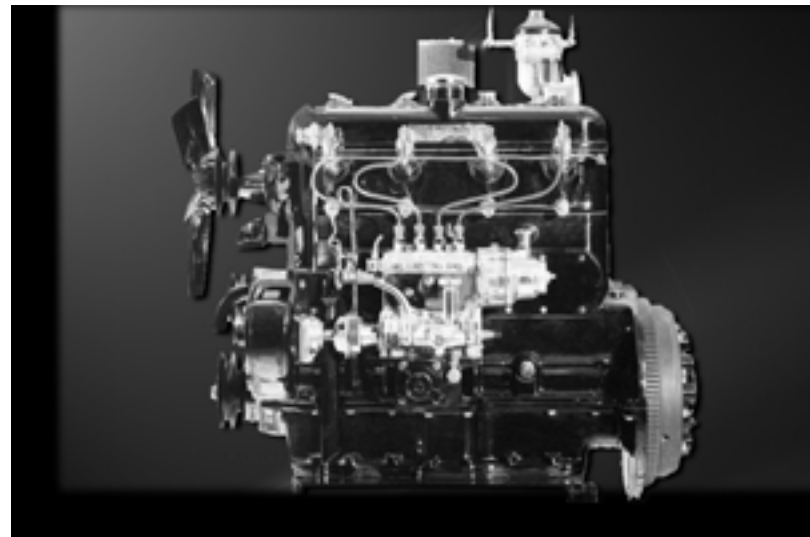
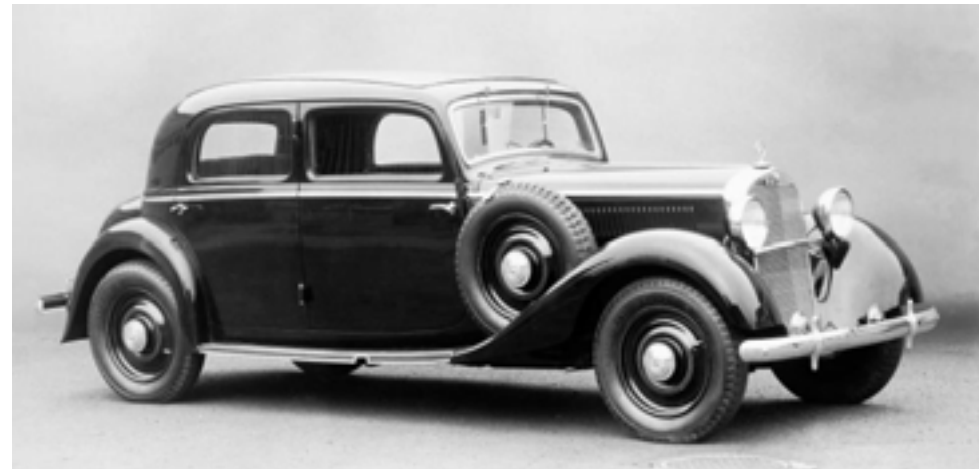
Mercedes-Benz: rich Diesel heritage and pacemaker of Diesel engine technology

- **1919: first prechamber Diesel engine**
- **1923: first Diesel engine in commercial vehicle**
- **1936: first diesel engine in a passenger car**
- **1979: first turbocharged diesel engine**
- **1985: first particulate filter in a passenger car**
- **1993: first passenger car Diesel engine with 4 valves/cylinder**
- **1997: introduction of Common Rail Technology**
- **2003: first modern particulate filter with additive free regeneration**
- **2006: presentation of worlds cleanest „Bluetec“ diesel engine**

Mercedes 260 D 1936: The First Diesel Engine in a Passenger Car



Rudolf Diesel
(1897)



E 320 CDI – the modern Diesel Engine



Rudolf Diesel
(2006)

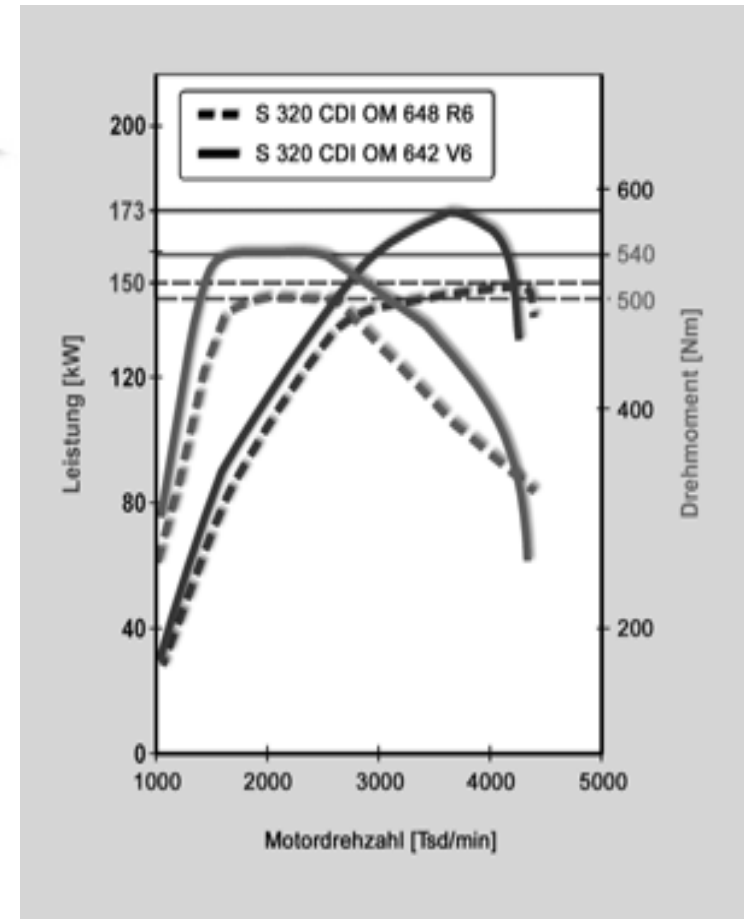


165 kW

540 Nm

7,3 l/100 km
(NEDC)

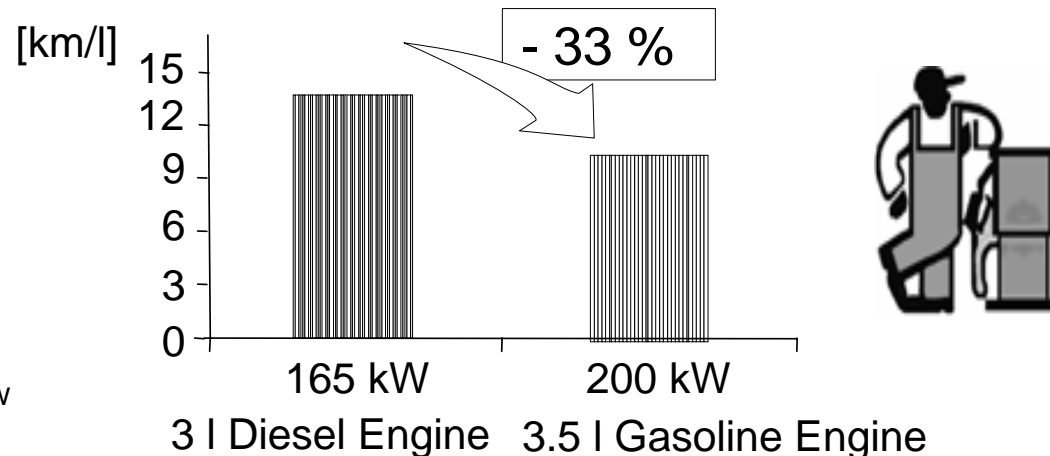
Clean - Powerful - Efficient: The new V6 3l-Diesel Engine with Particulate Filter



Compared to its predecessor, the new V6-Diesel engine offers 15% more power and 8% more torque over a wider speed range.

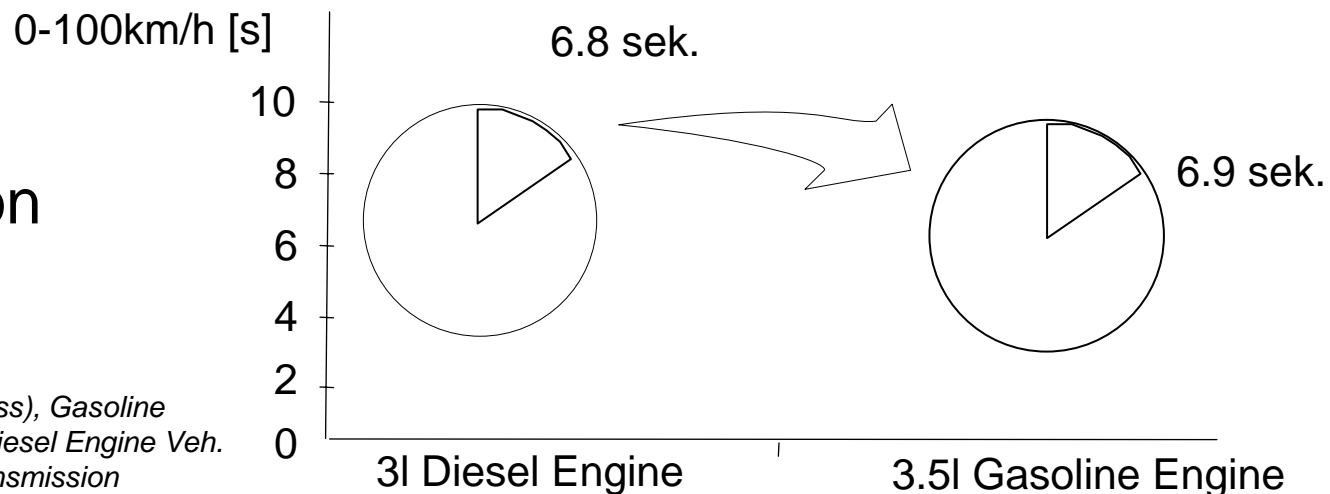
The Diesel engine shows slightly better driveability and over 30% better fuel economy.

Fuel Economy*



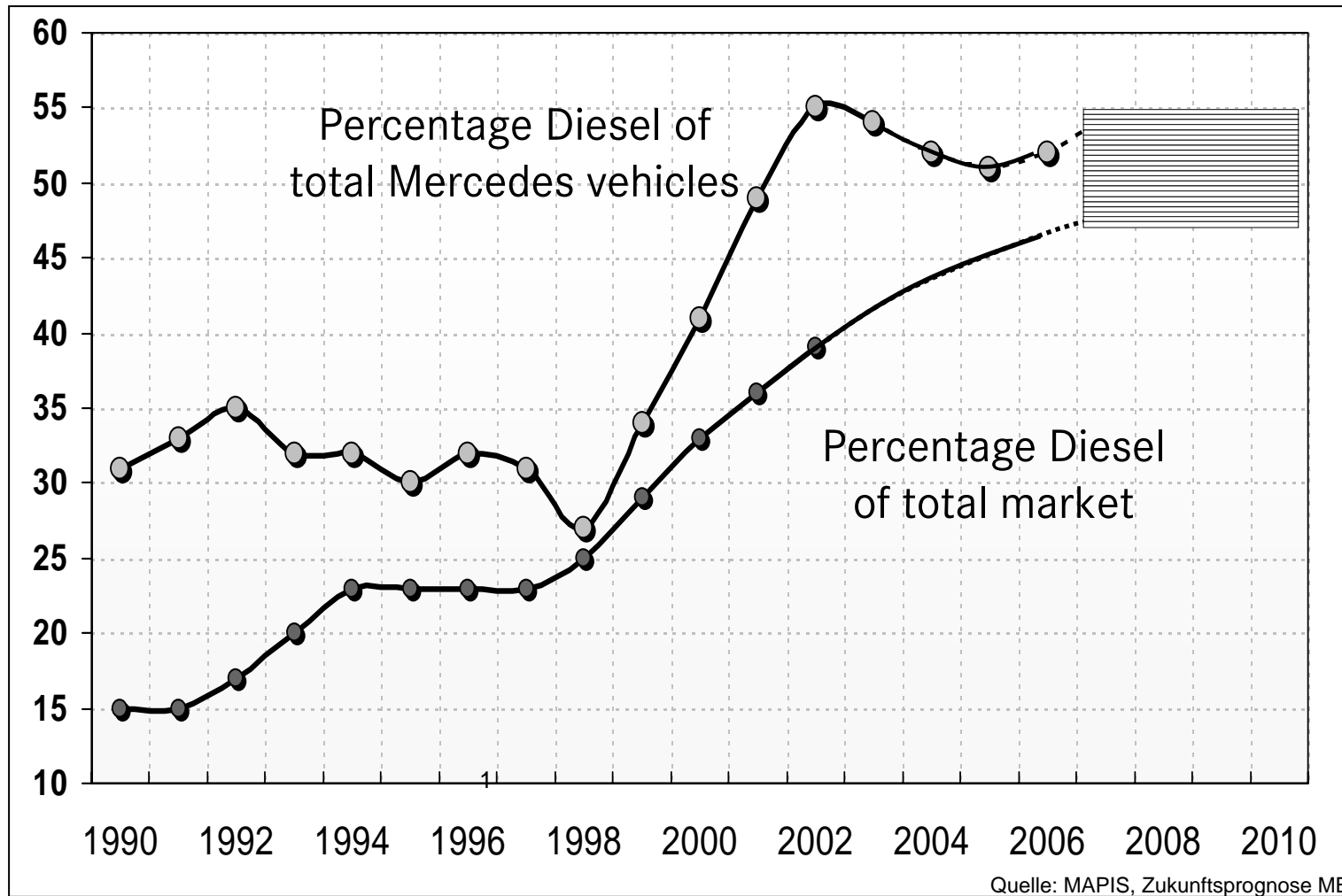
*based on certification in New European Drive Cycle

Acceleration



Identical Vehicle (E-Class), Gasoline Engine Veh. 1690 kg, Diesel Engine Veh. 1750 kg, Automatic Transmission

Percentage Diesel vehicles of newly registered vehicles in Europe

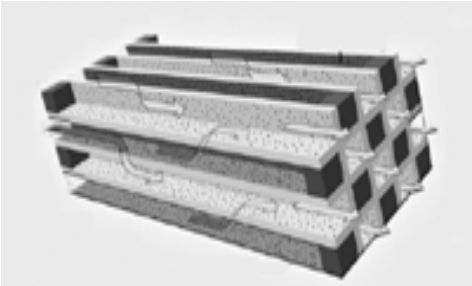
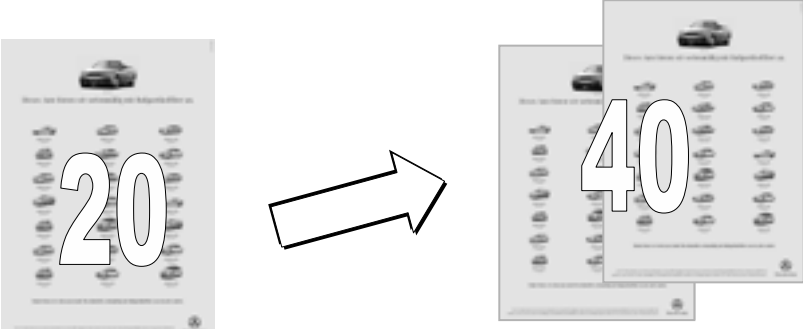



Mercedes customers value the diesel engine even higher than the average customer.

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Diesel Particulate Filters (DPF) Mercedes Benz is setting Standards

			
<p>2003</p>	<p>2004</p>	<p>2005</p>	
<p>October 2003</p> <ul style="list-style-type: none"> Mercedes-Benz offers as first automobile manufacturer the combination of Euro4 Emission limits and modern Diesel particulate filters with additive free regeneration. 	<p>2005:</p> <ul style="list-style-type: none"> Particulate filters, without additives and therefore maintenance-free, today standard in more than 20 Mercedes-Benz Diesel-models Summer 2005 Number of Mercedes-Benz Diesel models with particulate filters to over 40. <p>End 2005</p> <ul style="list-style-type: none"> All vehicles have particulate filters Retrofit being offered for C and E - Class 		<p>2006</p> <ul style="list-style-type: none"> Introduction of E-Class with Particulate Filter in USA and Japan smart CDI-models with particulate filters

Mercedes-Benz BLUETEC: Technologies for future emission legislation

BLUETEC



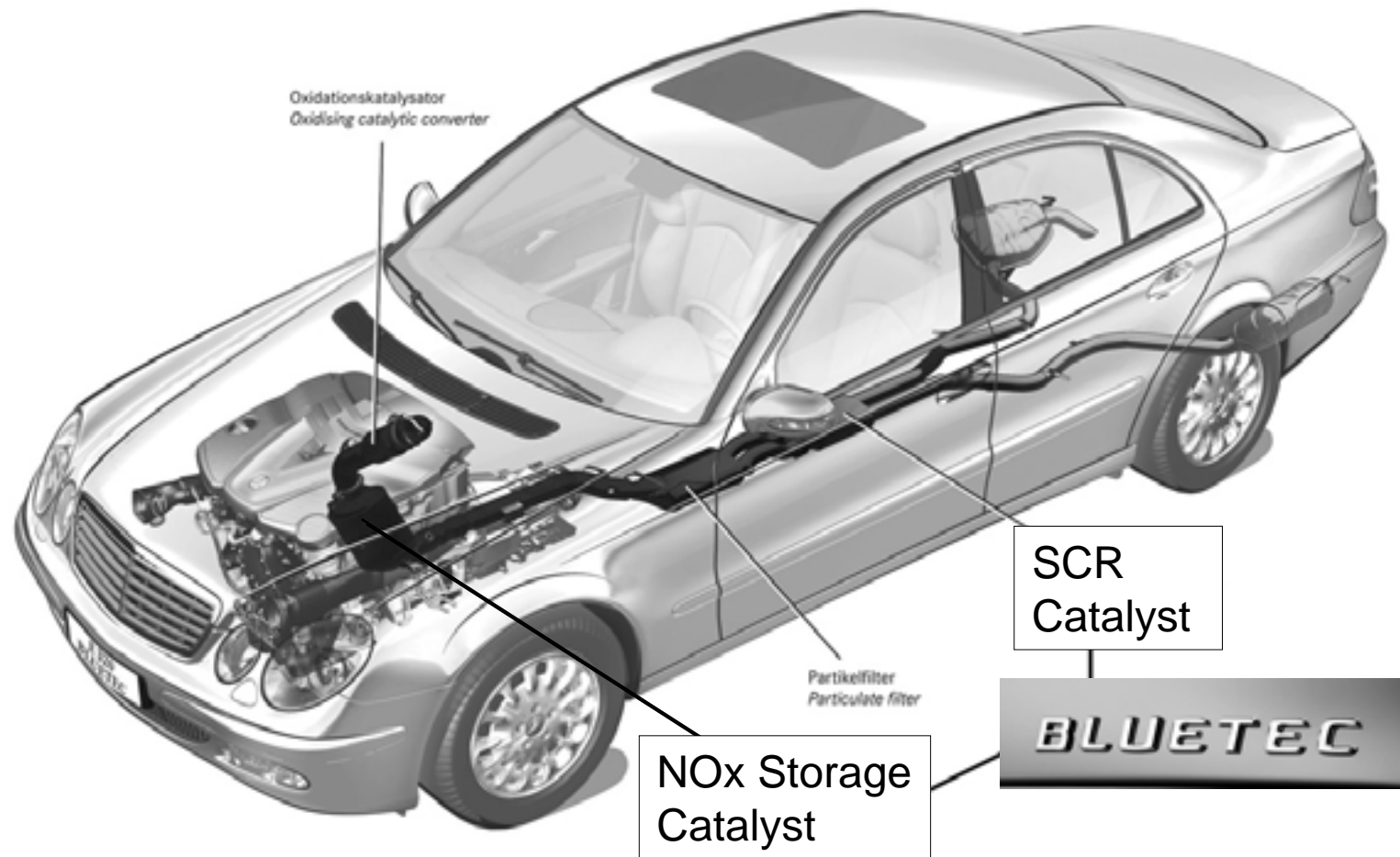
emission technology for
"California" states, 2009



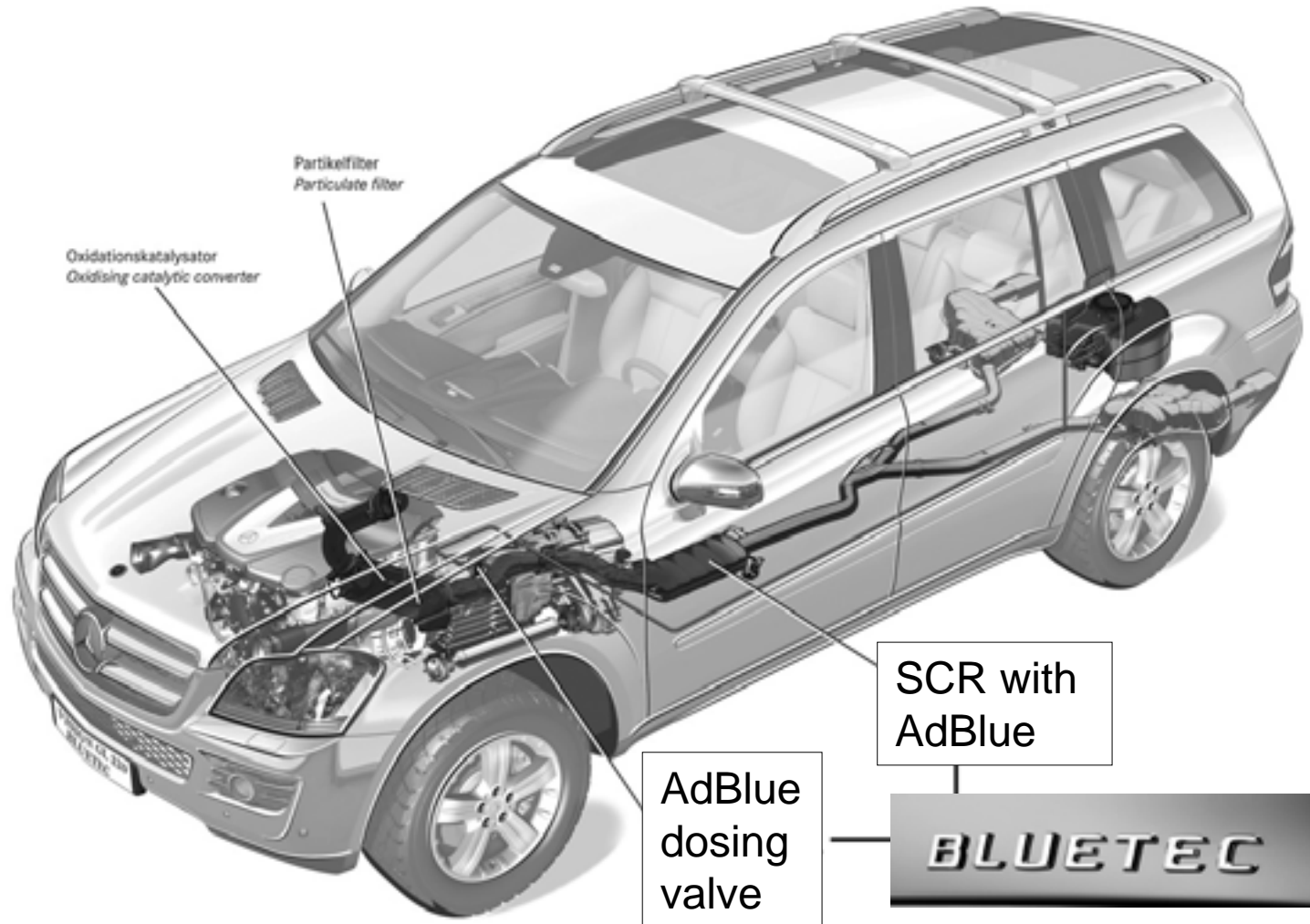
emission technology for
45 "EPA" states, 2007

Vision GL 320 CDI and E 320 CDI as presented in Detroit International
Auto Show, January 2006

Aftertreatment of the E 320 BLUETEC



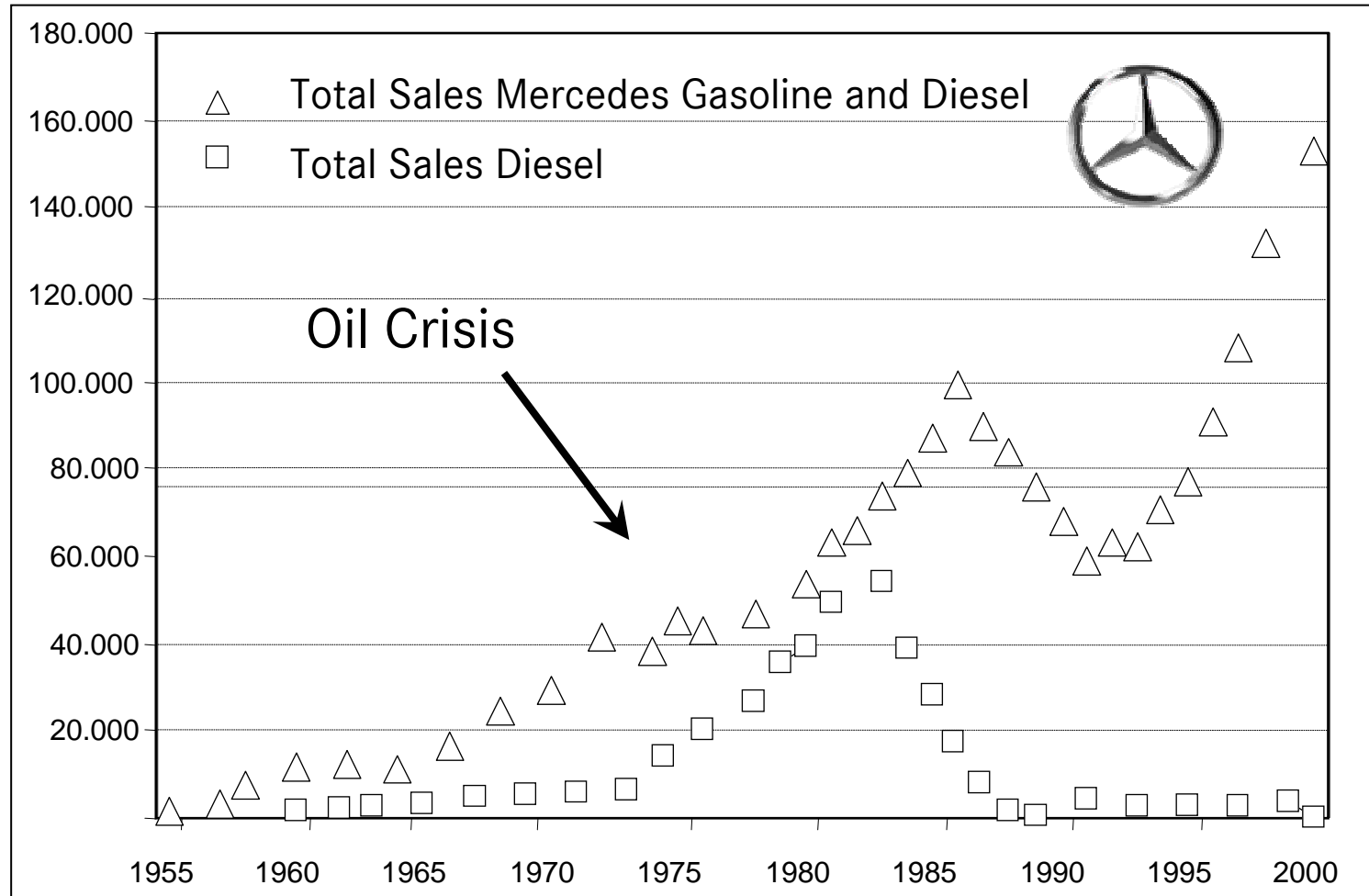
Aftertreatment of the VISION GL 320 BLUETEC



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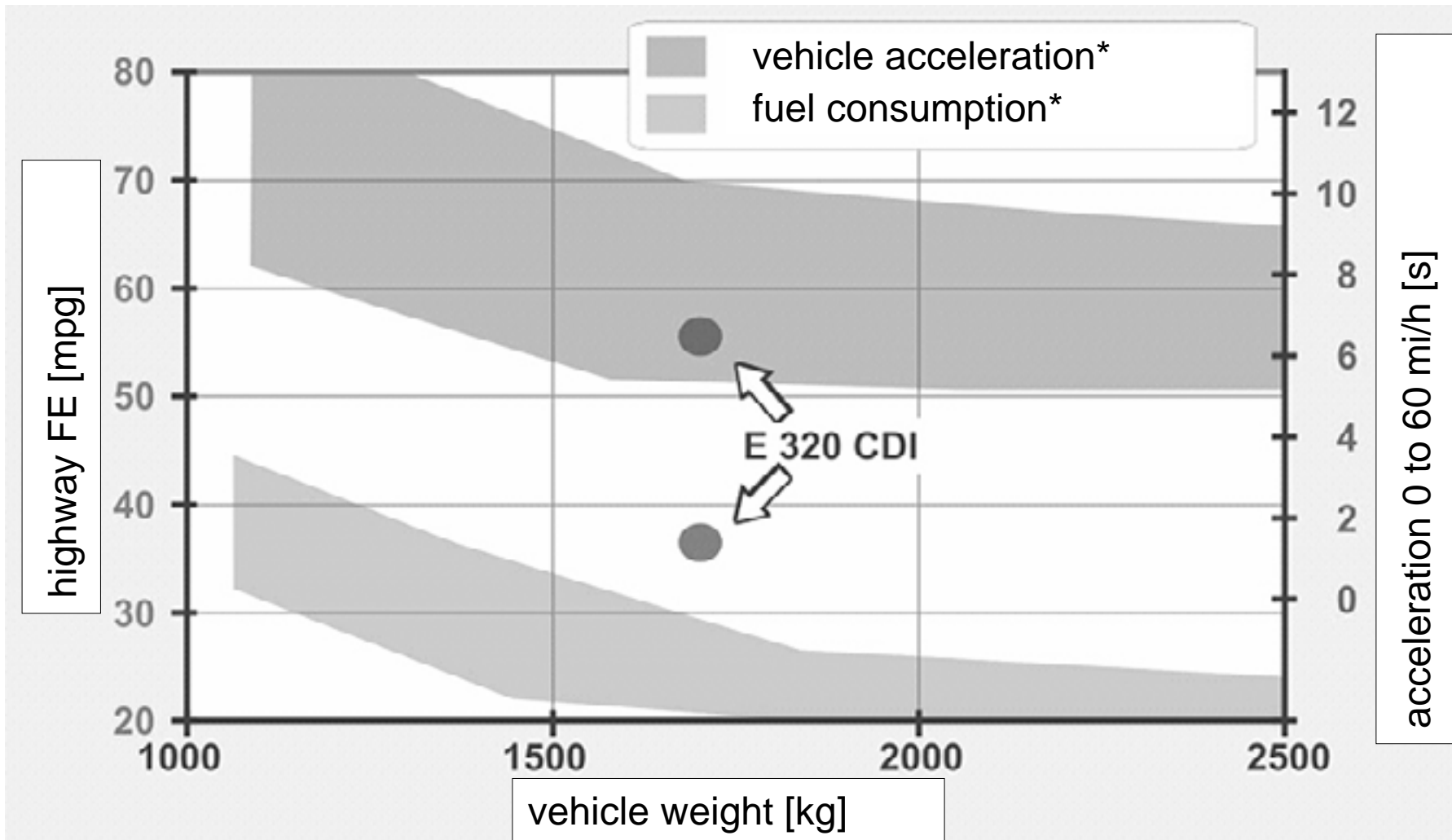
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Percentage of Diesel vehicles in newly registered vehicles in the USA



In the 1970's, the oil crisis triggered a diesel boom in the US. DC expects increasing interest now again due to high fuel prices.

Mercedes E 320 CDI and gasoline competitors



*competitors: gasoline engines

Quality and Reliability of Mercedes-Benz Powertrains

**"LAREDO GO 2005": 3 Long Distance Speed Records
22 International FIA Records**



World Speed Record: E-Class with V6 Diesel Engine

- 3 unmodified, serial production E320 CDI with particulate filter, randomly picked by FIA from the production line in Stuttgart
- 30 day high speed drive on test track in Laredo, 20000 laps on 5 mile track



World Records:

- 50,000 miles (80,467 kilometers) at 225.456 km/h
- 100,000 kilometers at 225.903 km/h
- 100,000 miles (160,934 kilometers) at 224.823 km/h

Fuel Economy Challenge with E 320 CDI with Vehicles after Speed World Record



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Chapter 1: USA - Diesel vs. Gasoline Hybrid



Auto Bild No. 33/2005
2005-08-19

- Diesel: 9.2 l/100 km
- Hybrid: 10.2 l/100 km

Engineering challenge in USA: Lexus RX 400h vs. Mercedes ML 320 CDI Hybrid vs. Diesel
 A 5000-kilometer benchmark test across North America* reveals strengths and weaknesses.

Vergleich: Vorteil für den Diesel

	Mercedes ML 320 CDI	Lexus RX 400h
Strecke	5259 km	5156 km
Kraftstoffverbrauch	482,3 l	527,4 l
City (4% der Gesamtstrecke)	12,0 l/100 km	11,5 l/100 km
Highway (80–130 km/h) [88%]	9,0 l/100 km	10,1 l/100 km
Mix [8%]	9,9 l/100 km	10,6 l/100 km
Verbrauch gesamt	9,2 l/100 km	10,2 l/100 km

* 5000 km test drive from New York to San Francisco, including city driving

Chapter 2: Europe - Diesel vs. Gasoline Hybrid



OFF ROAD

Issue 11/2005

Das große Tank-Duell

1000-kilometer benchmark test across Germany representing everyday traffic.

Mixture from speedy drive (160 km/h), heavy freeway traffic and walking speed (traffic jam).

“Hybrid gasoline engines only decreases the disadvantage compared to diesel engines.”

Das Ergebnis im Detail

Gesamte Messstrecke: 999,2 Kilometer

1. Etappe (Länge 465,0 km): Ottobrunn, A99 bis Eschenrieder Spange, A8 bis Kreuz Ulm/Elchingen, A7 bis Rastplatz Kirchheim am Kirchheimer Dreieck

Lexus RX 400h	
48,38 L	10,4 L/100 km

Mercedes ML 320 CDI	
45,78 L	9,9 L/100 km

2. Etappe (Länge 534,2 km): Rastplatz Kirchheim, A4 bis Hermstdorfer Kreuz, A9 bis Kreuz Nürnberg Ost, A6, ab Anschlussstelle Roth auf B2, 158 km Landstraße bis Odelzhausen

Lexus RX 400h	
57,40 L	10,8 L/100 km

Mercedes ML 320 CDI	
50,26 L	9,4 L/100 km

Chapter 3: Japan - Diesel vs. Gasoline Hybrid



Lexus GS 450h

Fuel cost over 1147.8 kilometers: 13,537 yen



Mercedes-Benz E 320 CDI

Fuel cost over 1147.8 kilometers: 8,783 yen

The E-Class diesel also displays impeccable acceleration from above 100 km/h, with no difference from a gasoline version. It allowed us to enjoy sporty driving to our heart's content. Of course, the exclusiveness typical of a Mercedes remains unchanged.

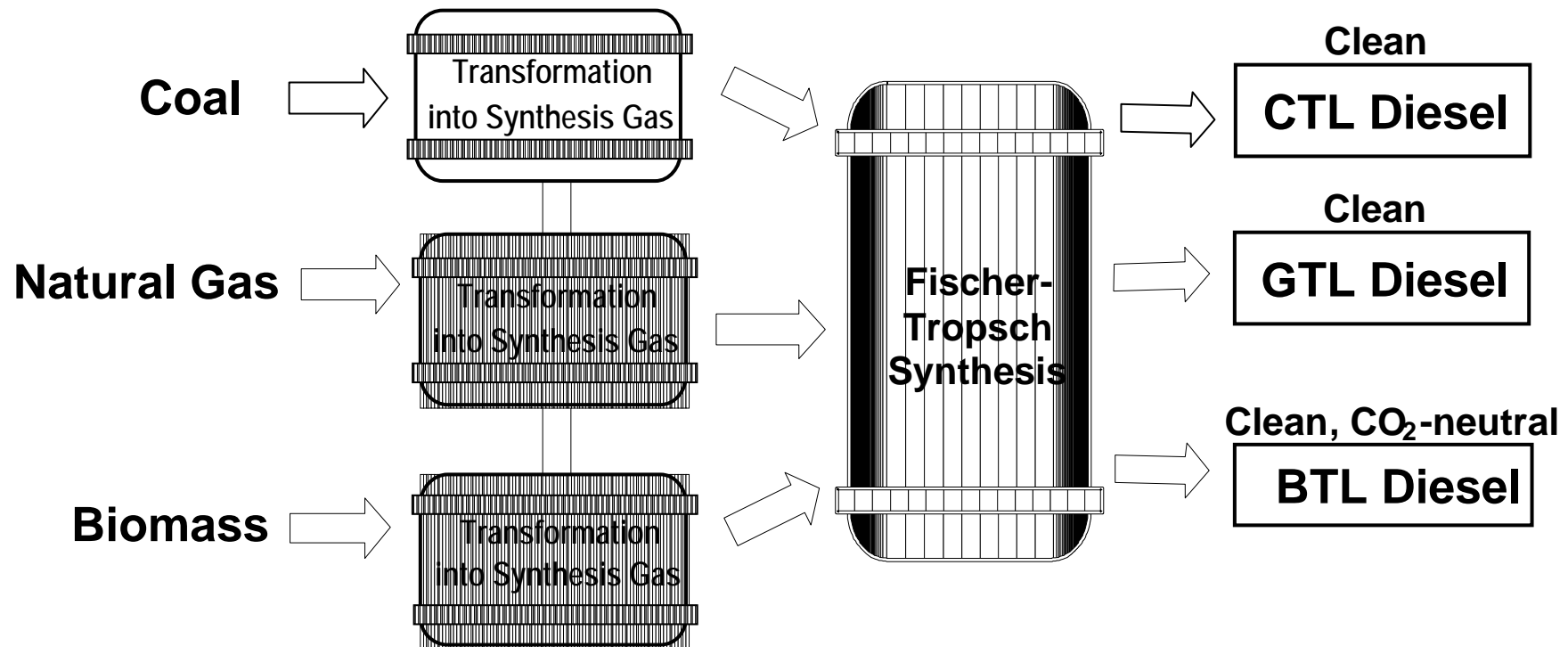
Source: Shukan Post, April 28, 2006; Report from a test drive of Lexus GS 450h and Mercedes E 320 CDI from Tokyo to Kyoto.

Fuel Economy Advantage E320 CDI: ca. 18%

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Alternative sources of Diesel fuel



Diesel fuel can be produced from various fossile and non fossile sources, using a well known industrial process (Fischer-Tropsch-Synthesis)

GTL Diesel: large investments are being made



ORYX GTL (Ras Laffan, Qatar) (Quelle: Sasol)

BTL Diesel: developing towards industrial scale plants



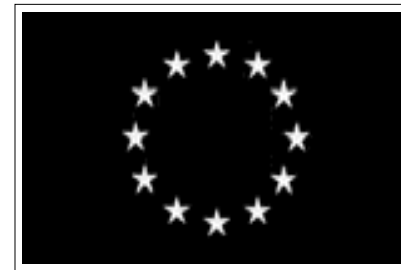
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Engine and Emission Strategy Today: Euro 4 Type Combustion, Particulate Filter



Emission Technology
meets standards:



...2009

...2006



...2009

Engine and Emission Strategy: Advanced Combustion, Particulate Filter, Fuel Economy Oriented, Euro V



Emission Technology has potential to meet standards:



2009- ...

Engine and Emission Strategy Bluetec



Emission Technology
has potential to meet
standards*:



2009- ...

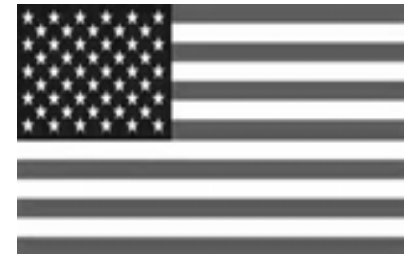
* Euro V is expected to cut NOx emissions for SUV > 1760 kg by ca. 50% from 390 mg/km to 200 mg/km.

Engine and Emission Strategy Bluetec



Emission Technology has potential to meet standards:

2009- ...



2009-...



Conclusions

- Conventional diesel and gasoline powertrains will remain mainstream technology for many years to come.
- The modern Diesel engine is fun to drive, with high torque and power, while maintaining excellent fuel economy.
- With the Mercedes Bluetec-concept, diesel engines can meet emission limits worldwide.
- The high crude oil prices will increase the diesel market share in both the USA and Japan. Due to better fuel economy in real life driving and a lower cost , the diesel engine will be a strong competitor for the gasoline hybrid.
- Diesel fuel can be efficiently produced from a multitude of sources, including renewable energy sources.
- The diesel engine is an important building block of the Mercedes-Benz powertrain strategy.

Thank you for
your attention!

