

**8th Diesel Engine Emissions
Reduction (DEER) Conference
August 25-29, 2002
San Diego, California**



Advances in Diesel Engine Technologies for European Passenger Vehicles

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Content

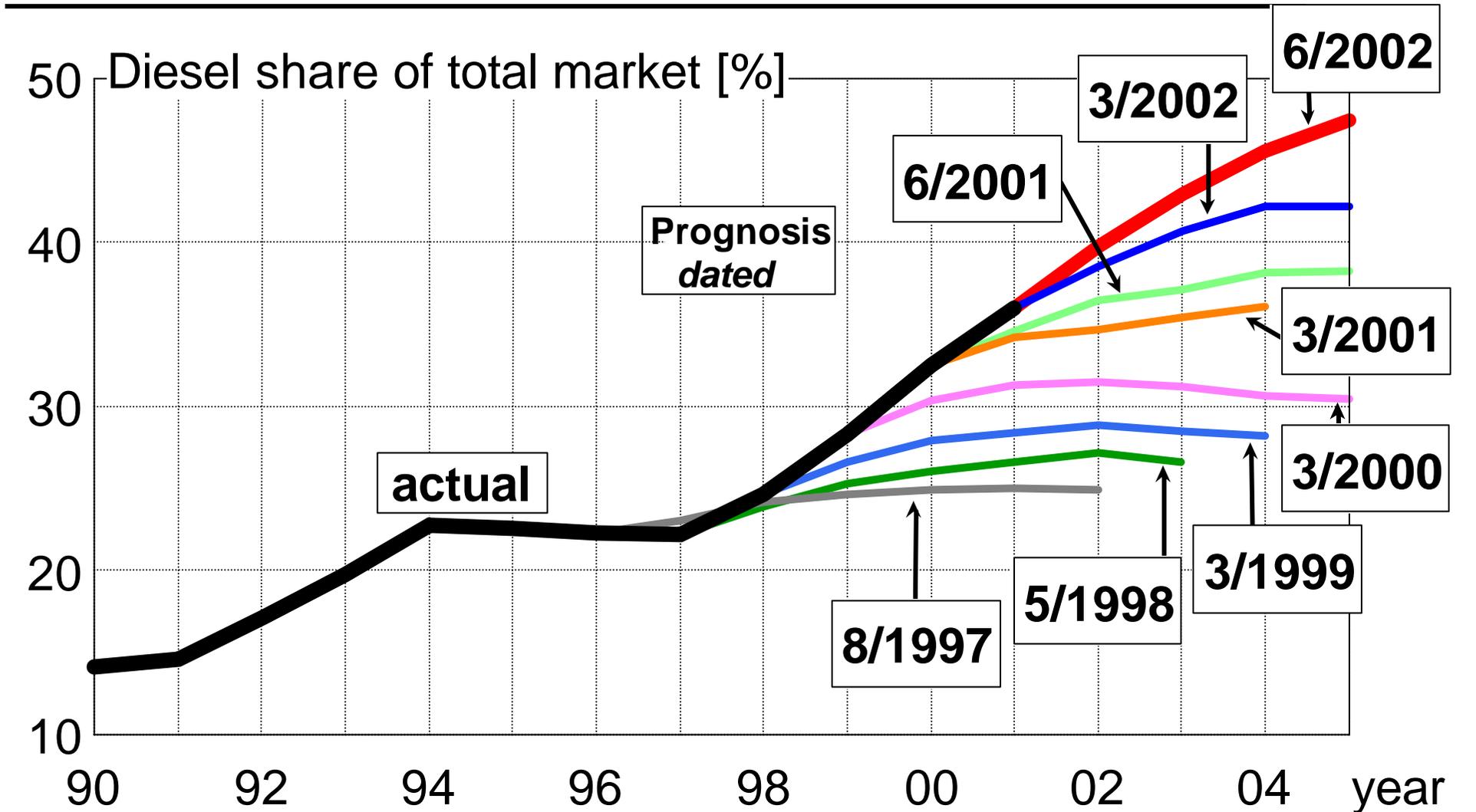


- 1. Diesel market in Western Europe**
- 2. Environmental relevant driving forces of vehicle development**
- 3. Powertrain concepts: today and in the future**
- 4. Outlook and conclusions**



Diesel Share in Western Europe

Comparison of different prognosis (DRI)

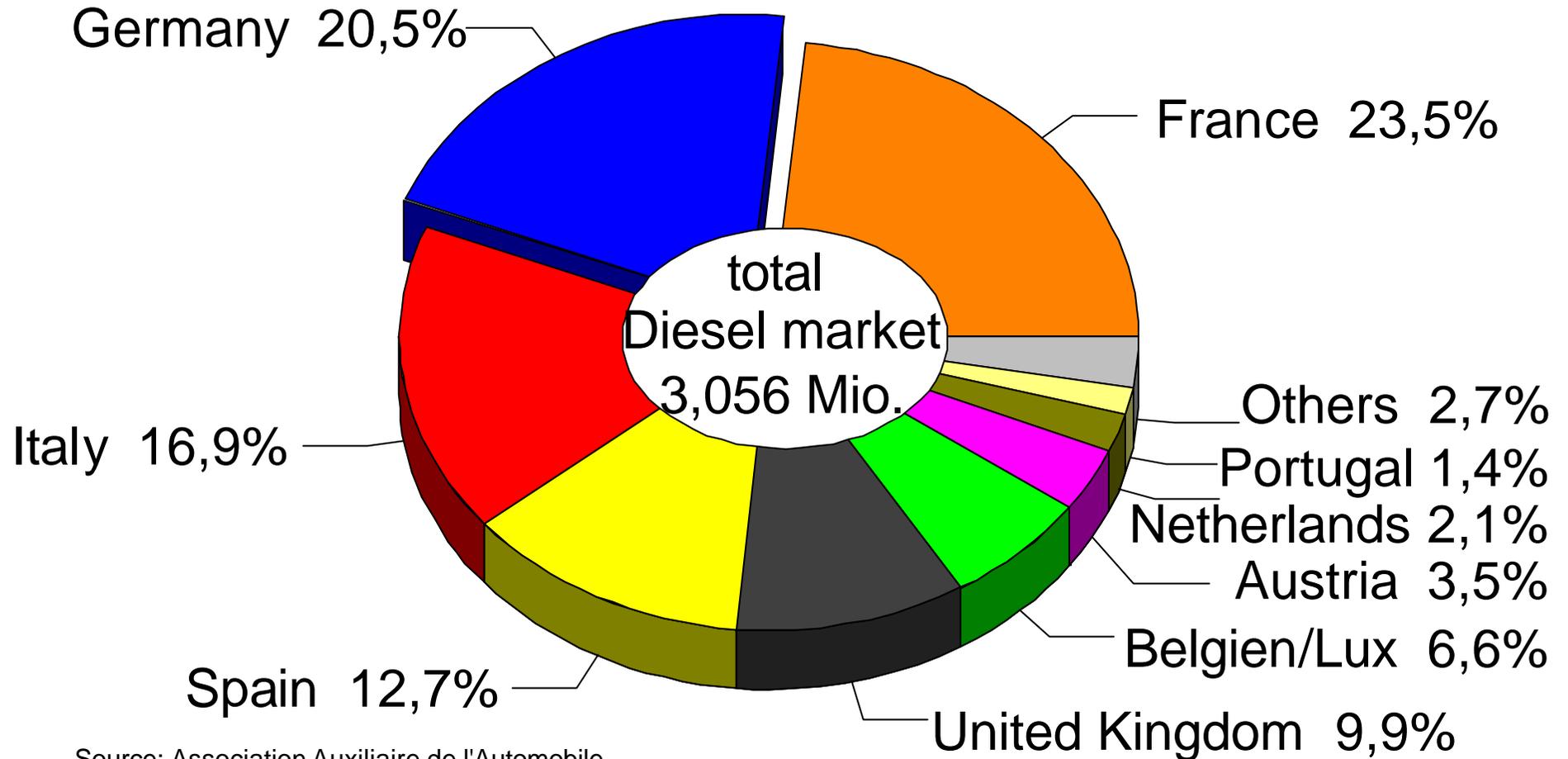


European Status



Diesel market in Western Europe

January – June 2002



Source: Association Auxiliaire de l'Automobile

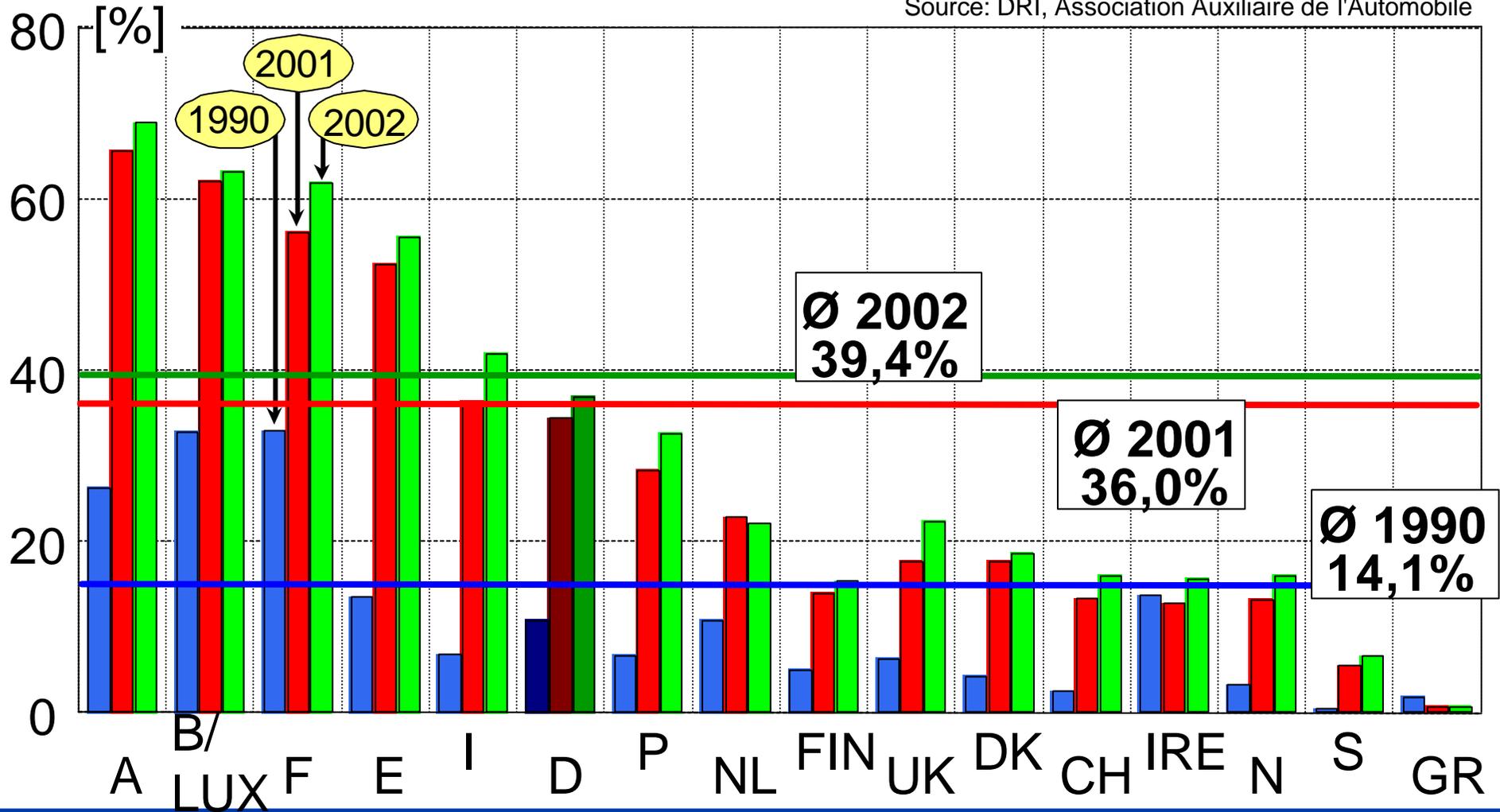
European Status



Western Europe

National Diesel Shares 1990 / 2001 / ½yr 2002

Source: DRI, Association Auxiliaire de l'Automobile

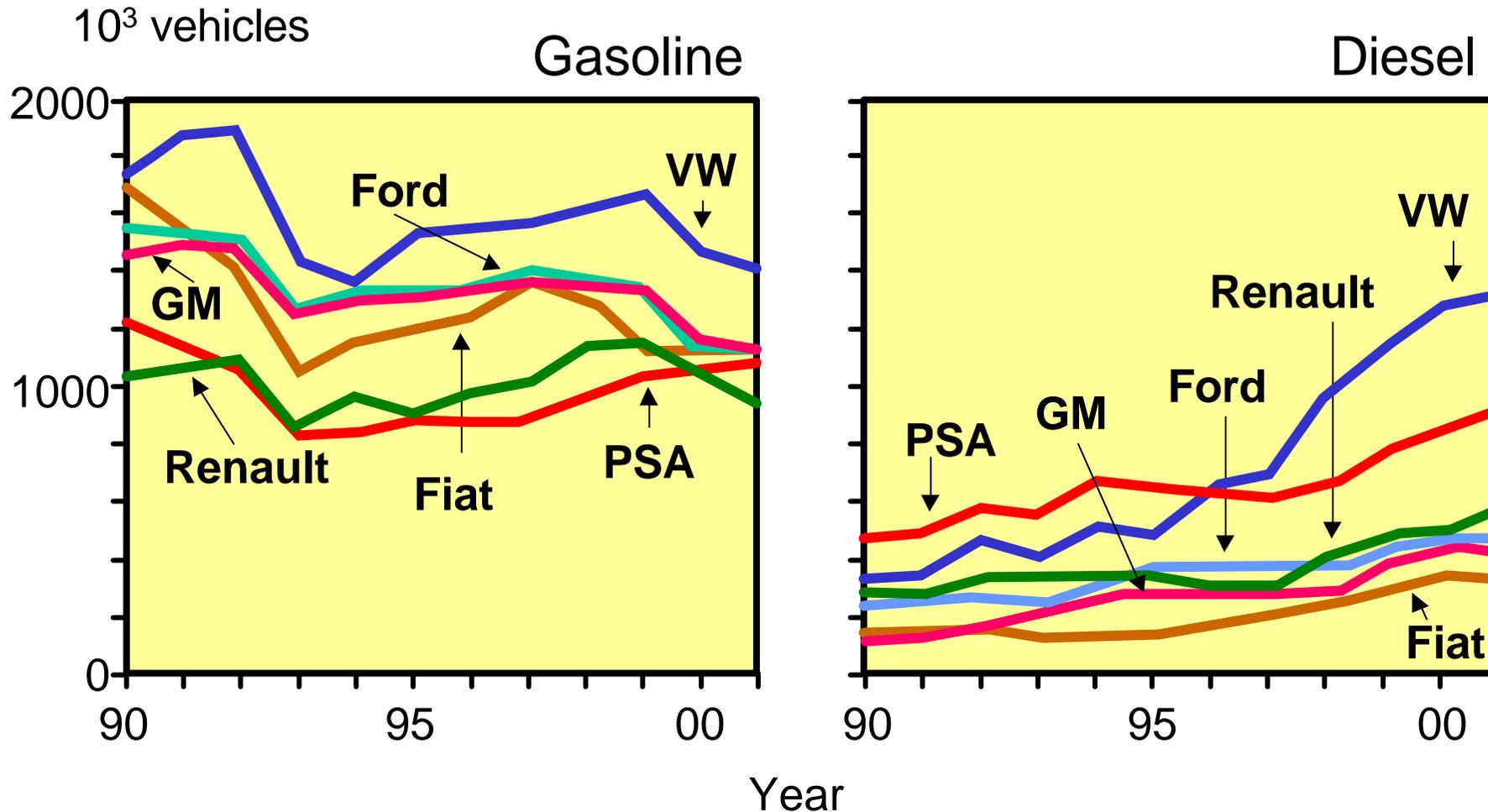


European Status



New registrations of Diesel passenger cars

Western Europe: 1990 - 2001

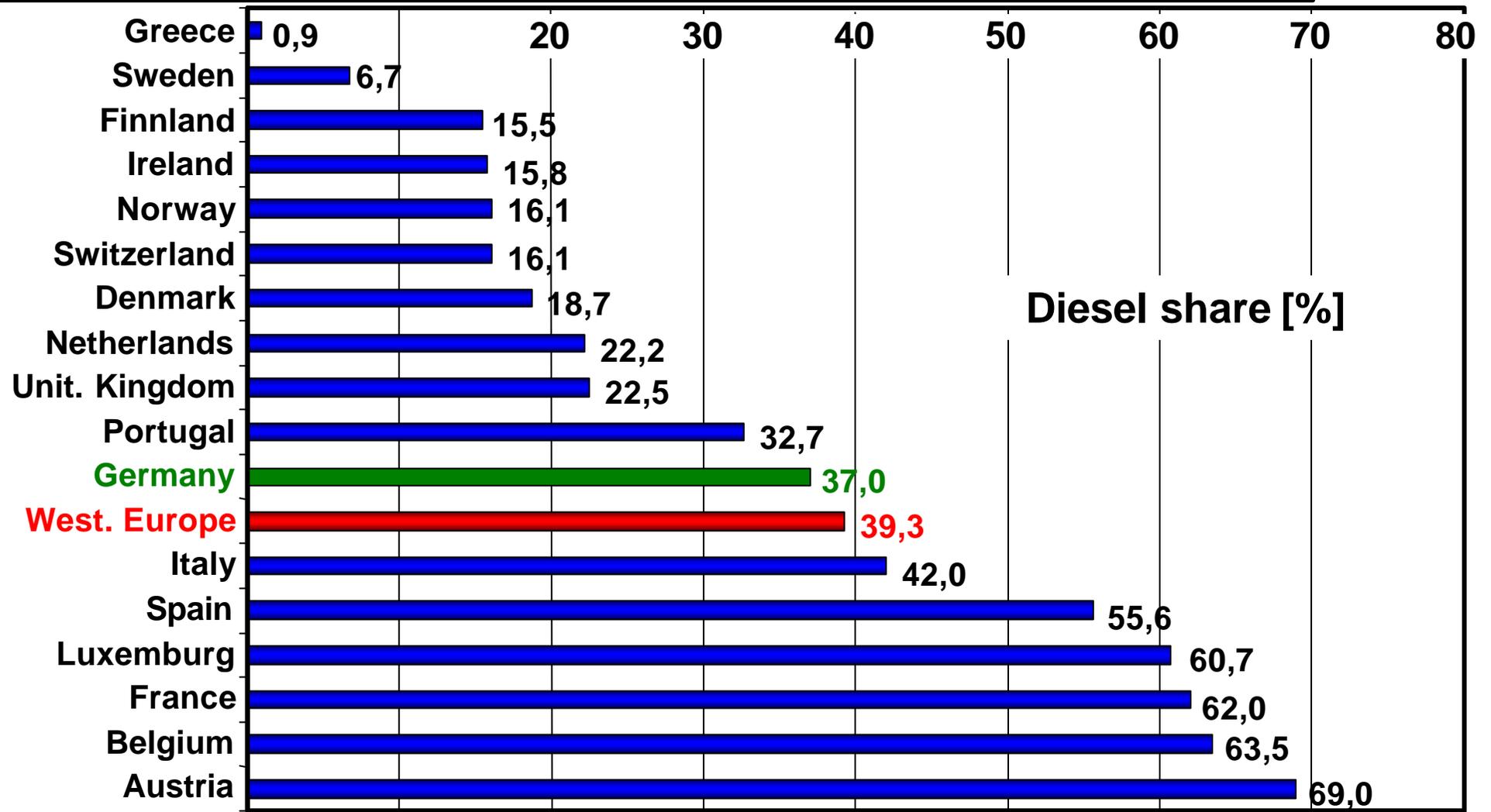


European Status



New registrations of Diesel passenger cars

Western Europe: January - June 2002

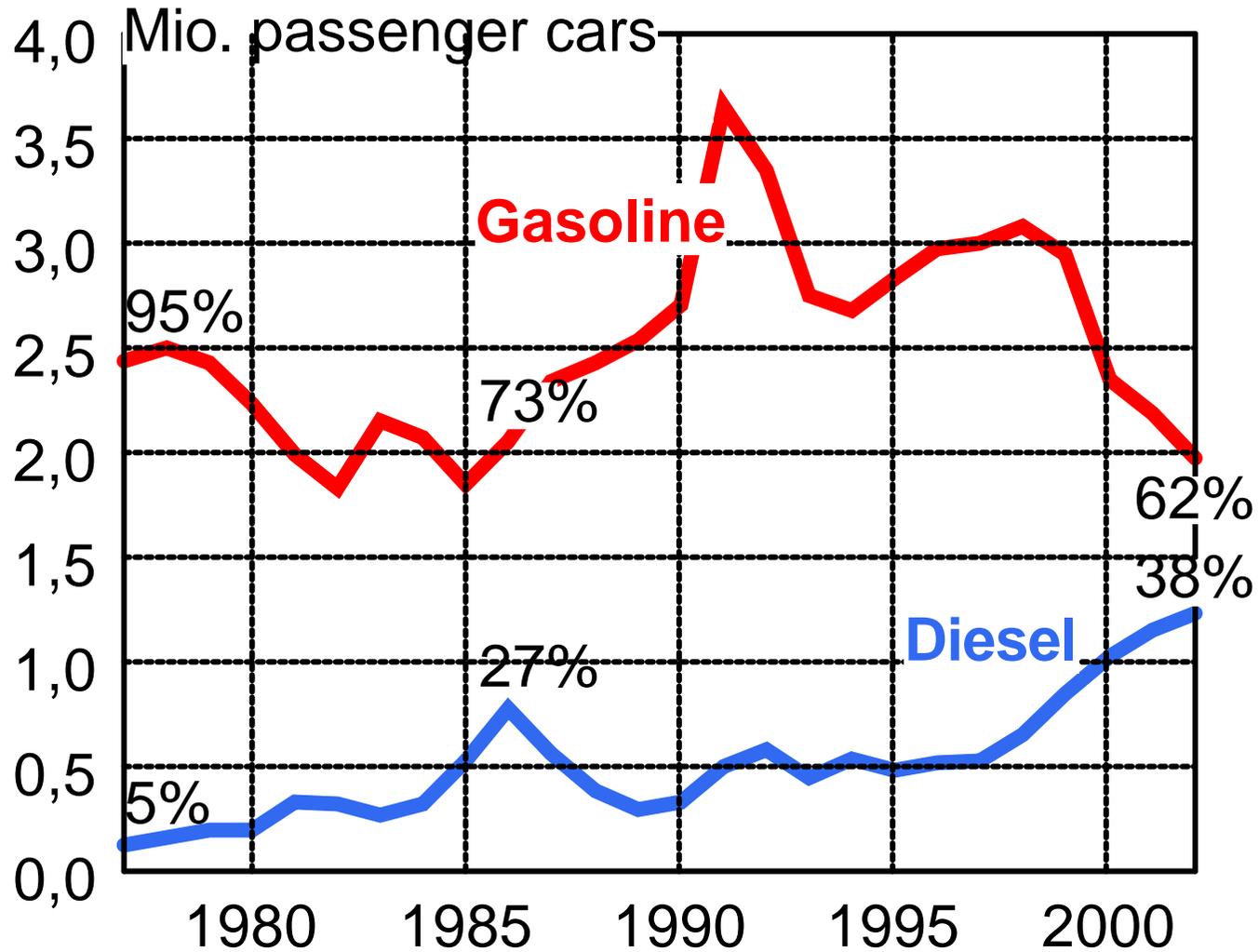


European Status



New registrations of passenger cars

Germany

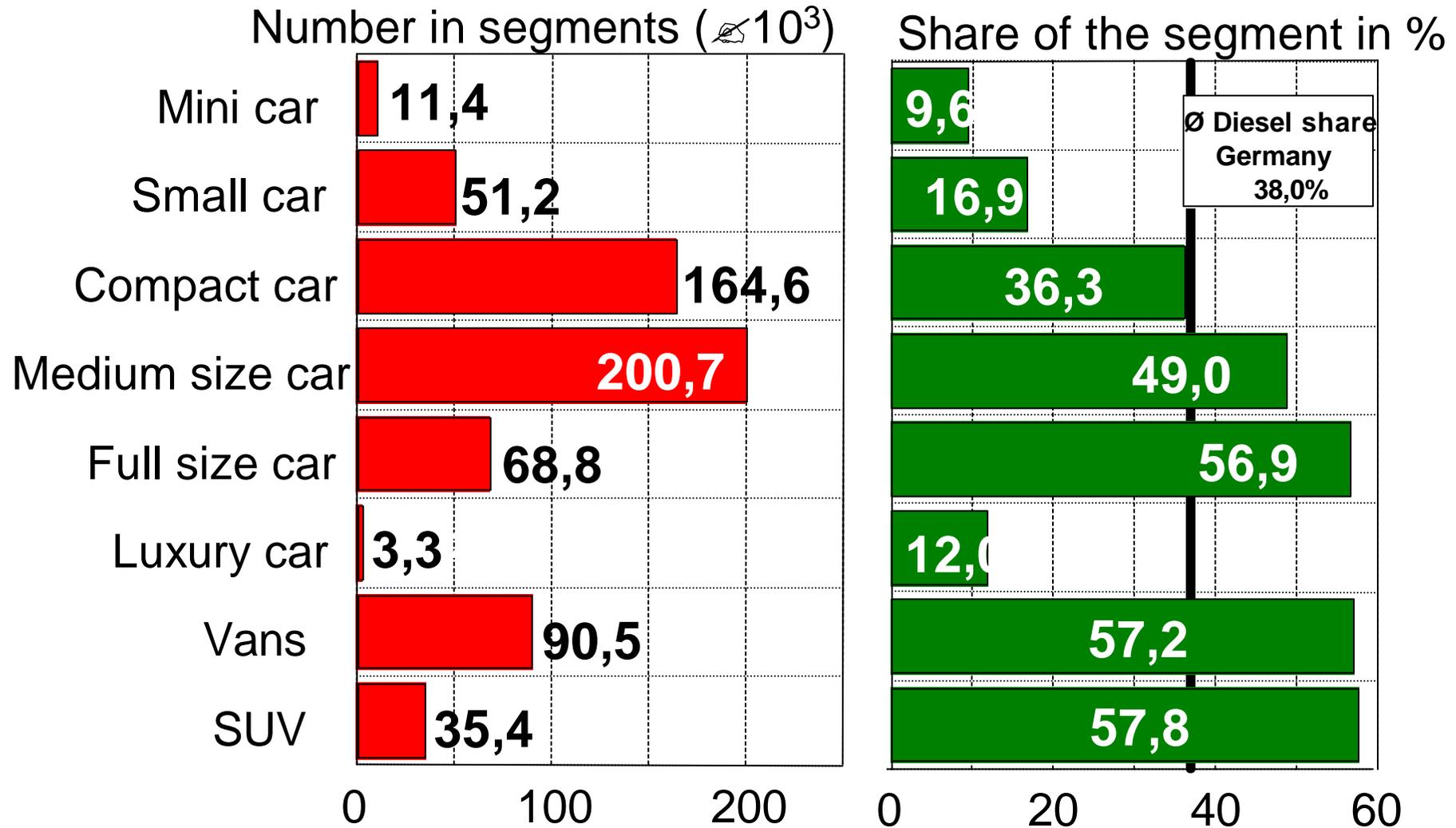


European Status



New registrations of Diesel passenger cars

Germany: January - June 2002

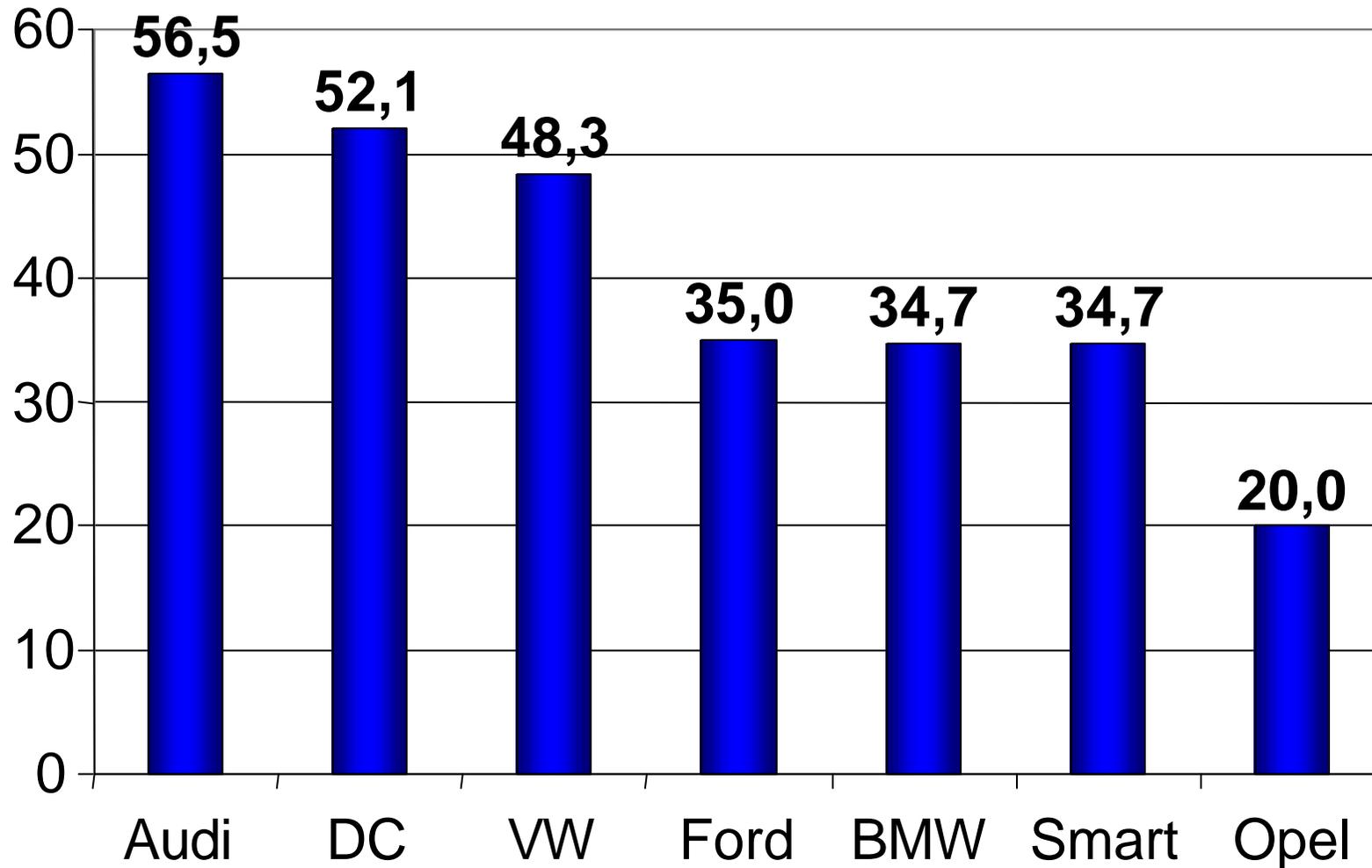


European Status



Diesel share in Germany

January to Juni 2002: German manufacturers

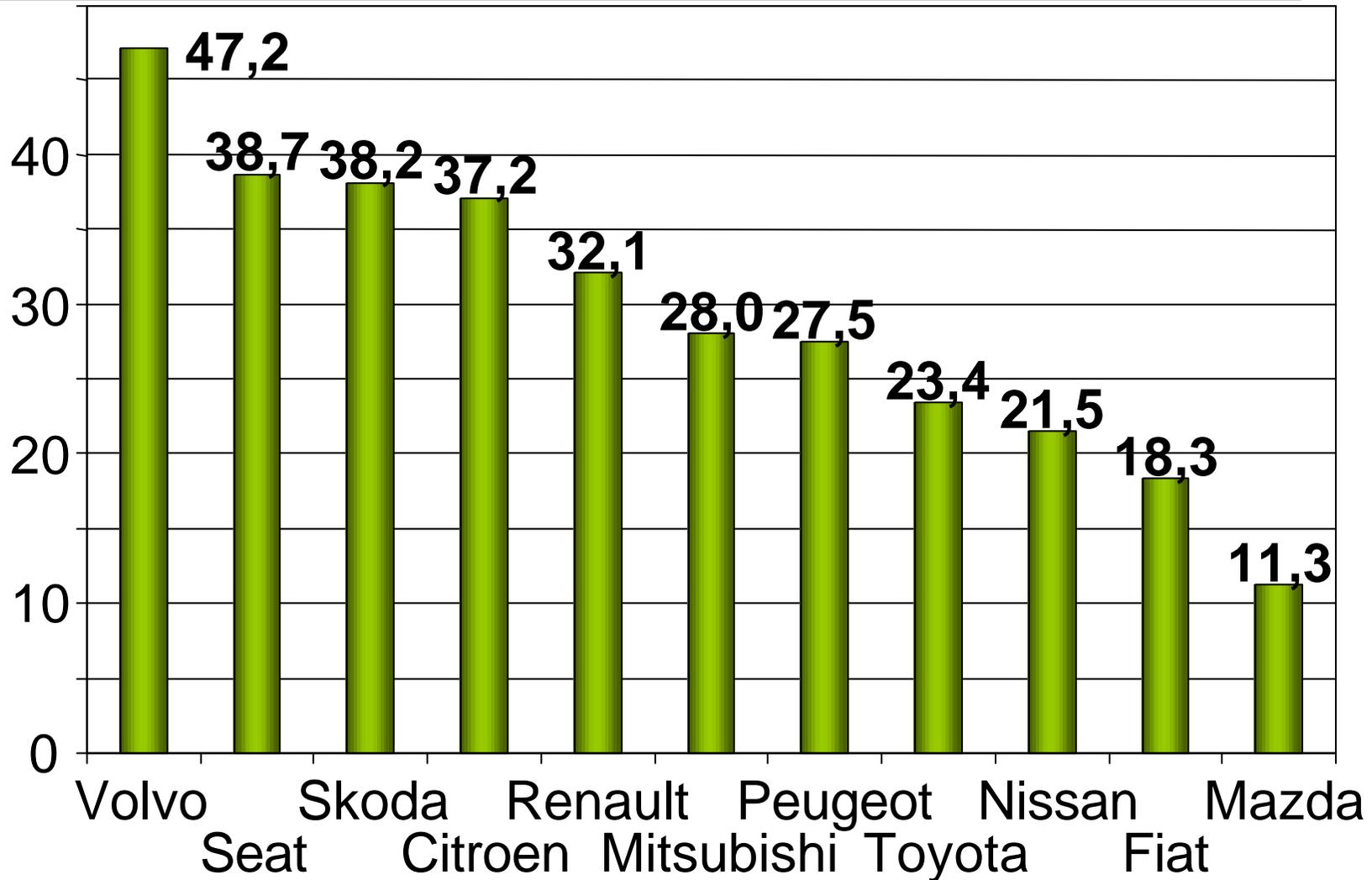


European Status



Diesel share in Germany

January to Juni 2002: Importers



European Status



Why do costumers in Europe buy the Diesel?

~~the~~ the diesel closed the gap to the gasoline engine on:

~~performance~~

~~noise~~

~~the~~ the diesel has reduced fuel consumption (CO₂ emissions)

~~the~~ the diesel has lower operating costs

European Status



Operating costs of a Diesel vehicle

~~✍~~ during purchasing

~~✍~~ vehicle price

~~✍~~ purchase tax

~~✍~~ VAT

~~✍~~ during operation yearly

~~✍~~ annual vehicle tax

~~✍~~ during driving

~~✍~~ fuel tax

~~✍~~ maintenance costs

~~✍~~ real costs from sophisticated calculation

But: costumers consider mainly the difference in gasoline and diesel fuel costs

European Status



Content



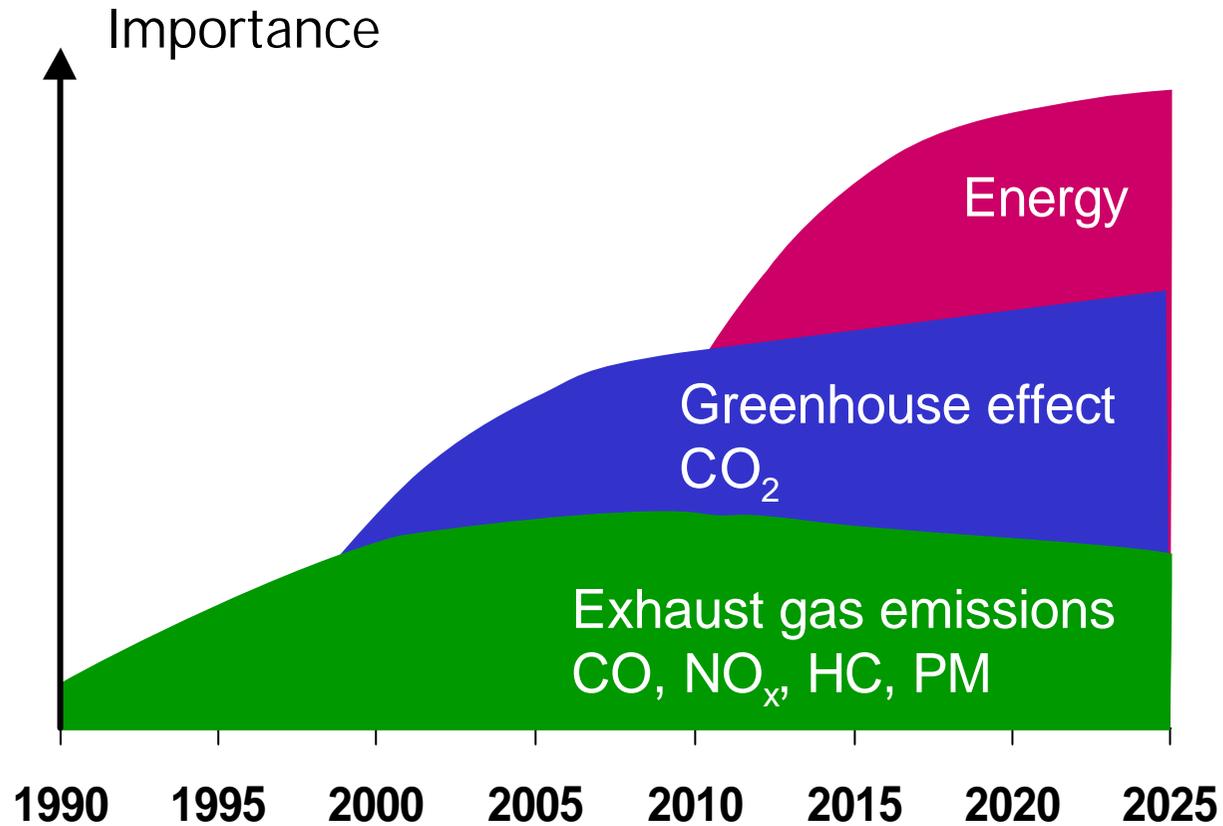
1. Diesel market in *Western Europe*

**2. Environmental relevant driving forces of
vehicle development**

European Status



Environmental relevant driving forces of vehicle development

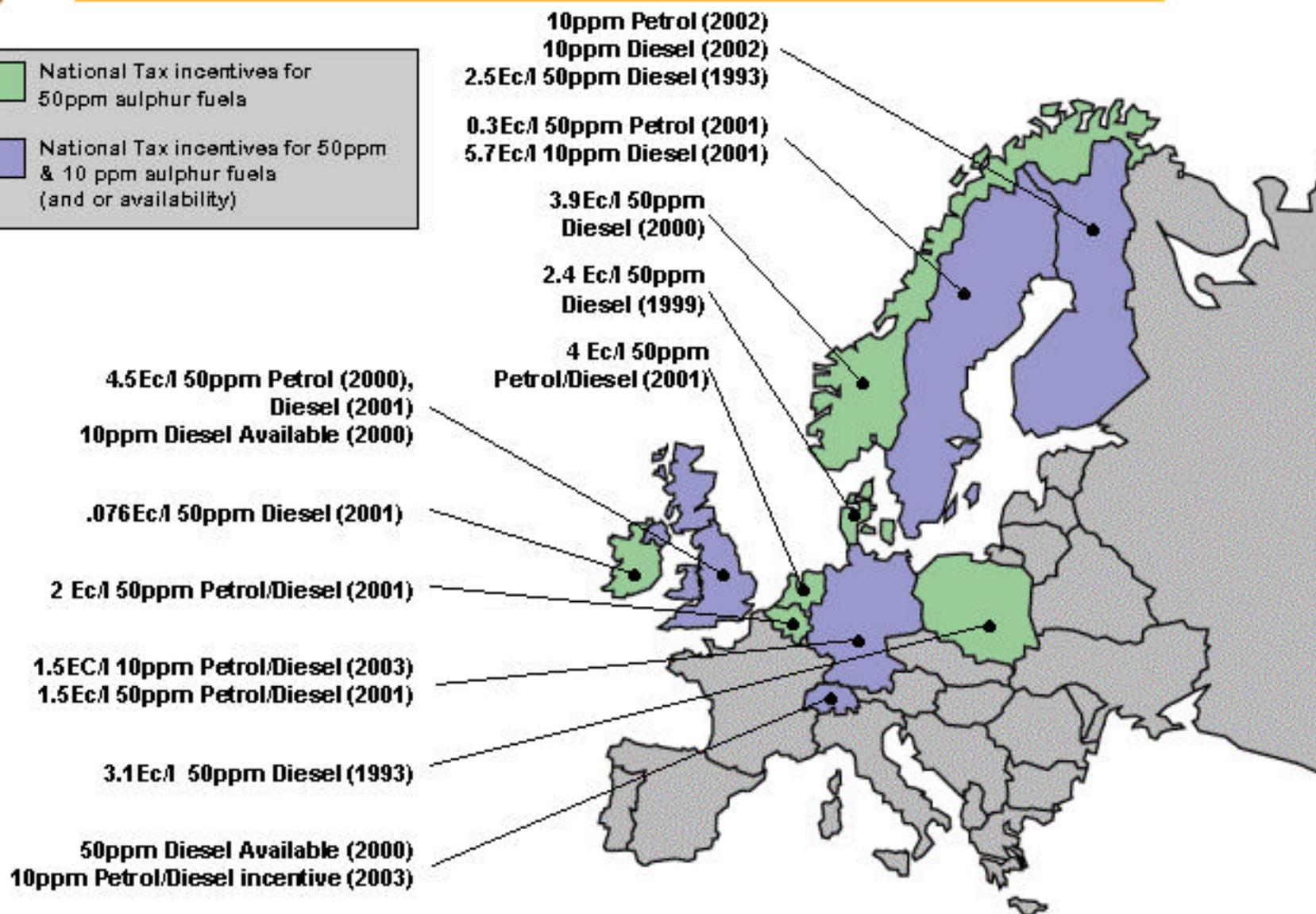
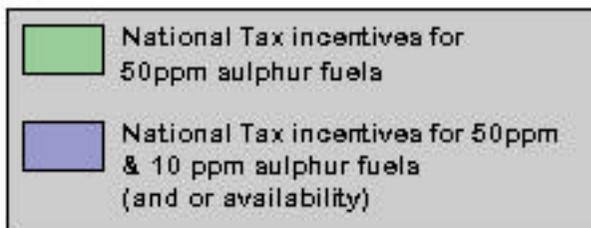


European Status

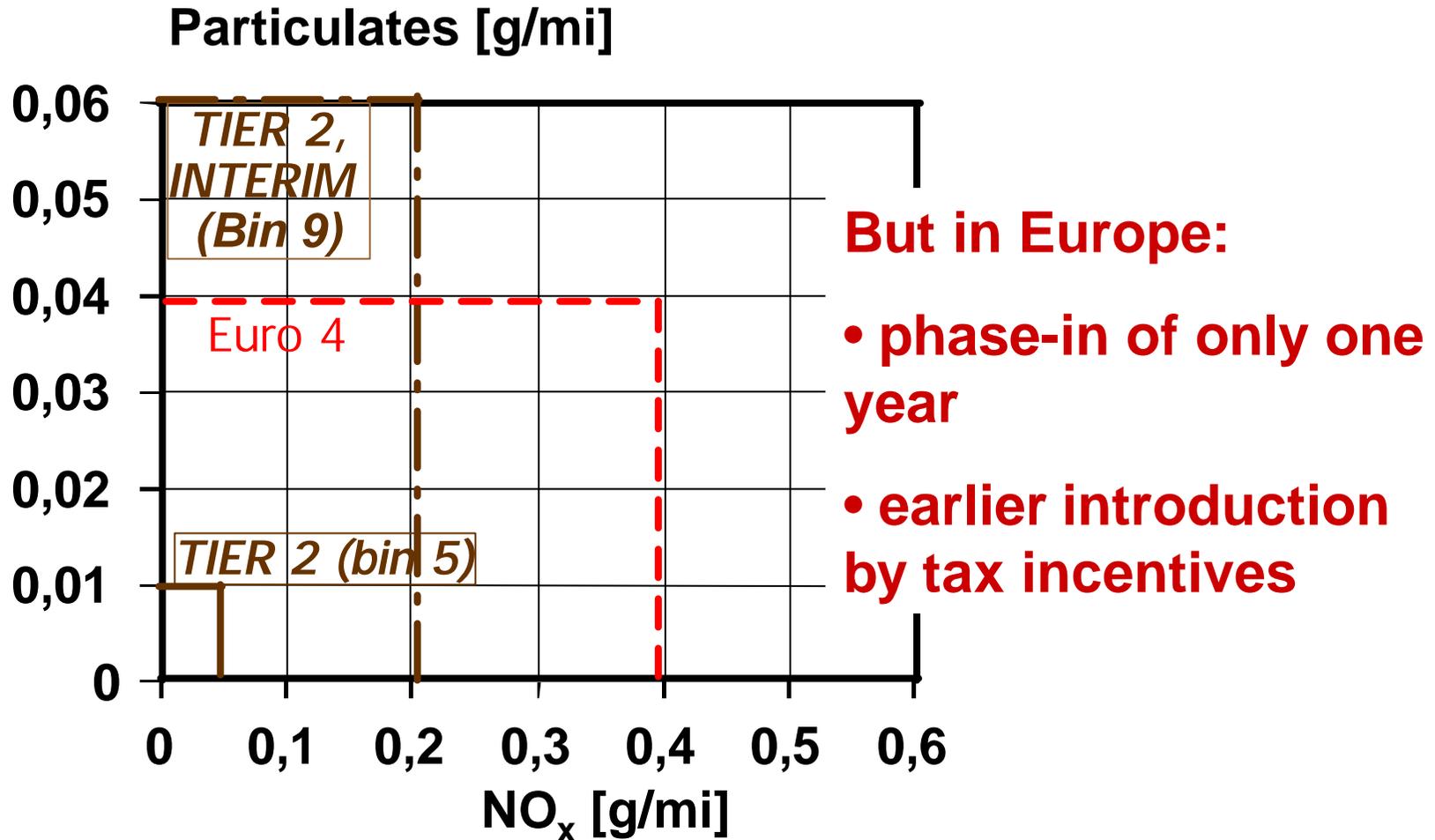




EU Member State Tax Incentives for 50 & 10ppm Sulphur fuels



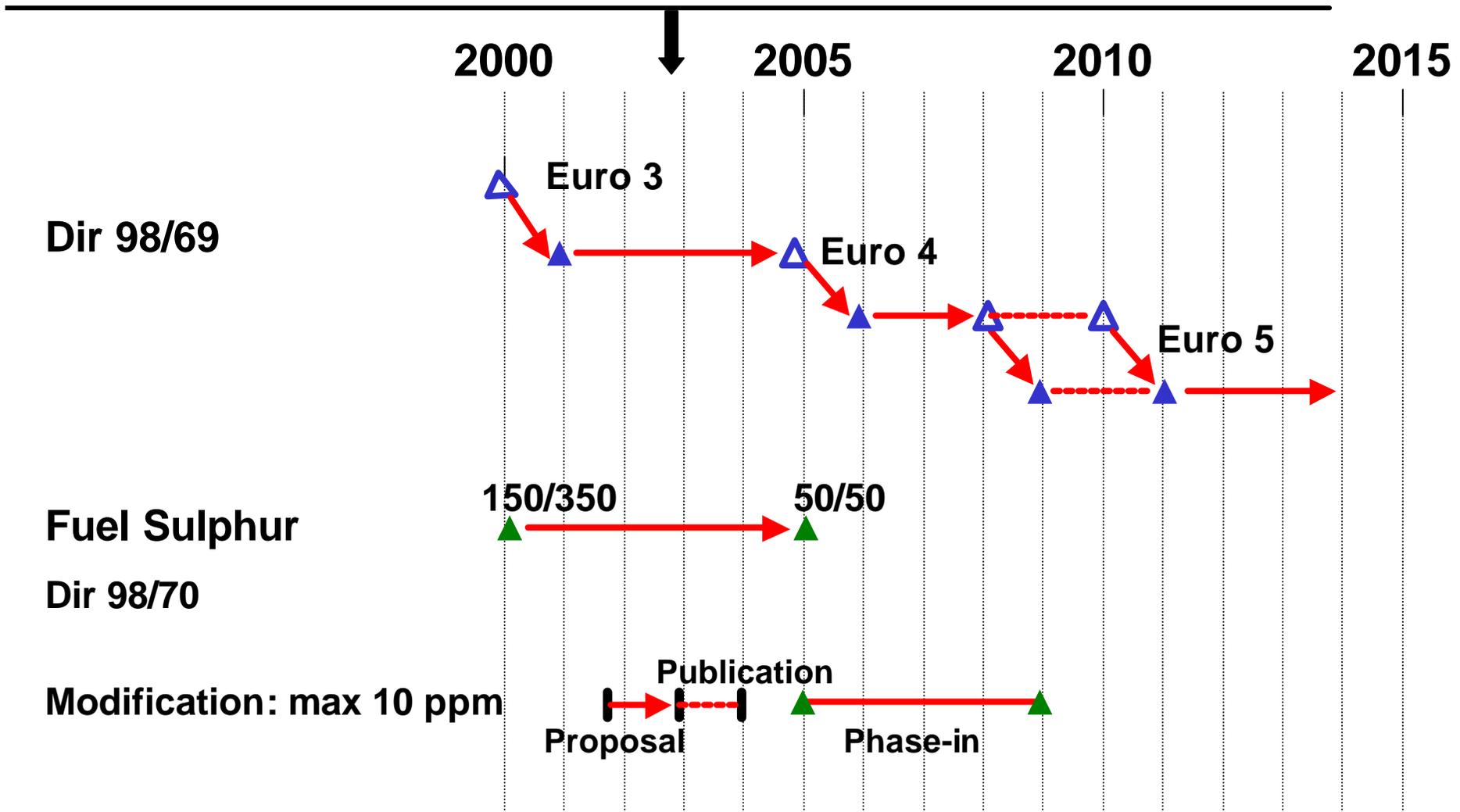
Comparison between EU and US legislation



European Status



Scenario EU exhaust gas legislation

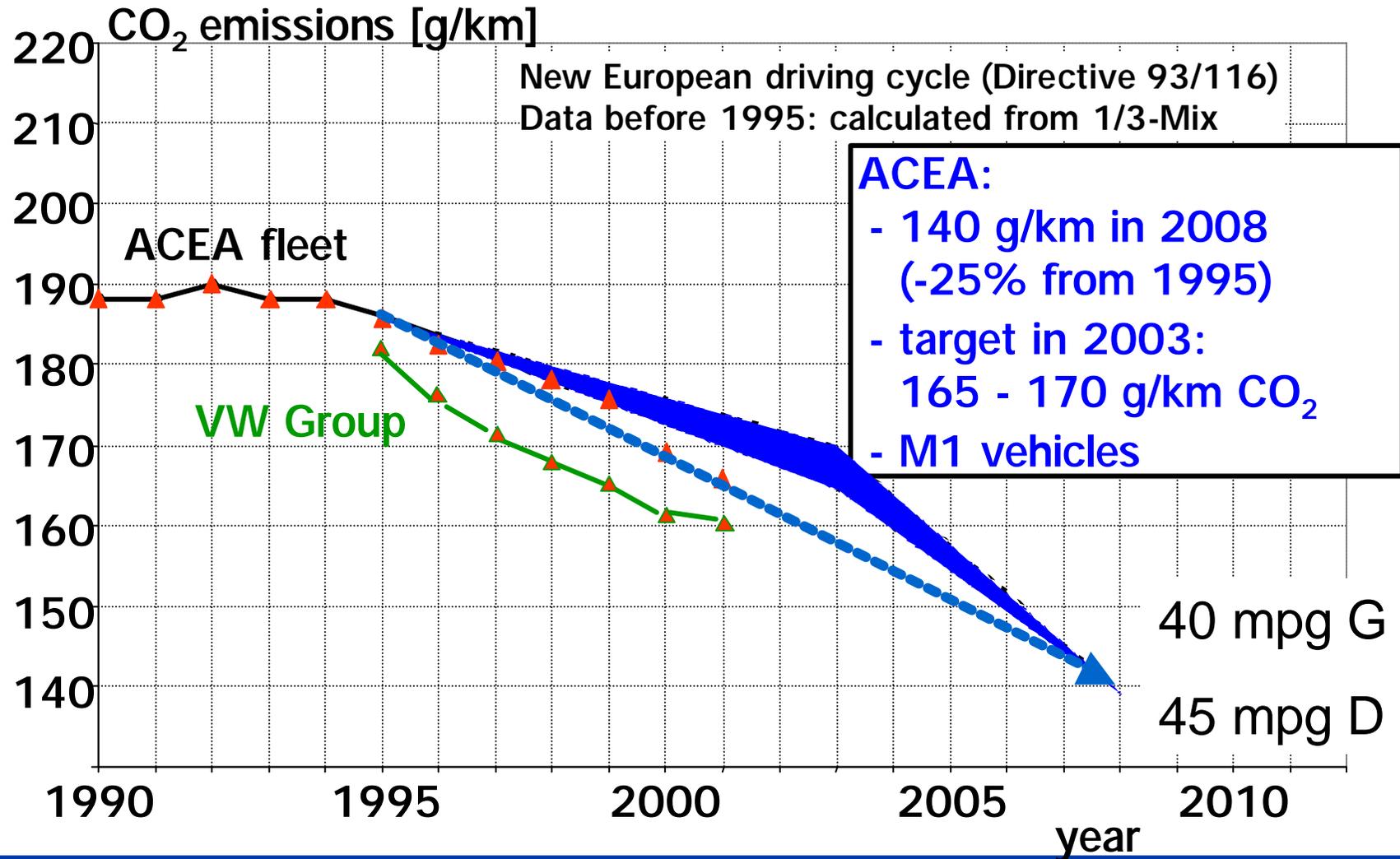


European Status



CO₂ Reduction in Europe

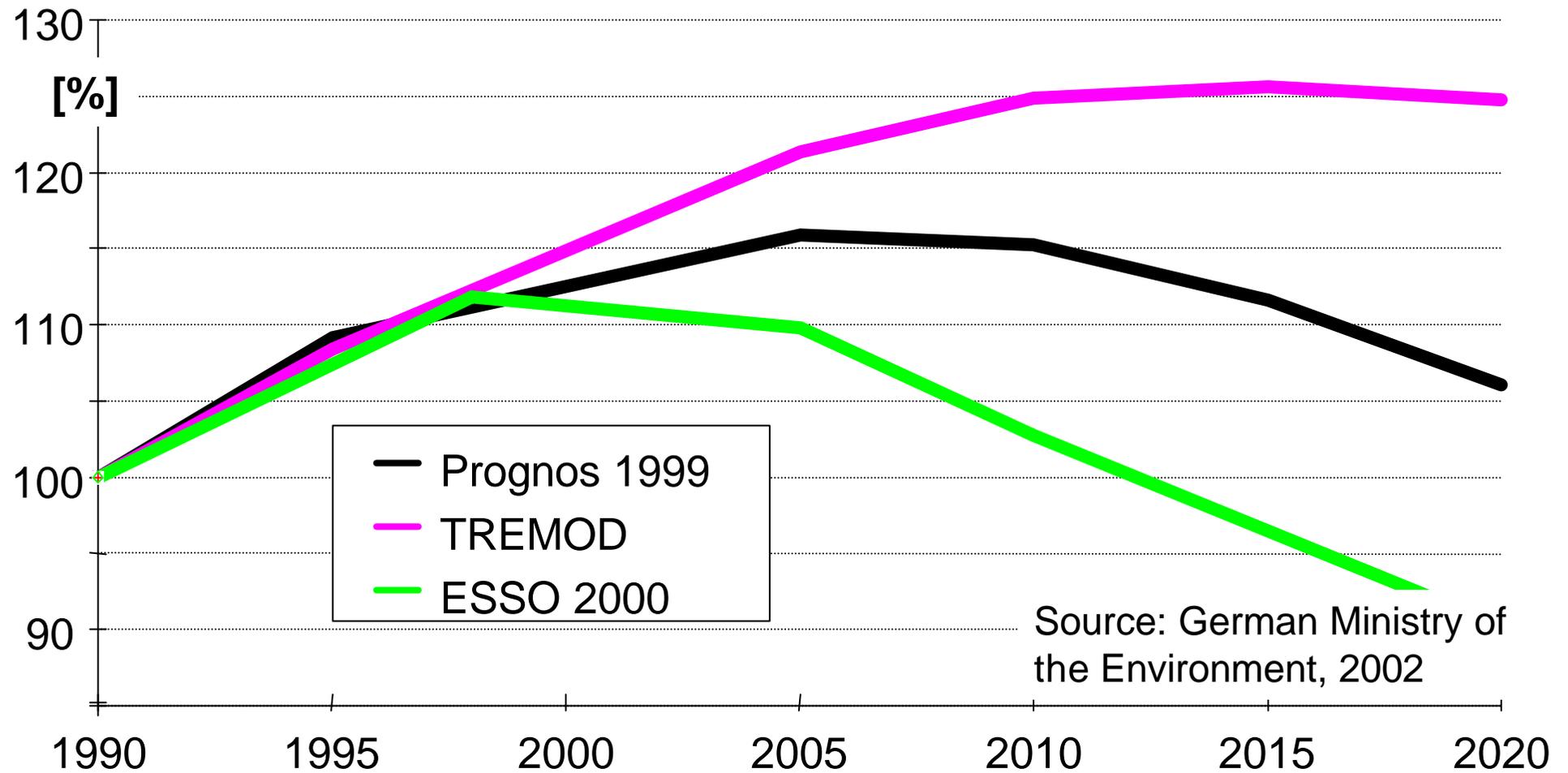
Agreement between ACEA and the EU Commission



European Status



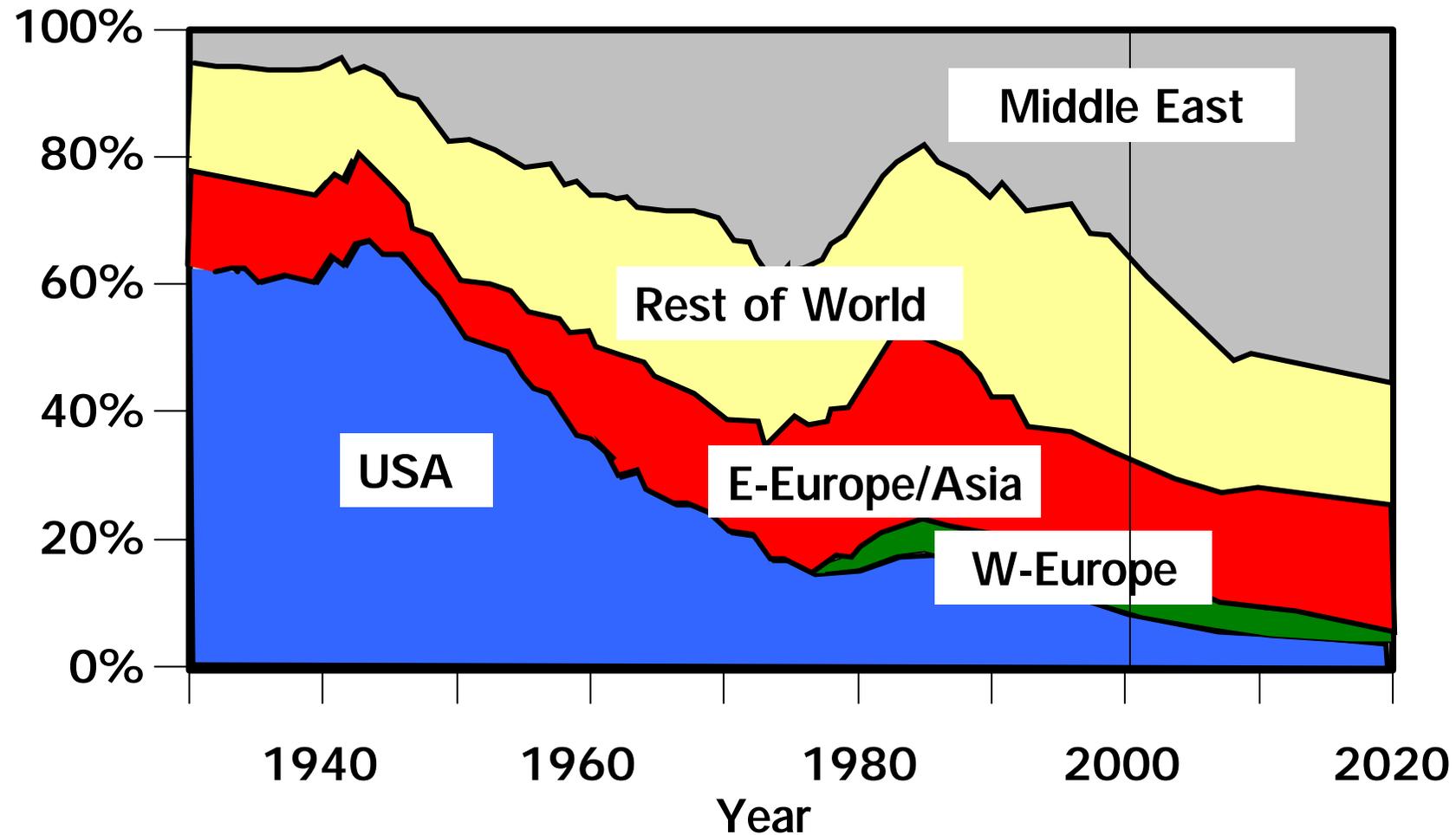
Simulation of CO₂ emissions from traffic in Germany



European Status



Share of regional oil production 1930-2020



European Status



Content

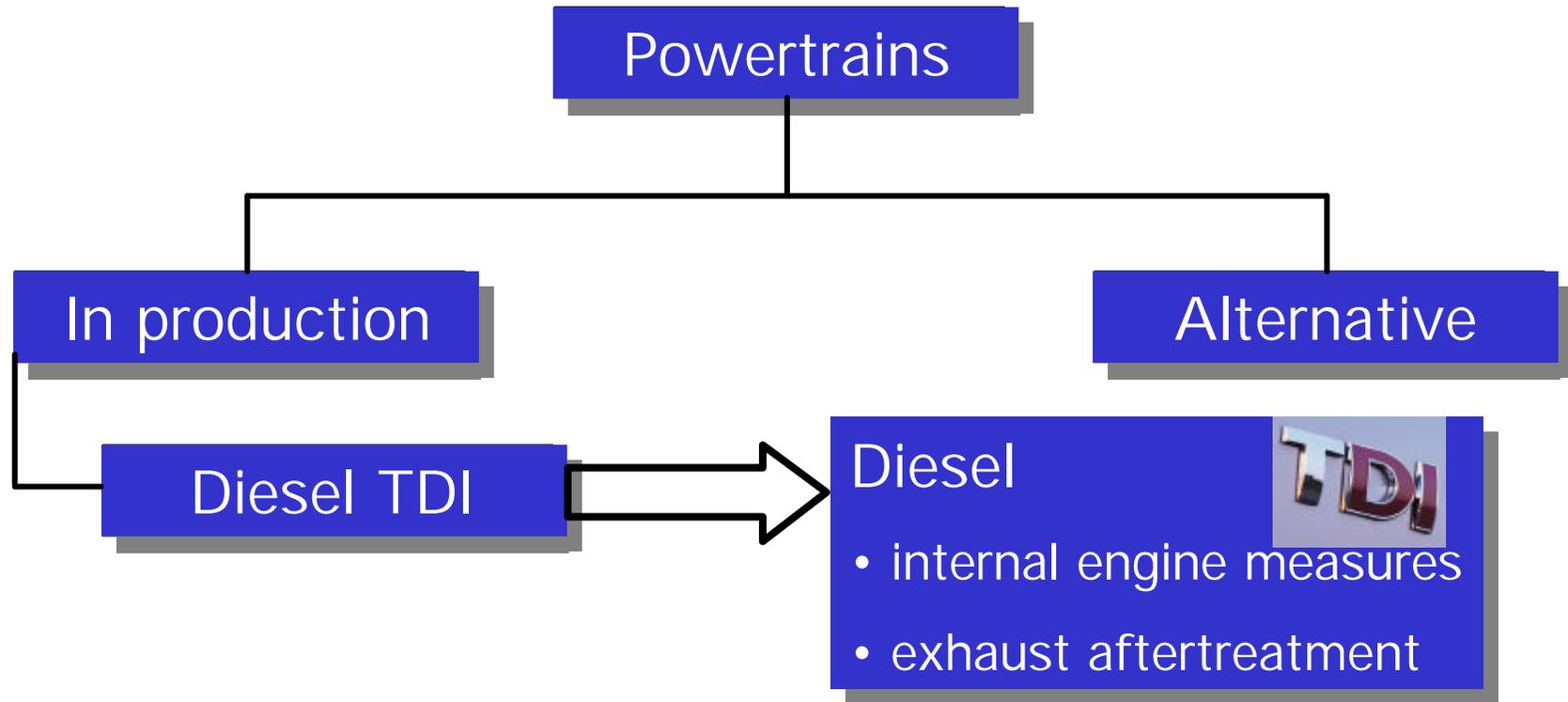


1. Diesel market in *Western Europe*
2. Environmental relevant driving forces of
vehicle development
- 3. Powertrain concepts: today and in the
future**

European Status

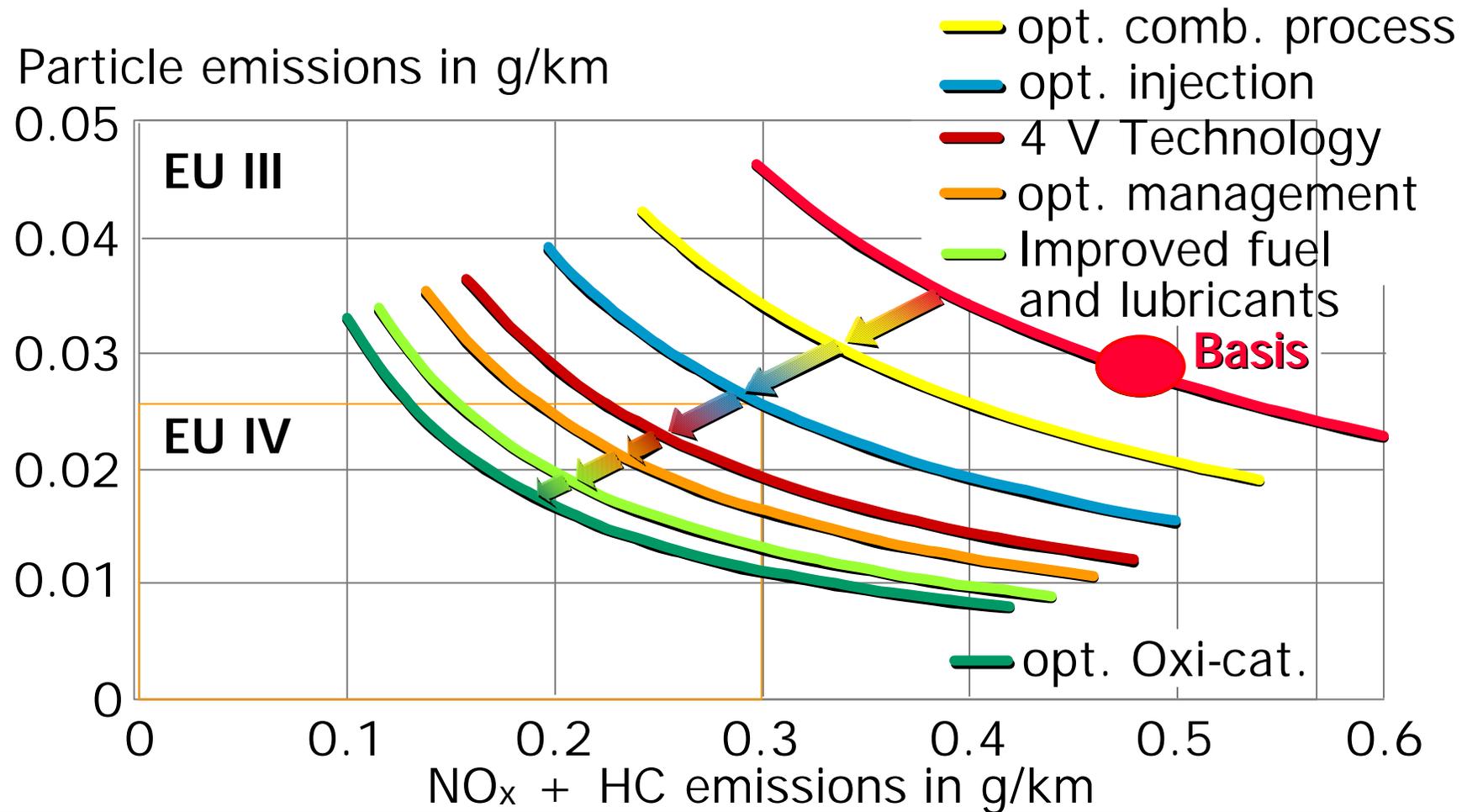


Approaches to maintain individual mobility



Estimate of potential

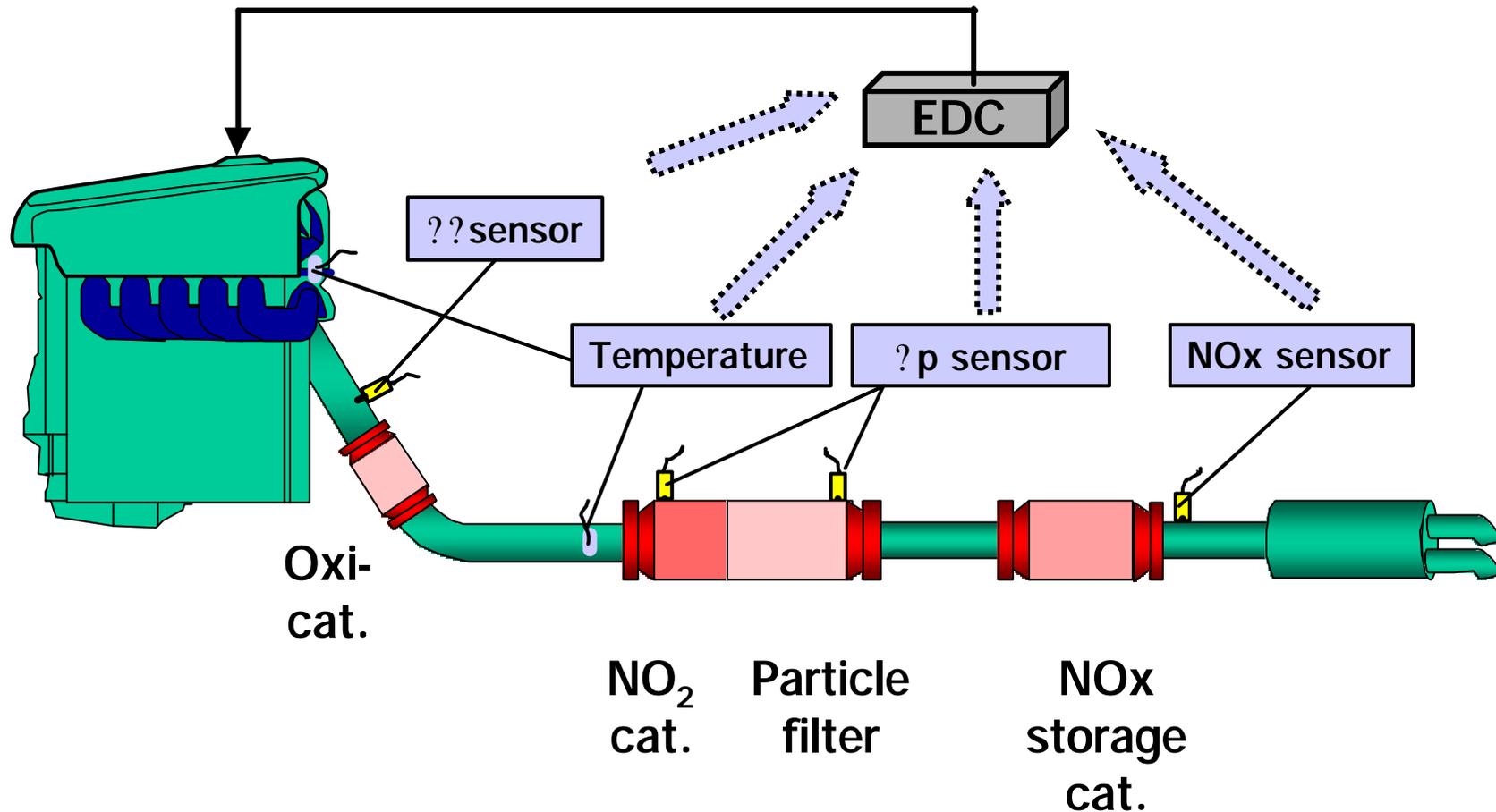
85 kW vehicle, Golf category, NEDC



European Status



VW exhaust aftertreatment systems: particle filter system & NOx storage catalytic converter

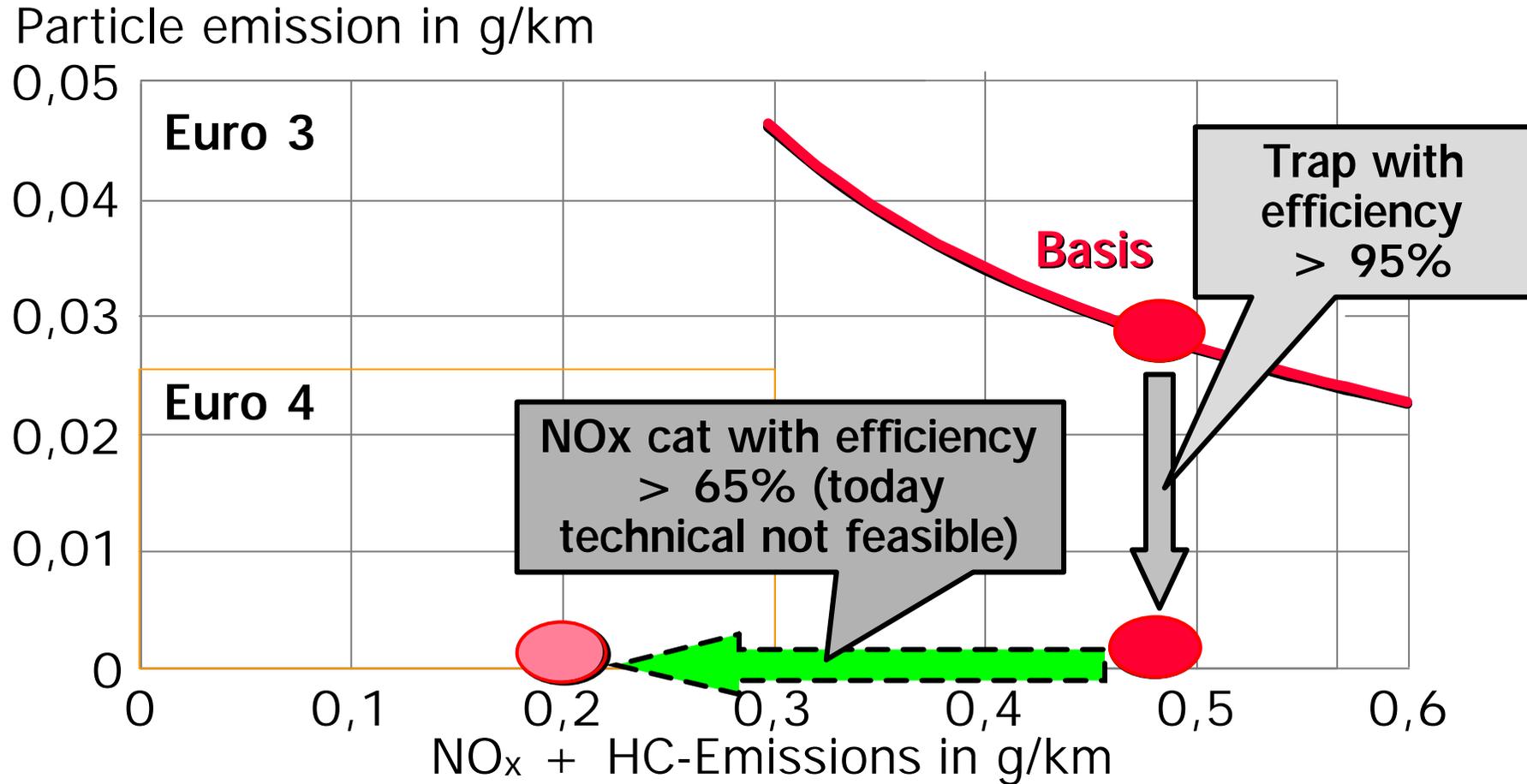


European Status



Strategies for future diesel development

Version 1



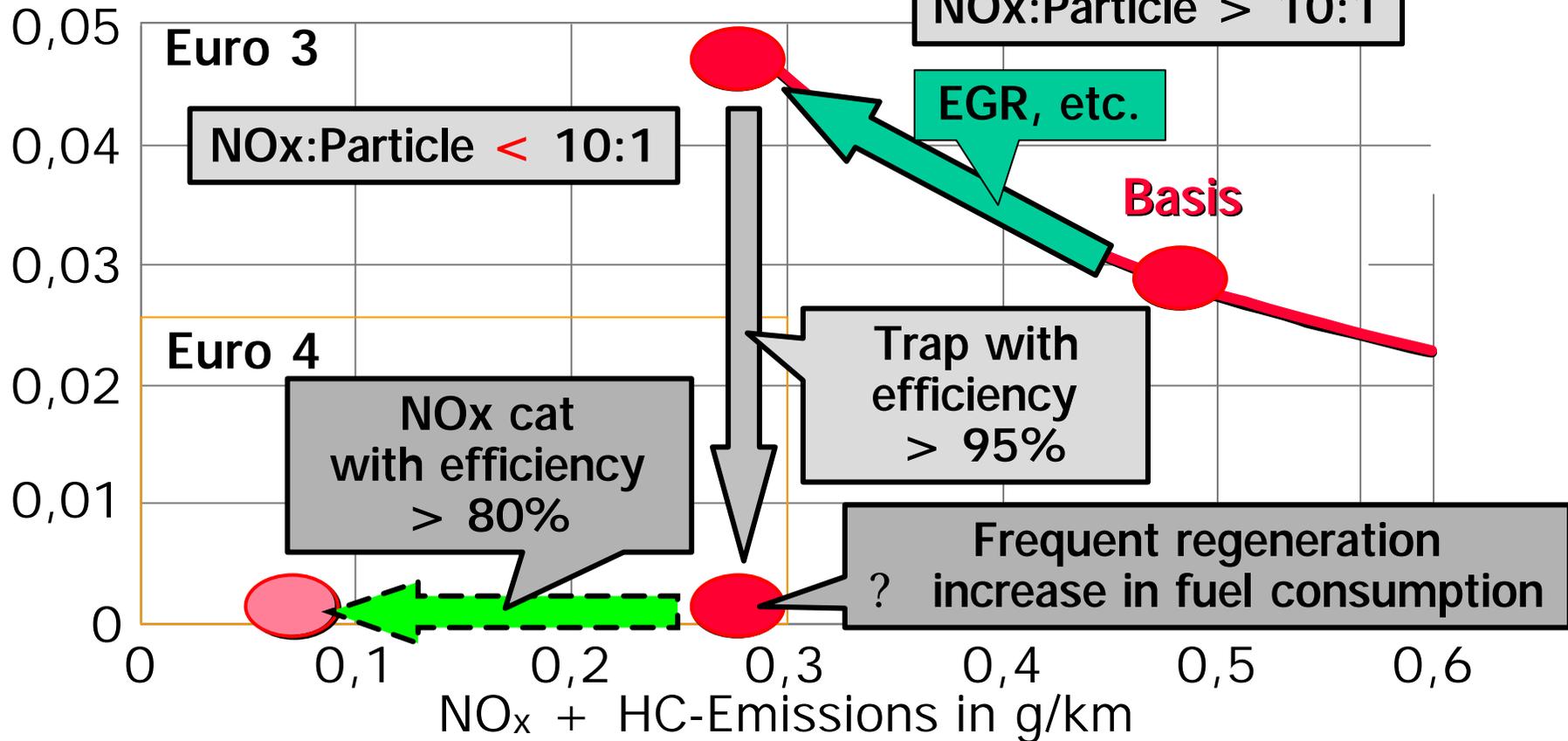
European Status



Strategies for future diesel development

Version 2

Particle emission in g/km

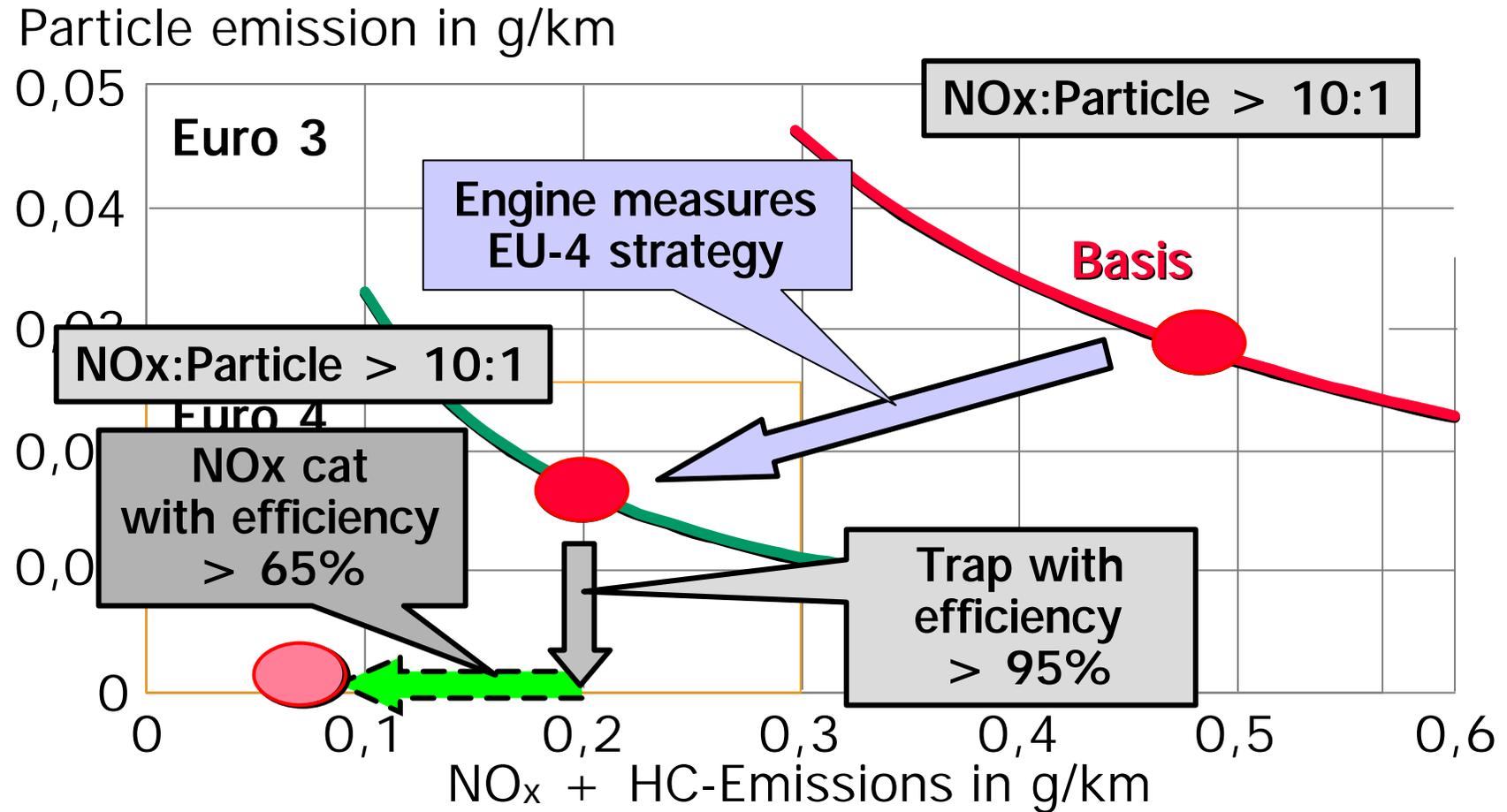


European Status



Strategies for future diesel development

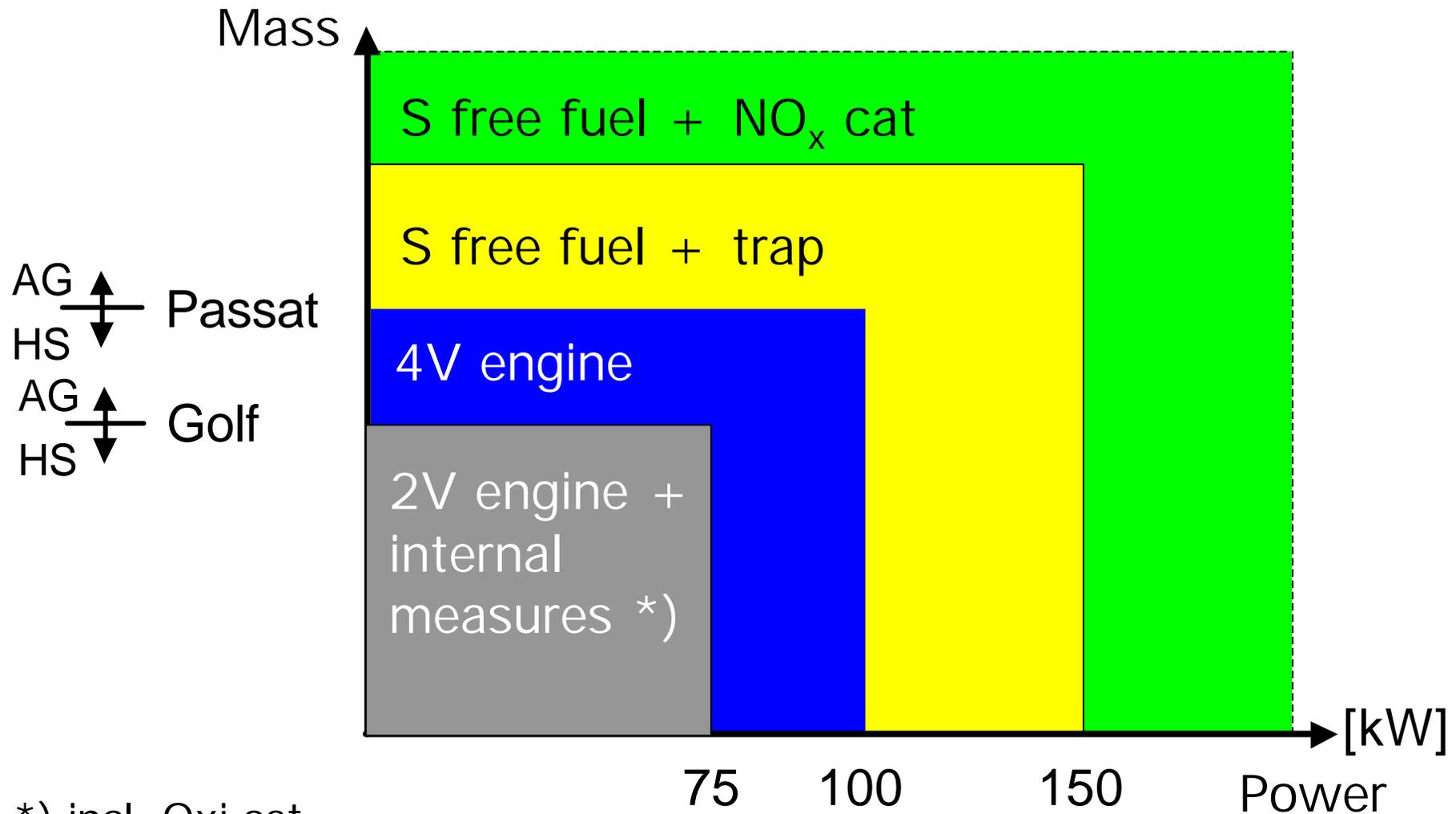
Version VW



European Status



VW-Reduction strategy for Euro 4 in combination with improved fuels



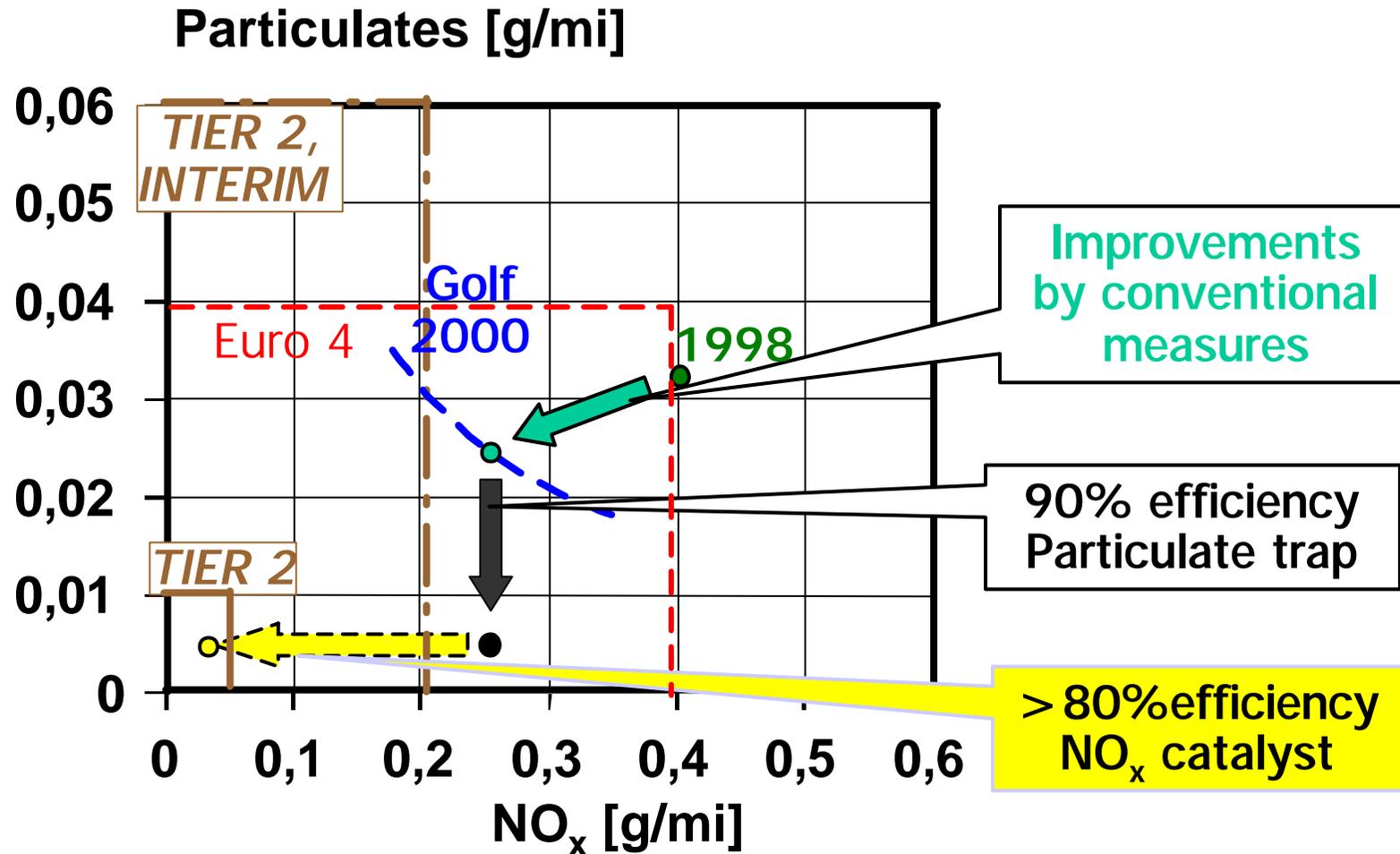
*) incl. Oxi-cat.

European Status



Potential for reduction of emissions

Example for a Golf with manual transmission



European Status



The first 3L vehicle in production

VW Lupo **3L TDI**

- 1.2 l TDI engine with unit injection
- 45 kW (61 PS)
- 2,99 l/100 km
- Euro 4 limits



European Status



Volkswagen 1-litre car (235 mpg) four wheels, low height, two seats in tandem



European Status



Volkswagen 1-litre car (235 mpg) carbon-fibre-reinforced outer skin over a Mg spaceframe



European Status



Volkswagen 1-litre car (235 mpg) impact and roll-over protection like a GT racing car



European Status



Volkswagen 1-litre car (235 mpg)

Technical data



European Status



Volkswagen 1-litre car (235 mpg)

Technical data

Performance / consumption	
Top speed	120 km/h
Consumption	0.99 litres / 100 kilometres
Body, wheel, tyre dimensions	
Length x width x height	3,646 x 1,248 x 1,110 mm
Wheelbase	2,205 mm
Track front / rear	1,000 / 810 mm
Fuel tank volume	6.5 litres
Vehicle weight	290 kg
Luggage space volume	80 litres
Drag coefficient c_d / area	0.159 / 1.0 m ²
Tyres front / rear	95/80 R 16 / 115/70 R 16

European Status



Volkswagen 1-litre car (235 mpg)

Technical data

Engine	
Principle	1-cylinder naturally-aspirated diesel with unit injector, aluminium monobloc
Volume	299 cc
Bore x stroke	69 mm x 80 mm
Compression ratio	16.5: 1
Valves per cylinder	3
Valve timing	Twin overhead camshafts
Engine weight (dry)	26 kg
Output	6.3 kW (8.5 bhp) at 4,000 rpm
Torque	18.4 Nm at 2,000 rpm

European Status



Volkswagen 1-litre car (235 mpg)

Technical data

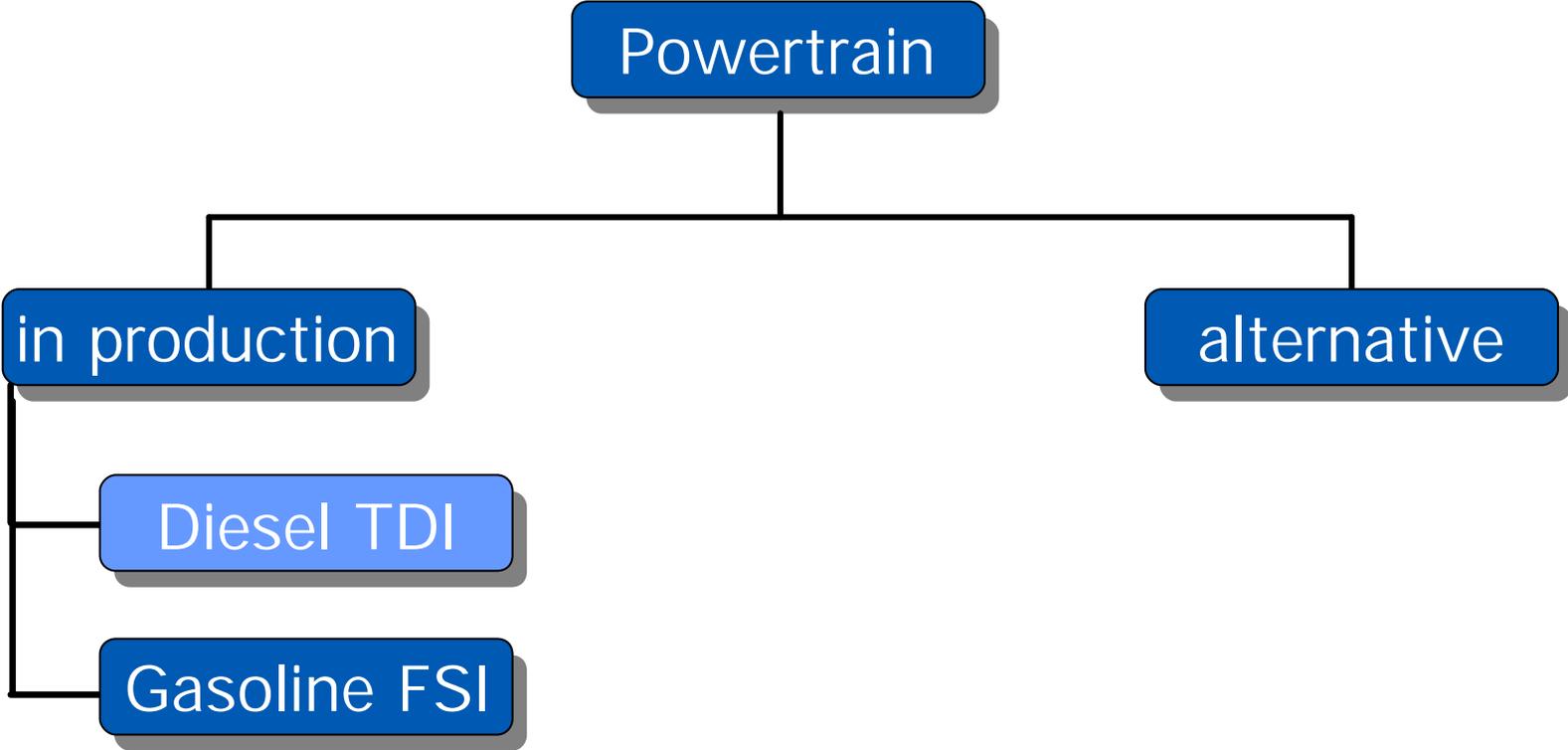
An idea for a possible new family of vehicles, which could cover new requirements ranging from the ultra-economical vehicle, through the low-cost everyday touring vehicle for young people to the high-performance sports supercar.



European Status

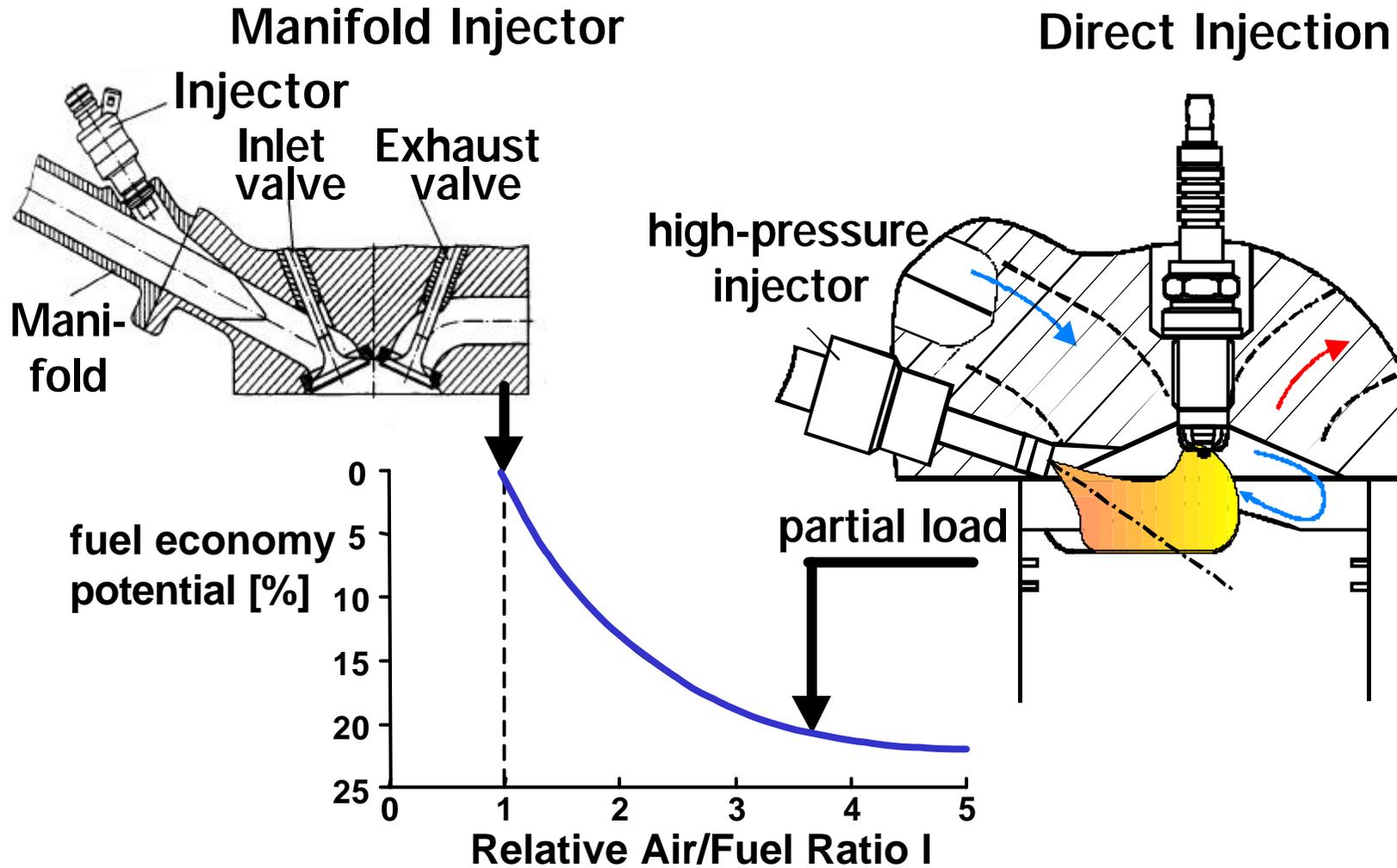


Maintaining individual mobility



Spark-ignition engine with direct injection

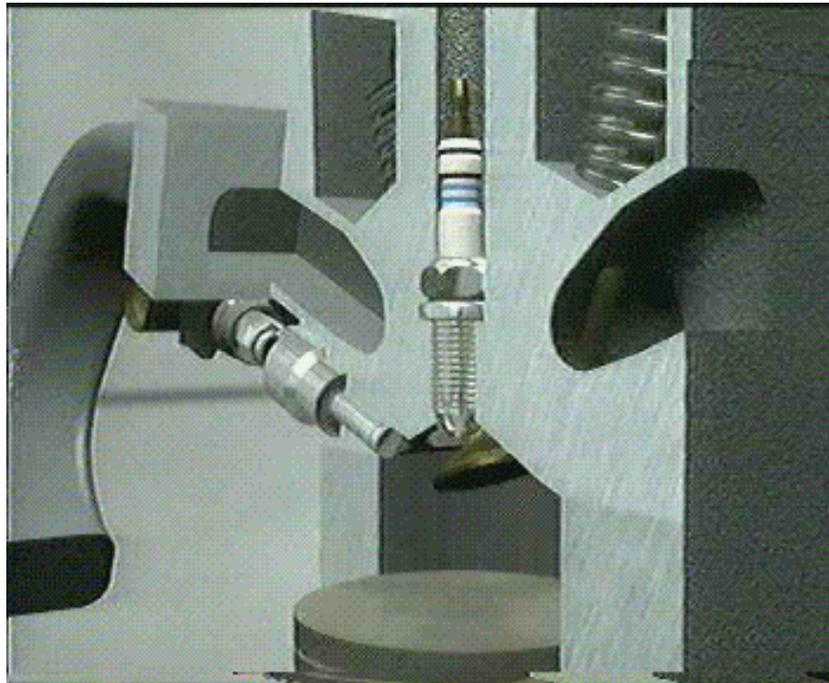
Fuel Economy Potential



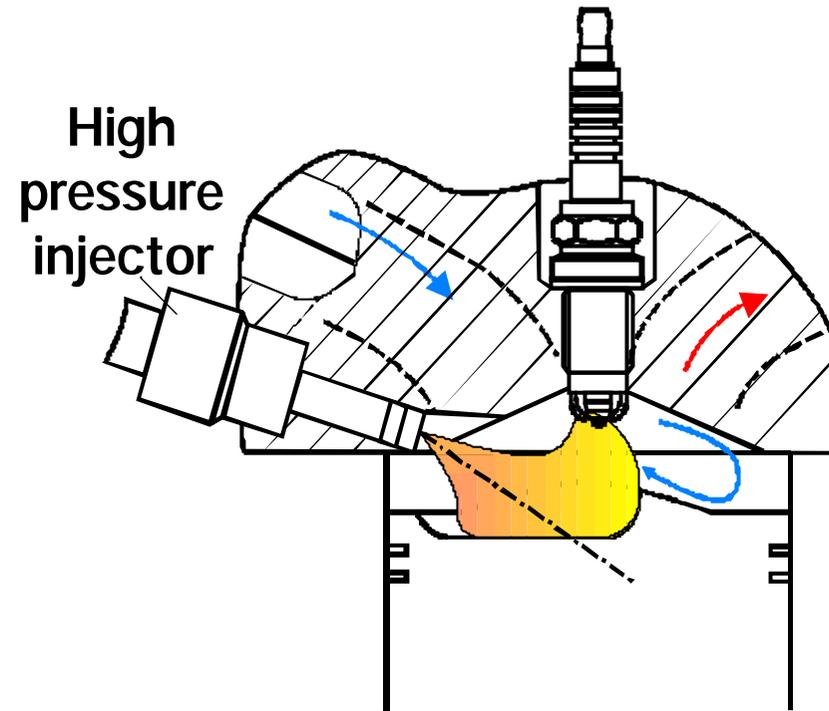
European Status



Spark-ignition engine with direct injection Fuel Economy Potential



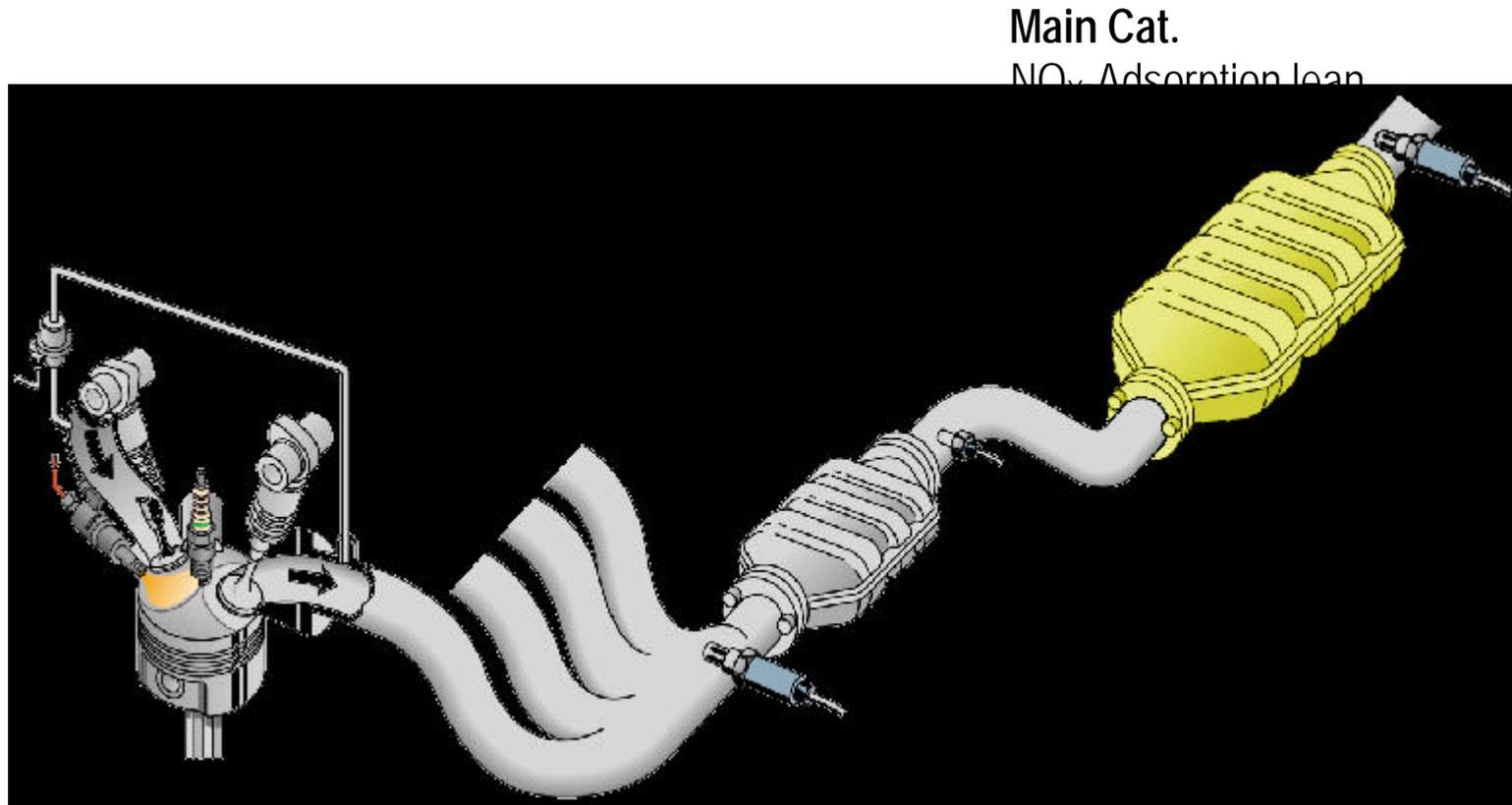
Direct injection



European Status



FSI: Exhaust gas aftertreatment



control at
analysis

control at variable ?,
control regeneration NO_x -cat.

European Status



Gasoline direct injection VW Lupo 1.4 I FSI (Fuel Stratified Injection)

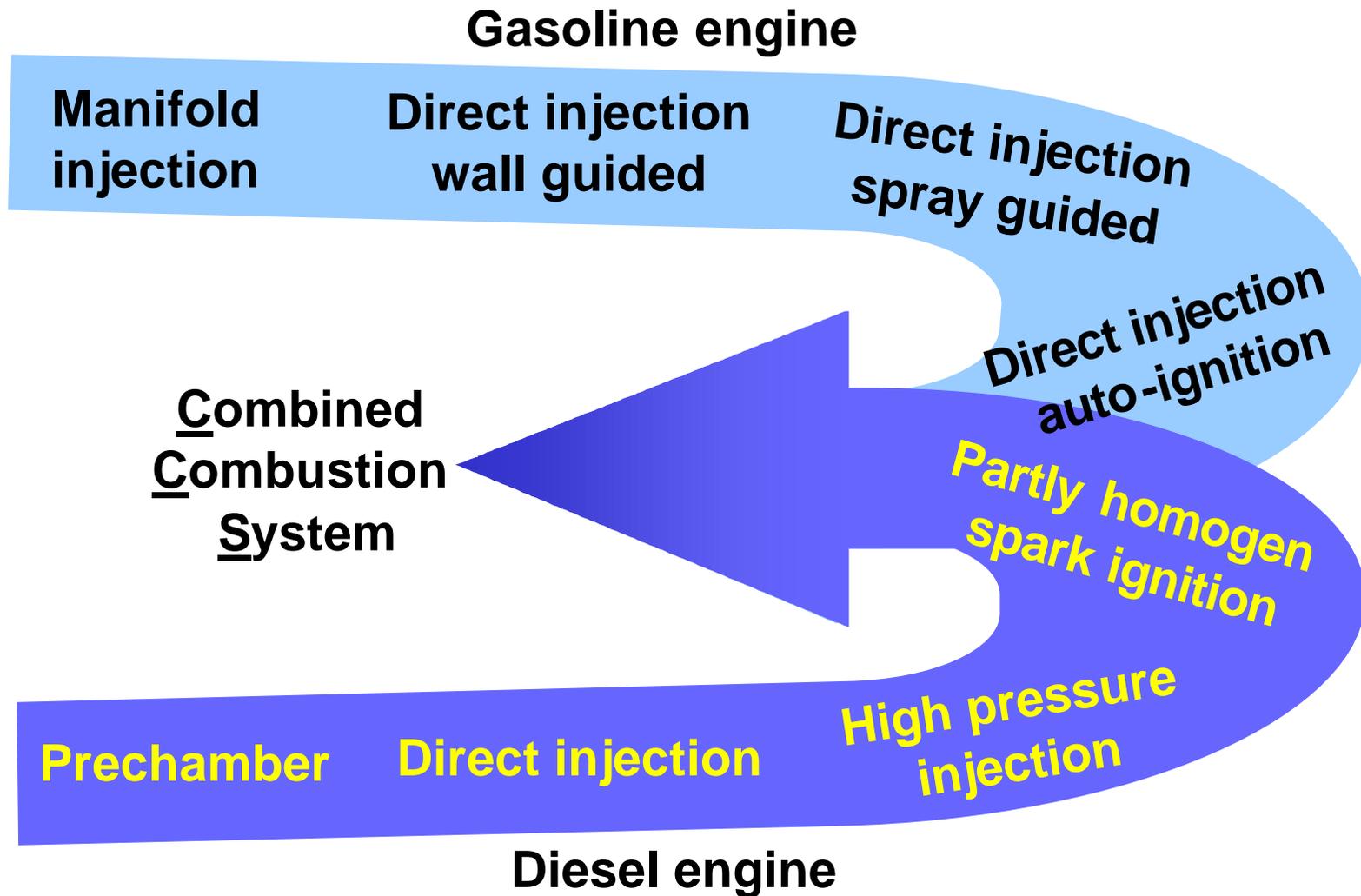
- 1.4 I Gasoline FSI
- 77 kW (105 PS)
- 4,99 l/100 km (47 mpg)
- Euro 4 (2005)



European Status



Further development of internal combustion engines

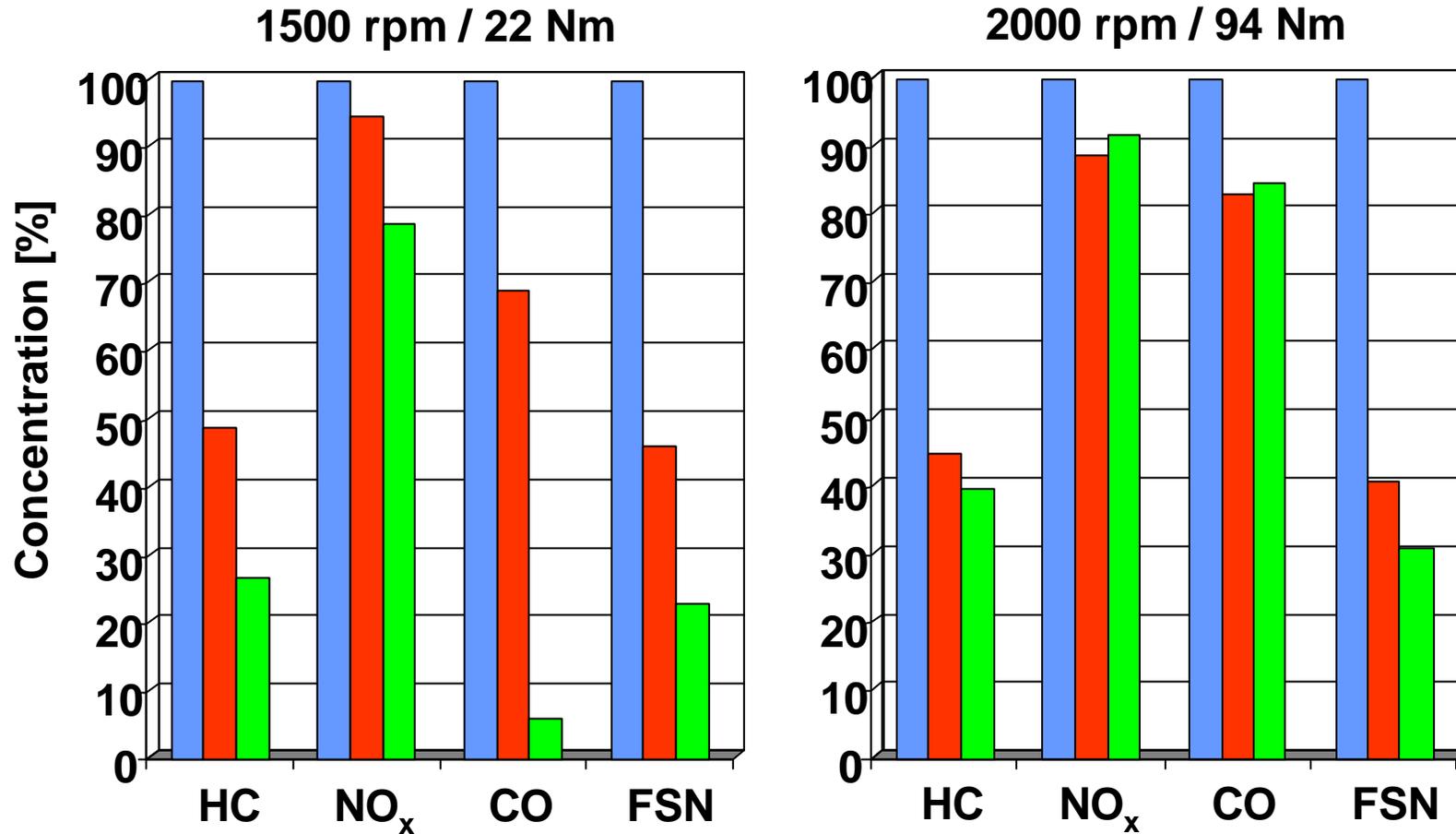


European Status



Reduction of exhaust gas emissions by using a SynFuel

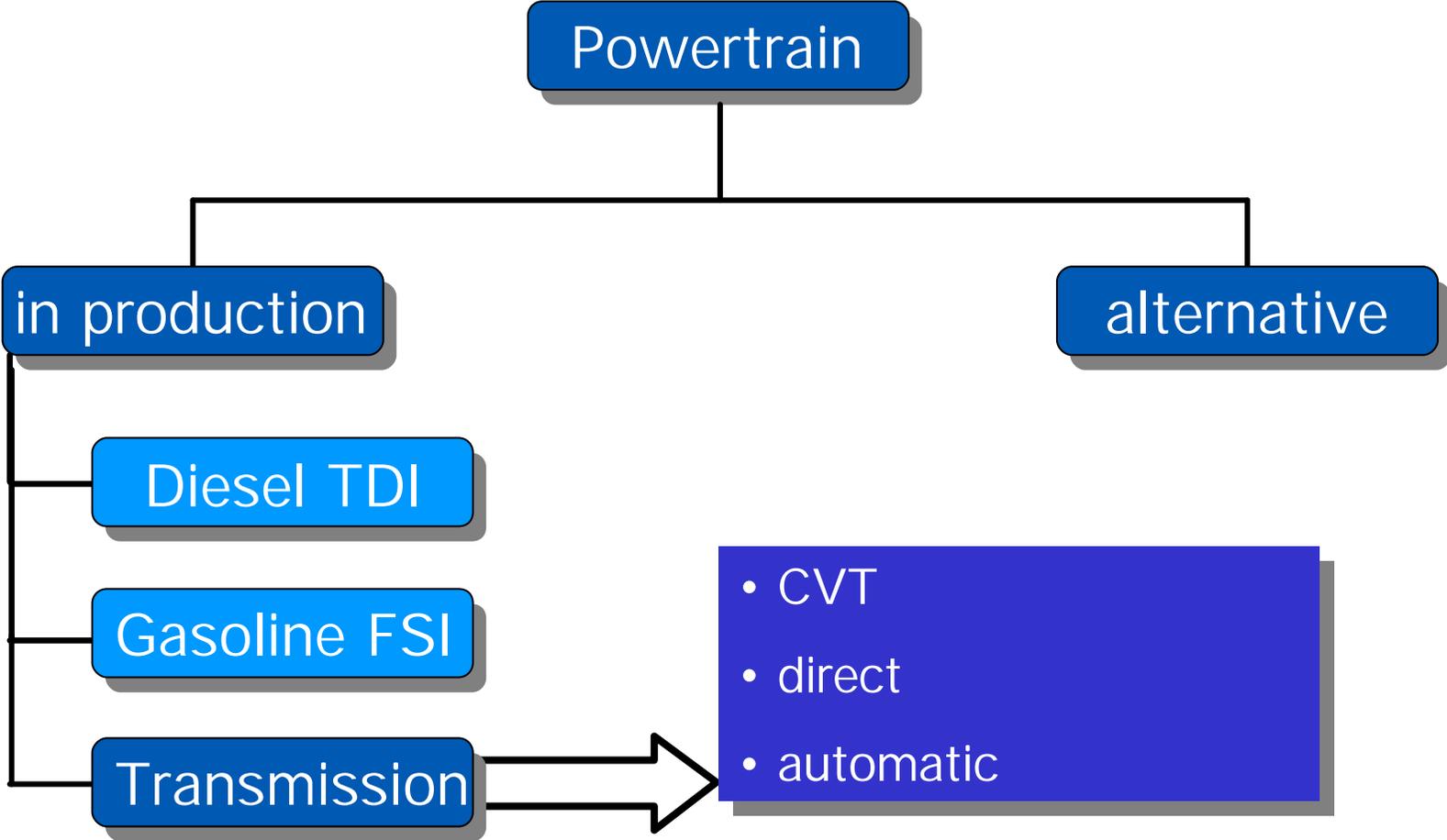
Reference Diesel Synfuel A Synfuel A + 5% O₂



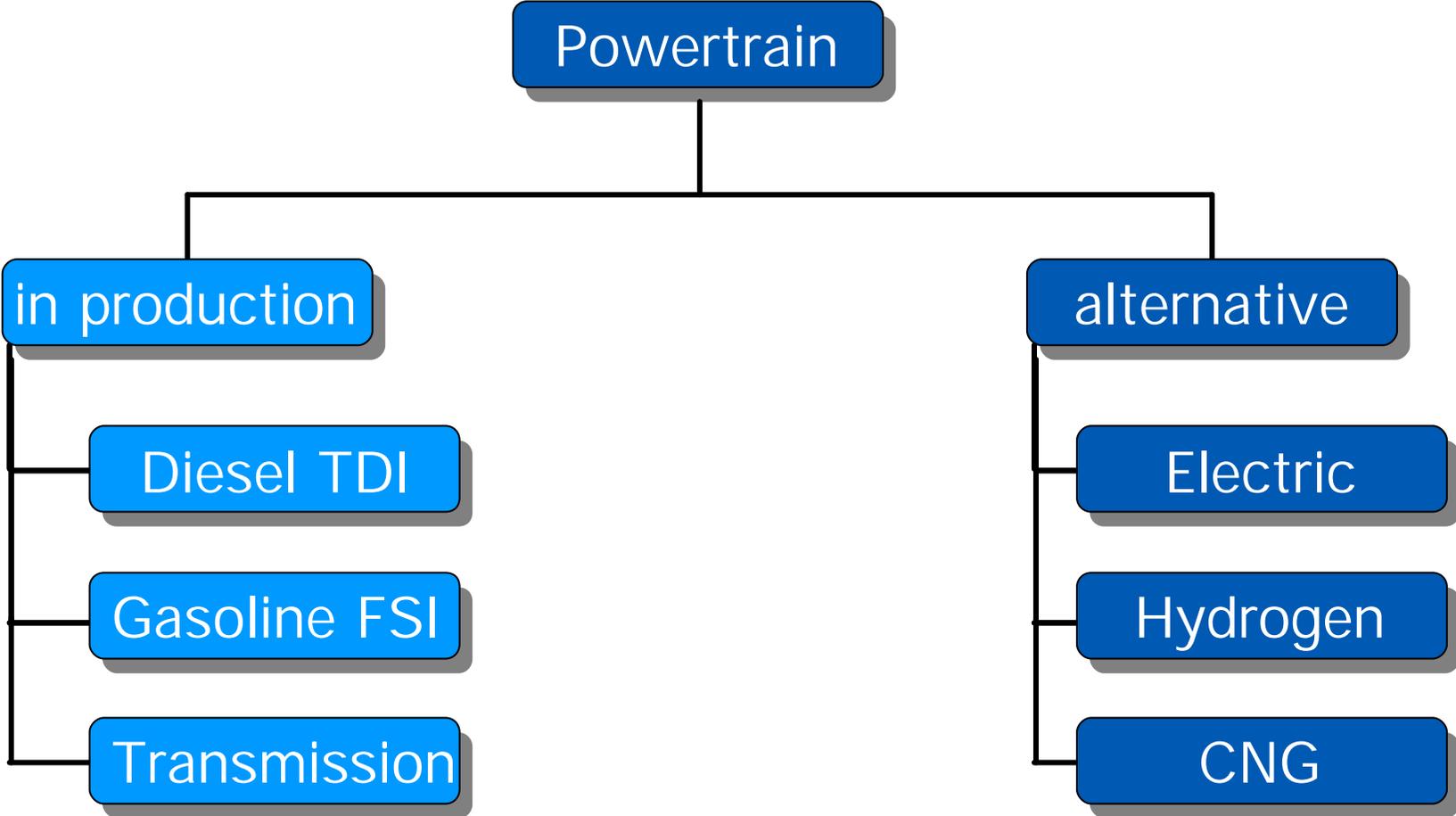
European Status



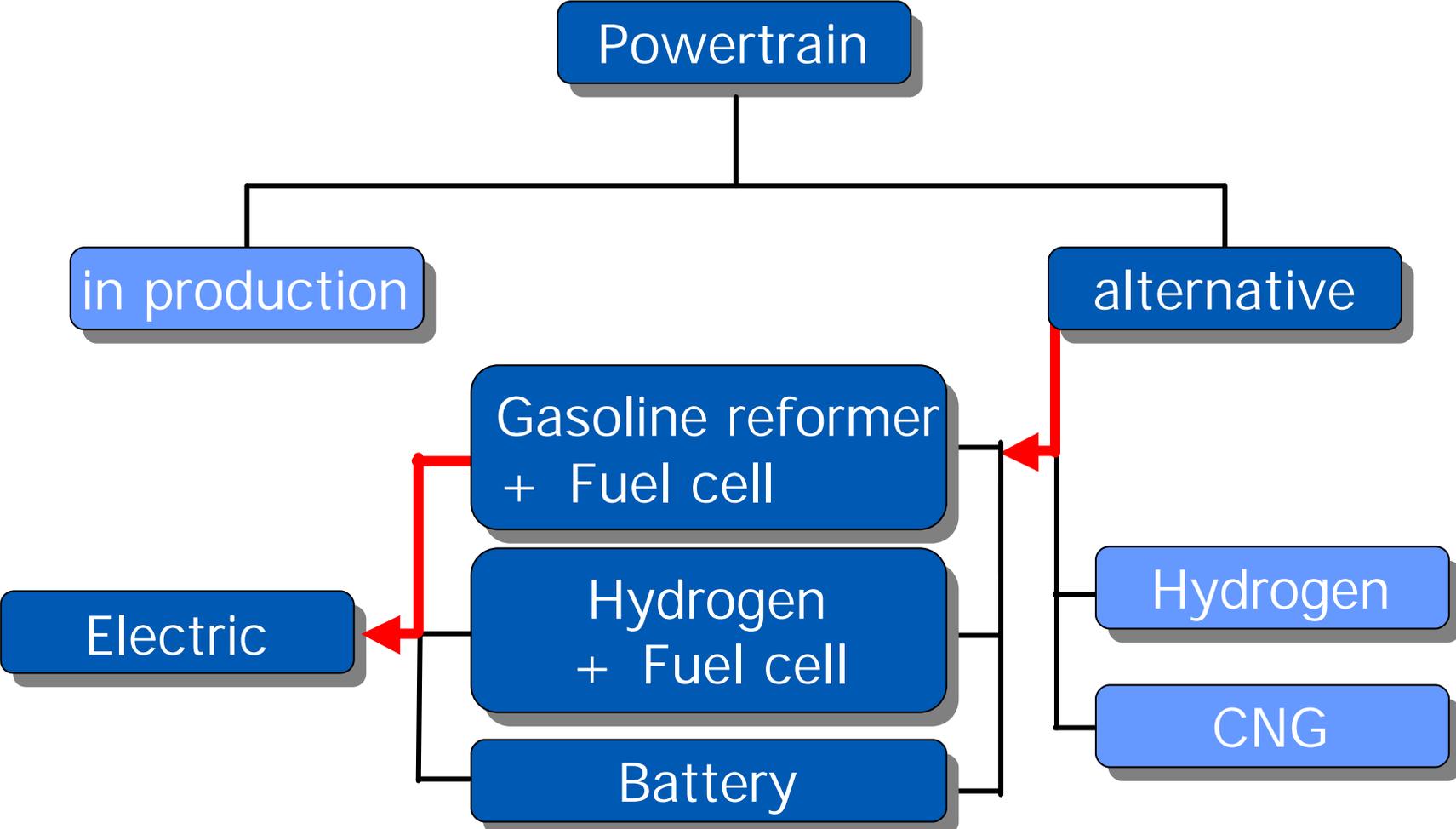
Maintaining individual mobility



Maintaining individual mobility

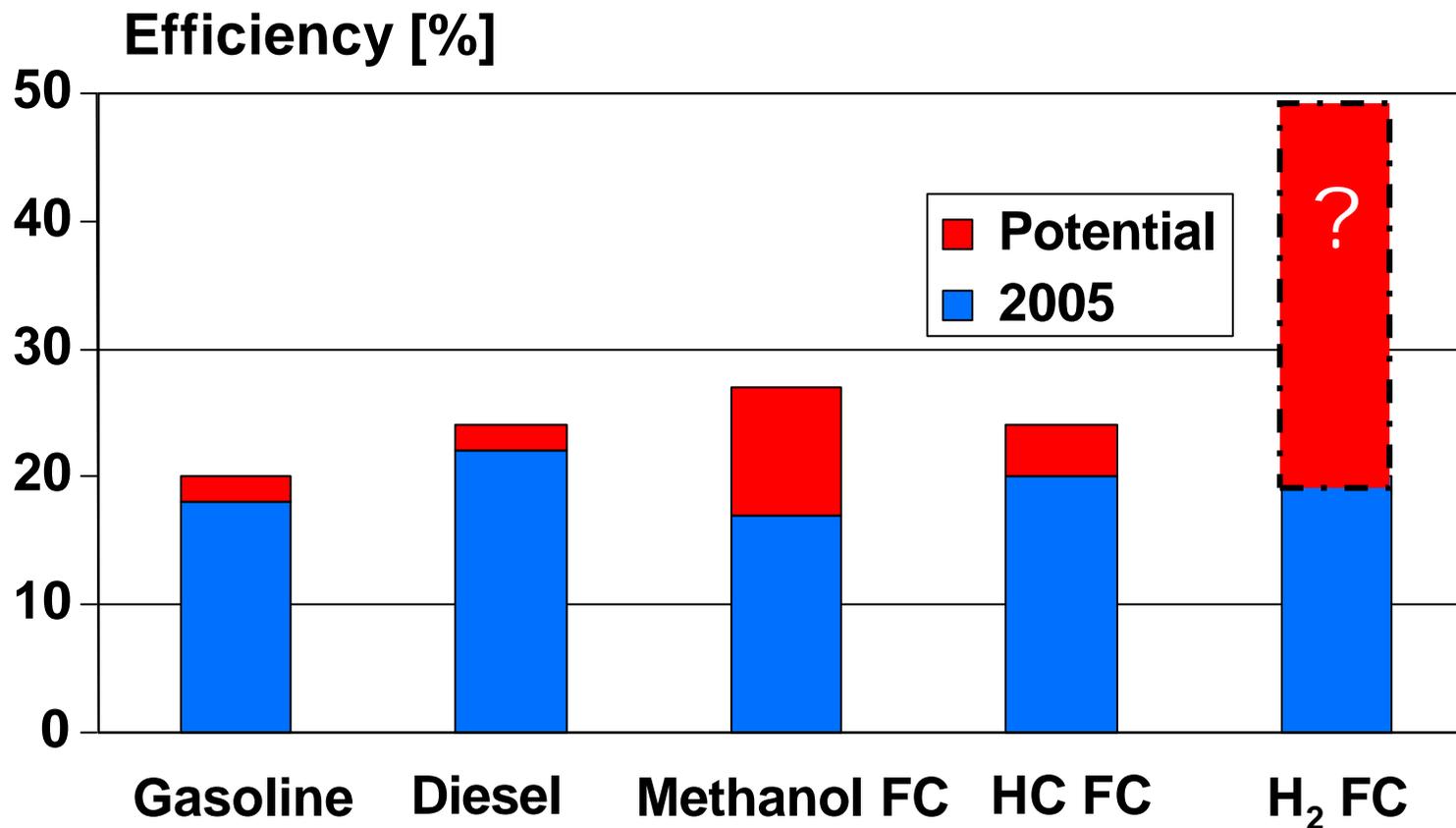


Maintaining individual mobility



Comparison of modern propulsion concepts

Total efficiency incl. fuel production, transport and vehicle operation



European Status

