Car emissions and EURO 5

the view of the German Federal Environmental Agency

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EU limit values for PM10 and NO_2

averaging period	limit value	attainment period
24 h	50 µg/m^3 PM_{10}	1 Jan. 2005
	35 exceedances/year	
1 year	40 µg/m^3 PM_{10}	1 Jan. 2005
24 h	50 µg/m^3 PM_{10}	1 Jan. 2010*
	7 exceedances/year	
1 year	20 µg/m^3 PM_{10}	1 Jan. 2010*
1 h	200 µg/m^3 NO_2	1 Jan. 2010
	18 exceedances/year	
1 year	40 µg/m^3 NO_2	1 Jan. 2010

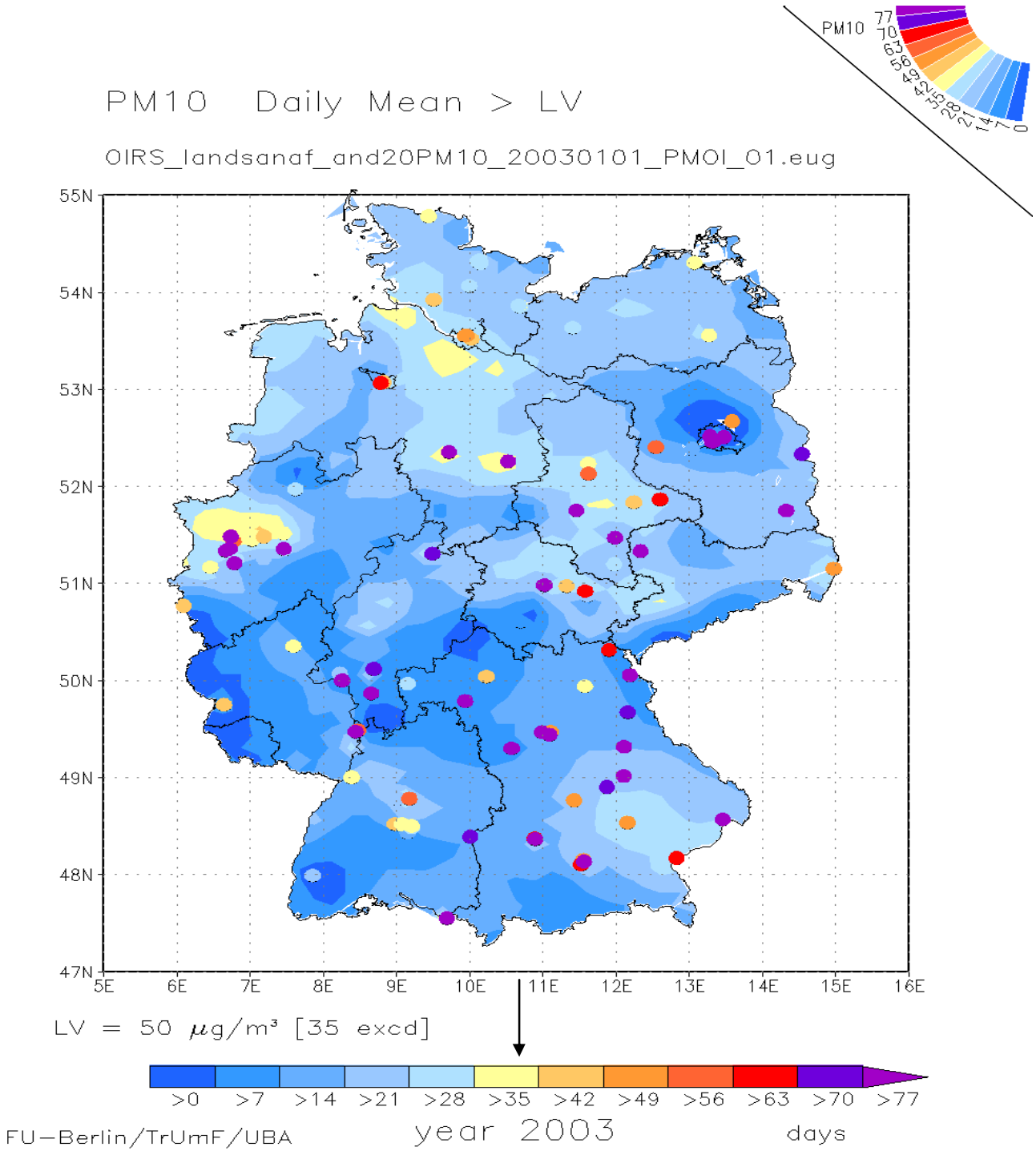
* **indicative limit values,** to be reviewed by the EU Commission

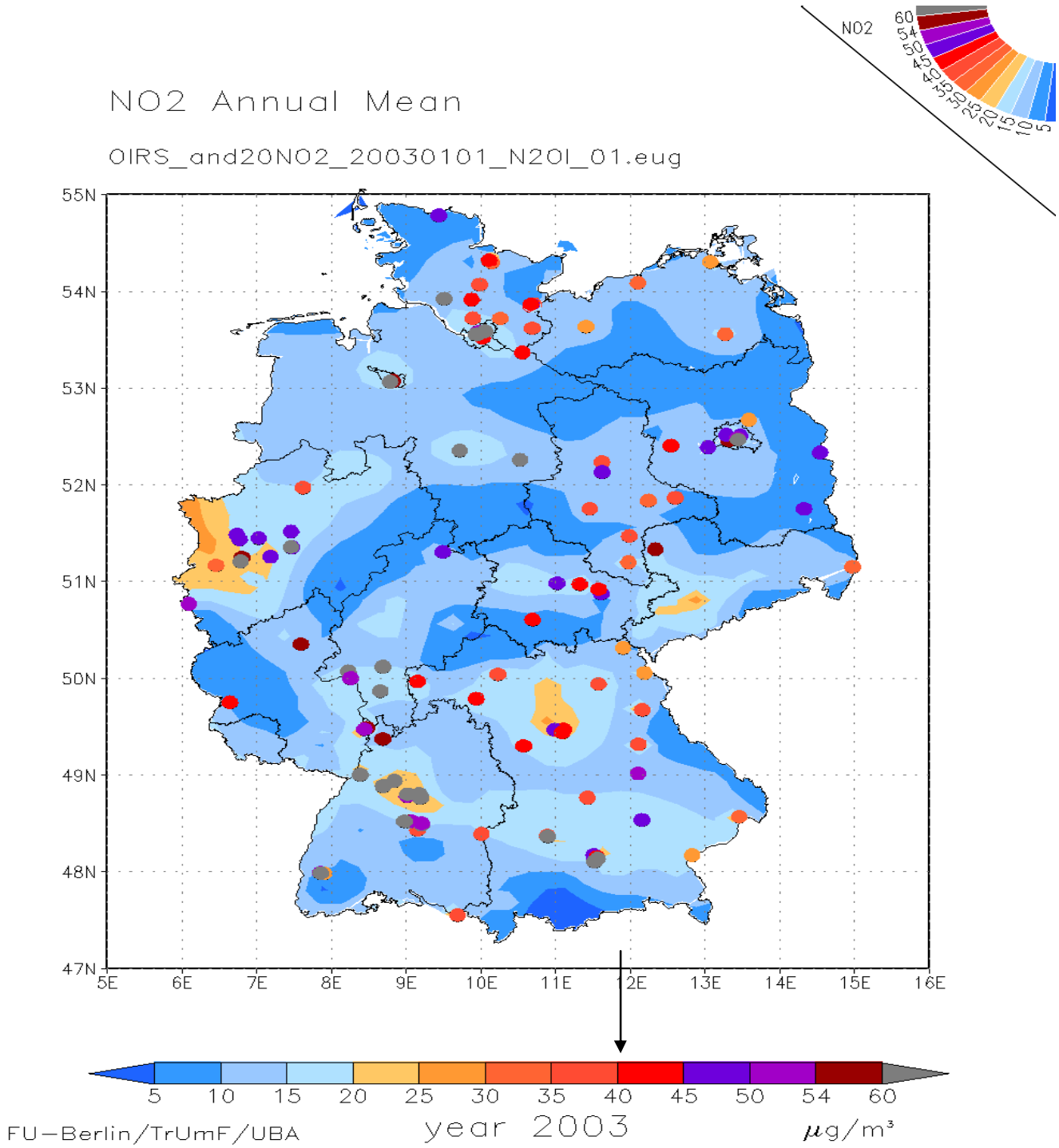
Directive 2001/81/EC on National Emission Ceilings (NEC) for Certain Atmospheric Pollutants

i.a. the national emission ceiling for Germany to be attained by 2010:

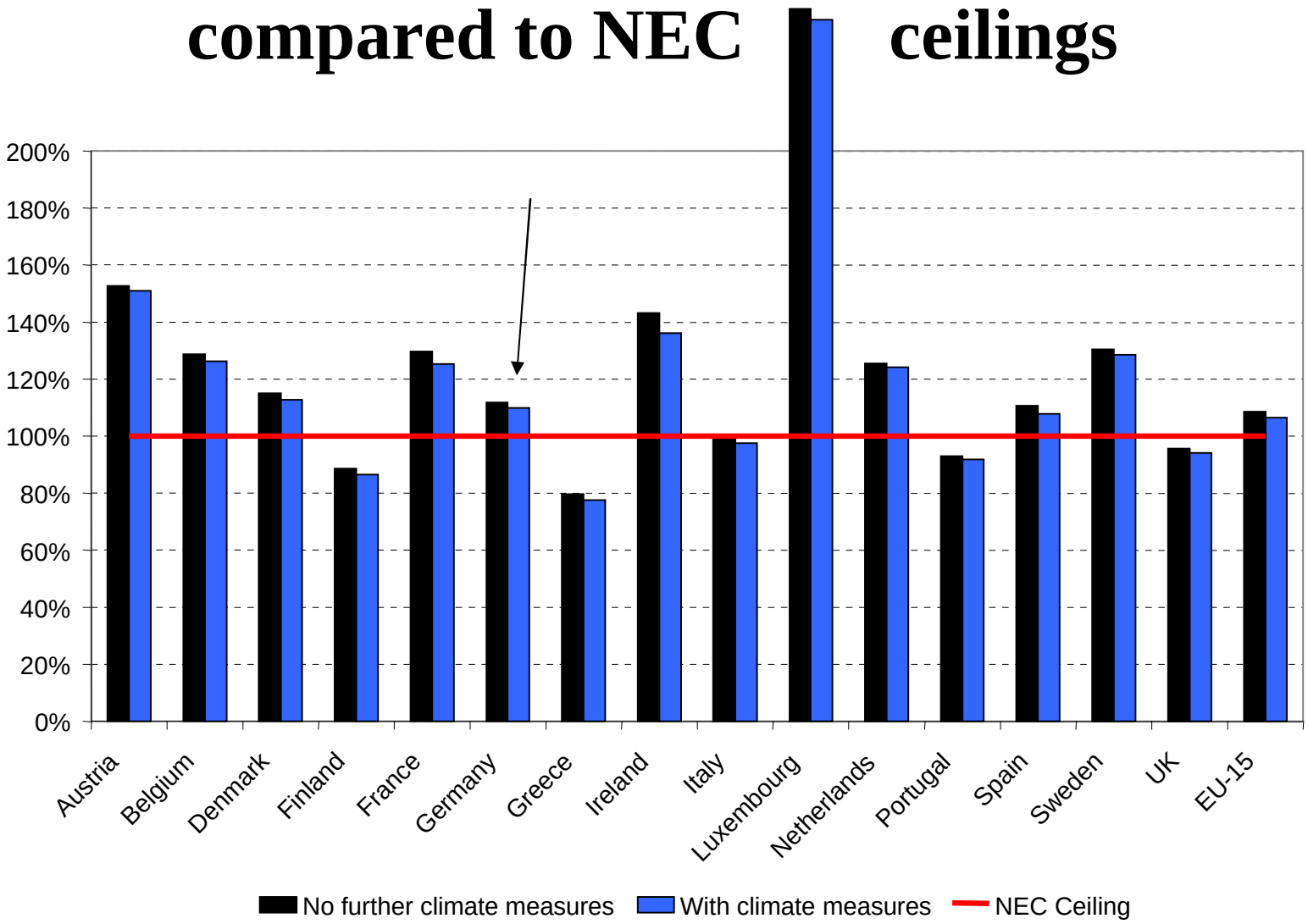
NOx max. 1.051 kt p.a.

(all sources, mobile sources alone produce 500 kt p.a.)

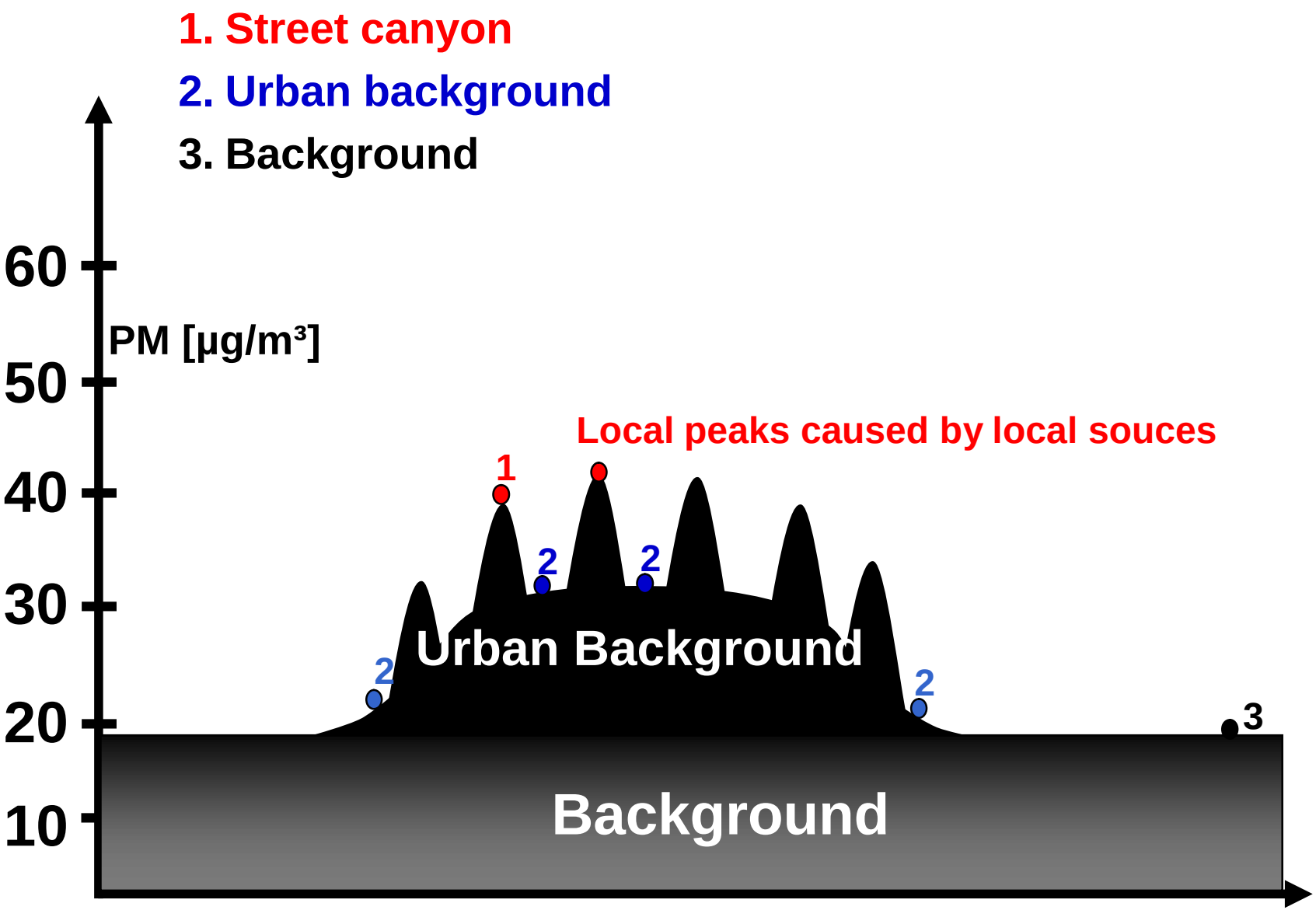

PM10 77 70 63 56 49 42 35 28 21 14 7 0
PM10 Daily Mean > LV
OIRS_landsanaf_and20PM10_20030101_PMOI_01.eug
55N
54N
53N
52N
51N
50N
49N
48N
47N
5E
6E
7E
8E
9E
10E
11E
12E
13E
14E
15E
16E
LV = 50 µg/m³ [35 excd]
>0 >7 >14 >21 >28 >35 >42 >49 >56 >63 >70 >77
FU-Berlin/TrUmF/UBA
year 2003
days


NO2
60
54
50
45
40
35
30
25
20
15
10
5
NO2 Annual Mean
OIRS_and20NO2_20030101_N20I_01.eug
55N
54N
53N
52N
51N
50N
49N
48N
47N
5E
6E
7E
8E
9E
10E
11E
12E
13E
14E
15E
16E
5
10
15
20
25
30
35
40
45
50
54
60
FU-Berlin/TrUmF/UBA
year 2003
µg/m³

Projected NO_x emissions in 2010 compared to NEC ceilings



General pollution pattern



Contribution of different geographical scales to PM10 and NO2 concentration (Annual Mean) at monitoring sites with high PM10/NO2 values

Geographical scale	Total PM10 /Total NO2
Street	0-40%/25-70%
City Background	5-35%/10-55%
Regional Background	30-80%/5-75%

Contribution of different sources to PM10 (including secondary particles) and NO2 emissions at monitoring sites with high PM10/NO2 values

Source	Total PM10/NO2
Transport	5-50%/35-85%
Industry/power plants	0-45%/0-15%
Domestic sources	0-25%/5-10%
Others	0-30%/0-30%

Conclusions of analysis

- **Direct emissions of PM and NOx need to be drastically reduced in order to meet the AQ limit values and NEC targets**
- **Road transport is major contributor to both, PM and NOx emissions as well as to PM and NO2 ambient air concentrations, and is therefore a key target for additional measures**
- **Measures adopted so far are insufficient; the cities/states cannot solve the problem alone => EU action urgently needed**

Criteria for additional measures

- **Technically feasible**
- **Practically feasible**
- **Cost efficient**
- **Time needed for implementation**

Results presented in UBA publication „Future Diesel“

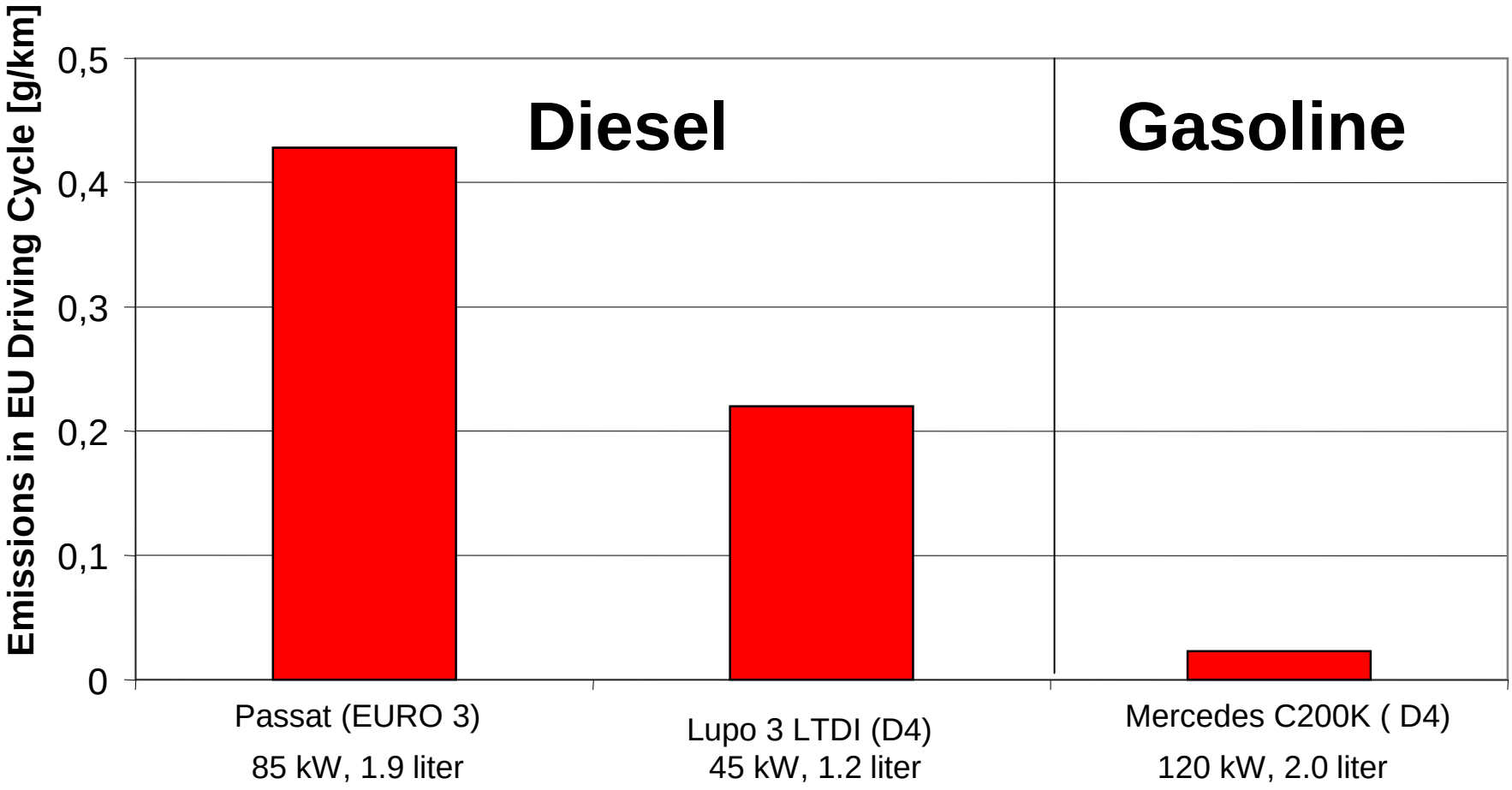
1. Is it necessary to tighten the limits for spark ignition cars?

- **Technically feasible => YES**
- **Practically feasible => YES**
- **Cost efficient => ?**
- **Timing => Medium (5 years for new cars)**

Summary: most likely NO*

***PM of GDI to be considered**

Comparison of NO_x -Emissions of Diesel- and Gasoline-PC

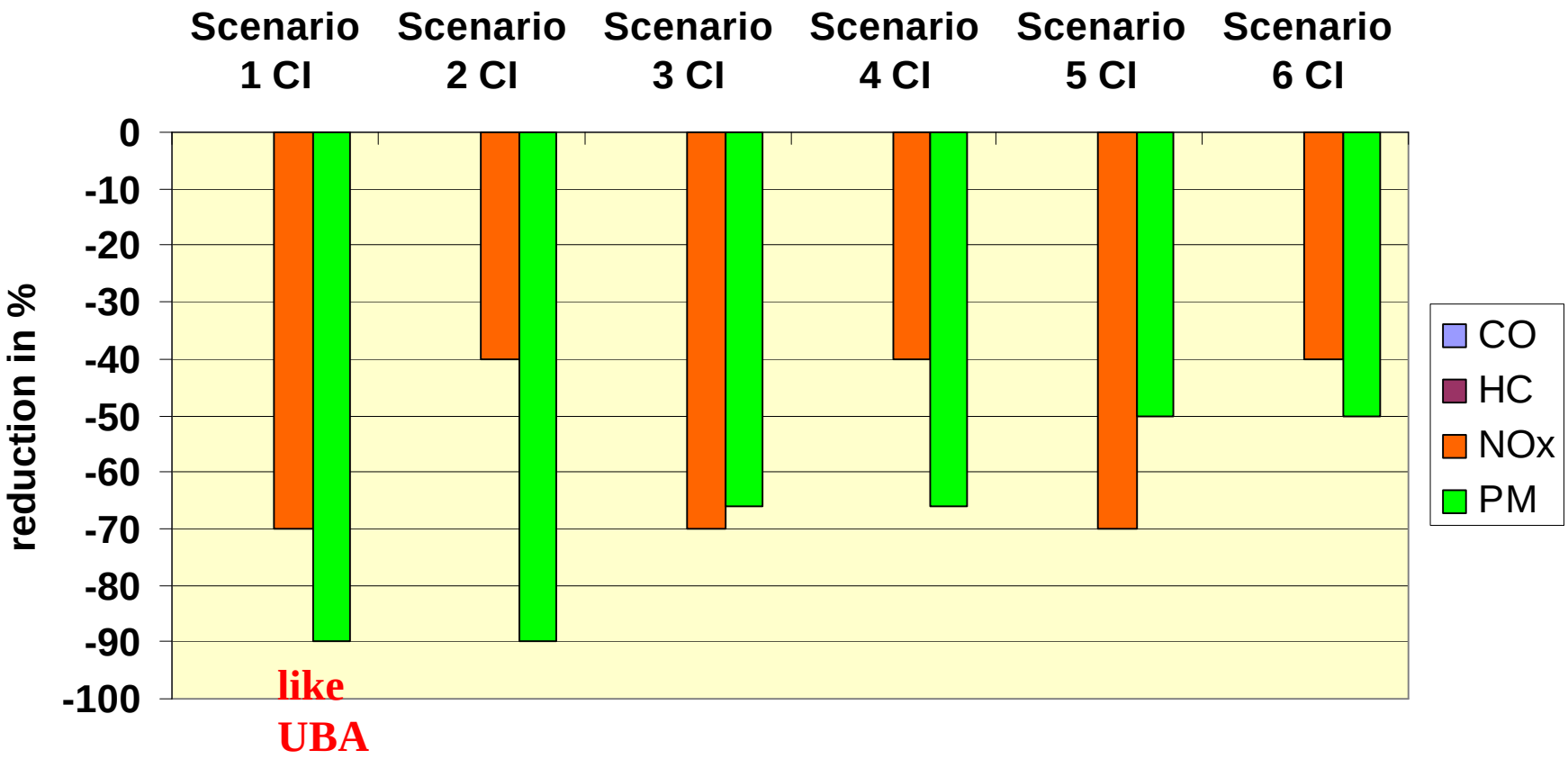


2. Should the diesel limits be aligned to the spark ignition values

- **Technically feasible => YES**
- **Practically feasible => YES**
- **Cost efficient => YES**
- **Timing => Short-term (1 – 2 years) for PM due to retrofitting option, medium term for NOx (5 years for new cars)**

Summary: YES (Let‘s break the image of the „dirty diesel“ and create a level playing field for car technologies)

EURO 5 - Questionnaire of the EU Commission (02/2004) - Scenarios compared to EURO 4



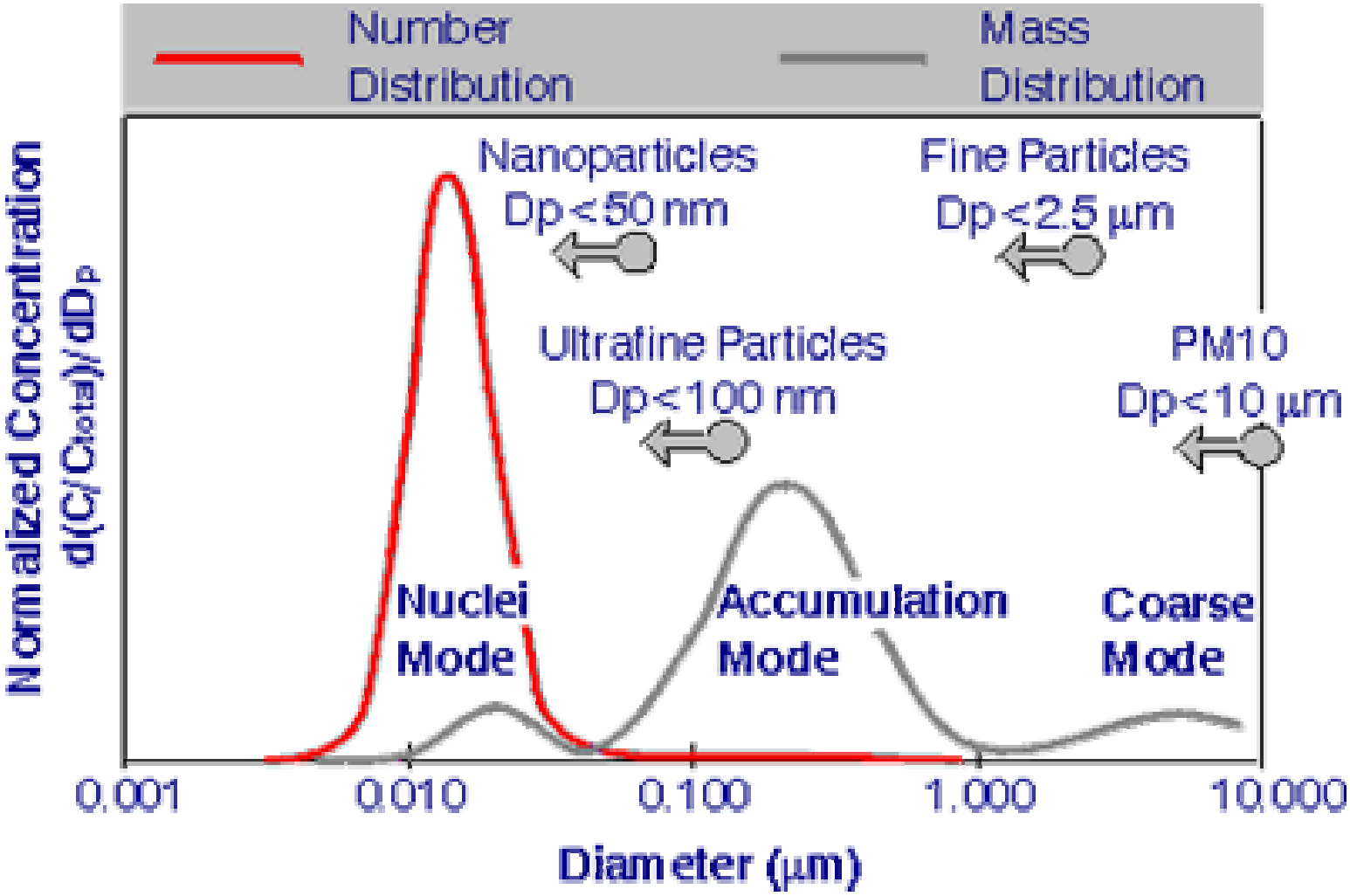
Proposal of UBA for EURO 5 Limits for PC and LDT

Date	vehicle categ./class		Reference Weight RW (kg)	CO (g/km)	HC (g/km)	NO_x (g/km)	PM- (g/km)
	categ.	class		petrol diesel	petrol diesel	petrol diesel	GDI diesel
01.01. 2008	PC	—	alle	1,0	0,05	0,08	0,0025
01.01. 2008	LDT	I	RW £ 1305	1,0	0,05	0,08	0,0025
		II	1305 < RW £ 1760	1,0	0,100	0,08	0,0025
		III	1760 < RW	1,25	0,125	0,10	0,0032

3. Is it reasonable to introduce limits for fine particle emissions?

- **Definition of particle fractions (fine/ultrafine)**
- **Technically feasible => YES/YES, to be expected**
- **Practically feasible => YES/YES, to be expected**
- **Cost efficient => YES/YES**
- **Timing => Short/long term (5/>10 years for new cars)**

Summary: YES/YES in the long run (be pro-active)


Number Distribution
Mass Distribution
Nanoparticles Dp<50 nm
Fine Particles Dp<2.5 µm
Ultrafine Particles Dp<100 nm
PM10 Dp<10 µm
Nuclei Mode
Accumulation Mode
Coarse Mode
Normalized Concentration d(C/Ctotal)/dDp
0.001
0.010
0.100
1.000
10.000
Diameter (µm)

Background on fine and ultrafine PM in ambient air

- **FINE: WHO sees strong evidence that $PM_{2,5}$ causes serious health effects; no evidence for "no effect-threshold" => AQLV will be set soon**
- **ULTRAFINE: WHO: in general the smaller the particle size the more health relevant are particles => AQLV are likely to be set in future**

Advantages of the use of efficient filter technology

- **Reduces ultrafine particles (particle numbers)**
- **Provides long-term regulatory stability for the vehicle sector**
- **Aligns diesel and gasoline technologies**

=> **Emission limits should be set at levels which require the use of efficient filter technology**

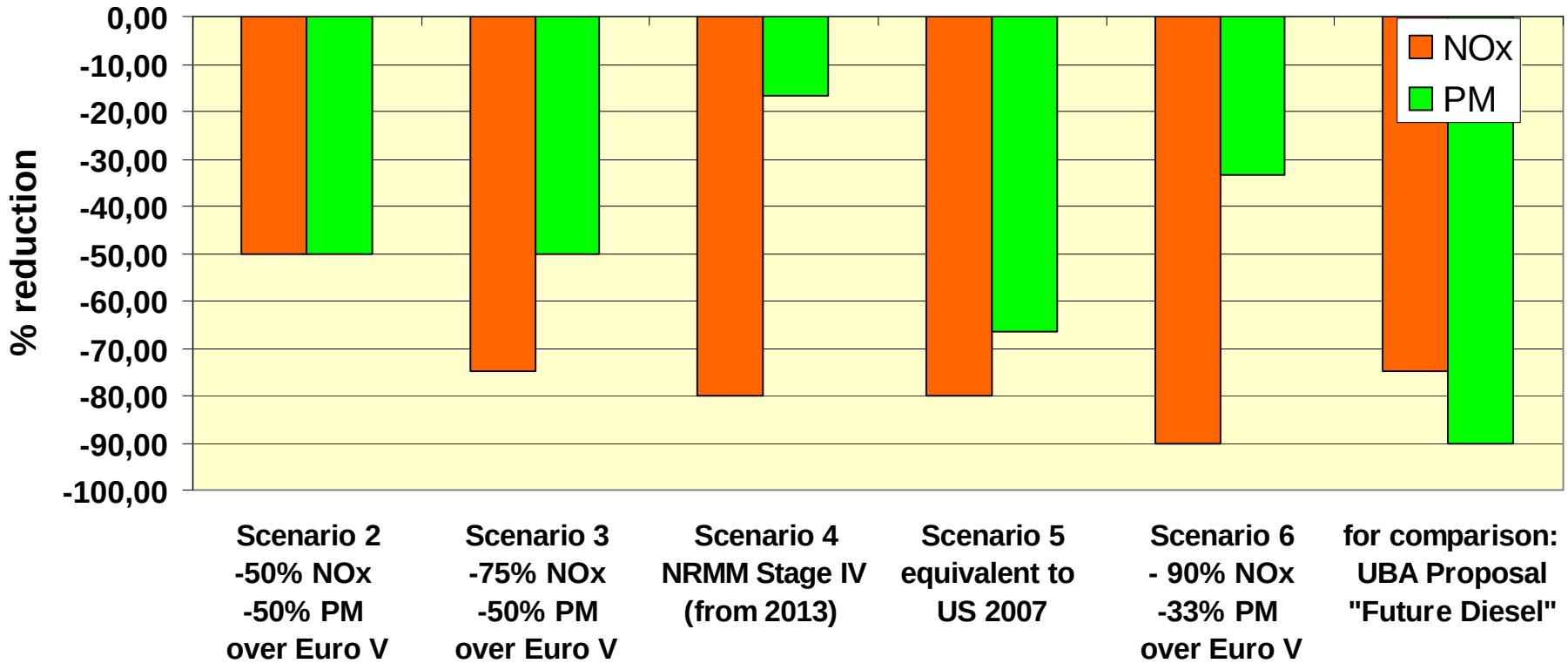
=> **Particle number concentrations should be measured in addition to mass concentration**

4. Is it necessary to tighten the limits for trucks?

- **Technically feasible => YES**
- **Practically feasible => YES, to be expected**
- **Cost efficient => YES**
- **Timing => Medium term (5 years for new cars)**

Summary: YES

EURO VI - HD Questionnaire of the EU Commission (05/2004) - Scenarios compared to EURO V (ETC)



UBA proposal for HDV

	Euro V 1999/96/EG 2008/2009		Euro VI As of 2010	
	ESC	ETC [1) 2)]	ESC	ETC [1) 2)]
	g / kWh	g / kWh	g / kWh	g / kWh
CO	1,5	4,0	1,5	4,0
HC	0,46		0,46	
NMHC		0,55		0,55
Methan		1,1 [3)]		1,1 [3)]
NO_x	2,0	2,0	0,5	0,5
Partikel	0,02	0,03	0,002	0,003

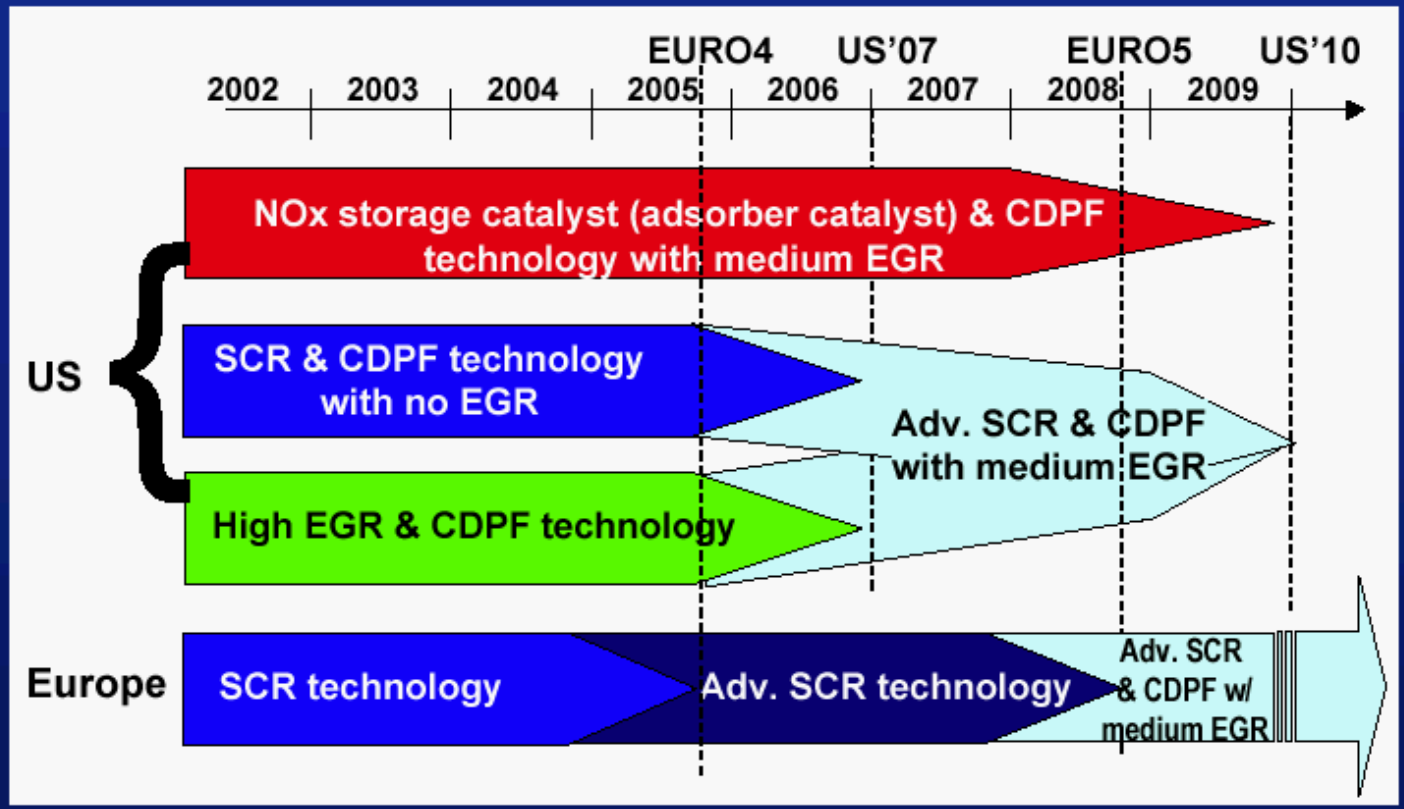
[1)] Additonal transient test for diesel with after treatment

[2)] For gas engines only transient test

[3)] For CNG engines only

Timelines of different emission strategies

DAIMLERCHRYSLER



5. Is it necessary to tighten the limits to save the individual mobility?

Mobility = Individual motorised transport?

Re-phrase question: Is it necessary to tighten the limits and to restrict individual motorised transport in order to meet AQLV?

- **Technically feasible => YES**
- **Practically feasible => Case-by-case**
- **Cost efficient => Case-by-case**
- **Timing => Short term**

Summary: YES, likely for specific cases

Measures to be considered

- **Improved conditions for modal shift (freight)**
- **Improved conditions for other means of urban transport (public transport, bicycles)**
- **Urban traffic management, e.g.**
  - **Access to city for „clean cars“ only**
  - **Speed limits (resuspension of particles)**
  - **Restrictions for transient traffic**
  - **High price parking, city maut, road pricing**

6. What are the demands for the future fuels?

- **Conventional fuels/alternative fuels**

- **Conventional fuels => gasoline, diesel => NONE**
- **Alternative fuels => CNG, LPG, Bio fuels, Hydrogen**

Summary: NONE (but need to develop a consolidated EU strategy for alternative fuels)

Summary of answers to FIA‘s questions

1. **Is it necessary to tighten the limits for spark ignition cars? NO (most likely not)**
2. **Should the diesel limits be aligned to the spark ignition values? YES**
3. **Is it reasonable to introduce limits for fine particle emissions? YES, for fine particles/YES, in the long run for ultrafine particles**
4. **Is it necessary to tighten the limits for trucks? YES**
5. **Is it necessary to tighten the limits to save the individual mobility? most likely YES (not mobility but IC engine use for transport)**
6. **What are the demands for the future fuels? NONE for conventional, CONSOLIDATION for alternative fuels**

Thank You for Your Attention !

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