European Commission

FUTURE EUROPEAN DEVELOPMENTS

MOTOR VEHICLE EMISSIONS AND FUEL QUALITY

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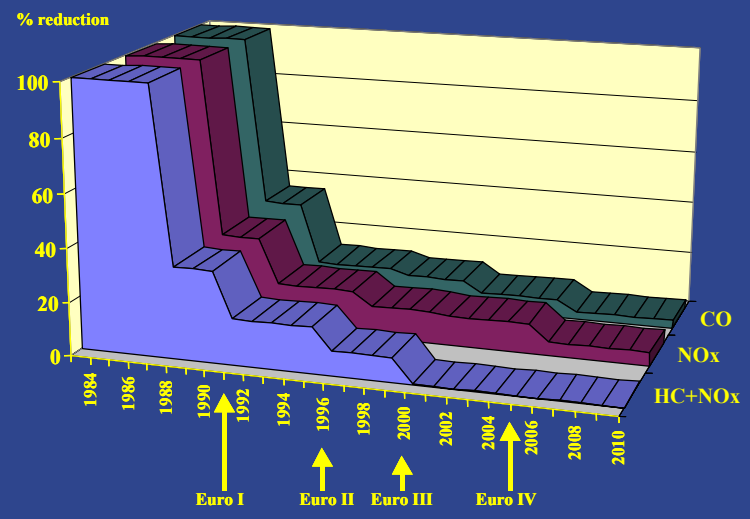
EXISTING AND NEAR-TERM MEASURES ON LIGHT-DUTY VEHICLES

Petrol cars



Euro 3 and Euro 4

	CO (g/km)		HC (g/km)		NOx (g/km)		HC+NOx (g/km)		PM (g/km)
	P	D	P	D	P	D	P	D	D
2000	2.3 (30%)	0.64 (40%)	0.20 (40%)	-	0.15 (40%)	0.50 (20-40%)	-	0.56 (20-40%)	0.05 (35-50%)
2005	1.0 (70%)	0.50 (54%)	0.10 (70%)	-	0.08 (68%)	0.25 (60-70%)	-	0.30 (58-68%)	0.025 (68-75%)

- New low temperature test at -7°C;
- In-use conformity testing with durability distance of 100,000 km for Euro 4;
- Revised evaporative emissions test;
- On-board diagnostics (OBD).

Additional technical work

- Revision of OBD threshold values:
  - For stoichiometric gasoline engines;
  - For diesel and direct injection gasoline engines;
- Date of application of new measures to be decided after impact assessment;
- Recast of 70/220/EEC, and also including:
  - Procedures for regenerating PM filters;
  - Procedures for hybrid vehicles.

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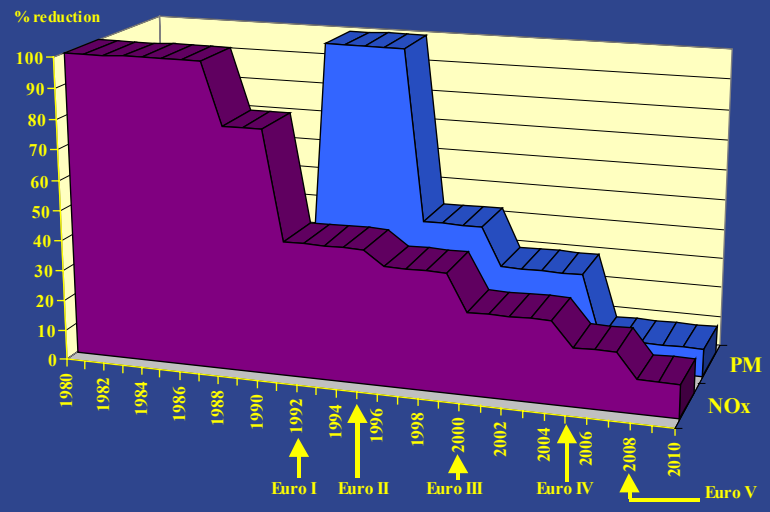
EXISTING AND NEAR-TERM MEASURES ON HEAVY-DUTY VEHICLES

Heavy-duty vehicles on ETC



Euro 4 limits (2005)

Euro 4 provides additional reductions of 30% in CO, HC and NOx and 80% in particulates over Euro 3:

- **ESC and ELR cycles:**

g/kWh	CO	HC	NOx	Particulates	Smoke (m^{-1})
Euro 4	1.5	0.46	3.5	0.02	0.5

- **ETC cycle:**

g/kWh	CO	NMHC	NOx	CH_4	Particulates
Euro 4	4.0	0.55	3.5	1.1	0.03

Euro 5 limits (2008)

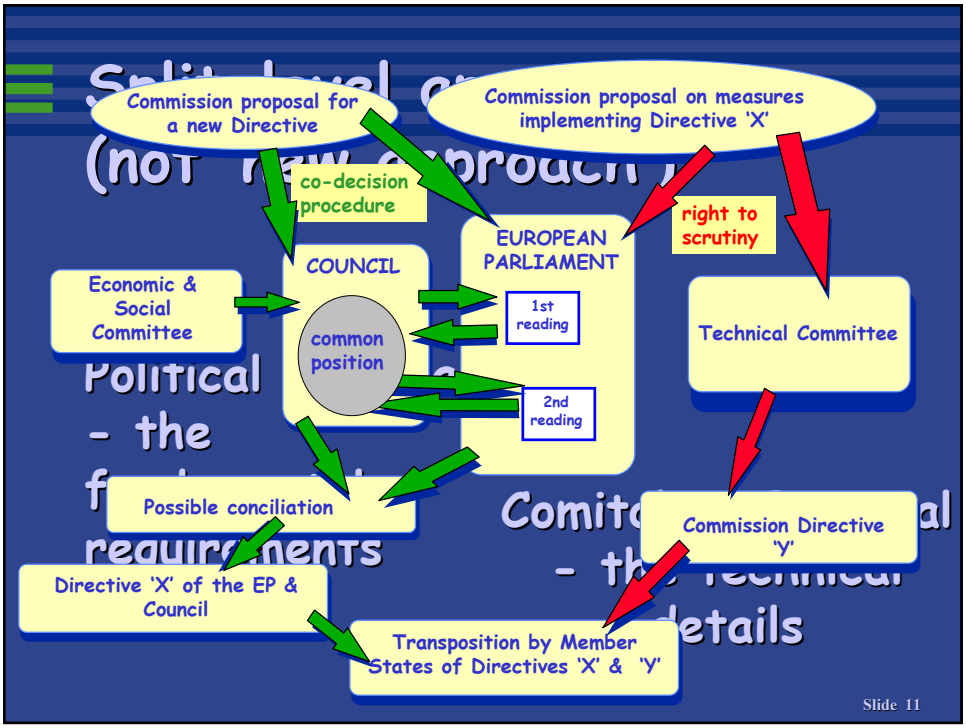
From 1 October 2008, the NOx limit on both the ESC and the ETC cycles will be 2.0 g/kWh.

See the following Commission web-page for study report:

http://europa.eu.int/comm/enterprise/automotive/pagesbackground/pollutant_emission/index.htm

Additional issues in Euro 4

- Commission proposal COM(2003)522, a new "split-level" approach:
- The proposal covers the fundamental elements of:
  - Durability of emission control systems;
  - On-board diagnostics in two stages;



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Durability

Vehicle category	Date applicable
N1	100,000 km or 6 years
N2	200,000 km or 6 years
N3 ≤ 16 tonnes	200,000 km or 6 years
N3 > 16 tonnes	500,000 km or 7 years
M2	100,000 km or 6 years
M3 class I, II, A & B ≤ 7.5 tonnes	200,000 km or 6 years
M3 class III & B > 7.5 tonnes	500,000 km or 7 years

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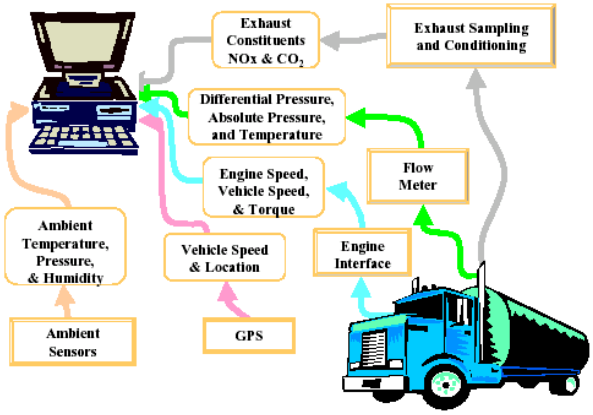
On-board diagnostics (OBD)

	Date	Content
Stage I OBD *NOx = 7* *PM = 0.1*	October 2005	Monitor engine & emission control system against OBD thresholds. Option to monitor emission control system for *major functional failure.*
Stage II OBD *NOx = 7* *PM = 0.1*	October 2008	Monitor engine & emission control system against OBD thresholds. Includes link between engine and chassis systems.

Other issues for HDV

- In-use conformity checking;
- Improved particulate mass measuring procedures for Euro 4;
- Procedures for regenerative particulate filter systems;
- Multi-setting engines;
- Off-cycle emissions;

MOBILE EMISSIONS MEASUREMENT SYSTEM (MEMS)



PEMS

- EU program in process;
- Collaborative effort coordinated by the European Commission DG Enterprise and Joint Research Centre;
- All ACEA members participating;
- Instrument manufacturers participating;
- Initial phase to complete in mid-2005.

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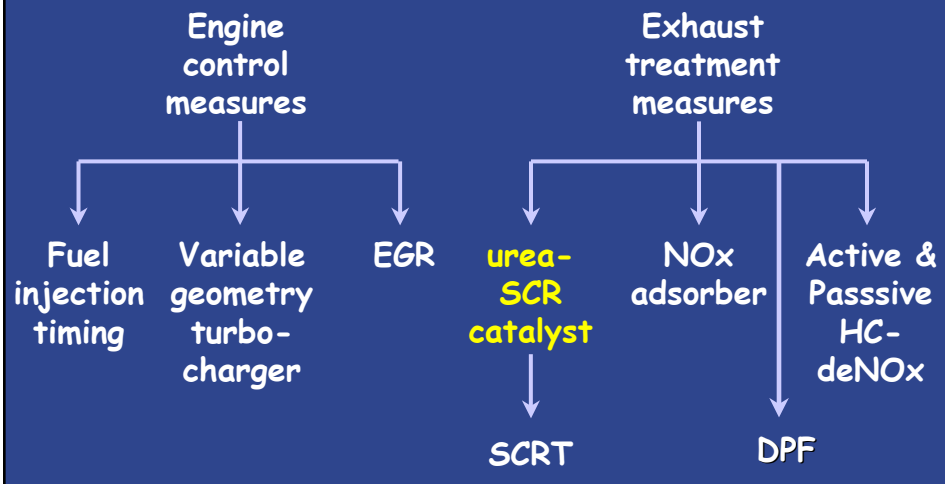
THE SCR ISSUE

Meeting low NOx



SCR systems

- SCR systems rely on the dosing of "urea";
- SCR equipped vehicles in EU market in early 2005;
- SCR can achieve Euro 4 and Euro 5 limits;
- Without urea, NOx emissions of a Euro 5 vehicle could be as poor as a Euro 2 vehicle – completely unacceptable !

SCR weak links

- Driver action to refill with urea;
- SCR relies on urea being a standard quality;
- Availability of urea;
- Urea storage tanks large enough;
- Tampering to save money;
- NOx, urea or ammonia sensors not yet available – market availability later.

SCR controls

- Action needed to encourage the driver to use urea and not tamper;
- Should the engine power be modulated?
  - Safety concerns paramount;
- Manufacturers must make operators aware of SCR and their obligations for use;
- Acceptability of SCR as a technology is at risk;
- Common regulatory approach.

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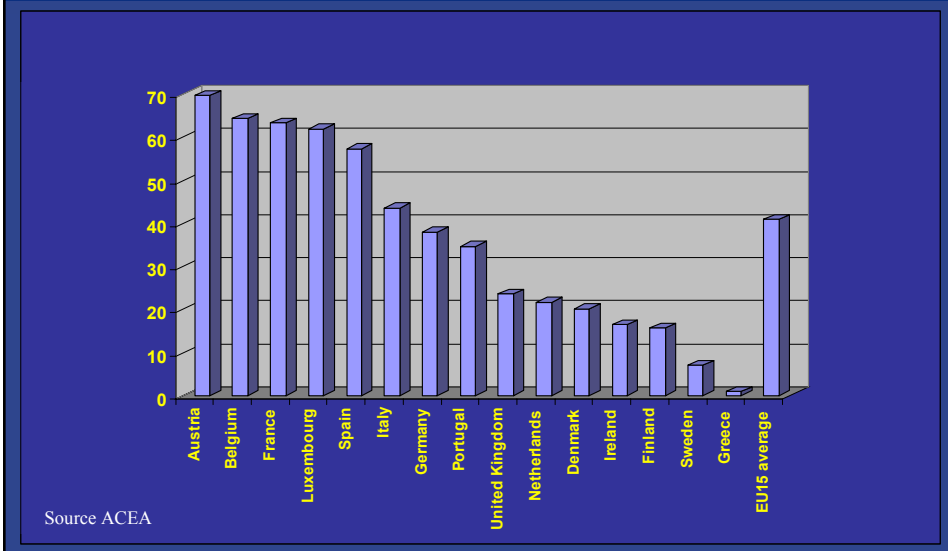
EURO 5

Already said in Council

- Environment Council 18-19 December 2000:
  - cleaner fuels for cleaner emission control technology;
  - efforts to reduce nano-particulate emissions;
  - diesel NOx limit closer to gasoline NOx;
  - start work to assess feasibility of new limit values from 2010.

EU15 new diesel car registrations in 2002 (%)



Source ACEA

Council - car emissions

- Several Member States have requested Environment Council 18-19 December 2000:
  - cleaner fuels for cleaner emission control technology;
  - efforts to reduce nano-particulate emissions;
  - diesel NOx limit closer to gasoline NOx;
  - start work to assess feasibility of new limit values from 2010.

Already said

- German-French communiqué March 2003:
  - reduce particulate emissions;
  - widespread introduction of diesel particulate filters;
  - reduce NOx emissions;
  - simultaneous reduction in emissions and fuel consumption/CO_2 emissions.

Already said

Euro 4	25 mg/km PM & 250 mg/km NOx.
Member State that expressed a view:	**Future limits (diesel):**
Germany	8.5 mg/km PM & 200 mg/km NOx.
France	12.5 mg/km PM & 200 mg/km NOx.
Denmark	2.5 mg/km PM
Sweden	2.5 mg/km NOx

Important factors

- Technical development capacity and cost;
- CO2:
  - the achievement of the 2008 commitment and post-2008 measures
- Trade off: Safety/environment;
- Market fuels.

Outside events

- European Parliament elections in 2004:
  - last session April 2004 (short session May 2004 involving accession members);
  - elections June 2004;
  - first plenary July 2004.
- New Commission from November 2004.

Issues for Euro 5

- Euro 5 (passenger cars & light commercial vehicles):
  - reduction in tailpipe emission limits:
    - technical feasibility and cost;
    - reduction in diesel PM (mass & nano-PM);
    - application of nano-PM measurement;
    - consider measures on DISI nano-PM;
    - attention to HC species and limits appropriate to alternative fuels;
    - reduction in tailpipe emission limits:
  - consideration of effects on CO2.

Issues for Euro 5

- **Euro 5** (passenger cars & light commercial vehicles):
  - durability beyond 160,000 km;
  - additional evaporative controls?
  - revision to test procedures:
    - mobile air conditioning ?
  - Is there a role for EFV in Euro 5?
  - improved measures on off-cycle, aligning with GTR ?

Euro 5 questionnaire aims

The purpose of this MVEG sub-group is to collect up to date information for the CAFE modelling and prepare the base for a consultation document

- emission control technologies and other technical measures;
- their performance and other characteristics;
- their investment and operation costs;
- their environmental impact to reduce particulates according to their mass and different classes of size (i.e. total mass, PM_{10}, $PM_{2.5}$, sub 1 micron and below), NOx and other appropriate pollutants.

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EURO 6

Already said on Euro 6

- development of diesel and gas engine control and aftertreatment technology and influence of fuel quality;
- improvements in accuracy and repeatability of measurement and sampling procedures for very low levels of particulates;
- development of WHDC;
- limits for pollutants currently non-regulated by virtue of introduction of new alternative fuels.

Issues for Euro 6

- Euro 6 (heavy-duty vehicles):
  - reduction in NOx beyond 2.0 g/kWh;
  - reduction in PM (mass & nano-PM) and application of measuring procedures for nano-PM;
  - closed crankcase ventilation;
  - introduction of WHDC;
  - increased durability;
  - improved measures on OBD & off-cycle, aligning with GTR ?

Conclusions

- Euro 5 and Euro 6 in preparation;
- Euro 5 proposal due mid-2005, Euro 6 in autumn 2005;
- The priority issues are further NOx and particulate mass reductions and controls on ultra-fine particles;
- SCR remains a problem to solve;
- Review of fuel quality is being addressed (except sulphur).