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Cars, health, environment and carmakers cheating

Commission Dieselgate Commissie 07 / 12 / 2015



- **Cars, pollutants and health**
- European legislation
- Norms cheating: dieselgate, VWgate or Cargate?
- Political answers – NGOs recommendations



Cars' pollutants emissions

Pollutant	Health
PM	<p>Can cause or aggravate cardiovascular and lung diseases, heart attacks and arrhythmias.</p> <p>It can also affect the central nervous system and the reproductive system, and can cause cancer.</p>
NO_x	<p>Can affect the liver, lung, spleen and blood. It can also aggravate lung diseases leading to respiratory symptoms and increased susceptibility to respiratory infection.</p> <p>It contributes to acid deposition but also to eutrophication of soil and water.</p> <p>NO_x contributes to the formation of ozone and particulate matter</p>
O₃	<p>Results from chemical reactions of precursor gases: NO_x, carbon monoxide (CO) and VOCs.</p> <p>It can cause respiratory health problems, including decreased lung function, aggravation of asthma, and other lung diseases.</p>



Deaths attributable to air pollution

Premature deaths attributable to fine particulate matter (PM_{2.5}), ozone (O₃) and nitrogen dioxide (NO₂) exposure in 2012

Geographical scope	PM _{2.5}	O ₃	NO ₂
Belgium	9 300	170	2 300
EU-28	403 000	16 000	72 000

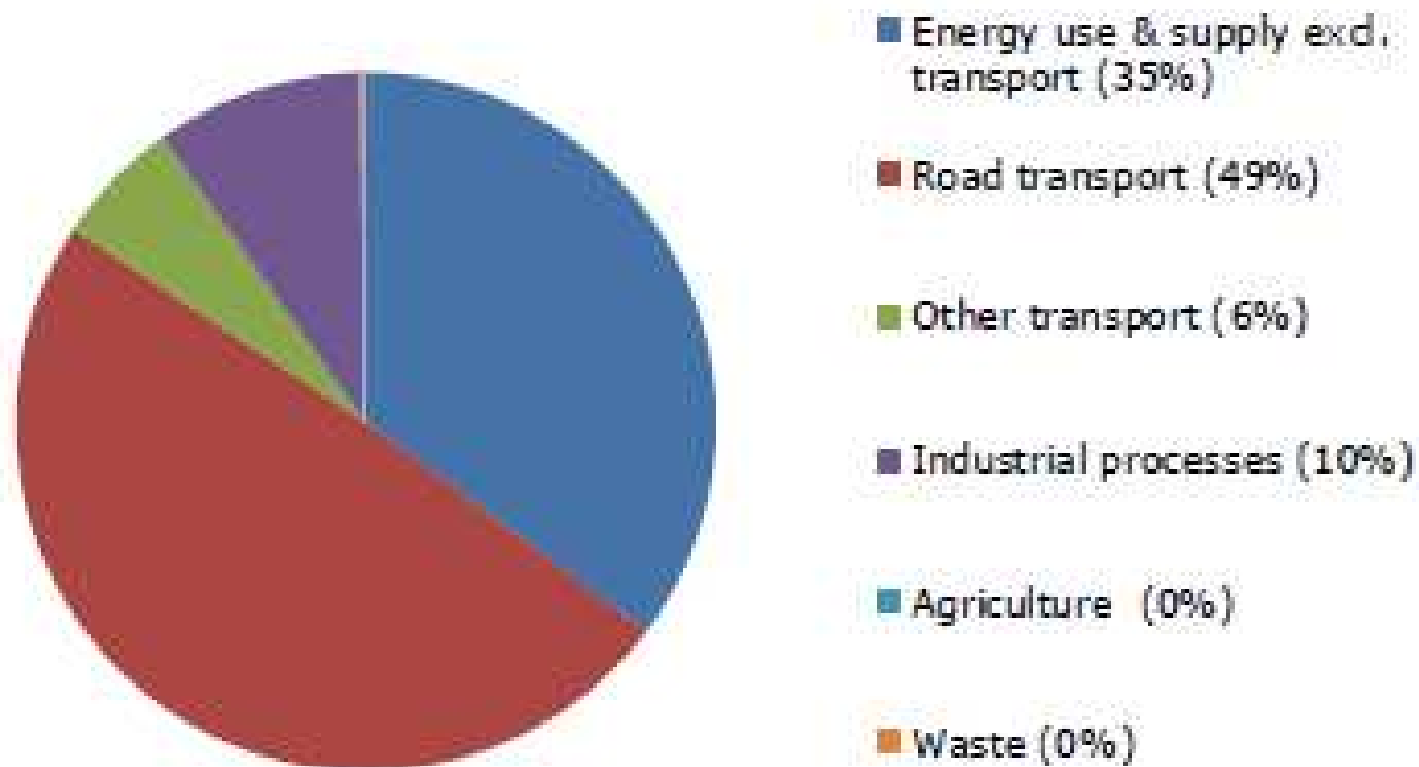
Source : EEA, 2015





Nitrogen oxydes emissions in BE

Emissions by sector - 2012



Source : EEA, 2014



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EU legal instruments for air quality management

- Limits or targets for ambient concentrations of air pollutants
notably Directive 2008/50/EC
- Limits on total pollutant emissions (e.g. national totals)
notably Directive 2001/81/EC (NEC directive)
- Emission standards (e.g. for vehicle emissions) and requirements on product quality (e.g. sulphur and benzene in fuel) for specific sources or sectors
notably Regulations (CE) n° 715/2007 and (UE) n° 459/2012)

Member States



Industry



Euro norms for cars

Positive ignition (PI) engines (petrol or gasoline)

Norm	From	CO	HC	NO _x	HC + NO _x	PM	PN (*)
		mg/km	mg/km	mg/km	mg/km	mg/km	#/km
Euro 5	01 / 2011	1 000	100	60	/	5	/
Euro 6	09/ 2015	1 000	100	60	/	4.5	6x10 ¹¹ (**)

(*) for direct injection engines (GDI)

(**) 6x10¹² during 3 years (2015 – 2018)

Compression ignition (CI) engines (diesel)

Norm	From	CO	HC	NO _x	HC + NO _x	PM	PN
		mg/km	mg/km	mg/km	mg/km	mg/km	#/km
Euro 5	01 / 2011	500	/	180	230	5	/
Euro 6	09/ 2015	500	/	80	170	4.5	6x10 ¹¹

Source : regulations (CE) n° 715/2007 and (UE) n° 459/2012)



“Stringency” of the norms : the example of PN

Particle Measurement Programme (PMP)

- Years 2003 - 2006
- 9 test laboratories in the EU, Korea and Japan
- Testing 16 light duty vehicles including 6 diesels equipped with DPFs
- Mean particle number emissions were less than 2×10^{11} particles/km for DPF equipped diesels
- One DPF equipped diesel did give higher mean results of around 6×10^{11} particles/km. This vehicle differed from the other DPF equipped vehicles in being fitted with a more porous cordierite DPF substrate

Source : Joint Research Center (JRC), 2007

Limit adopted for Euro Euro 6 (2015) : 6×10^{11} particles/km



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NO_x treatment

Aftertreatment NO_x control for Euro 6 light-duty CI vehicles is based primarily on two technologies:

- lean NO_x traps (LNTs)
- selective catalytic reduction (SCR)

These technologies can be applied in combination with:

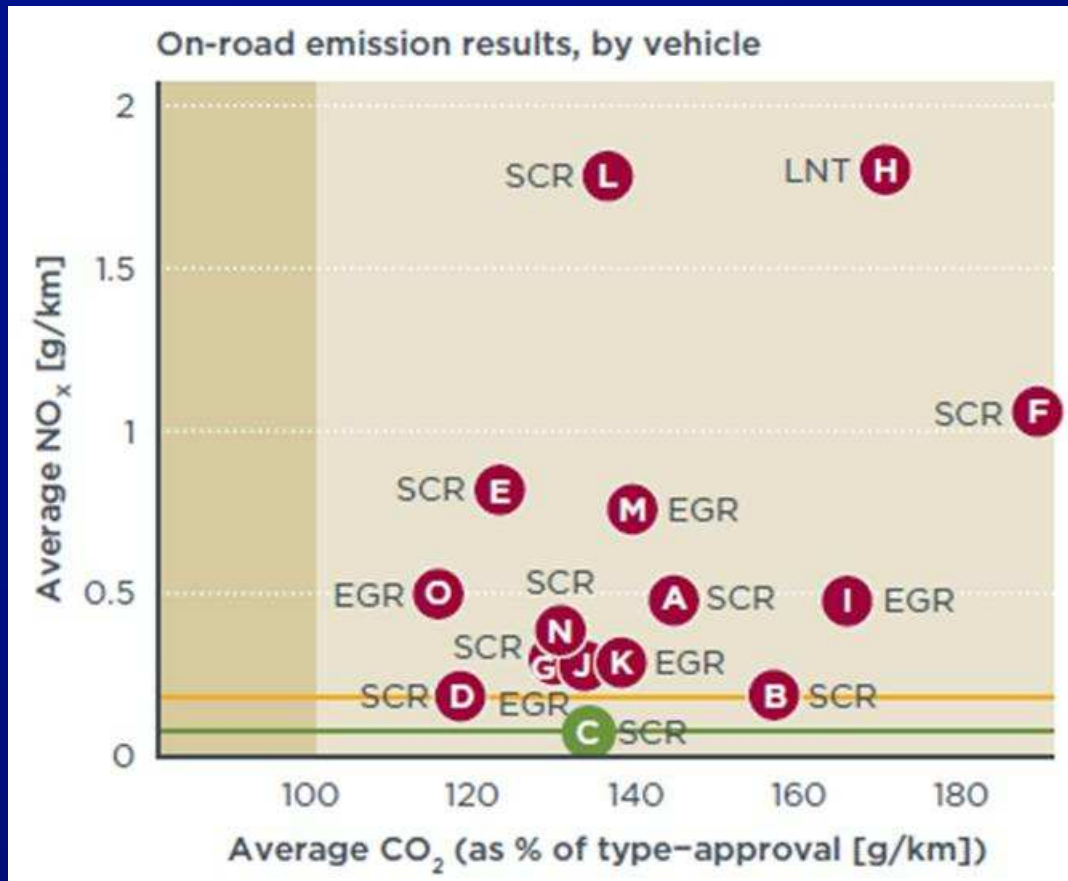
- exhaust gas recirculation (EGR), which has been applied since the adoption of Euro 2
- in-cylinder control strategies (e.g., fuel injection delay and other combustion improvements that reduce the need for aftertreatment systems).

Manufacturers will likely choose the NO_x aftertreatment technology based on a combination of factors that include cost, technical complexity, reliability, fuel economy, and consumer acceptance

Note: PI engines: three-way catalytic converter (TWC)



Real driving NO_x emissions (1)



15 vehicles, 6 manufacturers,
97 trips for a total of more than
140 hours and 6,400 kilometers
driven

15 test vehicles in total (6 manufacturers),
with different NO_x control technologies:

- 10 selective catalytic reduction (SCR)
- 4 exhaust gas recirculation (EGR)
- 1 lean NO_x trap (LNT)

Average Euro 6 NO_x conformity factors
(ratio of on-road emissions to legal limits):

- all cars: 7.1
- best performer (Vehicle C, SCR): 1.0
- bad performer (Vehicle H, LNT): 24.3
- worst performer (Vehicle L, SCR): 25.4



Real driving NO_x emissions (2)

“A number of independent studies have now confirmed the chasm that exists between emissions measured in official tests in a laboratory and those emitted in real life”.

Author	Year	N° of Euro 6 diesel tested	Type of measurement	Test severity	Average NO _x CF	N° of vehicles reaching the legal limit
EU JRC	2012	1	PEMS	Severe	2.6	0
INFRAS	2013	9	Dyno - CADC	Mild	4	NA
TNO	2010-2015	16	Dyno	Mild	2.9	1
		7	PEMS	Severe	5.2	0
ICCT	2014	15	PEMS	Severe	7	1
ADAC	2015	70	Dyno - WLTC	Weak	2.5	18
Baden Württemberg	2015	3	PEMS	Severe	4.2	0
Emission Analytics	2014-2015	25+	PEMS	Severe	4.5	3

Total

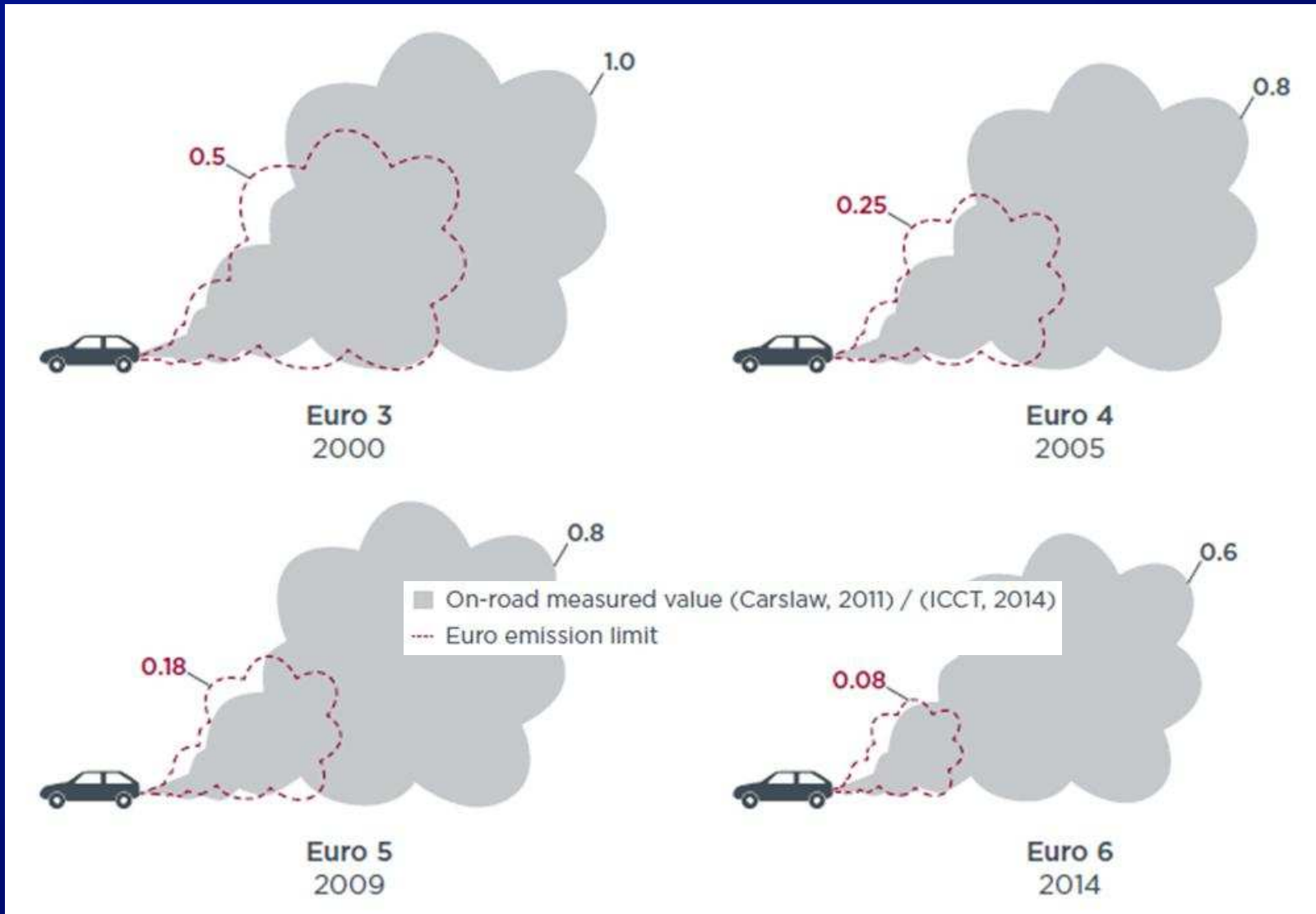
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23 (16%)

Source : Transport and Environment (T&E), 2015



Real driving NO_x emissions (3)



Source : ICCT, 2014



Real driving NO_x emissions (4)

Above and beyond the safe limit



- What they should emit (law limit)
- What they actually emit (on average above the limit)

Transport & Environment

Source : T&E, 2015



Defeat devices

Concept : identify when the car is tested => optimize de-NO_x treatment



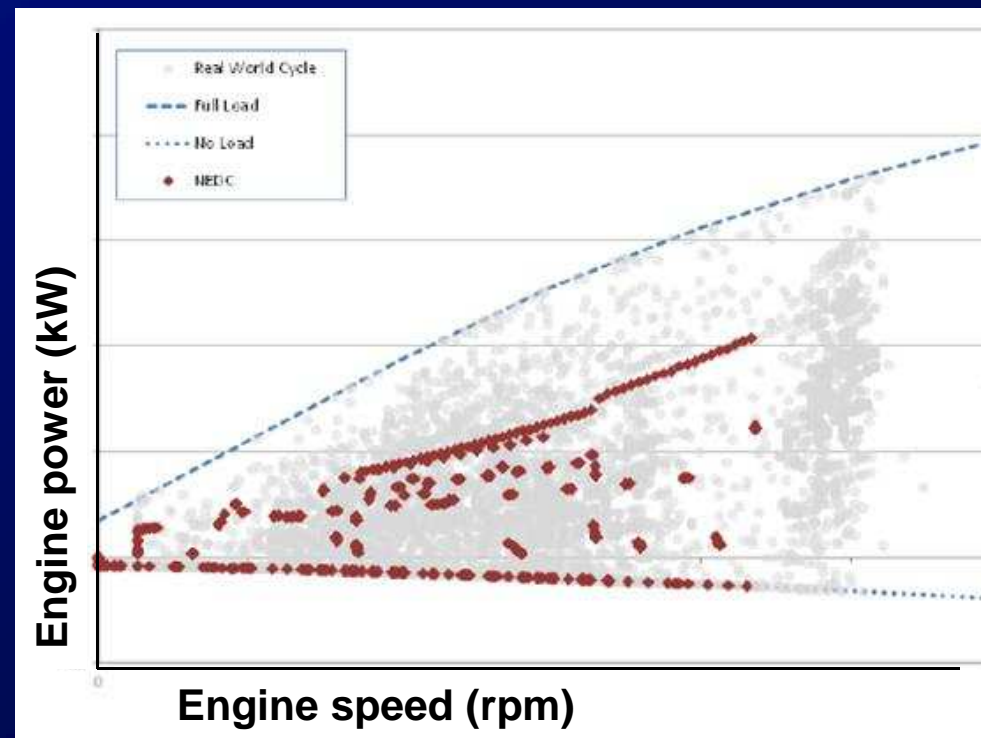
Check several parameters

- Wheels aligned
- Only front wheels turning
- Airco off
- Battery de-connected
- ...



Check motor's map

Engine must operate at selected (rpm, power) values





New evidence (1)

Tests for DUH at the
Bern University of applied science
Opel Zafira

- Only front wheels rotate : NO_x below norm
- 4 wheels rotate : NO_x 2 to 4 times above norm



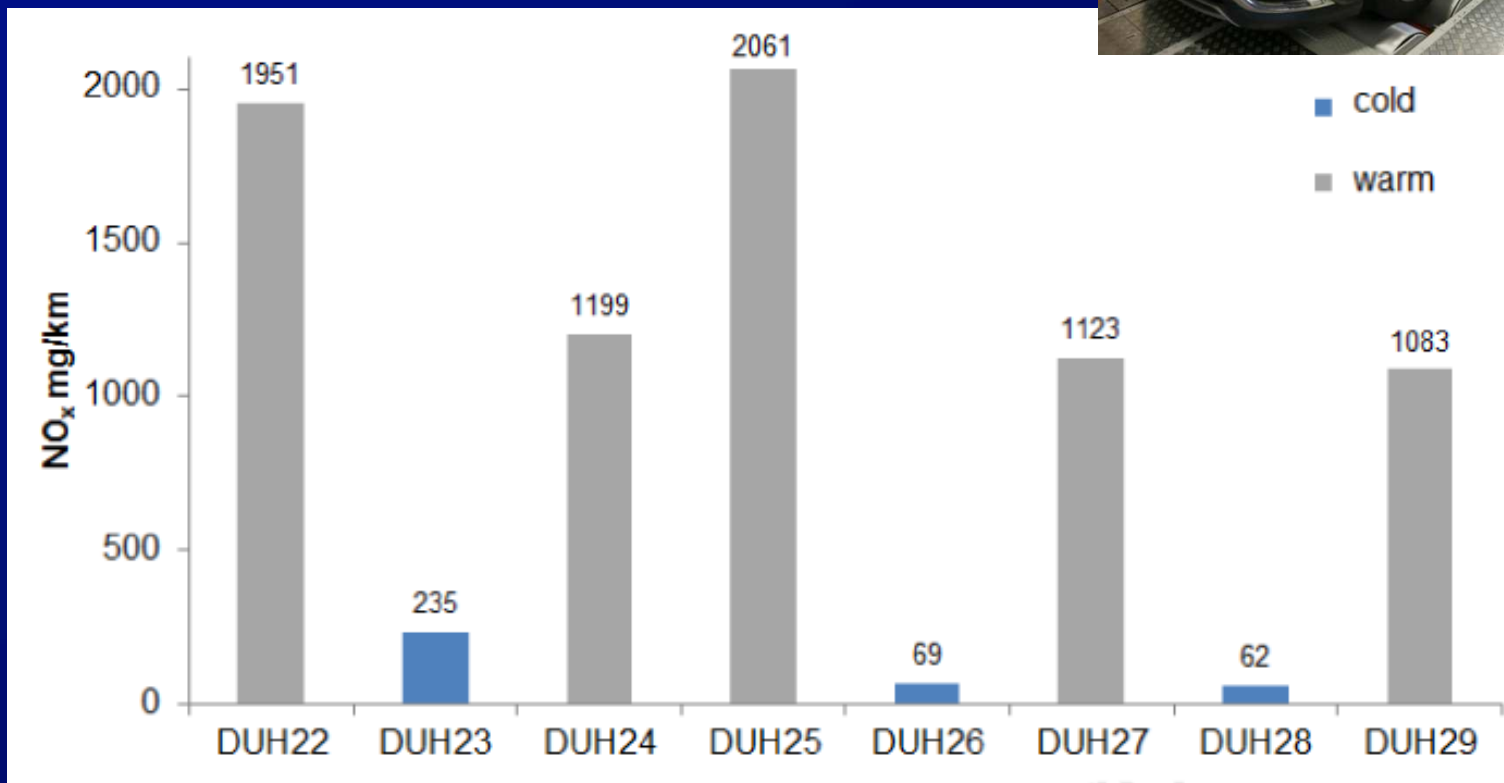
“I see no technical reason why the NO_x emissions increase drastically when the rear wheels rotate. I have no normal, technically plausible explanation for the emission behaviour of the Opel vehicle.”

Axel Friedrich, International Transport Advisor



New evidence (2)

Tests for DUH at the
Bern University of applied science
Renault Espace

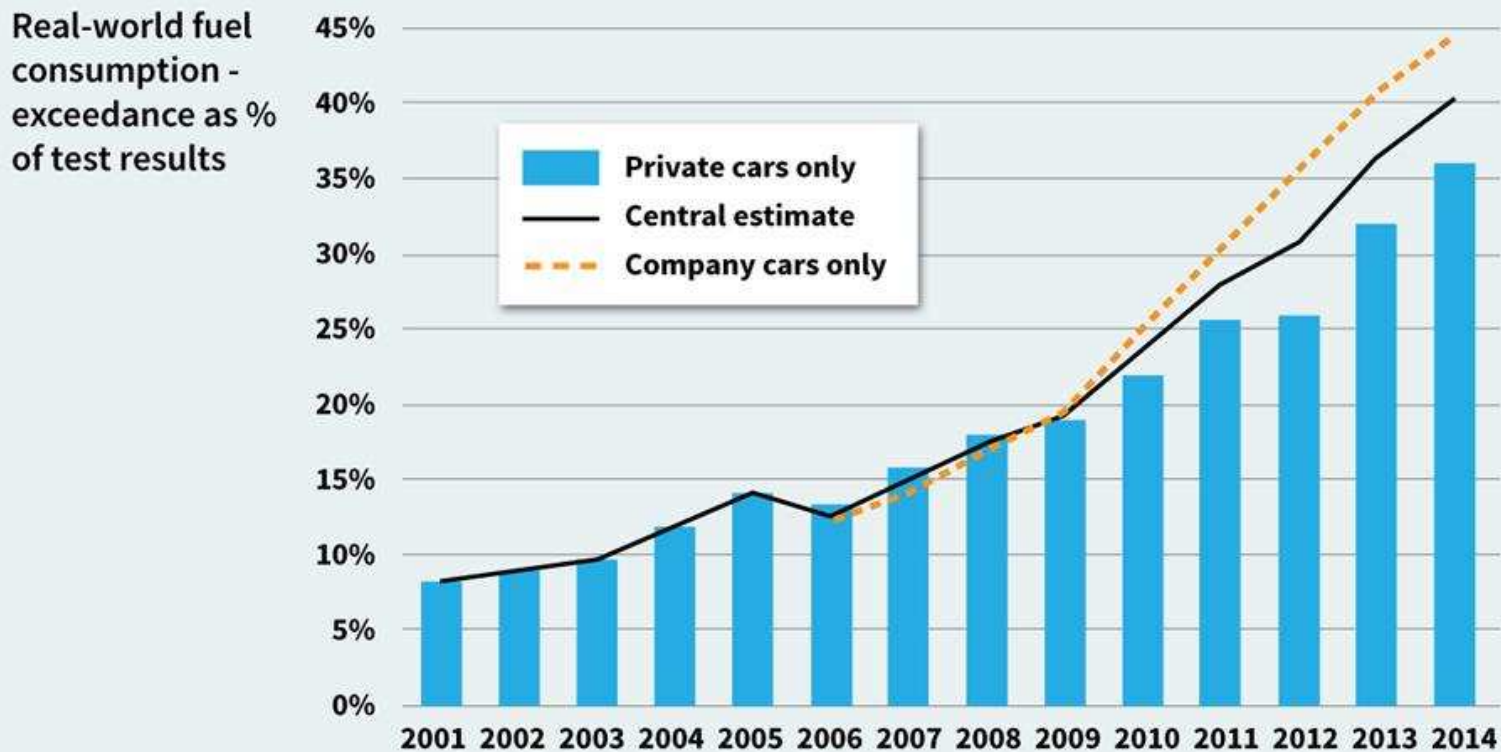


Source : DUH, 2015



Beyond NO_x : the CO₂ gap

The gap between official fuel economy/CO₂ tests and real-world driving 2014



Source: derived from ICCT, 2015

Transport & Environment



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recommandations**



Carmakers exception system

A cook in a restaurant

- Serves spoiled food
- Infringes health standards
- Betrays clients' confidence
- One person dies...
- Consequence :



Carmakers

- Make and sell too polluting cars
- Infringe emission standards
- Betray consumers' confidence
- Numerous persons die...(*)
- Consequence ?

On 28/10/2015 Member States agreed on “*robust testing*” ...

RDE conformity factor:

- 110% NO_x exceedences allowed for 2017-2019
- 50% exceedences from 2020

(*) “*La statistique est implacable: avec sa tricherie, VW a tué*”

Etienne de Callataÿ, La Libre Belgique, 15/10/2015



The facts

- First developed in the 1970's, the current test (NEDC) is obsolete and entirely unrepresentative of the way cars are driven
- When testing cars, carmakers consider that what is not formally forbidden is allowed. They manipulate tests and use « golden cars »
- Carmakers choose (market laws) the labs that conduct the tests. There is no independent european-wide authority
- Some carmakers cheat and use defeat devices
- The car lobby is powerful and continuously weakens the legislation
- The mass, power and top speed of cars continuously increase



What is needed (1)

- The system must be overseen by a European Type Approval Authority (TAA) to ensure tests are performed consistently and independently
- The new test cycle and procedures (WLTC/P) must be introduced from 2017. Loopholes must be closed
- Ambitious real driving emissions tests (RDE) must be introduced from 2018 for all cars and must concern all pollutants and CO₂
- Production checks must be developed to ensure production cars match emissions measured during type approval. All new models should be tested on the road.
- The system of periodic technical inspections (PTIs) for older vehicles in Member States must be strengthened



What is needed (2)

- EC must publish, in 2016, proposals for:
 - Euro 7 norm for light vehicles
 - Euro VII norm or heavy vehicles
 - Euro 6 norm for L vehicles (2, 3 and 4 wheelers)
 - 2025 CO₂ objectives for light vehicles
- EC must publish asap a proposal to limit the mass, power, and top speed of cars



Thank you for
your attention



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