



European Commission

Enterprise and Industry
Directorate General

ETH Conference on Combustion Generated Nanoparticels

Current and future European regulations on particle emissions

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Agenda

- **Drivers of emissions legislation**
- **Light duty (Euro 5/6)**
- **Heavy duty (Euro VI)**
- **Retrofit systems**
- **Conclusion**

Drivers of emissions legislation

Why is legislation needed?

- Set high standards in the interest of **human health** and **environmental protection**
- **Principal-Agent** situation: immediate actors (VMs, clients) are not direct beneficiaries of health and environmental standards

Why do we harmonise?

- Ensure a **single market** for vehicles across the EU
- Ensure implementation of EU's **Thematic Strategy on Air Pollution**

Emissions problem not yet solved

- With **no further changes** (i.e. **without** Euro 5 and 6 and Euro VI), road transport is forecast to contribute in 2020 :
 - 31% of total NOx emissions
 - 12% of VOC emissions
 - 7% of primary PM

Emissions problem not yet solved

- The **health impacts of air pollution** remain a problem
 - No safe level for human exposure to particulate matter
 - Average EU life expectancy is currently reduced by 9 months, by 2020 forecast to be reduced by 5 months

Tighter emissions standards are needed

- EU's Thematic Strategy on Air Pollution seeks **further reductions in emissions from all sectors**
- Required reductions (from 2000 to 2020)
 - 59% reduction in PM_{2.5}
 - 60% reduction in NO_x
 - 51% reduction in VOCs

Overview of EU Emissions Legislation

- 'Euro' emissions standards - introduced progressively since the 1990's:
 - Light duty
 - Euro 4 (2005 – 2007)
 - Euro 5 (2009 – 2012)
 - Euro 6 (2014 – 2016)
 - Heavy duty
 - Euro IV (2005 – 2006)
 - Euro V (2008 – 2009)
 - Euro VI (2013 – 2014)
 - Motorbikes
 - Euro 3 (2003 – 2006)

Light duty vehicles - Euro 5 and 6

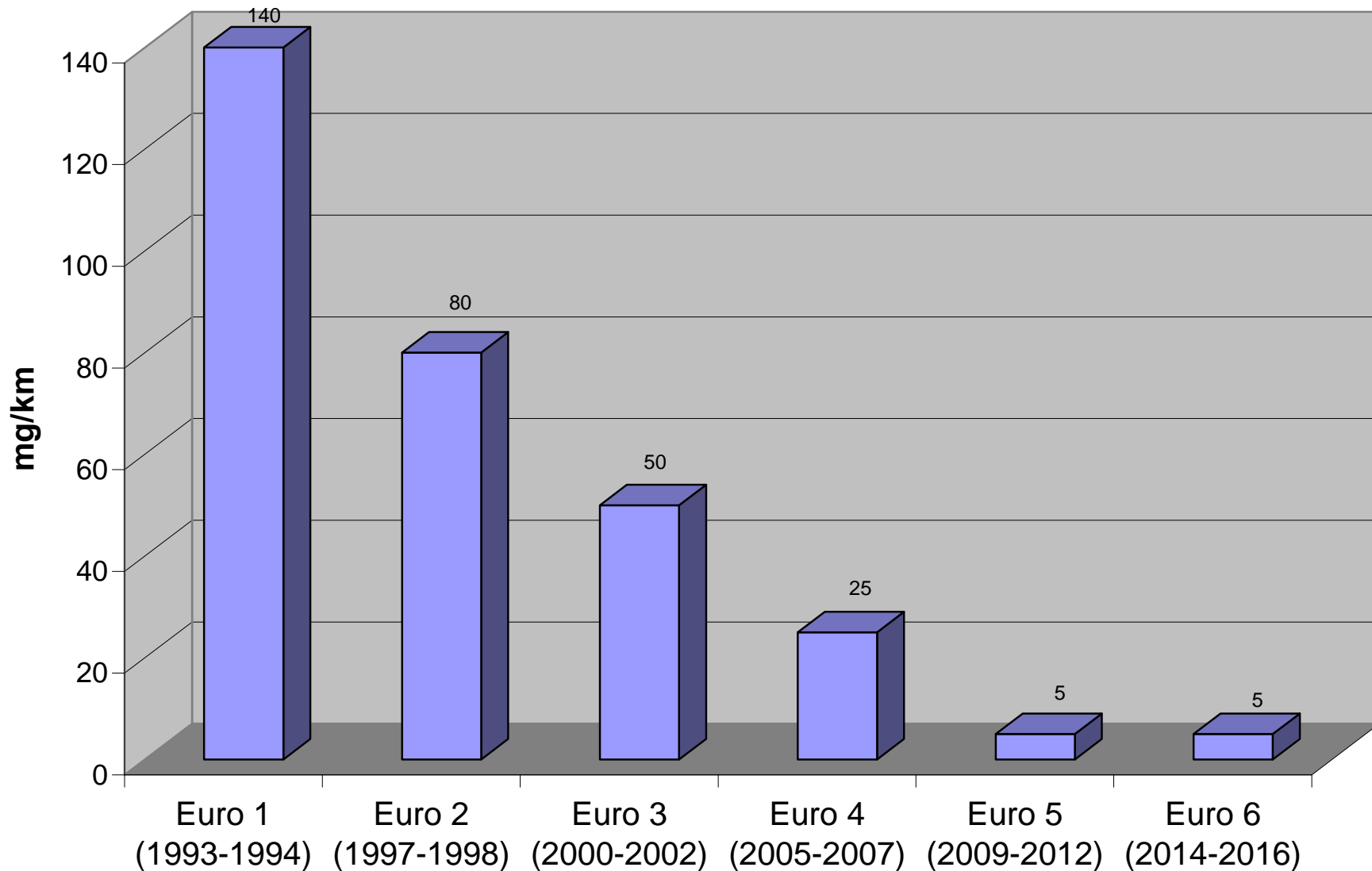
- **Euro 5 and 6 Regulation (715/2007)** entered into force 2 July 2007
- Adoption of the '**split-level**' approach, *i.e.* needs implementing legislation
- **Implementing Regulation (692/7008)** published on 28 July 2008
- A **Regulation** with direct applicability
- Extensive references to **UNECE regulations** wherever possible



Euro 5: Focus on Particulate Emissions

- Euro 5: applicable as from 1 September 2009 / 1 January 2011
- 80% reduction PM from CI diesel (from 25 to 5 mg/km)
- 90% reduction in PM from large diesel vans (from 60 to 5 mg/km)
- New PM standard for direct injection petrol engines (5 mg/km)
- Introduction of particle number limit ($PN \leq 6 \times 10^{11} / km$) for diesel vehicles by 1 September 2011 / 1 January 2013
- Revised measurement PM procedure
- PM OBD threshold limit: 50 mg/km

Evolution of PM emission limits



Euro 6: What will change?

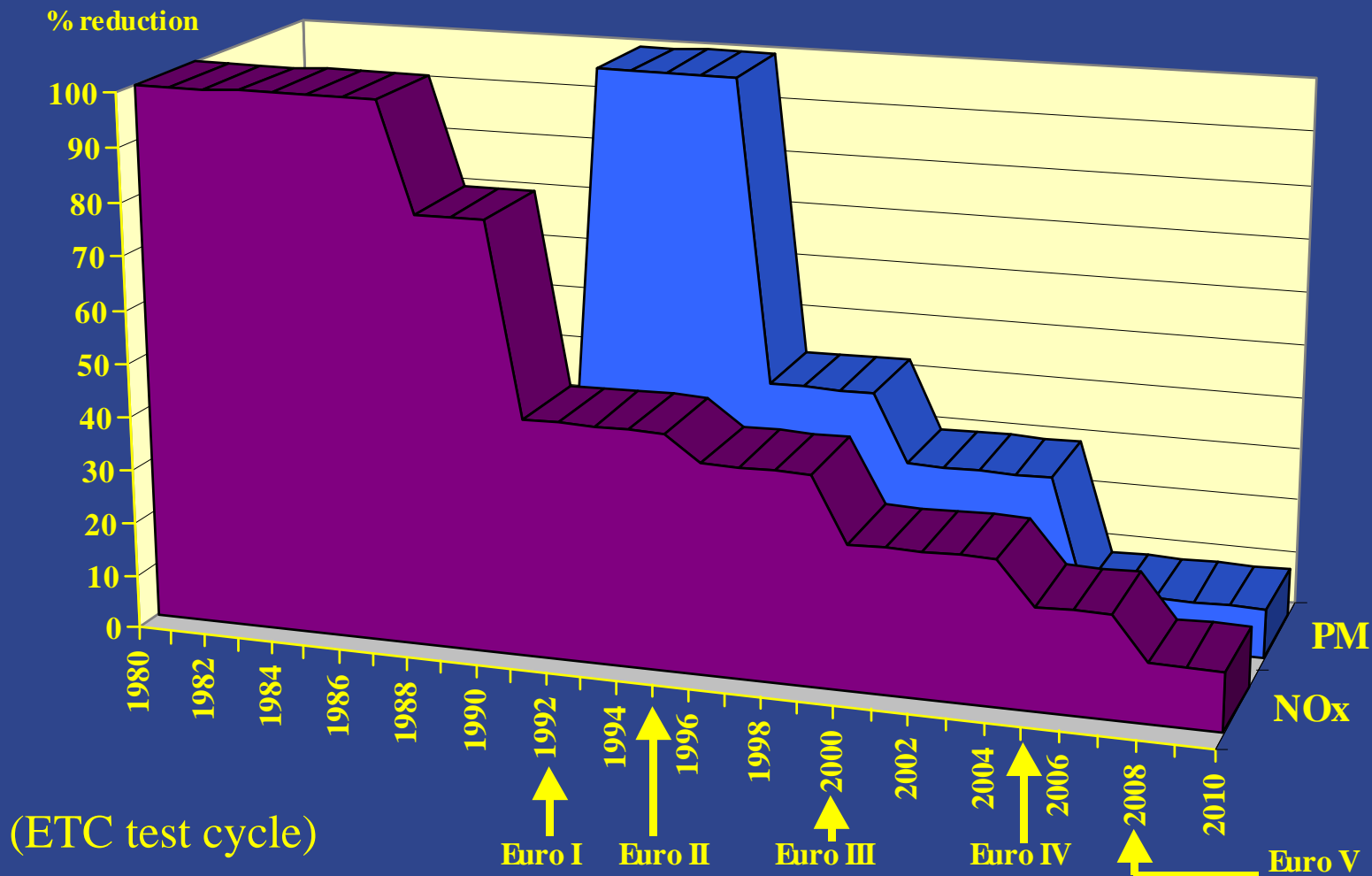
- Euro 6: **applicable as from 1 September 2014 / 1 September 2015**
- Focus on **diesel NOx** : 80 mg/km limit
- Particle number (PN) limit for **petrol vehicles**:
 - **Study** to be launched (by JRC)
 - Analyse **existing PN emissions**: numbers, chemical composition, ...
 - Health benefits: PN limit should be **same for petrol & diesel (?)**
 - **Technical feasibility** for reduction
- **Intended** OBD threshold limit for PM (PN): **9 mg/km (1,2 x 10¹¹ / km)** => monitoring for total/partial DPF failures?



HD **Euro VI** emission limits

- **Applicable from 2013 – 2014**
- **Key issues**
 - **PM/PN limits**
 - **NO_x reduction**
 - **technologies**
 - **CO₂ impacts**
 - **global harmonisation**

Heavy duty vehicles - Evolution of emission limits

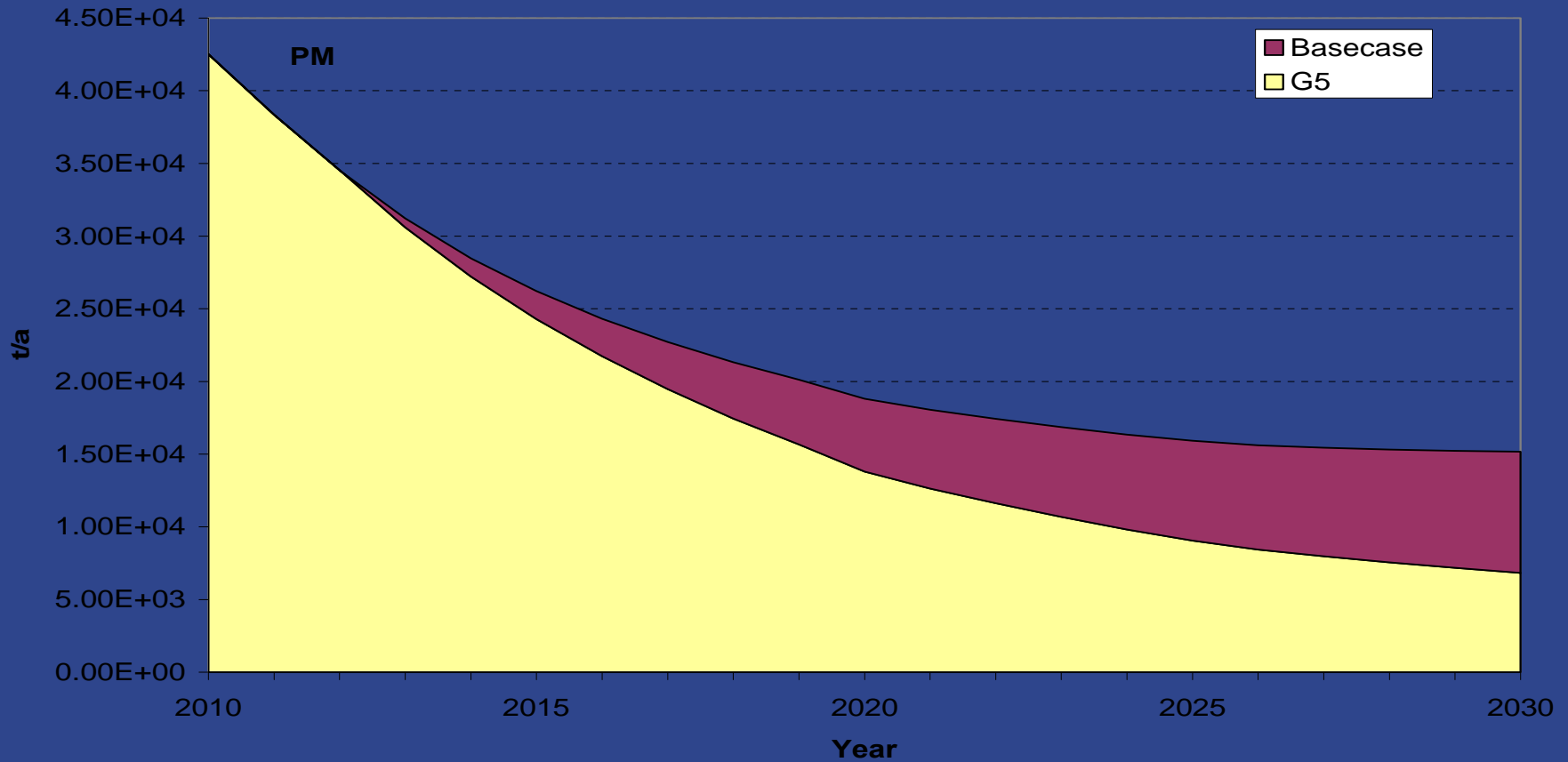


HD Euro VI emission limits

	CO (mg/kWh)	THC (mg/kWh)	NMHC (mg/kWh)	CH4 (mg/kWh)	NOX (mg/kWh)	NH3 (ppm)	PM mass (mg/kWh)
ESC (CI) -> WHSC	1500	130			400	10	10
ETC (PI) -> WHTC	4000	160			400	10	10
ETC (CI) -> WHTC	4000		160	500	400	10	10

ESC: European stationary cycle; ETC: European transient cycle;
 WHTC: World-harmonised transient cycle; WHSC: World-harmonised stationary cycle

HD Euro VI – total PM emissions





HD Euro VI – state of play

Split-level approach:

- **Co-decision regulation** – adopted by European Parliament & Council
- **Technical implementing regulation** – to be adopted by Commission with Committee in early 2010



HD Euro VI – PN limit

- Co-decision Regulation mandates Commission to establish **PN limit** in implementing legislation with reference to **technology used for meeting PM limit**
- **Issues at stake:**
 - **Technical basis** for definition of PN limit value, "best available technology", ...
 - **Implications on future technology implemented** for Euro VI (closed wall flow filter, open filters,...)
 - **Same/different** PN limit values for **WHTC** and **WHSC**?
 - Interpretation of **test data** supplied by industry and JRC
 - Influence of **active regeneration (Ki-factors)**

HD Euro VI – PN limit

- **Member States seem to support** a PN limit oriented at today's “main stream” technology for Euro VI, i.e. **wall flow filters**
 - Values « proposed » (for :
 - **5×10^{11} / kWh** (wall flow filter manufacturer)
 - **10^{12} / kWh** (Member State)
 - **3×10^{13} / kWh** (vehicle manufacturer not using wall flow filters)
- NB: these values have been proposed by individual stakeholders and **do not represent any consensus!**
- **WHSC: high loads & high passive regeneration** => more **porous** wall flow filters have **higher PN** and difficulties to meet demanding PN limit
 - **WHTC PN limit value** -> wall flow filter yes/no
 - **WHSC PN limit value** -> “maximum” porosity of wall flow filter

HD Euro VI – Retrofit systems

- Co-decision Regulation mandates Commission to establish **rules for financial incentives for retrofitting existing vehicles to Euro VI emission limits** in implementing legislation
- Working group chaired by the JRC has studied “harmonisation” of retrofit systems reducing particle emissions -> first draft on a **“system” approach** based on **minimum filtration efficiency** of the retrofit system (similar to the Swiss VERT)
- Key Member States support **“vehicle oriented” approach** (similar to German Anlage 27), i.e. **approval of individual combinations of retrofit systems/vehicles to Euro VI limit values**
- Issues: **off cycle** emission performance, **installation** requirements, **integration** of retrofit system (regeneration, safety, other pollutants,...), **conformity** assessment
- **UNECE Regulation**: “twin approach”, which leaves choice between “system” and “vehicle oriented” approach to retrofit system manufacturer???

Conclusion

- Continued air quality issues require further action on vehicle emissions
- Euro 5 and 6 Regulations for LDVs adopted
- Euro VI for HDVs: implementing Regulation being prepared
- More details:
http://ec.europa.eu/enterprise/automotive/index_en.htm



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THANK YOU
for your attention

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