



# European Motor Industry expectations towards Euro VI

## AECC Technical Seminar

Brussels, 25<sup>th</sup> October 2007

AECA





## Consultation on Euro VI

- ACEA supports the principles of better regulation endorsed in the conclusions of the CARS21 program.
- Commission must conduct a full and transparent impact assessment before deciding on a proposal for Euro VI.
- Public consultation:
  - No background information on the 4 scenarios:
  - Stakeholders unable to make a reasonable and rational comparison of the costs and the effects of the 4 proposed scenarios.
- Impact on fuel economy must be part of Euro VI policy considerations.



## Influencing factors for Euro VI

- Political pressure to adopt Euro VI limits that are similar to US2010.
- Comparison with US standards should take into account the specific rules applied by the US-EPA:
  - i.e. units, procedures, rounding rules, flexibilities, deficiencies, emission-averaging banking & trading, NTE rules etc).
- US applies “Averaging, Banking & Trading” system & FEL:
  - upper limit (cap) for the FEL of 0.65g/kWh NO<sub>x</sub> and 0.03g/kWh PM;
  - credits gained in the years prior to a new emission standard;
  - many engines will be certified to NO<sub>x</sub> and PM FEL's higher than the numeric limit values of 0.3g/kWh and 0.02g/kWh;
  - likely NO<sub>x</sub> levels will range between 0.4g/kWh and 0.65g/kWh.



## Influencing factors for Euro VI

- Scenarios A and D are broadly equivalent to US2010 in terms of the engine technology.
- Timing and introduction of standards:
  - Application of US standards can be spread over a number of years;
  - European limits apply to 100% production from a certain fixed date.



## ACEA proposal on Euro VI

- **A single Euro VI step** that sets emission limits which are technically challenging and achievable with sufficient industry lead-time.
- **Alignment of the Euro VI and US** emission standards must be the final goal of European policy makers:
  - technical feasibility to be fully demonstrated;
  - will produce a large air quality benefit with very high costs.
- Euro VI should apply **no earlier than 36 months** after the date of adoption of the complete Euro VI package:
  - Euro VI in the timeframe:
    - 1<sup>st</sup> October 2013 for new types and,
    - 1<sup>st</sup> October 2014 for all new registrations and sales.



## ACEA proposal on Euro VI

- **Euro VI NOx and PM:**

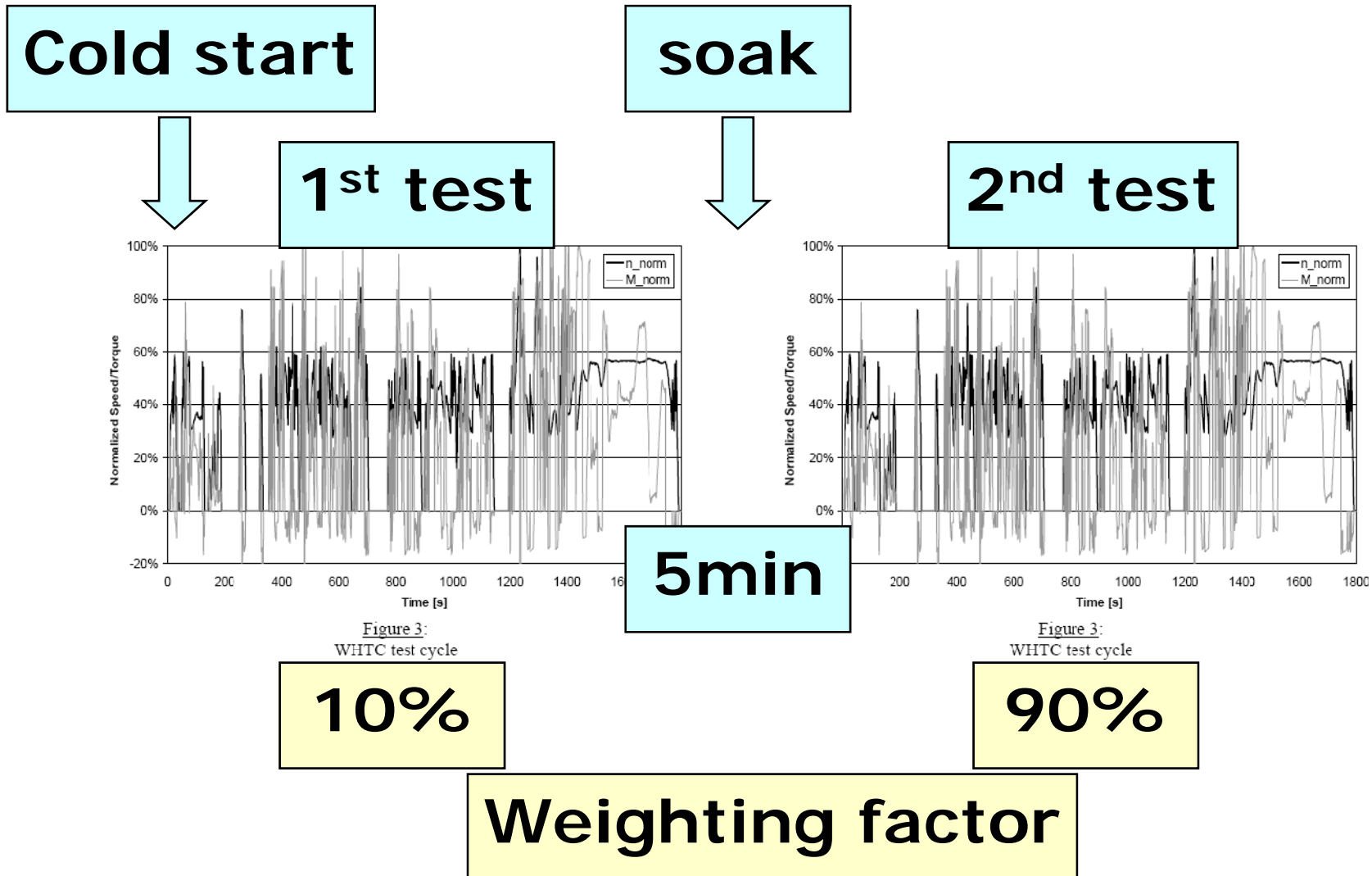
- Scenario 'A' (referred to the ETC), i.e. 0.4g/kWh NOx and 0.01 g/kWh PM.

- **Test cycles:**

- The WHDC cycle must be the basis for Euro VI:
  - UN-ECE Regulation No.49 to be completed;
- The Commission should adopt a Euro VI proposal this year on the basis of the ETC;
- The Commission must confirm its intention to introduce WHDC (UN-ECE Regulation No.49 version) through the comitology process;
- Regulation must establish the appropriate Euro VI WHDC-based emission limits on the basis of a well-established correlation between ETC and WHDC.



# WHTC procedure (UN-ECE R49)





## Approach

- Engine systems are optimised to comply with emission requirements while offering best performance and best fuel economy under conditions of use.
- Hence, engine maps might be shaped accordingly and it is very difficult to obtain a simple correlation between very different test cycles operating in different load/speed areas.
- This conclusion was already drawn in the report of the WHDC validation studies.



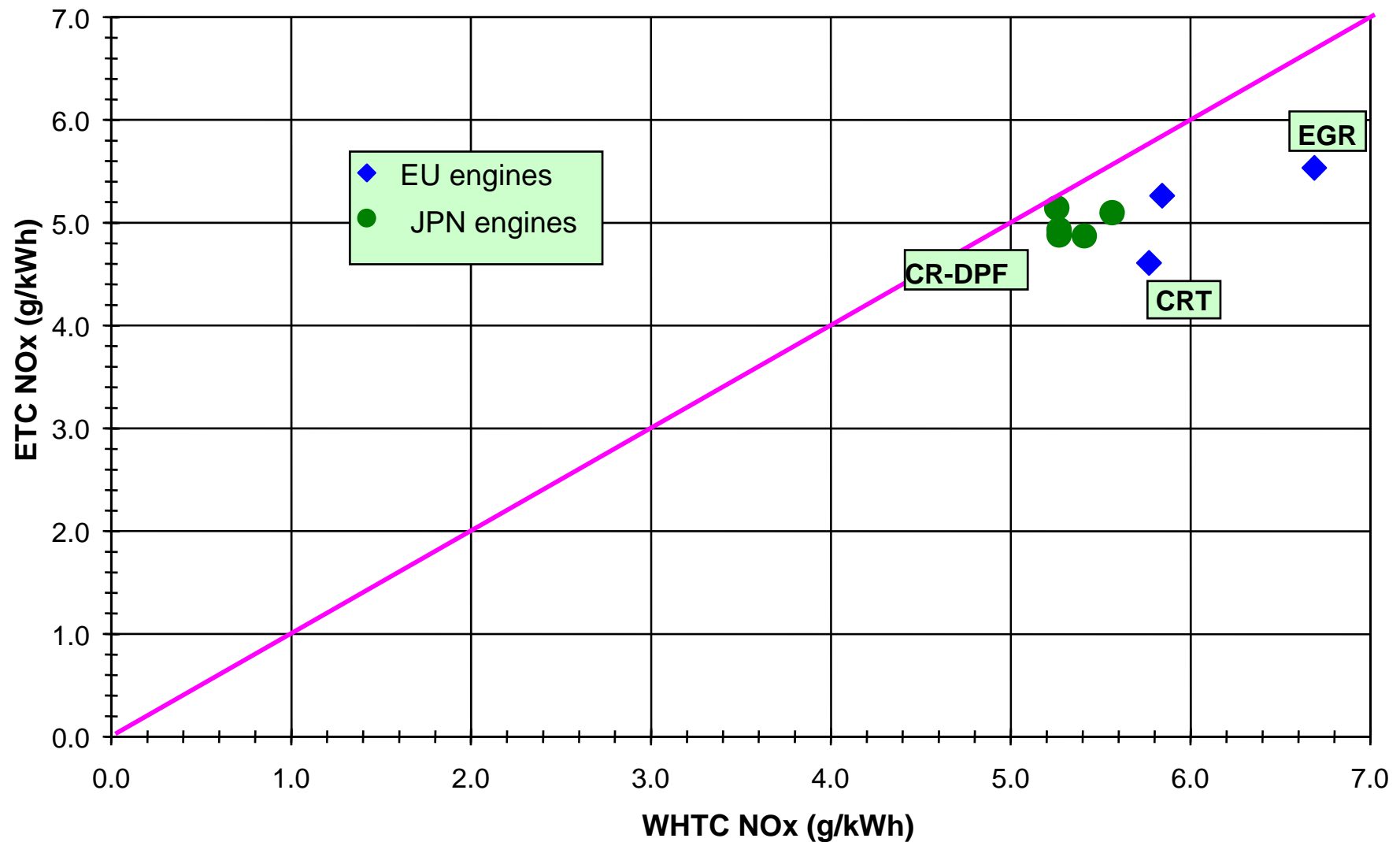


# Approach

- Introduction of cold start – hot soak – warm start procedure in the WHTC:
  - New requirements added which have a major influence on the engine calibration and, by default, to any test cycle correlation;
  - For this reason, a simple back-to-back testing of current production engines on different test cycles is not meaningful.
- Correlation ETC-WHTC:
  - ACEA focused on current / future engine systems with emission levels better than Euro V;
  - Applied engine calibrations taking into account the additional requirements of cold and warm start emission controls.



# ETC-WHTC hot pre-conditioning - initial situation





# ACEA correlation study (ETC R49)

Studies of all European OEM's

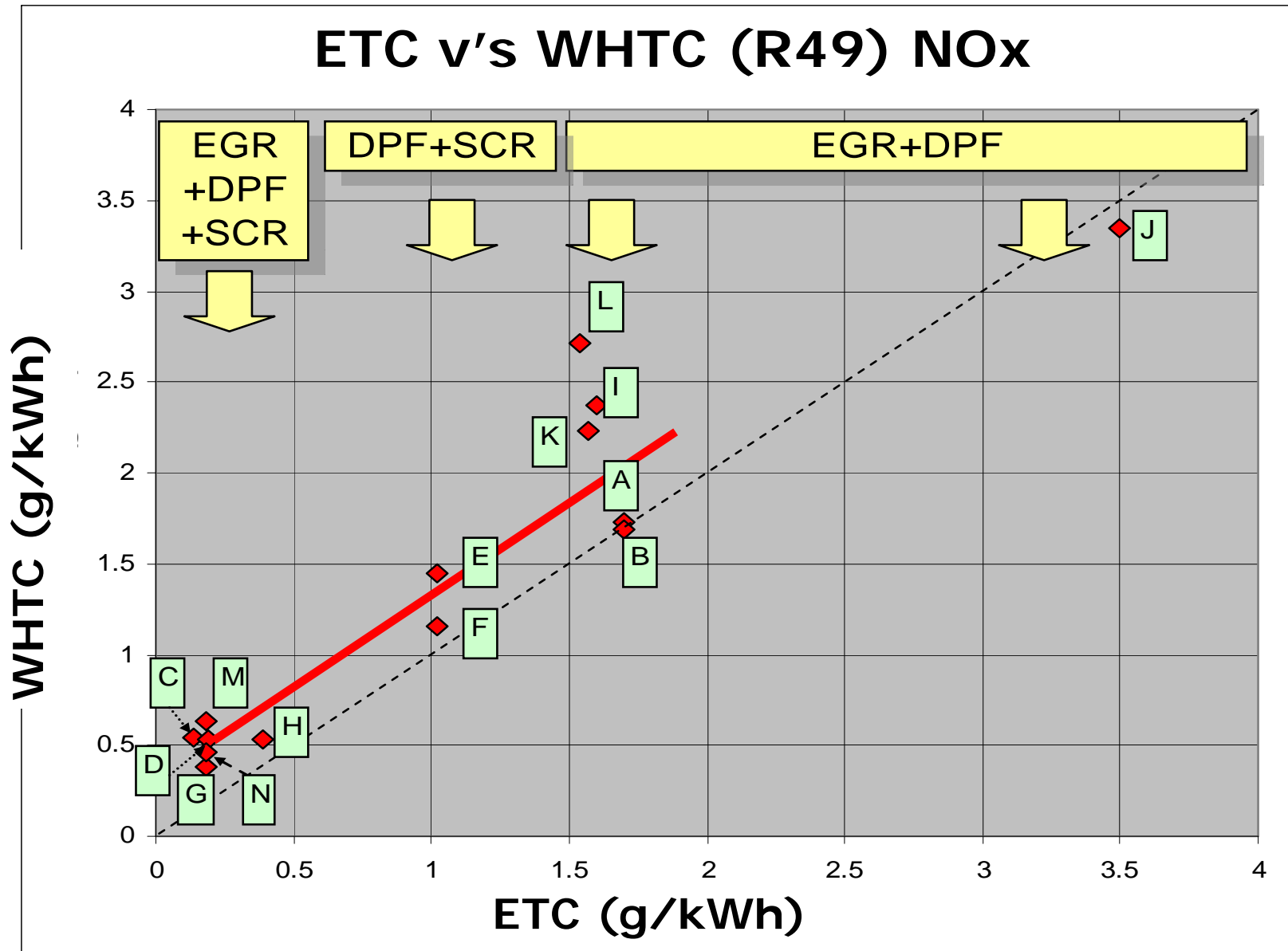
With advanced engine system technologies

At low NOx-levels g/kWh

	ETC	WHTC			cylinder number	displacement litre	max power kW	max torque Nm	Technology
	ETC	cold start	hot soak	combined					
A	1.7	2.23	1.67	1.73	6	12.8	362	2237	EGR+DPF
B	1.7	2.4	1.61	1.69	6	12.8	325	2237	EGR+DPF
C	0.14	2.38	0.44	0.54	6	12.8	362	2237	EGR+DPF+SCR
D	0.19	1.88	0.38	0.53	6	12.8	325	2237	EGR+DPF+SCR
E	1.02	2.5	1.33	1.45	6	6	220	1050	DPF+SCR
F	1.02	2.2	1.05	1.16	6	6	220	1050	DPF+SCR+thermal
G	0.18	1.34	0.28	0.38	6	12.8	335	2237	EGR+DPF+SCR
H	0.39			0.53	6	12.8	335	2237	EGR+DPF+SCR
I	1.6	2.23	2.38	2.37	6	12.8	335	2237	EGR+DPF
J	3.5			3.35	6	12.8	335	2237	EGR
K	1.57			2.23	6	10.5	287	1900	EGR+DPF
L	1.54	2.69	2.71	2.71	6	na	na	na	EGR
M	0.18	1.27	0.56	0.63	6	12.9	355	na	EGR+DPS+SCR
N	0.18	1.18	0.38	0.46	6	12.9	355	na	EGR+DPF+SCR thermal mgmt



# NOx correlation ETC-WHTC (R49)





## NOx correlation ETC-WHTC (R49)

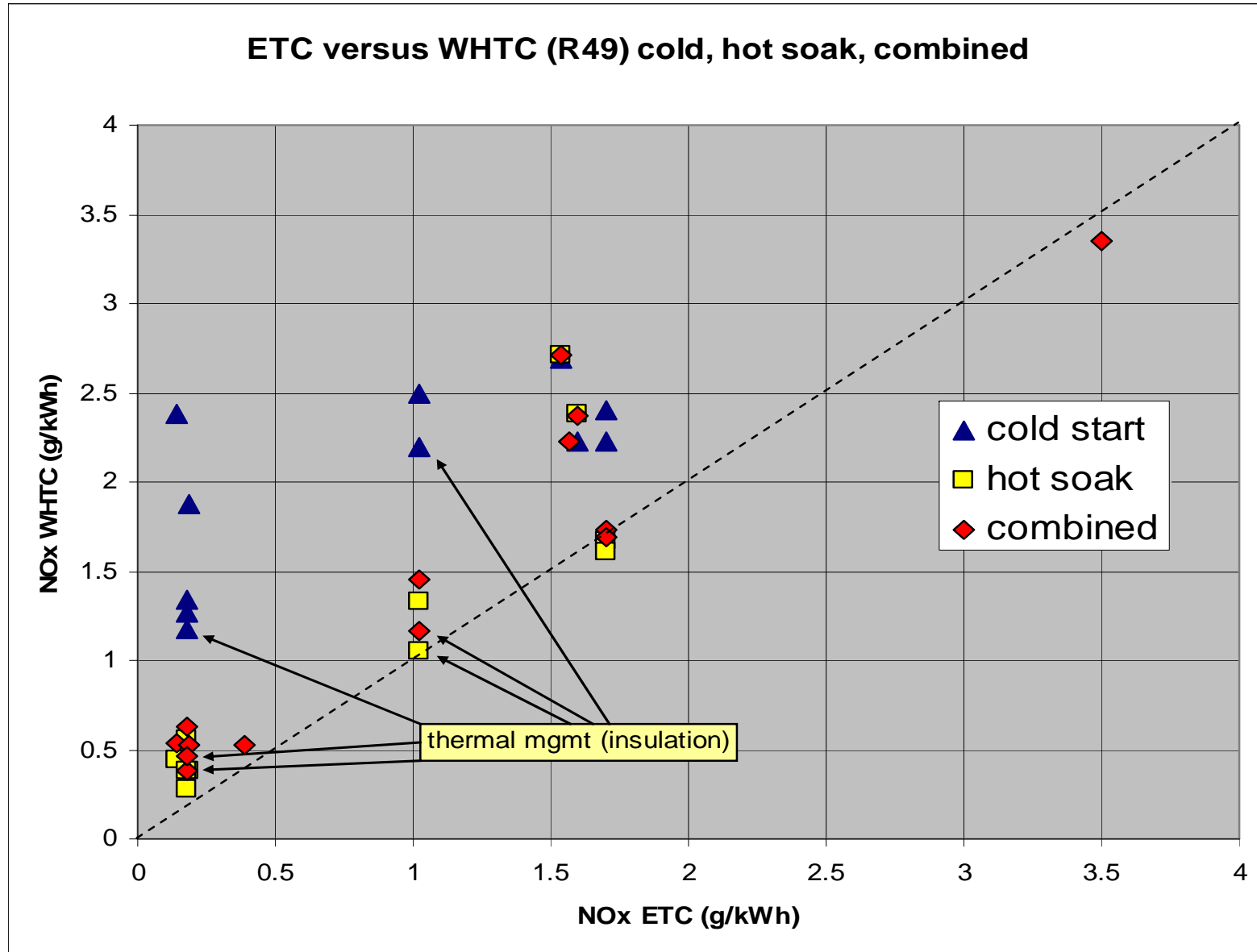
- The data supports the conclusion that an additive factor (offset) of 0.3 g/kWh is applied as follows:

$$\text{NOx}_{\text{WHDC}} = \text{NOx}_{\text{ETC}} + 0.3 \text{ g/kWh}$$

- Concerning PM, HC and CO it is proposed to apply a correlation factor of 1.0;
- These conclusions are only valid for the range of tested engine systems;
- Thermal management lowers both the WHTC-cold start and the hot soak test results but thermal management will not achieve a 1:1 correlation of the hot soak test with the ETC.



# Individual results cold-hot weighted





## What should be HDV contribution?

	<b>NOx limits modelled</b>	<b>NOx reduction in 2020</b>	<b>PM limits modelled</b>	<b>PM reduction in 2020</b>	<b>Cost</b>
<b>LD diesel</b>	65 mg/km	<b>263 kT</b>	2 mg/km	<b>21.7 kT</b>	€202 per vehicle
<b>HD diesel</b>	1.4 g/kWh	<b>125 kT</b>	0.01 – 0.015 g/kWh	<b>1.8 kT</b>	€1,159 per vehicle <sup>(1)</sup>
<b>Total CAFE reduction scenario from road transport:</b>		<b>388 kT</b>		<b>26 kT</b>	1.868 M€/year

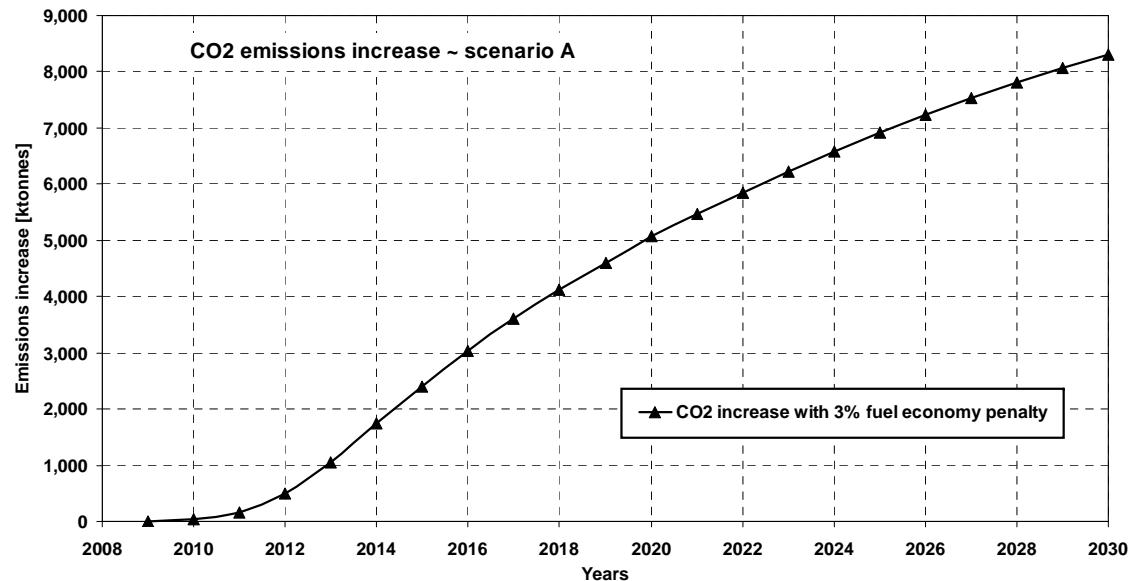
<sup>(1)</sup> Far lower than the ACEA costs for scenario 2 (NOx = 1.0 g/kWh) in the range €2,250 - € 4,000.



# Impact assessment

- No Commission impact analysis yet:
- ACEA's impact analysis shows the effect of Euro VI NOx and PM emission limits as per **Scenario A** will result in:
  - a reduction in NOx and PM of some 500kT and 3.25kT respectively by the year 2020;
  - a reduction in NOx and PM of some 800kT and 5.25kT respectively by the year 2030.

- 3% fuel economy assumed;
- Additional technical measures will also bring benefits;
- No need for Euro VII.







## ACEA supports

### Global Harmonisation:

- Priority – the Commission must establish Euro VI on the basis of a fully global WHDC:
  - World harmonisation of emission standards should represent the final goal of European policy makers;
  - World harmonisation should not be dictated by one Contracting Parties rules of today;
  - Final agreement on WHDC (options) must not penalise manufacturers through technical measures that would increase the stringency of any future emission limits.



## ACEA supports

### **Global Technical Regulations as part of Euro VI:**

- Worldwide Heavy-Duty On-Board Diagnostics (WWH-OBD);
  - Commission has already demonstrated its commitment to this GTR.
- Off-Cycle Emissions (OCE) and Portable Emission Measuring Systems (PEMS), when satisfactorily completed;
  - Based on the current OCE GTR proposal - the requirements as specified would represent a significant and additional change in severity of the Euro VI emission legislation and are more demanding than the US2010 NTE requirements.



## Test programs

- “Engine plus Aftertreatment” will not meet Euro VI:
  - The complete system has to be optimised;
  - Thermal management has to be optimised across the map;
  - Durability has to be demonstrated;
  - Fuel economy has to be realised;
  - The effects of biofuels have to be understood and catered for;
  - Technical solutions have to be adapted to production and packaging.
- As AECC has shown, if you apply all technical possibilities you can achieve ultra-low emissions but is that a cost-effective and sellable concept for the truck community?
- ACEA would welcome a joint program with AECC to look at future fuel effects.



## Summary

- A substantial proposal from ACEA.
- All stakeholders should recognise the contribution that the ACEA proposal will make to the reduction in NOx and PM emissions from heavy-duty vehicles.
- Policy makers should agree to play their part and achieve a Euro VI solution that is based on global regulations for heavy-duty vehicle manufacturers.
- A technology package applied globally will be a win-win for EU policy makers and for the competitiveness of the European industry.