EUROPEAN COMMISSION
DIRECTORATE-GENERAL
ENVIRONMENT

The Director-General

Brussels, 19 NOV. 2014
ENV.C.3 /Ares(2014)

NOTE TO THE ATTENTION OF MR DANIEL CALLEJA CRESPO
DIRECTOR GENERAL DG ENTR

Subject: Euro 6 real driving emissions

Dear Mr Calleja Crespo,

I am obliged to come back to you once again concerning the topics of Real World Driving Emissions under Euro 6 (and previous light duty emission standard) in the light of the newly incurred delays for a Commission proposal on implementing a real-world emission measurement protocol for Euro 6.

I understand the finalization of the Commission Decision implementing the 2011 compromise agreement reflected in the CARS 2020 Communication is now further postponed till end November and possibly December whereas it was previously agreed that the first step (communication phase) would enter into force from September 2014 onwards and the second step (regulatory phase) would apply from September 2017 onwards.

I am equally concerned about the Commission's continued openness to amendments of the draft text that aim at maintaining the current situation much beyond 2017 or even provide a legal basis for practices that are clearly irregular and have due consequences for human health, and for the integrity of the EU air quality policy framework.

Like myself, you must have been made aware of a recent study[1] which not only confirms the previous findings on Euro 5 exceedence by JRC, by Dutch and other vehicle tests laboratories. It also shows that for the new Euro 6 standard[2] once again diesel cars produced on average 7 times more NOx emissions than allowed by the type approval standard. In this study, 15 Euro 6 diesel cars were tested. For some of them NOx emissions were up to 20 (!) times above the standard..

[1] International Council on Clean Transportation: Real-world exhaust emissions from modern diesel cars. Vicente Franco et Al. 11 October 2014.
http://www.theicct.org/real-world-exhaust-emissions-modern-diesel-cars
[2] meant to reduce the NOx emission limit from 180 to 80 g/km

At such poor levels of compliance, diesel car emissions are amongst the single most important cause for the non-attainment of the NO_2 air quality standards[3] and the NOx emission ceiling.[4] Also in view of the WHO's classification of diesel exhaust as a carcinogenic in 2012, The Commission has started legal action against 17 Member States for non-conformity with the air quality legislation and more Member States will be subject to infringement procedures on exceedence of NOx concentrations in ambient air from 2015 on.

The situation is particularly serious for many reasons. Now that action to address the real world emissions has been postponed several times, the Commission will be seen as acting incoherently and even remaining passive facing the evidence on car emissions. We will project a situation which is clearly against the letter and the spirit of the EU type approval legislation, showing clear consequences on the integrity of the EU policy framework for internal market, air quality, human health, consumer protection and credibility of the EU.

We continue to believe indeed that DG ENTR should investigate the regularity (and if confirmed demand corrective action) of certain current practices documented extensively by the JRC and others, e.g. that certain manufacturers deploy emission abatement techniques that are switched off at low temperatures or when the vehicle needs additional power. I refer in particular to a recent reply by the Commission given to an inquiry of the Sunday Times[5], indicating clearly how the engine and depollution management beats the cycle during type approval under the currently prevailing testing procedures. This practice in our opinion goes beyond what is allowed by the Euro 5/6 legislation. A request to look into this matter more deeply has remained unanswered so far.

In view of the above, I have to ask you once more to finalize as a matter of urgency the drafting of the amending act and ensure its adoption and entry into force before the year's end and to resist further attempts from industry to water down provisions aimed at rectifying dubious practices. DG ENV is ready to accept a fast track ISC and will evaluate the draft decision on the basis of text that was circulated to Member States before the TCMV on 15 October. DG ENV will also continue to assist DG ENTR in ensuring that MS take positions that are coherent with the positions taken in the AQ Ctees and in the replies to the AQ-enforcement actions taken so far.

[3] Directive 2008/50/EC on on ambient air quality and cleaner air for Europe

[4] Directive 2001/81/EC of the European Parliament and the Council on National Emission Ceilings for certain pollutants (NEC Directive

[5] See attachment

We would also appreciate a parallel discussion on the actions that have been taken or could be taken to address at least the most extreme cases of apparent non-compliance with EU type approval legislation based upon evidence collected by the JRC or by other researchers. For that purpose I am proposing that DG ENTR and DG ENV address a joint letter to the Legal Service, asking advice on the type of actions that could be taken against practices that undermine the functioning both of air quality legislation and of the internal market.

Yours sincerely,

Karl FALKENBERG

[redacted] (ENV)

From: [redacted] (ENV)
Sent: 24 September 2015 15:56
To: ENV CAD
Cc: WENNING Marianne (ENV)
Subject: Ares(2014)3852283 - correction needed
Attachments: FW: The Sunday Times - Air pollution; press request LT 2014 09 22 vehicle emissions FINAL.DOCX

Importance: High

Dear colleagues,

Would it be possible to add an attachement to the above mentioned Ares file?
The Ares file is a note from Karl Falkenberg to Daniel Calleja. The note refers to an annex, which was not added.
The annex is the e-mail attached as well as the word document it contains.

Thank you very much in advance for confirming me that this is possible.
Kind regards,

[redacted]

[redacted]
ENV.C – Quality of Life, Water & Air

[redacted]

From: [redacted] (ENV) **On Behalf Of** WENNING Marianne (ENV)
Sent: Thursday, September 24, 2015 3:47 PM
To: [redacted] (ENV)
Subject: FW: The Sunday Times - Air pollution
Importance: High

From: [redacted] (JRC-ISPRA)
Sent: Thursday, September 25, 2014 11:47 AM
To: [redacted] (JRC); [redacted] (JRC); [redacted] (JRC); [redacted] (JRC); [redacted] (JRC); [redacted] (JRC); [redacted] (JRC-ISPRA); [redacted] (JRC-PETTEN); [redacted] (ENTR); [redacted] (ENV); [redacted] (ENV); [redacted] (ENTR); [redacted] (ENTR); [redacted] (CLIMA); [redacted] (ENTR); [redacted] (ENV); [redacted] (ENV); [redacted] (ENV); [redacted] (JRC)
Subject: FW: The Sunday Times - Air pollution
Importance: High

Dear colleagues,

Please find below the reply to The Sunday Times sent out this morning by DG COMM. Thank you to everyone for your collaboration.

Kind regards,

[redacted]

European Commission
Joint Research Centre

[redacted]

JRC Science Hub: https://ec.europa.eu/jrc

From: [redacted] (COMM)
Sent: Thursday, September 25, 2014 11:41 AM
To: [redacted]@sunday-times.co.uk'
Cc: [redacted] (COMM); [redacted] (COMM); [redacted] (JRC-ISPRA)

Subject: The Sunday Times - Air pollution
Importance: High

Dear [redacted]

Thank you very much for your e-mail requesting information for your article on air pollution generated by motor vehicles. We apologise for the delay in getting back to you.

Please find attached our detailed responses to the individual points you raised.

press request LT
2014 09 22 ve...

Thank you very much for your interest.

Best regards,

[redacted]

European Commission
Directorate-General for Communication
Spokespersons Service – Unit "Growth and Jobs"
[redacted]

EUROPEAN COMMISSION
JOINT RESEARCH CENTRE

Policy Support Coordination
Communication

Ispra, 25/09/2014

Re: Request from The Sunday Times on vehicle emissions

Dear [redacted],

Thank you very much for your e-mail requesting information for your article on air pollution generated by motor vehicles. We apologise for the delay in getting back to you.

Please find below our detailed responses to the individual points you raised:

1) ***One of the key factors in this European-wide problem appears to be that vehicles which have passed Euro Standards emissions tests in the laboratory emit much greater levels of pollution when in everyday use. I am trying to find out some of the reasons for this and would like to talk with some of the EC officials and scientists who know about the history and technical issues.***

Not all pollutants always exceed the emission levels measured during type approval (TA) tests (i.e. laboratory tests) in on-road emission tests. The emission tests conducted by the JRC in the laboratory and on road suggest that:

(i) Nitrous Oxide (NOx) emissions of diesel engine vehicles; and
(ii) particle number emissions of direct-injection gasoline engine vehicles

can exceed the established emission standards during on-road driving.

For the other regulated pollutants (carbon monoxide, total hydrocarbon emissions, particulate mass emissions of both diesel and gasoline vehicles, NOx emissions of gasoline vehicles), the established emission standards of light-duty vehicles are usually met both in the laboratory tests and on the road.

The JRC has already raised this issue in:

- a policy/scientific report (*A complementary emissions test for light-duty vehicles: assessing the technical feasibility of candidate procedures*):

(http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/27598/1/ld-na-25572-en-n_online.pdf)

- in the related news published online:

(https://ec.europa.eu/jrc/en/news/transport-emissions-jrc-lead-development-new-test-procedure-cars-9707)

In Europe, the compliance of emissions from passenger cars with regulatory standards is measured during a predefined test procedure in the laboratory (i.e. the current Euro 5 standard for diesel cars allows for 180 mg NOx emissions per kilometre).

Research carried out by the JRC suggests that this laboratory test does not accurately capture the amount of nitrogen oxides emitted by diesel cars on the road, which is substantially higher. In order to address those concerns, the Commission (JRC and DG ENTR) launched in January 2011 the "real-driving emissions of light duty vehicles" (RDE-LDV) working group, which aimed at developing a test procedure to directly assess the regulated emissions of light duty vehicles under real driving conditions. Following an in-depth analysis, on-road testing with the use of Portable Emission Measurements Systems (PEMS) has been considered to be the preferred option and was further developed. The main advantage of the PEMS-based procedure was the ability to test vehicles under a wide range of normal driving conditions in real time, thereby mitigating the risk that vehicles apply a special emission control strategy because of being on a test bench.

2) Apparently there are now discussions on changing these tests to ensure they reflect the way vehicles perform on the road, with a meeting involving manufacturers due on October 15. I also understand that one or more of the JRC institutes has been involved in this work. Can you tell me which ones?

The Institute for Energy and Transport (IET) of the JRC provides technical and scientific expertise for the development of the European legislation linked to road vehicle emissions. The legislative work in this context is led by:

- the Directorate-General for Enterprise and Industry for legislation on pollutant emissions; and
- the Directorate-General for Climate Action for legislation on carbon dioxide emissions.

The Technical Committee on Motor Vehicles (TCMV), comprising Member State representatives, will meet on 15 October 2014 to discuss a new on-road test procedure to assess real-driving emissions of light-duty vehicles. The new procedure, which is planned to be introduced already at the beginning of next year, will complement the laboratory-based type approval test and be used for testing the emissions of the regulated pollutants during the normal use of vehicles (on-road tests). From 2017 onwards, cars can only be type-approved if they comply with the regulatory limits according to the PEMS procedure within certain margins (so-called 'not-to-exceed' limits defined so as to ensure statistical robustness).

3) What I am also looking for initially is the published scientific research and EC policy documents outlining the problems with air pollution and the underlying issues regarding the Euro Standards tests and the reasons for changing them. Can you direct me to any of these documents and reports? I would be most grateful if you could help with this.

Please find below the links to two reports from the JRC:

- Analysing on-road emissions of light-duty vehicles with Portable Emission Measurement Systems (PEMS) (2011): http://ec.europa.eu/clima/policies/transport/vehicles/docs/2011_pems_jrc_62639_en.pdf

- A complementary emissions test for light-duty vehicles: assessing the technical feasibility of candidate procedures (2013): http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/27598/1/ld-na-25572-en-n_online.pdf

These reports document:

(i) the on-road emissions tests of light-duty vehicles being developed by the JRC. These reports already highlight the fact that the on-road NOx emissions of Euro 3-5 diesel cars exceed the applicable emissions threshold.
(ii) the first phase of the "real-driving emissions of light-duty vehicles" working group that was established to develop this type of test procedure for light-duty vehicles.

Both reports also contain explanations on the different levels of on-road and type approval emissions.

4) ***On the technical side I am particularly keen to learn just why the Euro Tests appear to have been so bad at predicting how vehicles perform on the road in terms of pollution.***

As indicated, the Euro standards have proved to be very efficient in lowering most pollutant emissions from vehicles since their introduction in the beginning of the 90s'. Problems which we currently observe refer **only** to diesel vehicles in terms of NOx and, to a much smaller extent, to particulate emissions from gasoline direct injection (GDI) engines. It should be noted that the latter issue has already been addressed by the introduction of a particulate number limit for GDI vehicles. Therefore, the statement that the Euro standards *'have been so bad at predicting how vehicles perform on the road in terms of pollution'* is justified only for NOx.

Regarding the technical aspects, there are a range of reasons for the differences of emission levels between on-road emissions and laboratory (type approval) tests. The type approval driving cycle NEDC (New European Driving Cycle), carried out in a laboratory, is based on driving patterns developed more than 25 years ago. The cycle requires only low accelerations and is limited to a maximum speed of 120 km/h. Thus, only a low amount of engine power is required.

This moderate driving leads to relatively low combustion temperatures, lean combustion conditions and consequently only a limited formation of NOx, which can be effectively removed by exhaust gas recirculation (EGR). If the vehicle is driven in more realistic conditions on the road, combustion temperatures increase and EGR is often deactivated to ensure sufficient power output. Moreover, EGR often remains deactivated at low ambient temperatures to ensure proper diesel combustion and to avoid water condensation in the cylinder/pipes. In summary, while EGR sufficiently reduces NOx at low acceleration and low engine loads during the laboratory test, it seems less effective unless other NOx after-treatment systems are introduced to reduce NOx emissions under normal driving conditions on the road.

In order to address those shortcomings, the European Commission has developed the real driving emission procedure (RDE) based on PEMS approach, which will more accurately measure the real life emissions of vehicles.

5) What has the JRC done on this?

The JRC was, together with DG Enterprise and Industry and DG Environment, a key player in the development of the new testing procedure providing scientific expertise in the area of vehicles emissions and testing procedures. In the broader context of vehicle emissions, the JRC has been analysing pollutant and carbon dioxide emissions of passenger cars both in the lab and on the road (with the portable emission measurement system – PEMS) for more than a decade. Based on this expertise, the JRC provides technical and scientific support to the relevant European Commission's policy services in Brussels for the development of new or revised test procedures.

6) Here is something I found already - who are these researchers and from what institute?

Scientists from the JRC Institute for Energy and Transport prepared the presentation you are referring to.

7) I am told that one key issue is that the standards set for vehicles being tested are very loose. This means that manufacturers can make all kinds of modifications to a "standard" vehicle being sent for testing, to ensure it performs far better than similar vehicles will actually do when on the road. Apparently this is known as "cycle beating". Here are some other examples of cycle beating tactics:

- *Programming vehicles' engine management system to recognise when a test is under way and then alter its behaviour to minimise emissions*
- *Installing systems that inject urea into the exhaust to remove NOx. This system works but needs a large canister of urea or constant replenishment. Most manufacturers install a small bottle which never gets refilled or only gets used during test cycles*
- *Use of special lubricants on test vehicles to minimise emissions*

The key issue in this respect is the fact that for the sake of reproducibility and repeatability of the tests, vehicles have been tested in strictly defined conditions. Those pre-defined conditions, due to many factors, e.g. higher power-to-mass ratio of contemporary vehicles, make the testing procedure outdated for ensuring that performance is reached under normal driving conditions. Having identified the problem, the Commission has performed extensive work over the last years, which has resulted in the above mentioned real driving emission procedure, which will change the paradigm of vehicles emission testing.

Regarding the measures mentioned in the question, it needs to be underlined that 'cycle beating' is illegal in accordance with European law and any manufacturer caught with such practices would face severe legal consequences. (Note that if properly implemented, urea injection is an effective NOx after-treatment (SCR). The new testing procedure should ensure that the car complies only if implementation is indeed robust (e.g. with adequate urea volumes)).

8) Another issue appears to be that there are a large number of laboratories that can give 'type approval' for new vehicles, including emissions testing. So far as I can tell there are more than 20 of these across Europe, all of them competing with each other for business and with no overall system for monitoring them and enforcing standards. This is a recipe

for disaster, with manufacturers able to choose whichever lab is most likely to give the result they want. Is this correct? Is there not a need for a single EC type approval laboratory? Has the JRC looked at any of this?

Type approval authorities are public and independent institutions performing vehicle certification in the Member States. This is by no means '*a recipe for disaster*', as type-approval authorities have the power to verify the type-approvals granted in other Member States. Such a set-up has been working properly for decades. Nevertheless, verification of its robustness will be assessed by the Commission during the on-going revision of Directive 2007/46/EC.

9) At the moment many European governments, especially in the UK, face infraction proceedings because of excessive air pollution. Part of this problem does indeed seem to be their fault - most have been far too slow to pay attention to this issue. However, part of that inactivity was because they were told that the European Emissions standards system would bring emissions down - a prediction which never came true. How is the JRC involved in efforts to put this right?

On the contrary, the Euro standards **have** reduced the level of emissions from vehicles. Since their introduction in 1992, the European emissions standards have effectively reduced emissions of most regulated pollutants, greatly improving the air quality in Europe as indicated explicitly in the paper: '*A global ex-post analysis of European emission controls in the road transport sector: what have we gained since the implementation of the EURO standards?*'; by R.Van Dingenen et. al, presented at the Transport and Air Pollution Symposium 2012.

The main exception is the specific case of NOx emissions from diesel vehicles where emissions in real life are higher than those on the test bench, but the problem will be addressed by the introduction of the new procedure.