



Brussels, 01 June 2012
ENTR.F1/KS D(2012)

RDE-LDV workshop of Member States of 3 May 2012: executive summary

Participants: DE, NL, SE, JRC, DG ENTR, DG ENV

General approach

Member States and the Commission agree on the general approach for the development of an RDE test procedure and respective NTE limits, as outlined in the preparatory document "Real Driving Emissions of Light Duty Vehicles: Meeting with Member States of 3 May 2012". Concerning the definitions of NTE limits, the importance of keeping in mind the principle of Regulation 715/2007/EC relating emission limits to normal conditions of use was emphasised, particularly in view of the air quality compliance problems caused across the EU by the real-world emissions from diesels. However, this principle may not have been fully recognised by all decision makers at the moment the Regulation was decided in the Council and the European Parliament, which must be considered when determining an appropriate lead time. Obviously, statistical uncertainties of the RDE test procedure (and the limited accuracy of PEMS test equipment under the wide range of normal on-road driving conditions, if applicable) must be reflected by the NTE limits.

Member States emphasised the need to implement the RDE test procedure in the type approval legislation in a binding manner (section 3.1 of the preparatory document). The final application date was a matter of debate since obviously air quality objectives compete with necessary industry lead time. There was a common understanding that the RDE test procedure together with NTE limits leading to a substantial reduction of NOx emissions with respect to the current situation should be applied at earliest from the mandatory Euro 6 dates onwards and at latest from 1 September 2017/18 (for all new type approvals/newly registered vehicles). The RDE test procedure could already be applied earlier with no or substantially less demanding NTE limits. The final application dates depend of course on the severity of the RDE requirements and can only be fixed after the RDE test procedure and NTE limits are decided. There was also a common understanding that RDE requirements could come in several steps, i.e. the NTE limits may become more severe in e.g. 3 years intervals (without making major changes to the RDE test procedure).

Member States did not support the "soft law approach" outlined in section 3.2 of the preparatory document. Such an approach would shift the burden and responsibility of compliance with air quality objectives from vehicle manufacturers to Member States (including regions and communalities) and citizens, which is politically not justified. In addition, its effectiveness is highly questionable. Only NL showed some interest in the "soft law approach" for granting potential future financial incentives related to environmentally well-performing vehicles.

Boundary conditions of the RDE test procedure

The JRC presented a consolidated preliminary list of boundary conditions for the future RDE test procedure with input from ACEA and DE. There was consensus that boundary conditions, in particular those in relation to dynamic characteristics such as speed, cannot be decided yet, therefore the list should be considered as a first, informal exchange of views. The boundary conditions should represent a wide range of European driving and environmental conditions and are not likely to constitute a major source of dispute.

Candidate RDE test methods

The JRC presented a consolidated assessment matrix of the two RDE candidate test methods (random test cycle and on-road emissions testing with PEMS). Participants identified the following most relevant elements differentiating between the two test methods:

- Cycle detection and potential beating: in order to be tested on a chassis dynamometer many Euro 6 vehicles will have to run in a special "test mode". Even if this is not the case, the vehicle ECU may easily identify the vehicle as being tested based on a range of parameters (other than the driven speed profile) and could therefore apply particular emission control strategies not applied under real-driving conditions. A random cycle RDE test method will therefore never be resilient to cycle beating.
- Boundary conditions: The application of a wide range of boundary conditions (ambient temperature/humidity, altitude, driving dynamics, ...) on the chassis dynamometer will be technically difficult, if not impossible and in any case very expensive. Even if vehicle manufacturers manage to do so, approval authorities will have difficulties to set up appropriate facilities due to limited financial resources, i.e., they would not be in a position to verify test results independently in a robust manner. Member States see a clear cost advantage for PEMS, at least with a mid- or long-term view, if the same range of boundary conditions is assumed for both methods.
- Human factor: Any future RDE test procedure would have to be well described in terms of boundary conditions, for instance driving dynamics would have to be constrained by some "minimum" and "maximum" criteria (formulated e.g. in terms of RPA, acceleration, speed,...). However, the driving style of the driver at a PEMS test may still have a relevant influence on the emission result. At least for an initial type approval test this "human" factor would be largely controlled by the vehicle manufacturer. A random test cycle, if correctly implemented (e.g. by a standard software used by all technical services according to common rules), could in principle eliminate this human factor.

There was consensus that a future RDE test procedure needs at least some robust PEMS element. It should be considered whether the RDE test procedure could be at least initially limited to NO_x and CO emissions¹ of diesel vehicles, but could be extended to other vehicle categories/pollutants, if there is an environmental need. In any case, particle number emission of positive ignition vehicles would also be subject to a RDE test procedure as from 1 September 2017/18 (which could be

¹ Even CO emissions are not of major concern for air quality, they are considered to be good indicator for the functioning of the oxidation or 3way catalyst. The PEMS measurement of HC is relatively complex (albeit not impossible) due to the need of on-board gas bottles and the high energy consumption of the FID.

different from the one applied to diesel vehicles). After an intense discussion participants agreed on two possible ways forward:

- (1) Use of PEMS as RDE test method for initial type approval and in-service conformity testing (not to be applied at conformity of production).
- (2) Use of PEMS at in-service conformity testing. At type approval the vehicle manufacturer could have the choice of using PEMS or the random test cycle for demonstrating conformity with RDE requirements. This option would solve potential logistical problems, which were claimed by vehicle manufacturers for the application of PEMS at the initial type approval (since they can choose the random test cycle).

If this option is chosen, both methods would have to be developed further. The JRC would focus on the development of PEMS, in close collaboration with stakeholders. Manufacturers would have to provide the main support for the development of the random test cycle, with limited involvement of the JRC, Member State experts and possibly a contractor. Before a final decision on the methods to be applied at the initial type approval can be taken, the equivalence of the final procedures (i.e., test method, boundary conditions, test evaluation and NTE limits) would have to be examined.

Participants emphasised that the PEMS method must be implemented such that the influence of potentially biased "human factors" and/or vehicle samplings is limited. This could be done for instance by mandating the responsible type approval authority to take into account PEMS tests performed by other parties (according to the specified procedure) for in-service conformity tests.

Presentation of emissions testing with PEMS and the random test cycle (JRC and NL)

The emissions tests conducted by the JRC on one Euro 6 and two Euro 5 diesel passenger cars indicate that:

- The random cycle generator is functional; the designed test cycles show good drivability (for a limited range of boundary conditions in terms of driving dynamics) with acceptable deviations between the scheduled and the actual vehicle speed. A random test cycle is technically feasible. To ensure an acceptable driveability of such cycles, narrowing down the boundary conditions might be necessary to a limited extent.
- The NO_x emissions over the random cycle exceed established emission limits by up to a factor of 2-4 while on-road emissions may exceed emission limits by much higher factors. The random cycle may indeed cover a relatively large range of on-road emissions as they occur during normal urban and rural driving. However, NO_x emissions as occurring during long periods of high-speed driving above 80 km/h on motorways and severe uphill-downhill driving exceed substantially the emission values established during random cycle testing.
- The presented results for one Euro 5 diesel car over the NEDC suggest strong dependency of emission values on the start temperature of the engine. This finding underlines the critical importance of cycle detection and a too narrow calibration of vehicle technologies for the actual emission performance of light-duty vehicles. The findings of the JRC also cautions against underestimating the effects of cycle detection of Euro 6 vehicles during random cycle testing: if the complex interaction of urea dosing, SCR light-off, and EGR rate are adapted to

any random test cycle, emission results may differ substantially from the actual on-road emissions during normal vehicle use.

TNO presented similar test results of a Euro 5b diesel vehicle, which only complied with the NO_x emission limit when the NEDC was driven with a start temperature between 20 and 30 degrees Celcius. In most other tests, including a hot start NEDC, the CADC and PEMS tests, the NO_x emissions were 2-8 times higher. Tests with a second vehicle gave identical results.

RDE-LDV audio/web conference of 11 May 2012: executive summary

Participants: DE, FR, NL, SE, JRC, DG ENTR, DG ENV

The purpose of this audio/web conference was to revise the conclusions of the 3 May workshop and to give additional Member States an opportunity to participate to the discussion. The Commission representative mentioned that before this meeting emails from UK and ES were received supporting the use of PEMS at least at some stage in the RDE test procedure.

In the further discussion the participating Member States (including FR, which was not present at the 3 May meeting) confirmed their commitment to the approach lined out above. The JRC mentioned that the plan for vehicle back-to-back testing (PEMS and random test cycle) of ACEA is still missing to date and a reminder would be sent out. The following next steps were agreed:

- (1) Presentation of recent JRC (and TNO) test results at the RDE-LDV meeting of 24 May
- (2) Discussion of the evaluation matrix of the two test methods
- (3) Commission service recommendation to use approach 3(1) or 3(2) described above, which would be supported at least by DE, FR, NL, SE, UK and ES.
- (4) Opportunity for industry feed back with a view to a final decision to be taken at the following RDE-LDV meeting scheduled for end of June.

RDE-LDV audio/web conference of 1 June 2012: executive summary

Participants: DE, FR, NL, SE, JRC, DG ENTR, DG ENV

At the last RDE-LDV meeting of 24 May vehicle manufacturers expressed strong reservations against using PEMS at any stage of type approval (initially and at in-service conformity). Member States however confirmed that PEMS will have to be used at some stage to guarantee robust NO_x emission measurements under real driving conditions. Although the arguments raised against PEMS were not very convincing to Member States and the Commission services, the following additional regulatory approach was generally discussed (in addition to options 3(1) and 3(2) above):

- (3) PEMS method is developed as "gold standard" for NO_x RDE assessment.
 - Random test cycle is developed in parallel as "demonstration" method, the two methods should be "technically equivalent".

- Manufacturers may use either PEMS or the random test cycle at type approval and in-service conformity testing.
- All Member States (i.e. not only the approving type approval authority!) may survey the in-service emission performance of vehicle families according to the well-defined PEMS method or the random test cycle.
- If non-compliance is identified, the case has to be reported to the approving authority and there is a mandatory further investigation for compliance based on the "gold standard" PEMS method, involving the complaining Member State, the approving authority (which may be from the same or a different Member State) and the vehicle manufacturer. If final non-compliance is established well defined and effective consequences for the manufacturer in a defined time frame are necessary.
- Member States emphasized in that context that Euro 6 ISC requirements (i.e. statistical evaluation, consequences in case of non-compliance) need to be improved. Current Euro VI requirements (Art. 12 of Regulation (EU) No 582/2009) should therefore be the minimum standard.

In the following discussion it became clear that the effectiveness of the regulatory option (3) largely depends on the actual amount of in-service surveillance testing with PEMS and the credibility of possible sanctions for non-compliance in order to create sufficient incentives for actually reducing the NOx emissions under real driving conditions. Given the current tight budgetary situation Member States had no clear view on this. The Commission representatives however emphasised that a certain level of surveillance testing by Member States will also be necessary if regulatory options (1) or (2) are chosen and the role of surveillance testing will need to be better implemented in the Euro 6 Regulation. Member States agreed and confirmed that some surveillance testing will be done anyway, but obviously regulatory option (3) would require the highest effort in this respect. Finally the participants agreed that at the current stage no final decision can be taken whether option (3) would be acceptable.

At the RDE meeting of 28 June the following ways forward will be presented:

- Adopt regulatory option (1), i.e. only PEMS will be developed further by JRC, with an offer to all stakeholders to join this process actively
- Adopt regulatory option (2) and possibly option (3), if Member States conclude that the latter is tenable after analysing budgetary and organisational implications (decision will not be taken before the end of 2012). In this case JRC would develop the "gold standard" PEMS procedure and industry would be in charge of developing the random test cycle with limited involvement of Member States and the Commission (NB: the random test cycle could be used for regulatory options (2) and (3) alike, to be decided at a later stage).

=> The further pursuit of regulatory options (2) or (3) will mainly depend on the willingness of vehicle manufacturers to shoulder the development of a random test cycle.

Additional note for clarification from 8th June 2012:

RDE requirements should apply to all vehicles in the scope of Euro 5/6 regulation. RDE discussions showed some support on side of Member states that it should be checked whether focus of RDE procedure could be NO_x and CO in the 1st step when using PEMS as RDE method (= exclusion of e.g. hydrocarbons).