



2018-01-18

Project Plan for the CEN Workshop on real drive test method for compiling comparable emission data (WS 90)

Workshop

(approved at the Kick-off meeting on 2017-11-28)

1. Status of the Project Plan

Draft Project Plan to be approved at the Kick-off meeting of the Workshop.

2. Background to the Workshop

2.1 Context of European vehicle emissions regulations

Vehicle emissions have been regulated in the EU since the early 1970s. The Council Directive 70/220/EEC of 20 March 1970 on the approximation of the laws of the Member States relating to measures to be taken against air pollution by gases from positive-ignition engines of motor vehicles¹, defined a chassis dynamometer test cycle protocol and specified limits on emissions of carbon monoxide and hydrocarbons. In the early 1990s, Council Directive 91/441/EEC of 26 June 1991² amended Directive 70/220/EEC to introduce the New European Driving Cycle (NEDC) to be used to regulate emissions of carbon monoxide, hydrocarbons, NO_x and particulate matter for both petrol and diesel vehicles. The NEDC specifies a vehicle speed for each second of the test carried out on a chassis dynamometer in a laboratory under specified temperature and pressure conditions.

The vehicle emissions standards referred to as Euro standards have been progressively tightened. The latest Euro 6 standards, originally conceived in 2007³ for passenger cars and light commercial vehicles, were adopted in 2012⁴ and entered into force for new vehicles from 2014.

¹ Directive 70/220/EEC <http://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX:31970L0220>

² Directive 91/441/EEC <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:31991L0441>

³ Directive 715/2007 <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1492107150906&uri=CELEX:32007R0715>

⁴ Directive 459/2012 <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012R0459>



All vehicles sold in the EU and EEA are required to meet the relevant Euro standard before they are introduced to the market, a process known as emissions type approval⁵.

From 2004, the EU funded research into the use of Portable Emissions Measurement Systems (PEMS) to measure heavy-duty vehicle emissions as part of in-service conformity emissions checks⁶ included in the heavy-duty type approval legislation⁷. The early development of PEMS technology was therefore motivated by the need to find a more cost-effective alternative to removing engines from heavy-duty vehicles for in-service testing on an engine test bench.

In 2007, Regulation 715/2007⁸, on type approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information. Specifically,

- i. Clause (15) states that the Commission should continue to review test procedures and cycles to ensure that real-world emissions correspond to those measured at type approval. Furthermore, that PEMS and the 'not to exceed' regulatory concept should be considered.
- ii. Article 4 (2) states that manufacturers ensure in-service conformity with emissions regulations for a period of either 5 years or 100,000 km, whichever is sooner.
- iii. Article 5 (2) prohibits the use of devices that reduce the effectiveness of emissions control systems in real-world driving (so-called defeat devices), unless
 - a. the device is needed to protect the engine against damage;
 - b. the device is only used during engine starting; or
 - c. the conditions are substantially included in the test procedures.
- iv. Article 14 (3) states that the Commission should continue to review test procedures and cycles with respect to their ability to accurately reflect emissions generated by real-world driving on the road.

The Commission's intention, as stated in this Regulation, is to ensure that the emissions test procedures accurately represent real-world driving such that the contribution of road transport emissions to air pollution could be reduced in time for implementation with the Euro 6 standards (i.e. from 2014).

At the same time the Joint Research Centre (JRC) (the European Commission's science and knowledge service), initiated the first research project to evaluate the suitability of PEMS for

⁵ Directive 692/2008 defines the type approval protocol for Euro 5 and 6 <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1492096718548&uri=CELEX:32008R0692>

⁶ http://publications.jrc.ec.europa.eu/repository/bitstream/JRC37578/7578%20-%20SESSION_C_PROCEEDINGS_Milan19_2111.pdf

⁷ Directive 2005/55/EC <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1492099801362&uri=CELEX:32005L0055>

⁸ Directive 715/2007 <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1492107150906&uri=CELEX:32007R0715>



emissions testing of Euro 3-4 light-duty vehicles, building upon their work on developing PEMS for heavy-duty vehicles. The final report⁹ published in December 2007 concluded that the NEDC test cycle did not represent real-world driving and that Euro 3 and 4 vehicles emitted 2-4 times more NO_x in the real-world compared to the respective emissions standard. The report recommended that PEMS systems should be further developed, and concluded that real-world testing was the only way to test vehicles at elevated motorway speeds.

The report proposed a method to normalise the real-world emissions results for varying driving dynamics between tests that is based on comparing the CO₂ emission on the road to the CO₂ emissions recorded during the NEDC test. This principle is referred to as CO₂ windowing and remains a key concept within the latest RDE regulations (now implemented in software known as EMROAD).

The JRC continued with a programme of research into real-world emissions testing using PEMS and in 2011, published a report¹⁰ that echoed the earlier 2007 report's conclusion that real-world NO_x emissions were several times higher (325 ± 90%) than the NEDC test results for a group of Euro 3 to 5 vehicles. The report also concluded that the PEMS equipment was able to provide 'reliable and accurate on-road emissions measurements for light-duty vehicles'.

The 2011 JRC report prompted the creation of a working group on real-driving emissions under the supervision of the EC. This working-group, was tasked with developing a new test procedure that would more effectively control vehicle emissions under normal vehicle operation and use. The JRC compiled a report¹¹ in 2013 outlining the intention of the European Commission to support the adoption of a complementary RDE test using PEMS.

2.2. EU Real Driving Emissions (RDE) regulations

On 28 October 2015, EU Member States voted on a draft proposal for an RDE regulation proposed by the EC that had been developed with participation from Member States, vehicle manufacturers and suppliers, technical services and NGOs in a working group called RDE-LDV¹². The text proposed to regulate real-world emissions on the basis of a conformity factor, a multiplier of the Euro 6 standard, which would cover the uncertainty of measurement of the PEMS equipment. This uncertainty was evaluated to be 50% and will apply starting from 2020, while a temporary conformity factor of 2.1 was allowed till then, if the manufacturer request it.

The RDE legislation was split into four packages¹³, with the first two packages published in March and April of 2016 as Directives 2016/427 and 2016/646 to amend Directive 692/2008.

- i. The first package, voted on in May 2015 and published in March 2016 (2016/427), includes the basic features of the RDE test, including the trip characteristics, description of data evaluation tools, technical requirements of the PEMS equipment, and reporting obligations.

⁹ https://ec.europa.eu/clima/sites/clima/files/transport/vehicles/docs/2007_pems_jrc_413194_en.pdf

¹⁰ http://publications.jrc.ec.europa.eu/repository/bitstream/JRC62639/jrc_62639_final.pdf

¹¹ http://publications.jrc.ec.europa.eu/repository/bitstream/JRC75998/ld-na-25572-en-n_online.pdf

¹² http://www.theicct.org/sites/default/files/publications/ICCTbrief_EU-RDE_201512.pdf

¹³ <http://www.theicct.org/RDE-test-procedure-exhaust-gas-pollutant-emissions-cars-and-LCVs>



- ii. The second package, voted on in October 2015 and published in April 2016 (2016/646) included the agreed conformity factors, the timetable for RDE implementation and a number of technical features, including the dynamic boundary conditions of the test and a limit on the altitude gain.
- iii. The third package, voted on in December 2016 and published on June 2017 (2017/1154)¹⁴, includes the introduction of a particulate number measurement and associated conformity factor, procedures for including cold starts and regeneration events in the RDE test, and provisions for hybrid vehicles. The same package introduced for the first time the possibility for manufacturers to declare that they emit even lower than the limit (i.e. the maximum value that any RDE trip might reach) in their Certificate of Conformity.
- iv. The fourth package, which is in its final drafting phase and expected to be voted by the Technical Committee by March 2018, is expected to cover in-service compliance and surveillance tests along with specific provisions for light commercial vehicles¹⁵.

The RDE legislation defines protocols for:

- Emissions limits
- Instrumentation and required specifications
- Trip specifications
- Boundary conditions that define test validity
- Verification of trip dynamic characteristics
- Data processing and normalisation for dynamicity
- Vehicle selection
- Reporting of results

The RDE test protocol is a clear improvement over the existing emissions type approval procedures, which are confined to laboratory tests, and it is likely to improve compliance with emissions standards in real world driving, as it did already for heavy duty vehicles. However, the RDE regulations are based on a Not-To-Exceed principle which means that each single RDE test needs to remain below the limits and is not designed to show the comparative or even average behaviour of vehicles. An indication of how good the vehicles really are is currently to be found in the declared maximum value. All RDE values during the type approval and the RDEmax can be found in publicly accessible and searchable databases of the manufacturers.

2.3 Need for public real-world emissions data

¹⁴ All three regulations can be found at: https://ec.europa.eu/growth/sectors/automotive/legislation/motor-vehicles-trailers_en

¹⁵ <http://www.theicct.org/RDE-test-procedure-exhaust-gas-pollutant-emissions-cars-and-LCVs>



The Euro 6d-TEMP standard applies to new types from 1st September 2017, followed by all new vehicles from 1st September 2019. Euro 6d will then apply from 1st January 2020 for new types and 1st January 2021 for new vehicles. The RDE standard is not retrospective.

The context to this is that many European cities are in breach of NO₂ ambient air quality standards¹⁶ that became legal limit values in 2010. In the UK, the Department for Food and Rural Affairs (Defra), who have overall responsibility for air quality compliance, have been instructed by the High Court¹⁷ to revise their Air Quality Plan to bring NO₂ concentrations into compliance as soon as possible, rather than in 2020 (and 2025 for London) as originally planned¹⁸. The latest revised Draft Air Quality Plan from Defra¹⁹ has increased estimates of road transport emissions in light of the latest evidence for real world emissions from Euro 6 vehicles. Defra now predict that 31/34 zones in the UK will remain non-compliant with NO₂ regulation in 2020 (up from their previous projections of 8/43) and that 3/43 zones will still be non-compliant in 2025 with current policies, including RDE. The revised plan states that Clean Air Zones that impose a financial penalty on older vehicles (older than Euro 6 diesel and Euro 4 petrol) are likely to be the only way to achieve compliance with NO₂ concentrations in the most polluted zones. A schematic showing the timescales of the Euro standards and RDE along with the latest timeline for NO₂ compliance in the UK is shown in Figure 1.

Additionally, cities such as London²⁰ and Stuttgart²¹ have stated their intentions to take urgent action to improve air quality by restricting the access of diesel vehicles to their city centres.

Therefore, the implementation of RDE standards, while very likely to improve real-world NO_x emissions of compliant diesel cars, may be too long term to satisfy the urgent needs of European nations and cities to reduce air pollution.

As evidence of this, the Mayors of London and Paris recently announced a scheme to publish real-world emissions results for vehicles, based on data from Emissions Analytics with potential roadside monitoring data from the ICCT²².

¹⁶ Directive 2008/50/EC <http://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX:32008L0050>

¹⁷ <https://www.judiciary.gov.uk/wp-content/uploads/2016/11/clientearth-v-ssenviron-food-rural-affairs-judgment-021116.pdf>

¹⁸ <https://uk-air.defra.gov.uk/library/no2ten/>

¹⁹ https://consult.defra.gov.uk/airquality/air-quality-plan-for-tackling-nitrogen-dioxide/supporting_documents/Draft%20Revised%20AQ%20Plan.pdf

²⁰ <https://tfl.gov.uk/modes/driving/ultra-low-emission-zone>

²¹ <http://www.reuters.com/article/us-germany-autos-diesel-idUSKBN16028H>

²² <https://www.london.gov.uk/press-releases/mayoral/mayor-unveils-polluting-vehicle-checker-scheme>

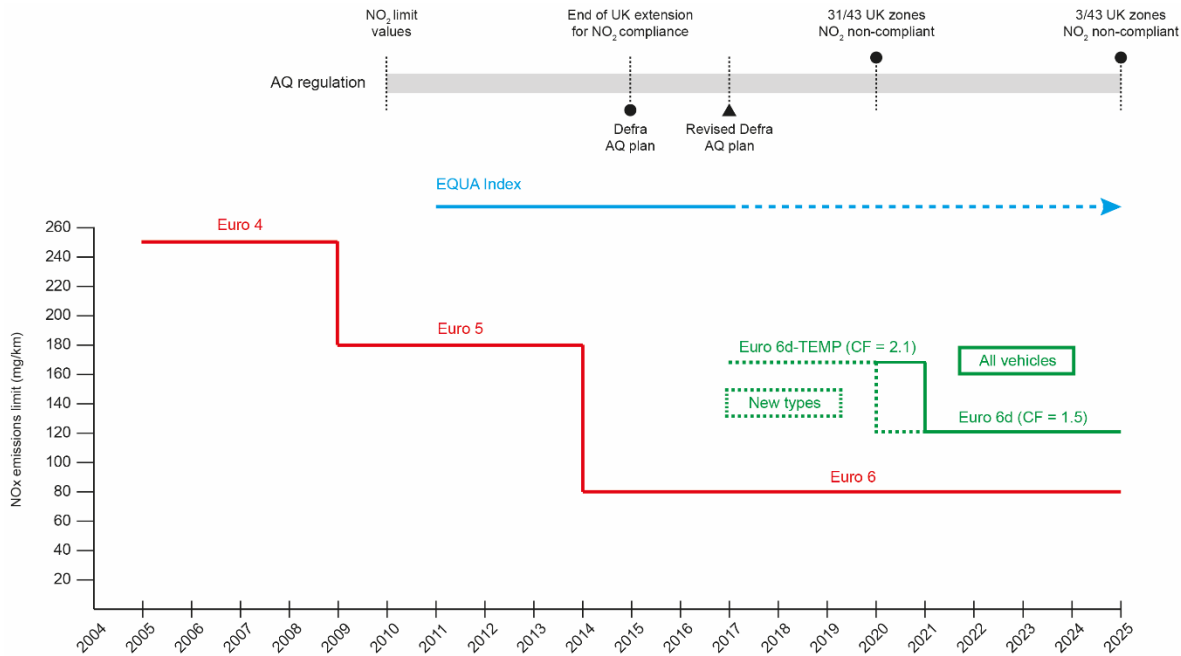


Figure 1: Timescales of Euro standards, RDE regulations, air quality plans and Emissions Analytics EQUA index

The motivation for this CEN workshop is therefore to define a method that would allow comparison of the real world emissions of vehicles under the same conditions of use. This would allow cities and regions to select the best and worst of vehicle for further measures designed to improve their air quality.. The method should prescribe protocols for implementation steps such that the emissions test result is robust to implementation by different operators

2.4 Benefits to consumers and policy makers

This CEN workshop aims to introduce a test to enable rating of the emissions performance of different vehicles for the purposes of comparison against each other. A real-world emissions test with published results will inform technical solutions, consumer choice and policy makers action. The RDE regulations are a significant improvement on existing emissions type approval regulations.

Comparisons of real emissions of vehicles would allow the best performing vehicles to be recognised, consumers to make informed purchasing decisions, and policy makers to set evidence based policies to reduce the air quality impact of road transport The overall benefit to consumers is of cleaner air in cities, reducing the health impacts of air pollution caused by road vehicles..

A number of policy options are being discussed to bring urban air quality into compliance with air quality standards. Two of the most high-profile policies are a ‘scrappage schemes’ and ‘clean air zones’ (CAZs). In both cases, the aim of the policy is to remove older vehicles from the road, with the assumption that these have significantly higher emissions than newer vehicles. In the



case of a scrappage scheme, consumers would be incentivised to switch from older vehicles to newer Euro 6 vehicles by way of a subsidy on the new vehicle. In the case of a CAZ, consumers are incentivised to switch newer Euro 6 vehicles by way of a financial penalty each time they enter a CAZ with an older vehicle.

However, given the evidence that only vehicles of the Euro 6d standards, i.e. those compliant with RDE regulations are the truly clean ones, such restrictions would have to be directed to such vehicles and not necessarily include all existing Euro 6 vehicles. If access restriction or charges are not based on the true real-world emissions, then some low-emitting vehicles could be prohibited and other high-emitting vehicles could be permitted.

The purpose of this CEN workshop is to provide comparable emissions test data by defining measurement standards and procedures that will generate results that can help consumers and policy makers make informed decisions to improve urban air quality.

3. Workshop proposers and Workshop participants

The proposer of this CEN Workshop is Emissions Analytics, a vehicle emissions and fuel efficiency data analysis and testing firm. It is privately owned, headquartered in the UK, with operations in Europe and the USA (Michigan and California). It measures and tracks real-world air quality, greenhouse gas emissions and fuel economy as an alternative currency to often misleading official figures. It conducts its testing independently and then makes the data and analysis available to the automotive marketplace.

Emissions Analytics conducts its testing exclusively using on-board tailpipe measurement with commercially available Portable Emissions Measurement Systems (PEMS). It has rolling test programmes in the UK and USA, testing around 500 vehicles per year.

Key achievements include:

- World's largest independent in-service test programme
- Largest commercially available database of real-time emissions data
- Over 1,500 vehicles tested to date
- Clients including governments, regulators, vehicle and engine manufacturers, Tier 1/2 suppliers and petrochemical companies
- Creating the EQUA Index to provide publicly-available real-world ratings of vehicles.

Emissions Analytics' expertise covers the test of passenger cars, vans, heavy commercial vehicles, non-road mobile machinery and marine craft – each using the same basic principles of testing vehicles in real-world operation using standardised, independent tests.

The list of interested stakeholders is included in Annex A.

4. Workshop scope and objectives



The CEN/WS intends to develop a CWA (CEN Workshop Agreement) which will define a standard test procedure that can be used to provide comparable emissions test data for different vehicles makes and models.

In particular, the CWA will specify a standard on road test procedure for real world emissions testing.

The resulting CWA is covered by copyright and the exploitation rights are with CEN.

5. Workshop programme

CEN/WS official language will be English. The CWA will be in English.

Three versions of the CWA will be produced during the CEN Workshop: first draft, one intermediate version, and a final version, according to the following milestones (dates and meeting places are tentative and subjected to confirmation).

CEN Workshop participants will decide at a later stage during the development of the CWA if the document will be submitted also to the public commenting phase of 60 days.

Tentative Time-plan*

Description	Time	Place	Duration
Announcement of the CEN/WS on CEN website	October 2017	CCMC	30 days' notice
CEN/WS Kick Off of Workshop	28 th November 2017	Brussels	1 day
Collection of inputs for the drafting of the first Draft content CWA	December 2017	N/A	
CEN/WS 1 st Plenary Meeting	18 th January 2018	Brussels	1 day
1 st Draft of the CWA deliverable	February 2018	N/A	N/A
Circulation of 1 st Draft CWA and collection of comments	March 2018	N/A	2 months
CEN/WS 2 nd Plenary Meeting	March 2018	TBD	1 day
Circulation of 2 nd Draft CWA and collection of comments	April 2018	N/A	1 month
CEN/WS 3 rd Plenary meeting and decision on next steps	May 2018	TBD	1 day
Circulation of 3 rd Draft CWA	May 2018	N/A	1 month
Publication of CWA deliverable after editorial check	June/July 2018	UNI/CCMC	2 months
* The Time-plan is subjected to be modified in relation to the drafting process of the CWA and to the eventual decision on the submission of the document to 60-days commenting phase.			



6. Workshop structure

The Workshop proposers suggest the following Workshop structure that has to be approved during the Workshop Kick-Off meeting:

Chair: Nick Molden (Emissions Analytics)

Main responsibilities:

- To preside at the Workshop plenary meetings
- To ensure that the Workshop delivers in lines with its Business plan;
- To manage the consensus building process
- To interface with CEN/WS Secretariat and CEN Management Centre regarding strategic indications, problems arising in the development of the CWA

Project leader: Marc Stettler (Centre for Transport Studies | Department of Civil and Environmental Engineering | Imperial College London)

Main responsibilities:

- To support the Chairman in the development process of the CWA
- To consolidate the comments received on the drafts during the enquiries and propose a resolution of comments for discussion with workshop participants
- With the support of the Secretariat, to prepare the drafts CWA to be circulated to CEN/WS participants

Secretariat: Elena Mocchio (UNI – Italian National Standard Body)

Main responsibilities:

- To offer the infrastructure for electronic operation (i.e. Livelink platform);
- To administer the CEN Workshop's members list(s) and official registration of participants;
- To manage documents and their distribution, and to update the document register;
- To prepare and distribute CEN/WS Documents (i.e. draft agendas and information on meetings arrangements, minutes of the meetings, draft CWAs, etc.);
- To chase actions as decided by the CEN Workshop meeting;
- To advise on the requirements of the CEN/CENELEC Internal Regulations and decisions of the CEN/CA and CEN/BT in the development of a CWA;



- To provide expertise in standardization and provide relevant standards to the Workshop, when or where necessary;
- To check conformity of all of the versions of the draft CEN Workshop Agreement to CEN rules;
- To initiate and manage the CWA approval process, upon decision by the Chairman;
- To record expression of support to the CWA for transmission to the CEN Management Centre;
- To participate to CEN Workshop plenary meetings, audioconferences and meetings with the Chairman.

7. Resource requirements

The registration and participation at this CEN Workshop is free of charge for every member of the Workshop, but each participant will bear his/her own costs for travel and subsistence.

The administrative costs of the Workshop Secretariat and other logistical support will be covered by Emissions Analytics.

8. Related activities, liaisons, etc.

Although the CWA does not address any issue specifically covered by a CEN/TC, the work carried out by the CEN/WS may be of some interest for CEN/TC 264 *Air quality* and CEN/TC 301 *Road vehicles*.

9. Contact points

Such as Workshop Chairperson, Workshop Secretariat, Editors, CCMC contact, etc.

Proposed Chairperson:

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Annex A - List of participants organisations

- ❖ ACEA - European Automobile Manufacturers' Association
- ❖ AIR - Allow Independent Road testing
- ❖ ANEC - European consumer voice in standardisation
- ❖ AUDI AG - N/ET-A33
- ❖ Brook Cottage Consultants Ltd
- ❖ Centre for Environmental Policy, Imperial College London
- ❖ Clean Air Lovers & Lobbyists
- ❖ CNH Industrial
- ❖ Consultants GmbH i.G.
- ❖ CUNA
- ❖ Deutsche Umwelthilfe e.V.
- ❖ Emisia Brussels
- ❖ HORIBA UK Limited
- ❖ Jaguar Land Rover
- ❖ King's College London, Environmental Research Group
- ❖ Lombardy Region (Italy)
- ❖ Opel Automobile GmbH - Groupe PSA
- ❖ P3 Group
- ❖ POLIS – European Cities and Regions networking for innovative transport solutions
- ❖ PORSCHE
- ❖ Senatsverwaltung für Umwelt, Verkehr und Klimaschutz
- ❖ Servei de Vigilància i Control de l'Aire Catalugna
- ❖ The Society of Motor Manufacturers and Traders Limited
- ❖ TNO – Sustainable Transport and Logistic Group
- ❖ University of Technology Graz - Institute for Internal Combustion Engines and Thermodynamics
- ❖ VDA - Verband der Automobilindustrie (German Association of the Automotive Industry)
- ❖ Volkswagen Aktiengesellschaft