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Consideration and vote by AC.3 of draft gtrs and/or draft amendments to established gtrs :
Proposal for a new gtr on the measurement procedure for two- or three-wheeled motor vehicles equipped with a combustion engine with regard to on-board diagnostics

Technical report on the development of draft global technical regulation on the measurement procedure for two- or three-wheeled motor vehicles with regard to on-board diagnostics

Submitted by the Working Party on Pollution and Energy*

The text reproduced below was adopted by the Working Party on Pollution and Energy (GRPE) at its seventy-third session (ECE/TRANS/WP.29/GRPE/73, para. 32). It is based on GRPE-73-18-Rev.1 as reproduced in Annex VII to the report. It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Executive Committee of the 1998 Agreement (AC.3) for consideration at their November 2016 sessions.

* In accordance with the programme of work of the Inland Transport Committee for 2016–2017 (ECE/TRANS/254, para. 159 and ECE/TRANS/2016/28/Add.1, cluster 3.1), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

Technical report on the development of global technical regulation on the measurement procedure for two- or three-wheeled motor vehicles with regard to on-board diagnostics

I. Introduction

1. The industry that produces two- and three-wheeled motor vehicles in the scope of this global technical regulation (gtr) is global with companies selling products in many different countries. The Contracting Parties to the 1998 Agreement have determined that work should be undertaken to address the environmental and propulsion unit performance requirements of two- and three-wheeled motor vehicles, among others as a way to help improve air quality internationally. This gtr is directed at harmonizing On-Board Diagnostic requirements (OBD) for two- and three-wheeled motor vehicles, though not fully similar as was targeted with gtr No. 5 for OBD requirements of heavy-duty motor vehicles. The common set of agreed rules in the area of OBD allows the Contracting Parties to realise their own domestic objectives and to pursue their own levels of priorities. Nonetheless, this gtr has been structured in a manner that facilitates a further extension of OBD requirements and to enhance the OBD objectives in the future.

2. An OBD system is an electronic system fitted on-board of a motor vehicle that has the capability of identifying the likely area of malfunction by means of fault codes stored in a computer memory which can be accessed by means of a generic scan tool. The Diagnostic Trouble Codes (DTCs), diagnostic signals like, e.g. data stream and freeze frame and the communication protocol are harmonized and standardized so that a repair person can efficiently determine which functionality of the vehicle is malfunctioning and analyse the failures before starting the actual repair of the vehicle. Generic scan-tools are widely available at a relatively low price and allow access to the OBD information without having to resolve technical incompatibilities and constraints. A major output of the OBD system is activation of a Malfunction Indicator (MI) on the instrument cluster to indicate to the driver that the vehicle is possibly broken and that the malfunction is serious enough to repair the vehicle as soon as possible.

3. For the purpose of coherency between gtrs on the same subject but with different motor vehicle types in its scope AC.3 underlined the importance of the principles laid down in gtr No. 5 regarding on-board diagnostic systems of heavy-duty motor vehicles, reading:

"*Recent years have seen a rapid increase in the number of vehicle functions that depend upon the use of electrical/electronic control. This trend is expected to continue. Further, the emissions control systems on highway vehicles are not the only systems for which OBD capability is important. Vehicle systems provided to manage or deliver safety control are also equipped with diagnostic capability. Recognizing this fact, and the negative implications that non-standardized diagnostics can have on maintenance and inspection procedures, this gtr has been structured such that further OBD functionality - e.g. OBD for safety related systems - could be added in the future as and when appropriate.*"

4. Despite different views within the EPPR IWG during the drafting process it has been possible to resolve controversial issues and bridge different positions of Contracting Parties and jointly develop wording that in the end was acceptable for country representatives and stakeholders. Herewith finding a common denominator in the complex field of OBD for two- and three-wheeled vehicles, allowing each Contracting Party to address national needs but on a solid basis of world harmonized requirements. The gtr text was drafted allowing harmonization to the extent possible and to pave the road for further converging of rules in the future.

II. Objective of the gtr on on-board diagnostics

5. The objectives of this gtr are:

(a) Able to provide an internationally harmonized set of functional OBD requirements on the "infra-structure" on-board of a motor vehicle in the scope of this gtr, which determines hardware and software design in a technology neutral way and that considers technical feasibility and cost-effectiveness, such as:

(i) Minimum monitoring requirements of electric and electronic circuits and failure mode detection as well as for monitoring of the control module(s) within the scope of OBD stage I;

(ii) Provisions regarding Diagnostic Trouble Codes (DTC), diagnostic signals and connection interfaces;

(iii) Provisions regarding access to OBD information which is needed as input to the repair process of a broken motor vehicle;

(b) Allowing referencing of international technical standards already established for other motor vehicle types with a proven track record of providing clarity for the design and configuration of the OBD system;

(c) Able to provide an internationally harmonized set of tests to ensure efficient and practicable testing;

(d) Corresponding to state-of-the-art testing technology, allowing to simulate failures where technically feasible;

(e) Applicable in practice to existing and foreseeable future powertrain technologies;

(f) Definition of propulsion unit families with regards to OBD.

6. The gtr also cover harmonized requirements to conduct the environmental verification test procedure (test type VIII) relating to OBD, which is a test procedure by simulating a failure of an emission relevant component in the powertrain management system and its emission control system which is used for type approval of an OBD system. Subsequently the OBD system reaction and detection of the failure is monitored and reported where necessary during type I tailpipe emission verification tests.

III. Controversially discussed subjects in the area of the measurement procedure for two- or three-wheeled motor vehicles with regard to on-board diagnostics, compromises and decisions taken by the EPPR IWG

7. A number of subjects within the draft gtr on on-board diagnostics led to discussions within the EPPR IWG and the different views and positions among the participants were debated at length, sometimes leading to long-standing open issues. For the largest share of these more difficult subjects a compromise could be worked out; for a few subjects the EPPR IWG decided to postpone the discussions and to reopen the debate at a later point in time when more scientific evidence is collected and available for assessment. The controversially discussed subjects, the associated compromises and decisions by the EPPR IWG are the following:

8. Objectives as well as fundamental principles of use and applicability of OBD

(a) Despite fundamental differences in opinion among the EPPR IWG members on objectives, the use and applicability of the OBD gtr, solutions were found that are satisfactory for the parties involved. It was possible to find wording that allows the Contracting Parties to harmonize OBD requirements to the largest extend possible and to apply it for the purposes needed. In many sessions the debate was held in the EPPR IWG meetings regarding the justification of introducing OBD requirements and the prioritisation in applicability of OBD;

(b) Traditionally the OBD requirements of light-duty motor vehicle categories 1 and 2, that have served as the basis for this gtr, have exclusively served the purpose of environmental protection with an associated rationale and practical implementation. The core OBD elements are given below:

(i) Diagnostic Trouble Code (DTC)

One or more DTCs are logged in the powertrain controller’s memory if one or more malfunctions are detected and confirmed. These harmonized codes allow identification of the failing devices in the vehicle’s powertrain and help the service technician to investigate and analyse the malfunctioning systems and components. Historically in emission legislation DTCs have been defined within a narrow scope. The DTCs have only been standardised for light- and heavy-duty motor vehicles in the past when these were affecting the vehicle´s environmental performance in terms of tailpipe and evaporative emissions, detected, confirmed and stored in the emission controller on-board of the motor vehicle.

At the same time vehicle manufacturers defined their own proprietary DTCs that allow authorized repairers to identify broken functionality on-board of the entire vehicle above and beyond the boundaries of emission relevant diagnostics. It concerns diagnosis of failing auxiliaries, safety-critical powertrain functionality as well as for failure identification of vehicle comfort functions that do not any longer operate according to the manufacturer’s design specifications;

(ii) Freeze frame

A so-called freeze frame is stored in the controller’s memory upon a detected, confirmed and stored DTC. This electronic file is a snapshot of powertrain data and relevant ambient conditions allowing a repairer or an enforcement authority to retrieve relevant powertrain information retroactively in order to reproduce the conditions under which the system or component has failed, e.g. the engine and vehicle speeds, throttle position, etc. Again, the freeze frame has been defined within the narrow scope of environmental performance, only storing data if a tailpipe emissions relevant malfunction is detected, which has been confirmed and stored in the controller’s memory;

(iii) Malfunction Indicator (MI)

The MI, typically a standardised warning light visible on the instrument panel, is briefly activated at key-on, engine off or ignition-on as bulb check and then turned-off again if the system has not detected a malfunction. The orange engine symbol shall be permanently illuminated on the cluster if an emission relevant malfunction is detected, confirmed by the OBD system and logged in the controller’s memory. This, in order to notify the driver that the system has detected one or multiple emission relevant DTCs. The underlying assumption is that if the driver is notified by the MI in time, he/she will visit a service station (repair workshop) as quickly as possible and have the emission relevant failure repaired, resulting in significantly lower tailpipe emissions.

For other types of detected errors, e.g. failing comfort and/or safety critical malfunctions, it is left to the discretion of the vehicle manufacturer if and how this information is transmitted to driver and repairer. The vehicle manufacturer might opt installing a second tell-tale displayed on the instrument cluster, sometimes referred to as "service soon light". However, with a few exceptions like the anti-lock brake system check light or lighting indicators there are no legal requirements for tell tales fitted to two- and three-wheeled motor vehicles informing the driver of a malfunctioning vehicle. Consequently, each manufacturer is free to handle the transmission of such information as well as the diagnostic contents differently as they deem appropriate;

(iv) Communication protocol

A standardised communication protocol for emission relevant failures is obligatory in approval legislation. This is a common computer language, allowing an off-board generic scan tool to communicate with the on-board diagnostic system and for the service mechanic to read-out stored malfunctions and the freeze frame. The harmonized protocol also allows actuator tests commanded by the scan tool to verify if actuators on-board of the vehicle still work as designed. The protocol is also used in case of re-programming the emission controller, if needed;

(v) OBD connector

In the initial proposal for the gtr, the OBD connector that was standardised for cars or any alternative connector was included in the proposal as interface for two- and three-wheeled vehicles. To reduce the number of connector configurations around the globe, the alternative connector was replaced, taking into account the development an ISO standard for OBD connector for two- and three-wheeled vehicles.[1]

Following some questions raised within the IWG on the vibration and temperature performance of the draft ISO standard,[1] the ISO working group that developed the standard (ISO TC22/SC38/WG4) provided an explanation to EPPR IWG.

9. A paradigm shift was proposed by the EU in the fundamental principles of use and applicability of OBD though some items such as the shift regarding functional safety and comfort were not retained to be part of the scope of this gtr:

[1] Motorcycles and Mopeds - Communication between vehicle and external equipment for diagnostics - Diagnostic connector and related electrical circuits, specification and use. ISO/DIS 19689.

(a) The conventional paradigm in OBD requires that if an "emission" relevant malfunction occurs is detected, the associated DTCs and freeze frame are stored in the controller's memory. Subsequently the MI is activated to notify the driver, who then should go to a service station to have the malfunction repaired. Upon arrival at the service station of the highly polluting vehicle owing to the active malfunction(s), the repairer can connect a generic scan tool directly to the OBD connector and swiftly obtain the vehicle's on-board diagnostic information as input for the analysis and the actual repair. After successful repair of the vehicle the pollutant emission levels should again be low, complying to the designed levels under the approved pollutant emission limits that are prescribed in regional or national environmental performance legislation over the vehicle's useful life;

(b) In the view of the EU many components in the powertrain management system are not only critical for the environmental performance of a vehicle but are also of key importance for functional safety and other vital vehicle functions. Functions of systems and components can only artificially be separated in environmental and other functionality, in practice sensors, actuators, the data transfer system and powertrain management functions serve many purposes simultaneously. For example, the crankshaft sensor provides rotation speed information to the powertrain controller, which is used as input for a large number of different functions build into the powertrain software. This functionality concerns among others:

(i) Functional safety, e.g. rotation speed information to determine if the engine is running as one of the variables to automatically turn on lighting or day-time running lights;

(ii) Environmental protection, e.g. rotation speed information used as input for the closed loop fuelling system;

(iii) Default information providing partial redundancy for other functions and back-up mode information in case of broken sensors, e.g. rotation speed as input to calculate roughly vehicle speed in case of a broken vehicle speed sensor or allowing to start and partially operate the engine in case of a broken cam sensor;

(iv) Information to the rider, e.g. rotation speed information as input to the engine speed gauge on the instrument cluster directly or to calculate a ratio, composed by the rotation speed divided by vehicle speed, allowing to determine the gear selected without having to install a gear selection sensor, which can be used as input to the gear indicator display on the instrument cluster;

(v) Comfort functions, e.g. rotation speed information as indicator for electric generator power used as one of the input variables to activate and operate electric seat or handle heating.

(c) With other words, the choice that e.g. the crank sensor is relevant for environmental protection only and to make it therefore subject to on-board diagnostic requirements has been a matter of debate in a historic decision process in the IWG EPPR;

(d) In the EU this traditional paradigm has already been shifted in approval legislation of L-category vehicles in force towards OBD information mainly needed for the effective and efficient repair of the vehicle. Effective repair means that the repairer is able to replace or repair that part of the vehicle that is actually broken. Efficient repair means that the repairer can fast identify the smallest identifiable or exchangeable "broken" unit;

(e) European Commission promoted that changing priorities from environmental protection only to the actual repair of the vehicle should help create a level playing field between authorized repairers and independent operators in the repair market. This, independent if the repair concerns an environmental protection issue, functional safety or any other type of vehicle functionality related malfunction. Moreover, this approach emphasizes the importance of OBD for the consumer as increased competition among service providers is expected to lead to lower repair prices and a better repair quality;

(f) Nevertheless, the OBD provisions set out in EU approval legislation[2] have been based on chapter 11 of Revision 4 of Regulation No. 83, which has been developed and agreed in the past based on the conventional paradigm related to environmental protection only. The EU OBD package for two- and three-wheeled vehicles in force is ready for further adaptation to technical progress in support of this paradigm shift and is aligned at the same time with the requirements set out in this gtr;

(g) The EU proposed this same approach to the EPPR IWG but this was not deemed acceptable for the larger share of Contracting Parties and stakeholders for various reasons. The EPPR IWG agreed that the gtr, once established, might be further developed in the future and other useful areas of harmonization in the field of OBD might be explored. It was deemed most important to establish the gtr within the planned timeframe, addressing the agreed mandate aiming to environmental protection by identifying common denominators in requirements and to phrase the requirements so as to allow all Contracting Parties to use the requirements for their purposes and objectives.

10. Scope in terms of functionality included; split between OBD stages I and II:

(a) The OBD requirements for light- and heavy-duty motor vehicles globally have been compiled over several decades starting roughly in the 1970’s in the Unites States of America. Owing to growing similarities in principle engine management system designs between modern two- and three-wheeled motor vehicles on the one hand and light-duty motor vehicles on the other hand, it seems obvious to carry over existing light-duty motor vehicle requirements as much as possible. However, it appeared that the gap between not being subject to any OBD requirement in approval legislation of two- and three-wheeled motor vehicles and the established rules applicable for light-duty motor vehicles today cannot be closed in one step for several reasons. This gap may therefore be bridged in two distinct steps, through OBD stages I and II;

(b) The precise boundaries what type of diagnostics should be allocated to OBD stage I and which ones to OBD stage II have not been precisely defined in light-duty motor vehicle approval legislation under UNECE, which could therefore not be used as benchmark for the EPPR IWG. The EPPR IWG decided to apply OBD I and II as set out in the EU and to incorporate explicit

[2] OBD requirements for the approval of L-category vehicles for the European internal market are laid down in Regulation (EU) No 168/2013, Annex XII of Regulation (EU) No 44/2014 and Annex VIII of Regulation (EU) No 134/2014.

malfunctions and symptoms to precisely define OBD stage I with appropriate requirements. Roughly the EPPR IWG decided that OBD stage I is to contain monitoring requirements of electric and electronic circuits of the powertrain management system and failure mode detection as well as for monitoring of the powertrain control module(s);

(c) OBD stage I should not oblige manufacturers to change or add fuelling or ignition hardware and should not impose fitting of an electronic carburettor, electronic fuel injection or electronically controlled ignition coils, providing the vehicle complies with the applicable environmental performance requirements. Compliance with the OBD stage I requirements implies that if fuel delivery, spark delivery or intake air hardware is electronically controlled by electric and/or electronic circuits as well as by a dedicated control module, the applicable input or output circuits of that control module need to be monitored, limited to the items and failure modes listed in the table of the gtr. OBD stage I should also not oblige Contracting Parties to change their objectives what should be achieved with on-board diagnostic requirements, in particular not be limited to environmental protection only;

(d) Consequently, in the future, if deemed appropriate by WP.29 and once the basis for OBD stage I is established, the gtr may be further developed and amended to incorporate OBD stage II requirements. This further stage might then also cover enhanced electric and electronic circuit diagnostics, not yet covered by and in addition to the circuit malfunctions such as sensor rationality diagnostics. It should then also be discussed whether diagnostics related to degradation of systems and components should be included in the future scope as it is today the case for other motor vehicle types. Also, in-use performance ratio monitoring and harmonized OBD performance requirements, such as degradation thresholds triggering the OBD system may be discussed;

(e) The EPPR IWG decided in this first stage not to harmonize dedicated functional safety requirements.

11. Discussion of scope in terms of motor vehicle types included:

(a) The scope in terms of vehicle types included was a horizontal issue for all the draft gtrs developed by the EPPR IWG involving the questions:

(i) Whether three-wheeled should be taken in the scope of the draft gtr?;

(ii) Whether other propulsion unit types besides the conventional combustion engine should be included in the scope?;

(iii) Whether the classification criteria of Special Resolution No. 1 are appropriate and whether the specific classification 3-1, 3-2, 3-3, etc. should be directly referenced or the reference should be done in a more generic way?;

(iv) Whether the exclusion criteria of the scope should be set out as well in the scope table or these exclusion criteria should have been described in full text?;

(v) How to deal with in- or exclusion of the various propulsion unit and fuelling types?

(b) The scope in terms of motor vehicle types included has been one of the more challenging items to resolve. The EPPR IWG settled for a compromise as set out in the scope section of the gtr submitted for adoption by GRPE.

12. Scope in terms of harmonized OBD data and information

The IWG on EPPR had an intense debate on and the assessment of access to relevant data and information:

(a) Access to OBD data: This is typically data from the on- and/or off-board diagnostic systems, which requires interpretation to become diagnostic information relevant for the repair of the vehicle. Obtaining this information in the diagnostic or pre-repair stage is paramount to identify the system or component of the vehicle that has failed and that needs repair or maintenance. The EPPR IWG agreed that this type of diagnostic data and information should be within the scope of the gtr;

(b) Access to repair and maintenance information: This is the step that typically commences after successful diagnostics has been completed or is needed in an iterative process of diagnostics and repair. The appropriateness of repair and maintenance information therefore is highly dependent on correct pre-repair stage OBD information as input so as to effectively and efficiently be able to repair a vehicle. The EPPR IWG decided that, similar as in the case of gtr No. 5 on heavy-duty vehicle on-board diagnostics, this type of repair and maintenance information shall remain outside the scope of the gtr, which offers the flexibility to each Contracting Party to formulate requirements on this type of information, e.g. in line with the relevant standard: ISO/DIS 18541-6, Standardized access to automotive RMI - Part 6: L-Category vehicle specific RMI use cases and requirements or as deemed appropriate;

(c) Diagnostic signal regarding freeze frame and data stream: There was a long discussion regarding the freeze frame and data stream among the Contracting Parties from the viewpoint of the aspect of reparability. The EPPR IWG finally agreed that both requirements to be exempted in case of Grade-A, provided that these exemptions are only applied to OBD-I. That is to say, the freeze frame and the data stream are implemented at the first stage when the discussion resumes on OBD-II in the near future.

13. Malfunction Indicator (MI) performance thresholds:

(a) In the context of the debated paradigm shift in OBD requirements the EU proposed introducing MI performance thresholds based on tailpipe emission thresholds and a torque threshold, independent if the triggered malfunction is allocated to circuit diagnostics attributed to OBD stage I or to more comprehensive diagnostics features possibly set out in future OBD stage II requirements. The proposed rationale behind this proposal, which is applied in EU approval legislation in force, is that the driver only needs to be informed of a significant emission relevant failure or in case of a default mode triggered by the powertrain software that significantly reduces propulsion unit torque. For other failure cases the EU proposed the manufacturer to decide whether or not the MI should be activated for malfunctions that are properly addressed by well-designed back-up modes by making use of powertrain system redundancy and:

(i) That compensate for the malfunction in terms of preventing tailpipe emission levels exceeding harmonized OBD emission thresholds. In this case it is assumed that a well-designed back-up mode mitigates the tailpipe emission increase from one or more malfunctions; and/or

(ii) Prevents a significant propulsion unit torque loss, e.g. more than 10% of normal torque after the OBD system has activated a back-up mode to protect the driver or the vehicle's powertrain. In case of failure the OBD system might activate such a back-up mode that may not be noticeable by the driver under certain driving conditions. For this case, e.g. an OBD tell-tale on the instrument cluster could be illuminated to warn the driver of an anticipated, abnormal drive-ability;

(b) Activation of the MI would therefore have been partially decoupled from storing diagnostic information in the powertrain controller's memory. Diagnostic information storage and availability upon request of a generic scan tool would have remained mandatory as prerequisite to effectively and efficiently repair the vehicle. The underlying justification of the EU proposal was to confront drivers as little as possible with the activated MI and to provide incentives to manufacturers to design excellent back-up and default modes to mitigate the adverse effects of a vehicle failure. Nevertheless, this methodology ensures that the diagnostic information is conveniently available to a repairer, free of charge and without technical constraints, which should help to level the playing field in the repair market. Again, it is assumed that a well maintained motor vehicle on which faults, if any, can easily be detected and diagnosed will result in lower emissions and a higher level of functional safety;

(c) Other Contracting Parties wished to deal with electric / electronic circuit diagnostics as digital faults (fault or no fault) and perceived the proposed performance requirements as too complex in this first stage. China was interested in developing simple diagnostic functionality and stepping-up requirements in complexity in due course following technical progress. India proposed additional grades of OBD complexity within OBD stage I allowing a minimum common denominator of requirements to be available to all Contracting Parties. Several iteration rounds of discussions have been held and proposals assessed but in the end it was decided to harmonize the requirements as much as possible allowing sufficient flexibility to apply the OBD requirements so as to ensure each Contracting Party to implement the harmonized requirements to satisfy national or regional needs. The EPPR IWG decided to compile a flow chart with recommended scenarios, based on a proposal from Japan, to deal with this complexity in the first stage and to incorporate this chart in the explanatory part of the gtr. In the future, upon need and if desired by Contracting Parties this flow chart can then be further developed covering increased harmonization of functionality.

14. Test type VIII, harmonized environmental verification testing of OBD:

(a) Owing to the fact that when implementing OBD stage I there are some Contracting Parties requiring harmonized tailpipe emission verification test procedures and that such requirements may be needed for all Contracting Parties in the future when developing enhanced diagnostic requirements in a future OBD stage II, the EPPR IWG could agree on optional provisions allowing to harmonize such an environmental verification test procedure. The starting point of this harmonized verification test procedure for two- and three-wheeled vehicles has been Annex 1 to chapter 11 of Regulation No. 83;

(b) In basic terms the fault under assessment is induced or simulated on a test vehicle which is subsequently run in a test type I emission laboratory cycle, applicable under national or regional requirements. The objective of test type VIII, which is a special test type I that in future might be harmonized as the WMTC set out in gtr No. 2, is to verify if the OBD system has detected the failure in time, stored the appropriate DTC and freeze frame. It offers also the possibility to assess the MI activation strategy and back-up mode activation, e.g. within one key cycle for certain malfunctions or within three key cycles for lesser urgent malfunctions or those requiring more data sampling to prevent false DTCs.

15. Reference fuel:

(a) Another horizontal issue for all EPPR gtrs in development has been the reference fuel specifications. The relevant questions were among others:

(i) Which types of reference fuels should be prescribed, all regional fuel types or just a reduced set?;

(ii) If the reference fuel has to be blended with ethanol or not?;

(iii) If the reference fuel specifications could be centrally stored in a repository like e.g. in a revised gtr No. 2 or as for example an annex of a mutual resolution?;

(b) Similar to the outcome of the discussions on a new gtr setting out requirements for two- and three-wheeled motor vehicles with respect to crankcase and evaporative emissions, the EPPR IWG decided that for the moment it is appropriate not to harmonize the reference fuel specifications yet. However, the EPPR IWG strongly recommended using the same test fuel specification for type VIII environmental OBD verification testing as also used for type I tailpipe emissions after cold start testing. It was decided to collect scientific data and to assess what the impact of the different fuel characteristic parameters may be in case of type VIII, environmental OBD verification testing. When sufficient scientific data is available and if deemed acceptable the EPPR IWG will undertake efforts to reduce the number of reference fuels and amend the gtr accordingly in due course.

16. Administrative provisions

Owing to the difference in views between the EPPR IWG members on the objectives and the need in split of information between diagnostic data and repair and maintenance information the initially proposed administrative provisions were assessed in depth, debated and revisited. The EPPR IWG managed to agree on the administrative provisions, despite the many controversial discussed subjects in the substantial requirements. Again, these provisions are regarded as minimum requirements and leave the flexibility to Contracting Parties to require the vehicle manufacturer to provide supplemental data and information. It was agreed to regularly review these provisions and to supplement them following technical progress and future enhancements of the gtr.

17. Harmonized OBD engine load variable

The European Commission introduced the idea of a harmonized OBD engine load variable which was considered out of scope of OBD I. Today it is hardly possible for parties other than the vehicle manufacturer to understand in which engine speed – engine load area an engine is running, relative to the maximum engine load that is typically achieved at wide open throttle, when e.g. a vehicle is tested in an emission laboratory test or under real world conditions. Being able to identify the engine load allows the legislator and enforcement authorities to comprehend which engine speed – engine load area is not sampled in regulatory testing. This helps authorities to estimate the caveats of environmental testing in approval of the vehicle or during in service conformity testing if applicable and to explain why there might be gaps between criteria pollutant emissions and fuel consumption in the emission laboratory testing and under real world conditions[3].

The proposed common OBD engine load variable was carried over from Regulation No. 83, chapter 11, definition 2.13., calculated load value. Despite the fact that the OBD engine load variable is based on airflow it is not necessary that a vehicle for that purpose is equipped with an expensive airflow sensor. The airflow is typically mapped in the development process of the engine on the dynamometer and subsequently calibrated in the powertrain control software. In dependence of the applicable load variable on-board of the vehicle, e.g. throttle position or MAP sensor reading, this unit-less, calculated OBD engine load variable can easily be predicted and be made available through the data link interface. The advantages of being able to continuously read a common available engine load variable largely outweigh the claimed disadvantages such as increased cost of software development, engine mapping and calibration for the manufacturer.

18. Definition and provision on "useful life"

The need for a definition of "useful life" has been debated at length in the EPPR IWG. Based on coherence with gtr Nos. 4, 5 and 11 the EPPR IWG decided to include a definition as well as a provision in the draft gtr in order to clarify during which time frame or accumulated distance and under which conditions the on-board diagnostic requirements have to be complied with by the motor vehicle type represented by the tested parent vehicle used in the approval process of the vehicle type. It was decided to specify this in a common way between all the draft gtrs in the scope of work of the EPPR IWG.

19. Temperature unit °C vs K

Indication of harmonized temperature unit (WLTP-09-19e) based on DIN EN ISO 80000-5. In summary:

(a) Define 0° C as 273.15 K;

(b) Use "°C" for definition of temperatures;

(c) Use Kelvin (with 273.15 K equal 0°C) in calculations;

(d) Delete redundant information where possible: (± 5 °C) (Example).

[3] For the technical relevance and more detailed explanation please refer to the JRC report: "Preparatory work for the Environmental Effect Study on the Euro 5 step of L-category vehicles", ISBN 978-92-79-57248-7 (print) or ISBN 978-92-79-57247-0 (pdf).