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**REPORT ON THE DEVELOPMENT OF
A GLOBAL TECHNICAL REGULATION CONCERNING:
ON-BOARD DIAGNOSTIC SYSTEMS (OBD)
FOR ROAD VEHICLES
(Worldwide harmonized Heavy-duty On-Board Diagnostics, WWH-OBD)**

Submitted by the Working Party on Pollution and Energy (GRPE)

Note: The text reproduced below was adopted by GRPE at its fifty-second session. It is based on ECE/TRANS/WP.29/GRPE/2006/19, not amended. It is submitted to WP.29 and AC.3 for consideration and vote (ECE/TRANS/WP.29/GRPE/52, para. 15).

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<http://www.unece.org/trans/main/welcwp29.htm>

1. OBJECTIVE OF THE REGULATION

The objective of the regulation is to establish a set of worldwide harmonized requirements for on-board diagnostic systems on heavy-duty vehicles. On-board diagnostic (OBD) systems are of interest to regulators for many reasons. The advent of electronic controls in the 1990s made the diagnosis of improperly operating engine systems and emissions control systems very difficult. Furthermore, the addition of exhaust gas recirculation (EGR) systems and exhaust after-treatment devices are expected to provide 50 to 99 per cent control of pollutant emissions. Without some form of on-board system capable of monitoring the performance of these devices for proper functioning, a driver could be completely unaware of a situation that might cause emissions to far exceed the applicable regulatory requirements.

Because computer and electronic systems are difficult to diagnose and repair when not functioning properly, most manufacturers of vehicles, trucks, and engines have incorporated OBD systems into their products. These OBD systems are capable of identifying improper functioning and help to pinpoint where the malfunction is occurring. This serves to inform both, the driver of the vehicle that repair is needed, and the repairer of the vehicle what needs to be repaired.

2. DESCRIPTION OF THE REGULATION

The global technical regulation (gtr) is directed only at OBD requirements for heavy-duty engines/vehicles necessary to maintain emissions-related performance (i.e. emissions-OBD). Nonetheless, the gtr has been structured in a manner that facilitates a wider application of OBD to other vehicle systems in the future. In brief, the gtr sets forth OBD performance requirements to which engine manufacturers shall demonstrate compliance to certification authorities. The gtr also sets forth a basic set of demonstration requirements for manufacturers, so that compliance can be demonstrated in a consistent manner. Also included are requirements to standardize the communication of on-board information to off-board devices to assist in maintenance of the increasingly complex modern diesel engines, and to facilitate the future use of OBD as a roadworthiness indicator for heavy-duty vehicles.

Of particular importance with respect to the use of OBD as a roadworthiness indicator is the introduction, with this gtr, of a failure severity indication via the dashboard malfunction warning signal (malfunction indicator). The failure severity indication is achieved in two ways. Firstly, the gtr requires the use of a separate and dedicated malfunction indicator to indicate a malfunction in the engine and emissions control system that results in an increase in emissions. Other failures that previously may have been communicated via a shared indicator shall now use a separate and discreet indicator. Secondly, the gtr requires that the effect of malfunctions be assessed as part of the design function and that their effect be designated to a specific level within a 3-tier classification. Upon malfunction detection, the malfunction indicator is required to communicate in a unique way depending on which of the three tiers to which the detected malfunction has been designated. While the requirements for the malfunction indicator provide for each of these failure levels to be discernible, only the upper two failure levels are automatically indicated to the driver. This has been termed a "discriminatory display" strategy as it discriminates between three possible severities of malfunctions when indicating them via the malfunction indicator. This new requirement is intended to allow vehicle operators, maintenance staff, inspectors and enforcement authorities to make an informed decision with regard the roadworthiness of the vehicle. Nevertheless, not all Contracting Parties may wish to apply this approach. Therefore, the gtr provides for a malfunction indicator that

would use a non-discriminatory display strategy (i.e. one that would communicate all malfunctions regardless of their severity in the same manner via the malfunction indicator) for regions that may find it more suitable than this new discriminatory display model.

The gtr recognizes that it is not always possible to know precisely the impact of a failure or deterioration of a system or its component parts on the actual emissions from the vehicle. Therefore, the gtr minimizes the burden on the manufacturer in this regard by allowing the classification of malfunctions to be achieved, as far as is reasonable, by engineering analysis. Inevitably, certification authorities will require validation of the engineering analysis and, therefore, the gtr provides for testing using deteriorated components to assess the OBD system performance. The gtr does not require testing to determine whether malfunctions should be placed in a lower level in the classification than that proposed by the manufacturer at the time of certification or type approval. However, the expectation is that manufacturers will apply best practice to achieve correct classification of malfunctions and evidence of this effort will be assessed, in part, from the engineering analysis provided as part of the certification process. Where experience or testing in the market indicates a significant malfunction misclassification, the gtr provides for its re-classification.

3. EXISTING REGULATIONS AND INTERNATIONAL STANDARDS

In the United States of America:

40 CFR 86.005-17 and 40 CFR 86.1806-05 contain OBD requirements for vehicles and engines fitted in vehicles less than 14,000 pounds gross vehicle weight ^{1/}. The United States Environmental Protection Agency is developing proposed OBD requirements for engines fitted in vehicles over 14,000 pounds gross vehicle weight.

Also, 13 CCR 1968.2, 13 CCR 1971 and 13 CCR 1971.1 contain OBD requirements for California vehicles up to 14,000 pounds gross vehicle weight and engines fitted in vehicles over 14,000 pounds gross vehicle weight, respectively.

In Europe:

The European Union (EU) Directive 98/69/EC ^{2/} (amending Directive 70/220/EEC ^{3/}) introduced, for the first time, emission-related OBD requirements applicable to petrol and diesel passenger cars and light-commercial vehicles (nominally up to 3.5 t gross vehicle mass).

EU Directive 1999/102/EC ^{4/} introduced, amongst other things, revised provisions for misfire monitoring, adoption of the CAN protocol and provisions for deficiencies. These requirements applied from the same dates as given in EU Directive 98/69/EC.

^{1/} See 58 FR 9468 and 65 FR 59896.

^{2/} See Official Journal of the European Communities, L350, 28.12.1998, p.1.

^{3/} See Official Journal of the European Communities, L76, 6.4.1970, p.1.

^{4/} See Official Journal of the European Communities, L334, 28.12.1999, p.43.

EU Directive 2005/55/EC 5/ lays down the fundamental elements relating to OBD for heavy-duty vehicles and engines.

In Japan:

Safety Regulations for Road Vehicles, Article 31 (Emission Control Device), Attachment 48 Technical Standard for On-Board Diagnostic (OBD) System for Exhaust Emission Control Devices for Motor Vehicles.

4. ADVANTAGES OF THE GTR

Designing and developing OBD systems that meet the emissions-OBD requirements of this gtr will cost industry considerable money. The cost of maintaining and repairing malfunctions identified by the OBD system will impact on industry, operators of heavy-duty vehicles and the general public. As noted in paragraph 3. above, many Contracting Parties have or are developing OBD requirements analogous to those in this gtr. Having one set of OBD requirements that would apply to all regions represented by the Contracting Parties would save industry considerable money relative to the situation they face currently with separate requirements in each region.

The specific air quality benefits expected to arise in Contracting Parties that implement the emissions-OBD paragraph of this gtr will be unique to each region. However, in general, the expectation is that properly operating emissions control systems will result in cleaner air regardless of the region being considered. Any effort to ensure that emissions control systems will operate properly during their real world lifetime is of value.

5. COST EFFECTIVENESS

Specific cost effectiveness values for this gtr have not been calculated. The decision by the Executive Committee (AC.3) of the 1998 Agreement to move forward with this gtr without specific emissions threshold levels (i.e. the emissions level at which a malfunction is indicated) is the key reason why this analysis has not been completed. This agreement has been made knowing that specific cost effectiveness values are not immediately available. However, it is fully expected that this information will be developed, generally in response to the adoption of this gtr in the national or regional requirements of the Contracting Parties and also in support of developing harmonized limit values for the next step in this gtr's development. E.g., each Contracting Party adopting this gtr into its national or regional legislation will be expected to determine the appropriate emission threshold levels associated with these OBD requirements. Experience will be gained by industry as to any costs and savings associated with these worldwide harmonized requirements. These costs and

5/ See Official Journal of the European Communities, L275,20.10.2005, p.1.

savings data and emissions performance data can then be analyzed as part of the next step in this regulation development to determine the cost effectiveness values of world harmonized OBD when matched with new harmonized limit values. While costs per tonne of pollutant reduced have not been calculated, the belief of the technical group is that there are clear benefits associated with this gtr.
