

# **Proposal: To Develop a Global Technical Regulation: Heavy-Duty Off Cycle Emissions**

Technical Sponsor: United States

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## **A. Objective of the Proposal**

The objective of the proposal is to establish a Global Technical Regulation for heavy-duty vehicle emissions. Over the last several years, it has become clear that in-use emissions might inappropriately exceed the applicable emission limits when engines were operated under conditions not found during traditional laboratory testing (i.e., off-cycle emissions). The basis will be harmonized procedures for ensuring that emission control technologies are actually effective under normal operating conditions because they test a broad range of normal driving conditions that are otherwise not subject to traditional emissions testing.

Trucks, like other motor vehicles, are driven over a wide variety of operating conditions, including starts, stops, accelerations, decelerations, steady cruises, and under varying loads and ambient conditions (e.g., variations in temperature, altitude, humidity and barometric pressure). Over many years of engineering study and development, manufacturers have developed sophisticated electronic and mechanical systems that control the performance of diesel truck engines over this wide variety of driving conditions. A central aspect of this sophisticated engineering is the constant monitoring of a wide range of engine operating parameters, including engine rotational speed, vehicle ground speed, and intake manifold pressure and temperature. Based on the monitored data, the engine computer is typically programmed to control the operation of the engine, by, for example, adjusting the timing and rate of fuel injection or the amount of air from a turbocharger.

For many years, the basic regulatory approach for heavy-duty diesel engine exhaust standards for NO<sub>x</sub> and PM relied on defeat device provisions and on a standardized test. The tests in various countries including the United States, Japan and the European Union are highly regimented laboratory test procedures. The engine is installed in a test cell and operated over the designated test cycles.

The test cycles are intended to simulate a representative driving regime, but a substantial portion of the wide variety of real world driving conditions are not incorporated into specific tests. For example, the U.S. FTP applies only at a specific temperature range and only at the specific speed and torque points and in the order specified in the FTP test cycle. This means that an engine might comply with the FTP in the laboratory, but not achieve FTP based emission reductions in real world driving.

The growing sophistication of engine technology has greatly increased the potential that emission control system will be modified under conditions not included or underrepresented on the laboratory test procedures, resulting in substantially higher emission levels under actual driving conditions. For this reason, the proposed GTR is an important step forward to ensure emission limits are met in-use, under a wide range of operating conditions.

## **B. Description of the proposed regulation**

The proposed regulation will be based on the additional requirements for both type-approval and certification that require adherence to a Not-to-exceed (NTE) protocol. The proposed GTR will be modelled after the United States NTE regulations developed to specifically address the need to better ensure that emission control technologies are actually effective under normal operating conditions because they test a broad range of normal driving conditions that are otherwise not subject to emissions testing. NTE protocols, in combination with the

defeat device prohibition, and a steady state test common to all regulatory entities will ensure that engines will operate at or below the lawful emission limits on the road.

In the past, regulating entities have relied exclusively on the defeat device provisions to achieve this purpose. The defeat device prohibition, however, does not provide a quantified numerical emissions limit and associated test procedure for conditions not encountered on the laboratory tests, resulting in case-by-case decision making regarding whether a particular element of design constitutes a defeat device.

The proposed GTR will focus on the requirements needed to be met for the purposes of type approval and certification as an additional requirement to the harmonized WHTC and WHSC procedures, when adopted.

### **C. Existing Regulations and International Standards**

#### UNECE Regulation:

UN-ECE Regulation No. 49 -Uniform provisions concerning the approval of compression ignition (C.I.) and natural gas (NG) engines as well as positive-ignition (P.I.) engines fuelled with liquefied petroleum gas (LPG) and vehicles equipped with C.I. and NG engines and P.I. engines fuelled with LPG, with regard to the emissions of pollutants by the engine

#### EU:

Directive 1999/96/EC of the European Parliament and of the Council on the approximation of the laws of Member States relating to measures to be taken against emission of gaseous and particulate pollutants from compression ignition engines for the use in vehicles, and the emission of gaseous pollutants from positive ignition engines fuelled with natural gas or liquefied petroleum gas for use in vehicles and amending 88/77/EEC;

Directive 2001/27/EC of the Commission adapting to technical progress Council Directive 88/77/EEC on the approximation of the laws of Member States relating to measures to be taken against emission of gaseous and particulate pollutants from compression ignition engines for the use in vehicles, and the emission of gaseous pollutants from positive ignition engines fuelled with natural gas or liquefied petroleum gas for use in vehicles.

#### Japanese Regulation:

Road Vehicles Act, Law no.185 of June 1951, as last amended by law No. 100 of 2002, Article 41 “Systems and devices of Motor vehicles.

#### USA Laws and Regulation:

42 U.S.C. § 7522(a)(3)(B); U.S. Code of Federal Regulations Title 40 Part 86.094-2;

U.S. Code of Federal Regulations Title 40 Part 86 – “Emissions Control, Air Pollution From 2004 and Later Model Year Heavy-Duty Highway Engines and Vehicles; Light-Duty On-Board Diagnostics Requirements, Revision; Final Rule”;

U.S. Code of Federal Regulations Title 40 Part 86 – “Control of Air Pollution From New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements; Final Rule”.