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Inland Transport Committee

Working Party on the Transport of Dangerous Goods

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Item 6 (a) of the provisional agenda

**Proposals for amendments to Annexes A and B of ADR:
construction and approval of vehicles**

Comment on ECE/TRANS/WP.15/2014/2 – Use of Liquefied Natural Gas as fuel for vehicles carrying dangerous goods

Transmitted by AEGPL

Summary

Executive summary: Gaseous fuels (compressed natural gas [CNG], liquefied natural gas [LNG] and liquefied petroleum gas [LPG]), either used separately to replace petrol or diesel or mixed with diesel fuel (dual-fuel) currently are being used as alternative fuels for heavy goods vehicles (also in passenger cars and other road and non-road vehicles).

The operational safety is maintained through the application and enforcement of the respective ECE Regulations No. 67 (LPG) and No. 110 (natural gas – for CNG and LNG vehicles)

The exclusion of LPG or CNG for ADR-certified trucks is not justified on the basis of safety concerns above and beyond petrol or diesel, although handling of these gaseous fuels is different than liquid fuels.

Action to be taken: Discussion on the topic, modification of the amendment proposed by the Government of the Netherlands to subsection 9.2.4.3 (Proposal 1 in ECE/TRANS/WP.15/2014/2) to include LPG and CNG referencing the respective ECE Regulations.

Related documents: Working Paper 2 (ECE/TRANS/WP.15/2014/2), INF.10 of the 95th Session, INF.11 of the 96th session.

Introduction

1. The introduction of gaseous fuels has been presented and discussed in the past sessions of WP.15. While the first documents acknowledge the use of all gaseous fuels in the transport sector the suggested amendment in ECE/TRANS/WP.15/2014/2 clearly rules out any use of gaseous fuels other than LNG.

2. Gaseous fuels have been used safely in the transport sector for many years. The safety requirements for gaseous fuels systems in vehicles has experienced through standardisation through the introduction of ECE Regulations No. 67 and No. 110 and many other standards and regulations in countries around the world, including the International Standards

Organization (ISO). The documents prepared by WP.29 under a safety minded philosophy incorporate demanding requirements that yield a high level of safety.

3. As stated in INF.10 of 95th session, ADR Regulation does not explicitly prohibit the use of gaseous fuels. The requirements in 9.2.4.3 b) although, had been worded with liquid fuels in mind. For gaseous fuels, which are stored in vessels equipped with pressure relief devices, an integral safety feature, consideration must be given to the release of gas when designing and constructing the fuel system as required by the respective ECE-Regulations. A careful wording of 9.2.4.3 b), as already included in ECE/TRANS/WP.15/2014/2, achieves a level of safety comparable to petrol and diesel.

4. The level of safety has been adequately summarised in ECE/TRANS/WP.15/2014/2. For LPG the same conditions apply as specified in ECE Regulation No. 67. Annex 10 of that Regulation contains construction and testing requirements for the fuel tank specifying the resistance to fire (bonfire test) and mechanical stresses (impact and drop tests). Likewise, R.110 for CNG and LNG has equally demanding material qualifications and testing requirements that have been embraced by the industry for decades.

5. The high autoignition temperatures of all gaseous fuels² (over 400 °C) in contrast to diesel (around 200 °C) minimise the risk of fuel igniting on hot parts of the engine to a very small portion of the exhaust system and only under the highest of engine loads. Venting can be directed in a safe direction and distance so, that under normal circumstances in the unlikely event that gas is vented it will have diluted under the lower flammability level even under adversely low ventilation conditions.

6. The holding time for LNG is regulated at 5 days but, under certain conditions the vehicles can exceed this. Truck operations seldom are idle for more than 2-3 days. The equivalent of only a few minutes of engine running time per day consumes enough fuel to maintain the contents of the tank sufficiently cool and to prevent subsequent venting. As long as the vehicles are used each day venting is improbable, as they are designed not to vent in normal operation. The venting behaviour is such that only the amount required to sufficiently cool the fuel is released at a slow flow rate (weeping). A newly released HAZOP study in the U.S. related to LNG and CNG vehicles in maintenance facility conclusively shows that, "Accordingly, for the low-flow release scenarios that involved a dormant LNG blow-off or a CNG fuel system purge, the flammable masses, volumes, and extents were low, and the flammable regions disappeared shortly after the conclusion of the leaks. Moreover, predicted peak overpressures indicated, there was no significant hazard expected.³ Furthermore, vehicles needing repairs surpassing the holding time of the tank are regularly defuelled. The amended ECE Regulation has considered the points for which a HAZID was suggested by the Representative of Germany.

7. CNG and LPG, like petrol and diesel can be stored indefinitely. The amendment of Regulation ECE Regulation No. 110 regarding the type approval of components for LNG systems has been approved and will come into force in June/July 2014. Between the current date and its entry into force no further substantive modifications are expected. The first possible point in time after which the registration of a vehicle powered by LNG will be possible should be included in the text of subsection 9.2.4.3 c) and a further explanation in a footnote.

² INF.10 of the 96th session contains an error. The auto ignition temperature of LPG regardless of composition lies above 400 °C and not at 287 °C as per Table.1 of INF.10

³ **Analyses in Support of Risk-Informed Natural Gas Vehicle Maintenance Facility Codes and standards: Phase I, SANDIA REPORT**, SAND2014-2342 ,Unlimited Release, March 2014, available through the Clean Vehicle Education Foundation.
<http://www.cleanvehicle.org/technology/CVEFSANDIAFinalReportPhase1.pdf>

8. The validation of the different requirements are not allocated with the vehicle constructors alone, as the vehicle needs to attain the approval of a notified body. The notified body will test the vehicle according to the text of ADR Regulation.

Proposal

9. Amend subsection 9.2.4.3 to read (new text in *italic* and underlined, replaced text stricken through):

“9.2.4.3 *Fuel tanks and fuel containers*

The fuel tanks and fuel containers supplying the engine of the vehicle shall meet the following requirements:

(a) In the event of any leakage *under normal operating conditions of the vehicle*, the fuel shall *not come* ~~drain to the ground without coming~~ into contact with hot parts of the vehicle or *of* the load;

(b) *Fuel tanks for liquid fuels shall comply with ECE Regulation No. 34.* Fuel tanks containing petrol shall be equipped with an effective flame trap at the filler opening or with a closure enabling the opening to be kept hermetically sealed;

(c) Fuel tanks for compressed natural gas (CNG) and for liquefied natural gas (LNG) shall comply with the provisions of ECE Regulation No. 110. Vehicles using LNG may only be registered after entry into force of the respective amendment of ECE Regulation No. 110 in July 2014. Additionally the discharge of the (emergency) pressure relief devices shall be directed away from the load or hot parts of the vehicle to avoid any danger to the load through heating or ignition;

(d) Fuel containers for liquefied petroleum gas (LPG) shall comply with the provisions of ECE Regulation No. 67. The discharge of the emergency pressure relief device shall be directed away from the load or hot parts of the vehicle to avoid any danger to the load through heating or ignition.”

Justification of Proposal

Heading

10. The safety requirements of all three gaseous fuels are laid down in the respective ECE Regulations 67 and 110. The current version of ADR Regulation does not explicitly prohibit the use of gaseous fuels although it was written with liquid fuels in mind. In ECE/TRANS/WP.15/2014/2 the Government of the Netherlands acknowledges that fuel containers for LPG and CNG provide an equal level of safety to LNG containers. The exclusion of these fuels from the use in the transport of dangerous goods is unjustified, particularly given the long, worldwide history of vehicle operating on these fuels.

9.2.4.3 (b), (c) and (d):

11. To define which types of fuel tanks are allowed to be used and which are not a reference to ECE Regulation 34 (further R.34) for liquid fuels is introduced; a reference to R.110 for CNG and LNG in (c) and to R.67 for LPG in (d).

12. In the new (c and d) additional requirements to R.67 and R.110 are introduced for the discharge of gas through the safety device. LNG fuel tanks have two pressure relief valves, one primary relief valve for the boil down and a secondary for emergencies. The discharge from the primary relief valve escapes through a vent stack that shall extend to a high level away from the hot engine or load. The primary relief valve and venting stack will also cope with most of the discharge in case of a temperature- pressure rise due to a loss of vacuum of the insulation of the fuel tank. Tanks for CNG and for LPG are equipped with pressure relief devices designed to protect the tank from bursting when heated. Directing the vents away from hot parts of the vehicle and the load shall minimize the risk.
