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## Economic Commission for Europe

### Inland Transport Committee

#### Working Party on the Transport of Dangerous Goods

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Item 5 (a) of the provisional agenda

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

16 October 2017

### **Electric vehicles and hybrid electric vehicles for the carriage of dangerous goods**

#### **Introduction**

1. Recently the first electric vehicle for the carriage of dangerous goods was taken into service in the Netherlands. ADR contains no specific requirements for the use of electric vehicles, neither for carrying dangerous goods in packages nor for the vehicle types mentioned in 9.1.1.2. Depending on the legal system it can be said that as there are no prohibitions, it is allowed to use electric vehicles and contra to this it is not allowed, because it is not described in ADR.
2. The Netherlands is of the opinion that the development of new technology should not be obstructed and that it should be allowed when at least an equivalent level of safety is achieved.
3. For this reason the Netherlands would encourage a discussion in WP.15 to develop a view on electric vehicles, and if acceptable allow them for the carriage of dangerous goods.

#### **Background**

4. A number of European countries announced to register only new electric vehicles from 2040 onwards. Although this will initially be for passenger cars and light commercial vehicles, it will inevitably mean that also dangerous goods may be carried in electric vehicles. Due to the current battery energy density it is not likely that there will be full electric heavy goods vehicles for long distance haulage in the near future.
5. For heavy goods vehicles it may be expected that they use a combustion engine with (synthetic/bio) diesel or (bio) LNG as fuel. However, the introduction of some form of electric drive may be expected to store regenerated braking energy and could be used for the acceleration of the vehicle. There are currently several experiments taking place to energize electric vehicles.
6. The first fully electric vehicle in the Netherlands is used for delivering petrol and diesel fuel to motor vehicles. For the time being, the capacity of the containments place it outside the scope of Chapter 9.2 of ADR but it is not unlikely that larger capacities are foreseen in the near future.
7. Although no initial inspection was needed and no ADR certificate issued, the use of this vehicle raised questions as if it is safe enough to be used and what measures should be appropriate to mitigate dangers from the electric drive system to the dangerous goods that are carried.

8. In the Netherlands the following issues were discussed:
- a) electric safety of the high voltage system;
  - b) fire risks in the battery system;
  - c) safety in hazardous areas.
9. Add a) Electric safety of high voltage system is already regulated in UN ECE Regulation No. 100. This Regulation applies as well to passenger as goods vehicles, full electric vehicles and hybrid electric vehicles. UN ECE Regulation No. 94 deals among others with crash behaviour of the high voltage system, but only for motor vehicles with a total mass of 2500 kg and with certain limitations to vehicles with a total mass up to 3500 kg. However certain requirements for high voltage system crash safety may be used for heavier vehicles carrying dangerous goods as well.
10. Add b) For the fire risk of batteries it can be said that at this moment there are a significant number of electric vehicles on the road. Although fires in batteries are reported they are relatively low in numbers compared to the number of vehicles. Battery fires seem to occur when the casing of the battery is damaged or the electronics for the control of the charge of the cells of the battery are malfunctioning. An unknown factor is how the batteries and their electronics will behave when ageing. Mitigating measures, like heat shields, may be applied when the batteries are placed under the load area.
11. Add c) The electric drive system should be made safe against ignition of explosive atmospheres just like the regular electrical system and hot parts. It is assumed that the connection between motor-battery-control units etc. can be interrupted if needed. However, this should be further investigated.
12. To make electric drive more usable and possibly applicable for electric drive of heavy goods vehicles as well, alternatives for electrical energy from batteries are developed. As these alternatives come on the market the risks should be considered before they should be applied for the carriage of dangerous goods.
13. Alternatives are for example range extenders, a generator driven by a combustion engine (piston or turbine), or fuel cells in which hydrogen is oxidized while delivering electrical energy. Recently an experiment in the Netherlands used Formic acid to deliver hydrogen for a fuel cell, in an attempt to solve the containment problem of hydrogen.

## Proposal

14. For vehicle types mentioned in 9.1.1.2 the following amendment may be suggested:
15. Introduce a new section 9.2.8 to read:
- 9.2.8 Electric and hybrid-electric vehicles
  - 9.2.8.1 Electric and hybrid electric vehicles shall comply with ECE Regulation No. 100<sup>y</sup>).
  - 9.2.8.2 The load shall be protected for fire or heat by a fire wall/heat shield from defective batteries.
  - 9.2.8.3 FL vehicles shall be provided with a system to neutralize the electrical drive system in hazardous areas (see also 9.2.2.8 and 9.2.2.9).

<sup>y</sup> ECE Regulation No. 100 (Uniform provisions concerning the approval of vehicles with regard to specific requirements for the electric power train)