

**Economic Commission for Europe****Inland Transport Committee****Working Party on the Transport of Perishable Foodstuffs****Seventy-seventh session**

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Item 5 (a) of the provisional agenda

**Proposals of amendments to ATP:****Pending proposals**

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19 October 2021

English

**Considerations on ECE/TRANS/WP.11/2010/1/Rev 2 -  
Energy supply of electrified mechanically refrigerated  
equipment.****Transmitted by the Government of the Netherlands****Introduction**

1. The energy transition brings new challenges to the ATP agreement. One of the challenges is that mechanically refrigerated thermal appliances become electrically driven only. The question arises how much electrical energy should be available on the equipment itself? This amount is felt to be of importance in relation to the question if equipment is independent. However this question is not felt to be an issue for Diesel fuelled equipment although there is not a minimum size of the fuel tank defined, which is in principle the same situation.
2. This document contains no concrete proposal but suggestions intended to help discussion on this topic.
3. It is also felt that the issue of non-independent, although linked, should be discussed in a second stage after the principle discussion is finished.

**Considerations***Developments.*

4. The power supply of electrically driven mechanical refrigerated appliances is linked to that of the development of batteries and of electrified road vehicles.
5. It is expected that the energy density of batteries will improve and the cost will go down. Besides these issues it is not expected that the weight of batteries will go down dramatically. The weight is a mayor issue for transport as each kilo of batteries will reduce the possible weight of the load.
6. Only an estimation can be made how heavy duty vehicles will develop over the next decades. Development will see changes in the drive line from the traditional internal combustion engine-gearbox-driveshaft-rear axle, and all environmental equipment to be replaced by simple electric motors on the axle or in the wheel. It is expected that also semi-trailers will be equipped with generators to recuperate braking energy, these generators may also act as motors. The generators will need an energy storage system like supercapacitors, batteries or a combination of both. Add to this autonomous driving, trucks driving without breaks or overnight stays, and the whole concept of (expensive) tractor and semi-trailer may be obsolete.

*Twelve hours.*

7. The oldest way of (international) long distance carriage of perishable foodstuffs would probably be in the interbellum period by rail. Cooling at that time would have been done by ice (frozen water) that was loaded in special compartments to condition the load. The refilling of these compartments with new ice, once the original charge had melted, would only be possible at determined stops where blocks of ice were available. This procedure was still applied in the years after the second world war. The original drafters of the ATP may have had this in mind when determining the 12 hour for a journey. This is reflected in the test procedures of Annex 1, Appendix 2 where after reaching an equilibrium of energy flow through the body the test should be conducted for 12 hours without refilling/recharging.

8. When separate testing and approval of mechanically refrigerated equipment was introduced the size of the fuel tank for each particular equipment the appliance was fitted to was not regulated. It was not given in the test report of the separately tested mechanical refrigerated appliance nor by provisions addressed to the equipment manufacturer that assembled the appliance to the body. It is obvious that diesel fuel can practically be refilled anywhere. On the other hand the energy density of diesel fuel is such that the a tank for 12 hours running would not be obsessive in size of the tank nor weight of the fuel carried. If leaving out provisions for the capacity of the fuel tank was left out on purpose or that it was overlooked will probably remain unknown. In ADR (agreement on the carriage of dangerous goods) the maximum exempted capacity of liquid fuel is limited to 500 litres on trailers.

*Four hours and thermal insulation.*

9. Four hours is thought to be the maximum period in which the temperature will remain within acceptable limits without additional cooling. This is based on the insulation factor, average ambient conditions, temperature of the loaded foodstuffs and the specific heat of the loaded foodstuffs. In this example the foodstuffs are frozen at -20 C and are allowed to increase to -18 C. These temperatures and period may be more critical to chilled foodstuffs.

10. Thermal insulation limits the increase of the internal temperature. The heat energy through the insulated body depends also on the temperature difference, what explains the different insulation factors of normal and heavily insulated equipment. One theory is that the original insulation factor was dictated by the distance between the available repair shops for servicing defective appliances. However it is more likely that the values chosen were the best technically possible at time of drafting the Agreement.

11. Document 2020/1 and INF 16 (2020 session of WP.11) states that if an energy supply capable of energizing the appliance for four hours at full power or 12 hour at nominal power is to be seen as independent.

*Article 4 and obligations of the carrier.*

12. In Article 4 of the agreement the carrier is obliged to select equipment suitable for transport, taking into account the foodstuffs, duration and ambient climatic conditions. Given the fact that the thermal appliance will have electric drive the carrier may select the energy source:

- Going a very short distance no use of the thermal appliance may be required based on the insulating properties of the equipment.
- Going medium distance the carrier may decide to take batteries along, the truck may drop-off the semi-trailer to preform another transport operation and there may be no power supply at the drop-off point.
- Going long distance the carrier may decide to use the batteries and fuel cell on the tractor of the semi-trailer and does not take a battery on the equipment itself.
- Going places with no regular electrical charging points are available he may decide to use a generator unit with internal combustion engine running on bio-fuel.

The energy transition will lead to a more diverse approach of energy supply, at least for the coming decades.

## Discussion

13. Taking the responsibilities of the carrier into account and the wide range of electrical energy sources possible it seems that no particular functioning time should be prescribed for semi-trailers. For heavy duty rigid trucks and light commercial vehicles the situation may be different as the configuration is known

14. When (type) testing mechanically refrigerated appliances the test station shall determine the specific capacity of the appliance. There is no need to specify that a particular size energy supply should be available. The required electrical energy to have this performance, taking energy losses into account, are already included in test report Model No. 12.

15. When dimensioning the equipment, to prove that the appliance has sufficient capacity for the particular body, it may be discussed when the supply of energy is sufficient. For example when a Hydrogen Fuel Cell can supply sufficient energy and is able to perform when the vehicle is standing still no remark is required. When a battery with limited capacity is fitted (for drive and temperature control) a warning could be included that the vehicle shall be plugged in the grid at stops. In these case it may be asked if this should be seen as non-independent. For semi-trailers it may be asked if “incomplete” would be more appropriate.

16. Another situation is when more than one sources of energy is available. Sources of energy may be seen as different sources of electricity, such as solar or braking energy or for example different types such as eutectic plates as a buffer (to be charged overnight) added by a mechanical unit.

## Suggestions

17. For equipment without or without a sufficient power supply that may come with the drawing- or carrying vehicle such as (semi)-trailers and containers the required connecting value need to be indicated on the ATP certificate and/or as a marking near the connection. They shall be seen as incomplete and require no additional “X”.

18. For equipment that is complete, such as rigid heavy duty truck or light commercial vehicle a minimum required electrical buffer capacity may be decided upon in the form of a battery or eutectic system to guarantee sufficient functioning time. Alternatively a warning could be given that the equipment requires external power supply after a to be determined time.

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