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**Committee of Experts on the Transport of Dangerous Goods  
and on the Globally Harmonized System of Classification  
and Labelling of Chemicals****Sub-Committee of Experts on the Transport of Dangerous Goods****Thirty-seventh session**

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Item 4 of the provisional agenda

**Electric storage systems****Transport of used or damaged lithium batteries****Transmitted by the expert from Germany<sup>1</sup>****Introduction**

1. Since the use of lithium metal batteries and lithium ion batteries has increasingly expanded into “large format” applications for hybrid-electric vehicles and electric vehicles, but also for telecommunications and for the military and aerospace purposes, the Sub-Committee decided in July 2008 that the applicable tests and criteria should be reviewed in the light of the exceptional growth of the market for lithium cells and batteries and the new technologies being implemented in the field. An informal working group was set up in order to review the testing requirements for lithium batteries accordingly and to assess the relevance of current transport requirements and propose amendments if necessary.

2. The growth of the market for lithium metal and lithium ion batteries entails an increased necessity to transport used or damaged batteries. In the past the transport of used batteries was mainly a question how to transport smaller lithium batteries that had been used in portable electronic equipment (e.g. cellular phones, notebook computers, DVD player, MP 3 players, digital cameras). These used lithium batteries are not individually protected and they are often collected together with other non-lithium batteries if collected for the purpose of disposal. These kind of transports are usually land transport operations and appropriate packing instructions have been introduced for European land transport (see P903a and P903b ADR/RID).

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<sup>1</sup> In accordance with the programme of work of the Sub-Committee for 2009–2010 approved by the Committee at its fourth session (refer to ST/SG/AC.10/C.3/68, para. 118 (a) and ST/SG/AC.10/36, para. 14).

3. Larger lithium batteries such as battery systems used for electric vehicles are elaborate and cost-intensive technology. This leads to an increasing necessity to cover long distances by all means of transport, at least sea transport. Used or spent batteries have to be carried to special test laboratories or test houses or to the manufacturer for examination within the framework of quality assurance programmes as well as for maintenance and repair. Furthermore, specialized facilities for disposal and for an environmentally rational recycling have to be used.

4. As the UN Model Regulation do not differentiate between new and used lithium batteries, the same provisions apply to both. Used batteries have to comply with the provisions assigned to UN 3090, UN 3091, UN 3480 and UN 3481. As the condition of used batteries may differ widely it can be questioned if these provisions are always appropriate:

- A used battery may be of same quality as a new battery, well-functioning and as safe as new;
- There are spent batteries at the end of their life cycle, aged but without any further defects;
- There are batteries with defects due to mechanical impact (e.g. crash); due to electrical impact (overcharge, depth discharge, short circuit, reversion of polarity) or due to thermal impact as overheating. These mistreatments may lead to leakage, blowing of electrolyte, thermal runaway with fire, bursting of the battery up to explosion.

5. The first two groups probably can be considered as safe for transport. The repair of these batteries has not been changed substantially compared to new batteries with the consequence that the provisions for new batteries are appropriate for them as well. Used lithium metal and ion batteries with defects as described in the third bullet point have to be assessed differently. From a formal point of view it has to be queried if such batteries are still of a the type proved to meet the requirements of each test of the Manual of Tests and Criteria, Part III, sub-section 38.3. As regards content it has to be considered if packing instruction P 903 ensures a sufficient level of safety, as large batteries may be transported even unpackaged or in packagings that are not conforming to a tested design type.

## Conclusion

6. Used lithium metal batteries and lithium ion batteries may be transported under the same conditions as new batteries if safe for transport. The question if a battery is still safe for transport premise an evaluation of the condition of a battery by the consignor prior to transport. Due to the fact that the inner condition of the battery is not known, an evaluation and prediction based on several criteria is necessary. In particular, the following aspects have to be taken into consideration:

- Known impacts on the battery
- Possible risks resulting from that impact
- External indication of defects: damages (cracks, deformation) of the outer case, leakage, development of fumes,
- Internal electric condition - indications of defects: Does the battery management system still work and how are the parameters - like those of a new battery or are there differences?

- The behaviour of the battery during storage for a certain period of time prior to transport.
7. Furthermore, it has to be decided to which extent batteries with defects should be allowed for transport, whether an approval of the competent authority should be required or which transport conditions are necessary to ensure a safe transport.

## **Proposal**

8. The Sub-Committee is invited to discuss a possible legal regime for the transport of used lithium batteries, especially with regards to:
- A concept based on a differentiation between used batteries to be transported like new batteries and other used (i.e. damaged, defective) batteries,
  - The question which criteria have to be taken into consideration for the differentiation and what is the threshold; and
  - Appropriate conditions for the carriage of used lithium batteries which should not be transported like new batteries.
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