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Work of WLTP on electrified vehicles (EV): phase 1b, 2 and 3

The issue of developing environmentally relevant regulations for EVs at UNECE has been a recurrent issue of discussions and subject of comments of the European Commission on the prolongation of the EVE IWG mandate (for which a modified version has been submitted as an informal document to WP.29) and on the "path forward" document of the EVE group.

This note intends to outline the next steps of WLTP IWG for the development of EV regulations, as supported by the European Commission, and indicate some areas of possible collaboration with the EVE IWG.

Suggested next steps of WLTP IWG work on EVs

- 1) WLTP phase 1b should conclude on the development of the EV testing for electric range, fuel and electric consumption under standardised lab conditions (e.g. ambient temperatures at +/- 23° C, no specific use of auxiliaries), but for a limited set of different user profiles, such as "general" and "city" use. The work is ongoing according to an existing time schedule and should be concluded by adopting the respective amendments to the WLTP GTR n° 15 in June 2016 (see document ECE/TRANS/WP.29/2014/30). If necessary, some elements may still be added to this work package.
- 2) WLTP phase 2 should address additional aspects of EV testing for electric range, fuel and electric consumption:
 - Non-standard conditions, such as "low" (e.g. – 7° C) or "real life" (e.g. 0° - 14° C) ambient temperatures.
 - (Optional) inclusion of the operation of mobile air-conditioning (MAC) and heating systems. NB: The EU has already developed a test assessing the energy efficiency of the operation of a MAC system in a vehicle. But these procedures do not seem to be appropriate for MAC systems in EVs, since the latter are likely to be propelled by electric compressors. It should also be noted that the effects of the energy consumption of a MAC system are more relevant on EVs than on conventional ICE vehicles, which means that the effects of MAC operation on a EV should be tested, regardless of the regulatory merits of the same test for a ICE vehicle.
 - It should be investigated, whether there are other auxiliary systems the operation of which is relevant for the electric range, fuel or electric consumption of EVs and whether to develop respective test procedures

- Specific questions related to the durability and in-service conformity of EVs should be addressed, which will naturally have a strong focus on battery performance.

A starting note for WLTP phase 2 should be discussed at the next WLTP IWG meeting in November 2014, a decision on a draft of the work schedule can be expected at the GRPE meeting of January 2015.

- 3) WLTP phase 3 should revise the completeness of necessary consumer information as delivered by WLTP phases 1 and 2 in the spirit of a general "gap analysis" (by the time more experience with EVs will be available). In addition A work schedule for WLTP phase 3 can be expected in **about 3 years from now**.

Collaboration with the EVE IWG

The European Commission is convinced that all regulatory work for light duty EVs on UNECE level, which has a direct relation to the test cycle or addresses work performed on a complete vehicle, should be primarily performed under the responsibility of the WLTP IWG. The latter has already a couple of years' experience and has established a well-functioning group of recognised experts in this respect. Re-distributing this work to other IWGs would mean a loss of efficiency, consistency and most likely also of time and expertise.

Therefore, in particular the work items summarised under points 1) and 2) should be performed under the guidance of the WLTP. It should however be investigated, whether the results of the work summarised under point 2), while being developed on the basis of the existing WLTP, could be formulated in a "modular" manner, such that the principles of considering different ambient conditions or the operation of auxiliaries for test results could be applied to basically any underlying cycle. The development of such concept would suggest the close collaboration of WLTP and EVE experts. The specific case of developing test methods for the power and torque of EVs (for different purposes and under different conditions needed as an input for the proper application of the WLTP) does not seem to depend on a particular test cycle and could therefore be performed by the EVE or the WLTP IWG alike.

Most likely the work to be done under points 2) and 3) will have to rely on input elements, such as battery testing or in-depth analysis of user behaviour, which are largely independent of the specific test cycle. It is suggested that WLTP and EVE experts perform a pre-analysis of such input elements needed, the development of which then could be guided by the EVE IWG.

The work of WLTP and EVE experts could be done on the basis of the principles outlined in a Commission service proposal of January 2014 (see annex).

Work of GRPE on environmental aspects of Electrified Vehicles (EV's)

At GRPE work on environmental aspects of electrified light duty vehicles (EV comprising PEV, HEV, FCV)¹ currently is performed by the "*Electric Vehicles and the Environment (EVE)*" and the "*World Light duty Test Procedures (WLTP)*" informal working groups. The EVE is preparing a reference guide on existing technical regulation for EVs (excluding FCVs) and potential future needs. The WLTP, notably its sub-group WLTP-DTP-EV, has already developed a number of technical elements in relation of the WLTP GTR phase 1a and is about to continue this work in WLTP GTR phase 1b for other technical elements already defined. The WLTP work should extend to phases 2 and 3 covering further environmental aspects of EVs, which are not defined yet in detail.

For the sake of efficiency it is essential that any double developments by EVE and WLTP are avoided and available expert resources are used in the best manner. While at a first glance it might appear as appropriate to perform all respective future work by the WLTP, the wish of contracting parties not implementing the WLTP GTR in the near future to develop a separate GTR for those environmental aspects of EV's, which are not directly linked to a specific test cycle, has to be acknowledged. It is therefore suggested to develop several complementary GTRs dealing with EV environmental aspects:

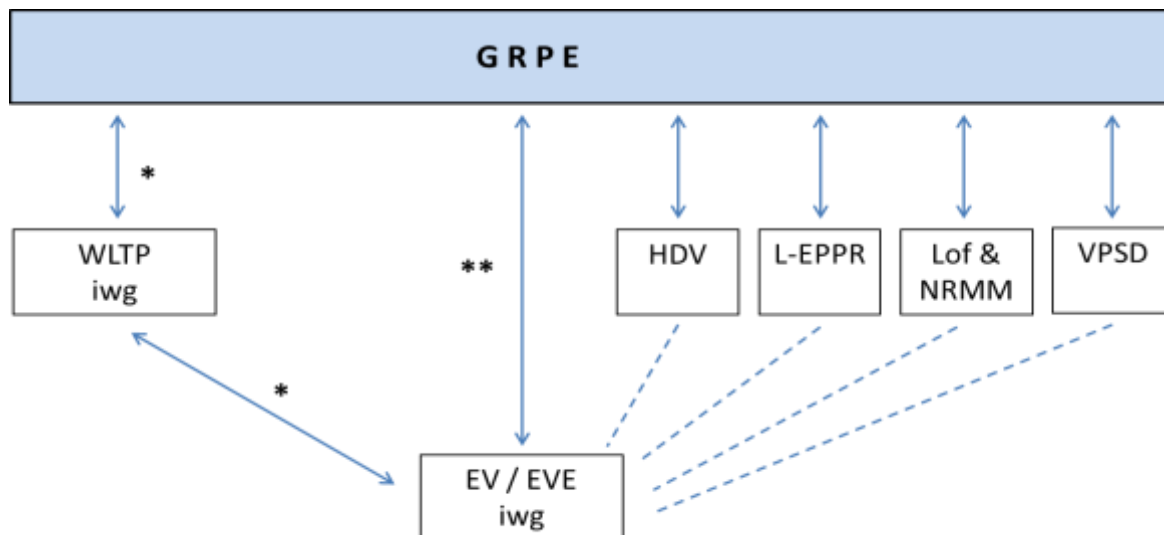
- (1) WLTP GTR covering all environmental aspects of EVs related to the characteristics of a particular test cycle, such as the determination of the electric range. In particular all elements covered by WLTP phase 1a and 1b should be exclusively included in the WLTP GTR.
- (2) EVE GTR(s) covering all environmental aspects of EVs, which are not related to the characteristics of a particular test cycle, such as certain battery tests (durability, charging performance, etc.). The procedures in the EVE GTR(s) could then be referenced by the WLTP GTR, where necessary, and transposed into regional regulations using other test cycles.

Both GTRs should be developed by a single EV expert group, which can designate specific task forces if necessary. The figure below illustrates a possible structure of the process. For all elements to be integrated into the WLTP GTR the EV expert group should report to the WLTP iwg. The EVE GTR(s) should be drafted by the EV expert group independently and be proposed to the GRPE for adoption.

The attribution of certain concrete technical elements to either an EVE or the WLTP GTR should be proposed by the particular (co-) sponsor(s), confirmed by GRPE and mandated officially by WP.29/AC.3, taking into account the views of the EVE and WLTP informal group (if applicable). In the interest of a smooth and timely process the EV expert group can already start working on such technical elements before its final attribution to a specific GTR is decided.

¹ EV = electrified vehicles, PEV = pure electric vehicle, HEV = hybrid electric vehicle, FCV = fuel cell vehicle.

The concrete items to be developed in a GTR on the basis of the recommendations of chapter 5 of the reference guide and the possible time schedule needs to be further considered by the involved parties.



* amendments/new annexes to WLTP-gtr [gtr no. 15]

** development of other EV related new gtr(s) – (light duty vehicles)