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**Items on which the exchange of views and data
should continue or begin:**

Electric vehicles and the environment

Proposal for authorization to develop amendments to gtr No. 15 and continue certain research items on environmental requirements for electric vehicles

**Submitted by the representatives of Canada, China, the European
Union, Japan and the United States of America***

The text reproduced below prepared by the representatives of Canada, China, the European Union, Japan and the United States of America to prolong the mandate of the informal working group on Electric Vehicles and the Environment (EVE), to authorize the development of amendments to gtr No. 15 and to continue certain research items on environmental requirements for electric vehicles. It is based on ECE/TRANS/WP.29/AC.3/40.

* In accordance with the programme of work of the Inland Transport Committee for 2016–2017 (ECE/TRANS/254, para. 159 and ECE/TRANS/2016/28/Add.1, cluster 3.1), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

Proposal for authorization to develop amendments to gtr No. 15 and continue certain research items on environmental requirements for electric vehicles

I. Mandate and Objectives

1. In the framework of the 1998 Agreement and under continued work by the informal working group (IWG) on Electric Vehicles and the Environment (EVE), the main objective of this proposal is to seek authorization for the EVE and IWG to begin Part B of the EVE mandate, specifically:

(a) Develop an amendment to gtr No. 15 to establish a procedure for determining the powertrain performance of electrified vehicles;

(b) Continue research on the topic of battery performance and durability, which influence vehicle performance, with the goal of returning to AC.3 seeking authorization for relevant activities (including gtr development) once this additional research is completed.; and

(c) Approach the *Group of Experts on Energy Efficiency (GEEE)*, and possibly the UNECE Executive Secretary, to request that they continue the work on the method of stating energy consumption with the support of the IWG on EVE.

2. The IWG on EVE and IWG on Worldwide harmonized Light vehicles Test Procedure (WLTP) will continue collaborating, to ensure each group's work is complimentary to the other, and avoids any duplication of effort.

II. Introduction

3. The IWG on EVE was set up in June 2012 following the approval by WP.29 of ECE/TRANS/WP.29/AC.3/32. This document established two distinct IWGs to examine environmental and safety issues related to EVs (IWGs on EVE, reporting to the Working Party on Pollution and Energy (GRPE) and the IWG on Electric Vehicle Safety (EVS), reporting to the Working Party on Passive Safety (GRSP)). As the two groups were formed at WP.29, they also reported to this forum directly. The proposal was supported by the European Commission, Directorate General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW), the National Highway Traffic Safety Administration (NHTSA) and the Environmental Protection Agency (EPA) of the United States of America, the Ministry of Industry and Information Technology (MIIT) of China, and Japan's Ministry of Land, Infrastructure, Transport and Tourism (MLIT).

4. During the first mandate of the IWG on EVE, the IWG aimed to accomplish the following objectives, which were successfully completed by November 2014:

(a) Develop a priority list of topics to address the most timely and significant considerations before the IWG on EVE;

(b) Understand and document the current considerations of Electric Vehicles (EVs) under the work of other established informal working groups: the IWGs on Electric Vehicle Safety (EVS), WLTP, Heavy Duty Hybrids (HDH), Environmental and Propulsion unit Performance Requirements (EPPR), and on Vehicle Propulsion System Definitions (VPSD);

(c) Establish a mechanism for sharing information and on-going research on topics related to EVs and the environment;

(d) Develop a reference guide for environmentally-related EV requirements already established or being considered by Contracting Parties (EV Regulatory Reference Guide (ECE/TRANS/WP.29/2014/81)).

5. The Guide¹ (ECE/TRANS/WP.29/2014/81), based on the information provided by the Contracting Parties and IWGs, presented the existing requirements relating to environmentally-related EV attributes at the time of the Guide's development (September 2013). As presented in Chapter 5 of the Guide, the analysis of such information led to the identification of gaps in requirements that could be addressed through the development of new gtr(s), and/or through supplementing the gtr(s) that are currently under development (i.e. WLTP, EPPR), and/or through other suitable efforts, like research.

6. Subsequently, a new mandate for the IWG on EVE, divided into Parts A and B was approved in November 2014 by AC.3 to conduct additional research to address the recommendations outlined in Chapter 5 of the Guide and EV power determination (i.e. now current mandate). This mandate was separate from the IWG on EVS. Part A of the current mandate was to be completed by November 2016, at which time the EVE was to return to AC.3 to seek authorization for gtr development (if appropriate):

Issues to be addressed in Parts A and B:

(a) Battery performance and durability (recommendation 5.3, ECE/TRANS/WP.29/2014/81);

(b) Determining the powertrain performance (maximum power and torque) of EVs.

Issues to be addressed only in Part A (information-sharing only):

(a) Method of stating energy consumption (recommendation 5.2, ECE/TRANS/WP.29/2014/81);

(b) Battery recycling/recyclability (recommendation 5.4, ECE/TRANS/WP.29/2014/81).

III. Areas of work

7. The initial findings and recommendations were compiled into a single report and presented to GRPE in June 2016 (GRPE-73-24), and form the basis of this request to continue work on certain topics under the EVE IWG. The EVE IWG's recommendation for areas of work on each of the four work items from Part A of the current mandate are below:

(a) Determining the powertrain performance

The work of EVE IWG during Part A of the current EVE mandate indicates that sufficient knowledge and capability exist to develop a suitable procedure for determining powertrain performance of electrified vehicles. Additionally, a procedure for determining powertrain performance has been requested by the WLTP IWG, and the membership of both IWGs have been regularly communicating during Part A of the current EVE mandate to ensure that each group's work is complimentary, and not duplicative. For this reason the EVE

¹ Available at: www.unece.org/trans/main/wp29/wp29wgs/wp29gen/gen2014.html

IWG is seeking AC.3 authorization to develop an amendment to gtr No. 15 to establish a procedure for determining the powertrain performance of electrified vehicles. The plan for this work is below.

Work Plan

- I. Consideration of the concepts:
 - Reference Method – Chassis dyno testing and calculation
 - Candidate Method – Component testing and calculation
- II. Consideration of the open points
 - Load Collectives and Maximum Power
 - Reference Method => Chassis Dyno Testing with completed vehicle and calculation to determine System Power
 - Candidate Method => Component Testing and calculation to determine System Power
 - Customer Information and other information with added value
- III. Determination of work plan with task list and including allocation of work load
- IV. Proof of concepts: Studies with different types of HEVs including. series HEV, REX and PEVs
- V. Test, refine / improve and validation of the method(s)
- VI. Drafting of the gtr
- VII. Proposal for a draft amendment to GTR No. 15
- VIII. Approval at GRPE, voting at WP.29 AC.3

(b) Battery performance and durability

The work of EVE IWG during Part A of the current EVE mandate indicates that while sufficient knowledge and capability exist to evaluate specific electrified vehicle designs for battery performance and durability, it is not clear that a vehicle-level test procedure which fairly compares all types of battery chemistries and constructions in all applications could be developed. Additionally, there is some concern among EVE members that developing a procedure prematurely may unduly influence battery design and material choice while the technology is still evolving. For these reasons the EVE IWG is seeking AC.3 authorization to continue research on the topic of battery performance and durability, which influences vehicle performance, with the goal of returning to AC.3 seeking authorization for relevant activities (including gtr development).

(c) Method of stating energy consumption

The EVE IWG developed a Microsoft Excel based model to evaluate the energy consumption of electrified vehicles during Part A of the EVE mandate. Although the EVE IWG feels this model would be suitable for the information-sharing purposes outlined in Part A of the EVE mandate, the current model is best used to make one-off evaluations of the energy consumption of a specific vehicle with a user-defined mix of source electricity.

The EVE IWG believes that improvements to this model, for the purpose of information-sharing, are important. However, in order to develop a generic model to analyse energy consumption for all cases, specific expert knowledge related to the generation and transmission of electricity will be required. It is recommended that EVE transfers this issue

to another independent group with a more cross-cutting mandate, so that appropriate experts with the required technical knowledge directly matches to this issue will be invited.

The EVE IWG is seeking AC.3 authorization to approach the *Group of Experts on Energy Efficiency (GEEE)* to request that they continue the work on the method of stating energy consumption. The EVE IWG would commit to fully supporting GEEE with any technical expertise required related to electric vehicles. The EVE IWG feels that the GEEE may be a suitable home for this work due their explicit focus on these types of issues, as noted in their mandate – "*Group of Experts focuses on ... sharing experience and best practices in the field of energy efficiency in the United Economic Commission for Europe (ECE) region*".

If the GEEE is unable to continue this work, the EVE IWG requests authority to request the aide of the UNECE Executive Secretary in identifying a suitable forum within the UNECE structure where experts in electric vehicles and experts in the generation and distribution of electricity may collaborate on this work. The EVE IWG acknowledges that the UNECE Executive Secretary may feel that the EVE IWG is the correct forum for continuing this work.

(d) Battery recycling/recyclability

As part of the work under its current mandate, the EVE IWG found that in general, EV battery recycling/recyclability is being managed by the various regional and manufacturer sponsored programs which currently exist or are under development around the world. Additionally, only a small number of EV batteries have reached the end of their useful life, and at this time it is not clear whether regulators will need to develop programs to specifically address EV recycling/recyclability issues.

The EVE IWG notes that the GRPE is primarily focused on vehicle performance topics, and the EVE IWG does not feel that battery recycling/recyclability is a vehicle performance focused topic at this time. While it may be appropriate for another group within the broader UNECE framework, the EVE IWG recommends removing battery recycling/recyclability from any subsequent mandate of the EVE IWG.

IV. Existing regulations

8. A variety of the regional regulations and directives applicable to various M- and N-category vehicles as well as UN Regulations, such as Regulation No. 85. However, there are very few which apply explicitly to electrified vehicles. At this time both the EVE and WLTP IWG agree that a procedure for determining powertrain performance specifically for electrified vehicles should be incorporated as an amendment to gtr No. 15.

V. Timeline

9. The timelines below are target timelines and are in line with those initially specified in the new EVE mandate, approved by AC.3 in November 2014. The plan will be regularly reviewed and updated to reflect progress and feasibility of the timeline.

- (a) Determining the powertrain performance:
 - (i) November 2016: Approval of the authorization to develop an amendment to gtr No. 15 by AC.3;
 - (ii) June 2018: Draft gtr available, guidance on any open issues by GRPE;
 - (iii) June 2018-January 2019: Final drafting work on gtr text;

- (iv) January 2019:
 - a. Endorsement of the draft gtr based on an informal document by GRPE;
 - b. Transmission of the draft gtr as an official document twelve weeks before the June 2019 session of GRPE.
- (v) June 2019: Recommendation of the draft gtr by GRPE;
- (vi) November 2019: establishment of the gtr by AC.3 in the Global Registry.

Note: Because this procedure may involve developing a candidate method (based on component testing) which must be validated against a reference method (based on chassis dyno testing), the EVE IWG is also asking AC.3 to allow up to 1 extra year beyond the timelines above for gtr development, if initial validation testing of the candidate method proves promising, and more time is needed to fully validate the candidate method.

- (b) Battery performance and durability:
 - (i) November 2016: Approval to continue research on the topic of battery performance and durability;
 - (ii) November 2016 - June 2018:
 - a. EVE continues research on battery performance and durability, which influence vehicle performance, such as pollutant emissions, fuel/energy consumption and range. EVE develops a detailed workplan and drafts request for relevant activities (including gtr development);
 - b. EVE continues consultation with the WLTP, including the WLTP-E-Lab sub-group and WLTP co-sponsors (Japan and the European Commission) as well as the EPPR IWG.
 - (iii) June 2018:
 - a. EVE IWG presents a first draft on the status of research work and proposal(s) for subsequent work (if appropriate) to GRPE;
 - b. EVE IWG presents informal documents on the status of research work and proposal(s) for subsequent work (if appropriate) for review by AC.3.
 - (iv) November 2018: Approval of the authorization to develop a gtr by AC.3, if appropriate;
- (c) Method of stating energy consumption:
 - (i) November 2016: Approval to approach the Group of Experts on Energy Efficiency (GEEE), and possibly UNECE Executive Secretary about continuing work on the method of stating energy consumption;
 - (ii) November 2016 - June 2018: EVE supports work of GEEE or another group on method of stating energy consumption as needed;
 - (iii) June 2018:
 - a. Report status of work on method of stating energy consumption to GRPE;
 - b. Report status of work on method of stating energy consumption to AC.3.