

Submitted by the EVE Secretariat

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(41st EVE IWG Session, December 2020)

**Report of the 41st Session of the
Electric Vehicles and the Environment Informal Working Group (EVE IWG)**

Location:	WebEx,
Time / Date:	05:30 – 07:15 EST
Chair:	Mr. Michael Olechiw (USA) [Present]
Vice-Chairs:	Mr. Hajime Ishii (Japan) [Present] Ms. Chen Chunmei (China) [Not Present]
Secretary:	Ms. Kendelle Anstey (Canada) [Present]
Drafting Coordinator(s):	Ms. Panagiota Dilara (European Commission) [Present]

Agenda items

- 1) Introductions, review of meeting agenda
- 2) Review of 40th meeting highlights and action items
- 3) Proposal on minimum performance requirement (MPR) from contracting parties
- 4) Position on MPR from OICA
- 5) Discussion of proposals and remaining open items of global technical regulation (GTR) draft, family definitions, action items

1) Introductions, review of meeting agenda

- Review of meeting agenda conducted
- Proposal to discuss family definitions in agenda (note: a proposal for a revised version for the concept of family definitions was not yet available ahead of the 41st EVE WG meeting)
- Initial intention to work on drafting document during Day 2 although may need more time.

2) Review of 40th meeting highlights and action items

- Drafting coordinator suggested to discuss family definitions on day 2 following proposal presentation
- Request to modify format of meeting minutes, in particular to capture points of agreement and disagreement from the meeting discussions and summarise outstanding decision points.

3) MPR proposal from EC, Canada and U.S. EPA

Discussion Summary

A proposal highlighting the regulators' position (EC, U.S. EPA and ECCC) was presented. It focused on the TEMA model and its use to determine an MPR value, review of warranty data and the concept of rock screening. In order to determine an appropriate MPR, the idea is to preclude performance levels that would be lower than what is currently commercially available. As this GTR would not technically be adopted by CPs before a few years from now, this value should be reflective of anticipated performance improvements in comparison to today's technologies.

The TEMA presentation provided an update of JRC's contribution to the EVE IWG "in-vehicle battery ageing" topic as of December 2020. It discussed the comparison of modeling and new real-world field data derived from aggregated average degradation data for 21 distinct vehicle models representing 64 makes, models, years with additional analyses of high usage, extreme climates and charging type. Over 6,300 EVs were assessed over a total of 1.8M operation days.

For phase 1 of the GTR, a 5% tolerance on monitor performance was proposed, meaning that if a measured value was less than 95% of the monitor, this would result in a "fail". Statistics could be based alternatively to the proposed text in the past on 3-20 vehicles sample (UNECE Reg. 83 based on ISO 8442:1991).

The proposal is supported by an extensive analysis of various vehicle parameters, battery architectures and recharging strategies, which includes anticipated battery degradation and capacity retention curves generated by the TEMA model, assuming 15% reserve capacity for BEVS and 25% reserve for PHEVS (capacity fade at 100,000 km/5years and 160,000 km/8years).

Discussion points:

- Japan, OICA, Avere and others requested additional time to further discuss/review proposal. Industry also expressed a series of concerns/comments given the compressed schedule and ambitious timelines of GTR:
 - Difficulties to reflect on positions could lead to unintended outcomes; Avere pointed out that there could be a gap between the policy intention or regulatory objective behind the GTR (i.e improving consumer certainty and transparency for battery health over time) and on the other hand, the proposed technical solution to reach this objective. In addition, there had been limited discussions on the potential impact of the GTR, for instance on the level of testing burden and unintended consequences of setting MPRs, which also depend on how the GTR's technical components are defined (vehicle family, verification procedures etc). Avere also asked how the verification procedure for part A and B would function in practice (slide 50 of the EC/US/ECCC presentation). OICA asked why a 25% capacity was assumed in the model;
 - Request to hold a workshop on TEMA model in parallel to GTR work given complexity of exercise to address discrepancies, vehicle assumptions and follow up questions;
 - Request to see proposal reflected in GTR text and opportunity to review;
 - TEMA estimates reproduce the ageing trends as depicted by GeoTab data. The results depends on the assumed driven mileages, charging power and frequency, capacity reserve etc. No information about how GeoTab curves were derived and how the vehicles were used are reported in the GeoTab set;GTR cannot be based on warranty

data since warranty points are mostly business oriented (proprietary information) and specific to each OEM; and

- Battery regulations introduced by the EU may put pressure on process of this GTR.
 - In particular that the ongoing discussions on the EU battery regulations proposal and related standardization work should not be a justification to accelerate the work of this UN GTR. (Can be found here: https://ec.europa.eu/commission/presscorner/detail/en/ip_20_2312)
- Chair acknowledged challenges related to timeline and agreed that providing more time to review proposals in advance of meetings would lead to better discussions. It was also acknowledged that CP's have asked industry for help with TEMA model and working together but no data was received to inform process, thus proposals needed to use the best publicly available data to inform the decisions. It was also reiterated that self-reported data from GeoTAB, warranties and TEMA model showed good alignment.
- OICA indicated that it was challenging to share proprietary data and work with OEMs in a way that respects confidential data.

4) Position from OICA on MPR

Summary of OICA proposal

OICA is proposing a minimum remaining energy capacity of 70% at the 5 year/100,000 km mark, whichever comes first, for M1 vehicles (passenger cars SOCC MPR) based on requirements of current ISC procedure and following the idea of rock screening level for Phase 1 of GTR. The OICA proposal is based on an average MPR, not a minimum, which could result in some number of vehicles retaining less than 70% of their original UBE. Monitoring only of N1 vehicles (vans SOCC monitoring) for phase 1 is also proposed as OICA is suggesting that a broader database (more vehicle on market/inclusion in TEMA model) is required for MPR discussions (Phase 1 data could later be used for Phase 2 discussions). Finally, OICA is proposing that no MPR values be set at this stage (Phase 1 of GTR) for M1/N1 SOCR (monitoring only) as influencing parameters/tolerance have a greater impact on range and it would be preferable to deal with this aspect in Phase 2 of the GTR discussions. The following key concerns were also articulated:

- The shape of the warranty/MPR difference curve presented during EVE 40 (EVE-40-02-Rev1e) is critical at this stage and unknown from OEMs and dependent on various factors (i.e., different regions, driving profiles, battery chemistry);
- OICA stated that the TEMA model cannot be used for creating the shape of that curve as it needs further evaluation;
- Phase 1 with implemented SOCC/SOCR should be used to identify the distribution in the field and the shape of the curve; and
- Following the Phase 1 rock screening approach, there should not be multiple ways for manufacturers to be analyzed (requirement of a fleet average MPR and a backstop criteria) and discussions on solutions should be deferred to Phase 2.

Discussion points:

- OICA finds proposal from EC, U.S. and Canada overly ambitious

- However, concerns were voiced by EC, U.S. and Canada that there is no other data being presented from industry on which to base decision; and
- Data based on warranty data are viewed by Industry as based on competitive aspects. . Industry pointed out that the data base is limited (vehicle market is currently growing; market entry of vehicles was introduced not long ago); in addition, these facts mean that the data are not representing calendar aging appropriately, a key factor in battery degradation.
- The chair noted that the determination of an appropriate MPR should be informed by publicly available data. Currently the EVE has access to three data sets and analyses: Warranty analysis, GeoTab data and the TEMA modeling performed by JRC. Steinbuch's data (EVE-30-12e.pdf and EVE-34-16e.pdf) and Myall's data (EVE-30-12e.pdf) were also reported in previous meetings. These data are relatively consistent and in lieu of other data should be used to inform the decision.

5) Discussion on proposals and GTR draft (Day 2)

Discussions with respect to timing on GTR submissions

- The Phase 1 proposal of the battery durability GTR submitted to, and approved by WP.29 allows for an extension of up to one year. This allows the EVE IWG flexibility in the submission of the draft GTR (January or later) without having to make a formal request.
- Avere requested to have a breakdown of the timeline for the GTR that would allow to assess the readiness of the draft over time and secure enough time for discussions, incl. using the time extension provided for in the mandate

Discussions on family definitions with respect to battery durability GTR

Key discussion points:

- All contracting parties were consulted on the proposal from agenda item 3. Japan requested additional time to review but agreed with the general idea;
- The supported premise from EC, U.S. and Canada is that a vehicle family will fail if 5% of values are below the MPR_i or the Declared Performance Requirement (DPR_i);
- U.S. EPA commented that fleet averaging makes use of a number of vehicles that can display lower performance than the performance requirements so an average is not considered appropriate, this combined to other factors result in a proposed MPR rather than average value;
- Industry response is that it is hard to define the appropriate percentage of vehicles which are allowed to fail due to the fact that the shape of the curve cannot be seen today due to the lack of data; going for an average ensures that in average the performance is above the MPR, going for an absolute value is requiring a broader and more representative data base;
- Vehicles equipped with the same battery should be classified under the same family definition, any subsequent changes to the battery composition would result in a new family definition; Concerns were expressed by several industry members, on the potentially high number of monitored families that the current definition could entail for Part A (e.g: whenever incremental changes are made to the battery management system). Note that vehicles tested for this

regulation are dated and current state-of-the-art vehicles likely perform much better than what data used in the TEMA model suggests;

- Industry proposed the idea of adding a ceiling to the criteria instead of just a backstop.
 - Comment from EC that manufacturers can declare a higher MPR (DPR), which avoids a ceiling and can offer manufacturers a market advantage.

Other concerns on MPR

- Unknown impacts of charging infrastructure on battery degradation and how that will be taken into account;
- Accuracy of SOC, vehicle cycling and how it may be taken into account in part A, but not necessarily in part B, when and if data is taken over the air:
 - The accuracy of the health monitor may be less when the vehicle is driven for short distances as the health monitor needs to be fully cycled; and
 - Would be up to OEMs to ensure that monitoring systems reflect this (possibly include asterisk in system indicating vehicle has not fully cycled);
- 5% tolerance rational and moving away from rock screening:
 - Lack of data: Mileage is easier to measure than time.
 - Looking at average performance of current vehicles (not most advanced technology);
 - MPR margin needed (data gaps and link with charging infrastructure missing); and
 - Driving behavior impacts and how survey accounts for it is unknown.
- Possibility of vehicles being scrapped at early stages due to inability to replace/repair batteries;
 - How to account for in GTR?

Presentation of battery durability GTR to GRPE

- Need to summarize all work so far, technical rational behind decisions and feedback;
- EVE IWG to also consider alternative timeframe; and
- Decision points must be clear. One so far being that everyone has agreed to the adoption of two state of health monitors (name change of SOH to also be reflected in GTR draft).

Decisions and Action items:

- Comments accepted on GTR draft up until December 23rd.
- Rob Gardner will provide edited draft by January 6th, 2021