

# Electric Vehicles and the Environment (EVE IWG)

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**REPORT TO GRPE 81<sup>ST</sup> SESSION**

# Original Mandate (Part B of 2<sup>nd</sup> Mandate)

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- **Hybrid power determination**
  - Targeted establishment of a power determination GTR by AC.3 in the Global Registry in November 2019 with flexibility to extend by up to 1 year based on results of validation testing
- **In-vehicle battery durability**
  - Continue research on EV battery performance and durability
  - Return to AC.3 with recommendation for next steps (such as GTR development) or conclusion of topic
- **Method of stating energy consumption**
  - Find another group within UNECE framework to assume leadership of the topic, with support of EVE IWG, with the *Group of Experts on Energy Efficiency (GEEE)* was identified as an initially promising option

# Updates to Mandate and Current Status

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- **Hybrid power determination**
  - The initial mandate envisioned the GTR as an Annex to GTR No. 15, but in March 2019 AC.3 approved the decision to instead develop it as a standalone GTR
  - In November 2019, the mandate for the GTR was extended by one year to complete additional testing to address validation concerns with the first phase test results
  - The draft GTR was submitted in March 2020 and is available as formal document GRPE/2020/12.
  - An informal document has been issued that amends GRPE/2020/12.
- **In-vehicle battery durability**
  - The EVE IWG presented a timeline proposal at the January 2020 GRPE with recommendations to approve the new mandate at AC.3 in March
  - The EVE IWG is presenting the probable framework of a Phase 1 GTR and commenting on the timeline and open issues remaining
- **Method of stating energy consumption**
  - The *Group of Experts on Energy Efficiency (GEEE)* has committed in their most recent mandate to assume leadership of the work with a one year timeline.
    - ✦ Interaction with these groups is led by the Secretary of GRPE

# Status of Power Determination GTR

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- The proposed GTR was submitted to the GRPE secretary in March 2020 (working document GRPE/2020/12)
- The drafting group has continued to resolve a few remaining open issues
- An informal document amends GRPE/2020/12 to account for these revisions

# Current power determination GTR timeline

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- **Timeline for power determination GTR**
  - June 2020: Final working document for GRPE
  - November 2020: Approval by AC.3

# Status of In-Vehicle Battery Durability

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- Review of general goals of a durability GTR:
  - Establish **minimum durability requirements**
  - **Prevent substandard products** from entering the market
  - Allow **continued development of the GTR** as the industry evolves
  - Implement a **data collection mechanism** for improving the GTR in the future

# Status of In-Vehicle Battery Durability

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- The EVE IWG reported on a potential solution for a durability GTR at the January 2020 GRPE
- The future durability GTR was expected to include:
  1. Minimum performance requirement (PR)
  2. State of Health monitor (SOH)
  3. In service conformity checks (ISC)
  4. Adoption of vehicle normal usage indices (NUI)
- EVE leadership senses that the level of interest in this work is rapidly increasing, as evidenced by EVE attendance and new expressions of interest by manufacturer organizations
  - California Air Resources Board (CARB) has communicated to EPA that they are also considering in-vehicle durability requirements and they may begin participating in the EVE
  - Alliance for Automotive Innovation is now regularly participating in EVE meetings

# Status of In-Vehicle Battery Durability

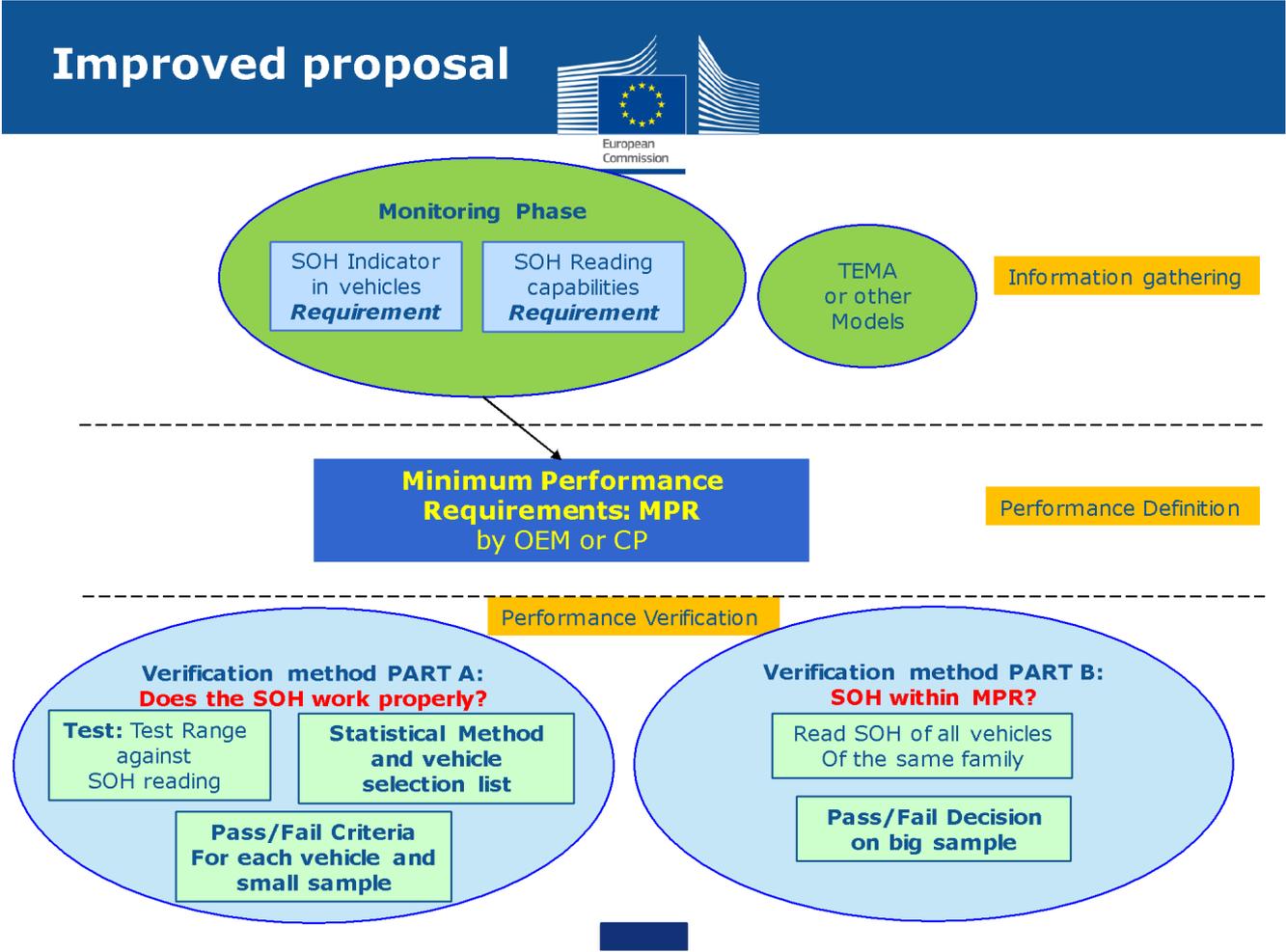
- The initial proposal included a multi-phase approach:
- Phase 1
  - Minimum performance requirement (PR) established by consensus
  - Require battery state of health (SOH) and normal usage indices (NUI) to be recorded by vehicle (e.g. on OBD)
  - In-service conformity (ISC) test which will include a way to consider usage of vehicle and a statistical method
  - SOH and NUI to be readable for ISC, and to provide source of data for improving GTR in the future
- Phase 2 *(refines PR and uses NUIs to evaluate usage at ISC)*
  - The performance requirement would be refined
  - The in-service conformity test would be refined by improving the statistical method and using NUI from vehicle to determine which vehicles are eligible to be in the sample
  - i.e. Vehicles with NUI that indicate non-“normal” usage are eliminated from ISC

# Current DRAFT framework for Phase 1

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1. **Minimum performance requirement (MPR)**
  - Percentage retention of certified range [or capacity] “x” years and/or “y” distance
  - MPR is applicable to all manufacturers
  - Individual manufacturers can declare a better performance (declared PR, or DPR)
2. **Onboard battery state-of-health (SOH) metric**
  - Definition of SOH = (Remaining range / certified range) [or based on capacity?]
  - OEMs responsible for their own algorithm
  - Readable by responsible authority (via OBD or similar)
3. **In-service conformity (ISC) and data collection**
  - Part A: Establish reliability of SOH metric
    - ✦ Small sample of 3-10 vehicles via ISC
    - ✦ Use checklist/survey to exclude vehicles with abnormal usage
    - ✦ Measure range via range test used for type approval (commonly, WLTC)
    - ✦ Verify accuracy of SOH metric by comparing to measured range
  - Part B: Determine conformity with MPR / DPR
    - ✦ Large sample of unspecified number of vehicles (may remove need for NUIs)
    - ✦ Routine collection of SOH metric, e.g. at safety inspections or via telematics
    - ✦ Determine conformity by reference to collected SOH
4. **Establish mechanism for ongoing data collection to inform Phase 2**
  - Primarily SOH collection
  - Identify simple NUIs that can be implemented now, if any
  - Discussion may be started in Phase 1 under limited samples

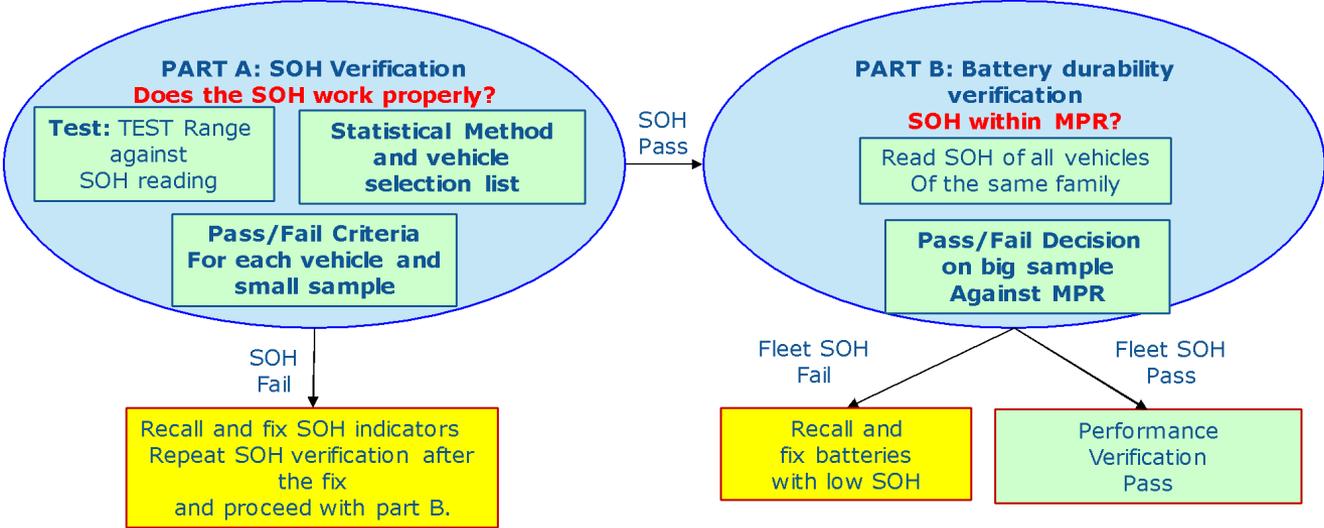
# Durability Process for SOH and MPR



# Durability Process for SOH and MPR



## Battery Performance Verification



# Original proposed mandate timeline

- (i) March 2020: Approval of mandate from AC.3
- (ii) January 2020 – June 2020: EVE IWG formulates new drafting group, and begins drafting GTR with elements agreed upon by EVE IWG
- (iii) **June 2020: EVE IWG provides update to GRPE outlining details of draft outline of GTR**
- (iv) June 2020 – December 2020: EVE begins validation testing of relevant aspects of the proposed procedure, assesses results and makes changes to GTR
- (v) January 2021: EVE IWG submits first draft proposal for the GTR as an informal document to January 2021 session of GRPE for further discussion and recommendation.
- (vi) January 2021- March 2021
  - a. EVE revises draft proposal based on recommendations from GRPE
  - b. Transmission of the draft GTR as an informal document twelve weeks before the June 2021 session of GRPE;
  - c. Endorsement of the draft GTR based on an informal document by GRPE.
- (vii) June 2021: EVE presents the final GTR to GRPE
- (viii) November 2021: establishment of the GTR by AC.3 in the Global Registry.
- (ix) January 2021-January 2024: EVE IWG continues information gathering on possible modifications to the GTR and develops amendments to the GTR for consideration by WP.29 and AC.3, as deemed appropriate.

# Requirements to meet proposed schedule

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- The proposed schedule is very ambitious
- EVE IWG plans to increase cadence of meetings to improve the chances of meeting the schedule
- EVE feels that the proposed schedule may be achievable, conditional on many developments, including (most notably) the following:
  - Ability to reach consensus on the remaining details of Phase 1, among a growing group of stakeholders who have recently expressed interest in the work
  - Availability and suitability of any existing regulatory text (e.g., ISC statistical method and questionnaire/survey) that can be adapted to the GTR
  - No need to develop prescribed NUI algorithms
  - No need for a technical validation program
  - Any prior notice needed to establish outside services to support the program (e.g. application for any new OBD PIDs)
- Mandate request includes possibility of an additional year if necessary

# Possible references for ISC development

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- **Criteria for vehicle selection (Part A):**
  - Could be modeled on existing survey such as “Selection of Vehicles for In Service Conformity Emissions Testing”, e.g. Appendix 1 of Commission Regulation (EU) 2018/1832
  - With added questions specific to vehicle and battery usage
  - Will require agreement on questions that adequately indicate potential for abnormal battery degradation
- **Statistical procedure:**
  - Could be modeled on practices and decision charts described in 5.10 of above

# Next Steps For Electrified Vehicle Durability

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- Reach final consensus on the framework of Phase 1
- Finalize membership of drafting group and identify any needed task forces and their leaders
- Identify and adapt existing text that may be useful for the GTR
- Begin drafting GTR with elements agreed upon
- Many significant open issues remain, and more are likely to be identified as this process continues

# Method of Stating Energy Consumption

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- Proposed path forward for method of stating energy consumption
  - EVE remain available as experts on EV performance to support this work under leadership of GEEE
- The EVE IWG and GEEE met at January 2020 GRPE to discuss the roles of both groups and the areas of focus for each group
- EVE IWG and the GEEE proposed to have a joint workshop depending on funding resources for further planning

# EVE Meetings

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- Regular meetings concurrent with GRPE each January and June
- 24-25 October 2017 – Vienna, Austria
- 27-28 March 2018 – Tokyo, Japan
- 16-18 October 2018 – Ottawa, Canada
- 8-10 April 2019 – Stockholm, Sweden
- 8-9 October 2019 – Brussels, Belgium
- [23-24 March 2020 – USA \(teleconference due to COVID\)](#)
- [Monthly EVE teleconferences starting in late June 2020](#)
- Fall 2020 – TBD (Asia?)
- Spring 2021 – TBD (Europe?)