

## **Proposal for a new UN GTR on in-vehicle battery durability for electrified vehicles**

### **Submitted by the Informal Working Group on Electric Vehicles and the Environment (EVE)\***

A first draft of the text for a new UN GTR on in-vehicle battery durability for electrified vehicles is reproduced below. It has been prepared by the Informal Working Group (IWG) on Electric Vehicles and the Environment (EVE) following the authorization given by WP.29/AC.3 in June 2020 to develop this UN GTR (ECE/TRANS/WP.29/AC.3/57).

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\* In accordance with the programme of work of the Inland Transport Committee for 2020 as outlined in proposed programme budget for 2020 (A/74/6 (part V sect. 20) para 20.37), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

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for electrified vehicles**

Contents

*Page*

I.	Statement of technical rationale and justification.....	x
II.	Text of the GTR .....	x
1.	Purpose .....	x
2.	Scope and application .....	x
3.	Definitions .....	x
	Etc	

Annexes

1	Vehicle survey.....	x
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## I. Statement of technical rationale and justification

### A. Introduction

[To be prepared]

### B. Procedural background

[To be prepared]

### C. Etc.

...

## II. Text of the GTR

### 1. Purpose

This Global Technical Regulation provides a worldwide harmonized method to set and verify minimum performance requirement on in-vehicle battery durability of PEV and OVC-HEVs.

### 2. Scope and application

This UN GTR applies to PEV and OVC-HEV vehicles of categories 1-2 and 2, both having a technically permissible maximum laden mass not exceeding 3,500 kg, and to all vehicles of category 1-1.

**Commented [DP(1)]:** To review scope before the finalisation to reflect all CPs as much as possible.

### 3. Definitions

The following definitions shall apply in this Global Technical Regulation. For any terms not herein defined, the definition set out in UN UN GTR No. 15 shall apply.

- 3.x. *"Battery"* means a rechargeable electrical energy storage system (REESS) installed in an electrified vehicle.
- 3.x. *"Battery energy"* refers to the Usable Battery Energy (UBE) that would be determined during the test procedure used for certification of the vehicle, if the test was performed at the present point in the lifetime of the vehicle.
- 3.x. *"Certified battery energy"* refers to the UBE that was determined during the test procedure used for certification of the vehicle.
- 3.x. *"Certified range"* refers to the all-electric driving range that was determined by the range test procedure used during certification of the vehicle.
- 3.x. *"Range"* refers to the applicable electric driving range that would be determined by the range test procedure used for certification of the vehicle, if the test was performed at the present point in the lifetime of the vehicle and the originally installed battery. For pure electric vehicles (PEVs), the applicable range is the all-electric range (AER) as defined in the certification procedure. For OVC-HEVs, the applicable range is the equivalent all-electric range (EAER) as defined in the certification procedure.

**While manufacturers commonly estimate or publicise other range-based metrics for informational purposes (such as, for example, an in-use range under real driving conditions, or the remaining range**

available before the next charging event), the range-related provisions of this GTR are concerned only with the certified range as would be measured by the applicable certification test procedure.

- 3.x. "Rechargeable electrical energy storage system" (REESS) means a propulsion energy storage system that stores electrical energy and which is rechargeable. A battery whose primary use is to supply power for starting the engine and/or lighting and/or other vehicle auxiliaries systems is not considered as a REESS. The REESS may include the necessary ancillary systems for physical support, thermal management, electronic controls and casing.
- 3.x. "State of certified energy" (SOCE) means the SOH of a REESS installed in a vehicle, where the performance metric is usable battery energy (UBE) as defined according to the test procedure applicable at certification.
- 3.x. "State of certified range" (SOCR) means the SOH of a REESS installed in a vehicle, where the performance metric is the pure electric range for PEV or equivalent all-electric range for OVC-HEV as defined according to the test procedure applicable at certification.
- 3.x. "State of health" (SOH) means the measured or estimated state of a specific performance metric of a vehicle or REESS at a specific point in its lifetime, expressed as a percentage of the performance that was determined when certified or new.
- 3.x. "Usable battery energy" (UBE) is the energy supplied by the REESS determined by the applicable test procedure from the beginning of the procedure until the applicable break-off criterion during charge depleting test.
- 3.x. "Vehicle" the use of vehicle in this GTR refers to solely vehicles to which this GTR applies to, namely PEV and OVC-HEV vehicles of categories 1-2 and 2, both having a technically permissible maximum laden mass not exceeding 3,500 kg, and to all vehicles of category 1-1.

**Commented [DP(2):** For phase 2, but in principle we could review if this is the appropriate metric.

## 4. Abbreviations

[To be completed]

## 5. Requirements

### 5.1. Installation of State-of-Certified Range/Energy (SOCR/SOCE) monitors

The OEM shall install SOCR/SOCE monitors that represents estimated state of electric range and battery energy at all times during the life of the vehicle. The SOCR/SOCE monitors shall include both a state of certified energy (SOCE) metric and a -state of certified range (SOCR) metric.

The OEM shall determine the algorithms by which SOCR/SOCE are estimated for the vehicles they produce. The manufacturer shall update the values of SOCR/SOCE with sufficient frequency as to maintain the necessary degree of accuracy during all normal vehicle operation. In case of abnormal use of the vehicle, the monitor may distinguish cases that would not allow the monitor to evaluate correctly and put a warning on the confidence on the values to be read.

The OEM shall make available the most recently determined values of the SOCR/SOCE monitors via the OBD port and optional over-the-air (OTA) for as long as the battery is in the vehicle.

For the purposes of consumer information, the OEM shall make easily available to the owner of the vehicle the most recently determined value of the SOCE monitor via, but not limited to, the following:

**Commented [DP(3):** Definition is needed for the abnormal use.

**Commented [DP(4):** Could possibly make use of OBD, further development might be needed in OBD

- (i) dashboard indicator
- (ii) infotainment system
- (iii) remote access (such as via mobile-phone applications).

**5.2. Battery Performance Requirements**

The CPs shall define Minimum Performance Requirements (MPR<sub>i</sub>) for both certified battery energy and certified range for batteries installed inside a vehicle. Vehicles falling under the categories of OVC-HEVs and PEVs shall meet both of the Minimum Performance Requirements in Tables 1 and 2 below. The MPRs may differ depending on the type of vehicle and propulsion.

**Table 1: Battery Energy based MPR**

Passenger cars	OVC-HEV	PEV
5 years or 100,000 km, whichever comes first	[90%]	[80%]
<u>Vehicles between 5 years/100,000 km and 8 years or 160,000 km, whichever comes first</u>	[80%]	[70%]
Vans	OVC-HEV	PEV
5 years or 100,000 km, whichever comes first	[90%]	[80%]
<u>Vehicles between 5 years/100,000 km and 8 years or 160,000 km, whichever comes first</u>	[80%]	[70%]

Range shall be monitored in view of setting the values below at a second phase.

**Table 2: Range based MPR**

Passenger cars	OVC-HEV	PEV
5 years or 100,000 km, whichever comes first	tbc	tbc
<u>Vehicles between 5 years/100,000 km and 8 years or 160,000 km, whichever comes first</u>	tbc	tbc
Vans	OVC-HEV	PEV
5 years or 100,000 km, whichever comes first	tbc	tbc
<u>Vehicles between 5 years/100,000 km and 8 years or 160,000 km, whichever comes first</u>	tbc	tbc

OEMs may declare better performance than the MPR<sub>i</sub>, i.e. a Declared Performance Requirement (DPR<sub>i</sub>). The OEM shall ensure that batteries installed in vehicles will perform equal or better than the MPR<sub>i</sub> (or DPR<sub>i</sub>) throughout the lifetime of the vehicle.

add a "placeholder" Annex 2, titled "RESERVED: Annex X/MPR matrix", containing text such as

[In Phase 2, the substandard areas will be defined and each CP can decide MPR]

**6. In-Use Verification**

**Families Definition**

Vehicles having the same characteristics with respect to their evaluation under Part A or Part B below shall be grouped into vehicle families for the purpose of compliance verification. Families under Part A shall have the same characteristics with respect to verification of the SOCR/SOCE monitors. Families under Part B shall have the same characteristics with respect to verification of battery durability and shall be subsets of Part A families.

**Commented [JPN0701215]:** (1) The followings were new elements added at EVE 41.  
 i) Geo-tab data was shown.  
 ii) Part B decision was changed to "Backstop concept" from "Fleet average."  
 iii) The treatment of reserve was proposed;

(2) Japan requests to provide information regarding Geo-Tab data, in the concrete analysis of information related to battery degradation, such as the battery temperature information, SOC distribution, and battery input/output power distribution. This information is considered to be an important factor in determining MPR, including the Backstop concept.

(3) In order to evaluate the degradation of the battery, it should be compared under non-reserve conditions. If the reserves are separated for PEVs and PHEVs, the concept of reserve should be clearly presented in terms of CO2 impact, user benefits, etc. Larger reserve values leading higher MPR have disadvantages such as increased battery weight and decreased lifetime EV range. Therefore, Japan at this moment has a doubt "assumption which there is always reserve" can appropriately address the purpose of eliminating substandard batteries. It would be alternative ideas that reserve is not be used for setting MPR, or that, if higher MPR values are selected in anticipation of "there is basically reserve", user benefits rather than merely checking battery degradation and the effect on total CO2 performance should be considered.

(4) Japan expects that IWG continues discussion on these.

**Commented [DP(6R5)]:** There was no proposal to add requirement for reserve capacity. Only a presentation was made on how the TEMA model treated the reserve in order to be transparent. The comparison is made with publicly available data that show similar degradation as the model. So the proposal for these values is not based on only a model but also on what data show about vehicles already in the market.

**Commented [JPN0701217]:** Japan understands that this table doesn't mean CPs need to define both 5- and 8-year MPR and that CPs may exempt the one of the useful life requirements.

**Commented [DP(8R7)]:** To be discussed further. But in principle both MPRs should apply.

**Commented [OICA\_TF9]:** OICA support Japanese proposal on single value for Phase 1.

Phase 1 should include one time/distance point: 5yr / 100k km whichever comes first

**Commented [DP(10R9)]:** The values were not proposed based on set number of battery reserve, but on all the publicly available data (GEOTAB, Warranty data, TEMA model, Tests), which show that these values are achievable with vehicles already in the market.

**Commented [OICA\_TF11]:** OICA proposal: 70%

**Commented [OICA\_TF12]:** OICA proposal: 70%

**Commented [OICA\_TF13]:** OICA proposal: delete this line for Phase 1.

**Commented [OICA\_TF14]:** N1 should be monitored only in Phase 1:  
 ▪ Not enough vehicles in the market  
 ▪ Not covered by TEMA  
 ▪ Broader data base required for MPR discussion

**Commented [DP(15R14)]:** If there are no data that show that the battery degrades differently in the vans, then why only monitor and not require the same behaviour as for PC?

**Commented [JPN07012116]:** This was proposed by Japan in the EVE40 (EVE 40 -03e) for phase 2.

**Commented [DP(17R16)]:** There is no need for an Annex, since the sentence above Table 2 states that the values shall be monitored to inform the 2<sup>nd</sup> phase. But we should definitely not add that each CP can decide MPRs. This would be against harmonisation.

Families with same characteristics for what regards compliance verification shall be defined as follows:

**For PART A: Verification of monitors**

Only vehicles that are identical with respect to the following elements may be part of the same **monitor family**:

- (a) Algorithm for SOH calculation, including software version\*
- (b) Sensor configuration (for sensors used in the SOH calculation)
- (c) Type of battery (or cell?)
- (d) Battery management system (BMS)\*
- (e) Type of vehicle (PEVs or OVC-HEVs)

\*The monitor family may be extended in the case of a different algorithm or BMS if there is sufficient evidence that the performance of the monitor will not be affected.

**For Part B: Verification of Battery Durability**

Only vehicles that are identical with respect to the following electric powertrain/transmission characteristics may be part of the same **battery durability family**:

- (a) Type and number of electric machines: construction type (asynchronous/ synchronous, etc.), type of coolant (air, liquid) and any other characteristics having a non-negligible influence on electric energy consumption and certified range;
- (b) Type of traction REESS (size, type of cell, including material, format and chemistry, capacity (Ampere-hour), nominal voltage, nominal power, type of coolant (air, liquid));
- (c) Battery management system (BMS)
- (d) Worst case energy efficiency of the vehicle (if different); Insulation/packaging of the battery should be the same
- (e) Transmission type (e.g. manual, automatic, CVT) and transmission model (e.g. torque rating, number of gears, numbers of clutches, etc.);
- (f) Number of powered axles;
- (g) Type of electric energy converter between the electric machine and traction REESS, between the traction REESS and low voltage power supply and between the recharge-plug-in and traction REESS, and any other characteristics having a non-negligible influence on electric energy consumption and range under WLTP conditions;
- (h) Operation strategy of all components influencing the electric energy consumption within the powertrain;
- (i) n/v ratios (engine rotational speed divided by vehicle speed). This requirement shall be considered fulfilled if, for all transmission ratios concerned, the difference with respect to the n/v ratios of the most commonly installed transmission type and model is within 8 per cent

**Information gathering**

The following information shall be made available to the authorities by the manufacturer: Annual report on relevant warranty claims, annual statistics on repairs for batteries and other systems that might influence the electric energy consumption of the vehicle.

**Frequency of verifications**

The manufacturer shall complete the procedure for in-use verification for Part A at least every two years until 8 years after the last vehicle of each type is sold and report the results of the

**Commented [JPN07012118]:** Cell should be used because different capacities can be defined as the same family. The definition in WLTP is proposed to be unified by "type of cell".

**Commented [OICA\_TF19]:** This should assume similar specifications for battery pack (Cell level should not matter)

**Commented [OICA\_TF20]:** Further discussion required.

**Commented [OICA\_TF21]:** Further discussion required.

verification to the authorities. The authorities may decide to proceed with their own verification of Part A, at a frequency and magnitude based on risk assessment, or request more information from the manufacturers.

The authorities shall complete the verification of Part B on a frequency based on risk assessment.

**PART A: Verification of SOCR/SOCE monitors**

In order to verify the SOCR/SOCE monitors, the values for range and battery energy shall be measured at the time of the verification and the related values from the monitors read. The measured SOCR/SOCE values shall be determined by dividing the measured values for range and battery energy (measured during Part A) by the certified values of range and battery energy (manufacturer declared values).

$$SOCE_{measured} = \frac{\text{Energy measured in Part A}}{\text{Declared energy from Type approval}}$$

$$SOCR_{measured} = \frac{\text{Range measured in Part A}}{\text{Declared range from Type approval}}$$

The values of the measured SOCR/SOCE<sub>measured</sub> monitor shall remain more than 95% of SOCE read from the vehicle, the values read from the SOCR/SOCE.

The SOCR<sub>measured</sub> monitor shall be monitored during Phase 1.

Both range and battery energy shall be measured during Part A according to the range test procedure defined in the legislation.

An adequate number of vehicles (3-10 or 20 vehicles) shall be selected from the same monitor family for testing following a vehicle survey (see annex 1) containing information designed to ensure that the vehicle has been properly used and maintained according to the specifications of the manufacturer. The following statistics shall be used to take a decision on the accuracy of the monitor.

<<New definition>>

UBE<sub>base</sub> = UBE<sub>measured</sub> \* PER (or EAER)<sub>declared</sub> / PER (or EAER)<sub>measured</sub>  
 UBE for OVC-HEV

$$UBE_{OVC-HEV} = \sum_{j=1}^{n+1} \Delta E_{REESS,j}$$

n+1 : confirmation cycle  
 energy balance during confirmation cycle needs to be considered  
 EAER : GTR#15 Annex 8 para. 4.4.4.1. shall be follow  
 <additional references from US need to be added – where is EAER defined in US-regulation>

$$EAER = \left( \frac{M_{CO2,CS} - M_{CO2,CD,avg,measured} \times \frac{M_{CO2,CD}}{M_{CO2,CS}}}{M_{CO2,CS}} \right) \times R_{CDC}$$

Statistics:

Separate statistics shall be calculated for the SOCR monitor and the SOCE monitor.

A vehicle test shall be considered a fail (f) when the measured SOCR/SOCE is less than the 95% of the value of the SOCR/SOCE monitor

A vehicle test shall be considered a pass (p) when the measured SOH is more than the 95% of the SOCR/SOCE monitor value.

Pass/Fail decision for a sample

**Commented [JPN07012122]:** 1) Since one-direction and a tolerance of 5% are generally equal to the Japanese proposal, Japan will accept them.  
 2) Please clarify the intent of the proposal for "Another possibility of the table from current Reg. 83."  
 3) Basically, there should be no problem with vehicle selection, but Japan wants to check if such vehicle selection works through conducting some case studies according to the legislative text.

**Commented [OICA\_TF23]:** First wording proposal for further discussion.

**Commented [OICA\_TF24]:** Tolerance needs to be larger to account for design and test execution/measurement variation.

Therefore, OICA is supporting a higher tolerance as the 7% proposed in Japan presentation (EVE-40-03).

**Commented [OICA\_TF25]:** SOCR verification of tolerance not in Phase A  
 → Only monitoring  
 Means: SOCR shall be available, but not held to achieving tolerance requirement as required for SOCC

**Commented [DP(26R25)]:** This is impossible. If we do not have accurate data from the monitor it will be hard to come up with a good MPR for range.

**Commented [t27]:** These new definitions will be needed

**Commented [OICA\_TF28]:** Definitions just copy in from EVE-38-03:  
 New definitions are required but need further discussion.

**Commented [OICA\_TF29]:** Tolerance needs to be larger to account for design and test execution/measurement variation.

Therefore, OICA is supporting a higher tolerance as the 7% proposed in Japan presentation (EVE-40-03).

**Commented [DP(30R29)]:** Having higher tolerance is not appropriate because it will also influence the accuracy of the values read for Part B.

**Commented [OICA\_TF31]:** Tolerance needs to be larger to account for design and test execution/measurement variation.

Therefore, OICA is supporting a higher tolerance as the 7% proposed in Japan presentation (EVE-40-03).

**Commented [DP(32R31)]:** See comment above.

For the purposes of deciding on a pass/fail result for the sample, 'p' is the count of passed results, and 'f' is the count of failed results. Each passed test result shall increase the 'p' count by 1 and each failed test result shall increase the 'f' count by 1 for the relevant open statistical procedure.

Upon the incorporation of valid SOH test results to an open instance of the statistical procedure, the type approval authority shall perform the following actions:

- update the cumulative sample size 'n' for that instance to reflect the total number of valid tests incorporated to the statistical procedure;
- following an evaluation of the results, update the count of passed results 'p' and the count of failed results 'f';
- check whether a decision is reached with the procedure described below.

The decision depends on the cumulative sample size 'n', the passed and failed result counts 'p' and 'f'. For the decision on a pass/fail of an verification sample the authority shall use the decision chart in Figure 1. The charts indicate the decision to be taken for a given cumulative sample size 'n' and failed count result 'f'.

Two decisions are possible for a statistical procedure for a given vehicle family:

'Sample pass' outcome shall be reached when the decision chart from Figure 1 gives a "PASS" outcome for the current cumulative sample size 'n' and the count of failed results 'f'.

'Sample fail' decision shall be reached when, for a given cumulative sample size 'n', when the applicable decision chart from Figure 1 gives a "FAIL" decision for the current cumulative sample size 'n' and the count of failed results 'f'.

If no decision is reached, the statistical procedure shall remain open and further results shall be incorporated into it until a decision is reached.

Figure 1:

Decision chart for the statistical procedure (where 'UND' means undecided).

failed result count f	10							FAIL
	9						FAIL	FAIL
	8					FAIL	FAIL	FAIL
	7				FAIL	FAIL	FAIL	FAIL
	6			FAIL	FAIL	FAIL	FAIL	FAIL
	5		FAIL	FAIL	FAIL	UND	UND	PASS
	4	FAIL	FAIL	UND	UND	UND	UND	PASS
	3	FAIL	FAIL	UND	UND	UND	UND	PASS
	2	UND	UND	UND	UND	PASS	PASS	PASS
	1	UND	PASS	PASS	PASS	PASS	PASS	PASS
	0	PASS	PASS	PASS	PASS	PASS	PASS	PASS
	3	4	5	6	7	8	9	10
	<b>Cumulative sample size n</b>							

[Another possibility is the table from current Reg. 83, which is based on International Standard ISO 8422:1991:](#)

**Commented [OICA\_TF33]:** New Option (proposed first time in EVE-41)  
 → needs further evaluation.



**Table for acceptance/rejection sampling plan by attributes**

<i>Cumulative sample size (n)</i>	<i>Pass decision number</i>	<i>Fail decision number</i>
<u>3</u>	<u>0</u>	<u>=</u>
<u>4</u>	<u>1</u>	<u>=</u>
<u>5</u>	<u>1</u>	<u>5</u>
<u>6</u>	<u>2</u>	<u>6</u>
<u>7</u>	<u>2</u>	<u>6</u>
<u>8</u>	<u>3</u>	<u>7</u>
<u>9</u>	<u>4</u>	<u>8</u>
<u>10</u>	<u>4</u>	<u>8</u>
<u>11</u>	<u>5</u>	<u>9</u>
<u>12</u>	<u>5</u>	<u>9</u>
<u>13</u>	<u>6</u>	<u>10</u>
<u>14</u>	<u>6</u>	<u>11</u>
<u>15</u>	<u>7</u>	<u>11</u>
<u>16</u>	<u>8</u>	<u>12</u>
<u>17</u>	<u>8</u>	<u>12</u>
<u>18</u>	<u>9</u>	<u>13</u>
<u>19</u>	<u>9</u>	<u>13</u>
<u>20</u>	<u>11</u>	<u>12</u>

Corrective measures for the monitor:

A fail decision for the sample means that the monitors fail to report accurately the durability of the system and appropriate action shall be taken by the OEM with the agreement of the authority. This may lead to the requirement that the OEM brings all vehicles in the same monitor family in conformity by repairing or replacing the faulty monitor including the relevant sensors or applying software measures.

Part B shall be started within [x] years from the date of fail decision.

A pass decision or correction of the non-conformity is required for proceeding with Part B (i.e. the verification of the Battery Durability).

**PART B: Verification of Battery Durability**

Data shall be collected yearly by the authorities from a statistically adequate sample of vehicles within the same battery durability family. The decision on the number of the vehicles in the sample may be taken by the authority based on risk assessment methodology, but in principle should not be less than 500. If the number of vehicles in the sample is less than 500, then the vehicle survey in Annex 1 shall be used to decide whether the vehicle has been abnormally used and therefore should be excluded from the sample. The data read shall be those of the SOCR/SOCE monitors (and other relevant data tbd).

The authorities shall take a decision for what concerns the application of this GTR to Small Volume Manufacturers.

*Pass/Fail Criteria*

A family shall **pass** if more than [95%] of SOCR/SOCE values read from the vehicle sample are above the MPRI or DPRI.

A family shall **fail** if more than [5%] of SOCR/SOCE values read from the vehicle sample are below the MPRI or DPRI.

**Commented [JPN07012134]:** When failure continues in Part A, it is not necessary to shift to Part B. No description of penalties. Japan made a presentation at EVE 40 (EVE 40 -03e)

**Commented [DP(35R34)]:** I suggest to delete this line. The periodicity of the PART B is already defined below. If the monitor fails then first it should be corrected and as soon as possible PART B shall continue.

**Commented [JPN07012136]:** As a matter of concern, the distribution on the lower side of the SOCE includes a large number of severely used vehicles. Need to discuss NUI, which was concluded that Fleet Average judgement does not need NUI.

Japan would like to ask or confirm the following points.  
Did you add this condition for the case where less than 500 units of the vehicle of the same battery durability family will be sold?  
Is it correct that the vehicle survey will not be conducted for more than 500 units?  
How to deal with survey in case of OTA data collection?

**Commented [DP(37R36)]:** To be discussed at the next meeting

**Commented [OICA\_TF38]:** Only SOCR/SOCE values shall be provided (scope of MPR does not require additional data)

**Commented [DP(39R38)]:** There might be scope to collect other data to inform PHASE B. tbd

**Commented [OICA\_TF40]:** Should be moved to scope of GTR

**Commented [DP(41R40)]:** The intention is not to exclude application of the GTR for SVM, but rather to allow for better application

**Commented [OICA\_TF42]:** MPR should be based upon the Fleet average not a backstop requirement.

Taking an average value for the comparison with MPR is the right approach for Phase 1 as no one has data to see how the shape of the curve is. Manufacturers are also lacking of representative data base...no one has a reasonable amount of 8 year old PHEVs and BEVs.

The average is addressing this uncertainty and in addition covers outliers.

**Commented [DP(43R42)]:** The proposal for the MPR is based on this backstop criterion and not on fleet average, which would require even higher MPR.

*Corrective Measures for the Battery Durability Family*

In case of a fail for a battery durability family, corrective measures shall be taken with the agreement of the approval authority in order to bring the family or part of the family affected by the issue in conformity.

## Annex 1

### Vehicle Survey

- The vehicle survey shall be used for all vehicles selected for testing in Part A of the verification. The vehicle survey shall also be used for Part B, only in the case that the sample of vehicles is smaller than 500.

	x = Exclusion Criteria	X = Checked and reported	Confidential
Date:			x
Name of investigator:			x
Location of test:			x
Country of registration:		x	

Vehicle Characteristics	x = Exclusion Criteria	X = Checked and reported	Confidential
Registration plate number:		x	x
Mileage: <i>The vehicle must have mileage and age (defined as the time elapsed after first registration) below the one required for the MPR verification</i>	x		
Is the vehicle either PHEV or BEV?	x		
Date of first registration:		x	

VIN:		x	
Emission class and character or Model Year		x	
Country of registration: <i>The vehicle must be registered in a CP</i>	x	x	
Model:		x	
Engine code:		x	
Engine volume (l):		x	
Engine power (kW):		x	
Electric Engine code:		x	
Electric Engine power (kW):		x	
Electric powertrain type		x	
Energy capacity and type of battery		x	
Gearbox type (auto/manual):		x	
Drive axle (FWD/AWD/RWD):		x	
Tyre size (front and rear if different):		x	
Average fuel consumption for PHEVs		x	

Commented [DP(44)]: Add other points taken from family definition after it is finalised

<b>Is the vehicle involved in a recall or service campaign? If yes: Which one? Has the campaign repairs already been done?</b> <i>The repairs must have been done before selecting the vehicle.</i>	x	x	
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**Vehicle Owner Interview**

*(the owner will only be asked the main questions and shall have no knowledge of the implications of the replies)*

<b>Name of the owner (only available to the accredited inspection body or laboratory/technical service)</b>			x
<b>Contact (address / telephone) (only available to the accredited inspection body or laboratory/technical service)</b>			x

<b>How many owners did the vehicle have?</b>		x	
<b>Did the odometer not work?</b> <i>If yes, the vehicle cannot be selected.</i>	x		
<b>Was the vehicle used for one of the following?</b>			
As car used in show-rooms?		x	
As a taxi?		x	
As delivery vehicle?		x	
For racing / motor sports?	x		
As a rental car?		x	
<b>Has the vehicle carried heavy loads over the specifications of the manufacturer?</b> <i>If yes, the vehicle cannot be selected.</i>	x		
<b>Have there been major engine or vehicle repairs?</b>		x	
<b>Have there been unauthorised major engine or vehicle repairs?</b> <i>If yes, the vehicle cannot be selected.</i>	x		
<b>Was the propulsion battery changed or repaired?</b> <i>If yes the vehicle cannot be selected for testing, but information should be collected</i>	x		x
<b>Has there been a power increase/tuning?</b> <i>If yes, the vehicle cannot be selected.</i>	x		
<b>Was any part of the emissions after-treatment system modified?</b> <i>If yes, the vehicle cannot be selected</i>	x		
<b>Where do you use your vehicle more often?</b>	-	-	-
% motorway	-	x	-
% rural	-	x	-
% urban	-	x	-
<b>Has the vehicle been maintained and used in accordance with the manufacturer's instructions?</b> <i>If not, the vehicle cannot be selected.</i>	x		

**Commented [OICA\_ACEA45]:** What is a major vehicle repair? What would be considered as reason to not select the vehicle?

**Commented [DP(46R45)]:** This is not a reason to not select the vehicle. It is just for information purposes. The ones below are.

<b>Full service and repair history including any re-works</b> <i>If the full documentation cannot be provided, the vehicle cannot be selected.</i>	x		
<b>Battery related checks: (Indicating Normal Use)</b>			
<b>How often did you charge the vehicle when:</b>			
%with battery almost at 0 charge	-	X	
%with battery half charged	-	X	
%with battery almost fully charged	-	x	
<b>On average how often were fast or superfast chargers used in a month?</b>		x	
<b>What is your estimation of the percentage of time that the vehicle was used in the following ambient temperature ranges:</b>			
Below -7C:		x	
Between -7C and 35C:		x	
More than 35C:		x	
<b>What percentage of time was the vehicle used for V2G or other similar non-propulsion purposes?</b>		x	
<b>How many months per year was the vehicle stored and not used?</b>		x	

**Commented [DP(47)]:** To decide whether some of these could be exclusion criteria for Part B

**Commented [OICA\_TF48]:** Should be an exclusion criteria

**Commented [DP(49R48)]:** Proposal? What would be the acceptable percentage of time? And on which criteria?

X=  
Exclusion Criteria    X=checked and reported    Relevant for BEV

#### Vehicle Examination and Maintenance

<b>Fuel tank level (full / empty)</b> <i>Is the fuel reserve light ON? If yes, refuel before test.</i>		x	
<b>Are there any warning lights on the instrument panel activated indicating a vehicle or exhaust after-treatment system malfunctioning that cannot be resolved by normal maintenance? (Malfunction Indication Light, Engine Service Light, etc?)</b> <i>If yes, the vehicle cannot be selected</i>	x		
<b>Is the SCR light on after engine-on?</b> <i>If yes, the reagent should be filled, or the repair executed before the vehicle is used for testing.</i>	x		
<b>Visual inspection exhaust system</b> Check leaks between exhaust manifold and end of tailpipe. Check and document (with photos) <i>If there is damage or leaks, the vehicle cannot be tested</i>	x		
<b>Exhaust gas relevant components</b> Check and document (with photos) all emissions relevant components for damage. <i>If there is damage, the vehicle cannot be tested</i>	x		
<b>Fuel sample</b> Collect fuel sample from non-pressurised fuel tanks		x	
<b>Air filter and oil filter</b> Check for contamination and damage. Change if damaged or heavily contaminated or less than 800 km before the next recommended change.		x	

## GRPE-82-27

<b>Wheels (front &amp; rear)</b> Check whether the wheels are freely moveable or blocked or impeded by the brake. <i>If not freely moveable, the vehicle cannot be selected.</i>	x		Y
<b>Drive belts &amp; cooler cover</b> <i>In case of damage, the vehicle cannot be tested.</i>	x		
<b>Check fluid levels</b> Check the max. and min. levels (engine oil, cooling liquid) / top up if below minimum		x	
<b>Vacuum hoses and electrical wiring</b> Check all for integrity. <i>In case of damage, the vehicle cannot be tested.</i>	x		Y
<b>Injection valves / cabling</b> Check all cables and fuel lines. <i>In case of damage, the vehicle cannot be tested.</i>	x		Y
<b>Ignition cable (gasoline)</b> Check spark plugs, cables, etc. In case of damage, replace them.		x	
<b>EGR &amp; Catalyst, Particle Filter</b> Check all cables, wires and sensors. <i>In case of tampering or damage, the vehicle cannot be selected.</i>	x		
<b>Safety condition</b> Check tyres, vehicle's body, electrical and braking system status are in safe conditions for the test and respect road traffic rules. <i>If not, the vehicle cannot be selected.</i>	x		Y
<b>Semi-trailer</b> Are there electric cables for semi-trailer connection, where required?		x	Y
<b>Check if less than 800 km away from next scheduled service, if yes, then perform the service.</b>		x	Y
<b>Powertrain Control Module calibration part number and checksum</b>		x	Y
<b>OBD diagnosis (before or after the emissions test)</b> Read Diagnostic Trouble Codes & Print error log		x	
<b>OBD Service Mode 09 Query (before or after the emissions test)</b> Read Service Mode 09. Record the information.		x	
<b>OBD mode 7 (before or after the emissions test)</b> Read Service Mode 07. Record the information			

Remarks for: Repair / replacement of components / part numbers

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