

Japan Comments Part 2 for
Battery Durability GTR
@EVE45

25. March.2021

5. Requirements

5.1. State-of-Certified Range and State-of Certified Energy (SOCR and SOCE) monitors

The manufacturer shall determine the algorithms by which estimated SOCR and estimated SOCE are determined for the vehicles they produce. The manufacturer shall update the estimated SOCR and SOCE with sufficient frequency as to maintain the necessary degree of accuracy during all normal vehicle operation. As defined in Annex 2, in cases when the monitor would not have appropriate data to produce an accurate value or when the vehicle was abnormally used, the monitor shall distinguish these cases and put a flag on the values read.

The estimated SOCR and SOCE shall be rounded to the [nearest whole number/first decimal place] according to paragraph 7 of this GTR.

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

<Japan Comment>

In this proposal, the estimated (or on-board) SOCR and SOCE are judged to be measurable with 1% or 0.1% accuracy by ECU, and the consistency with the 5% (*) criteria of Part A cannot be ensured.

(* 5% justification was presented by Japan in EVE 34 -15 and agreed by the IWG)

Technically meaningless requirements (All underlined sentences, including the SB portion) should be deleted.

< Japan concerns >

1. The estimated (or on-board) SOCE calculated by the ECU can be given with an accuracy of, for example, 1/256 (0.3906%).

There is measurement variability, the results of the 99 percentile determination varies by 13.4% from the measured capacity, according to the figure presented at EVE 34 -15 .

That is, a difference of 0.4% or 1% has no technical meaning.

2. Due to the large measurement variation of Estimated (or on-board) SOCE, the criteria of Part A was set by 5%, but this rounding description makes it inconsistent.

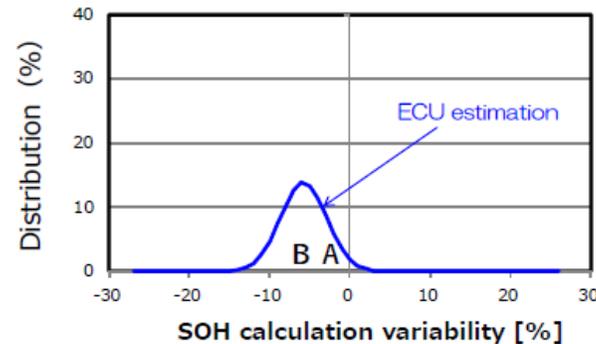
3. Estimated (or on-board) SOCE is used in the ISC Part A process and does not require Rounding

4. Resolution shall be determined according to the algorithms.

ECU estimation accuracy of SOH

EVE34-15

2012MY Prius PHV (previous Model)



Current model has not recovered yet

[%]	-99 Percentile	Average	+99 Percentile
Calculation error in in-vehicle ECU	-12.0	-5.3	1.4

Variation factor of capacity in ECU

1. Current and voltage sensors
2. Characteristic deviation of SOC-voltage relationship
3. Other, such as conservative estimation...

In the previous model, SOH in the in-vehicle ECU is lower than the measured true value by 5% on average and varies in a range of about 15%. Accumulating design tolerance further increases the variation.

Note; Vehicle A and B are within this variation.

6. In-Use Verification

6.1. Definitions of Families

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**]. Families with the same characteristics for what regards compliance verification shall be defined as follows:

<Japan Comment>

ISC Part A and Part B have different purposes. Is there a necessity to be combined into a subset ?

Otherwise, [] should be deleted.

6.3.1. Frequency of verifications

The manufacturer shall complete the procedure for in-use verification for Part A with a frequency agreed with the authorities, until 5 or 8 years as defined in paragraph 5.2. after the last vehicle of each monitor family is sold and report the results of the 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 verification of the monitors shall not be mandatory if the annual sales of the monitor family are less than 5,000 vehicles in the market for the previous year. Such in-service conformity families may still be selected to be tested for Part A, at the request of the responsible authorities.]

<Japan Comment>

- Japan thinks that this kind of exemption due to less sales is usually provided in each country's or region's legislation and it should also be appropriate in this case of Battery Durability GTR to put this exemption into each domestic legislation considering similar provisions in each county or region.
- Japan understand that monitor family may still be selected at the request of the responsible authorities, however we are concern it would be difficult to agree first sentence in this square bracket.
- Therefore, Japan proposes these two sentences in the square bracket should be deleted as whole of this exemption is depend on CPs.

6.3.2. Verification procedure

In order to verify the SOCR/SOCE monitors, the values for range and battery usable energy shall be measured at the time of the verification and the related values from the monitors read. In cases where the either monitor is reporting a flag for not being able to monitor accurately according to Annex 2, Cases A, then these vehicles shall be corrected, according to the instructions of the manufacturer, until the flag disappears and then tested. The manufacturer shall provide instructions on what is required to make the monitor able to provide an accurate value. The measured SOCR and measured SOCE values shall be determined by dividing the measured values for range and battery energy by the certified values for range and battery energy, respectively and rounded to the nearest [whole number/first decimal place] according to paragraph 7 of this GTR, expressed in %.

<Japan Comment>

As shown before (slide p.2,3), underlined sentence "and rounded to the nearest [whole number/first decimal place] according to paragraph 7 of this GTR, expressed in %." should be deleted.

6.3.4. Statistical Method for Pass/Fail decision for a sample of vehicles

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

An adequate number of 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.

[To be defined as one from the following options:

OptionB

$x_i = \text{SOC_read},i / \text{SOC_measured},i$

OptionB

the factor A shall be set at [1.01]

<Japan Comment>

In any case, Japan will accept the decision of the IWG.

IF Option B will be selected, formula should be changed from ratio to delta and [A] should be 0.05.

[Annex 2

Monitor Flag

Cases where the monitor will raise a flag, since it will not be able to produce an accurate value or the vehicle has been used abnormally:

Cases A: where the monitor does not have enough data to produce an accurate value:

1. The vehicle has not done a full charge-discharge cycle during the last month

Cases B: where the vehicle was used “abnormally”:

1. The vehicle was stored (not connected) and not used for a full month on more than 3 occasions per year.
2. The vehicle was used more than 20 per cent of the time in conditions below -7 C or more than 35 C.
3. The vehicle was charged with superfast chargers more than 50 per cent of the time.
4. There was significant V2G or other usage of the battery that would not be shown by miles driven.]

< Japan Proposal >

Case A; additional condition

2. Estimated (or on-board) SOCE has never been updated in [1 month].

< Justification >

- 1) Since the algorithm for updating estimated (or on-board) SOCE is different for each manufacturer, uniform definition and determination conditions cannot be set.
- 2) For accurate estimation of SOCE, each manufacturer takes into account the following input information , according to the each algorithm : (Charge amount, Duration between running and charging, battery temperature, etc.) Each manufacturer shall develop the algorithm and then instructions to make flag off will be determined.

< Japan Proposal >

Case B; additional tentative conditions

5. The vehicle was used more than [10] % of the time in conditions higher than [90] % of rated maximum voltage
6. The vehicle was used more than [10] % of the time in conditions higher than [90] % of rated maximum current
7. The vehicle was used more than [10] % of the time in conditions higher than [90] % of designed maximum SOC

Technical justification

Currently the market driving distribution data is being analyzed and possible proposals are under consideration.