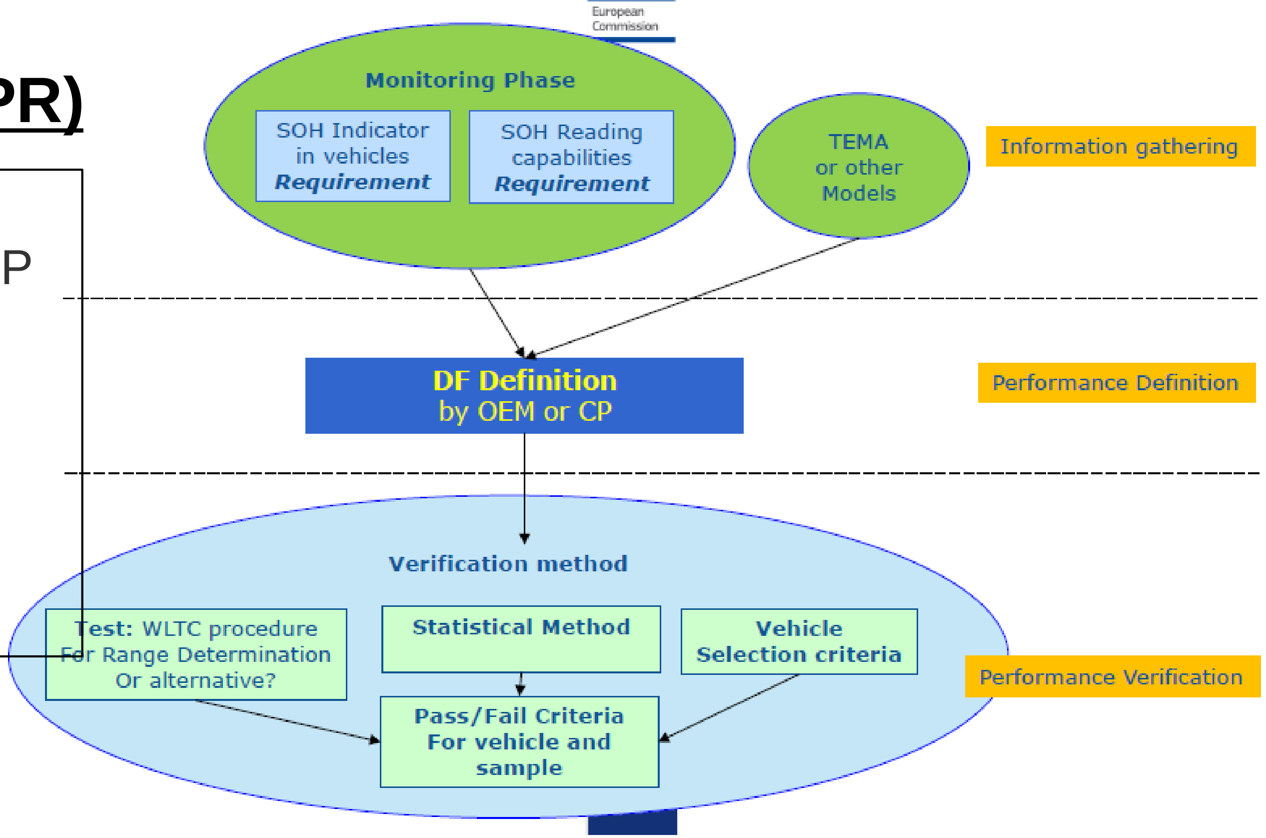
Japan Comments for Battery Durability GTR

19.May.2020

1.Minimum performance requirement (MPR)

MPR Definition:
Japan wants to confirm whether MPR is set by OEM or CP
1.Does each CP have an option to select ?
2.If OEM and CP defines different values,
which will be selected for ISC ?
For example;
1) CP: 80% > OEM: 70%
2) OEM: 80% > CP: 70%



<JAPAN Proposal>

Definition of MPR (avoid substandard battery) will be discussed in parallel with two approaches.
1) **Absolute value definition** : The selection of an appropriate value can be supported by OEM information from the TEMA model. The selected value shall still allow cost-effective products (low-end model) in the market.

2) **OEM declaration**: OEM declares appropriate levels for new vehicles, taking into account vehicle class and targeted market. If the degradation level relative to the declared value is large, it is determined that the battery is of poor quality and it will be detected by ISC.
Since it is too early to develop a uniform durability test method, the declaration is made based on the know-how of each OEM. (Accuracy cannot be guaranteed, but certain levels of degradation can be predicted)

2. State of Health monitor (SOH)

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Since we confirmed that the degradation of the electric consumption is considered to be negligibly small, EV Range method and capacity method can be considered to produce the almost the same results. [evidence in P.4,5]
Therefore **the same criteria can be used for range and capacity methods for SOH validation**,

3.In service conformity checks (ISC)

<JAPAN Proposal>

1. For all selected vehicles for ISC, NUIs to be collected via an interview and/or ECU ,also SoH from ECU once available during phase 1

Reason: Time is needed to define an appropriate list of NUIs and develop the software ,
all vehicle NUI information is required for Phase 2 improvements

2.For vehicles which are eliminated by the interview, NUI and SOH will be collected, but the ISC pass/fail judgment will not be made.

Reason: The SOH distribution of the vehicles rejected may help to estimate a more severe MPR in Phase2

Case study: Prius PHV

Electricity Consumption（**100Wh/km**）=
Net work + **Joule heat due to internal resistance of battery** + auxiliary load (ACDC, DCDC)/km

Internal resistance of the battery pack (initial value)：95 mΩ
Average current squared value: 1000 AA (WLTC driving)
Joule heat ：0.095X1000= ９５W
Average vehicle speed: 40 km/h
Contribution to electricity consumption：95/40= **2.4Wh/Km**
Internal resistance degradation (x1.5)：2.4x1.5=3.6Wh/Km. <u>1.2 Wh/Km of increase</u>
(The worst data indicated 1.25 times or lower)
Sensitivity 101.2/100: **1.2% due to deterioration in electricity consumption**

	WLTC ver.4					日本	EU/ECE	USA （参考）
	低速サイクル	中速サイクル	高速サイクル	超高速サイクル	WLTC総計	JC-08	NEDC	"Standard Cycles" FTP75
Time (sec)	589	433	455	323	1,800	1,204	1,180	1,877
Distance (m)	3,090	4,760	7,160	8,250	23,260	8,172	11,007	17,860
Max Speed (km/h)	56.5	76.6	97.4	131.3	131.3	81.6	120.0	91.2
Ave. Speed (km/h)	18.9	39.5	56.6	92.0	46.5	24.4	33.6	34.2

Case study: Leaf

Electricity Consumption （155**Wh/km**) =
Net work + **Joule heat due to internal resistance of battery** + auxiliary load (ACDC, DCDC)/km

Internal resistance of the battery pack (initial value)：90 mΩ
Average current squared value: 1000 AA (WLTC driving)
Joule heat ：0.09X1000= ９０W
Average vehicle speed: 30 km/h
Contribution to electricity consumption：90/30= **3Wh/Km**
Internal resistance degradation (x1.5)：3x1.5=4.5Wh/Km. **1.5 Wh/Km of increase**
Sensitivity 156.5/155: **1% due to deterioration in electricity consumption**