

Battery Durability review of topics

EVE-38 teleconference

8-9 October 2020

GTR Framework for Phase 1

1. Minimum performance requirement (MPR)
 - Percentage retention of certified range [or capacity] after “x” years 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 [or capacity] / certified range [or 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 (large sample may remove need for NUIs or survey)
 - Routine collection of SOH metric, e.g. at safety inspections or via telematics
 - Determine conformity by reference to collected SOH
4. Provide for data collection to inform Phase 2

1. Minimum performance requirement (MPR)

Recent discussion topic (not a complete list!)	Direction of recent proposals/discussions/drafting
Is MPR based on range retention, capacity retention, both?	<ul style="list-style-type: none"> - Broad support for capacity - Range also desired for Part B
What is the definition of “range”?	<ul style="list-style-type: none"> - Range = “certification range”, as would be measured using the applicable test procedure (<u>not</u> real-world or “personal” range)
What is the definition of “capacity”?	Capacity = UBE as defined in test procedure?
What is the MPR? What is the percentage retention? What is “x” (years)? What is “y” (kilometers)?	<ul style="list-style-type: none"> - Identify reasonable level to prevent substandard products - Refer to warranty practice, JRC TEMA modeling, trends
Is the MPR defined in the GTR, or by individual CPs?	?
What is the benefit for an OEM to declare a DPR?	? Mention on sticker?

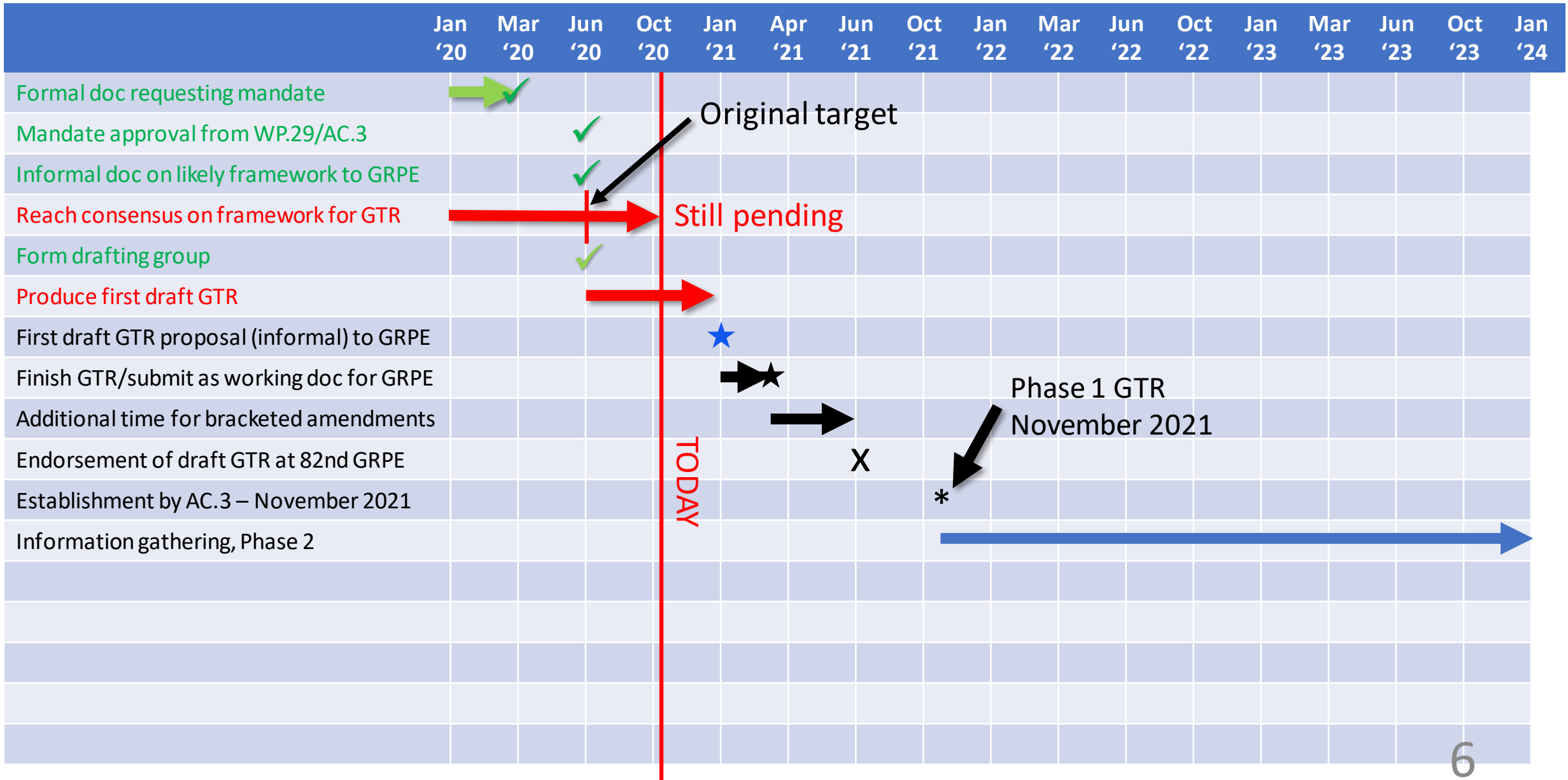
2. Onboard battery state-of-health (SOH) metric

Recent discussion topic (not a complete list!)	Direction of recent proposals/discussions/drafting
What is/are the SOH metric(s)?	CSOH = Capacity state of health RSOH = Range state of health
What is CSOH?	$(\text{determined } UBE_{\text{today}}) / (UBE_{\text{certification value}})$ <ul style="list-style-type: none">- UBE is as defined in certification procedure- “Determined” = estimated by an onboard algorithm, or measured by the test procedure
What is RSOH?	$(\text{determined } \text{Range}_{\text{today}}) / (\text{Range}_{\text{certification value}})$ <ul style="list-style-type: none">- “Range” is as defined in certification procedure- “Determined” = estimated by an onboard algorithm, or measured by the test procedure
Who can see the CSOH and RSOH?	<ul style="list-style-type: none">- CSOH is customer facing (RSOH optional)- Both readable by authority

3. In-service conformity (ISC) and data collection

Recent discussion topic (not a complete list!)	Direction of recent proposals/discussions/drafting
What is Part A? “Verification of battery durability monitor”	<ol style="list-style-type: none">1. Collect “small” sample of in-use vehicles (eliminate “abnormal” by survey)2. Read $CSOH_{onboard}$, $RSOH_{onboard}$3. Perform certification test to determine actual CSOH, RSOH4. Confirm that onboard values are “accurate” <ul style="list-style-type: none">- Criteria for accuracy to be defined- Statistics and pass/fail criteria to be defined
What is Part B? “Verification of Fleet SOH”	<ul style="list-style-type: none">- If OEM passes Part A, conformity is determined by “large” sample of $RSOH_{onboard}$- Statistics and pass/fail criteria to be defined- Sampling method to be defined (safety inspections? Telematics?)

Visual timeline (without use of additional year)



Key considerations to maintain progress:

- Reach consensus soon on the framework of Phase 1
 - Agree on the main components of the program
 - Agree that each component “can” be achieved (not exactly how to achieve)
- Identify key milestones
 - Identify each component that calls for a solution
 - Identify a timeline for each
- Identify existing regulatory text that can be incorporated or serve as a template for any/all of the components
- If possible, avoid solutions that would require more lead time
 - Avoid need for NUI algorithms by identifying an appropriate statistical design
 - Identify a framework that does not depend on a technical validation phase

Meeting roadmap

- Recent meetings:
 - EVE 34 teleconference (23-26 March 2020)
 - EVE 35 teleconference (19 May 2020)
 - EVE 36 teleconference (29-30 June 2020)
 - EVE 37 teleconference (8-9 September 2020)
 - This meeting (8-9 October 2020)
- Currently scheduled meetings before 82nd GRPE:
 - November 3-4, 2020
 - November 24-25, 2020
 - December 16-17, 2020

Timeline in mandate request

- (i) January 2020: Approval of mandate from GRPE
- (ii) June 2020: Approval of mandate from AC.3
- (iii) January 2020 – June 2020: EVE IWG formulates new drafting group, and begins drafting GTR with elements agreed upon by EVE IWG
- (iv) June 2020: EVE IWG provides update to GRPE outlining details of draft outline of GTR
- (v) **June 2020 – December 2020: ~~EVE begins validation testing of relevant aspects of the proposed procedure~~, assesses results and **makes changes to GTR****
- (vi) **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.**
- (vii) January 2021- March 2021
 - a. EVE revises draft proposal based on recommendations from GRPE
 - b. Transmission of the draft GTR as a working document twelve weeks before the June 2021 session of GRPE;
 - c. Endorsement of the draft GTR based on an informal document by GRPE.
- (viii) June 2021: EVE presents the final GTR to GRPE
- (ix) November 2021: establishment of the GTR by AC.3 in the Global Registry.
- (x) January 2022-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.
- Mandate request includes possibility of one additional year