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)

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<thead>
<tr>
<th>Recent discussion topic (not a complete list!)</th>
<th>Direction of recent proposals/discussions/drafting</th>
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</table>
| Is MPR based on range retention, capacity retention, both? | - Broad support for capacity  
- Range also desired for Part B |
| What is the definition of “range”? | - Range = “certification range”, as would be measured using the applicable test procedure (not 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)? | - 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? |
# Onboard battery state-of-health (SOH) metric

## Recent discussion topic (not a complete list!)

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<tr>
<th>What is/are the SOH metric(s)?</th>
<th>Direction of recent proposals/discussions/drafting</th>
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<tbody>
<tr>
<td>CSOH = Capacity state of health</td>
<td>(determined UBE&lt;sub&gt;today&lt;/sub&gt;) / (UBE&lt;sub&gt;certification value&lt;/sub&gt;)</td>
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<tr>
<td>RSOH = Range state of health</td>
<td>- UBE is as defined in certification procedure</td>
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<td>- “Determined” = estimated by an onboard algorithm,</td>
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<td>or measured by the test procedure</td>
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## What is CSOH?

(determined Range<sub>today</sub>) / (Range<sub>certification value</sub>)

- “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?

- CSOH is customer facing (RSOH optional)
- Both readable by authority
### 3. In-service conformity (ISC) and data collection

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| What is Part A? “Verification of battery durability monitor” | 1. Collect “small” sample of in-use vehicles (eliminate “abnormal” by survey)  
2. Read CSOH\textsubscript{onboard}, RSOH\textsubscript{onboard}  
3. Perform certification test to determine actual CSOH, RSOH  
4. Confirm that onboard values are “accurate”  

- Criteria for accuracy to be defined  
- Statistics and pass/fail criteria to be defined |
| What is Part B? “Verification of Fleet SOH” |  
- If OEM passes Part A, conformity is determined by “large” sample of RSOH\textsubscript{onboard}  
- Statistics and pass/fail criteria to be defined  
- Sampling method to be defined (safety inspections? Telematics?) |
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**Visual timeline (without use of additional year)**

- Original target
- Still pending
- Phase 1 GTR November 2021
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 82\textsuperscript{nd} GRPE:
  • November 3-4, 2020
  • November 24-25, 2020
  • December 16-17, 2020
Timeline in mandate request

1. **January 2020**: Approval of mandate from GRPE
2. **June 2020**: Approval of mandate from AC.3
3. **January 2020 – June 2020**: EVE IWG formulates new drafting group, and begins drafting GTR with elements agreed upon by EVE IWG
4. **June 2020**: EVE IWG provides update to GRPE outlining details of draft outline of GTR
5. **June 2020 – December 2020**: EVE begins validation testing of relevant aspects of the proposed procedure, assesses results and makes changes to GTR
6. **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.
   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.
7. **January 2021- March 2021**: EVE revises draft proposal based on recommendations from GRPE
8. **June 2021**: EVE presents the final GTR to GRPE
9. **November 2021**: Establishment of the GTR by AC.3 in the Global Registry.
10. **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**