In-vehicle Battery Durability: EC proposal

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Monitoring Phase

SOH Indicator in vehicles
Requiremente
SOH Reading capabilities
Requirement

TEMA or other Models

Information gathering

Performance Verification

Minimum Performance Requirements: MPR
by OEM or CP

Verification method PART A:
Does the SOH work properly?

Test: Test Range against SOH reading

Statistical Method and vehicle selection list

Pass/Fail Criteria For each vehicle and small sample

Verification method PART B:
SOH within MPR?

Read SOH of all vehicles Of the same family

Pass/Fail Decision on bigger sample
Both capacity and range needed as metrics

**Range:**
*Important for performance of vehicle and as accurate measure for second-hand sales of vehicles*
*For PHEV important as it will also determine CO2 and pollutant emissions*

**Capacity:**
*Important for second-life of vehicles*
*More stable as quantity to show on-board for consumer information*
PART A: SOH Verification
Does the SOH work properly?

Test: TEST UBE/Range against SOH readings

Statistical Method and vehicle survey

Pass/Fail Criteria
For each vehicle and small sample (3-10)

SOH Fail:
Recall and fix SOH indicators
Repeat SOH verification after the fix
and proceed with part B.

SOH Pass:

PART B: Battery durability verification
SOH within MPR?

Read SOHs of many vehicles
Of the same family

Pass/Fail Decision
on bigger sample (tbd)*
Against MPR

Fleet SOH Fail:
Recall and fix batteries with low SOH

Fleet SOH Pass:
Performance Verification Pass

Battery Performance Verification
For capacity and range

*If sample is below x, then the vehicle survey shall be used
PART A: Elements needed

**Information Elements**

- Annual report on warranty claims, repairs for batteries to be provided by manufacturer to the authorities
- List of faulty vehicles found during ISC vehicle selection

**Definition of SOH**

- Algorithm can be OEM proprietary, but verifiable
PART A: Selection Criteria for vehicles

**Vehicle examination and interview with owner**
- Using the survey
- Regular and appropriate maintenance (with proof)
- No unauthorised major repair to engine or vehicle
- No unauthorised change or repair of battery
- No evident safety problems
PART A: Testing

- Families with similarities on their battery characteristics/drivetrain need to be defined
- Testing performed every 2 years throughout lifetime of vehicle
- Method of testing according to what was used for the original definition of range/capacity
  - WLTP in Europe
  - USA?
PART A: Sample Statistics

- **3- 10 vehicles tested for range/capacity**
- **Tested Range,Capacity/ Original Range,Capacity within x% of SOH**

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PART B: Data collection

- Data may be collected yearly
  - from all registered vehicles during Periodic Technical Inspection or
  - over the air or
  - through a selected number of vehicles
- Number of Vehicles to be included in the sample shall be based on risk analysis
- If number of vehicles is less than x, then the vehicle survey shall be used to exclude vehicles
PART B: Verification of Fleet SOH

- Appropriate analysis to show if fleet SOH is above the Minimum Performance Requirements
- Recall may be necessary for those vehicles with SOH below MPR only, but to be agreed with approval authority
Conclusion

- New method proposed is simpler and avoid taking decisions on the battery durability based on testing few vehicles
- Testing of few vehicles is required to prove whether SOH is accurate
- Both capacity and range shall be verified
- Collection of SOH from many vehicles can support analysis of fleet average values
Thank you for your attention!