

Comments on Durability GTR

Technical input from USA

46th EVE, 23 and 26 April 2021

Part B families

- Part B families are intended to group vehicles for which the battery durability can be expected to be the same
- Therefore, Part B criteria should represent the design features that can affect the durability of the battery
- The current list of Part B criteria was adapted from ICEVs, for their effect on emissions of the vehicle
- Some of these criteria might not have an impact on durability of the battery; and some criteria that do have an impact may be missing
- Recommend careful functional analysis to identify meaningful criteria that relate vehicle design features to battery durability

Example of functional analysis

- What are the primary factors that impact battery durability?

Factor (from EVE-31-03e.doc)	Implicated design features
Discharge rates (duty cycle, or activity/inactivity)	<ul style="list-style-type: none">• Energy consumption of vehicle per mile• Maximum power rating of vehicle
Charge rates (speed and frequency of charging)	<ul style="list-style-type: none">• Power rating of onboard charger• DC fast charging capability, and rate• Extreme fast charging capability, and rate• Maximum regenerative braking pulse (related to size of vehicle?)
SOC window used in normal operation	<ul style="list-style-type: none">• BMS settings (usable vs. gross capacity)• <i>Cell balancing method (active or passive)</i>
Battery temperature during operation and rest	<ul style="list-style-type: none">• Battery thermal control features• Location of battery in vehicle• Insulation of battery
Calendar life	N/A

Resulting framework for Part B families (example)

1. Same maximum power rating of the electric drivetrain
2. Same certified vehicle energy consumption (within x percent?)
3. Same type of charging and maximum charging power
4. Same BMS aspects (balancing method, temperature management during charge and discharge, and cold/hot weather management)
5. Same design of traction REESS (gross and usable energy capacity, maximum power ratings for charge and discharge, cell and module topology, and battery thermal management system)
6. Same thermal insulation and battery placement in vehicle

Formation of a technical subgroup may be appropriate to identify and capture all relevant factors.

V2G and V2Home

- V2G and V2Home are increasingly a selling point for PEVs and should not be inadvertently discouraged
- This battery usage is legitimate but is not evidenced by odometer mileage
- Preferable option is to keep track of V2G energy throughput and convert it to “virtual” mileage for purpose of Part B evaluation

Possible loopholes

- Unlimited exclusion of vehicles from Part B?
 - Raising of Part A monitor flag excludes a vehicle from Part B sample
 - There is no explicit limitation on raising of the Part A monitor flag
 - Monitor might be poorly designed, and always in need of “correction until the flag disappears”
 - What happens if vehicles raise a Part A monitor flag so often that most vehicles are thus excluded from Part B?
- Unlimited exclusion of vehicles due to V2G use?
 - Any amount of V2G use is currently considered abnormal use, and would exclude a vehicle from Part B
 - If a specific vehicle model is widely used for V2G or V2Home, most or all of their vehicles might be eliminated from Part B evaluation

Battery leasing or battery swapping

- The GTR assumes that all PEVs retain the original battery for the life of the vehicle
- There do exist vehicles where the battery is regularly swapped
 - e.g. Nio Motors in China
 - These vehicles do not have any concept of “original battery”
- There do exist models where the battery is “leased”
 - e.g. Renault Zoe
 - A leased battery is not the property of the vehicle owner, and thus its degradation is not (theoretically) a liability to the vehicle owner
- Should the GTR clarify its applicability to these situations?