

Battery Durability Day 1 and 2 Open Issues for further Discussion

34th EVE IWG Meeting via WebEx, March 25th, 2020

Five main focus areas of open issues

- Performance requirements
- In-service conformity
- SOH algorithms
- Normal Usage Indices
- Validation testing and development plans

Performance requirements

- What is an acceptable minimum performance requirement ?
 - No agreed upon standard yet
 - TEMA model numbers shown are a starting point from research which has only compared select vehicle models
 - Is more testing is needed?
 - Comments that 80 to 90% basis needs more validation
- Will a performance requirement set by manufacturers and subsequently verified by authorities prevent substandard products?
 - Some concerns how this is verified and if substandard products will be prevented
 - Perhaps non issues with competitive market
 - Verifiability and availability for consumer knowledge might prevent from market
 - Importance of testing and making decisions as data becomes available

In-service conformity open issues

- What should the ISC focus on? What other ISC details are agreed on?
 - Is the direction clear on this? Or is it more of a debate on range vs capacity? Is the goal to measure range or capacity? What are the pros or cons? Could both be measured and compared?
 - Easier to measure range, not practical if include heavy duty
 - Capacity direction could create problems if the system is designed to open the capacity up
 - In case where capacity is opened range might be better to rely on
 - What details are left to look into ?
 - Is SOH part of ISC check or separate? Is it in phase 1 2 or both?
 - More reporting from dealers? Perhaps more local implementations for data?
- Concerns from EU on having manipulation in test results and should have an ISC to check values not just read on ECU
- Concerns that current ISC tests that do not test a significant amount of vehicles may be insufficient for battery durability ISC

SOH test algorithms

- Need for different algorithms and data presentation for long term management instead of instantaneous variation when being measured
- Need for common algorithm to control the conditions for when an SOC swing happens in a vehicle
- Concerns on how to properly account for driver behavior appropriately when measuring physical battery parameters
- Concerns on whether a standard set algorithm is reflective of vehicle design
- Concerns if the OEMs calculate their own SOH can it be verified for accuracy?

Normal usage indices

- What type of usage are vehicles exposed to?
 - JRC model indicator of important parameters to focus on
- How should driver behavior be appropriately accounted for when measuring physical battery parameters ?
- Where is the line drawn between normal and abnormal usage? Is there sufficient data available to determine this?
 - Use time (mileage) and fuel consumption (?) as well as idle or storage time, not just total elapsed time (i.e. intermittent, irregular use and regular)
 - Possibly compare all warranties on market...or do a warranty study?
- What should be read from the OBD port?

Validation test and development plans

- What should the focus on validation testing be on and or development plans?
 - Identified some areas from discussion
 - Not enough ISC tested vehicles
 - More verification of TEMA model to verify 80 to 90% capacity values
 - Comparing ageing models from Volvo with TEMA model
 - General SOH and ISC tests
 - Comparison of proprietary algorithms with SOH accuracy test vs ISC test?
 - Warranty study?
 - Japan's current SOH plans

Some identified action items (to be edited)

- On normal usage indices open issue: Manufacturers to provide durability management data or other algorithm data if available and possible
- On performance requirements: Volvo and JRC to look into comparing JRC TEMA modelling results with battery ageing research at Volvo

Matrix for reference

	Air pollutants	CO ₂ / Energy Consumption	Electric Driving Range
HEV	EVE group view: no consensus view yet	EVE group view: some consideration at WLTP & other areas for higher threshold EVE group view: HEV CO ₂ emission durability lifetime should always be the same as air pollutant durability lifetime	x
	EU position: HEV/PHEV pollutants should refer to useful life 160,000 km and in service conformity check requirements at 100,000 km		
	Japan position: Suggestion to use deterioration factors for degraded batteries from OVC-HEVs and NOVC-HEVs since DF's are already available for internal combustion engine type vehicles. Recommendation that manufacturers provide clear explanations that indicate that the pollutant management system can still maintain appropriate pollutant levels as the battery degrades.		
PHEV	EU position: The same position as HEVs	EVE group view: PHEV should always have the same CO ₂ emission durability lifetime requirement as HEV	EU group view: some concern about requiring durability for this value, since some manufacturers have ICE operate in certain conditions regardless of battery condition (i.e. above 80 km/h)
PEV	x	EU position: this criteria is not needed	EVE group view: There should be the same battery durability lifetime on range as other vehicle architectures. Could consider longer durability requirement for PEV range (i.e. [80% or 70%] at 150,000 km or 200,000 km; 8 or 10 years;) Could consider defining durability requirement as a function of base range, perhaps within a threshold (i.e. [80 km to 350 km] base range)
		EVE group view: The only reason to establish energy consumption requirement for PEV is if there will be an associated requirement to assess or include upstream emissions	