EU-Commission
JRC Contribution to EVE IWG:
In-vehicle battery durability e-HDVs capacity fade draft test procedure updates

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Electric Vehicles and the Environment (EVE)

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European Commission

Presentation Summary

Draft test procedure for battery capacity fade in e-HDVs

Draft test procedure for capacity fade in e-HDVs

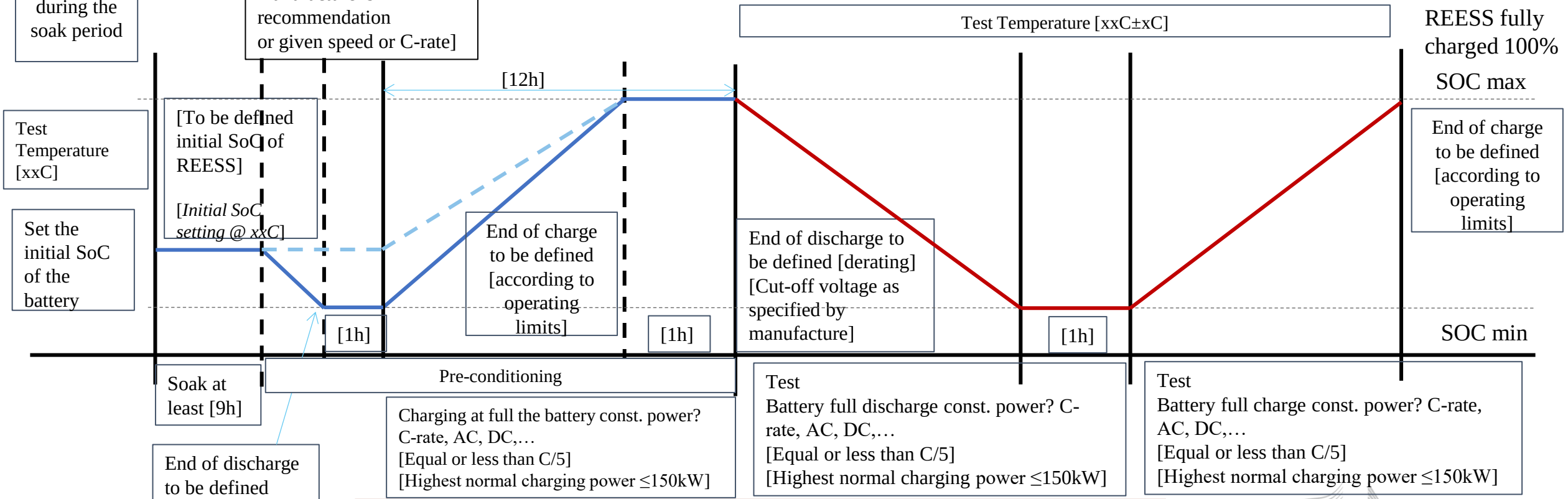
Vehicle transfer from the soak area.
This shall be done without any unjustified delay and in any case within [20] minutes.
During that time the vehicle shall not receive unjustified exposure to other temperatures but if that is unavoidable this time should in any case be limited to a maximum of [10] minutes.

[Charging and discharging
C-rate equal or less then C/5]
Highest normal charging power available [≤150kW]

Ex: 800kWh →C/5 160kW
1200kWh →C/5 240kW; C/10 120kW

The REESS shall not be charged during the soak period

Battery discharge [according to manufacturer's recommendation or given speed or C-rate]



Draft test procedure for capacity fade in e-HDVs

UN GTR 15 Annex 8 Appendix 4 for LDVs

2.2.3 Application of a normal charge
Normal charging is the transfer of electricity to an electrified vehicle with a power of less than or equal to 22 kW.

[Charging and discharging
C-rate equal or less then C/5]
Highest normal charging power available [≤150kW]

Ex: 800kWh →C/5 160kW
1200kWh →C/5 240kW; C/10 120kW

https://www.transportenvironment.org/wp-content/uploads/2021/07/2020_06_TE_comparison_hydrogen_battery_electric_trucks_methodology.pdf

Max. range without refuelling / recharging
Long-haul 800km
Regional delivery 400km

Normal charge for HDVs:
Specifications of an overnight charger for long-haul (150 kW)
Specifications of an overnight charger for regional delivery (75 kW)
→ ≤ 150kW
→ Or ≤ 200-250kW?

Ultra-fast charge:
mega charger for long-haul (1.2 MW)
Ultra-fast charger for regional delivery (600 kW)

OICA EVE-57-10e

Methods for battery in field aging determination

Constraints

- Measurement shall produce accurate, reproducible results
- Impact of in service test on customer shall be kept as low as possible
- Special equipment could be used for testing, since only a limited number of tests have to be performed in field

Solution strategy

	Battery testbench	Bidirectional charger	Road driving
No vehicle disassembly to reduce impact on customer		✓	✓
Minimize wear and risk of damaging	✓	✓	
Controled environment to get reproducible results	✓	✓	

Suggestions:

A test pulse (full charge/discharge cycle) should be applied via charging port. This can be done with a bidirectional charging unit.

Proposed test cycle

Preconditioning	▪ Charge battery to > 90 % ▪ Bring vehicle to test temperature
Charging	▪ Fully charge battery according to operating limits ▪ Sleep duration of e.g. 1h after automatic power down
Discharging	▪ Discharge with constant power ▪ Derating determines end of discharge ▪ Sleep duration of e.g. 1h after end of discharge
Charging	▪ Fully charge battery according to operating limits

Suggestions:

- Test temperature should be between 15 and 25 °C in order to reduce testing effort
- Charging should be done without any special measures to achieve good comparability with field operation
- Few vehicle tests inside of boundary conditions should represent fleet

Measured values

The following values could be derived from testing data:

- Total usable energy at constant power
- Full cycle efficiency
- Accuracy of remaining energy prediction
- Battery reference capacity (assumption: single cell voltages and OCV curves are available)
- Accuracy of SoH determined by BMS

The more accurate BMS SoH is, the lower the number of vehicle tests needed to judge field behavior may be.

Boundary conditions that qualify vehicle for testing:

- **Cell temperature** normally distributed with average temperature at Y°C and variance <Z
- **Average SoC** normally distributed with average value Y*% and variance <Z*
- **Depth of discharge (DoD):** share of cycles with DoD >Y**% must be below Z**%

Y,Y*,Y**; Z,Z*,Z** = values of variables tbd.

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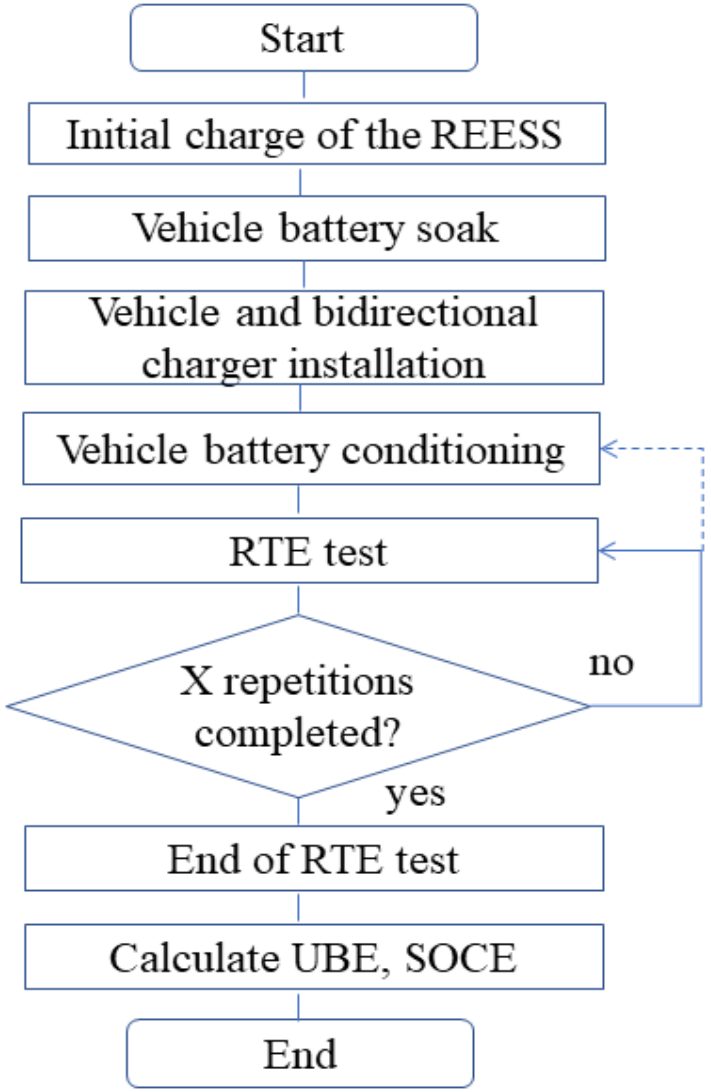

Thank you

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