The use stage of the battery in the PEFCR on batteries should include scenarios

We propose to include the potential second life

The PEFCR on Batteries: Applicable to a Self-Healing Smartphone Battery?

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Scope

- The goal is to compare a self-healing battery to a state-of-the-art battery.
- Functional Unit = "1 kWh of the total energy provided over the life by the battery".
- Reference flow = mass (kg) of battery per kWh of the total energy required by the application over its service life but there is no guidance on how to calculate the application service. If the quantity of functional unit (kWh over service life per battery) is superior to the application service, the reference flow is lower than the battery weight, which poses questions on the potential second life of such battery.

  Ex: A battery with a cycle life ≥ 500 charged every 2 days would last more than 2.7 years and if charged every 3 days, it would last more than 4.1 years.
- System boundaries include the single cell from raw material acquisition, main product production, distribution, use stage to the end of life and the charger. They exclude the mobile application (smartphone).

Inventory

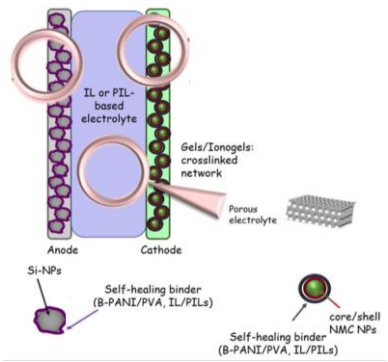
Manufacturing of:

- core/shell structured Ni Mn Co cathode particles,
- ionic liquid-based electrolytes capable of integration into self-healing ionogels,
- ionogels and polymers for the generation of self-healing battery components.

The use stage of a smartphone depends on the user profile and the PEFCR do not propose to use scenarios.

→ **3 scenarios = from low to intense use of the battery.**

Use stage only involves losses during charging.



Second life

- **Smartphone batteries may have a second life**, as the market for second-hand smartphones is growing and self-healing batteries are expected to have a longer cycle life.
- We propose that the mass of the battery not allocated to the first life can be allocated to the second life, when the energy delivered by the battery is superior to the smartphone's energy needs. The end of life can be treated and allocated similarly.

End of first life = 80 % remaining capacity and end of second life = 60% remaining capacity.

Reference flow for first life = $Rf_1 = \frac{mass}{\sum_{i=0}^{n} Edc_i}$

Reference flow for second life = $Rf_2 = \frac{mass}{\sum_{i=0}^{m} Edc_i}$

mass = mass of the battery (kg)
n= number of cycles during first life (between 243 and 730)
m= number of cycles during first life (between 243 and 730)
Edc_i= Energy delivered by cycle (kWh) is not constant

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 957225

BAT4EVER
This project is funded by the European Union