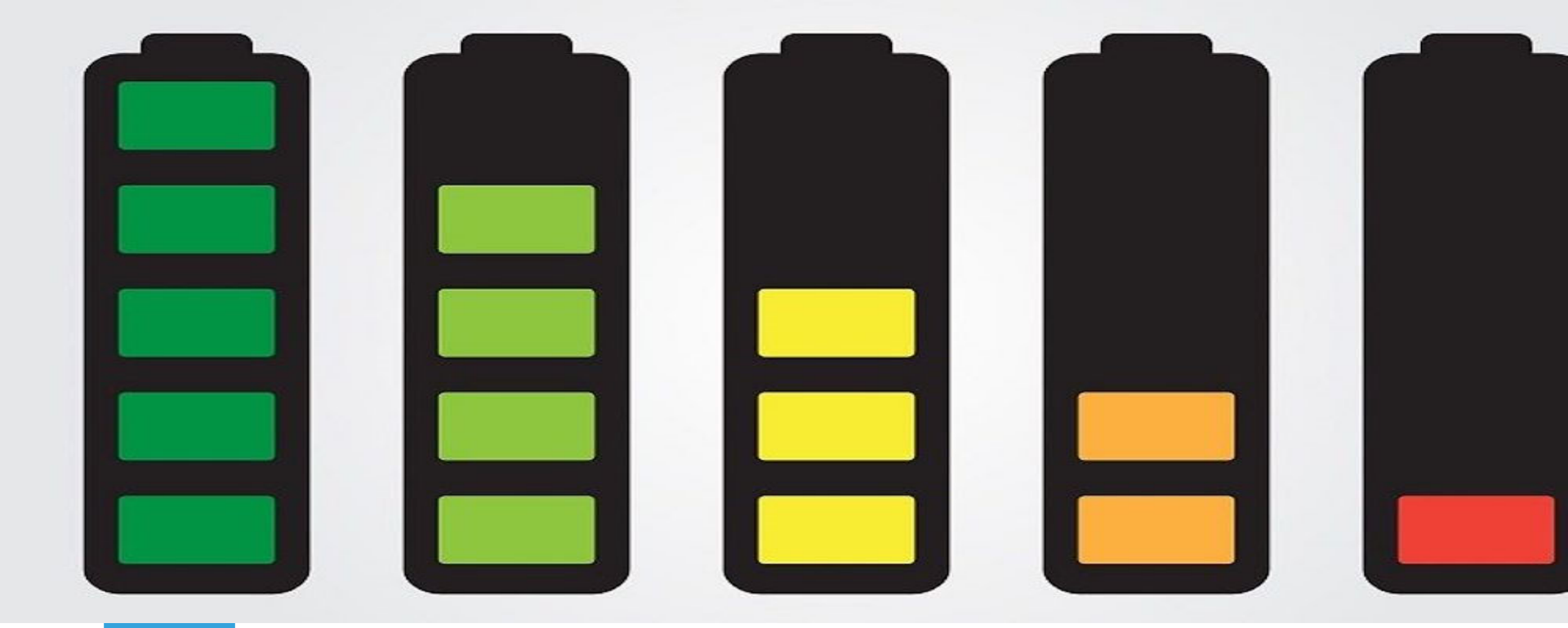

ECODESIGN BATTERIES – TASK 7.1 POLICY MEASURES ON SUSTAINABILITY

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Intro

Objectives:

- potential policy criteria on sustainability to improve the whole life cycle product performance apart from the use phase performance

There are proposals for:

- Partial Open Battery Management System
- carbon footprint information
- Battery information
- Minimum battery pack design and construction requirements

Battery Management System with partially open data

Rationale:

- A BMS with partially open data has multiple benefits
  - consumer confidence
  - support life time warranty
  - Support repair
  - Support 2nd hand car sales trust, second life applications,

> Increased life time to reduce carbon footprint per FU

Battery Management System with partially open data

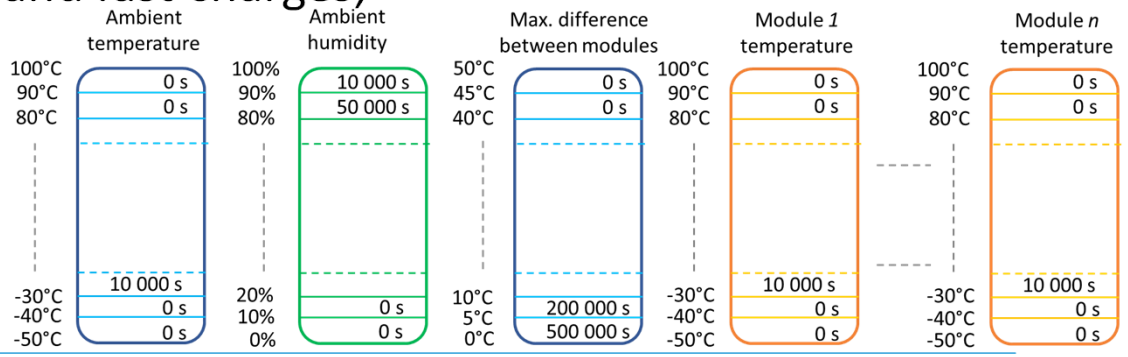
Proposal:

- State of health information
- Lifetime information
- General battery information
- BMS update possibility

Battery Management System with partially open data

Proposal:

- State of health information, e.g.:
  - (remaining) capacity, both in Ah and kWh
  - Remaining efficiency
  - Internal resistance in in mΩ for each module in a pack
- Lifetime information, e.g.:
  - calendar age including manufacturing date and start of service
  - energy throughput and capacity throughput;
  - number of normal charges and fast charges;
  - Battery use statistics like



Battery Management System with partially open data

Timing:

- The timing is one to one related to the standardization need, typically this will take 2 to 4 years to develop

Challenges:

- Development of the format for data access, and test protocols
- General uncertainty on SOH exists. No clear definition of SOH.
- Standardization of diagnostics connector on each BMS (OBD connector is not enough)
- Key challenges cover health & safety concerns, regulatory and technical ones
- Ensuring not to endanger the functional safety (esp. for firmware update)

Battery Information

Rationale:

- To allow repair, reuse, remanufacturing, repurposing, recycling
- To facilitate the End-of-Life (EoL) treatment for sustainable collection-sorting-recycling
- Linked to other policy proposals on
  - product performance
  - on BMS + some essential manufacturer dependent parameters.
- Could be used to promote responsible sourcing(?)

Battery Information

Proposal:

- The battery should carry at all levels (battery system, battery pack and module) a bar code, QR code or similar with an EAN number and serial number.
- This code provides data on a server which the manufacturer or supplier bears the responsibility of updating, e.g. such as the European Product Database for Energy Labelling (EPREL), in three levels:
  - Level 1: Public part (no access restriction)
  - Level 2: Data available to third party accredited professionals
  - Level 3: Compliance part (Information available for market surveillance authorities only)

Battery Information

Proposal:

- Data on a server
  - Level 1: Public part (no access restriction), e.g.:
    - General info
    - Lifetime info
    - Results test requirements
    - Carbon footprint info
  - Level 2: Data available to third party accredited professionals, e.g.:
    - Battery composition
    - Precise contents critical raw materials
    - Repair information
    - Dismantling information
  - Level 3: Compliance part (market surveillance authorities) , e.g.:
    - Test reports proving compliance

Battery Information

Timing:

- From 2022 onwards.

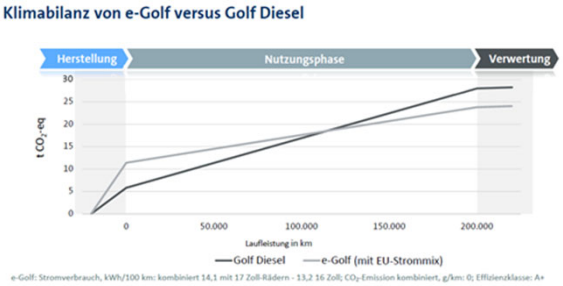
challenges:

- The proposed contents differ from other product groups so far in the European product database for energy labelling (EPREL)
- Requiring to detailed information on battery pack design might compromise or conflict intellectual property rights
- For battery marking several standards exist, updates probably needed
- For recycled content it relies on a credible traceability system throughout the value chain
- There might be standards needed for traceability of information

Carbon footprint

Rationale:

- battery requires far more energy compared to its storage capacity, typically 500 to 1000 times
- electricity takes a large share in the carbon footprint and this opens the opportunity to use low carbon electricity but also lignite and hard coal + there are also in manufacturing process EE optimizations
- help to promote "cleaner" BEV and might be a useful benchmarking between car manufacturers



Carbon footprint

Proposal:

- **Carbon footprint**(GWP) according to the Product Environmental Footprint Category Rules (PEFCR) and **relative (gCO2eq/kWh):**
  - to minimum FU(kWh) based on **product warranty life**
  - to the **specified average life time** (EN standards test cycles)
- In addition:
  - the calculated Primary Energy (MJ) and the share of electricity (MJ)
  - If no local electricity mix is used: a warranty that the low carbon electricity (if any) has been supplied based on hourly net metering (.. Might require ESS)

Carbon footprint

Timing:

- In minimum threshold ≠ recommended (too premature concept)
- For cells: as of 2021
- For packs and modules: as of 2022

challenges:

- First ever implementation & might benefit from learning. However some manufacturers already participated in the PEF pilot
- Issues on how to deal with electricity should be defined
- LCA in PEF is exhaustive method, might be simplified?
- note: only PEFC available for LiB for mobile applications!
- Market surveillance?

Design and construction requirements

Rationale:

- To support reusability/recyclability/recoverability
- simplify recycling at the end of life
- create a more competitive market and level of playing field
- support 2nd life applications
- create consumer confidence (second source supplier available, avoid a vendor lock in, back up solution in case of bankruptcy)

Design and construction requirements

Proposal:

- Introduce a new minimum recyclability index wherein:
  - Mandatory use of technical design features of the product (battery) that enable assembly/disassembly
  - Time lapsed digital photo record showing disassembly
  - Bonus/malus:
    - Standardized interfaces for hardware and software
    - Standardized thermal interface
    - Standardized dimensions and connections
    - Use of standard cell formats
    - Calculate the amount of material that can be recycled
    - Anything more?

Design and construction requirements

Timing:

- It is recommended to **start developing a standard** for two main applications before introduction (see next paragraph).
- It is also recommended to introduce this requirement **first for vehicle applications** due to the size of the market volume and they are familiar with the concept due to Directive 2005/64/EC.

Design and construction requirements

Challenges .. Needs a new standard:

- Connects to Directive 2005/64/EC on the type-approval of motor vehicles with regard to their usability, recyclability and recoverability (Annex I)
- could built on the ISO 22628:2002 + IEC/TR 62635:2012..?
- On the negative side is that EV batteries are a new market and setting such strong requirements could hamper innovation
- For niche markets, this might be a cost burden and there is not a benefit in the economy of scale for recycling?
- Car manufacturers have already a long track record in O&M tools and methods .., hence is this still needed?

INTERCONNECTION TASKS 6 AND 7

		Task 6/7 model option					
		long life	energy density	low carbon elec.	EE process opt.	low aux. power	more recycling ?
performance policy requirements							
	Minimum battery pack/system life time requirements	xxx					
	Maximum auxiliary power consumption of the BMS					xx	
sustainability policy requirements							
	Partial Open Battery Management System	xxx					
	carbon footprint information		x	xxx	xxx		
	Battery information	x					xx
	Minimum battery pack design and construction requirements	xx					xxx