

# What is the functional unit of flow batteries?



# The functional unit answers 4 questions about a product:



**What?**  
**= the function**



**How much?**  
**= the unit & magnitude**

**How long?**  
**= the duration**



**How well?**  
**= the level of quality**



# Functional unit of industrial batteries proposed by the JRC

The JRC proposed distinguishing between off-the-shelf and customised industrial batteries. The functional unit and total energy for customised batteries would be based on the client's specifications.

**Two services** for rechargeable industrial batteries are considered:



1. The battery supplies electricity stored beforehand, providing repetitive energy supply (REP) for frequent cycling behaviour in mobile and stationary equipment.

2. The battery offers backup or on-demand services (OND), staying charged and discharging sporadically during power failures or blackouts. OND batteries are suitable for mobile and stationary equipment.



The JRC defines the functional unit for the two services as follows:

- **REP batteries:** functional unit is defined as 1kWh of total energy delivered over service life. Service life ends at 80% initial capacity and the reference flow is measured in kg of battery per kWh of total energy delivered.
- **OND batteries:** functional unit is defined as 1kWmin of backup power capability (uninterrupted discharge at specified power levels) over service life (years until end-of-life). The reference flow is measured in kg of battery per kWmin of backup power capability.



# What about the functional unit of flow batteries?

The functional unit of industrial batteries proposed by the JRC is a valuable base for the carbon footprint calculation. However, several aspects and parameters must be considered when **defining the functional unit for flow batteries** such as:



☐ round-trip efficiency

☐ degradation curve

☐ depth of discharge

☐ battery lifetime

☐ generated heat

☐ recyclability of components

☐ reuse rate of electrolytes

☐ ...



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