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**Repurposing of secondary batteries –
Part 1: General requirements**

**Réaffectation des batteries d'accumulateurs –
Partie 1: Exigences générales**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

REPURPOSING OF SECONDARY BATTERIES –**Part 1: General requirements**

FOREWORD

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IEC 63330-1 has been prepared by IEC technical committee 21: Secondary cells and batteries. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
21/1193/FDIS	21/1202/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 63330 series, published under the general title *Repurposing of secondary batteries*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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REPURPOSING OF SECONDARY BATTERIES –

Part 1: General requirements

1 Scope

This part of IEC 63330 provides general requirements for repurposing of secondary cells, modules, battery packs and battery systems, herein also referred to as "PRODUCT", that are originally manufactured for other applications such as electric vehicles.

This document specifies the procedure to evaluate the performance and safety of used PRODUCT for repurposing.

This document also provides basic requirements for application of repurposed PRODUCT.

This document targets secondary lithium ion PRODUCT and battery technologies with data traceability.

The redox flow, Ni-MH and Pb-acid batteries are not covered by this document.

NOTE 1 General guidance on reuse and repurposing of secondary cells and batteries is provided in IEC 63338 (under development).

NOTE 2 Transportation is out of the scope of this document.

2 Normative references

There are no normative references in this document.

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3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 repurposing

operation that results in PRODUCT being used for a different purpose or application than the one that PRODUCT was originally designed for

Note 1 to entry: In this document, PRODUCT is cell, battery, module, battery pack and battery system.

Note 2 to entry: The repurposing in this document includes usage of used battery for the same type of purpose as original equipment, with change of battery pack composition.

Note 3 to entry: Alternative common terms for repurposing include "second use" and "second life".

3.2 secondary cell cell

basic manufactured unit providing a source of electrical energy by direct conversion of chemical energy, that consists of electrodes, separators, electrolyte, container and terminals, and that is designed to be charged electrically

3.3 module

group of cells connected together either in a series and/or parallel configuration with or without protective devices (e.g. fuse or positive temperature coefficient device) and monitoring circuitry

[SOURCE: IEC 62619:2022, 3.9]

3.4 battery pack

energy storage device, which comprises one or more cells or modules electrically connected and has monitoring circuitry which provides information (e.g. cell voltage) to a battery system to influence the battery's safety, performance and/or service life

Note 1 to entry: The battery pack may incorporate a protective housing and be provided with terminals or other interconnection arrangements.

[SOURCE: IEC 62619: 2022, 3.10]

3.5 battery system

system which comprises one or more cells, modules or battery packs and has a battery management system capable of controlling current in case of overcharge, overcurrent, overdischarge, and overheating

Note 1 to entry: The battery system may have cooling or heating units. More than one battery system may constitute a larger battery system. The battery system is sometimes also referred to as a battery.

[SOURCE: IEC 62619:2022, 3.11, modified – The second preferred term and original Note 1 to entry have been deleted.]

3.6 battery management system BMS

electronic system associated with a battery which has functions to control current in case of overcharge, overcurrent, overdischarge, and overheating and which monitors and/or manages the battery's state, calculates secondary data, reports that data and/or controls its environment to influence the battery's safety, performance and/or service life

Note 1 to entry: Overdischarge cut off is not mandatory if there is an agreement between the cell manufacturer and the customer.

Note 2 to entry: The function of the BMS can be assigned to the battery pack or to equipment that uses the battery.

Note 3 to entry: The BMS can be divided and it can be found partially in the battery pack and partially on the equipment that uses the battery.

Note 4 to entry: The BMS is sometimes also referred to as a BMU (battery management unit).

[SOURCE: IEC 62619:2022, 3.12, modified – Note 1 to entry has been modified.]

3.7 rated capacity

 C_n

capacity value of a cell or battery determined under specified conditions and declared by the cell manufacturer

Note 1 to entry: C_n is expressed in ampere hour (A h).

[SOURCE: IEC 60050-482:2004, 482-03-15, modified – The definition has been changed because both a cell and a battery can be tested for rated capacity. Note 1 to entry has been added.]

3.8 state of charge SOC

quantity of electricity stored in a cell expressed as a percentage of rated capacity

3.9 state of certified energy SOCE

measured or on-board usable battery energy (UBE) performance at a specific point in its lifetime, expressed as a percentage of the certified usable battery energy

Note 1 to entry: SOCE is available only for off vehicle charging hybrid electric vehicle and pure electric vehicle.

[SOURCE: UN-GTR22, 3.9]

3.10 usable battery energy UBE

the energy supplied by the battery from the beginning of the test procedure used for certification until the applicable break-off criterion of the test procedure used for certification is reached

[SOURCE: UN-GTR22, 3.3]

3.11 operating region

set of conditions during charging and discharging in which the cell operates within the range of voltage, current and temperature as specified by the cell manufacturer to ensure the safe use of the cell

Note 1 to entry: The limits of the operating region are specified for the minimum safety; they are different from the charging voltage and temperature to optimize the performance of the cell such as cycle life.

3.12 operating range

set of conditions during charging and discharging in which the battery system operates within the range of voltage, current and temperature as specified by the system manufacturer to ensure the safe use of the battery system

Note 1 to entry: Figure B.2 shows the relation between the operating range and the operating region.

3.13 safety design

battery design to avoid or control systematic failures and to detect or control random hardware failures, or mitigate their harmful effects

3.14
systematic failure

failure related in a deterministic way to a certain cause, that can only be eliminated by a change of the design or of the manufacturing process, operational procedures, documentation or other relevant factors

3.15
random hardware failure

failure that can occur unpredictably during the lifetime of a battery and that follows a probability distribution

3.16
critical failure

termination of an intended behaviour of a battery due to a fault manifestation

3.17
fault

abnormal condition that can cause a battery to fail

3.18
service life

total period of useful life of PRODUCT in operation which is specified for original usage

Note 1 to entry: For secondary cells and batteries, the service life may be expressed in time, number of charging/discharging cycles, capacity in ampere hours (Ah) and operating conditions (temperature range, depth of discharge, etc.).

Note 2 to entry: The service life does not equal the guarantee or warranty period provided by the original manufacturer.

Note 3 to entry: The service life is not clearly specified for vehicle propulsion application.

[SOURCE: IEC 60050-482:2004, 482-03-46, modified – The entry has been changed because batteries can still be utilized after reaching the end of their service life for the original purpose when repurposed.]

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3.19
residual usable period

remaining period of service life or estimated remaining period of useful life of battery in operation

3.20
usable period for repurposing

period usable in the application with repurposed PRODUCT specified by the designer of a system with repurposed PRODUCT

3.21
basic system design

design of repurposed PRODUCT in order to use repurposed PRODUCT safely in a system or subsystem for energy storage

4 General requirements

4.1 Structure of repurposing

Typical structure for repurposing of PRODUCT is shown in Figure 2. In this document, requirements for the following phases are specified:

- removal of PRODUCT from original equipment;
- inspection and assessment of used PRODUCT;
- storage of PRODUCT to be repurposed;
- basic system design using repurposed PRODUCT.

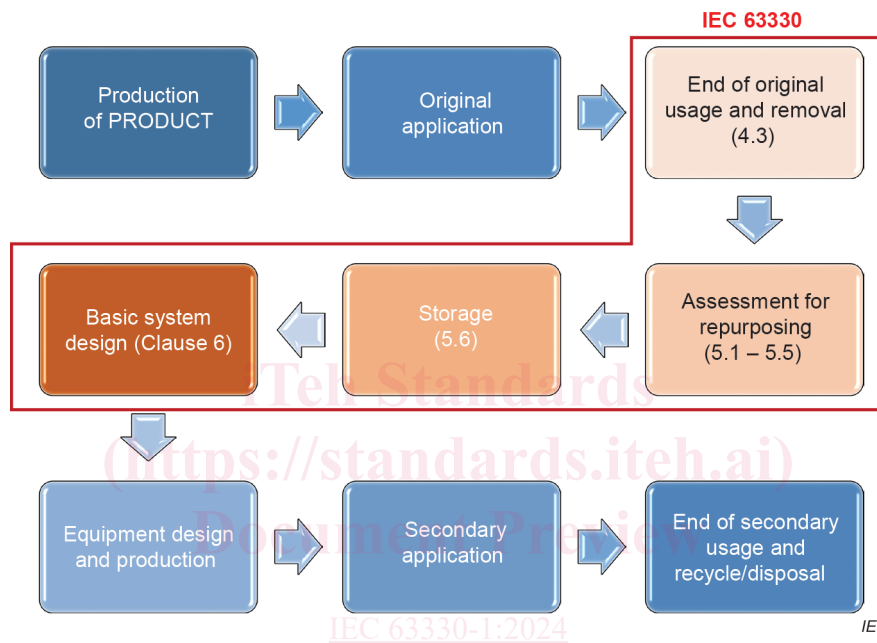
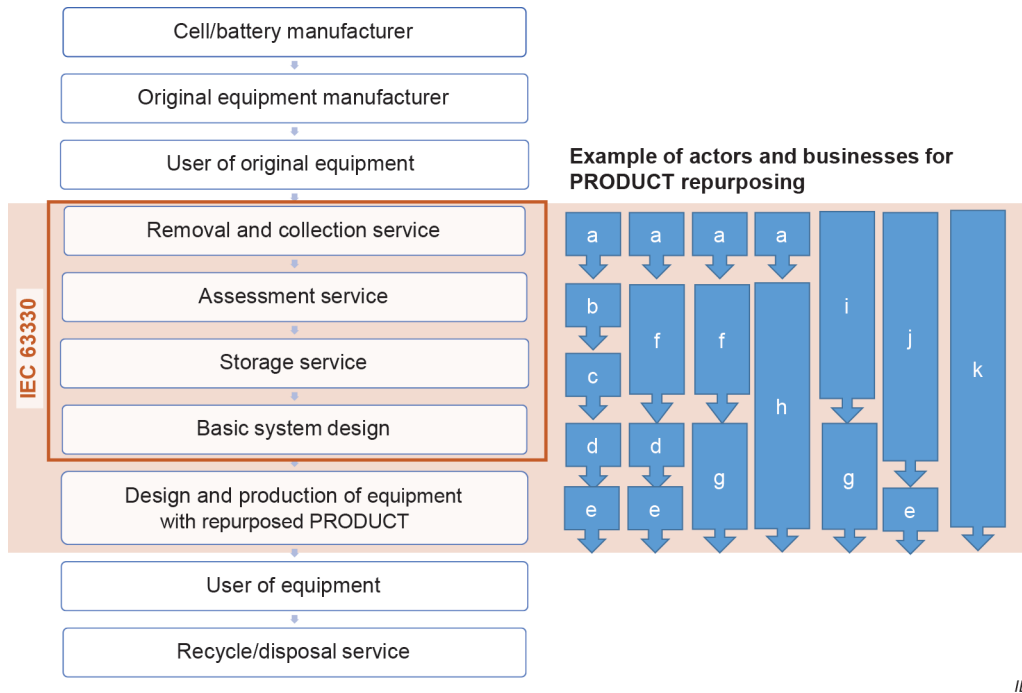


Figure 2 – Typical structure of PRODUCT repurposing

Figure 3 shows examples of actors for PRODUCT repurposing.



Key

a to k actors for each business area

Figure 3 – Example of actors for PRODUCT repurposing

This document may be applied for the PRODUCT that is repurposed after the second use. If the PRODUCT is repurposed multiple times, all the data on original usage (Table 1) and any subsequent usage shall be assessed.

NOTE For specific requirements for electrical energy storage (EES) systems using reused battery, see IEC 62933-4-4 and IEC 62933-5-3.

4.2 Relevant data

Data required for repurposing of PRODUCT are as follows.

1) Basic information:

- manufacturer of original equipment;
- chemistry;
- manufacture year and month;
- serial number, if available;
- battery pack dismantling safety procedure.

2) Data on original usage:

- operating range;
- history of critical failure;
- residual performance;
- residual usable period for original usage at the end of it;
- SOCE for traction batteries for off vehicle charging hybrid electric vehicle and pure electric vehicle;
- storage;
- history of repair and date, if existing.