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**Recovery of traction battery used in electric vehicle - Echelon
use - Part 5: Battery design guide for echelon use**

车用动力电池回收利用 梯次利用 第5部分：可梯次利用设计指南

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Table of Contents

1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Basic principles	2
5 Design for echelon use	4
Annex A (informative) Separate collection symbol of batteries	6
Annex B (normative) Factors to be considered in the design of the battery management system and of the remote monitoring data for whole-pack echelon use	7
Bibliography	9

Foreword

This document was drafted in accordance with the rules given in GB/T 1.1-2020 "Directives for standardization - Part 1: Rules for the structure and drafting of standardizing documents".

This document is Part 5 of GB/T 34015. The following parts of GB/T 34015 have already been issued:

- Recovery of traction battery used in electric vehicle - Residual energy detection;
- Recovery of traction battery used in electric vehicle - Echelon use - Part 2: Removal requirements;
- Recovery of traction battery used in electric vehicle - Echelon use - Part 3: Echelon use requirements;
- Recovery of traction battery used in electric vehicle - Echelon use - Part 4: Marking of echelon-use products;
- Recovery of traction battery used in electric vehicle - Echelon use - Part 5: Battery design guide for echelon use.

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Main drafters: Zhang Tongzhu, Liu Jingrong, Liu Shaohui, Wang Xu, Yu Haijun, Huang Dongyi, Wang Fang, Li Changdong, Ma Ruijun, Liu Meiling, Xu Kaihua, Lu Yuliang, Xu Yuhong, Li Yuke, Zhang Yuping, Wang Pan, Chen Min, Wei Qiong, Bao Wei, Li Zhenbiao, Gong Qinxue, Wang Jia, Wang Wenbin, Zhang Kun, Bie Chuanyu, Wang Xue, Xu Mao, Qian Long, Wang Hao, Chen Yinjiao, Shao Liqing, Xu Hao.

Introduction

When the remaining capacity of a traction battery falls to 80 % of its nominal capacity or below, it can no longer meet the requirements of an electric vehicle. However, once the traction battery has been retired from the electric vehicle it still has good electrical performance, thanks to the advanced manufacturing process, and its remaining capacity can still meet the requirements of energy storage facilities and low-power electrical appliances. Moreover, a traction battery pack is made up of a number of modules or cells: even where the pack can no longer be used because individual modules or cells inside it are damaged, the other modules and cells still have considerable room for secondary use. If a retired traction battery were simply crushed to recover its materials, a great waste of resources would result. Starting from the principle of maximum resource utilization, the echelon use of retired traction batteries is therefore necessary; and since its modules and cells can be combined and reused according to the actual demand of the market, the potential market and economic value is considerable.

Although the echelon use of retired traction batteries is of great significance, not every retired traction battery meets the requirements for echelon use. After a traction battery has been in use for a time, its electrical performance - capacity, internal resistance, charge retention, the consistency between cells and so on - changes in every part. Moreover, the object of echelon use is no longer an electric vehicle, so the technical requirements of use also change. Which batteries meet the criteria for echelon use, which specifications the echelon-use process is to follow, and which requirements echelon-use products are to satisfy are therefore the key technical questions faced in the echelon use of retired traction batteries. Because the echelon use of traction batteries raises many technical questions and involves many parties with different needs, GB/T 34015 is intended to consist of 6 parts.

- Part 1: Residual energy detection. Intended to judge the remaining capacity of a retired

battery and to determine whether it has echelon-use value.

- Part 2: Removal requirements. Intended to guide enterprises in removing and sorting the battery from the electric vehicle safely and efficiently.
- Part 3: Echelon use requirements. Intended to guide echelon-use enterprises in judging the echelon usability of retired batteries.
- Part 4: Marking of echelon-use products. Intended to standardize the marking of echelon-use products and to safeguard the consumer's right to know.
- Part 5: Battery design guide for echelon use. Intended to guide battery manufacturers in raising the echelon usability of new batteries and, while the requirements of use in an electric vehicle are met, in lowering the cost of echelon use in the future.
- Part 6: Specification for residual life assessment. Intended to determine the residual cycle life of retired batteries efficiently, non-destructively and at low cost, so that echelon-use products still have a high residual cycle life and a high level of safety.

This document is of significance for the echelon-use process that follows the retirement of a traction battery. Taking the later echelon-use process into account at the very beginning of the design of a traction battery, guiding battery manufacturers to raise the echelon usability of new batteries, and adopting a design for echelon use while the requirements of use in an electric vehicle are met, can effectively reduce the technical and financial investment of the State, the industry and the enterprise in the later echelon-use process, lower the technical difficulty of using retired traction batteries in low-speed electric vehicles and energy storage scenarios, reduce the damage and the loss inflicted on the battery itself during the handling of echelon-use batteries, and reduce the waste of resources in the echelon-use process.

1 Scope

This document establishes the basic principles for the design of traction batteries for echelon use and provides guidance and recommendations on the design for echelon use and related aspects.

This document applies to the design of traction battery systems, battery packs, modules and cells that can be used in echelon.

2 Normative references

The contents of the following documents constitute indispensable provisions of this document through normative reference in the text. For dated references, only the edition corresponding to that date applies to this document; for undated references, the latest edition (including all amendments) applies to this document.

GB/T 19596 Terminology of electric vehicles · GB/T 20861 Terminology of waste product

recovery and recycling · GB/T 25978 Road vehicles - Nameplates and labels · GB/T 30512 Requirements for prohibited substances on automobiles · GB/T 32960.3 Technical specifications of remote service and management system for electric vehicles - Part 3: Communication protocol and data format · GB/T 33993-2024 Commodity two-dimensional code · GB/T 34014-2017 Automotive traction battery coding rules · GB/T 34015.3-2021 Recovery of traction battery used in electric vehicle - Echelon use - Part 3: Echelon use requirements · GB/T 37133 Technical requirements of high voltage and high current wiring harness and connector for electric vehicles · GB 38031-2020 Electric vehicles traction battery safety requirements · GB/T 38661-2020 Specification for battery management system of electric vehicles

3 Terms and definitions

For the purposes of this document, the terms and definitions given in GB/T 19596, GB/T 20861 and GB 38031-2020 and the following apply.

3.1 Secondary cell

The basic unit device that converts chemical energy and electrical energy into one another.

Note: it usually comprises electrodes, a separator, electrolyte, a case and terminals, and is designed to be rechargeable.

[SOURCE: GB 38031-2020, 3.1]

3.2 Battery module

An assembly of more than one secondary cell connected in series, in parallel or in series-parallel and used as a power source.

[SOURCE: GB 38031-2020, 3.2]

3.3 Battery pack

A unit that can obtain electric energy from outside and deliver electric energy to outside.

Note: it usually comprises secondary cells, a battery management module (excluding the battery control unit), a battery case and the corresponding accessories (cooling parts, connecting cables and so on).

[SOURCE: GB 38031-2020, 3.3]

3.4 Remove

The process of detaching and taking a traction battery down from an electric vehicle.