Providing Information Guideline of in-vehicle battery performance

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Council for Electrified Vehicle Society

Ministry of Economy Trade and Industry

Table of contents

I. Introduction

In July 2018, the Ministry of Economy, Trade and Industry (METI) released an interim report by Strategic Meeting for the New Era of Automobiles. The report encourages the Japanese automakers to develop its technology so that "it can reach the highest level of environmental performance in the world" and that "it can reduce 80% Greenhouse Gas emission per vehicle – 90% per passenger vehicle", which may lead to contribution to achieve the ultimate goal, "Well-to-Wheel Zero Emission". As part of efforts to pursue the goals, this Guideline provide the fundamental approaches and examples of basic methods to indicate remaining performance of lithium ion battery (LIB) for electrified vehicles.

Regarding remaining performance of LIB for electrified vehicles, mainly two issues has been pointed out. First, different battery manufacturers have different structures, cell types, cathode/anode materials and/or exterior materials for electrified vehicle's LIB. It may cause so different and various character of remaining performance of LIB that single unique indication method for the remaining performance of LIB. Second, strict standardization how to indicate the remaining performance may impede the competition for development of control systems of automotive battery among automakers because strict standardization force automotive manufacture disclose the information of control systems of automotive battery, which allows automakers to have competitive edge. Paying attention to those issues, this Guideline exemplify basic methods to indicate the remaining performance which is being used and assumed today. However, since the trend of related technology continues to change, the Guideline shall be reviewed and updated accordingly. It is necessary to note that the Guideline do not intend to eliminate products which indicate the remaining performance based on methods other than the ones introduced in this Guideline.

II. Definition of the topic

1. Purpose

The Guideline are designed to facilitate automakers to provide the basic methods which enable users to know remaining performance of LIB, so that users can get rid of excessive anxiety over battery degradation and re-sale values of EVs (Electric vehicle) and PHVs (Plug-in Hybrid Electric vehicle) can be evaluated properly. The approaches in the Guideline will also be applied to create the automotive battery reuse and repurposing markets in future.

2. Outline of the Guideline

The fundamental justifications to the general basic methods to indicate the remaining performance (hereinafter called "basic methods") are as follows:

- The basic methods shall (1) present initial performance of electrified vehicles and (2) help users understand objectively how much performance the vehicles maintain compared to their initial performance. To be more specific, certified specification or specification in the catalogue such as all-electric driving range or battery capacity shall be used to indicate how much performance the vehicles still preserve.
- Regarding reliability of the indications of the remaining performance, an appropriate procedures should be developed. The objectivity of indication should be proved by third party institutions.

There are two styles how to indicate the remaining performance – indication based on all-electric driving range and the one based on the measurement of the battery capacity. Both shows how much performance the vehicles have maintain against the initial values (certified specification / specification in the catalogue).

Remaining performance can be indicated on an instrument panel, smartphone, or displayed on the dedicated tool through On-Board Diagnostics (OBD) port upon request of users. Besides, the direct measurement of the battery performance itself with a other measurement instrument, which is not mounted on vehicles, can also be one of the options considering users' convenience.

III. Examples

1. Case 1. Indication of remaining performance based on all-electric driving range

① This method provides how much proportion of all-electric driving range an EV and PHV maintain against the range referred to in catalogue. *1 *2

② The Remaining performance is measured by using Electronic Control Unit in vehicles.

③ The Remaining performance through Vehicle diagnostic tools shall be indicated on this tool, the instrumental panels, or the portable information terminals such as smartphones upon request of users.

④ The Remaining performance is indicated in 10% increments.

2. Case 2. Indication of the remaining performance based on the battery capacity (in vehicle*3)

① This method provides how much proportion of the battery capacity preserved in

an EV and PHV against the capacity referred to in the catalogue. *4 *5

② The Remaining performance is measured by using Electronic Control Unit in vehicles.

③ The Remaining performance through Vehicle diagnostic tools shall be indicated on this tool, the instrumental panels, or the portable information terminals such as smartphones upon request of users.

④ The Remaining performance is indicated in 10% increments.

Note 1: Since the energy consumption of heavy-duty vehicles varies depending on pay load and those equipment, the indication of remaining performance for heavy-duty vehicles may fit battery capacity indication method (Case 1) rather than all-electric driving range method (Case 2).

Note 2: The Guideline will cover a case of two wheel vehicles after their specification is determined.

IV. Future prospect

The purpose of this Guideline is to help users know the battery degradation in an objective manner. As the first step of the action, it is preferable for automakers to adopt the system of indication of the remaining performance based on the Guideline onto new-model cars which will be manufactured after 2022. The next step of the action is to create automotive battery reuse markets. To achieve, main current challenges up for discussion are as follows below.

- Registering a port number used to indicate remaining performance via OBD port to SAE/ISO
- The verification process for third party institutions might be developed in the future. Developing the standard level of allowance/accuracy of indication
- Acknowledge the Guideline to users and relevant parties of vehicles and reuse and repurposing LIB market

Council for Electrified Vehicle Society will discuss above challenges and promote standardization of indication method and alignment with international standard. The Guideline will be revised around 2022. The examples of heavy-duty vehicles and two wheel vehicles considering sales of those vehicles also considered as well.

*1 Catalogue specs of all-electric driving range are confirmed by national institutions when a vehicle obtains a type-approval certificate.
*2 The following method can be assumed to verify reliability of indication. A verification scheme for third party institutions may be developed in future.

1) Verifier drives a car and checks all-electric driving range following procedures required to obtain the national type-approval certificate.

2) Verifier assesses reliability of indication by comparing the all-electric driving range which the car actually traveled and catalogue specs.

*3 The following method can also be applied to measure and indicate battery capacity other than measuring batteries in vehicle.

1) Remaining performance of LIB is measured by dealers and others using measurement instruments which are not mounted on vehicles.

2) Remaining performance of LIB is presented to users utilizing output data from these measurement instruments.

*4 Catalogue specs of battery capacity are not confirmed by national institutions when a vehicle obtains a type-approval certificate.
*5 The following method can be assumed to verify reliability of indication. A verification scheme for third party institutions may be developed in future.

1) The automaker discloses a measurement method of battery capacity referred to in catalogue to third party institutions.

2) Battery capacity is measured by the similar measurement method with 1)

3) Reliability of indication is verified by comparing results of the measurement 2) and catalogue specs.