

VDA Aligned Paper on Battery Energy Density

Sep. 13th, 2018

Current situation

It is well observed that China remains firmly devoted to promote and lead the NEV development. Three key technical parameters have been leveraged to steer the development, incl. Battery Energy Density* (abbr. as BED), eRange and Energy efficiency.

BED requirements

1. In 2017, the BED requirement at system level was, for first time, linked to **national subsidy** and set 90 Wh/kg as threshold for subsidy. In 2018, the BED threshold was further tightened.

BED [Wh/kg]	2017 multiplier	2018 multiplier
<90	0	0
90-105	1.0	0
105 -120	1.0	0.6
120-140	1.1	1.0
140-160	1.1	1.1
>=160	1.1	1.2

BEV battery pack density multipliers

2. In additional, a minimal BED threshold was introduced at 95 Wh/kg for **Vehicle purchase tax (VPT) exemption** of NEVs.
3. Furthermore, the technical thresholds of the subsidy and VPT exemption have been adopted by some local cities as the criteria for **local non-financial incentives, e.g. free license plate**, which means BED is also relevant for access to NEV license plates.
4. It is expected that the BED thresholds for subsidy and VPT exemption will be tightened in upcoming years 2019/2020. In addition, there are some discussions on going that may consider to link BED to **NEV credit calculation after 2020**.
5. In a recent NDRC draft of Admin Rules for Automobile Investments, BED of 220 Wh/kg at system level is defined as a pre-condition to be met by **new investment projects** into battery production.

Challenges

On one hand, OEMs and suppliers are forced to pursue higher battery density within very short timeframe so to meet the ever-increasing thresholds of BED, which is highly likely raise the safety-related issues in the near future.

On the other hands, many NEV models will not be able to be sold in many cities where the local authorities issue the NEV plate on the basis of MIIT NEV Recommendation List (list of NEVs eligible for national subsidy).

At last but not least, we believe that the quality of technical solutions is best measured by the value the technology adds to customers. However, BED at system level is not an appropriate criterion to measure the

technical performance of EVs. It's limiting the technical development of battery technology and reducing the flexibility of intelligent solutions and hindering innovation. To really encourage the technological development and products of the highest quality, the government needs to let the battery technology solutions develop without any interferences.

1. The industry is currently developing improvements to the battery pack housing with the goal of achieving even better mechanical crash safety and durability, which will add weight to the battery pack and therefore decrease the energy density of the battery pack.

Furthermore, improvements to the battery pack unit are being developed to achieve better control for thermal propagation (new added thermal stability requirement in GB "Traction battery safety requirement") and fire resistance. Striving for a high energy density is detrimental for thermal safety, due to increasing energy content of battery cells. Since the thermal propagation requirement was added into battery standard just recently, the current testing method in GB has not been proved by field experience yet. Research and discussions are still on-going in the EVS-GTR circle for the trigger method, potential new testing methods and the pass/fail criteria. With the testing method and requirements still immature and under discussion, pushing the industry towards even higher battery energy densities is a conflict of interest with vehicle safety.

2. It is very popular for OEMs to add cooling and other thermal management systems, which will add weight to the battery pack, to extend the battery lifetime, prevent short-term power degradation and enable fast charging.
3. The trend of battery development is towards integrated battery solutions, since these have cost-saving potentials that can make NEVs more affordable for customers in the future. Finally, in the not too distant future, it is possible that it's a better solution to integrate battery cells directly into the vehicle body, and skip the concept of a "battery pack" altogether. How will the requirement on battery pack density then deal with such cases?

Recommendations

To solve the current challenges:

- It is suggested to give a clear definition of battery energy calculation criteria (e.g. to use installed or usable energy, and to provide a clear description of what components are included in the battery system weight) so the same testing criteria could be applied to all.
- We strongly recommend Chinese government to focus on customer relevant criteria and avoid using BED requirements to push the technological development of NEV (e.g. **avoid linkage to NEV incentives including subsidy, VPT exemption, and NEV credits, etc. after 2020**).
- If above proposal not possible, we suggest **to maintain the current (2018) technical thresholds throughout the period of 2019 – 2020**, so that the NEV models already on the Recommendation List will remain eligible for the national subsidy.
- If above proposal not possible, we suggest **the current BED minimum threshold is sufficiently stringent and should be kept stable**.

- If above proposal not possible, we suggest **all NEV models which are eligible for 2018 subsidy requirements should remain in MOF/MIIT NEV Recommendation List and enjoy free license plate in regulated cities till 2020. But only the models which meet the requirements of 2019/2020 subsidy policy would get the subsidy.** In this way, NEVs already compliant with current technical threshold will still appear on the MOF/MIIT NEV Recommendation List and sell normally in cities with purchase restrictions, even if they are ineligible for the subsidy.