Proposal on MPR

China

What factors would affect battery durability?

■ **Different system design and working conditions would have huge influences on performance of battery durability. It is important to consider as many situations as possible when determining MPR.**

☐ **Design of battery system**
① Rate of charging: in real-world applications, there are large differences between rates of charging, ranging from 0.1C to 2C. The higher the charging rate, the higher the temperature would increase, resulting in faster attenuation.
② Design of lifetime: the application-based requirements on lifetime vary, the requirements on cycle life performance for operational and passenger vehicles could be quite different
③ Thermal management: the ways of thermal management are different among vehicles. Whether there is a cooling system would affect the system to a large extent. The lifetime would decrease by 1 year when the cell temperature increases by 2°C.

☐ **Working conditions of vehicles**
① Temperature: the products are being sold to a wide range of regions that have diverse geographical conditions. For instance, the difference of temperatures could reach 20°C between the northern and southern parts in China. The high temperature would cause faster attenuation of batteries.
② Number of cycles per day: the daily number of cycles is largely dependent on application scenarios. The operational vehicles tend to need more cycles per day, which would lead to faster attenuation.

# Sales Volume of Electric Commercial Vehicles in China

The sales volume of electric commercial vehicles has risen over the past 6 years.

N2,N3<16t; N3≥16t, M2（L≤6 meters），M3<7.5t（6 meters<L≤7 meters），M3 ≥7.5t（L>7 meters）

Sales Volume of Commercial Vehicles by category from 2018 to 2023				
Year	N3≥16t	N2、N3＜16t	M2（L≤6）	M3<7.5t (6<L≤7)	M3 ≥7.5t(L＞7)
2018	676	120,842	70	3,457	88,617
2019	4,826	60,923	1,282	3,669	72,393
2020	2,607	64,068	1,801	3,884	56,571
2021	10,433	142,771	1,909	3,329	42,644
2022	25,093	259,463	1,676	4,399	45,730
2023	23,384	230,307	2,003	1,484	18,435
	67,019	878,374	8,741	20,222	324,390
Total	945,393			353,353	

MPR Evaluation: M2——[300,000] km or [8] years@70%
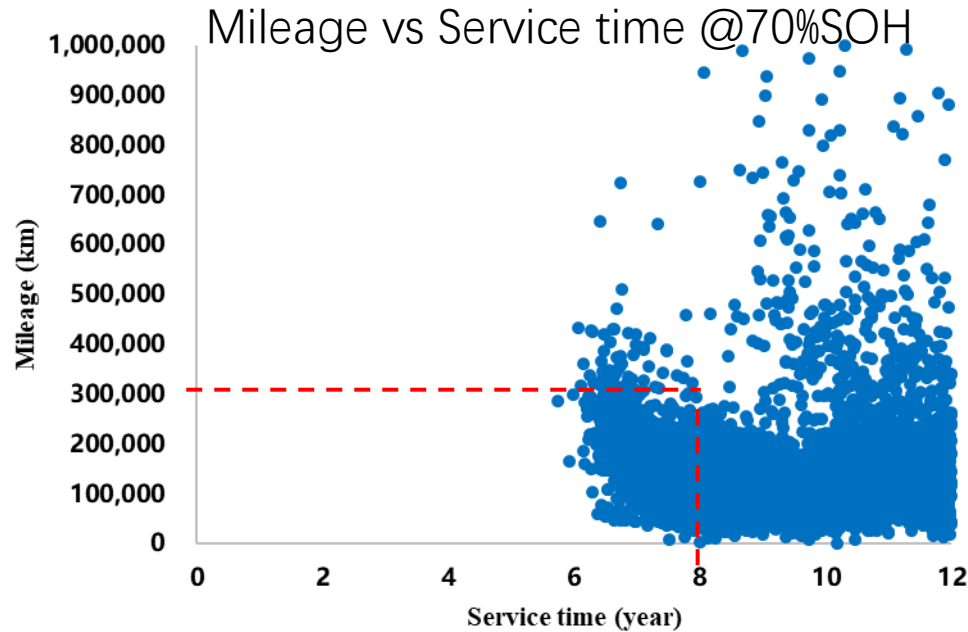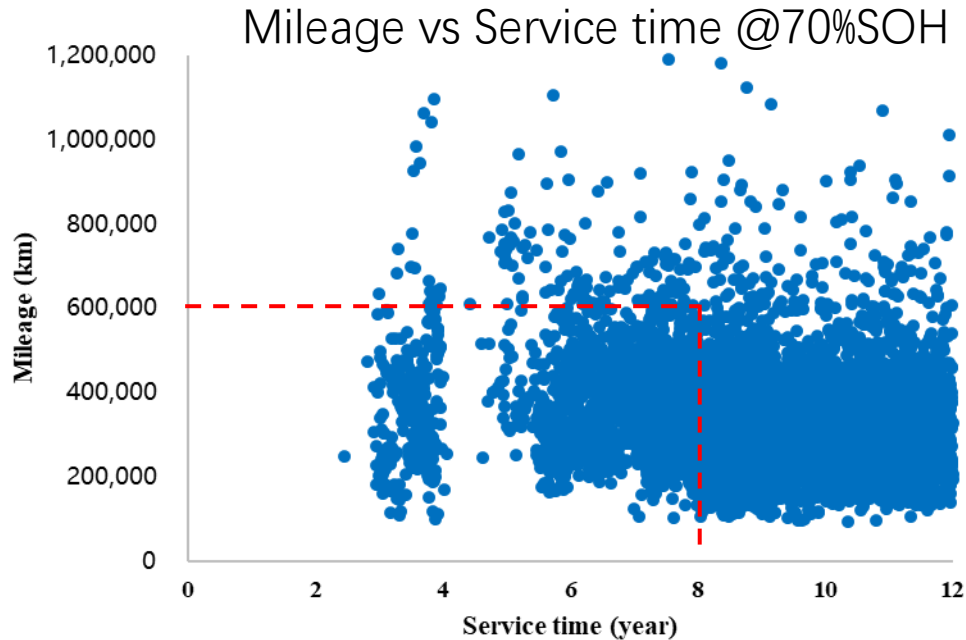
☐ Real market data

Mileage vs Service time @70%SOH

✓ Covers data from the total ownership of more than 100,000
✓ Covers multiple vehicle types such as vans
✓ Covers different designs of systems: charging rates, designs of lifetime, with/without cooling system
✓ Covers different working conditions: the average yearly temperatures range from 12.3 to 23.6°C, the daily numbers of cycles range from 0.1 to 1.3
✓ However, the data of SOH have not taken into account the precision of SOCE monitor

∎ The diagram above shows that the MPR [300,000] km or [8] years@70% would be able to cover 83% of the data.

MPR Evaluation: M3——[600,000] km or [8] years@70%

◻ Real market data

Mileage vs Service time @70%SOH

✓ Covers data from the total ownership of more than 130,000
✓ Covers multiple vehicle types such as buses, school buses, operational vehicles at airport or ports, etc;
✓ Covers different designs of systems: charging rates, designs of lifetime, with/without cooling system
✓ Covers different working conditions: the average yearly temperatures range from 12.3 to 23.6°C, the daily numbers of cycles range from 0.1 to 1.4
✓ However, the data of SOH have not taken into account the precision of SOCE monitor

■ The diagram above shows that the [600,000] km or [8] years@70% would be able to cover 92% of the data.

# MPR Evaluation: N2——[400,000] km or [8] years@70%
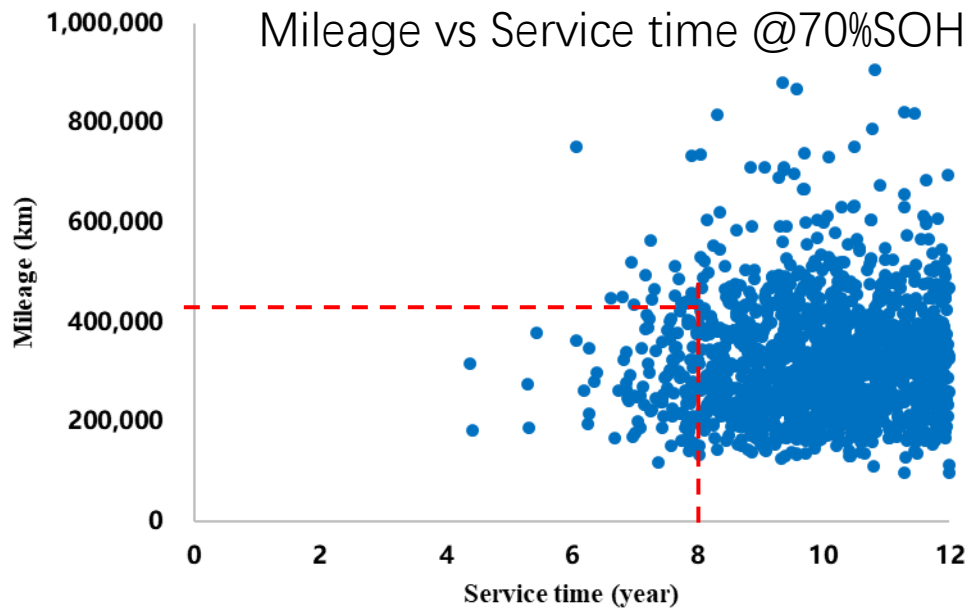
❑ Real market data

Mileage vs Service time @70%SOH

✓ Covers data from the total ownership of more than 100,000
✓ Covers multiple vehicle types such as light-duty trucks
✓ Covers different designs of systems: charging rates, designs of lifetime, with/without cooling system
✓ Covers different working conditions: the average yearly temperatures range from 12.3 to 23.6°C, the daily numbers of cycles range from 0.1 to 1.5
✓ However, the data of SOH have not taken into account the precision of SOCE monitor

■ The diagram above shows that the [400,000] km or [8] years@70% would be able to cover 98% of the data.

MPR Evaluation: N3——[600,000] km or [8] years@70%

☐ Real market data

Mileage vs Service time @70%SOH
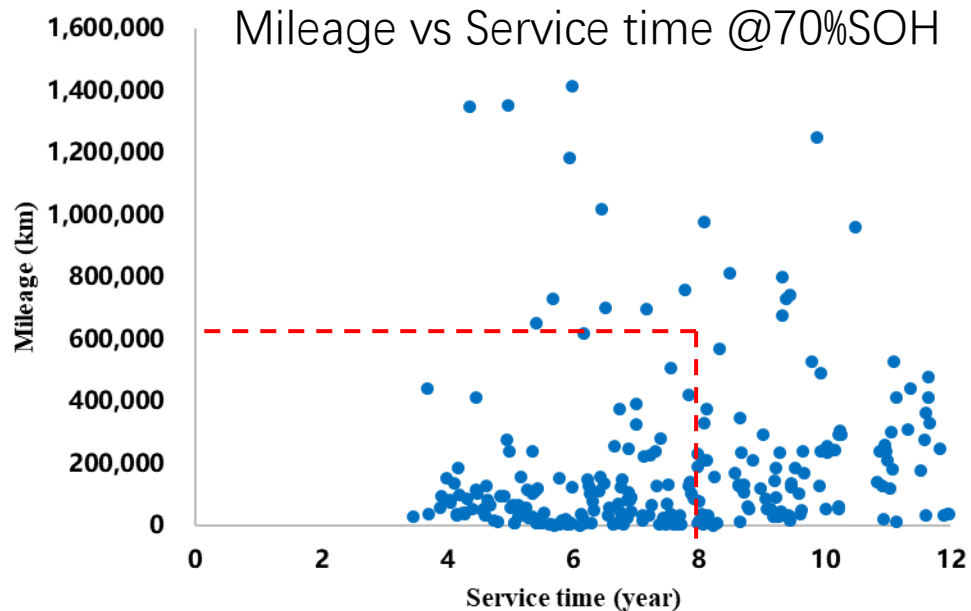
✓ Covers data from the total ownership of more than 20,000
✓ Covers multiple vehicle types such as tractors, dump trucks, special purpose vehicles and etc;
✓ Covers different designs of systems: charging rates, designs of lifetime, with/without cooling system
✓ Covers different working conditions: the average yearly temperatures range from 12.3 to 23.6°C, the daily numbers of cycles range from 0.2 to 3
✓ However, the data of SOH have not taken into account the precision of SOCE monitor

■ The diagram above shows that the [600,000] km or [8] years@70% would be able to cover 57% of the data.

Thank you for your attention.