Personal Case Study

How Long do eBike Batteries Last?

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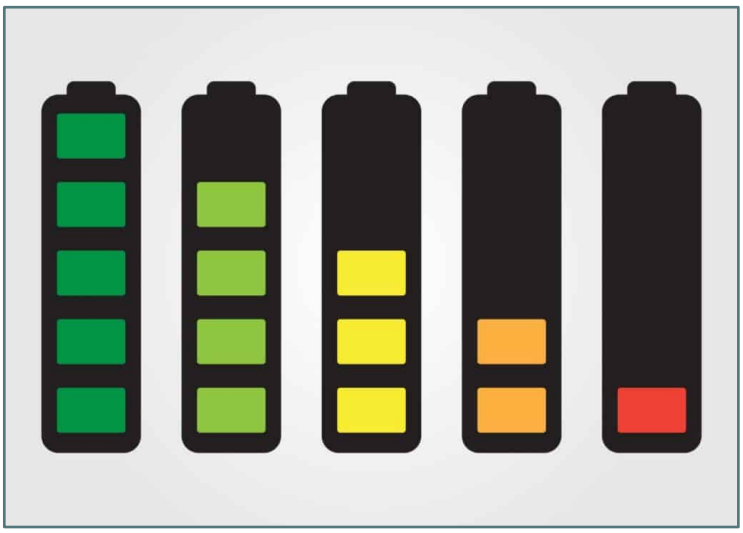

This is a personal case study based on my own experience, assessed on an ongoing basis.

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Introduction

This study is about ebike battery lifetime, that is how tong them will last before they need replacing rather than how far you can go between charges as there are simply too many variables to allow that to be answered accurately.

I'm not a mystic and I can't tell you exactly how long your battery will last but I can tell you about my experiences and you can draw whatever conclusions you want to from them.

Hopefully I'll be able to pop back and update this as my batteries get older and my mileage increases, I'll probably do this when I have a battery failure so hopefully not too soon. At the time of writing this, here are some high-level statistics.

- My oldest battery is about two and a half years old; it is not perfect but still works ok
- I've been on 580 ebike rides
- I've ridden 4,300 ebike miles
- My batteries have covered a total of 7,600 miles (not all of my bikes were bought new).

Manufacturers and Expectations

Battery degradation is driven by a combination of three factors

- Number of charge cycles
- Age
- How it is treated

When you look at the various manufacturer's websites, they will give you different views but broadly speaking, they tend to suggest that after 1,000 charge cycles the battery pack should have between 70% and 100% of its original capacity.

There are a lot of articles on the internet covering how many years Lithium batteries will last if looks after and the summary is that it is a limited time even if the recharge cycle 'limit' is not met. The most common figure seems to be around five years. Obviously, there are electric cars around which are older than this, but it is worth noting that they generally have 'cleverer' management systems in place and maybe even a heating or cooling system in some cases.

This all assumes a 'perfect world' where your battery pack is looked after perfectly, this is not always terribly realistic as we use our ebikes in the 'real world' in line with our own lifestyles and requirements. I'll explain how I 'look after' mine.

When to Replace a Battery?

Forgetting all the stuff about charge cycles and age for a minute. You are not going to change in just for the sake of it when would you want to replace a battery? There are basically three scenarios

1. It is totally dead; nothing lights up and it will not take a charge. Did this happen suddenly, or had it started giving you problems? If it is a sudden thing it is worth noting that many packs have fuses and they may have blown, some are internal. In this scenario it is worth seeking expert advice or even checking on the internet for details of your specific battery pack. Only open it up if you know what you are doing, there is more than enough power in there to burn your house down (or kill you in another way) if not handled correctly. It would also be a charger fault or the Battery Management System (BMS) so getting it checked is the best starting point.
2. Holding a charge; it may be that the battery charges ok but will not hold charge for long. If it holds charge for a few days, it may well be usable with advance planning, but it is time to start counting pennies. If it discharges very quickly the game is usually over.
3. Range has dropped; the ebike is no use if the battery won't take you where you need to go so definitely time for a new battery. It is still worth keeping the old one if it will take you on short journeys, maybe to the shop rather than a blast on the trails, an old battery can still have a use.

My eBiking History

Some personal background, a quick introduction to my eBiking before I look at home my batteries are getting on.

When I was thinking about buying an ebike, I was concerned about how long the battery would last before it needed replacing, after all they are quite expensive items.

I'd heard all the scare stories (admittedly most of them are aimed at electric cars) and this put me off buying an ebike for quite a few months.

Anyway, I've been using electric bikes for a while now (two and a half years); it started off just as a pastime. When the Covid-19 pandemic hit us, I found myself out of work and when I eventually found another job it involved a lot of working from home. The car sat outside, rarely used and when it was time for a replacement I didn't bother to. Maybe I will one day but for 'local' travel the bike became my normal transport. It was soon joined by another one, more suitable for shopping trips, I now find that I've got four (these things happen).

So how are the batteries holding up?

My Battery Experiences

The table below shows the lifetime of my batteries so far, I'll explain what the individual batteries are too along with any issues that I've noticed.

Battery Lifespan					Mileage		Charge Interval	
Battery	Condition	Start	Age (days)	Charges	With Me	Total	Miles	Days
B1	New	28/02/2020	911	154	3370	3370	23	6
B2	Used	07/04/2020	872	55	681	827	18	16
B4	New	18/03/2022	162	5	42	42	8	32
B5	Used	26/06/2020	792	186	198	3359	18	4
					4291	7598		

Notes on the table above

- B2; came with a second-hand low mileage bike, the seller told me it was 18 months old and had been charged monthly, so the charge cycles have been based on this plus my own.
- B5; came with a second-hand high mileage bike, it was used for commuting, and I have assumed that the previous owner would have been charged at similar interval to me
- Both B2 & B5 have been used for a lot of short shopping trips, I live at the top of a steep long climb, this has a big negative effect on the charge interval from a distance perspective

Pack	Type	Issues
B1	Reention Dorado 48v, 16Ah; Supplied new with my NCM Moscow Plus Mountain Bike	Charges fully and works as expected but recently the battery slowly discharges, maybe losing 25% a week. I believe that there is a power switch fault and the BMS is draining it. To be fair, this pack has had a hard life as I have had some significant off-road crashes on the bike (resulting in one total bike rebuild)
B2	Reention Dorado 48v, 13Ah; Supplied second-hand with my NCM Venice Bike	Performs as new, this and B1 are interchangeable of the bikes
B3	n/a	Came with an old Freego Eagle bike purchased as 'dead', has a range of two miles so is not used
B4	Silverfish 36v 10aH; Bought new to replace B3. Only used for occasional commuting on the train	Performs as new, will never get much use but invaluable when I need it (saves me at least 2 hours each time), this was a cheap battery rather than a premium brand
B5	Shimano STEPS BT-E6010 STEPS, 36v 418Wh; supplied second-hand with Pinnacle Lithium Ice Bike	Purchased with 3,000 miles on it so I don't know how it performed new, but it seems to work fine. When I bought the bike I'd budgeted to replace both the battery and the motor in the near future

Looking After Batteries

When I first started using an ebike, I was paranoid about ‘looking after’ the battery, there was lots of advice about; never leave it full, minimise the charging cycles etc. After about a week I abandoned this and have taken no special care since. Why? because it would stop the bike from being useful.

There is no point in having it sitting around with insufficient range to go somewhere, yes this means it sometimes gets charged long before it is ‘empty’, never mind. It is only a tool and without charge it is a useless tool.

The advice I would follow would be

- Don’t charge when the battery is below freezing point
- If storing for an extended period (months), check the battery every few weeks and try to keep it between 30 and 80% charged (no need to be precise over this)

Replacing the Battery

If the day arrived when you do have to replace the battery you may have some choices, some manufacturers now ‘pair’ the bike and battery or actually check for a ‘genuine’ one when powering on but this is not always the case so it may be possible to by an unbranded battery, this is your choice but bear in mind that there are good cells and bad cells, some of the cheaper ones are rubbish so do your research. Sone cheaper batteries may also pose a fire risk.

It may be possible to ‘re-cell’ your existing pack, there are specialist companies which do this. At the simplest level, it is swapping the old internal cells for new ones. Check the market before following this path, it is not always cheaper due to low wages in some of the countries where new batteries are made.

Budgeting and Saving

I have budgeted for replacing one of my battery packs each year, this equates to just over £1 per day which dies not sound excessive. I don’t like riding with loose change in my pocket (it falls out) and keep a jar by my bikes, I simply put my change in their when I go out and this has provided plenty of funding without noticing it (I bought my last bike from it too).

Conclusions

Based on what I've seen so far, my initial fears over battery cost were unfounded, for a small daily cost you can easily replace it when needed and it is likely to last longer than you expect.

When buying a bike, I'd ideally buy something with a range at least 50% over that which you need for most journeys. That way, you can handle a significant amount of degradation before it becomes a real-world issue. Having said this, higher capacity batteries cost more and are heavier so take your time over the decision, it is important.

I hope this is helpful to someone. As I mentioned at the start, I'll update it at some point but there is probably not a lot of point until I have a failure so I hope it is a while yet.