

metroSTOR Webinar Summary

Lithium-ion Battery Fire Risk with Electrical Safety First

19.06.24

Summary

Henry Cainen and Giuseppe Capanna framed the conversation by sharing [Scott's Story](#) to show the potential adverse impact that Lithium-ion batteries can have on human life when used incorrectly, and also introduced the [Battery Breakdown report](#) which helps understand the fire safety issues within the context of their value in improving mobility and the decarbonisation of our transportation system while also offering potential solutions. The scale of this challenge is huge, even with the use of private e-scooters on public streets not yet legalised.

Lithium-ion Batteries

Lithium-ion batteries have an enormous amount of energy packed into a really tight space, which is great because we can go further and faster, but when something goes wrong, it can be really devastating. The fires are so fierce that they can burn through solid aluminium like a flame thrower. And once the chemical reaction starts, it can't stop, unplugging it won't make any difference, and trying to put the fire out with traditional firefighting methods also won't work, because fire extinguishers and fire blankets work by smothering the fire and removing the oxygen, and when a lithium ion battery goes into thermal runaway it creates its own oxygen.

Thermal runaway can be caused by overcharging the battery, sometimes due to incompatibilities between the battery and charger, short circuits caused by water getting into the battery, poor manufacturing or mechanical damage, such as hitting a curb, the battery being penetrated by an object or subjected to extreme high and low temperatures. Videos of the [BRE LiB tests](#) were played.

Last year 11 people died as a result of an e-bike or a scooter battery, and the London Fire Brigade data showed that 40% of these were caused by conversion kits. In a recent one-day investigation, Electrical Safety First identified 60 chargers that didn't meet any safety standards. None of them had ever been anywhere near a test house, despite the fact that they were all CE marked. Products are also being modified by consumers, getting their e-bike to go faster and longer by making modifications to the battery management system which is there to protect against overvoltage and the battery getting too hot.

User Precautions

Make sure you buy your e-bike e-scooter battery from a reputable retailer, and always use the charger that comes with it, and if you do need to replace it, go back to the original manufacturer. Avoid third party sellers on online marketplaces because you can't guarantee that those products have been through the proper safety testing. When the battery has finished charging, unplug it. Don't leave it on charge continuously overnight and

make sure you've got working smoke alarms. Never charge it in an exit route, and if you can charge your device outside the building, it reduces the likelihood of the fire damaging properties and risking lives by reducing the proximity of the consumer to the device.

Electrical Safety First Campaign

Electrical Safety First are calling for mandatory third party certification and approval for these products before they're put on sale and before people buy them and bring them into their homes, as well as standards for conversion kits and either a non-proprietary charging system, similar to what you have for your mobile phone, where the charger will talk to the battery before charging starts so they can establish a protocol or a system where you can't plug in the wrong type of charger to the wrong type of battery, or a proprietary system where only the correct charger will work with the product

They are also encouraging manufacturers to improve their designs, moving the battery above the axle of e-scooters, so it's more resistant to damage for example, and making sure they have a minimum IP rating, so we don't get issues with water ingress, as well as investing in the safer battery technologies of the future.

The other half of it is consumer behaviour, you can regulate up to a point, but you have to get through to people and help them understand the dangers so that in time they start to change their behaviour. Electrical Safety First appreciates the opportunity to engage with landlords and start getting the message out to people that might live in social housing. The Safety Bill was due to be heard on the 5th of June and Parliament was prorogued just before that so they're using this time to build support for their campaign before they try and get through to the next government and make this an issue that people can't ignore.

There's also a need for stronger controls around the disposal of LiBs as there have been numerous instances of fires in refuse collection vehicles, even when something as small as a disposable vape gets crushed or compacted.

Food Delivery Riders

There's a need to engage with food delivery companies, as their riders' bikes are a big problem, especially when they modify them, but the obstacle is that they're technically self-employed, so there's no obligation on the companies to change things. It's more about making it illegal to have e-bikes that don't meet standards, making the purchasing of substandard batteries illegal and trying to get education across to the riders themselves, try and get to a point where people understand the risk. But a lot of the time, unfortunately, they know the risk but it's a choice they're making, they need the battery to go further, to make more money.

Charging Bags

Electrical Safety First have looked at charging bags and storage solutions for batteries, but, at the moment, there's no standard for them, and you've still got all the gases to deal with, and trying to contain that is going to be a challenge.

Comparison to EVs

There are standards for e-bikes and e-scooters, and we hope that they will become more robust over time, but at the moment we don't see cars, laptops and phones bursting into flames with the same frequency because you've got reputable manufacturers making these products to a standard that's been put together by a committee of experts, reducing the risk to a tolerable level. The same thing exists for e-bikes and e-scooters, they aren't all inherently unsafe, but some manufacturers are not taking any notice of the work that's been done and they're putting high risk products on the market without the safety features.

Advice for Landlords

Electrical Safety First advised charging outside the property if you've got the potential to do that, making sure if you don't, that residents don't charge in an escape route, unplugging the device once they've finished charging and making sure they've got working smoke alarms.

These are all things that you should do, whether you've got a high quality product or not, there's less chance of your product going into thermal runaway, but it still can happen, things can go wrong, even if they're tested properly. So it still makes sense to take sensible steps in order to reduce the risk, because a lithium ion battery holds the same amount of energy as the TNT in six hand grenades. So even if it's a safe product and it's been designed properly, it still needs safe and careful handling, we have to have respect for the amount of energy that is now being stored in these batteries.

Insurers need to know what the risk profile is of the properties that they're insuring, and having lithium-ion batteries inside will greatly increase the risk. It's a big issue in the insurance sector, because at the moment there's no clear understanding of where they fail and cause loss of life, who pays out? We're working with them to get clear guidance and regulation coming down the line.

The metroSTOR team are keen to assist landlords by providing information in collaboration with Electrical Safety, graphics, very clear messaging, to get this message out to all residents, not just the users of the devices, because if all residents are aware of the risk, then we can be having an open, collaborative conversation and actually get them involved to co-design solutions, whether it's finding safe charging points, maybe moving devices that are particularly high risk, we will get much more engagement and adherence to guidelines.

Design of New Buildings

For new buildings there's guidance around underground car parking and the provisions we should be making for the safe parking and charging of electric vehicles, but it quite specifically says this is not designed to cover light electric vehicles, so there definitely needs to be some specific guidance developed for them.

London Fire Brigade Advice

The London Fire Brigade guidance note GN 103 contains a clear recommendation to store e-mobility devices externally wherever you can, and if you have to use an internal space, it needs to have full compartmentation, fire detection and suppression, fume extraction, but also identifying the potential need for additional structural reinforcement, because some of the common materials we might have used up till now can be penetrated very quickly with a thermal runaway event. For example, fire doors are designed for a standard fire curve and the fire curve from a lithium-ion battery is much more severe, it's more like the curve from a jet fire.

DDA Issues

Comparing mobility scooters and electric wheelchairs in terms of their risk profile, in theory it's at the same level of risk, because with a lithium-ion battery there's always a risk of thermal runaway. Traditionally these products used lead-acid batteries, but the newer ones use lithium-ion batteries, so you end up with the same issue and the same precautions need to be taken. In fact, we would recommend a detailed individual risk assessment approach where you've got users with limited mobility because of the increased risk presented.