

To: Cambridgeshire and Peterborough Fire Authority
From: Area Commander (AC) – Wayne Swales
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Report on the use of Lithium-ion Batteries and response by Cambridgeshire Fire and Rescue Service

1. Purpose

- 1.1 The purpose of this report is to provide the Fire Authority with an update on the rise of lithium-ion batteries and specifically their use in micro mobility items being involved in fire and the response to this by Cambridgeshire Fire and Rescue Service (CFRS).
- 1.2 This report was first presented to the Overview and Scrutiny Committee on 4 October 2023; discussion highlights can be found in Minute 71 of the published Minutes. The subject matter was also discussed at the Policy and Resources Committee at its meeting on 31 October 2023 when reviewing the Strategic Risk and Opportunity Management Register (Minute 57 refers).

2. Recommendation

- 2.1 The Authority is asked to note the contents of this report.

3. Risk Assessment

- 3.1 Political - the IRMP process, outlined in the Fire and Rescue National Framework for England, requires the Authority to look for opportunities to drive down risk by utilising resources in the most efficient and effective way.
- 3.2 Economic - the management of risk through a proactive preventable agenda serves to not only reduce costs associated with reactive response services but also aids in the promotion of prosperous communities.
- 3.3 Sociological – the increased popularity and availability of micro mobility products will increase the instances of their involvement in fire and the resources required to respond to these. The current risk profile for users of these is unknown and may change the targeted groups we seek to support

through fire prevention requiring more resource. We will, through our risk planning processes, identify and react to this accordingly.

- 3.4 Technological – emerging technologies may see battery safety improve which could reduce the instances of fire. We will continue to evaluate the availability and effectiveness of technologies for detecting and extinguishing battery fires to protect the safety of our responding crews and the community.

4. Equality Impact Assessment

- 4.1 Due to the discriminative nature of fire, those with certain protected characteristics are more likely to suffer the effects. Prevention strategies aim to minimise the disadvantage suffered by people due to their protected characteristic, specifically, age and disability.

5. Background

- 5.1 Lithium-ion batteries are rechargeable batteries in electrical items such as mobile phones, laptops, e-scooters, e-bikes and e-cigarettes. There is growing national concern over the rise in the involvement of these batteries in incidents involving fire, including fatalities and especially in their use in e-bikes and PLEV's (Personal Light Electric Vehicles).
- 5.2 The electrified form of micro mobility is becoming more popular and is seen as an affordable alternative to fossil fuel driven cars/vehicles for use over short distances in urban areas. Economic factors are also making e-micro mobility more popular. Shimano's 'State of the Nation 2022' report reveals that, across all 12 European countries profiled, of those surveyed, cost of living for example, higher car fuel prices is the primary motivating factor (47%) in e-bike usage now, compared to one year ago. In the United Kingdom, this number rises to 56%.
- 5.3 Micro mobility encompasses a wide range of small lightweight vehicles operating at speeds typically below 25 kilometres per hour and ridden by users personally. Micro mobility devices more commonly referred to as PLEV's includes bicycles, e-scooters, e-bikes, electric skateboards, shared bicycle fleets and other electric pedal assisted cycles. These can also include cycles fitted with a conversion kit to enable battery powered propulsion.
- 5.4 The primary risk associated with lithium-ion batteries used in micro mobility products is thermal runaway. The process of thermal runaway starts when a battery cell overheats, perhaps due to an internal fault, physical or electrical abuse or extreme temperatures. This elevated cell temperature results in reactions which produce more heat than can be dissipated to surroundings. Eventually the internal structure of the battery cell begins to become unstable

and collapse resulting in the production of flammable and toxic gases, fire and explosion. The heat spreads to nearby cells, causing them to also enter an uncontrollable and irreversible state of thermal runaway.

- 5.5 Battery safety and stability depends on maintaining internal temperatures within specific limits. Poor quality and substandard components, flawed design, physical abuse and improper charging or discharging can all cause a battery to become thermally unstable and can lead to catastrophic failure. Even if a fire is extinguished, it is common for the fire to start again, highlighting the dynamic nature of lithium-ion battery fire.

6. Incident Data and Analysis

- 6.1 Currently, there is limited data relating to the number of fires in the United Kingdom, mainly due to deficiencies in the national Incident Recording System (IRS). However, London Fire Brigade (LFB) has reported attending 87 e-bike and 29 e-scooter fires across Greater London in 2022. In the first half of 2023, on average, LFB has been called to an e-scooter or e-bike fire once every two days; a 60% increase in the number of these fires compared to the same period last year. Fire data recorded regionally is not mandatory.
- 6.2 IRS is a national data collection system, which collates detailed information on all incidents attended by fire and rescue services (FRS's). The IRS enables data on all incidents attended by FRS's to be collected electronically and verified at source. However, the quality of the fire data recorded at national level does not allow fires to be attributed specifically to lithium-ion batteries, e-scooters or e-bikes; the IRS currently has no 'e-scooter' or 'e-bike' category. Firefighters must record that a fire involved one of these vehicles in an open text box field. Information entered in an open text box field does not appear in the publicly available fire statistics published by the Home Office.
- 6.3 In Cambridgeshire our five-year incident data of fires in which lithium-ion batteries have been involved is given in the table below (as at the time of writing). These are where it has specifically been recorded as involving lithium-ion batteries, e-scooters or e-bikes. The most significant incident in Cambridgeshire tragically resulted in three fatalities.

6.4

E-scooter and E-bike Fires involving Lithium-ion Batteries

Calendar Year	Fires caused by faulty e-scooter or e-bike batteries
2018	0
2019	1
2020	4
2021	1
2022	1
2023	3

The way in which the current IRS data collection process works does mean that there is a possibility that incidents involving lithium-ion batteries have been under reported (due to the need to add that detail into an open text box). In the past 12-month period, CFRS has attended 277 accidental dwelling fires of which 64 have been deemed to be caused by electrical failure. These have been recorded using the national IRS system fields and categories.

7. CFRS and National Fire Chiefs Council (NFCC) Activities

- 7.1 In response to the growth in lithium-ion battery fires and the risk they pose when being charged in dwellings, we have incorporated risk mitigation within our IRMP Action Plan. This means educational safety activity is delivered through our prevention group to highlight the risks posed to owners and training activities are undertaken to ensure our response to incidents is professional and appropriate.
- 7.2 The NFCC has seconded an Officer to lead the work around emerging technologies across the workstreams of prevention, protection and operations. This role works with Government, industry and all FRS's to support the creation of national guidance and support.
- 7.3 The NFCC has also produced e-bikes and fire safety guidance with key areas of messaging to be used when communicating with the public; CFRS is using this within our prevention activities for consistent messaging.
- 7.4 Operational training is being provided and undertaken on the risks and tactics for firefighting where lithium-ion batteries are, or suspected to be, involved in fire.

- 7.5 A joint team from prevention and protection is engaging with the Cambridge Landlord Forum providing information on the specific threats and emerging risks posed by e-scooters and e-bikes.
- 7.6 The County Risk Analysis Group takes information and intelligence, adopting a joint approach to risk between departments to ensure a collective service awareness to managing it. This ensures that where known risks are identified, the appropriate targeted interventions and actions are undertaken.

Source Documents

Electrical Safety-First Report 2023

Fire Authority Minutes - various

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Hinchingbrooke Cottage

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