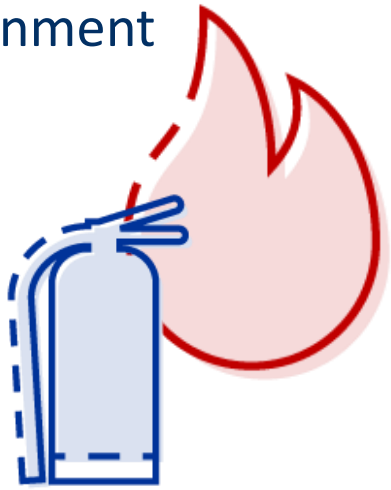
LASH FIRE

Legislative Assessment for Safety Hazards of Fire and Innovations in Ro-ro Ship Environment

Facts and Myths About Fires in Battery Electric Vehicles



The passenger car vehicle fleet is going through a major change in terms of the energy used for propulsion. Petrol and diesel are exchanged for alternative fuels, not least batteries.

A rapid growth is seen in the sales of electric vehicles in major markets such as China and Europe. In 2020, 4% of new passenger vehicles sold globally were electric vehicles. Sales are predicted to increase exponentially and could meet sales benchmark values of >80% in 2030.

Lithium-ion (Li-ion) batteries

Li-ion batteries can be found in a variety of formats and chemistries which enable them to be used in a variety of different applications, from mobile phones to battery electric vehicles (BEVs).

Fire hazards

New technologies naturally raise a large interest in the public and as new energy carriers make their way into the market, some misconceptions will naturally also make their way to the public.

BEVs are not more hazardous than internal combustion engine vehicles (ICEVs), but the risks of Li-ion batteries differ to those of conventional fuels.

Facts and myths

The objective of this short communication is to respond to some of the common misconceptions regarding BEV fires.

A **detailed answer** to each statement and a **complete reference list** can be found in the report (https//lashfire.eu). Below each statement, a reference to the relevant section in the report is found.

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More information: https://lashfire.eu/

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FACTS & MYTHS ABOUT FIRES IN BEVs

1. ”BEVs burn more often than ICEVs”

The number of BEV fires is currently lower than that of ICEV fires (relative to the total number of vehicles). Common causes of passenger car fires are arson, hot brakes, and flammable liquid + hot surfaces or electrical faults in the engine compartment . The probability of fire for the former two will be independent of the fuel used. (Report Section 2.1)

2. “BEV fires are more intense than ICEV fires”

All modern vehicles carry a large amount of chemical energy in terms of materials used in for example seating, other cabin interior and tyres. Most of the chemical energy in an average sized passenger car does not come from the energy storage. The total heat release for modern BEVs and ICEVs ranges between 3.3 and 10 GJ and is independent of the traction energy. (Report Section 2.2)

3. “Jet flames from BEV fires will spread fire faster than ICEV fires”

Different fuel types have different modes of fire spread. For example, liquid fuel such as diesel may spread the fire by means of leakage and pool fires, and gas pressure vessels and lithium-ion batteries may be prone to jet flames that could spread the fire.

If exposed to external heat, such as a fire, a plastic fuel tank will catch fire much faster than a Li-ion battery. (Report Section 2.3)

4. “Battery fires can’t be extinguished & the drencher cannot control BEV fires”

A thermal runaway event is difficult to extinguish unless water/fire-fighting agent is injected into the battery. However, the fire will most likely not start in the battery. Activities that support fast/early fire suppression are highly encouraged, since this will hinder fire spread.

Data indicate that early activation of the deluge system will hinder fire spread by suppressing the fire and cooling ship surface and nearby vehicles. (Report Section 2.5)

5. “BEV fires burn very hot and can melt the deck below the fire”

The temperature of a fire will vary and depend on several factors such as fuel source, atmospheric pressure, adjacent temperatures, oxygen content etc. There is no data which suggests that BEV fires would be hotter than ICEV fires. (Report Section 2.4)

6. “You can get electrocuted whilst extinguishing a BEV with water”

Electric cars have extensive safety systems that will automatically break the power and isolate the battery pack when a collision or a short circuit is detected.

If the car would be submerged in water or if water by other means would get into the battery pack or electrical system and cause a short circuit, then you would need to be physically in between the positive and negative pole or in contact with both conductors at the same time to experience an electric shock, which is very unlikely. (Report Section 2.6)

7. ”Hydrogen fluoride produced from BEV fires is highly toxic”

It is true that hydrogen fluoride (HF) is very toxic and that it has been detected in higher quantities in BEV fires than in ICEV fires. However, combustion gases and effluents from all types of vehicle fires are toxic.

Staying out of the smoke plume and wearing adequate personal protective equipment when dealing with burning or burnt vehicles are of great importance, independent of the energy carrier of the vehicle. (Report Section 2.7)

8. ”The fire crew is not protected from BEV fires by the standard fire suits”

The health risks of HF when smoke diving was studied by the Swedish Defence Research Agency (FOI). Firefighters that were fully dressed* and equipped with breathing apparatus (BA) performed different exercises in a HF contaminated enclosure. Exposure values observed for a normal firefighting mission were within acceptable limits. (Report Section 2.8)

*Underwear trousers/sweater, thick socks, fire suit trousers, fire suit jacket, boots, balaclava/flash hood, helmet and gloves

9. “Overcharging a Li-ion battery can cause thermal runaway”

This is true on a cell and module level if no safety systems are applied. A Li-ion battery pack in a car has a Battery Management System that will prevent the cells from overcharging.

There have been reports of fires starting in a BEV "while charging". It is important to keep in mind that a fires in such situations may have multiple reasons, such as electric malfunction in the charging infrastructure, the cable or other general car fire causes. (Report Section 2.9)

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