IUMI Policy Agenda

11. Transport of electric vehicles (EVs)

Brief description

In light of the drive to decarbonize all modes of transport, the number of new energy vehicles has been on the rise. The European Automobile Manufacturers Association (ACEA) has collected passenger car registration data in the EU per fuel type which show a significant growth of alternative fuel vehicles (AFVs) registered. Electric vehicles (EVs) are projected to match the sales of internal combustion engine (ICE) vehicles by 2030, and to surpass them by 2040.

Battery electric vehicles are usually fitted with a lithium-ion traction battery which is encapsulated and shielded by the vehicle's body. The battery pack consists of various battery modules which in turn are comprised of several battery cells. The chemical process which produces electricity that can be used for propulsion of the EV takes place within the battery packs. The battery system is usually placed in the vehicle floor or undercarriage where it is protected from damage by an anti-crash frame.

Electric vehicles have extensive safety systems designed to automatically shut down the power and isolate the battery pack when a collision or a short circuit is detected. An important safety feature of EV battery packs are in-built battery management systems (BMS). The BMS monitors and controls the battery and is a crucial factor in ensuring EV safety. It safeguards both the user and the battery by ensuring that the cell operates within its safe operating parameters. It monitors the state of a cell as represented by parameters.

The state of charge (SoC) is an electrical cell or battery’s charge level compared to the total capacity of the cell or battery. Batteries at high SOCs have been shown to experience more violent reactions during thermal runaway. Testing has indicated that high SoC cells produce higher heat release rates, maximum temperatures, and concentrations of flammable and toxic gases during thermal runway events. However, while the SoC does affect the growth and peak heat release, it does not affect the total heat release. In the absence of international rules and regulations, it is recommended for the transport of EV onboard Pure Care and Truck Carriers (PCTCs) to keep the SoC as low as practically possible.

Despite this inherently safe design thermal runaway may occur if a cell is abused, e.g. by heat, mechanical damage or overcharge. Thermal runaway can also occur as a consequence of a cell or battery manufacturing error. When thermal runaway occurs, the cell is undergoing an unstable chemical reaction that is difficult to bring under control. At some point, the separator structure collapses and the electrodes touch, causing an internal short circuit and masses of heat, bringing the cell to ever higher temperatures and generating toxic and flammable gases. Cell heating will continue until the rise in temperature exceeds the heat that can be dissipated to the cell's construction. This released heat will then increase and start to affect other nearby battery cells. When the generation of heat becomes self-sustaining - the heat releases energy and the energy in turn releases more heat - the overheating propagates from cell to cell and the battery is in thermal runaway.

The safety standards integrated into EV traction batteries, including solid casings and the BMS, make the likelihood of damage to an EV battery pack and thermal runaway extremely low. However, in view of the low possibility for thermal runaway the significance of the BMS as incorporated into EVs is particularly relevant. These safety systems prevent the battery cells from over and under charging, and thus prevent thermal runaway.

As statistics continue to be gathered, it is currently estimated that, in general, there are fewer fires from EVs compared with fires from conventional vehicles when compared over the same distance.

A thermal runaway in a Lithium-Ion battery is difficult to stop unless the firefighting agents are injected directly into the battery to enable efficient cooling. If a fire breaks out in an EV or in an ICEV (internal combustion engine vehicle), activities in support of early detection and verification/confirmation, early fire suppression and boundary cooling are critical actions to stop the spread of the fire to the battery and to adjacent vehicles.

A particularity of EVs is the risk of re-ignition which tends to be higher for a longer period than for ICEVs. Precautionary measures to avoid re-ignition of the traction battery must therefore be taken for an extended period after a fire has been extinguished.

IUMI published a recommendations and best practice paper in September 2023 which includes technical information about EVs as well as best practice for the safe transport of EVs on board PCTCs and roro vessels. The paper is currently being revised and updated to reflect the latest technological advances and research.

The IMO’s Sub-Committee on Ship Systems and Equipment (SSE) has an agenda item titled “Evaluation of adequacy of fire protection, detection and extinction arrangements in vehicle, special category and ro-ro spaces in order to reduce the fire risk of ships carrying new energy vehicles” on the agenda and it was discussed at its 10th session in March 2024. The work continued in a Correspondence Group which reported to SSE 11 in 2025. IUMI participated in the Fire Protection Working Group which was established during SSE 11. The WG agreed on a draft action plan with the objective to enhance fire safety measures for ships carrying new energy vehicles, including EVs, through improved fire detection, prevention, and extinguishing systems. It consists of five pillars:

- Review of scientific reports, studies, new technologies and casualty reports.
- Identification of hazards related to new energy vehicles compared to ICEVs.
- Consideration of a goal-based approach.
- Identification of gaps in existing regulations and consideration of the way forward.
- Identification of placeholders for possible future amendments.

The broad scope of work involving multiple technical aspects ranging from fire detection to extinguishing systems requires careful consideration and prioritisation of tasks. Further work is necessary and will continue in the Correspondence Group prior to SSE 12. IUMI participates in the CG.

IUMI will:

- Be involved in the IMO's work to effect appropriate safety measures to address this new risk.