

Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

Sub-Committee of Experts on the Transport of Dangerous Goods

21 June 2024

Sixty-fourth session

Geneva, 24 June-3 July 2024

Item 4 (b) of the provisional agenda

Electric storage systems:

Hazard based system for classification of lithium batteries

Comments on document ST/SG/AC.10/C.3/2024/13 - Proposed requirements for sodium-ion batteries

Transmitted by KiloFarad International (KFI)

Considerations on further regulation of sodium ion cells and batteries

1. KFI notes with interest the document by the experts from Belgium and France and by the lithium battery industry association, RECHARGE, which unexpectedly recommends new requirements for sodium-ion cells/batteries. KFI understands that the decision to expand the working group remit to include sodium ion batteries is one not formally made by the Sub-Committee but rather one tentatively made by the working group. To our understanding, the informal working group (IWG) decision was based on information provided to the IWG in December which described a failure of a casing of 1 cell design at 220°C (presumably a temperature in excess of its design temperature). The conclusion in the informal paper potentially contradicts research carried out by the United States Department of Transportation (DOT) on sodium ion batteries.¹ Based on limited information provided to the IWG, it is far from clear that sodium ion batteries present the same degree of hazard that have historically been posed by lithium batteries. The IWG itself acknowledges a lower degree of hazard of sodium ion batteries. KFI recommends that a decision not be taken on including sodium ion batteries as part of the IWG terms of reference until further substantiation is provided.

2. KFI assumes that in reaching a decision, the Sub-Committee will take into account ECOSOC's Agenda. It is commonly recognized that in comparison to lithium batteries and many other battery types, sodium ion batteries are far more environmentally friendly and far more sustainable. In this respect, expanding the new requirements to sodium ion batteries without safety-related justification may have implications that could be contrary to progress towards ECOSOC's Sustainable Development Goal 9 "*Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation*" and Goal 12 "*Ensure sustainable consumption and production patterns*".

Considerations on regulating based on test results rather than cell or battery type

3. With technologically advanced battery technology playing an increasingly essential part in achieving ECOSOC Goals, KFI finds it anachronistic for the UN *Model Regulations* to regulate batteries as subject to regulation based on generic descriptions (e.g., sodium ion battery) regardless of whether a particular battery type fitting the generic description poses an inherent transport risk.

¹ Available at [DOT SIB Testing Report | PHMSA](#).

4. KFI submits that, to keep in step with the ECOSOC Goals and to ensure regulation is written with a focus on demonstrated shipping risks, the best approach for new battery regulations is to focus on a thorough test plan that assesses a cell's or battery's response to expected shipping conditions and risks. Examples of relevant shipping conditions to be assessed include (i) maximum expected shipping temperatures, (ii) potential for sharp objects to be dropped onto the cells or batteries, leading to a puncture of the outer shell, (iii) potential for the package to be dropped or otherwise impacted during transportation.

5. KFI further submits that any added testing for batteries needs to provide a basis for finding that new safer batteries need not be subject to regulation as dangerous goods when there is no apparent inherent transport risk under normal conditions of transport. That is to say, there should be a clear definition within the standards of test results that demonstrate the regulatory needs for a cell or battery, which should include (i) no further regulation needed, (ii) regulation with limited scope needed, and (iii) full regulation needed.

6. KFI appreciates that some notes within document ST/SG/AC.10/C.3/2024/13 (see comment on page 19 of the English version) suggest that this is being considered by the IWG; but no details are provided. Below KFI provides more technical comments.

Consideration of a nail penetration screening test

7. A nail penetration test (as used by the expert from France in informal document INF.9 of the fifty-seventh session to demonstrate the results of internal short circuit) is recognized in consensus standards (e.g., Underwriter's Laboratory's UL 9450A) as a means of assessing whether a cell is capable of dangerous reaction. KFI suggests that if a cell were incapable of dangerously reacting when subjected to a nail penetration test, it could be deemed safe for transport and only subject to "protection against external causes of short-circuiting requirements."

The term "thermal runaway" is undefined

8. The meaning of thermal runaway (i.e., one leading to propagation) in the document ST/SG/AC.10/C.3/2024/13 document varies significantly from that used in other parts of the *Model Regulations*. In other parts, "thermal runaway" is commonly understood to be an uncontrolled exothermic reaction where temperature and pressure rise exponentially (e.g. organic peroxides with a self accelerating decomposition temperature (SADT) of less than 75°C). Further, a different understanding of thermal runaway as provided in document ST/SG/AC.10/C.3/2024/13 is evident in a document provided to the IWG (presentation by BAM at the December IWG meeting). Based on it, it may be that the IWG would consider that even a benign, controlled, or of a nature that does not lead to a positive feedback loop temperature spike within a cell characterizes as thermal runaway.

9. To avoid ambiguity, KFI recommends that the Sub-Committee consider replacing "thermal runaway" with criteria tied to the Sub-Committee's authority to regulate cells and batteries based on their inherent transport risk (i.e.; extreme temperature rise, and propensity to fragment, rupture, catch fire under conditions normal to transport). This would be consistent with what is proposed by the expert from Japan in document ST/SG/AC.10/C.3/2024/42 (page 4, proposal XXX subparagraph (c)).

Significance of 350°C temperature test for quantifying transportation risks

10. The IWG document would subject cells and batteries to a temperature of 350°C to determine whether a cell or battery will react dangerously and propagate that reaction to adjacent cells or batteries. While KFI appreciates that this test is intended as a worst case test to create a reaction in a single cell of battery and to evaluate whether the reaction propagates to other cells, it is unclear how such a severe test of a battery can be taken as a basis for concluding it poses a danger under conditions inherent in transport. Further, it is unclear why

such an abusive test would be used to evaluate other responses such self-heating, fire and gas evolution. When such responses occur at temperatures significantly beyond those expected for shipping, one has to question what significance such a response has to quantify a cell's or battery's safety to be transported at ambient temperatures.

11. A 350°C test criteria is not otherwise applied in classifying other goods under the *Model Regulations* for shipping. Why would it be appropriate for cells and batteries? Through the test is the Sub-Committee indirectly requiring that cell/battery components have an autoignition temperature in excess of 350°C, requiring that cell/battery containment survive 350°C, and regulate batteries simply because they employ an organic electrolyte that produces carbon monoxide owing to incomplete oxidation within a cell?

Special provision 188

12. We note that special provision 188 as shown in document ST/SG/AC.10/C.3/2024/13, while providing relief for lithium cells and batteries, provides no comparable relief for sodium ion batteries. It is unclear whether this was intentional considering sodium ion batteries are considered as being safer.

Conclusion

13. KFI appreciates the Sub-Committee's consideration of its views in its ongoing deliberations related to agenda item and requests that the Sub-Committee requests that the IWG respond to the points raised before taking any decision on including sodium ion batteries as part of the IWG terms of reference (Agenda item 4 (b) Electric storage systems: Hazard based system for classification of lithium batteries).

14. KFI expects to submit proposals reflecting its views to the IWG meeting in August 2024.
