JRC replies to the comments of USA on the EVS25-E1TP-0510 Draft regulatory text for the Thermal Runaway Propagation test

Colour code:
Black – comments of USA
Blue – replies of JRC

1. General Comment – Recommend adding the source citation for ISO-6469-1:2019/AMD1:2022(E).
This is being addressed.

2. Recommend a battery technology neutral approach (e.g., "flammable electrolyte"). This comment also applies to the proposed draft regulatory text in Section 5 below.
As discussed in Phase 1 of the GTR EVS, thermal runaway occurs in battery cells with specific chemistry, namely Li-ion batteries. Paragraph 193 of the GTR EVS Phase 1 text states: "Thermal runaway is a characteristic of the lithium ion battery which is currently used in many REESS for electric vehicle." Meanwhile it has been demonstrated that also Na-ion battery cells featuring flammable electrolyte can undergo thermal runaway (please see e.g. A. Bordes, G. Marlair, A. Zantman, A. Chesnaye, P.-A. Le Lore, A. Lecocq, "Safety Evaluation of a Sodium-Ion Cell: Assessment of Vent Gas Emissions under Thermal Runaway", ACS Energy Lett., 2022, 7, 10, 3386–3391). In our view, it would be fair to request thermal propagation test for the battery chemistries known to exhibit this failure mode. For this reason it was agreed in GTR EVS Phase 1 to focus this test on *"...REESS containing flammable electrolyte..."*

3. How is the risk of SC TR & P due to an ISC prevented or reduced by the proposal above?
The purpose of the thermal propagation test is to ensure the occupant safety in a vehicle if thermal runaway occurs in the battery system. As such thermal propagation test shall be conducted to verify that the hazard of the thermal propagation is prevented or eliminated by design.

4. How is the internal advance warning relevant to field incidents?
As paragraphs 16 to 20 of sub-section 2 "Warning signals", section C "Technical background" state, it is a common practice in the field to provide a warning to the driver in the event of a failure of the REESS.

5. How is conducting this test in the temporary parking mode representative?
As explained at various TF-TP meetings, JRC are in favour of performing a thermal propagation test under sufficiently stringent conditions. JRC also suggest to focus on avoiding "human harm that may occur from the electric power train" as stated in the Section II, Text of the Regulation, Purpose of GTR EVS text agreed in Phase 1. JRC proposed to perform the thermal propagation test in such a way that "*At the beginning of and for as long as possible during the test, all test devices shall be operational; Defined cooling/safety strategy and the battery management system used within the REESS shall be fully operational. The coolant flow could be null or active depending on the BMS. The native cooling strategy (if installed), battery control unit (BCU) and any other battery control systems, which are necessary for the test, shall be operational for as long as possible during the test.*" In our view, these arguments are considered when the test is conducted while the vehicle is "on" in the "parked" mode.

6. Why is the initiation cell not randomly selected?
JRC appreciate that for technical reasons not all potential heater positions would be equally accessible in the REESS. For this reason, the requirement was formulated outlining the general philosophy for choosing

the target cell "*among those with a maximum number of nearest neighbours approximating the centre of the battery pack*". This important question needs to be further discussed and agreed within Informal Working Group tasked with the development of the GTR EVS.

7. If TR is not detected, would the compliance test result be considered a "Pass"?
In our view, a set of the proposed thermal runaway detection criteria is rather robust. Supplementary criteria and post-analysis criteria provide further evidence and help ascertaining the occurrence of thermal runaway. In our view, the probability of not detecting a thermal runaway given all these tools is rather limited.