U.S. Department
of Transportation
**Pipeline and Hazardous
Materials Safety
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

June 26, 2025

Frank Lopez
Regulatory Compliance Specialist
Currie Associates
101 Ridge Street Suite I
Glens Falls, NY 12801

Reference No. 25-0021

Dear Mr. Lopez:

This letter is in response to your February 18, 2025 email requesting clarification of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) applicable to the transportation of lithium ion cells and batteries. Specifically, you ask several questions regarding the use of firmware (*i.e.*, the software that controls the hardware of an electronic device) to limit the nominal energy expressed as the Watt-hour (Wh) rating of a lithium ion cell or battery contained in equipment. You present the following scenarios:

1. A lithium ion cell is capable of exceeding 20 Wh or a lithium ion battery is capable of exceeding 100 Wh, but the cell or battery firmware limits the nominal energy of the cell or battery to 20 Wh or 100 Wh, respectively.
2. A lithium ion cell is capable of exceeding 20 Wh or a lithium ion battery is capable of exceeding 100 Wh and is contained in equipment, but the cell or battery firmware limits the nominal energy of the cell or battery to 20 Wh or 100 Wh, respectively.
3. A lithium ion cell is capable of exceeding 20 Wh or a lithium ion battery is capable of exceeding 100 Wh and is contained in equipment, but the equipment's software limits the nominal energy of the cell or battery to 20 Wh or 100 Wh, respectively.
4. A lithium ion cell is capable of exceeding 20 Wh or a lithium ion battery is capable of exceeding 100 Wh and is contained in equipment, but the cell or battery firmware limits the nominal energy of the cell or battery to 20 Wh or 100 Wh. Furthermore, the cell or battery firmware is designed such that the end user can modify the cell or battery voltage to full capacity, exceeding 20 Wh or 100 Wh, respectively.

We have paraphrased and answered your questions as follows:

Q1. May the lithium ion cell or battery described in Scenario 1 be shipped in accordance with the smaller lithium ion cell and battery provisions in § 173.185(c)?

A1. Yes. The United Nations Manual of Tests and Criteria (UNMTC) (incorporated by reference, see § 171.7), subsection 38.3.2.3, defines nominal energy or Watt-hour rating as "the energy value of a cell or battery determined under specified conditions and declared by the manufacturer..." Firmware that controls the voltage and ultimately the nominal energy is within the design and specified conditions of the lithium ion cell or battery manufacturer. Therefore, the lithium ion cell or battery—as described in Scenario 1—can be considered a smaller lithium ion cell or battery for transportation.

Q2. May the lithium ion cell or battery contained in equipment described in Scenario 2 be shipped in accordance with the smaller lithium ion cell and battery provisions in § 173.185(c)?

A2. Yes. See answer A1. The lithium ion cell or battery contained in equipment—as described in Scenario 2—can be considered a smaller lithium ion cell or battery for transportation.

Q3. May the lithium ion cell or battery contained in equipment described in Scenario 3 be shipped in accordance with the smaller lithium ion cell and battery provisions in § 173.185(c)?

A3. No. In Scenario 3, the software that limits the lithium ion cell or battery nominal energy to 20 Wh or 100 Wh, respectively, is not inherent to the battery itself. Therefore, the lithium ion cell or battery manufacturer's declared nominal energy value for the lithium ion cell or battery must be used when determining the applicability of the small lithium ion cell and battery provisions in § 173.185(c).

Q4. May the lithium ion cell or battery contained in equipment described in Scenario 4 be shipped in accordance with the smaller lithium ion cell and battery provisions in § 173.185(c)?

A4. Yes. See answer A1. The lithium ion cell or battery contained in equipment—as described in Scenario 4—can be considered a smaller lithium ion cell or battery for transportation. However, PHMSA notes that any modification to the lithium ion battery firmware that increases the Wh rating or nominal voltage by 20 percent or more or any modification that represents a change that would lead to failure of any of the tests specified in the UNMTC Section 38.3 (incorporated by reference, *see* § 171.7), constitutes a new lithium battery type that must be tested prior to any further transportation—*see* § 173.185(a)(1) and UNMTC 38.3.2.2. In addition, the lithium ion cell or battery's marked Wh rating must be updated to reflect the new, higher Wh rating before any further transportation in commerce of the lithium ion cell or battery.

Q5. If the lithium ion cell or battery firmware limits the Wh rating of the cell or battery as described in Scenarios 1 through 4, should the cell or battery be marked[1] with the Wh

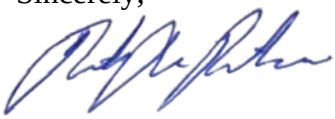
[1] See § 173.185(a)(5).

rating as limited by the firmware or the maximum possible nominal energy for the cell or battery?

A5. For Scenarios 1, 2, and 3, the lithium ion cell or battery must be marked with the Wh rating determined under the manufacturer's specified conditions—*i.e.*, as limited by the lithium ion cell or battery firmware (note – not the device's *software* for Scenario 3). For Scenario 4, the lithium ion battery must be marked with the Wh rating allowed by the currently operative firmware before transportation in commerce or as specified in A4, the new, higher Wh rating for the new lithium battery type before any subsequent transport in commerce. Please note that in each scenario, the lithium battery test summary must indicate the Wh rating appropriate to the cell or battery. For Scenario 4, this could require an update to reflect the higher Wh rating resulting from firmware updates.

I hope this information is helpful. Please contact us if we can be of further assistance.

Sincerely,



Dirk Der Kinderen
Chief, Standards Development Branch
Standards and Rulemaking Division

February 18, 2025

Mr. Shane Kelley
Director, Standards and Rulemaking Division
Pipeline and Hazardous Materials Safety Administration
Attn: PHH-10
U.S. Department of Transportation
East Building, 1200 New Jersey Ave., SE
Washington, D.C. 20590-0001
Submitted: Via Email
cc: infocntr@dot.gov

Dear Mr. Kelley,

Currie Associates would like to request a formal letter of interpretation regarding the standing interpretation of Letter of Interpretation (LOI) No. 22-0113. Specifically, we would like to confirm that the interpretation provided by the LOI, applicable to packaging exceptions based on lithium-ion battery size, including a battery physically capable of a Watt-hour (Wh) rating of more than 100 Wh, designed and programmed with firmware (i.e., software for device hardware) that prevents the user from charging the lithium ion battery to an energy level that exceeds 100 Wh, is considered less than 100 Wh for the purposes of transportation.

In the LOI No. 22-0113, PHMSA states "Firmware that controls the voltage and ultimately the nominal energy is within the design and specified conditions of the lithium-ion battery manufacturer, following the definition as stated in the United Nations Manual of Tests and Criteria."

The United Nations Manual of Tests and Criteria, subsection 38.3.2.3, defines

> *Watt-hour rating or nominal energy as "the energy value of a cell or battery determined under specified conditions and declared by the manufacturer…."*

Currie Associates requests if the interpretation can expand the above scenario to include Lithium ion batteries contained in equipment? Can a Lithium ion battery or cell contained in equipment with a physical battery rating capable of exceeding the Wh requirement, while installed in a device, be designed and programmed with firmware to limit the energy level Wh to meet requirements and be shipped under the small cell/battery exception?

Example
A cell >20 Wh or a battery > 100 Wh, is installed in an electronic device that is designed and programmed with firmware that will limit the nominal energy to >20 Wh (cell) or a >100 Wh (battery) for transport purposes.

If permitted, would the required battery case marking display the Watt-hour rating based on the firmware limitations (≤100 Wh) or the actual capacity before the firmware limitations (>100 Wh)?

Additionally, If the manufacturer can program the cell/battery to lower the rating of the cell/battery for transportation not to exceed 20 Wh/100 Wh, can the manufacturer's programming also allow energy levels to be increased by a future firmware update back to the full limit of the cell/battery once it is no longer in the transport chain and in the possession of the end user?

Currie Associates requests affirmation that LOI 22-0113 is still valid for lithium batteries and cells contained in equipment having a physical capability to exceed the small battery exception but be reduced by design and programming to meet the conditions of the exception for transportation. Further, may these programing or physical limitations be removed by firmware updates to permit the full nominal energy?

We appreciate your review of this interpretation request and look forward to hearing from you soon.

Sincerely,

Frank Lopez
Regulatory Compliance Specialist
Currie Associates
www.currieassociates.com
frank@currieassociates.com
O: 518-761-0668 Extn. 222