



Latest Standardization, Certification and Regulatory updates for consumer use batteries and micro-mobility

Battery Tech Expo 2024

Jakub Kački, Global Business Manager
April 16, 2024

Safety. Science. Transformation.™

Today's speaker



Jakub Kački

Global Business Manager, UL Solutions

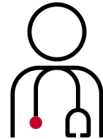
Jakub Kački has been with UL Solutions for 18 years. He is the Global Business Manager focused on global battery business (portable, wearable, micromobility) within the Consumer, Medical and Information Technology division at UL Solutions. He works with our Commercial, Operations and Field Services departments to drive the development of safety-related services and programs for batteries, information technology equipment, consumer electronics products, micromobility and more.

Powering a world of innovation



Entertainment and work

Mobile telecommunication products (mobile phones, tablets), home/office equipment, gaming, augmented reality (AR), virtual reality (VR), mixed reality (MR)



Health and wellness

Fitness trackers, hearing aids, toothbrushes, smart clothing/wearables, personal grooming equipment, Bluetooth® headphones



Home and garden

Service robots, robot mowers/vacuums, hobby drones, security systems



Micro mobility and e-Mobility

E-bikes, e-scooters, hoverboards, electric vehicles



Industrial

Industrial electric vehicles, portable power packs, uninterruptible power supply

Headlines invite concerns, challenges

In 2020, the Consumer Product Safety Commission reported more than 25,000 incidents involving li-ion battery-operated products since 2012, resulting in more than 70 product recalls representing more than seven million units of various battery and end products.



Explosions and Fires have plagued cities, e-bike retailers, and homes

FDNY: E-bike battery fires in NYC on pace to double this year



[Battery sparks fire in Washington Heights: FDNY \(ny1.com\)](#)

E-bike and e-scooter fires have injured at least 190 people in UK, data shows

Exclusive: Fires more than quadruple since 2020 after surge in popularity of battery-assisted travel



Remains of an electric bike that caught fire while on charge in a hotel room in Liverpool. Photograph: Merseyside fire and rescue service

Fires sparked by faulty e-bikes and e-scooters have injured at least 190 people in the UK and killed eight, the Guardian can reveal, as a surge in public enthusiasm for battery-assisted travel is matched by a more than quadrupling in blazes since 2020.

[E-bike and e-scooter fires have injured at least 190 people in UK, data shows \(The Guardian\)](#)



[Fire engulfs Mill Bay home Saturday afternoon \(cheknews.ca\)](#)

“There have been 50 e-bike and scooter fires recorded in the capital already this year, half of which caused injuries, including two deaths. UK fire brigades have been called out to at least 565 e-bike and e-scooter blazes since the start of 2020, according to Guardian Fol requests answered by 38 brigades. May 2, 2023, The Guardian

“New York City has seen hundreds of fires linked to the batteries that power electric bikes and scooters in recent years. City officials have blamed off-market batteries and chargers for many of the fires and they have lobbied the federal government to strengthen regulations governing the sale of e-bikes and batteries.”

December 4th, 2023, FOX News

Variety of battery standards

US*

- **Portable**
 - **UL 1642**
 - **UL 2054**
 - **UL 2056**
 - **UL 8139**
 - **UL 62133-1 & UL 62133-2**
 - **UL 60086-4**
 - **UL 62368-1**
- **Motive/eTransportation**
 - **UL 2271**
 - **UL 2272**
 - UL 2580
 - **UL 2849**
 - UL 3030
 - SAE (multiple standards)
- **Stationary**
 - UL 1989
 - UL 1973
 - UL 9540
- **Multi-use**
 - UL 810A
 - UL 2743
- **Appliance, Lighting, Tool**
 - UL 924
 - UL 2595
 - **UL 60745-1**
 - **UL 62841-1**

CB scheme*

- **Portable**
 - **IEC 62133-1,-2**
 - **IEC 60086-1,2,4,5**
 - IEC 61960
 - IEC 61951-1,2
 - IEC 62188
 - **IEC 62368-1**
- **Motive/Stationary**
 - IEC 60896 series
 - IEC 62040-1
 - IEC 62485 series
 - IEC 62619
 - IEC 62933 series
 - IEC 62660-1,2,3
 - IEC 62620
 - IEC 60335-2-114
- **Multi-Use**
 - IEC 62281
- **Appliance, Lighting, Tool**
 - **IEC 60745-1**
 - **IEC 62841-1**

Japan*

- JIS C 8712
- JIS C 8714
- JIS C 8715
- PSE DENAN
- SBA S 1101

Others*

- **UN 38.3 - Transportation**
- CTIA – USA Cellular Industry
 - IEEE 1625
 - IEEE 1725
- BSMI - Taiwan
 - CNS 15364
 - CNS 15387
 - CNS 15424-1,2
- BIS - India
 - Ed 16046-2015
- GB - China
 - GB/T 31241
 - GB/T 18287
- KC 62133 – Korea
- **EN 50604-1**

*More standards could be listed, but for brevity, ones commonly tested are listed.

What are applicable standards for micromobility, portable & wearable use batteries?


IEC and UN

- **UN 38.3** - UN Manual of Tests and Criteria, Lithium Metal and Lithium-Ion Batteries, applicable for packs and cells — mandatory/required for safe transportation of battery cells (IEC 62281 „equivalent“)
- **IEC 62133-1** Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes - Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made From Them, for Use in Portable Applications - Part 1: Nickel Systems
- **IEC 62133-2:2017/AMD1:2021** Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes - Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made From Them, for Use in Portable Applications - Part 2: Lithium Systems
- **IEC 60086** series of standards for Primary Batteries
- **EN 50604-1:2016/A1:2021** Secondary lithium batteries for light EV (electric vehicle) applications

UL/CSA

- **UL 1642**, Lithium Batteries (battery cells)
- **UL 2054**, Household and Commercial Batteries
- **UL/CSA 62133-1**, Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes - Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made From Them, for Use in Portable Applications - Part 1: Nickel Systems
- **UL/CSA 62133-2**, Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes - Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made From Them, for Use in Portable Applications - Part 2: Lithium Systems
- **UL/CSA 60086**, Primary Batteries - Part 4: Safety of Lithium Batteries
- **UL2271** ANSI/CAN/UL/ULC Batteries for Use in Light Electric Vehicle (LEV) Applications

CPSC December 2022 Micromobility Guidance & NYC March 2023 Law



United States
Consumer Product Safety Commission

December 19, 2022

Dear Manufacturers, Importers, Distributors, and Retailers of Micromobility Devices for Consumer Use:

The U.S. Consumer Product Safety Commission (CPSC) is an independent federal regulatory agency responsible for protecting consumers from unreasonable risks of injury and death from consumer products.


As you may be aware, in recent years there has been a rise in fires and other thermal events involving micromobility products—including e-scooters, self-balancing scooters (often referred to as hoverboards), e-bicycles, and e-unicycles. From January 1, 2021, through November 28, 2022, CPSC received reports from 39 states of at least 208 micromobility fire or overheating incidents. These incidents resulted in at least 19 fatalities, including 5 deaths associated with e-scooters, 11 with hoverboards, and 3 with e-bikes. CPSC also received reports of at least 22 injuries that resulted in emergency department visits, with 12 of the injuries involving e-scooters and 10 of them involving e-bikes.

I am writing to urge you to ensure that the micromobility devices for consumer use that you manufacture, import, distribute, or sell in the United States have been designed, manufactured, and certified for compliance with the applicable consensus safety standards.¹ These safety standards include ANSI/CAN/UL 2272 – **Standard for Electrical Systems for Personal E-Mobility Devices** dated February 26, 2019, and ANSI/CAN/UL 2849 – **Standard for Safety for Electrical Systems for eBikes** dated June 17, 2022, and standards they incorporate by reference. The UL standards, which can be viewed for free and purchased from the UL Standards Sales Site,² were designed to reduce the serious risk of dangerous fires in these products. **Compliance with the standards should be demonstrated by certification from an accredited testing laboratory.**

Manufacturing these products in compliance with the applicable UL standards significantly reduces the risk of injuries and deaths from micromobility device fires. Consumers face an unreasonable risk of fire and risk serious injury or death if their micromobility devices do not meet the level of safety provided by the relevant UL standards. Accordingly, products that do not meet these standards could present a substantial product hazard under Section 15(a) of the CPSA, 15 U.S.C. § 2064(a), and, should CPSC’s Office of Compliance and

¹ This letter supersedes the letter from Robert S. Kaye dated February 22, 2018, to Manufacturers, Importers, and Retailers of Self-Balancing Scooters.
² <https://standards.ul.com/ProductDetail.aspx?productId=UL2272> (UL 2272), https://www.shopulstandards.com/ProductDetail.aspx?productId=UL2849_1_S_20200102 (UL 2849).

| | |
|---|--|
| <p>U.S. Consumer Product Safety Commission 4330 East-West Highway Bethesda, MD 20814 cpsc.gov</p> | <p>National Product Testing & Evaluation Center 5 Research Place Rockville, MD 20850</p> |
|---|--|



United States
Consumer Product Safety Commission


Field Operations encounter such products, we will seek corrective action as appropriate.

I urge you to review your product line immediately and ensure that all micromobility devices that you manufacture, import, distribute, or sell in the United States comply with the relevant UL standards.¹ Failure to do so puts U.S. consumers at risk of serious harm and may result in enforcement action.

Please also note that Section 15(b) of the CPSA, 15 U.S.C. § 2064(b), requires every manufacturer, importer, distributor, and retailer of consumer products to report immediately to the Commission when the firm obtains information that reasonably supports the conclusion that a product distributed in commerce contains a defect that could create a substantial product hazard or that the product creates an unreasonable risk of serious injury or death. The statute also provides for imposition of civil and criminal penalties for failing to report the required information.

If you have any questions, or if we can be of any assistance, you may contact micromobility@cpsc.gov.

Sincerely,




Robert S. Kaye
Director
Office of Compliance and Field Operations

¹ Any third-party certification body that is accredited by an international accreditation body for ANSI/CAN/UL 2272 or ANSI/CAN/UL 2849 product certification is acceptable to ensure compliance.

| | |
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| <p>U.S. Consumer Product Safety Commission 4330 East-West Highway Bethesda, MD 20814 cpsc.gov</p> | <p>National Product Testing & Evaluation Center 5 Research Place Rockville, MD 20850</p> |
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<https://www.cpsc.gov/Newsroom/News-Releases/2023/CPSC-Calls-on-Manufacturers-to-Comply-with-Safety-Standards-for-Battery-Powered-Products-to-Reduce-the-Risk-of-Injury-and-Death>



Passed!

INT 663-A



PROHIBITING THE SALE OF UNCERTIFIED LITHIUM-ION BATTERIES

PROHIBITING THE DISTRIBUTION, SALE, LEASE, OR RENTAL OF POWERED MOBILITY DEVICES, SUCH AS E-BIKES AND ELECTRIC SCOOTERS, AND STORAGE BATTERIES FOR THESE DEVICES, THAT FAIL TO MEET RECOGNIZED SAFETY STANDARDS. IN ORDER TO BE LEGALLY SOLD, THESE DEVICES AND THEIR STORAGE BATTERIES WOULD BE REQUIRED TO HAVE BEEN CERTIFIED AS MEETING THE APPLICABLE UNDERWRITERS LABORATORIES (UL) SAFETY STANDARDS BY AN ACCREDITED TESTING LABORATORY.

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<https://council.nyc.gov/press/2023/03/02/2361/>

NYC Initiative 663-A Law details

Under the new law, which came into effect on **September 16th, 2023** any company selling, leasing or distributing micromobility devices, must obtain certification to:

- UL 2849, the Standard for Electrical Systems for e-Bikes, for the electrical system of any powered bicycle sold, distributed, leased, or rented in New York City.
- UL 2272, the Standard for Electrical Systems for Personal E-Mobility Devices, for all powered mobility devices, including e-scooters, sold, distributed, leased, or rented in New York City.
- **UL 2271**, the Standard for Batteries for Use In Light Electric Vehicle Applications, of any storage battery for a powered bicycle or mobility device sold, distributed, leased or rented in New York City.



Law signed by NYC Mayor Eric Adams on March 20th, 2023, with FDNY Commissioner and UL Solutions Chief Scientist in attendance.

Tested to is NOT compliance nor certification

Test clauses in any UL standard is only one part of the standard. Generally, test clauses are 1/3rd or less of the standard's published pages.

No accredited ISO 17025 testing organization can claim they have provided certification to UL 2849, UL 2272, or UL 2271. Accredited ISO 17065 certification organization or by an **OSHA National Recognized Test Laboratory** can certify.

To become UL Product Safety Certified Micromobility or Light EV Battery:

- Full compliance to UL 2849, UL 2272, or UL 2271 has to be demonstrated
 - Materials & their ratings suitability for application
 - Components & their compliance (e-Motor, Battery Cell & Pack, Charger)
 - Functional Safety (Battery Management System, Motor Controller)
 - End-Product Evaluation & Testing
- Ongoing market surveillance of the factory production and sold product.

Reese Law - federal regulation testing & certification

Toys with Button Cell or Coin Battery

- Must comply with *16 CFR part 1250* covering Toys (which mandates ASTM F963).
- **UL 4200A not required** (since ASTM F963 has button cell / coin battery requirements).



Children's Products (designed / intended for use by children 12 years of age or younger) with Button Cell or Coin Battery

- Must comply with [16 CFR part 1263](#) covering Button cell or coin batteries and consumer products containing such batteries (which mandates UL 4200A:2023).
- In accordance with the [CPSIA](#), children's product must be tested by a CPSC-accepted third party laboratory (UL 4200A accredited) and have a Children's Product Certificate ([CPC](#)).
- **UL 4200A required.**
- NRTL not required.



Non-Children's Product with Button Cell or Coin Battery

- Must comply with final rule ([88 FR 65274](#)).
- In accordance with the [CPSIA](#), Manufacturer may self-test /-certify a non-children's product and issue a General Certificate of Conformity ([GCC](#)) that the product complies with all applicable CPSC-enforced requirements.
- **UL 4200A required.**
- NRTL not required.

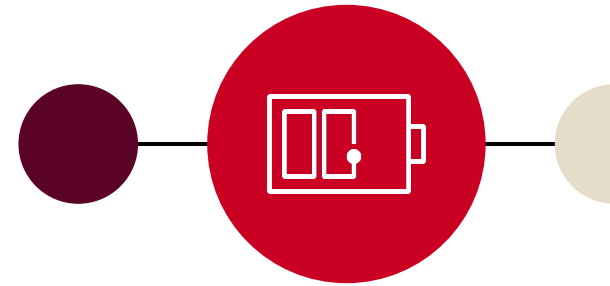


New EU battery regulation

The new Battery Regulation in the EU entered into force on **Aug. 17 2023**. It applies to **all batteries** placed on the EU market, and to **all economic operators** placing batteries on the market. That means it has **global** applicability and brings new requirements to many parties involved in the battery supply chain.

This regulation applies to **all categories of batteries** and to batteries that are **incorporated or added** (or designed to be) to products.

The regulation lays down requirements on sustainability, safety, labeling, marking, and information. It also lays down minimum requirements for extended producer responsibility, the collection and treatment of waste batteries, and reporting. It imposes battery due diligence obligations and also lays down requirements for green public procurement operators.



New EU battery regulation - key areas covered

Design requirements

- Restrictions of substances
- Carbon footprint
- Recycled content
- Performance and durability
- Removability and replaceability
- Safety only for energy storage like stationary battery energy storage systems (SBESS) requirements

Information and traceability

- Labelling and CE marking
- Information via QR code
- Digital battery passport

End of life

- Extended producer responsibility (EPR) obligations for producers/producer organizations (PROs)
- Collection of waste portable/light means of transport (LMT) batteries
- Recycling efficiency targets
- Material recovery targets
- Shipment of waste batteries outside the EU
- Reporting obligations

Due diligence

- Due diligence policy
- Management system
- Risk management plan
- Third-party verification
- Disclosure of information

Battery types and applicability of major articles

| | Carbon footprint — Art. 7 | Restriction of substances (Cd/Hg/Pb) — Art. 6 | Recycled content (Co/Pb/Li/Ni) — Art. 8 | Replacability and repairability — Art. 11 | Performance and durability — Art. 9 and 10 | Safety requirements — Art. 12 | Labeling, marking and information requirements — Art. Art. 17, 18, 19, 20 | Info on state of health and expected lifetime of batteries with BMS — Art. 14 and 76 |
|-------------------------------------|---|---|--|---|--|--------------------------------|---|--|
| Portable | - | +/+ | - | + (Feb. 18, 2027) | + (only for general-use batteries) (Aug. 18, 2028) | - | + (Aug. 18, 2024) | - |
| LMT | + (Aug. 18, 2028) | -/+ | + (Aug. 18, 2033) | + (Feb. 18, 2027) | + (From Aug. 18, 2024) | - | + (Aug. 18, 2024) | + (Aug. 18, 2024) |
| SLI | - | -/+ | + (Aug. 18, 2028) | - | - | - | + (Aug. 18, 2024) | - |
| EV | + (Feb. 18, 2025) | -/+ | + (Aug. 18, 2028) | - | + (From Aug. 18, 2024) | - | + (Aug. 18, 2024) | + (Aug. 18, 2024) |
| Industrial — less than 2 kWh | - | -/+ | - | - | - | + (only SBESS) (Aug. 18, 2024) | + (Aug. 18, 2024) | + (only SBESS) (Aug.18, 2024) |
| Industrial — more than 2 kWh | + (non-rechargeable excluded) (Feb. 18, 2026) | -/+ | + (flow batteries excluded) (Aug.18, 2028) | - | + (non-rechargeable excluded) (From Aug. 18, 2024) | + (only SBESS) (Aug. 18, 2024) | + (Aug. 18, 2024) | + (only SBESS) (Aug. 18, 2024) |

New EU battery regulation - notified body

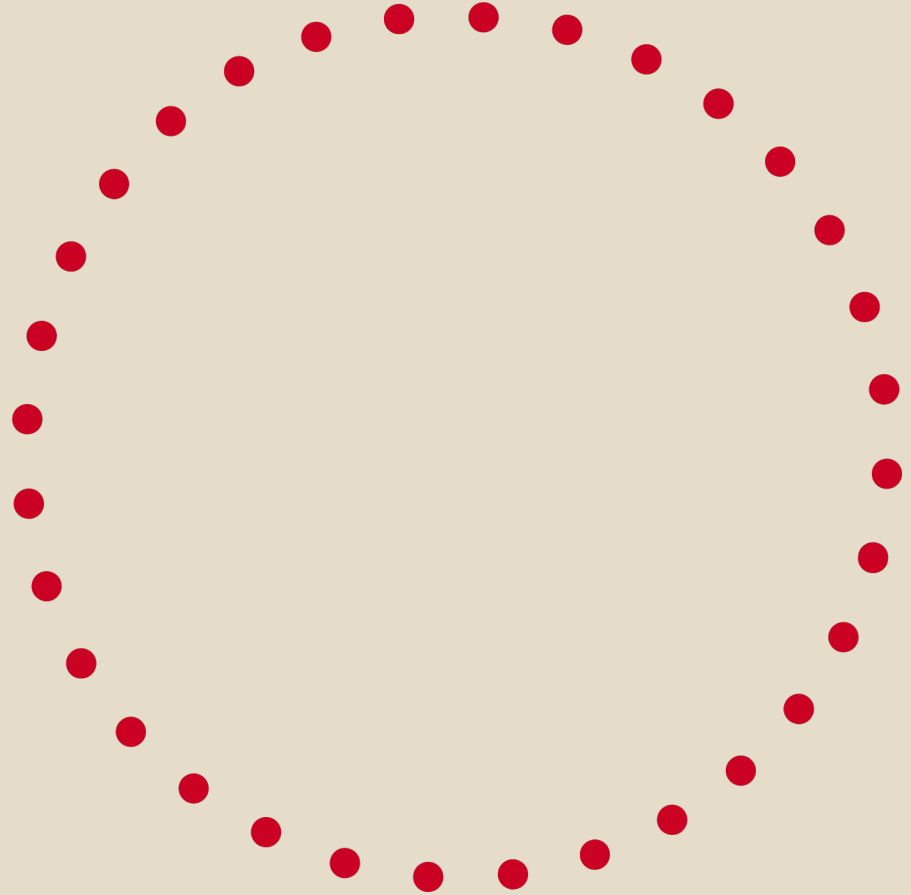
- Notified body assessment is required and mandatory for Articles 7 and 8 (Carbon Footprint and Recycled Content) and, for companies with net turnover above EUR 40 million, Due Diligence Articles 49, 50 and 52 (all batteries).
- A notified body could be requested on a voluntary basis for other articles (Articles 6-10 and Articles 12 and 14).
- Effective dates:
 - Article 7 – Feb. 18, 2025 (starting with EV batteries)
 - Article 8 – Aug. 18, 2028 (for industrial batteries greater than 2 kWh, EV and SLI batteries)
 - Due diligence articles – Aug. 18, 2025
- UL Solutions is exploring options to set up a notified body in Europe.



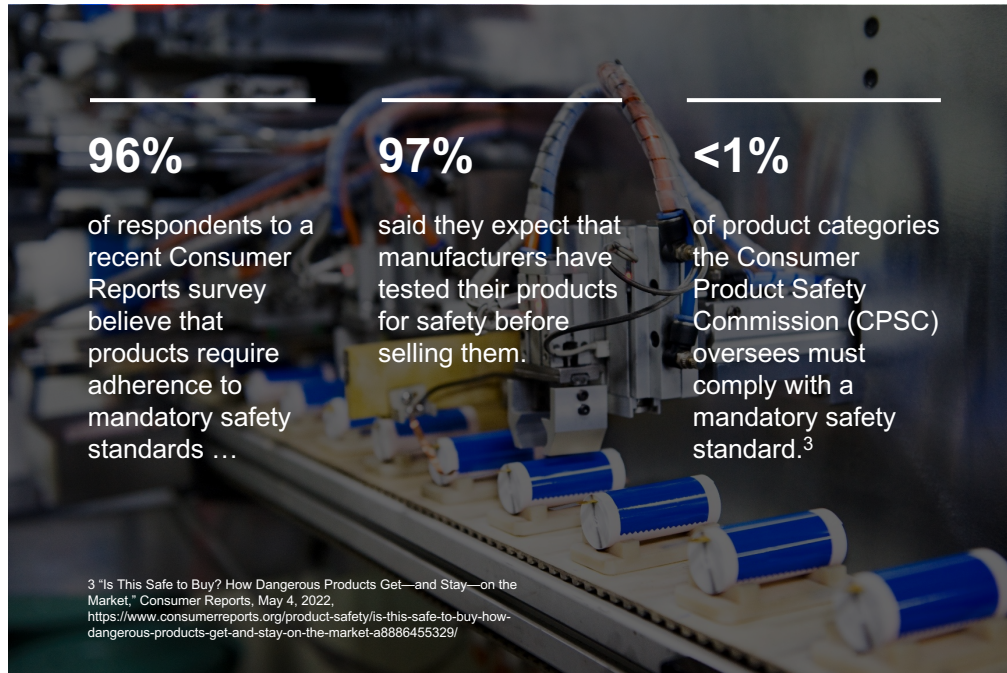
Batteries: recap

- Batteries are typically components — applicable requirements depend on end-product/end-use application.
- It is critical to learn the end-product/end-use application and basic battery information (e.g., chemistry, size, weight, capacity, electrical parameters).
- Many battery pack standards require battery cells to be already tested/certified to specific standards, depending on battery pack and/or end-product standards.
- If you are a battery manufacturer and looking for applicable requirements, ask your customer about their end-product/end-use application. Ask them what they require from you. If you have doubts, ask UL Solutions.

UL Solutions global support



Consumer perception versus reality



Takeaway

Consumers expect that the products they use, such as those with lithium-ion batteries, have been tested for safety.

Smart manufacturers will rise to that expectation and demonstrate compliance with key safety standards to build consumer's trust.

How to build trust in your brand

These steps can help reduce the likelihood of safety concerns:



Risk assessment

- Evaluate potential safety risks and hazards associated with the power source.
- Identify necessary design changes to address risks and hazards.
- Pinpoint other necessary safety evaluation and testing criteria.



Understand the regulatory landscape

- Identify target markets and relevant regulations in each geographic location.
- Investigate and outline baseline requirements.
- Map evaluation, testing and/or certification plans based on regulatory requirements.



Consider marketplace requirements and customer expectations

- Identify requirements or measures that could result in competitive advantage.
- Map any evaluations, tests and/or certifications required to validate product claims, enhance product acceptance or differentiate offerings.



Seek expert advice and counsel

- Identify a third-party product certification organization that is accredited to ISO/IEC 17065 to facilitate planning
- Outline cost-effective evaluation, testing and certification strategies for long-term savings.
- Ask questions about international requirements.

UL Solutions offerings

Comprehensive battery safety program designed for battery and battery-operated product manufacturers

1



Battery safety testing and certification

We can evaluate battery products, such as lithium-ion battery cells and packs, chargers, adapters, and battery-operated end products to key standards and certification schemes.

2



In-house electromagnetic compatibility (EMC) services

We offer EMC testing services, providing you a customized package to optimize testing capabilities. This enables you to identify and resolve EMC issues as early as possible.

3



Environmental Claim Validation (ECV)

Boost the credibility of your environmental sustainability claims, such as battery recycling programs.

4



Additional UL Solutions services

UL Prospector® and Product iQ® databases helps cell manufacturers enhance their reputation as a trustworthy supplier.

Our value proposition

- Provide applicable testing/certification capabilities for North America, EU and other countries and regions.
- Provide market access research and advisory (training, education and identification of applicable requirements).
- Provide independent custom research, including forensic analysis/failure investigations.
- Evaluate for safety, functional safety, performance aspects, etc.
- Access to global market access experts and knowledge on worldwide requirements.





More information on batteries:

<https://www.UL.com/services/battery-safety-testing>

<https://www.ul.com/insights/industry-insights-eu-battery-regulation-20231542>

<https://fsri.org/lithium-ion-battery-guide?linkId=198894370>

How can we help?

Interested in a quote, an early engagement project, or a preliminary investigation?

Contact us: [UL.com/contact-us](https://www.UL.com/contact-us)



Thank you

[UL.com/Solutions](https://www.ul.com/Solutions)

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