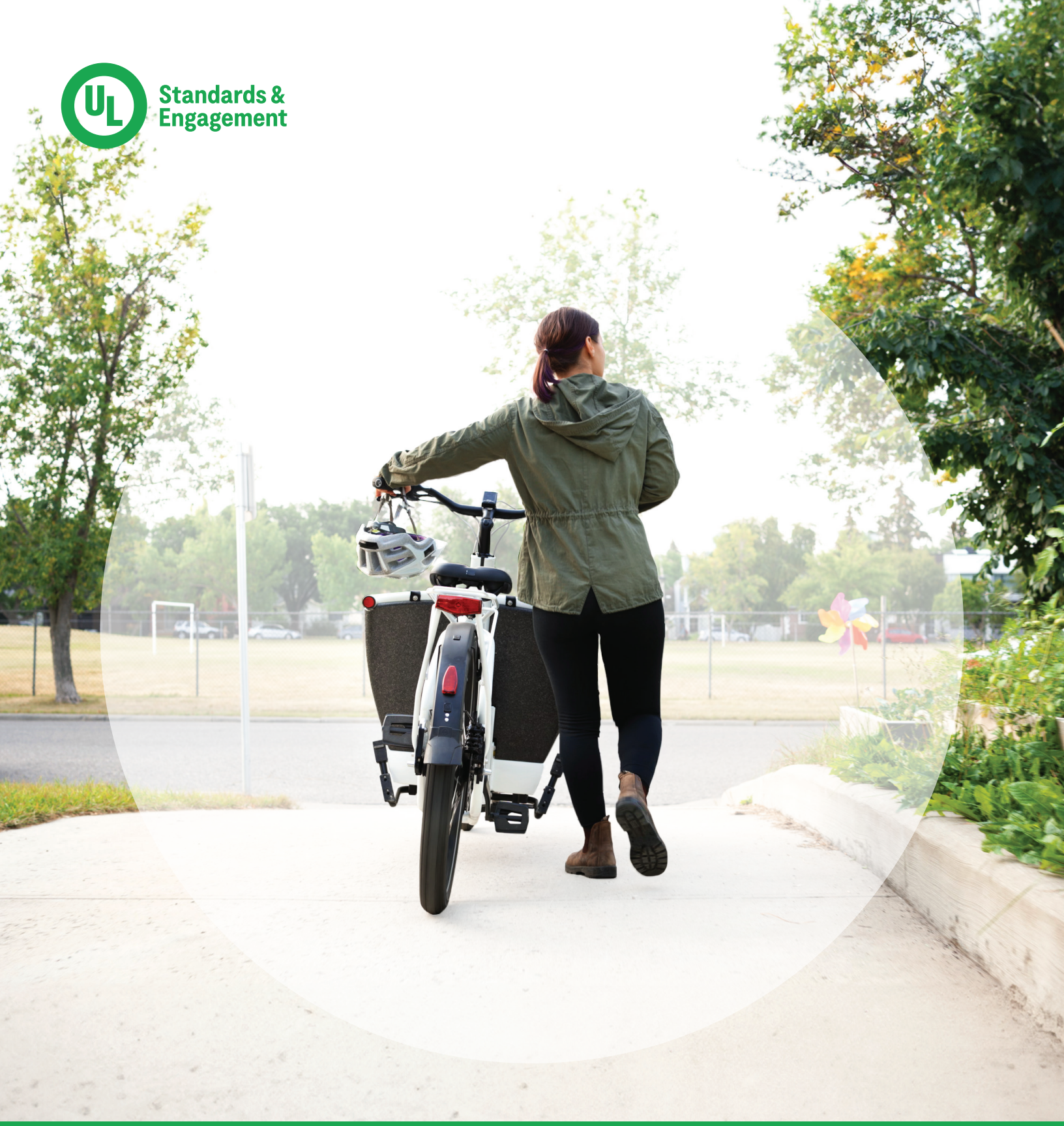
UL Standards & Engagement



INSIGHTS AND RESOURCES

Toolkit for City and State Government Leaders to Address E-Bike Fires

Standards & Engagement

Overview

About UL Standards & Engagement

UL Standards & Engagement is a nonprofit standards development and advocacy organization that translates safety science into practical, action-oriented standards.

The organization also serves as a vital resource for policymakers and shares knowledge, advances partnerships, and advocates for standards and policies to create a safer, more sustainable world.

About this Document

This document is intended to provide guidance to local governments considering developing legislation related to reducing fires and other incidents caused by the lithium-ion batteries in e-mobility devices.

UL Standards & Engagement supports the adoption of three UL standards that will improve e-mobility safety: UL 2849, the standard for e-bikes; UL 2272, the standard for personal e-mobility devices; and UL 2271, the standard for lithium-ion batteries in e-mobility devices.

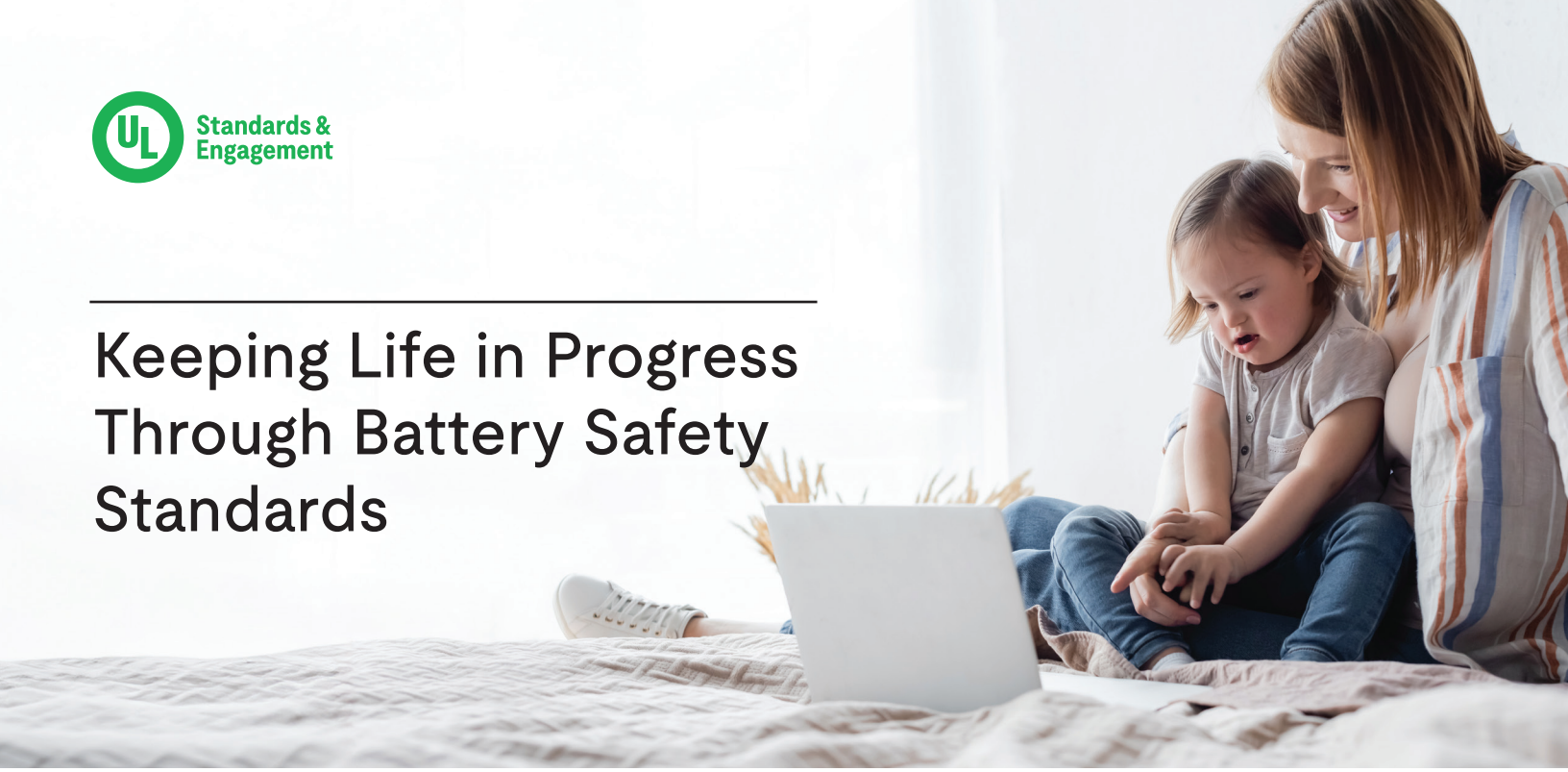
Safety standards are developed by industry experts, consumers, nonprofits, and others. These documents provide guidance and requirements on the design, installation, and operation of a product or service.

Instructions for Use

This document is designed to help inform the development of legislation that requires all e-mobility devices be tested to the above standards. It may not be achievable for the government to adopt precisely as it is written. It is intended to be advisory, and users should not rely upon it as legal advice. Government officials are urged to seek legal advice from their attorneys before enacting a battery energy storage system ordinance. Local governments must consider how the language in this model legislation may or should be modified to suit local conditions and planning.

Table of Contents

UL Standards & Engagement



Keeping Life in Progress Through Battery Safety Standards

As society moves toward clean, renewable, and sustainable energy sources, lithium-ion batteries have become a critical power source. These rechargeable batteries are small and compact, yet still capable of storing large amounts of energy. They are also ubiquitous, found in everything from smartphones and e-bikes to electric vehicles and large-scale energy grid storage systems. Standards help lessen the risks and hazards inherent in lithium-ion battery power and support technological progress in clean energy.

Lithium-Ion Battery Hazards

Thermal Runaway

Thermal runaway is a phenomenon in which a lithium-ion cell enters an uncontrollable, self-heating state. This reaction can be caused by substandard quality and design, poor components, physical abuse, and improper charging, discharging, or device integration. Thermal runaway can result in extremely high temperatures, violent cell venting, fire, and explosion.

Stranded Energy

Stranded energy refers to the remaining energy in a battery after it has been damaged or removed from service. If batteries are not properly managed, stranded energy can lead to thermal runaway and hazards such as electrical shock, fire, and explosion.

Off-Gassing

Off-gassing is the act of releasing gases from a battery during charging or discharging. Off-gassing at a minor scale can be a normal part of battery operation, but it can accelerate to dangerous levels if the battery is damaged, overcharged, or overheated. These gases can be flammable and toxic. Off-gassing poses an elevated safety risk if it occurs in a confined space, or one that is not properly ventilated.

Standards & Engagement

CASE STUDY

How Governments Are Reducing E-Bike Fires with Standards

Problem:

Ownership of e-bikes and scooters has soared since the pandemic, offering a cost-effective and environmentally friendly way to get from point A to point B. However, the lithium-ion batteries that power these devices and allow them to be rechargeable have the potential to cause extreme damage if they go into thermal runaway, an uncontrollable, self-heating state that can result in fire or even explosion.

Lithium-ion battery fires are intense, fast, and difficult to extinguish. The Fire Safety Research Institute of UL Research Institutes conducted an e-bike fire test in partnership with the FDNY, finding that it took less than 20 seconds from when the first smoke appeared from the e-bike to when the room was completely engulfed in flames.

Instances of these devastating fires have been reported across the country. They present a unique risk in cities, as more densely populated areas can result in fires that spread quickly from apartment to apartment or building to building.

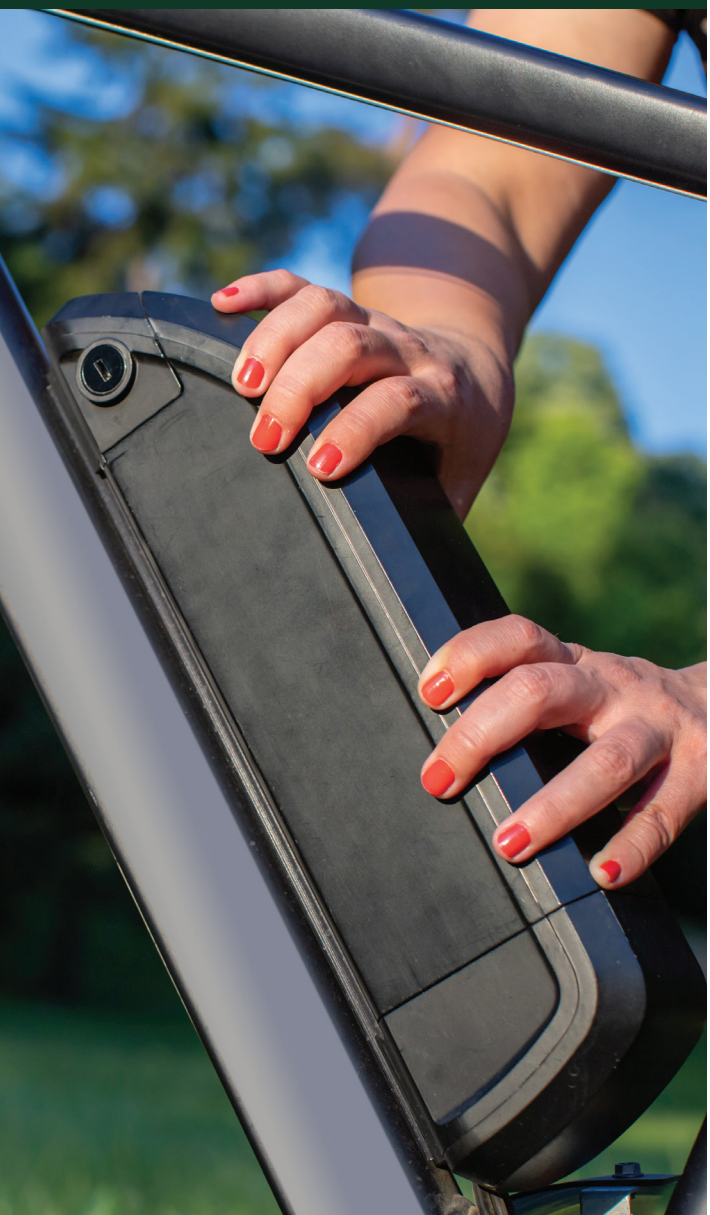
Solution:

At UL Standards & Engagement, we are working with stakeholders to achieve a safer, more sustainable world through standards. Standards are guidance documents for manufacturing and testing a product's safety, developed by a committee of experts from industry, manufacturing, government, academia, and more.

For e-bikes and scooters, ULSE has three standards that cover the devices and the batteries that power those devices: UL 2849, the standard for e-bikes; UL 2272, for personal e-mobility devices; and UL 2271, the standard for lithium-ion batteries in e-mobility devices. These standards are designed to help protect against thermal runaway and the devastating fires it can produce.

How are governments handling this issue?

From local to federal government, a variety of approaches are being used to curb deadly lithium-ion battery fires. While each solution is unique, leveraging UL standards as part of the solution is common to all of them.



At the Federal Level

Legislation is advancing through Congress that aims to reduce the risk of lithium-ion battery related fires.

The Setting Consumer Standards for Lithium-Ion Batteries Act (H.R. 1797 and S. 1008) would require the U.S. Consumer Product Safety Commission to issue a safety standard for rechargeable lithium-ion batteries used in e-mobility devices.

A City-Level Legislative Approach: New York City, NY

In New York City — where e-mobility fires more than doubled from 2021 to 2022 and have become the leading cause of deadly fires — the increasing problem required action. The signing of Local Law 39 on March 30, 2023, took a critical step forward in protecting consumers by prohibiting the sale, lease, or rental of e-mobility devices and their batteries that did not meet specific ULSE's safety standards (UL 2849, UL 2272, and UL 2271).

In an effort to remove e-mobility devices that do not conform to safety standards, the city council approved a trade-in program for residents which will allow them to purchase certified products at a lower cost. Additionally, the city approved a separate e-bike trade-in program specifically for delivery workers so that they can safely do their job without worrying about a cost burden.

Examples of Incentive Programs Approach: Washington, D.C. and Denver, CO

Both Denver and Washington, D.C. created financial incentive programs that make e-mobility devices more accessible and safer. The D.C. model offers vouchers ranging from $75 for bike locks to $2,000 for an e-bike while Denver allows residents to save up to $1,400 through their rebate program. Both programs require that e-mobility devices are certified to specific ULSE standards.

Understanding the Battery Power Ecosystem

Our catalog includes more than 80 standards that reduce the risks associated with lithium-ion batteries and the devices that rely on them, such as electric vehicles and e-mobility devices, charging systems, grid energy storage, drones and robotic equipment, audio/video and virtual reality equipment, and household electronics and appliances.

e-Mobility

1. Personal e-Mobility Devices | UL 2272
2. e-Bikes | UL 2849
3. Light Electric Vehicles | UL 2271
4. Light Electric Rail | UL 1973

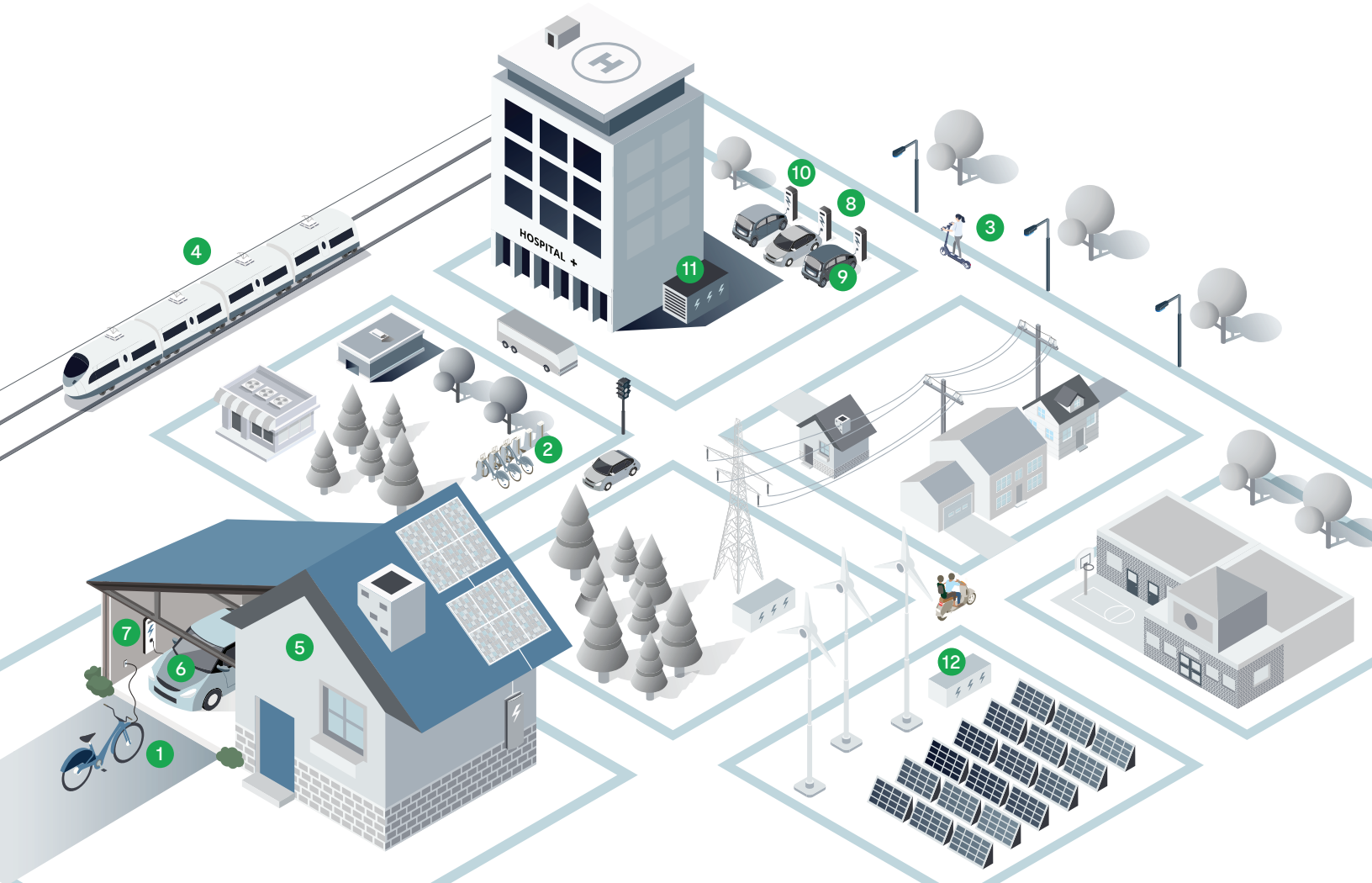
Batteries and Electrical Systems

5. Household and Commercial Batteries | UL 2054
6. Batteries for Electric Vehicles | UL 2580

Charging and Energy Storage and Distribution

7. Electric Vehicle Supply Equipment | UL 2594
8. Charging System Equipment | UL 2202
9. Plugs, Receptacles and Couplers | UL 2251
10. Protection Devices in Charging Systems | UL 2231-1, UL 2231-2
11. Energy Storage Systems | UL 9540

    Test Methods for Evaluating Thermal Runaway Fire Propagation in Battery ESS | UL 9540A
12. Energy Management Equipment | UL 916



UL Standards & Engagement

Perceptions of E-mobility Battery Safety

Lithium-ion batteries are widely used by e-bike and e-scooter manufacturers but these batteries can present safety hazards to owners if damaged, improperly charged, poorly manufactured, or counterfeit. Educating consumers about safety hazards and associated risks such as thermal runaway are paramount to ensuring the safe future of electric micromobility.

01

E-mobility devices are critical to the work lives of urban residents

45%
of riders are in urban areas

54%
of owners purchased e-bikes or e-scooters for work, 72% have used it for delivery gigs in the past 12 months

39%
of riders are low income and 32% are middle income

Source: ULSE E-mobility Insights Surveys Jan-April 2024

02

Battery replacement practices bring concerning safety variables

Nearly half of e-bike owners (48%) have replaced their old e-bike battery. Many did so as a result of circumstances that threaten safety:

11%
caught on fire

24%
were overheating

16%
damaged from a crash or collision

28%
were swelling or bulging

03

Lack of awareness translates to behaviors that increase fire risk

Nearly half of riders who charge at home are blocking their home's fire exits, a contributing factor in several cases where death occurred.

It takes only 20 seconds from the first sign of smoke to a room being engulfed in flames from a lithium-ion battery. A traditional fire typically takes about three minutes, according to tests conducted by Fire Safety Research Institute.

04

There is little awareness of the power source or its risk

The majority of owners of these devices are unaware that their devices are powered by a lithium-ion battery.

e-bike

e-scooter

UL Standards & Engagement

UL Standards & Engagement: 120 years in standards development

UL Standards & Engagement is a nonprofit standards development and advocacy organization that translates safety science into practical, action-oriented standards, from toasters to life jackets, and lithium-ion batteries to solar power.

The organization also serves as a vital resource for policymakers and shares knowledge, advances partnerships, and advocates for standards and policies to create a safer, more sustainable world.

What is safety science?

Safety science engages the ingenuity of top minds across scientific fields to engineer a safer and more sustainable world in which every individual can thrive.

What is a standard?

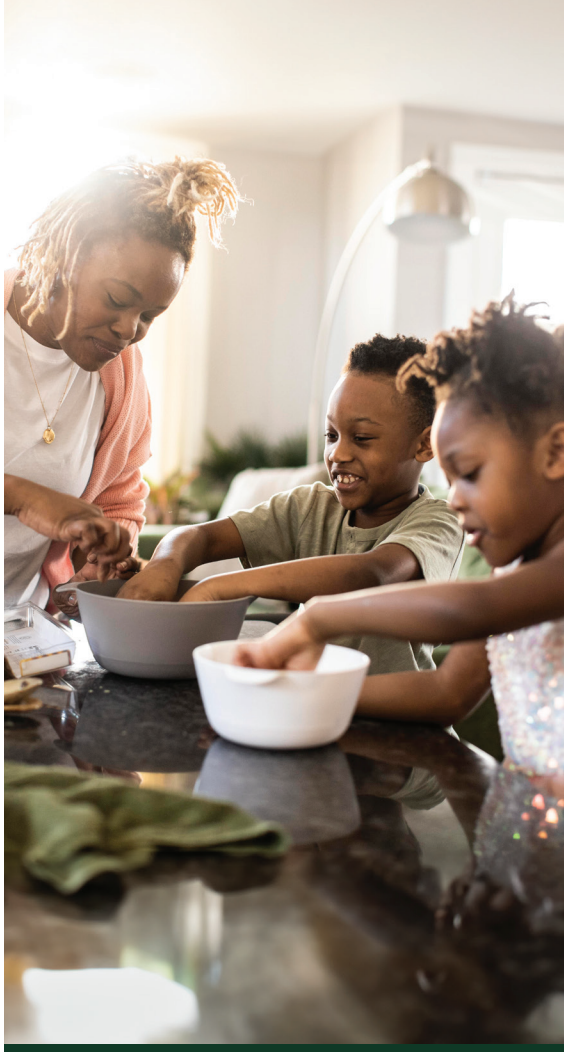
A standard is a document of best practices for manufacturing and testing the safety, security, and sustainability of a product or system, developed and voted on by experts across industries and interests.

How are standards developed?

UL Standards & Engagement convenes technical committees comprised of experts from manufacturing, government, academia, nonprofits, and other relevant groups to determine a standard. Technical committee members review proposals for new or revised standards and work together to achieve consensus through balloting in a fair and transparent process.

What happens after a standard is published?

All standards are free to view. Manufacturers and innovators can develop products, which can then be tested and certified that they conform to our standards to ensure they are as safe as possible. UL Standards & Engagement is continuously monitoring and revising standards to address a changing risk landscape and emerging technologies.



Fast Facts:

- 1,700+ standards and documents in use today
- 4,000+ individuals serve on ULSE Technical Committees
- 40+ countries are represented through our Technical Committees
- 81 MOUs with agreements in several countries and regions
- ULSE is the only standards organization accredited to publish for the U.S., Canada, and Mexico

Standards & Engagement

For more information or to discuss how we can partner, please contact David McKnight, Head of Partnerships, at David.McKnight@ul.org