UL Standards & Engagement

THE RECHARGEABLE SOCIETY:

Building Trust in a Battery-Powered World

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Introduction

Over the past decade, we have entered a new era: the **Rechargeable Society**. More than ever, the ways we live, work, move, and power our lives depend on rechargeable lithium-ion batteries.

But as our usage of these rechargeable power sources has increased, their risks have become harder to ignore. From a rise in aviation battery incidents to growing concerns about the safety of battery energy storage systems, the risk of thermal runaway — an uncontrollable self-heating event that can result in smoke, fire, or explosion — is forcing a critical question: Have we planned for the risk?

This inaugural report features insights from ULSE experts and analysis of consumer data, taking an in-depth look at how the Rechargeable Society is reshaping everyday life, the safety challenges emerging alongside rapid adoption, and the critical role of standards, education, and public awareness in building a safer future.

The Rechargeable Society is Here

As we increasingly live in a world powered by battery-operated technologies that enable communication, mobility, energy resilience, and economic growth, rechargeable batteries are now embedded in nearly every aspect of daily life.

Consumer adoption of rechargeable products has increased demand for the batteries that power them. Between 2018 and 2023, U.S. lithium-ion battery imports grew sevenfold, according to the Center for Strategic & International Studies.

> Rechargeable products have reached near-universal adoption, with nearly every American consumer (98%) owning at least one rechargeable product, and the average person owning nine rechargeable battery-powered devices.

This level of adoption underscores the degree to which rechargeable technologies have become essential infrastructure for modern living rather than optional conveniences.

Aviation cargo shipments carrying rechargeable batteries and products are increasing as e-commerce, consumer electronics demand, and advanced manufacturing drive greater movement of goods worldwide. The growing movement of batteries in the global supply chain reflects society's increasing dependence on rechargeable technologies.

Energy Storage Expands Beyond Traditional Devices

The Rechargeable Society extends well beyond personal electronics. One of the most significant shifts in the Rechargeable Society is that batteries are becoming infrastructure.

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9 The number of rechargeable devices owned by the average U.S. consumer

Among Homeowners Who Have Installed a BESS:

69%

cite access to backup power during outages as a major reason for installation.

63%

say they want to save money on energy bills.

57%

note they want to reduce their dependence on the electrical grid.

Today, 87% of consumers report having heard of battery energy storage systems, which store energy for use when it is needed most. As awareness grows, adoption is beginning to follow. Nearly 1 in 10 homeowners (9%) report having installed a BESS in their homes. The motivations behind these investments highlight changing consumer priorities.

These systems are increasingly viewed as tools for energy resilience, allowing households to maintain power during disruptions while also providing greater control over energy usage.

Many homeowners are also taking proactive steps to support safe operation. Among those who have installed a BESS:

51% report installing a smoke detector or monitoring device near the storage system.

50% say they have educated themselves on what to do in the event of a lithium-ion battery-related fire.

These findings suggest that as battery technologies become more visible and integrated into homes, many consumers are planning for safer operation to mitigate risk. A near-equal number, however, are not.

> As electrification accelerates across the country, Battery Energy Storage Systems are an essential foundational element of the Rechargeable Society. With this growth, consumers and industry alike must prioritize safety through strong standards, rigorous testing, proper installation, and effective monitoring.

Randi Myers
UL Standards & Engagement
Director of Electrification Standards

The use of BESS goes beyond the home and has become increasingly important to the modern energy ecosystem of the Rechargeable Society. While BESS installations play a significant role in grid infrastructure, the growing scale and concentration of stored battery energy can introduce safety risks that must be carefully managed. These systems can provide backup power during disruptions, help balance fluctuation between supply and demand of energy regionally, and are expected to play a role in the surge of energy-intensive data centers that will continue to drive growing electricity needs.

> As BESS installations increase in size, they can concentrate significant amounts of stored energy in one place. That does not make them inherently unsafe, but it does increase the importance of proper design, testing, installation, monitoring, and emergency planning to help manage the consequences of a potential failure.

Dr. Denice Durrant,
UL Standards & Engagement
Senior Director of Applied Sciences

The importance of BESS is expected to increase as society continues to electrify and as digital infrastructure expands. Energy utilization by data centers alone expanded 80% from 2020 to 2025, according to the International Energy Agency. Data centers, which power everything from cloud computing and streaming services to artificial intelligence, are emerging as one of the fastest-growing sources of electricity demand.

As battery energy storage systems become increasingly integral to homes, businesses, data centers, and the electric grid, their role extends far beyond storing energy. They are becoming foundational to the infrastructure that supports connectivity, economic activity, and energy resilience. With that growing importance comes a shared responsibility to help ensure these systems are designed, tested, installed, and operated safely.

The Rise of Electric Mobility

Transportation represents another major driver of the Rechargeable Society. Battery-powered mobility options continue to gain traction across multiple categories.

While these percentage increases may appear modest, they represent continued growth across multiple sectors of electric transportation and reflect an expanding ecosystem of battery-powered mobility solutions. Consumers increasingly view rechargeable transportation technologies as practical alternatives for commuting, recreation, and everyday travel. More than half (51%) of owners who purchased an e-bike said that being able to use it for work-related tasks such as delivery work was somewhat or very important to them.

As adoption grows, so does the importance of ensuring that consumers understand how to use, charge, and store these products safely.

Most participants reported that they did not think about battery safety when purchasing their e-bike. Instead, consumers tended to focus on factors such as cost, battery life, charging performance, battery installation, and battery location. When discussing e-bike safety, participants were more likely to mention physical or road safety concerns than battery-related risks.

It follows that many e-mobility owners are unknowingly engaging in risky behavior. Nearly half (49%) store their e-mobility device by the door or in a hallway that would block their exit in the event of a fire. More than half (53%) leave their e-bikes or e-scooters plugged in even after reaching full charge. Further e-mobility users report routinely charging either overnight (41%) or unattended while away from home (26%).

The challenges associated with battery safety awareness extend beyond micromobility devices to electric vehicles and plug-in hybrid electric vehicles (PHEVs). UL Standards & Engagement research found that 17% of EV owners and 21% of PHEV owners reported receiving no information about battery safety or charging best practices from their vehicle manufacturer or dealership. This lack of guidance may contribute to unsafe charging behaviors and increased risk. Notably, 14% of EV and PHEV owners reported that a charger unit or connector had become excessively hot to the touch, 11% had witnessed visible sparks while plugging in or unplugging their vehicle, and 9% had experienced a burning smell, smoke, or scorch marks on a charging cable or connector. These incidents were reported in both home charging environments and public charging settings, underscoring the need for greater consumer education as transportation becomes increasingly electrified.

These findings suggest an opportunity to better integrate battery safety education into the consumer journey, helping people understand not only how products perform, but also how to use, charge, store, and maintain them throughout their lifecycle.

EV Fire Incidents

Alongside e-mobility, electric vehicle sales are on the rise, and with that, UL Research Institutes' Fire Safety experts are closely evaluating battery safety and fires.

New research from UL Research Institutes' Fire Safety Research Institute examines burning characteristics and suppression tactics for electric vehicles, following full-scale burns of 18 vehicles. The report found that EV and gas vehicle fires are similar in fire growth rate, peak fire size and fire duration, and for most EV fire incidents, water can be used to control the cabin fire, limit exposures, and control flaming from thermal runaway while the fire burns itself out.

Read the Full Report

ULSE Data Shows Ownership Trends

(April 2025 to April 2026 unless otherwise noted):

Electric Bicycles
Ownership increased from 19.2 million people to 21.6 million

Electric Scooters
Ownership rose from 16.8 million people to 21.6 million

Electric Vehicles
Ownership held steady at 16.8 million people

Plug-in Hybrid Electric Vehicles
Ownership increased from 9.6 million to 12 million (October 2025 to April 2026)

The Risk Is Outpacing Awareness

The rise of the Rechargeable Society has delivered extraordinary benefits in connectivity, mobility, and energy resilience. Yet, the ubiquity of lithium-ion batteries in our homes, vehicles, infrastructure, and supply chains is causing battery-related incidents to become more visible.

Nowhere is the risk becoming more visible or more acute than in air travel. While thermal runaway is a risk anywhere, at 30,000 feet, it is immensely more complicated to deal with. Thermal runaway incidents on passenger aircraft increased 15%, rising from 107 incidents in 2024 to 123 incidents in 2025, according to ULSE research. Airlines are now experiencing an average of 2.36 incidents per week.

The trend is also visible in cargo operations. Thermal runaway incidents in air cargo increased approximately 40% between 2021 and 2025, reflecting the growing number of lithium-ion batteries moving through global supply chains. External reporting and incident data from the Federal Aviation Administration further show a continued rise in reported smoke, fire, and overheating events involving batteries transported by air.

Despite these developments, public awareness remains limited. Only 9% of U.S. adults report hearing about an aircraft thermal runaway incident, a figure that has trended slightly downward even as incidents have increased.

ULSE researchers interviewed consumers who have experienced battery failures. One of those interviews, a respondent from Westchester County said her e-scooter caught fire while charging in her garage only months after she received it as a gift. While incidents remain low compared to the number of products in use, the consequences can be significant when safe practices are not understood or followed.

> “Protect your home… your family, be aware, be proactive, always pay attention, be on guard if you smell anything weird.”
>
> **ULSE Interviewee**

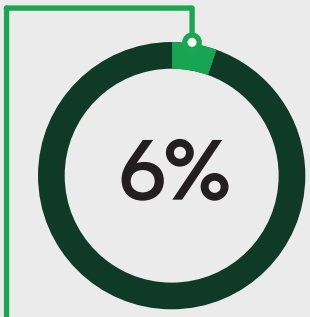
An Example of City Action Toward Battery Safety

Local fire departments across the country are increasingly responding to lithium-ion battery incidents, particularly those involving e-bikes, e-scooters, and other micromobility devices.

New York City provides one of the clearest illustrations of the challenge. Over the course of just a few years, NYC proved the value of products certified to safety standards. After a surge in e-mobility fires that led to injuries, deaths, and property damage totaling as much as an estimated $518.6 million between 2019 and 2023, the city required devices sold, rented, or leased within its borders to be certified to three ULSE safety standards. In addition, the city launched public education campaigns, inspections, and enforcement efforts to help reduce the number of deaths and injuries linked to e-bike battery fires. The law was enacted in 2023 as the number of deaths from e-mobility fires in New York City reached an annual peak of 18. In only two years following the enactment of the law, deaths fell to one.

However, overall consumer preparedness across the country remains uneven. These findings suggest that while incidents can be severe, outcomes are often influenced by preparedness, early detection, and adherence to safe charging and storage practices.

Residential Battery Fire Damage



of American consumers report experiencing a lithium-ion battery-related fire in or around their home within the past five years.

- **18%** resulted in major damage
- **45%** caused medium damage
- **37%** caused minor damage

Of American consumers, 80% have a smoke alarm (hardwired, battery-powered, or combination smoke and carbon monoxide) and 17% have a residential sprinkler system.

Consumers Are Becoming Risk Multipliers

What Consumers Do With Product Recalls

Recalls often identify known risks before injuries occur. Yet consumer response remains inconsistent. Among consumers who knowingly experienced a recall:

74%
did not return a rechargeable product that was recalled

13%
continued using the recalled product

28%
obtained a replacement product

17%
stopped using the product but didn't return it

15%
repaired the product themselves

Millions of consumers are reliant on lithium-ion battery-powered technologies, yet many remain unfamiliar with the associated risks and the steps necessary to reduce them. As a result, consumers can unknowingly become risk multipliers, creating conditions that elevate the likelihood and severity of thermal runaway incidents.

Recall data provides an important indication that many battery incidents are foreseeable and preventable. Nearly 3 in 4 consumers (74%) report not returning a rechargeable product that was recalled.

Percentage of consumers that returned their product due to a recall	
8%	Smartphone
6%	Laptop
3%	Portable Charger
3%	E-Cigarette

Reporting from the Consumer Product Safety Commission demonstrates the breadth of warnings around battery-related hazards and recalls, ranging from faulty battery packs and charging systems to incompatible chargers that can lead to overheating, short circuits, and fire risks. In just the first five months of 2024, the CPSC received 156 fire and thermal incident reports involving micromobility chargers that were incompatible with many devices, despite being marketed as "universal."

Recall data indicates an important lesson: **many battery failures are not surprises; they are unheeded warnings**. Standards can help reduce failures before they occur and education can support safer actions when recalls are issued.

Knowledge Gaps Create the Foundation for Risk

Nearly, 3 in 5 consumers (58%) are unaware that lithium-ion batteries power many of the products they routinely use. This knowledge gap exists even as lithium-ion batteries power products that consumers interact with countless times each day.

The result is a paradox of the Rechargeable Society — consumers are more dependent upon lithium-ion batteries than ever before, yet many remain unaware that they power the technologies they rely on every day. Batteries that power these devices are largely viewed as invisible components rather than technologies that warrant independent evaluation.

This becomes particularly problematic during purchasing decisions. Research participants routinely described evaluating products based on performance, price, convenience, battery life, charging speed, or brand reputation, while rarely considering battery safety.

> "Consumers want to make informed decisions, but many told us they struggled with finding clear, accessible information about lithium-ion batteries," says Brimsek. "Even basic questions around what products contain them, what risks they pose, how to travel with them, and how to maintain them often require significant research. They are often also left without instructions for managing batteries that are damaged, defective, recalled, or showing signs of thermal runaway."

Product listings often provide little information about battery certifications, safety testing, or compliance with recognized standards, making it difficult for consumers to incorporate safety into purchasing decisions even when they want to.

> "I assume that [products] pass all the safety requirements and that they're good to go … I mean, it's on the market, you know, it had good reviews. It's on Amazon. It was like a reputable seller on Amazon. So I just assume that it was, you know, good to go."
>
> **ULSE Interviewee**

Many believe that thermal runaway will not happen to them. Knowledge gaps are compounded by another powerful risk factor: perceived invulnerability. Only 44% feel personally at risk of lithium-ion batteries overheating, whether from their own products or those owned by others.

However, consumers express concern about thermal runaway when it is defined for them and they are asked about it directly. Two-thirds (66%) say they are concerned about thermal runaway risks, while 65% are concerned specifically about incidents occurring on airplanes. Half (50%) are worried about other passengers' devices overheating during a flight.

43%

of consumers

say they do not know what a lithium-ion battery is, according to a ULSE survey.

Nearly 6 in 10 consumers (59%) say they are unfamiliar with strategies that can help reduce the risk of thermal runaway. That uncertainty frequently translates into behaviors that elevate risk rather than reduce it.

Concerns extend to portable chargers, e-cigarettes, and improperly packed batteries in carry-on or checked baggage. Yet despite these concerns, 56% do not believe they are personally at risk of experiencing a lithium-ion battery overheating event.

This disconnect between concern and perceived personal invulnerability influences behavior in important ways.

One participant of ULSE's ethnography study, Jennifer, whose phone entered thermal runaway, described her realization:

> "Before this happened, I probably would have purchased a phone off of Craigslist or something like that. I never would have thought that this could happen to me."

These experiences reveal a recurring pattern. Many consumers view battery incidents as rare events that happen to other people. The absence of a previous incident often reinforces a false sense of security, causing warning signs and safe-use recommendations to be overlooked.

More than 4 in 10 consumers (44%) choose affordable replacement batteries and chargers, regardless of whether they are produced by the original equipment manufacturer. While cost-conscious decision-making is understandable, it can increase exposure to counterfeit, incompatible, or uncertified charging equipment.

Similarly, many consumers continue to assume that products available for sale are inherently safe. ULSE interviews repeatedly showed participants expressing confidence that products sold through online marketplaces or major retailers must have already been vetted for safety. Most participants were unfamiliar with battery certification standards and did not know which safety markings or certifications they should look for when making purchases.

> Lots of consumers shop online, where third-party and less reputable sellers are more easily reaching buyers with counterfeit and substandard products that may be harder to distinguish on screen than in person. And the consequences of purchasing an imitation — that could possibly be lower-cost — rechargeable product can directly risk your safety.

Wilbert Fletcher,
UL Standards & Engagement
Principal Standards Engineer

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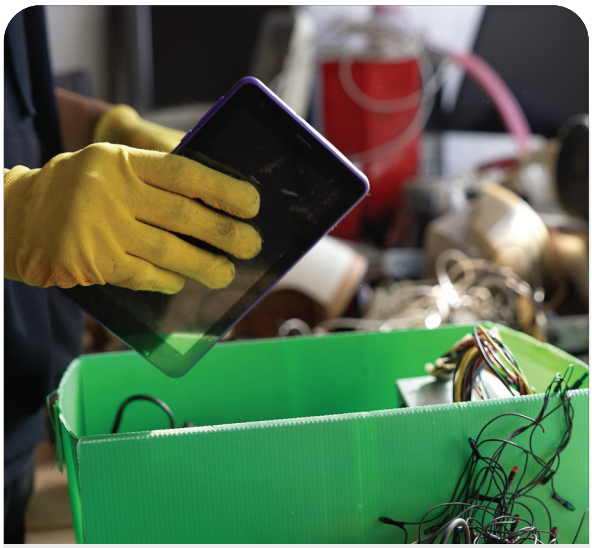
Everyday Behaviors Can Elevate Risk

The Rechargeable Society has normalized behaviors that may unintentionally increase risk. ULSE research revealed recurring warning signs: following thermal runaway incidents, many participants recalled noticing unusual device behavior beforehand. Devices became abnormally hot, batteries swelled, chargers malfunctioned, or performance degraded. Yet, because the devices continued functioning, consumers often continued using them.

"Consumers recognize overheating as an inconvenience rather than a safety warning."
Dr. Denice Durrant

"I have a portable charger that gets hot — not hot enough to explode."
ULSE Interviewee



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Battery Disposal Decisions Create Additional Risks

The consumer's role as a risk multiplier extends beyond product use and into end-of-life management. ULSE found that more than one-third of consumers (36%) are either unsure or incorrectly believe it is safe to throw lithium-ion batteries in household trash. Additionally, 44% believe batteries should remain inside devices when those devices are recycled.

Among ULSE interview participants who experienced thermal runaway incidents, uncertainty around disposal was widespread. One participant admitted:

> "I have not been educated on the proper way to dispose of a cell phone battery."

Another described storing a damaged battery in a jar because they did not know what else to do: "I didn't know what to do... I just put it in it, you know, like we'll deal with it another time."

This risk also extends to waste management companies. In December 2024, a lithium-ion battery caused a garbage truck to explode in a Chicago suburb. In New York, the Department of Sanitation reported more than 20 garbage truck fires from lithium-ion batteries that same year.

Better disposal practices are available. “The biggest challenge is not an absence of recycling options,” says Caitlin D’Onofrio, ULSE senior manager of sustainability standards. “It is that millions of consumers don't know what to recycle, where to take it, or when they should.”

Counterfeit and Substandard Products Distort Risk

The Rechargeable Society depends on trust. Counterfeit and substandard batteries undermine that trust in ways consumers often cannot see until something goes wrong.

The Rechargeable Society has given consumers access to purchase rechargeable products from virtually anywhere at any time. Global e-commerce platforms, online marketplaces, third-party sellers, international shipping networks, and secondary markets have dramatically expanded access to battery-powered technologies. This accessibility has helped drive innovation and adoption, but it has also created new safety challenges.

As rechargeable products continue to become more pervasive, consumers increasingly face a marketplace where legitimate products compete alongside counterfeit, substandard, refurbished, modified, and otherwise less safe alternatives. In this environment, risk is often invisible. Products that appear identical on the surface may differ substantially in terms of battery quality, manufacturing controls, testing, certification, and safety performance.

According to the National Crime Prevention Council, counterfeit and dupe electronics cause more than 70 deaths and 350,000 serious injuries every year. Counterfeit products are made to look exactly like name-brand items, typically infringing illegally on a name-brand's trademark logo and packaging while attempting to pass as a genuine product; dupe products mimic the look or function of name-brand items, but carry their own branding and are typically sold legally because they do not infringe on trademark branding. Quality and safety of these products can vary, but they typically do not carry the same safeguards as genuine products that conform to safety standards.

ULSE research highlights a fundamental reality about battery safety: product quality matters. As one battery manufacturer we interviewed explained:

> "If you have poor quality, everything else down the road doesn't matter because poor quality is always going to show its head."

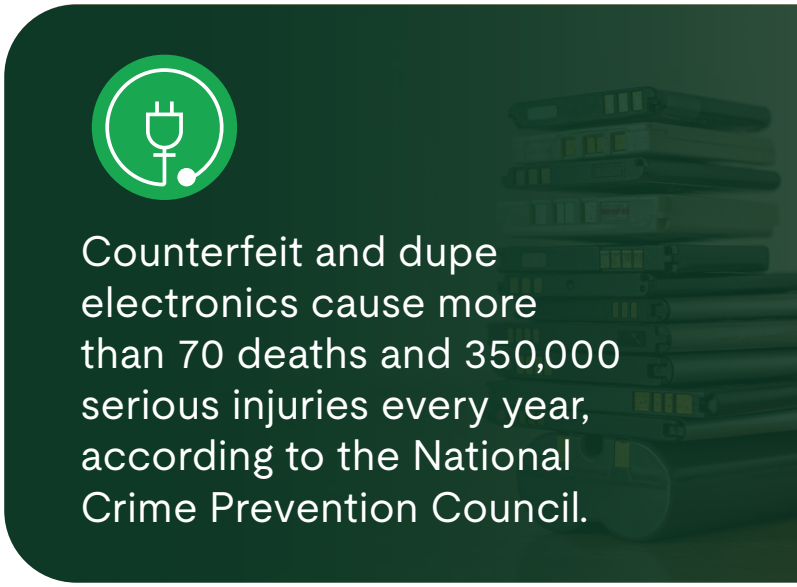
> The result is a hidden safety risk that may not become visible until a battery overheats, malfunctions, enters thermal runaway, or causes a fire.
>
> **Wilbert Fletcher,**
> UL Standards & Engagement
> Principal Standards Engineer

Another regulatory official emphasized the difficulty of understanding the true scale of the challenge:

"We don't actually know the size of the problem when it comes to purported compliance [with required testing] versus those that actually comply."

These observations expose a core challenge: safety systems are built on assumptions about product quality and compliance.

Batteries are expected to meet design requirements, pass testing protocols, comply with transportation regulations, and perform within known operating parameters. Counterfeit and substandard products undermine those assumptions by entering the marketplace outside established quality controls.



Building Trust in a Rechargeable Society

Consumer purchasing behaviors increasingly place them in direct contact with markets where product authenticity can be difficult to verify.

The popularity of online marketplaces creates tremendous opportunities for consumers but also creates environments in which counterfeit and substandard products can more easily reach buyers. Consumers shopping online typically evaluate products using ratings, reviews, appearance, specifications, and price.

Safety certifications, battery sourcing, manufacturer verification, and testing records are rarely front-and-center in purchasing decisions.

The Organisation for Economic Co-operation and Development has repeatedly highlighted how global e-commerce has accelerated the distribution of counterfeit goods by allowing small sellers to access international markets directly. At the same time, customs agencies around the world continue to seize counterfeit electronics, batteries, and accessories entering supply chains through small parcel shipments.

Perhaps more concerning is the growing normalization of counterfeit and imitation products.

> This overlap of convenience, low prices, and limited transparency creates conditions in which counterfeit and non-compliant products can flourish.
>
> **Anna Schnerre,**
> UL Standards & Engagement Lead Analyst for Quantitative Insights

Among consumers, ULSE found:

56%
purchase rechargeable products through online marketplaces such as Amazon or eBay.

66%
prefer purchasing rechargeable products based primarily on finding the best available price or promotion.

26%
purchase rechargeable devices from discount international platforms such as Temu or AliExpress.

57%
say brand reputation is the single most important purchase factor, but 49% say low price remains a major driver.

Consequences Could Be Deadly

A battery, charger, power bank, or replacement component may lack key safety protections, utilize lower-quality cells, contain manufacturing defects, or bypass certification testing altogether.

Yet to consumers, these products often appear nearly indistinguishable from legitimate alternatives.

ULSE interviews with individuals who experienced thermal runaway incidents involving suspected counterfeit or imitation products reveal a consistent pattern: consumers frequently describe purchasing products without knowing what indicators of authenticity or safety they should evaluate. Many assumed that if a product was available for purchase, it had already met appropriate safety requirements.

38%

of consumers report knowingly purchasing a **counterfeit** product within the past several years.

Of this group:

- **20%** purchased electronics
- **13%** purchased rechargeable lithium-ion batteries or chargers, including power banks.

57%

of consumers report knowingly purchasing a **dupe**, or imitation product.

Of this group:

- **19%** purchased electronics
- **12%** purchased rechargeable lithium-ion batteries or chargers, including power banks.

> With lithium-ion batteries, safety and quality should never be compromised. Compromising on quality can increase the likelihood of overheating, battery performance issues, and serious safety incidents.

Dr. Denice Durrant,
UL Standards & Engagement
Senior Director of Applied Sciences

Small Shipments Create Big Risks

The challenge extends well beyond consumer purchases. The growth of direct-to-consumer commerce means batteries increasingly move through supply chains driven by small businesses, resellers, independent shippers, and individual consumers — many of whom possess little understanding of hazardous materials regulations.

Research involving small shippers revealed significant knowledge gaps. More than 4 in 10 (43%) U.S. adults say they have never heard of any special rules or requirements for mailing or shipping rechargeable or lithium-ion battery-powered products.

One operator explained:

"The post office is supposed to ask everybody, 'Do you have any hazmat in this box?' But people don't understand what's being asked and they may not perceive lithium batteries as being a hazmat."

Another battery seller described receiving improperly packaged shipments:

"I know nothing about regulations. I just throw them in a FedEx envelope and ship them across the country... You just broke federal law by stuffing 50 lithium batteries in a FedEx envelope."

Some relied entirely on original packaging:

"I don't think there are any 'don'ts' and so I just ship as things are packaged to me."

Other shippers admitted they had never considered the risks associated with air transportation:

"When I ship via air, that didn't even cross my mind that I need to be worried about these batteries."

These comments reveal a recurring challenge within the Rechargeable Society: risk is often introduced not through intentional misconduct but **through incomplete knowledge.**

Another finding from shipper interviews points to a broader systemic problem. Many participants assumed someone else was responsible for safety. As one shipper explained:

> "Ultimately we feel like the responsibility lies on the manufacturer."

This diffusion of responsibility creates vulnerabilities throughout the rechargeable ecosystem. And when every participant assumes someone else is managing risk, important safeguards can be overlooked.

Safety Standards

Safety standards are a critical tool in helping to make rechargeable batteries (and the products that rely on them) safer for consumers, before they even begin using them.

These standards act like instruction manuals that help guide the testing of products, services, and systems.

To meet standards like UL 1642, which covers lithium batteries, or UL 2271, which covers batteries used in e-bikes and e-scooters, or one of the many other ULSE standards for batteries and the devices that rely on them, products must undergo rigorous testing, including electrical short-circuit and abnormal charging tests, mechanical crush and impact tests, and environmental heating and altitude-simulation tests. In order to pass these tests and comply with the standards, a battery must be able to resist the abuses to which it may be subjected.

Additionally, ULSE sustainability standards, like UL 110, Sustainability for Mobile Phones, or UL 3601, Measuring and Reporting Circularity of Li-ion and Other Secondary Batteries, help to equip product manufacturers and battery recycling and remanufacturing facilities with best practices for circular design and end-of-life management.

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A Few Examples of ULSE Battery Safety Standards

UL 1642 | Lithium Batteries: Covers rechargeable and non-rechargeable lithium batteries and is referenced by a number of ULSE standards for products that use lithium-ion batteries as power sources.

UL 2580 | Batteries for Use in Electric Vehicles: Covers electrical energy storage assemblies, such as battery packs and modules, for electric-powered vehicles.

UL 2056 | Power Banks: Covers portable power banks, including portable USB chargers and backup battery power products intended for mobile powering of devices such as smartphones and tablets.

UL 5800 | Battery Fire Containment Products: Covers containment products designed to suppress the flames and smoke from lithium-ion battery fires on aircraft.

UL 2850 | Vehicle Systems of Electric Scooters and Motorcycles: Addresses the safety of battery-powered electrical systems used in electric scooters and electric motorcycles.

Conclusion

Battery Safety Begins with a Safer Market

Products that have been certified to safety standards help provide assurance that critical design, performance, and safety requirements have been independently assessed. When standards are ignored, the risk can include battery failure, fire, property damage, and injury, underscoring the vital role safety standards play in building trust in our increasingly Rechargeable Society.

Consumers too have a role in making informed purchasing decisions. Approaching battery-powered products as educated consumers and paying particular attention to areas of outsized risk, such as products from unfamiliar sellers and refurbished devices, is a critical start. If it seems too good to be true, it most likely is.

As battery ownership expands and new applications emerge, the opportunity is clear: by pairing innovation with safety, industry and policymakers can help ensure that consumers continue to benefit from the convenience, resilience, and sustainability that rechargeable technologies provide with safety in mind.

Trust is built when people can confidently adopt and rely on the technologies that power modern life — and that trust begins with a commitment to safety from owners across the battery lifecycle.

Survey Methodology

This report combines findings from four survey series designed by UL Standards & Engagement and administered online by BV Insights. Data is drawn from ULSE's Consumer Tracker Series: a nationally representative online survey series of U.S. adults 18+, measuring awareness, attitudes, and behavior around lithium-ion battery safety, e-mobility, aviation safety, energy storage, circularity, and counterfeits.

Key series cited in this report include:

- Battery Safety series: data collected November 2024 – April 2026, n=24,193
- Sustainability series: data collected December 2023 – December 2025, n=12,089
- E-Mobility series: data collected April 2024 – February 2026, n=13,277
- CO & Fire Safety series: data collected August 2023 – May 2025, n=24,164

Differences between population segments are noted where statistically significant at the 95% confidence level. Sampling error is larger for subgroups of the data. As with any survey, sampling error is only one source of possible error. While non-sampling error cannot be accurately calculated, precautionary steps were taken in all phases of the survey design, collection, and processing of the data to minimize its influence.

Qualitative Methodology

Qualitative insights presented throughout this report draw on multiple studies conducted by UL Standards & Engagement between 2024 and 2026. Qualitative methods included in-depth interviews, focus groups, and ethnographic research with consumers (n=61), airline passengers (n=96), and industry stakeholders (n=36). Qualitative data were transcribed, uploaded into the MAXQDA software platform, and analyzed with a hybrid coding frame.

Economic Methodology

The economic modelling and results presented within this report are based on information provided by third parties, upon which Oxford Economics has produced estimates in good faith alongside ULSE. To derive ranges for estimates of fire incidents and associated costs, Oxford Economics considered several indicators collected by FDNY, CPSC, NII Clearinghouse, and the UL Solutions Li-Ion Battery Fire Incident Database, including: number of e-mobility-related lithium-ion battery fire incidents; number of fatalities associated with such incidents; number and severity of injuries associated with such incidents; and number of such incidents that involve structural property damage, including NYCHA properties. Note that Oxford Economics did not account for the cost of damage associated with non-structural fires due to a lack of data.


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