

E-Bikes and the Gig Economy in NYC

Have you ever seen or ridden an electric bike? Have you ever ordered food from an app or had something delivered by someone riding an e-bike? Electric bikes help some New York City residents get to work, do their job, and get around, but these bikes can also be dangerous if you are not careful while riding them, charging them, or storing them.

As you read, pay attention to different points of view about the safety of e-bikes. Gather information to help you make sense of this technology and its impacts on people, places, and culture.



What is an e-bike?

The earliest patent for an electric bicycle or e-bike was obtained by Ogden Bolton Jr. in 1895. Early e-bike designs were limited by the battery's size, weight, and limited energy storage. In the 1990s, ■ **lithium-ion batteries** (LiBs) provided a dense, compact, efficient source of energy, and the e-bike of today was born. E-bikes today have powerful electric motors and lightweight lithium-ion batteries to climb bigger hills, travel further on a single charge, and go faster.

Lithium-ion cells make up the batteries in e-bikes and many other devices you may use like headphones, watches, and power tools. During regular use, the lithium ions move from the negative to positive within the cell. During charging, the ions move the other direction. But the cell materials, especially the separator, are sensitive to damage.

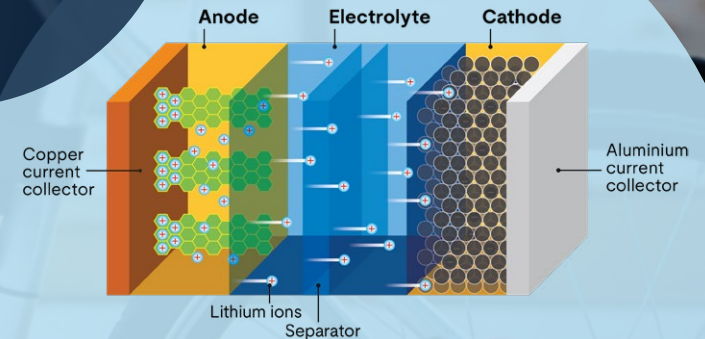
Damage to the separator may lead to an unstoppable release of thermal energy. This uncontrolled chain reaction is called ■ **thermal runaway**. Heat that spreads from one cell, and can damage another resulting in a growing danger. Separator failure can come from exposure to extreme temperatures or water, physical damage, improper charging, and unsafe or uncertified parts. Damage also comes from using incorrect chargers or batteries that are not meant for the device. Turns out, using a cheap charger might actually cost e-bike users a lot of money it leads to thermal runaway! Thermal runaway is also very dangerous and can lead to serious harm.



■ **Lithium-ion battery:** A type of rechargeable battery that is powered by the movement of lithium ions.

■ **Thermal runaway:** Uncontrolled, self-heating of lithium-ion batteries. Can result in battery swelling, venting, smoke, fire, and even explosion.

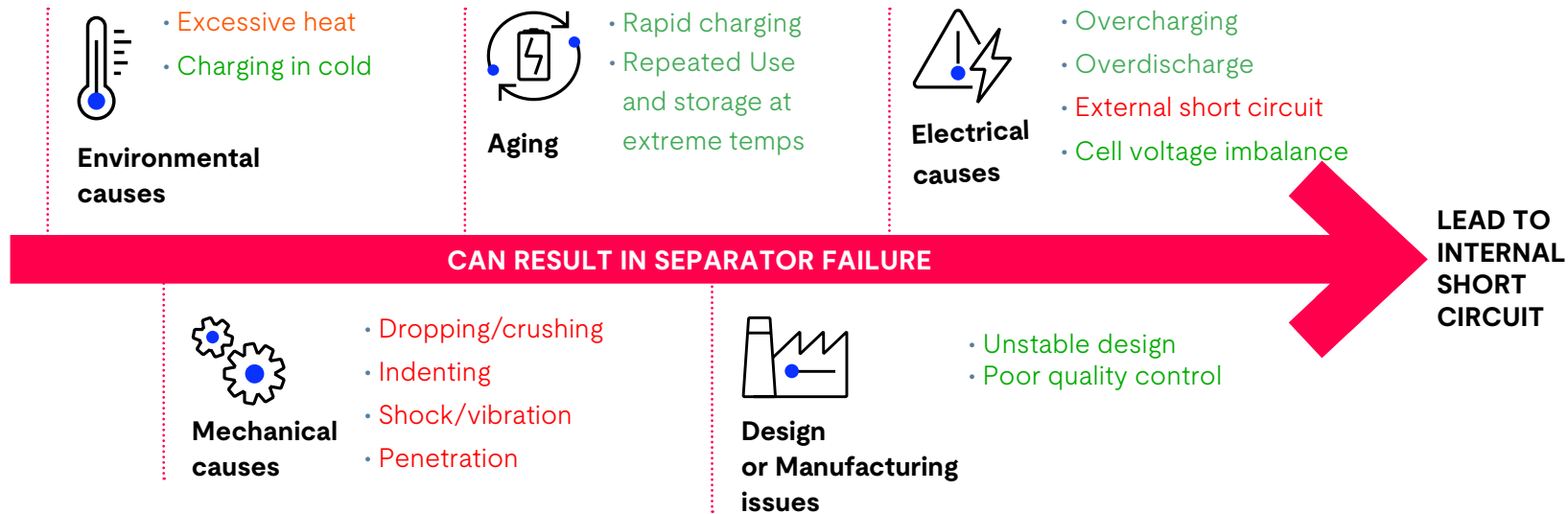
A lithium-ion battery contains many cells. Each cell is made up of a positively charged cathode, a negatively charged anode, an electrolyte, and a porous separator that allows for controlled movement of the lithium ions.



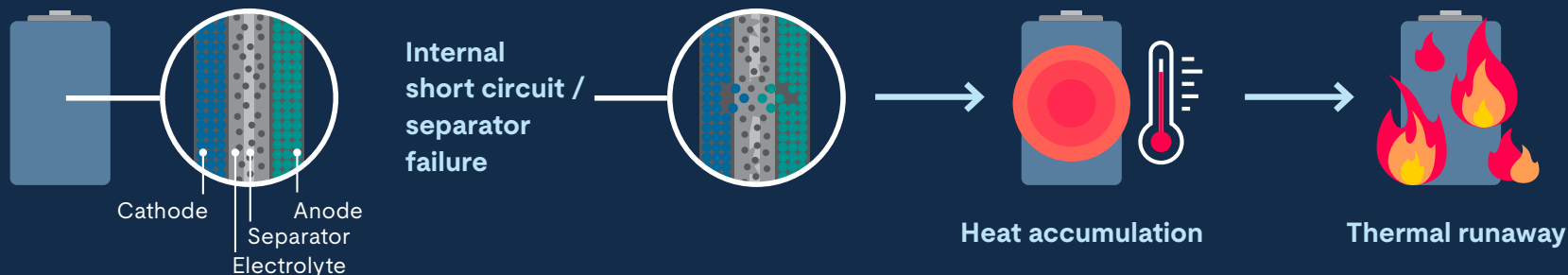
Learn more about how a lithium-ion battery works?

Common causes of thermal runaway in lithium-ion batteries

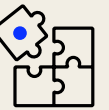
This image is based on research from UL Fire Safety Research Institute. Look closely at some types of abuse that can cause a separator to fail. Some of these causes **lead to immediate effects**, and others can **lead to failure over time**.



Stages of thermal runaway in lithium-ion batteries



1 SENSEMAKING



[A survey from UL Standards & Engagement](#) found that 53% of e-bike owners admit to not knowing their e-bike was powered by a lithium-ion battery. This means those owners also do not know the risks of lithium-ion batteries or how to safely use them.

1. Consider your own lithium-ion battery-powered devices. Are you using your devices safely?

2. Think about large cities, like New York City. What could be the dangers of having too many e-bikes in one place?

3. Who benefits the most from e-bikes? Who might be at a disadvantage because of this technology?



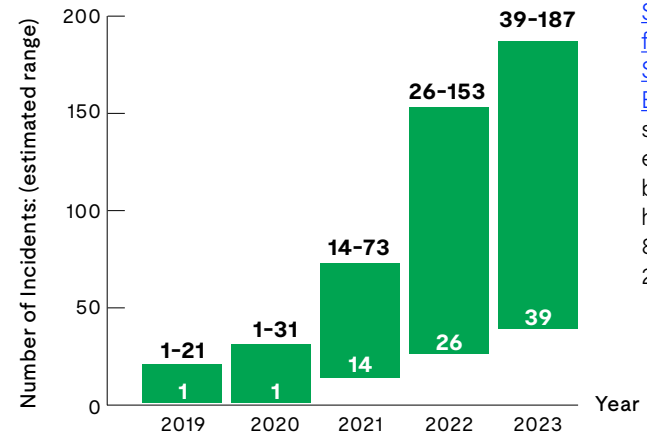
FDNY firefighters perform a rope rescue after a fire involving lithium-ion batteries injured almost 40 people and blocked emergency exits.
 New York, NY, Nov. 2022.

Are e-bikes safe in apartments?

In 2023, there were over 65,000 e-bikes being used in NYC. As e-bike riders increase, there has also been an increase in battery fires. In fact, 53% of e-bike owners do not know that their device is powered by a lithium-ion battery. Many even admit to charging it in a location that blocks a primary exit. What could go wrong?

Lithium-ion battery fires are fast and fierce. They can spread quickly from apartment to apartment and even from building to building. In 2022, a fire in a 37-story apartment building was traced back to a faulty lithium-ion battery. The fire impacted many residents, blocked their escape paths, and resulted in a dangerous rope rescue by FDNY firefighters. The number of fires from e-bikes and other e-mobility devices are dramatically increasing. People are getting injured and even dying. Firefighters are urging users of lithium-ion batteries to follow the manufacturer's charging and storage instructions, use only certified cords and stop using a battery if it overheats.

E-mobility battery fire incidents in NYC



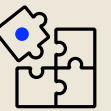
[Survey results from UL Standards & Engagement](#) show that e-mobility battery fires have increased 8 times since 2019

It is not only the fire department that is worried about these fires. Public housing officials like the New York City Housing Authority are trying to educate residents to prevent these fires too. In 2024, NYCHA adopted rules to try to reduce these fires.

1. You may only charge one e-bike, e-scooter, or its battery at a time.
2. Someone 18 years or older must be present and awake in the apartment the entire time the device or battery is charging.
3. The charger must be plugged directly into an electrical wall outlet (extension cords or power strips must not be used).
4. You cannot keep or charge a lithium-ion battery that has been assembled, **refurbished**, or reconditioned.
5. You cannot charge a lithium-ion battery within 5 feet of a radiator or any other direct heat source.
6. You cannot charge a lithium-ion battery next to an apartment entrance door or any other place that could prevent escape in the event of a fire.
7. You cannot charge an e-bike, e-scooter, or its battery in a common area unless that area is designated as a charging area by NYCHA.

■ **Refurbish:** Restoring and testing a used device so that it can be resold.

2 SENSEMAKING



49% of e-bike owners who charge their bikes indoors admit to charging it in a location that blocks a primary exit.

1. How would you feel if your neighbor's e-bike caused a fire that damaged your home or property?

2. How are the interventions described linked to what we know can cause thermal runaway in e-mobility devices?

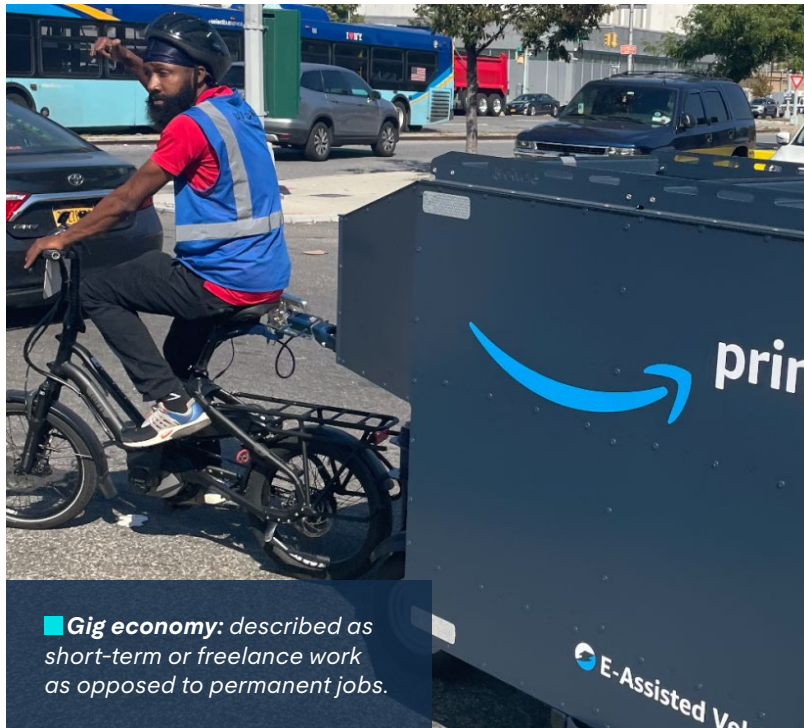
Do New Yorkers need e-bikes?

The COVID-19 pandemic increased U.S. e-bike demand, especially for people living in cities. E-bikes are an affordable, compact, convenient way to get around town. They can carry large, heavy loads and easily travel uphill due with the help of the powerful, lithium-ion battery.

Many e-bike owners use them for work and are part of the **gig economy**. Why are e-bikes so important to gig workers? Deliveries are faster on e-bikes, so more deliveries are being made. More deliveries means more money coming

in. However, this has led to gig riders pushing e-bikes to the limit and quickly aging the batteries. The batteries are then charged overnight to be ready for the next day.

Many riders will use more than one battery in a day, trading out a drained battery for one that is charged. New batteries and chargers are expensive, so some riders seek out lower cost alternatives. These alternatives can be “do it yourself” e-bike kits, low-quality brands, and uncertified products that can increase the risks of thermal runaway.

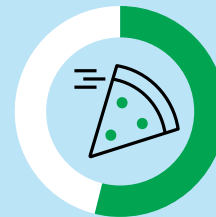


Gig economy: described as short-term or freelance work as opposed to permanent jobs.

[Survey results from UL Standards & Engagement](#) show who uses e-mobility devices.



45%
of riders are in urban areas

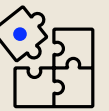


54%
of owners purchased e-bikes or e-scooters for work.



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

SENSEMAKING



“Gig economy” workers rely on e-bikes to make a living, and they may be forced to choose between safety and cost.

1. How can e-bike users balance safety and affordability?

2. Consider who is using e-mobility devices in NYC. Do you think access to safety is equitable?



Learn more at [BatteryFireSafety.org](https://www.batterysafety.org)

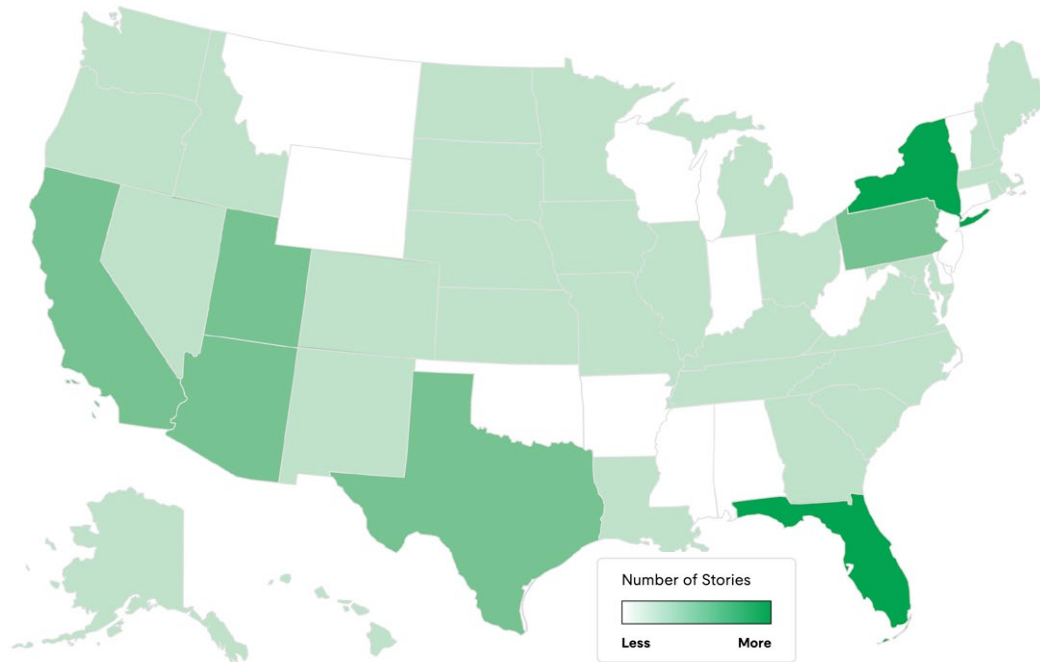
Further study

Research from UL Fire Safety Research Institute demonstrates that fires from LiB devices can reduce the amount of time someone has escape a fire. In 2023 FSRI launched the “Take C.H.A.R.G.E of Battery Safety” campaign to educate people about the safe use of lithium-ion battery powered devices. That same year, NYC passed a local law which says that any company looking to distribute e-bikes must be certified. The law also bans the sale of refurbished or used e-bike batteries. The city offers free education on safe e-bike charging. Since the law was passed, [e-bike fires in New York City have gone down](#). This is an example of how research, public awareness and education can make a big impact of safety. This is safety science.

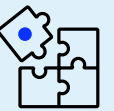
See where fires are occurring

New York City has had success managing these fires. But battery fires are not restricted to one city — they are occurring everywhere.

Explore the latest headlines involving e-bike, e-scooter, and hoverboard battery fires.



YOUR TURN!



1. Research fires in your community, city, or state. Have any of them been caused by lithium-ion batteries?

2. Select a fire that was caused by a lithium-ion battery. If you can't find one locally, pick one from the [E-Bike and E-Scooter Safety Action Center from ULSE](#). From the information provided, can you tell why the lithium-ion battery failed? Could it have been prevented?

3. Think about how you could educate e-bike users in your community about safely using lithium-ion battery-powered devices?