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## New York's E-Bikes Keep Catching Fire, and It's Getting Worse

Electric mobility devices are exploding at an increasing rate. But without a better understanding of the problem, it will be hard for the city to address it.



By [Aaron Gordon](#)

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...making on some repairs. The bike shop sells mostly regular bikes, but some e-bikes too from name brands like Specialized and Trek. I was chatting with the owner about e-bike fires, which have been making the local news recently. As we spoke, a young man walked in and asked the owner if they do e-bike battery repairs for a specific brand. The owner said they don't carry that brand so they can't do repairs, either. The man said, "OK, I guess I'll buy the battery I saw on Alibaba then," and walked out.



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"And that's how you get fires," the owner said.

The Fire Department of New York (FDNY) has been posting about e-bike fires for more than six months. On April 21, it posted yet another plea on Instagram. "In the last 24 hours, FDNY Fire Marshals have determined that there were 4 accidental electrical fires caused by lithium-ion batteries in electric scooters/E-bikes," the Instagram post read next to photos of burned out bikes and scooters.

In those four fires—three in Manhattan and one in Brooklyn—12 people were injured, according to the FDNY. As of that April day, the FDNY reported "more than 40 fires caused by lithium-ion batteries in electric scooters/E-bikes" with more than 20 injuries. A spokesperson for the FDNY told Motherboard that, as of July 7, the department has reached 104 lithium ion battery fires for the year so far tracked by the fire marshal, matching the number for all of 2021, although it's not clear if that number includes all lithium ion battery fires or just ones from e-bikes.

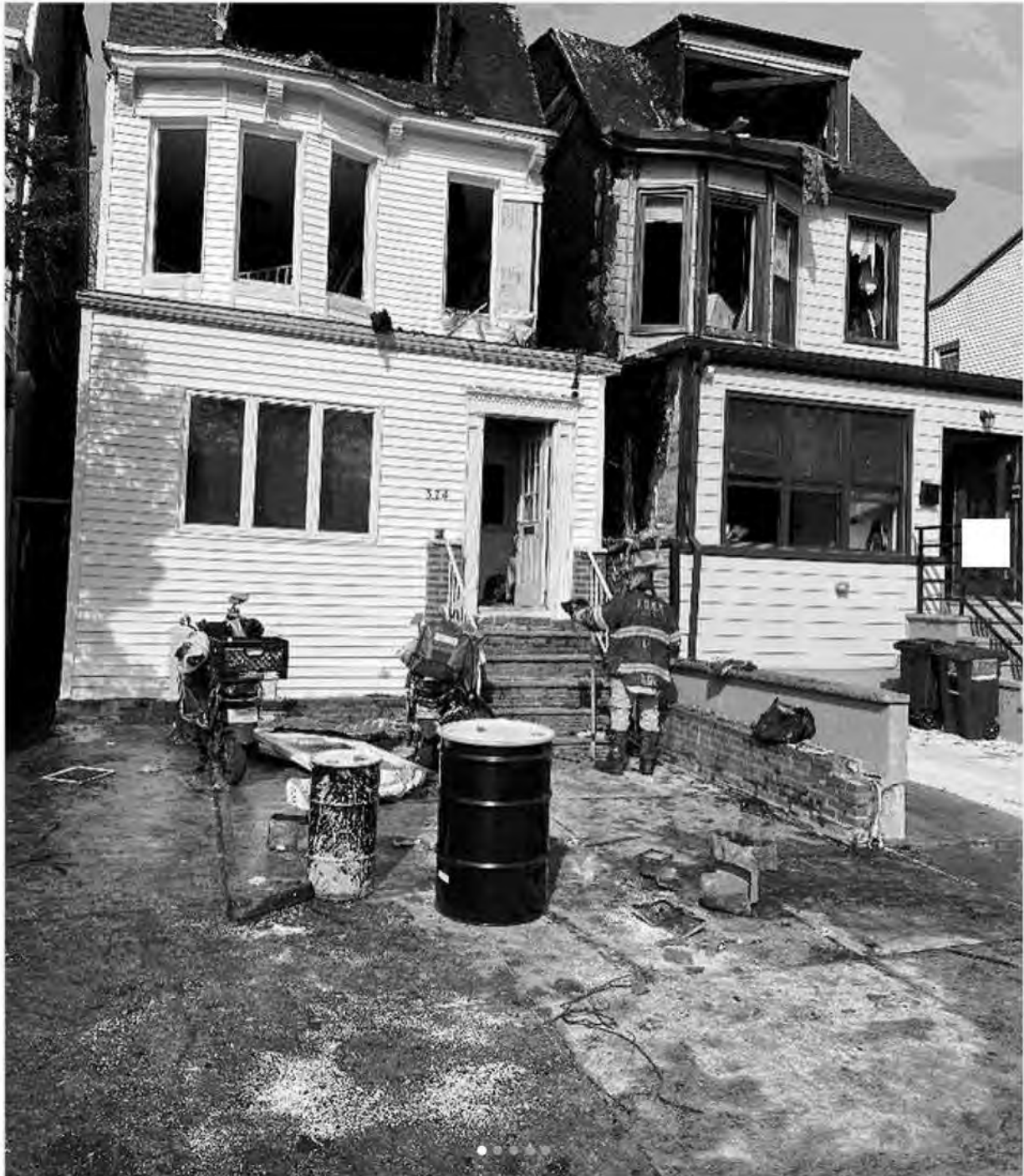


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In the last 24 hours, FDNY Fire Marshals have determined that there were 4 accidental electrical fires caused by lithium-ion batteries in electric scooters/E-Bikes. At these four fires, a total of 12 people were injured. To date this year, there have been more than 40 fires caused by lithium-ion batteries in

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374 East 9th Street in Brooklyn

286 Fort Washington Avenue in Manhattan

East 125th Street/Park Avenue in Manhattan

213 West 23rd Street in Manhattan

Be #FDNYSmart- If using a lithium battery, follow the manufacturer's instructions for charging and storage. Always use the manufacturer's cord and power adapter made specifically for the device. If a battery overheats, discontinue use immediately. Learn more at [fdnysmart.org](http://fdnysmart.org)

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Regardless, there's no debate that New York City has an e-bike fire problem that is getting worse. But that is about all we know. And in a well-intentioned push to curtail the fires but lacking critical details like which type of bikes catch fire and in what conditions, an industry-wide blame game has erupted, most especially towards low-income delivery workers who rely on e-bikes to make a living, with no clear path to actually solving the problem.

"It is a big bunch of problems," said Manny Ramirez, an experienced e-bike mechanic and a leader for the advocacy group Los Deliveristas Unidos. "But we are trying to fix it one by one, little by little."

E-bike fires, like all lithium-ion battery fires, are tricky for firefighters to deal with, because they are chemical reactions that, once underway, cannot be extinguished like traditional fires. Large batteries like the ones found in e-bikes can have up to 90 cells, and once a cell goes into "thermal runaway," the only thing to be done is try to prevent the bad cell from creating a chain reaction. And if lots of lithium-ion batteries are stored together in the same room, one exploding battery can cause the others to go into thermal runaway, too. Not only do lithium-ion batteries cause extremely hot



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can be just as dangerous as the heat.

While e-bike fires exist everywhere, no city in the U.S. or Canada is struggling with such a sharp increase in e-bike fires like New York. “There’s nothing specific about the water in NYC that means they have more battery fires,” Eric Frederickson, managing director of operations for Call2Recycle, a rechargeable battery collection program who works on lithium ion battery safety, told Motherboard. Instead, it’s a complex issue with both engineering and socioeconomic causes, rooted in the fact that New York has a massive supply of electric mobility devices and huge demand for cheap bikes and replacement parts.

Among the five electric mobility and battery safety experts Motherboard spoke to, there is broad agreement that cheap e-bikes and batteries from China—used by the city’s 65,000-plus delivery workforce who constitute the biggest group of e-bike users in the city—are more likely to explode than batteries certified to third-party standards made in Korea from name-brands like LG, Samsung, and Panasonic, which tend to be found in the upscale e-bikes used by wealthier people. But they also said even cheap batteries are not especially dangerous on their own. It is likely in conjunction with other risks, like DIY modifications, unsafe charging behavior, or damaged batteries, that cause explosions.

On this front, experts disagree on to what degree this problem can be solved by educating e-bike owners on proper charging procedures, safe bike storage, and battery management practices. Some argue that even the shoddiest-made batteries can hold up if properly handled. Others say a bad battery is a ticking time bomb no matter how it is plugged in and the key is to get them out of the market.

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...e-bike seller appears capable of filling. Efforts to subsidize the purchase of more expensive devices still leaves expensive repairs and poor charging practices unaddressed.

At the center of this controversy is the fact that we simply don't know what brands, models, or types of e-bikes and accompanying batteries are most fire prone, making any proposed fix based largely on anecdotal evidence and hunches rather than solid analysis.

Regardless, the experts Motherboard spoke to—who are also e-bike proponents—warn that if the problem is not dealt with, it could tarnish the reputation and hamper the growth of what is otherwise a revolutionary transportation device.

“You know, my biggest fear is that fires are going to turn our society off electric bicycles altogether,” said Mike Fritz, a consultant who has worked on e-bikes since the mid-1990s. “I mean, these are wonderful machines.”

## **What Is Actually Catching On Fire?**

E-bikes, e-scooters, and e-mopeds come in all kinds of different shapes, sizes, and prices. They range from lightweight devices meant to go just a few miles with a top speed of 12 mph to several hundred pound sit-down moped-like devices of dubious street legality that can travel several dozen miles on a single charge. Neither of these are technically e-bikes, often referred to as pedal-assist, which are legally defined as two-wheeled devices with a battery and motor supplementing a pedal system.



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...scooter, moped which look like bicycles but use a motor rather than pedal assist. It is common, if incorrect, to refer to all of the above devices as “e-bikes.” It is common to do this for the same reason I will in this article, because it is easier than saying “e-bike/e-scooter/e-moped” every time.

The problem this confusing naming convention creates is, when it comes time to differentiate between the devices for important purposes like determining which of them is catching on fire, many people don't take the time to specify even if they know the difference. For example, the FDNY regularly refers to all of the above as “e-bikes” or “e-bike/e-scooter,” lumping them all into one category. Photos posted by the department show various devices making it difficult to determine whether it was an e-bike, an e-scooter, an e-moped, or some hybrid that caught fire.



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This is important beyond the issue of not scaring people away from regular e-bikes. These devices have different batteries from different sources coming from different places. They are often made by different companies and sold by different retailers. And without knowing what, exactly, is catching fire, it is impossible to target the problem with any specificity.

## Certified or Not?

Without that information, experts are left to do a lot of guessing. And the first assumption is that bikes with certified batteries are less likely to catch fire. These are the bikes you will find in any traditional bike shop or from a major name-brand retailer.

But most e-bikes in New York do not have certified batteries. Instead, they're typically cheaper devices that are often bought through local shops ordered directly from pop-up factories in China or from sites like Alibaba. Ramirez said virtually all of the e-bikes delivery workers in the city use come from the same factory in China, which will put whatever branding on it the buyer wants as long as they purchase more than a thousand bikes.

Although one may assume the e-bikes delivery workers buy are cheaper, this isn't necessarily the case, reflecting a long line of literature that lower income urban and minority workers pay more for the same or inferior products. A new delivery-ready e-bike will cost about \$1,500 plus tax, Ramirez said, before adding on necessary upgrades like a rack and second battery, helmet, GPS, and better lights. All in, these e-bikes with accessories cost \$3,000, more than enough to walk into a local bike shop and buy a



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Competitive market entry level, name brand e-bikes.

But delivery workers can't simply buy a \$3,000 Trek for their shifts because those bikes are not designed for the work they do. Retail bikes are typically for commuting or weekend fun rides, often without swappable batteries, and have locked down architecture with bespoke parts that makes repairs difficult and expensive. And few local bike shops offer financing programs, a critical feature for delivery workers who don't have thousands of dollars in spare cash to buy a bike.

That being said, there is no question the batteries themselves cost less on the retail side. And that is a classic case of you get what you pay for, Fritz told Motherboard. He said a typical high-quality e-bike battery will cost between \$250 and \$270 to manufacture, and traditionally manufacturers roughly triple the price to translate it into a retail price to pay for all the other costs of building bikes and doing business. As a result, Fritz said battery packs are around \$900 of the price of the e-bike at the retail side, which makes the math on the \$1,500 bikes tough to pencil.

One of the biggest corners getting cut, Fritz suspects, is with the separators, a membrane that allows ions to pass from the anode to the cathode and vice versa during charge and discharge. If the manufacturing facility doesn't have "very strict controls" around the cleanliness of the production process, Fritz said, "a contaminant can land on that separator compromising its integrity over time. Eventually, that could result in a short circuit resulting in a thermal runaway resulting in a fire."

Another potential problem point is the battery management system, or BMS. It's a program run on a small chip in the battery that manages its load to prevent electricity being released too quickly, too slowly, or overcharging, all of which could result in a thermal runaway.

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These problems arise even when a bike is brand new and while there is disagreement on how much these differences really matter for battery safety, there seems to be unanimous agreement that what happens after the bike is sold is the real danger.

## Never Touch the Battery

Ramirez's wife, sister, and brother-in-law also work as e-bike mechanics. In the seven years they have been working on the bikes, he's never had any issues with the batteries. All the problems, Ramirez says, come from unscrupulous mechanics messing with the batteries or poor charging practices causing electrical fires that then spread to the batteries, fires that would get classified as battery fires by the fire department but have a different root cause.

The cheaper e-bike market has its own ecosystem of repair shops, DIY modifications, and hackers to make the bikes go faster, appear legal, or simply fix broken parts. A key problem, Ramirez and other experts say, is that when a battery gets damaged in a crash or starts losing charge, unscrupulous mechanics will offer to fix the batteries for a cut-rate price of about \$100, an attractive proposition to delivery workers making less than minimum wage versus buying a replacement battery for \$500 or more, especially since workers pay for all their repairs and equipment.

But "riders really shouldn't try to modify their e-bikes and scooters," Frederickson said, even for e-bikes from reputable brands with safety certifications. "These are complex systems with a battery operating in conjunction with a motor and a charger, certifications are with the entire system, and if you modify the motor drive, it can have cascading effects and safety implications down the road." Most dangerously, modifications can



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Li-ion batteries are also more prone to thermal runaway if they're damaged. Likewise, Ramirez never recommends anyone repairs an e-bike battery or pays anyone to do it for them.

## Safe Charging Practices vs. Reality

Most delivery workers in the city run 10 to 15 hour shifts with no protections for bathroom breaks, meal breaks, or minimum wages. Even if they are aware of industry best practices to always charge the battery from the charger provided at purchase, they don't have time to follow it.

“Most of the workers live in Queens, Bronx, Manhattan and work in the middle of Manhattan, downtown, Borough Hall,” Ramirez said. “It's very hard for them going back to get another battery and go back to work. And the stores know that. So they start charging for charging batteries.”

All over Manhattan and downtown Brooklyn, small restaurants and parking garages provide charging services for delivery workers. For a fee of around \$50 a month, delivery workers can charge their e-bike batteries there where it is more convenient. Many such locations have spaces for 50 batteries or more, meaning a cool \$2,500 a month in mostly profit.

The catch is these facilities rarely practice safe charging methods. These areas are typically an empty room with racks and racks of chargers, extension cords and power strips stretching across the wall, just about the most dangerous arrangement to overload the power strips or extension cords and spark a fire which then spreads the batteries. Many of these rooms are also back rooms or basements without ventilation, making any potential fire even more dangerous. In June, fire marshals found more than 100 batteries in a fire on 51st St and 11th Avenue.

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A TYPICAL CHARGING HUB FOR DELIVERY WORKERS. THE RACKS ARE LINED WITH CHARGERS HOOKED UP VIA EXTENSION CORDS AND POWER STRIPS. PHOTO: MANNY RAMIREZ

Ramirez said Los Deliveristas Unidos are working on converting some space into a safe charging location, which requires working with a licensed electrician and Con Edison. Few restaurants and parking garages that provide these spaces are willing to go through that hassle and expense.

## Short Term, Long Term

So far, the official reaction to the fires has mostly been to emphasize education. But, more recently, officials have pursued the idea of banning e-bikes from certain locations. For example, the New York City Housing Authority has proposed banning e-bikes from its buildings, a proposition that could have catastrophic consequences for residents who need the bikes to make a living.

Some experts are putting a lot of stock in education in the belief that even shoddy batteries can be more safely managed. “This is a preventable issue,” Fredrickson said, “And it’s going to be preventable through education. It has primarily to do with how batteries are used and misused.” But, he added that



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products on the market.

But regulation can often have unintended consequences when there's clear demand for a product. And there is no denying that these e-bikes are filling a need in New York, whether it's to allow delivery workers to fill increasingly extreme quotas to hit a livable wage shuttling food around for billion-dollar apps or providing an affordable means of transportation for low-income New Yorkers living in transit deserts.

One proposal is for the city to enforce building codes that ban the storage or sale of lithium-ion batteries without safety certifications, ensuring they come from reputable manufacturers. This may address the quality problem, or it may simply push these facilities figuratively or literally underground, making the problem both more difficult to study and more dangerous when fires do happen.

Still, there are some solutions on the horizon. The Equitable Commute Project is hoping to bridge this gap by making 5,000 higher quality bikes available to low-income New Yorkers through grants and no-credit financing agreements. Longer term, the underground economy of charging stations and rest areas that *deliveristas* have had to cobble together on their own could be replaced with companies like Zoomo that rent certified e-bikes with swappable batteries and repairs built into the cost. Such businesses exist in Asian countries where the e-bike market is more mature. And Fritz is hopeful that solid state batteries, which do not have the flammable electrolyte that lithium ion batteries do, will one day become the dominant technology.

For his part, Ramirez is hopeful a series of laws recently passed to curtail the abuses of delivery workers will help. With a guaranteed minimum hourly wage, workers may not need to work such long shifts and charge at home

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new battery if the old one gets damaged rather than trying to have it repaired.

Until then, Ramirez has no doubts about e-bike batteries. He is willing to bet his family's life on it. He keeps the batteries for his e-bike in his apartment, near where his family sleeps.

"If I'm thinking or feeling the battery is really the trouble," he told Motherboard, "I never have it close to the room of my child."

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