Peggy Shepard

As a purchasing agent years ago at Master Specialties, Costa Mesa, CA - sole source for nuclear power plant switches, we had a disqualified vendor list. I purchased metals, metal plating, rfi screens, screw machine parts etc. per DOD regulations. A tiny contact was purchased using a large blue print detailing the Mil-spec requirements and list of engineering orders detailing complete traceability from the original design through each corrective action made to the design of its current state. Vendors provided certification of the mountain where metal was mined from. We had receiving inspection with an engineer receiving parts, a radio active isotope was used to measure the thickness of precious metal plating. I disqualified one plater after touring the facility and seeing the office where they claimed to operate their QA process which only had an empty desk and no documents.

Tesla, a major manufacturer of BESS batteries is listed as a potential vendor for the proposed BESS facility in Snoqualmie, Tesla should be disqualified to be a vendor for anything:

https://sfdistrictattorney.org/tesla-inc-settles-environmental-enforcement-action-brought-by-california
TESLA, INC. SETTLES ENVIRONMENTAL ENFORCEMENT ACTION BROUGHT BY CALIFORNIA DISTRICT ATTORNEYS

• February 1, 2024

Electric car company illegally disposed of hazardous waste at its service centers, energy centers, and its Fremont factory.

San Francisco, CA – San Francisco District Attorney Brooke Jenkins, along with 24 other District Attorneys throughout California, announced today that a judge in San Joaquin County has ordered Tesla, Inc. to pay $1.5 million as part of a settlement of a civil environmental prosecution alleging the electric car company illegally disposed of hazardous waste at its car service centers, energy centers, and its factory in Fremont.

"While electric vehicles may benefit the environment, the manufacturing and servicing of these vehicles still generates many harmful waste streams," said District Attorney Brooke Jenkins. "Today's settlement against Tesla, Inc. serves to provide a cleaner environment for citizens throughout the state by preventing the contamination of our precious natural resources when hazardous waste is mismanaged and unlawfully disposed. We are proud to work with our district attorney partners to enforce California's environmental laws to ensure these hazardous wastes are handled properly."

In the complaint filed in San Joaquin County, prosecutors alleged Tesla, Inc. illegally disposed of hazardous waste generated during its servicing and manufacturing of its electric vehicles in violation of California law establishing the proper control, storage, management, and disposal of hazardous waste. Tesla, Inc., a Delaware Corporation, currently owns and operates approximately 57 car service centers and 18 solar energy facilities throughout California. It also manufactures electric vehicles at its Fremont Factory in Alameda County. The case is brought by the San Francisco District Attorney's Office and 24 other California District Attorneys' Offices where Tesla, Inc.'s factory, car service centers, and energy locations are located.

The investigation, initiated by the San Francisco District Attorney's Office Environmental Division, began in 2018 when San Francisco District Attorney investigators conducted undercover inspections of Tesla, Inc.'s trash containers at its car service centers, which revealed the illegal disposal of numerous used hazardous automotive components (i.e., lubricating oils, brake cleaners, lead acid and other batteries, aerosols, antifreeze, waste solvents and other cleaners, electronic

waste, waste paint, and debris contaminated with the above).
Following this discovery, District Attorney investigators from Alameda, Monterey, Orange, Placer, Riverside, San Diego, and San Joaquin counties conducted additional inspections at Tesla, Inc.'s car service centers throughout California and found similar unlawful disposals. Alameda County District Attorney investigators also conducted waste inspections of trash containers at the Fremont Factory and found Tesla's unlawful disposal of additional hazardous wastes, including metal car panel welding spatter waste (which can contain copper), waste paint mix cups produced during paint repair and wipes/debris contaminated with primer.
Tesla, Inc. cooperated with the District Attorneys' investigation and took steps to improve its compliance with the environmental protection laws brought to its attention by the prosecutors. After Tesla was notified of the issues, they began quarantining and screening trash containers for hazardous waste at all of its service centers before trash was brought to the landfill.
As part of the settlement, Tesla, Inc. is ordered to pay $1.3 million in civil penalties and $200,000 to reimburse the costs of the investigation. Tesla, Inc. is also ordered to comply with a detailed injunction for five years. Injunctive compliance measures include proper training of employees and the hiring of a third party to conduct annual waste audits of its trash containers at ten percent of its facilities. These audits will occur each year for five years and auditors will examine trash containers for hazardous waste.

Tesla Powerwalls Remotely Disabled — Thousands Left With Dead Batteries
https://youtu.be/b5cSicjTODQ?si=XSTdnM30uiCvZjP1

Musk ordered shutdown of Starlink satellite service as Ukraine retook territory from Russia
https://www.reuters.com/investigations/musk-ordered-shutdown-starlink-satellite-service-ukraine-reto

Musk acknowledges he turned off Starlink internet access last year during Ukraine attack on Russia military
https://thehill.com/policy/defense/4193788-musk-acknowledges-he-turned-off-starlink-internet-access

Legal affairs of Elon Musk - Wikipedia
https://en.wikipedia.org/wiki/Legal_affairs_of_Elon_Musk

Retired EV Batteries Get Second Life on the Grid

https://sfdistrictattorney.org/tesla-inc-settles-environmental-enforcement-action-brought-by-california-district-attorneys/

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The NEVADA INDEPENDENT

EXCLUSIVE

Tesla pays Nevada $200K in fines for operating battery recycling equipment without permit

> The settlement is the latest in a string of environmental fines and settlements involving Elon Musk-owned companies in Nevada.

Amy Alonzo February 12th, 2026 at 11:30 AM Environment



Machinery at the Nevada Tesla Gigafactory on Feb. 26, 2019. (David Calvert/The Nevada Independent)

Tesla will pay Nevada $200,000 for operating battery recycling equipment at its Northern Nevada Tesla Gigafactory without a permit, according to a settlement signed by the company and the Nevada Division of Environmental Protection (NDEP) and obtained by *The Nevada Independent* through a public records request.

Tesla produces electric vehicle motors and battery packs at its facility in the Tahoe-Reno Industrial Center — a hub of data centers, warehouses and battery producing and recycling facilities. Tesla's facility also includes battery cell recycling.

In February 2023, NDEP compliance staff visited the Tesla Gigafactory and discovered a "cell recycling" line, including a shredding unit and a module dissection unit — equipment used to recover valuable materials such as lithium and copper from end-of-life products such as batteries or solar panels — operating without a permit.

Records later provided to division inspectors indicated the equipment had been built in late 2020 and operating since at least May 2021.

The equipment was the subject of a draft permit being reviewed by the Environmental Protection Agency because it emits pollutants, according to a report filed by NDEP.

More than a year after the violation, NDEP held an enforcement conference with Tesla. Tesla did not deny the violation.

The settlement was signed Jan. 30, just days before state lawmakers grilled officials about the state's potential oversight of environmental violations, including water contamination, at Southern Nevada tunnelling sites being developed by The Boring Co., another company run by Elon Musk, the world's richest person. The Boring Co. is an expanding underground transportation tunnel network that has been accused of nearly 800 environmental regulation violations, as first reported by *ProPublica*.

Tesla must pay the $200,000 within 60 days. The company didn't immediately return a request for comment on Thursday.

The money will be deposited into NDEP's air quality management account and may be used at NDEP's discretion to support the division's Clean Trucks and Buses Incentive Program or other programs geared toward air quality improvement.

The money is not to be used for any grant or incentive that Tesla could receive.

Despite the violation, NDEP in October granted the Gigafactory a Class I Air Quality Operating Permit, reserved for facilities with the highest emissions. The permit allows the Gigafactory to emit more than 100 tons of a regulated pollutant and more than 25 tons of hazardous air pollutants per year. The updated permit was issued because of the company's growth and potential to emit more pollutants.

The facility previously operated under a Class II Air Quality Operating Permit, issued in 2019. That permit allowed the facility to emit less than 100 tons of any one regulated pollutant annually and less than 25 tons of hazardous air pollutants.

History of violations

In 2022, Tesla reached a $275,000 settlement with the Environmental Protection Agency (EPA) for violating the federal Clean Air Act at its car manufacturing facility in Fremont, California.

In 2019, the EPA fined the company $31,000 for hazardous waste violations at its Fremont plant, according to *Lookout Santa Cruz*. The company was also ordered to pay $55,000 to the Fremont Fire Department. In 2021, Tesla was fined $1 million by the Bay Area Air Quality Management District after 33 violation notices, including emissions that exceeded permitted thresholds.

Last year, Tesla successfully fended off proposed environmental regulations in Nevada that would have applied more stringent rules on its battery production operations by petitioning NDEP and Republican Gov. Joe Lombardo. The proposals would have required companies such as Tesla to obtain more onerous permits for certain operations while also requiring them to continue following more stringent federal waste regulations.

Also last year, Musk's Boring Co. was accused of releasing untreated water onto city streets and spilling muck from its trucks, according to *ProPublica*.

Some of those violations went against a settlement agreement the company had entered into after being fined previously for discharging groundwater into storm drains without a permit, violating state water pollution laws.

State officials issued $400,000 in fines, then withdrew them after finding the citations "legally insufficient."

The Boring Co. also faced a $500,000 illegal dumping fine from the Clark County Water Reclamation District.

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Amy Alonzo

Amy Alonzo is the energy and environment reporter for The Nevada Independent.

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ENVIRONMENT

Testing finds toxic metals where Tesla lithium refinery discharges wastewater in South Texas

The drainage district that commissioned the testing has sent a cease-and-desist letter to the company, which says it is in compliance with all requirements for its state wastewater discharge permit.

BY ARCELIA MARTIN, INSIDE CLIMATE NEWS

REPUBLISH

APRIL 21, 2026, 3:15 P.M. CENTRAL



A Texas Commission on Environmental Quality investigator tested wastewater from Tesla's Robstown lithium refinery on Feb. 12. Travis Prater/Texas Commission on Environmental Quality

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Testing finds toxic metals where Tesla lithium refinery discharges wastewater in South Texas
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*This story is published in partnership with **Inside Climate News**, a nonprofit, independent news organization that covers climate, energy and the environment. Sign up for the ICN newsletter **here.***

After Texas regulators said Tesla's lithium refinery near Corpus Christi wasn't violating its permits by discharging what local officials reported as black wastewater into a drainage ditch, independent water testing there this month found two toxic metals and other contaminants.

Eurofins Environment Testing, an accredited lab with locations across the globe, **reported** traces of hexavalent chromium, a well-known carcinogen, and arsenic, an environmental poison. Nueces County Drainage District No. 2, which **manages the ditch**, commissioned the test.

Neither hexavalent chromium nor arsenic is included as an allowable discharge pollutant in Tesla's wastewater permit.

"The results are quite disturbing," wrote Frank Lazarte, an attorney representing Nueces County Drainage District No. 2, in a **cease and desist letter** to Tesla's associate general counsel last week. The district is asking Tesla to stop discharging wastewater into the ditch until they can discuss the lab results.

Jason Bevan, senior manager of site operations for Tesla's plant, in the small municipality of Robstown, said the company remains in complete compliance with all requirements of its state-issued wastewater discharge permit, including applicable water quality standards.

"Tesla routinely monitors and tests its permitted wastewater discharge," Bevan said in an emailed statement to Inside Climate News. "Tesla is currently reviewing the letter from Nueces County Drainage District #2 and looks forward to working cooperatively with the district to address their concerns."

The Texas Commission on Environmental Quality sampled and tested Tesla's wastewater discharge in February and confirmed that the company is in compliance with its permit, Bevan said.

But the state environmental regulator, known as TCEQ, didn't look for heavy metals in February. Its water sample tested for dissolved solids, oil and grease, chlorides, sulfates, temperature and oxygen—all of which were within the bounds of Tesla's permit.

Victoria Cann, a spokesperson for TCEQ, said Tesla's facility was required to conduct initial sampling of the wastewater discharged from its outfall pipe for conventional and non-conventional pollutants, including metals used at the facility and toxic pollutants believed to be present in discharge.

The TCEQ industrial permits team reviewed those initial submitted results and had no concerns, Cann stated. Therefore it didn't require an amendment to the permit to include additional wastewater limitations or monitoring requirements.

TCEQ initiated its February investigation after workers for the drainage district found an unfamiliar pipe stretched across its easement. The workers reported black liquid expelling into the ditch. The drainage district, which manages the ditch area, was unaware that the state gave Tesla permission to use it.

District officials were confused how the state could allow Tesla to discharge an average of 231,000 gallons of lithium refinery wastewater each day into the district's ditch without notification. TCEQ said it doesn't communicate directly with local drainage districts as part of the permitting process.

Volunteer drainage district engineer Aref Mazloum said TCEQ didn't test for heavy metals in its compliance investigation because that hadn't been part of the district's complaint filed earlier this year. When the investigation concluded, he said he requested the results and commissioned the third-party wastewater testing to see what else might be in the water.

Eurofin conducted its testing earlier this month, according to its report. It placed a sampling machine in the wastewater for 24 hours to monitor and collect the discharge, then sent the results to its San Antonio lab on April 7.

As soon as district staff saw the lab results, they notified a raft of local elected officials, said Mazloum, who also recently started working as an engineer in the water supply division at TCEQ and is a mechanical engineering assistant professor at Texas A&M University-Corpus Christi.

Mazloum doesn't want to be known as the guy who gave Tesla such a hard time he drove them out of Robstown, but he said the heavy metals must be remediated from the county's wastewater. He said he wouldn't be able to sleep if he were to keep quiet about this information.

"Public safety is my highest priority," Mazloum said. "Secondly would come the economy."

To safely manage its hyper-saline and toxic discharges, the electric vehicle company should design and fund an on-site multi-stage wastewater treatment plant, Mazloum said. The process Mazloum recommended Tesla take on would remove heavy metals and use industrial reverse osmosis technology. Then, Mazloum said, Tesla could use district infrastructure to dispel wastewater again.

"The resulting clean water will then be discharged and nothing will happen to the infrastructure, the ditches, the plants, the fish, the frogs, the animals, the people, from that water," Mazloum said.



The unnamed ditch less than a mile upstream of Tesla's discharge pipe. 📷 Travis Prater/Texas Commission on Environmental Quality

Mazloum added that the concentrated brine solution created by that on-site treatment would need to be hauled to a hazardous waste facility or processed through a zero-liquid discharge system.

While water in the ditch does not reach the drinking supply, people can be affected in other ways, such as by eating fish caught nearby or by facing increased flood risk if the ditch infrastructure erodes, Mazloum said. The wastewater pooling in the drainage ditch flows to Petronila Creek and ultimately to Baffin Bay, a longtime fishing spot suffering from decades of deteriorating ecosystem health.

Nueces County groundwater is known to contain some arsenic, said Chris Cuellar, a retired chemical plant worker who spent 10 years managing wastewater operations at one of the region's largest industrial facilities. Eurofins tested the wastewater from the ditch, rather than from Tesla's outfall pipe, so it's possible there was residual arsenic from a nearby pond overflow that leached into the ditch, for example, rather than coming from the industrial process itself, Cuellar said.

The metallic particles of arsenic in the sample measured 0.0025 milligrams per liter, a fraction of the federal limit for drinking water, 0.01 milligrams per liter.

The Eurofins sample is good to have, Cuellar added, but offers a one-time baseline of that day. "It's not what it always is or what it has been," he said.

In the wastewater sample Eurofins tested, the concentrations of lithium, strontium and vanadium were abnormally high compared to levels in rainwater or groundwater, according to Lazarte, the attorney. "The three metals/chemicals act like a chemical signature pointing back to the battery processing facility," he wrote.

Lithium is the active material inside rechargeable batteries. Tesla is seeking to increase the domestic supply of battery-grade lithium hydroxide at its nearly $1 billion lithium refinery plant in Robstown. It processes spodumene, an often yellowish mineral and a commercially important source of lithium.

A **report** written by Mazloum that's been distributed to legislators and will soon be discussed with Robstown residents calls the traces of lithium a "fingerprint at a crime scene."

The electric vehicle company's wastewater permit does not monitor for lithium and wasn't tested for in the TCEQ's February investigation. In the first 60 days of the facility's operation, Tesla had to test for a variety of metal and chemical pollutants not listed in its permit. Lithium was not among them.

When the permit was being considered and public comments expressed concern about how the facility would affect the environment, Kelly Keel, TCEQ's executive director, said the wastewater wasn't expected to contain any residual lithium, chemical runoff or other harmful pollutants.

No surface water intake for domestic drinking water supplies is located within five miles downstream of the wastewater discharge point, and so there would be no impact on water wells or drinking water, Keel said at the time.

Before the permit was issued, TCEQ determined that Tesla's wastewater discharge plan would meet state requirements and protect the environment, water quality and human health.

Mazloum's report noted that Eurofins detected 1.17 milligrams of strontium per liter of water in the sample and said long-term exposure could affect bone density and kidney function in humans and wildlife.

His report also flagged heightened levels of several chemicals consistent with industrial discharge, including manganese, iron, phosphorus, calcium, magnesium and potassium. Manganese, a battery process tracer, can have neurological effects at chronic doses, the report stated. Too much iron can stain the ditch's infrastructure and too much phosphorus can cause algae blooms that starve waterways of oxygen.

The risk of algal growth is amplified by ammonia, which the lab results found in the form of nitrogen at 1.68 milligrams per liter of water. "At this level," Mazloum's report said, it is "directly toxic to fish and aquatic invertebrates. Imagine a slow-acting suffocant for anything that lives in the water."

The high sodium concentrate, combined with elevated calcium, magnesium and potassium, creates a near-brackish water condition that's 10 to 20 times saltier than normal surface water, according to Mazloum's report.

"This directly threatens the drainage ditch's ability to protect the neighborhoods," Lazarte wrote. "Plants hate salt the same way you'd hate drinking ocean water when you're thirsty."

As salt draws out the moisture of plant roots, it kills the grass and ground cover lining the walls of the ditch. Then the bare soil washes away in rain, Mazloum said, and as the drainage ditch walls collapse, the channel loses the capacity to carry stormwater away from homes and raises the risk of floods during heavy rains.

When a state investigator went to test the wastewater in February, it appeared clear as it flowed downstream, according to state records. Along the banks and in the ditch, there was a heavy growth of algae and vegetation.

News of the contaminants Eurofin found in the wastewater sample comes as South Texas faces a serious water crisis. Corpus Christi is in the midst of developing **groundwater projects** to try to stave off imminent deletion of its dwindling reservoirs, and it expects to enact **emergency water-use restrictions** in September if weather patterns don't change.

Robstown is 16 miles west of Corpus Christi. The Tesla situation is the first time the drainage district has had to deal with discharge water quality, said Steve Ray, a consultant for the district. The drainage district typically focuses on maintaining the integrity of its ditches and flood preparedness, he said.

"We want to make sure that this is environmentally safe for our citizens and for our employees who have to work in those ditches," Ray said. "We also want to make sure it's environmentally safe and sound for the future—for our kids, our grandkids."

Mazloum recommended that Robstown residents stay away from the ditch. It's off U.S. 77 and County Road 28.

The content is also available in the following languages: 简体中文, 繁體中文

20 Aug 2025
Terry Collingsworth, IRAdvocates

Article

USA: Tesla sued over alleged forced labour and greenwashing in cobalt supply chain

Glencore, Tenke Fungurume Mining (TFM) (Joint venture between CMOC (80%) and Gecamines (20%)), Tesla, Zhejiang Huayou Cobalt Co. Ltd., Congo Dongfang International Mining (CDM), ...

Mining, Automobile & other motor vehicles

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“Human Rights Group Sues Tesla for Greenwashing and Consumer”, 20 August 2025

International Rights Advocates (IRAdvocates) filed a lawsuit

today against Tesla, Inc., accusing the company of deceiving consumers about the ethics and sustainability of its supply chain.

While Tesla promotes itself as an environmentally conscious and socially responsible leader in electric vehicles, the lawsuit alleges that the company relies on cobalt from suppliers deeply implicated in forced labor, corruption, and widespread environmental destruction in the Democratic Republic of Congo (DRC).

...According to the complaint, Tesla purchases cobalt from Glencore , one of the world’s most notorious mining companies. Glencore has faced criminal convictions in both the United States and Switzerland for bribery and money laundering. In the DRC, Glencore’s workers report exhausting shifts with little food or water and meager pay.

Local communities have suffered from poisoned air, water, and farmland. Security forces contracted by Glencore have been accused of shooting, torturing, and killing residents suspected — often wrongly — of artisanal mining.

Tesla also relies on Huayou Cobalt, a Chinese multinational whose subsidiary, Congo Dongfang International Mining SARL (CDM), operates artisanal mines and sources from large industrial projects such as Sicomines and Tenke Fungurume Mining (TFM). These mines are notorious for forced labor, physical abuse of workers, and violent evictions. In 2024, TFM displaced approximately 2,500 residents living near its operations after pollution from its facilities killed dozens. Despite this record, Huayou blends cobalt from these suppliers during refining, funneling it directly into Tesla’s supply chain.

...Yet the reality exposed in the lawsuit paints a starkly different picture: Tesla continues to profit from supply chains steeped in human suffering and ecological devastation.

The case, filed under the D.C. Consumer Protection Procedures Act (CPPA), argues that Tesla’s public claims amount to deceptive and unfair business practices. The Act allows consumers to hold companies accountable for misrepresentations and misleading conduct, particularly when those misrepresentations impact the choices of consumers in the District of Columbia.

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Retired EV Batteries Get Second Life on the Grid

Combining old packs creates megawatt-scale energy storage

https://spectrum.ieee.org/second-life-ev-batteries

Spent batteries from older electric vehicles are starting to pile up, but a handful of companies are repurposing them in a novel way: as energy storage for the grid.

These batteries are retired from EVs after their capacity falls to 70 to 80 percent; that's too low to satisfy drivers, but leaves enough juice for many stationary-storage applications. With some clever engineering, hundreds of retired battery packs can be assembled into megawatt-scale energy-storage systems.

June was a busy month for this nascent industry in the United States. On 4 June, Los Angeles–based B2U Storage Solutions announced it would repurpose used batteries from Waymo robotaxis for stationary grid storage. Two weeks later, Carson City, Nev.–based Redwood Materials unveiled a plan to combine about 100 used batteries from General Motors vehicles to provide 1.5 megawatts to one of the automaker's plants in Michigan. And a week after that, Vancouver-based Moment Energy completed construction of what it says is the world's largest EV battery-repurposing facility.

The efforts address two significant needs in the energy industry: Grid operators need somewhere to store valuable excess energy from renewables, and the auto industry needs somewhere for old EV batteries to land. Second-life battery companies could satisfy both needs, if they can get the engineering worked out.

Second-Life EV Batteries Back Up the Grid

The first mass-market all-electric vehicles arrived in the early 2010s, and those batteries are starting to retire in increasingly large numbers. In 2012, 130,000 EVs were sold globally, and that's since skyrocketed to more than 20 million in 2025.

Sending spent batteries to landfills wastes valuable materials and years of remaining electrochemical life. Recycling—recovering metals such as lithium, nickel, cobalt, and copper to manufacture new batteries—is one option, but researchers have long argued that many batteries could provide additional value in less demanding applications, like second-life stationary storage, before being dismantled.

Stationary-storage batteries cycle more predictably and can tolerate slower charging and discharging rates, and a lot less current runs through them. Second-life uses include commercial backup power, microgrids, EV charging infrastructure, and increasingly, grid-

scale energy storage, such as storing excess renewable energy for later use and reducing demand during expensive peak hours.

Over the last decade, the second-life EV-battery industry has been trying to move beyond small pilot projects and demonstrations into commercial deployment. But progress was slowed by a lack of retired batteries, labor-intensive testing and engineering, and uncertain economics that often made recycling or investing in new batteries more attractive.

In the last few years, diagnostic tools and testing procedures for evaluating battery health have improved, allowing companies to identify suitable batteries faster, more accurately, and at lower cost. On top of that, demand for grid-scale energy storage is soaring, driven mainly by the need to bank excess wind and solar power. This combination of forces has prompted companies to invest big in battery energy storage systems (BESS) from second-life EV batteries.

This confidence "was not there three or four years ago," says Simona Onori, a professor of energy science and engineering at Stanford University. Much of the confidence stems from field data showing that the remaining capacity of retired lithium-ion EV batteries is sufficient for other uses. "Batteries retired with 70 to 80 percent of their original capacity…can be excellent candidates for grid storage," she says.

That's true as long as the batteries show no signs of abnormal degradation, have low internal resistance (meaning the battery can still charge and discharge efficiently without generating excessive heat), and limited cell-to-cell variability (so that individual cells within the battery pack perform similarly rather than some degrading much faster than others).

How Is EV Battery Health Tested?

Turning a car battery into a grid asset is more complex than just giving it a stationary address. Different chemistries, architectures, and usage histories leave batteries in varying states of health. They have to be tested and analyzed to make sure they're fit for repurposing, then must be wired together so they can be managed as one system.

One of the first steps is determining a battery's remaining capacity. A battery's age "by itself is a weak signal," of its capacity, says Anurag Srivastava, a professor of electrical engineering at West Virginia University. "Two battery packs that are the same age can have very different states of health depending on their depth of discharge history, fast-charging frequency, and temperature exposure in their EV life," he says.

To evaluate the health of a battery, B2U follows UL 1974, the standard for safely repurposing EV batteries. It directs engineers to look at remaining capacity, internal resistance, consistency among cells, and signs of damage or abnormal degradation.

“We inspect the battery itself, making sure visually, structurally, and mechanically it has integrity,” says Freeman Hall, B2U’s president, who walked *IEEE Spectrum* through the company’s process. Company researchers then establish communication with the battery management system (BMS), an onboard computer that records operating data like voltage, temperature, charging history, and fault conditions.

The most surefire way to know a battery’s state of health is through direct capacity testing, which runs batteries through controlled charge-discharge cycles to see how much charge they can still hold. The problem with this method is that it’s slow; a full cycle can take hours, which gets unwieldy and expensive when dealing with thousands of batteries.



B2U CEO Freeman Hall [left] and technician Donte Terrell inspect battery cabinets at a facility in Lancaster, Calif.Awarded Goods

However, engineers can combine BMS data with rapid tests such as electrochemical impedance spectroscopy, which sends a small alternating electrical signal through a battery and measures how it responds. Advances in data analytics and machine learning let researchers build models that can estimate battery health faster and more consistently.

Batteries Combine for Grid-Scale Energy Storage

After testing and weeding out incoming batteries, the next step is to integrate them. A stationary storage system combines dozens or hundreds of battery packs that need to work together as one. That means grouping batteries with similar chemistries and performance characteristics, connecting them electrically, and integrating them with battery-management software, cooling systems, and other controls that monitor their operation.

B2U uses a matrix architecture, where batteries of the same chemistry are wired together in parallel strings inside shipping-container-size enclosures called cabinets. Each cabinet has voltage and temperature limits tailored to the chemistry of the batteries it contains. B2U sets the high-end voltage threshold below the optimal operating voltage level for safety. “The weaker batteries will hit their upper voltage limits earlier, and then they can disconnect and not inhibit the stronger batteries from reaching their higher voltage limit,” says Hall, adding that “there’s a lot of software required to do that well.”

Once the system is brought online, a new challenge arises: every battery needs to be monitored continuously in real time for performance and safety. “We’re monitoring voltage and temperature not just at the pack level, but at the cell level,” Hall says. The matrix architecture makes it easy to disconnect a battery if there are any issues; with over 500 batteries in a system, one or a few coming offline doesn’t affect the performance of the site. “We make sure everything is healthy, then reconnect it the next time those batteries come through at the right voltage level,” Hall says.

At its facility in Lancaster, Calif., B2U receives retired EV battery packs, evaluates their condition, and reconfigures suitable batteries into containerized energy storage systems for deployment on regional power grids. The company’s operating projects in California and Texas use hundreds of second-life battery packs to provide grid-scale storage.

Will EV Batteries Get Repurposed or Recycled?

While the supply of second-life EV batteries is sure to grow in the coming years, so will the quality of the competition. The cost of new batteries is falling, and second-life systems will have to deliver enough savings to offset the expense of testing and integrating them. And some types of second-life batteries are more valuable if they’re recycled. Recent research by Onori and her colleagues suggests that iron-based lithium iron phosphate batteries are often better candidates for repurposing, while batteries containing larger amounts of nickel and cobalt may generate more value through recycling.

“I do expect a much larger wave of batteries to become available over the next several years as more EVs reach the end of their automotive life,” says Onori. “At that point, whether a battery is repurposed or recycled will come down to its condition and the economics.”

For now, second-life batteries are a small part of the storage market—Srivastava estimates they account for just 2 to 3 percent of deployed capacity. However, he believes they could "become 20 to 25 percent of deployed capacity in the next decade, if recycling stays expensive and diagnostics keep improving."