Testimony Before the U.S. House Committee on Energy and Commerce, Subcommittee on Environment

Written Statement of Testimony

Testimony of Dr. Jessica Dunn

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June 24, 2026

Chair Palmer, Ranking Member Tonko, and Members of the Subcommittee:

Thank you for the opportunity to appear before you today to discuss how we can increase safe domestic critical-mineral recovery.

My name is Dr. Jessica Dunn, and I am a scientist at the Union of Concerned Scientists. I use environmental engineering methods to assess the circularity potential of critical minerals in lithium-ion batteries, and research approaches to increase collection and mineral recovery.

My peer-reviewed research, along with the work of scientists at universities and national labs, has demonstrated that recycled minerals could meet a substantial portion of future critical mineral demand.[1,2] Estimates vary based on assumptions of battery sales, lifespan, collection, and recycling efficiency. But the research shows that approximately 25-50% of future lithium, and 40-50% cobalt, and nickel demand for electric vehicles can be met with recycled content in the United States by 2050.[3,4]

For that reason, I appreciate the committee's focus on this topic and agree that it is important to assess how policy can help us safely recover the maximum amount of minerals from waste and support our domestic economy. At the same time, it is important to ensure that our solutions for building domestic recycled supply chains uphold

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[1] Xu, C., Dai, Q., Gaines, L., Hu, M., Tukker, A., Steubing, B., 2020. Future material demand for automotive lithium-based batteries. Commun. Mater. 1, 99. https://doi.org/10.1038/s43246-020-00095-x

[2] Ziemann, S., Müller, D.B., Schebek, L., Weil, M., 2018. Modeling the potential impact of lithium recycling from EV batteries on lithium demand: A dynamic MFA approach. Resour. Conserv. Recycl. 133, 76–85. https://doi.org/10.1016/j.resconrec.2018.01.031

[3] Dunn, J., Anair, D., Reichmuth, D., Shen, K., 2024. Making the Most of Electric Vehicle Batteries: How recycling, innovation, and efficiency can support a sustainable transportation future. https://doi.org/10.47923/2024.15617

[4] Dunn, J., Kendall, A., Slattery, M., 2022. Electric vehicle lithium-ion battery recycled content standards for the US – targets, costs, and environmental impacts. Resour. Conserv. Recycl. 185, 106488. https://doi.org/10.1016/j.resconrec.2022.106488

foundational environmental laws necessary to protect people and the resources we rely on.

There are various approaches taken, both globally and at the state level, that can be incorporated into the proposed bills to promote responsible domestic recovery of critical minerals. Before I dive into those approaches, I would like to first talk about the harms of using deregulation as proposed in the BRACE Act and the language used in the CHARM Act.

Battery Recycling for America's Competitive Economy Act (BRACE Act)

The proposed BRACE Act would create loopholes in necessary environmental laws, which I am concerned will harm people and the environment. Lithium-ion batteries, when retired, are at risk of ignitability and reactivity. This is especially true if the battery is damaged, charged, and/or stored in an area open to the elements. In addition, the pre-processing (shredding, crushing, smelting, etc.) and storage of black mass pose a high risk of exposure to heavy metals and per- and polyfluoroalkyl substances (PFAS). The Resource Conservation and Recovery Act (RCRA) helps prevent these harms, and lessening stringency would diminish these essential protections. There is a history of vast harm in the recycling of lead-acid batteries, even with these regulations. Lead-acid battery recycling has resulted in lead poisoning in California and abroad. Ensuring that regulations remain intact and enforced is crucial to avoiding the harms of the past.[5]

The specific sections of concern are outlined below.

Section 2. (b) (1) the Environmental Protection Agency has announced a rulemaking process to establish universal waste standards specific to lithium-ion batteries, acknowledging that they pose unique fire risks. It is critical that mitigating fire risk is incorporated in these regulations.

Section 2. (b) (2) would allow recycling facilities to store batteries onsite under the same timeline requirements for universal waste handlers (i.e., up to one year) without being fully permitted as a Hazardous Waste Treatment, Storage, and Disposal Facility. Currently, recyclers can store batteries with a hazardous waste storage permit for an extended period under RCRA 40 C.F.R. § 273.60(a). They have instead opted to forgo this option and use an off-location storage facility that does not require a permit under the reduced universal waste handler rules. This change to recycling facility regulations would remove RCRA

[5] Dunn, J., 206. How Recycling is Done Matters. https://blog.ucs.org/jessica-dunn/how-recycling-is-done-matters-lessons-learned-from-the-lead-acid-battery/

requirements for the recycling facility, creating significant exemptions for important requirements, including fire and spill control, storage and disposal standards, transportation manifests, financial assurance mechanisms for post-closure cleanup, air emissions standards, and public notice requirements.

Further, the way this section is drafted insulates the exemption from future EPA rulemaking by locking in the current inadequate requirements ("as in effect on the date of enactment of this section").

Section 3 would ensure that the less stringent regulations established under 2. (b) (1) apply to the collection, storage, and transportation of rechargeable batteries, rather than the 1995 universal waste rules that were codified in the referenced Battery Act. This could preempt state regulations, considering the original text: "The collection, storage, or transportation of used rechargeable batteries… shall, notwithstanding any law of a State or political subdivision thereof governing such collection, storage, or transportation, be regulated under applicable provisions of the regulations promulgated by the Environmental Protection Agency at 60 Fed. Reg. 25492 (May 11, 1995), as effective on May 11, 1995…". Such preemption is unprecedented under RCRA and is a very dangerous precedent.

Classification of Black Mass as Solid Waste

"Black mass" can take multiple forms but is generally a powder containing the crushed cathode and anode materials, including cobalt, nickel, lithium, and graphite. While it can be a valuable source of critical minerals, it contains heavy metals and combustible materials that must be handled and processed with extreme caution. The European Union classifies black mass as hazardous waste.

If black mass is not classified as solid waste, a company could begin collecting it with no environmental oversight regarding how it's stored (dust controls, water runoff, fire-risk mitigation, etc.). Then, if there were no market for it at the time, there would be no requirement for how operators dispose of whatever material they did not sell.

The battery shredding and crushing process produces a variety of materials, including black mass, but many of which are not currently valuable for recycling, such as plastic fluff and electrolyte fluid. If those are included in the definition of black mass, these materials would all be removed from the solid waste definition and all accompanying regulations, including for safe handling and storage, secure disposal, the manifest system, and export notification. Generally, the fact that a material is later recovered and used in manufacturing is irrelevant to whether it's a solid waste, and this sets a dangerous precedent.

Coordinating and Harnessing America's Recovery of Minerals Act (CHARM Act)

I agree that identifying a coordinated strategy of critical mineral recovery from waste material is advantageous. The phrasing referring to discarded materials as not solid waste could create dangerous exemptions from the Resource Conservation and Recovery Act and should be removed. All discarded materials should be treated as solid waste to prevent the mishandling of hazardous waste and the abandonment of unused materials.

> "(a) STRATEGY.— ''(1) IN GENERAL.—The Administrator shall, in consultation with the heads of other Federal agencies that the Administrator determines to be relevant, develop and carry out a National Critical Mineral Recovery Strategy (in this section referred to as the 'Strategy') for the purpose of coordinating Federal efforts to **recover critical minerals from discarded materials, including solid waste and such materials that are not solid waste**."

Routes to increasing domestic recovery of critical minerals from waste

I urge this committee to consider approaches to build a robust recycling system that also upholds environmental protections. My work is informed by years of in-depth discussion with both industry and other researchers, including the California Electric Vehicle Battery Recycling Advisory Group.[6] Those conversations have made clear there are key areas where policy can improve the system without lowering necessary environmental and safety standards.

Extended producer responsibility

The first issue to address is increasing battery collection and ensuring they reach recycling facilities safely. The dispersed nature of battery retirements across the nation leads to many instances where the cost of collection and recycling exceeds the revenue from recovery.[7] This lowers battery collection rates and squeezes the recycling market.

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[6] Kendall, A., Slattery, M., Dunn, J., 2022. Lithium-ion Car Battery Recycling Advisory Group Report. https://calepa.ca.gov/lithium-ion-car-battery-recycling-advisory-group/

[7] Dunn, J., Kendall, A., Slattery, M., 2022. Electric vehicle lithium-ion battery recycled content standards for the US – targets, costs, and environmental impacts. Resour. Conserv. Recycl. 185, 106488. https://doi.org/10.1016/j.resconrec.2022.106488

In Colorado, this issue was addressed by a recently enacted law requiring the recycling and recovery of critical minerals from batteries in hybrid and electric vehicles.[8] This bill allows the collection and recycling market to continue operating, but holds the producer accountable for batteries that would otherwise fall through the cracks. The US needs a comprehensive policy to manage retired electric vehicle (EV) batteries.[9] Relying on market dynamics alone risks wasted materials, unsafe and unregulated dismantling, and a lack of accountability for proper disposal.

This bill was supported by automakers[10] and other affected stakeholders[11] because creating an efficient battery collection network will decrease transportation costs,[12] increase feedstock to recyclers, and increase the critical mineral supply for future manufacturing needs.

This type of extended producer responsibility policy also incentivizes design for disassembly. The producer factors in the cost of recycling in the design process. When an EV is retired, the battery is removed from the vehicle and then typically further disassembled. If the disassembly is planned for during the design of the EV and the battery, the process can become safer and more efficient. Examples of potential deconstruction process improvements through EV and battery design include the use of binders instead of adhesives and standardization among pack designs. Disassembly is currently a manual, slow and expensive process. If batteries are standardized and built to be taken apart, the process can be streamlined.[13]

Ensuring mineral recovery

Ensuring minerals are actually recovered from these batteries when they reach a recycling facility is crucial. Research shows hydrometallurgical processes can recover over 90% of cobalt, nickel, lithium, manganese and 60% of graphite from black mass. The pre-

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[8] Dunn, J., 2026. Colorado Takes a Big Step Forward for EV Battery Recycling. https://blog.ucs.org/jessica-dunn/colorado-takes-a-big-step-forward-for-ev-battery-recycling/

[9] Dunn. J., 2023. Guiding Principles for EV Battery Recycling Policy. https://blog.ucsusa.org/jessica-dunn/guiding-principles-for-ev-battery-recycling-policy/

[10] Western Resource Advocates, 2026. Colorado Passes Electric Vehicle Battery Recycling Bill. https://westernresourceadvocates.org/news/colorado-passes-electric-vehicle-battery-recycling-bill/

[11] ARA, 2026. Colorado Assembly Passes Landmark Propulsion Battery Framework. https://www.a-r-a.org/news/colorado-assembly-passes-landmark-propulsion-battery-framework/

[12] Slattery, M., Dunn, J., Kendall, A., 2021. Transportation of electric vehicle lithium-ion batteries at end-of-life: A literature review. Resour. Conserv. Recycl. 174, 105755. https://doi.org/10.1016/j.resconrec.2021.105755

[13] Thompson, D.L., Hartley, J.M., Lambert, S.M., Shiref, M., Harper, G.D.J., Kendrick, E., Anderson, P., Ryder, K.S., Gaines, L., Abbott, A.P., 2020. The importance of design in lithium ion battery recycling-a critical review. Green Chemistry. https://doi.org/10.1039/d0gc02745f

processing step recovers the black mass and then the hydrometallurgical process recovers these minerals in forms such as cobalt sulfate, nickel sulfate, lithium carbonate, lithium hydroxide, or a combination. Pyrometallurgy (smelting) does not recover lithium at all.[14] Currently, researchers expect that minerals are recovered at rates below the technologically achievable level due to fluctuating mineral market prices and outdated technology.[15]

Due to a lack of reporting and accountability on recovery rate thresholds for critical minerals by recyclers, the recovery rates of industrial-scale recyclers remain unclear. This is specifically true for lower-value minerals such as lithium and graphite. Graphite is predominantly used as an anode in lithium-ion batteries, but likely not recovered at an industrial scale due to the low market price. This is a mineral that the United States does not mine or have reserves of, despite its importance to lithium-ion battery manufacturing.[16]

By setting minimum recovery thresholds, such as in the European Union, more minerals will be recovered and added to US production.[17,18] This can also be achieved by creating a market for the recycled materials using minimum thresholds for recycled content in new products. In addition, tax credits can be used to incentivize the use of recycled materials. At the bare minimum, reporting on critical mineral rates and the forms of their output can increase knowledge of US production and ensure the minerals are not wasted. Many of the lithium-ion battery recycling companies in the US claim to recover 90% of these critical minerals, but it is unclear whether they are reporting the recovery from pre-processing that breaks down the batteries to black mass in a form that can be used as an input to the manufacturing process, or if they are reporting the recovery of these materials from black mass. Due to the high export volume of black mass, it is likely the former.[19]

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[14] He, B., Zheng, H., Tang, K., Xi, P., Li, M., Wei, L., Guan, Q., 2024. A Comprehensive Review of Lithium-Ion Battery (LiB) Recycling Technologies and Industrial Market Trend Insights. Recycling. https://doi.org/10.3390/recycling9010009

[15] Chacana-Olivares, J., Peceño, B., Grageda, M., Cruz, C., Rojas, L., 2025. Lithium-ion battery recycling: a perspective on key challenges and opportunities. npj Materials Sustainability 3. https://doi.org/10.1038/s44296-025-00083-7

[16] United States Geological Survey, 2025. Graphite. https://pubs.usgs.gov/periodicals/mcs2026/mcs2026-graphite.pdf

[17] European Commission, 2024. Mineral Recovery Rate Regulation. https://images.chemycal.com/Media/Files/TBT/24_06520_01_e.pdf

[18] Dunn, J., 2025. Mineral Recovery Rates. https://blog.ucs.org/jessica-dunn/mineral-recovery-rates-the-why-and-how-for-lithium-ion-battery-recycling-policy/

[19] Petras, K,. 2024. US burgeoning black mass exporter; domestic battery recycling demand to soar. https://www.fastmarkets.com/insights/us-burgeoning-black-mass-exporter-domestic-battery-recycling-demand-to-soar-sources/

Colorado has the first-ever critical mineral recovery rates for lithium, cobalt, and nickel in the United States. These rates allow recovery to be calculated at the black mass level, thereby not guaranteeing that minerals will be recovered and returned to the supply chain, unlike the European Union rates. Despite this shortfall, these rates do ensure that lithium is not lost to outdated smelting pre-processes.[20]

Third-party access to battery health information

Battery health refers to the battery's capacity and efficiency, which slowly degrade over time and with use.[21] This indicator is typically represented as a percentage and indicates the battery's percentage of maximum available capacity relative to when the battery was new. It is important for battery health to be accessible once the battery is removed from the car. Battery health is a key determinant of whether the battery can be safely shipped and whether it should be reused, repurposed, or sent directly for recycling. If the battery is in good health (i.e., relatively high capacity and efficiency), it is more economical to reuse or repurpose for a second life prior to recycling.

Currently, if there is no visible damage, third parties assess health by monitoring it during a full charge and discharge cycle or through a specially designed testing process. If this information, owned by the producer, were accessible, they would more easily know whether it is safe to ship or should be repurposed. By requiring the sharing of this information, the battery end-of-life market would be safer, more profitable, and more efficient.

Enacting the previously stated policies to increase critical mineral recovery while also upholding key environmental regulations is of national importance. These recovered minerals are a domestic replacement for newly mined minerals and result in significantly less environmental impact.

Thank you for the opportunity to testify, and I would be pleased to answer any questions you may have.

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[20] Dunn, J., 2026. Colorado Takes a Big Step Forward for EV Battery Recycling. https://blog.ucs.org/jessica-dunn/colorado-takes-a-big-step-forward-for-ev-battery-recycling/

[21] Dunn, J., 2022. Battery State of Health. https://blog.ucsusa.org/jessica-dunn/battery-state-of-health-what-is-it-why-is-it-important/