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WHAT'S INSIDE

Beyond metals in auto recycling

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Plastics, glass and automotive fluids – once viewed primarily as waste streams or cost centers – are now emerging as critical components of the next phase of automotive recycling.

For decades, the economics of automotive recycling have been firmly anchored in metals – steel, aluminum and copper have long delivered reliable value streams supported by mature infrastructure, global commodity markets and relatively straightforward processing.

Today, however, that long-standing model is beginning to shift as vehicle composition evolves, regulatory pressure intensifies and recyclers are forced to look beyond traditional revenue drivers to remain competitive. Plastics, glass and automotive fluids – once viewed primarily as waste streams or cost centers – are now emerging as critical components of the next phase of automotive recycling, bringing both opportunity and complexity as the industry works to unlock their value.

A Convergence of Change

That shift is not happening in isolation, but rather through a convergence of forces that are reshaping how end-of-life vehicles are evaluated. Increasing material scarcity, evolving environmental regulations and rapid advancements in sorting and processing technologies are all contributing to a new perspective on non-metal materials, even as economic realities continue to present challenges.

"The economics of metal recovery from end-of-life vehicles are well established and remarkably efficient," said Kari Bliss, principal of sustainability for PADNOS. "Steel, aluminum and copper have liquid global markets, established processing infrastructure and commodity pricing that makes recovery straightforward. Plastics, glass and fluids never had any of that – so they didn't get the investment."

What is changing, according to industry leaders, is not just regulatory pressure but the growing ability to actually extract value from these materials. According to Ryan Paterson, chief executive officer of Crush Software Solutions, technology is fundamentally altering what recyclers can recover and how precisely they can do it.

"The technology for recovery is what is driving the ability to recycle more of the material that exists in an end-of-life vehicle," Paterson said. "There are emerging technologies and techniques that enable recyclers to get more precise in the separation of materials into pure collections that have a real market for recycled parts."

For instance, the European Union's End-of-Life Vehicles regulation is a significant catalyst driving this change, requiring automakers to incorporate recycled plastic content into new vehicles – 15 percent within 6 years, rising to 25 percent within 10. "When OEMs face binding recycled content requirements, suddenly the non-metal streams sitting in shredder residue start looking like supply rather than liability," Bliss said.

The Growing Volume of Non-Metal Materials

Diana Rasner, group lead for materials, chemicals, waste and recycling at Cleantech Group, pointed out that vehicle composition itself is accelerating this transformation, as non-metal materials now represent a substantial portion of modern vehicles.

"Over 50 percent of a vehicle's volume is non-metal, and that share is growing as manufacturers experiment with lightweight materials," she said, noting that foam, textiles, dashboards, seats, glass and liners are increasingly common components.

Much of this material still ends up in landfills, but with regulatory frameworks pushing for higher recovery rates and recycled content, the industry is being forced to confront the scale of untapped value embedded in these streams.

Beyond bulk materials, Paterson points to another growing opportunity: automotive electronics. "One of the largest untapped values in recycled vehicles is the electronic control modules that are beginning to show up in yards," he said. "The average age of a car that enters the self-service recycling yard is approximately 14 years, and those 2012-era vehicles were just beginning to see computers become prolific."

Those components can carry significant resale value if properly identified and removed. "For instance, the forward-looking cruise control radar in a 2016 Honda Civic currently sells for $350," Paterson said. "We are beginning to catalog these parts, identify the labor involved in removing them and integrate that into our systems so recyclers can identify and recover high-value components."

Economic and Behavioral Barriers

Despite these opportunities, unlocking value from non-metals in automotive recycling remains challenging, particularly when it comes to aligning recovery processes with viable end markets. Rasner emphasized that success depends on both technical feasibility and economic viability.

"The biggest near-term opportunities are in materials where recovery is feasible without excessive labor, and where there's a defined end market or a manufacturer willing to pay a premium for recycled content," she said.

Paterson echoed this sentiment, noting that the economics of recovery are often the limiting factor rather than the technology itself. "One of the more difficult problems involving plastics recycling in the automotive industry is the economics behind it," he said. "You need to ensure that the plastic recovered is worth the upfront capital for the equipment required to isolate it."

Another major challenge lies in the structure of traditional sorting systems, which are often binary. "For every additional material component you look to extract, you have to either rerun material or invest in additional equipment," Paterson explained, highlighting why many recyclers have historically focused on metals, where returns are more predictable.

At the same time, new technologies are rapidly expanding what is possible. Rasner said the advancement of AI-powered sorting systems can distinguish between resin types with increasing accuracy. "AI-powered sorting is getting significantly better at distinguishing between resin types, which is foundational to any scalable recovery operation," she said.

Paterson pointed to similar innovations, particularly in plastics recovery. "Sensor-based technologies are becoming more precise in their ability to quickly sort through many different types of materials,

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Carpet recycling industry celebrates 10th anniversary of grant program

The Carpet America Recovery Effort (CARE) is celebrating the 10th anniversary of its California Carpet Stewardship Grant Program – marking a decade of strategic investment, market development and infrastructure expansion that has dramatically increased the state's capacity to collect, process and recycle post-consumer carpet (PCC). As one indicator of the grants' impact, the carpet recycling rate for the state has soared from 11 percent in 2016 to 37 percent in 2025, a rate of growth unmatched anywhere.

Since launching the grants in 2016, CARE's California program has awarded 98 grants to 79 entities, totaling approximately $12 million, catalyzing new recycling facilities, supporting product innovation and expanding collection access across the state.

Building Recycling and Collection Capacity in California

Over the past decade, CARE has made targeted capital investments to expand in-state processing and manufacturing capacity. Through 36 Capital Improvement Grants awarded to 21 entities, the program has helped launch and scale major recycling and manufacturing operations.

Among the most notable achievements are:

- Ongoing support of Circular Polymers in Lincoln, California, which became the first Northern California PCC recycling facility via a 2016 CARE grant investment.
- Supporting the launch of both Aquafil Carpet Recycling and Kian Green Up processng and manufacturing facilities in California.
- Investment in three California-based downstream manufacturers incorporating recycled PCC into finished goods.

Cumulatively, CARE's capital investments have driven grant-supported PCC output growth from 5 million pounds annually in 2016–17 to nearly 50 million pounds annually in 2023–25. New investments made in 2025 are expected to grow recycled or manufactured output by another 15 million pounds annually.

Capital Improvement grants have supported collection growth by over 20 million additional pounds annually and recent investments expect to add another 13 million additional pounds annually. The program kickstarted three new PCC collectors in the state, bringing total CARE public Dropoff Sites to 174 at the end of 2025.

Grants in Modest Amounts Lead to Big Payoffs

CARE's Micro Grants for Collection and Reuse have supported dozens of existing or new public collection sites, increasing convenience, access and PCC collections by 13.6 million pounds annually. The Micro Grants (up to $15,000 each) have also supported two new reuse hubs in the state, tripling carpet tile reuse from just a few hundred thousand pounds to over 3 million pounds of reuse annually.

Driving Innovation and Sustainable Product Design

Beyond infrastructure, CARE has invested in market development and innovation to address material bottlenecks, particularly for post-consumer carpet calcium carbonate backing (PC4) and PET fiber streams.

Product Testing and Innovation & Design Grants

- 13 Product Testing Grants and 6 Innovation & Design Grants were awarded.
- More than $1.08 million was allocated to Product Testing projects.
- $492,000 was awarded for Innovation & Design initiatives.

These grants have supported field trials and commercialization efforts across multiple sectors, including:

- New PCC-content products entering the marketplace, such as lightweight aggregate and ballistic barriers.
- Carpet and carpet-tile designs that improve recyclability and sustainability.
- Fiber-agnostic applications to absorb challenging material streams.
- Testing of advanced fiber identification technologies to improve material sorting and processing efficiency.

By funding laboratory work, pilot manufacturing runs and applied research partnerships, CARE has helped companies move recycled PCC from concept to commercial reality.

Lautenbach Recycling expands with regional recycling facility

Lautenbach Recycling has announced the opening of a new recycling and materials recovery facility in Bellingham, Washington, expanding the company's ability to serve businesses, contractors and residents across Northwest Washington.

The new site consolidates Lautenbach's Whatcom County operations into a single upgraded facility designed to improve efficiency, increase materials recovery, and expand recycling access throughout the region.

The Bellingham facility will accept a wide range of recyclable materials including construction and demolition debris, wood, metal, cardboard and other recoverable commodities. It will also feature a self-haul recycling area open to the public, providing residents with a convenient local option for recycling wood, metal and cardboard that might otherwise end up in landfills.

With the addition of the Bellingham site, Lautenbach Recycling now operates facilities in San Juan, Mount Vernon, and Bellingham, serving communities throughout the region with construction and demolition recycling, container services, organics management and specialized hauling.

BHS partners with Napa Recycling and City of Napa for renewable natural gas facility

In a public-private partnership, Bulk Handling Systems (BHS) is partnering with Napa Recycling and Waste Services and the City of Napa in the development and operation of an industry-leading dry anaerobic digestion and renewable natural gas (AD-RNG) facility at the existing Napa Recycling and Composting Facility.

"We are excited to be partnering with the City of Napa, and Napa Recycling on this important carbon reducing project," said Eric Herbert, president of Zero Waste Energy and BHS.

The AD-RNG facility features Zero Waste Energy's SMARTFERM® Plug Flow system which is specially designed to recover the energy content from Napa Recycling's existing organic waste stream in the form of biogas. The facility will provide the City of Napa with the ability to produce renewable natural gas (RNG) while also significantly reducing greenhouse gas emissions.

"This project virtually eliminates methane emissions from organic waste being disposed of from the service area," said Herbert. "Additionally, we will also replace the fossil fuel derived gas used by the trucking fleet with renewable natural gas generated from organic waste converted onsite. A truly circular solution."

The AD-RNG facility is estimated to generate up to 500,000 diesel gallon equivalents of CNG annually; enough to power approximately 50 heavy duty waste collection trucks or similar high-mileage vehicles per year. The renewable natural gas (RNG) generated will be used to fuel Napa Recycling's fleet of waste collection trucks. The facility can also utilize its RNG to generate electricity for the fleet should local regulations require refuse and recycling fleets to transition to electric-only vehicles.

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Auto recycling

■ Continued from Page A1

including various plastics," he said. "Polypropylene, polycarbonate, ABS and polyamide can be detected and sorted with AI-based image classifiers."

Once identified, materials can be separated using mechanical techniques such as air jets, varying belt speeds and density-sensitive systems. "The more precise the separation becomes, the more valuable the material becomes," Paterson said.

He also highlighted emerging solutions that could fundamentally change the economics of sorting. One example is a system developed by Möbius Industries, which aims to separate multiple material streams in a single pass.

"They envision replacing complex, multi-step sorting lines with a single high-precision machine that can isolate up to five fractions at once," Paterson said. "This changes the economics for recyclers looking to extract the most value without a massive equipment investment."

The Challenges of Glass

Glass remains one of the most difficult materials to recycle economically, due largely to both technical and market constraints. "Glass is made from sand, which is abundant and cheap," Bliss said, making it difficult to justify the cost of recycling without regulatory support.

Compounding the challenge is the laminated structure of automotive glass, which is designed for safety but complicates recycling. "The ability to separate the material before contamination remains a major problem," Paterson said. "The safety laminations make it difficult to get back to a pure glass substrate."

Rather than focusing solely on closed-loop recycling, some innovators are exploring alternative applications. "One area where the process can achieve gains is allowing the glass to go into different materials, such as insulation," Paterson said, noting that this shift in thinking could improve recovery rates.

Fluid Recovery Gains Ground

Automotive fluids, by contrast, represent a more mature segment of non-metal recycling, though their full potential is still evolving. "Fluids are actually one of the more mature non-metal recovery stories in automotive recycling," Bliss said.

Paterson agrees, noting that many recycling yards already treat fluids as valuable resources rather than waste. "Yards have very specific processing areas for removing all of the fluids, including Freon," he said. "You're very likely to find recycled windshield washer fluid and engine coolant available for resale."

Recovered fuels can also be reused internally or even sold, depending on regulations. "Gasoline and diesel are filtered and purified and then used to power the machinery of the yard or given to employees," Paterson said. "In some cases, operations can sell recovered fuel to the public at a significant discount."

Oil recycling, meanwhile, has been established for decades. "We were recycling used oil back in the 1980s," Paterson said. "It's filtered, decontaminated and repurposed for a wide range of products."

Finding Economic Parity

Achieving economic viability for non-metal materials will require coordinated progress across multiple areas. Bliss pointed to the need for demand signals, infrastructure investment and realistic economic expectations.

Paterson framed the challenge slightly differently, emphasizing that non-metals do not need to match metals in value but must become more predictable and scalable. "I would not frame it as needing to be as valuable as metals," he said. "For non-metals to get closer economically, several things have to happen."

Those include capturing materials before contamination, reducing labor costs through automation, establishing reliable quality metrics and strengthening end-market demand. "The more predictable the quality and the buyer, the more financeable the recovery process becomes," Paterson said.

While recycled non-metal materials are likely to remain more expensive than virgin alternatives, regulatory pressure and corporate sustainability commitments are beginning to shift the equation.

Looking ahead, the role of non-metal materials in automotive recycling is expected to expand significantly as both technology and market demand continue to evolve. "My experience has been that the recycling community will continue to try to extract every piece of value out of the vehicles that enter the recycling stream," Paterson said.

As these materials become viable profit centers, their recovery will become standard practice rather than an exception. Regulations may accelerate adoption, but long-term success will depend on making recovery both efficient and economically attractive.

For recyclers, the implications are clear. Those who invest in the capability to recover, process and market non-metal materials will be better positioned to meet the demands of automakers and regulators alike. As Rasner noted, "the industry that doesn't develop non-metal recovery capabilities will increasingly be leaving value on the table or facing regulatory penalties."

NH the Beautiful awards recycling equipment grants

The Board of Directors of NH the Beautiful, Inc. (NHtB) has approved $40,200 in recycling equipment grant funding to support two solid waste districts and eight New Hampshire municipalities.

The grants will help local recycling facilities improve material handling, expand storage capacity, increase operational efficiency and strengthen municipal recycling programs across the state.

2025-26 Recycling Equipment Grant Recipients

- B.C.E.P. Solid Waste District – Awarded $5,000 toward the purchase of a skid steer. Serving Barnstead, Chichester, Epsom, and Pittsfield, the new equipment will replace an older model and is essential for transporting recyclables.
- Coös County Recycling Center – Awarded $3,000 toward the purchase of two storage containers. The cooperative facility, serving five New Hampshire towns and three Vermont towns, will use the containers to store baled mixed paper and old corrugated cardboard.
- Town of Epping – Awarded $4,000 toward the purchase of two 30-yard open-top roll-off containers. The added capacity will allow the town to collect more aluminum cans and glass for recycling, preventing overflow and unnecessary disposal.
- Town of Hooksett – Awarded $5,000 toward the purchase of a baler to compact aluminum cans, OCC, paper, and plastics. Baling reduces material volume, improves storage efficiency, lowers transportation costs, and increases the value of recyclable commodities.
- Town of Raymond – Awarded $4,000 toward the purchase of a refurbished compactor.
- Town of Winchester – Awarded $3,000 toward the purchase of a baler, enabling the town to transition from loose to baled recyclables.
- Town of Antrim – Awarded $2,400 toward the purchase of four shipping containers to store baled recyclables. The containers will eliminate ongoing rental expenses and allow the facility to accumulate full loads of material before shipment.
- Town of Dunbarton – Awarded $5,000 toward the purchase of a compact wheel loader. The equipment supports daily facility operations, including loading trailers with baled recyclables and managing compost operations.
- Town of Hancock – Awarded $5,000 toward the purchase of a forklift. Recycling is mandatory in Hancock, and the forklift will be used to move baled materials, load trailers, and manage recyclable containers safely and efficiently.
- Town of Whitefield – Awarded $3,800 toward the purchase of two 40-foot Conex storage boxes and one 20-foot modified storage trailer. The units will store baled plastics awaiting shipment and provide safe storage for used oil collected from residents.

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Google purchases carbon removal credits generated by organic waste processing

Google has signed an agreement with Commonwealth Sortation LLC, an affiliate of AMP Robotics Corporation, to remove 200,000 metric tonnes of CO2e by 2030, while also accelerating new pathways for the waste industry to tackle methane, a potent super pollutant.

AMP uses AI-powered sortation technology to recover recyclable commodities and organic material from municipal solid waste (MSW). Instead of allowing organic waste to decompose in landfills and release methane, AMP converts it into biochar, a stable material that sequesters carbon and keeps it out of the atmosphere for hundreds of years.

Landfilled municipal solid waste is the third largest source of human-generated methane emissions in the United States, according to the U.S. Environmental Protection Agency. By diverting organic material from landfills and transforming it into biochar before it produces methane, AMP's process both reduces near-term warming and locks carbon away for the long term.

This purchase will enable AMP to add biochar production capacity to the largest recycling project in the United States, ultimately unlocking the potential to convert five million tons of organic waste into biochar over the next 20 years.

AMP and Google will also work together to establish frameworks for quantifying the impact that waste diversion paired with biochar carbon removal could have on methane elimination, and help lay the groundwork for scaling these solutions across the municipal waste industry.

"We're excited to catalyze an approach to waste management that takes on the twin challenges of climate change: the near term warming of methane and the long term warming of carbon dioxide. AMP's technology, through its partnerships with local waste management authorities, offers a scalable way to turn waste organic materials into a real climate solution, all while supporting local communities by reducing waste and mitigating air pollution," said Randy Spock, Carbon Credits and Removal Lead at Google.

A First-of-Its-Kind Model in Virginia

In late 2025, AMP affiliate Commonwealth Sortation LLC signed a 20 year contract with the Southeastern Public Service Authority of Virginia, the regional waste authority that serves eight communities and 1.2 million residents in South Hampton Roads.

Through this project, AMP's AI sortation technology will ultimately process 540,000 tons of MSW annually, diverting or repurposing at least 50 percent of this material from the landfill. In addition to preventing waste buildup at SPSA's landfill, each ton diverted reduces or sequesters more than 0.7 tons of CO_2e – amounting to more than 378,000 tons of carbon dioxide avoided or removed annually, equivalent to taking more than 88,000 cars off the road each year.

The project demonstrates how AI-powered waste processing can transform MSW disposal – among the world's largest human-caused sources of superpollutant emissions – into a climate solution.

"Recycling and carbon sequestration are a powerful pairing," said Matanya Horowitz, AMP founder and chief technology officer. "The waste industry is built to capture value from materials. We can turn organic waste from a major source of emissions into a durable, carbon-storing asset for municipalities and waste operators."

CP Group acquires Recycleye

CP Group (CPG), a leading designer, manufacturer and integrator of advanced material recovery facilities (MRFs) and automated sorting technologies, has acquired a majority stake in Recycleye. This strategic move significantly expands CPG's AI-driven sorting capabilities while further enabling MRF operators to increase recovery, improve purity, and generate valuable operational data.

Recycleye, headquartered in London, specializes in high-accuracy AI-vision systems used across robotic and belt-based sorting applications. The acquisition unlocks technical synergies that enable alignment of products and technologies across the two companies, leading to new innovations that strengthen the company's position as a global leader.

"This acquisition brings together the industry's leading MRF integrator with Europe's most established AI-based sorting company. The combined organization accelerates AI-enabled sorting and plant control across the full MRF – delivering the performance and purity levels that define the next generation of material recovery," said Terry Schneider, CP Group chief executive officer.

The transaction unlocks multiple next-generation AI-based capabilities that transform system operations, offering real-time alerts, performance and material insights, and expert advice never before possible. Customers will also gain access to extended 24/7 technical support enabled by Recycleye's UK-based engineering team, broadening coverage across time zones.

CP Group and Recycleye began collaborating in 2023, deploying the Vivid-AI optical sorter through CPG's Optical Sorting Division, MSS. Vivid AI is the industry's first AI system paired with air ejection, which enables higher volume sorting and less maintenance than an AI-enabled mechanical arm. MSS and Recycleye have already completed over 23 live installations together in the U.S. and Europe.

Through continued investments in engineering, research and development and product line alignment, the acquisition strengthens CPG's ability to deliver value to customers while addressing emerging industry needs and trends and to maintain its industry-leading reputation for reliability and performance.

Sweden's deposit return system recycled three billion beverage containers in 2025

For the first time, more than 3 billion PET bottles and aluminum cans were returned through Sweden's deposit return system (DRS) in 2025, 130 million more than the previous year. On average, every person in Sweden returned 283 containers, a 4 percent increase from 2024. Sweden's return rate also increased to 88.4 percent, approaching the national target of 90 percent, according to new data from Returpack/Pantamera, the operator of the country's DRS.

In 2025, Sweden's deposit system delivered 27,826 metric tons of aluminum and 24,835 metric tons of PET to material buyers. Unlike general packaging recycling, where materials are often downcycled into lower-quality products, the DRS keeps bottles and cans in a dedicated, high-quality stream.

When PET bottles and aluminum cans are returned through the deposit system instead of general packaging recycling, their carbon footprint is cut in half. The material stays in closed recycling loops, preserving its quality so it can become new packaging again and again. This reduces the need for virgin raw materials, said Sara Bergendorff, Head of Sustainability and Quality at Returpack/Pantamera.

One of the defining features of Sweden's DRS is how seamlessly it fits into everyday life. For most people, returning containers happens during a regular trip to the grocery store, making accessibility a cornerstone of the system's high return rates.

This year's data also highlights the growing role of high-capacity reverse vending machines, where entire bags of containers can be emptied at once. These machines represent 14 percent of all reverse vending machines and account for 45 percent of total volume. In areas where retailers install them, return volumes consistently increase.

Launched in 1984, as the world's first deposit return system, Sweden has to date collected more than 55 billion bottles and cans – the result of four decades of collaboration between beverage producers, retailers and consumers. As deposit return systems are introduced and expanded across Europe, Sweden's experience offers a long-term perspective on which key factors have been crucial to achieving high collection rates, circular material flows and long-term sustainability.

Partnership to transform Providence materials collection system

The City of Providence, Rhode Island, will start delivering new, standardized trash and recycling collection carts to residents to help divert recyclables from landfills and create new materials with recycled content. These collection carts will replace aging and inconsistent containers and lay the foundation for a stronger, more effective recycling system citywide. The recycling effort is supported by a $7.4 million investment from Closed Loop Partners, American Beverage Association and other major brands, The Recycling Partnership, and the U.S. Environmental Protection Agency's Solid Waste Infrastructure for Recycling (SWIFR) Grant Program.

The new carts are a major step in a multi-year public-private partnership to address longstanding challenges in Providence's recycling system. By aligning public funding, private investments, infrastructure upgrades and resident education, the project is taking direct action to reduce contamination, strengthen recycling operations, and deliver measurable recycling rate improvements citywide. Providence's current contamination rate is over 47 percent, resulting in over 8,000 tons of valuable materials intended for recycling being rejected and sent to landfills annually instead of being made into new products. That is equivalent to approximately 288 pounds of valuable materials lost to landfill per household.

Contributing to the multi-million dollar project, circular-economy focused firm Closed Loop Partners provided a commitment of over $5 million in financing from its Catalytic Capital & Private Credit group, including its beverage strategy, backed by the American Beverage's Every Bottle Back Initiative, in partnership with Rhode Island's beverage companies, and its infrastructure strategy, backed by Amazon, The Coca-Cola Company, Colgate-Palmolive, Danone North America, Kenvue, Keurig Dr Pepper, P&G, PepsiCo, Primo Brands, Starbucks, Unilever, the Venn Foundation and the Walmart Foundation. Additionally, the city secured two grants including $625,000 from The Recycling Partnership, with funding through the Every Bottle Back Initiative, and an additional $1.8 million through the EPA's SWIFR grant program, which supports improvements of post-consumer materials management and infrastructure. Together these investments aim to improve Providence's recycling rate of 2.4 percent, currently the lowest in Rhode Island.

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METALS

Tariffs on steel, aluminum and copper imports strengthened

President Donald J. Trump signed a Proclamation to strengthen tariffs imposed on imported steel, aluminum and copper in order to more effectively address the national-security threat posed by such imports. These new tariffs were announced April 2, 2026.

The Proclamation defines the way that tariffs are assessed, ensuring that they reflect the full value of imported steel, aluminum and copper products –not an artificially low foreign price.

The Proclamation establishes clear rules for calculating Section 232 metals tariffs.

- Articles made entirely or almost entirely of aluminum, steel or copper will pay a flat 50 percent on their full value – for example, steel coils and aluminum sheet.
- Derivative articles substantially made of steel, aluminum or copper will pay a flat 25 percent on their full value.
- Certain metal-intensive industrial equipment and electrical grid equipment will pay 15 percent through 2027, to accelerate the massive industrial base buildout currently underway across the United States.
- Products made abroad but entirely with American steel, aluminum and copper will be subject to lower tariffs of 10 percent.
- Products made of 15 percent or less steel, aluminum or copper will no longer be subject to Section 232 metals tariffs.

Over 4 million tons of new crude steel-making capacity is expected to become operational in the next two years, including in West Virginia, Arkansas and South Carolina, with additional investments underway across the country.

New U.S. aluminum and copper smelting is also underway across America. Earlier this year, Century Aluminum and Emirates Global Aluminum announced a joint venture to build the first new aluminum smelter in the United States in decades, in Oklahoma. Companies such as Highland Copper, Ivanhoe Electric, Rio Tinto and Wieland are expanding U.S. copper mining, smelting and fabrication facilities.

This buildout – and the continued health of these vital American industries – is possible through the continued implementation and strengthening of the President's Section 232 tariff programs. These tariffs ensure domestic producers and workers can compete on a level playing field.

AR Scrap Metals MarketWatch

Commodity		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Ferrous						
#1 Bushelings	per gross ton	$414.00	$408.00	$410.00	$411.00	$409.00
#1 Bundles	per gross ton	396.00	382.00	390.00	391.00	389.00
Structural	per gross ton	362.00	358.00	359.00	361.00	365.00
#1 & #2 Mixed Steel	per gross ton	293.00	290.00	291.00	290.00	292.00
Crushed Auto Bodies	per gross ton	209.00	210.00	212.00	211.00	210.00
Shredded Auto Scrap	per gross ton	409.00	406.00	409.00	407.00	413.00
NON FERROUS						
#1 Copper Bare Bright	per pound	5.99	5.61	5.54	5.36	5.59
#2 Copper Wire & Tubing	per pound	5.77	5.41	5.34	5.21	5.39
Aluminum Cans	per pound	.96	.95	.96	.99	1.00
Al/Cu Radiators	per pound	2.81	2.75	2.76	2.79	2.81
Aluminum Radiators	per pound	.53	.50	.46	.42	.43
Heater Cores	per pound	1.34	1.31	1.29	1.28	1.33
Stainless Steel	per pound	.66	.64	.66	.65	.65

All prices are expressed in USD. Printed as a reader service only.

DISCLAIMER: American Recycler (AR) collects pricing and other information from experienced buyers, sellers and facilitators of scrap metal transactions throughout the industry. All figures are believed to be reliable and represent approximate pricing based on information obtained by AR (if applicable) prior to publication. Factors such as grades, quality, volumes and other considerations will invariably affect actual transaction prices. Figures shown may not be consistent with pricing for commodities associated with a futures market. While the objective is to provide credible information, there is always a chance for human error or unforeseen circumstances leading to error or omission. As such, AR is not responsible for the accuracy or completeness of the information provided, or for outcomes arising from use of this information. American Recycler disclaims any liability to any person or entity for loss or damage resulting from errors or omissions, including those resulting from negligence of AR, its employees, agents or other representatives.

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BHS

TECHNOLOGY CONTINUED

BHS (Bulk Handling Systems) has opened the Nashville-based CTEC (Customer Testing and Education Center); offering material stream testing and evaluation in real time with BHS equipment and systems.

Testing at CTEC gives customers vital information about the characterization and value of materials being processed at every stage. This type of testing will benefit operators who may be struggling to improve the percentage value of their waste stream purity. By sending a sample to test with the BHS team, operators can receive key insights into what system changes would be required to improve purity rates. Customers can choose to submit test samples and have BHS provide results, or participate in real-time testing via virtual or in-person sessions.

Understanding the costs of required system updates and the timeframe for a return on investment is crucial to businesses where investing in new equipment retrofits could mean critical downtime and lost productivity and revenue. The CTEC system provides clear, tested validation on what purity levels can be achieved.

An industry-first facility, CTEC utilizes Max-AI® Flex robots, followed by the industry-leading SpydIR®-HS optical sorter; the loop showcases a fully automated QC where customers can choose either the proven Max-AI® AQC-2 robotic QC featuring the iEOT, or Max-AI® AIR direct eject QC machine—all controlled via the Total Intelligence Platform.

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See the loop in Action

PAPER

New 2025 pulp & paper manufacturing figures show resilience in rising costs

Cepi preliminary statistics for 2025 show European paper and board production decreased by 1.5 percent. The drop is similarly experienced by most global competitors. In Europe, the industry has capitalized on its leading position in bio-based and circular materials creating resilience.

The production decreased by 1.5 percent compared to the previous year. The general trend since 2021 remains negative, reflecting the troubles encountered across all European manufacturing sectors over the past five year period due to adverse macro-economic trends: a sluggish demand, the heavy impact on the industry of high energy and manufacturing costs compared to global competitors, as well as growing regulatory burden in Europe, geopolitical challenges and rising trade tensions.

Graphic paper production – still more fragile than other segments – decreased by 7.2 percent in 2025. Focusing only on packaging paper and board (+0,1 percent), tissue paper (-0.8 percent) and other paper and board (+0.4 percent), European production looked relatively stable in 2025, but still 6.8 percent below the record level registered in 2021.

The performance of the European pulp and paper sector in 2025 is to be put in contrast with that of global competitors, and while global paper and board production remained unchanged (-0.3 percent). Production decreased more than in Europe in most paper and board producing countries in 2025. The United States, Japan, Canada and South Korea recorded a decline of their production (-1.9 percent to -5.7 percent). Exceptions are Brazil (+0.1 percent), an important pulp exporter to Europe, and China (+2.9 percent), which has accelerated paper and board production since 2020.

The trade balance of paper and board, although slightly eroding, decreased by 4.4 percent for the Cepi area compared to 2024 but remains largely positive, a unique position amongst energy-intensive sectors in Europe. Estimated on the most recent Eurostat data (11 months), EU paper and board exports have declined by 2.2 percent while imports are estimated to have increased by 1.4 percent in 2025, showing the fragility of the EU's global competitive position.

Recent figures published by Deloitte show however that Europe is unmatched in crucial competitiveness metrics: biomass flows directed to biomaterials and circular material use rate, which is mainly driven by the EU's paper and board sector.

Poly coated paper recycling gains industry backing as alliance adds new members

The Poly Coated Paper Alliance (PCPA) announced that Domtar, NextGen Consortium, Smurfit Westrock and Toppan Inc. have joined the Alliance, expanding its work to advance practical, scalable recycling solutions for poly coated paper packaging in the U.S. PCPA focuses on paper-based packaging with polymer coatings or laminations, including common formats used in foodservice, beverage, household, and personal care.

These new members represent key points across the paper and packaging value chain, from mills and packaging manufacturers to cross-sector recovery collaboratives. Their participation signals increasing market confidence in the recyclability of poly coated paper packaging as well as a shared focus on improving the systems required to scale it.

PCPA has built a foundational dataset that traces how poly coated paper packaging moves through the recycling system from collection to end markets. PCPA is now focused on closing gaps by improving data completeness, aligning guidance, and supporting consistent recovery and market acceptance.

But addressing these challenges and scaling solutions requires coordination across the entire value chain, rather than fragmented or single company approaches. The addition of these companies with deep operational expertise supports market development and helps reduce friction across collection, processing and manufacturing realities.

"Our role is to bring more of the value chain into the same room for candid, technical discussions," said Shannon Moore, Director of Global Packaging Sustainability, Mars Snacking. "Every new member strengthens the shared understanding needed to make better decisions across the system and we're excited to welcome Domtar, NextGen, Smurfit Westrock, and Toppan into the mix."

As recycling policy frameworks evolve, including the continued expansion of EPR programs in several states, end-market readiness and clear material pathways are increasingly important to program performance. PCPA continues to align recycling pathways to ensure poly coated paper can be managed effectively in real-world recycling systems.

PCPA welcomes additional organizations interested in contributing to the advancement of poly coated paper recovery. Membership is open year-round.

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WASTE

U.S. Farms have more than doubled biogas capture over five years

The American Biogas Council (ABC) released new data showing U.S. farms are capturing 166 percent more biogas – a source of energy created by recycling organic waste like manure and food scraps – than they were just five years ago. Yet most of the nation's potential to produce domestic energy from agricultural waste on farms remains untapped.

According to the ABC, 631 farms operate biogas capture systems – more than double the number in 2020. Those farms can produce over 61 million MMBtu of energy annually, compared to about 23 million MMBtu five years ago.

In 2025, 41 new systems came online, representing $835 million in investment. Total investment in farm-based biogas capture systems has now reached $6.4 billion.

Biogas projects convert manure, wastewater, food waste and captured landfill gas into renewable natural gas (RNG), renewable electricity, heat and nutrient-rich fertilizer. These systems also process 25 billion gallons of manure annually, reducing methane emissions, improving air and water quality, and recycling nutrients back into agricultural soil.

"Biogas capture systems recycle everyday agricultural waste into reliable, around-the-clock energy while delivering real economic benefits to rural communities," said ABC executive director Patrick Serfass. "This technology is one of the most scalable, immediate opportunities we have to expand domestic energy production. With the right policies and continued investment, this sector can deliver transformative benefits for farmers, communities and the entire country."

Dairy farms account for the majority of farm-based biogas capture systems (79 percent), followed by hog farms (19 percent). A smaller number of systems recycle poultry manure or crop residues. Together, the energy these systems generate annually is enough to meet the needs of approximately 800,000 U.S. homes.

Use of this energy has shifted since 2020, when three-quarters (74 percent) of biogas capture systems generated on-site power. Today, roughly two-thirds of these systems produce renewable natural gas (RNG) for pipeline injection or transportation fuel, providing significant reductions in air pollution.

California, the nation's largest agriculture state, accounts for more than a quarter of all farm-based biogas capture systems, most of which capture energy from dairies. Wisconsin represents nine percent of facilities, followed by New York (six percent) and North Carolina (five percent).

Despite this growth, much of the opportunity remains untapped. Nearly 3,000 U.S. dairy farms with herds of 500 or more could support biogas capture systems but do not, leaving about 86 percent of potential undeveloped. In the hog farming sector, fewer than 2 percent of farms that could support biogas capture systems have adopted the technology.

If fully realized, U.S. agriculture could produce enough additional biogas to meet the energy needs of approximately 7.7 million homes, enough to power nearly all the households in New York State.

With continued investment and supportive policies, farm-based biogas can deliver more energy, fertilizer and economic benefits for rural communities nationwide.

Frontier Waste Solutions acquired by GFL Environmental

Brown Gibbons Lang & Company (BGL), an independent investment bank and financial advisory firm, announced the sale of Frontier Waste Solutions, a vertically integrated network of solid waste assets and portfolio company of Concentric Equity Partners and Summer Street Capital Partners, to GFL Environmental Inc., the fourth largest diversified environmental services company in North America. BGL's Environmental Services investment banking team served as lead financial advisor to Frontier in the transaction. The specific terms of the transaction were not disclosed.

BGL's Environmental Services investment banking team served as lead financial advisor to Frontier in the transaction.

Founded in 2017, Frontier is a leading vertically integrated solid waste and recycling company providing full-service waste capabilities to commercial, residential, municipal and industrial customers across the largest population centers in Texas. Frontier has established itself as one of the largest independent solid waste businesses in the U.S. serving over 460,000 customers across communities stretching from Texoma in North Texas, through Dallas-Fort Worth, Austin and San Antonio to Corpus Christi and Houston with a fleet of 665 vehicles across 24 locations.

GFL is the fourth largest diversified environmental services company in North America, providing comprehensive solid waste management services from its platform of facilities throughout Canada and 18 U.S. states. GFL has a workforce of more than 15,000 employees across its organization.

Casella Waste acquires Star Waste Systems

Casella Waste Systems, Inc., a regional solid waste, recycling and resource management services company, announced that it has completed the acquisition of Star Waste Systems, LLC, a privately held waste collection company with operations in eastern Massachusetts, including the greater Boston area and southern New Hampshire.

The transaction closed on April 1, 2026, and is expected to generate approximately $100 million of annualized revenue. The acquisition was funded through cash on hand and available capacity under the company's revolving credit facility.

Star Waste provides residential, commercial and roll-off collection services to approximately 80,000 locations across its operating footprint. The acquired business includes three solid waste collection locations and a construction and demolition processing and transfer station.

Meridian Waste completes acquisition of Waste Knot

Meridian Waste Virginia, LLC has acquired Waste Knot, LLC. The transaction strengthens Meridian Waste's footprint in the greater Richmond, Virginia market and reinforces its growth strategy through strategic tuck-in acquisitions.

The addition of Waste Knot expands the company's residential and commercial collection platform, increasing route density and driving incremental volume to Meridian Waste's vertically integrated assets, including its Tri-City Materials Recovery Facility and Lunenburg Municipal Solid Waste Landfill. This enhanced asset utilization is expected to support improved operating efficiencies, margin expansion, and long-term cash flow growth.

Waste Knot's operations will be seamlessly integrated into Meridian Waste's existing Petersburg hauling facility. Customers will continue to receive uninterrupted service under existing agreements, while benefiting from Meridian Waste's expanded resources, safety standards, and service capabilities.

SWACO awards more than $275,000 in grants to reduce waste

The Solid Waste Authority of Central Ohio (SWACO) is awarding more than $275,000 in grants to 14 local community partners as part of the Community Waste Reduction (CWR) grant program. This annual competitive grant funds innovative projects each year that significantly reduce waste or increase the diversion of waste from the Franklin County Landfill. The recipients are local governments and nonprofits, schools, hospitals and faith-based organizations, and SWACO prioritizes applications with an emphasis on partnership and collaboration.

The projects funded by this year's CWR grants prioritize waste reduction and reuse, including by supporting the purchase of a new food waste digester at Doctor's Hospital, expanded recycling stations in classrooms and common spaces at the Columbus College of Art and Design, and new recycling and landfill receptacles at Groveport and Gahanna city parks and in the Linden neighborhood of Columbus.

"Reducing the amount of waste that SWACO takes in is one of our core missions and will extend the life of the landfill, which is an asset for our whole community," said SWACO executive director, Joe Lombardi. "The Community Waste Reduction grant program provides key funding to kick-start waste reduction efforts all over Franklin County, and we're excited to see the program continue to grow."

Successful Community Waste Reduction grant applications emphasize partnership-building and collaboration, and leverage the waste stream for community and economic benefit. They must be within SWACO's jurisdiction, which is comprised of Franklin County and includes the cities of Canal Winchester, Dublin, New Albany, Reynoldsburg and Westerville, and the grant recipients are required to provide a 20 percent cash match and document the project's impact.

Last year, SWACO awarded more than $250,000 in CWR grants to 12 local governments and nonprofit organizations for initiatives to divert waste material from the landfill, including a new donation incentive program from Goodwill Columbus that rewards residents for donating their unused goods. In addition, last year's grants supported a reusable coffee cup program at a local coffee shops, a program to make donated sporting goods available to under-resourced schools and educational programing.

Next year, the maximum funding amount available through a Community Waste Reduction grant will be $50,000, a more-than 40 percent increase over previous years, and SWACO will be studying ways that this grant program can best support waste reduction efforts by their county's faith-based communities. Applications for next year's CWR grants will be accepted beginning in May of 2026. To learn more about the CWR grant program visit SWACO.org.

BUSINESS BRIEFS

Harris American acquires G.P.S.

Harris American Company, a subsidiary of Avis Industrial Corporation, has completed the acquisition of G.P.S. S.r.l., Ferrara, Italy. Founded by Marco Garuti in 2013, G.P.S. is a manufacturer of ferrous and nonferrous scrap processing balers and shears recognized for innovative design, high efficiency throughput and the flexibility of stationary and mobile equipment applications. Through its flagship M Generation balers, Predator baler/loggers, and Destroyer shear/baler/loggers, G.P.S. has built a robust and loyal global installed base. Harris American and G.P.S. have been business partners since the 2021 launch of the Predator and Destroyer products in North America and have completed and installed numerous machines throughout the United States over that time.

Metals Innovation Initiative welcomes engineer veteran

Kentucky's Metals Innovation Initiative (MI2) team recently welcomed metals manufacturing industry veteran Laura Haury as the organization's sustainability project coordinator. Haury's role will bridge manufacturing operations, environmental stewardship and public education, one of the only roles of its kind in the state.

In her position, Haury will focus on recycling efforts, environmental education and outreach. In partnership with The Recycling Society's Million Can contest, she will also help raise awareness about aluminum recycling while developing school and community programs to increase current recycling rates.

Haury brings decades of experience in environmental engineering and manufacturing sustainability to MI2.

NH Recycles names new executive director

After seven years as executive director, Reagan Bissonnette will be stepping down from her role. The board of trustees has selected Andrea Folsom as the organization's next executive director, effective May 18, 2026. Folsom has served as NH Recycles' education & grants manager since 2021. Reagan is leaving to start a nonprofit consulting and coaching business.

This transition reflects a thoughtful, planned process and positions NH Recycles to continue its work supporting municipalities, operators and communities.

Folsom has been a key contributor to many of NH Recycles' successes over the past five years. As a member of the leadership team, she has helped guide day-to-day operations and strategic initiatives. She has led a communications rebrand, co-authored numerous successful federal grant applications and expanded educational resources.

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RECYCLING EQUIPMENT SALES, INC

E-scrap: From hazardous waste to strategic recovery

by MAURA KELLER
mkeller@americanrecycler.com

For decades, electronic recycling was largely defined by risk mitigation. The industry's primary mission centered on safely managing hazardous materials such as lead, mercury and cadmium, ensuring these toxic substances did not leach into soil, water or air. Regulations like the Resource Conservation and Recovery Act (RCRA) shaped practices, with recyclers focusing on items such as cathode ray tubes, fluorescent lamps and batteries that posed clear environmental threats.

Today, however, that mission is evolving. While environmental protection remains a core priority, electronic recycling is increasingly being viewed through a different lens – one centered on resource recovery, supply chain resilience and economic opportunity. Critical and rare elements such as cobalt, lithium, indium and rare earth metals are now at the forefront, transforming e-scrap from a waste management challenge into a strategic resource stream.

The shift reflects both technological progress and global demand for materials essential to modern life. According to Astha Upadhyay, materials and environmental scientist and critical element recovery expert at Temple University, the evolution has been significant over the past decade.

"Initially, the focus was on mitigating environmental hazards, particularly the safe handling of lead, mercury and cadmium in devices," Upadhyay explained. "The priority was to prevent contamination from CRTs, fluorescent lamps and batteries."

That focus has broadened as demand for advanced technologies has surged. "In recent years, the focus has shifted toward recovering critical and scarce elements due to growing global demand, limited primary supply and their strategic importance in high-tech and renewable applications," Upadhyay said.

Danielle Spalding, senior vice president of marketing, communications and government affairs at Cirba Solutions, sees a similar transformation, particularly in battery recycling. "Battery recycling started as a way to keep these materials out of waste streams and has now become a strategic source for critical minerals," she said. "Once extracted from end-of-life and scrap batteries, the materials can be used over and again to manufacture new batteries."

Demand Driven by Technology and Energy

The growing emphasis on critical material recovery is being fueled by rapid expansion across multiple sectors. Electric vehicles, renewable energy systems, consumer electronics and data infrastructure are all driving unprecedented demand for battery materials and specialty metals.

"The increased demand for critical minerals is driven by the rapid growth of the technology and energy sector," Spalding said. "These sectors rely on materials like lithium, nickel and cobalt to power the batteries needed."

Upadhyay added that the rise of electric vehicles and energy storage is significantly increasing demand for battery materials. "Global demand for lithium and cobalt is expected to continue rising sharply due to the rapid expansion of electric vehicle production, portable electronics and energy storage technologies," she said.

At the same time, high-tech devices are placing pressure on other critical materials. "Indium, used in LCDs and touchscreens, has a very limited global supply, and the rise of 5G networks and AI-driven data centers is driving increased demand," Upadhyay explained.

Supply chain concerns are also amplifying the urgency. Many of these materials are sourced from geopolitically sensitive regions, making domestic recovery increasingly attractive. "Nearly three-quarters of the United States' lithium-ion batteries come from foreign entities," Spalding noted. "Recovering critical minerals from those batteries is important to securing a diversified source and building more resilient supply chains."

Unlocking Value in Complex Devices

As the focus shifts toward resource recovery, e-waste recyclers are investing in technologies capable of extracting valuable materials from increasingly

Electronic recycling is increasingly being viewed through a different lens – one centered on resource recovery, supply chain resilience and economic opportunity.

complex devices. Electronic products today are highly engineered, with materials often embedded in intricate configurations that make recovery challenging.

"Recycling technologies are becoming increasingly targeted and selective to recover high-value metals from complex electronics," Upadhyay said. Mechanical separation techniques such as shredding and sieving are used to concentrate metals, while advanced methods take recovery further.

"Hydrometallurgical methods, including acid and bio-leaching, can selectively extract metals such as cobalt and indium, with recovery rates exceeding 90 percent in laboratory studies," she said. Pyrometallurgy is also being adapted with pre-concentration steps to capture rare elements, while AI-assisted sorting systems improve material purity.

Spalding emphasized that battery recycling technologies are evolving rapidly to meet industry needs. "Technological advancements are focused on improving efficiency to recover valuable materials like lithium, nickel and cobalt," she said. "Companies are looking for high-quality battery-grade metals to make new batteries, and that is driving innovation."

Upadhyay's own research explores emerging approaches that go beyond traditional methods. "We are looking at biogenic approaches, using plants to accumulate metals and convert them into high-performance materials," she said. "This combination of advanced engineering, AI and biogenic recovery is transforming electronic recycling into a precision-driven resource supply chain."

The Challenge of Trace Materials

Despite these advances, recovering critical materials presents unique challenges compared to traditional metals. Unlike copper or steel, which are present in relatively high concentrations and are easier to extract, critical elements are often dispersed in trace amounts throughout electronic devices.

"These materials are typically present at only 0.01 to 0.5 percent by weight," Upadhyay said. "They are embedded in plastics, ceramics or coatings, making mechanical recovery challenging."

The complexity of devices adds another layer of difficulty. Shredding can result in the loss of tiny particles, while chemical extraction introduces additional costs and safety considerations. "Successful recovery requires not just removing the metal, but doing so safely, efficiently and profitably," she said.

Battery recycling presents its own set

See E-SCRAP, Page B2

E-scrap

■ Continued from Page B1

of challenges. “There are varying cathode chemistries in lithium-ion batteries, compared to a traditional lead-acid battery,” Spalding explained. “The safe handling of these devices throughout the recycling process is crucial.”

Proper packaging, transportation and processing are essential to mitigate risks, particularly as damaged or defective batteries enter the waste stream. “The processing of lithium-ion requires more advanced technologies than previous battery chemistries,” she said.

And while recovery can be complex, the value of critical materials is reshaping the economics of electronic recycling. Many of these elements command high market prices due to limited supply and growing demand.

“The high market value of critical metals such as cobalt, indium and rare earths can significantly offset the costs of collection, sorting and processing,” Upadhyay said. She noted that indium prices alone highlight the opportunity, with refined indium reaching hundreds of thousands of dollars per ton.

Spalding pointed to the broader economic potential of e-waste. “The United Nations projects e-waste to rise to $82 billion worth of metals by 2030,” she said. “There is tremendous value in used electronics that often gets mistakenly thrown away.”

This shift is also influencing investment trends. “Battery recycling is a key piece to enhancing our critical mineral supply chains,” Spalding said. “It’s a main driver for new investments and an expanding domestic industrial base.”

Beyond direct financial returns, e-waste recycling offers cost and environmental advantages over primary mining. Upadhyay noted that recovering metals from secondary sources can reduce both processing costs and environmental impact, supporting a more sustainable supply chain.

Targeting High-Value Streams

Of course, not all e-waste is created equal when it comes to material recovery. Certain products contain higher concentrations of critical elements, making them priority targets for recyclers.

“Lithium-ion batteries from electric vehicles, laptops and mobile devices are particularly high in cobalt, nickel and lithium,” Upadhyay said. LCD screens and LED devices are key sources of indium, while hard drives, magnets and speakers often contain rare earth elements such as neodymium and dysprosium.

Spalding emphasized the importance of capturing all battery types. “End-of-life batteries, even those that are damaged, defective or recalled, can contain valuable materials that can be reused,” she said.

To access these materials, recyclers are expanding collection networks and partnerships. “Through expanded collection programs, recyclers are working with manufacturers on extended producer responsibility compliance, retail and municipal collections and environmental services,” she said.

Indeed, the shift toward recovering critical materials is reshaping relationships across the electronics ecosystem. Recyclers, manufacturers and technology

companies are increasingly working together to create more integrated, circular supply chains.

“Manufacturers and technology companies are partnering with recyclers to secure a reliable and sustainable supply of high-value metals,” Upadhyay said. Take-back programs, retailer drop-offs and mail-in recycling initiatives are helping companies reclaim materials from used devices.

These partnerships are also influencing product design. “Devices are being engineered for easier disassembly, modularity and recyclability,” she said, improving the recovery of critical elements.

Spalding highlighted similar trends, noting that collaboration is being driven by the need to secure stable, domestic sources of materials. “This strategic focus is creating closer collaboration across recyclers, manufacturers and technology companies to effectively manage the full lifecycle of electronic devices,” she said.

The push toward closed-loop systems is a key driver. By recovering and reusing materials, companies can reduce reliance on mining while improving supply chain resilience and meeting sustainability goals.

The Future of E-Scrap

As demand for electronics, batteries and renewable technologies continues to grow, the role of electronic recycling is expected to expand significantly. What was once viewed primarily as waste management is now becoming an essential component of global resource strategy.

“Electronic recycling is a core part of the global supply chain,” Spalding said. “As usage increases, so will the need for critical minerals, with recycling being an important contributor to securing these materials domestically.”

Upadhyay sees continued innovation as critical to meeting this demand. “A well-designed, multi-step strategy that integrates mechanical, chemical and emerging methods will be essential for effectively managing critical and rare elements,” she said.

Ultimately, the industry’s evolution reflects a broader shift in how materials are valued. E-scrap is no longer just a liability to be managed – it is a resource to be mined, refined and reintegrated into the economy.

Vermont expands battery recycling program

Vermont has officially expanded its battery recycling program under a new law that significantly broadens the types of batteries that can be safely recycled statewide. Coinciding with National Battery Day, the launch highlights the importance of safe battery disposal and recycling. The expanded law is supported by The Battery Network, the state-approved battery stewardship organization, and makes it easier than ever for Vermonters to safely recycle batteries.

Under the expanded program, Vermonters can now recycle most primary (single-use) and rechargeable batteries weighing up to 25 pounds (or 2,000 watt hours). This includes batteries from common household devices and battery-powered products such as remotes, toys, flashlights, cordless power tools, portable chargers, drones and more.

The expansion also includes medium-format batteries, such as larger rechargeable batteries used in electric and cordless lawn mowers, snowblowers, e-bikes and e-scooters. These batteries are typically larger than a cordless tool battery but smaller than an EV battery.

The program addresses growing safety concerns associated with improper battery disposal – particularly fires at recycling and waste facilities caused by lithium-ion batteries – while continuing Vermont’s leadership in solid waste management and environmental stewardship.

“For the safety of our solid waste workers, our communities and the environment, it’s critical that batteries are properly managed,” said Josh Kelly for the Vermont Agency of Natural Resources. “With the expansion of Vermont’s battery recycling program, safely recycling batteries is now easier than ever. Vermonters can recycle most single-use and rechargeable batteries up to 25 pounds – or 2,000 watt hours – at more than 100 convenient locations across the state.”

What the Expansion Includes

Under the expanded battery recycling program, the following batteries are now accepted:

- Most primary (single-use) batteries, including alkaline and lithium primary batteries
- Rechargeable batteries, such as lithium-ion, nickel-metal hydride, and sealed lead-acid batteries
- Batteries weighing up to 25 pounds or rated up to 2,000 watt hours
- More than 100 collection sites are available statewide at participating retailers, municipal facilities, and other approved locations.

ERI and ITOCHU collaborate to launch ERI Japan

ERI and ITOCHU will team up to bring state-of-the-art e-waste recycling and ITAD services to Japan at the first foreign location of ERI – "ERI Japan."

ERI, the U.S.'s leading material resource recovery, ITAD, mobility and data destruction/processing provider and largest recycler of electronics has announced a collaborative partnership with ITOCHU Corporation, a global trading and investment conglomerate engaged in domestic trading, import/export and overseas trading of various products, as well as business investment in Japan and overseas.

ERI and ITOCHU will team up to bring state-of-the-art e-waste recycling and ITAD services to Japan at the first foreign location of ERI – "ERI Japan." The venture, co-owned by ERI and ITOCHU (50 percent ownership for each organization, with ITOCHU's investment made through its wholly owned subsidiary, Belong Inc.), will incorporate best practices from both organizations, including ERI's innovation-driven circular solutions for responsibly recycling electronics and the networks of the ITOCHU Group and its partners in Japan and overseas.

"It's an honor to partner with this storied, 150+ year Japanese brand for this first-of-its-kind venture," said John Shegerian, ERI's chairman and chief executive officer. "ITOCHU and ERI working together signals a unique, unprecedented partnership that will bring best sustainability and circularity practices from North America and Asia together as a unified front. Our work will be done in a radically transparent, end-to-end closed loop manner where materials will be kept out of landfills, responsibly recycled and put back into the circular economy to produce new products in Japan. We are incredibly excited and honored to be entering into this strategic partnership with our future-minded friends at ITOCHU."

With eight locations in the United States, ERI's strengths lie in its ability to provide circular solutions ranging from data destruction and the advanced shredding of end-of-life IT equipment to remarketing, recycling, logistics and regulatory compliance services. In addition to its achievement of highly transparent chain of custody management ensuring the tracking of each IT asset using proprietary software, ERI also possesses technologies leveraging AI image recognition and robotic arms to automatically and accurately sort shredded materials.

Since its establishment, ERI has recycled more than 2.5 billion pounds of e-waste in the U.S., and it has contributed significantly to the realization of a circular economy. While ERI has stringently audited ITAD and recycling partners in over 140 countries, this new venture with ITOCHU is ERI's first owned and ERI-branded location outside the United States.

ERI Japan is scheduled to begin doing business later in 2026.

Redwood expands into San Francisco

Redwood recycled over 20 GWh of lithium-ion batteries in 2025 – the equivalent of about 250,000 electric vehicles.

Redwood has now opened the first lithium source and nickel "mine" in the U.S. in over a decade and began construction on what will be the first U.S. commercial cathode facility. With Battery Materials Campuses underway in Nevada and South Carolina, and production scaling rapidly, their next chapter is focused on deepening technical innovation to support their growth.

Redwood has announced the opening of a new research and development center in the heart of San Francisco. This facility will mark Redwood's first footprint in the Bay Area and a major milestone in their continued growth as they scale their engineering capabilities to meet the demands of an accelerating energy transition.

This 15,000 sq.ft. facility, located in the Design District, will be equipped with state-of-the-art lab spaces to support innovation across the battery ecosystem, including cathode production, and future product lines.

EQUIPMENT SPOTLIGHT

Size Reduction Equipment

by MARY M. THORNTON
maryt@americanrecycler.com

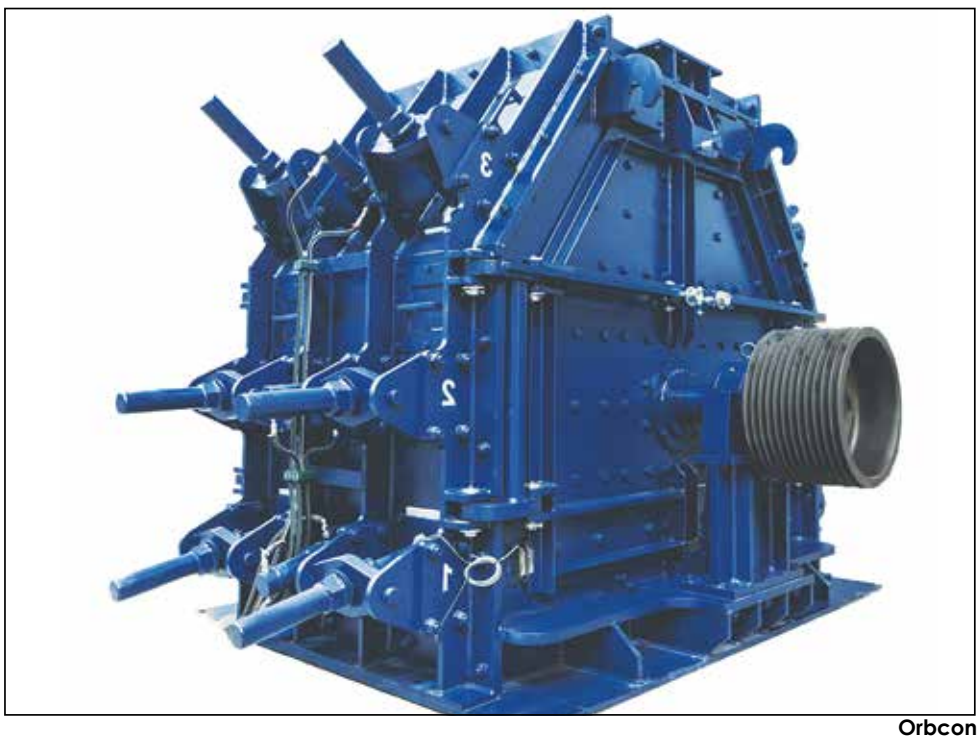
The volume of global e-waste generated shows no sign of slowing and raw materials retrieved via recycling can take the place of virgin material that would otherwise be needed for production supply. Manufacturers have detailed below, some of the products available to aid in e-waste recycling.

The ELDAN Heavy Duty Granulator (HDG) is modified for recycling tough material, including electrical waste such as ASCR cables, low-grade cables with some impurities – as well as nonferrous metals, refrigerators, industrial waste and more. The product's new knife system with integrated rotary knives/knife holders with a rotor provides a solid foundation for the resistance required when processing heavy objects. The knives are straight, can be used on all four sides and grind materials easily. Friction clutches protect the machine from material overload and the belt drive involved ensures a simple transmission. The HDG also processes RDF well and can produce 20 mm material size. The HDG performs well as a pre-chopper for these materials and other Cu or Al cables and can include various screen hole sizes down to 12mm and upwards, according to customer requirements.

A summary of HDG features includes: adjustable knife clearance, which optimizes the cutting function; product knives that can be reground multiple times on a "flat-bed" grinder, ensuring long life and low operation costs; the HDG design allows for the quick and easy change of knives and screens; the rotor is manufactured and designed for minimum wear with hardface welding; screens provide different hole sizes for flexible production; five pieces of screens per set are included and interchangeable, depending on wear and exchangeable wear parts "provide operators with a virtually indestructible machine," Carsten Nielsen, product manager, stated.

Orbcon, utilizing Prall-Tec's shredding platform, offers multiple types of size reduction technologies based on the application involved – electronics recycling, C&D recycling, glass, incinerator bottom ash, auto shred residue and metals in general. "We offer multiple types of size reduction technologies, including impact crushers, fine grinding mills, hammermills, dual shaft shredders and balling mills. Throughputs of our products extend from 6tph up to 400tph for impact crushers that process aggregate materials," explained Pedro Orbezo, managing director of Orbcon.

Orbezo mentioned that in order to achieve the best sorting of e-waste recyclables, employing a combination of two types of shredders is important to maximize recovery and quality of the products. "For example, for the processing of e-waste, the use of a dual shaft shredder as a primary shredding step helps us achieve a high throughput, low cost and decent liberation of electronics.



Orbcon

Eldan Recycling A/S

Once the material has been reduced to roughly a size of 3-4in., we employ our PTV Balling Mill technology. This is a versatile shredding step that allows us to further liberate, size reduce and separate the comingled recyclables.

"Depending upon the configuration employed on the PTV, we are not only able to liberate comingled materials, but can also detach the insulation from the copper wires in one single step. Also, while doing so, the shape of the copper strands changes into a round and denser particle; this is crucial for further sorting steps. We see other higher-speed, more aggressive, shredding technologies that achieve similar results, however, the PTV is a high throughput, low-cost system that achieves the balling effect without compromising the recovery of metals, including precious metals, that other systems blast-off into powder."

Orbezo commented that customers prefer high throughput, low operating cost systems – whether they are processing electronic waste, scrap metal, auto shredder residue or aggregate materials. "It is fundamentally important to process materials at high capacity, with high liberation efficiency – and with a low operating cost. The versatility of the PTV allows us to achieve all these key metrics. It can be used to process other types of mixed materials, such as handpicked wire from a ferrous stream and mixed ICW products from sensor technology and even if some stainless waste is in the mix."

For nearly a century, Schutte Hammermill has been known for providing high quality size reduction equipment solutions. "Today, our RAS and DataKiller Pro models are state-of-the-art solutions designed to meet the rigorous demands involved in e-scrap processing, providing exceptional throughput and efficient, fast processing of large volumes of electronic scrap to below 2mm. This high-capacity production rate ensures that facilities with e-waste recycling needs can keep up with the exponential increase in material," said Chris Berardi, president of Schutte Hammermill.

According to Berardi, the RAS and DataKiller Pro models are multi-stage combination mills – the DataKiller Pro combining an industry-leading shredder atop a dual-stage hammer mill. The RAS is a stacked, dual-stage hammer mill – constructed to ensure long-lasting performance, even under the most demanding conditions. "This durability equals lower maintenance costs and reduced downtime. These machines also deliver precise, consistent particle size reduction, which creates value in two ways: by causing the e-waste to meet regulatory/industry data destruction requirements,

See Size Reduction Equipment, Page B5

MANUFACTURERS
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Sarah Lewey
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www.alleghenyshredders.com

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BHS-Sonthofen Inc.
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www.bhs-sonthofen.com

■ **Eldan Recycling A/S**
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Vecoplan
Matt Lowman
877-738-3241
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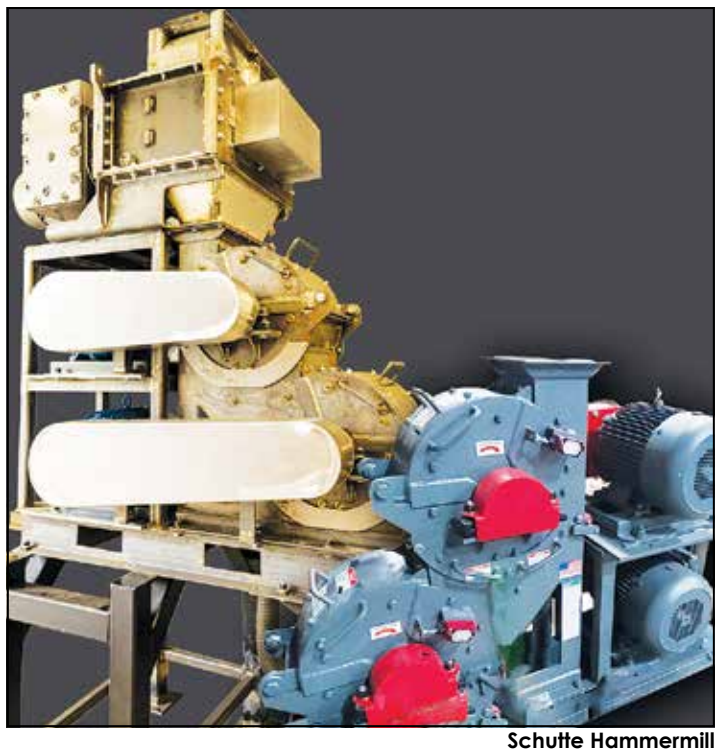
Size Reduction Equipment

■ Continued from Page B4

and by significantly enhancing downstream recovery rates of valuable metals and other materials."

Through advanced technology, the RAS and DataKiller Pro "help reduce the environmental impact of e-waste while ensuring that sensitive or hazardous materials are safely handled and valuable resources are recovered, aiding sustainability. In combining long-time technical precision and cutting-edge engineering, the RAS and DataKiller Pro can be invaluable assets for recycling facilities, data centers and other end users facing the growing e-waste problem while striving for environmental sustainability," Berardi said.


Schutte Hammermill

He also noted that as electronic devices become obsolete faster, it causes an increase in the challenges with electronics disposal. This trend necessitates advanced recycling solutions that can handle the intricate mix of metals, plastics and hazardous materials found in e-waste. Schutte Hammermill, with a reputation for manufacturing robust and reliable size reduction equipment, is ready to meet these challenges, head-on.

MAY

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PFAs Forum VI
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Bolton Landing, New York
www.nyfederation.org
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Tozero launches battery recycling demonstration plant

Tozero has launched its first industrial demonstration plant in Germany. This facility is capable of turning end-of-life batteries into domestic supplies of lithium, graphite and a nickel-cobalt mix at scale for the first time.

Located in Bavaria at Chemical Park Gendorf, the plant was established in a record six months and can process more than 1,500t of battery waste every year. From this waste, Tozero can produce high-purity lithium carbonate – the equivalent of saving 6,000 electric vehicles' worth of batteries from landfill – and recover graphite and nickel-cobalt mix at industrial scale. Thanks to Tozero's proprietary acid-free, hydrometallurgical process, this recycling takes place in a single, superior cycle and the recovered materials are fed directly back into manufacturing.

Tozero has already demonstrated successful qualification of its recycled lithium and graphite for lithium-ion batteries with leading cathode and anode manufacturers. Building on this, the company aims to close the battery materials loop and support Europe's ambition to achieve greater independence in critical raw materials. This aligns with the EU Critical Raw Materials Act, which calls for 25 percent of supply to come from recycling sources.

Tozero finally gives Europe a domestic source of critical materials – freeing it from its overwhelming dependence on Chinese imports. The facility will be used to deliver recycled lithium and graphite to companies across sectors including construction, ceramics, and lubricants.

"Europe doesn't yet have the critical raw materials it needs to build and scale its own energy transition and battery industry," said Sarah Fleischer, co-founder and chief executive officer of Tozero. "Our technology changes this by enabling us to recycle end-of-life batteries and extract these materials at industrial scale for the first time.

Following its success, the industrial demo plant will now form the blueprint for a full-scale commercial operation planned for 2030, capable of producing thousands of tonnes of lithium carbonate and graphite. It also forms a blueprint for Europe's ability to secure a sustainable and independent supply of the critical raw materials its growing battery industry needs.

Global demand for lithium is set to quadruple by 2030, while in the EU alone, graphite demand is expected to rise by up to 25 times by 2040, driven by EVs, grid-scale storage and industrial electrification. Yet Europe remains almost entirely reliant on imports – China controls global graphite supplies, and 99 percent of Europe's lithium comes from abroad. Ironically, Europe is sitting on a stockpile of the very materials it's scrambling to source in the growing number of end-of-life batteries, largely from Europe's growth in EVs, across the continent. It hasn't been possible to recover them effectively until now.

The projected exponential growth in material demand is expected to result in a global supply gap exceeding 33 percent from 2035 onward. As a result, battery recycling will become essential, emerging as a key alternative source of critical raw materials. Leveraging its breakthrough recycling process, Tozero enables this transition without a "green premium," instead delivering a "green discount." Positioned as a "miner of tomorrow," Tozero is on an accelerated path to help bridge the critical raw material supply gap sustainably.

Cirba Solutions celebrates 35 years of battery recycling

Cirba Solutions, a leader in battery recycling and critical minerals recovery, is celebrating 35 years of advancing responsible, safe and scalable battery recycling in North America.

Founded in 1991, the company has helped shape the modern battery recycling industry in North America – pioneering commercial scale lithium-ion processing and building one of the most comprehensive operational footprints coast-to-coast. As global battery demand accelerates, the company continues to strengthen domestic supply chains by focusing on the recovery and refinement of critical minerals required to support that growth.

Over its 35 year history, Cirba Solutions has achieved milestones that define its leadership in the industry:

- First company in the U.S. to process lithium-ion at a commercial scale.
- One of the only companies in the world to process lithium metal, used in the next generation of battery technology.
- The only battery recycler in the U.S. with an internal logistics fleet, ensuring end-to-end control, safety and compliance.

The company safely handles all battery chemistries and formats – including lithium-ion, lithium primary, alkaline, lead, and nickel-based batteries – serving automotive OEMs, retailers, gigafactories, data centers, municipalities and commercial enterprises.

Looking ahead, the company is strategically expanding its capabilities to meet the surging demand for battery-grade materials. Cirba Solutions is positioned to execute large-scale expansions that will produce battery-grade metal sulfates and lithium carbonate to support domestic battery manufacturing. To date, the company has:

- Increased processing capacity of end-of-life lithium-ion batteries and manufacturing scrap by 600 percent over the past few years.
- Invested more than $400 million into expanding capacity.
- Created new generational clean energy jobs across the country.

PyroGenesis confirms testing success with battery recycler

PyroGenesis Inc., a leader in ultra-high temperature processes and engineering innovation, reported the successful results of a primary testing campaign with a leading battery recycler.

PyroGenesis signed a contract with a company engaged in large-scale battery recycling, to test PyroGenesis' high-temperature plasma as part of the client's material recovery and new battery production process. The client's research and development has proven the recovery potential of key minerals (such as nickel, cobalt, copper and oxides such as lithium) from batteries. It was stated that the testing agreement had a timeline target of Q4 2025 to Q1 2026. PyroGenesis confirms the success of the primary testing phase.

The tests were witnessed by a team of client engineers at PyroGenesis' facilities. These tests confirmed the anticipated outcomes from using plasma in their specific application.

There may be a subsequent testing phase required which, if needed, would be expected to occur before the end of Q2 2026. The client's ultimate goal would be to purchase an initial 1 MW plasma torch system, followed by a subsequent purchase of 5 x 1 MW plasma torch systems or 1 x 5 MW plasma torch systems. The client has indicated a potential need for multiple 5 MW plasma torch systems. There is no certainty as to if, and when, further tests may be required, nor if any future plasma torch systems would ever be purchased.

Project Highlights

- Purpose – Using plasma to replace fossil fuel heating during lithium-ion battery recycling
- Scope – Confirmation after primary testing that PyroGenesis' plasma technology for superheating materials as part of the process to recover cathode or anode materials from batteries, is a viable option. Subsequent testing may occur towards scaling up to the potential purchase of (i) an initial 1 MW plasma torch system, followed by (ii) five 1 MW plasma systems or one 5 MW plasma torch system
- Timeline – Additional testing and go/no-go decisions toward scale-up to be completed by end of Q2 2026
- Strategic Impact – Supports end customer goals to achieve all-electric operations, to increase competitiveness against overseas manufacturers; for a cleaner, more sustainable supply chain for reusable battery material, reducing the reliance on new mining activities; and to provide a second life for batteries which, when retired, can have years of usable capacity left or be disassembled for material recovery. With the demand for lithium-ion batteries rapidly increasing, the volume of end-of-life lithium-ion batteries is expected to reach 20.5 million tons by 2040 from 900 thousand tons in 2025, growing at an annual rate of 25 percent. This emphasizes the need for effective recycling and repurposing strategies.

"As global electrification accelerates and the first major wave of large lithium-ion batteries approaches retirement, the test results we announced today confirm that plasma may be a valuable component in the manufacturing lifecycle as the focus shifts from battery production to complete battery lifecycle management," said P. Peter Pascali, president and chief executive officer of PyroGenesis. "The long-term sustainability and economics of the battery sector will increasingly depend on scalable, closed-loop recovery systems, capable of repurposing high-value minerals into new battery manufacturing. By deploying advanced technologies that include PyroGenesis' proven electric-based plasma torch systems, companies like our client are helping transform end-of-life batteries from a waste challenge into a strategic resource. In doing so, they enable battery manufacturers to reduce exposure to commodity price volatility and supply chain constraints."

Battery recycler, Ascend Elements files Chapter 11 Bankruptcy

Battery recycler, Ascend Elements, which operates a major facility about 35 miles east of Atlanta, has filed for bankruptcy, making it the latest company in the electric vehicle and clean energy supply chain to struggle with financial strain under president Donald Trump's administration.

The company filed for Chapter 11 protection in the Southern District of Texas. In a supporting declaration, chief executive officer Linh Austin disclosed that Ascend carries $103.5 million in long-term debt.

Ascend Elements said the filing is intended to help secure long term financial stability. The move follows persistent liabilities and structural challenges that could not be resolved through cost-cutting efforts or new financing.

Despite citing more than $2 billion in commercial agreements and $320 million in government funding tied to Poland, the company acknowledged these measures were not enough to sustain liquidity.

Operations are expected to continue as normal throughout the restructuring process. Existing customer agreements – including a purchase deal with Trafigura – will remain in place.

Its Covington, Georgia facility has already reached commercial scale production and, since 2025, has been producing lithium carbonate with purity exceeding 99 percent. Additional projects in Kentucky and Poland are in development, though the capital-intensive nature of these expansions has added further pressure to the company's finances.

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