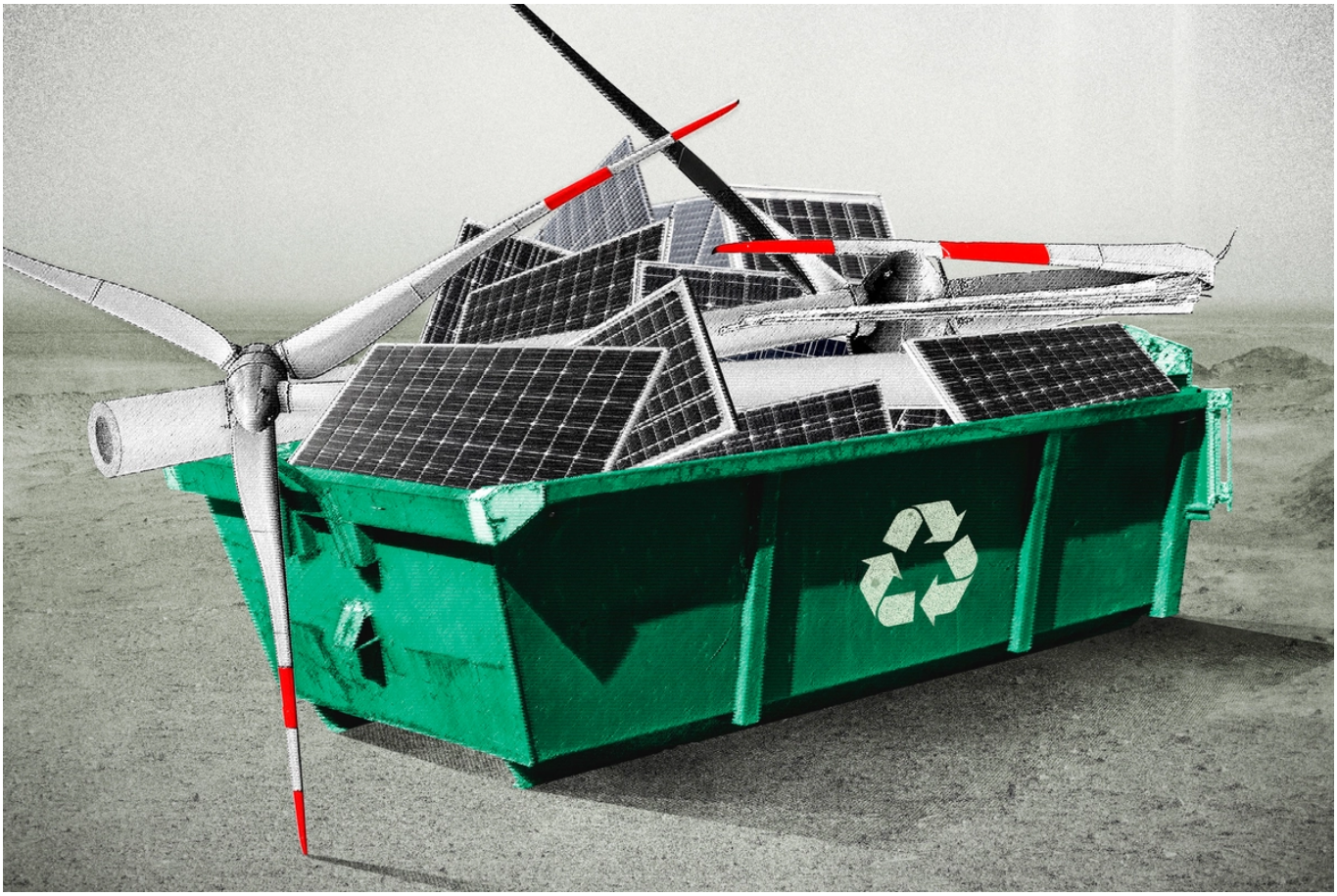
PREMIUM REPORTS

Green Energy Waste Overlooked in Climate Agenda

Where do the mountains of broken solar panels and wind turbine blades end up?



(Illustration by The Epoch Times, Shutterstock)

By Autumn Spredemann | January 04, 2024 Updated: January 05, 2024

The amount of waste piling up from solar panels and wind turbine blades can be measured in tons. And the industry is just getting started.

Almost all spent solar panels in the United States end up in landfills, and many first- and second-generation panels are already tapping out, well ahead of their anticipated 30-year lifespan.

Added to that will be an estimated 9.8 million metric tons of dead panels to deal with between 2030 and 2060, according to a study published in Science Direct.

Tossing a solar panel into a U.S. landfill currently costs about $1, maybe $2. To recycle that same panel, the cost balloons to $20 to $30, according to an estimate reported by PV Magazine.

Wind turbine parts present a similar challenge, with thousands of blades having already found their way into dumps and fields in Texas, Wyoming, South Dakota, and Iowa.

Currently, about 7,000 wind turbine blades are scrapped per year in the United States, according to David Morgan, chief strategy officer for Carbon Rivers.

It's no small feat to dump a blade. The length of a single wind turbine blade can be more than 200 feet or longer than the wingspan of a Boeing 747, according to the Department of Energy. Offshore wind rigs are even larger.

Currently, about 7,000 blades are scrapped per year in the United States, according to David Morgan, chief strategy officer for Carbon Rivers, a Tennessee-based recycling center for advanced materials.

Of all the glass fiber waste that Carbon Rivers receives, wind turbine blades are the most challenging, Mr. Morgan said.

"They're a very hardy, robust material. They're large and cumbersome to deal with," he told The Epoch Times.

"Large wind turbine blades, travel trailers, boat hulls, and other waste streams can be converted into clean, high-quality glass fiber that can be economically reincorporated into your next car, boat, or turbine blade," the Carbon Rivers website states.

As wind turbine graveyards have turned into viral video content, the wind industry has become more "conversational" about end-of-life solutions, Mr. Morgan said, but it's not set up for a "composite circular economy."

In an aerial view, discarded wind turbine blades are seen in a field next to the Sweetwater Cemetery in Sweetwater, Texas, on Oct. 4, 2023. (Brandon Bell/Getty Images)

When it comes to truly "green" solutions, a "circular economy" is vital, Mr. Morgan said. It's basically a business model that prioritizes the

reuse, repair, or regeneration of materials to continue production in as sustainable a way as possible.

He said renewable waste isn't just an infrastructure problem, there are also legislation gaps.

"Right now, you can largely landfill wind blades. It varies state by state."

Some companies backing wind energy—particularly those tied to fossil fuel giants such as Shell Global and General Electric—have left critics dubious about whether true sustainability is part of the existing plan.

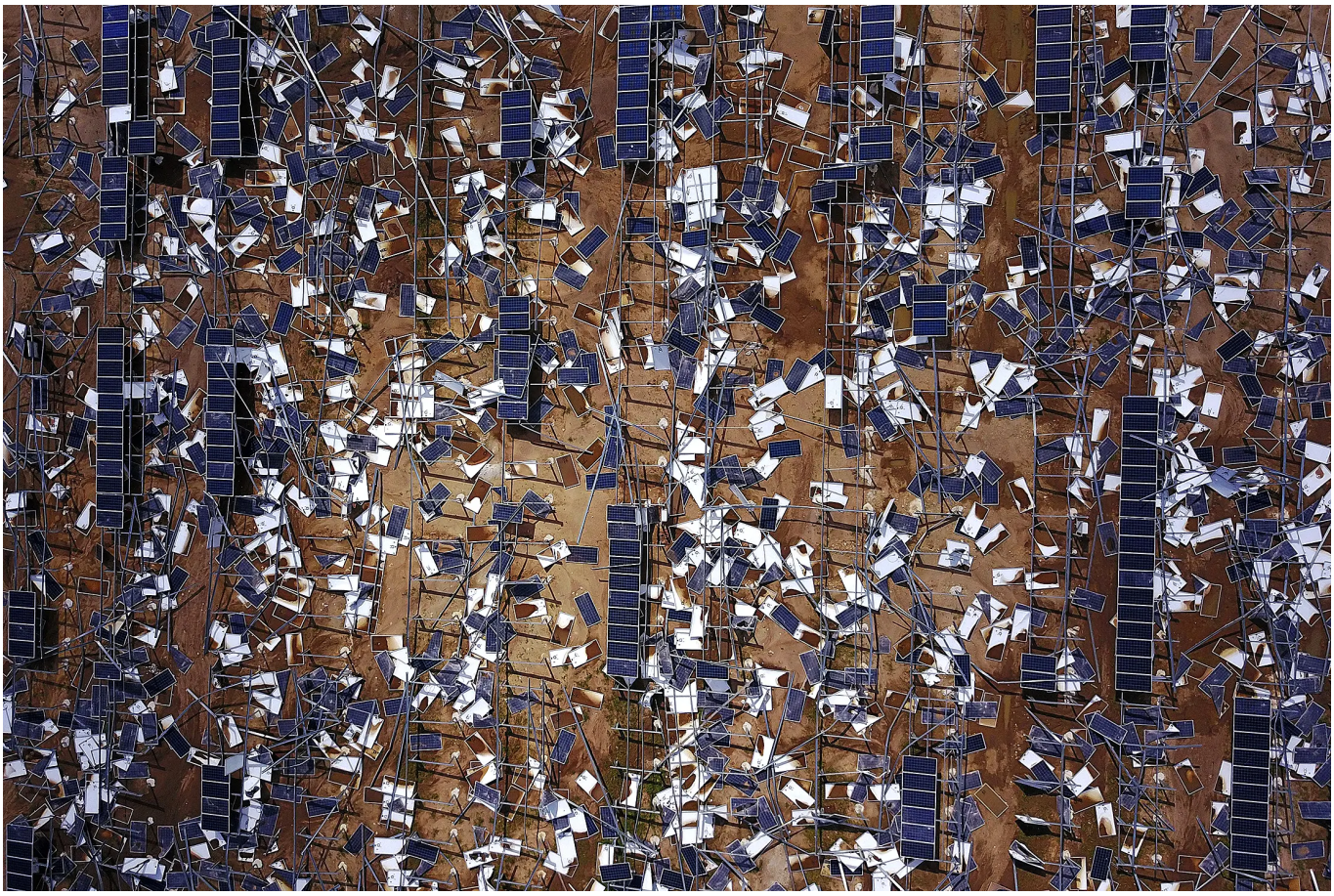
The U.S. Environmental Protection Agency (EPA), under former President Donald Trump, identified the looming problems with increasing renewable energy waste.

"Without a strategy for their end-of-life management, so-called green technologies like solar panels, electric vehicle batteries, and windmills will ultimately place the same unintended burdens on our planet and economy as traditional commodities," former EPA administrator Andrew Wheeler said.

Expanding Industry

As the so-called renewable energy industry expands—largely because of massive subsidies from the Biden administration—so does the waste on the back end.

Solar generation capacity is forecast to increase by more than 38 percent in 2024, according to a Dec. 12 report by the Energy Information Administration (EIA), a U.S. government agency. Wind energy capacity is forecast to increase by 4.4 percent.



Solar panel debris is seen scattered in a solar farm in the aftermath of Hurricane Maria in Humacao, Puerto Rico, on Oct. 2, 2017. (Ricardo Arduengo/AFP via Getty Images)

Despite this notable surge in deployment of renewable energy systems, America's electric generation in 2022 was primarily (about 60 percent) from fossil fuels—coal, natural gas, petroleum, and other gases, according to the EIA.

Renewable energy sources accounted for about 21 percent and 18 percent was from nuclear energy. An additional fraction was from small-scale solar systems.

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Powered by 100 Percent Renewable Energy? Unlikely

Solar panels have a life span of up to 30 years. Understandably, some environmental organizations are raising the alarm.

"If solar and nuclear produce the same amount of electricity over the next 25 years that nuclear produced in 2016, and the wastes are stacked on football fields, the nuclear waste would reach the height of the Leaning Tower of Pisa," California-based Environmental Progress states.

"The solar waste would reach the height of two Mt. Everests."

The number of retired wind turbine blades is expected to reach 9,000 per year over the next five years, according to a 2022 analysis published by Chemical and Engineering News.

Mr. Morgan said he's keeping pace with the inbound waste for now and the company is scaling up operations, including construction of a large-scale facility in Texas. Carbon Rivers has also broadened its scope into anything "composite-based," including glass fiber and even aerospace parts.

E-Waste

Another area of waste—electronic waste, commonly known as e-waste—is growing at an exponential rate. It's the fastest-growing solid waste stream in the world and includes renewable items such as solar panels and electric vehicle (EV) batteries.

Only a small portion is being recycled.

One analysis from 2019 released this year showed that of the 53.6 million tons of e-waste produced globally, barely 17 percent was recycled.

"People think plastic is the waste boogeyman ... but e-waste is still growing," Paul Williams, vice president of communications for recycling company ERI, told The Epoch Times.

Focused on breaking down and recycling all kinds of e-waste, Mr. Williams said ERI maintains a “military grade” level of data destruction when it comes to electronics.

Privacy protection is a huge concern with e-waste.

A man walks by an auto scrap yard on the waterfront in the Sunset Park neighborhood of Brooklyn in New York City on Oct. 4, 2016. (Spencer Platt/Getty Images)

“It becomes not just an environmental issue, not just a human rights issue, it’s also a cyber security issue. A lot of technology today contains private data,” he said.

In the early days of e-waste disposal, negligent companies handled e-waste in a way that left the door wide open to data theft.

"What we found were these unscrupulous types were just shipping this stuff to developing nations ... and it was a huge privacy challenge because of the data," Mr. Williams said.

Data security preparations must also be made for EVs, and not just their potentially volatile batteries, but also for the onboard computers in EVs when they reach the end of their life.

“Cars are particularly scary because the type of data that is captured is very personal. It knows your routes, the weight, and sizes of the people sitting in the seats of the car,” he said. “It’s kind of scary to think about.”

While ERI isn’t seeing a lot of solar panels or EV-related battery waste just yet, Mr. Williams said they’re ready for it.

“They will ultimately come to our door. We don’t turn any e-waste away.”

He said great strides have been made in the past two decades regarding the public’s disposal of e-waste.

In the early 2000s, when ERI was first getting started, Mr. Williams says everyone had “old TVs in their garage or attic. People didn’t know what to do with them.”

The same goes for the younger generations with retired cellphones. But he says attitudes have changed over the past 10 to 15 years, and much of that has to do with the data security challenges involved with e-waste.

A sign displays recyclable items at an 'e-waste' drop-off location inside a Staples store in Mount Prospect, Ill., on Sept. 29, 2005. (Tim Boyle/Getty Images)

Mr. Williams isn't daunted by the coming influx of solar panels and EV components.

"Even with lithium-ion batteries and solar panels, they aren't the last mile. We know there will be something new at some point."

He said transparency has been an issue with companies claiming to recycle e-waste in years past, with some advertising eco-friendly solutions while secretly dumping their e-waste in landfills.

"The most important thing, really, is transparency. When ERI started, we were literally mounting cameras on our ceilings. Nothing goes to landfill when we work on it," Mr. Williams said.

Domino Effect

Recycling dead solar panels, EV batteries, and wind turbine parts are major components of the waste problem, but supportive

infrastructure is also impacted as alternative energy production ramps up.

Chief among this infrastructure are electrical transformers, which industry insiders say there's a skyrocketing demand for both new and reconditioned units.

The wait for a new transformer is months, or even a year, says Clayton Saunderson, director of inventory and purchasing at Maddox Industrial Transformers, which reconditions transformers.

Reconditioning and returning existing units from solar farms have become an integral part of Maddox's business, Mr. Saunderson told The Epoch Times.

A worker at Fortech presents metals recycled from electric car batteries in Cartago, Costa Rica, on Feb. 20, 2023. (Ezequiel Becerra/AFP via Getty Images)

"We buy from pretty much anyone and everyone. There's enormous demand," he said.

Right now, demand for transformers is exceeding supply, including within the renewables sector, Mr. Saunderson said.

“Doesn’t matter what segment you’re in. It’s really hard to get a transformer quickly ... If you have an existing project and you have a failure, a lot of times you can’t wait 50 weeks,” he said.

Maddox’s turnaround time on a reconditioned transformer is one to four weeks.

He said renewable energy farms tend to run their transformers “pretty hard,” causing them to wear down faster.

The wait for a new electrical transformer is months, or even a year, says Clayton Saunderson, director of inventory and purchasing at Maddox Industrial Transformers.

Refurbishing an existing transformer is the quickest option, while recycling is a lengthier, more intensive process requiring more time and logistics to make its way back into the circular economy.

“We’re able to take a product [and] bring it back to life to keep it from being disassembled or sent to a recycling facility,” he said.

But the EV industry demand is stretching resources even thinner.

“In the EV segment, there’s a battle for EV chargers [stations],” Mr. Saunderson said, saying this additional competition for transformers needed to power EV charging stations “hamstrings” the ability to get ahead of the shortage.

“It’s going to be more and more difficult to get product on the shelf,“ he said. ”We’re seeing tremendous growth. It’s higher than it’s ever been.”

Hazardous Material

New battery technology, especially the lithium-ions that run EVs, bring a new set of challenges and toxic chemicals to the recycling business.

“Things like nickel are carcinogenic. You don’t want that ending up in a landfill,” Marcus Randolph, CEO of battery recycler Ecobat, told The Epoch Times.

From a waste management standpoint, there’s a silver lining when it comes to processing EV batteries, according to Mr. Randolph. In spite of the complex composition of EV batteries, he believes recycling will be the “clear winner” in the long run due to the short supply of key elements, such as cobalt, used in their construction.

He says the value of the minerals recovered as “black mass” from retired batteries is far too valuable to simply dump in a landfill.

'Black mass' containing rare minerals is obtained by crushing used batteries at Lithion's battery recycling plant in Montreal, Quebec, on Jan. 17, 2023. (Mathiew Leiser/AFP via Getty Images)

It's also incredibly hazardous.

"We can't keep throwing hazardous materials in landfills. And you're talking to a mining engineer," Mr. Randolph said.

However, it doesn't make EV batteries any less challenging to break down.

"We stood back and said, you know, lithium batteries are our greatest threat and our greatest opportunity," he said, adding that lithium-based batteries are "a lot more complex."

Moreover, they can start fires that are impossible to extinguish through traditional methods. Mr. Randolph said that since oxygen isn't part of the combustion equation with lithium batteries, water and some conventional suppression methods won't work.

This becomes particularly dangerous when more than one cell in a compromised battery ignites, creating what's known as "thermal runaway."

Baltimore County Fire Bureau Chief Tim Rostkowski told 11 News Investigates that when lithium-ion batteries go into thermal runaway, "they will generate their own heat, and they will propagate, or they will move from cell to cell to cell to cell. These batteries can get over 1,000 degrees.

"If we don't cool it down quick enough, and for a long enough period of time, it will generate heat and catch itself back on fire."