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Can Malaysia `mine` precious metals from waste?

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CAN MALAYSIA 'MINE' PRECIOUS METALS FROM WASTE?

There is a global movement to recycle used electric vehicle batteries and solar panels, and extract the precious metals, which are viewed as critical raw materials in the energy transition. Industry players are also keen to turn this into a new industry in Malaysia, but challenges remain. P68



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Sashi Ambihapahan, director of corporate communications and sustainability at BMW Group Malaysia, has been searching for a circular economy solution for used electric vehicle (EV) batteries since 2019, when BMW EVs were first sold in the country.

The circular economy refers to a concept that keeps materials in the loop rather than letting them become waste.

In 2022, this culminated in a project that turned used EV batteries into portable vehicle chargers under the BMW Re:Generate initiative. Sashi wanted to push the agenda further. Could the company achieve full circularity in Malaysia by extracting precious metals from used EV batteries to be made into new ones?

Globally, the BMW Group had already been investing in a closed-loop recycling system for its EV batteries with selected partners. Bringing this system to Malaysia could promote local EV battery manufacturing and make the country a hub for recycled precious metals.

There was, however, a lack of local recyclers with the capability — and sufficient volume of used EV batteries — to complete

the recycling process, down to the extraction of precious metals from the battery cell.

At the moment, BMW Malaysia collects used EV batteries, which are a scheduled waste under the waste code SW103, from its service centres every six months, and sends them to a partner licensed waste facility.

The other components of the battery pack, comprising plastic and metals, are removed for recycling, while the battery cell — made up of the cathode and anode — is ground into powder. This by-product, called “black mass”, is the most valuable part of the battery, as it contains the precious metals lithium, nickel and cobalt. The black mass is currently exported to refineries abroad.

“Moving forward, we want to see whether we can find partners who can do the last process [of transforming the black mass] and keep the batteries within the country ... [Most recyclers] stop at grinding down



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Sashi, BMW Group Malaysia

the batteries to black mass, then they take it to another country, where the last process is to break it down to the original elements,” says Sashi.

“I think there are a lot of opportunities here. We are encouraging battery manufacturers to come to Malaysia. This (recycling of EV batteries) has to happen concurrently as well. Then there is a facility for recycling and production of batteries, which will enhance the supplier network.”

Black mass is increasingly seen as a sustainable source of critical raw material globally, according to reports by S&P Global. China and South Korea are major importers and processors of black mass, with the former aiming to further relax import regulations for the material. Europe, meanwhile, recently reclassified black mass as hazardous waste to keep the critical material within the European economy.

Interestingly, there is a parallel movement by solar panel recyclers in Malaysia to extract silver, copper and silicon from used panels.

“Solar panels are large, heavy and come in large quantities, so they take up space in the landfills. Secondly, these materials can be recovered and reused, so why are you letting it sit there in the landfill when there is so much that can be done?” asks Austin Kuok, general manager of Zenviro Solar Panel Recycling Sdn Bhd.

The hurdles faced by this industry are even higher. There is a lack of clarity on the standard operating procedures for collecting and recycling the panels, which are considered e-waste under the code SW110 in Malaysia.

“We’ve only been able to take 5% to 10% of the waste we’ve been offered because of a number of factors, one being the uncertainty of regulations,” says Kuok.

“I think if the central goal of any mandatory scheme is to divert waste from landfills and making sure it goes to the right channels, you have to make sure there are no leakages and ensure the waste goes to people who can process it.”

Nor Azah Masrom, head of operational sustainability at Cypark Resources Bhd, says the company is exploring options for solar panel recycling and waiting for the government’s guidelines on solar panel end-of-life management, which are currently being developed and expected to be finalised by the end of the year.

As solar panels are large and heavy, it can be difficult finding sufficient storage space and transport options.

“If we send 5,000 panels to recyclers, we need around five 40ft trucks to carry and deliver them. That incurs cost,” says Nor Azah. Describing the scale of



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these projects, she explains that in a 500MW solar farm using panels with 700W capacity, up to one million solar panels are needed.

These trends are a natural progression in the energy transition, where critical materials such as silver and silicon in solar panels and lithium in EV batteries are sorely needed.

Yet at the same time, there are concerns about the negative social and environmental impacts of mining operations for these metals, which result in land degradation, extensive water usage and water contamination.

A truly sustainable energy transition would require such materials to be mined responsibly, and a circular economy would call for the repurposing of used products and extraction of precious metals from recycled products rather than the environment.

Some local industry players are eager for Malaysia to be a part of this transition and become a hub for recycled precious metals, which could support the growth of a local EV battery manufacturing industry as well.

Getting there, however, will require clearer guidelines, standards and urgency to take action, industry players tell ESG.

PREPARING FOR ONSLAUGHT OF WASTE

Based on the road maps and strategies for the country to achieve net zero emissions by 2050, huge amounts of EVs and solar panels must be deployed to reduce emissions from the mobility and energy sectors.

EV batteries tend to last for 15 to 20 years. According to data from the Road Transport Department Malaysia (JPJ) in April 2025, new EV registrations sharply increased to 15,669 in 2023, accounting for 5.6% of the total industry volume that year.

This means the first big batch of EV batteries may be retired by 2038. The number is expected to increase dramatically if Malaysia wants to achieve its target of EVs making up 80% of annual new vehicle sales by 2050.

Since 2000, a total of 69,371 EVs have been registered, according to JPJ.

Meanwhile, new solar panels generally last for 25 to 30 years. Malaysia introduced the Large Scale Solar (LSS) programme in 2016, and some of the projects were operational by 2018. This could mean the first large batch of solar panels will be retired by 2043. The number will increase over the years as the LSS programme is now in its fifth iteration.

The National Energy Transition Roadmap targets solar energy contributing 58% of the installed capacity mix by 2050, from less than 5% in 2020.

Industry players believe Malaysia should not wait for the waste to accumulate before taking action.

“We need time to prepare ... I don’t think it’s right for us to reach the 10-year mark and realise we’re nowhere close to establishing anything. It can be something we explore now, so we can have a facility in five to eight years,” says Sashi.

“EV batteries have a longer life span, but more plug-in hybrid vehicles are already coming into the market. These batteries are constantly being worked, so the battery life is shorter. Within eight years [from when we introduced plug-in hybrid vehicles], we already have around 8,000 batteries.”

In the case of solar panels, older or damaged panels are already being retired.

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BY TAN ZHAI YUN





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Scrap metal dealers take the aluminium frames from the used panels, but are unable to recycle the solar cells effectively, says Kuok. Some companies opt to export the used panels to less developed countries, but he is concerned this will result in waste being transferred to countries with no recycling capabilities.

SHOULD IT BE MANDATORY TO RECYCLE EV BATTERIES AND SOLAR PANELS?

Clearly, for Malaysia to become a hub for recycled precious metals, it must have local recyclers and refiners capable of running the necessary processes. On the other hand, for these companies to be financially viable, there must be sufficient feedstock as well as ready buyers for the recycled metals — which may opt for newly mined metals if they are cheaper.

There is another obstacle: while EV batteries and solar panels are scheduled waste that must be handled by licensed waste facilities in Malaysia, it is not mandatory for them to be recycled currently.

For solar panel owners, there is also a need for clearer guidelines on how the waste should be handled. E-waste that falls under code SW110 must be collected, transported and reported according to specific requirements.

"This can involve the installers and those who manage the LSS sites. You have to appoint a competent person and have proper documentation. You have to store the e-waste in a secure area," says Kuok, explaining that solar asset owners would have to incur additional costs for proper management of the waste.

There have been suggestions that solar panels be categorised separately from e-waste, as its main components are aluminium and glass.

"Singapore has a table of e-waste materials, where you have household appliances and other technologies. They have a category for just solar panels, so I think they

understand that it takes special [processes] to recycle this," says Kuok.

He does, however, acknowledge the Malaysian government's awareness of this problem.

The Minister of Natural Resources and Environmental Sustainability Nik Nazmi Nik Ahmad said guidelines for managing EV battery and solar panel waste were being prepared, and an extended-producer responsibility (EPR) system was being considered.

In addition, the Malaysia Automotive, Robotics and IoT Institute has spearheaded a Battery Passport initiative to track EV batteries.

Cypark's Nor Azah agrees that an EPR system much like Taiwan's could be considered, whereby fees paid by manufacturers or importers of solar panels to a central agency are used to subsidise collection and recycling costs.

"The cost to set up [the recycling facilities] is very expensive. If the government wants to make it mandatory for discarded solar panels to be sent to the facilities, they have to ensure there are more facilities in Malaysia," she says.

The recycling of EV batteries and solar panels are already being incentivised or mandated by countries such as Singapore, Australia, Japan and China, and those in the European Union (EU).

In Singapore, producers of electronic products have to pay a fee to a designated recycler, and retailers must collect the used electronic products and send them to the recycler.

The EU's Waste Electrical and Electronic Equipment Directive requires the separate

collection and proper treatment of e-waste, and sets targets for the recovery and reuse of e-waste and its extracted metals. After 2012, the cost of management and disposal of electronic equipment has been borne by manufacturers.

In China, the Provisional Measures on Recycling and Repurposing of EV Power Storage Batteries require EV manufacturers to collect and recycle used EV batteries via its network of recycling service centres.

If these models are considered for Malaysia, the fees charged on consumers and manufacturers must be practical and introduced gradually, those interviewed say.

"China has about 20 years of track record in this industry, and it's a very mature and competitive market. In Europe, more recyclers are going into this area as well. Every country has its own players. I think we need to pull attention [to these matters] so the government will help us a bit," says Jayden Goh, founder and CEO of EcoNiLi Battery New Energy Sdn Bhd, an Ipoh-based lithium battery recycler.

"I remember prior to 2015, most batteries in China were sent to landfills. In 2018, everyone knew the value and went back to dig up and recycle the batteries."

If Malaysia can extract the precious metals from used EV batteries, it could pave the way for the country to set up its own EV battery manufacturing plants, he believes.

"What happens if we rely on China to supply us with the critical raw materials? To build a battery supply chain, recycling is the first [step]."

Goh has been in the industry for around a decade. From 2014 to 2019, he worked in China with companies that recycled used lithium batteries from electronic gadgets. Later, he set up factories in Indonesia and

Spain to recycle lithium batteries, and a company in Singapore to trade in battery waste materials.

He returned to Malaysia in 2023 and set up two factories in Ipoh. One does the mechanical recycling of used lithium batteries while the other is a refinery that extracts precious metals from black mass.

The EcoNiLi factories are currently recycling mostly lithium batteries from electronic gadgets, and importing black mass from recyclers. After extraction, the lithium, cobalt and nickel are exported to China.

"Last year, we [extracted metals from] over 10,000 tonnes of black mass. Around 95% of the [metals can be successfully] extracted," he says.

Goh wants to expand the recycling effort to EV lithium batteries, and is currently engaging with the government on formulating relevant policies, such as a battery passport to trace the life cycle of EV batteries.

"What I see is that in the next five to eight years, we will have a lot of domestic EV batteries waiting to be recycled, and there must be someone who has a proper process to do the job," he says.

Most recyclers do not process the black mass because building a refinery capable of performing hydrometallurgy is capital intensive. The compliance cost in the recycling industry is also high, says Goh, which puts them at a disadvantage to illegal recyclers.

To support the EV battery recycling industry in Malaysia, Goh suggests that the government allow the import of used EV batteries.

"Last year, we broke even, but I don't think we can get our return on investment within three or four years if we cannot import. We need to be able to import [used EV batteries], and we need the government as our stakeholder so we can become a truly competitive global player," he says.



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