

Solar panels - an eco-disaster waiting to happen?

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Climate change



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By Daniel Gordon

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While they are being promoted around the world as a crucial weapon in reducing carbon emissions, solar panels have an average lifespan of 25-30 years.

Experts say billions of panels will eventually all need to be disposed of and replaced.

"The world has installed more than one terawatt of solar capacity. Ordinary solar panels have a capacity of about 400W, so if you count both rooftop and solar farms, there could be as many as 2.5 billion solar panels.," says Dr Rong Deng, an expert in solar panel recycling at the University of New South Wales in Australia.

According to the British government, there are tens of millions of solar panels in the UK. But the specialist infrastructure to scrap and recycle them is lacking.

Energy experts are calling for urgent government action to prevent a looming global environmental disaster.

"It's going to be a waste mountain by 2050, unless we get recycling chains going now," says Ute Collier, deputy director of the International Renewable Energy Agency.

"We're producing more and more solar panels - which is great - but how are we going to deal with the waste?" she asks.

It is hoped a major step will be taken at the end of June, when the world's first factory dedicated to fully recycling solar panels officially opens in France.

ROSI, the specialist solar recycling company which owns the facility, in the Alpine city of Grenoble, hopes eventually to be able to extract and re-use 99% of a unit's components.

As well as recycling the glass fronts and aluminium frames, the new factory can recover nearly all of the precious materials contained within the panels, such as silver and copper, which are typically some of the hardest materials to extract.

These rare materials can subsequently be recycled and reused to make new, more powerful, solar units.



Silver fragments recovered from solar panels, at the ROSI plant in Grenoble

Conventional methods of recycling solar panels recover most of the aluminium and glass - but ROSI says the glass, in particular, is of relatively low-quality.

The glass recovered using those methods can be used to create tiles, or in sandblasting - it can also be mixed with other materials to make asphalt - but it cannot be used in applications where high-grade glass is required, such as the production of new solar panels.

Boom period

The new ROSI plant will open during a boom period for solar panel installations.

The world's solar energy generation capacity grew by 22% in 2021. Around 13,000 photovoltaic (PV) solar panels are fitted in the UK every month - most of them on the roofs of private houses.

In many cases, solar units become relatively uneconomical before they reach the end of their expected lifespan. New, more efficient designs evolve at regular intervals, meaning it can prove cheaper to replace solar panels that are only 10 or 15 years old with updated versions.

If current growth trends are sustained, Ms Collier says, the volume of scrap solar panels could be huge.

"By 2030, we think we're going to have four million tonnes [of scrap] - which is still manageable - but by 2050, we could end up with more than 200 million tonnes globally."

To put that into perspective, the world currently produces a total of 400 million tonnes of plastic every year.

Recycling challenges

The reason there are so few facilities for recycling solar panels is because there has not been much waste to process and reuse until recently.

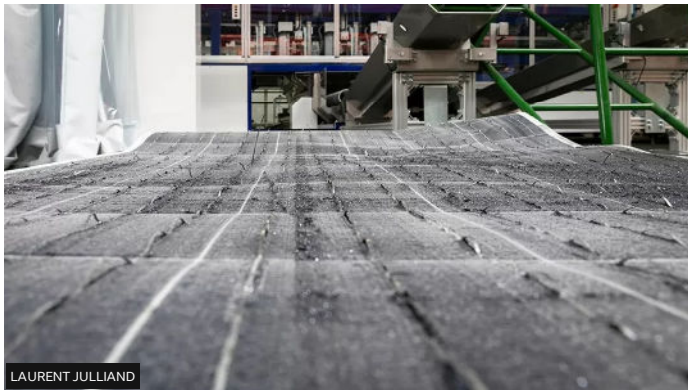
The first generation of domestic solar panels is only now coming to the end of its usable life. With those units now approaching retirement, experts say urgent action is needed.

"Now is the time to think about this," says Ms Collier.

France is already a leader among European nations when it comes to processing photovoltaic waste, says Nicolas Defrenne. His organisation, Soren, partners with ROSI and other firms, co-ordinating the decommissioning of solar panels all over France.

"The biggest one [we decommissioned] took three months," Mr Defrenne recalls.

His team at Soren has been experimenting with different ways of recycling what they collect: "We're throwing everything at the wall and seeing what sticks."



Solar panels are delaminated in order to recover precious materials

At ROSI's high-tech plant in Grenoble, the solar panels are painstakingly taken apart to recover the precious materials inside - such as copper, silicon and silver.

Each solar panel contains only tiny fragments of these precious materials and those fragments are so intertwined with other components that, until now, it has not been economically viable to separate them.

But because they are so valuable, extracting those precious materials efficiently could be a game-changer, says Mr Defrenne.

"Over 60% of the value is contained in 3% of the weight of the solar panels," he says.

The team at Soren are hopeful that, in the future, nearly three-quarters of the materials needed to make new solar panels - including silver - can be recovered from retired PV units and recycled - to help speed up production of new panels.

Currently there is not enough silver available to build the millions of solar panels which will be required in the the transition from fossil fuels, says Mr Defrenne: "You can see where you have a production bottleneck, it's silver."



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A lorry loaded with solar panels

Meanwhile British scientists have been trying to develop similar technology to ROSI.

Last year, researchers at the **University of Leicester** announced they had worked out how to extract silver from PV units using a form of saline.

But so far, ROSI is the only company in its field to have scaled up its operation to industrial levels.

Moreover, the technology is expensive. In Europe, importers or producers of solar panels are responsible for disposing of them when they become expendable. And many favour crushing or shredding the waste - which is far cheaper.

Mr Defrenne acknowledges that intensive recycling of solar panels is still in its infancy. Soren and its partners recycled just under 4,000 tonnes of French solar panels last year.

But there is potential to do a lot more. And he's making that his mission.

"The weight of all the new solar panels sold last year in France was 232,000 tonnes - so, by the time those wear out in 20 years, that's how much I'll need to collect every year.

"When that happens, my personal goal is to ensure France will be the technological leader of the world."