

What Happens to Old Solar Panels?



With a lifespan of 25-30 years, used solar panels are becoming an e-waste issue in the U.S. as new residential and commercial installations increase.

The benefits of using solar energy are many: It's **cheaper than any other form of energy** production, it taps into one of the universe's renewable energy sources, and many residential and commercial users get some or all of their investment back in the form of tax credits and other incentives.

As a whole, renewable energies like solar power **generate no greenhouse gas emissions (GHGs) from fossil fuels**, reduce certain types of air pollution, diversify our energy supply, lessen our dependence on imported fuels, and help create new jobs and other positive economic impacts.

Solar's Dark Side

Solar power also presents some potential downsides, namely that the large panels used to capture the sun's power and distribute it for use typically last about 25-30 years. Citing new research from BloombergNEF, the *Wall Street Journal* says this reality could result in millions of tons of junk panels by 2050.

Using BloombergNEF's numbers, that would mean solar panels installed in 1997 or earlier are now reaching their end-of-life. "Most [panels] in use today have many years of life left in them, and the few that are scrapped due to damage or age often end up in trash heaps," WSJ reports. "Experts say the small waste volumes mean it isn't yet profitable to harvest the glass, aluminum, copper, silicon, silver and lead from old panels, but the bottleneck expansion of solar power is expected to change that."

Hopefully those changes come sooner rather than later. According to WSJ, the global volume of solar-panel waste generated annually will rise from 30,000 metric tons in 2021 to more than 1 million tons in 2035 and more than 10 million tons in 2050. Up to 95% of the materials in a solar panel can be recycled using current technology.

The **International Renewable Energy Agency (IRENA)** estimates that the recovered materials could be worth \$450 million by 2030 and \$15 billion by 2050. IRENA also says that the cost of manufacturing solar panels has "plummeted dramatically" over the last 10 years, making them not only affordable but often the cheapest form of electricity. "Solar panels have a lifespan of roughly 30 years," IRENA points out, "and come in a variety of shades depending on the type of material used in manufacturing."

Addressing the Issue Head-On

In *The Dark Side of Solar Power*, Harvard Business Review reports that the use of residential solar power is expected to quadruple over the next 10 years, and that the prediction doesn't factor in the impact of possible new regulations and incentives launched by the current presidential administration.

The problem, it says, is that economic incentives may encourage solar users to trade their existing panels for newer, cheaper and more efficient models. "In an industry where circularity solutions such as recycling remain woefully inadequate," HBR states, "the sheer volume of discarded panels will soon pose a risk of existentially damaging proportions."

Using its own modeling, HBR worked out that the solar panel replacement cycles may produce 50 times more waste within just four years (versus what IRENA anticipates). “That figure translates to around 315,000 metric tonnes of waste, based on an estimate of 90 tonnes per MW weight-to-power ratio,” HBR notes.

“Alarming as they are, these stats may not do full justice to the crisis, as our analysis is restricted to residential installations,” the publication continues. “With commercial and industrial panels added to the picture, the scale of replacements could be much, much larger.”

Reducing Solar Trash

Recognizing that waste from end-of-life solar panels presents opportunities to recover valuable materials and create jobs through recycling, the [EPA](#) says that diverting solar panels from landfills to recycling “saves space in landfills in addition to capturing the value of the raw materials.”

For example, glass composes most of the weight of a solar panel (about 75%), and glass recycling is already a well-established industry, the EPA points out. Other materials that are easily recyclable include the aluminum frame, copper wire, and plastic junction box. Ideally, the EPA says a solar panel recycling system would recover as much material from the panels and look something like this:

1. Removal of the frame and junction box
2. Separation of the glass and the silicon wafer through thermal, mechanical or chemical processes
3. Separation and purification of the silicon cells and specialty metals (e.g., silver, tin, lead, copper) through chemical and electrical techniques.

Acknowledging that the solar panel recycling industry is “new and still growing,” the EPA says researchers are examining how to commercialize recycling to economically recover most of the components of a solar panel. “Elements of this recycling process can be found in the US,” it adds, “but it is not yet happening on a large scale.”

Panel reuse could also help keep solar panels out of landfills, but the infrastructure and regulations aren’t in place yet on this front. “The secondary market has not yet gained traction in the US,” the EPA reports, “and regulatory considerations include electrical grid interconnection regulations, and fire, building and electrical codes that must be examined when planning for solar panel reuse.”

