

Implementing Sustainable Solutions in Türkiye: Addressing Solar Panel Waste Management for a Green Future

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Circularity and waste management are crucial aspects in the lifecycle of products, and solar panels, albeit they have 25-30 year life time, are not the exception. As the utilization of solar panels continues to grow, it becomes imperative to establish effective systems for their end-of-life management. Circular economy principles [A new Circular Economy Action Plan For a cleaner and more competitive Europe,2020] can play a significant role in ensuring the sustainability and responsible disposal of solar panels.

Solar panels are composed of various materials like glass, silicon, metals (Ag, Al, Pb,Cd,Sb), and plastics. These materials can be repaired or recycled, reducing the environmental impact associated with their disposal. Through proper recycling processes, valuable components can be extracted and reused in the production of new solar panels, reducing the need for raw materials. By applying circularity principles, the environmental footprint of solar panels can be minimized, mitigating the impact of their production and disposal.

However, the global waste management of solar panels still faces challenges (Heath,G.A et al. 2020). In Europe, photovoltaic module recycling was authorised through the Waste Electrical and Electronic Equipment (WEEE) Directive 2012/19/EU since 2021. Despite, recycling infrastructure and policies for solar panels are not well-developed in many countries, like Türkiye, leading to a significant amount of waste being sent to landfills or incineration facilities. This can result in the release of harmful substances into the environment and the loss of valuable resources. Türkiye's installed solar energy capacity was 9.43 GW by the end of 2022 (Solarist,2022). Ministry of Energy and Natural Sources (ETKB) predicts installed photovoltaic capacity of the country will reach 53 GW by the end of 2035 (ETKB,2020). IRENA claims that considerable waste volumes of end-of-life PV panels will result by 2030. It is essential for governments, manufacturers, and stakeholders to work together to establish effective collection, recycling, or reusing systems to minimize the waste generated by solar panels and ensure their proper management.

In conclusion, circularity and waste management are critical considerations for the sustainable development of the solar industry (PV CYCLE,2018). Improving reuse is critical from an energy perspective, because recycling destroys most of the embedded energy of products. Establishing robust recycling and repair systems for solar panels can contribute to reducing waste, conserving resources, and minimizing the environmental impact of these vital renewable energy technologies. Collaboration among all stakeholders is necessary to ensure a circular and responsible approach to solar panel lifecycle management.

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