

# Sustainable Energy: Recycling Renewables

Just as sustainability is at the heart of our industry, circular-economy principles are central to the Canadian Renewable Energy Association (CanREA). This series of factsheets on Recycling and Renewables examines the current recycling options for wind energy, solar energy and energy-storage technologies in Canada, and points the way for the future.



## Recycling Solar Panels in Canada

**Recycling and renewables go hand in hand. But what happens to renewable-energy components when they reach the end of their life span? This CanREA fact sheet examines the current recycling options for solar panels in Canada.**

### Powering up solar

In just about every corner of the world, solar photovoltaic (PV) energy is emerging as a reliable, sustainable and scalable solution for low-cost electricity, powering everything from single-family dwellings in remote communities to massive power plants serving the world's largest cities.

Canada's solar-power industry is developing a full life-cycle approach, aiming not only to eliminate the carbon emissions of fossil-fuel electricity generation, but also to reduce waste in solar panel manufacturing, and in their end-of-life processes as well.

### Giving panels new life

Solar power systems are typically designed with a life span of 25 years. Performance often outshines these expectations, and there are also significant re-powering opportunities thanks to accelerating technological advances.

But eventually, older panels may need to be replaced with new, higher-performing modules. In many cases, used solar panels can be sold for a significant portion of their initial value.

Likewise, solar panels that are damaged during shipping, installation and service, or by extreme weather events such as hailstorms or tornados, can be repaired, and re-sold after a proper safety inspection. This second-hand market serves an important purpose, as they are useful for sites that aren't necessarily looking for the newest technology.

### Solar panels are 90% recyclable by mass

A solar-power plant is comprised of several key components:

- Power-management equipment, such as transformers, power inverters and power-collection systems (wiring, control panels, conduits, etc.)

- Mounting system for the panels
- Solar modules ("panels") grouped into arrays
- An energy-storage device, such as lithium-ion batteries, may also be part of the system.

These components can be reused, refurbished or upcycled at the end of their life, and eventually, they can be recycled.

Solar power systems consist of recyclable materials, including copper (cabling), aluminum (racking), steel (posts), glass and electronic components. There are also precious metals, such as silver, but the proportion of these materials has been greatly reduced over the past few years, contributing to solar's significant cost-reduction.

Once the glass and metal have been channelled into well established recycling processes, there is very little mass remaining that requires special treatment.

There are several recycling methods for the solar panels themselves, including disassembly and shredding.

### Canadian ingenuity

As popular support grows for circular-economy principles, there is an increased focus on ways to divert all forms of waste from landfills, and the renewable energy sector is no exception.

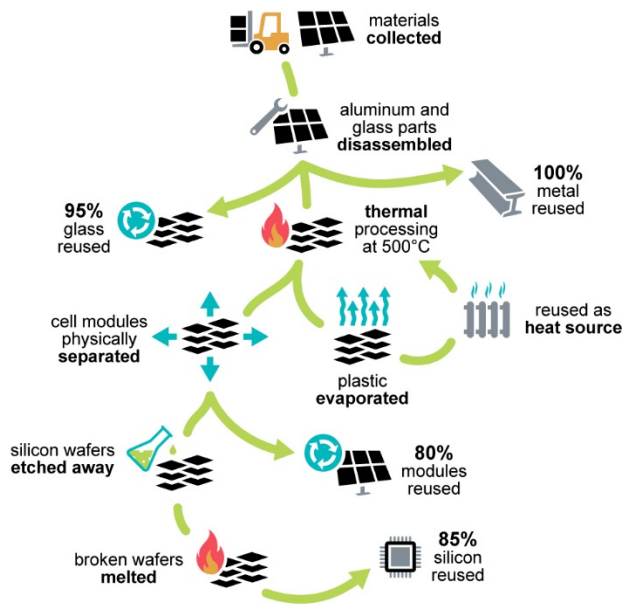
Canada's transition to non-emitting energy is expected to greatly increase the need for solar panels and other renewable energy technologies.

The disposal of solar panels is at a low volume today, but this will ramp up in the future, providing greater feed stocks for recycling processes. Plans are already being put into place to handle the increase.

Innovators are rapidly developing solutions to the sustainability challenges being faced across many sectors. They are stepping up today to manage our future needs.

Delivering these solutions will require a collaborative effort between the solar-power industry, the recycling sector, manufacturing, clean-tech, and governments at every level. Logistics and transportation will also play a significant role, given Canada’s vast landmass.

### Recycling process for solar panels (silicon based)



### Think globally

To put solar waste into perspective, the United Nations Environment Programme estimates that 50 million metric tons of electronic waste (such as computers, televisions and cell phones) are produced annually around the globe. Of this, solar PV represents only 0.5%, or about 250,000 tons annually, according to a [2016 IEA report](#).

As this stream keeps growing, the industry is anticipating the need and ramping up its capability to recover waste materials for re-use, not just for sustainability reasons but for the economic opportunity presented by each decommissioned component.

Canada is by no means alone in the adoption of solar PV and the eventual need to recycle its materials. Many countries and regions are well ahead of North America on this front and present various solutions from which the emerging Canadian industry can learn.

The International Energy Agency (IEA) has produced numerous resources quantifying the problem with a scientific approach, including [Canada’s expert input](#).

Likewise, the European Commission has established a directive on “[Waste from Electrical and Electronic Equipment \(WEEE\)](#),” guiding end-of-life strategies for solar panels in the European Union.

In North America, similar considerations are being developed with notable progress in California and Washington State.

### Next steps

In Canada today, end-use electricity consumers, as well as manufacturing facilities with strong Environmental, Social, and Governance (ESG) goals, are fueling new interest in working with CanREA to eliminate carbon emissions and improve sustainability throughout the supply chain.

As Canada’s solar PV capacity grows, CanREA members are examining new ways to innovate and close the circular economy loop. From the sourcing of raw materials to the final disposal and reuse of components, the opportunities to push further into sustainability over the full life cycle of our technologies continue to expand.

### For more information

Learn more about recycling and renewables in the “Life Cycle” section of the CanREA website: [Repowering and Decommissioning](#).



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