Whose waste is it anyway?

PV waste | Europe is leading the way in efforts to regulate the disposal and recycling of old or discarded PV modules. Sara Ver-Bruggen investigates the extent to which the industry is complying with the rules and whether PV markets in other parts of the world are likely to follow Europe's lead

How sustainable is the solar photovoltaic industry? Aside from the obvious, that it is enabling countries around the world to move away from burning fossil fuels for generating electricity, the industry has no official policy on the appropriate take-back and recycling of old or damaged PV panels.

However, legislative changes in Europe in 2012 are forcing the industry to address this challenge, which could show the way for how other markets might approach this issue in the coming years.

When the original Waste Electrical and Electronic Equipment (WEEE) directive was introduced in Europe in 2003, it placed legal and financial responsibility on producers and manufacturers for the safe collection and disposal of old electrical goods and equipment. In 2012 the WEEE Directive was beefed up, strengthening member state governments' powers to ensure compliance and extend to forms of waste previously exempt, including photovoltaic panels.

The recast directive also imposes new targets that will see member states having to collect 45% of electronic equipment sold for approved recycling or disposal from 2016. From 2019 member states must demonstrate achievement of either one of the collection rates: 65% of EEE equipment sold or 85% of electronic waste generated.

While member states were given until 2014 to transpose the directive into their national legislation, most are still in the process of drafting rules. A few, including Germany, which is the largest and oldest solar market in Europe, the UK and Italy, are the furthest ahead.

Source: PV Cycle.

A PV module being shredded. The effective disposal and recycling of old modules will become an increasing priority for the solar industry.

The penalties of non-compliance

To ensure member states meet their targets, the latest WEEE Act seals up loopholes and ensures more consistency in terms of how the act is transposed across the various states. Because the act places the onus of responsibility on the producer, penalties for non-compliance are tough. Measures vary between each member state, but generally they can include fines. These are usually proportional to the amount of PV modules undeclared as quantities sold in the EU, as well as fines from local municipalities and government authorities.

In some cases a producer's panels can be barred from sale in a market. In some countries, including Germany and Austria, the representative of a company in that market – typically the general manager – risks a criminal record if the local entity has been found guilty of non-compliance. In a highly competitive market, it is hardly surprising that established players will use non-compliance as a means of taking out the competition because producers, especially from abroad, can often fall foul through ignorance, according to one company that offers compliance services to the PV industry in relation to WEEE.

However, compared to four years ago there is a growing awareness of the penalties of non-compliance and what producers need to do to ensure they do comply.

Defining a PV producer

One of the challenges under WEEE (II) is defining exactly what sort of company or entity qualifies as a PV producer.

Module take-back firm PV Cycle lists four definitions. The first is a manufacturer

Source: PV Cycle.

established in a member state that makes or assembles and sells PV modules under their own name or trademark within the territory of a member state. The next is the distributor, which resells PV modules produced by other suppliers (except where the brand of the original producer appears on the product) within a member state under their own name or trademark. Then there are the importers, in other words entities that place PV modules from a third country or from another member state into the member state they are operating in. The fourth category of producer covers any entity engaged in internet or distance sales, either to private households, or to other types of users in a member state, and is established in another member state or in a third country.

Each type of producer is legally obligated to ensure the take-back and recycling – including the related administration, reporting and financing – of their discarded PV modules.

According to Alina Lange, a spokeswoman for PV Cycle, the act ensures that the producer complies at the national level of any market the modules are sold into. Brussels-based PV Cycle was set up as a member-based pan-European scheme providing dedicated compliance and waste management services for solar energy system products falling under WEEE and Battery Producer Responsibility legislation.

One of the first steps by any company that potentially fits the bill as a producer should be to ensure that their product falls within the scope of the directive. A good first port of call is to visit the site of the Europe WEEE Registers Network (EWRN), which also has direct links to all of the national registration bodies for each member state.

In Germany, for example, this body is Elektro-Altgeräte-Register (EAR). The register obligates all manufacturers and distributes the burden of proper disposal, collection and recycling fairly, under the WEEE act. "All producers have to register and report the volumes that they have put into circulation in the market. If manufacturers fail to register with EAR or fail to report properly in terms of quantities supplied in Germany, EAR can take action such as levying fines," says Oliver Friedrichs, managing director of take-back company, Take-e-way.

Responsibility for the disposal of PV waste in Europe now falls on the producer.

Reporting and fees

Again, just as in who qualifies as a producer, requirements for reporting quantities of panels supplied in a market is not as straightforward as it might seem at first. Getting this right is important because the data is used to calculate what each producer is paying fairly, in proportion to volumes they supply in the market in question. The fees levied go towards the infrastructure required to ensure the disposal, collection and reclamation/recycling of their products that have to be discarded, through damage or when they reach their end of life.

"What makes the compliance obligations with regard to quantity reporting much more difficult is the fact that they are handled in different ways depending on each EU member state," says Friedrichs. "Reporting has to be done more than just once a year in most cases. In Germany, for example, manufacturers have to report every month, whereas quarterly in many other countries. The reporting is based on actual sold quantities. Manufacturers ensure they are reporting accurate quantities in the data of their enterprise resource planning systems. In Germany EAR can also demand the confirmation of reported quantities by an outside auditor as well."

Take-e-way provides administrative services to ensure producers comply in Germany. The company also has a database with information for each of the member states, with details of how the manufacturer has to register in each country, information on take-back schemes in each market, volumes that can be handled and which types of modules can be disposed of appropriately, as well as links with local partners in local markets.

Methods or models of financing the disposal, collection and recycling of old PV panels also vary state-by-state.

Jürgen Fuchs, a key account manager at the European Recycling Platform (ERP) in Germany, says: "For example, some use a pay-as-you go system based on sales data throughout the year. So if a company sells 20% of the PV panel demand in a market then they are expected to allocate for collection of 20%. Other countries have models in place more geared towards the future, based on financial guarantees, chipping into a pot of money that can be used to invest in the collection, disposal and recycling of panels when it becomes an issue in the future."

The ERP was set up in the wake of previous waste directives. Its founder members – Sony, Hewlett-Packard, Electrolux and Braun-Gillette – wanted to see a competitive market in Europe for offering compliance and waste management services arising from extended producer responsibility legislation as opposed to having to deal with one monopolistic organisation.

Scott Butler, from the ERP's UK branch, says: "At every other stage of the supply chain, fast-moving consumer goods brands are able to choose suppliers from a competitive marketplace. Competition engenders efforts by suppliers, be it of products, components, systems or services, to innovate and improve on costs and efficiencies. End-of-life product management should also benefit from free market forces."

The ERP offers PV companies a pan-European service for compliance with WEEE and other waste-related legislation. In recent years the PV industry has become

more globalised and consolidated. To producers, Europe is on the one hand a single market made up of many. So producers are likely to be active in several member states. However, the problem with the original WEEE directive was that it allowed for too much leeway in terms of how each state transposed the act into their national laws. Even the recast directive still raises the issue of who shoulders the responsibility of compliance.

A producer will want to know what they have to do to ensure compliance across all markets they may be involved in, whether as a direct entity in a country or as a supplier to an importer in a specific country. They do not want to have to tackle the issue country by country, as this would entail a lot of admin and bureaucracy.

"ERP aims to provide simplicity and co-ordination in a complex environment, using its knowledge database to ensure that a company can provide the right information at the right time for all markets. It also provides consistency. All contracts, for example, are produced in two languages – the local language and also always in English," says Butler.

Though companies such as ERP, PV Cycle and Take-e-way, play an important role in helping producers comply, Lange advises that any producer in Europe should appoint a member of staff internally through whom compliance-related matters are channelled.

The global picture

Today volumes of waste from PV panels in Europe are relatively small, compared with volumes of panels actually installed. Since it was set up in 2007 PV Cycle has dealt with 11,000 tonnes of PV modules. However, only about 1% of this amount is due to modules that reached the end of their operational lifetime. Typically the modules have been disposed of because they are damaged, usually during transportation or installation. "In the next five years and beyond this trend is going to change in Europe as the first PV farms in early adopter markets like Germany reach the end of their operational lifetime resulting in big quantities of modules needing disposal and recycling," says Lange.

In preparation, PV Cycle, ERP and Take-e-way are working with waste management companies across Europe with the capability of industrially processing old PV modules for recycling.

Under WEEE, companies can also introduce their own take-back, disposal and recycling schemes. First Solar is a good example and has had one in place for a decade but this was set up out of necessity at the time when the industry was much smaller. In the UK, the developer Solarcentury also ensures that any modules broken during installation of projects that need to be discarded are recycled in line with WEEE. "It is doubtful that PV companies really want to be recyclers. It is highly likely that as the volumes of PV panels in the waste stream increase in the next five to eight years that the industry will warrant its own bespoke disposal-collection-recycling system," says Fuchs.

But the extended producer responsibility approach to PV recycling, already adopted in Europe, promoted as an industry-wide approach or standard would have far-reaching benefits believes Vasilis Fthenakis, a scientist at Brookhaven National Laboratory, Columbia University. He has been studying the environmental impacts of the solar photovoltaics industry for a number of years.

Compared with fossil fuel electricity production the impact of solar on factors such as the environment and also health is comparatively benign. But that does not mean the industry should not embrace measures that ensure that PV modules do not end up in landfill. "PV companies are under immense pressure to compete with fossil fuels. Margins, which used to be 30-40%, are now in the region of 5%. Such market conditions are not conducive to encouraging an industry to finance now what will be an issue in 20-30 years' time," says Fthenakis.

He sees a chicken and egg situation. The volumes of panels that are discarded are nowhere near big enough to warrant an economically profitable full-scale take-back and recycling operation in the US that will earn the buy-in of suppliers and producers. However that could change in several years' time.

But should it be left to free-market economics and enterprise to ensure old PV modules are recycled? Fthenakis and his colleagues' work in other areas show that PV module materials recovery can incur negative cost or even a small profit. However, the more difficult cost to account for is the one associated with logistics and collection. It is likely, therefore, that industry will need to finance some of this.

"With an industry collective operation, the recovery of materials can be fully optimised. For PV glass, for example, this would mean recovering the pure material for reuse in the form of culets for soda-lime glass production – a higher value commodity than reusing waste glass in fibreglass."

He is in no doubt that there needs to be some sort of federal-level legislative effort, and in the next few years, to ensure that all technological types of PV modules are properly disposed of and that will eventually lead to optimised recycling processes that can extract maximum value while minimising environmental impacts and costs. ■

PV disposal around the world

Solar industry players and associations in other countries are beginning to consider the issue of PV module waste. "We've been contacted to provide advice to manufacturers and agencies abroad, mainly the US, Canada and Russia," says Oliver Friedrichs, managing director of Take-e-way.

"Our advice is be proactive, set up an industry scheme that the producers fund and that ensures proper collection, disposal and recycling of panels before the government, be at federal or state level, imposes legislation to drive this type of activity, which could end up being most costly for the industry as a whole," Friedrichs says.

Countries taking steps in the right direction include Australia, which has introduced a policy on e-waste, and Japan, which has an established take-back system for IT equipment and more recently decided to draft new rules covering disposal and recycling of decommissioned renewable energy plants. ERP has also supplied its waste management and tracking software to the Canadian e-waste stewardship system.

However says Jürgen Fuchs: "Europe is really where the heart of this issue as it now has legislation in place that obligates the PV industry to address the issue of waste generated by old, damaged, end-of-life PV panels. The PV market in Europe is also the oldest in terms of panels in the ground and biggest by installed base."

Source: PV Cycle.

Proper PV waste management offers the prospect of recovering materials such as glass for reuse.

Author

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