Guidelines for Storage and Handling of Waste Solar Photo-Voltaic Modules or Panels or Cells

under

E-Waste (Management) Rules, 2022

Version 1.0
March, 2026

CENTRAL POLLUTION CONTROL BOARD
(Ministry of Environment, Forests & Climate Change)
Parivesh Bhawan, East Arjun Nagar DELHI -110 032
Website: www.cpcb.nic.in

Table of Contents

1. Background:

The management of E-Waste in India is presently regulated under E-Waste (Management) Rules, 2022. The Ministry of Environment Forest & Climate Change, Government of India, has notified E-Waste (Management) Rules, 2022 for the effective management of the E-Waste in the country, and are effective from 01.04.2023. The overall objective of the E-Waste (Management) Rules, 2022 is to take all steps necessary to ensure that E-Waste is managed in a manner which shall protect health and environment against any adverse effects, which may result from such E-Waste.

The Rules encompass the management of waste electrical and electronic equipment (EEE), including their components, consumables, parts and spares including solar photo-voltaic modules or panels or cells, whole or in part discarded as waste, as well as rejects from manufacturing, refurbishment and repair processes. The Rules cover 106 categories of electrical and electronic equipment (EEEs) as per Schedule I of the aforesaid rules, including solar photovoltaic panels/cells/modules, categorized as CEEW 14.

The management of E-Waste is presently regulated through the principle of Extended Producer Responsibility (EPR), where all producers have given recycling targets as per Schedule-III and Schedule-IV of the rules, which can be met only through purchase of EPR certificates through registered recyclers of e-waste to ensure environmentally sound management of such waste. However, as per the provisions under the aforesaid rules, E-Waste recycling targets are currently not applicable for waste solar photo-voltaic modules or panels or cells.

The management of waste solar photo-voltaic modules or panels or cells are covered under the Chapter V of the E-Waste (Management), Rules, 2022, where the manufacturers, producers and the recyclers of solar photo-voltaic modules or panels or cells have been assigned responsibilities to ensure the compliance with the said rules through registration, storing the waste solar photo-voltaic modules or panels or cells up to the year 2034-35, filing annual returns on the portal, and ensuring compliances with the guidelines and standard operating procedure (SOP) laid down by CPCB.

2. Objective and Scope of the Guidelines

The present guidelines are intended to provide technical guidance w.r.t. transport, handle and store the waste solar photo-voltaic panels or modules or cells including their components, consumables, parts and spares (hereinafter will be referred as Solar Waste) in an environmentally sound manner which shall protect the health and environment. The guidelines shall be applicable to the Producers, manufacturers, recyclers of waste solar photo-voltaic panels or modules or cell.

3. Environmental Concerns of Improper management of End-of-life solar waste

The solar energy expansion supports sustainability, however improper management of end-of-life solar waste may pose environmental and health risks.

4. General Average Composition of the Solar Panels

Solar Waste refers end-of-life solar photo-voltaic modules or panels or cells, whole or in part discarded as waste, rejects and waste generated from manufacturing, refurbishment and repair process and solar panels damaged during their transportation, handling, storage and installation.

Solar panels consist of recyclable and non-recyclable materials such as:

1. Glass
2. Aluminum frame
3. Silicon wafers
4. Metals (copper, silver, lead, cadmium, tellurium, gallium, arsenic, tin, etc.)
5. Plastics

5. Guidelines for Transportation, handling and Storage of Solar photo-voltaic modules, panels or cells waste:

The collection and transportation of solar waste is to be done in the following manner:

1. The Solar Waste shall not be disposed of or dumped in open area/landfill, as it may result into release toxic chemicals into the environment.
2. The Solar Waste intended for recycling shall only be handed over to registered recycler of E- Waste. However, in case of collection and storage of the solar waste, the same may be handed over to the registered producers and manufacturers.
3. After assessing the requirement of storage, the producers and manufacturers shall devise a collection mechanism from consumer/bulk consumer which may include take-back through different stakeholders.
4. Producers and manufacturers shall publicize their collection system which may include details of their collection points for the collection of Solar Waste, take-back schemes.
5. Producers and manufactures may provide consumer/ bulk consumer following details of their collection system/ take-back system:
   a. Link of their web site where information pertaining to collection/ take-back system.
   b. Contact number of a designated person for handling queries regarding the collection/ take-back system and grievance support.
   c. Details of their collection system including, collection points/pick up vans linked to

collection centers for depositing solar waste.

d. Details of authorized recycling facilities who can collect/take-back solar waste.

e. Producers may maintain a database of consumers'/bulk consumers and location details while selling solar panels or modules or cells so that consumers/ bulk consumers can be approached for collection of solar waste.

6. Transportation of Solar Waste should be done in covered trucks.

7. While transporting Solar Waste destined for final disposal the sender should follow the provisions under Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

The storage and handling of waste solar panels, cells or modules is to be done in the following manner:

1. Storage of Solar Waste shall be done in a manner which does not lead to breakage of the waste collected and is safe to workers handling such products.
2. Avoid sharp objects contact or collision with Solar Waste so as not to damage the internal module.
3. Storage of Solar Waste shall be carried out in such a way that its end use such as re-use after refurbishing or recycling/recovery is unaffected and there should not be any damage to health, environment and to the product itself.
4. Covered shed/spaces shall be used for storage of Solar Waste. The Solar Waste shall be placed in a dry environment and a well ventilated area.
5. Considering the leaching potential of metals such as antimony, cadmium, arsenic, lead, selenium, among others, the floor used for storage of Solar Waste shall be non-leachable, impervious to prevent contamination to the ground water and soil.
6. Disintegrated or broken Solar Waste shall be stored separately in a rigid, stable and water resistant container with proper labelling.
7. The Solar Waste shall be stored in a stable configuration and not stacked higher than the point at which mechanical stability or safe access cannot be maintained.
8. The storage area shall have fire protection system with adequate firefighting arrangement, escape route for emergency exit, ERP- emergency response plan in place.
9. Any fire incidents shall be reported to the local authority.
10. Storage racks or containers shall be clearly labelled with the type of waste they contain to help in easy identification and sorting during recycling processes.
11. Inventorization shall be done for the stored Solar Waste from time to time to maintain the records.
12. The storage area shall be monthly inspected and recorded to check for any damage. The

monthly report should be recorded as per format enclosed at Annexure-I. The same should be made available at the time of inspection or audit, by CPCB/SPCB or any other designated agency.

13. All personnel handling waste solar panels shall be provided with appropriate PPE wears, including gloves, safety footwear, eye protection, and respirators where dust or glass breakage risk exists.

--OO—

Annexure-I

a. Inspection Month:
b. Unit's Name & Location:
c. Inspected by: (Name & Designation)
d. Date of inspection: DD/MM/YYYY
e. Total quantity stored at the time of inspection (in MT):
f. Details of the storage area (as per the tale below):

S. No.	Inspection parameter	Condition as observed during inspection (Satisfactory/Not Satisfactory)	Remarks/ Corrective action if any
1.	Storage area floor is non-leachable, impervious		
2.	Covered shed/spaces available		
3.	Adequate ventilation and lighting provided		
4.	E-waste properly segregated and labeled		
5.	Fire safety equipment installed and functional		
6.	Spill control kits and personal protective equipment available		
7.	Latest storage inventory updated and available		

g. Any incident of damage, spillage, or leakage recorded and addressed:

Signature of the personnel inspecting: