

# Photovoltaic (PV) Modules Management as Universal Waste

Department of  
Toxic Substances  
Control

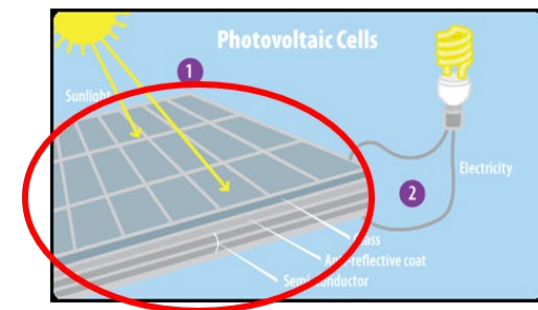
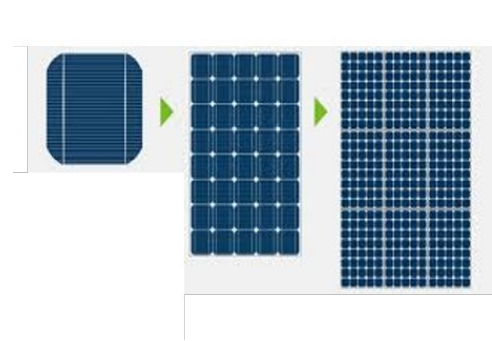
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# DTSC's definition of PV module

- Photovoltaic cells designed to convert solar radiation into electrical energy
- Includes integrated components that cannot be separated without breaking the photovoltaic module glass (e.g. protective glass, metal frames..)
- Composition (xSi, semiconducting materials)
- One cell or multiple cells
- Roof top solar panels, thin film, PV module with integrated components



*CCR Sections 66260.10 and 66273.9*



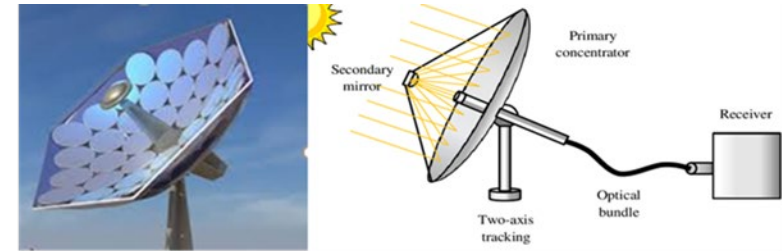
# Examples of PV module

- Solar cells/panels
- Solar garden lights
- Solar powered devices



# Examples of not a PV module

- Solar concentrators
- Solar powered electronic devices



# PV module vs. PV system

- PV system is a set of ancillary components including PV modules.
- Ancillary components that can be taken apart from PV module without breaking the PV module glass are not considered a PV module.
- E.g. batteries, junction box, inverters, wires
- UW regulations apply only to PV modules, not the entire PV system.

*Sections 66260.10 and 66273.9*



# PV modules vs. electronic devices

- Two different universal waste categories
- Device is not an electronic device and has PV module, then it is a PV module. (e.g. solar powered backpack, garden lamps, bikes)
- Device functions as an electronic device and has PV module, then it is an electronic device. (e.g. calculator, wireless keyboard)



CCR Section 66273.7.1



# When do universal waste regulations apply to PV modules?

- When PV module is discarded and becomes **a waste**\*
- When you know PV module is hazardous:
  - ✓ Analytical test results that show that the module is hazardous
  - ✓ Using generators' knowledge of the materials in the panel
- All PV module waste can be managed as universal waste without requiring a hazardous waste determination.

**\*Universal waste management standards do not apply to PV modules that are refurbished or reused.**



# Hazardous constituents in PV modules

- Lead
- Cadmium
- Chromium
- Antimony
- Gallium
- Selenium
- Tellurium
- Other metals

## Test Methods

FEDERAL	CALIFORNIA
<ul style="list-style-type: none"><li>• Toxicity Characteristic Leaching Procedure (TCLP)</li></ul>	<ul style="list-style-type: none"><li>• Total Threshold Limit Concentrations (TTLC)</li><li>• Waste Extraction Test (WET)<ul style="list-style-type: none"><li>- Soluble Threshold Limit Concentrations (STLC)</li></ul></li></ul>





# Universal waste handlers of PV modules

- Generators
- Installers\*
- Manufacturers
- Distributers/Warehouses
- Storage facilities
- Recyclers
- Treatment facilities

*CCR Section 66273.9*

\*Installers may take part in removal of solar panels



# Notifications

- **Initial:**
  - Handlers that accept or accumulate from offsite ANY quantity of PV module waste
- **For Treating PV modules**
  - Handlers intend to treat the waste
- **For UW PV modules disposal**
  - Handlers decide to discard the waste

*CCR Sections 66273.32(e) and 66273.72*



# Notifications – initial and treating PV modules

- Department (DTSC) notification
- One-time requirement and never expire
- **Site specific**\*
- Submit a written notification to DTSC 30 days prior to accepting, accumulating, or treating the waste
- Can submit starting January 1, 2021

\* Handler's business facility(ies); not the location where the handler uninstalls solar panels

*CCR Section 66273.32(e)*



# Initial and treating PV modules notifications

- Forms are in development
- The forms are optional; handlers may submit the notification to DTSC without using the forms
- Includes:
  - Handler's name
  - ID
  - Contact info
  - PV types if available
  - PV source
  - Indication if 5,000 kg or more accumulation at one time
  - List of authorized treatment activities handlers plan to conduct

*CCR Section 66273.32(e)*



# Authorized treatment activities

- **Removal activities**

Removing discrete assemblies from the PV system that are typically removed for replacement during normal operation and maintenance

- **Dismantling activities**

Dismantle, remove, segregate components of a PV module but does not break the PV module glass

- **Processing activities**

Treat PV modules by intentionally breaking the PV module glass

**Treatment method that involves use of chemicals or heat is not allowed under universal waste regulations and would require a permit**

*CCR Sections 66273.71 – 66273.73*



# Disposal notification

- PV modules can only go from one UW handler to UW handler or to the disposal facility
- UW PV modules become a hazardous waste the moment handlers decide to discard them
- Nothing prohibits a facility from sending the waste to hazardous waste disposal; the waste must be managed according to all applicable HW regulations
- Make hazardous waste determination

*CCR Section 66273.72*



# Disposal notification continued

- Submit a written notification to DTSC 15 days prior to disposal
- Need to submit to DTSC for every disposal
- Includes:
  - The ID number for the universal waste handler's facility where the PV modules were generated;
  - A description of the authorized treatment method(s) used; and
  - The name, address, and ID number of the hazardous waste disposal facility where the PV modules will be disposed of.

*CCR Section 66273.72*



# Annual reporting

- Applies to
  - ✓ Handlers that accept more than 100 kilograms (220 pounds) from an external source;
  - ✓ Handlers that generate more than 5,000 kilograms (11,000 pounds) of PV module waste
  - ✓ Handlers that treat PV modules
- Due on February 1 of the following year for the activities done in the previous year

*Sections 66273.32 and 66273.74*





# Annual reporting continued

- Includes
  - handler's name
  - ID
  - Contact info
  - PV types handled
  - Total quantity of PV modules handled
  - PV source
  - Info of where PV modules were shipped, quantity shipped, and intention
- From is in development

*Sections 66273.32 and 66273.74*



# Universal waste handler training

- Same as other universal wastes
- Familiar with UW management and emergency response procedures
- Initial training and annual training:
  - Type of hazards associated with UW
  - Proper disposition of UW
  - Response to releases
  - Labelling, collecting, handling, shipping, recordkeeping, any prohibitions, etc.

*CCR Sections 66273.36*



# Labeling

- Each PV module, or container or pallet in or on which PV module(s) is contained, needs to be labeled “**Universal Waste-PV module(s)**”
- PV module(s) or a container or pallet of PV modules need to be placed within a designated area
- Commingling PV modules with other universal wastes is NOT allowed.

*CCR Section 66273.34*



# Labeling treatment residuals

- Based on waste classification of the residuals
- Example: metal frames
- Hazardous waste determination must be made to properly manage PV module treatment residuals after dismantling and processing activities
- Comply with labeling requirements for the residuals that are reused and recycled

*CCR Section 66273.34*



# Accumulation time limit

- A facility can accumulate PV modules for up to **one year** from the date they were generated or received from another handler
- The PV module handler has to demonstrate the length of time the waste is accumulated from the date it became a waste (or was received)
  - Place label and earliest date when the waste is received
  - Inventory at the facility

*CCR Section 66273.35*



# Transporting and containment

- Same as other universal waste requirements
- If transport more than 100 kilograms (220 pounds) of PV modules at any one time, contain the PV modules
  - 220 pounds (100 kilograms) is about 4-6 big panels
  - Weight of a rooftop panel is about 40 pounds (18 kilograms)
  - Weight of a thin-film sheet is about 5 pounds (2.2 kilograms)

*CCR Section 66273.51*



# Containment

- Manage PV modules in a way that prevents releases of any constituent of a PV module to the environment
  - Prevent breakage, (leakage, spillage)
  - Containment could be on a pallet, in a container, wrapping with stretch film, etc.
  - Clean up immediately if PV module(s) break accidentally or unintentionally

***CCR Section 66273.3.6***



# Accidental breakage Response to releases

- Requirements are the same as other universal wastes
- Clean up immediately if PV module(s) break accidentally and contain all residues in a container that is structurally sound and is compatible with PV modules

*CCR Section 66273.37*





# Accidental breakage - Response to releases

- How should the accidentally broken PV module waste be labeled?

*A universal waste handler shall **determine whether any material resulting from such a release is a hazardous waste**, and if so, shall manage the hazardous waste in compliance with all applicable requirements...*

- Can the accidentally broken waste be placed together with intact PV modules?

*Hazardous waste consisting **only of residues** of leaking, broken, or otherwise damaged universal waste **may be managed as universal waste...***

**CCR Section 66273.37**



# Recordkeeping

- Requirements are the same as other universal wastes

## **Incoming:**

- ✓ Receipt of shipments (Example: log, invoice, bill of lading, etc.)
- ✓ Name of UW handler that sent the shipment
- ✓ Quantity of waste received (waste goes from handler to handler)
- ✓ Date of shipment received

## **Outgoing:**

- ✓ Shipments (Example: log, invoice, bill of lading, hw manifest, etc.)
  - ✓ Name of the destination facility
  - ✓ Quantity of waste shipped
  - ✓ Date of waste shipped
- Keep logs of both shipped and received waste for at least three years

*CCR Section 66273.39*



# Treatment facility closure

- Only applies to handlers that do processing treatment (in section 66273.73) by intentionally breaking the PV module glass
- Required to have Financial Assurance/Financial Responsibility, a Closure Plan, and a Closure Cost Estimate
- When such facilities close, they must notify DTSC, implement their Closure Plan, and undergo a closure inspection

*CCR Sections 66273.76 and 66273.77*



# DTSC Information

## **UW PV Modules:**

<https://dtsc.ca.gov/photovoltaic-modules-pv-modules-universal-waste-management-regulations/>

## **Final Regulation:**

<https://dtsc.ca.gov/dtsc-final-regulations/>

## **Emails:**

[PVmodules@dtsc.ca.gov](mailto:PVmodules@dtsc.ca.gov)

## **DTSC E-list:**

<https://dtsc.ca.gov/dtsc-e-lists/>

