

# FIRST PUBLIC COMMENT PERIOD: RESPONSE TO COMMENTS

APRIL 19, 2019 – JUNE 10, 2019

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## I. Overview and Organization

This document summarizes and responds to public comments submitted to the Department of Toxic Substances Control (DTSC) on the proposed rulemaking titled *Photovoltaic modules (PV modules) – Universal Waste Management*, which was released to the public on April 19, 2019. The timeline for DTSC interaction with the public with regard to this proposed rulemaking is as follows:

- The proposal was released to the public on April 19, 2019 for a public comment period of fifty-two (52) days which ended on June 10, 2019;
- A public hearing was held on June 10, 2019;

- A second proposal was released to the public on September 9, 2019 for a 15-day public comment period which ended on September 24, 2019;
- A third proposal was released to the public on October 18, 2019 for a 15-day public comment period which ended on November 2, 2019; and
- A fourth proposal was released to the public on December 24, 2019 for a 15-day public comment period which ended on January 8, 2020.

This Response to Comments document addresses the comments received during the public comment period that ended on June 10, 2019. There were eleven (11) written comments and five (5) oral comments received during this comment period. A list of commenters and their affiliations, in alphabetical order, and the number assigned to their correspondence are included in **Table 1**.

For a list of commenters and responses to comments received on the proposed regulations, please refer to the following:

- Second Public Comment Period: Response to Comments, September 9, 2019 – September 24, 2019;
- Third Public Comment Period: Response to Comments, October 18, 2019 – November 2, 2019; and
- Fourth Public Comment Period: Response to Comments, December 24, 2019 – January 8, 2020.

Each comment letter was issued a number. DTSC subsequently numbered each of the comments contained in the letter and collated similar comments together. For example, the designation “1-1” means comment letter number 1, comment number 1, and so forth. Each commenter who presented oral comments during the public hearing was issued a number based on the order they presented comments; these comments start with PH-, then the commenter number followed by the comment number. For example, PH-1-1 means public hearing commenter number 1, comment number 1.

For the purpose of orderly presentation, the comments have been categorized by the article in the regulation that they address. The comments that are general in nature or have overarching applicability have been addressed under “General.” For all other comments related to a specific article or section, please refer to the respective article or section.

All referenced section numbers are found in division 4.5 of title 22 of the California Code of Regulations, unless otherwise specified.

**Table 1. List of Commenters**

<b>#</b>	<b>Name of Entity</b>	<b>Commenter</b>	<b>Number of comments</b>
1	California Refuse Recycling Council, Northern District	Veronica Pardo	7
2	California Electronic Asset Recovery	Kristin DiLallo Sherrill	4
3	Carlos Chavez	Carlos Chavez	3
4	First Solar Inc.	Matthew Garamone	7
5	NextEra Energy Resources, LLC	Tomey Tuttle	13
6	Recycle PV Solar, LLC	Peter Beadle	15
7	Rural Counties Environmental Services Joint Powers Authority	Larry Sweetser	64
8	San Francisco Department of the Environment	Maggie Johnson	15
9	Solar Energy Industries Association	Evelyn Butler	62
10	Solar Energy Industries Association; California Solar Storage Association	Evelyn Butler; Benjamin Davis	12
11	Solar Energy Industries Association; California Solar Storage Association; National Stewardship Action Council; California Product Stewardship Council	Evelyn Butler; Benjamin Davis; Doug Kobold; Heidi Sanborn	22
PH-1	Solar Energy Industries Association	Evelyn Butler	10
PH-2	Waste Management	Sharon Simpson	5
PH-3	National Stewardship Action Council	Heidi Sanborn	8
PH-4	California Solar and Storage Association	Benjamin Davis	6
PH-5	Rural Counties Environmental Services Joint Powers Authority	Larry Sweetser	13

## II. Definitions

### A. DEFINITION OF PHOTOVOLTAIC (PV) MODULE

#### Comment Summary:

The comments request that DTSC reconsider the definition of "Photovoltaic module" by excluding ancillary components, including photovoltaic cells (PV cells) that are not electrically connected to be managed as a PV module, and adding perovskite to the example of types of PV modules that can be managed as a universal waste PV module. The commenters further recommend creating a new definition for "Photovoltaic system" which includes the PV module and ancillary components. The definition, as proposed, appears to better describe a photovoltaic (or solar) system because it includes "ancillary components," such as metal mounting frames, junction boxes, inverters, batteries, wires, and cables. These ancillary components can be easily removed and then recycled accordingly as electronic waste or scrap metal.

**Comments:** 1-1, 1-3, 7-7, 7-14, 7-16, 7-17, 7-19, 7-20, 7-31, 7-32, 7-49, 7-62, 8-3, 8-4, 8-5, 8-6, 8-7, 8-8, 8-11, 9-1, 9-2, 9-6, 9-32, 11-6, 11-7, PH-1-3, PH-2-5, PH-5-6, PH-5-7

#### Response:

DTSC agrees with the comments and revised the definition of "Photovoltaic module" to include PV cells that are not electrically connected and to exclude the ancillary components that are not integrated in the module. Examples of components that are integrated in a PV module are provided in the proposed regulation; the list is not all inclusive, because each PV module design, and thus its components, may be different depending on the manufacturer.

To provide further clarification, DTSC also added a new definition, "Photovoltaic system," that includes ancillary components in sections 66260.10 and 66273.9 to differentiate between a PV module and PV system. Examples of ancillary components are provided, but are not all inclusive, because they could vary depending on the manufacturer. Electrical components that are not integrated in the PV module are a part of a PV system, but not a part of a PV module.

The removal activities specified in section 66273.71 will then apply to removing components from the PV system, while the disassembling and processing activities specified in sections 66273.72 and 66273.73, respectively, will apply only to PV modules instead of the entire PV system.

### B. SOLAR THERMAL COLLECTORS

#### Comment Summary:

The comment suggests explicitly excluding solar thermal collectors in the definition “Photovoltaic module” in section 66260.10.

**Comment:** 9-2

**Response:**

DTSC respectfully disagrees with the comment to explicitly exclude solar thermal collectors in the definition “Photovoltaic module” in section 662760.10. DTSC recognizes a PV module as a device consisting of one or more electrically connected PV cells, which are a specialized semiconductor diode, that are designed to convert solar radiation into electrical energy. The primary function of solar thermal collectors, such as mirrors, is to concentrate heat from the sun without converting solar radiation into electrical energy. Therefore, solar thermal collectors are outside the scope of the definition of “Photovoltaic module” as proposed in the regulatory text. Therefore, no regulatory text change is made in the proposed regulation.

### **C. PEROVSKITE PV MODULES**

**Comment Summary:**

The comment suggests that PV modules with perovskite cells should also be added as an example of a photovoltaic module to the proposed definition in section 66260.10 so that they are not assumed to be excluded.

**Comment:** 9-2

**Response:**

DTSC agrees that the types of PV modules provided in the definition are not an exhaustive list. DTSC assumes that new materials and material compositions could become available as PV module technology advances. DTSC further clarified the definition of the “Photovoltaic module” by replacing “Types of photovoltaic modules include” with “Photovoltaic modules are composed of, but are not limited to,” in the definition. By replacing “Types of photovoltaic modules” with “Photovoltaic modules are composed of, but not limited to,” the definition accommodates different material compositions that PV modules are made of while making room for future technologies. Furthermore, DTSC included “perovskite” to the examples of types of PV modules given in the definition of “Photovoltaic module” in sections 66260.10 because it was provided as an example by the commenter. Because relevant definitions from section 66260.10 are duplicated in section 66273.9, corresponding changes were also made in the definition of “Photovoltaic module” in section 66273.9.

### **D. UNDEFINED TERMS – INTACT, BREAK, BROKEN, BREAKAGE**

**Comment Summary:**

The comments state that the terms "intact," "break," "broken," and "breakage" are used throughout the proposed regulation text; however, none of these terms are defined. Without definitions, these terms are open to several interpretations and are burdensome on the handler.

**Comments:** 4-2, 5-9, 7-10, 9-26, PH-2-3, PH-2-4, PH-5-10

**Response:**

DTSC respectfully disagrees with the comments and determined that no regulatory change is necessary. The terms "intact," "break," "broken," and "breakage," are commonly used words that can be found in a dictionary, such as Webster's Dictionary, and such dictionary definitions apply for the interpretation of this proposed regulation. Broken panels that are not intentionally broken are required to be managed as universal waste as long as they are contained to prevent any releases to the environment.

**E. UNDEFINED TERMS – INTENTIONAL, OCCASIONAL, UNINTENTIONAL**

**Comment Summary:**

The comments assert that there is a lack of clarity regarding the distinction between "intentional," "occasional," and "unintentional" breakage of photovoltaic modules. This creates a subjective standard that is uncertain and creates confusion for compliance efforts.

The comments state that when solar panel handling activities are occurring in practice, the potential triggering of "treatment" requirements in the course of normal handling practices is unnecessarily restrictive and likely to lead to ambiguity and confusion.

The comments also assert that the proposed regulation does not recognize and/or address that PV modules may be broken in the field during decommissioning activities and that, unless the breakage is accidental, the handler could be deemed to be conducting a "treatment" activity. This could mean that a handler could be found to have violated the regulations by failing to follow certain regulatory requirements. Breakage of PV modules during disassembly of arrays should not be a basis for violation of the treatment requirements because they are often an incidental consequence of the type of decommissioning and dismantling activities that are necessary for photovoltaic solar panel arrays.

The comments go on to ask if a breakage rate percentage could be considered frequent enough to no longer be deemed "occasional."

**Comments:** 4-3, 7-10, 7-50

**Response:**

DTSC respectfully disagrees with the comments and determined that no regulatory change is necessary. The terms "intentional(ly)," "occasional(ly)" and "unintentional(ly)," are commonly used words that can be found in a dictionary, such as Webster's Dictionary, and such dictionary definitions apply for the interpretation of this proposed regulation.

Additionally, DTSC respectfully disagrees that the treatment requirements for PV modules as proposed are restrictive and likely to lead to ambiguity and confusion. As proposed, these requirements for PV modules follow the standard universal waste treatment requirements for existing universal wastes, such as electronic devices and cathode ray tubes (CRTs), in California since 2003.

DTSC considers treatment activities to mean activities as specified in article 7, which are removal of discrete assemblies during normal use and operation of PV modules as specified in section 66273.71, dismantling of PV modules without intentionally breaking the PV module glass as specified in section 66273.72, and processing PV modules by intentionally breaking the PV module glass as specified in section 66273.73. PV modules that are accidentally broken during the course of normal handling activities are considered unintentional breakage, and thus are not considered as a treatment activity under article 7, provided handlers comply with the requirements for PV modules in section 66273.33.6.

Universal waste management requirements for PV modules in section 66273.33.6 specify that handlers are required to contain PV modules in a manner that prevents breakage and release of any constituent of a PV module to the environment. Handlers are also required to immediately clean up any PV modules or constituent of the PV module if the module is accidently or unintentionally broken. PV modules that are broken must be contained to prevent release of potentially hazardous residuals to the environment. Intentional breakage of a PV module is considered a treatment activity, as specified in section 66273.73. Therefore, handlers must comply with treatment requirements if PV modules are intentionally broken.

**F. CONTAINMENT****Comment Summary:**

The comment requests clarification to the proposed regulation in section 66273.33.6(a)(3) regarding containment requirements that universal waste handlers must comply with if a PV module is accidentally or unintentionally broken. The commenter believes that the proposed regulation refers to the glass on the PV module; however, if another part of the PV module is broken or bent, a special container may not be necessary because the PV module could be repaired, in which case, the PV module

is not yet deemed waste. The comment suggests editing the proposed regulation text to read, "...if that photovoltaic module's glass is accidentally or unintentionally broken."

**Comment:** 9-27

**Response:**

DTSC agrees with the commenter's assertion regarding containment of broken PV modules to mean breakage of PV module glass. DTSC revised the definition of "Photovoltaic module" to include PV cells that are not electrically connected to be managed as PV modules and exclude the ancillary components that are not integrated to the module. Based on the redefined term of "Photovoltaic module," the proposed regulatory text refers specifically to the PV module glass and other integrated components.

The proposed regulation is clear that universal waste management requirements do not apply to PV modules that are not yet wastes as specified in sections 66273.7.1(b)(1) and 66273.7.1(b)(7). Section 66273.7.1(b)(1) specifies PV modules that are not yet wastes pursuant to chapter 11, and section 66273.7.1(b)(7) specifies that "PV modules that were previously identified as waste pursuant to chapter 11, but are no longer identified as a waste (e.g., discarded PV modules that are refurbished and are returned to service)" are not covered to be managed as universal waste PV modules pursuant to relevant requirements in chapter 23. Therefore, if a PV module is reused, repaired, repurposed, or refurbished to use as a functioning PV module, it is not yet a waste; therefore, universal waste management requirements do not apply.

### **III. Requirements for Universal Waste**

#### **A. PV CELL**

**Comment Summary:**

The comments suggest that the proposed language in section 66261.9(a)(8), regarding the list of hazardous wastes that are exempt from the management requirements of chapter 6.5 of division 20 of Health and Safety Code, and section 66273.7.1, regarding the applicability of PV modules to be managed as universal waste, should also include PV cells since it is likely that individual cells could be disposed of without the rest of the PV module. The current proposed definition of "Photovoltaic module" does not specify whether individual PV cells can be managed as universal waste PV modules. Including PV cells in the definition of "Photovoltaic module" will clarify that individual PV cells can also be managed as universal waste photovoltaic modules.

**Comments:** 7-21, 7-22, 7-23

**Response:**

DTSC agrees with the comments and revised the definition of "Photovoltaic module" to include PV cells that are not electrically connected, allowing them to be managed as universal waste PV modules. As a result, no further changes are required in section 66261.9(a)(8), regarding the list of hazardous wastes that are exempt from the management requirements of chapter 6.5 of division 20 of Health and Safety Code, and section 66273.7.1, regarding the applicability of PV modules to be managed as universal waste.

**B. PV MODULE**

**Comment Summary:**

The comment suggests allowing PV modules that contain batteries, which are an ancillary component based on the definition of "Photovoltaic module" and exhibit the hazardous characteristic for corrosivity, to be managed as universal waste PV modules.

The comment recommended the following change to section 66273.7.1(b)(3):

(3) PV modules that exhibit any characteristic of hazardous waste other than the characteristic of toxicity. PV modules that contain batteries as ancillary components are covered under this chapter. Such PV modules shall be managed as hazardous wastes pursuant to chapters 10 through 16, 18, and 20 through 22 of this division:

**Comment:** 7-24

**Response:**

DTSC reviewed the comment and has determined that regulatory text changes, which are made for the definition of "Photovoltaic module" and a newly defined "Photovoltaic system" based on other comments received, address the comment. Therefore, DTSC did not make any further regulatory changes. The term "Photovoltaic module" was revised to exclude ancillary components, such as batteries, that are not integrated to the module. A new definition for "Photovoltaic system," that includes external ancillary components, was added in sections 66290.10 and 66273.9 to differentiate between PV modules and PV system. Examples of ancillary components are provided, but are not all inclusive, because they could vary depending on the manufacturer.

Based on the revised definition of PV modules and newly defined PV system, batteries are now considered an external ancillary component of PV modules; and thus, batteries are outside the scope of universal waste management as a PV module. Therefore, a waste determination would need to be made for batteries that are removed from a PV system after removal and/or disassembling activities as specified in sections 66273.71 and 66273.72 and managed appropriately based on this determination.

## **IV. Applicability**

### **A. CATEGORIZATION**

#### **Comment Summary:**

The comments request that DTSC clarify how to categorize PV modules integrated into the structure of electronic devices. It is unclear if PV modules integrated into the structure of electronic devices should be categorized as electronic wastes and managed as such.

**Comments:** 2-1, 2-2, 2-3, 3-1, 7-6, 7-15, 7-25, 7-26, 7-27, 7-28, 7-29, 7-30, 9-5, 11-8, PH-5-9

#### **Response:**

DTSC agrees that the applicability of the regulations for electronic devices that have integrated PV modules is not clear. To clarify, DTSC first deleted the proposed regulatory text that specifies that electronic devices that have integrated PV modules are not managed as a PV module but are instead managed as an electronic device, from section 66273.7.1(b)(8) and created a separate subsection 66273.7.1(c) to address electronic devices, independently from PV module requirements in section 66273.7.1(b).

Additionally, DTSC added a new definition “Photovoltaic module integrated device” in sections 66260.10 and 66273.9 to define the term to mean “a device with a photovoltaic module embedded or attached, for which the photovoltaic module is not intended to be removed or replaced as part of the normal use and operation of the device, and is intended for personal or household use or adornment.” DTSC subsequently added the regulatory text that specifies that a PV module integrated device that is not an electronic device is not managed as universal waste PV module; instead it must be evaluated to determine if it is a hazardous waste and must be managed as such to section 66273.7.1(b)(8).

### **B. PV MODULE INTEGRATED DEVICE**

#### **Comment summary:**

The comment states that small photovoltaics, like in garden lights, are coming into their facilities in large quantities and that there is no way they can treat them as hazardous waste. The commenter asks if the small photovoltaics should be universal waste or solid waste. The comment requests that small photovoltaics be excluded from the proposed regulation.

**Comment:** PH-3-4

**Response:**

DTSC acknowledges that the applicability of the proposed regulation for devices that have integrated PV modules is not clear. To clarify, DTSC added a new definition "Photovoltaic module integrated device" in sections 66260.10 and 66273.9 to define the term to mean "a device with a PV module embedded or attached, for which the PV module is not intended to be removed or replaced as part of the normal use and operation of the device, and is intended for personal or household use or adornment." DTSC subsequently made changes in section 66273.7.1(b)(8) to specify that PV module integrated device that is not an electronic device is not managed as universal waste PV module, and instead must be evaluated to determine if it is a hazardous waste and must be managed as such.

### **C. RECYCLE IN A MANNER CONSTITUTING DISPOSAL**

**Comment summary:**

The comments state that the proposed language in section 66273.7.1(b)(4) used to identify applicability of PV modules that are "...destined for recycling (or are recycled)" by being "used in a manner constituting disposal" is confusing and potentially misunderstood by recyclers to mean that recycling is not allowed. This language should be better clarified by re-wording or adding an example.

**Comments:** 9-4, 11-9

**Response:**

DTSC respectfully disagrees with the comments and has determined that no regulatory change is necessary. To clarify, the proposed language specifies that recycling by being "used in a manner constituting disposal" as described in section 66266.20, applies to recyclable materials that, in the course of being recycled, are placed on land, either without mixing with other materials or after mixing with other materials. Such materials are not eligible for management as universal waste and are required to be managed as hazardous waste. Additionally, the regulatory language as proposed in section 66273.7.1(b)(4) is consistent with applicability for other universal wastes, such as electronic devices and CRTs.

## **V. Prohibitions**

### **A. EXCLUSION OF ANCILLARY PARTS**

**Comment Summary:**

The comment relates to section 66273.31(b) regarding prohibition from diluting or treating universal waste except by responding to releases. PV module manufacturing scrap which is deemed a waste may not include the frame or the normally attached components such as the junction box, wiring/cables, etc. Such PV modules (which may also be referred to as 'laminates') can still be recycled. Frames and other attached components may be removed from a PV module to determine if the product should be deemed waste. Such removal activities should not be considered 'treatment' since the entire product is not yet deemed waste.

**Comment:** 9-7

**Response:**

DTSC reviewed the comment and has determined that no regulatory change is necessary. The proposed regulation is clear that the intent of the regulatory language in section 66273.31 is to prohibit universal waste handlers from diluting or treating a universal waste except in a case of containment from spillage or managing the universal waste PV modules as specified in section 66273.33.6. The comment regarding waste determination and treatment is not relevant to this section; therefore, no changes are made.

DTSC would like to clarify that universal waste management requirements do not apply to PV modules that are not yet wastes as specified in sections 66273.7.1(b)(1) and 66273.7.1(b)(7). Section 66273.7.1(b)(1) specifies PV modules that are not yet wastes pursuant to chapter 11, and section 66273.7.1(b)(7) specifies that "PV modules that were previously identified as waste pursuant to chapter 11, but are no longer identified as a waste (e.g., discarded PV modules that are refurbished and are returned to service)" are not covered to be managed as universal waste PV modules pursuant to relevant requirements in chapter 23. Therefore, if PV module manufacturing scrap that the commenter described in the comment are reused, repurposed, or refurbished to use as a functioning PV module, it is not yet a waste; therefore, universal waste management requirements do not apply.

If the manufacturer determines that the PV module manufacturing scrap is deemed a waste, the manufacturer may choose to manage it as universal waste. Handlers are then required to comply with universal waste management standards as specified in chapter 23.

## **VI. Notification and Reporting Requirements for Universal Waste Handlers**

### **A. NOTIFICATION REQUIREMENTS PRIOR TO ACCEPTING PV MODULES**

#### **Comment Summary:**

The comments state the Department requires handlers to notify DTSC prior to handling any PV modules. This requirement will work for entities intending to handle PV modules but is unrealistic for solid waste facilities, household hazardous waste facilities, and illegal disposal cleanup programs. These facilities may not intend to handle PV modules but may inadvertently receive photovoltaics (hidden within loads of other materials) or accept them to prevent illegal disposal elsewhere. It is common for solid waste facilities to receive hazardous and other prohibited wastes hidden in loads that are not identified until after the responsible party has left the site.

The comments further state that the mandatory 30 calendar day notification prior to accepting PV modules is not possible unless all the thousands of programs send notifications to the Department even if there is no intent to collect photovoltaics. There should be an allowance for notification after acceptance.

**Comments:** 7-8, 7-34, 9-46, PH-1-5

#### **Response:**

DTSC respectfully disagrees with the comments and has determined that no regulatory change is necessary. Notification is a one-time event that all handlers are required to do if they intend or anticipate accepting or handling PV modules. If the solid waste facility does not intend to collect PV modules, it is the responsibility of the facility to reject the load and ensure that incoming loads do not contain wastes that it is not authorized to accept, including hazardous wastes, pursuant to title 27, California Code of Regulations, section 20870(b).

The notification requirement applies to any handling facilities that will collect and handle waste PV modules. DTSC assumes that if a handler accepts PV module waste once, it is likely that the handler will accept more of such waste in the future. However, the handler will only notify DTSC one-time 30 days prior to the first acceptance. The 30-day timeframe provides DTSC with sufficient time to receive the notification and document that handlers intend to accept and accumulate PV modules. Without the notifications, DTSC would have no means to identify these handlers or where they are operating.

## **B. CLARIFY NOTIFICATION AND ANNUAL REPORT REQUIREMENTS**

### **Comment Summary:**

The comments request clarification on notification and annual reporting requirements, such as who is required to submit a notification or annual report and when the notification or report should be submitted. These requirements could become burdensome. Comments state that it is unclear if homeowners, warehouses, or distribution centers would be held to the notification and reporting requirements. The comments request to exempt warehouses, distribution centers and other such facilities from registering as universal waste handlers because many of such facilities are leased and may not be allowed to have such waste on the premises.

**Comments:** 9-13, 11-12

### **Response:**

DTSC reviewed the comments and has determined that no regulatory change is necessary because the proposed regulatory text clearly states the requirements for notification and annual reporting. The notification requirement as specified in section 66273.32(e)(1) explains that any universal waste handler who might accept and accumulate, but not treat, any PV modules from an offsite source shall submit a written notification. The notification requirement applies to any handling facilities, including warehouses and distribution centers, that will collect and handle waste PV modules. These requirements do not apply to homeowners unless they are in the business of accepting PV modules as universal waste.

Notification is a one-time event that handlers are required to notify DTSC if they foresee or intend to accept PV modules. DTSC assumes that if a handler accepts PV module waste once, it is likely that the handler will accept more of such waste in the future. However, the handler will only notify DTSC once.

The annual reporting requirements as specified in sections 66273.32(f)(1) and 66273.32(f)(2) are for handlers, including warehouses and distribution centers, that accept more than 100 kilograms (220 pounds) or generate 5,000 kilograms (11,000 pounds) of PV modules, respectively, in a calendar year. These requirements do not apply to homeowners unless they are in the business of accepting PV modules as universal waste and only apply to businesses that accept or generate PV modules at the specified thresholds.

It is the responsibility of the warehouses and distribution centers to ensure that they are not violating any property lease terms and agreements, which are outside the scope of DTSC jurisdiction. The comments did not provide any justification for why warehouses

and distribution centers need to be exempt from notification, annual reporting, and chapter 23 requirements, outside of the concern regarding the lease agreement, for universal waste PV modules. Therefore, DTSC continues to require all universal waste handlers that accept or accumulate PV modules to comply with applicable requirements in the proposed regulation.

### **C. ADDING PV MODULES TO EXISTING E-WASTE NOTIFICATION FORM**

#### **Comment Summary:**

The comments are in relation to the notification requirements in section 66273.32(e). The comments request DTSC to consider adding PV modules to the current e-waste notification form rather than creating a parallel system just for PV modules.

**Comments:** 3-2, 7-33

#### **Response:**

DTSC has reviewed the comments and determined that no regulatory change is necessary. Section 66273.32(e) requires handlers to notify DTSC once 30 days prior to accepting or accumulating PV modules.

PV modules are proposed as a new waste stream to be managed under universal waste requirements. If a business intends to handle hazardous waste PV modules, the business is required to submit a notification to DTSC indicating its intent to handle PV modules regardless of any other universal wastes, such as electronic devices, they handle. Therefore, notification requirements for PV modules will not be added to the existing e-waste notification form for electronic devices and CRTs.

### **D. COMBINE REPORTING SYSTEM**

#### **Comment Summary:**

The comments recommend integrating annual reporting requirements into the existing electronic waste reporting system, so handlers do not have to file multiple reports for different materials.

**Comments:** 1-5, 7-11, 7-43, PH-5-11

#### **Response:**

DTSC respectfully disagrees with the comments and has determined that no regulatory change is necessary. The annual report for photovoltaic modules will be a separate reporting requirement from other universal wastes, such as electronic waste and CRTs,

because PV modules are a separate and new universal waste stream. DTSC reorganized the reporting requirements in sections 66273.32 and 66273.74 in the proposed regulations to be consistent with those of electronic devices and CRTs.

## **E. REPORTING PV MODULES BY “TYPE”**

### **Comment Summary:**

The comments state that DTSC proposes to require PV module handlers to include the types of PV modules they expect to handle in both notification and annual reporting. This requirement would be burdensome as household hazardous waste facilities, as well as other types of waste management facilities, may not be able to identify PV modules by type either before or after acceptance. This requirement would be impossible to reasonably implement in the field and result in unreasonable violations. Handlers may be required to do research to determine the PV module by type, as new PV module technology is developed, which would be extremely burdensome. The comments suggest the removal of this requirement from the proposed text.

**Comments:** 1-4, 7-35, 7-36, 7-37, 7-38, 7-39, 7-40, 7-41, 7-45, 7-46, 7-64, 8-9, 9-10, 9-16, PH-5-8

### **Response:**

DTSC agrees with the comments that handlers do not always know in advance what type of PV modules they will receive or cannot always definitively determine what PV modules they receive just by visual inspection alone. Therefore, sections 66273.32(e)(2)(H) and 66273.32(f)(3)(H) have been revised to require the handlers to report the type(s) of PV modules handled in the notification and annual reports only if that information is known. DTSC further provides an example of types of PV modules to be reported, such as crystalline silicon, to clarify what DTSC means by type of PV module. Respective changes have also been made to sections 66273.74(a)(4)(H) and 66273.74(b)(3)(G) to be consistent with the requirements for types of PV modules in the notification and annual reporting. However, identifying types of PV modules handled is necessary because DTSC collects these data to understand the types of PV module waste stream overtime.

## **F. NOTIFYING PV MODULES BY “SOURCE”**

### **Comment Summary:**

The comment states that section 66273.32(e)(2)(I), regarding identifying sources from which handlers are going to accept and accumulate PV modules in the notification, should include a listing for “source unknown” if the source is not known. Some sources may not be known at the time of discovery such as roadside cleanup of illegally

disposed wastes or in load checking programs. There should be a listing for "source unknown."

**Comment:** 7-42

**Response:**

DTSC agrees with the comment that handlers do not always know in advance or cannot always identify the sources of PV modules they handle. However, notifying DTSC of the sources of PV modules handled is necessary for DTSC to collect data on where the waste is generated in California, which is used to report to public and predict trends and outlooks. Therefore, section 66273.32(e)(2)(I) has been revised to require the handlers to report the source of PV modules in the notification if that information is known and report as "source unknown" if the source is not known.

## **G. REPORTING PV MODULES BY "LOCATION"**

**Comment Summary:**

The comment refers to section 66273.32(f)(3)(J)(3) regarding the requirement to include a description of how each of the PV module handling location intends to manage the waste PV modules in the annual report, including where the waste PV modules are recycled or disposed of. The comment states that this requirement should allow for a company-wide disclosure, if the company has multiple locations, instead of requiring to report for individual locations.

**Comment:** 9-20

**Response:**

DTSC respectfully disagrees with the comment and has determined that no regulatory change is necessary. The proposed annual reporting requirement to include a description of how each handling location intends to manage the waste PV modules is for DTSC to be able to track which facilities, regardless of being managed by one organization, receive PV modules. The annual report requires handlers to include the quantities of PV modules that were handled, whether accumulated at the facility or shipped, during the previous calendar year. Handling facilities could have different handling and management practices, regardless of being under the same ownership, and would likely send varying quantities of PV modules to various locations. Therefore, each handling facility is required to submit an annual report specific to its location.

## **H. CLASSIFY INTACT PV MODULES AS SOLID WASTE FOR THE PURPOSE OF TRANSPORTATION**

**Comment summary:**

The comment suggests adding new language to the regulation text in sections 66273.32(e)(2) regarding notification requirements for the universal waste handlers as follows:

“(k) Any unbroken (intact) waste PV modules should be considered solid waste for the purposes of transportation to any facility permitted to treat waste PV modules. Any broken (glass breakage) should be handled in accordance with these regulations.”

The comment states that adding this new language will encourage installers to avoid breakage.

**Comment:** 9-11

**Response:**

DTSC reviewed the comment and has determined that no regulatory change is necessary. The proposed regulation is clear that section 66273.32(e) outlines the notification requirements for universal waste handlers.

The use of the term “solid waste” is unclear in the comment. DTSC assumes the commenter’s use of the term “solid waste” to mean nonhazardous solid waste as specified in California Code of Regulations, title 27, section 20220; otherwise, the comment would not make sense as the PV modules that are managed as universal waste under this proposed regulation are hazardous waste. Based on this assumption, adding the suggested language classifying intact PV modules as a solid waste for the purpose of transportation would mean allowing discarded PV modules that are hazardous to be managed as nonhazardous waste outside the standards for transporters of universal waste management as proposed; instead of managing the wastes as universal waste from the point of generation to its final destination facility. Allowing for the management of these wastes as anything other than universal or hazardous waste during the handling process could lead to improper disposal of these wastes in municipal solid waste landfills since they would no longer be classified as a universal or hazardous waste, a classification that indicates that municipal solid waste landfills may not accept them. Therefore, no regulatory text change is made to address the comment.

The notification requirement in section 66273.32(e) is a one-time event that all “universal waste handlers,” as defined in section 66273.9, are required to comply with if they intend or anticipate accepting or handling PV modules. The notification requirement is not applicable for “universal waste transporters,” as defined in section 66273.9. Adding language regarding transportation requirements for solid waste by installers under the requirements for notification would lead to a clarity issue since the suggested language is not applicable to notification requirements.

Additionally, installers manage PV module products that are used for installation, not waste management. As such, adding the suggested language per the comment, to

encourage installers to avoid PV module breakage, to the proposed regulation which is specific for the management of waste PV modules that are hazardous, is outside the scope of the proposed regulation. Adding language regarding transportation requirements for solid waste by installers under the requirements for notification would lead to a clarity issue since DTSC does not regulate products that installers would be managing, only wastes that are hazardous.

Based on the reasons above, no regulatory text change is made in the proposed regulation.

## **I. QUANTITY CLARIFICATION IN THE ANNUAL REPORT**

### **Comment Summary:**

The comment requests clarification on whether to report “quantity” as the number of units or the total weight at one collection or for a year for annual reporting purposes in subsection 66273.32(f)(3)(I).

**Comment:** 9-17

### **Response:**

DTSC agrees with the comment that the unit measure for the quantity of PV modules needs to be clarified for the annual reporting requirement. However, DTSC unintentionally overlooked including clarification on the unit measure during the changes made for the second public comment period. Instead, the unit measure indication, either by count or weight, was added to the proposed regulation text during the third comment period to clarify the quantity of photovoltaic modules that handlers are required to report in the annual reports.

## **J. ANNUAL REPORTING THRESHOLD FOR HANDLERS THAT ACCEPT PV MODULES OR THAT GENERATE WASTE**

### **Comment Summary:**

The comments state that the thresholds that require submission of an annual report for universal waste handlers that accept or generate PV modules are overly restrictive. Such requirements would discourage consolidation of panels from different sites and would increase the frequency of the required submissions of notifications and annual reports, which discourage handlers from handling PV modules. The comments suggest increasing the threshold that would require submission of an annual report from 100 kilograms (220 pounds) to 500 kilograms (1,100 pounds) per month for accepting PV modules, and 5,000 kilograms (11,000 pounds) per year to 1,000 kilograms (2,200 pounds) per month or 5,000 kilograms (11,000 pounds) of PV module accumulation on site at one time.

**Comments:** 5-4, 5-5, 5-6, 5-7, 5-8, 7-44, 11-10, PH-1-4, PH-4-3, PH-4-4

**Response:**

DTSC respectfully disagrees with the comments and has determined that no regulatory change is necessary.

The annual reporting threshold requirements are for handlers that accept more than 100 kilograms (or 220 pounds) or generate more than 5,000 kilograms (or 11,000 pounds) of PV modules in a calendar year.

The proposed annual reporting requirement to report on activities that were conducted in the previous calendar year allows DTSC to understand the nature of handling and treatment activities that are occurring at the different facilities and to verify compliance with the requirements. If a handler is accepting PV modules from an offsite source or generating PV modules, the handler is in the business of universal waste management of PV modules and thus is required to submit annual report for such business.

The annual report threshold limit for handlers that accept PV modules is set at 100 kilograms (or 220 pounds) to maintain consistency among annual reporting requirements for other universal wastes and stemmed from the generation limit for conditionally exempt small quantity generators, as described in 40 Code of Federal Regulations **section 261.5**. This annual report is not required for households and businesses that generate small quantities of PV modules.

The annual reporting threshold limit of 5,000 kilograms (or 11,000 pounds) for handlers that generate PV modules is set as such because it reflects the federal notification threshold limit under the U.S. EPA universal waste management requirements. According to federal laws, a state may adopt regulations that are more stringent but not less stringent than federal standards; therefore, DTSC is not allowed to set threshold limits that are lower than the U.S. EPA universal waste requirements.

Additionally, annual reporting requirements allow DTSC to keep a record of businesses that manage universal waste, which DTSC oversees. As such, if a business handles universal waste, under California's laws and regulations, it must comply with annual reporting requirements. There is no notification or annual report cost or fees that handlers need to pay. DTSC determined that the time and cost it takes to prepare the annual report by responsible parties will be minimal.

## **K. WRITTEN ANNUAL REPORTS**

**Comment Summary:**

The comments state that section 66273.32(g) allows written or electronic submittal of notifications and annual reports. The comments greatly appreciate allowing written

submittals since not all handlers have access to electronic reporting or may encounter technical issues. They also appreciate that written submissions are not required to also be submitted electronically.

**Comments:** 7-47, PH-5-4

**Response:**

DTSC acknowledges and appreciates the comments and made no changes to the proposed regulation or supporting documents in response to the comments. The proposed regulation is clear that universal waste handlers of PV modules can submit the notification and annual reporting via written submission only, not electronically.

#### **L. SECTION 66273.32(d)**

**Comment Summary:**

The comment states that the 100 kilograms threshold in section 66273.32(d) creates a significant impact to system owners including residential, small businesses owners, solar installers, distributors, warehouses, and other related businesses. Having to register each branch warehouse as a location handling universal waste will be onerous and costly for solar companies that have multiple facilities. Similarly, this may inadvertently affect current leasing agreements which may not allow universal waste on-site. Registering and possibly requiring permitting of such facilities as universal wastes locations may drive up lease costs. The commenter request that DTSC confirm if these considerations are included in the Economic and Fiscal Impact Statement.

**Comment:** 9-8

**Response:**

DTSC reviewed the comment and has determined that no regulatory change is necessary. Section 66273.32(d) outlines the annual reporting requirements for universal waste handlers of electronic devices, Cathode Ray Tubes (CRTs), and CRT glass and is outside the scope of the proposed regulation for PV modules.

#### **M. ANNUAL REPORTING REQUIREMENT ONLY APPLIES TO BROKEN WASTE PV MODULES**

**Comment summary:**

The comment suggests clarifying the annual reporting requirements in section 66273.32(f) to apply only to universal waste handlers that generate 5,000 kilograms (11,000 pounds) or more of waste PV modules that are broken.

**Comment:** 9-61

**Response:**

DTSC reviewed the comment and has determined that no regulatory change is necessary. DTSC respectfully disagrees with the comment that suggests that annual reporting requirements should only apply to universal waste handlers that generate waste PV modules that are broken. The annual reporting allows for DTSC to adequately track and record the quantity of PV modules waste generated, regardless of whether broken or intact, in California. Allowing only a partial reporting, as the comment suggested, would result in inaccurately capturing the quantity of PV module waste that is generated in a calendar year in California. Unless all PV module wastes generated by a universal waste handler are reported, DTSC has no way of knowing the quantity of wastes handlers manage. Therefore, no regulatory change is made to address this comment.

## **N. ELECTRONIC SUBMISSIONS**

### **Comment summary:**

The comment asserts that allowing written submission, as specified in section 66273.32(g)(3), disincentivizes DTSC from maintaining a functional electronic submission system. The comment requests a commitment from DTSC to develop an electronic reporting tool for notifications and annual reports.

**Comment:** 9-21

### **Response:**

DTSC reviewed the comment and has determined that no regulatory change is necessary. In the event that electronic submission is unavailable, the requirement for submission of notification and annual reporting in writing allows for an alternate method to submit the information as required. Therefore, no regulatory change is made to address this comment.

## **VII. Universal Waste Management Requirements for PV Modules**

### **A. APPLICABILITY**

#### **Comment Summary:**

The comment states that section 66273.33.6(a)(3) describes procedures for management of PV modules or constituents of the PV modules accidentally or unintentionally broken, which could include individual PV cells. The comment recommends that these parts be allowed to be managed as universal wastes and included with the PV modules, which would be consistent with other universal wastes as indicated in section 66273.37.

**Comment:** 7-48

**Response:**

DTSC agrees with the comment and has determined that changes made to the definition of "Photovoltaic module" in response to prior comments address this comment. The definition of the term "Photovoltaic module" was revised to include PV cells that are not electrically connected and exclude the ancillary components that are not integrated to the PV module. As such, universal waste management requirements for PV modules apply specifically to PV modules, including individual PV cells. This proposed regulatory text of section 66273.33.6 was included in section 66273.37 to include requirements for responding to releases for managing PV modules as universal waste.

## **B. BEST MANAGEMENT PRACTICES**

**Comment Summary:**

The comment suggests changing the proposed text in section 66273.33.6(a)(2) to read as follows:

"Manage waste photovoltaic modules in accordance with best management practices to prevent releases of any constituent of a photovoltaic module to the environment under reasonably foreseeable conditions, as follows."

The comment states that the industry is willing to work on developing the best management practices. The comment further suggests that such standard should ensure that no more packaging material is required than that which ensures handler's and the environment's safety and should aim reduce packaging waste.

**Comment:** 9-24

**Response:**

DTSC respectfully disagrees with the comment and has determined that no regulatory change is necessary. Under chapter 23, handlers are required to manage universal wastes in a way that prevents releases to the environment under reasonably foreseeable conditions, by containing the waste, preventing breakage, and cleaning up immediately if the waste is accidentally or unintentionally broken. The commenter's suggestion to manage the waste using unspecified best management practices is ambiguous and DTSC cannot enforce best management practices which are not specifically identified in a regulation, which is why the clear requirements are included in this proposed regulation.

The containment requirements are intended to prevent accidental breakage and release of hazardous constituents to the environment and ensure that PV modules are handled in a manner that would prevent any release to the environment. Containment is not limited to purchasing new packaging materials as long as PV modules are handled in a manner that prevents releases to the environment.

### **C. EXEMPTION FROM ARTICLE 7 TREATMENT REQUIREMENTS**

#### **Comment Summary:**

The comments state that the proposed regulation in section 66273.33.6(c)(1), regarding article 7 exemption requirements for universal waste handlers that only manage intact PV modules as universal waste, could be commercially prohibitive and could disallow distributors or warehouses from accepting returns or products that arrive broken due to issues in-transit. Similarly, a universal waste handler may have received the PV module because it is not intact and needs to be recycled, refurbished, or properly disposed of. This could potentially introduce costly re-locating of millions of pounds of inventory if lease agreements do not allow for the management of universal waste.

**Comments:** 9-29, 9-59

#### **Response:**

DTSC respectfully disagrees with the comments and has determined that no regulatory change is necessary. Numbering changes were made to section 66273.33.6 to align with other universal wastes, such as electronic devices and CRTs. The proposed regulatory text now in section 66273.33.6(a)(3)(A), previously section 66273.33.6(c)(1), specifies that handlers are exempt from article 7 requirements, such as a closure plan and financial plan for closure, if handlers do not treat but manage only the intact PV modules, unless PV modules are unintentionally or accidentally broken.

The requirements in article 7 apply only to universal waste handlers that treat PV modules by intentionally breaking PV module glass. If activities handlers conduct do not involve intentionally breaking PV module glass, handlers, including warehouses and distribution centers, are exempt from the requirements of article 7 of chapter 23. Section 66273.33.6(a)(3)(C) specifies one of the conditions that handlers must comply with to be exempt from article 7 requirements. Section 66273.33.6(a)(1)(B) specifies how handlers are required to manage PV modules to prevent releases of any constituent of a PV module, to avoid the concern that commenters have regarding PV modules that arrive broken due to issues in-transit. If there are unintentional and/or accidental breakage of PV modules, handlers then must comply with requirements as specified in section 66273.37 regarding response to releases. If there is a known market for PV module refurbishment, those PV modules are no longer considered a waste and are outside of PV module universal waste management, as specified in section

66273.7.1(b)(7). This applies to all handlers of PV modules, including warehouses and distribution centers.

#### **D. INCLUSION OF THE WORD “HAZARDOUS” IN FRONT OF “CONSTITUENT” IN SECTION 66273.33.6(a)(1)(B)1.b**

##### **Comment Summary:**

The comment suggests adding the word "hazardous" in section 66273.33.6(a)(1)(B)1.b to read as follows:

“A universal waste handler shall contain any photovoltaic module in a manner that prevents breakage and release of any hazardous constituent of a photovoltaic module to the environment under reasonably foreseeable conditions, as follows:”

**Comment:** 9-25

##### **Response:**

DTSC reviewed the comment and determined that no regulatory change is necessary.

When a PV module breaks, there is no definite way of knowing which broken constituents are hazardous and which are not just by visual inspection. As such, all broken constituents must be managed as if they have potential to be hazardous, until a hazardous waste determination is made. Additionally, adding "hazardous" in front of constituent would mean that handlers are required to determine which constituent of the broken PV module is hazardous at the point of unintentional or accidental breakage, which is impractical. Therefore, DTSC did not add "hazardous" in front of "constituent."

## **VIII. Labeling/Marking**

##### **Comment Summary:**

The comments state an appreciation for the allowance to combine PV modules with other universal wastes. This will be very beneficial to handlers since these items are likely to be sent together to a processor. The comments also suggest that the labeling requirements for universal waste that has been combined, packaged, or accumulated be made simpler and shorter. The comments go on to suggest that the label list all the materials and omit the term "universal waste" that precedes each waste.

**Comments:** 1-6, 3-3, 7-51, 7-52, PH-5-12

##### **Response:**

DTSC reviewed the comments and found that DTSC unintentionally added PV modules to the labeling/marketing requirements for other universal waste electronic devices, CRTs, and CRT glass. PV modules are a separate universal waste stream and were not intended to be combined with other universal waste streams. As such, DTSC removed PV modules from subsection 66273.34(h). Therefore, the correct labeling for universal waste electronic devices, CRTs, and/or CRT glass is "Universal Waste-Electronic Device(s)/Universal Waste-CRT(s)/Universal Waste-CRT Glass." DTSC also added language to section 66273.34(g) that PV modules that are placed within a designated area demarcated by boundaries must be clearly labeled with the phrase "Universal Waste-PV module(s)."

## **IX. Response to Releases**

### **Comment Summary:**

The comment states that section 66273.33.6, regarding universal waste management requirements for PV modules, should be referenced in section 66273.37(c) for responding to releases as follows:

"(c) Hazardous waste consisting only of residues of leaking, broken, or otherwise damaged universal waste may be managed as universal waste provided that the leaking, broken, or otherwise damaged universal waste is repackaged according to the standards of section 66273.33, or 66273.33.5, or 66273.33.6."

**Comment:** 7-53

### **Response:**

DTSC agrees with the comment that hazardous waste consisting residues of broken or damaged PV modules may be managed as universal waste provided the waste is repackaged as required in section 66273.33.6 as a part of responding to releases. DTSC unintentionally overlooked reference to section 66273.33.6, regarding universal waste management requirements for PV modules, in section 66273.37(c) for responding to releases, before noticing the regulatory text for public comment. DTSC appreciates the recommendation and corrected the error.

## **X. Recordkeeping/Tracking Universal Waste Shipments**

### **A. EXCESSIVE RECORDKEEPING/TRACKING REQUIREMENTS**

#### **Comment Summary:**

The comments state that recordkeeping and tracking requirements in section 66273.39 are excessive, provide no value for management of photovoltaic modules, serve no

useful purpose for the handler, and impose an unreasonable burden. The comments state that there is no justification or benefit for tracking these wastes on an incoming basis and the type and amount of wastes are recorded when the wastes are shipped. The proposed regulatory requirements to track photovoltaic modules by type is even more excessive and a burdensome requirement.

**Comments:** 7-9, 7-54, 7-55

**Response:**

DTSC respectfully disagrees with the comments that recordkeeping requirements are excessive for photovoltaic modules and tracking incoming universal wastes serves no useful purpose for the handlers and has determined that no regulatory change is necessary. Tracking the incoming and outgoing shipments of universal waste is intended to accurately monitor the quantity of universal wastes on-site and the accumulation time the wastes are at the handlers' facilities. Tracking wastes also helps handlers in preparing annual reports. Additionally, this tracking requirement is the only way handlers and DTSC can identify where the waste is shipped since universal waste is not shipped on a manifest. This requirement also aligns with the federal requirements for tracking universal waste shipments.

The proposed regulation is clear that the "type" of universal waste subject to the tracking requirements in sections 66273.39(a)(2) and 66273.39(c)(2) could be reported as "electronic devices" or "photovoltaic modules," for example, and not a specific type of PV module waste, for example, "crystalline silicon" or "thin film." As such, no regulatory changes were made.

## **B. MAKING TRACKING SHIPMENTS LESS BURDENSOME**

**Comment Summary:**

The comments suggest that sections 66273.39(a), regarding receipt of universal waste shipments, and 66273.39(b), regarding receipts of universal wastes from household generators and conditionally exempt small quantity universal waste generators, be eliminated from section 66273.39 for PV modules and all other universal wastes in order to make tracking less burdensome.

**Comments:** 7-56, 7-57

**Response:**

DTSC respectfully disagrees with the comments to remove tracking requirements for receipt of shipments of PV modules and all other universal wastes and has determined that no regulatory change is necessary. The requirement for tracking receipt of universal waste shipments is for handlers to accurately monitor the quantity of PV modules

received and the date of receipt to ensure compliance with accumulation time limit at the handling facility.

Additionally, the request to remove tracking requirement for receipt of all universal wastes from household generators and conditionally exempt small quantity universal waste generators as specified in section 66273.39(b) is outside of the scope of this proposed regulation for photovoltaic modules, and therefore, no regulatory text changes are made.

### **C. RECORDKEEPING CLARIFICATION AT HANDLER'S TREATMENT FACILITIES**

#### **Comment Summary:**

The comment requests clarification on whether other universal waste handlers are also required to provide a local air district permit and/or other relevant permit(s) mentioned in section 66273.74(c)(A)(3).

**Comment:** 9-58

#### **Response:**

DTSC reviewed the comment and has determined that no regulatory change is necessary. The requirements for other universal waste streams are outside the scope of this proposed regulation for photovoltaic modules.

## **XI. Universal Waste Transporters**

### **A. CONTAINMENT**

#### **Comment Summary:**

The comment states that homeowners who want to partake in a module return program or warranty return will typically send the modules back to manufacturer (possibly through a contracted installer or service company) and likely do not have packaging materials to meet the requirements specified in section 66273.32. Yet if they transport more than 100 kilograms of panels without said packaging, this is prohibited per section 66273.51, regarding prohibitions for universal waste transporters.

This will require either manufacturers to purchase and send empty boxes out to each site for a return to comply with the packaging requirements; or it would require the homeowners to purchase the packaging material, which realistically is not sold in single units and may result in more solid waste generated than intended.

**Comment:** 11-11

**Response:**

DTSC respectfully disagrees with the comment that containment requirements for transporting PV modules set at 100 kilograms would result in more waste generated due to packaging and containment requirements and has determined that no regulatory change is necessary. Due to the size and location of the PV modules on homeowners' rooftops, DTSC anticipates that homeowners would contract services for the removal of and transporting PV modules from roof tops. As such, professional transporters are required to comply with applicable transportation laws and regulations as outlined in article 5 of chapter 23.

The containment requirements are set to prevent accidental breakage and release of hazardous constituents to the environment. The containment requirements are intended to ensure that PV modules are transported in a manner that would prevent any release to the environment. Containment is not limited to purchasing new packaging materials as long as PV modules are transported in a manner that prevents releases to the environment.

**B. CLASSIFY INTACT PV MODULES AS SOLID WASTE FOR THE PURPOSE OF TRANSPORTATION**

**Comment Summary:**

The comment suggests adding a new language to the regulation text in sections 66273.51 regarding prohibitions for universal waste transporters as follows:

“(f) Any unbroken (intact) waste PV modules should be considered solid waste for the purposes of transportation to any facility permitted to treat waste PV modules. Any broken (glass breakage) should be handled in accordance with these regulations.”

The comment states that adding this new language will encourage installers to avoid breakage.

**Comment:** 9-31

**Response:**

DTSC reviewed the comment and has determined that no regulatory change is necessary. The proposed regulation is clear that section 66273.51 specifies prohibitions for universal waste transporters.

The use of the term “solid waste” is unclear in the comment. DTSC assumes the commenter’s use of the term “solid waste” to mean nonhazardous solid waste as specified in California Code of Regulations, title 27, section 20220; otherwise, the comment would not make sense as the photovoltaic modules that are managed as

universal waste under this proposed regulation are hazardous waste. Based on this assumption, adding the suggested language classifying intact PV modules as a solid waste for the purpose of transportation would mean allowing discarded PV modules that are hazardous to be managed as nonhazardous waste outside the standards for transporters of universal waste management as proposed; instead of managing the wastes as universal waste from the point of generation to its final destination facility. Allowing for the management of these wastes as anything other than universal or hazardous waste during the handling process could lead to improper disposal of these wastes in municipal solid waste landfills since they would no longer be classified as a universal or hazardous waste, a classification that indicates that municipal solid waste landfills may not accept them. Therefore, no regulatory text change is made to address the comment.

Section 66273.51 specifies the prohibitions for universal waste transporters. The proposed regulation is clear that universal waste transporters of PV modules are prohibited from transporting more than 100 kilograms (220 pounds) of PV modules at any one time unless the PV modules are contained as described in section 66273.33.6(a)(1)(B) of the proposed regulation to prevent breakage and release of any constituents to the environment. Additionally, installers manage PV modules that are used for installation, not waste management. As such, adding the suggested language per the comment, to encourage installers to avoid PV module breakage, to the proposed regulation which is specific for the management of waste PV modules that are hazardous, is outside the scope of the proposed regulation. Adding language regarding transportation requirements for solid waste by installers under the requirements for notification would lead to clarity issue since DTSC does not regulate products that installers would be managing, only wastes that are hazardous.

Based on the reasons above, no regulatory text change is made in the proposed regulation.

### **C. COMMINGLING WITH OTHER UNIVERSAL WASTES**

#### **Comment Summary:**

The comment suggests adding a new language for PV modules to in section 66273.51 regarding the prohibitions for universal waste transporters to the proposed regulation as follows:

“(g) and may be co-mingled with other universal waste electronics.”

**Comment:** 9-60

**Response:**

DTSC reviewed the comment and has determined that no regulatory change is necessary. The proposed regulation is clear that section 66273.51(e) prohibits universal waste transporters from transporting more than 100 kilograms (220 pounds) of PV modules at any one time, unless the wastes are contained as specified in section 66273.33.6(a)(1)(B). Adding the allowance to commingle PV modules with universal waste electronic devices as the comment suggested would negate with the containment requirements as specified in section 66273.33.5(a)(1)(B) for electronic devices, as well as the containment requirements as proposed in section 66273.33.6(a)(1)(B) for PV modules, and pose a clarity issue in the regulations and for the regulated community. Therefore, no regulatory text change is made.

## **D. TRANSPORT METHODS**

### **Comment Summary:**

The comment suggests that DTSC clarify in section 66273.51(e) that PV modules are not required to be transported in a container so long as the transportation prevents releases to the environment. This is consistent with storage methods allowed for PV modules in proposed section 66273.33.6 and is common practice for other universal wastes such as CRTs and large electronic devices.

**Comment:** 8-10

### **Response:**

DTSC agrees with the commenter's request for clarification and has modified the text. DTSC renumbered the reference used in section 66273.51(e) from section 66273.33.6(a)(2) to section 66273.33.6(a)(1)(B), to accurately capture containment requirements for universal waste handlers that transport more than 100 kilograms (220 pounds) of PV modules at any one time. Section 66273.33.6(a)(1)(B) specifies PV module universal waste management requirements to prevent releases of PV module constituents to the environment. DTSC added "stretch-film on a pallet," as the comment suggested, as an example of what is qualified as a form of containment that prevents breakage and release of constituents of PV modules in section 66273.33.6(a)(1)(B)1.b. Universal waste transporters of PV modules are required to comply with the proposed regulation as outlined in section 66273.51(e).

## **E. TRANSPORTING PV MODULES**

### **Comment Summary:**

The comment states that residuals from the cleanup of PV modules and constituents should also be included in this section's transportation requirement. The commenter suggests referencing section 66273.33.6(a)(3) in section 66273.51(e) as follows:

“(e) Prohibited from transporting more than 100 kilograms (220 pounds) of photovoltaic modules at any one time unless the photovoltaic modules are contained as described in section 66273.33.6, subsection (a)(2) and (a)(3).”

**Comment:** 7-58

**Response:**

DTSC agrees with the commenter's recommendation that residuals from the cleanup of PV modules and constituents should be included in section 66273.51 and has revised the regulation text. Universal waste transporters of PV modules are prohibited from transporting more than 100 kilograms of PV modules at any time unless the transporters contain the waste in a manner that prevents breakage and release of constituents to the environment and that the transporters shall immediately clean up if the waste if it is accidentally broken. DTSC has corrected the reference used in section 66273.51, from section 66273.33.6(a)(2) to section 66273.33.6(a)(1)(B), to accurately capture containment requirements and to reflect preventing releases of any constituent of PV module and cleanup of accidental breakage requirements for PV modules.

## **F. CONTAINMENT REQUIREMENT FOR TRANSPORTERS**

**Comment Summary:**

The comment states that the proposed regulation in section 66273.51(e) is concerning given the lack of clarity on acceptable packaging methods in the section referenced. This may unnecessarily increase the cost of recycling making it prohibitively expensive from the logistics and freight costs.

**Comment:** 9-30

**Response:**

DTSC agrees with the commenter's assertion that containment requirements for transporting PV modules are unclear due to the lack of packaging and containment referenced. The containment language as proposed in section 66273.51(e) is to prevent any release of hazardous constituents to the environment while transporting PV modules.

The reference used in section 66273.51(e), prohibitions for universal waste transporters, is corrected from section 66273.33.6(a)(2) to section 66273.33.6(a)(1)(B), to accurately capture acceptable containment requirements for universal waste handlers that transport more than 100 kilograms (220 pounds) of PV modules at any one time. An example of containment requirement, such as stretch-film on a pallet, is added to subsection (a)(1)(B)1.b of section 66273.33.6 to clarify what is qualified as containment requirements to prevent releases of PV module constituents to the environment.

## **XII. Treatment Activities – Applicability**

### **A. LANGUAGE CLARITY**

#### **Comment Summary:**

The comment suggests the following addition to section 66273.71, that specifies authorization for removal activities, to clarify that these activities regarding user-replaceable components are not considered treatment:

“(d) None of the activities in this section (a), (b) or (c) constitute treatment.”

**Comment:** 9-33

#### **Response:**

DTSC reviewed the comment and has determined that no regulatory change is necessary. The term “Treatment” is defined in section 66273.9 as any method, technique, or process which changes or is designed to change the physical, chemical, or biological character or composition of any hazardous waste. Activities outlined in section 66273.71 are for removing discrete assemblies during normal use and operation of a product, which would constitute treatment as defined. Section 66273.71(a) specifies that activities identified in sections 66273.71(b) and 66273.71(c) are exempt from treatment requirements of sections 66273.74 through 66273.77, provided the universal waste handler complies with the requirements specified in sections 66273.71(b) through 66273.71(g). Therefore, the removal activities would be considered treatment by definition.

## **XIII. Removal Activities**

### **A. REMOVING DISCRETE ASSEMBLY PARTS**

#### **Comment Summary:**

The comments suggest that serviceable parts that are routine maintenance items over the life of the PV panel, such as cables, connectors, and diode boxes, as discrete assemblies that may be removed from PV modules in section 66273.71, regarding removal activities, or not to include ancillary components as a part of PV modules, to allow for removal of non-hazardous components.

**Comments:** 5-10, 7-59, PH-5-3

#### **Response:**

DTSC agrees with the comments and has made the following changes to the proposed regulation.

The definition of "Photovoltaic module" was revised to include photovoltaic cells that are not electrically connected to be managed as PV modules and exclude the ancillary components that are not integrated to the module. Examples of components that are integrated to a PV module are provided, but are not all inclusive, because each PV module design, and thus its components, could vary depending on the manufacturer. This also allows for advances in technology not yet realized.

A new definition for "Photovoltaic system," that includes ancillary components, was added in sections 66260.10 and 66273.9 to differentiate between a PV module and a PV system. Examples of ancillary components are provided, but are not all inclusive, because they could vary depending on the manufacturer. Electrical components, that are not integrated to the PV module, are a part of PV system but are not a part of PV module.

DTSC changed removal activities in section 66273.71 from PV module to PV system as redefined. As such, removal activities include removing discrete assemblies that handlers can remove during the normal operation and maintenance of the PV system. DTSC also added in section 66273.71(b) examples of serviceable parts, such as cables, connectors, or diode boxes. Subsequent treatment activities specific for residual printed circuit board resulting from removal activities are also added in section 66273.71(f).

## **B. REMOVING ELECTRICAL CORDS**

### **Comment Summary:**

The comment suggests that language be added to section 66273.71, that specifies the authorization for removal activities, for the removal of cords for safety issues, handling, and packaging. According to the commenter, cords were being removed from electronic devices and photovoltaic modules prior to the proposed regulations, and helps handlers manage these devices safely.

**Comment:** PH-2-2

### **Response:**

DTSC reviewed the comment and has determined that the regulatory changes to the definition of photovoltaic module and newly defined photovoltaic system address the comments, and no further regulatory changes were made. The definition of "Photovoltaic module" was revised in sections 66260.10 and 66273.9 to exclude ancillary components that are not integrated with the module. A new definition "Photovoltaic system" is added that includes ancillary components to differentiate

between PV module and PV system. DTSC consequently changed the removal activities in section 66273.71 to apply to the newly defined PV system. Based on the redefined definition of PV module and newly defined PV system, removal activities specified in section 66273.71 apply specifically to removing discrete assemblies that are typically removed for replacement during the normal operation and maintenance of the PV system. If removal of electrical cords, without cutting the cord, is an activity that is typically conducted for replacement or maintenance during normal operation of the PV system, then such removal activity applies under section 66273.71, which was revised based on the comments regarding the definition of "Photovoltaic module." Cutting a cord is not a typical removal activity during the normal operation and maintenance and therefore is not authorized under section 66273.71 removal activities.

## **XIV. Disassembling/draining activities**

### **A. PV MODULE DISASSEMBLING ACTIVITIES**

#### **Comment Summary:**

The comments suggest that if DTSC retains the proposed definition of "Photovoltaic module" without change, DTSC's proposed text in section 66273.72 regarding disassembling of PV modules should be modified slightly to reflect the fact that PV modules, unlike other universal wastes, are likely to be disassembled outside of an enclosed facility, for example, often on a roof. The commenter suggests the following language to section 66273.72(f)(2):

- Allow dismantling photovoltaic modules outside handling activities, such as a roof;
- Add the word "glass" after "photovoltaic module" in section 66273.72(f)(2)(D)(1) to prevent breakage during photovoltaic module dismantling activities;
- Modify compliance language in section 66273.72(f)(2)(D)(5) from "facility is operated" to "handler is operating," if DTSC had modified the regulatory language to allow dismantling activities outside the handling facilities; and
- Modify compliance language in section 66273.72(f)(2)(D)(6) from "facility" to "handler," if DTSC had modified the regulatory language to allow dismantling activities outside the handling facilities.

**Comments:** 8-12, 8-13

#### **Response:**

DTSC reviewed the comments and has determined that the regulatory changes to the definition of photovoltaic module and newly defined photovoltaic system address the comments, and no further regulatory changes were made. The definition of "Photovoltaic module" was revised in sections 66260.10 and 66273.9 to exclude

ancillary components that are not integrated to the module. A new definition "Photovoltaic system" is added that includes ancillary components to differentiate between PV module and PV system. Based on the new definitions of PV module and PV system, removal activities specified in section 66273.71 will then apply to removing user replaceable components that can be removed during normal use and operation of the PV system. Disassembling and processing activities specified in sections 66273.72 and 66273.73, respectively, apply specifically only to PV modules, instead of the entire PV system, and such activities are required to be conducted at the handling facility. As such, health and safety measures as outlined in section 66273.72(f)(2)(D) apply to the facility.

DTSC respectfully disagrees with the comments to allow PV module dismantling activities to be performed on a roof. Since authorized removal activities as specified in 66273.71 allow handlers to separate PV modules from the PV system, the disassembling activities are solely for the PV modules. Dismantling of photovoltaic modules as specified in section 66273.72 must be completed over or in a designated area, and handlers must take care to conduct these activities in a manner that prevents breakage of the PV module, which is not feasible on a rooftop.

DTSC respectfully disagrees with the comments to change health and safety requirements from the operating facility to handlers performing the disassembling activities. Since disassembling activities are performed at the handler's facility, facility must be in compliance with applicable health and safety laws and regulations and must ensure to maintain aisle space as required, as outlined in sections 66273.72(f)(2)(D)5 and 66273.72(f)(2)(D)6 respectively.

## **B. INCLUSION OF THE WORD "HAZARDOUS" IN FRONT OF "CONSTITUENT" IN SECTION 66273.72(f)(2)(D)**

### **Comment Summary:**

The comment suggests adding the word "hazardous" in front of "constituents of the photovoltaic modules" in section 66273.72(f)(2)(D) and would read as follows:

"Conduct the activities in a manner that protects persons managing the PV modules, and that prevents releases of any universal wastes and/or any hazardous constituents of the PV modules to the environment under reasonably foreseeable conditions, as follows:"

**Comment:** 8-13

### **Response:**

DTSC reviewed the comment and has determined that no regulatory change is necessary. When a PV module breaks, there is no definite way of knowing which

broken constituents are hazardous and which are not just by visual inspection. As such, all broken constituents must be managed as if they have the potential to be hazardous, until a hazardous waste determination is made. Additionally, adding "hazardous" in front of "constituents" would mean that handlers are required to determine which constituent of the broken PV module is hazardous at the point of unintentional or accidental breakage, which is impractical. Therefore, DTSC did not add "hazardous" in front of "constituents" as the comment suggested.

### **C. INCLUSION OF THE WORD "GLASS" AFTER "PV MODULE GLASS" IN SECTION 66273.72(f)(2)(D)(1)**

#### **Comment Summary:**

The comment suggests adding the word "glass" after "PV module" in section 66273.72(f)(2)(D)(1) and would read as follows:

"Dismantle PV modules over or in a designated area (e.g., a concrete surface) sufficient in size and construction to contain any materials from being released to the environment under reasonably foreseeable conditions, and provided the universal waste handler conducts such activities in a manner that prevents breakage of the PV module glass."

**Comment:** 8-13

#### **Response:**

DTSC reviewed the comment and has determined that the regulatory change to the definition of photovoltaic module addresses the comment, and that no additional regulatory text change in section 66273.72(f)(2)(D)(1) is necessary. The revised definition of "Photovoltaic module" includes PV cells that are not electrically connected to be managed as PV modules, includes integrated components that cannot be separated without breaking the PV glass, and excludes the ancillary components that are not integrated to the module.

PV module disassembling activities authorized in section 66273.72 apply specifically to PV modules as redefined in sections 66260.10 and 66273.9. Intentional breakage of PV modules during disassembling activities are not authorized and is specified in section 66273.72(f)(1).

### **D. DISCONNECTING CONNECTED PANELS**

#### **Comment Summary:**

The comment states that multiple connected panels should be allowed to be disconnected from each other to make management easier without considering these modifications as a regulated treatment activity as long as these items are not intentionally broken.

**Comment:** 7-18

**Response:**

DTSC agrees with the comment and made the following regulatory changes to address the commenter's concern. DTSC redefined the definition of "Photovoltaic module" to exclude ancillary components that are not integrated to the module. A new definition of "Photovoltaic system" is added that includes ancillary components to differentiate between PV module and PV system. DTSC made changes in section 66273.71 for removal activities, such as removing user replaceable components during normal use and operations, from the PV system. Once v modules are removed/separated from the PV system as specified in section 66273.71, disassembling and processing activities in sections 66273.72 and 66273.73, respectively, are specific to PV modules as redefined. Disassembling activities in section 66273.72 were revised to specify disassembling of PV modules without breaking the PV module glass, to allow for disassembling of connected panels. Universal waste handlers of PV modules are authorized to perform removal and disassembling activities as specified in sections 66273.71 and 66273.72, in which PV modules are not intentionally broken.

## **E. DISMANTLING PV MODULES**

**Comment Summary:**

The comments suggest amending the proposed language in subsection (f)(1) of section 66273.72, that specifies the authorization for disassembling/draining activities, to include removing or cutting of wires and cables. The comments state that one aspect of handling PV modules, and many electronic devices, that can present a safety hazard is loose cords. Cutting cords is considered a treatment activity since it physically alters the device. Moving devices with loose cords presents a significant safety hazard for trips and falls. Wrapping the cords around a part of the device or taping the cords is not always feasible. The comment states that allowing the ability to cut loose cords that cannot be unplugged as user-removable would be tremendously helpful.

**Comments:** 1-2, 7-60

**Response:**

DTSC reviewed the comments and has determined that the regulatory changes to the definition of photovoltaic module and newly defined photovoltaic system address the comments. DTSC has revised changes for the definition of the term "Photovoltaic module" in sections 66260.10 and 66273.9 to exclude the ancillary components that are not integrated to the module and added the definition for PV system which includes ancillary components. Therefore, PV module disassembling activities authorized in section 66273.72 apply specifically to PV modules as redefined and do not apply to external components such as cords.

## **F. INTENTIONAL BREAKAGE DURING REMOVAL/DISMANTLE/PROCESS ACTIVITIES**

### **Comment Summary:**

The comments suggest adding the word "intentional" in front of "breakage of the PV modules" in section 66273.72(f)(2)(D)1 regarding dismantling PV modules activities. Currently, section 66273.72(f)(2)(D)1 indicates that if a handler dismantles PV modules, the dismantling activities must occur over or in a designated area and the handler must conduct dismantling activities in a manner that prevents breakage of the PV modules. The comments assert that this concept works when the PV modules are removed, but these limitations are unreasonable when the PV modules are being removed from the home or building especially when on the roof. The comments state that adding the word "intentional" in front of "breakage of the PV modules" will ensure dismantling activities are conducted in a manner that prevents "intentional" breakage of the modules.

**Comments:** 7-61, 9-35

### **Response:**

DTSC reviewed the comments and has determined that the regulatory change to the definition of photovoltaic module addresses the comments. PV module disassembling activities authorized in section 66273.72 apply specifically to PV modules as redefined in sections 66260.10 and 66273.9, which excludes ancillary components that are not integrated to the module. As such, disassembling of PV modules as redefined in the proposed regulation must be performed in a designated area at the handling facility and without breaking the PV module glass, as specified in section 66273.72(f)(1). Handlers that manage only intact PV modules are exempt from article 7 treatment requirements as specified in section 66273.33.6(a)(3)(A). Intentional breakage of PV modules during disassembling activities under section 66273.72 is not authorized as specified in section 66273.72(f)(1); and thus, additional clarification in section 66273.72(f)(2)(D)(1) that the breakage cannot be intentional is not necessary.

## **G. USE OF WATER OR HEAT DURING DISASSEMBLING ACTIVITIES**

### **Comment Summary:**

The comment notes that washing photovoltaic modules might occur prior to treatment to remove any dirt or dust from storage. Not allowing use of water or heat during disassembling activities may restrict innovation of recycling techniques in the development of effective material recovery methods.

**Comment:** 9-34

**Response:**

DTSC acknowledges the comment and determined that no regulatory change is necessary. The use of water, or any other methods, to remove dirt or dust from a PV module is outside of the scope for the PV module disassembling/draining activities as specified under section 66273.72. The proposed regulation is clear that the use of chemicals, including water, or heat is not authorized for PV module disassembling activities in section 66273.72 because these activities alter the chemical composition of the materials, which pose a higher risk to human health and the environment. These activities would require a form of authorization outside of universal waste, such as a hazardous waste permit from DTSC.

**H. GRAMMATICAL ERROR**

**Comment Summary:**

The comment suggests changing the proposed text in section 66273.72(f)(3)(B) to read:

"Ensure that for disposal at a permitted hazardous waste disposal facility," instead of "For disposal at a permitted hazardous waste disposal facility," to grammatically correct the regulatory text as currently incorrectly written.

**Comment:** 9-37

**Response:**

DTSC agrees with the comment and made changes to section 66273.72(f)(3)(B) to reflect the grammatical language accuracy in the proposed regulation text.

**I. RESIDUAL CONTAINMENT**

**Comment summary:**

The comment is in relation to section 66273.72(f)(2)(D)(2) regarding containment of residuals produced from PV module disassembling activities. The comment states that potentially hazardous materials are self-contained within the encapsulant and the laminate of the PV module. This clause prevents something that may not be a risk.

**Comment:** 9-36

**Response:**

DTSC reviewed the comment and has determined that no regulatory change is necessary. There is no definite way of knowing which residuals produced from PV module dismantling activities have potential to be hazardous just from visual inspection, whether they are self-contained or not. Also, other integrated components may still

produce residuals during PV module dismantling activities even if PV panel itself may not produce residuals as the comment stated. Therefore, the proposed regulation text in section 66273.72(f)(2)(D)(2) is included to require that handlers that dismantle PV modules must contain PV module residuals in order to prevent releases to the environment and then make a hazardous waste determination.

## **J. HAZARDOUS WASTE GENERATOR**

### **Comment summary:**

The comment asserts in section 66273.72(f)(3)(B)1., regarding a universal waste handler who disposes of PV module waste in a permitted hazardous waste disposal facility being deemed the generator, that if a broker receives PV modules and separates components for various recycling streams, the broker becomes the generator. This may not incentivize collection points/recyclers to accept PV modules that may have been treated due to the burden of becoming a hazardous waste generator.

**Comment:** 9-62

### **Response:**

DTSC respectfully disagrees with the comment and has determined that no regulatory change is necessary. Based on the commenter's description of the activities a broker conducts, the term "broker" would be considered a universal waste handler under these requirements. If a universal waste handler makes a determination to dispose of the PV module waste after any treatment activities, the handler becomes the hazardous waste generator and is required to comply with all hazardous waste management requirements.

## **XV. Treatment (Processing) Activities**

### **A. AUTHORIZED TREATMENT ACTIVITIES**

#### **Comment Summary:**

The comments state that the restrictions on use of chemicals, water, or heat to treat waste in section 66273.73 processing activities will stifle innovation to maximize valuable material recovery that may be employed. The restrictions on the processes and the application of chemicals, including water and external heat, will disincentivize many waste handlers and treatment facilities from accepting PV modules in their facilities.

**Comments:** 5-11, 5-12, 11-13, PH-1-6, PH-1-7, PH-4-5

#### **Response:**

DTSC acknowledges the comments and determined that no regulatory change is necessary. Under universal waste management requirements, the use of chemicals, including water, or heat is not authorized. DTSC determined these treatments to be high risk since the use of chemicals and heat alter the chemical composition of the materials, which can have a greater impact to human health and the environment. These activities are not prohibited by DTSC but are prohibited under universal waste management standards. Therefore, facilities that conduct treatment using chemicals or heat are required to obtain a hazardous waste treatment permit or other form of authorization.

## **B. PRINTED CIRCUIT BOARDS IN PV MODULES**

### **Comment Summary:**

The comment states photovoltaic modules may include printed circuit boards and should be added to the text of subparagraph (f)(2)(A) in section 66273.73 regarding management of residual printed circuit boards after the processing treatment activities as below:

“(2) As used in this subsection, "printed circuit boards produced by an authorized handler" means residual printed circuit boards that a handler has:

(A) derived from electronic devices or photovoltaic modules by completing treatment authorized under this article.”

**Comment:** 8-14

### **Response:**

DTSC agrees with the comment that photovoltaic modules may contain printed circuit boards. To address the comment, DTSC conducted a literature research and included literature references that indicate the presence of printed circuit board in PV modules in the 15-day public notice for comment period. DTSC also revised the proposed regulatory text. Based on the presence of residual printed circuit board in PV modules, DTSC revised the definition of “Scrap metal” in sections 66260.10 and 66273.9. Corresponding changes were also made in section 66273.73 regarding the authorization for processing treatment activities that allow residual printed circuit boards generated from the PV modules to be managed under standards similar to the residual printed circuit boards removed from electronic devices.

## **C. RESIDUAL PRINTED CIRCUIT BOARDS FROM PV MODULES**

### **Comment Summary:**

The comment suggests that circuit boards removed from PV modules should be included in section 66273.72(f)(1) as follows:

“(A) Derived from electronic devices and PV modules by completing treatment authorized under this article,”

**Comment:** 7-63

**Response:**

DTSC agrees with the commenter's assertion for the management of residual printed circuit boards generated from PV modules. In order to address this, DTSC has redefined the definition of "scrap metal" to exclude printed circuit boards from PV modules as scrap metal, added treatment of residual printed circuit boards from PV modules in sections 66273.73(c)(1) and 66273.73(c)(2), and added PV modules in section 66273.73(f)(2)(A).

## **XVI. Notification, Annual Reporting, and Recordkeeping Requirements for Handlers that Treat PV Modules**

### **A. NOTIFICATION AND ANNUAL REPORT REQUIREMENTS FOR DISPOSAL**

**Comment Summary:**

The comments ask DTSC to provide more clarification on the requirements in subsection 66273.74(a)(5), regarding requiring universal waste handlers to send the notification every time PV module wastes are sent for disposal. The comments state that it would be an administrative burden to all the potential companies that might need to register as well as the weight threshold of 100 kilograms.

The comments also recur to the proposed regulation and state that the reporting requirements in section 66273.74 direct handlers to submit annual reports containing various information regarding the final disposition of the modules and requires handlers to notify DTSC if a handler ultimately chooses to dispose of a module, and mandates that the notification include the name, address and ID number of the hazardous waste disposal facility where the modules will be disposed of.

**Comments:** 4-5, 9-46

**Response:**

DTSC reviewed the comments and has determined that no regulatory change is necessary. The proposed regulation is clear that the notification requirement for handlers that intend to accept or accumulate PV modules as specified in section 66273.32(e) and the notification requirement for handlers that determine to dispose of PV module waste as specified in section 66273.74(a)(5) are two different requirements. The notification in section 66273.32(e) is a one-time requirement that handlers that intend to accept or accumulate PV modules are required to comply with by notifying

DTSC 30 days prior to accepting PV modules. The notification in section 66273.74(a)(5) is the requirement for universal waste handlers to notify DTSC no later than 15 calendar days after the handlers determine that they will dispose of PV modules, after conducting disassembling treatments as specified in section 66273.72. The proposed regulation is clear that there is no threshold limit set for any of the notification requirements. Universal waste handlers are required to notify DTSC regardless of the amount of waste they intend to accept, accumulate, or dispose of.

As the comments recurred, the PV module waste disposal notification in section 66273.74(a)(5) includes a list of information that is required to be included in the disposal notification: the ID number of the handling facility where the waste was generated, a description of treatment methods used, and the name, address, and ID number of the hazardous waste disposal facility where the waste will be disposed of. This information allows DTSC to prepare for the department activities such as, but not limited to, verification of facility compliance with the hazardous waste generator standards and estimation of the amount of photovoltaic module wastes being disposed of in California.

The universal waste handlers that dispose of the PV module wastes in a calendar year are required to submit an annual report to DTSC by February 1 of the following year, as specified in section 66273.74(b)(3).

## **XVII. California's Regulatory Jurisdiction**

### **A. JURISDICTION OUTSIDE OF CALIFORNIA**

#### **Comment Summary:**

The comments state that DTSC's jurisdiction over California-only universal waste PV modules ends once the modules cross the state line; however, various provisions in the proposed regulations seek to control the final disposition of PV modules. The comments interpret the various provisions as only applying to waste PV modules that are and remain physically within the state of California. Once the PV modules cross state lines, DTSC no longer has the authority to dictate how the modules are transported, treated, or ultimately disposed of.

**Comments:** 4-4, 4-5, 4-6, PH-3-7

#### **Response:**

DTSC reviewed the comments and has determined that no regulatory change is necessary. The commenters' assertion is correct that DTSC does not have jurisdiction over hazardous waste management requirements outside the state of California. Universal waste management of PV modules ends at the California state line.

The proposed regulation for the universal waste management of PV modules applies to both the Resource Conservation and Recovery Act (RCRA) and non-RCRA hazardous wastes. DTSC has information that indicates that some PV modules fail the federal Toxicity Characteristic Leaching Procedure (TCLP) test. Therefore, universal waste handlers of PV modules could potentially become generators of RCRA hazardous waste once the waste crosses the state line. These generators of hazardous waste PV modules must comply with applicable federal and state laws and regulations for transportation and management of a hazardous waste outside California.

Neither California nor any other state can adopt regulations that are less stringent than the standards as specified under RCRA, pursuant to Health and Safety Code section 25159.5(a). The federal hazardous waste regulations currently do not exclude PV modules that are hazardous waste from being managed as RCRA hazardous waste. Because analytical information indicates that some PV modules exhibit the federal hazardous characteristic of toxicity, DTSC must conclude that a portion of the PV module waste stream is a federal hazardous waste. Excluding such waste would result in California adopting regulations that are less stringent than federal requirements, which is prohibited. Therefore, DTSC determined that these wastes must be managed as hazardous waste in California also.

However, DTSC's Universal Waste Management Program is authorized by U.S. EPA, meaning DTSC may add new waste streams to the Universal Waste Management Program as long as such wastes meet the universal waste criteria outlined in section 66260.23. As such, photovoltaic modules that exhibit the RCRA hazardous waste characteristic for toxicity may be managed as universal waste as proposed.

The proposed regulation is clear that PV modules can only be managed as universal waste in California because they are not considered universal waste under federal laws. Under the California universal waste management standards, universal waste handlers that send PV modules offsite must comply with offsite shipment requirements as outlined in section 66273.38, tracking universal waste shipments as outlined in section 66273.39, and recordkeeping requirements as outlined in section 66273.74. Universal waste transporters must comply with offsite shipments as outlined in section 66273.55. DTSC does not seek to control the final destination of the waste PV modules, as long as the destination facilities that universal wastes are shipped to are authorized to accept these wastes and comply with standards as outlined in article 6 of chapter 23.

## XVIII. Statute

### A. SENATE BILL 489 FULFILLMENT

#### **Comment Summary:**

The comment states that the assumptions made by DTSC referenced in the Economic & Fiscal Impact Statement, the Appendix and its attachment, do not fulfill the intent or statement of the original bill (Senate Bill (SB) 489, Chapter 419, Statutes of 2015):

(1) Foster a comprehensive and innovative system for the reuse, recycling, and proper and legal disposal of end-of-life photovoltaic modules.

(2) Encourage the photovoltaic module industry to make end-of-life management of photovoltaic modules convenient for consumers and the public, to ensure the recovery and recycling of photovoltaic modules, which is the most efficient and environmentally safe disposition of end-of-life photovoltaic modules, by developing a plan for recycling end-of-life photovoltaic modules in the state in an economically efficient manner.

(3) Reduce the likelihood of end-of-life photovoltaic modules being disposed of in landfills. (c) It is further the intent of the Legislature that photovoltaic modules should be designed for extended life, repair, and reuse, and that collection and recycling services should be promoted.

Following then, the bill also states that:

#### Article 17. Photovoltaic Modules

25259. The department may, by regulation, designate end-of-life photovoltaic modules that are identified as hazardous waste as a universal waste and subject those modules to universal waste management. The department may revise these regulations as necessary.

**Comment:** 11-17

#### **Response:**

DTSC respectfully disagrees with the commenter's assertion that assumptions made in the economic and fiscal impact analysis do not fulfill the intent of SB 489. The assumptions made in the economic and fiscal impact analysis are based on the standards and requirements for the universal waste management of PV modules, as proposed, and assumed the worst-case scenario projections and data available, as provided by public correspondents during DTSC's public workshops.

SB 489 vests DTSC with the authority to regulate the generation and disposal of hazardous waste and authorizes DTSC to adopt regulations to designate end-of-life PV modules that are hazardous as universal waste and subject those modules to universal waste management.

DTSC's proposed regulation for the universal waste management of PV modules provides a less stringent alternative to full hazardous waste management requirements which generators of hazardous waste PV modules would otherwise be required to comply with. Universal waste management is a streamlined approach to managing low-risk hazardous wastes and outlines the universal waste management requirements for those that generate, transport, store, accumulate, handle, manage, and treat these wastes. Relaxing the management requirements of hazardous waste PV modules under universal waste intends to encourage the PV module industry to make management of PV modules convenient for consumers and the public, and to ensure the recovery and recycling of PV modules. By lowering management requirements for hazardous waste PV modules as universal waste, the likelihood of these wastes being illegally disposed of in solid waste landfills is reduced. Therefore, the proposed regulation and its economic and fiscal impact analysis fulfill the intent of the SB 489.

## **B. PURPOSE OF SENATE BILL 489**

### **Comment Summary:**

The comment states that the commenters worked closely with Senator Monning on the photovoltaics legislation in 2015. The intent was to make it easier and less costly to recycle solar panels. The regulations should be simple for the consumers and businesses to recycle or they will not.

**Comment:** PH-3-2

### **Response:**

DTSC agrees with the commenter's assertion that the proposed regulation should make it easier, less costly, and be simple for the consumers and business to recycle PV modules. The purpose of SB 489 allows DTSC to adopt regulations to designate end-of-life PV modules that are identified as hazardous waste and subject those modules to universal waste management. The intent of the legislation is to foster a comprehensive and innovative system for the reuse, recycling, and proper and legal disposal of end-of-life PV modules, to encourage the PV module industry to make end-of-life management of PV modules convenient for consumers and the public, to ensure the recovery and recycling of PV modules, and to reduce the likelihood of end-of-life PV modules being disposed of in landfills.

The proposed regulation outlines the universal waste management requirements of PV modules that are determined by the generator to be hazardous. Universal waste

management is an alternative to full hazardous waste management requirements that universal waste handlers would otherwise be required to comply with and provides a streamlined approach to managing hazardous wastes. Therefore, the proposed regulation provides a less stringent management system for hazardous waste PV modules, in order to promote a path for proper handling, treatment (recycle), and disposal of these wastes. Managing hazardous waste PV modules as universal waste reduces the cost burden, such as having to use a manifest for hazardous waste transportation. Universal waste management standards also authorize certain physical treatment (recycle) activities of PV modules without requiring a permit, which handlers would otherwise require under hazardous wastes management standards.

## **XIX. Recycle**

### **A. RECYCLING MARKET**

#### **Comment Summary:**

The comments state that the introduction of the universal waste classification will enable PV module recycling in the state through existing e-waste recyclers. However, close examination behind the proposed legislation shows that the PV modules are not being recycled per se. Instead, frames and junction boxes are being removed and the remaining laminates are being disposed of in hazardous waste landfills.

The rationale advanced in the documents is that there is no known recycling market for 85% of PV modules that are therefore assumed directed to hazardous waste landfills.

**Comments:** 6-2, 6-3, 6-4

#### **Response:**

DTSC has reviewed the comments and has determined that no regulatory change is necessary. The proposed regulation is clear that the comments intend to address the proposed regulation and its economic and fiscal impact assumptions, not the legislation as the comments stated.

The proposed regulation applies specifically to California and provides a streamlined waste management of hazardous PV modules as universal waste and provides requirements for proper handling, storage, transport, treatment (recycle), and disposal of the waste. Its economic and fiscal impact assumptions are the worst-case scenario assumptions and are made based on impacted businesses and trends that DTSC has currently observed within California. DTSC is not aware of any treatment (recycle) facilities in California that currently treats (recycles) PV modules. Therefore, DTSC assumes that 85% of the PV module waste, the remaining PV module laminate after removing frames and other external components as specified under authorized

universal waste treatment activities, will be disposed of as hazardous waste in California.

DTSC is aware that PV module recycling technologies and businesses are available outside California. Treatment (recycling) of hazardous waste PV modules by such technologies and businesses involve the use of chemicals, including water, and external heat, which is strictly prohibited under universal waste management and would require a permit from DTSC to pursue such treatment.

DTSC's proposed regulation for the universal waste management of PV modules is an alternative and streamlined approach to managing hazardous waste PV modules, thereby making it less stringent, in order to encourage and promote a path for proper handling, treatment (recycle), and disposal of these wastes. Through the universal waste management approach, DTSC anticipates that a streamlined method for collection, transport, physical treatment, and recycling of photovoltaic modules will take hold in California.

## **B. PROMOTE RECYCLING**

The comments also recommend that DTSC reconsider or remove the prohibition on the use of water and heat in section 66273.73(e)(2) and instead develop an exemption with industry and stakeholders to avoid unintended consequences. One example might be developing requirements to obtain a permit for photovoltaic recyclers or an accelerated permitting program for PV recyclers.

**Comments:** 9-38, 9-39, 11-14

### **Response:**

DTSC has reviewed the comments and determined that no regulatory change is necessary. Universal waste handlers are authorized to perform certain physical treatment (processing) activities under universal waste management because these treatment activities are activities that pose lower risks. Treatment activities that use chemicals, including water, and/or heat alter the chemical composition of the materials, which pose a higher risk to human health and the environment and would require a permit to perform. DTSC has a tiered permitting system in place for treatment activities and welcomes an opportunity to work with the PV module industry to understand the nature of the treatment activities for PV module recycling to determine the appropriate tier.

The waste exclusion alternative for photovoltaic modules is not a viable option because California, nor any other state, cannot adopt regulations that are less stringent than the standards as specified under RCRA under United States Environmental Protection Agency (U.S. EPA). Analytical tests using the federal TCLP demonstrated that some PV modules may exceed the federal threshold levels for toxicity of regulated metals. The

federal hazardous waste regulations currently do not exclude PV modules that are hazardous waste from being managed as RCRA hazardous waste. Selecting the waste exclusion alternative for the management of PV modules that are RCRA hazardous waste would mean allowing them to be managed under less stringent standards than those of federal requirements, which is not allowed under Health and Safety Code section 25150(d). Therefore, DTSC determines that these wastes must be managed as hazardous waste in California also. However, DTSC is authorized by U.S. EPA to add a new waste stream to the universal waste management program as long as such wastes meet universal waste criteria outlined in section 66260.23.

### **C. LEARN FROM E-WASTE PROGRAM**

#### **Comment Summary:**

The comments state that the proposed California legislation is misguided and would place the state at variance with its declared stance of environmental leadership. The comments state that there is a precedent set by the e-waste program and now electronics are being recycled and managed in state. The comments further express the concern that the proposed regulations are burdensome and will complicate the management of PV modules, thus adding costs and losing jobs in California.

**Comments:** 6-11, 10-11, PH-3-5, PH-3-6, PH-3-8

#### **Response:**

DTSC respectfully disagrees with the commenters' assertion and has determined that no regulatory change is necessary. The proposed regulation is clear that the Department has oversight only for PV modules that are hazardous. If generators determine that PV modules being handled are not hazardous, through testing or generator knowledge of the PV modules, handlers are not required to comply with the PV module universal waste management requirements proposed.

DTSC's proposed regulation for PV modules streamlines the waste management of hazardous waste PV modules and provides an alternative for the management of these wastes. The proposed regulation is in alignment with universal waste management requirements set forth by U.S. EPA and existing universal waste management requirements for other universal waste streams, such as electronic devices. DTSC used publicly available data and references that show that some PV modules may be hazardous, as cited in the ISOR, as the basis for the proposed regulation. By lowering management requirements for hazardous waste PV modules as universal waste, the likelihood of these wastes being illegally disposed of in solid waste landfills is reduced. DTSC also hopes that by lessening the regulatory burden of having to manage the hazardous waste PV modules as hazardous waste, more businesses will become available in California that handle, transport, treat, or recycle these wastes.

## **D. HANDLING COSTS**

### **Comment Summary:**

The comments explain how recycling is mandated in Europe and describes how developers pay recyclers for collection and processing. The comments further state how recyclers are paid for collecting and processing PV modules and the typical costs in the United States for processing. The commenter believes that there are mechanisms that could fund the process with very little impact on the solar industry.

**Comments:** 6-9, 6-10

### **Response:**

DTSC believes the comments to be informational, outside of the scope of the proposed PV module rulemaking, and thus no regulatory change is necessary.

## **XX. Economic and Fiscal Impact Statement**

### **A. ALTERNATIVES TO UNIVERSAL WASTE CLASSIFICATION**

#### **Comment Summary:**

The comments state that according to STD 399 Attachment to the Economic and Fiscal Impact Statement, DTSC did not seriously consider any alternatives to the proposed legislation. Only two alternatives were mentioned, "No Action" and "Waste Exclusion." The first requires no comment, as "No Action" is clearly not an option. The "Waste Exclusion" option does have merit and may be the best way forward. With this alternative, DTSC would create, by regulation, an exemption requiring PV modules to be sent for recycling, similar to the exemption for scrap metal, and for reclamation. Reclamation is a form of recycling that recovers usable materials and hazardous constituents. This alternative could reduce or remove the regulatory requirements placed on handlers and transporters if they intend to recycle the PV modules.

**Comments:** 6-5, 6-6, 6-12, 6-14, 6-15, 11-19, PH-3-3

#### **Response:**

DTSC respectfully disagrees with the commenters' assertion. DTSC has evaluated plausible alternatives for the proposed regulation. The "No Action" alternative is not an option because it would mean that PV modules that are determined to be hazardous would continue to be subject to full hazardous waste management when discarded.

The waste exclusion alternative for PV modules is not a viable option because California, nor any other state, cannot adopt regulations that are less stringent than the

standards as specified under RCRA under U.S. EPA. Analytical tests using the federal TCLP demonstrated that some PV modules may exceed the federal threshold levels for toxicity of regulated metals. The federal hazardous waste regulations currently do not exclude PV modules that are hazardous waste from being managed as RCRA hazardous waste. Selecting the waste exclusion alternative for the management of PV modules that are RCRA hazardous waste would mean allowing them to be managed under less stringent standards than those of federal requirements, which is not allowed under Health and Safety Code section 25150(d). Therefore, DTSC determined that these wastes must be managed as hazardous waste in California also. However, DTSC is authorized by U.S. EPA to add a new waste stream to the universal waste management program as long as such wastes meet universal waste criteria outlined in section 66260.23. Therefore, DTSC rejected the waste exclusion alternative.

For these reasons, DTSC has selected the proposed regulation for the universal waste management of PV modules.

## **B. RECYCLING**

### **Comment summary:**

The comment states that the assumption made on page 4 of the Appendix of the Economic & Fiscal Impact Statement (STD 399), will not encourage the recycling of all PV modules within the state of California if they must all then be managed as hazardous waste.

From Page 4 of the Appendix:

“As of 2018, there are no businesses in California with a hazardous waste facility permit to store or treat PV modules. For the baseline, DTSC assumes that at least 10 disposal facilities that are established to manage waste PV modules. With the proposed regulation, DTSC assumes that there will be at least 10 handlers that accept waste PV modules for waste management. This assumption is based on a 2017 stakeholder workshop held by DTSC, when electronic waste recyclers expressed interest in potentially expanding their operations to manage waste PV modules. Under the proposed regulation, these handlers are authorized to accept waste PV modules as a new universal waste stream. Once the universal waste handler decides to dispose of the PV modules, they become a hazardous waste generator and must manage the waste in accordance with hazardous waste management requirements. At this point, the universal waste regulations no longer apply, and handlers must comply with full hazardous waste regulations for handling and disposal of a hazardous waste in California.”

**Comment:** 11-16

**Response:**

DTSC respectfully disagrees with the commenter's assertion that assumptions used in the Fiscal and Economic Impact analysis, regarding recycle (treatment) facilities for treatment and disposal of hazardous waste PV modules, do not encourage the recycling of PV modules in the state of California.

The proposed regulation is clear that universal waste management of PV modules apply only to PV module wastes that are determined to be hazardous. As such, if the generator of PV module waste determines that the waste is not hazardous, then the waste is not required to be managed as universal waste. However, generators bear the burden of proving that PV module waste is not hazardous through materials knowledge of the waste or testing.

The economic and fiscal impact analysis assumptions of the proposed regulation are worst case scenario assumptions based on the observed trends and data available in the literature and provided by industry associations during PV module workshop communications held prior to the proposed rulemaking. These assumptions only impact California and do not account for businesses outside of California.

At the time of the notice of this proposed rulemaking, there was no known recycling or treatment facilities in California that treat or recycle PV modules. Therefore, the assumption was made that universal waste handlers, after the authorized universal waste treatment activities would dispose of PV modules at a permitted hazardous waste facility. When PV modules are disposed of, then the handlers become a hazardous waste generator and the waste must be disposed of as hazardous waste. DTSC hopes that universal waste management of PV modules, as proposed, would encourage new opportunities for recycling of PV modules within California.

**C. BUSINESSES IMPACT****Comment summary:**

The comments state that the Economic & Fiscal Impact Statement contains many assumptions that can be corrected or better clarified. For example, the number of facilities impacted (2,849) is grossly underestimated; therefore, the costs associated with the impact would be higher.

The comments state that the following assumption from page 4 of the Appendix is incorrect:

"The assumptions made in this analysis do not include residential installation of solar panels. This analysis assumes residential homes have a service warranty with installers that take back any damaged photovoltaic modules before the end of service life, and those wastes are already included in the total generated amount."

Some residential and commercial PV systems are wholly owned by the home or business owner and are not required to have a service contract with installers or operations and service/maintenance providers. The PV systems are typically covered under a manufacturer's product warranty from the original transaction. However, the PV system owner will likely contract with an installer or service provider to remove and replace the warranted products, but the labor and disposal costs are not part of the originally transacted system cost nor covered by the manufacturer's product warranty. Therefore, the figure of 2,849 businesses affected may be severely underestimated.

**Comments:** 11-18, PH-1-8

**Response:**

DTSC has reviewed the comments and has determined that no regulatory change is necessary. DTSC respectfully disagrees with the comments that the number of businesses impacted is grossly underestimated, and therefore the costs associated with the impact would be higher. The commenters did not provide any substantiating evidence to support the claim that the number of businesses used in the economic and fiscal impact analysis are underestimated, and therefore, no revisions were made.

DTSC did not include nonresidential with PV module rooftop installations in the number of businesses that are impacted because DTSC assumes that these rooftop installations do not generate waste PV modules for their expected service life of 30 years. DTSC did not include homeowners with rooftop PV module installations in the number of businesses that are impacted because DTSC assumes that residential homeowners will acquire handling service for the removal of end-of-life PV modules, either using warranty service with installers at the time of PV modules installation or acquiring a service provider to remove PV modules at the end of their life. Therefore, the cost for removal of PV modules from residential rooftops is calculated as service charge, either through warranty or removal service by manufacturers or handlers. That said, the number of residential rooftops or the cost of PV modules removal from residential homes does not have an impact on the fiscal and economic impact analysis estimated for the proposed regulation.

## **XXI. References**

### **A. HAZARDOUS WASTE CHARACTERISTIC FOR TOXICITY**

**Comment Summary:**

Comments suggest that the references DTSC used to indicate that some PV modules were tested using RCRA and non-RCRA tests for toxicity are insufficient.

**Comments:** 10-4, 10-5, 10-6, 10-7, 10-8, 10-10

**Response:**

DTSC reviewed the comments and has determined that no regulatory change is necessary. DTSC has a hard copy of the references used in the ISOR available for public inspection upon request and only used references that are readily available at global web search sites. Those references are published by nationally and internationally accredited organizations and indicate that some, but not all, PV modules that were tested using federal and California hazardous waste test methods show that they exhibit the hazardous characteristic for toxicity. Additionally, references further indicate that PV modules contain substances, such as lead in solder, that have the potential for exhibiting hazardous waste characteristic for toxicity at certain thresholds. Even with only the limited test data and knowledge of materials composition that indicate that some PV modules may be hazardous, a reasonable conclusion can be made that some PV modules may fail federal or California hazardous waste test for toxicity. Based on this conclusion, DTSC has proposed regulations that aim to streamline the waste management of PV modules that are determined to be hazardous and provide an alternative for the management of these wastes. DTSC only has jurisdiction over wastes that are hazardous. As such, PV modules that are not hazardous are outside the scope of the proposed regulation.

**B. MISHANDLING AT HANDLING FACILITIES****Comment Summary:**

The comment asserts that the evidence DTSC provided showing PV module mismanagement activities at handling facilities is insufficient.

**Comment:** 10-9

**Response:**

DTSC reviewed the comment and has determined that no regulatory change is necessary. The proposed regulation is clear that the commenter's assertion refers to the findings during DTSC's inspection to electronic waste handling facilities followed by enforcement activities, which are cited in the ISOR. Findings that handling facilities are mismanaging PV modules stemmed from additional observations that DTSC's enforcement team discovered during its inspection and enforcement activities at electronic waste handling facilities and records from universal waste handlers that manage electronic waste (case number: 34-2017-00217931, *People of the state of California, Director of Department of Toxic Substances Control v California Electronic Asset Recovery, a California corporation*). Settlement for the case is based on such electronic waste activities and is unrelated to findings that handling facilities are mismanaging PV modules. DTSC cited this enforcement case as a reference only because the findings of PV module mismanagement are a part of the case report.

## **XXII. Test Methods**

### **A. RCRA CHARACTERISTIC**

#### **Comment Summary:**

The comment pointed to the definition of the term “RCRA Characteristic” in section 66260.10 in the proposed regulatory text and indicates that there are comments provided in a separate comment letter regarding appropriate Test Method for Wet Extraction Test.

**Comment:** 9-3

#### **Response:**

DTSC reviewed the comment and has determined that no regulatory change is necessary. The proposed regulation is clear that this comment located at the definition of the term "RCRA Characteristic" in section 66260.10 in the proposed regulatory text, is of which DTSC used as a bookmark in the proposed regulation to indicate where to insert the proposed regulatory text. As such, the comment on the definition of “RCRA Characteristic” is outside the scope of the proposed regulation, and no regulatory text changes were made. The referenced comments referred to are identified as comments “10-2” and “10-3” and are addressed accordingly.

### **B. TEST METHODS 3050 AND 3052**

#### **Comment Summary:**

The comments suggest that DTSC should confirm that Method 3050 or 3052 shall be used for the Waste Extraction Test for determining whether solar panels are hazardous and are subject to the Universal Waste Rule.

**Comments:** 10-2, 10-3

#### **Response:**

DTSC acknowledges the comments and has determined that no regulatory change is necessary. Accredited test laboratories are best equipped with and have best knowledge to select appropriate test methods to perform testing on samples to determine if PV modules are hazardous. As such, DTSC has refrained from prescribing a specific test method to make hazardous waste determination of a waste stream.

## XXIII. Encouragement

### A. SUPPORT

#### Comment Summary:

The comments offer support for the proposed regulation such that

- PV modules do not end up in a landfill;
- California positions at the forefront of PV system recycling without affecting their mandate of protecting the state and its inhabitants from toxic materials;
- It enables and facilitates recycling within the State, without much of the bureaucracy required for universal waste;
- It allows the recycling industry to develop economic methods for reclamation;
- It allows the pursuance and development of alternative uses for the end-streams;
- It promotes competition between recyclers in a vibrant and growing industry that will lead to lower costs;
- It crafts a framework for management of end-of-life and damaged photovoltaic modules as universal waste that benefit the renewable industry, the public, and the environment; and
- It offers a regulatory relief for the handling of PV modules, which will enable the recycling of panels that would have previously been landfilled.

**Comments:** 1-7, 5-2, 5-3, 5-13, 6-7, 6-13, 10-12, 11-3, 11-4, 11-5, 11-15, 11-21, PH-1-1, PH-1-9, PH-1-10, PH-2-1, PH-3-8, PH-4-1, PH-5-1, PH-5-2

#### Response:

DTSC acknowledges and appreciates the support offered by the comments:

- Assisting DTSC of the proposed rulemaking;
- Extending a hand to help adopt regulations that promote recycling of PV modules;
- Assuring that the solar industry is committed to working with DTSC in the making of the proposed regulations for the management of hazardous waste PV modules as universal waste in California;
- Encouraging DTSC to promote innovation in the recycling of PV modules, working with the industry for the process; and
- Offering assistance from the commenter to help in the process and providing contact information for communication.

DTSC made no changes to the proposed regulation or supporting documents in response to the comments.

## **B. SUPPORT OF PROPOSED REGULATION**

### **Comment Summary:**

The comments express support and encouragement of the proposed regulations for the management of hazardous waste PV modules as universal waste.

**Comments:** 1-7, 5-2, 5-3, 5-13, 6-7, 6-13, 6-15, 7-2, 7-13, 10-12, 11-3, 11-4, 11-15, 11-21, PH-1-1, PH-1-9, PH-1-10, PH-2-1, PH-3-8, PH-4-1, PH-5-1, PH-5-2

### **Response:**

DTSC acknowledges and appreciates the comments encouraging DTSC of the proposed regulations for the management of hazardous waste PV modules as universal waste. DTSC made no changes to the proposed regulation or supporting documents in response to the comments.

## **C. SUPPORT OF PROMOTING RECYCLING**

### **Comment Summary:**

The comment states that it is in the financial interest of the state and the solar industry to promote recycling.

**Comment:** 6-8

### **Response:**

DTSC agrees with the commenter's assertion for promoting recycle opportunities for PV modules in California. DTSC's proposed regulations for PV modules aim to streamline the waste management of PV modules that are determined to be hazardous and provide an alternative for the management of these wastes. DTSC made no changes to the proposed regulation or supporting documents in response to the comment.

## **D. ADDITIONAL INFORMATION**

### **Comment Summary:**

The comments provided information to help with the proposed regulations in addition to expressing support and encouragement of the proposed regulations for the management of hazardous waste PV modules as universal waste.

**Comments:** 7-3, 7-4

### **Response:**

DTSC believe the comments to be informational and no regulatory change is necessary. DTSC welcomes the commenters to provide references that support the information provided.

## **XXIV. General**

### **A. INCLUSION OF THE TERM “WASTE” IN FRONT OF PV MODULES**

#### **Comment summary:**

The comments suggest adding the term "waste" in front of all instances of PV modules.

**Comments:** 9-10, 9-12, 9-14, 9-15, 9-16, 9-17, 9-18, 9-19, 9-20, 9-22, 9-23, 9-24, 9-28, 9-40, 9-41, 9-42, 9-43, 9-44, 9-45, 9-47, 9-48, 9-49, 9-50, 9-51, 9-52, 9-53, 9-54, 9-55, 9-56, 9-57

#### **Response:**

DTSC reviewed the comments and determined that no regulatory change is necessary. DTSC has defined in the applicability section 66273.7.1(a)(2) that PV modules covered pursuant to chapter 23 apply to discarded PV modules that are hazardous solely because the modules exhibit the characteristic of toxicity specified in section 66261.24. DTSC determined that there is no additional need to add "waste" in front of every PV module in chapter 23 as it presumed the PV modules in chapter 23 are a waste.

### **B. INTRODUCTION**

#### **Comment Summary:**

The comments are the introductory language made to the proposed regulations during the 52-day comment period and public hearing following the comment period.

**Comments:** 4-1, 6-1, 5-1, 7-1, 7-12, 8-2, 11-1, 11-5, 11-22, PH-1-2, PH-2-1, PH-2-5, PH-3-1, PH-4-1, PH-4-2, PH-5-1, PH-5-5, PH-5-6

#### **Response:**

DTSC acknowledges the comments and determined that no regulatory change is necessary. The comments are introductory language of the comment letters indicating that the comments provided refer to the proposed regulation for the management of hazardous waste PV modules as universal waste in California.

## **C. APPROVAL**

### **Comment Summary:**

The comment supports DTSC's efforts to designate and manage waste PV modules, that would otherwise be characterized as California-only hazardous waste, as a universal waste; understanding that not all waste PV modules are characterized as a California-only hazardous waste nor as a characterized hazardous waste.

**Comment:** 11-2

### **Response:**

DTSC acknowledges the support offered by the comment. The proposed regulation is clear that the proposed PV module universal waste regulations would apply to both RCRA and non-RCRA hazardous waste PV modules in California. DTSC is authorized by U.S. EPA to add a new waste stream to the universal waste management program as long as such wastes meet universal waste criteria outlined in section 66260.23.

## **D. LISTING**

### **Comment Summary:**

The comment provides a list of items in the introductory language which will be addressed in detail later in the comment letter:

- Including PV modules into the universal waste regulatory structure.
- Allowing inclusion of PVs into the same container as universal waste electronic devices.
- Allowing PV modules that are occasionally "accidentally or unintentionally broken" to be managed.
- Authorizing removal of user-replaceable components without designation as a treatment activity.
- Allowing written notifications and reports, not just online reporting.

**Comment:** 7-5

### **Response:**

The comment is the introductory language of a letter encouraging DTSC of its proposed regulations on PV modules. DTSC made no changes to the proposed

regulation to address this comment; individual comments as provided in this comment are addressed throughout this document.

## **E. ADDITIONAL INFORMATION**

### **Comment Summary:**

Comments indicated in the introductory language that additional information are provided in the submitted comments.

**Comments:** 10-1, 11-20

### **Response:**

The comments are the assisting language of the comment letter indicating additional information was provided. DTSC acknowledges the comments and determined that no regulatory change is necessary.

## **F. SPELLING**

### **Comment Summary:**

The comment states there is a typographical error in section 66273.32(d)(1). The proposed text says "pursuarnt" and it should be spelled "pursuant."

**Comment:** 9-9

### **Response:**

DTSC acknowledges the commenter's assertion on the spelling error and corrected it.

## **G. CLOSING**

### **Comment Summary:**

The comments provide closing remarks regarding the proposed regulations during the 52-day comment period and public hearing following the comment period.

**Comments:** 4-7, 2-4, 8-15, PH-5-13

### **Response:**

The comments are a closing remark encouraging DTSC for its proposed regulations and assisting and providing contact information for communication. DTSC acknowledges the comments and determined that no regulatory change is necessary.

## **H. THANK YOU**

### **Comment Summary:**

The comments express appreciation of the proposed regulations for the management of hazardous waste PV modules as universal waste.

**Comments:** 8-1, 7-1, 7-13, PH-1-10, PH-3-8, PH-4-5, PH-4-6

### **Response:**

DTSC acknowledges these comments as gratitude. DTSC made no changes to the proposed regulation or supporting documents in response to these comments.