ECS
REFINING

October 1, 2012

VIA ELECTRONIC MAIL
Department of Toxic Substances Control
Solar Panel Regulation Development
P.O. Box 806
Sacramento, CA 95812

Re: Office of Administrative Law Notice File Number Z-2012-0802-01

Comments and Questions on the "PROPOSED STANDARDS FOR THE MANAGEMENT OF HAZARDOUS WASTE SOLAR MODULES"

To Whom It May Concern:

ECS Refining is an electronic waste recycling company and permitted treatment, storage and disposal facility under the standardized permit program. We have reviewed the proposed regulations designed to codify appropriate management of solar modules under the Department of Toxic Substances Control's regulatory scheme and offer the following questions and comments.

General Questions on the Proposed Regulation

1. Please confirm that whether the following interpretations of the proposed regulation are valid:
    a. Solar modules may be managed as a universal waste by generators and solar module vendors, provided they are intact, are properly packaged, are properly labeled, and are delivered to a reclamation facility within the United States.
    b. Solar modules that are broken must be managed as hazardous wastes, regardless of whether they are managed by a generator, a solar module vendor, or a transporter.

2. Is a solar module that is unintentionally broken during the course of transportation to a reclamation facility still eligible to be managed as a universal waste, or must it be managed as a hazardous waste? Please note that a cracked panel can be properly packaged so that it does not disperse toxic components. Requiring cracked panels to be fully regulated as hazardous wastes while intact panels are

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universal wastes makes a distinction that will be difficult for generators to understand, will be difficult to enforce, and doesn't make practical sense.

3. In the 45 Day Public Notice and Public Comment Period announcement, the Department discusses the feasibility of recycling solar modules and concludes, based upon pilot scale studies, that recycling is feasible. Does DTSC believe that the only legitimate methodology to recycle solar modules is to strip the photovoltaic coatings from the silicon substrate and chemically recover the metals in the coatings? An alternative recycling method would be for the panels to be used for their silica value in a primary smelting operation which includes recovery of any toxic metals that are present. In this scenario, the toxic metals would be recovered but not necessarily sold as recovered end products. Is this recycling methodology in conformance with the proposed regulation?

4. The 45 Day Public Notice and Public Comment Period announcement indicates that DTSC believes that there will be no adverse impact on California businesses if these proposed regulations were to be enacted. ECS Refining disagrees with this assessment. Under this proposed regulatory scheme, a California business that wishes to recycle solar modules must do so under a hazardous waste facility permit; businesses outside of California will not have the same requirement and California businesses will be relatively disadvantaged. Due to the permitting requirement, ECS Refining believes that there will not be any development of recycling infrastructure for solar modules in California, even though many solar module manufacturers are located here. The effect of this regulation will be to drive recyclers to set up operations outside of California in order to remain competitive.

5. We are aware of at least one manufacturer of solar modules that builds the module with printed circuit boards inside, and does not use any toxic metals in the unit that would not normally be found in printed circuit boards. This would seem to be an example of a solar module that could be classified as a universal waste electronic device. How does the Department propose to classify this type of panel? Could a universal waste recycler recycle units that meet the definition of electronic device, or does the Department believe no solar module meets the definition of electronic device?

ECS REFINING

Questions on Specific Regulatory Sections

66260.10 Definitions

Question: Is the definition of 'solar module vendor' intended to include a third party company that collects solar modules for transfer to the final recycling destination but is not a solar module manufacturer, distributor, or installer? For example, can ECS Refining collect intact solar modules and manage them as universal wastes while they are transported, stored and shipped to their recycling destination?

66261.6(a)(8)(I)

This section says that solar modules shall be recycled by being '…reclaimed at the designated facility, including recovery of the hazardous constituents which cause the solar module to be classified as hazardous waste…". What is considered acceptable recovery? Does the Department intend this to mean that, for example, a solar module reclamation process must recover distinct toxic metals such as cadmium and selenium (for example) as end products in order to be a valid recycling method?

Thank you for the opportunity to comment on the proposed regulations.

Sincerely,

Beverly Pester Kennedy
Environmental Health and Safety Manager
Phone (408) 768-4966
E-mail bkennedy@ecsrefining.com

First Solar®

September 28, 2012

Krysia Von Burg, Regulations Coordinator
Regulations Section
Department of Toxic Substances Control
P.O. Box 806
Sacramento, CA 95812-0806

Re: First Solar Inc.'s Comments on Proposed Standards for the Management of Hazardous Waste Solar Modules Rulemaking

Dear Ms. Krysia Von Burg:

First Solar Inc. is submitting the following comments regarding the Proposed Standards for the Management of Hazardous Waste Solar Modules rulemaking.

DTSC released workshop regulations during the summer of 2010 that were intended to streamline the management of California-only hazardous waste modules and to address the issues described above. So long as the modules were recycled, they would be designated as "universal wastes," which are ubiquitous, relatively non-hazardous wastes that the State has determined can be managed under more relaxed standards. And if the modules were recycled as part of a manufacturer-operated product take-back program that met certain requirements, DTSC would further relax its standards and classify the modules as hazardous wastes that are "exempt from regulation." Under either regime – universal waste or conditional exemption – the modules would be recycled, the costs of managing hazardous wastes would be eliminated because the handler would not have to manifest the waste or pay waste generation fees, and the stigma of hazardous waste management would largely be eliminated. Further, both regimes would encourage recycling and the exemption would encourage manufacturers to operate recycling programs and to design modules to be recyclable.

DTSC released draft regulations on August 17, 2012. The draft regulations incorporate many of the revisions proposed by the PV industry, and now:

1. Allow manufacturers to contract with third-party entities to operate take-back programs,
2. Allow manufacturers to manage "cracked" modules in the same manner as intact modules,
3. Apply the Household Universal Waste and Conditionally Exempt Small Quantity Generator exemptions to waste modules,

4. Allow the removal of module components without classifying that activity as "treatment."
5. Require manufacturers recycling modules only to recover hazardous constituents that led the module to be classified as hazardous waste, instead of all hazardous constituents;
6. Exempt modules that are no longer wastes (e.g., refurbished modules) from regulation as wastes; and,
7. Incorporate multiple other minor revisions suggested by industry.

The revised regulations, however, did not incorporate a number of the industry's proposed revisions and were changed in other ways that are problematic.

1. The regulations improperly utilize the distinction between "intact" and "broken" modules

Both the conditional exemption and the universal waste rules approach the concept of broken modules in a way that severely compromises the potential efficacy of the regulations. The regulations somewhat unnecessarily draw the distinction between "intact" modules and broken modules because of a fear that, like CRTs, breakage will cause modules to leach hazardous constituents into the environment. While the regulatory Initial Statement of Reasons (ISOR) recognizes that the modules are more like electronic devices,[1] not CRTs, and do not necessarily release hazardous constituents when broken, the regulations show that DTSC has a significant fear that module breakage will lead to environmental contamination,[2] and strongly emphasizes

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[1] *See* ISOR, Alternative 1, Criteria for Addition to the State's Universal Waste Rule, subpart (e) ("This proposed rulemaking applies similar packaging standards to solar modules that are applied to universal waste electronic devices. However, there is little difference between the acute hazards of managing electronic devices and solar modules. For both wastes, the hazardous components are in a form that minimizes the potential for any release during handling. Therefore, DTSC believes that because of the relatively low acute hazards associated with handling solar modules, the proposed management standards (e.g., packaging standards that prevent breakage and ensure proper handling and immediate response to releases) provide more than adequate protection to human health and the environment."

[2] For example, Section 66273.36 requires personnel training to on the types and hazards associated with universal waste (e.g., hazards due to leaded glass in CRT devices or CRTs; hazards due to cadmium, lead or selenium in solar modules." (underlined represents new text).

that module breakage should be minimized, as both the conditional exemption and the universal waste rule require that modules be managed to "prevent breakage."

Decommissioning arrays in the most efficient way possible may lead to significant module breakage, and that handling modules to prevent breakage would not be practical or justified by concerns over releases of solar module constituents. Further, since the modules tend to be placed into a container prior to breakage, there is little risk that the broken modules could be released into the environment, so there is no environmental benefit to managing the modules to minimize breakage.

Under the rule any broken modules *must be handled as hazardous wastes.* Both the conditional exemption and the universal waste rule define "solar module" to exclude modules that are "fractured and fragmented" or that are "physically damaged" to the point that they are no longer "recognizable" as intact modules. And the conditional exemption further states that "only intact modules shall be managed" which means that a handler, under the conditional exemption or the universal waste rule, will have to manage "intact" modules under one regulatory scheme and "broken" modules under another, which undermine the benefits of the relaxed schemes. Both schemes are constructed in the proposed regulations in such a manner that will be burdensome for industry to easily implement them. The proposed regulation of broken modules should be revised in the proposed regulations.

Section 66273.33 of the universal waste rule, taken alone – ignoring the problematic "solar module" definition discussed in the above paragraph – offers a reasonable model for how the exemption and rule should handle breakage. It utilizes the "intact" versus broken distinction, but only to classify how the modules must be contained, not to determine whether they are eligible for the program at all. All modules must be contained to avoid releases to the environment, but for "intact" modules that requirement may be satisfied by containing them with stretch film on a pallet. If modules are broken *and* "may be expected to cause a release of hazardous constituents to the environment under reasonable foreseeable conditions," the handler must place the modules in a "structurally sound" container that is "compatible with the contents of the modules" and that prevents "releases of hazardous components to the environment." It is somewhat reasonable to

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This section clearly indicates that DTSC is regulating solar modules as in a manner equivalent to CRTs, not electronic devices, regardless of the language in the ISOR.

draw a distinction between broken and intact modules for the purpose of containment (rather than eligibility for the exemption).

The universal waste rule contains other problematic provisions. First, Section 66273.33 only purports to handle the management of modules that are "accidentally or unintentionally broken."

If handling practices result in the intentional breakage of solar modules, they may not be covered by the exemption. Second, Section 66273.7.1 states that waste modules are generated when they are "physically damaged, deteriorated, or altered and no longer an intact solar module . . . (e.g., solar modules that are cracked, fractured into more than one piece, or fragmented)." Which means that under the universal waste rule, when a solar module breaks it becomes a waste subject to the rule (under Section 66273.7.1), but *at the same time* it also becomes a waste not eligible for the rule because it is completely excluded from the definition of a solar module (under Section 66273.9). Last, the universal waste rule defines "intact" solar modules to include "cracked" panels (in other words, merely being cracked does not make a panel "broken), but Section 66273.7.1 states that modules become wastes when they are "cracked" *because they are no longer intact.* Different sections of the regulation cannot state that cracked modules are both intact and not intact. The use of "intact" and "cracked" must be made uniform across the regulations to eliminate these irreconcilable conflicts.

2. <u>The regulations do not exempt modules handled in a product take-back program from the definition of waste or hazardous waste</u>

In order to eliminate the stigma associated with hazardous waste management and to properly incentivize manufacturers to develop product take-back programs, DTSC should exempt modules managed in take-back programs from the definition of "waste" or "hazardous waste." DTSC has always stated that while it may exempt hazardous waste modules from certain regulations, it did not believe that an exemption from classification as hazardous waste was warranted. For that reason, DTSC placed the take-back program exemption within Section 66261.6(a)(3), classifying modules as hazardous recyclable materials that are "not subject to regulation." DTSC should place the exemption in Section 66261.4(a) or (b), as industry proposed, which would redefined used modules so that they would not be classified as wastes or hazardous wastes at all.

3. The regulations overly restrict handlers' ability to disassemble modules prior to reclamation

Under the draft regulations, handlers may "remove junction boxes and junction box cables as long as the solar module remains intact" without conducting "treatment." But industry previously requested that it be permitted to remove wires and metal frames from solar modules and to disassemble modules into individual components, modules, or cells. The regulations do not allow for that removal to occur. To the extent necessary to allow for efficient transportation and recycling of waste modules, DTSC should expand the ability to disassemble modules.

4. The regulations do not allow the offsite aggregation of modules necessary to maximize the efficiency of the reclamation program

In order for the transportation program to be efficient, entities operating a take-back program should be permitted to stockpile modules *offsite* prior to transporting them to the reclamation facility. While the revised regulations give the operator the ability to stockpile the modules for a year, the transporter cannot deliver modules to a place other than a reclamation facility. That delivery limitation largely prevents the operator from aggregating modules from multiple locations in a single place prior to transportation. The regulations attempt to eliminate that limitation by subjecting transporters to "universal waste transfer facility" requirements, but that only allows storage (and hence aggregation) for up to 10 days, which may be insufficient.

5. The modules incorporate hazardous waste requirements where they should incorporate universal waste requirements

In several instances, the regulations state that handlers or transporters must comply with certain hazardous waste management requirements. Since the modules are universal wastes, the regulations should incorporate universal waste handling and transportation requirements, not hazardous waste requirements. While substantively insignificant, incorporation of hazardous waste requirements rather than identical universal waste requirements might increase the stigma associated with the exemption. For example, in Section 66261.6(a)(8)(H), export must be conducted in accordance with "export requirements for hazardous waste," when they should be conducted in accordance with the substantively identical export requirements for universal waste.

And destination facilities are subject to hazardous waste regulations when they too should be subject to universal waste requirements.

If you have any questions concerning these comments, please feel free to contact me at 908-809-4127 or mgaramone@firstsolar.com.

Regards,

Matthew D. Garamone
Corporate Environmental Director and Senior Counsel – Environmental, Health & Safety
First Solar Inc.

North County Watch

Looking Out Today For Tomorrow

Krysia Von Burg, Regulations Coordinator
Regulations Section
Department of Toxic Substances Control

E-mail Address: regs@dtsc.ca.gov

October 1, 2012

RE: *Standards for Management of Hazardous Waste Solar Modules*
Department Reference Number: R-2010-01
Office of Administrative Law Notice File Number: Z-2012-0802-01

Dear Ms. Von Burg,

North County Watch is a 501 3c non-profit Public Benefit corporation. We are an all-volunteer organization committed to sustainable development in and around north San Luis Obispo County. We have been in operation for over a decade.

We appreciate the intent of the goal to direct the disposal of panels to appropriate facilities. And we understand your reluctance to proceed with Alternative 4 "Do Nothing' although, as you state, Alternative 4 "ensures the greatest protection of the environment…." We have concerns that given the volume of panels that will become a waste issue, in the near term and in the future, Alternative 1 and the proposed changes are not protective enough. Although, "DTSC has concluded that because solar modules are low risk and generated by a wide segment of society, the application of universal waste management standards for these wastes provides appropriate protection of the environment.", we believe DTSC has underestimated the risk involved based on a failure to assess the extent of the problem that will be coming our way.

We request that DTSC institute stricter standards for generators of these wastes, handler, packagers and transporters, and generation sites of 20 MW or greater, that is, some compromise position between Alternative 4 and the proposed guidelines.

We believe that your estimate of 100 to 200 waste solar modules over the lifetime of a large industrial project and 400 to 4,000 end[1] of life modules is very low. A CdTe project in San Luis Obispo

[1] *Initial Statement of Reasons* Standards for the Management of Hazardous Waste Solar Modules Department of Toxic Substances Control; Reference Number: R-2010-01; Office of Administrative Law Notice File Number: Z-2012-0802-01 P. 8

County will generate 586 MW from 9 million panels[2]. That works out to 15,358 panels per MW. Even a low .05% failure rate equates to 77 panels per MW. Seventy-seven (77) panels times 586 MW is 45,122 waste panels. A 200 MW CdTe facility would generate 15,400 waste panels with a .05% failure rate. A .01% failure rate for a 200 MW CdTe facility would generate 3,000 waste panels; a .01% failure rate for a 586 MW facility would generate over 8,000 waste panels.

First Solar Inc. is the primary producer of CdTe panels. The company has experienced a higher failure rate of its panels in hot climates. For example, a one-third acre demonstration installation at the Topaz Solar Farm (thin film CdTe PV) experienced the loss of one panel when the surface glass shattered. The First Solar Inc. Annual Report filed for the period ending 12/31/2011 states on page 40:

> ***Module Installation in Non-Temperate Climates***
> We believe our PV modules are potentially subject to increased failure rates in hot climates. This assumption is based on technical literature, data that we have developed internally including through accelerated-life testing, our analysis of modules returned under warranty, and our analysis of performance data from systems that we monitor under O&M agreements. Processes that are accelerated by higher ambient temperatures include stress corrosion cracking in glass, polymer creepage and impurity diffusion processes. For more information about risks related to thin film module product performance, please see Item 1A: " *Thin-film technology has a short history, and our thin-film technology and solar modules and systems may perform below expectations; problems with product quality or performance may cause us to incur significant and/or unexpected warranty and related expenses, damage our market reputation, and prevent us from maintaining or increasing our market share.* " First Solar has an extensive deployment history in temperate climates, such as Europe. Our deployed volume into hot climates, such as the southwestern United States, is mostly recent.

Waste panels, the result of breakage in shipment, and failure will likely occur in the construction phase and in the initial years of operation. Nonetheless, they represent large numbers and a problem that will need to be addressed within the next few years.

Similarly, the 586 MW project in San Luis Obispo County will be sending 9 million panels to a waste facility at end of life.

We raise this issue because we are not assured that your proposed studies and conclusions have adequately assessed the enormity of the waste problem and the volume of toxic materials in even a modest sized CdTe installation. Each CdTe module averages 7-9g/ m^2. Nine Million panels (586 MW) could contain over 60 tons of cadmium.

We are concerned that you seem to be anticipating that CdTe panels might be candidates for curbside collection of electronic wastes and other household wastes[3] based on the statement that

[2] Topaz Solar Farm EIR http://www.sloplanning.org/EIRs/topaz/FEIR/FEIR/Vol1/B_Proj%20Desc_DONE.pdf
[3] *ISOR* p. 11

"…there is little difference between the acute hazards of managing electronic devices and solar modules. For both wastes, the hazardous components are in a form that minimizes the potential for any release during normal handling. Therefore, DTSC believes that because of the relatively low acute hazards associated with handling solar modules, the proposed management standards (e.g., packaging standards that prevents breakage and ensuring proper handling and immediate response to releases) provide more than adequate protection to human health and the environment. These standards apply to the wastes through all phases of handling, collection, accumulation, and transport."[4] CdTe panels that have compromised seals or broken glass and could release cadmium, may pose a threat to human health and environment. We believe that different standards for handling and transportation of compromised or broken CdTe panels should be delineated. While your definition of "solar module" excludes damaged or compromised panels, and thus, theoretically, assumes different standards for handling and transportation of compromised or broken CdTe panels, how will the separate paths for handling be addressed? A site may be packaging hundreds or thousands of panels for transport to a facility.

How will a shipment of panels being carried by common carrier be handled in the event the shipment is involved in a traffic incident? How will clean-up of broken modules be handled?

Are there requirements for specific handling procedures of PV panels by workers unpacking factory shipments of panels on-site should the shipment contain damaged panels?

§ 66261.6.(a)(4)(E) states "A solar module shall be accumulated by any person for no longer than one year from the date the solar module became a waste." Given the potential numbers for waste modules as presented in the beginning of our comments, we are concerned that solar generation facilities would store waste modules on site for up to a year. We believe that intact waste modules should not remain on-site at generation sites for more than 90 days. Modules that are compromised in anyway should be transported from the generation facility within 30 days because they present an increased danger to the health and safety of personnel and the environment.

It should be required that solar modules that are to be transported are stored within a facility that protects the modules from the weather, particularly rain.

Regarding the following Section, we recommend that more specificity be included as to the responsibility of the generation facility to immediately identify, locate and, within 10 days, remove any module that is cracked or compromised. A facility with millions of panels that might be compromised by "stress corrosion cracking in glass, polymer creepage and impurity diffusion process" due to exposure to temperature extremes of California, should be responsible for timely removal of damaged panels.

> **§66273.7.1. [~~Reserved~~.] Applicability—Solar Modules.**
> **(c)(1)(B)** The solar module is physically damaged, deteriorated, or altered and no longer an intact solar module as defined in section 66273.9 (e.g., solar modules that are cracked, fractured into more than one piece, or fragmented), or otherwise removed from service without intent to re-install it.

[4] *Ibid.* p. 10

North County Watch P.O. Box 455 Templeton, CA 93465

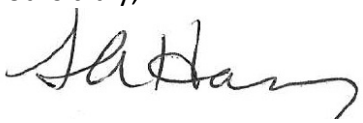
Regarding the following section, original factory shipping containers should be constructed so that it complies with the standards in Section 66273.33 (d)(B)1.a. to prevent leakage, spillage, etc.

> **§ 66273.33. Universal Waste Management Requirements for Batteries, Lamps, and Mercury-Containing Equipment, and Solar Modules.(d)(B)1.a.** A universal waste handler shall contain any solar module in a manner that prevents breakage and release of hazardous components to the environment. If a container is used, such a container shall prevent leakage, spillage, or damage that could cause leakage of hazardous components under reasonably foreseeable conditions.

PV generation sites of 20 MW or greater should be held to the same standards as a universal waste handler regarding the collection, storage, packaging, spills or releases etc of waste modules. Installers and handlers of PV panels at sites of 20 MW or greater should have training specific to the handling of the hazardous materials.

Thank you for the consideration of our comments.

Yours truly,



Susan Harvey
President

North County Watch P.O. Box 455 Templeton, CA 93465

October 1, 2012

Krysia Von Burg
Regulations Section
Department of Toxic Substances Control (DTSC)
P.O. Box 806
Sacramento, CO 98512-0806

Attention: Krysia Von Burg

Re: Comments on Proposed Standards for Management of Hazardous Waste Solar Panels

Dear Krysia Von Burg and DTSC,

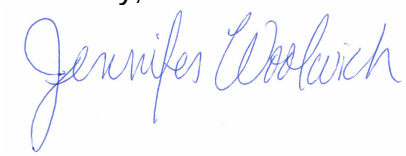
Attached are comments from pv recycling, llc in reference to DTSC's Proposed Standards for Management of Hazardous Waste Solar Panels, Department Reference Number R-2010-01.

Attachment A comprises of suggestions for wording and technical language.

Attachment B presents the argument that DTSC's goal to effectively and efficiently divert waste solar modules from landfills will not be attained by providing an option to utilize either the Universal Waste Management or the Solar Module Vendor, but rather the goals will be reached by implementing regulation that requires photovoltaic module manufacturers to administer a reclamation program internally or through an independent third party.

Thank you for considering suggestions and comments from pv recycling, llc. Having an opportunity to discuss these replies would be greatly welcomed. Please feel free to contact Jennifer Woolwich if there are any further questions.

Sincerely,



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Attachment A

Amend California Code of Regulations, title 22, division 4.5, Table of Contents, chapter 23 to read as follows:
Table of Contents

Chapter 23. Standards for Universal Waste Management
Article 1. General

§66273.1. Scope.

§66273.7.1. [Reserved.] Applicability~~— Solar modules~~. **Photovoltaic Modules**

Comments:	The standard industry language is photovoltaic module or PV module.
Suggested Changes:	Replace “Solar modules” with “Photovoltaic Modules”

Article 3. Standards for Universal Waste Handlers
§66273.30. Applicability.

§ 66273.33. Universal Waste Management Requirements for Batteries, Lamps, and Mercury-Containing Equipment, and ~~Solar modules.~~ **Photovoltaic Modules**

Comments:	The standard industry language is photovoltaic module or PV module.
Suggested Changes:	Replace “Solar modules” with “Photovoltaic Modules”

Amend California Code of Regulations, title 22, division 4.5, chapter 10, article 2, section 66260.10 to read:

§ 66260.10. Definitions.
When used in this division, the following terms have the meanings given below:

“Soil-pore liquid” means the liquid contained in openings between particles of soil in the unsaturated zone.
"~~Solar module~~" **Photovoltaic (PV) Module** means
(a) any one or more of the following, except as provided in subsection (b) of this section:
(1) any ~~photovoltaic~~ module **of any form factor such as rigid or flexible** ~~or other photovoltaic device~~ that collects **photons** ~~energy~~ from the sun for the purpose of converting **the photons** ~~light~~ into **electrons** ~~electricity~~ for general electricity use.
(2) “intact" ~~solar modules~~ **PV Modules** are ~~solar modules~~ **PV Modules** that are complete with no component removed or missing (e.g., ~~solar module~~s **PV Modules** that are non-functional and which contain glass panes, on one or both sides of the module, where the glass may have been cracked or otherwise damaged, and the size and shape

of such a module remains identical to that of a newly-installed ~~solar module~~ **PV Module**). "Intact" ~~solar module~~s **PV Modules** also include ~~solar module~~s **PV Modules** that do not contain glass and which are otherwise non-functional (e.g., flexible ~~membrane~~ **substrate** ~~solar module~~s **PV Modules**).
(b) "~~Solar module~~" "**PV Module"** excludes all of the following:
(1) physically-damaged, -deteriorated, or -altered ~~solar module~~s **PV Modules** (or components thereof), that are no longer recognizable as intact ~~solar module~~s **PV Modules**, as defined in subsection (a) of this section.
(2) fractured or fragmented portions of a ~~solar module~~ **PV Module**, although recognizable as being part of a ~~solar module~~ **PV Module**, which are no longer attached to an intact ~~solar module~~ **PV Module**, as defined in subsection (a) of this section.
(3) solar-powered electronic devices that have ~~solar cells~~ **photovoltaic** cells incorporated into their structures.

"~~Solar module vendor~~" **Reclamation Vendor** means the manufacturer, producer, marketer, or distributor of ~~solar module~~s **PV Modules**, or a third party entity acting on behalf of such manufacturer, producer, marketer, or distributor, located within the United States and its territories, who administers a ~~solar module~~ **PV Module** reclamation program and who accepts (for reclamation) one or more ~~solar module~~s **PV Modules** that are subject to the conditions for the exemption in section 66261.6 of chapter 11 of this division.

"Solid Waste Management Unit" means any unit at a hazardous waste facility from which hazardous constituents might migrate, irrespective of whether the units were intended for the management of wastes, including but not limited to: containers, tanks, surface impoundments, waste piles, land treatment units, landfills, incinerators and underground injection wells.

Comments:	The standard industry language is photovoltaic module or PV module. The standard industry language is photovoltaic cells or PV cells. **§ 66260.10 (a) (1)** • Need to state in the beginning of the definition that the form factor can be rigid or flexible. It is mentioned later, but better to state it in the very beginning. • Need to have standard industry language defining how the module generates electricity • Need to remove "photovoltaic device." It is thought that this language was initially used to describe non-rigid modules. With "non-rigid modules" and "flexible substrate" suggested for replacement, "photovoltaic device" should be removed. It also could be confused with solar-powered electronic devices mentioned later in the section, which are excluded from this regulation. See **§ 66260.10 (b) (3).** **§ 66260.10 (a) (2)** Flexible PV modules are on substrates not membranes.

	§ 66260.10 (no subsection indicated) The use of "Solar Module Vendor" suggests an entity that sells solar modules. This can be clarified by calling the entity a "Reclamation Vendor." It is understood that a Reclamation Vendor can be the manufacture, producer, marketer, or distributor of PV Modules, or a third party entity acting on behalf of such manufacturer, producer, marketer, or distributor.
Suggested Changes:	Replace the first mention of "solar module" with "Photovoltaic (PV) Module" Replace subsequent "solar module" with "PV Module" Replace "solar modules" with "PV Modules" Replace "solar cells" with "photovoltaic cells" Replace "Solar Module Vendor" to "Reclamation Vendor" **Change § 66260.10 (1)** From: any photovoltaic module or other photovoltaic device that collects energy from the sun for the purpose of converting light into electricity for general electricity use. To: any ~~photovoltaic~~ module **of any form factor such as rigid or flexible** ~~or other photovoltaic device~~ that collects **photons** ~~energy~~ from the sun for the purpose of converting **the photons** ~~light~~ into **electrons** ~~electricity~~ for general electricity use. **Change § 66260.10 (2)** From: …….that do not contain glass and which are otherwise non-functional (e.g., flexible membrane ……. To: …….that do not contain glass and which are otherwise non-functional (e.g., flexible~~membrane~~ **substrate**……. **Change § 66260.10 (no subsection indicated)** From:

	"Solar module vendor" means the manufacturer, producer, marketer, or distributor of solar modules , or a third party entity acting on behalf of such manufacturer, producer, marketer, or distributor, located within the United States and its territories, who administers a solar module reclamation program and who accepts (for reclamation) one or more solar modules that are subject to the conditions for the exemption in section 66261.6 of chapter 11 of this division. To: (c) "~~Solar module vendor~~" **Reclamation Vendor** means (1) the manufacturer, producer, marketer, or distributor of ~~solar module~~s **PV Modules**, or a third party entity acting on behalf of such manufacturer, producer, marketer, or distributor, located within the United States and its territories and, (2) who administers a ~~solar module~~ **PV Module** reclamation program and (3) who accepts (for reclamation) one or more ~~solar module~~s **PV Modules** that are subject to the conditions for the exemption in section 66261.6 of chapter 11 of this division.

Amend California Code of Regulations, title 22, division 4.5, chapter 11, article 1, section 66261.6 to read:

§ 66261.6. Requirements for Recyclable Materials.
(a)(1) Recyclable materials are subject to the applicable requirements for generators, transporters and facilities of articles 1 and 2 of chapter 16 of this division, except as specified otherwise for the materials listed in subsections (a)(2), (a)(3), (a)(4), (a)(5), and (a)(6) of this section.
(2) The following recyclable materials are also regulated under the articles (of chapter 16 of this division) specified below, and all applicable provisions in chapters 20 and 21 of this division:
(A) [RESERVED];
(B) hazardous wastes burned for energy recovery in boilers and industrial furnaces that are not regulated under article 15 of chapter 14 or 15 of this division are regulated under article 8 of chapter 16 of this division.
(C) spent lead-acid storage batteries that are being reclaimed are regulated under article 7 of chapter 16 of this division;
(D) recyclable materials that are being used in agriculture are regulated under article 8.5 of chapter 16 of this division;
(E) waste elemental mercury that is being recycled is regulated under article 9 of chapter 16 of this division.
(3) The following are not subject to regulation under this division, and are not subject to the notification requirements of Health and Safety Code section 25153.6:
(A) materials that can be shown to be recycled by methods identified in subdivisions (b), (c) or (d) of Health and Safety Code section 25143.2; and
(B) scrap metal as defined in section 66260.10. However, scrap metal that meets the definition of a RCRA hazardous waste is not subject to regulation under this division

and is not subject to the notification requirements of Health and Safety Code section 25153.6, only when the scrap metal is being recycled; and
(C) hazardous wastes that exhibit the characteristic of toxicity specified in section 66261.24(a)(1) and do not exhibit any other characteristic of a hazardous waste specified in article 3 of this chapter (commencing with section 66261.20), are not listed in article 4 of this chapter (commencing with section 66261.30), and that qualify as one of the materials specified in 40 CFR section 261.6(a)(3) (incorporated by reference in section 66260.11).
(D) ~~solar modules~~ **PV Module** destined for reclamation within the United States and its territories in a program administered by a ~~solar module~~ **Reclamation Vendor** ~~vendor~~ provided that the conditions in subsection (a)(8) of this section are met. However, such ~~solar modules~~ **PV Modules** are subject to regulation as described in subsection (a)(8)(I) of this section upon arrival at a designated facility located in California.
(4) The following are prohibited as specified:
(A) the use of material (e.g., waste, used oil or other material) which is contaminated with dioxin or any other hazardous waste (other than a waste identified solely on the basis of ignitability), for dust suppression or road treatment is prohibited;
(B) the use of used oil as a road oil, dust suppressant or weed control agent is prohibited, except as provided otherwise in Health and Safety Code section 25250.5.
(7) Hazardous waste that is exported to or imported from designated member countries of the Organization for Economic Cooperation and Development (OECD) (as defined in 40 CFR section 262.58(a)(1) or section 66262.58(a)(1)) for purpose of recovery is subject to the requirements of 40 CFR Part 262, Subpart H or this article, if it is subject to either the Federal manifesting requirements of 40 CFR Part 262, or to the universal waste management standards of 40 CFR Part 273.
(8)(A) ~~Solar modules~~ **PV Modules** shall be managed in a manner that prevents breakage and prevents ~~releases from any solar modules or~~ of any hazardous component of a ~~solarmodule~~ **PV Module** to the environment under reasonably foreseeable conditions pursuant to the requirements of this section.
(B) Only intact ~~solar module~~s **PV Modules** shall be managed. Any ~~solar module~~ **PV Module** or container of ~~solar module~~s **PV Modules** that shows evidence of leakage or damage that could cause a release of hazardous constituents to the environment shall be managed and contained in the same manner as are universal waste ~~solar module~~s **PV Modules** pursuant to section 66273.33, subsection (d) of chapter 23 of this division.
(C) A ~~solar module~~ **PV Module** or container of ~~solar module~~s **PV Modules** shall be labeled with the following phrase: "~~Solar modules--Not Scrap Metal or CRT Glass~~". **"Universal Waste-PV Modules."**
(D) Any spills or releases of a ~~solar module~~ **PV Module** or hazardous components there of shall be cleaned up immediately and shall be managed and contained pursuant to subsection (a)(8)(B) of this section.
(E) A ~~solar module~~ **PV Module** shall be accumulated by any person for no longer than one year from the date the ~~solar module~~ became a waste.
(F) A transporter of ~~solar module~~s **PV Modules** shall manage ~~solar module~~s **PV Modules** in compliance with the requirements of article 5 of chapter 23 of this division, including but not limited to ~~solar module~~ **PV Module** transport in accordance with universal waste transfer facility requirements.
(G) A transporter of ~~solar module~~s **PV Modules** shall not deliver ~~solar module~~s **PV Modules** to a place other than to a reclamation facility within the United States and its territories designated by the ~~solar module~~ **PV Module** vendor who is administering the ~~solar module~~ **PV Module** reclamation program.
(H) A person is prohibited from exporting ~~solar module~~s **PV Modules** to **destinations outside of the United States or its territories**, unless export is conducted in

accordance with applicable export requirements for hazardous waste as described in chapter 12 of this division.
(I) ~~Solar module~~s **PV Modules** shall be recycled by being reclaimed at the designated facility, including recovery of the hazardous constituents which cause the ~~solar module~~ **PV Module** to be classified as hazardous waste pursuant to article 3, chapter 11 of this division.
(J) Any ~~solar module~~ **Reclamation Vendor** ~~vendor~~ who administers a ~~solar module~~ **PV Module** reclamation program as described in this subsection shall submit to the Department at the address given in this subparagraph, a written notification containing the information specified in this subparagraph no later than 30 calendar days prior to executing the ~~solar module~~ **PV Module** reclamation program.
1. This notification shall include:
a. Name of ~~solar module~~ **Reclamation Vendor** ~~vendor;~~
b. ID Number of the ~~solar module~~ **Reclamation Vendor** ~~vendor~~, if applicable;
c. Telephone number of ~~solar module~~ **Reclamation Vendor** ~~vendor~~;
d. Mailing address of ~~solar module~~ **Reclamation Vendor** ~~vendor~~ and physical address, including country and county, if different from the mailing address;
e. Name of the contact person at the ~~solar module~~ **Reclamation Vendor's** ~~vendor's~~ site who should be contacted regarding ~~solar module~~ **PV Module** reclamation program activities;
f. Telephone number of the contact person;
g. An e-mail address for the contact person or organization, if available;
h. The types of ~~solar module~~s **PV Modules** (e.g., thin-film CdTe/CdS, thin-film CIGS/CdS, thinfilm amorphous silicon, thin-film CIGS/InP, crystalline silicon, etc.) expected to be handled;
i. The sources of the ~~solar module~~s **PV Modules** (e.g., residential, commercial, governmental decommissions, etc.); and
j. The name, address and contact person(s) of the designated facility or location where the ~~solar module~~s **PV Modules** will be reclaimed.
2. ~~solar module~~ **Reclamation Vendors** ~~vendor~~ shall provide to the Department any changes to the information provided pursuant to subsection (a)(8)(J) of this subsection within 30 days of such changes.
3. Written submissions. Department notifications required pursuant to subsection (a)(8)(J) of this section shall be sent to the Department by certified mail, return receipt requested, at the following address: Department of Toxic Substances Control, Solar Module Vendor Notification Staff, P.O. Box 806, Sacramento, CA 95812-0806, with the words "Attention: ~~solar module~~ **Reclamation Vendor** ~~vendor~~ Activities" prominently displayed on the front of the envelope.

Comments:	The standard industry language is photovoltaic module or PV module. In **§ 66261.6. (a) (8) (C)** Need to have consistency in labeling containers as Universal Waste-PV Modules. In **§ 66261.6. (a) (8) (H) "**A person is prohibited from exporting solar modules, unless export is conducted in accordance with applicable export requirements for hazardous waste as described in chapter 12 of this division." • Need to specify that export is defined as export to destinations outside of the United States or its territories. If exported to another state within the United States, such material will be covered by the

	other States' regulation, if in existence, or by Federal RCRA • Need to specify that the exportation is of either intact or not-intact waste PV Modules. As stated it includes all PV Modules whether they are covered by this regulation or not. Meaning those that are NOT waste. • Need to change "person" to "person or entity". Individuals, companies, and other organizations will be collecting, transporting, handling, and storing the waste PV Modules.
Suggested Changes:	Replace "Solar module" with "PV Module" Replace "Solar modules" with "PV Modules" Replace "Solar Module Vendor" to "Reclamation Vendor" **Change § 66261.6. (a) (8) (C)** From: ….shall be labeled with the following phrase: "Solar modules--Not Scrap Metal or CRT Glass". To: ….shall be labeled with the following phrase: "~~Solar modules--Not Scrap Metal or CRT Glass~~". **"Universal Waste-PV Modules."** **Change § 66261.6. (a) (8) (H)** From: (H) A person is prohibited from exporting solar modules, unless export is conducted in accordance with applicable export requirements for hazardous waste as described in chapter 12 of this division. To: (H) A ~~person~~ **person or entity** is prohibited from exporting ~~solar modules~~ **PV Modules** to **destinations outside of the United States or its territories**, unless export is conducted in accordance with applicable export requirements for hazardous waste as described in chapter 12 of this division.

Amend California Code of Regulations, title 22, division 4.5, chapter 11, article 1, section 66261.9 to read:

§66261.9. Requirements for Universal Waste.
(a) The hazardous wastes listed in this section are exempt from the management requirements of chapter 6.5 of division 20 of the Health and Safety Code and its implementing regulations except as specified in chapter 23 and, therefore, are not fully regulated as hazardous wastes. The wastes listed in this section are subject to regulation pursuant to chapter 23 and shall be known as "universal wastes."
(1) Batteries, as described in section 66273.2, subsection (a);
(2) Electronic devices, as described in section 66273.3, subsection (a);
(3) Mercury-containing equipment, as described in section 66273.4, subsection (a);
(4) Lamps, as described in section 66273.5, subsection (a) (including, but not limited to, M003 wastes);
(5) Cathode ray tubes, as described in section 66273.6, subsection (a);
(6) Cathode ray tube glass, as described in section 66273.7, subsection (a); and
(7) Aerosol cans, as specified in Health and Safety Code section 25201.16. and
(8) ~~Solar modules~~ **PV Modules**, as described in section 66273.7.1, subsection (a).
(b) Unless specified otherwise in section 66273.60, universal wastes shall be managed as hazardous wastes pursuant to chapters 10 through 16, 18, and 20 through 22 of this division upon arrival at a destination facility.

Comments:	The standard industry language is photovoltaic module or PV module.
Suggested Changes:	Replace "Solar modules" with "PV Modules"

Amend California Code of Regulations, title 22, division 4.5, chapter 23, article 1, section 66273.1 to read:

Chapter 23. Standards for Universal Waste Management
Article 1. General

§66273.1. Scope.
(a) This chapter establishes requirements for managing universal wastes, as defined in section 66273.9. The following universal wastes are subject to regulation pursuant to this chapter:
(1) Batteries, as described in section 66273.2, subsection (a);
(2) Electronic devices, as described in section 66273.3, subsection (a);
(3) Mercury-containing equipment, as described in section 66273.4, subsection (a);
(4) Lamps, as described in section 66273.5, subsection (a) (including, but not limited to, M003 wastes);
(5) Cathode ray tubes, as described in section 66273.6, subsection (a);
(6) Cathode ray tube glass, as described in section 66273.7, subsection (a); and
(7) Aerosol cans, as specified in Health and Safety Code section 25201.16. ; and
(8) ~~Solar modules~~ **PV Modules**, as described in section 66273.7.1, subsection (a).
(b) This chapter provides an alternative set of management standards in lieu of regulation as hazardous wastes pursuant to chapters 10 through 16, 18, and 20 through 22 of this division. The alternative management standards of articles 1 through 3 of this chapter do not apply to destination facilities, as defined in section 66273.9, except as otherwise specified in section 66273.60, subsections (b) or (c).

Comments:	The standard industry language is photovoltaic module or PV module.
Suggested Changes:	Replace “Solar modules” with “PV Modules”

Add California Code of Regulations, title 22, division 4.5, chapter 23, article 1, section 66273.7.1 to read:

§66273.7.1. [Reserved.] Applicability~~—Solar modules~~. PV Modules
(a) ~~Solar modules~~ **PV Modules** covered pursuant to chapter 23. The requirements of this article apply to ~~solar modules~~ **PV Modules**, as defined in section 66273.9, except those listed in subsection (b) of this section.
(b) ~~Solar modules~~ **PV Modules** not covered pursuant to this chapter. The requirements of this chapter do not apply to the following ~~solar modules~~ **PV Modules**:
(1) ~~Solar modules~~ **PV Modules** that are not yet wastes pursuant to chapter 11 as provided in subsection (c) of this section;
(2) ~~Solar modules~~ **PV Modules** that do not exhibit a characteristic of a hazardous waste as set forth in article 3 of chapter 11 and that are not otherwise identified as hazardous waste pursuant to chapter 11 of this division;
(3) ~~Solar modules~~ **PV Modules** that are destined for recycling (or are recycled) by being “used in a manner constituting disposal,” as described in section 66266.20, or that are destined for disposal (or are disposed) to a class I landfill. Such ~~solar modules~~ **PV Modules** shall be managed as hazardous wastes pursuant to chapters 10 through 16, 18, and 20 through 22 of this division;
(4) ~~Solar modules~~ **PV Modules** that are managed as hazardous wastes pursuant to chapters 10 through 16, 18, and 20 through 22 of this division;
(5) ~~Solar modules~~ **PV Modules** managed pursuant to section 66261.6(a)(3)(D).
(6) ~~Solar modules~~ **PV Modules** that were previously identified as waste pursuant to chapter 11, but are no longer identified as a waste (e.g., a discarded ~~solar modules~~ **PV Modules** that is refurbished and is returned to service).
(c) Generation of waste ~~solar modules~~ **PV Modules**.
(1) A used ~~solar module~~ **PV Module** becomes a waste on the date when the earlier of the following occurs:
(A) The owner discards the ~~solar module~~ **PV Module** (e.g., removes the ~~solar module~~ **PV Module** without the intent to re-install it); or
(B) The ~~solar module~~ **PV Module** is physically damaged, deteriorated, or altered and no longer an intact ~~solar module~~ **PV Module** as defined in section 66273.9 (e.g., ~~solar modules~~ **PV Modules** that are cracked, fractured into more than one piece, or fragmented), or otherwise removed from service without intent to re-install it.
(2) Unused ~~solar modules~~ **PV Modules**.
(A) An unused ~~solar module~~ **PV Module** that is not a retrograde material becomes a waste on the date it is discarded (e.g., when stored prior to being sent for reclamation).
(B) An unused ~~solar module~~ **PV Module** that is a retrograde material becomes a waste on the date that it becomes a recyclable material pursuant to subsection (e) of the definition of “recyclable materials” in section 66260.10.
(d) A respondent in an action to enforce regulations implementing this division who claims that a ~~solar module~~ **PV Module** is not a waste bears the burden of demonstrating that there is a known market or disposition for its use as a ~~solar module~~ **PV Module**.

Comments:	The standard industry language is photovoltaic module or PV module.

Suggested Changes:	Replace “Solar module” with “PV Module” Replace “Solar modules” with “PV Modules”

Amend California Code of Regulations, title 22, division 4.5, chapter 23, article 1, section 66273.9 to read:

§66273.9. Definitions.
When used in this chapter, the terms listed in this section have the meanings given below. Unless otherwise specified, listed terms that cross-reference the definitions of other listed terms refer to the definitions set forth in this section for those other terms. Terms that are also defined in chapter 10 of this division are duplicated here solely for convenience of the regulated community. Terms used in this chapter that are not defined in this section but are defined in chapter 10 of this division and/or chapter 6.5 of division 20 of the Health and Safety Code have the meanings given in those sources.

"Scrap metal" means (a) any one or more of the following, except as provided in subsection (b) of this section:
(1) manufactured, solid metal objects and products;
(2) metal workings, including cuttings, trimmings, stampings, grindings, shavings and sandings;
(3) solid metal residues of metal production; or
(4) printed circuit boards that are recycled [except for printed circuit boards referenced in subsec. (b)(7) of this section].
(b) "Scrap metal" excludes all of the following:
(1) lead-acid storage batteries, waste elemental mercury, and water-reactive metals such as sodium, potassium and lithium;
(2) magnesium borings, trimmings, grindings, shavings and sandings and any other forms capable of producing independent combustion;
(3) beryllium borings, trimmings, grindings, shavings, sandings and any other forms capable of producing adverse health effects or environmental harm in the opinion of the Department;
(4) any metal contaminated with a hazardous waste, such that the contaminated metal exhibits any characteristic of a hazardous waste under article 3 of chapter 11 of this division;
(5) any metal contaminated with an oil that is a hazardous waste and that is free flowing;
(6) sludges, fine powders, semi-solids and liquid solutions that are hazardous wastes; and
(7) any printed circuit board that has been removed from a universal waste electronic device by a universal waste handler as a result of the handler's conduct of activities authorized by sections 66273.71, 66273.72, and/or 66273.73 of chapter 23 of this division and is subject to management as a hazardous waste pursuant to sections 66273.71, 66273.72 and/or 66273.73.
"~~Solar module~~" **Photovoltaic (PV) Module** means, except as provided in subsection (b) of this section any ~~photovoltaic~~ module **of any form factor such as rigid or flexible** ~~or other photovoltaic device~~ that collects **photons** ~~energy~~ from the sun for the purpose of converting **the photons** ~~light~~ into **electrons** ~~electricity~~ for general electricity use.
(a) “intact" ~~solar modules~~ **PV Modules** are ~~solar modules~~ that are complete with no component removed or missing (e.g., ~~solar modules~~ **PV Modules** that are non-functional and which contain glass panes, on one or both sides of the module, where

the glass may have been cracked or otherwise damaged, and the size and shape of such a module remains identical to that of a newly-installed ~~solar module~~ **PV Module**). "Intact" ~~solar module~~s **PV Modules** also include ~~solar module~~s **PV Modules** that do not contain glass and which are otherwise non-functional (e.g., flexible membrane ~~solar module~~s **PV Modules**).
(b) "~~Solar module~~" "**PV Module"** excludes all of the following:
(1) physically-damaged, -deteriorated, or -altered ~~solar module~~ss **PV Module** (or components thereof), that are no longer recognizable as intact ~~solar module~~s **PV Modules**, as defined in subsection (a) of this section.
(2) fractured or fragmented portions of a ~~solar module~~ **PV Module**, although recognizable as being part of a ~~solar module~~ **PV Module**, which are no longer attached to an intact ~~solar module~~ **PV Module**, as defined in subsection (a) of this section.
(3) solar-powered electronic devices that have ~~solar~~ **photovoltaic** cells incorporated into their structures.
"Thermometer" means any thermometer that uses the expansion and contraction of a column of mercury to measure temperature.

Comments:	The standard industry language is photovoltaic module or PV module. The standard industry language is photovoltaic cells or PV cells. **§ 66273.9 (No section indicated) (a)** • Need to state in the beginning of the definition that the form factor can be rigid or flexible. It is mentioned later, but better to state it in the very beginning. • Need to have standard industry language defining how the module generates electricity • Flexible PV modules are on substrates not membranes. • Need to remove "photovoltaic device." It is thought that this language was initially used to describe non-rigid modules. With "non-rigid modules" and "flexible substrate" suggested for replacement, "photovoltaic device" should be removed. It also could be confused with solar-powered electronic devices mentioned later in the section, which are excluded from this regulation. See **§ 66273.9 (No section indicated) (b) (3).**
Suggested Changes:	Replace the first mention of "solar module" with "Photovoltaic (PV) Module" Replace subsequent "solar module" with "PV Module" Replace "solar modules" with "PV Modules" Replace "solar cells" with "photovoltaic cells" **Change § 66273.9 (No section indicated)** From: any photovoltaic module or other photovoltaic device that collects energy from the sun for the purpose of converting light into electricity for general

	electricity use. To: any ~~photovoltaic~~ module **of any form factor such as rigid or flexible** ~~or other photovoltaic device~~ that collects **photons** ~~energy~~ from the sun for the purpose of converting **the photons** ~~light~~ into **electrons** ~~electricity~~ for general electricity use. **Change § 66273.9 (No section indicated) (a)** From: …….that do not contain glass and which are otherwise non-functional (e.g., flexible membrane …… To: …….that do not contain glass and which are otherwise non-functional (e.g., flexible~~membrane~~ **substrate**…….

Amend California Code of Regulations, title 22, division 4.5, chapter 23, article 3, section 66273.32 to read:

§ 66273.32. USEPA Notification, Department Notification, and Reporting Requirements for Universal Waste Handlers.
(a) USEPA notification requirements.

(f) Written submissions. If submitted in writing, Department notifications and annual reports required pursuant to subsections (c) and (d) of this section shall be sent to the Department by certified mail, return receipt requested, at the following address: Department of Toxic Substances Control, Universal Waste Notification and Reporting Staff, P.O. Box 806, Sacramento, CA 95812-0806, with the words “Attention: Universal Waste Handling Activities” prominently displayed on the front of the envelope.
(g) Department notification requirement for universal waste handlers of solar modules.
(1) Any universal waste handler of ~~solar modules~~ **PV Modules** who accepts more than 10,000 kilograms (or 22,000 pounds) of ~~solar modules~~ **PV Modules** from all offsite sources in a calendar year, calculated collectively, shall submit to the Department at the address provided in subsection (f) of this section, a written notification containing the information specified in subsection (g)(2) of this section no later than 30 calendar days from the date the 10,000 kilogram quantity is reached.
(2) This notification shall include:
(A) Name of universal waste handler (if the facility owner is different than the facility operator, also include the owner's name);
(B) ID Number of the universal waste handler, if applicable;
(C) Telephone number of universal waste handler;
(D) Mailing address of universal waste handler and physical address, if different from the mailing address, including county;
(E) Name of the contact person at the universal waste handler's site who should be contacted regarding universal waste management activities;
(F) Telephone number of the contact person;

(G) An e-mail address for the contact person or organization, if available;
(H) The types of ~~solar modules~~ **PV Modules** accepted (e.g., thin-film CdTe/CdS, thin-film
CIGS/CdS, thin-film amorphous silicon, thin-film CIGS/InP, crystalline silicon, etc.); and
(I) The sources of the ~~solar modules~~ **PV Modules** (e.g., residential, commercial, governmental
decommissions, etc.).
(3) Universal waste handlers shall provide to the Department any changes to the information provided pursuant to subsections (g)(1) and (g)(2) of this section within 30 days of such changes.

Comments:	The standard industry language is photovoltaic module or PV module.
Suggested Changes:	Replace “Solar modules” with “PV Modules”

Amend California Code of Regulations, title 22, division 4.5, chapter 23, article 3, section 66273.33 to read:

§ 66273.33. Universal Waste Management Requirements for Batteries, Lamps, and Mercury-Containing Equipment, and ~~Solar modules~~.
The requirements of this section apply only to universal waste handlers of batteries, lamps (including M003 wastes that contain lamps), and mercury-containing equipment. The corresponding requirements for universal waste handlers of electronic devices, CRTs, and CRT glass are set forth in section 66273.33.5. Handlers of universal wastes that are both electronic devices and M003 wastes [e.g., an electronic device that contains a lamp [an M003 waste)] shall comply with this section and section 66273.33.5 for the management of those universal wastes. However, once lamp removal is completed on such waste, such waste shall no longer to be managed as M003 waste and it shall be managed as an electronic device pursuant to section 66273.33.5, if applicable.

(d) ~~Solar modules~~. **PV Modules**
(1) A universal waste handler of ~~solar modules~~ **PV Modules** shall:
(A) Comply with the applicable requirements of sections 66273.30 through 66273.32, and of sections 66273.34 through 66273.39 of this article with respect to the management of those ~~solar modules~~ **PV Modules**; and
(B) Manage ~~solar modules~~ **PV Modules** in a way that prevents releases of any universal waste or component of a universal waste to the environment under reasonably foreseeable conditions, as follows:
1.a. A universal waste handler shall contain any ~~solar module~~ **PV Module** in a manner that prevents breakage and release of hazardous components to the environment. If a container is used, such a container shall prevent leakage, spillage, or damage that could cause leakage of hazardous components under reasonably foreseeable conditions.
b. Intact ~~solar modules~~ **PV Modules** (i.e., ~~solar modules~~ **PV Modules** that are complete with no component removed or missing) that are managed in a manner that prevents breakage and release of hazardous components to the environment under reasonably foreseeable conditions (e.g., stretch-film on a pallet) shall be deemed to comply with subsection (d)(1)(B)1.a. of this section.
2. A universal waste handler shall immediately clean up and place in a container

any ~~solar module~~ **PV Module** that is accidentally or unintentionally broken and which may be expected to cause a release of hazardous constituents to the environment under reasonably foreseeable conditions. The container shall be structurally sound, compatible with the contents of the ~~solar module~~s, **PV Modules** and shall prevent releases of hazardous components to the environment under reasonably foreseeable conditions.
(2) A universal waste handler may remove junction boxes and junction box cables as long as the ~~solar module~~ **PV Module** remains intact (i.e., ~~solar module~~s **PV Modules** that are complete
with no component removed or missing), and the original size and shape of the ~~solar module~~ **PV Module** is not altered or modified:

Comments:	The standard industry language is photovoltaic module or PV module.
Suggested Changes:	Replace “Solar module” with “PV Module” Replace “Solar modules” with “PV Modules”

Amend California Code of Regulations, title 22, division 4.5, chapter 23, article 3, section 66273.34 to read:

§ 66273.34. Labeling/Marking.
Except as otherwise provided in subsections (gh) and (i) of this section, a universal waste handler shall label or mark universal waste to identify the type of universal waste as specified in subsections (a) through (fg) of this section.

(g) ~~Solar module~~s **PV Modules** (i.e., each ~~solar module~~), or a container or pallet in or on which the ~~solar module~~s **PV Modules** are contained, shall be labeled or marked clearly with the following phrase: "Universal Waste-~~Solar module~~(s) **PV Module(s)** ".
(h) In lieu of labeling individual electronic devices, CRTs, and/or containers of CRT glass pursuant to subsections (d) through (f) of this section, a universal waste handler may combine, package, and accumulate those universal wastes in appropriate containers or within a designated area demarcated by boundaries that are clearly labeled with the applicable portion(s) of the following phrase: “Universal Waste-Electronic Device(s)/Universal Waste -CRT(s)/Universal Waste-CRT Glass”.
(i) In lieu of labeling individual ~~solar module~~s **PV Modules** and/or containers or pallets of ~~solar modules~~ **PV Modules** pursuant to subsection (g) of this section, a universal waste handler may accumulate ~~solar module~~s **PV Modules** within a designated area demarcated by boundaries that are clearly labeled with the following phrase: "Universal Waste—~~Solar module~~(s) **PV Module(s)** ".

Comments:	The standard industry language is photovoltaic module or PV module. **§ 66273.34 (g) and (i)** Need to have consistency in labeling containers as Universal Waste-PV Modules.
Suggested Changes:	Replace “Solar module” with “PV Module” Replace “Solar modules” with “PV Modules”

Amend California Code of Regulations, title 22, division 4.5, chapter 23, article 3, section 66273.36 to read:

§ 66273.36. Personnel Training.
(a) A universal waste handler shall ensure that all personnel who manage universal wastes at the universal waste handler's facility are thoroughly familiar with proper universal waste management and emergency response procedures relative to those persons' responsibilities, as specified in subsections (b) and (c) of this section.
(1) For purposes of this section, “personnel who manage universal waste” means any persons who consolidate, sort, treat, recycle, package for transport, offer for transport, or physically relocate containers of universal waste.
(2) Persons who, in the course of their normal duties, only generate universal wastes from onsite sources and place them into accumulation containers, areas or locations are not “personnel who manage universal waste” (e.g., an office worker who removes spent batteries from an electronic device).
(b) A universal waste handler shall initially train and provide annually, thereafter, training to all personnel who manage or who supervise those who manage universal wastes. Training materials shall be in the form of any written media (e.g., brochures, electronic mail, company letters, pamphlets, posters, etc.) and shall include the date of that material. This training shall include, at a minimum:
(1) The types and hazards associated with the universal waste that personnel may manage at the facility (e.g., hazards due to leaded glass in CRT devices or CRTs; hazards due to cadmium, lead, or selenium in ~~solar module~~s **PV Modules**);

Comments:	The standard industry language is photovoltaic module or PV module.
Suggested Changes:	Replace “Solar module” with “PV Module” Replace “Solar modules” with “PV Modules”

Amend California Code of Regulations, title 22, division 4.5, chapter 23, article 3, section 66273.39 to read:

§ 66273.39. Tracking Universal Waste Shipments.
(a) Receipt of shipments. A universal waste handler shall keep a record of each shipment of universal waste received at the universal waste handler's facility. The record may take the form of a log, invoice, manifest, bill of lading, or other shipping document. The record for each shipment of universal waste received shall include the following information:
(1) The name and address of the originating universal waste handler from which the universal waste was sent;
(2) The quantity [count or weight, consistent with, for example, section 66273.32, subsection (d)] of each type of universal waste received (e.g., batteries, thermostats, lamps, electronic devices, CRTs, CRT glass, ~~solar module~~s **PV Modules**); and
(3) The date of receipt of the shipment of universal waste.

(c) Shipments offsite. A universal waste handler shall keep a record of each shipment of universal waste sent from the universal waste handler's facility to another facility. The record may take the form of a log, invoice, manifest, bill of lading or other shipping document. The record for each shipment of universal waste sent shall include the following information:
(1) The name and address of the universal waste handler or destination facility to

which the universal waste was sent;
(2) The quantity [count or weight, consistent with, for example, section 66273.32, subsection (d)] of each type of universal waste sent (e.g., batteries, thermostats, lamps, electronic devices, CRTs, CRT glass, ~~solar modules~~ **PV Modules**);
(3) The date of departure of the shipment of universal waste.

Comments:	The standard industry language is photovoltaic module or PV module.
Suggested Changes:	Replace “Solar module” with “PV Module” Replace “Solar modules” with “PV Modules”

Amend California Code of Regulations, title 22, division 4.5, chapter 23, article 5, section 66273.51 to read:

Article 5. Standards for Universal Waste Transporters
§ 66273.51. Prohibitions.
A universal waste transporter is:
(a) Prohibited from disposing of universal waste;
(b) Prohibited from diluting or treating universal waste, except as a consequence of responding to a release as provided in section 66273.54;
(c) Prohibited from transporting more than five CRTs at any one time unless the CRTs are contained as described in section 66273.33.5, subsection (b)(1)(B); and
(d) Prohibited from transporting more than 100 kilograms or 220 pounds of electronic devices at any one time unless the electronic devices are contained as described in section 66273.33.5, subsection (a)(1)(B).
(e) Prohibited from transporting more than ~~100~~ **585**kilograms or ~~220~~ **1,290** pounds of ~~solar Modules~~ **PV Modules** at any one time unless the ~~solar modules~~ **PV Modules** are contained as described in section 66273.33, subsection (d)(1)(B).

Comments:	The standard industry language is photovoltaic module or PV module. In**§ 66273.51 (e)** The weight requiring modules to be contained as described is too low. With a single PV module weighing 50 lbs. the current proposed regulation would require 4 PV modules to be containerized. It can be foreseen that an individual, installer, and/or system owner bringing such a small quantity to a collection point/reclamation facility will not have them in a container. Educating them on such a need, and having them be compliant, is not foreseeable either. Also, since it is highly unlikely that such a small quantity of broken modules will release materials reaching levels of toxicity into the environment, there is no need to containerize them. It is reasonable to have the quantity of 25 intact PV modules stacked on a pallet to be prepared in a manner to prevent leakage and breakage. At 50 lbs. each this would be a weight of 1,290 lbs.

	It is also reasonable to have the quantity of 25 NOT intact PV modules containerized. At 50 lbs. each this would be a weight of 1,290 lbs. Although educating an individual, installer, and/or system owner may prove difficult, most new PV modules arrive at the customer in reinforced cardboard containers. These containers can be re-used to transport PV module waste to collection points/reclamation facilities. Although it is unlikely that even this quantity of 25 NOT intact PV modules will release materials reaching levels of toxicity into the environment, using such containers will further reduce damage during transport.
Suggested Changes:	Replace “Solar module” with “PV Module” Replace “Solar modules” with “PV Modules” **Change § 66273.51 (e)** From: “Prohibited from transporting more than 100 kilograms or 220 pounds of solar modules at any one time” To: “Prohibited from transporting more than 585 kilograms or 1,290 pounds of PV modules at any one time”

Of the two option presented by DTSC to effectively and efficiently divert solar module waste from landfills, backyards, and storage, pv recycling llc argues that inclusion of such waste in the Standards for Universal Waste (UW) Management will not meet this objective. When contrasted with the inclusion of solar module waste into the Requirements for Recyclable Materials on the basis of education, implementation, compliance, and funding; having the module manufacturers directly responsible for administering such activities, will greatly increase the likelihood of this waste being reclaimed not landfilled or stored.

Before proceeding with the argument, it is necessary to present background data not only about solar installations and waste management resources in the State of California, but also with the current volumes of waste needing to be addressed, and the experience the module manufacturers' have had with waste solar module recycling in the European Union.

Solar Installations and Waste Management

From data collected between 2007-2012, the State of California has approximately 113,291 solar installations consisting of almost 8 million modules. It is of importance to notice that 85% of these modules were produced by 15 manufacturers.

Data for California

Solar Industry[1]	Waste Management[2,3]
• 113,291 installations of 7,670,216 PV modules • 77% of these modules are from 10 manufacturers • 85% of these modules are from 15 manufacturers • Excludes 70,000 SMUD decommissioning	• 4,766 UW Handler/Recycler • 2 HW Landfills • Who conducts education? • Who monitors compliance? • How will it be funded?

Sources:
[1]Go Solar California, California Solar Statistics, 2007-2012, Working Data Set, 9/26/2012, includes pending projects
[2]California Department of Toxic Substance Control , UWED and CRT Database, 9/2012
[3]California Department of Toxic Substance Control, Envirostor Database, 9/2012

There have been questions about solar waste volumes in relation to the number of modules installed. In response, there have been reliability studies demonstrating probability of module failure rates, announcements by manufacturers regarding quality issues leading to catastrophic failures in the field, and anecdotal accounts of larger than expected warranty take-back quantities. In addition, the Sacramento Municipal Utility

District (SMUD) will itself be decommissioning 70,000 modules in the very near future. The volumes requiring an organized effort to collect and recycle waste solar modules is here, and it needs to be addressed now.

PV Module Waste Prognosis

Volumes are Here

- 7,670,216 PV modules installed[1]
- 1% module waste annually = 76,702[2]
- 0.5% module waste annually = 38,351[2]
- Anecdotal 250-500 modules a month per manufacturer
- 70,000 SMUD decommissioning
- Excludes manufacturing scrap

Sources:
[1]Go Solar California, California Solar Statistics, 2007-2012, Working Data Set, 9/26/2012, includes pending projects
[2]Study on the Development of a Take Back and Recovery System for Photovoltaic Products, BMU, EPIA, 9/2007

With respect to waste management, according to DTSC's web site there are approximately 5,000 UW handlers/recyclers and 2 Hazardous Waste (HW) Landfills in the State of California. One must ask how a government department oversees recycling programs when there are so many in operations throughout the entire state. This will be further explored later in this attachment.

Solar Module Waste Recycling in the European Union

All 15 of the manufacturers representing 85% of all modules installed in California are members of an organization in Europe that was given an opportunity to self-regulate the collection and recycling of solar waste module in the European Union. Per a contracted European Commission study it was determined that the goals to maintain such self-regulation were not met. As a result collection and recycling of these modules has now been incorporated into, and will be regulated by, the WEEE Directive. The WEEE Directive is the European Community law on waste electrical and electronic equipment that sets collection and recycling targets for electronic goods.

Reclamation in the Solar Industry

Of the 10 -15 manufacturers representing 77% - 85% of the modules installed in California, all of them:

- Pay for collection and recycling in Europe
- Understand the concept of such activities
- Developed methods to finance these activities
- Understand that participating as a group will "even the playing field"
- Have approached at least one reclamation entity to acquire proposals, quotes, and contracts

Given opportunity to self regulate in the European Union

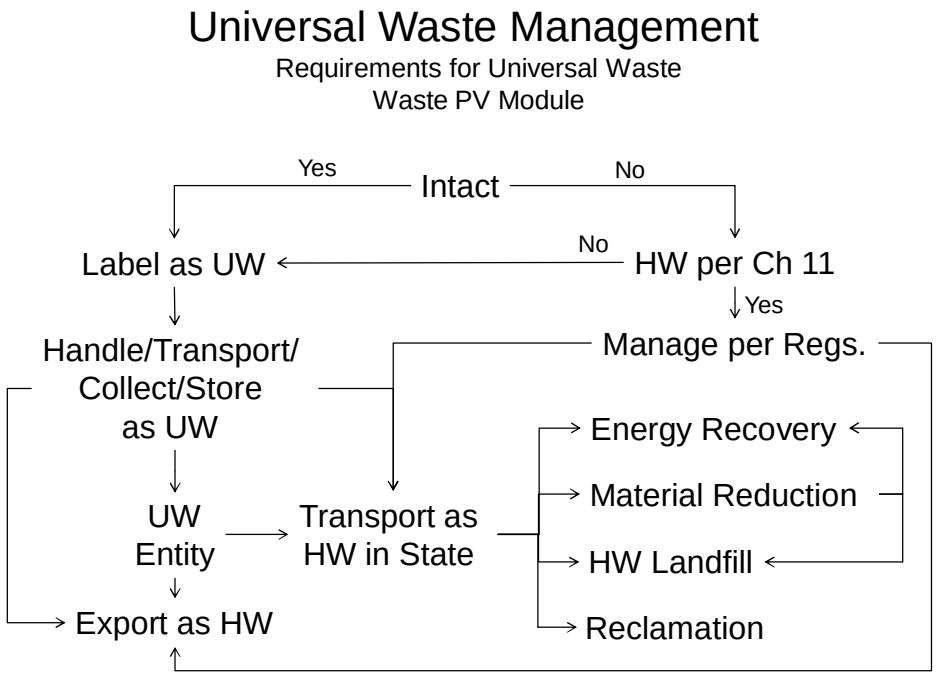
- Per European Commission study, goals were not met
- Recycling of PV modules is now part of the WEEE Directive

Regardless of the ability to self-regulate in the European Union, all the manufacturers involved all currently pay for collection and recycling in Europe, all understand the concept of such activities, all developed methods to finance such activities, and all understand that participating as a group "evens the playing field," in relation to cost. What is being requested of them in DTSC's Requirements for Recyclable Materials option is very similar to what these manufacturers must already comply with overseas.

It also must be mentioned that, all 15 of these manufacturers have approached at least one independent third party reclamation entity in the United States to acquire proposals, quotes, and sign contracts. These companies know they will be held responsible for administering collection and recycling, and are preparing themselves for the future requirement.

Option 1: Standards for Universal Waste Management, Waste Solar Modules

From interpreting how solar module waste will be incorporated into existing UW Management Standards, it is understood that the individual/entity possessing a solar waste module is responsible for determining if it is intact, if it is UW or HW, then know how to label, handle, collect, store, and transport such waste, and then know where it is to be sent. With about 5,000 UW handlers/recyclers listed on the DTSC web site, how are they to know which ones are permitted to receive such material, and which ones are not. In addition to this, the UW entities working with a certain amount of solar waste modules must know to notify DTSC 30 days prior to receiving such product, and also must know the management regulations including labeling, personnel training, tracking, reporting, and transport. And as with those generating the waste, the handlers/recyclers need to know the different options for the final disposition of the waste.



Despite the efforts of these entities to comply with the intended regulation, the options for final disposition of the modules, intact or not, UW or HW, still includes landfilling in addition to material reclamation, exporting to a foreign country as HW, or exporting to other states in the United States. When transporting to other states, the waste is regulated per the other state or federal jurisdiction.

Option 1: Incorporating Solar Module Waste into Existing UW Management Standards Will not Meet DTSC's Intended Objective

The argument as to why incorporating waste solar modules into the existing UW Management Standards will not achieve DTSC's objective to effectively and efficiently divert waste solar modules from landfills is described below.

First and foremost, it is not explained how the UW option will be financed. Those collecting, handling, transporting, disposing, or reclaiming material from the modules will want to be compensated for their services. The value of the material reclaimed will not support the cost of providing such services. And, landfilling will only cost money for everyone except the landfill owners. From past electronic waste, fluorescent bulb, and other recycling efforts, it has been demonstrated that someone will have to pay for the services. When that financial burden is placed upon the waste generator, there tends to be little compliance with the necessary steps to be taken. In this case, if the polluter has to pay for disposal or recycling of the waste solar modules, it is likely that rather than paying, this waste will be dumped somewhere illegally, thrown in a dumpster, stockpiled outside, or just stored.

With regard to informing the general public, waste management entities, and the solar industry itself, DTSC has not specified who will be responsible for preparing and

implementing an education campaign on the regulation. Without an effective campaign those with waste solar modules will not know how to categorize, label, handle, or transport the product, nor to which of the possible 5,000 locations it should be sent. Similarly, how are the UW entities going to know that waste solar modules have been added to the standard, what that means, and how they need to comply with the regulation. The manufacturers of the modules also need to be involved to know how to direct their customers, distributors, and installers when the issues of such modules arise. Without an effective education campaign those coming into contact with this waste will be ignorant of what to do with it, how to handle, collect, or transport it. If not ignorant of the process, they will find it too burdensome to follow. And, if it even does get sent to the appropriate collection/recycling location, there is the likelihood it will be disposed of in a manner that is detrimental to the environment and human well-being.

Another aspect that DTSC does not specify is how compliance of managing solar module waste under UW standards will be monitored. With over 100,000 owners of solar installations in California who then can choose from about 5,000 eligible UW handlers/recyclers, how can one be sure anyone is following the requirements? Although reporting is to be submitted to DTSC, it will be at a level that does not demonstrate compliance of daily activities.

Thus, from the information presented above, it can be understood that incorporating solar module waste into existing UW Management Standards will be underfunded, confusing to the users, and difficult to implement and monitor. As a result, the status quo will be maintained with such waste being managed in a manner that is detrimental to the environment and its inhabitants.

Option 2: Requirements for Recyclable Materials

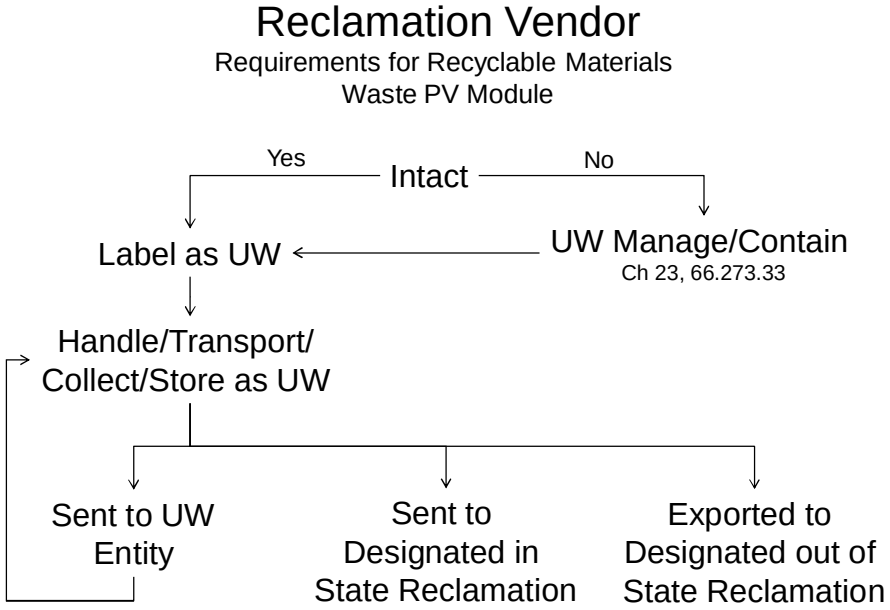
From interpreting how solar module waste will be incorporated into the existing Requirement for Recyclable Materials, it is understood that the module manufacturer itself, or a third party acting on behalf of the manufacturer, is to administer a collection and recycling program, also known as a reclamation program, with the intent of all solar waste modules to be sent to a designated in or out of state reclamation facility. None of the modules are to be landfilled. In exchange for such administration, both intact and not-intact modules can be contained and managed as UW.

Option 2: Incorporating Solar Module Waste into Existing Requirements for Recyclable Materials Will Successfully Meet DTSC's Intended Objective

The argument as to why incorporating waste solar modules into the existing Requirements for Recyclable Materials will successfully achieve DTSC's objective to effectively and efficiently divert waste solar modules from landfills is described below.

As with the incorporation of solar module waste into UW Management Standards discussed above, financing the operations of a manufacturer/third party entity administered reclamation program is the key to its success. By incorporating waste solar modules into the Requirements for Recyclable Materials, also known as the Solar Module Vendor approach or Reclamation Vendor approach, is funded by the module

manufacturer. Although the cost burden will ultimately be passed along from the manufacturer to the consumer or waste generator of solar modules, such prefunding will prevent lack of recycling compliance that has been observed when the polluter has to pay. In addition, since all manufacturers with modules installed in California will be required to participate, the cost of financing such activity will be proportionally equal across the manufacturers. Some say this arrangement "evens the playing field." This is in contrast to the underdetermined financing mechanism discussed in Option 1, where it can be thought the polluter will have to pay, leading to noncompliance, and inappropriate disposal.



With regard to informing its customers, distributors, installers, reclamation facilities, and its own employees, the manufacturer or its third party entity, can tailor an education campaign to these targeted audiences. Other groups in the general public such as schools, utilities, and governments can also be informed of the services in manner that is tailored to their needs. Since all intact and non-intact modules can be categorized to be contained and/or managed as UW, and there will be facilities designated to receive the waste modules, educating these groups on what to do with the waste will be more effective and efficient than the efforts required under Option 1. Overall, greater compliance can be expected.

As a result of the manufacturers or their third party entities administering the collection and recycling program, there will be fewer organizations and processes for DTSC to monitor for compliance in contrast to the number of these in Option 1. In addition, manufacturers can monitor and enforce compliance of their third party administrators though contractual agreements and incentives. It can also be thought that the

manufacturers themselves will be informally monitoring each other with regard to noncompliance since all need to participate to “even the playing field.”

Conclusion

In conclusion, one can contend that DTSC will best meet its landfill diversion goal by implementing regulation that incorporates waste solar modules in the Requirements for Recyclable Materials. From the data presented it is understood that there is substantial current quantities of waste needing attention now, those manufacturers having the largest percentage of modules installed in California have had experience administering collection and recycling in Europe, and all are preparing to operationalize programs in the United States. From this it is clear that the demand for such a service is now. The module manufacturers know they will have to act, and they are waiting for DTSC to implement such regulation.

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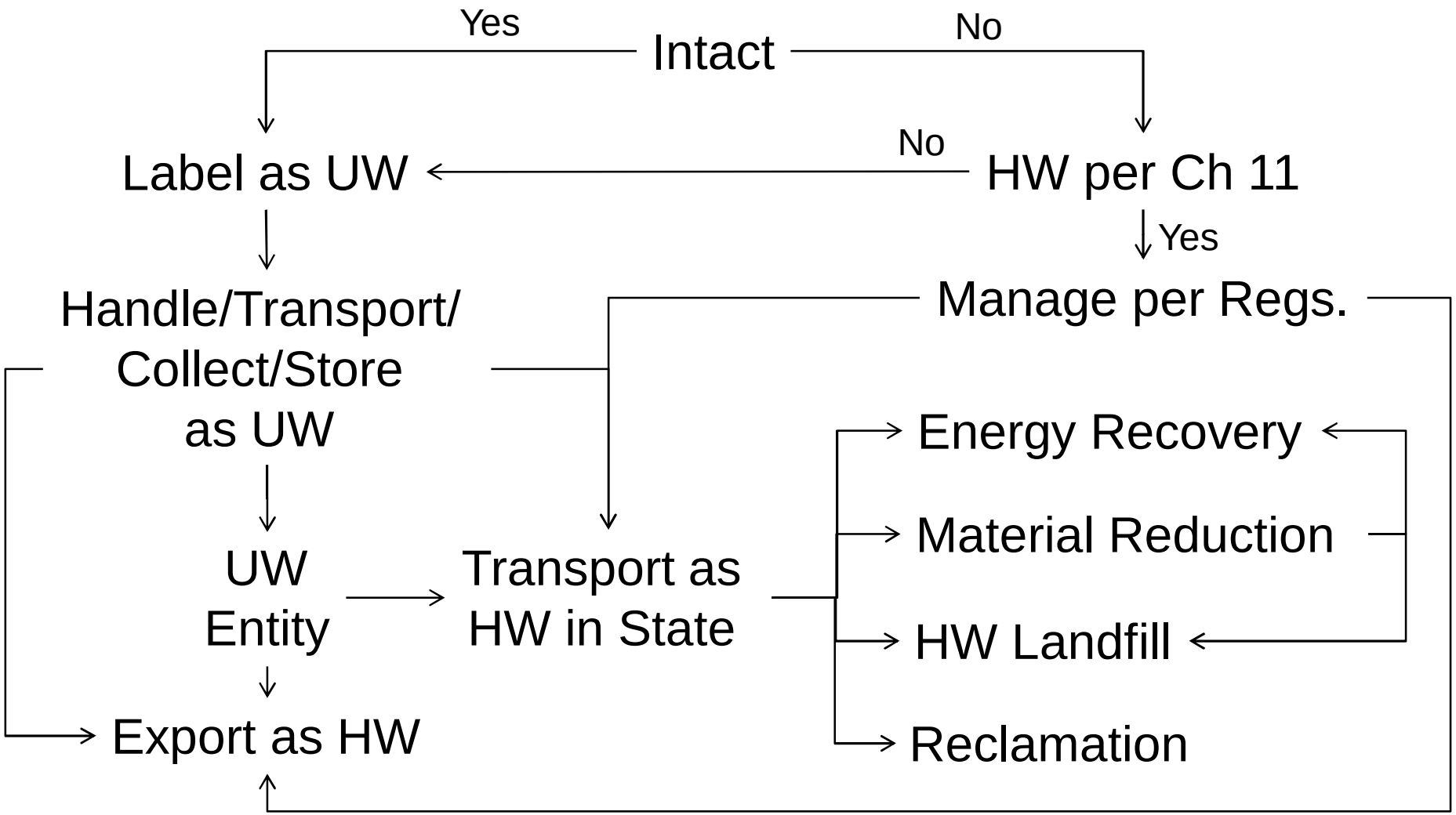
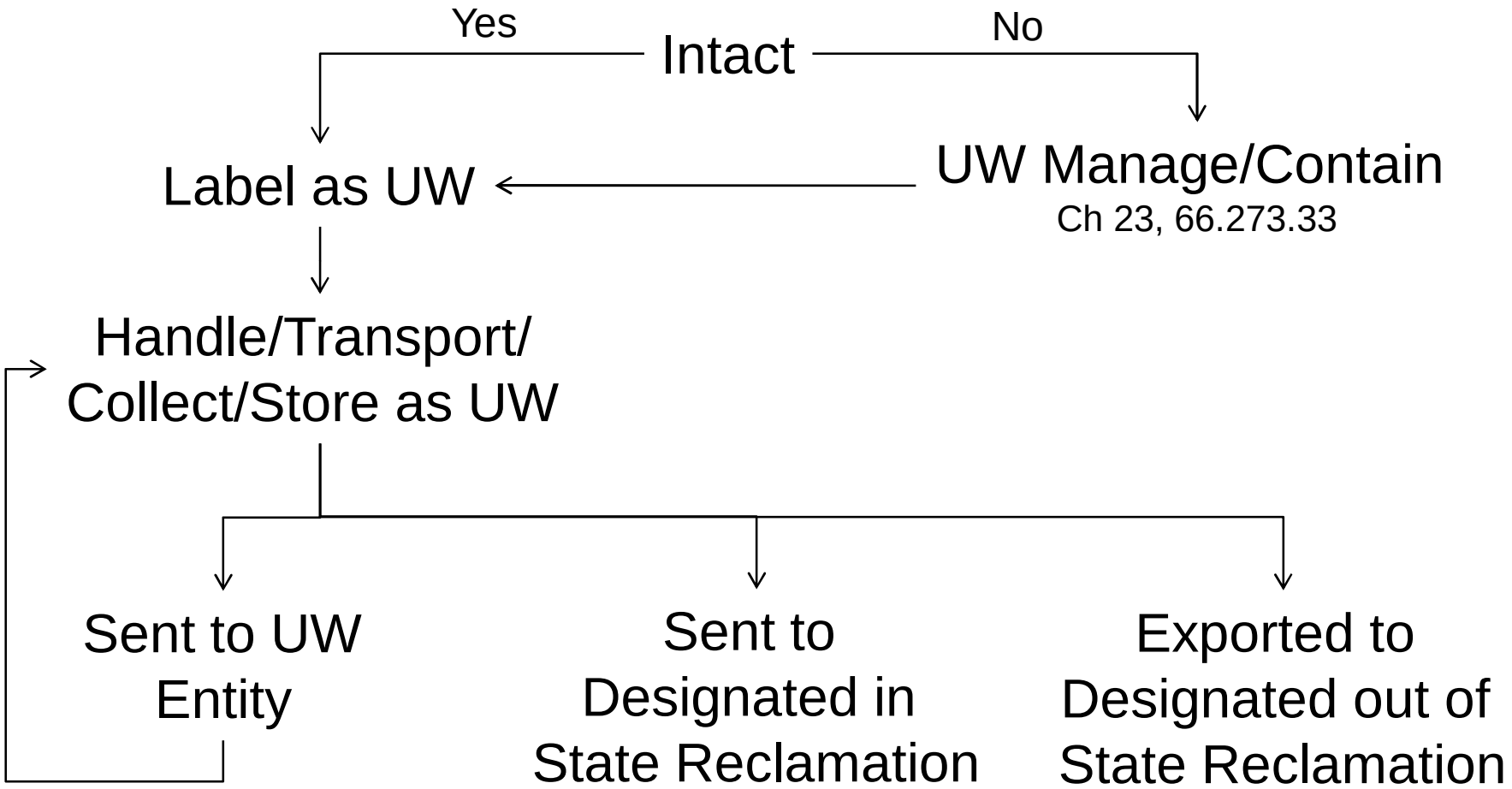
Universal Waste Management

Requirements for Universal Waste
Waste PV Module



Reclamation Vendor

Requirements for Recyclable Materials
Waste PV Module



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[2]Study on the Development of a Take Back and Recovery System for Photovoltaic Products, BMU, EPIA, 9/2007

October 1, 2012

VIA E-MAIL & FAX

Ms. Krysia Von Burg, Regulations Coordinator
Regulations Section
Department of Toxic Substances Control
P.O. Box 806
Sacramento, CA 95812-0806

Re: Comments on Proposed Standards for the Management of Hazardous Waste Solar Modules – Department Reference Number R-2010-01

Dear Ms. Krysia Von Burg:

On behalf of the Solar Energy Industries Association ("SEIA"), we provide the following comments regarding the Proposed Standards for the Management of Hazardous Waste Solar Modules, Department Reference Number R-2010-01 ("Proposed Regulations"). We would like to thank the Department of Toxic Substances Control ("DTSC") for its outreach to industry as the DTSC has developed the Proposed Regulations. We also appreciate the DTSC's consideration of the August 11, 2010 Joint Comments provided by CalSEIA, SEIA, and the Solar Alliance (which recently merged with SEIA) ("Joint Comments") and subsequent adoption of several Joint Comment recommendations into the Proposed Regulations.

The draft regulations put forth on August 17, 2012, as we understand them, incorporate many of the revisions proposed by the PV industry and would:

1. Allow manufacturers to contract with third-party entities to operate take-back programs;
2. Apply the Household Universal Waste and Conditionally Exempt Small Quantity Generator exemptions to waste modules;
3. Allow the removal of module components without classifying that activity as "treatment;"
4. Require manufacturers recycling modules only to recover hazardous constituents that led the module to be classified as hazardous waste, instead of all hazardous constituents;

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505 9th Street, NW · Suite 800 · Washington, DC 20004
(202) 556-2906 · jsmirnow@seia.org

5. Exempt modules that are no longer waste (*e.g.*, refurbished modules) from regulation as waste; and
6. Incorporate multiple other minor revisions suggested by industry.

The revised regulations, however, did not incorporate a number of additional industry proposals or were changed in other ways we find problematic. We, therefore, resubmit the original Joint Comments, *see* **Attachment A**, and provide the following additional comments:

A. <u>The regulations improperly utilize a distinction between "intact" and "broken" modules</u>

Both the conditional exemption and the universal waste rules approach the concept of broken modules in a way that severely compromises the potential efficacy of the regulations. In our view, the regulations unnecessarily draw a distinction between "intact" modules and "broken" modules.

We presume this distinction is based on an unfounded assumption that solar module breakage, like cathode ray tube ("CRT") breakage, will cause a release of hazardous constituents into the environment.[1] In contrast, the regulatory Initial Statement of Reasons ("ISOR") properly recognizes that solar modules are more like "electronic devices" than CRTs, *i.e.*, there is "little difference between the acute hazards of managing electronic devices and solar modules."[2]

We are also concerned that under the Proposed Regulations a handler will have to manage intact modules under one regulatory scheme and broken modules under another, which undermines the benefits of the relaxed schemes. The regulation of broken modules should, therefore, be revised in the Proposed Regulations. And Section 66273.33 of the universal waste

[1] We base this assumption of the language of Section 66273.36, which requires personnel training on the types and hazards associated with universal waste (*e.g.*, hazards due to leaded glass in CRT devices or CRTs; <u>hazards due to cadmium, lead or selenium in solar modules</u>." (underlined represents new text). This section indicates that the DTSC is proposing to regulate solar modules in a manner equivalent to CRTs, not electronic devices. The Proposed Regulations further provide that any broken modules *must be handled as hazardous waste.* Both the conditional exemption and the universal waste rule define "solar module" to exclude modules that are "fractured and fragmented" or that are "physically damaged" to the point that they are no longer "recognizable" as intact modules.

[2] *See* ISOR, Alternative 1, <u>Criteria for Addition to the State's Universal Waste Rule</u>, subpart (e) ("This proposed rulemaking applies similar packaging standards to solar modules that are applied to universal waste electronic devices. However, there is little difference between the acute hazards of managing electronic devices and solar modules. For both wastes, the hazardous components are in a form that minimizes the potential for any release during handling. Therefore, DTSC believes that because of the relatively low acute hazards associated with handling solar modules, the proposed management standards (e.g., packaging standards that prevent breakage and ensure proper handling and immediate response to releases) provide more than adequate protection to human health and the environment.").

rule, taken alone, offers a reasonable model for how the exemption and rule should handle breakage.

Section 66273.33 utilizes the intact versus broken distinction, but only to classify how the modules must be contained, not to determine whether they are eligible for the program. All modules must be contained to avoid releases to the environment, and for intact modules that requirement may be satisfied by containing them with stretch film on a pallet.

If modules are broken *and* "may be expected to cause a release of hazardous constituents to the environment under reasonable foreseeable conditions," the handler must place the modules in a "structurally sound" container that is "compatible with the contents of the modules" and that prevents "releases of hazardous components to the environment." We, therefore, believe the better solution is to draw a distinction between broken and intact modules only for the purpose of containment, and not eligibility for the exemption.

The universal waste rule contains other problematic provisions. First, Section 66273.33 only purports to handle the management of modules that are "accidentally or unintentionally broken." If handling practices result in the intentional breakage of solar modules, they may not be covered by the exemption.

Second, Section 66273.7.1 states that waste modules are generated when they are "physically damaged, deteriorated, or altered and no longer an intact solar module . . . (e.g., solar modules that are cracked, fractured into more than one piece, or fragmented)." The effect of this is that under the universal waste rule, when a solar module breaks it becomes waste subject to the rule (under Section 66273.7.1), but *at the same time* it also becomes waste not eligible for the rule because it is completely excluded from the definition of a solar module (under Section 66273.9).

Lastly, the universal waste rule defines intact solar modules to include "cracked" panels (in other words, merely being cracked does not make a panel "broken), but Section 66273.7.1 states that modules become waste when they are cracked *because they are no longer intact*. Different sections of the regulation cannot state that cracked modules are both intact and not intact. The use of intact and cracked must be made uniform across the regulations to eliminate these irreconcilable conflicts.

B. <u>The regulations do not exempt modules handled in a product take-back program from the definition of waste or hazardous waste</u>

In order to eliminate the stigma associated with hazardous waste management and to properly incentivize manufacturers to develop product take-back programs, DTSC should exempt modules managed in take-back programs from the definition of "waste" or "hazardous waste."

DTSC has always stated that while it may exempt hazardous waste modules from certain regulations, it did not believe that an exemption from classification as hazardous waste was warranted. For that reason, DTSC placed the take-back program exemption within Section 66261.6(a)(3), classifying modules as hazardous recyclable materials that are "not subject to regulation." DTSC should place the exemption in Section 66261.4(a) or (b), as industry proposed, which would redefine used modules so that they would not be classified as waste or hazardous waste at all.

C. The regulations overly restrict handlers' ability to disassemble modules prior to reclamation

Under the draft regulations, handlers may "remove junction boxes and junction box cables as long as the solar module remains intact" without conducting "treatment." Industry previously requested, however, that companies be permitted to remove wires and metal frames from solar modules and to disassemble modules into individual components, modules, or cells. The regulations do not allow for that removal to occur. To the extent necessary to allow for efficient transportation and recycling of waste modules, DTSC should expand the ability to disassemble modules.

D. The regulations do not allow the offsite aggregation of modules necessary to maximize the efficiency of the reclamation program

In order for the transportation program to be efficient, entities operating a take-back program should be permitted to stockpile modules *offsite* prior to transporting them to the reclamation facility. While the revised regulations give the operator the ability to stockpile the modules for a year, the transporter cannot deliver modules to a place other than a reclamation facility. That delivery limitation largely prevents the operator from aggregating modules from multiple locations in a single place prior to transportation. The regulations attempt to eliminate that limitation by subjecting transporters to "universal waste transfer facility" requirements, but that only allows storage (and hence aggregation) for up to 10 days, which may be insufficient.

E. The Proposed Regulations incorporate hazardous waste requirements where they should incorporate universal waste requirements

In several instances, the regulations state that handlers or transporters must comply with certain hazardous waste management requirements. Since the modules are universal waste, the regulations should incorporate universal waste handling and transportation requirements, not hazardous waste requirements.

While substantively insignificant, incorporation of hazardous waste requirements rather than identical universal waste requirements might increase the stigma associated with the

exemption. For example, in Section 66261.6(a)(8)(H), export must be conducted in accordance with "export requirements for hazardous waste," when they should be conducted in accordance with the substantively identical export requirements for universal waste. And destination facilities are subject to hazardous waste regulations when they too should be subject to universal waste requirements.

In conclusion, SEIA appreciates this opportunity to submit additional comments on the DTSC's Proposed Regulations regarding the management of waste solar panels. If you have any questions concerning these comments, please feel free to contact me at (202) 556-2906 or jsmirnow@seia.org.

Regards,

John P. Smirnow
Vice President of Trade & Competitiveness
Solar Energy Industries Association

cc: Rhone Resch, President & CEO, Solar Energy Industries Association
Seth Dunn, Chairman, SEIA PV Recycling Working Group

Attachment

ATTACHMENT A

August 11, 2010

Ellen Haertle
Department of Toxic Substances Control
P.O. Box 806
Sacramento, California 95812

Re: Comments on DTSC Proposed Solar Panel Management Regulations

Dear Ms. Haertle:

Pursuant to the Department of Toxic Substances Control (DTSC) request for written comments on DTSC's draft regulation on the management of waste solar panels, The California Solar Energy Industries Association, Solar Alliance and the Solar Energy Industries Association submit the following comments.

A. Proposed Revisions to Description of Regulations

As currently drafted, the cover page of the proposed regulations describes the creation of "three management options." This description of the proposed regulatory package is unnecessarily complicated and may confuse the public and the regulated community.

DTSC should explain that the baseline classification for waste solar panels is universal waste. For example, DTSC does not state that the generator of an electronic device has an option as to whether to handle the waste as a universal or hazardous waste. Instead, DTSC states that waste batteries *are* universal wastes, and thereafter elaborates through a sub-section that electronic devices managed as hazardous wastes cannot be managed as universal wastes (See 22 C.C.R. § 66273.7(b)(6)).

Describing universal waste as the baseline for waste solar panels will preserve the existence of what is currently described in the write-up as the option to manage waste solar panels under the "full hazardous waste regulations." DTSC has already proposed a provision in the solar panel applicability provision that is identical to the electronic device provision described above. *See* § 66273.7.1(b)(4). Given that "full hazardous waste regulation" is already an option contained in the universal waste baseline, there is no reason to potentially confuse the public and regulated community by describing "full hazardous waste regulation" as a separate regulatory option.

Similarly, the Department should describe the exemption for solar panels managed as recyclable materials pursuant to § 66261.6 as an exemption from the universal waste regulations

rather than as a separate option that is "not mutually exclusive" with the universal waste classification. By doing so, the Department will not alter the proposed recyclable material exemption in any way, but will lessen potential confusion for the regulated community.

To make clear that the proposed regulatory package classifies waste solar panels as universal waste and creates an additional exemption from the regulatory requirements governing universal wastes for those entities that adhere to the requirements of section 66261.6, *DTSC should revise the cover page to read as follows:*

> This document proposes regulatory amendments that provide for the appropriate regulation of waste solar panels that are currently regulated by the Department. ~~presents two, proposed (new) options for the management of hazardous waste solar panels at end-of-life. Both options are not mutually-exclusive, but are presented together so that a regulatory entity has a choice of management schemes. Absent these two regulatory conditional exemptions, hazardous waste solar panels must be managed under full hazardous waste regulations, which are California's current standards. Thus, as drafted, there would be three (3) options for management of hazardous waste solar panels:~~ It proposes regulations that classify waste solar panels as universal wastes and waste solar panels will be regulated under that statutory scheme. The proposal creates an additional regulatory option for those panels that will be managed as recyclable materials. When recycled as "recyclable materials," those panels will be subject only to the requirements of section 66261.6(a)(8)(A)-(I) governing recyclable materials and to the standards incorporated therein. Note that pursuant to the universal waste standards set forth in existing regulations, universal wastes destined for disposal must be handled as hazardous wastes.
>
> ~~1. Full hazardous waste regulations (current standard)~~
> ~~2. Conditional hazardous waste exemption (proposed)~~
> ~~3. Universal waste management (proposed)~~
>
> ~~It is also important to note that once a regulatory scheme is chosen for the management of a particular hazardous waste solar panel, that scheme must be followed or that waste may no longer be subject to that particular exemption.~~

B. Comments on Regulations

1. Section 66260.10 Definition of "Solar Panel Vendor" Should be Revised to Ensure that Vendors may use Third Parties to Perform Duties on Their Behalf

It is unclear whether the proposed definition for "Solar Panel Vendor" in § 66260.10 will allow solar panel manufacturers, producers, marketers and distributors to conduct current and proposed recycling activities under contract with third-parties. Third-party administration of section 66261.6 recycling activities will allow for specialization and aggregation of recycling expertise, which will ultimately reduce the cost of recycling solar panels. Third-party administration of recycling activities should, therefore, be encouraged. During the July 28 workshop, DTSC staff stated that the proposed regulation was intended to allow for third-party recycling. However, as currently drafted it is not clear that the definition of "Solar Panel Vendor" allows for third-party administration of recycling.

To increase the clarity of the section, the department should amend the definition of "Solar Panel Vendor" to explicitly include third-party entities that administers a solar panel reclamation program on behalf of a manufacturer, producer, marketer or distributor of solar panels in California. *The Department may do so by amending section 66260.10 to read as follows:*

> "Solar Panel Vendor" means the manufacturer, producer, marketer or distributor of solar panels located within the United States and its territories, or a third-party entity acting on behalf of such manufacturer, producer, marketer or distributor, who administers a solar panel reclamation program and who accepts (for reclamation) one or more solar panels that are subject to the conditions for the exemption in section 66261.6 of chapter 11 of this division.

2. Section 66261.6(a)(3)(D) Should be Revised to Facilitate Recycling of Panels and to Remove Redundant Language

Currently, the proposed section 66261.6(a)(3)(D) modifies regulatory requirements for solar panels that are properly recycled, but the panels are still classified as California-only hazardous wastes. The Department, in providing a recyclable material option for solar panels, recognizes that it is appropriate to reduce the regulatory burden on Solar Panel Vendors that properly recycle their solar panels. However, by choosing not to exclude those solar panels from being classified as hazardous wastes, DTSC has proposed a program that will still impose a substantial regulatory burden on solar panel vendors. The Department should, therefore, include in its proposed regulatory regime established by section 66261.6 an exclusion for properly recycled solar panels from classification as a hazardous waste. In doing so, the Department will create a strong incentive for Solar Panel Vendors that recycle panels in compliance with the requirements of section 66261.6.

The suggested exclusion from classification as a hazardous waste can be qualified in such a way to ensure that panels are still regulated as universal wastes:

(i) in transport (pursuant to section 66261.6(a)(8)(E) that incorporates universal waste transportation standards); and
(ii) at reclamation facilities (pursuant to proposed section 66261.6(a)(8)(I), suggested below, which incorporates universal waste destination facilities standard in the same manner that current subpart (8)(E) incorporates universal waste transportation standards).

As a result, while the suggested exclusion will provide an incentive for Solar Panel Vendors to manage their panels under section 66261.6, it will not result in any reduction in the proposed regulation of waste solar panel recycling.

To ensure that the exclusion from the definition of hazardous wastes for recycled solar panels added to § 66261.6(a)(3)(D) does not result in reduced regulatory requirements for solar panel reclamation facilities, a new subsection should be added that requires solar panel reclamation facilities to manage solar panels in compliance with the requirements of Article 6 of Chapter 23, "Standards for Destination Facilities."

Separately, the second sentence of section 66261.6(a)(3)(D), as currently drafted, is redundant and should be removed. That sentence appears to indicate that subpart (a)(8)(H) is somehow different from subparts (a)(8)(A)-(G). However, every subpart under (a)(8) is prescriptive, so there is no apparent meaning to the second sentence of (a)(3)(D). Not only is the sentence unnecessary, but the use of the word "however" is confusing because it indicates that the sentence somehow qualifies the first sentence. Since the sentence has no independent meaning and could lead the regulated community to believe that it somehow modifies the first sentence of (a)(3)(D), it should be removed.

To exclude properly recycled waste solar panels from classification as hazardous wastes and to avoid the confusion created by the second sentence of subpart (a)(3)(D), *66261.6(a)(3)(D) should be revised to read as follows:*

> (D) solar panels destined for reclamation within the United States and its territories in a program administered by a Solar Panel Vendor provided that the conditions in subsection (a)(8) of this section are met. However~~, such solar panels are subject to regulation as described in subsection (a)(8)(H) of this section upon arrival at a designated facility located in California.~~ solar panels managed pursuant to this provision are not hazardous wastes.

Also, to ensure that reclamation facilities accepting waste solar panel recyclable material are subject to regulation, *§66261(a)(8) should be amended by the addition of a subsection (I) as follows:*

> (I) A solar panels reclamation facility shall manage solar panels in compliance with the requirements of Article 6 of Chapter 23 of this division

3. Section 66273.7.1(c)(1)'s Criteria for Defining Waste Solar Panels Should be Revised to take into Account the Continued Functioning of Cracked Panels

As currently written, section 66273.7.1(c)(1)(B) appears to state that solar panels become waste as soon as they crack, regardless of whether or not they retain functionality and remain in service. That breakage provision is too restrictive, appears to violate the statutory definition of "waste" at Health & Safety Code section 25124 and will lead to unintended consequences. "Broken" in the context of when a solar panel becomes a waste can only mean when (i) a solar panel is damaged to the point that the photovoltaic panel cannot operate within an array to generate electricity and (ii) the panel is therefore removed from the array. Solar panels that are cracked, crazed or fractured are generally designed to retain functionality and be left in place by their owners. By seemingly automatically designating "cracked, broken or shattered" panels as wastes DTSC in effect requires that potentially functioning solar panels be removed, and triggers accumulation time-limits and other criteria.

To avoid this unintended result, and to ensure that DTSC does not regulate products that are not yet waste pursuant to Health & Safety Code section 25124, subsection (c)(1) *should be revised to read as follows:*

(c) Generation of waste solar panels.

(1) A used solar panel becomes a waste on the date ~~when the earlier of the following occurs:(A) The~~ the owner discards the solar panel ~~; or(B) The solar panel is physically cracked, broken, or shattered, or otherwise removed from service~~ without intent to re-install it.

4. Section 66261.6(a)(8)(B) Should be Revised to Clarify that Broken Solar Panels May be Handled as Recyclable Materials and to Establish Handling Standards for Recycling Broken Panels

As written, section 66261.6(a)(8)(B) states that only "intact" solar panels qualify for management as recyclable materials under § 66261.6. That provision is inconsistent with the definition of "solar panel" contained in section 66261.10, which provides for "broken" panels to be managed as universal waste so long as they can be identified as panels. The intent of the proposed regulations is to encourage the recycling of such universal waste. The limitation on recycling broken panels is further inconsistent with statements made by DTSC staff at the July 28, 2010 workshop that both intact and cracked panels are intended to qualify for management as recyclable materials under § 66261.6.

Requiring generators and transporters to manage the subset of broken panels as universal waste while the rest remain recyclable materials would significantly reduce the feasibility of managing solar panels under section 66261.6, and would result in no added benefits. Intact and cracked panels are equally recyclable, and the structure and inherent stability of solar panels means that cracked and broken panels are no more likely to release hazardous constituents than intact panels. In that respect, solar panels are fundamentally different than CRTs. Cracked CRTs cannot function as designed and are at risk of releasing their constituents. Cracked solar

panels continue to function as designed. Therefore, there is no reason to limit the applicability of section 66261.6 recycling to intact panels and to require that broken panels be treated separately as universal waste.

To clarify that broken panels can be managed under section 66261.6 and to ensure that those panels are managed properly in a way to avoid releases to the environment under reasonably foreseeable conditions, *DTSC should revise section 66261.6(a)(8)(B) to read as follows:*

> (B) ~~Only intact solar panels shall be managed.~~ Any solar panel or container of solar panels that shows evidence of ~~leakage or~~ damage that could cause a release of hazardous constituents to the environment shall be managed in accordance with ~~article 8 of chapter 23 of this division.~~ the requirements of section 66273.83.

5. Section 66273.83(a) Should be Amended to Conform the Management of Solar Panel Universal Wastes with Existing Management Standards for Similar Universal Wastes

Subsection (a) of Section 66273.83 specifying how solar panel universal waste is to be managed includes language amalgamated from various sections of Chapter 23 applicable to other classes of universal waste, including provisions of section 66273.33 governing lamps, and provisions of section 66273.33.5 governing CRTs and electronic devices. A number of the provisions applied to solar panels, particularly those governing lamps and CRTs, are designed to prevent the breakage of universal wastes that are far more fragile and prone to releasing hazardous constituents than are end-of-life solar panels.

CRTs, which are easily broken and, when broken, may release lead into the environment are distinctly different than solar panels and, for that matter, electronic devices. Similarly, waste lamps are significantly more fragile and likely to release hazardous constituents into the environment than are solar panels. Solar panels, by comparison, are designed in a robust fashion to operate in and withstand extreme weather conditions for over two decades. They are necessarily much more robust than lamps or CRTs, and as a result are much less prone to breaking or loss of constituents. The hazardous constituents contained in waste solar panels are highly stable, and are unlikely to escape even if the panels are broken. The fact that the panels are far less likely to break than CRTs or lamps, combined with the fact that broken panels are much less likely than broken CRTs or lamps to release hazardous constituents, indicates that the panels should *not* be subject to the same management standards as those governing CRTS or lamps.

Solar panels should, therefore, be subject to management standards substantially equivalent to those governing electronic devices. Like waste solar panels, waste electronic devices are unlikely to break or release hazardous constituents to the environment. Section 66273.83(a) should therefore be revised to include language similar to that utilized by the management standards for electronic devices at section 66273.33.5(a)(1)(B). *Section 66273.83(a) should be revised as follows:*

(a) A handler of universal waste solar panels shall manage the solar panels in a manner that prevents releases of any ~~solar panels~~ hazardous constituents ~~or any hazardous component of a solar panel~~ to the environment under reasonably foreseeable conditions, as follows:

(1) A handler of universal waste solar panels shall contain any solar panel in a ~~container or package that is structurally sound, adequate to prevent breakage~~ manner that prevents release of hazardous constituents to the environment. ~~the solar panel, and compatible with the contents of the solar panel. Such a container or package~~ If a container is used, such a container shall ~~lack evidence of leakage, spillage or damage that could cause leakage~~ prevent the release of hazardous constituents under reasonable foreseeable conditions.

(2) Intact solar panels that are managed in a manner that prevents ~~breakage of the solar panels and~~ release of hazardous constituents ~~components of the solar panels~~ to the environment under reasonably foreseeable conditions (e.g., stretch-film on a pallet) shall be deemed to comply with subsection (a)(1) of this section.

(3) A handler of universal waste solar panels shall immediately clean up and place in a container any solar panel that ~~is broken and shall place in a container any solar panel that shows evidence of breakage, leakage, or damage that could cause the release of solar panel glass or other~~ may be expected to cause a release of hazardous constituents to the environment under reasonably foreseeable conditions. The containers shall be structurally sound, compatible with the contents of the solar panels and shall ~~lack evidence of leakage, spillage or damage that could cause leakage or releases of solar panel glass or other hazardous constituents~~ prevent releases of hazardous constituents to the environment under reasonably foreseeable conditions.

~~(4) A handler of universal waste solar panels shall place solar panels in a container with packing materials, if such material is necessary to prevent breakage during handling, storage and transportation.~~

6. Subsection of 66273.8(c) Should be Deleted to Ensure Reasonable Regulation of Universal Waste Solar Panels

DTSC has proposed eliminating the exemption for Household Universal Waste and Conditionally Exempt Small Quantity Generators of Universal Waste from § 66273.8 for generators of solar panels. The stated intent for this elimination of those general universal waste provisions is to encourage small quantity generators to use trained installers to disassemble solar arrays. In the first instance, there is no reason for DTSC to treat small quantity generators of universal waste solar panels differently from small quantity generators of other universal wastes, because the characteristics of universal waste solar panels are no different from the characteristics of other universal wastes. In many instances, universal waste solar panels are *more* amenable to handling by individuals than other universal wastes. For example, the hazardous constituents in universal waste solar panels are far more stable and less prone to release than the hazardous constituents contained in universal waste CRTs.

Additionally, DTSC's proposal will have many unintended side-effects and will not accomplish DTSC's stated purpose. By removing the requirement, DTSC would subject all household owners and small quantity generators of universal waste solar panels to accumulation time-limit, personnel training, and many other requirements that will not advance the Department's stated goal of ensuring that "only universal waste solar panel handlers manage solar panels."

Further, the structural purpose of both the federal and state-based universal waste regulatory regimes is to transfer the regulatory burden from unsophisticated entities (such as households) to sophisticated entities (such as collection centers). Removing the exemptions would eliminate this key facet of the Universal Waste program.

Section 66273.8(c) should therefore be deleted, as follows:

~~(c) The exemptions provided for in subsections (a) and (b) of this section shall not be applicable to the management of universal waste solar panels.~~

7. Section 66261.6(a)(8)(E) Regarding the Transportation of Recyclable Solar Panels Should be Revised to Ensure that the Small Quantity Exemptions Applicable to the Transportation of Universal Wastes Also Apply to Transportation of Recyclable Materials

Section 66261.6(a)(8)(E) incorporates the transportation requirements of Article 5, governing universal waste transporters and applies them to the transportation of recyclable solar panels. However, it does not explicitly incorporate other provisions of the universal waste regulations that act to limit the scope of Article 5. Specifically, Section 66261.6(a)(8)(E) does not incorporate the exemptions found in section 66273.8 of Chapter 23, which, as revised by the comments proposed in this letter, exempt households and small quantity generators of universal waste solar panels from the transportation requirements of Article 5. To ensure that the scope of Article 5 is the same for transporters of recyclable solar panels under section 66261.6 and Chapter 23, *section 66261.6(a)(8)(E) should be revised to read as follows:*

(E) A transporter of solar panels shall manage solar panels in compliance with the requirements of article 5 of chapter 23 of this division, subject to the exemptions in section 66273.8.

8. Section 66261.6(a)(8)(H) Should be Revised to Clarify the Constituents that Must be Recovered and to Permit Panel Reuse

The phrase "including recovery of hazardous constituents" found in Section 66261.6(a)(8)(H), fails to clarify that the hazardous constituents which must be recovered are those that result in the panels being classified as a hazardous waste under California law. As currently written, section (a)(8)(H) could be misinterpreted to require recovery of any hazardous constituent, even trace constituents, listed in Division 4.5 of Title 22 of the California Code of Regulations, regardless of the relationship between that constituent and the panel's hazardous waste classification. Section (a)(8)(H) should be revised to clarify that Solar Panel Vendors need only recover the hazardous constituent(s) that resulted in a panel's classification as a hazardous waste under California law.

Separately, as currently drafted, Solar Panel Vendors may only manage waste solar panels pursuant to section 66261.6(a)(3)(D) if the panels will be recycled by being reclaimed. In other words, the panels may not be reused by being refurbished and put back into service. Limiting applicability of section 66261.6(a)(3)(D) to panels which will be reclaimed will skew incentives for Vendors by incentivizing reclamation at the expense of panel reuse. If panels retain functionality sufficient to warrant reuse and there is a market for their reuse, there is no reason why Solar Panel Vendors should be precluded from refurbishing and reinstalling the panels. Section 66261.69(a)(8)(H) should therefore be revised to allow Solar Panel Vendors to reuse the panels.

To ensure that waste panels managed under section 66261.6 may be recycled by being reused and to make clear that the hazardous constituents that must be recovered are those that cause the panels to be classified as hazardous under these regulations, *section 66261.6(a)(8)(H) should be revised to read as follows:*

(Note. The subsection revised below is relabeled as subsection (H) because it was erroneously labeled as a second subsection (G) in the draft regulations.)

(~~G~~H) The solar panels shall be recycled by being reclaimed at the designated facility, including recovery of the hazardous constituents that cause the panels to be classified as a hazardous waste under these regulations, or by being reused as solar panels.

9. DTSC Should Clarify that Removal of Wires and Metal Frames Does not Rise to the Level of "Treatment" of Solar Panels, and therefore does not Require Specific Regulations Allowing for the Conduct of such Activity

The disassembly of a solar panel array, including the removal of wires and metal frames, should not be considered "treatment" by DTSC because until an array is disassembled, solar panels cannot be classified as waste. (By analogy, unplugging a computer and removing it from its docking station is not considered "treatment.") Therefore, all steps associated with the disassembly of a solar panel array should not be considered treatment of a waste.

Further, simple, discrete activities such as removal of wires or metal frames from waste solar panels should not be considered treatment because such activities involve the reclamation of usable products from the waste solar panel and not the treatment of a hazardous waste to alter its characteristics.

Insofar as the Department determines that the removal of wires and/or metal frames *does* rise to the level of treatment, it should insert a provision into § 66273.83 as new subpart (d) allowing handlers, transporters, and collection facilities to remove wires and metal frames from solar panels. This new subsection (d) should be similar in structure and function to the treatment standards for batteries found at § 66273.33(a)(2), and *should read as follows:*

(d) A universal waste solar panel handler, transporter, or collection facility may conduct the following activities:

(1) Removing wires from solar panels;
(2) Removing metal frames from solar panels; or
(3) Disassembling solar panels into individual components, modules or cells.

Additionally it would be highly beneficial to the nascent solar panel industry for the Department to adopt regulations, similar to those found at § 66273.71 - 73 governing printed circuit boards, that will allow solar panel handlers, transporters, and/or collection facilities to shred solar panels prior to their arrival at destination facilities. Allowing those entities to shred panels prior to their transportation to destination facilities will lower the cost of recycling, which will in turn encourage more generators to recycle the panels.

10. Section 66261.6(a)(8)(F) Should be Revised to Allow for Efficient Management and Transportation of Waste Solar Panels

Section 66261.6(a)(8)(F) requires transporters of waste solar panels to deliver the panels to reclamation facilities. While that provision is intended to ensure that solar panels will be recycled in the United States at a reclamation facility chosen by the Solar Panel Vendor, the fact that transporters would not be allowed to take the panels to aggregation points prior to delivering them to reclamation facilities will lead to highly inefficient recycling programs that are financially burdensome.

For example, under Section 66261.6(a)(8)(F) as currently proposed if an twenty panel array on a residential rooftop in California reaches end-of-life and the Vendor plans to send the

panels to a reclamation facility in Massachusetts, the Vendor cannot first have the panels transported to a nearby collection facility to be aggregated with other small quantities of waste solar panels. Instead, the twenty panels must be sent immediately to the reclamation facility in Massachusetts, despite the fact that twenty panels will fill up only a fraction of a truck or shipping container. A recycling program operated in such a manner will be significantly more expensive than one in which small quantities of waste may be aggregated prior to long-distance transportation.

The requirement under Section 66261.6(a)(8)(F), that prevent a transporter of recyclable solar panels from taking the panels to an aggregation point, will result in recyclable solar panels being handled as universal wastes. This is because a entity managing panels designated as universal wastes may accept panels from offsite and hold them for a year prior to transporting them to a destination facility, thereby allowing for aggregation and cost-effective recycling.

To allow Vendors to aggregate recyclable solar panels prior to sending them to reclamation facilities for recycling , and to ensure that reclamation facilities are in the United States, *section 66261.6(a)(8)(F) should therefore be revised to read as follows:*

> (F) ~~A transporter of solar panels shall not deliver s~~ Solar panels managed under this section must be delivered within one year after the solar panels become waste to a ~~place other than to a~~ reclamation facility within the United States and its territories that is designated by the Solar Panel Vendor. ~~who is administering the solar panel reclamation program~~

11. Proposed Chapter 23, Article 8 Standards should be Integrated into Existing Chapter 23 Standards

DTSC recently finished streamlining and consolidating existing universal waste regulations by removing duplicitous provisions of from the C.C.R. Since the proposed solar panel regulations are nearly identical to existing Chapter 23 standards in most respects, there is no reason to begin the duplication process anew by adding a new article to the standards. Further, there is no apparent reason why separation of solar panel regulations into a new article would benefit DTSC or the regulated community. Article 8 should therefore be integrated into existing chapter 23 standards.

12. Section 66261.6(a)(8)(A) and (D) should be Revised to Avoid Confusion and Duplication of Requirements found in Subparts (8)(A) and in (8)(H)

Section 66261.6(a)(8)(A), as currently proposed, may lead people to believe that they cannot place solar panels on the ground at any point during solar panel array dismantling. The intent of (a)(8)(A) is that no hazardous materials enter the environment. That provision should be rewritten to achieve more directly that objective. Rewriting the section will ensure that the hazardous constituents of solar panels are not released into the environment. Because sections (a)(8)(F) and (H) currently ensure that entire solar panels are not disposed of into the environment by requiring that the panels be recycled at a reclamation facility, there is no need for that section (a)(8)(A) to duplicate that protection with respect to entire solar panels.

Similarly, Section 66261.6(a)(8)(D), as currently proposed, is somewhat unclear. It may lead Vendors to believe that they cannot place solar panels on the ground at any point during array dismantling. The intent of (a)(8)(D) appears to be to ensure that no hazardous constituents enter the environment. The provision should be rewritten to achieve that objective more directly.

To tailor section (a)(8)(A) and (D) more directly to the objective of preventing the release of hazardous constituents to the environment and to avoid confusion over the proper handling of entire solar panels during solar panel array dismantling, *the sections should be revised to read as follows:*

> (8)(A) Solar panels shall be managed in a manner that prevents releases of ~~any solar panels or~~ any hazardous ~~component of~~ constituent from a waste solar panel to the environment under reasonably foreseeable conditions pursuant to the requirements of this section.
>
> . . .
>
> (D) Any ~~spills or~~ releases of any hazardous constituent from a solar panel ~~or components thereof~~ shall be cleaned up immediately.

13. Comment Proposing Revision of § 66261.6(a)(8)(C) to Ensure that Waste Solar Panels are Not Confused with "Scrap Metals" or "CRTs"

The purpose of proposed section 66261.6(a)(8)(C) is to ensure that waste solar panels are not mistaken for waste CRTs or waste scrap metal. As currently written, a Vendor labeling solar panels under section 66261.6(a)(8)(C) must label waste solar panels either as "Solar Panels not Scrap Metal" *or* as "Solar Panels not CRTs." To ensure that waste solar panels are not mistaken for either, section 66261.6(a)(8)(C) should have a label which reads "Solar Panels, Not Scrap Metal or CRT Glass." *The section should therefore be revised as follows:*

> (C) A solar panel or container of solar panels shall be labeled with ~~one of~~ the following phrase~~s~~: "Solar Panels, Not Scrap Metal~~",~~ or ~~"Solar Panels Not~~ CRT Glass".

14. The Export Standard in Section § 66261.6(a)(8)(G) Should be Revised to Ensure that Universal Waste Export Requirements Apply to Waste Solar Panels

Section 66261.6(a)(8)(G) requires that waste solar panels managed as recyclable materials pursuant to section 66261.6(a) will be exported as hazardous wastes. By comparison, solar panels handled as universal wastes that will be exported must be handled *either* as universal wastes in accordance with Article 4 of Chapter 23 or as hazardous wastes. Given that section 66261.6 is meant to incentivize recycling by creating an appropriate regulatory framework, it is counterproductive to describe export standards for recyclable materials under that provision as different than export standards for universal wastes.

To ensure that waste panels managed as recyclable materials under section 66261.6 are subject to export standards that are the same as those governing universal waste solar panels, *section 66261.6 should be revised to read as follows:*

> (G) A person is prohibited from exporting solar panels unless export is conducted in accordance with applicable export requirements for ~~hazardous~~ universal waste as described in ~~chapter 12~~ Article 4 of Chapter 23 of this division.

15. A Subsection Should be Added to Section 66273.7.1(b) to Ensure that the Proposed Regulatory Scheme does not Unintentionally Suppress the Market for Second-hand Panels

As currently written, the applicability standards of section 66273.7.1 do not allow for panels previously designated as wastes that are subsequently refurbished or otherwise reinstalled to shed their classification as wastes. It appears that section 66273.7.1 was modeled, at least in part, on the applicability standards governing universal waste electronic devices (section 66273.3). Those standards already contain a provision (at 66273.3(b)(6)) which allows for electronic device wastes that are refurbished or otherwise reinstalled to shed their classification as wastes. DTSC should add a provision identical to that governing electronic device wastes to the applicability standards governing solar panels. In doing so, DTSC will ensure that it does not unintentionally suppress the market for second-hand or refurbished panels by inappropriately designating them as wastes. *DTSC should therefore revise section 66273.7.1 to read as follows:*

> (b) Solar panels not covered pursuant to this chapter. The requirements of this chapter do not apply to the following solar panels:
>
> . . .
>
> (6) Solar panels that were previously identified as wastes, but are no longer identified as wastes (e.g., a discarded solar panel that is refurbished and is returned to service).

16. There is no need to Require Additional Annual Reporting or other Notification Requirements for Entities Generating or Managing Waste Solar Panels

The requirements currently established for solar panel transporters, departmental notification, and annual reporting are sufficient and need not be augmented.

With regard to transportation requirements, current universal waste transporter requirements are sufficient to ensure safe transportation of universal waste solar panels. The current standards governing universal waste transporters, as augmented by applicable federal DOT standards, are presently deemed sufficient enough to protect the public during transportation of universal waste. There is no reason to believe that the transportation of solar panels is any more risky -- and ample evidence of the stability of hazardous materials in solar panels which would indicate that they are less risky -- than other classes of universal wastes. Applying Article 5 of Chapter 23 to the transportation of solar panels managed under section

66261.6 is therefore more than sufficient.

Annual reports are unnecessary and burdensome. DTSC does not currently require all categories of universal waste to submit annual reports, reserving that requirement for a small subset of universal wastes. Given that management under section 66261.6 is meant to encourage recycling, it would be counterintuitive to reduce the effectiveness of the program by increasing the regulatory burden on Vendors by requiring annual reports.

With regards to notification requirements under section 66261.6, DTSC should obtain enough information to allow it to identify and contact Solar Panel Vendors. To ensure that this information remains current, Solar Panel Vendors should be required to update the information within a reasonable amount of time after the information changes. A provision analogous to the 5000 kg Department notification threshold contained in the Universal Waste Rule is not necessary, and would be overly burdensome. The information requirements should not be overly burdensome.

17. Replace the Term "Panel" with "Module" To Reflect the Standard Use in the Solar Industry

In the solar industry, the term "module" is generally used in describing photovoltaic technologies and equipment while the term "panel" is more generally used to describe solar thermal technologies and equipment. As currently drafted, solar thermal technologies are not included within the existing definition of "Solar panel." As a result, it is recommended that the term "module" replace "panel" where used in the regulation.

18. Clarification Regarding Solar Thermal Technologies

Solar thermal technologies use the sun to provide thermal energy for solar water heating, solar pool heating, solar space heating and cooling, and industrial process pre-heating. Solar thermal technologies produce heat while photovoltaic technologies produce electricity. Because of the significant metals composition of most solar thermal equipment, we expect that solar thermal equipment would be covered under the existing recycled scrap metal exemption.

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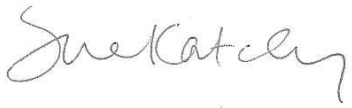
The California Solar Energy Industries Association, Solar Alliance and the Solar Energy Industries Association appreciate this opportunity to submit comments on the DTSC's proposed regulations on the management of waste solar panels.

Respectfully submitted,



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October 1, 2012

Krysia Von Burg, Regulations Coordinator
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Department of Toxic Substances Control (DTSC)
P.O. Box 806
Sacramento, CA 98512-0806,

Dear Krysia Von Burg and DTSC,

Attached are the comments that the Silicon Valley Toxics Coalition (SVTC) submitted in 2010 in reference to DTSC's Proposed Standards for Management of Waste Solar Panels Department Reference Number: R-2010-01. We are submitting them again, because it seems that the 2012 regulations are still lacking in some important areas.

As expressed in SVTC's August 11, 2010 comments to DTSC, we have grave concerns regarding DTSC's effort to deregulate hazardous solar PV waste. Deregulation of solar PV waste without Extended Producer Responsibility (EPR) lacks corporate accountability and long term programmatic sustainability.

SVTC would like to emphasize our concern that the proposed solar regulations lack the following basic components and do not do their part to ensure protection for workers, communities or the environment:

- Extended Producer Responsibility – all solar manufacturers should take full responsible for recycling and end of life management of their solar PV modules.
- Labeling – a state recycling program should require labels on panels that identify the manufacture and makes it is easier for consumers to know who is responsible and how to recycle.
- Prohibition against prison labor and export of hazardous PV waste to overseas locations in countries without the infrastructure to deal with such waste.
- Third party performance review of any new PV recycling regulations proposed by DTSC

In addition, SVTC strongly recommends that DTSC include provisions for a third party review of the proposed regulations. SVTC recommends that a third party review of DTSC's Proposed Standards for Management of Waste Solar Panels include the following:

- The review should take place after the third year in which the regulations are implemented.
- DTSC should clearly state the agencies' performance goals for the proposed regulations (for example, are the goals landfill diversion, recycling rates, collection rates, in -state recycling processing etc?).
- DTSC should identify type of data to be collected and the methodology for collection.
- DTSC should request input from "stakeholders" (recyclers, manufacturers, installers, NGOs) on the type of data that should be collected, the methodology and ways in which to stream line the data collection process.

This type of review process is imperative to the on-going support of responsible recycling in California.

As an organization that has done our best to remedy the mistakes of regulations that improperly handle electronic waste, we were hopeful that with this new industry – proactive and productive regulations could be created for the solar industry

DTSC's proposed regulations do nothing to prevent a similar crisis that is occurring with e-waste in our state. We strongly encourage you to look seriously at our comments in your current review process.

Thank you again for considering these detailed comments and suggestions. Please feel free to contact Sheila Davis (sdavis@svtc.org) at 408. 287. 6707 if you have any further questions.

Sincerely,

Sheila Davis
Executive Director

SVTC Attachment

August 11, 2010

Department of Toxic Substances Control (DTSC)
P.O. Box 806
Sacramento, CA 98512-0806,

Attention: Ellen L. Haertle, MS-22
ehaertle@dtsc.ca.gov

Re: Solar regulations regarding the exemption of hazardous panels

Dear Ellen Haertle and DTSC,

Attached are comments from the Silicon Valley Toxics Coalition (SVTC) in reference to DTSC's Proposed Standards for Management of Waste Solar Panels Department Reference Number: R-2010-01.

As expressed previously, we have grave concerns regarding DTSC's effort to deregulate hazardous waste. The proposed reclassification of PV waste leaves in place a system with no accountability. The only treatment option that can hold manufacturers accountable for product and hazardous waste stewardship is pre-financed extended producer responsibility (EPR). EPR fits with California's Green Chemistry Initiative, and a well-designed EPR can foster eco-design and green innovation.

Recent reports on TCLP, TTLC, and STLC from the Non-Toxic Solar Alliance (NTSA), the Norwegian Geotechnical Institute (NGI), and a review of both studies by the Wuppertal Institute for Climate, Environment, and Energy all suggest that a number of PV modules sold in California fail toxicity tests. Panels based on Cadmium compounds (cadmium sulfide (CdS), cadmium telluride (CdTe), cadmium stannate) are among the failing panels, making them hazardous waste. From our estimates, California utilities and homeowners will be responsible for the disposal of 900,000 pounds of cadmium based on the total planned, announced, and installed PV in California's regional grid. Yet, with the current capacity to recycle CdTe in the US, it will take 155 years to recycle this waste. Without a pre-financed collection scheme, no one will build the necessary infrastructure to recycle PV modules.

In addition, DTSC's rules do not address any environmental justice (EJ) consideration as is required by DTSC's own Environmental Justice Policy (2008). EJ considerations in this rule include, but are not limited to concerns regarding worker safety in handling hazardous end-of-life (EOL) modules.

It is important to note that a recent European Union decision to grant a four-year exemption to the Restriction on Hazardous Substances (RoHS) was based on the apparent efforts of PV Cycle and European PV Industry Association (EPIA) to establish a national recycling and collection scheme. No similar model of EPR is being proposed by SEIA or any US-based solar or PV industry association.

Finally, what are the benchmarks in the proposed rules to determine whether or not the manufacturer in question should be granted an exemption? What constitutes a solar panel "reclamation (recycling) program"? What kind of recycling rates are anticipated? Will it be administered by each solar panel vendor,

or will the industry pool its resources to build out a more comprehensive infrastructure? How much will be set aside to pay for the collection and recycling scheme? Will the money be set aside in escrow or bonded to ensure that PV modules are not orphaned when a company goes out of business?

Enclosed are three attachments. Firstly, you will first find our overall comments to the proposal in Attachment A. Attachment B contain answers to your specific questions for participants. Lastly, we have commented on some of the specific language proposed for the regulation in Attachment C.

Thank you again for considering these detailed comments and suggestions. We welcome an opportunity to discuss these with you at your earliest convenience. Please feel free to contact Sheila Davis (sdavis@svtc.org) or Dustin Mulvaney (dustin.mulvaney@gmail.com) at 408. 287. 6707 if you have any further questions.

Sincerely,

Sheila Davis
Executive Director

Dustin Mulvaney, PhD
Research Scientist

Attachment A

Important issues missing from DTSC's regulatory framework for end-of-life PV

SVTC is gravely concerned that DTSC does not have the regulatory authority to develop the necessary recycling programs to support the declassification of hazardous PV to universal waste. SVTC strongly supports a recycling program that includes all types of PV modules sold in the State of California and support the State of California's resources conservation, recycling, renewable energy and green chemistry goals.

DTSC's effort to deregulate hazardous PV modules without considering the cost or extending the financial responsibility of end-of-life management to manufacturers risks instituting sham recycling that will cause further harm to human health and the environment. The following important issues are missing from DTSC's regulatory framework for end-of-life PV.

- **Provision for Extended Producer Responsibility (EPR)**. Who is responsible for paying? The proposed regulations do not require manufacturers or "producers" to support the cost of recycling. There is an inaccurate assumption that hazardous waste recycling is profitable and that there will be a profit motive in the collection and processing. All hazardous waste has a cost associated with it. Estimates on the costs of recycling PV range from $0.02/watt for crystalline silicon PV modules in large shipments in 20 ton containers (Fthenakis 2000) to $0.04-$0.05/watt for CdTe PV modules (Bohland et al. 1997) to $0.08-$0.11/watt for CIGS modules like those manufactured by six Bay Area startups. Based on total announced, planned, and installed PV capacity in California, the cost of recycling would be over $800 million. Weakening the law without identifying who will pay the cost of recycling will lead to irresponsible and sham recycling.

- **Enforcement**. DTSC doesn't have the capacity, or the resources, to enforce a universal waste rule for solar panels. The current electronic universal waste recycling program is mismanaged and riddled with abuses. DTSC doesn't have the resources to enforce compliance for domestic recycling or the export of electronic waste. No state official has travel out of state to investigate fraudulent claims and the state has paid an estimated $30 million in ineligible claims as a result.(http://www.sacbee.com/2010/07/18/2897609/californias-pioneering-e-waste.html#storylink=scinlineshare#ixzz0wEVFJMXI) DTSC should not propose new universal waste regulations without identifying who will manage and pay for regulatory enforcement.

- **Labeling**. The proposed regulations do not include provisions for product labeling. In order to facilitate proper and safe recycling, all solar PV should be labeled for the benefit of the customers. Without a labeling regime, customers (and other generators) who put their modules in a landfill cannot be held responsible for complying with hazardous waste laws. The label used in the DTSC workshop

presentation is insufficient for an effective recycling scheme. In addition to mandatory labeling, there needs to be more discussion about the size and permanence of labels and what information is required.

- **Pre-Market Testing**. All PV panels that enter the market should be tested for hazardous materials. Testing will allow DTSC to track panels that require special handling when they become waste. Pre-market testing is also a prerequisite for product labeling, EOL handling, and will allow the state government to track PV modules that require special EOL management,

- **DTSC testing protocols and regulatory thresholds**. DTSC doesn't have testing methods for emerging materials such as nanoparticles. DTSC also has no regulatory threshold for tellurium.

- **Nanomaterial and Hazardous waste characterization**. It is unclear if nanomaterials will be characterized as hazardous waste by DTSC. The proposed Green Chemistry regulations include nanomaterials as a chemical of concern. However, it is unclear how the Green Chemistry regulations will apply to EOL. Most state hazardous waste regulations are based on TSCA's definition of hazardous waste. However, TSCA only considers certain types of nanomaterials as hazardous.

- **Domestic recycling (treatment)**. Although the proposed regulations only exempt products that are recycled (i.e., treated) domestically, there is very little incentive for recyclers to invest in hazardous waste recycling/treatment facilities based on a voluntary recycling program. The materials risk being illegally dumped, mishandled by recycler, or land filled without adequate treatment facilities.

- **Household hazardous waste**. If households and small quantity generators are not included in the universal waste rule then local governments will be responsible for the cost of hazardous waste handling of end-of-life panels. Local governments can't afford this additional waste stream.

Attachment B

Responses to questions for participants

Include examples and supporting documentation, especially in your response to Questions to Participants

1. *Should treatment of solar panels be allowed? For example, should some level of simple disassembly of the solar panels (e.g., removal of metal frames, wires) be allowed? Will that facilitate reclamation? Who should conduct such treatment?*

   If disassembly facilitates recycling than it should be allowed. Aluminum and copper are low hanging fruit in terms of recycling, and they could be of value. However, recycling the materials should not come at the expense of disposing of the remaining materials. Also, the removal of frames could make it more likely that the panel is broken, possibly releasing cadmium or lead into the environment.

2. *Do we integrate the proposed chapter 23, article 8 standards into existing chapter 23 standards?*

   The universal waste option for PV is not a sufficient response to ensuring takeback and recycling. Other articles regulated as universal waste—lamps, thermostats, and batteries—have very low rates of recycling.

3. *Under the proposed exemption in 66261.6, will transport directly to a reclamation facility allow for current solar panel recycling activities that are already in-place by some solar panel manufacturers? Will this allow for 3rd party entities to receive solar panels with ultimate disposition to a reclamation facility?*

   NA

4. *Are solar panel transporter requirements enough? Is reference to chapter 23 universal waste transporter requirements enough? Should there be specific shipping paper requirements and tracking of shipment?*

   If PV modules are known to be hazardous, then their transport should be tracked to monitor recycling rates and to ensure that it is disposed of properly.

5. *Proposed inclusion of solar panels into universal waste management scheme does not include existing household or conditionally exempt small quantity universal waste generator universal waste exemptions. Is this necessary to ensure that only universal waste solar panel handlers manage solar panels (e.g., trained solar panel installers)? Does this support current solar panel manufacturer take-back models and provide a more pro-active approach to mitigate the impact on local solid waste collection facilities/resources?*

   The only take back model currently in the industry is administered by a company that almost exclusively sells to large customers. There is currently no take back model for homeowners. Because of the nature

of PV installation, it is likely that trained installers will be onsite for decommissioning. However, the decommissioning will have to be paid for by customers as currently proposed, making it less likely that PV will be effectively recycled.

6. *Is there a need for annual reports? If so, what kind of information should be provided to DTSC, and who should provide this information?*

   An annual report should monitor recycling rates and overall policy effectiveness.

7. *Are the regulations clear on the definition of a solar panel? Are visual standards enough? How broken is broken? Is a definition for solar cell needed as well?*

   The definition of solar panel is currently too subjective.

8. *Does DTSC need information (i.e., notification) to identify "solar panel vendors"? If so, what kind of information is needed, and how frequently would that initial information be updated (e.g., annually, owner name/address changes, etc.)?*

   NA

Attachment C

Comments on the specific sections and language

§ 66260.10. Definitions.

"Solar panels" does not include physically damaged, deteriorated, or altered solar panels (or components thereof), that are no longer recognizable as intact or broken solar panels, nor does it include solar powered electronic devices that have solar cells incorporated into their structures."

COMMENT: The definition of solar panel needs to be more specific. Recognizable to whom? Are there less subjective criteria? It seems that even a shredded solar panel could still be recognizable.

§ 66261.6. Requirements for Recyclable Materials.

(8)(B) Only intact solar panels shall be managed. Any solar panel or container of solar panels that shows evidence of leakage or damage that could cause a release of hazardous constituents to the environment shall be managed in accordance with article 8 of chapter 23 of this division.

COMMENT: The definition of intact panel should be explicitly stated. What is the benchmark for evidence of leakage? Does a cracked module constitute evidence of leakage or damage?

(8)(C) A solar panel or container of solar panels shall be labeled with one of the following phrases: "Solar Panels Not Scrap Metal", or "Solar Panels Not CRT Glass".

COMMENT: Since the container is not going to remain with the panels it seems that both the panel and the container should be labeled. Also, it's not clear why PV needs to be distinguished by saying "not scrap metal" or "not CRT glass."

PROPOSED LANGUAGE: (8)(C) ~~A~~ Each solar panel ~~or~~ and container of solar panels shall be labeled with one of the following phrases: "Solar Panels Not Scrap Metal", or "Solar Panels Not CRT Glass".

(8)(D) Any spills or releases of a solar panel or components thereof shall be cleaned up immediately.

COMMENT: What does "cleaned up" mean? What does "immediately" mean? Also, it should be required that spills or releases be reported.

PROPOSED LANGUAGE: (8)(D) Any spills or releases of a solar panel or components thereof shall be reported within 24 hours, any contaminants shall be cleaned up to non-detect levels, and cleanup should ensue immediately.

§66261.9. Requirements for Universal Waste.

Universal Waste Option

COMMENT: In general most of the wastes listed in the universal wastes section have very low recycling rates.

§66273.8. Exemptions.

(c) The exemptions provided for in subsections (a) and (b) of this section shall not be applicable to the management of universal waste solar panels.

COMMENT: It is very important that households not be exempted since a great number of modules installed will be on home rooftops.

§66273.9. Definitions.

"Solar panel" means any photovoltaic module, photovoltaic panel, or other photovoltaic device that collects energy from the sun for the purpose of converting light into electricity for general electricity grid use.

COMMENT: General electricity grid use does not account for any PV modules that would be sold for off grid applications (e.g. off grid homes, water pumping systems, etc.)

PROPOSED LANGUAGE: "Solar panel" means any photovoltaic module, photovoltaic panel, or other photovoltaic device that collects energy from the sun for the purpose of converting light into electricity for general electricity ~~grid~~ use.

§ 66273.82. Notification Requirements for Handlers of Universal Waste Solar Panels

(4) A list of all of the types of universal waste solar panels managed by the handler (e.g., thin-film, crystalline silicon)

(5) A statement indicating that the handler of universal waste solar panels is accumulating more than 5,000 kilograms of universal waste solar panels at one time and the types of universal waste solar panels (e.g.,

thin-film, crystalline silicon) the handler of universal waste solar panels is accumulating above this quantity.

COMMENT: The generic term thin film is not an apprpriate identifier of the type of waste. The thin films should note what kinds of semiconductor layers the panel is made from.

PROPOSED LANGUAGE**:** (4) A list of all of the types of universal waste solar panels managed by the handler (e.g., thin-film CdTe/CdS, thin-film CIGS/CdS, thin film amorphous silicon, thin-film CIGS/InP, crystalline silicon)
(5) A statement indicating that the handler of universal waste solar panels is accumulating more than 5,000 kilograms of universal waste solar panels at one time and the types of universal waste solar panels (e.g., thin-film CdTe/CdS, thin-film CIGS/CdS, thin film amorphous silicon, thin-film CIGS/InP, crystalline silicon) the handler of universal waste solar panels is accumulating above this quantity.

§66273.83. Waste Management and Response to Releases.

(a)(1) A handler of universal waste solar panels shall contain any solar panel in a container or package that is structurally sound, adequate to prevent breakage of the solar panel, and compatible with the contents of the solar panel. Such a container or package shall lack evidence of leakage, spillage or damage that could cause leakage under reasonable foreseeable conditions.

(3) A handler of universal waste solar panels shall immediately clean up and place in a container any solar panel that is broken and shall place in a container any solar panel that shows evidence of breakage, leakage, or damage that could cause the release of solar panel glass or other hazardous constituents to the environment under reasonably foreseeable conditions. The containers shall be structurally sound, compatible with the contents of the solar panels and shall lack evidence of leakage, spillage or damage that could cause leakage or releases of solar panel glass or other hazardous constituents to the environment under reasonably foreseeable conditions.

COMMENT: The evidence of leakage, spillage, and particularly damage that could cause leakage needs to be more clearly defined.

(b)(1) A solar panel generator shall determine whether any material resulting from such a release is a hazardous waste, and if so, shall manage the hazardous waste in compliance with all applicable requirements of this division. The handler of universal waste solar panels is the generator of the hazardous waste resulting from the release, and is subject to the requirements of chapter 12.

COMMENT: Since pv is not labeled based on semiconductor type, it is not clear that the solar panel generator will even know what constituent materials the panel might have. To put the onus on the generator to determine is the release is a hazardous waste is not the best way to do this. If panels were labeled, it would be easier. It seems like part of the condition should be to label the product as hazardous waste, or at

least naming the constituent semiconductor and TCO layers.

(c) Hazardous waste consisting only of broken, or otherwise damaged solar panels, but that still satisfy the definition of solar panel in section 66273.9 may be managed as universal waste provided that the broken, or otherwise damaged solar panel is repackaged according to the standards of this section.

COMMENT: Since the definition earlier in the rules says broken panels cannot be considered solar panels, it is not clear how it could still satisfy the definition. Please clarify.

§ 66273.84. Labeling/ Marking.

(a) A handler of universal waste solar panels shall clearly label or mark solar panels (i.e., each solar panel), or a container or pallet in which solar panels are contained with the following phrase: "Universal Waste—Solar Panel(s)".

(b) In lieu of labeling individual solar panels and/or containers or pallets of solar panels pursuant to subsection (a) of this section, a handler of universal waste solar panels may accumulate universal waste solar panels within a designated area demarcated by boundaries that are clearly labeled with the following phrase: "Universal Waste—Solar Panel(s)".

COMMENT: This is not clear. Will simply a magic marker on cardboard suffice? It seems that the label should at least have stipulations about text or label size.

References

Bohland, J., I. Anisimov, and T. Dapkus. 1997. Economic Recycling of CdTe Photovoltaic Modules. In *PVSC*. Anaheim, CA.

DTSC. 2008. DTSC Environmental Justice Policy. http://www.dtsc.ca.gov/GetInvolved/upload/OEA_POL_EJ_7-08.pdf

Fthenakis, Vasilis. 2000. End-of-life mangement and recycling of PV modules. *Energy Policy* 28:1051–8.

From: Wayne Kiso [waynek@ehs-mgr.com]
Sent: Friday, August 17, 2012 6:54 AM
To: Ohta, Ronald@DTSC
Subject: Solar Panels

Ron:

I see that the public comment period has started for the solar panel rulemaking. I will be submitting comments, if only in support of the reg. Just curious in the meantime, what is the one facility in California that the Department is aware of that recycles panels?

Wayne

DTSC REGS@DTSC

From: Phin, Kathryn <Kathryn.Phin@kyocera.com>
Sent: Monday, August 20, 2012 10:09 AM
To: DTSC REGS@DTSC
Subject: RE: Management of Hazardous Waste Solar Modules Rulemaking

Thank you. In the Public Notice file on the website (Page 4), you mention one company in CA that is currently authorized to recycle solar panels. Can you tell us what that company's name is? We are manufacturing solar panels in San Diego and would like to talk to a company that could possibly help us recycle them. Thanks Kate

Kate Phin
EH&S Compliance
Kyocera America, Inc.
8611 Balboa Ave., San Diego, CA 92123-1580
858-576-2707 (desk)
858-583-9321 (cell)
Please consider the environment before printing this e-mail.

From: Von Burg, Krysia@DTSC [mailto:Krysia.VonBurg@dtsc.ca.gov] **On Behalf Of** DTSC REGS@DTSC
Sent: Friday, August 17, 2012 9:46 AM
To: Phin, Kathryn
Subject: RE: Management of Hazardous Waste Solar Modules Rulemaking

Sorry, we've experienced some technical issues with the link. Try this one:

http://www.dtsc.ca.gov/LawsRegsPolicies/Regs/Reg_Exempt_HW_Solar_Panels.cfm

Krysia Von Burg
Office of Policy
DTSC

From: Phin, Kathryn [mailto:Kathryn.Phin@kyocera.com]
Sent: Friday, August 17, 2012 8:18 AM
To: DTSC REGS@DTSC
Subject: FW: Management of Hazardous Waste Solar Modules Rulemaking

This link didn't work. Can you please update the link?

I am interested in learning more about this subject. Thanks

Kate Phin
EH&S Compliance
Kyocera America, Inc.
8611 Balboa Ave., San Diego, CA 92123-1580
858-576-2707 (desk)
858-583-9321 (cell)
Please consider the environment before printing this e-mail.

From: Department of Toxic Substances Control [mailto:departmentoftoxicsubstancescontrol@dtsc.ccsend.com] **On Behalf Of** Department of Toxic Substances Control
Sent: Thursday, August 16, 2012 2:16 PM
To: Phin, Kathryn
Subject: Management of Hazardous Waste Solar Modules Rulemaking

Department of Toxic Substances Control

August 16, 2012

Dear Regulations List Subscriber:

The Department of Toxic Substances Control (DTSC) has submitted a new rulemaking proposal to the Office of Administrative Law (OAL) for review and public comment. We are sending you this notification because you have expressed an interest in DTSC's rulemaking activities.

Proposed Regulation: **STANDARDS FOR MANAGEMENT OF HAZARDOUS WASTE SOLAR MODULES**

Department Reference Number: R-2010-01

Office of Administrative Law Notice File Number: Z-2012-0802-01

Public Comment Period: August 17, 2012 - October 1, 2012

The Public Notice and all related documents will be posted at http://www.dtsc.ca.gov/LawsRegsPolicies/Regs/index.cfm.

If you have any questions or comments, please email DTSC at regs@dtsc.ca.gov.

DTSC REGS@DTSC

From: Daniel Rivest <daniel@beyondoilsolar.com>
Sent: Friday, August 17, 2012 10:46 AM
To: DTSC REGS@DTSC
Subject: standards for management of hazardous waste solar modules

Hello:

So now that the standards have been determined. How about the CEC not buying any panels that are made out of Cadmium Telluride?

This is only common sense. Should I write this up?

--
Sunny Regards,

Daniel Rivest

Beyond Oil Solar
[redacted]

[redacted]
www.beyondoilsolar.com