SENATE COMMITTEE ON ENVIRONMENTAL QUALITY
Senator Blakespear, Chair
2025 - 2026 Regular

Bill No:	AB 864		
Author:	Ward		
Version:	7/1/2025	**Hearing Date:**	7/16/2025
Urgency:	No	**Fiscal:**	Yes
Consultant:	Brynn Cook		

SUBJECT: Hazardous waste: solar photovoltaic modules

DIGEST: This bill specifies that if solar panels can be resold, reused, or refurbished, they are designated as surplus materials, and panels that are intended for recycling shall be exempted from state hazardous waste regulations if transferred to a designated recycler, or designated as universal waste until the Department of Toxic Substance Control (DTSC) creates alternative management standards for panels.

ANALYSIS:

Existing law:

1) Creates the Hazardous Waste Control Law (HWCL) and provides the DTSC with responsibility for overseeing the management of hazardous waste in California. (Health and Safety Code (HSC) § 25100 et seq).

2) Defines hazardous wastes as those identified in regulation by DTSC; wastes categorized as hazardous under the federal Resource Conservation and Recovery Act (RCRA); and, extremely hazardous waste and acutely hazardous waste. (HSC § 25117)

3) Prohibits the disposal of any hazardous waste when the disposal is at a facility that does not have a permit from DTSC. (HSC § 25189.5)

4) Prohibits the owner or operator of a storage facility, treatment facility, transfer facility, resource recovery facility, or disposal site from accepting, treating, storing, or disposing of hazardous waste at the facility, area, or site, unless the owner or operator holds a hazardous waste facility permit or other grant of authorization from DTSC. (HSC § 25201)

5) Regulates seven categories of hazardous wastes that can be managed as universal wastes. (22 CCR § 66261.9)

6) Authorizes a recyclable material to be excluded from classification as a waste if it meets all of the following requirements:
   a) The material is held in a container, tank, containment building, or waste pile that is labeled, marked, and placarded in accordance with DTSC's requirements;
   b) The material is addressed in business plans that meet applicable state law;
   c) The material is stored and handled in accordance with all local ordinances and codes, or the material is managed in accordance with DTSC's interim status requirements; and
   d) If the material is being exported to a foreign country, the person exporting the material shall meet all applicable requirements for exporting that material. (HSC § 25143.9)

7) Defines "surplus material" as an unused raw material or commercial product obtained by a person who intended to use or sell it, but who no longer needs it, and who transfers ownership of it to another person for use in a manner for which the material or product is commonly used; specifies that surplus material is excess material. (22 CCR § 66260.10)

8) Provides that hazardous secondary material that is generated and then transferred to another person for the purpose of reclamation is not a solid waste, provided that the material meets specified requirements under federal regulation (also known as the "transfer-based exclusion"). (40 Code of Federal Regulations (CFR) § 261.4(a)(24))

9) Authorizes the recycling of hazardous secondary materials to be exempt from hazardous waste regulations if it is legitimate recycling. Provides that recycling is legitimate if it meets all of the specified requirements in federal regulation. (40 CFR § 260.43)

This bill:

1) Requires that the universal waste designation (for solar PV modules) only apply to a solar PV module that is intended for recycling and cannot otherwise be resold, reused, or refurbished. A solar PV module that can be resold, reused, or refurbished is designated as surplus material, as defined in the California Code of Regulations (CCR).

2) Provides that the universal waste designation for solar PV modules will remain in place only until DTSC adopts regulations implementing alternative management standards for solar PV modules.

3) Requires solar PV modules that are subject to existing federal transfer-based exclusion requirements and that are transferred to a legitimate recycling facility, to be managed according to the universal waste management standards for PV modules.

4) Provides that solar PV modules that are not hazardous waste, but are treated as universal waste, are exempt from regulation as hazardous waste if the modules are transferred to a designated recycler for legitimate recycling as defined under federal regulation.

Background

1) *Solar by the numbers.* California has set ambitious goals for deploying solar energy. By 2045, the state aims to generate 100% of its electricity from clean energy sources, including solar. In pursuit of this goal, California has introduced numerous policies, including grants and rebate programs, to advance the deployment of residential and commercial solar energy. In 1978, the state passed the Solar Energy Development Act, which established a goal of generating 20% of the state's electricity from solar by 2020. In 2006, California passed the Solar Initiative, which provided a number of incentives for the installation of solar panels. These incentives helped to make solar panels more affordable and accessible and led to a surge in solar panel installations. In 2018, California passed the Self-Generation Incentive Program (SGIP), which provides financial incentives for homeowners and businesses to generate their own electricity, including from solar panels. In 2017, California passed AB 1414 (Friedman, Chapter 849, Statutes of 2017), which requires all new homes be constructed with the proper infrastructure for solar installation.

   About 1.5 million homes and businesses have installed rooftop solar systems in California. California is the highest solar power generating state in the nation, with approximately 13% of the State's electric generation coming from solar in 2018 according to the California Energy Commission. The growing solar energy industry supports an increasing number of businesses and workers. According to the Solar Energy Industries Association (SEIA), there were 403 manufacturers, 1103 installers/developers, and 874 other solar businesses in California in the first quarter of 2023.

2) *Solar panels incoming (to a landfill near you).* According to a 2020 report by SEIA, there are an estimated 100,000 metric tons of solar panels in landfills in the United States. The majority of these panels are located in California, which has the largest solar market in the country. These numbers will grow at an increasing rate to reflect the increase in solar panel deployment over the last

decades. The SEIA report estimates that between 200,000 and 300,000 metric tons of solar panels will reach the end of their lifespan and be headed to landfills in the next ten years, and the International Renewable Energy Agency (IRENA) estimates that by 2030, the United States is expected to have a million tons of solar panel waste. According to the SEIA:

"[Solar panels] are designed to last more than 25 years, and many manufacturers back their products with performance guarantees backed by warranties. The lifespan of a [solar panel] is approximately 20-30 years, while the lifetime of an inverter is approximately 10 years. Therefore, many solar products have not yet reached end-of-life, and in fact, panels installed in the early 1980s are still performing at levels nearly equal to the installation performance level. Thus, even accounting for the dramatic growth of the industry, annual [solar panel] waste will not exceed 10,000 tons until after 2014, and will not exceed 100,000 tons until after 2017."

Right now, solar panel recycling suffers from a chicken-or-egg problem: there currently are not many places to recycle old solar panels, and there are not enough defunct solar panels to make recycling them economically attractive."

3) *Hazardous and universal waste.* Universal wastes are hazardous wastes that are widely produced by households and many different types of businesses. Universal wastes include televisions, computers, other electronic devices, batteries, fluorescent lamps, mercury thermostats, and other mercury containing equipment, among others.

   The hazardous waste regulations identify seven categories of hazardous wastes that can be managed as universal wastes. Any unwanted item that falls within one of these waste streams can be handled, transported, and recycled following the simple requirements set forth in the universal waste regulations versus the more stringent requirements for hazardous waste.

   California's Universal Waste Rule allows individuals and businesses to transport, handle, and recycle universal wastes in a manner that differs from the requirements for most hazardous wastes. The more relaxed requirements for managing universal wastes were adopted to ensure that they are managed safely and are not disposed of in the trash. The universal waste requirements are also less complex and structured to increase compliance.

4) *Solar Panels Waste Classification.* End-of-life disposal of solar products in the United States is governed by the Federal Waste Resource Conservation and Recovery Act (RCRA). In addition to RCRA, state policies also govern waste.

To be governed by the RCRA, solar panels must be classified as hazardous waste. To be classified as hazardous, panels must fail to pass the Toxicity Characteristics Leach Procedure (TCLP) test. Most solar panels pass the TCLP test, and thus are classified as non-hazardous and are not federally regulated. However, the production of solar panels involves toxic heavy metals, such as cadmium, copper, lead, and selenium; therefore, some solar panels are likely to exhibit the characteristic of toxicity that have adverse environmental and public health effects.

On January 1, 2021, DTSC re-classified solar panels as universal waste instead of hazardous waste, relaxing criteria on how solar panels can be handled in the waste stream and making it easier to sort, store, and transport solar panels. According to DTSC's website:

"Universal waste regulations apply to PV modules that exhibit the hazardous waste characteristic for toxicity. Not all PV modules are hazardous. PV modules can contain heavy metals such as silver, copper, lead, arsenic, cadmium, selenium, which at certain levels are classified as hazardous waste. Analytical test results, using federal and California specific toxicity test procedures, show that older PV modules have more potential for the hazardous characteristic of toxicity due to the use of substances of concern, such as lead in solders and hexavalent chromium in coatings. Cadmium telluride (CdTe) modules could have hazardous characteristic of toxicity due to the cadmium; Gallium arsenide (GaAs) modules due to arsenic; Thin film modules, such as copper indium gallium selenide (CIS/CIGS) modules due to copper and/or selenium."

Under the new universal waste requirements, solar panel handlers may accumulate solar PV panels for up to one year, while under the previous general hazardous waste requirements, handlers could only accumulate solar panels for 90 days (for large quantity generators). The longer accumulation period now allowed under law will allow handlers to transport the solar panels to destination facilities in bulk rather than on a more frequent basis. DTSC estimated that streamlining the regulations for collecting, recycling, and treating solar panels would result in cost savings of nearly $18 million per year. In addition, DTSC estimated the total statewide benefits from this regulation at more than $91 million. This estimate is partially based on e-recyclers expressing interest in expanding their businesses in light of solar panels being regulated as universal waste.

5) *Recycling hazardous waste.* On March 14, 2025, DTSC released its draft hazardous waste management plan (Plan). The Plan is organized into 10 goals,

each with specific recommendations intended to address the challenges of California's hazardous waste management system and strive towards the development of a circular economy. The Plan recommends that DTSC evaluate how the state can promote and incentivize protective hazardous waste recycling facilities in California to progress towards the state's goal of a circular economy and that DTSC evaluate incentives for new recycling facilities to operate in-state instead of relying on neighboring states or encouraging mismanagement. According to the Plan: "Recycling facilities contribute to a circular economy and are important to supporting circularity in waste streams like alternative energy sources including lithium-ion batteries and photovoltaic modules (solar panels). With proper siting and safeguards, new facilities can be designed to protect people and communities from negative impacts."

One approach to promote more recycling for hazardous waste is to make it easier to transport and store this material by granting it exclusions or exemptions from hazardous waste requirements if the material is going to legitimate recycling. The U.S. EPA has adopted exclusions and exemptions for certain types of hazardous secondary materials or the processing of hazardous waste. California, however, has not adopted all of the exclusions or exemptions for recycling hazardous wastes that the federal government has adopted. One example of an exclusion that is the law at the Federal level but not in California is the transfer-based exclusion (Title 40 of the Code of Federal Regulations section 261.4(a)(24). The transfer-based exclusion is a regulatory exclusion for hazardous secondary material that is recycled, as long as certain criteria laid out in the regulations are followed. This conditional exclusion is designed to encourage recycling of materials by third parties while still providing a regulatory framework that prevents mismanagement.

Currently, at least 15 states have adopted these exclusion rules, and the Hazardous waste Management Plan has recommended that these exclusions be evaluated California's hazardous waste management program. DTSC will begin the evaluation in 2025 and may be complete by 2026. Then, if DTSC recommends moving forward with one of these recycling exclusions, a regulatory or statutory process will be identified before implementation.

Comments

1) *Purpose of Bill.* According to the author, "As of 2022, California has the largest solar market in the United States, supplying over 20% of its electricity. Unfortunately, given a 20-30-year life span, many of these panels are beginning to reach the end of their lifecycle. This poses a huge challenge for the State to ensure these panels are properly collected and managed; however,

it also offers a huge opportunity to reclaim valuable materials and create a truly sustainable and circular market. AB 864 reduces barriers for legitimate recyclers to transport and manage these panels at the end of their useful life, by adopting the federal transfer based exclusion.*"*

2) *Adding clarity or muddying the waters?* This bill is intended to clarify how to properly manage solar PV modules. Currently, identifying how to properly manage a given solar PV module is not easy, since there are numerous overlapping factors to consider. Some of these modules are hazardous waste and need to be managed as universal waste at the end of the life: however, some panels are not hazardous waste. The entities that remove solar panels may not be certain which panels are hazardous and which are not, and may conservatively opt to manage everything under the more stringent universal waste regulations.

   Beyond that, whether or not a PV module is waste or not determines if it actually is at the *end* of its life-- if a module can be reused or refurbished, it is not at the end of its life. At what point then, is that PV module classified as waste? According to DTSC's website, solar panels become waste when the generator decides to discard them, or, for modules that will not be reused, when they are disconnected/removed from service. The implication of this guidance is that if modules are to be reused, they are not considered waste (universal or otherwise). AB 864 adds some clarity to these outstanding questions by specifying that solar panels that are removed from service and intended to resold/repurposed/refurbished are to be treated as 'surplus material', which already has set management requirements in the CCR.

   However, AB 864 also introduces some potential conflicts by mixing and matching state and federal requirements for managing solar panels, which are apples to oranges. AB 864 specifies that solar panels are not classified as waste if they meet the requirements for the Federal Transfer Based Exclusion, including that the panels go to a legitimate recycler. The panels also have to be managed as universal waste, and also have to be managed according to another set of requirements for managing waste established by DTSC. These three sets of management requirements, including the Federal and State requirements, have overlapping intentions but distinct apples-to-oranges requirements that could add more confusion on how to properly manage solar PV modules. In addition, the current language does not actually authorize modules to get the benefits of the Federal Transfer Based exclusions (which is currently not allowed in California)—it simply requires that the panels meet the requirements of the federal transfer based exclusion in order to not be classified as waste: at the same time, the panels must also be managed as universal waste,

meaning that in order to not be classified as waste, solar panels must be managed with numerous overlapping requirements for hazardous waste.

To iron out this confusion and clarify the author's intent of managing solar panels eligible for the Federal Transfer Based Exclusion in California, the author and committee may wish to strike the existing language that establishes the requirements that panels be managed in accordance with the Federal Transfer Based Exclusions and instead require DTSC to develop alternative management standards and adopt the federal transfer based exclusion for solar panels.

3) *Transitioning panels out of the universal waste designation.* In 2021, DTSC re-classified solar panels as universal waste instead of hazardous waste, relaxing criteria on how solar panels can be handled in the waste stream and making it easier to sort, store, and transport solar panels. AB 864 specifies that solar PVs that are intended for recycling, which are currently designated as universal waste, shall *only* continue to be designated as universal waste until DTSC adopts regulations implementing alternative management standards for solar PVs. Alternative management standards typically have less rigorous parameters for how to manage products compared to hazardous wastes designation. However, universal waste designation itself is already an alternative management standard (an alternative to the more rigorous hazardous waste standards). It is unclear if the bill intends to task DTSC with creating yet another alternative management standard specific to solar panels.

   Overall, AB 864 makes several changes that try to add clarity on how to manage solar panels and specifies multiple conditions in which solar panels need not be treated as universal waste. If a solar panel is going to be reused or repurposed, it is not universal waste, and AB 864 clarifies that it is surplus material. If the solar panel is going to be recycled, it can still get out of requirements to meet the universal waste regulation requirements if it's transferred to a designated recycler for legitimate recycling. With both the added clarity and specification that going to a legitimate recycler moves solar PV modules out of the universal waste designation in some cases, AB 864 specifies that only solar PV modules that are going to undesignated recyclers are still under the universal waste regulations and subject to hazardous waste regulations –and even those panels are only classified as universal waste until DTSC adopts regulations to implement alternative management standards.

   Reducing the number of solar panels that are designated as 'universal waste' when those panels are heading to recycling facilities can certainly make it easier and cheaper to store, transport and manage solar panels, although there

may be inherent risks of diminishing regulations intended to protect environmental and human health in the process.

4) *Committee amendments. **Staff recommends the committee adopt the bolded amendments contained in comment 2 above.***

Related/Prior Legislation

AB 1238 (Ward, 2023) would have added consumer-owned solar PV modules to the definition of covered electronic devices, thereby subjecting consumer-owned solar PV modules to the Electronic Waste Recycling Act. Would have created a stewardship program for the collection and recycling of non-consumer owned solar PV modules. This bill was held in the Senate Rules Committee.

AB 2 (Ward, 2023) would have added consumer-owned solar PV modules to the definition of covered electronic devices, thereby subjecting consumer-owned solar PV modules to the Electronic Waste Recycling Act. This bill was held on the suspense file in the Senate Appropriations Committee.

SUPPORT:

Alameda; County of
California Product Stewardship Council
California Solar & Storage Association
Californians Against Waste
Climate Reality Project San Diego
Climate Reality Project San Fernando Valley Chapter
Climate Reality Project, California Coalition
Climate Reality Project, Los Angeles Chapter
Climate Reality Project, Orange County Chapter
South Bayside Waste Management Authority (sbwma) Dba Rethinkwaste

OPPOSITION:
None received.

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