Date of Hearing: April 29, 2025

ASSEMBLY COMMITTEE ON ENVIRONMENTAL SAFETY AND TOXIC MATERIALS
Damon Connolly, Chair
AB 864 (Ward) – As Amended April 21, 2025

SUBJECT: Hazardous waste: solar photovoltaic modules

SUMMARY: Exempts solar photovoltaic modules (solar PV modules), not identified as hazardous waste and treated as universal waste, from state hazardous waste requirements if the solar PV modules are transferred to a designated recycler for legitimate recycling as authorized under federal law and regulation. Specifically, **this bill**:

1) Requires solar PV modules, subject to the federal transfer-based exclusion requirements under federal regulation, and transferred to a legitimate recycling facility, to be managed in accordance with those federal regulations.

2) Requires solar PV modules to comply with the requirements for recyclable materials under the Hazardous Waste Control Law (HWCL).

3) Provides that the universal waste designation (for solar PV modules) shall only apply to a solar PV module that is intended for recycling and cannot otherwise be resold, reused, or refurbished.

4) Provides that the universal waste designation for solar PV modules will remain in place until the Department of Toxic Substances Control (DTSC) adopts regulations implementing alternative management standards for solar PV modules.

5) Provides that a solar PV module that can be resold, reused, or refurbished, is designated as surplus materials, as defined in the California Code of Regulations (CCR).

6) 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.

EXISTING LAW:

1) Creates the 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 (slso 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)

FISCAL EFFECT: Unknown.

COMMENTS:

Need for the 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."

Life expectancy of a solar panel: According to the Solar Energy Industries Association, "[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.

Solar energy is ever-growing: Under California law, the renewable portfolio standard (RPS) requires 50% of all of California's energy to be generated from eligible renewable energy resources, including solar energy, by 2030. Solar power will be an integral part in reaching the RPS requirements for 2030.

End-of-life solar PV recycling: According to the 2020 article, "An overview of solar photovoltaic panels' end-of-life material recycling," published in *Energy Strategy Reviews*,:

> "End-of-life (EOL) solar panels may become a source of hazardous waste although there are enormous benefits globally from the growth in solar power generation. Global installed PV capacity reached around 400 GW at the end of 2017 and is expected to rise further to 4500 GW by 2050. Considering an average panel lifetime of 25 years, the worldwide solar PV waste is anticipated to reach between 4%-14% of total generation capacity by 2030 and rise to over 80% (around 78 million tons) by 2050. Therefore, the disposal of PV panels will become a pertinent environmental issue in the next decades. The EU has pioneered PV electronic waste regulations including PV-specific collection, recovery and recycling targets. The EU Waste of Electrical and Electronic Equipment Directive requires all producers supplying PV panels to the EU market to finance the costs of collecting and recycling EOL PV panels in Europe. Lessons can be learned from the involvement of the EU in forming its regulatory framework, to assist other countries develop locally apposite approaches.
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> Solar panels contain lead, cadmium and many other harmful chemicals that could not be removed if the entire panel is cracked. China with a larger number of solar plants, currently operates around two times as many solar panels as the United States and has no proposals for the dumping of the whole old panels. Despite the presence of environmental awareness, California, another world leader in solar panels, also has no waste disposal plan. CO_2 emissions could also be reduced by recycling solar PV waste which will consequently pose substantial positive impact on the environment. We recommend that recycling should be made commercially necessary by making manufacturers responsible for recovering materials from solar PV panels EOL."

Are solar panels hazardous? End-of-life disposal of solar products in the United States is governed by RCRA, and state policies that govern waste. To be governed by 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.

SB 489 (Monning, Chapter 419, Statutes of 2015) added section 25259 to Health and Safety Code, Division 20, Chapter 6.5, Article 17, which authorizes DTSC to adopt regulations to designate end-of-life photovoltaic modules that are identified as hazardous waste as a universal waste and subject those modules to universal waste management.

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 (22 CCR § 66261.9) 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 (22 CCR § 66261.9) versus the more stringent requirements for hazardous waste.

California's Universal Waste Rule allows individuals and businesses to transport, handle, and recycle certain common hazardous wastes, termed 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.

Hazardous Waste Management Report (Report): In July 2023, as part of its programmatic reforms, DTSC released the first Report, which presents data on the types and amounts of hazardous waste generated, transported, and disposed of in the state. The main objectives of the first Report were to establish a baseline understanding of the management of hazardous waste in California, identify data gaps and items that require additional research, and develop plans to fill data gaps. The final Report was issued by DTSC in the fall of 2023.

Hazardous Waste Management Plan (Plan): On March 14, 2025, DTSC released the draft 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.

Evaluating opportunities to support circular economy capacity: Included in the Plan is DTSC's evaluation of opportunities to support circular economy capacity:

> "DTSC recommends an evaluation on 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.
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> The Plan recommends that DTSC evaluate incentives for new recycling facilities to operate in-state instead of relying on neighboring states or encouraging mismanagement. 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 method to identify potential opportunities to promote hazardous waste recycling is through the evaluation of exemptions

and exclusions. U.S. EPA has adopted exclusions and exemptions for certain types of hazardous secondary materials or the processing of hazardous waste. However, California 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 DTSC will evaluate is 40 Code of Federal Regulations (CFR) §261.4 (a)(24). The conditions associated with this exclusion were introduced under U.S. EPA's Definition of Solid Waste (DSW) rulemakings and are intended to facilitate the legitimate reclamation of hazardous secondary materials to encourage resource conservation and materials recovery, while also maintaining protection of human health and the environment. This recycling exclusion provides a list of requirements for the safe and legitimate use of certain hazardous secondary materials. States may implement one of two separate versions of 40 CFR §261.4 (a)(24) by implementing the 2018 Transfer-Based exclusion or the 2015 Verified Recycler exclusion. Currently, 33 states have adopted at least one version of these two rules. An evaluation of these recycling exclusions is recommended to determine how they may be adopted for 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."

Clarifications for managing solar PV modules: This bill is intending to clarify how to properly manage solar PV modules. Some of these modules are hazardous waste at the end of the life, however some are not. Additionally, a person needs to make this waste determination at the end of life of the module; however, if a module can be reused or refurbished, knowing whether or not the module is a waste can be confusing. Additionally, there are federal requirements for recycling these solar PV modules that do not currently apply in California. DTSC, as part of its Plan, is currently evaluating the federal requirements that this bill is applying to the management of solar PV modules.

This bill: AB 864 is designed to provide clarity and consistency for the recycling of solar PV modules in California. This bill provides that solar PV modules that are not hazardous waste, but managed in California as universal waste, do not have to be managed as hazardous waste as long as they are transferred to a designated recycler for legitimate recycling, as authorized under federal law and regulation.

Arguments in support: According to the California Product Stewardship Council,

"California is currently listed as one of the top three states for annual solar capacity additions. In the next 25 years, rooftop solar installations are expected to continue increasing. These installations, often subsidized, will decrease California homeowners' energy bills by as much as 75% and reduce reliance on fossil fuels. The success of solar adoption has also led to a requisite increase in de-installation across the state as panels near the end of their lifecycle.

Solar panels are one of the few products that are not accepted for free at most collection sites, like other universal or household hazardous waste. There are limited opportunities for solar panel owners dropping unwanted panels at a public collection site, or directly with recyclers. As more panels are removed from rooftops, more recycling opportunities are needed. Current DTSC rules for managing solar panel waste have limitations on how collectors can

select and transfer the panels to a legitimate recycler and how that recycler can manage the panel.

AB 864 provides DTSC with a pathway for alternative management standards for solar panels, so working and repairable panels go into reuse, and nonviable, nonhazardous panels can be safely recycled in or out-of-state. Allowing transfer-based exemption for solar panels to be more easily recycled out of state supports the growing demand for industry-funded recyclers managing take-back programs and decommissioning plans."

Arguments in opposition:

None on file.

Related legislation:

1) 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 Environmental Quality Committee.

2) 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.

REGISTERED SUPPORT / OPPOSITION:

Support

California Product Stewardship Council
California Solar & Storage Association
Solar Energy Industry Association
SOLARCYCLE
The Climate Reality Project Los Angeles Chapter
The Climate Reality Project, California State Coalition
The Climate Reality Project, Los Angeles Chapter
The Climate Reality Project, San Diego Chapter
The Climate Reality Project, San Fernando Valley CA Chapter

Opposition

None on file.

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