Crystalline Silicon Photovoltaic Cells and Modules from China

Investigation Nos. 701-TA-481 and 731-TA-1190 (Second Review)

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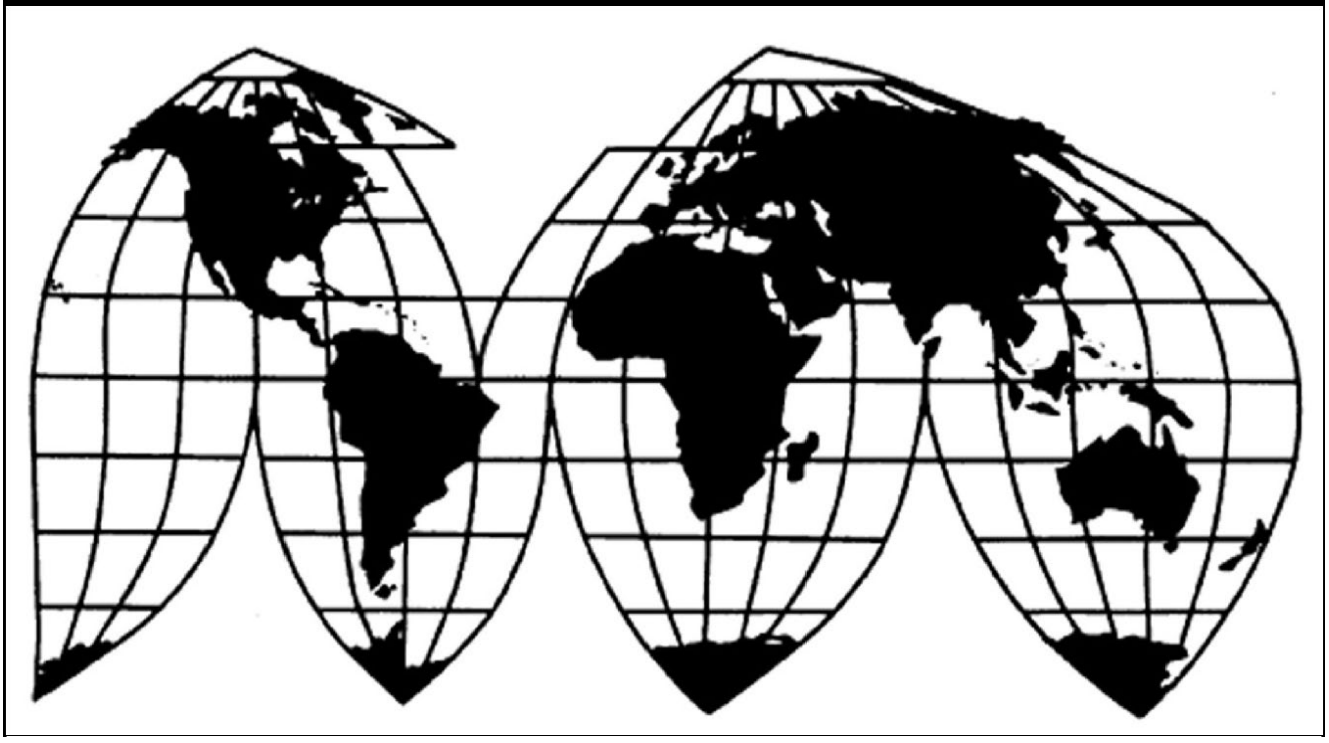
U.S. International Trade Commission



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UNITED STATES INTERNATIONAL TRADE COMMISSION

Investigation Nos. 701-TA-481 and 731-TA-1190 (Second Review)

Crystalline Silicon Photovoltaic Cells and Modules from China

DETERMINATIONS

On the basis of the record[1] developed in the subject five-year reviews, the United States International Trade Commission ("Commission") determines, pursuant to the Tariff Act of 1930 ("the Act"), that revocation of the countervailing and antidumping duty orders on crystalline silicon photovoltaic cells and modules from China would be likely to lead to continuation or recurrence of material injury to an industry in the United States within a reasonably foreseeable time.

BACKGROUND

The Commission instituted these reviews on February 1, 2024 (89 FR 6550) and determined on May 6, 2024 that it would conduct expedited reviews (89 FR 48442, June 6, 2024).

[1] The record is defined in § 207.2(f) of the Commission's Rules of Practice and Procedure (19 CFR 207.2(f)).

Views of the Commission

Based on the record in these five-year reviews, we determine under section 751(c) of the Tariff Act of 1930, as amended ("the Tariff Act"), that revocation of the antidumping duty and countervailing duty orders on crystalline silicon photovoltaic ("CSPV") cells and modules from China would be likely to lead to continuation or recurrence of material injury to an industry in the United States within a reasonably foreseeable time.

I. Background

Original Investigations. In October 2011, SolarWorld Industries America, Inc. ("SolarWorld") filed antidumping and countervailing duty petitions concerning CSPV cells and modules from China. In November 2012, the Commission determined that an industry in the United States was materially injured by reason of imports of CSPV cells and modules from China.[1] Subsequently, the Department of Commerce ("Commerce") issued antidumping and countervailing duty orders ("*CSPV 1* orders").[2] These orders covered CSPV cells produced in

[1] *Crystalline Silicon Photovoltaic Cells and Modules from China*, Inv. Nos. 701-TA-481 and 731-TA-1190 (Final), USITC Pub. 4360 (Nov. 2012) ("*CSPV 1*"); *Crystalline Silicon Photovoltaic Cells and Modules from China*, Confidential Opinion, EDIS Doc. 817286 ("*CSPV 1 Confidential Opinion*"). The Commission determined that critical circumstances did not exist with respect to subject imports from China that were covered by affirmative critical circumstances determinations in Commerce's final antidumping and countervailing duty investigations. Then Chairman Williamson and Commissioner Pinkert dissented with respect to critical circumstances.

[2] *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, from the People's Republic of China: Countervailing Duty Order*, 77 Fed. Reg. 73017 (Dep't of Commerce Dec. 7, 2012); *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules from the People's Republic of China: Antidumping Duty Order*, 77 Fed. Reg. 73018 (Dep't of Commerce Dec. 7, 2012).

China, CSPV modules assembled in China from CSPV cells made in China, and CSPV modules assembled in a third country from CSPV cells made in China.[3]

First Five-Year Reviews. In the first five-year reviews of the orders, the Commission conducted full reviews and on March 1, 2019, determined that revocation of the antidumping and countervailing duty orders on CSPV cells and modules from China would be likely to lead to continuation or recurrence of material injury to a domestic industry.[4] On March 20, 2019, Commerce issued notices of continuation of the antidumping and countervailing duty orders on CSPV cells and modules from China.[5]

Current Reviews. On February 1, 2024, the Commission instituted these second five-year reviews.[6] The Commission received a response to the notice of institution from the American Alliance for Solar Manufacturing, whose individual members, First Solar Inc., Hanwha Q CELLS USA, Inc., Heliene USA Inc., Mission Solar Energy, LLC, and Suniva, Inc. (collectively the

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[3] *Countervailing Duty Order*, 77 Fed. Reg. 73017; *Antidumping Duty Order*, 77 Fed. Reg. 73018. Three producers in China and four U.S. importers subsequently appealed the Commission's affirmative determinations to the U.S. Court of International Trade; the Court sustained the determinations as supported by substantial evidence and otherwise in accordance with law. *Changzhou Trina Solar Energy Co. v. United States Int'l Trade Comm'n*, 100 F. Supp. 3d 1314 (Ct. Int'l Trade 2015). On appeal, the U.S. Court of Appeals for the Federal Circuit rejected the Chinese respondents' claims and affirmed the Court of International Trade's judgment. *Changzhou Trina Solar Energy Co. v. United States Int'l Trade Comm'n*, 879 F.3d 1377 (Fed. Cir. 2018).

[4] *Crystalline Silicon Photovoltaic Cells and Modules from China*, Inv. Nos. 701-TA-481 and 731-TA-1190 (Review), USITC Pub. 4874 (Mar. 2019) ("*First Reviews*"); Crystalline Silicon Photovoltaic Cells and Modules from China, Confidential Opinion, EDIS Doc. 817288 ("*First Reviews Confidential Opinion*").

[5] *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China: Continuation of Countervailing Duty Order*, 84 Fed. Reg. 10299 (Dep't of Commerce Mar. 20, 2019); *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China: Continuation of Antidumping Duty Order*, 84 Fed. Reg. 10300 (Dep't of Commerce Mar. 20, 2019).

[6] *Crystalline Silicon Photovoltaic Cells and Modules from China; Institution of First Five-Year Reviews*, 89 Fed. Reg. 6550 (Feb. 1, 2024).

"Alliance") include U.S. producers of CSPV products.[7] No respondent interested party responded to the notice of institution or participated in these reviews. On May 6, 2024, the Commission found that the domestic interested party group response was adequate and that the respondent interested party group response was inadequate.[8] Finding no other circumstances that would warrant conducting full reviews, the Commission determined that it would conduct expedited reviews of the antidumping and countervailing duty orders.[9] The Alliance submitted final comments pursuant to 19 C.F.R. § 207.62(d)(1) arguing that the Commission should reach affirmative determinations.[10]

In these reviews, U.S. industry data are based on information in the joint response to the notice of institution provided by the Alliance, whose producing members are estimated to have collectively accounted for *** percent of U.S. production of CSPV products in 2023, as well as publicly available information compiled by the Commission and information contained in the recently issued safeguard monitoring report.[11] U.S. import data are based on Commerce's official import statistics.[12] Foreign industry data and related information are based on information from the original investigations and first full five-year reviews, information

[7] Confidential Domestic Response to Notice of Institution, EDIS Doc. 815434 (Mar. 4, 2024) ("Domestic Response"). Three of the five members of the Alliance are domestic producers of CSPV cells and modules: Hanwha, Heliene, and Mission. Domestic Response at 1-2 and Exhibit 1.

[8] Explanation of Commission Determination on Adequacy ("Explanation on Adequacy"), EDIS Doc. 822189 (May 23, 2024)

[9] Explanation on Adequacy.

[10] Domestic Industry's Confidential Final Comments, EDIS Doc. 831009 (Aug. 29, 2024); Domestic Industry's Final Comments, EDIS Doc. 831010 (Aug. 29, 2024).

[11] Confidential Staff Report, INV-WW-029, EDIS Doc. 819522 (Apr. 24, 2024) ("CR"); *Crystalline Silicon Photovoltaic Cells and Modules from China*, Inv. Nos. 701-TA-481 and 731-TA-1190 (Second Review), USITC Pub. 5546 (Sep. 2024) ("PR") at I-11-I-33 & Tables I-2, I-6, I-7, I-8.

[12] CR/PR at Table I-11.

submitted by the Alliance in its response to the notice of institution, and publicly available information compiled by the Commission.[13] Additionally, one firm identified by the Alliance as a U.S. purchaser of CSPV cells and modules, ***, responded to the Commission's adequacy phase purchaser questionnaire.[14]

II. Domestic Like Product and Industry

A. Domestic Like Product

In making its determination under section 751(c) of the Tariff Act, the Commission defines the "domestic like product" and the "industry."[15] The Tariff Act defines "domestic like product" as "a product which is like, or in the absence of like, most similar in characteristics and uses with, the article subject to an investigation under this subtitle."[16] The Commission's practice in five-year reviews is to examine the domestic like product definition from the original investigation and consider whether the record indicates any reason to revisit the prior findings.[17]

Commerce has defined the imported merchandise within the scope of the orders under review as follows:

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[13] CR/PR at Table I-13 to Table I-16.

[14] CR/PR at D-3. The Commission sent purchaser questionnaires to the five largest purchasers of CSPV cells and modules, as identified by the Alliance. *Id*.

[15] 19 U.S.C. § 1677(4)(A).

[16] 19 U.S.C. § 1677(10); *see*, *e.g., Cleo Inc. v. United States*, 501 F.3d 1291, 1299 (Fed. Cir. 2007); *NEC Corp. v. Department of Commerce*, 36 F. Supp. 2d 380, 383 (Ct. Int'l Trade 1998); *Nippon Steel Corp. v. United States*, 19 CIT 450, 455 (1995); *Timken Co. v. United States*, 913 F. Supp. 580, 584 (Ct. Int'l Trade 1996); *Torrington Co. v. United States*, 747 F. Supp. 744, 748-49 (Ct. Int'l Trade 1990), *aff'd*, 938 F.2d 1278 (Fed. Cir. 1991); *see also* S. Rep. No. 249, 96th Cong., 1st Sess. 90-91 (1979).

[17] *See*, *e.g.*, *Internal Combustion Industrial Forklift Trucks from Japan*, Inv. No. 731-TA-377 (Second Review), USITC Pub. 3831 at 8-9 (Dec. 2005); *Crawfish Tail Meat from China*, Inv. No. 731-TA-752 (Review), USITC Pub. 3614 at 4 (July 2003); *Steel Concrete Reinforcing Bar from Turkey*, Inv. No. 731-TA-745 (Review), USITC Pub. 3577 at 4 (Feb. 2003).

The merchandise covered by the Order is crystalline silicon photovoltaic cells, and modules, laminates, and panels, consisting of crystalline silicon photovoltaic cells, whether or not partially or fully assembled into other products, including, but not limited to, modules, laminates, panels and building integrated materials. The Order covers crystalline silicon photovoltaic cells of thickness equal to or greater than 20 micrometers, having a p/n junction formed by any means, whether or not the cell has undergone other processing, including, but not limited to, cleaning, etching, coating, and/or addition of materials (including, but not limited to, metallization and conductor patterns) to collect and forward the electricity that is generated by the cell. Merchandise under consideration may be described at the time of importation as parts for final finished products that are assembled after importation, including, but not limited to, modules, laminates, panels, building-integrated modules, building-integrated panels, or other finished goods kits. Such parts that otherwise meet the definition of merchandise under consideration are included in the scope of the Order.

Excluded from the scope of this Order are thin film photovoltaic products produced from amorphous silicon (a-Si), cadmium telluride (CdTe), or copper indium gallium selenide (CIGS). Also excluded from the scope of this Order are crystalline silicon photovoltaic cells, not exceeding 10,000mm2 in surface area, that are permanently integrated into a consumer good whose function is other than power generation and that consumes the electricity generated by the integrated crystalline silicon photovoltaic cell. Where more than one cell is permanently integrated into a consumer good, the surface area for purposes of this exclusion shall be the total combined surface area of all cells that are integrated into the consumer good. Additionally, excluded from the scope of this Order are panels with surface area from 3,450 mm2 to 33,782 mm2 with one black wire and one red wire (each of type 22 AWG or 24 AWG not more than 206 mm in length when measured from panel extrusion), and not exceeding 2.9 volts, 1.1 amps, and 3.19 watts. For the purposes of this exclusion, no panel shall contain an internal battery or external computer peripheral ports.

Modules, laminates, and panels produced in a third-country from cells produced in China are covered by this Order; however, modules, laminates, and panels produced in China from cells produced in a third-country are not covered by this Order.[18]

[18] *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China: Continuation of Countervailing Duty Order*, 84 Fed. Reg. 10299 (Dep't of Commerce Mar. 20, 2019); *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China: Continuation of Antidumping Duty Order*, 84 Fed. Reg. 10300 (Dep't of Commerce Mar. 20, 2019).

On December 17, 2021, following a changed circumstances review, Commerce revoked the orders, in part, with respect to the following off-grid small portable CSPV panels:[19]

> Also excluded from the scope of the Orders are:
>
> *1.* Off grid CSPV panels in rigid form with a glass cover, with the following characteristics:
>
> *(A)* a total power output of 100 watts or less per panel;
>
> *(B)* a maximum surface area of 8,000 cm2 per panel;
>
> *(C)* do not include a built-in inverter;
>
> *(D)* must include a permanently connected wire that terminates in either an 8mm male barrel connector, or a two-port rectangular connector with two pins in square housings of different colors;
>
> *(E)* must include visible parallel grid collector metallic wire lines every 1–4 millimeters across each solar cell; and
>
> *(F)* must be in individual retail packaging (for purposes of this provision, retail packaging typically includes graphics, the product name, its description and/or features, and foam for transport); and
>
> *2.* Off grid CSPV panels without a glass cover, with the following characteristics:
>
> *(A)* a total power output of 100 watts or less per panel;
>
> *(B)* a maximum surface area of 8,000 cm2 per panel;
>
> *(C)* do not include a built-in inverter;
>
> *(D)* must include visible parallel grid collector metallic wire lines every 1–4 millimeters across each solar cell; and
>
> (E) each panel is
>
> 1. permanently integrated into a consumer good;
> 2. encased in a laminated material without stitching, or
> 3. has all of the following characteristics: (i) the panel is encased in sewn fabric with visible stitching, (ii) includes a mesh zippered storage pocket, and (iii) includes a permanently attached wire that terminates in a female USB–A connector.
>
> In addition, the following CSPV panels are excluded from the scope of the Orders: off-grid CSPV panels in rigid form with a glass cover, with each of the following

[19] *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China: Final Results of Changed Circumstances Reviews, and Revocation of the Antidumping and Countervailing Duty Orders, in* Part, 86 Fed. Reg. 71615 (Dep't of Commerce Dec. 17, 2021).

physical characteristics, whether or not assembled into a fully completed off-grid hydropanel whose function is conversion of water vapor into liquid water:

(A) A total power output of no more than 80 watts per panel;
(B) A surface area of less than 5,000 square centimeters (cm2) per panel;
(C) Do not include a built-in inverter;
(D) Do not have a frame around the edges of the panel;
(E) Include a clear glass back panel; and
(F) Must include a permanently connected wire that terminates in a twoport rectangular connector.

On March 20, 2024, following a changed circumstances review, Commerce revoked the orders, in part, with respect to the following off-grid small portable CSPV panels:[20]

> Additionally excluded from the scope of these Orders are off-grid small portable crystalline silicon photovoltaic panels, with or without a glass cover, with the following characteristics: (1) a total power output of 200 watts or less per panel; (2) a maximum surface area of 16,000 cm2 per panel; (3) no built-in inverter; (4) an integrated handle or a handle attached to the package for ease of carry; (5) one or more integrated kickstands for easy installation or angle adjustment; and (6) a wire of not less than 3 meters either permanently connected or attached to the package that terminates in an 8mm diameter male barrel connector. Also excluded from the scope of these Orders are off-grid crystalline silicon photovoltaic panels in rigid form with a glass cover, with each of the following physical characteristics, whether or not assembled into a fully completed off-grid hydropanel whose function is conversion of water vapor into liquid water:
>
> (A) A total power output of no more than 180 watts per panel at 155 degrees Celsius;
> (B) A surface area of less than 16,000 square centimeters (cm2) per panel;
> (C) Include a keep-out area of approximately 1,200 cm2 around the edges of the panel that does not contain solar cells;
> (D) Do not include a built-in inverter;
> (E) Do not have a frame around the edges of the panel;

[20] *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China: Final Results of Changed Circumstances Reviews, and Revocation of the Antidumping and Countervailing Duty Orders, in Part*, 89 Fed. Reg. 19809 (Dep't of Commerce Mar. 20, 2024).

(F) Include a clear glass back panel;
(G) Must include a permanently connected wire that terminates in a twoport rounded rectangular, sealed connector;
(H) Include a thermistor installed into the permanently connected wire before the two-port connector; and
(I) Include exposed positive and negative terminals at opposite ends of the panel, not enclosed in a junction box.

CSPV cells are the essential element in CSPV modules (also commonly referred to as panels), which in turn are the main components of CSPV systems that convert sunlight into electricity.[21] There are four main market segments: residential, non-residential, utility on-grid applications, and off-grid applications.[22] Off-grid solar products are excluded from the scope of these reviews.[23]

CSPV cells use either monocrystalline or multicrystalline silicon to convert sunlight to electricity and may be fully square or slightly rounded.[24] CSPV cells have a positive layer, a negative layer, and a positive-negative (p/n) junction, and vary in size depending on the size of the wafer used to produce the cell.[25] CSPV cells can be monofacial, with a materialized opaque

[21] CR/PR at I-11.
[22] CR/PR at I-17.
[23] CR/PR at I-8.
[24] CR/PR at I-15. Monocrystalline cells are made from a single grown crystal and tend to have a higher conversion efficiency than multicrystalline cells, which have a random crystal structure. CR/PR at I-15. Conversion efficiency is the percent of sunlight that is converted to electricity. CR/PR at I-15, n.29.
Monocrystalline and multicrystalline cells commonly use Passive Emitter Rear Contact ("PERC") or other heterojunction technologies, such as Passivated Emitter Totally Diffused ("PERT") and Passivated Emitter Rear Locally Diffused ("PERL"). CR/PR at I-16. Monocrystalline cells can either be p-type or n-type, with n-type CSPV cells typically being more expensive to produce, but also having higher conversion efficiencies. CR/PR at I-16.
[25] CR/PR at I-14. Wafers are produced in standard sizes, ranging from 156 to 210 mm in side length. *See* CR/PR at Table I-5.

back layer, or bifacial, with a transparent or translucent back that allows the cell to convert light that hits both the front and back of the cell into electricity.[26]

CSPV modules consist of CSPV cells that are soldered together, placed on a matrix, and laminated.[27] The laminate is then typically framed in aluminum and attached to one or more junction boxes.[28] CSPV modules can be used in both ground-mounted and rooftop-mounted systems, both on and off the electrical grid.[29] As monofacial and bifacial modules have moved closer to cost parity, manufacturers have adjusted their product lines, including by purchasing bifacial cells as inputs and replacing opaque back sheets with glass.[30] The most common on-grid CSPV modules have 60 cells (or 120 half-cut cells) or 72 cells (or 144 half-cut cells).[31]

In the original investigations, the Commission found a single domestic like product consisting of CSPV cells and modules corresponding to Commerce's scope. In doing so, the Commission considered whether to define the domestic like product more broadly than the scope to include thin-film products.[32] The Commission analyzed the issue under its traditional

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[26] *See* CR/PR at I-13.

[27] CR/PR at I-25.

[28] CR/PR at I-21.

[29] CR/PR at I-17.

[30] CR/PR at I-14.

[31] CR/PR at I-16. Half-cut cells result in lower cell current, which reduces power losses and increases cell efficiency and overall module output. *Id*.

[32] *CSPV 1*, USITC Pub. 4360 at 6-12. In the preliminary phase of the original investigations, the Commission also considered whether to treat CSPV cells and modules as separate domestic like products. It further considered whether to define "off-grid" CSPV modules, which are used in CSPV systems that are designed to operate outside an electrical grid, as a separate domestic like product. *Crystalline Silicon Photovoltaic Cells and Modules from China*, Inv. Nos. 701-TA-481 and 731-TA-1190 (Preliminary), USITC Pub. 4295 at 10-12 (Dec. 2011). The Commission, noting that no party had advocated in favor of finding any of these items to be separate domestic like products, found no basis in the record to do so. *See id.* In the final phase of the investigations, the Commission found that the record continued to support the Commission's findings on these issues in its preliminary determinations. *CSPV 1*, USITC Pub. 4360 at 6.

six-factor analysis. The Commission, finding that the record demonstrated a number of differences between CSPV and thin-film products, concluded that the definition of the domestic like product should not be expanded to include thin-film products.[33]

In the first five-year reviews, the Commission found that there was no new information in the record indicating that the pertinent characteristics and uses of CSPV cells and modules had changed since the original investigations, and noted that no party had argued for a different definition of the domestic like product than that employed in the original investigations. Thus, the Commission defined a single domestic like product consisting of all domestically produced CSPV cells and modules that corresponded to the scope.[34]

In the current reviews, the Alliance agrees with the Commission's prior definition of the domestic like product, and no respondent parties participated in these reviews.[35] The available information indicates that domestic cell production ceased early in the period of review ("POR") so there is currently no domestic production of CSPV cells, although U.S. producers continue to produce CSPV modules using imported cells.[36] In the recent safeguard monitoring

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[33] Specifically, the Commission found that the two products were manufactured using different raw materials, manufacturing facilities, manufacturing processes, and production employees. Additionally, differences between the two products in terms of chemical composition, weight, size, conversion efficiency, output, inherent properties, and other factors limited their interchangeability after the design phase and in specific projects. These differences also limited overlap in distribution channels, particularly for non-utility sales. Further, a number of market participants reported viewing CSPV and thin-film products as sometimes competitive, but generally different products; they reported CSPV products to be generally higher priced than thin-film products. *CSPV 1*, USITC Pub. 4360 at 8-12.

[34] *First Reviews*, USITC Pub. 4874 at 8 n.33.

[35] Domestic Response at 32.

[36] CR/PR at Table I-9 (showing no domestic production of CSPV cells in 2023); *see Crystalline Silicon Photovoltaic Cells, Whether or Not Partially or Fully Assembled into Other Products: Monitoring Developments in the Domestic Industry*, Inv. No. TA-201-075 (Second Monitoring), USITC Pub. 5494 (Feb. 2024), at 5, I-62, II-10 n.15 (EDIS Doc. 818810) ("*Second Safeguard Monitoring*"), I-62; III-14 (noting that (Continued…)

proceedings involving CSPV cells and modules, the Commission noted that several U.S. module producers have reported that they intend to begin domestic production of CSPV cells facilities in the near term.[37] Given that the domestic industry is currently producing CSPV modules and there is the potential for domestic production of cells in the reasonably foreseeable future,[38] along with the fact that no party has advocated for a different definition, we adopt the domestic like product definition from the prior proceedings: a single domestic like product consisting of all domestically produced CSPV cells and modules that correspond to the scope description.

B. Domestic Industry

Section 771(4)(A) of the Tariff Act defines the relevant industry as the domestic "producers as a whole of a domestic like product, or those producers whose collective output of a domestic like product constitutes a major proportion of the total domestic production of the product."[39] In defining the domestic industry, the Commission's general practice has been to include in the industry producers of all domestic production of the like product, whether toll-produced, captively consumed, or sold in the domestic merchant market.

Panasonic reported domestic cell production in 2020 before shutting down its operations in June that year).

[37] *Second Safeguard Monitoring*, USITC Pub. 5494 at I-62.

[38] Because "the Commission's analysis in five-year reviews is counter-factual and prospective," *Timken Co. v. United States*, 264 F. Supp. 2d 1264, 1276 (Ct. Int'l Trade 2003), we find it appropriate to consider the effects of subject imports of cells on future domestic cell production in our analysis of whether revocation of the orders would be likely to lead to continuation or recurrence of material injury to an industry in the United States within a reasonably foreseeable time.

[39] 19 U.S.C. § 1677(4)(A). The definitions in 19 U.S.C. § 1677 are applicable to the entire subtitle containing the antidumping and countervailing duty laws, including 19 U.S.C. §§ 1675 and 1675a. *See* 19 U.S.C. § 1677.

In the original investigations, the Commission addressed whether U.S. firms that assembled CSPV cells into CSPV modules engaged in sufficient production-related activities to be considered part of the domestic industry.[40] The Commission found that module assembly operations involved non-insubstantial capital expenditures, ongoing research and development ("R&D") expenses, some automation and technical expertise, and higher employment levels, although with generally less technically skilled workers than for CSPV cell production.[41] Additionally, it found that while CSPV module operations provided lower added value than CSPV cell manufacturing, they still provided meaningful value-added. Although a relatively large portion of U.S.-made CSPV modules used CSPV cells that were imported from nonsubject or subject sources, the majority were made from domestically produced CSPV cells by the end of the period of investigation.[42] The Commission concluded that, on balance and absent contrary argument by the parties, U.S. firms assembling CSPV cells into modules engaged in sufficient production-related activities to be included in the domestic industry.[43]

Additionally, two U.S. producers, Suntech and Motech, were subject to possible exclusion pursuant to the related parties provision by virtue of their imports of subject merchandise from China.[44] Both companies also were affiliated with producers and exporters of subject merchandise in China. The Commission determined that appropriate circumstances did not exist to exclude Motech from the domestic industry, but that appropriate circumstances

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[40] *CSPV 1*, USITC Pub. 4360 at 12-13.
[41] *CSPV 1*, USITC Pub. 4360 at 12-13.
[42] *CSPV 1*, USITC Pub. 4360 at 13.
[43] *CSPV 1*, USITC Pub. 4360 at 12-13.
[44] *CSPV 1*, USITC Pub. 4360 at 14-16.

existed to exclude Suntech from the domestic industry because its interests lay more with importing than domestic production.[45] Thus, the Commission defined the domestic industry to include all producers of CSPV products, including domestic assemblers of CSPV modules, except for Suntech.[46]

In the first five-year reviews, the Commission determined that there were no new facts on the record that would warrant revisiting its finding that U.S. firms assembling CSPV modules engage in sufficient production-related activities to include these firms in the domestic industry.[47] The Commission also found that appropriate circumstances did not exist to exclude any U.S. producers from the domestic industry pursuant to the related parties provision.[48] Thus, the Commission defined the domestic industry to include all producers of CSPV products, including domestic assemblers of CSPV modules.[49]

In the current reviews, the Alliance agrees with the Commission's definition of the domestic industry in the original investigations.[50] It does not address whether assemblers of CSPV modules engage in sufficient production-related activities to be included in the domestic industry. The record in these reviews does not contain any new information that would alter the prior finding that U.S. firms assembling CSPV modules engage in sufficient production-related activities to include these firms in the domestic industry.

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[45] *CSPV 1*, USITC Pub. 4360 at 14-16.
[46] *CSPV 1*, USITC Pub. 4360 at 16.
[47] *First Reviews*, USITC Pub. 4874 at 9-10.
[48] *First Reviews*, USITC Pub. 4874 at 10.
[49] *First Reviews*, USITC Pub. 4874 at 10.
[50] Domestic Response at 35.

The Alliance also reported that there are "known related parties" but did not provide specific information or address whether appropriate circumstances exist to exclude any U.S. producer from the domestic industry.[51] The Alliance further states that the companies that comprise the Alliance are not related to a foreign producer or exporter of subject merchandise and no member of the Alliance is an importer of the subject merchandise or "reasonably believes that it is related to such importers."[52]

There is no specific information in the current record regarding any importation of subject CSPV modules by U.S. producers or whether any U.S. producer is subject to possible exclusion under the related parties provision because of a relationship with a foreign producer, exporter, or U.S. importer of subject merchandise.[53] Because there has not been domestic production of CSPV cells since at least January 2020, U.S. producers of CSPV modules have had to import or purchase foreign-produced CSPV cells for domestic module assembly during the POR.[54] However, the limited information available does not indicate whether any U.S. producer

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[51] Domestic Response at 35 & Exhibit 1. The Alliance submitted lists of U.S. producers of the domestic like product as well as importers and foreign producers of subject merchandise, which appears to indicate that some U.S. producers may also be importers of subject merchandise and/or related to importers or foreign producers of subject merchandise. Domestic Response at Exhibit 1.

[52] Domestic Response at 32. The Alliance also reported that ***. Domestic Response at Exhibit 1.

[53] In the Second Safeguard Monitoring report, the Commission noted that all responding U.S. producers reported that they were either related to U.S. importers of CSPV products or were themselves direct importers of CSPV products. This report, however, is not specific to imports of CSPV products from China and the specific information regarding importing activities is business proprietary information that is redacted in the publication that is on the current record. *Second Safeguard Monitoring*, USITC Pub. 5494 at I-85 & Tables III-17, III-18. Similarly, although the Commission found that six U.S. producers reported related foreign producers of CSPV products, the safeguard report is not specific to producers in China and the specific information regarding the nature of these relationships is redacted business proprietary information. *Second Safeguard Monitoring*, USITC Pub. 5494 at I-85 & Table I-20.

[54] *See Second Safeguard Monitoring*, USITC Pub. 5494 at 4.

imported or purchased subject CSPV cells such that they would be subject to possible exclusion pursuant to the related parties provision.[55] Moreover, there is no company-specific data for 2023 to exclude for producers that are not members of the Alliance. Thus, consistent with our definition of the domestic like product, we define the domestic industry as all domestic producers of CSPV cells and modules.

III. Revocation of the Antidumping and Countervailing Duty Orders Would Likely Lead to Continuation or Recurrence of Material Injury Within a Reasonably Foreseeable Time

A. Legal Standards

In a five-year review conducted under section 751(c) of the Tariff Act, Commerce will revoke an antidumping or countervailing duty order unless: (1) it makes a determination that dumping or subsidization is likely to continue or recur and (2) the Commission makes a determination that revocation of the antidumping or countervailing duty order "would be likely to lead to continuation or recurrence of material injury within a reasonably foreseeable time."[56] The SAA states that "under the likelihood standard, the Commission will engage in a counterfactual analysis; it must decide the likely impact in the reasonably foreseeable future of an important change in the status quo – the revocation or termination of a proceeding and the elimination of its restraining effects on volumes and prices of imports."[57] Thus, the likelihood

[55] As discussed below in Section III.B.2, the available information indicates that nonsubject imports are the largest source of supply to the U.S. market, accounting for *** percent of apparent U.S. consumption in 2023. CR/PR at Table I-12.

[56] 19 U.S.C. § 1675a(a).

[57] SAA at 883-84. The SAA states that "{t}he likelihood of injury standard applies regardless of the nature of the Commission's original determination (material injury, threat of material injury, or material retardation of an industry). Likewise, the standard applies to suspended investigations that were never completed." *Id*. at 883.

standard is prospective in nature.[58] The U.S. Court of International Trade has found that "likely," as used in the five-year review provisions of the Act, means "probable," and the Commission applies that standard in five-year reviews.[59]

The statute states that "the Commission shall consider that the effects of revocation or termination may not be imminent, but may manifest themselves only over a longer period of time."[60] According to the SAA, a "'reasonably foreseeable time' will vary from case-to-case, but normally will exceed the 'imminent' timeframe applicable in a threat of injury analysis in original investigations."[61]

Although the standard in a five-year review is not the same as the standard applied in an original investigation, it contains some of the same fundamental elements. The statute provides that the Commission is to "consider the likely volume, price effect, and impact of

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[58] While the SAA states that "a separate determination regarding current material injury is not necessary," it indicates that "the Commission may consider relevant factors such as current and likely continued depressed shipment levels and current and likely continued {sic} prices for the domestic like product in the U.S. market in making its determination of the likelihood of continuation or recurrence of material injury if the order is revoked." SAA at 884.

[59] *See NMB Singapore Ltd. v. United States*, 288 F. Supp. 2d 1306, 1352 (Ct. Int'l Trade 2003) ("'likely' means probable within the context of 19 U.S.C. § 1675(c) and 19 U.S.C. § 1675a(a)"), *aff'd mem.*, 140 Fed. Appx. 268 (Fed. Cir. 2005); *Nippon Steel Corp. v. United States*, 26 CIT 1416, 1419 (2002) (same); *Usinor Industeel, S.A. v. United States*, 26 CIT 1402, 1404 nn.3, 6 (2002) ("more likely than not" standard is "consistent with the court's opinion;" "the court has not interpreted 'likely' to imply any particular degree of 'certainty'"); *Indorama Chemicals (Thailand) Ltd. v. United States*, 26 CIT 1059, 1070 (2002) ("standard is based on a likelihood of continuation or recurrence of injury, not a certainty"); *Usinor v. United States*, 26 CIT 767, 794 (2002) ("'likely' is tantamount to 'probable,' not merely 'possible'").

[60] 19 U.S.C. § 1675a(a)(5).

[61] SAA at 887. Among the factors that the Commission should consider in this regard are "the fungibility or differentiation within the product in question, the level of substitutability between the imported and domestic products, the channels of distribution used, the methods of contracting (such as spot sales or long-term contracts), and lead times for delivery of goods, as well as other factors that may only manifest themselves in the longer term, such as planned investment and the shifting of production facilities." *Id*.

imports of the subject merchandise on the industry if the orders are revoked or the suspended investigation is terminated."[62] It directs the Commission to take into account its prior injury determination, whether any improvement in the state of the industry is related to the order or the suspension agreement under review, whether the industry is vulnerable to material injury if an order is revoked or a suspension agreement is terminated, and any findings by Commerce regarding duty absorption pursuant to 19 U.S.C. § 1675(a)(4).[63] The statute further provides that the presence or absence of any factor that the Commission is required to consider shall not necessarily give decisive guidance with respect to the Commission's determination.[64]

In evaluating the likely volume of imports of subject merchandise if an order under review is revoked and/or a suspended investigation is terminated, the Commission is directed to consider whether the likely volume of imports would be significant either in absolute terms or relative to production or consumption in the United States.[65] In doing so, the Commission must consider "all relevant economic factors," including four enumerated factors: (1) any likely increase in production capacity or existing unused production capacity in the exporting country; (2) existing inventories of the subject merchandise, or likely increases in inventories; (3) the existence of barriers to the importation of the subject merchandise into countries other than

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[62] 19 U.S.C. § 1675a(a)(1).

[63] 19 U.S.C. § 1675a(a)(1). Commerce has not made any duty absorption findings. *See Issues and Decision Memorandum for the Final Results of the Expedited Second Sunset Review of the Antidumping Duty Order on Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, from the People's Republic of China*, EDIS Doc. 831219 ("Commerce AD Issues and Decision Memo"); *Issues and Decision Memorandum for the Final Results of the Expedited Second Sunset Review of the Countervailing Duty Order on Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, from the People's Republic of China*, EDIS Doc. 830512 ("Commerce CVD Issues and Decision Memo").

[64] 19 U.S.C. § 1675a(a)(5). Although the Commission must consider all factors, no one factor is necessarily dispositive. SAA at 886.

[65] 19 U.S.C. § 1675a(a)(2).

the United States; and (4) the potential for product shifting if production facilities in the foreign country, which can be used to produce the subject merchandise, are currently being used to produce other products.[66]

In evaluating the likely price effects of subject imports if an order under review is revoked and/or a suspended investigation is terminated, the Commission is directed to consider whether there is likely to be significant underselling by the subject imports as compared to the domestic like product and whether the subject imports are likely to enter the United States at prices that otherwise would have a significant depressing or suppressing effect on the price of the domestic like product.[67]

In evaluating the likely impact of imports of subject merchandise if an order under review is revoked and/or a suspended investigation is terminated, the Commission is directed to consider all relevant economic factors that are likely to have a bearing on the state of the industry in the United States, including but not limited to the following: (1) likely declines in output, sales, market share, profits, productivity, return on investments, and utilization of capacity; (2) likely negative effects on cash flow, inventories, employment, wages, growth, ability to raise capital, and investment; and (3) likely negative effects on the existing development and production efforts of the industry, including efforts to develop a derivative or more advanced version of the domestic like product.[68] All relevant economic factors are to be

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[66] 19 U.S.C. § 1675a(a)(2)(A-D).

[67] *See* 19 U.S.C. § 1675a(a)(3). The SAA states that "{c}onsistent with its practice in investigations, in considering the likely price effects of imports in the event of revocation and termination, the Commission may rely on circumstantial, as well as direct, evidence of the adverse effects of unfairly traded imports on domestic prices." SAA at 886.

[68] 19 U.S.C. § 1675a(a)(4).

considered within the context of the business cycle and the conditions of competition that are distinctive to the industry. As instructed by the statute, we have considered the extent to which any improvement in the state of the domestic industry is related to the orders under review and whether the industry is vulnerable to material injury upon revocation.[69]

No respondent interested party participated in these expedited reviews. The record, therefore, contains limited new information with respect to the CSPV cells and modules industry in China. There also is limited information on the CSPV products market in the United States during the POR. Accordingly, for our determination, we rely as appropriate on the facts available from the original investigations and first reviews, and the limited new information on the record in these second five-year reviews.

B. Conditions of Competition and the Business Cycle

In evaluating the likely impact of the subject imports on the domestic industry if an order is revoked, the statute directs the Commission to consider all relevant economic factors "within the context of the business cycle and conditions of competition that are distinctive to the affected industry."[70] The following conditions of competition inform our determinations.

1. Demand Conditions

In the original investigations, the Commission found that despite a severe downturn in macroeconomic conditions, apparent U.S. consumption of CSPV products increased from 2009

[69] The SAA states that in assessing whether the domestic industry is vulnerable to injury if the order is revoked, the Commission "considers, in addition to imports, other factors that may be contributing to overall injury. While these factors, in some cases, may account for the injury to the domestic industry, they may also demonstrate that an industry is facing difficulties from a variety of sources and is vulnerable to dumped or subsidized imports." SAA at 885.

[70] 19 U.S.C. § 1675a(a)(4).

to 2011.[71] The Commission observed that demand for CSPV products was derived from the demand for solar electricity, which was affected by factors such as total energy consumption, environmental concerns, cost competitiveness with traditional energy sources, and the availability of Federal, state, and local incentives to reduce the cost of solar-generated electricity and stimulate demand.[72] Competition with renewable-energy electricity-generators such as thin-film solar systems also affected demand for CSPV systems and their components.[73]

In the first five-year reviews, the Commission found that demand for CSPV cells and modules remained dependent on the demand for solar electricity, which continued to be impacted by factors such as cost competitiveness with other electricity sources. Electricity providers using renewable energy sources seek to achieve "grid parity" with other sources of electricity (the price at which the levelized cost of electricity generated from renewable sources is competitive with the cost of electricity generated by conventional sources such as coal and natural gas) and their ability to do so affects demand for these products.[74] The Commission also found that changes in Federal, state, and local government incentives affected demand for CSPV products. These programs offset the cost of generating solar energy, mandated or encouraged its use, or otherwise influenced the price for solar energy, which stimulated

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[71] *CSPV 1*, USITC Pub. 4360 at 24. Apparent U.S. consumption of CSPV cells and modules was *** MW in 2009, *** MW in 2010, and *** MW in 2011; it was *** MW in interim 2011 and *** MW in interim 2012. *CSPV 1 Confidential Opinion* at 36.

[72] *CSPV 1*, USITC Pub. 4360 at 21, 23-24. The Commission observed that Federal, state, and local government programs, which were intended to reduce the cost of solar-generated electricity (and electricity generated by other renewable energy sources), successfully stimulated demand for CSPV products in the United States. *See id.* at 22-23.

[73] *CSPV 1*, USITC Pub. 4360 at 22.

[74] *First Reviews*, USITC Pub. 4874 at 15. The levelized cost of electricity varies by region, time of the day, and availability of other electricity sources. *Id*.

demand for renewable energy sources.[75] These programs assisted solar electricity developers in achieving economies of scale to become more competitive with conventional sources of energy.[76] During the period of review in the first five-year reviews, apparent U.S. consumption of cells increased by *** percent, increasing from *** kW in 2012 to *** kW in 2017.[77]

In the current five-year reviews, the information available indicates that demand for CSPV cells and modules continues to derive from the demand for solar-generated electricity. The Alliance argues that the share of electricity generated by renewable sources increases each year, which drives demand for CSPV cells and modules.[78] Government incentives continue to play an important role in driving demand, as many U.S. producers announced plans for new facilities after Congress enacted the Inflation Reduction Act ("IRA") in 2022.[79] The IRA extended the Investment Tax Credit and the Production Tax Credit, which are two major federal policies that promote solar energy.[80] Apparent U.S. consumption of CSPV cells and modules was *** kW in 2023, which is higher than apparent U.S. consumption in 2017 at *** kW.[81]

2. Supply Conditions

In the original investigations, the Commission observed that during the period of investigation, a number of U.S. firms began production of CSPV cells and/or CSPV modules in the United States as demand increased, but that a substantial number of domestic producers

[75] *First Reviews*, USITC Pub. 4874 at 15.
[76] *First Reviews*, USITC Pub. 4874 at 15.
[77] *First Reviews Confidential Opinion* at 24.
[78] Domestic Response at 34.
[79] CR/PR at I-26.
[80] CR/PR at I-26.
[81] CR/PR at I-39.

also shuttered facilities and/or declared bankruptcy.[82] The Commission found that the domestic industry's market share declined during the period of investigation, while the respective market shares of subject imports and nonsubject imports increased.[83]

In the first five-year reviews, the domestic industry's share of apparent U.S. consumption decreased each year but one of the POR, accounting for *** percent of apparent U.S. consumption in 2012, *** percent in 2013, *** percent in 2014, *** percent in 2015, *** percent in 2016, and *** percent in 2017; it was lower in interim 2018 at *** percent than in interim 2017 at *** percent.[84] There was substantial turnover of domestic producers of CSPV products; several firms exited the domestic industry in each full year of the period of review while several firms began manufacturing CSPV cells and/or CSPV modules.[85] Subject imports' share of apparent U.S. consumption increased irregularly during the period of review, from *** percent in 2012 to *** percent in 2017; it was lower in interim 2018 than in interim 2017.[86] Nonsubject imports' share of apparent U.S. consumption increased irregularly from 2012 to 2017; it was higher in interim 2018 than in interim 2017.[87]

In the current reviews, the domestic industry was the second largest source of supply in the U.S. market in 2023, accounting for *** percent of apparent U.S. consumption by

[82] *CSPV 1*, USITC Pub. 4360 at 25-26.

[83] *CSPV 1*, USITC Pub. 4360 at 25. The domestic industry's market share declined from *** percent in 2009 to *** percent in 2011; it was *** percent in interim 2011 and *** percent in interim 2012. *CSPV1 Confidential Opinion* at 54 n.322.

[84] *First Reviews Confidential Opinion* at 26.

[85] *First Reviews Confidential Opinion* at 26.

[86] *First Reviews Confidential Opinion* at 28.

[87] *First Reviews Confidential Opinion* at 28.

quantity.[88] This was higher than the domestic industry's *** percent share of apparent U.S. consumption in 2017, the final full year of the prior reviews.[89]

There have been numerous changes to the domestic industry since the prior reviews. There have been several plant closures, as LG Electronics closed its 550 MW Alabama module facility in 2022, Panasonic ceased U.S. solar cell and module production in 2020,[90] and Sunenergy California closed its plant and filed for bankruptcy in 2021.[91] Several domestic producers, however, opened plants during the POI: Heliene opened a 150 MW module plant in 2018, Jinko Solar and Hanwha opened module plants in 2019, Silfab Solar and Crossroads Solar opened module plants in 2021, NanoPV opened a module production plant in 2022, Solar4America expanded its module plant in 2023, and GAF Energy opened a module production facility.[92] Several companies have also announced plans to expand or open domestic module production facilities or open domestic cell production facilities.[93]

Subject imports were the smallest source of supply in 2023, accounting for *** percent of apparent U.S. consumption that year.[94] This market share was lower than their *** percent share in 2017, the final year of the prior reviews.[95]

[88] CR/PR at Table I-12.
[89] CR/PR at Table I-12.
[90] *Second Safeguard Monitoring*, USITC Pub. 5495 at III-8.
[91] CR/PR at Table I-6.
[92] CR/PR at Table I-6.
[93] CR/PR at Table I-7 and Table I-8.
[94] CR/PR at Table I-12.
[95] CR/PR at Table I-12.

Nonsubject imports were the largest source of supply in 2023, accounting for *** percent of apparent U.S. consumption that year.[96] This market share was higher than their *** percent share in 2017, the final year of the prior reviews.[97]

3. Substitutability

In the original investigation and prior five-year reviews, the Commission found that subject imports and the domestic like product were highly substitutable.[98] The Commission also found that price was an important factor in purchasing decisions.[99]

The record in these reviews contains no new information to indicate that the degree of substitutability between the domestic like product and subject imports, or the importance of price in purchasing decisions, have changed since the prior proceedings. The Alliance argues that there is a high degree of substitutability between subject imports and the domestic like product and that price remains an important factor in purchasing decisions.[100] Accordingly, we find, as in the prior proceedings, that the domestic like product and subject imports are substitutable, and that price is an important factor in purchasing decisions.

4. Other Conditions

CSPV products from China have been the subject of other trade actions in the United States. In 2015, antidumping and countervailing duty orders (the "*CSPV 2*" orders) were imposed on additional imports of CSPV products from China, and an antidumping duty order

[96] CR/PR at Table I-12.
[97] CR/PR at Table I-12.
[98] *CSPV 1*, USITC Pub. 4360 at 27-28; *First Reviews*, USITC Pub. 4874 at 19.
[99] *CSPV 1*, USITC Pub. 4360 at 27-28; *First Reviews*, USITC Pub. 4874 at 19.
[100] Domestic Response at 17.

was imposed on imports of CSPV products from Taiwan.[101] These orders were continued in 2020 after affirmative determinations in five-year reviews by Commerce and the Commission.[102]

The President imposed a global safeguard measure on imports of CSPV products under Section 201 of the Trade Act of 1974 for a period of four years beginning on February 7, 2018, in the form of (1) a tariff-rate quota on imports of CSPV cells not partially or fully assembled into other products, and (2) additional duties on imports of CSPV modules.[103] On February 4, 2022, the President announced an extension of the safeguard measure for an additional four years through February 6, 2026, with modifications.[104]

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[101] *Certain Crystalline Silicon Photovoltaic Products From the People's Republic of China: Antidumping Duty Order; and Amended Final Affirmative Countervailing Duty Determination and Countervailing Duty Order*, 80 Fed. Red. 8592 (Feb. 18, 2015); *Certain Crystalline Silicon Photovoltaic Products From Taiwan: Antidumping Duty Order*, 80 Fed. Reg. 8596 (Feb. 18, 2015); *Certain Crystalline Silicon Photovoltaic Products from China and Taiwan*, Inv. Nos. 701-TA-511 and 731-TA-1246-1247 (Final), USITC Pub. 4519 (Feb. 2015).

These orders cover imports of the following: (1) CSPV modules assembled in China from CSPV cells made in Taiwan and (2) CSPV modules assembled in China from CSPV cells made in third countries. Commerce defined the subject merchandise from Taiwan to include U.S. imports of: (1) CSPV cells made in Taiwan; (2) CSPV modules assembled in Taiwan from CSPV cells made in Taiwan; and (3) CSPV modules assembled in third countries other than China from CSPV cells made in Taiwan. Therefore, the module assembly location determined the country of origin for U.S. imports of modules from China, except for modules covered by the prior CSPV I orders (which were considered nonsubject merchandise from China in the *CSPV 2* investigations), while the cell manufacture location determined the country of origin for U.S. imports of cells and modules from Taiwan.

[102] *Crystalline Silicon Photovoltaic Products From the People's Republic of China and Taiwan: Continuation of Antidumping and Countervailing Duty Orders on China and the Antidumping Duty Order on Taiwan*, 85 Fed. Reg. 56215 (Sept. 11, 2020); *Certain Crystalline Silicon Photovoltaic Products from China and Taiwan*, Inv. Nos. 701-TA-511 and 731-TA-1246-1247 (Final), USITC Pub. 5112 (Aug. 2020).

[103] In June 2019, USTR granted an exclusion for bifacial CSPV modules from the safeguard measures. *See Presidential Proclamation 10339 of February 4, 2022*, 87 Fed. Reg. 7357 (Feb. 9, 2022).

[104] *Presidential Proclamation 10339 of February 4, 2022*, 87 Fed. Reg. 7357 (Feb. 9, 2022).

Effective August 23, 2018, CSPV cells and modules from China became subject to an additional 25 percent ad valorem duty under Section 301 of the Trade Act of 1974.[105]

Effective August 23, 2023, Commerce made final affirmative determinations of circumvention of the *CSPV 1* orders with respect to imports from Cambodia, Malaysia, Thailand, and Vietnam.[106] On June 6, 2022, before Commerce made a preliminary determination in those proceedings, the President issued a proclamation declaring an emergency and authorizing the Secretary of Commerce to take action to permit, for up to 24 months, imports of CSPV products from Cambodia, Malaysia, Thailand, and Vietnam to be free of any antidumping or countervailing duties from the anticircumvention proceeding (the "tariff holiday").[107] Commerce's Federal Register notice for its final determinations provided that it would not require cash deposits for entries subject to the circumvention proceeding for the duration of the emergency declared by the President, so long as those imports occurred on or before the end of the emergency period and the imports were assembled into U.S. solar energy products within 180 days thereafter.[108] Commerce also provided a certification mechanism for firms to

[105] CR/PR at I-10.

[106] *Antidumping and Countervailing Duty Orders on Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, From the People's Republic of China: Final Scope Determination and Final Affirmative Determinations of Circumvention With Respect to Cambodia, Malaysia, Thailand, and Vietnam*, 88 Fed. Reg. 57419 (Aug. 23, 2023).

[107] *Presidential Proclamation 10414 of June 6, 2022, Declaration of Emergency and Authorization for Temporary Extensions of Time and Duty-Free Importation of Solar Cells and Modules from Southeast Asia*, 87 Fed. Reg. 35087 (June 9, 2022).

[108] *Antidumping and Countervailing Duty Orders on Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, From the People's Republic of China: Final Scope Determination and Final Affirmative Determinations of Circumvention With Respect to Cambodia, Malaysia, Thailand, and Vietnam*, 88 Fed. Reg. 57419 (Aug. 23, 2023).

demonstrate that particular merchandise was not subject to the circumvention requirements.[109]

C. Likely Volume of Subject Imports

1. Original Investigations and Prior Reviews

In the original investigations, the Commission found that the volume of subject imports was significant both in absolute terms and relative to consumption and production in the United States, and that the increase in subject import volume was also significant, both in absolute terms and relative to consumption and production in the United States.[110] The Commission found that the volume of U.S. shipments of subject imports increased substantially faster than the rapid growth in apparent U.S. consumption throughout the POI, with subject imports' growth of *** percent between 2009 and 2011 being more than double the very significant *** percent growth of apparent U.S. consumption during the same period.[111] Subject imports' share of apparent U.S. consumption was *** percent in 2009, *** percent in 2010, and *** percent in 2011; their share of apparent U.S. consumption was *** percent in interim 2011 and *** percent in interim 2012.[112]

In the first five-year reviews, the Commission found that the volume of subject imports would be significant if the orders were revoked. Because there was limited questionnaire coverage of the Chinese industry, the Commission relied primarily on publicly available data,

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[109] *Antidumping and Countervailing Duty Orders on Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, From the People's Republic of China: Final Scope Determination and Final Affirmative Determinations of Circumvention With Respect to Cambodia, Malaysia, Thailand, and Vietnam*, 88 Fed. Reg. 57419, 57421-57423 (Aug. 23, 2023).

[110] *CSPV 1*, USITC Pub. 4360 at 28-30.

[111] *CSPV 1 Confidential Opinion* at 43.

[112] *CSPV 1 Confidential Opinion* at 43 n.255.

including official import statistics, in examining the subject industry. The available data showed that there was enormous and growing CSPV cell and module production capacity in China and substantial unused capacity.[113] Specifically, CSPV cell production capacity increased from 40 GW in 2012 to 82.8 GW in 2017, and CSPV module production capacity increased from 40 GW in 2012 to 105 GW in 2017, which exceeded the total wattage of CSPV systems installed worldwide that year.[114] Chinese producers also significantly increased production of both cells and modules, but also maintained unused capacity for cells and modules that each exceeded the size of apparent U.S. consumption in 2017.[115]

The Commission found that subject producers in China were highly export-oriented, and that even with the orders in place the United States was among the top three destination markets for CSPV cell and module exports from China for most of the period of review.[116] Subject imports accounted for *** percent of apparent U.S. consumption in 2012, *** percent in 2013, *** percent in 2014, *** percent in 2015, *** percent in 2016, and *** percent in 2017; they accounted for *** percent in interim 2017 and *** percent in interim 2018.[117] The Commission also found that the Section 201 and Section 301 tariffs would not provide sufficient disincentive for Chinese producers to export CSPV products to the United States upon revocation of the orders.[118] The pricing data on the record showed that in 2018 CSPV module

[113] *First Reviews*, USITC Pub. 4874 at 24.
[114] *First Reviews*, USITC Pub. 4874 at 24.
[115] *First Reviews*, USITC Pub. 4874 at 24.
[116] *First Reviews*, USITC Pub. 4874 at 24.
[117] *Confidential First Reviews* at 39.
[118] *First Reviews*, USITC Pub. 4874 at 26.

prices in the United States were substantially higher than those in China, which demonstrated that the U.S. market was still an attractive destination despite the Section 201 and 301 tariffs.[119]

2. Current Reviews

Subject imports maintained a presence in the U.S. market throughout the period of review, while under the disciplining effects of the orders. Subject import volume increased from 190,314 kW in 2018 to 535,511 kW in 2019 and 1.4 million kW in 2020, before decreasing to 218,482 kW in 2021, 196,537 kW in 2022, and 51,961 kW in 2023.[120] Subject imports accounted for *** percent of apparent U.S. consumption of CSPV cells and modules in 2023, compared to *** percent in 2017.[121]

The record in these reviews contains limited information on the CSPV cells and module industry in China. The available information indicates that subject producers have the ability and incentive to export subject merchandise to the U.S. market at significant volumes if the orders were revoked.

The Alliance identified hundreds of possible producers of CSPV cells and modules in China.[122] The information available indicates that subject producers in China have substantial capacity that could be used to increase exports of CSPV cells and modules to the U.S. market if

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[119] The Commission also did not find persuasive the Chinese respondents' argument that the volume of subject imports would not likely be significant if the orders were revoked due to the global restructuring of the industry, which entailed long-term investments in new production facilities outside of China. The record indicated that subject producers added substantial capacity and increased production in China throughout the POR. *First Reviews*, USITC Pub. 4874 at 25.

[120] CR/PR at Table I-11.

[121] CR/PR at Table I-12.

[122] CR/PR at I-40; Domestic Response at Exhibit 1. The Alliance provided a list of 448 possible producers, but the list likely overstates the actual number of producers of CSPV cells and modules in China because it includes numerous freight forwarding and logistics firms as well as several duplicate entries. CR/PR at Table I-40 n.53.

the orders were revoked.[123] According to information submitted by the Alliance, Chinese producers tripled their CSPV module production capacity in four years, from 130 GW in 2018 to almost 400 GW in 2022, and then doubled that capacity in 2023, surpassing 800 GW of CSPV module production capacity.[124] Other record evidence indicates that Chinese producers have opened CSPV cell and module production facilities during the POR.[125] For example, Risen Energy opened a 5 GW CSPV cell and module plant in January 2019, LONGi Green Energy opened a 5 GW CSPV module plant in 2019,[126] and Chinese producer Trina Solar opened a plant with 10GW of CSPV cell capacity and 10 GW of CSPV module capacity in April 2023.[127] Further, Chinese CSPV cell and module production is projected to grow by 21 percent in 2024 and, by end of 2024, the Chinese CSPV industry's existing capacity is projected to be sufficient to meet annual global demand through 2032.[128]

The information available also indicates that subject producers in China export substantial quantities of products that include subject merchandise. Global Trade Atlas data indicate that, throughout the POR, China was the world's largest exporter of CSPV cells and modules covered by Harmonized Schedule ("HS") subheadings 8541.40, 8541.42, and 8541.43, which include CSPV cells and modules as well as out-of-scope products.[129] These data also

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[123] Domestic Response at 21-23.

[124] Domestic Response at 22; Domestic Response at Exhibit 3 (*Manufacturing capacity of solar photovoltaic modules in China from 2018 to 2022*, Statista (Feb. 2023).

[125] CR/PR at Table I-13.

[126] CR/PR at Table I-13.

[127] CR/PR at Table I-13.

[128] Domestic Response at 23, Domestic Response at Exhibit 6 (John Fitzgerald Weaver, *A terawatt of solar module capacity expected within 16 months*, PV Magazine (Sep. 13, 2023); Domestic Response at Exhibit 7 (*China to hold over 80% of global solar manufacturing capacity from 2023-2026*, Wood Mackenzie (Nov. 7,2023).

[129] CR/PR at Table I-16.

show that the value of China's total exports of such merchandise increased irregularly over the POR from $18.2 billion in 2018 to $43.8 billion in 2023.[130]

The record also indicates that the United States remains an attractive market for the subject producers. As discussed above, subject imports maintained a presence in the U.S. market throughout the POR. The United States is a rapidly growing market for CSPV cells and modules; apparent U.S. consumption rose from *** kW in 2017 to *** kW in 2023.[131] Furthermore, Commerce's determinations that some imports of CSPV cells and modules from Cambodia, Malaysia, Thailand, and Vietnam are circumventing these antidumping and countervailing duty orders indicate that Chinese producers seek to serve the U.S. market through other avenues of access.[132] Moreover, trade measures on CSPV products from China in third country markets would likely make the U.S. market relatively more attractive in the event of revocation. Brazil imposed a 12 percent tariff on CSPV modules from China in February 2024.[133] Canada continued prior antidumping duties of 124.4 percent, and countervailing duties of 6.2 percent, on CSPV modules from China in January 2021.[134] Turkey continued antidumping duties of $20 to $25 per square meter on CSPV modules from China in September 2023.[135]

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[130] CR/PR at Table I-16. In 2023, the next largest global exporter, the Netherlands, exported $7.9 billion of CSPV cells and modules. *Id*.

[131] CR/PR at Table I-12.

[132] *Antidumping and Countervailing Duty Orders on Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, from the People's Republic of China: Final Scope Determination and Final Affirmative Determinations of Circumvention With Respect to Cambodia, Malaysia, Thailand, and Vietnam*, 88 Fed. Reg. 57419 (Dep't of Commerce Aug. 23, 2023).

[133] CR/PR at Table I-15.

[134] CR/PR at I-45.

[135] CR/PR at I-46.

Given the foregoing, including the significant volume and market share of subject imports in the original investigation, the presence of subject imports from China in the U.S. market during the period of review and Commerce's circumvention findings regarding imports from other countries that originated in China, the large size and exports of the subject industry, and the attractiveness of the U.S. market, we conclude that the volume of subject imports would likely be significant, both in absolute terms and relative to consumption, if the orders were revoked.[136]

D. Likely Price Effects

1. Original Investigations and Prior Reviews

In the original investigations, the Commission found that, given the high degree of substitutability between the subject imports from China and the domestic like product, competition in the U.S. CSPV products market was based primarily on price.[137] The quarterly pricing comparison data showed that subject imports undersold the domestic like product in 35 of 46 (76.0 percent of) possible quarterly comparisons, at margins ranging as high as ***

[136] Given the subject industry's large size and export orientation, the attractiveness of the U.S. market, and that Commerce has already found circumvention of the orders, we further find that the duties under Section 201 and Section 301 are not likely to prevent subject imports from entering the market at significant levels after revocation.

The record of these expedited reviews contains limited information about inventories of subject merchandise in China. According to information provided by the Alliance, U.S. importers have as much as 45 GW of solar modules stockpiled in warehouses in the United States, many of which are Chinese origin. Domestic Response at 25, Exhibit 2 (*Renewables 2023: Analysis and forecast to 2028*, International Energy Agency (Jan. 2024) at 70)). The Alliance argues that compared to this 45 GW stockpile, installations of CSPV systems in the United States totaled just 21 GW in 2022. *Id*. (citing *Second Safeguard Monitoring*, USITC Pub. 5494 at Table I-9).

[137] *CSPV 1*, USITC Pub. 4360 at 30.

percent.[138] The Commission concluded that there had been significant underselling of the domestic like product by subject imports from China.[139]

The Commission further concluded that this underselling enabled subject importers to gain market share at the expense of the domestic industry.[140] The Commission found that low-priced subject imports depressed prices of the domestic like product in the U.S. market to a significant degree.[141] In particular, the Commission observed that the quarterly pricing data showed a steady decline in prices for both the domestic like product and subject imports, and other record evidence, including narrative responses from purchasers confirmed lost revenue allegations, indicated that the domestic industry lowered its prices to compete with low-priced CSPV products from China.[142]

The Commission further considered whether subject imports suppressed prices for the domestic like product, observing that the domestic industry's ratio of COGS to net sales was

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[138] *CSPV 1 Confidential Opinion* at 46.

[139] *CSPV 1*, USITC Pub. 4360 at 31-33. The Commission rejected respondents' argument that there was limited head-to-head competition between subject imports and the domestic like product, observing that the pricing data showed that both U.S. importers and domestic producers offered and sold higher-wattage products as well as lower-wattage modules and that subject imports of both lower- and higher-wattage products pervasively undersold the domestic like product at wide margins in sales to all segments of the U.S. market – residential, non-residential, and utility. The Commission also rejected respondents' argument that the underselling by subject imports was not significant because the price differential between the products reflected that a significant portion of the domestic industry's pricing data consisted of higher-cost monocrystalline modules whereas subject imports largely consisted of multi-crystalline modules that did not command comparable prices. The Commission observed that the record demonstrated that, to the contrary, the domestic industry, like importers of subject merchandise from China, sold both mono- and multi-crystalline CSPV products in the U.S. market. *CSPV 1*, USITC Pub. 4360 at 32-33.

[140] *CSPV 1*, USITC Pub. 4360 at 33.

[141] *CSPV 1*, USITC Pub. 4360 at 33-35.

[142] *CSPV 1*, USITC Pub. 4360 at 33.

high between January 2009 and June 2012 and increased overall during this period.[143] Even though the domestic industry's unit COGS declined overall during the period of investigation, the Commission found that the extremely high and increasing COGS-to-net-sales ratio demonstrated that the substantial and increasing volume of low-priced subject imports from China undersold the domestic industry at substantial margins and prevented the domestic industry from pricing the domestic like product at levels that would permit it to recover its costs during the period examined.[144]

In the first five-year reviews of the orders, the Commission again found that there is a high degree of substitutability between subject imports and the domestic like product, and that price is an important factor in purchasing decisions. The pricing data showed that the prices for subject imports undersold the domestic like product in 62 of 85 instances (involving 1.5 million kW of CSPV modules imported from China), with margins ranging from *** percent. In the remaining 23 instances (involving 131,481 kW of CSPV modules imported from China), prices for subject imports were above prices for the domestic like product, with margins ranging from *** percent.[145] Prices for domestically produced CSPV modules fell by between *** percent

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[143] *CSPV 1*, USITC Pub. 4360 at 33.

[144] *CSPV 1*, USITC Pub. 4360 at 33. The Commission acknowledged that there might have been other factors exerting downward price pressure on CSPV products – such as technological improvements in CSPV production manufacturing, the decline in prices for polysilicon, the need to attain grid parity, competition from thin-film products, and the decline in Federal, state and local incentives – but found that these factors did not individually or collectively account for the substantial margins of underselling by subject imports, the accelerating decline in prices in the U.S. market during the period examined, and the inability of the domestic industry to price its products at levels that would permit the recovery of its costs during a period of significant demand growth. The Commission further found that these factors also did not explain the pace at which subject imports captured market share at the domestic industry's expense throughout the period of investigation. *CSPV 1*, USITC Pub. 4360 at 34-35.

[145] *First Reviews Confidential Opinion* at 44-45. Widespread underselling of the domestic like product by subject imports occurred regardless of cell count (60-cell and 72-cell). *Id*. at 45 n.179.

and *** percent during the period of review.[146] The Commission rejected the respondents' argument that Section 201 and 301 tariffs would deter subject imports and ameliorate any potential adverse price effects in the market if the order were revoked.[147] The Commission found that even with the Section 201 and 301 tariffs in effect, the United States market was attractive for subject imports and that subject producers maintained aggressive pricing practices even under the disciplining effects of the orders, which operate differently than 201 and 301 ad valorem tariffs.[148] Consequently, the Commission found that subject imports would likely have significant price depressing and/or suppressing effects, and/or would likely gain market share at the domestic industry's expense, upon revocation of the order within a reasonably foreseeable time.[149]

2. Current Reviews

As discussed in section III.B.3 above, we continue to find a high degree of substitutability between the domestic like product and subject imports and that price remains an important factor in purchasing decisions.

The record in these expedited reviews does not contain product-specific pricing information. Based on the available information, including the high degree of substitutability between the domestic like product and subject imports, the fact that price is an important

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[146] *First Reviews Confidential Opinion* at 45.

[147] *First Reviews*, USITC Pub. 4874 at 31.

[148] *First Reviews*, USITC Pub. 4874 at 31. The Commission noted that antidumping and countervailing duties imposed under the *CSPV 1* orders are subject to annual reviews and recalculation by Commerce to ensure that they address actual levels of dumping and subsidization. Section 201 and 301 tariffs are not subject to such review or modification, and producers therefore could lower prices without the possibility of incurring higher duties. Additionally, unlike the antidumping duty statute, neither the Section 201 nor Section 301 tariffs have mechanisms to account for duty absorption. *Id*.

[149] *First Reviews*, USITC Pub. 4874 at 31.

factor in purchasing decisions, and the prevalent underselling by subject imports in the original investigations and prior reviews, we find that if the orders were revoked, the likely significant volumes of subject imports would likely undersell the domestic like product to a significant degree, as they did in the original investigations and prior reviews. Absent the discipline of the orders, the significant volumes of low-priced subject imports would likely take sales and market share from domestic producers and/or force the domestic industry to cut prices or forgo needed price increases, thereby depressing or suppressing prices for the domestic like product. Consequently, we find that if the orders were revoked, subject imports would likely have significant price effects.

E. Likely Impact[150]

1. Original Investigations and Prior Reviews

In the original investigations, the Commission found that the domestic industry was materially injured by reason of subject imports.[151] It found that some of the domestic industry's performance factors, including production and U.S. shipments, appeared to improve during the period of investigation, but explained that these improvements occurred during a

[150] In its expedited review of the antidumping duty order, Commerce determined that revocation of the order would likely result in the continuation or recurrence of dumping with margins of 249.96 percent. *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China: Final Results of the Expedited Second Sunset Review of the Antidumping Duty Order*, 89 Fed. Reg. 48391, 48392 (Dep't of Commerce June 6, 2024). Commerce also determined that revocation of the countervailing duty order on CSPV cells and modules from China would likely result in the continuation or recurrence of countervailable subsidies at rates of 25.56 percent for Wuxi Suntech Power Co., Ltd, 26.75 percent for Changzhou Trina Solar Energy Co., Ltd., and 26.15 for all other producers of CSPV cells and modules in China. *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules From the People's Republic of China: Final Results of the Expedited Second Sunset Review of the Countervailing Duty Order*, 89 Fed. Reg. 48560, 48561 (Dep't of Commerce June 7, 2024).

[151] *CSPV 1*, USITC Pub. 4360 at 38.

period of significant growth in demand for CSPV products.[152] It found that, notwithstanding improvements in certain factors, the domestic industry's market share declined significantly and its financial condition deteriorated throughout the period of investigation because of the significant volume and adverse price effects of subject imports.[153] The domestic industry incurred operating losses during the entire period of investigation, the industry's net sales value declined in 2011 and interim 2012, and its capital and research and development expenditures declined steadily.[154] In addition, a substantial number of domestic producers shuttered facilities or declared bankruptcy.[155]

The Commission also considered the role of other factors so as not to attribute injury from these factors to the subject imports.[156] It rejected respondents' argument that the domestic industry was unable or unwilling to supply products demanded by the utility segment, observing that the record showed that the domestic industry supplied higher-wattage modules as well as mono- and multi-crystalline modules; in any event, the Commission found that that the record did not support the argument that the utility segment preferred 72-cell modules, as significant volumes of 60-cell and lower-wattage pricing products were sold to utilities/developers during the period of investigation.[157] The Commission also rejected respondents' suggestion that the domestic industry was adversely affected by unfavorable long-term polysilicon contracts. It observed that polysilicon prices began substantial declines

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[152] *CSPV 1*, USITC Pub. 4360 at 35.
[153] *CSPV 1*, USITC Pub. 4360 at 35-36.
[154] *CSPV 1*, USITC Pub. 4360 at 36.
[155] *CSPV 1*, USITC Pub. 4360 at 36.
[156] *CSPV 1*, USITC Pub. 4360 at 37-38.
[157] *CSPV 1*, USITC Pub. 4360 at 37.

well before the period of investigation. Further, domestic producers had termination provisions or were able to renegotiate their contracts and some domestic producers did not purchase polysilicon through long-term contracts.[158] The Commission also found, despite respondents' claims that domestic producers made "bad bets" on technology, that almost all purchasers reported U.S. CSPV modules as being superior or comparable to subject imports in terms of conversion efficiency and quality.[159] The Commission further observed that nonsubject imports declined over the investigation period, both in absolute and relative terms, and, unlike subject imports, nonsubject imports frequently oversold the domestic like product.[160]

In the first five-year reviews, the Commission found that the domestic industry's trade, financial, and employment indicators generally declined over the period of review. The Commission noted that five U.S. firms closed their CSPV cell production facilities and 25 U.S. firms closed their CSPV module production facilities, although several firms began production of CSPV cells and modules and six others announced plans for new facilities.[161] The domestic industry's cell capacity and production decreased irregularly over the POR, and its cell capacity utilization increased irregularly but remained well below full capacity during the POR.[162] The

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[158] *CSPV 1*, USITC Pub. 4360 at 37.
[159] *CSPV 1*, USITC Pub. 4360 at 37.
[160] *CSPV 1*, USITC Pub. 4360 at 37-38.
[161] *First Reviews*, USITC Pub. 4874 at 33.
[162] *First Reviews Confidential Opinion* at 50. The domestic industry's cell capacity decreased irregularly by *** percent during the period of review, increasing from *** kW in 2012 to *** kW in 2013, declining to *** kW in 2014, increasing to *** kW in 2015, and declining to *** kW in 2016 and *** kW in 2017. Production of cells decreased irregularly by *** percent overall, increasing from *** kW in 2012 to *** kW in 2013, *** kW in 2014, *** kW in 2015, and *** kW in 2016, and declining to *** kW in 2017. *Id*. Capacity utilization for CSPV cells increased irregularly but remained below full (Continued…)

domestic industry's module capacity increased steadily by *** percent during the POR,[163] and module production also increased irregularly by *** percent overall.[164] The domestic industry's shipments increased overall by *** percent during the POR, but this was dwarfed by the *** percent growth in apparent U.S. consumption during the same period.[165] Thus, the domestic industry's market share decreased overall during the POR from *** percent in 2012 to *** percent in 2017.[166] The Commission found that the domestic industry's employment indicators declined, with the number of production related workers engaged in CSPV cell and module operations, total hours worked, and wages paid to CSPV cell employees all decreasing by more than *** percent overall during the POR.[167] The domestic industry's financial performance was also weak during the POR, as net sales decreased by more than *** percent and the industry's COGs to net sales ratio was near or exceeded *** percent during the POR.[168] The domestic industry also experience net *** over the POR, and several plants closed.[169] Consequently, the Commission found that the domestic industry was in a vulnerable position.[170]

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capacity, with capacity utilization increasing from *** percent in 2012 to *** percent in 2013 and *** percent in 2014, declining to *** percent in 2015, increasing to *** percent in 2016, and declining to *** percent in 2017. *Id*.

[163] *First Reviews Confidential Opinion* at 50. Domestic module capacity increased from *** kW in 2012 to *** kW in 2013, *** kW in 2014, *** kW in 2015, and *** kW in 2016 and 2017. *Id.* at 50-51.

[164] *First Reviews Confidential Opinion* at 51. Domestic production of modules increased irregularly by *** percent overall, decreasing from *** kW in 2012 to *** kW in 2013, increasing to *** kW in 2014, *** kW in 2015, and *** kW in 2016, and declining to *** kW in 2017. *Id*. at 51.

[165] *First Reviews Confidential Opinion* at 51.

[166] *First Reviews Confidential Opinion* at 51.

[167] *First Reviews Confidential Opinion* at 52.

[168] Net sales decreased irregularly from $*** in 2012 to $*** in 2017. *Id.* at 52-53. The domestic industry's COGS to net sales ratio was *** percent in 2012, *** percent in 2013, *** percent in 2014, *** percent in 2015, *** percent in 2016, and *** percent in 2017. *Id.*

[169] *First Reviews Confidential Opinion* at 53-54.

[170] *First Reviews*, USITC Pub. 4874 at 35.

The Commission rejected the respondents' assertion that future harm to the domestic industry may be attributable to the domestic producers' inability to supply the utility segment of the market.[171] The Commission found that the residential and commercial sectors accounted for substantial portions of U.S. consumption of CSPV cells and modules, and that during the POR, subject imports competed with the domestic like product in all market segments—utilities, distributors, and residential and commercial installers.[172]

The Commission also considered the role of nonsubject imports and found that there was no indication on the record that the presence of nonsubject imports would prevent subject imports from China from significantly increasing their presence in the U.S. market in the event of revocation of the orders, given the export orientation of the subject industry and the relative attractiveness of the U.S. market.[173] The Commission determined that competition for sales between low-priced subject imports and nonsubject imports would likely affect market prices negatively to the detriment of the domestic industry.[174]

2. Current Reviews

The record in these reviews shows that although the domestic industry's trade and financial indicators have improved somewhat since the prior review, the domestic industry still operated *** in 2023.[175] Furthermore, the domestic industry ceased CSPV cell production during the POR, and currently produces only CSPV modules.[176]

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[171] *First Reviews*, USITC Pub. 4874 at 36.
[172] *First Reviews*, USITC Pub. 4874 at 36.
[173] *First Reviews*, USITC Pub. 4874 at 36.
[174] *First Reviews*, USITC Pub. 4874 at 37.
[175] CR/PR at Table I-10.
[176] *See* CR/PR at Table I-9.

As previously discussed, the domestic industry does not produce CSPV cells.[177] The domestic industry's CSPV module capacity and production, at *** kW and *** kW, respectively, were higher than in 2017.[178] Capacity utilization was higher in 2023, at *** percent, than in 2017.[179] While the industry's U.S. shipments increased by over *** kW from 2017 to 2023, from *** kW to *** kW,[180] apparent U.S. consumption increased by over *** kW, from *** kW to *** kW in 2023; thus, the industry's share of apparent U.S. consumption increased from *** percent in 2017 to *** percent in 2023.[181] The industry's net sales value (***) and gross profit (***) were also higher than in 2017.[182] The industry had an *** of *** in 2023, equivalent to ***, which was ***, equivalent to ***.[183] The industry's ratio of COGS to net sales of *** percent was lower than in 2017, when it was *** percent.[184] The limited information on the record is insufficient for us to make a finding on whether the domestic industry is vulnerable to the continuation or recurrence of material injury in the event of revocation of the orders.[185]

Based on the information available in these reviews, we find that revocation of the orders would likely result in a significant volume of subject imports that would likely undersell

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[177] CR/PR at Table I-9.

[178] CR/PR at Table I-10. The domestic industry's CSPV module capacity was *** kW in 2017 and production was *** kW in 2017. *Id*.

[179] CR/PR at Table I-10. The domestic industry's capacity utilization was *** percent in 2017. *Id*.

[180] CR/PR at Table I-10, Table I-12.

[181] See CR/PR at Table I-12.

[182] CR/PR at Table I-10. The domestic industry's net sales were *** and it had a *** of *** in 2017. *Id*.

[183] CR/PR at Table I-10.

[184] CR/PR at Table I-10.

[185] Commissioner Kearns finds the industry to be in a vulnerable condition, particularly based on its low market share and continued operating losses, despite the considerable increase in demand in the United States for CSPV products.

the domestic like product to a significant degree. Given the high degree of substitutability between the domestic like product and subject imports, the importance of price in purchasing decisions, and the substantial underselling by subject imports in the original investigations and prior reviews, upon revocation of the orders, the significant volumes of low-priced subject imports would likely capture sales and market share from the domestic industry and/or significantly depress or suppress prices for the domestic like product. The likely significant volume of subject imports and their adverse price effects would likely have a significant adverse impact on the domestic industry's production, shipments, sales, market share, and revenues, which in turn would have a direct adverse impact on the industry's profitability and employment, as well as its ability to raise capital and make and maintain necessary capital investments.

We have also considered the role of factors other than subject imports, including the presence of nonsubject imports. The information available indicates that nonsubject imports have increased their presence in the U.S. market since the prior reviews, from *** percent of apparent U.S. consumption in 2017 to *** percent of apparent U.S. consumption in 2023.[186] Nevertheless, the record provides no indication that the presence of nonsubject imports would prevent subject imports from China from significantly increasing their presence in the U.S. market after revocation, given the Chinese industry's capacity and substantial global exports, and the attractiveness of the U.S. market. Indeed, Commerce has found that nonsubject imports from Cambodia, Malaysia, Thailand, and Vietnam made using inputs from China

[186] CR/PR at Table I-12.

circumvented the orders.[187] In light of the high degree of substitutability between subject imports and the domestic like product and the importance of price to purchasers, the significant volume of low-priced subject imports would likely take market share from the domestic industry after revocation, at least in part, as well as from nonsubject imports, and/or force domestic producers to either lower prices or forgo price increases to retain market share. Moreover, any price competition between subject and nonsubject imports would likely have a negative impact on U.S. market prices, which would also put downward pressure on the domestic industry's prices. Consequently, any future effects on nonsubject imports would be distinct from the likely effects attributable to subject imports.

IV. Conclusion

For the foregoing reasons, we determine that revocation of the antidumping and countervailing duty orders on CSPV cells and modules from China would be likely to lead to continuation or recurrence of material injury to an industry in the United States within a reasonably foreseeable time.

[187] *Antidumping and Countervailing Duty Orders on Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, from the People's Republic of China: Final Scope Determination and Final Affirmative Determinations of Circumvention With Respect to Cambodia, Malaysia, Thailand, and Vietnam*, 88 Fed. Reg. 57419 (Dep't of Commerce Aug. 23, 2023).

Information obtained in these reviews

Background

On February 1, 2024, the U.S. International Trade Commission ("Commission") gave notice, pursuant to section 751(c) of the Tariff Act of 1930, as amended ("the Act"),[1] that it had instituted reviews to determine whether revocation of antidumping and countervailing duty orders on crystalline silicon photovoltaic ("CSPV") cells and modules from China would be likely to lead to continuation or recurrence of material injury.[2] All interested parties were requested to respond to this notice by submitting certain information requested by the Commission.[3] [4] Table I-1 presents information relating to the background and schedule of this proceeding:

Table I-1
CSPV cells and modules: Information relating to the background and schedule of this proceeding

Effective date	Action
February 1, 2024	Notice of initiation by Commerce (89 FR 6499, February 1, 2024)
February 1, 2024	Notice of institution by Commission (89 FR 6550, February 1, 2024)
May 6, 2024	Commission's vote on adequacy
June 6, 2024	Commerce's results of its expedited reviews (AD) (89 FR 48391)
June 7, 2024	Commerce's results of its expedited reviews (CVD) (89 FR 48559)
September 20, 2024	Commission's determinations and views

[1] 19 U.S.C. 1675(c).

[2] 89 FR 6550, February 1, 2024. In accordance with section 751(c) of the Act, the U.S. Department of Commerce ("Commerce") published a notice of initiation of five-year reviews of the subject antidumping and countervailing duty orders. 89 FR 6499, February 1, 2024. Pertinent Federal Register notices are referenced in app. A, and may be found at the Commission's website (www.usitc.gov).

[3] As part of their response to the notice of institution, interested parties were requested to provide company-specific information. That information is presented in app. B. Summary data compiled in the original investigations and subsequent full reviews are presented in app. C.

[4] Interested parties were also requested to provide a list of three to five leading purchasers in the U.S. market for the domestic like product and the subject merchandise. Presented in app. D are the responses received from purchaser surveys transmitted to the purchasers identified in this proceeding.

Responses to the Commission's notice of institution

Individual responses

The Commission received one submission in response to its notice of institution in the subject reviews. It was filed on behalf of

1. The American Alliance for Solar Manufacturing ("Alliance"), a majority of whose members produce CSPV modules (referred to herein as "domestic interested party").[5]

A complete response to the Commission's notice of institution requires that the responding interested party submit to the Commission all the information listed in the notice. Responding firms are given an opportunity to remedy or explain deficiencies in their responses and to provide clarifying details where appropriate. A summary of the number of responses and estimates of coverage for each is shown in table I-2.

Table I-2
CSPV cells and modules: Summary of responses to the Commission's notice of institution

Interested party type	Number	Coverage
U.S. producer association	1	***%

Note: The U.S. trade association coverage figure presented is the domestic interested parties' estimate of their share of total U.S. production of CSPV cells and modules during 2023. Domestic interested parties' fourth supplement to substantive response to the notice of institution, April 18, 2024, p.2 and exhibit 1.

[5] The members of the Alliance are as follows: First Solar, Inc. ("First Solar"), Hanwha Q CELLS USA, Inc. ("Hanwha"), Heliene USA, Inc. ("Heliene"), Mission Solar Energy LLC ("Mission"), and Suniva Inc. ("Suniva"). Three of the five members are domestic producers of CSPV cells and modules: Hanwha, Heliene, and Mission. Domestic interested party's response to the notice of institution, March 4, 2024, pp. 1-2; and Domestic interested party's supplemental response to the notice of institution, March 25, 2024, p. 2.

Party comments on adequacy

The Commission received party comments on the adequacy of responses to the notice of institution and whether the Commission should conduct expedited or full reviews from the Alliance. The Alliance requests that the Commission conduct expedited reviews of the antidumping and countervailing duty orders on CSPV cells and modules.[6]

The original investigations

The original investigations resulted from petitions filed on October 19, 2011 with Commerce and the Commission by SolarWorld Industries America, Inc. ("SolarWorld"), Hillsboro, Oregon.[7] On October 17, 2012, Commerce determined that imports of CSPV cells and modules from China were being sold at less than fair value ("LTFV") and subsidized by the Government of China.[8] The Commission determined on November 30, 2012 that an industry in the United States was materially injured by reason of imports of CSPV cells and modules from China.[9] On December 7, 2012, Commerce issued its antidumping and countervailing duty orders with final weighted-average dumping margins ranging from 18.32 to 249.96 percent and net subsidy rates ranging from 14.78 to 15.97 percent.[10]

The first five-year reviews

On February 5, 2018, the Commission determined that it would conduct full reviews of the antidumping and countervailing duty orders on CSPV cells and modules from China.[11] On March 9, 2018, Commerce determined that revocation of the countervailing duty order on CSPV cells and modules from China would be likely to lead to continuation or recurrence of subsidization.[12] On March 12, 2018, Commerce determined that revocation of the antidumping duty order on CSPV cells and modules from China would be likely to lead to continuation or

[6] Domestic interested party's comments on adequacy, April 10, 2024, p. 1.

[7] Crystalline Silicon Photovoltaic Cells and Modules From China, Inv. Nos. 701-TA-481 and 731-TA-1190 (Final), USITC Publication 4360, November 2012 ("Original publication"), p. 1.

[8] 77 FR 63788 and 77 FR 63791, October 17, 2012.

[9] 77 FR 72884, December 6, 2012. The Commission also found that imports subject to Commerce's affirmative critical circumstances determinations were not likely to undermine seriously the remedial effect of the orders on China. Ibid.

[10] 77 FR 73017 and 77 FR 73018, December 7, 2012.

[11] 83 FR 8296, February 26, 2018.

[12] 83 FR 10431, March 9, 2018.

recurrence of dumping.[13] On March 1, 2019, the Commission determined that material injury would be likely to continue or recur within a reasonably foreseeable time.[14] Following affirmative determinations in the five-year reviews by Commerce and the Commission, effective March 20, 2019, Commerce issued a continuation of the antidumping and countervailing duty orders on imports of CSPV cells and modules from China.[15]

Previous and related investigations

The Commission has conducted a number of previous import relief investigations on CSPV cells and modules or similar merchandise, as presented in table I-3.[16] In addition, at time of report issuance on April 24, 2024, the American Alliance for Solar Manufacturing and Trade Committee[17] filed petitions with Commerce and the Commission alleging that imports of CSPV cells and modules from Cambodia, Malaysia, Thailand, and Vietnam are being sold at LTFV and subsidized by the Governments of Cambodia, Malaysia, Thailand, and Vietnam.

[13] 83 FR 10663, March 12, 2018.

[14] 84 FR 8342, March 7, 2019.

[15] 84 FR 10299 and 84 FR 10300, March 20, 2019.

[16] The safeguard measure on CSPV products (TA-201-075) is in the form of (1) a TRQ on imports of CSPV cells not partially or fully assembled into other products and (2) an increase in duties on imports of CSPV modules. Crystalline Silicon Photovoltaic Cells, Whether or Not Partially or Fully Assembled Into Other Products, Monitoring Developments in the Domestic Industry, Inv. No. TA-201-075 (Second Monitoring), USITC Publication 5494, February 2024 ("Second monitoring publication"), pp. I-8–I-10.

[17] The Committee is comprised of 4 U.S. producers of CSPV cells and modules: Convalt Energy, First Solar, Hanwha, and Mission.

Table I-3
CSPV cells and modules: Previous and related Commission proceedings and current status

Date	Number	Country	ITC original determination	Current status
2013	701-TA-511	China	Affirmative	Order continued after first review, effective September 11, 2020
2013	731-TA-1246	China	Affirmative	Order continued after first review, effective September 11, 2020
2013	731-TA-1247	Taiwan	Affirmative	Order continued after first review, effective September 11, 2020
2017	TA-201-075	---	Affirmative	Safeguard measure in effect from February 7, 2018 through, February 6, 2026

Source: U.S. International Trade Commission publications and Federal Register notices.

Note: "Date" refers to the year in which the investigation was instituted by the Commission.

Commerce's five-year reviews

Commerce announced that it would conduct expedited reviews with respect to the orders on imports of CSPV cells and modules from China with the intent of issuing the final results of these reviews based on the facts available not later than May 31, 2024.[18] Commerce publishes its Issues and Decision Memoranda and its final results concurrently, accessible upon publication at https://access.trade.gov/public/FRNoticesListLayout.aspx. Issues and Decision Memoranda contain complete and up-to-date information regarding the background and history of the order, including scope rulings, duty absorption, changed circumstances reviews, and anticircumvention, as well as any decisions that may have been pending at the issuance of this report. Any foreign producers/exporters that are not currently subject to the antidumping and countervailing duty orders on imports of CSPV cells and modules from China are noted in the sections titled "The original investigations" and "U.S. imports," if applicable.

[18] Letter from Eric Greynolds, Office Director, AD/CVD Operations, Enforcement and Compliance, U.S. Department of Commerce to Nannette Christ, Director of Investigations, March 22, 2024.

The product

Commerce's scope

Commerce has defined the scope as follows:

The merchandise covered by the Order is crystalline silicon photovoltaic cells, and modules, laminates, and panels, consisting of crystalline silicon photovoltaic cells, whether or not partially or fully assembled into other products, including, but not limited to, modules, laminates, panels and building integrated materials. The Order covers crystalline silicon photovoltaic cells of thickness equal to or greater than 20 micrometers, having a p/n junction formed by any means, whether or not the cell has undergone other processing, including, but not limited to, cleaning, etching, coating, and/or addition of materials (including, but not limited to, metallization and conductor patterns) to collect and forward the electricity that is generated by the cell. Merchandise under consideration may be described at the time of importation as parts for final finished products that are assembled after importation, including, but not limited to, modules, laminates, panels, building-integrated modules, building-integrated panels, or other finished goods kits. Such parts that otherwise meet the definition of merchandise under consideration are included in the scope of the Order.

Excluded from the scope of this Order are thin film photovoltaic products produced from amorphous silicon (a-Si), cadmium telluride (CdTe), or copper indium gallium selenide (CIGS). Also excluded from the scope of this Order are crystalline silicon photovoltaic cells, not exceeding 10,000mm2 in surface area, that are permanently integrated into a consumer good whose function is other than power generation and that consumes the electricity generated by the integrated crystalline silicon photovoltaic cell. Where more than one cell is permanently integrated into a consumer good, the surface area for purposes of this exclusion shall be the total combined surface area of all cells that are integrated into the consumer good. Additionally, excluded from the scope of this Order are panels with surface area from 3,450 mm2 to 33,782 mm2 with one black wire and one red wire (each of type 22 AWG or 24 AWG not more than 206 mm in length when measured from panel extrusion), and not exceeding 2.9 volts, 1.1 amps, and 3.19 watts. For the purposes

of this exclusion, no panel shall contain an internal battery or external computer peripheral ports.

Modules, laminates, and panels produced in a third-country from cells produced in China are covered by this Order; however, modules, laminates, and panels produced in China from cells produced in a third-country are not covered by this Order.[19]

Partial Revocations

On December 17, 2021, following a changed circumstances review, Commerce revoked the orders, in part, with respect to the following off-grid small portable CSPV panels:[20]

Also excluded from the scope of the Orders are:
1. Off grid CSPV panels in rigid form with a glass cover, with the following characteristics:
(A) a total power output of 100 watts or less per panel;
(B) a maximum surface area of 8,000 cm2 per panel;
(C) do not include a built-in inverter;
(D) must include a permanently connected wire that terminates in either an 8mm male barrel connector, or a two-port rectangular connector with two pins in square housings of different colors;
(E) must include visible parallel grid collector metallic wire lines every 1–4 millimeters across each solar cell; and
(F) must be in individual retail packaging (for purposes of this provision, retail packaging typically includes graphics, the product name, its description and/or features, and foam for transport); and
2. Off grid CSPV panels without a glass cover, with the following characteristics:
(A) a total power output of 100 watts or less per panel;
(B) a maximum surface area of 8,000 cm2 per panel;
(C) do not include a built-in inverter;
(D) must include visible parallel grid collector metallic wire lines every 1–4 millimeters across each solar cell; and
(E) each panel is

[19] 84 FR 10299 and 84 FR 10300, March 20, 2019.
[20] 86 FR 71615, December 17, 2021.

1. permanently integrated into a consumer good;

2. encased in a laminated material without stitching, or

3. has all of the following characteristics: (i) the panel is encased in sewn fabric with visible stitching, (ii) includes a mesh zippered storage pocket, and (iii) includes a permanently attached wire that terminates in a female USB–A connector.

In addition, the following CSPV panels are excluded from the scope of the Orders: off-grid CSPV panels in rigid form with a glass cover, with each of the following physical characteristics, whether or not assembled into a fully completed off-grid hydropanel whose function is conversion of water vapor into liquid water:

(A) A total power output of no more than 80 watts per panel;

(B) A surface area of less than 5,000 square centimeters (cm2) per panel;

(C) Do not include a built-in inverter;

(D) Do not have a frame around the edges of the panel;

(E) Include a clear glass back panel; and

(F) Must include a permanently connected wire that terminates in a two-port rectangular connector.

On March 20, 2024, following a changed circumstances review, Commerce revoked the orders, in part, with respect to the following off-grid small portable CSPV panels:[21]

Additionally excluded from the scope of these Orders are off-grid small portable crystalline silicon photovoltaic panels, with or without a glass cover, with the following characteristics: (1) a total power output of 200 watts or less per panel; (2) a maximum surface area of 16,000 cm2 per panel; (3) no built-in inverter; (4) an integrated handle or a handle attached to the package for ease of carry; (5) one or more integrated kickstands for easy installation or angle adjustment; and (6) a wire of not less than 3 meters either permanently connected or attached to the package that terminates in an 8mm diameter male barrel connector.

Also excluded from the scope of these Orders are off-grid crystalline silicon photovoltaic panels in rigid form with a glass cover, with each of the following physical characteristics, whether or not assembled into a

[21] 89 FR 19809, March 20, 2024.

fully completed off-grid hydropanel whose function is conversion of water vapor into liquid water:
(A) A total power output of no more than 180 watts per panel at 155 degrees Celsius;
(B) A surface area of less than 16,000 square centimeters (cm^2) per panel;
(C) Include a keep-out area of approximately 1,200 cm^2 around the edges of the panel that does not contain solar cells;
(D) Do not include a built-in inverter;
(E) Do not have a frame around the edges of the panel;
(F) Include a clear glass back panel;
(G) Must include a permanently connected wire that terminates in a two-port rounded rectangular, sealed connector;
(H) Include a thermistor installed into the permanently connected wire before the two-port connector; and
(I) Include exposed positive and negative terminals at opposite ends of the panel, not enclosed in a junction box.

U.S. tariff treatment

CSPV cells and modules are currently provided for in subheadings 8541.42.00 ("photovoltaic cells not assembled in modules or made up into panels") and 8541.43.00 ("photovoltaic cells assembled in modules or made up into panels") of the Harmonized Tariff Schedule of the United States ("HTS"). The general rate of duty is "free."[22]

Under subheading 9903.45.22, imports of cells in excess of the prescribed tariff-rate quota quantity are subject to a general duty rate of 14.25 percent ad valorem (unless the product of an exempt country);[23] under subheading 9903.45.25 all covered modules from nonexempt countries are dutiable at 14.25 percent ad valorem.

These articles may also be imported as parts or subassemblies of goods provided for in headings 8501.72 and 8501.80 and subheadings 8501.71.00 and 8507.20.80.[24] Goods classified in headings 8501.72 and 8501.80 and subheading 8501.71.00 have a general duty rate of 2.5 percent ad valorem, and goods classified in subheading 8507.20.80 have a general duty rate of 3.5 percent ad valorem. Decisions on the tariff classification and treatment of imported articles are within the authority of U.S. Customs and Border Protection.

Effective August 23, 2018, CSPV cells and modules originating in China are subject to an additional 25 percent ad valorem duty under section 301 of the Trade Act of 1974.[25]

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[22] *2022 Basic Edition*, Chapter 85, January 26, 2022. Prior to January 26, 2022, CSPV cells and modules entered under HTS statistical reporting numbers 8541.40.6015 and 8541.40.6025, effective July 1, 2018. Prior to July 1, 2018, CSPV cells and modules entered under HTS statistical reporting numbers 8541.40.6020 and 8541.40.6030, effective January 1, 2001.

[23] On February 4, 2022, the President signed Proclamation 10339 "To Continue Facilitating Positive Adjustment to Competition from Imports of Certain Crystalline Silicon Photovoltaic Cells (Whether or not Partially or Fully Assembled into Other Products)" under Section 201 of the Trade Act of 1974 providing for a tariff rate quota for Crystalline Silicon Photovoltaic (CSPV) cells and an additional duty for modules comprised of CSPV cells, effective February 7, 2022.

[24] The subject cells may be presented as integral elements of subassemblies of components or of goods of these headings and subheadings, even if not treated as "parts" for tariff purposes. In addition, CSPV cells covered by the reviews may also be classifiable as DC generators of heading 8501.72 and subheading 8501.71.00 and AC generators of heading 8501.80, when such generators are imported with CSPV cells attached.

[25] 83 FR 40823, August 16,2018. See also HTS heading 9903.88.02 and U.S. notes 20(c) and 20(d) to subchapter III of chapter 99 and related tariff provisions for this duty treatment. USITC, HTS (2022) Revision 8, USITC Publication 5345, July 2022, pp. 99-III-23–99-III-26, 99-III-293.

Description and uses[26]

CSPV cells are the essential element in CSPV modules (also commonly referred to as panels), which in turn are the main components of CSPV systems. Solar CSPV systems convert sunlight into electricity for on-site use or for distribution through the electric grid.[27]

CSPV cells

CSPV cells use crystalline silicon to convert sunlight to electricity and are the basic elements of a CSPV module. CSPV cells may be fully square or may have slightly rounded corners ("pseudo square") (figure I-1).

Figure I-1
CSPV cells

Source: International Energy Agency website, https://www.iea.org/reports/solar-pv-global-supply-chains, accessed December 19, 2023.

[26] Unless otherwise noted, this information is based on the second monitoring publication, pp. I-13–I-22.

Common sizes of CSPV cells, as measured by the side length of the cell, and the type of wafer used in producing cells of that size are shown in table I-4.

Table I-4
CSPV cells: Examples of wafer sizes used in monocrystalline cell production

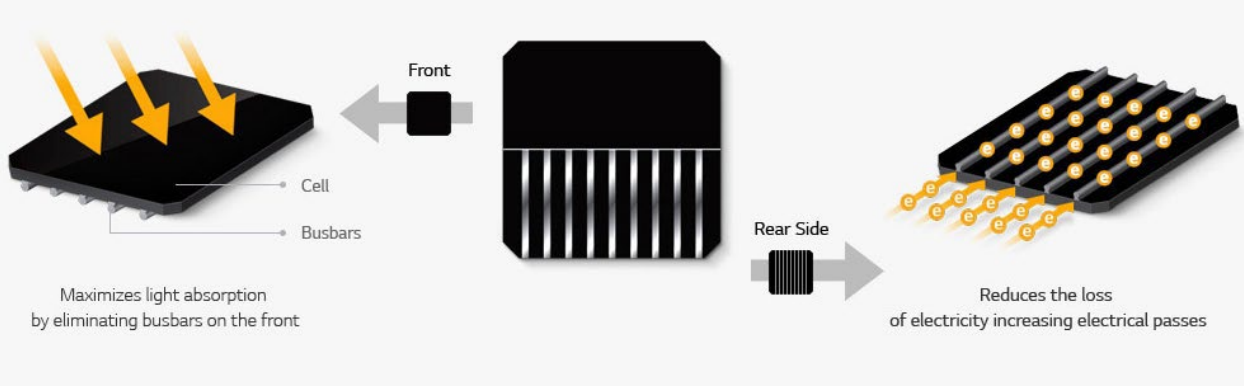
Wafer	Side length in mm
M0	156
M2	156.75
G1	158.75
M4	161.70
M6	166
M10	200
M12	210

Source: Novergy, "Significance of Increasing Size of Mono-Crystalline Wafers in Modules," https://www.novergysolar.com/significance-increasing-size-mono-crystalline-wafers-modules/, accessed March 29, 2024.

CSPV cells have a positive layer, a negative layer, and a positive-negative junction (p/n junction). Electricity is generated when sunlight strikes the CSPV cell, knocking electrons loose that flow onto thin metal "fingers" that run across the CSPV cell and conduct electricity to the busbars.[28] The number of busbars in cells varies, and has increased over time as more busbars improve efficiency and power output. Further, some cells contain no busbars ("busbarless"), which can provide benefits such as reducing electrical losses and increasing the surface area of the CSPV cell that can absorb sunlight. Alternatively, some cells have metal contacts on the rear side of the CSPV cell, creating back (or rear contact) cells (including interdigitated back contact ("IBC") cells) (figure I-2). This provides several advantages such as reduced shading, improved cell interconnection, and better aesthetics.

[28] Electricity is carried from the thin metal strips on solar cells to wider metal strips known as busbars. These busbars are interconnected during the manufacturing process so that electricity is carried from the cell to the junction box.

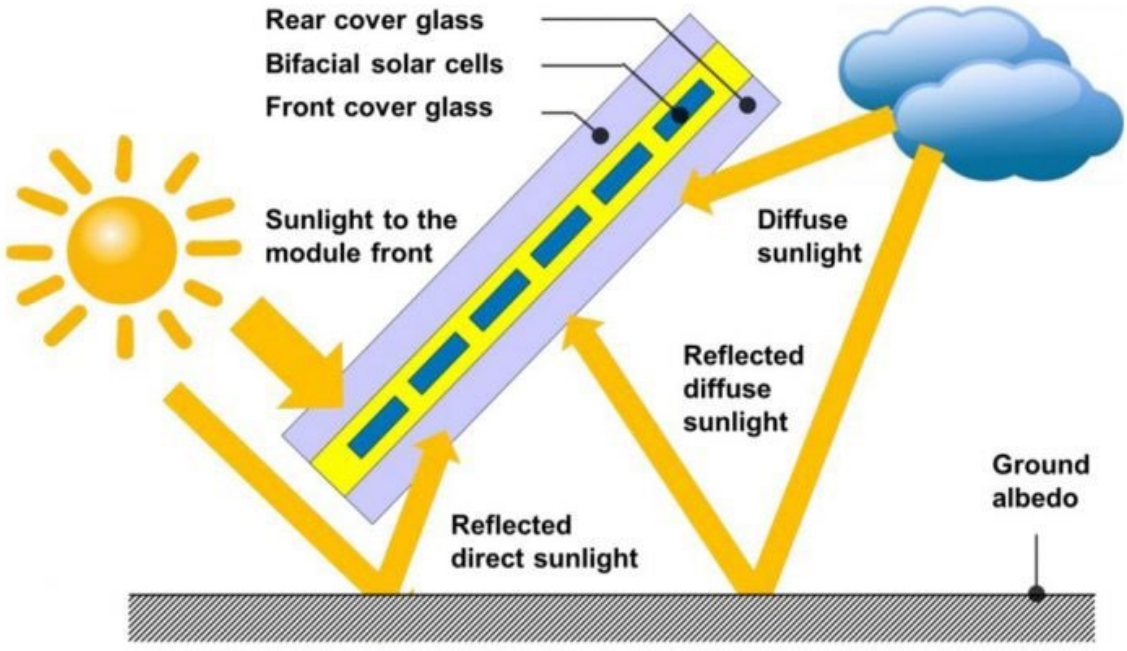
Figure I-2
CSPV cells and modules: Back contact CSPV cells



Source: Solar Analytica website, https://solaranalytica.com/lg-neon-r-report/, accessed December 19, 2023.

CSPV cells can be either monofacial or bifacial. Bifacial CSPV cells convert light that hits both the front and back of the CSPV cell into electricity (figure I-3). Whereas most CSPV cells have a metalized back layer, bifacial cells allow light through to the back side of the CSPV cell. They often incorporate either the Passive Emitter Rear Contact ("PERC") or heterojunction technologies, discussed later in this section.

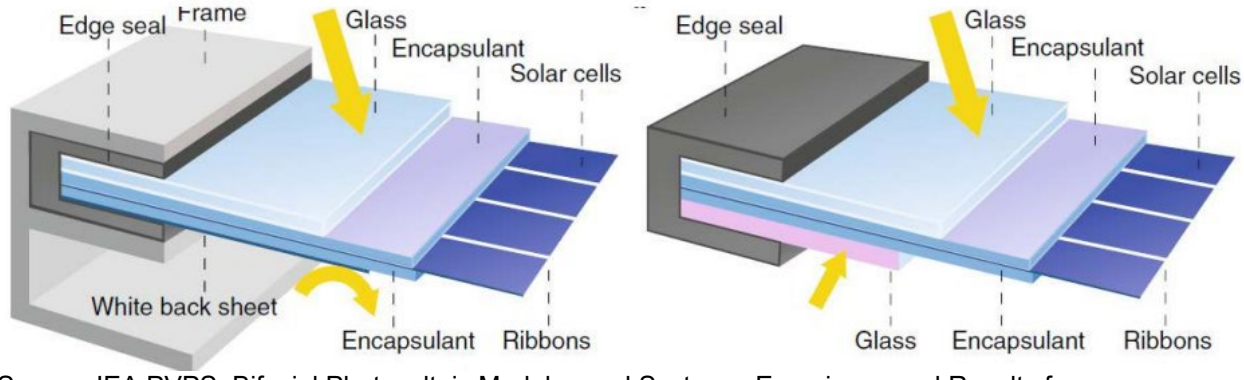
Figure I-3
CSPV cells and modules: Bifacial photovoltaic modules absorb sunlight on both sides of the module



Source: Glazer, Becca and Mayer, Kevin, "Bifacial or Bust? Engineering Solar Financings of the Future,"April 4, 2019, Sol Source, https://www.solsystems.com/blog/2019/04/04/bifacial-or-bust-engineeringsolar-financings-of-the-future/, accessed December 20, 2023.

When assembled into CSPV modules, bifacial modules use a transparent back sheet or rear glass layer to allow reflected sunlight on the rear of the CSPV cell. Figure I-4 shows a monofacial module on the left with a traditional back sheet, and a bifacial module on the right with a glass layer that allows light through the back side of the cell.

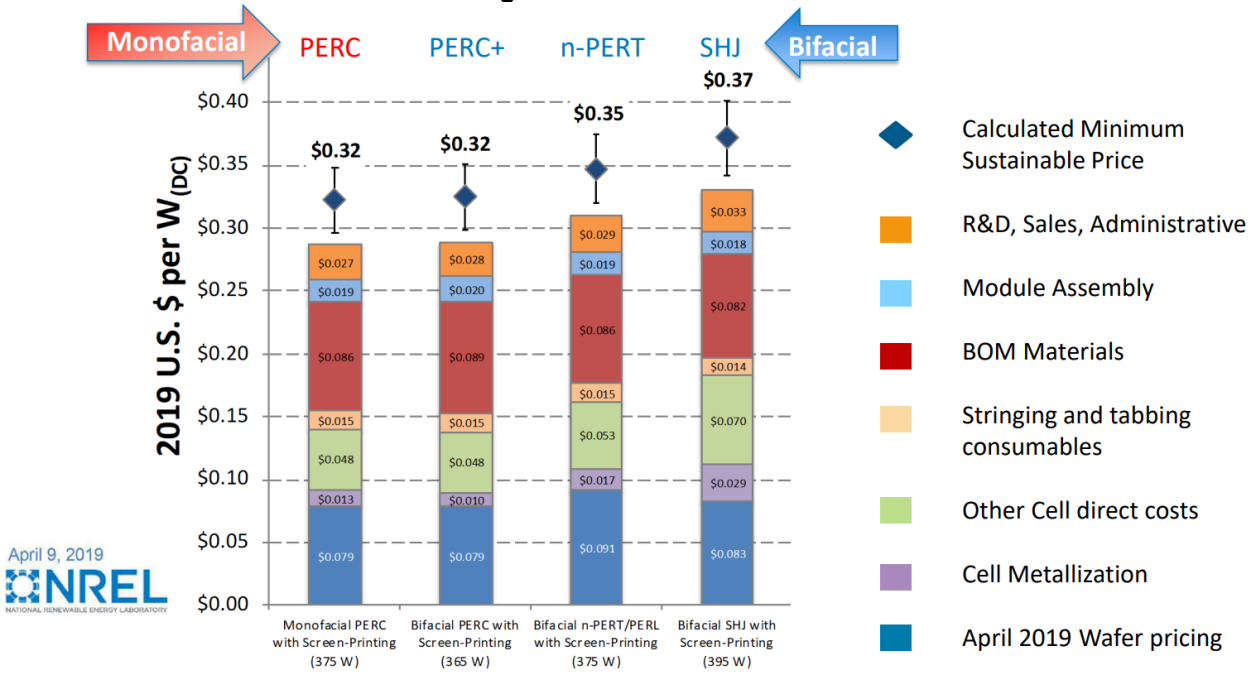
Figure I-4
CSPV cells and modules: Assembly of a monofacial module (left) and bifacial module (right)



Source: IEA PVPS, Bifacial Photovoltaic Modules and Systems: Experience and Results from International Research and Pilot Applications 2021, IEA-PVPS T13-14:2021, p. 28 https://ieapvps.org/wp-content/uploads/2021/04/IEA-PVPS-T13-14_2021-Bifacial-Photovoltaic-Modules-and-Systems-report.pdf, accessed October 23, 2023.

As monofacial and bifacial modules have moved closer to cost parity (figure I-5), manufacturers who have switched from assembling monofacial modules to bifacial modules have had to make a few adjustments to their production lines, such as replacing the traditional back sheet with glass and sourcing bifacial cells.

Figure I-5
CSPV cells and modules: Manufacturing cost of monofacial and bifacial modules



Source: National Renewable Energy Laboratory, Bifacial PV System Performance: Separating Fact from Fiction, p. 6 https://www.nrel.gov/docs/fy19osti/74090.pdf, accessed October 23, 2023.

The two main types of CSPV cells are monocrystalline and multicrystalline (or polycrystalline) silicon, though there are various subtypes within these two categories, as discussed below. Monocrystalline cells are made from a single grown crystal and tend to convert sunlight into electricity more efficiently. Multicrystalline cells have a random crystal structure and tend to have a lower conversion efficiency, though there are a range of conversion efficiencies for monocrystalline and multicrystalline CSPV modules.[29]

[29] Conversion efficiency is the percent of sunlight that is converted to electricity.

Monocrystalline and multicrystalline cells commonly use PERC and related technologies.[30] PERC cells incorporate an additional rear dielectric layer that reflects light that did not generate electricity as it initially passed through the CSPV cell back into the CSPV cell. There is, therefore, another opportunity for the CSPV cell to absorb this light. PERC cells have a higher efficiency and improved performance in certain conditions, such as low light and high heat conditions.

Monocrystalline cells can be either p-type or n-type. In the production of p-type of monocrystalline CSPV wafers, the silicon is doped with boron or gallium to create a positive electrical orientation. In the production of n-type mono wafers, the silicon is doped with phosphorous to create a negative electrical orientation. In the CSPV cell production process, a positive layer is added to create the p/n junction.

N-type CSPV cells can be more expensive to produce, but have a number of benefits, such as higher conversion efficiencies and no light-induced degradation. Heterojunction n-type CSPV cells (including heterojunction with intrinsic thin layer ("HIT")) add thin layers of photosensitive semiconductor materials (such as amorphous silicon) on top of an n-type monocrystalline wafer. These additional layers increase the absorption of sunlight and the overall efficiencies of the CSPV cells, as well as improve performance in hot climates. Tunnel Oxide Passivated Contacts ("TOPCon") is another technology used for n-type cells. TOPCon cells are created by "depositing a nanometer scale layer of silicon oxide, followed by a thicker polycrystalline silicon layer, between the silicon wafer and metal contacts. The layers reduce charge recombination between the wafer and the contacts, increasing carrier lifetime and resulting in a conversion efficiency boost."

CSPV laminates

CSPV laminates consist of CSPV cells that are connected, encapsulated (most commonly in an ethyl vinyl acetate ("EVA") film), and covered with a glass front layer and a back sheet or rear glass. The back sheet is most commonly a plastic film composite, though glass is also used in some applications such as bifacial CSPV modules. CSPV laminates can use full cells or cells cut in smaller pieces, such as half-cut cells. These are standard CSPV cells that are cut, such that a standard 60-cell CSPV module would instead have 120 half cells. Half-cut cells result in lower cell currents and, therefore, reduce power losses and increase cell efficiency and overall module output. Some products use shingling, paving, and other low or zero gap technologies to reduce the distance between cells.

[30] Related technologies include Passivated Emitter Rear Totally Diffused ("PERT") and Passivated Emitter Rear Locally Diffused ("PERL").

CSPV modules

CSPV modules typically consist of the laminate that is typically framed in aluminum, and then attached to one or more junction boxes (figure I-6).[31] CSPV modules can be used in both ground-mounted and rooftop-mounted systems and in both the off-grid market segment and the three on-grid market segments—residential, nonresidential, and utility.[32] The junction box can be connected to other modules, an inverter (which converts the direct current generated by the system to alternating current), or, in the case of off-grid modules, a battery and a charge controller (which controls battery charging).

[31] Some CSPV modules do not use a frame, which reduces costs. These modules typically use glass as the rear layer to ensure mechanical stability.

[32] Photovoltaics ("PV") do not include solar water heat and concentrated solar power ("CSP"). While PV uses a photosensitive semiconductor material to convert sunlight directly to electricity, solar water heat uses sunlight to heat water and CSP uses reflected sunlight to generate steam or a vapor that turns a turbine to generate electricity.

Figure I-6
CSPV products: CSPV module with half-cut cells

Source: Solar Power World website, "Hanwha Q CELLS' newest half-cell module will launch in USA later this year," https://www.solarpowerworldonline.com/2019/04/hanwha-q-cells-newest-half-cell-module-will-launch-in-usa-later-this-year/, accessed December 19, 2023.

The most common on-grid CSPV modules have 60 cells (or 120 half cut cells) or 72 cells (or 144 half cut cells). Common sizes of 72 cell solar modules, depending on the size of the wafer, are shown in table I-5.

Table I-5
CSPV modules: Typical 72 cell module area by wafer size, 2020

Wafer	Wafer side length in mm	Module area, square meters
M0	156	1.94
M2	156.75	2.00
G1	158.75	2.05
M4	161.7 or 161.75	2.11
M6	166	2.24
M10	182	2.56
M12/G12 (60 cell modules)	210	2.40

Source: Chunduri, Shravan K. and Michael Schmela, *500W+ Solar Modules, 2020 Edition*, Taiyang News, p. 10, http://taiyangnews.info/reports/500w-solar-modules-2020/, accessed December 19, 2023.

In addition to standard size CSPV modules, CSPV cells can be used in building-integrated PV ("BIPV modules" or "BIPV products"). BIPV products are materials integrated into the building envelope, such as the façade or roof, containing CSPV cells. These building integrated materials replace conventional construction materials, such as glass or roof shingles, taking over the function that conventional materials would otherwise perform while also producing electricity.

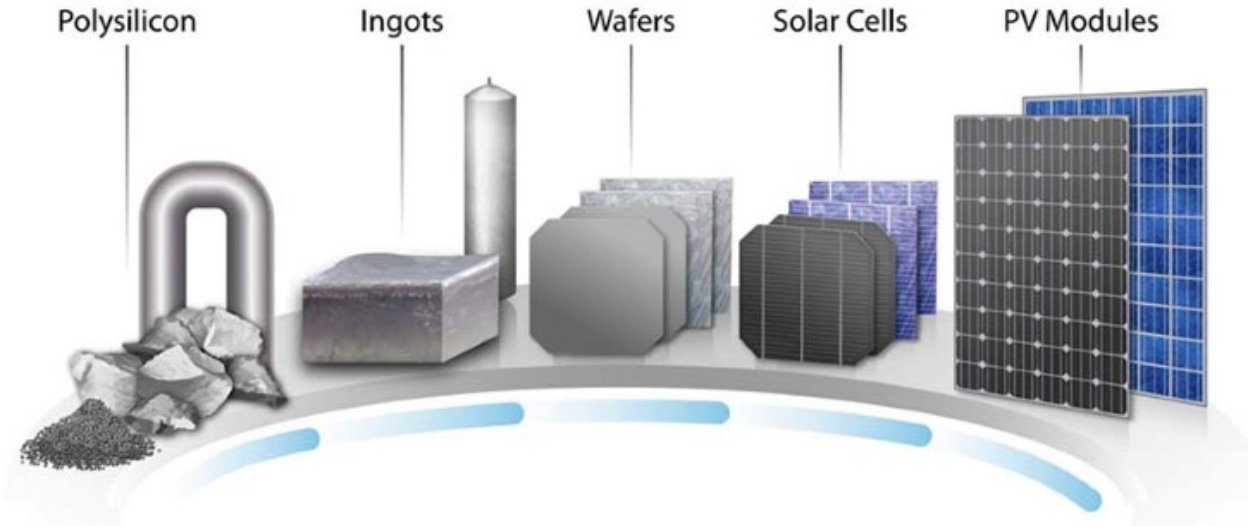
CSPV modules are also used in off-grid applications. In many instances, CSPV modules typically used in on-grid applications may also be used in off-grid applications. For example, a house that is not connected to the electrical grid could use the same CSPV modules as a house that is grid-connected. However, there is a broad range of off-grid applications, such as power generation in remote locations, mobile power solutions, telecommunications power and lighting systems, and portable consumer goods (such as systems for recharging consumer electronics like tablets and phones). The CSPV modules used in some of these applications may be different from those typically used in on-grid applications. For example, these products are often designed for specific power and portability requirements, and some CSPV modules used in off-grid applications have different wattages than CSPV modules used in grid-connected applications.

Manufacturing process[33]

There are five principal stages involved in the manufacture of CSPV products. First, polysilicon is refined, then it is formed into ingots, which are sliced into wafers, converted to CSPV cells, and assembled into the finished product, modules (figure I-7). These are discrete production steps that may be done in different plants or locations. Companies may source products at each stage of the value chain or produce the products in-house. CSPV cells and modules are tested and inspected during the production process. The ingot and wafer production process differs for monocrystalline and multicrystalline cells, as discussed below.

[33] Unless otherwise noted, this information and additional details can be found in the second monitoring publication, pp. I-25–I-32.

Figure I-7
CSPV production process



Source: Lees, Edward and Fugmann, Ulrik, "What you need to know about polysilicon and its role in solar modules," https://viewpoint.bnpparibas-am.com/what-you-need-to-know-about-polysilicon-and-its-role-in-solar-modules/, accessed March 29, 2024.

Note: For ingots, the top picture is a crystal used in monocrystalline wafers, while the bottom picture is an ingot used in making multicrystalline wafers.

Silicon refining

The first step in the CSPV value chain is refining polysilicon. There are multiple approaches to polysilicon refining. This discussion will focus on the Siemens method and fluidized bed reactor ("FBR") technology, which accounts for most of the market.

In the first step in the Siemens process, quartz (silicon dioxide) and carbon are heated to around 1,800 degrees Celsius. The carbon reacts with the oxygen, resulting in carbon dioxide and silicon with a purity of around 98 to 99 percent. The silicon is then combined with hydrogen chloride gas at 300 to 350 degrees Celsius, with the reaction resulting in liquid trichlorosilane.

Next, heated silicon rods are inserted into a Siemens reactor, where they are further heated to 1,000 degrees Celsius or more. Hydrogen and trichlorosilane gas are fed into the reactor. The silicon from the trichlorosilane is deposited onto the rods, which steadily increase in size until they are removed from the reactor about a week later. The resulting products are high purity polysilicon chunks or rocks.

Instead of inserting rods, "FBR uses seed granules of purified silicon. The seed granules are fed into a chamber that has heated silane gas entering from below and exiting above. The flow of gas 'fluidizes' the silicon granules, causing them to flow like a liquid, as the silane gas breaks down and deposits silicon layers on them. The granules grow larger and heavier and exit when they are sufficiently large. As they do so, new seed granules and gas are introduced into the chamber and the process continues." The FBR process, which is newer than the Siemens process, uses 80 to 90 percent less energy, requires a smaller footprint, is a continuous process, takes up less space in shipping and can increase downstream production efficiency. However, the process is difficult to scale and achieve high purity production at low cost.

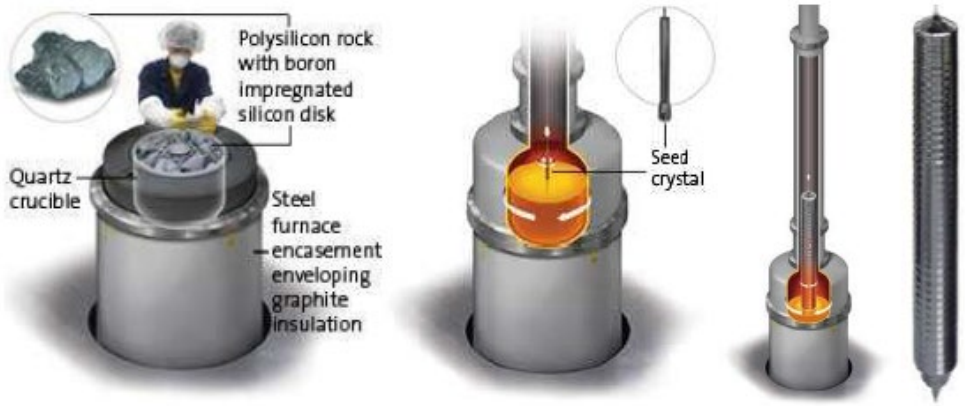
Ingots and wafers for monocrystalline cells

In the Czochralski process for producing crystals used in monocrystalline wafers, polysilicon rocks are first placed into a quartz crucible along with a small amount of boron, which is used to provide a positive electric orientation (figure I-8).[34] The crucible is then loaded into a Czochralski furnace and heated to about 2,500 degrees Fahrenheit. Once the polysilicon is melted, a seed crystal is lowered into the material and rotated, with the crucible rotated in the opposite direction. The melt starts to solidify on the seed and the seed is slowly raised out of the melt—creating a single long crystal. The crystal is then cooled before it is moved onto the next step. The process of growing the crystal takes about 2.5 days.

Once the crystal has cooled, it is processed into wafers. The top and tail (each end of the cylindrical crystal) are cut off (figure I-9). The remaining portion of the crystal (or ingot) is cut into equal length pieces and then it is squared. In squaring, the rounded sides of the ingot are cut into four flat sides, leaving only rounded corners. A wire saw then slices the ingots into wafers. A majority of global manufacturers have switched to diamond wire saws for monocrystalline wafer slicing, which has several benefits including increasing the speed of the production process. The wafers are then cleaned, dried, and inspected.

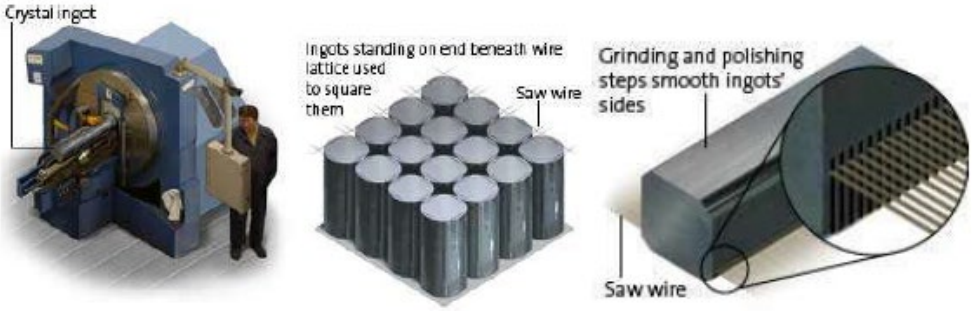
[34] This discussion will focus on the Czochralski process, which was considered the most popular method for producing silicon ingots and wafers in 2023.

Figure I-8
Czochralski process, crucible loading/charging (left), seed crystal (second from left), crystal growing (second from right), and finished crystal (right)



Source: SolarWorld Website, https://www.solarworld-usa.com/solar-101/making-solar-panels, Jan 22, 2015.

Figure I-9
Wafer production: Cutting off the top and tail (left), squaring (middle), and slicing into wafers (right)



Source: SolarWorld Website, https://www.solarworld-usa.com/solar-101/making-solar-panels, Jan 22, 2015

Ingots and wafers for multicrystalline cells

For multicrystalline ingots, the first step is also loading polysilicon into a crucible. This crucible is then loaded into a directional solidification systems ("DSS") furnace, where it is cast into ingots. The ingot is then cut into blocks. These blocks are tested and any parts of the block that do not pass these tests are cropped off. The blocks are sliced into wafers using a wire saw. Finally, the wafers are cleaned, dried, and inspected. This process results in square wafers, while the monocrystalline process results in wafers with rounded corners.

CSPV cells

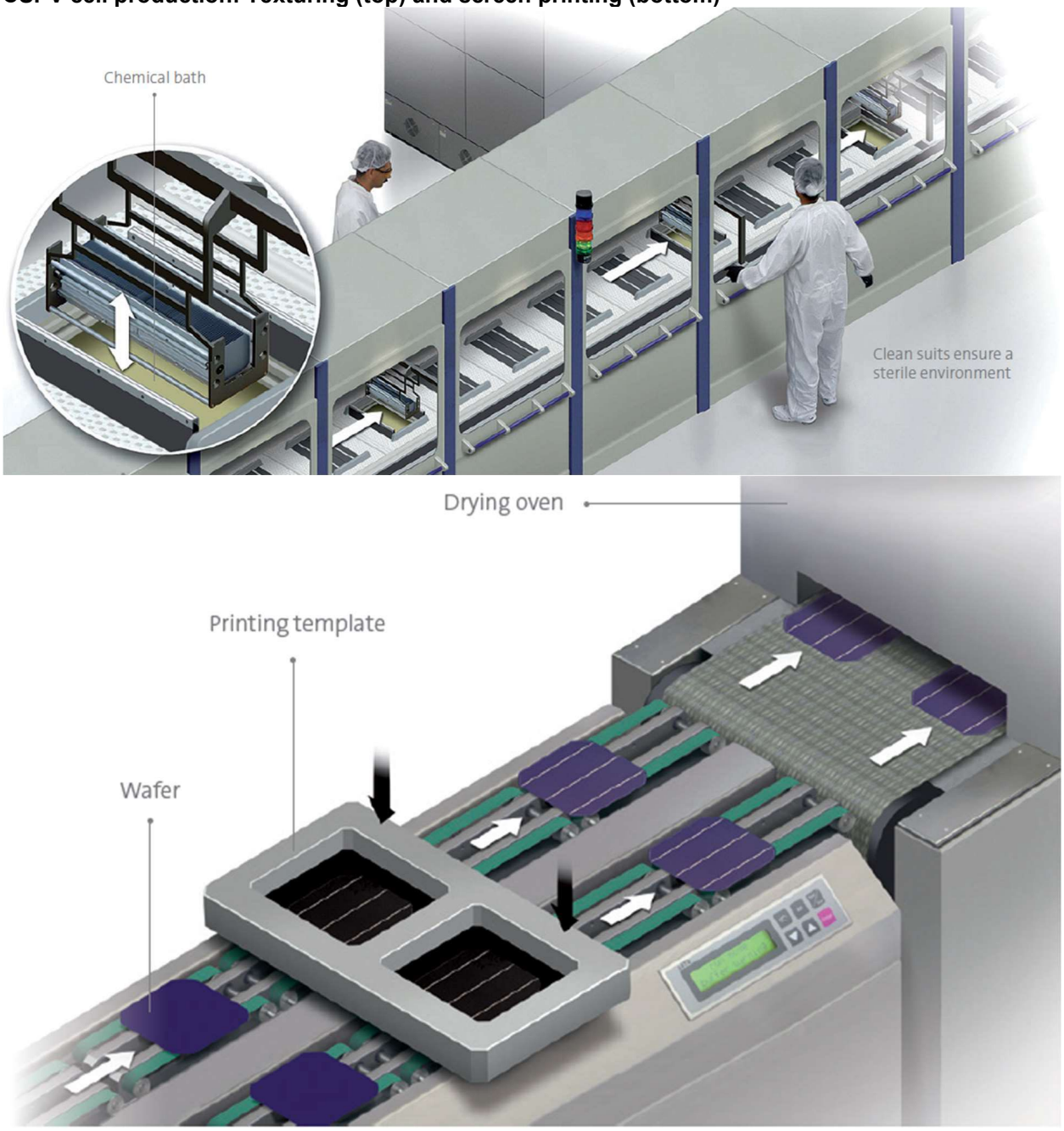
The monocrystalline and multicrystalline wafers, which are 180 to 200 micrometers thick, are next processed into CSPV cells.[35] CSPV cell production is capital intensive and requires a skilled workforce. Some firms use a highly automated manufacturing process, while others mix automation and manual labor in their production processes. The main steps in CSPV cell production are as follows:[36]

- **Cleaning and texturing:** First, the wafers are cleaned, then the surface of the wafer undergoes a chemical treatment that reduces the reflection of sunlight and increases light absorption (figure I-10).

[35] The cell manufacturing process varies by company and technology.

[36] This section will discuss the general manufacturing process. There may be additional steps for certain technologies.

Figure I-10
CSPV cell production: Texturing (top) and screen printing (bottom)



Source: SolarWorld, “Energy for You and Me” brochure, pp. 12–13.

- **Diffusion:** In the next step, "phosphorus is diffused into a thin layer of the wafer surface. The molecular-level impregnation occurs as the wafer surface is exposed to phosphorus gas at a high heat, a step that gives the surface a negative potential electrical orientation. The combination of that layer and the boron-doped layer below creates a positive-negative, or p/n, junction–a critical partition in the functioning of a PV cell."[37]
- **Edge isolation:** A thin layer of silicon is then removed from the edge of the CSPV cell to separate the positive and negative layers.
- **Coating:** Next, a silicon nitride antireflective coating is added to the PV cells to increase the absorption of sunlight.
- **Printing:** Metals are then printed on the solar CSPV cell to collect the electricity. On the front of the CSPV cell, these metals are printed in thin metal strips called fingers, which are connected to the rest of the module via busbars. A metal layer, typically aluminum, is also printed on the back of the CSPV cell.
- **Testing and sorting:** The final step in the process is the testing and sorting of the CSPV cells based on their characteristics and efficiency.

CSPV modules

The CSPV cells are next assembled into modules. The extent of automation and manual labor involved in module assembly varies depending on the company, though it is generally the most labor-intensive part of the manufacturing process. First, a string of CSPV cells is soldered together. A piece of glass is placed on the production line, on top of which is added a piece of ethyl vinyl acetate. The CSPV cells are laid out in a rectangular matrix that will provide the appropriate wattage and power requirements. Typically, a sealant is added, often EVA, and a back sheet is added. The CSPV cells are then laminated in a vacuum and are cured. At this stage, the CSPV cells are referred to as a "laminate." Frames are then usually attached to the laminate, and a junction box is attached to the back. In the final step, modules are cleaned and inspected.

[37] SolarWorld, "Energy for You and Me" brochure, https://www.akamaienergyhawaii.com/dimages/17118/solar-101-eng-solar-photovoltaic.pdf, p. 12, accessed April 17, 2024.

The industry in the United States

U.S. producers

During the final phase of the original investigations, the Commission received U.S. producer questionnaires from 14 firms, which accounted for approximately *** percent of production of CSPV cells and *** percent of production of CSPV modules in the United States during 2011.[38] During the first five-year reviews, the Commission received U.S. producer questionnaires from 11 firms, which accounted for approximately *** percent of CSPV cell capacity and *** percent of CSPV module capacity in the United States during 2017.[39]

In response to the Commission's notice of institution in these current reviews, domestic interested parties provided a list of 18 known and currently operating U.S. producers of CSPV cells and modules. Three firms providing U.S. industry data in response to the Commission's notice of institution accounted for approximately *** percent of production of CSPV modules in the United States during 2023.[40] There is no known U.S. production of CSPV cells.

[38] Investigation Nos. 701-TA-481 and 731-TA-1190 (Final): Crystalline Silicon Photovoltaic Cells and Modules from China, Confidential Report, INV-KK-103, October 25, 2012, as revised in INV-KK-107, November 6, 2012 ("Original confidential report"), p. III-1.

[39] Investigation Nos. 701-TA-481 and 731-TA-1190 (First Review): Crystalline Silicon Photovoltaic Cells and Modules from China, Confidential Report, INV-QQ-151, December 18, 2018, as revised in INV-QQ-152, December 20, 2018 ("First review confidential report"), p. III-1.

[40] Domestic interested party's response to the notice of institution, March 4, 2023, Exhibit 1.

Recent developments[41]

While there were multiple plant openings from 2018 to 2023 (table I-6), many announcements for new facilities took place after the passing of the Inflation Reduction Act ("IRA") of 2022. The IRA extended the Investment Tax Credit ("ITC") and the Production Tax Credit ("PTC"), two of the major federal policies that promote solar energy. The IRA increased the ITC back to 30 percent and extended it through 2034 and extended the PTC of 2.75 cents/kWh through at least 2025 for systems that meet the prevailing wage and apprenticeship requirements or are under 1 megawatt in size. In addition, the IRA established the Advanced Manufacturing Production Tax Credit and expanded the Advanced Energy Project Investment Tax Credit for manufacturers of eligible components.[42]

[41] Unless otherwise noted, this information and additional details can be found in the second monitoring publication, pp. I-62–I-71.

[42] For additional discussion of the Inflation Reduction Act and other U.S. policies, see Crystalline Silicon Photovoltaic Cells, Whether or Not Partially or Fully Assembled Into Other Products, Monitoring Developments in the Domestic Industry, Inv. No. TA-201-075 (Second Monitoring), USITC Publication 5494, February 2024 ("Second monitoring publication"), pp. I-71–I-81.

Table I-6
CSPV cells and modules: Developments in the U.S. industry

Item	Firm	Plant location	Event
Plant Closure	LG Electronics	Huntsville, AL	LG closed its 550 MW facility producing modules in June 2022.
Plant Closure	Sunenergy California	n.a.	Sunenergy California filed for bankruptcy in 2021.
Plant Closure	Panasonic	n.a.	Panasonic ceased U.S. solar manufacturing operations in May 2020 and exited Tesla's facility in September 2020.
Plant Expansion	Solar4America	Sacramento, CA	Solar4America expanded its plant producing modules to 2.4 GW in 2023.
Plant Opening	NanoPV	Americus, GA	NanoPV opened a plant in 2022 producing modules.
Plant Opening	Crossroads Solar	South Bend, IN	Crossroads Solar opened a 12 MW plant in September 2021.
Plant Opening	Silfab Solar	Burlington, WA	Silfab Solar opened a facility producing modules in 2021.
Plant Opening	GAF Energy	San Jose, CA	GAF Energy opened a facility producing modules.
Plant Opening	Hanwha	Dalton, GA	Hanwha opened a 1.7 GW plant in September 2019 producing modules.
Plant Opening	JinkoSolar	Jacksonville, FL	JinkoSolar opened a 400 MW plant producing modules in February 2019.
Plant Opening	Heliene	Mountain Iron, MN	Heliene opened a 150 megawatt (MW) plant in 2018.

Sources: Sylvia, Tim, "LG to close US solar module manufacturing facility," https://pv-magazine-usa.com/2022/02/23/lg-to-close-us-solar-module-manufacturing-facility/, February 23, 2022; "Panasonic to Wind Down U.S. Manufacturing of Solar Cells and Modules in Buffalo, NY in Alignment with its Global Solar Strategy," https://news.panasonic.com/global/press/data/2020/02/en200226-8/en200226-8-1.pdf, retrieved October 10; and "Tesla and Panasonic end joint solar cell production," https://asia.nikkei.com/Business/Technology/Tesla-and-Panasonic-end-joint-solar-cell-production, retrieved October 10, 2023.Schoeck, Michael, "Solar4America begins module production at 2.4 GW Sacramento factory," https://pv-magazine-usa.com/2023/01/09/solar4america-begins-module-production-at-2-4-gw-sacramento-factory/, January 9, 2023; Engel, John, "Heliene opens solar module plant expansion," https://www.renewableenergyworld.com/solar/heliene-opens-solar-module-plant-expansion/#gref, October 28, 2022; Roselund, Christian, "Hanwha Q Cells opens the largest solar factory in the Western Hemisphere," https://pv-magazine-usa.com/2019/09/23/hanwha-q-cells-officially-opens-the-largest-solar-factory-in-the-western-hemisphere/#:~:text=pv%20magazine%20USA-,Hanwha%20Q%20Cells%20opens%20the%20largest%20solar%20factory%20in%20the,capacity%20as%20the%20Hoover%20Dam., September 23, 2019; Sylvia, Tim, "NanoPV to open US manufacturing plant," https://www.pv-magazine.com/2021/10/08/nanopv-to-open-us-manufacturing-plant/, October 8, 2021; Pickerel, Kelly, "What it's like starting a new solar panel factory amidst supply chain woes," https://www.solarpowerworldonline.com/2021/09/what-its-like-starting-a-new-solar-panel-factory-amidst-supply-chain-woes/, September 29, 2021; Roselund, Christian, "Inside JinkoSolar's Jacksonville factory," https://pv-magazine-usa.com/2019/02/26/inside-jinkosolars-jacksonville-factory/#:~:text=JinkoSolar%20has%20begun%20producing%20mono,and%20First%20Solar's%20Perryburg%20facility., February 26, 2019.

Table I-7 presents planned U.S. CSPV cell production facilities that have been publicly announced. According to Clean Energy Associates ("CEA"), a clean energy advisory company, public announcements of U.S. cell capacity additions total 84 GW, of which CEA expects 33 GW to be operational by 2027.[43]

Table I-7
CSPV cells: New U.S. CSPV cell production facilities announced

n.a.= not available

Company	State	Planned start of production	Notes
Canadian Solar	IN	Late 2025	State-of-the-art solar photovoltaic cell manufacturing plant in Jeffersonville, Indiana with an annual output of 5 GW, equivalent to approximately 20,000 high-power modules per day. Cells produced at this facility will be used at the announced 5 GW module assembly plant in Mesquite, Texas.
Convalt	NY	2025	Factory #2. Producing ingots, wafers, cells and modules in one integrated factory. Will produce Tier 1 panels for residential, commercial & industrial, and utility-scale solar projects. Annual capacity will be 10,000 MW. Expected to begin construction in June 2024 and production in May 2025.
Enel	OK	Late 2024	Facility for both bifacial PV modules and cells. Construction is planned to begin in the fall of 2023 with the first panel produced and available to the market by the end of 2024. Expected to reach 3 GW annual capacity in 2025, with the possibility of a future expansion to 6 GW.
First Solar	LA	2026	Will be First Solar's fifth fully vertically integrated manufacturing facility in the United States. Expected to grow the company's nameplate manufacturing capacity by 3.5 GW.
Heliene	MN	2025	Plans to produce 1 GW of solar modules and 1.5 GW of cells in a new facility in Minnesota. Driven by the IRA, the plan is for the new factory to begin producing modules in 2024 and cells in 2025.
Maxeon Solar	NM	2025	3GW facility for both solar modules and cells. Subject to a successful financial close under the DOE Title 17 Clean Energy Financing Program.

Table continued on next page.

[43] "PV module procurement – US factory announcements add to complexity," https://www.pv-tech.org/pv-module-procurement-us-factory-announcements-add-to-complexity/, retrieved December 12, 2023.

Table I-7 Continued
CSPV cells: New U.S. CSPV cell production facilities announced

n.a.= not available

Company	State	Planned start of production	Notes
Meyer Burger	CO	Q4 2024	With an initial capacity of 2 GW of solar cells per year, the new plant will exclusively supply Meyer Burger's solar module production in Goodyear, Arizona.
Q Cells	GA	Late 2024	In addition to its existing two solar module assembly facilities in Dalton, Georgia, the company will build a new factory in the state that will manufacture 3.3 GW of silicon ingots, wafers, cells, and more finished panels.
Silfab Solar	SC	2024	Anticipated to be fully operational in 2024 with an initial annual capability of 1 GW cell production and an additional 1.2 GW of PV solar module assembly.
Solar4America	n.a.	Late 2024	n.a.
VSK Energy	n.a.	2025	Plans for vertically integrated manufacturing facility in southern U.S. Annual production capacity of 4 GW for cells, ingots, and wafers.

Note: This table is based on publicly available information. Information on changes in production capacity at existing plants is not included. For further discussion on U.S. production capacity, see the second monitoring publication, pp. I-62–I-71.

Several additional investments in U.S. CSPV module manufacturing have been announced or are under consideration (table I-8). Industry experts estimate that over 150 GW in additional module capacity by 2027 have been announced thus far but expect less than half of announced investments to be online by 2027.[44]

Table I-8
CSPV modules: New CSPV module production facilities announced

n.a.= not available

Company	State	Planned start of production	Notes
Bila Solar	IN	2024	Will produce 1 GW of glassless, frameless solar modules per year.

Table continued on next page.

[44] PV module procurement – US factory announcements add to complexity, https://www.pv-tech.org/pv-module-procurement-us-factory-announcements-add-to-complexity/, retrieved December 12, 2023.

Table I-8 Continued
CSPV modules: New CSPV module production facilities announced

Company	State	Planned start of production	Notes
Convalt	ME	2024	Convalt's Factory #0. Establishing one solar module production line with a maximum annual capacity of 638 MW. This location will produce Tier 1 panels for residential, commercial & industrial, and utility-scale solar projects. Construction scheduled to begin October 2023 and commercial operations are scheduled to begin March 2024.
Convalt	NY	Q3 2024	Factory #1. Acquired SunPower Corporation's solar module factory in April 2021. Dismantled entire factory and has moved all the equipment to Watertown, NY. Will produce Tier 1 panels for residential, commercial & industrial and utility scale solar projects, expected to start production in Q3 of 2024.
Convalt	NY	2025	Factory #2. Producing ingots, wafers, cells and modules in one integrated factory. Will produce Tier 1 panels for residential, commercial & industrial, and utility-scale solar projects. Annual capacity will be 10,000 MW. Expected to begin construction in June 2024 and production in May 2025.
Enel	OK	Late 2024	Facility for both bifacial PV modules and cells. Construction is planned to begin in the fall of 2023 with the first panel produced and available to the market by the end of 2024. Expected to reach 3 GW annual capacity in 2025, with the possibility of a future expansion to 6 GW.
First Solar	AL	2025	Expected to be commissioned in 2025, with a planned annual capacity of 3.5 GW
First Solar	LA	2026	Will be First Solar's fifth fully vertically integrated manufacturing facility in the United States. Expected to grow the company's nameplate manufacturing capacity by 3.5 GW.

Table continued on next page.

Table I-8 Continued
CSPV modules: New CSPV module production facilities announced

Company	State	Planned start of production	Notes
Heliene	MN	2024	Plans to produce 1 GW of solar modules and 1.5 GW of cells in a new facility in Minnesota. Driven by the Inflation Reduction Act, the plan is for the new factory to begin producing modules in 2024 and cells in 2025.
Hounen	SC	n.a.	U.S. division of Zhejiang Haoneng Optoelectric Co., has announced plans for its first U.S. solar module manufacturing facility in South Carolina, a 1GW factory representing US$33 million in investment.
Maxeon Solar	NM	2025	3 GW facility for both solar modules and cells. Subject to a successful financial close under the DOE Title 17 Clean Energy Financing Program.
Meyer Burger	AZ	n.a.	Module facility in Goodyear, Arizona under construction since 2021. Plans to have cells supplied by its own cell production facility in Colorado.
Mitrex	n.a.	Q1 2024	2.5 GW solar panel factory. Will make a mix of building-integrated PV products and traditional solar panels.
Navitas Solar	n.a.	n.a.	Will be built at an undisclosed location in the U.S. Midwest with an initial capacity of 1.2 GW. Will be scaled to 10 GW capacity within a few years.
Hanwha Q Cells	GA	Late 2024	In addition to its existing two solar module assembly facilities in Dalton, Georgia, the company will build a new factory in the state that will manufacture 3.3 GW of silicon ingots, wafers, cells and more finished panels.

Table continued on next page.

Table I-8 Continued
CSPV modules: New CSPV module production facilities announced

Company	State	Planned start of production	Notes
SEG Solar	TX	2024	Plans to produce 2 GW of solar modules based on n-type TOPCon cell technology. Plans to supply the utility, commercial and residential markets.
Silfab Solar	SC	2024	Anticipated to be fully operational in 2024 with an initial annual capability of 1 GW cell production and an additional 1.2 GW of PV solar module assembly.
Trina Solar	TX	2024	Starting in 2024, when completed the facility will produce 5 GW of modules and source polysilicon from the United States and Europe.
VSK Energy	CO	2024	Plans for vertically integrated manufacturing facility. Module production will be located in Colorado with an initial capacity of 2 GW and expansion of up to 4 GW.

Note: This table is based on publicly available information. Information on producers of off-grid products and changes in production capacity at existing plants is not included.

U.S. producers' trade and financial data

The Commission asked domestic interested parties to provide trade and financial data in their response to the notice of institution in the current five-year reviews.[45] Tables I-9 and I-10 present a compilation of the trade and financial data submitted from all responding U.S. producers in the original investigations and subsequent five-year reviews.

Table I-9
CSPV cells: Trade and financial data submitted by U.S. producers, by period

Quantity in kilowatts; value in 1,000 dollars; unit value in dollars per kilowatt; ratio in percent

Item	Measure	2011	2017	2023
Capacity	Quantity	***	***	---
Production	Quantity	***	***	---
Capacity utilization	Ratio	***	***	---
U.S. shipments	Quantity	***	***	---
U.S. shipments	Value	***	***	---
U.S. shipments	Unit value	***	***	---
Net sales	Value	***	***	---
COGS	Value	***	***	---
COGS to net sales	Ratio	***	***	---
Gross profit or (loss)	Value	***	***	---
SG&A expenses	Value	***	***	---
Operating income or (loss)	Value	***	***	---
Operating income or (loss) to net sales	Ratio	***	***	---

Source: For the years 2011 and 2017, data are compiled using data submitted in the Commission's original investigation and first five-year reviews. Responding U.S. producers did not produce CSPV cells in 2023.

Note: For a discussion of data coverage, please see "U.S. producers" section."

Note: Zeroes, null values, and undefined calculations are suppressed and shown as "---".

[45] Individual company trade and financial data are presented in app. B.

Table I-10
CSPV modules: Trade and financial data submitted by U.S. producers, by period

Quantity in kilowatts; value in 1,000 dollars; unit value in dollars per kilowatt; ratio in percent

Item	Measure	2011	2017	2023
Capacity	Quantity	***	***	***
Production	Quantity	***	***	***
Capacity utilization	Ratio	***	***	***
U.S. shipments	Quantity	***	***	***
U.S. shipments	Value	***	***	***
U.S. shipments	Unit value	***	***	***
Net sales	Value	***	***	***
COGS	Value	***	***	***
COGS to net sales	Ratio	***	***	***
Gross profit or (loss)	Value	***	***	***
SG&A expenses	Value	***	***	***
Operating income or (loss)	Value	***	***	***
Operating income or (loss) to net sales	Ratio	***	***	***

Source: For the years 2011 and 2017, data are compiled using data submitted in the Commission's original investigation and first five-year reviews. For the year 2023, data are compiled using data submitted by the domestic interested party. Domestic interested party's fourth supplement to substantive response to the notice of institution, April 8, 2024, exhibit 1.

Note: For a discussion of data coverage, please see "U.S. producers" section.

Note: In the original investigations, the Commission excluded Suntech from the domestic industry. Thus, Suntech is excluded from the 2011 trade and financial data.

Definitions of the domestic like product and domestic industry

The domestic like product is defined as the domestically produced product or products which are like, or in the absence of like, most similar in characteristics and uses with, the subject merchandise. The domestic industry is defined as the U.S. producers as a whole of the domestic like product, or those producers whose collective output of the domestic like product constitutes a major proportion of the total domestic production of the product. Under the related parties provision, the Commission may exclude a U.S. producer from the domestic industry for purposes of its injury determination if "appropriate circumstances" exist.[46]

In its original determinations and first five-year review determinations, the Commission defined a single domestic like product, CSPV cells and modules, corresponding to Commerce's scope. In its original determinations and its first five-year review determinations, the Commission defined a single domestic industry as all producers of CSPV cells and modules. One firm was excluded from the domestic industry under the related parties provision in the original determinations.[47]

U.S. importers

During the final phase of the original investigations, the Commission received U.S. importer questionnaires from 49 firms, which accounted for approximately 67.1 percent of total U.S. imports of CSPV cells and modules from China during 2011.[48] Import data presented in the original investigations are based on questionnaire responses.

During the first five-year reviews, the Commission received U.S. importer questionnaires from 47 firms, which accounted for approximately 26.2 percent of total U.S. imports of CSPV cells and modules from China during 2017. Import data presented in the first reviews are based on questionnaire responses submitted during the Commission's 2017 Section 201 investigation on CSPV products. [49]

[46] Section 771(4)(B) of the Tariff Act of 1930, 19 U.S.C. § 1677(4)(B).
[47] 89 FR 6550, February 1, 2024.
[48] Original publication, p. IV-1.
[49] Crystalline Silicon Photovoltaic Cells and Modules from China, Inv. Nos. 701-TA-481 and 731-TA-1190 (Review), USITC Publication 4874, March 2019 ("First review publication"), pp. IV-1-IV-2.

Although the Commission did not receive responses from any respondent interested parties in these current reviews, in its response to the Commission's notice of institution, the domestic interested parties provided a list of 612 potential U.S. importers of CSPV cells and modules.[50]

U.S. imports

Table I-11 presents the quantity, value, and unit value of U.S. imports from China as well as the other top sources of U.S. imports (shown in descending order of 2023 imports by quantity).

[50] The list of possible U.S. importers submitted by the domestic interested party likely overstates the actual number of U.S. importers of CSPV cells and modules because it includes numerous freight forwarding and logistics firms as well as a number of duplicate entities. Domestic interested party's response to the notice of institution, March 4, 2024, exhibit 1.

Table I-11
CSPV cells and modules: U.S. imports, by source and period

Quantity in kilowatts; value in 1,000 dollars; unit value in dollars per kilowatts

U.S. imports from	Measure	2018	2019	2020	2021	2022	2023
China	Quantity	190,314	535,511	1,397,154	218,482	196,537	51,961
Vietnam	Quantity	997,499	6,078,288	7,737,291	8,048,745	11,266,700	16,294,405
Malaysia	Quantity	2,422,011	7,666,972	9,326,057	8,044,269	6,265,817	11,415,039
Thailand	Quantity	345,974	1,462,368	4,329,612	4,305,412	4,935,342	11,244,161
All other sources	Quantity	2,837,276	5,445,840	6,162,706	5,600,099	8,939,591	18,947,691
Nonsubject sources	Quantity	6,602,761	20,653,468	27,555,667	25,998,526	31,407,450	57,901,296
All import sources	Quantity	6,793,074	21,188,980	28,952,821	26,217,008	31,603,987	57,953,257
China	Value	26,367	124,923	399,551	34,494	36,321	13,219
Vietnam	Value	451,179	1,884,374	2,622,596	2,346,240	3,694,975	5,031,407
Malaysia	Value	1,268,765	2,877,692	2,873,479	2,479,322	1,779,920	3,291,738
Thailand	Value	198,605	578,264	1,497,883	1,338,788	1,711,823	4,249,674
All other sources	Value	1,547,445	1,613,064	1,845,764	1,588,595	3,600,047	7,452,208
Nonsubject sources	Value	3,465,995	6,953,394	8,839,722	7,752,945	10,786,765	20,025,028
All import sources	Value	3,492,361	7,078,317	9,239,273	7,787,439	10,823,085	20,038,247
China	Unit value	139	233	286	158	185	254
Vietnam	Unit value	452	310	339	292	328	309
Malaysia	Unit value	524	375	308	308	284	288
Thailand	Unit value	574	395	346	311	347	378
All other sources	Unit value	545	296	300	284	403	393
Nonsubject sources	Unit value	525	337	321	298	343	346
All import sources	Unit value	514	334	319	297	342	346

Source: Compiled from official Commerce statistics for HTS statistical reporting numbers 8541.40.6015, 8541.40.6020, 8541.40.6025, 8541.40.6030, 8541.40.6035, 8541.40.6045, 8541.42.0010, 8541.42.0080, 8541.43.0010, and 8541.43.0080, accessed April 1, 2024. These data may be overstated by certain items that are outside the scope of these reviews such as thin film products.

Note: Because of rounding, figure may not add to total shown.

Apparent U.S. consumption and market shares

Table I-12 presents data on U.S. producers' U.S. shipments, U.S. imports, apparent U.S. consumption, and market shares.

Table I-12
CSPV cells and modules: Apparent U.S. consumption and market shares, by source and period

Quantity in kilowatts; value in 1,000 dollars; shares in percent

Source	Measure	2011	2017	2023
U.S. producers	Quantity	***	***	***
China	Quantity	***	1,307,134	51,961
Nonsubject sources	Quantity	***	6,864,094	57,901,296
All import sources	Quantity	***	8,171,228	57,953,257
Apparent U.S. consumption	Quantity	***	***	***
U.S. producers	Value	***	***	***
China	Value	***	441,381	13,219
Nonsubject sources	Value	***	3,354,314	20,025,028
All import sources	Value	***	3,795,695	20,038,247
Apparent U.S. consumption	Value	***	***	***
U.S. producers	Share of quantity	***	***	***
China	Share of quantity	***	***	***
Nonsubject sources	Share of quantity	***	***	***
All import sources	Share of quantity	***	***	***
U.S. producers	Share of value	***	***	***
China	Share of value	***	***	***
Nonsubject sources	Share of value	***	***	***
All import sources	Share of value	***	***	***

Source: For the years 2011 and 2017, data are compiled using data submitted in the Commission's original investigations and first five-year reviews. For the year 2023, U.S. producers' U.S. shipments are compiled from the domestic interested party's response to the Commission's notice of institution and U.S. imports are compiled using official Commerce statistics under HTS statistical reporting numbers 8541.40.6015, 8541.40.6020, 8541.40.6025, 8541.40.6030, 8541.40.6035, 8541.40.6045, 8541.42.0010, 8541.42.0080, 8541.43.0010, and 8541.43.0080, accessed April 1, 2024.

Note: Share of quantity is the share of apparent U.S. consumption by quantity in percent; share of value is the share of apparent U.S. consumption by value in percent.

Note: For 2011, apparent U.S. consumption does not include data for CSPV cells and is derived from U.S. shipments of imports, rather than U.S. imports. See original publication, p. 21 n.166, for additional detail.

Note: For a discussion of data coverage, please see "U.S. producers" and "U.S. importers" sections.

The industry in China

Producers in China

During the final phase of the original investigations, the Commission received foreign producer/exporter questionnaires from 18 firms, which accounted for approximately *** percent of production of CSPV cells and *** percent of production of CSPV modules in China during 2011.[51]

During the first five-year reviews, the Commission received foreign producer/exporter questionnaires from nine firms, which accounted for approximately *** percent of production of CSPV cells and *** percent of production of CSPV modules in China during 2017.[52]

Although the Commission did not receive responses from any respondent interested parties in these five-year reviews, the domestic interested party provided a list of 448 possible producers of CSPV cells and modules in China.[53]

[51] Original confidential report, p. VII-2.

[52] First review confidential report, p. IV-23.

[53] Domestic interested party's supplement to substantive response to the notice of institution, March 25, 2024, exhibit 1. The list of possible foreign producers submitted by the domestic interested party likely overstates the actual number of foreign producers of CSPV cells and modules in China because it includes numerous freight forwarding and logistics firms as well as a number of duplicate entities. Ibid.

Recent developments

Table I-13 presents events in the Chinese industry since the Commission's last five-year reviews.

Table I-13
CSPV cells and modules: Developments in the Chinese industry

Item	Firm	Event
Acquisition	LONGi Green Energy	LONGi acquired CSPV cell and module manufacturer Ningbo Jiangbei Yize New Technology for $252.8 million in 2020.
Plant Closure	Kyocera	Kyocera ceased operations in Tianjin, China in March 2023.
Plant Opening	Trina Solar	Trina opened a plant with 10 GW of cell and 10 GW of module capacity in Xining, Qinghai, China in April 2023.
Plant Opening	LONGi Green Energy	LONGi opened a 5 GW plant in Chuzhou, Anhui, China producing modules in March 2019.
Plant Opening	Risen Energy	Risen opened a 5 GW plant in Changzhou City, Jiangsu, China producing cells and modules in January 2018.

Sources: Thomas, Nithin, "LONGi Solar to Acquire Chinese Solar Cell and Module Manufacturer for $253 million," https://www.mercomindia.com/longi-solar-acquire-solar-cell-module-manufacturer, March 2, 2020; Fichtner, Sebrina, "Japan's Kyocera closes solar factory in China," https://www.solarbeglobal.com/japans-kyocera-closes-solar-factory-in-china/#:~:text=Ceramics%20professional%20manufacturer%20Kyocera%20has,Japan's%20major%20press%20Nikkei%20yesterday.&text=Kyocera's%20solar%20panel%20business%20was%20in%20a%20loss%20state%20in%202021., March 9, 2023; Publicover, Brian, "Longi to invest $300 million in 5 GW module plant in China," https://www.pv-magazine.com/2018/01/08/longi-to-invest-300-million-in-5-gw-module-plant-in-china/, January 8, 2018; Trina Solar, "Trina Solar Breaks Ground on PV Factory to Support N-Type Technology," https://www.trinasolar.com/us/resources/newsroom/ustrina-solar-breaks-ground-pv-factory-support-n-type-technology, July 5, 2022; Beetz, Becky, "Risen Energy to start production at new 5 GW solar factory in China," https://www.pv-magazine.com/2018/01/11/risen-energy-to-start-production-at-new-5-gw-solar-factory-in-china/, January 11, 2018

In addition, on January 19, 2020, China imposed antidumping and countervailing duties between 55.4 percent and 59.1 percent on U.S. manufacturers of polysilicon, including Hemlock Semiconductor Corporation (55.4 percent), REC Solar Grade Silicon LLC (57.0 percent), REC Advanced Silicon Materials LLC (57.0 percent), MEMC Pasadena Inc. (53.6 percent), AE Polysilicon Corp. (59.1 percent), and other U.S. companies (59.1 percent).[54] These duties are set to expire on January 19, 2025.[55]

China imposed antidumping and countervailing duties between 4.4 percent and 113.8 percent on South Korean manufacturers of polysilicon, including OCI company Ltd. (4.4 percent), Hanwha Chemical Corp. (8.9 percent), Hankook Silicon Co., Ltd. (9.5 percent), SMP Ltd. (88.7 percent), Woongjin Polysilicon Co., Ltd. (113.8 percent), KCC Corp. (113.8 percent), KAM Corp. (113.8 percent), Innovative Silicon Co., Ltd (113.8 percent), and other South Korean companies (88.7 percent).[56] These duties are set to expire on January 19, 2025 unless they are extended for another five years.[57]

[54] BernReuter Research, "New Chinese polysilicon duties are slap in the face to trade deal," https://www.bernreuter.com/newsroom/polysilicon-news/article/new-chinese-polysilicon-duties-are-slap-in-the-face-to-u-s-trade-deal/#:~:text=China%20will%20impose%20high%20duties%20on%20polysilicon%20imports,those%20introduced%20in%202014%20or%20amended%20in%202017, January 19, 2020.

[55] *Ibid.*

[56] *Ibid.*

[57] *Ibid.*

Exports

Table I-14 presents export data from the Global Trade Atlas, HTS subheadings 8541.40, 8541.42, and 8541.43, categories that include CSPV cells and modules and out-of-scope products, from China (by export destination in descending order of quantity for 2023).

Table I-14
CSPV cells and modules: Value of exports from China, by destination and period

Value in 1,000 dollars

Destination market	2018	2019	2020	2021	2022	2023
Netherlands	456,713	2,272,729	3,001,726	6,063,831	11,308,981	9,031,616
Brazil	588,402	1,143,059	1,083,742	3,103,031	4,826,533	3,719,980
India	2,352,657	1,661,949	1,456,134	4,050,009	3,343,395	3,169,068
Spain	293,801	945,719	875,619	1,252,913	2,892,284	2,227,491
Pakistan	323,660	369,488	373,074	594,183	902,910	1,454,247
Saudi Arabia	24,279	113,960	26,432	24,063	316,698	1,335,909
Japan	1,954,212	1,935,604	1,651,471	1,726,008	1,854,112	1,327,871
Australia	1,289,481	1,236,824	991,664	1,287,802	1,325,514	1,314,955
Turkey	81,909	174,376	233,808	385,838	930,010	1,233,162
Belgium	67,121	125,356	140,427	231,389	511,999	1,080,521
All other markets	10,735,579	13,602,467	14,006,250	14,738,530	18,165,991	17,888,521
All markets	18,167,813	23,581,531	23,841,346	33,457,596	46,378,428	43,783,325

Source: Global Trade Information Services, Inc., Global Trade Atlas, HS subheadings 8541.40, 8541.42, and 8541.43, accessed April 2, 2024. These data may be overstated as HS subheading 8541.40 may contain products outside the scope of this review.

Note: Because of rounding, figures may not add to totals shown.

Third-country trade actions

Several countries have imposed antidumping and/or countervailing duties on imports of CSPV products from one or more sources. Such restraints (as well as investigations that did not result in duties) are discussed in detail in the sections that follow, organized by the specific country that has undertaken such measures. A summary of import restraint measures taken by third countries is presented in table I-15.

Table I-15
CSPV cells and modules: Third country market import restraints in effect, since 2018

Imposing Country	Product	Measure Imposed	Date	Countries Impacted
Brazil	CSPV Modules	Import tax: 12%	February 2024	All countries
Canada	CSPV Modules	Antidumping duties: 124.4% Subsidy rate: 6.2%	January 2021	China
Turkey	CSPV Modules	Antidumping duties: $20/square meter to $25/square meter	September 2023	China

Source: Cited public articles in sections that follow.

Brazil

On December 12, 2023, the Brazilian Ministry of Industry and Trade approved a 12 percent import tariff on solar panels to go into effect in February 2024.[58] The Brazilian government revoked over 300 temporary tax reduction measures on solar components.[59] The majority of CSPV components exported to Brazil originate in China.[60]

[58] Reuters, "Brazil to resume import taxes on solar panels, wind turbines," https://www.reuters.com/business/energy/brazil-resume-import-taxes-solar-panels-wind-turbines-2023-12-12/, December 12, 2023.

[59] OWELL Industries, "Brazil Reinstates 12% Import Tariff on Photovoltaic Components!" https://www.owellindustries.com/brazil-reinstates-import-tariff-on-photovoltaic-components.html, December 21, 2023.

[60] *Ibid.*

Canada[61]

On July 3, 2015, the CITT determined that the dumping and subsidizing of the CSPV products from China did not cause injury but threatened to cause injury to the Canadian industry. The Canada Border Services Agency ("CBSA") determined that 100 percent of the subject goods imported into Canada from China had been dumped at a weighted average margin of 124.4 percent (expressed as an export price percentage). The CBSA also determined that 100 percent of the subject goods imported into Canada from China had been subsidized at a weighted average subsidy amount of 6.2 percent (expressed as an export price percentage).[62] As such, on March 25, 2021, the CITT decided to continue findings made on July 3, 2015.[63]

On March 25, 2021, the Canadian International Trade Tribunal (CITT) released an order regarding "the dumping and subsidizing of photovoltaic modules and laminates consisting of crystalline silicon photovoltaic cells, including laminates shipped or packaged with other components of photovoltaic modules, and thin-film photovoltaic products produced from amorphous silicon (a-Si), cadmium telluride (CdTe), or copper indium gallium selenide (CIGS), originating in or exported from the People's Republic of China excluding modules, laminates or thin-film products with a power output not exceeding 100 W, and also, excluding modules, laminates or thin-film products incorporated into electrical goods where the function of the electrical goods is other than power generation and these electrical goods consume the electricity generated by the photovoltaic product."[64]

[61] Canadian International Trade Tribunal, "PHOTOVOLTAIC MODULES AND LAMINATES ORIGINATING IN OR EXPORTED FROM THE PEOPLE'S REPUBLIC OF CHINA," https://decisions.citt-tcce.gc.ca/citt-tcce/a/en/item/494513/index.do, March 25, 2021.

[62] *Photovoltaic Modules and Laminates*, Inquiry No. NQ-2014-003, Canadian International Trade Tribunal, July 3, 2015, http://www.citt.gc.ca/en/node/7411#_Toc426546520, accessed July 10, 2017.

[63] Canadian International Trade Tribunal, "PHOTOVOLTAIC MODULES AND LAMINATES ORIGINATING IN OR EXPORTED FROM THE PEOPLE'S REPUBLIC OF CHINA," https://decisions.citt-tcce.gc.ca/citt-tcce/a/en/item/494513/index.do, March 25, 2021.

[64] *Ibid.*

Turkey

On July 1, 2016, Turkey initiated on antidumping investigation on photovoltaic modules from China. The Turkish government issued an affirmative ruling on April 1, 2017, and resulting in anti-dumping duties of US$20/square meter and US$25/square meter on the products involved.[65] On March 26, 2022, Turkey initiated the first sunset review of the 2016-2017 investigation which resulted in an affirmative ruling on September 15, 2023, and thereby continuing to impose the above outlined antidumping duties.

The global market

Table I-16 presents global export data for HTS subheadings 8541.40, 8541.42, and 8541.43, categories that include CSPV cells and modules and out-of-scope products, by source in descending order of quantity for 2023.

Table I-16
CSPV cells and modules: Value of global exports by country and period

Value in 1,000 dollars

Export markets	2018	2019	2020	2021	2022	2023
China	18,167,813	23,581,531	23,841,346	33,457,596	46,378,428	43,783,325
Netherlands	2,367,420	2,774,931	3,238,122	5,170,386	8,237,383	7,858,801
Thailand	1,206,234	1,356,289	1,907,536	1,978,817	2,154,048	4,237,355
Malaysia	4,515,916	4,678,637	4,196,322	4,883,605	4,502,406	4,165,078
India	114,771	233,839	114,210	165,020	572,166	1,836,433
Germany	2,598,398	2,461,274	2,423,381	3,067,642	1,557,261	1,180,943
South Korea	4,307,645	3,512,496	3,110,777	3,053,825	1,576,203	1,159,182
Belgium	131,579	213,658	204,985	317,754	414,072	700,351
Portugal	17,212	265,840	242,342	319,779	745,788	617,947
Taiwan	2,833,435	1,769,269	1,496,457	2,225,125	1,757,311	592,349
Slovenia	71,267	98,777	153,972	195,245	405,968	540,015
All other markets	16,748,615	16,988,830	18,794,817	21,394,066	11,605,781	3,846,898
All markets	53,080,304	57,935,371	59,724,267	76,228,860	79,906,814	70,518,677

Source: Global Trade Information Services, Inc., Global Trade Atlas, HS subheadings 8541.40, 8541.42, and 8541.43, accessed April 2, 2024. These data may be overstated as HS subheading 8541.40 may contain products outside the scope of this review.

Note: Because of rounding, figures may not add to total shown.

[65] Jingsun, "Türkiye Imposes Anti-Dumping Duties On Chinese Solar Panels," https://www.jingsun-power.com/news/t-rkiye-imposes-anti-dumping-duties-on-chinese-76102589.html, March 25, 2024.

APPENDIX A

FEDERAL REGISTER NOTICES

The Commission makes available notices relevant to its investigations and reviews on its website, www.usitc.gov. In addition, the following tabulation presents, in chronological order, Federal Register notices issued by the Commission and Commerce during the current proceeding.

Citation	Title	Link
89 FR 6499, February 1, 2024	*Initiation of Five-Year (Sunset) Reviews*	https://www.govinfo.gov/content/pkg/FR-2024-02-01/pdf/2024-02001.pdf
89 FR 6550, February 1, 2024	*Crystalline Silicon Photovoltaic Cells and Modules From China; Institution of Five-Year Reviews*	https://www.govinfo.gov/content/pkg/FR-2024-02-01/pdf/2024-01908.pdf

APPENDIX B

COMPANY-SPECIFIC DATA

* * * * * * *

APPENDIX C

SUMMARY DATA COMPILED IN PRIOR PROCEEDINGS

Single like product: CSPV cells and modules: Total market

Table C-1
CSPV cells and modules: Summary data concerning the total U.S. market, 2012-17, January to June 2017, and January to June 2018

(Quantity=kilowatts; Value=1,000 dollars; Unit values, unit labor costs, and unit expenses=dollars per kilowatt; Period changes=percent--exceptions noted)

	Reported data							
	Calendar year						January to June	
	2012	2013	2014	2015	2016	2017	2017	2018
U.S. total market consumption quantity:								
Amount	***	***	***	***	***	***	***	***
Producers' share (fn1)	***	***	***	***	***	***	***	***
Importers' share (fn1):								
China	***	***	***	***	***	***	***	***
Nonsubject sources	***	***	***	***	***	***	***	***
All import sources	***	***	***	***	***	***	***	***
U.S. total market consumption value:								
Amount	***	***	***	***	***	***	***	***
Producers' share (fn1):								
Fully domestic	***	***	***	***	***	***	***	***
Value added to imports	***	***	***	***	***	***	***	***
Total value	***	***	***	***	***	***	***	***
Importers' share (fn1):								
China	***	***	***	***	***	***	***	***
Nonsubject sources	***	***	***	***	***	***	***	***
All import sources	***	***	***	***	***	***	***	***
U.S. imports from:								
China:								
Quantity	326,846	82,264	1,263,270	3,311,513	2,720,193	1,307,134	50,760	22,962
Value	291,878	69,976	747,148	1,680,733	1,258,864	441,381	25,860	12,670
Unit value	$893	$851	$591	$508	$463	$338	$509	$552
Ending inventory quantity	***	***	***	***	***	***	***	***
Nonsubject sources:								
Quantity	1,835,542	3,019,148	3,319,628	5,118,880	10,093,375	6,864,094	2,244,954	2,350,780
Value	1,612,786	2,144,481	2,267,713	3,287,132	5,801,625	3,354,314	1,053,465	1,023,168
Unit value	$879	$710	$683	$642	$575	$489	$469	$435
Ending inventory quantity	***	***	***	***	***	***	***	***
All import sources:								
Quantity	2,162,388	3,101,412	4,582,898	8,430,393	12,813,568	8,171,228	2,295,714	2,373,742
Value	1,904,664	2,214,457	3,014,861	4,967,865	7,060,489	3,795,695	1,079,325	1,035,838
Unit value	$881	$714	$658	$589	$551	$465	$470	$436
Ending inventory quantity	***	***	***	***	***	***	***	***
U.S. cell producers':								
Average capacity quantity	***	***	***	***	***	***	***	***
Production quantity	***	***	***	***	***	***	***	***
Capacity utilization (fn1)	***	***	***	***	***	***	***	***
U.S. module assemblers':								
Average capacity quantity	***	***	***	***	***	***	***	***
Production quantity	***	***	***	***	***	***	***	***
Capacity utilization (fn1)	***	***	***	***	***	***	***	***
Combined U.S. cell producers and U.S. module assemblers:								
U.S. shipments (fn3):								
Quantity	***	***	***	***	***	***	***	***
Value:								
Fully domestic	***	***	***	***	***	***	***	***
Value added to imports	***	***	***	***	***	***	***	***
Total value	***	***	***	***	***	***	***	***
Unit value (fn4)	***	***	***	***	***	***	***	***
Export shipments (fn5):								
Quantity	***	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***	***
Inventories/total shipments (fn1)	***	***	***	***	***	***	***	***
Production workers	***	***	***	***	***	***	***	***
Hours worked (1,000s)	***	***	***	***	***	***	***	***
Wages paid ($1,000)	***	***	***	***	***	***	***	***
Hourly wages	***	***	***	***	***	***	***	***
Total market net sales: (fn6)								
Quantity	***	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***	***
Cost of goods sold (COGS)	***	***	***	***	***	***	***	***
Gross profit of (loss)	***	***	***	***	***	***	***	***
SG&A expenses	***	***	***	***	***	***	***	***
Operating income or (loss)	***	***	***	***	***	***	***	***
Net income or (loss)	***	***	***	***	***	***	***	***
Capital expenditures	***	***	***	***	***	***	***	***
Unit COGS	***	***	***	***	***	***	***	***
Unit SG&A expenses	***	***	***	***	***	***	***	***
Unit operating income or (loss)	***	***	***	***	***	***	***	***
Unit net income or (loss)	***	***	***	***	***	***	***	***
COGS/sales (fn1)	***	***	***	***	***	***	***	***
Operating income or (loss)/sales (fn1)	***	***	***	***	***	***	***	***
Net income or (loss)/sales (fn1)	***	***	***	***	***	***	***	***

Table continued on next page.

Table C-1--Continued
CSPV cells and modules: Summary data concerning the total U.S. market, 2012-17, January to June 2017, and January to June 2018

(Quantity=kilowatts; Value=1,000 dollars; Unit values, unit labor costs, and unit expenses=dollars per kilowatt; Period changes=percent--exceptions noted)

	Period changes						
	Comparison years						Jan-Jun
	2012-17	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
U.S. consumption quantity:							
Amount	***	***	***	***	***	***	***
Producers' share (fn1)	***	***	***	***	***	***	***
Importers' share (fn1):							
China	***	***	***	***	***	***	***
Nonsubject sources	***	***	***	***	***	***	***
All import sources	***	***	***	***	***	***	***
U.S. consumption value:							
Amount	***	***	***	***	***	***	***
Producers' share (fn1)							
Fully domestic	***	***	***	***	***	***	***
Value added to imports	***	***	***	***	***	***	***
Total value	***	***	***	***	***	***	***
Importers' share (fn1):							
China	***	***	***	***	***	***	***
Nonsubject sources	***	***	***	***	***	***	***
All import sources	***	***	***	***	***	***	***
U.S. imports from:							
China:							
Quantity	299.9	(74.8)	1,435.6	162.1	(17.9)	(51.9)	(54.8)
Value	51.2	(76.0)	967.7	125.0	(25.1)	(64.9)	(51.0)
Unit value	(62.2)	(4.7)	(30.5)	(14.2)	(8.8)	(27.0)	8.3
Ending inventory quantity	***	***	***	***	***	***	***
Nonsubject sources:							
Quantity	274.0	64.5	10.0	54.2	97.2	(32.0)	4.7
Value	108.0	33.0	5.7	45.0	76.5	(42.2)	(2.9)
Unit value	(44.4)	(19.2)	(3.8)	(6.0)	(10.5)	(15.0)	(7.2)
Ending inventory quantity	***	***	***	***	***	***	***
All import sources:							
Quantity	277.9	43.4	47.8	84.0	52.0	(36.2)	3.4
Value	99.3	16.3	36.1	64.8	42.1	(46.2)	(4.0)
Unit value	(47.3)	(18.9)	(7.9)	(10.4)	(6.5)	(15.7)	(7.2)
Ending inventory quantity	***	***	***	***	***	***	***
U.S. cell producers':							
Average capacity quantity	***	***	***	***	***	***	***
Production quantity	***	***	***	***	***	***	***
Capacity utilization (fn1)	***	***	***	***	***	***	***
U.S. module assemblers':							
Average capacity quantity	***	***	***	***	***	***	***
Production quantity	***	***	***	***	***	***	***
Capacity utilization (fn1)	***	***	***	***	***	***	***
Combined U.S. cell producers' and U.S. module assemblers':							
U.S. shipments (fn3):							
Quantity	***	***	***	***	***	***	***
Value:							
Fully domestic	***	***	***	***	***	***	***
Value added to imports	***	***	***	***	***	***	***
Total value	***	***	***	***	***	***	***
Unit value (fn4)	***	***	***	***	***	***	***
Export shipments (fn5):							
Quantity	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***
Inventories/total shipments (fn1)	***	***	***	***	***	***	***
Production workers	***	***	***	***	***	***	***
Hours worked (1,000s)	***	***	***	***	***	***	***
Wages paid ($1,000)	***	***	***	***	***	***	***
Hourly wages	***	***	***	***	***	***	***
Total market net sales: (fn6)							
Quantity	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***
Cost of goods sold (COGS)	***	***	***	***	***	***	***
Gross profit of (loss)	***	***	***	***	***	***	***
SG&A expenses	***	***	***	***	***	***	***
Operating income or (loss)	***	***	***	***	***	***	***
Net income or (loss)	***	***	***	***	***	***	***
Capital expenditures	***	***	***	***	***	***	***
Unit COGS	***	***	***	***	***	***	***
Unit SG&A expenses	***	***	***	***	***	***	***
Unit operating income or (loss)	***	***	***	***	***	***	***
Unit net income or (loss)	***	***	***	***	***	***	***
COGS/sales (fn1)	***	***	***	***	***	***	***
Operating income or (loss)/sales (fn1)	***	***	***	***	***	***	***
Net income or (loss)/sales (fn1)	***	***	***	***	***	***	***

Table notes on next page.

Table C-1--Continued
CSPV cells and modules: Summary data concerning the total U.S. market, 2012-17, January to June 2017, and January to June 2018

Note.--Shares and ratios shown as "0.0" represent values greater than zero, but less than "0.05" percent.

fn1.--Reported data are in percent and period changes are in percentage points.
fn2.--Undefined.
fn3.--The quantity for U.S. producers' U.S. shipments reflects the quantity of U.S.-origin CSPV cells manufactured and sold in the United States regardless of where module assembly occurred; The value for U.S. producers' U.S. shipments reflects the value of U.S.-origin cells manufactured and sold in the United States plus the value added by domestic modules assemblers that imported foreign-origin CSPV cells and assembled them into modules in the United States. In measuring consumption and market share this methodology avoids reclassifying and/or double counting merchandise already reported once as an import.
fn4.--Unit value of U.S. producers' U.S. shipments excludes the value added to imports by domestic module assemblers.
fn5.--A portion of ***.
fn6.--The financial data presented here represents both module assemblers (total market operations) and cell producers (open market operations) combined operations, and, therefore, a portion of the reported net sales quantities includes some volume of merchandise reported as imports within the apparent consumption calculations.

Source: Compiled from data submitted in response to Commission questionnaires. Import data compiled from data reported in Office of Investigations memorandum INV-PP-119 (CPSV 3, solar 201 staff report) for 2012-16 period, and compiled from data submitted in response to commission questionaires and official U.S. import statistics under HTS codes 8541.40.6020 and 8541.40.6030, accessed October 30, 2018, for the 2017, January to June 2017, and January to June 2018 periods with adjustment. See detailed explanation of the methodology for adjusted official U.S. import statistics in part IV of this report.

Split like product: CSPV modules: Total market

Table C-2
CSPV modules: Summary data concerning the total U.S. market, 2012-17, January to June 2017, and January to June 2018

(Quantity=kilowatts; Value=1,000 dollars; Unit values, unit labor costs, and unit expenses=dollars per kilowatt; Period changes=percent--exceptions noted)

	Reported data							
	Calendar year						January to June	
	2012	2013	2014	2015	2016	2017	2017	2018
U.S. total market consumption quantity:								
Amount	***	***	***	***	***	***	***	***
Producers' share (fn1)	***	***	***	***	***	***	***	***
Importers' share (fn1):								
China	***	***	***	***	***	***	***	***
Nonsubject sources	***	***	***	***	***	***	***	***
All import sources	***	***	***	***	***	***	***	***
U.S. total market consumption value:								
Amount	***	***	***	***	***	***	***	***
Producers' share (fn1)	***	***	***	***	***	***	***	***
Importers' share (fn1):								
China	***	***	***	***	***	***	***	***
Nonsubject sources	***	***	***	***	***	***	***	***
All import sources	***	***	***	***	***	***	***	***
U.S. imports from:								
China:								
Quantity	***	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***	***
Nonsubject sources:								
Quantity	***	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***	***
All import sources:								
Quantity	***	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***	***
U.S. producers':								
Average capacity quantity	***	***	***	***	***	***	***	***
Production quantity	***	***	***	***	***	***	***	***
Capacity utilization (fn1)	***	***	***	***	***	***	***	***
U.S. shipments:								
Quantity	***	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***	***
Export shipments:								
Quantity	***	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***	***
Inventories/total shipments (fn1)	***	***	***	***	***	***	***	***
Production workers	***	***	***	***	***	***	***	***
Hours worked (1,000s)	***	***	***	***	***	***	***	***
Wages paid ($1,000)	***	***	***	***	***	***	***	***
Hourly wages	***	***	***	***	***	***	***	***
Productivity (watts per hour)	***	***	***	***	***	***	***	***
Unit labor costs	***	***	***	***	***	***	***	***
Total market net sales:								
Quantity	***	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***	***
Cost of goods sold (COGS)	***	***	***	***	***	***	***	***
Gross profit of (loss)	***	***	***	***	***	***	***	***
SG&A expenses	***	***	***	***	***	***	***	***
Operating income or (loss)	***	***	***	***	***	***	***	***
Net income or (loss)	***	***	***	***	***	***	***	***
Capital expenditures	***	***	***	***	***	***	***	***
Unit COGS	***	***	***	***	***	***	***	***
Unit SG&A expenses	***	***	***	***	***	***	***	***
Unit operating income or (loss)	***	***	***	***	***	***	***	***
Unit net income or (loss)	***	***	***	***	***	***	***	***
COGS/sales (fn1)	***	***	***	***	***	***	***	***
Operating income or (loss)/sales (fn1)	***	***	***	***	***	***	***	***
Net income or (loss)/sales (fn1)	***	***	***	***	***	***	***	***

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Table C-2--Continued
CSPV modules: Summary data concerning the U.S. market, 2012-17, January to June 2017, and January to June 2018

(Quantity=kilowatts; Value=1,000 dollars; Unit values, unit labor costs, and unit expenses=dollars per kilowatt; Period changes=percent--exceptions noted)

	Period changes						
	Comparison years						Jan-Jun
	2012-17	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
U.S. consumption quantity:							
Amount	***	***	***	***	***	***	***
Producers' share (fn1)	***	***	***	***	***	***	***
Importers' share (fn1):							
China	***	***	***	***	***	***	***
Nonsubject sources	***	***	***	***	***	***	***
All import sources	***	***	***	***	***	***	***
U.S. consumption value:							
Amount	***	***	***	***	***	***	***
Producers' share (fn1)	***	***	***	***	***	***	***
Importers' share (fn1):							
China	***	***	***	***	***	***	***
Nonsubject sources	***	***	***	***	***	***	***
All import sources	***	***	***	***	***	***	***
U.S. imports from:							
China:							
Quantity	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***
Nonsubject sources:							
Quantity	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***
All import sources:							
Quantity	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***
U.S. module producers':							
Average capacity quantity	***	***	***	***	***	***	***
Production quantity	***	***	***	***	***	***	***
Capacity utilization (fn1)	***	***	***	***	***	***	***
U.S. shipments:							
Quantity	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***
Export shipments:							
Quantity	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***
Inventories/total shipments (fn1)	***	***	***	***	***	***	***
Production workers	***	***	***	***	***	***	***
Hours worked (1,000s)	***	***	***	***	***	***	***
Wages paid ($1,000)	***	***	***	***	***	***	***
Hourly wages	***	***	***	***	***	***	***
Productivity (watts per hour)	***	***	***	***	***	***	***
Unit labor costs	***	***	***	***	***	***	***
Total market net sales:							
Quantity	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***
Cost of goods sold (COGS)	***	***	***	***	***	***	***
Gross profit of (loss)	***	***	***	***	***	***	***
SG&A expenses	***	***	***	***	***	***	***
Operating income or (loss)	***	***	***	***	***	***	***
Net income or (loss)	***	***	***	***	***	***	***
Capital expenditures	***	***	***	***	***	***	***
Unit COGS	***	***	***	***	***	***	***
Unit SG&A expenses	***	***	***	***	***	***	***
Unit operating income or (loss)	***	***	***	***	***	***	***
Unit net income or (loss)	***	***	***	***	***	***	***
COGS/sales (fn1)	***	***	***	***	***	***	***
Operating income or (loss)/sales (fn1)	***	***	***	***	***	***	***
Net income or (loss)/sales (fn1)	***	***	***	***	***	***	***

Note.--Shares and ratios shown as "0.0" represent values greater than zero, but less than "0.05" percent.

fn1.--Reported data are in percent and period changes are in percentage points.
fn2.--Undefined.
fn3.--U.S. producers' U.S. shipments includes ***.

Source: Compiled from data submitted in response to Commission questionnaires. Import data compiled from data reported in Office of Investigations memorandum INV-PP-119 (CPSV 3, solar 201 staff report) for 2012-16 period, and compiled from data submitted in response to commission questionaires and official U.S. import statistics under HTS statistical reporting number 8541.40.6030, accessed October 30, 2018, for the 2017, January to June 2017, and January to June 2018 periods with adjustment. See detailed explanation of the methodology for adjusted official U.S. import statistics in part IV of this report.

Split like product: CSPV cells: Merchant market

Table C-3
CSPV cells: Summary data concerning the merchant U.S. market, 2012-17, January to June 2017, and January to June 2018

(Quantity=kilowatts; Value=1,000 dollars; Unit values, unit labor costs, and unit expenses=dollars per kilowatt; Period changes=percent--exceptions noted)

	Reported data							
	Calendar year						January to June	
	2012	2013	2014	2015	2016	2017	2017	2018
U.S. merchant market consumption quantity:								
Amount	***	***	***	***	***	***	***	***
Producers' share (fn1)	***	***	***	***	***	***	***	***
Importers' share (fn1):								
China	***	***	***	***	***	***	***	***
Nonsubject sources	***	***	***	***	***	***	***	***
All import sources	***	***	***	***	***	***	***	***
U.S. merchant market consumption value:								
Amount	***	***	***	***	***	***	***	***
Producers' share (fn1)	***	***	***	***	***	***	***	***
Importers' share (fn1):								
China	***	***	***	***	***	***	***	***
Nonsubject sources	***	***	***	***	***	***	***	***
All import sources	***	***	***	***	***	***	***	***
U.S. imports from:								
China:								
Quantity	***	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***	***
Nonsubject sources:								
Quantity	***	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***	***
All import sources:								
Quantity	***	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***	***
U.S. producers':								
Average capacity quantity	***	***	***	***	***	***	***	***
Production quantity	***	***	***	***	***	***	***	***
Capacity utilization (fn1)	***	***	***	***	***	***	***	***
Commercial U.S. shipments:								
Quantity	***	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***	***
Export shipments:								
Quantity	***	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***	***
Inventories/total shipments (fn1)	***	***	***	***	***	***	***	***
Production workers	***	***	***	***	***	***	***	***
Hours worked (1,000s)	***	***	***	***	***	***	***	***
Wages paid ($1,000)	***	***	***	***	***	***	***	***
Hourly wages	***	***	***	***	***	***	***	***
Productivity (watts per hour)	***	***	***	***	***	***	***	***
Unit labor costs	***	***	***	***	***	***	***	***
Open market net sales:								
Quantity	***	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***	***
Cost of goods sold (COGS)	***	***	***	***	***	***	***	***
Gross profit of (loss)	***	***	***	***	***	***	***	***
SG&A expenses	***	***	***	***	***	***	***	***
Operating income or (loss)	***	***	***	***	***	***	***	***
Net income or (loss)	***	***	***	***	***	***	***	***
Capital expenditures	***	***	***	***	***	***	***	***
Unit COGS	***	***	***	***	***	***	***	***
Unit SG&A expenses	***	***	***	***	***	***	***	***
Unit operating income or (loss)	***	***	***	***	***	***	***	***
Unit net income or (loss)	***	***	***	***	***	***	***	***
COGS/sales (fn1)	***	***	***	***	***	***	***	***
Operating income or (loss)/sales (fn1)	***	***	***	***	***	***	***	***
Net income or (loss)/sales (fn1)	***	***	***	***	***	***	***	***

Table continued on next page.

Table C-3--Continued
CSPV cells: Summary data concerning the merchant U.S. market, 2012-17, January to June 2017, and January to June 2018

(Quantity=kilowatts; Value=1,000 dollars; Unit values, unit labor costs, and unit expenses=dollars per kilowatt; Period changes=percent--exceptions noted)

	Period changes						
	Comparison years						Jan-Jun
	2012-17	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
U.S. consumption quantity:							
Amount	***	***	***	***	***	***	***
Producers' share (fn1)	***	***	***	***	***	***	***
Importers' share (fn1):							
China	***	***	***	***	***	***	***
Nonsubject sources	***	***	***	***	***	***	***
All import sources	***	***	***	***	***	***	***
U.S. consumption value:							
Amount	***	***	***	***	***	***	***
Producers' share (fn1)	***	***	***	***	***	***	***
Importers' share (fn1):							
China	***	***	***	***	***	***	***
Nonsubject sources	***	***	***	***	***	***	***
All import sources	***	***	***	***	***	***	***
U.S. imports from:							
China:							
Quantity	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***
Nonsubject sources:							
Quantity	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***
All import sources:							
Quantity	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***
U.S. cell producers':							
Average capacity quantity	***	***	***	***	***	***	***
Production quantity	***	***	***	***	***	***	***
Capacity utilization (fn1)	***	***	***	***	***	***	***
Commercial U.S. shipments:							
Quantity	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***
Export shipments:							
Quantity	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***
Ending inventory quantity	***	***	***	***	***	***	***
Inventories/total shipments (fn1)	***	***	***	***	***	***	***
Production workers	***	***	***	***	***	***	***
Hours worked (1,000s)	***	***	***	***	***	***	***
Wages paid ($1,000)	***	***	***	***	***	***	***
Hourly wages	***	***	***	***	***	***	***
Productivity (watts per hour)	***	***	***	***	***	***	***
Unit labor costs	***	***	***	***	***	***	***
Open market net sales:							
Quantity	***	***	***	***	***	***	***
Value	***	***	***	***	***	***	***
Unit value	***	***	***	***	***	***	***
Cost of goods sold (COGS)	***	***	***	***	***	***	***
Gross profit of (loss)	***	***	***	***	***	***	***
SG&A expenses	***	***	***	***	***	***	***
Operating income or (loss)	***	***	***	***	***	***	***
Net income or (loss)	***	***	***	***	***	***	***
Capital expenditures	***	***	***	***	***	***	***
Unit COGS	***	***	***	***	***	***	***
Unit SG&A expenses	***	***	***	***	***	***	***
Unit operating income or (loss)	***	***	***	***	***	***	***
Unit net income or (loss)	***	***	***	***	***	***	***
COGS/sales (fn1)	***	***	***	***	***	***	***
Operating income or (loss)/sales (fn1)	***	***	***	***	***	***	***
Net income or (loss)/sales (fn1)	***	***	***	***	***	***	***

Note.--Shares and ratios shown as "0.0" represent values greater than zero, but less than "0.05" percent.

fn1.--Reported data are in percent and period changes are in percentage points.
fn2.--Undefined.

Source: Compiled from data submitted in response to Commission questionnaires. Import data compiled from data reported in Office of Investigations memorandum INV-PP-119 (CPSV 3, solar 201 staff report) for 2012-16 period, and compiled from official U.S. import statistics under HTS statistical reporting number 8541.40.6020, accessed October 30, 2018, for the 2017, January to June 2017, and January to June 2018 periods with adjustment. See detailed explanation of the methodology for adjusted official U.S. import statistics in part IV of this report.

Table C-1:
CSPV cells: Summary data concerning the U.S. market, 2009-11, January-June 2011, and January-June 2012

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Table C-7:
CSPV modules (with Suntech excluded from U.S. producer data): Summary data concerning the U.S. market, 2009-11, January-June 2011, and January-June 2012

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Table C-8:
CSPV cells and modules (with Suntech excluded): Summary financial data concerning the U.S. market, 2009-11, January-June 2011, and January-June 2012

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APPENDIX D

PURCHASER QUESTIONNAIRE RESPONSES

As part of their response to the notice of institution, interested parties were asked to provide a list of three to five leading purchasers in the U.S. market for the domestic like product. A response was received from domestic interested parties, and it provided contact information for the following five firms as top purchasers of CSPV cells and modules: ***. Purchaser questionnaires were sent to these five firms and one firm (***) provided responses, which are presented below.

1. Have there been any significant changes in the supply and demand conditions for finished CSPV cells and modules that have occurred in the United States or in the market for CSPV cells and modules in China since January 1, 2019?

Purchaser	Yes / No	Changes that have occurred
***	***	***.

2. Do you anticipate any significant changes in the supply and demand conditions for CSPV cells and modules in the United States or in the market for CSPV cells and modules in China within a reasonably foreseeable time?

Purchaser	Yes / No	Anticipated changes
***	***	***.