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The Honorable Gina M. Raimondo
Secretary of Commerce
International Trade Administration
Attn: Enforcement and Compliance
APO/Dockets Unit, Room 18022
U.S. Department of Commerce
14th Street and Constitution Avenue, NW
Washington, DC 20230

Re: ***Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China*****:** Request for Circumvention Ruling Pursuant to Section 781(b) of the Tariff Act of 1930

Dear Secretary Raimondo:

On behalf of the American Solar Manufacturers Against Chinese Circumvention ("A-SMACC"), including domestic [ ], domestic [ ], and domestic [ ], we respectfully request that the U.S. Department of Commerce (the "Department") determine, pursuant to section 781(b) of the Tariff Act of 1930 (the "Act"), *codified as amended at* 19 U.S.C. § 1677j(b), that imports from certain producers of crystalline silicon photovoltaic ("CSPV") cells and modules from the People's Republic of China ("China") that are completed in Vietnam prior to exportation to the United States are circumventing the antidumping ("AD") and countervailing duty ("CVD") orders on imports of CSPV cells, whether or not assembled into modules, from China (collectively, the "Orders").[1] A-SMACC is a domestic interested party pursuant to 19 C.F.R. § 351.102(b)(17) and 19 U.S.C. § 1677(9)(F). [ ] are interested parties within the meaning of 19 U.S.C. 1677(9)(C), [ ].

As discussed below, information reasonably available to A-SMACC demonstrates that certain Chinese producers are diverting Chinese-origin components through Vietnam to undergo minor processing to complete CSPV cells and modules subject to the Orders and subsequently to export the merchandise to the United States to avoid AD/CVD duties. Specifically, certain companies are completing the production of CSPV cells in Vietnam using wafers manufactured in China from Chinese polysilicon with additional Chinese-origin components and then exporting the cells to the United States or assembling such cells into modules with additional Chinese-origin components before exporting to the United States. These companies are Trina Solar (Vietnam) Science & Technology Co., Ltd. ("Trina Solar Vietnam"), a subsidiary of Trina Solar Co., Ltd. ("Trina Solar");[2] Canadian Solar Manufacturing (Vietnam) Co., Ltd. ("Canadian Solar Vietnam"), a subsidiary of Canadian Solar Inc. ("Canadian Solar");[3] China Sunergy Co., Ltd. in Vietnam ("CSUN Vietnam"), the Vietnam base of the Chinese producer CSUN Solar Tech Co., Ltd. which appears to also be called China Sunergy Co., Ltd. or China Sunergy (Nanjing) Co., Ltd. ("CSUN"),

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1 *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China*, 77 Fed. Reg. 73,018 (Dep't Commerce Dec. 7, 2012) (amended final deter. of sales at less than fair value, and antidumping duty order) ("AD Order"); *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China*, 77 Fed. Reg. 73,017 (Dep't Commerce Dec. 7, 2012) (countervailing duty order) ("CVD Order").

2 Trina Solar 2020 Auditor's Report, attached at **Exhibit 15**.

3 Canadian Solar Inc., United States Securities and Exchange Commission, Form 20-F (for the fiscal year ended December 31, 2020) ("Canadian Solar 2020 Financial Statements"), attached at **Exhibit 2**.

and is a subsidiary of the Chinese company China Electric Equipment Group ("CEEG");[4] Boviet Solar Technology (Vietnam) Co., Ltd. or Boviet Solar Technology Co., Ltd. ("Boviet Solar"), a subsidiary of Chinese producer Boway Group Co., Ltd. ("Boway Group");[5] GCL System Integration Technology (Vietnam) Co. Ltd. ("GCL-Si Vietnam"), a subsidiary of Chinese energy conglomerate Golden Concord Holdings Limited ("GCL");[6] Vina Cell Technology Company Limited and Vina Solar Technology Company Limited (collectively, "Vina Solar"),[7] a subsidiary of Chinese producer LONGi Green Energy Technology Co., Ltd. ("LONGi Group" or "LONGi");[8] LONGi Group;[9] and JinkoSolar (Vietnam) Co., Ltd. ("Jinko Solar Vietnam"), a subsidiary of

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4 China Sunergy Website Excerpts, attached at **Exhibit 3**; *see also* CSUN Solar Tech Co., Ltd. Website Excerpts, attached at **Exhibit 4**. CSUN first began operations in Vietnam under the name Solairviet but no longer appears to be using that name. *See* China Sunergy Co., Ltd. 2015 Annual/Transition Report at Exhibit 8.1, excerpts attached at **Exhibit 5**.

5 Boway Group Website Excerpts, attached at **Exhibit 6**.

6 GCL Website Excerpts, attached at **Exhibit 7**. GCL has ties to the Chinese government. For instance, GCL's website states that the chairman of GCL, Zhu Gongshan, also serves as a member of the 12 National Committee of the Chinese People's Political Consultative Conference (CPPCC), the 12th Jiangsu Provincial CPPCC Standing Committee, Chairman of the Global Green Energy Industrial Council, Chairman of the Global Solar Council, and Vice Chairman of the China Electricity Council. In addition, Mr. Zhu is the executive chairmen of Environment and the Energy Committee of International Chamber of Commerce China, vice president of China Overseas Chinese Entrepreneurs Association, vice president of China Overseas Development Association, vice chairmen of Jiangsu Federation of Industry and Commerce, Honorary President of Jiangsu Residents (HK) Association, executive vice president of Federation of Hong Kong Jiangsu Community Organization. *See id.*

7 Certain information indicates that Vina Solar is also known as Vietnam Photovoltaic Technology, Co., Ltd. A-SMACC requests that the Department investigate Vina Solar even if it may use other names for its cells/modules completed in Vietnam. *See* Vietnam Photovoltaic Technology Website Excerpts, attached at **Exhibit 8**.

8 LONGi Group 2020 Annual Report at 5, excerpts attached at **Exhibit 9**. LONGi's annual reports list Vina Cell and Vina Solar separately, identifying both as wholly owned subsidiaries acquired by the company in July 2020. Vina Cell's principal business is described as the manufacturing and sales of PV cells, and Vina Solar's principal business is the manufacturing and sales of PV modules. *Id.* at 5, 33. [ ]. [ ] Data, attached at **Exhibit 10**. However, industry articles widely reference "Vina Solar," presumably referring to the two companies collectively and/or one of them individually. In addition, industry publication [ ]. [ ], excerpts attached at **Exhibit 11**; As such, A-SMACC refers to both Vina Solar and Vina Cell collectively as Vina Solar. To the extent that Vina Cell and Vina Solar have separate operations, both companies are covered by A-SMACC's request for anti-circumvention inquiry.

9 LONGi is separately identified as a company subject to this request for an anti-circumvention inquiry as [ ] data show [

Chinese producer JinkoSolar Holding Co., Ltd. ("Jinko Solar Group" or "Jinko Solar").[10] These companies are subject to high AD/CVD rates under the Orders.[11]

China's dominance in the global supply chain for CSPV products has grown in recent years and is well documented in the industry. Following the imposition of AD/CVD duties on Chinese-origin solar cells, Chinese integrated producers started building cell and module assembly plants across Southeast Asia, while continuing to rely heavily on Chinese labor, raw materials, and inputs. Chinese producers have developed a circumvention scheme that involves moving the end of the production process for CSPV products, which entails only minor processing, to a third country for the express purpose of avoiding AD/CVD duties while at the same time retaining as much of the subsidized supply chain and labor as possible in China. In fact, Chinese-owned Boviet Solar has admitted that it has "strategically headquartered its solar panel manufacturing operations in Vietnam" because "Vietnam is not a U.S. listed Anti-dumping and Countervailing region. No tariffs influence Boviet's U.S. business, and those cost-savings ultimately trickle down to the

]. [ ] Data, attached at **Exhibit 10**; LONGi 2020 Annual Report at 4-6, excerpts attached at **Exhibit 9**. A-SMACC requests that the Department initiate an investigation on LONGi regardless of which affiliate's name is identified as the producer or exporter.

[10] JinkoSolar Holding Co., Ltd., United States Securities and Exchange Commission, Form 20-F (for the fiscal year ended December 31, 2020) ("Jinko Solar Annual Report") at 86, excerpts attached at **Exhibit 12**.

[11] The current AD China-wide rate is 238.95 percent. *See Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China*, 85 Fed. Reg. 79,165, 79,167 (Dep't Commerce Dec. 9, 2020) (notice of correction to the final results of the 2017-2018 antidumping duty admin. rev.). Certain Canadian Solar companies and certain Jinko Solar companies received 95.50 percent AD rates in the last completed review. *See id.* Certain Trina Solar companies received a 92.52 AD rate in the last completed review. *See id.* In the AD review for the period December 1, 2015 through November 30, 2016, LERRI Solar Technology Co., Ltd. (aka LONGi Solar Technology Co. Ltd.) received an AD rate of 15.85 percent. *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China*, 83 Fed. Reg. 35,616, 35,618 (Dep't Commerce July 27, 2018) (final results of antidumping duty admin. rev. and final deter. of no shipments; 2015-2016). The CVD all others rate is 15.24 percent. *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China*, 77 Fed. Reg. 63,788, 63,789 (Dep't Commerce Oct. 17, 2012) (final affirm. countervailing duty deter. and final affirm. critical circumstances deter.). Certain Canadian Solar, Trina Solar, and Jinko Solar companies received a 11.97 percent CVD rate in the last completed review. *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China*, 86 Fed. Reg. 17,356 (Dep't Commerce Apr. 2, 2021) (notice of amended final results of the 2017 countervailing duty admin. rev.).

buyer."[12] As described below, an assessment of global capital expenditures for ingots, wafers, CSPV cells, and modules as a whole shows that China's share of global capital expenditures continues to grow and to dwarf the rest of the world.[13] For example, in 2020, China accounted for [ ] of global polysilicon capacity,[14] and [ ] of global ingot and solar wafer capacity.[15] In terms of production, China accounted for approximately 80 percent of solar-related polysilicon production in 2020,[16] and 95 percent of global production of wafers in 2019.[17] Chinese companies have made the bare minimum investment outside of China in order to be able to avoid AD/CVD duties, while the vast majority of investments and expenditures remain in China. Industry experts also confirm that the majority of CSPV products imported into the United States arrive from Southeast Asia post-assembly (with most of the assembly plants being owned by Chinese firms), but "70% of the actual value of that equipment accrues to China where key, pre-assembly steps in the making of the equipment take place, including production of solar-grade silicon, ingots, wafers and cells."[18] For this reason, generally, production costs from "Southeast Asian nations account for just 27% of the value of a typical PV module exported to the

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12 *Why Solar Panel Manufacturing Location Matters: A Look into Boviet's Facility in Vietnam*, Boviet Solar USA (Aug. 28, 2017), attached at **Exhibit 13** (emphasis added).

13 *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, USITC Pub. 5021 (Feb. 2020) (Monitoring) ("USITC Pub. 5021") at F-26 – F-27, excerpts attached at **Exhibit 14**.

14 [ ], excerpts attached at **Exhibit 11**; Expert Report at 4, attached at **Exhibit 1**.

15 [ ], excerpts attached at **Exhibit 11**. [ ].

16 Expert Report at 4, attached at **Exhibit 1**.

17 *Id.* at 7.

18 *Solar PV Trade and Manufacturing: A Deep Dive*, BloombergNEF (Feb. 2021) at 22, excerpts attached at **Exhibit 16**.

U.S., despite those nations being most likely to be the last port of call before final, assembled equipment arrives in the U.S."[19] As discussed below, an assessment of the statutory factors demonstrates that the Department should determine that imports of CSPV cells and modules produced and/or exported by these companies in Vietnam are circumventing the Orders and that such imports should be included within the scope of the Orders.

A-SMACC requests that the Department initiate an anti-circumvention inquiry on imports of CSPV cells and modules from Vietnam that are produced and/or exported by the companies subject to this request and simultaneously issue an affirmative preliminary circumvention determination as soon as possible to provide the domestic industry with the relief to which it is entitled to under these Orders.

I. BACKGROUND

The AD and CVD investigations on imports of CSPV cells, whether or not assembled into modules, from China, were initiated on November 8, 2011.[20] On October 17, 2012, the Department published its final determination that subject merchandise was being sold, or was likely to be sold, in the United States at less than fair value.[21] On the same day, the Department issued a final determination that countervailable subsidies were being provided to producers and exporters of subject merchandise.[22] Following the U.S. International Trade Commission's ("Commission")

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19 *Id.*

20 *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China*, 76 Fed. Reg. 70,960 (Dep't Commerce Nov. 16, 2011) (initiation of antidumping duty investigation); *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China*, 76 Fed. Reg. 70,966 (Dep't Commerce Nov. 16, 2011) (initiation of countervailing duty investigation).

21 *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China*, 77 Fed. Reg. 63,791 (Dep't Commerce Oct. 17, 2012) (final deter. of sales at less than fair value, and affirm. final deter. of critical circumstances, in part).

22 *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China*, 77 Fed. Reg. 63,788 (Dep't Commerce Oct. 17, 2012) (final affirm. countervailing duty deter. and final affirm. critical circumstances deter.).

determination that the domestic industry was materially injured by reason of imports of subject merchandise,[23] the Department imposed the AD and CVD orders on December 7, 2012. On March 20, 2019, after the completion of the first sunset review of the Orders by the Department and the Commission, the Department published the continuation of both the AD and CVD orders.[24]

The scope of the Orders provides that:

> The merchandise covered by this 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.
>
> This order cover{s} 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 this 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 10,000 mm^2 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

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23 *Crystalline Silicon Photovoltaic Cells and Modules From China*, 77 Fed. Reg. 72,884 (U.S. Int'l Trade Comm'n Dec. 6, 2012).

24 *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China*, 84 Fed. Reg. 10,300 (Dep't Commerce Mar. 20, 2019) (continuation of antidumping duty order); *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China*, 84 Fed. Reg. 10,299 (Dep't Commerce Mar. 20, 2019) (continuation of countervailing duty order).

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 mm^2 to 33,782 mm^2 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.

Also excluded from the scope of this order 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 cm^2 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-part 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 cm^2 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.

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.

> Merchandise covered by this order is currently classified in the Harmonized Tariff System (HTS) of the United States under subheadings 8501.61.0010, 8507.20.80, 8541.40.6015, 8541.40.6025, and 8501.31.8010. These HTSUS subheadings are provided for convenience and customs purposes; the written description of the scope of this order is dispositive.[25]

The Department has found that cells manufactured in China, modules manufactured in China with Chinese cells, and modules manufactured in third countries from Chinese cells are subject to the Orders.

Since the imposition of the Orders, U.S. imports of CSPV cells and modules from China have declined significantly. For instance, from 2011, the year the petitions were filed in the underlying investigations, to 2020, the value of Chinese imports decreased 86 percent, from approximately $2.8 billion to approximately $392 million.[26] The sharp decline has continued into 2021, with less than $7.5 million of imports from China from January through May of this year.[27] At the same time, U.S. imports of CSPV cells and modules from Vietnam have surged. In 2011, the United States imported a mere $1.3 million of CSPV cells and modules from Vietnam.[28] Since then, Vietnamese imports dramatically increased, to more than $1.6 billion in 2020.[29] This trend

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25 *See, e.g.*, Preliminary Decision Memorandum accompanying *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China*, 86 Fed. Reg. 21,277 (Dep't Commerce Apr. 22, 2021) (prelim. results of antidumping duty admin. rev., partial rescission of antidumping admin. rev., and prelim. deter. of no shipments; 2018-2019) at 3-5.

26 Official Import Statistics, attached at **Exhibit 17**. Merchandise subject to the Orders is provided for in HTS subheading 8541.40.60. Within subheading 8541.40.60, subject merchandise was included in statistical reporting numbers 8541.40.6020 ("solar cells, assembled into modules or made up into panels") and 8541.40.6030 ("solar cells, other") through June 30, 2018. As of July 1, 2018, a superior text for CSPV cells (described in statistical note 11 to chapter 85) applies to two subordinate reporting categories, 8541.40.6015 ("assembled into modules or made up into panels") and 8541.40.6025 ("other"). *See* USITC Pub. 5021 at I-15 – I-16, excerpts attached at **Exhibit 14**. A-SMACC provides official import data for HTS numbers 8541.40.6020 and 8541.40.6030 for the period from 2010 through June 30, 2018 and data for HTS numbers 8541.40.6015 and 8541.40.6025 for the period from July 1, 2018 to date. The HTS numbers through June 30, 2018, *i.e.*, 8541.40.6020 and 8541.40.6030 included thin film products.

27 Official Import Statistics, attached at **Exhibit 17**.

28 *Id.*

29 *Id.*

has continued into 2021, with more than $681 million of imports in just the first five months of the year.[30] Notably, in ten years, Vietnamese import value share of CSPV cells and modules went from accounting for less than a one percent value share of total U.S. imports in 2010 to nearly 25 percent in the first five months of 2021.[31] As detailed below, the evidence indicates that these imports include CSPV cells and modules that are circumventing, and should be included within, the scope of the Orders.

II. DESCRIPTION OF THE PRODUCT AND MANUFACTURING PROCESS

CSPV cells use crystalline silicon to convert sunlight to electricity, and have a positive layer, a negative layer, and a positive-negative junction (p/n junction).[32] 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.[33] CSPV cells are a primary component of CSPV modules (also called panels), which in turn are the main components of CSPV systems.[34] CSPV laminates consist of CSPV cells that are connected, encapsulated in an ethyl vinyl acetate ("EVA") film, and covered with a glass front sheet and a back sheet.[35] The back sheet is most commonly a plastic film composite, but glass is also used on the back of the module in some applications, like bifacial modules, to improve efficiency.[36] CSPV modules typically are

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30 *Id.*

31 *Id.*

32 *Crystalline Silicon Photovoltaic Cells and Modules from China*, Inv. Nos. 701-TA-481 and 731-TA-1190 (Review), USITC Pub. 4874 (Mar. 2019) ("USITC Pub. 4874") at I-30, excerpts attached at **Exhibit 18**.

33 *Id.*

34 *Id.*

35 *Id.* at I-31.

36 *Id.*

comprised of the laminate that is framed in aluminum and attached to a junction box.[37] CSPV modules can be used in both ground-mounted and rooftop-mounted systems.[38] In addition, CSPV modules can be used in both the off-grid market segment and the three on-grid market segments – residential, nonresidential, and utility.[39] The junction box of CSPV modules 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).[40] In addition to standard size modules, CSPV cells can be used in building-integrated PV.[41] Solar CSPV systems convert sunlight into electricity for on-site use or for distribution through the electric grid.[42] The two main types of CSPV cells and modules are monocrystalline silicon and multicrystalline (or polycrystalline) silicon, with various products within these two categories.[43] Within these two categories, there are a number of cell and module technologies.[44]

There are five main stages in the manufacturing process for CSPV products.[45] Polysilicon is refined, then it is formed into ingots, which are sliced into wafers, doped and converted into CSPV cells, and then assembled into modules.[46] A large part of the process involves procurement of the polysilicon itself. These are discrete production steps that may occur in different plants or

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37 *Id.* at I-32.

38 *Id.*

39 *Id.*

40 *Id.*

41 *Id.* at I-38.

42 *Id.* at I-30.

43 *Id.* at I-33.

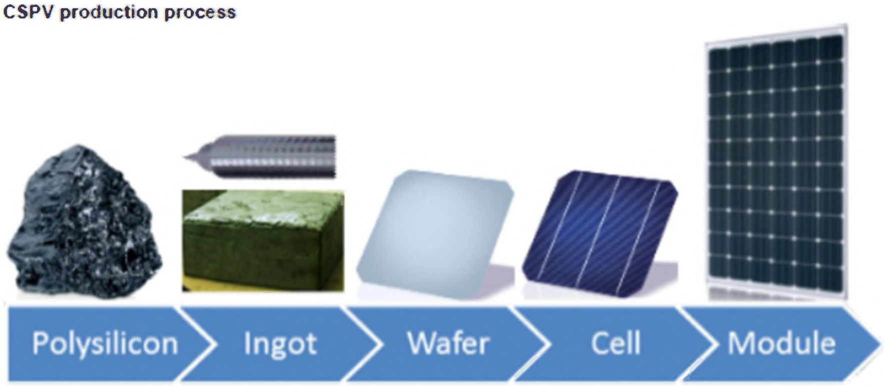
44 *Id.* at I-35 – I-38.

45 *Id.* at I-43.

46 *Id.* at I-30.

locations, and producers may source products at each stage of the value chain or produce the products in-house.[47] CSPV cells and modules are tested and inspected at various points during the production process.[48]

CSPV production process



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.

Source: SolarWorld, "Energy for You and Me" brochure, pp. 6–7, 9; ingot photo courtesy of DOE/NREL, credit John Wohlgemuth, Solarex, https://www.nrel.gov/.

Source: USITC Pub. 4874 at I-44, excerpts attached **Exhibit 18**.

The first stage in the manufacturing process is refining polysilicon. This is an extremely important step, requiring very high levels of energy, labor and capital investment (approximately $1.4 billion for a largescale polysilicon production factory).[49] Indeed, the capital cost requirements for polysilicon are the most significant in the PV module supply chain.[50] Polysilicon is the primary raw material in the production of CSPV cells.[51] Polysilicon and wafers have higher technical hurdles and factories are larger, more expensive and time-consuming to build compared to the

47 *Id.* at I-43.

48 *Id.*

49 *See* Expert Report at 6, attached at **Exhibit 1**.

50 *Id.*

51 USITC Pub. 5021 at I-7, excerpts attached at **Exhibit 14**.

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downstream production stages,[52] and as discussed below, polysilicon facilities require very substantial investments. There are multiple approaches to polysilicon refining.[53] The Siemens method accounted for more than 85 percent of global production in 2017.[54] The fluidized bed reactor ("FBR") technology accounts for most of the remaining market.[55]

> 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 the 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.[56]

In the Czochralski process for producing crystals used in monocrystalline wafers:

> {P}olysilicon rocks are first placed into a quartz crucible along with a small amount of boron, which is used to provide a positive electric orientation . . . . 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

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52 *Solar PV Trade and Manufacturing: A Deep Dive*, BloombergNEF (Feb. 2021) at 4, excerpts attached at **Exhibit 16**.

53 USITC Pub. 4874 at I-44, excerpts attached at **Exhibit 18**.

54 *Id.*

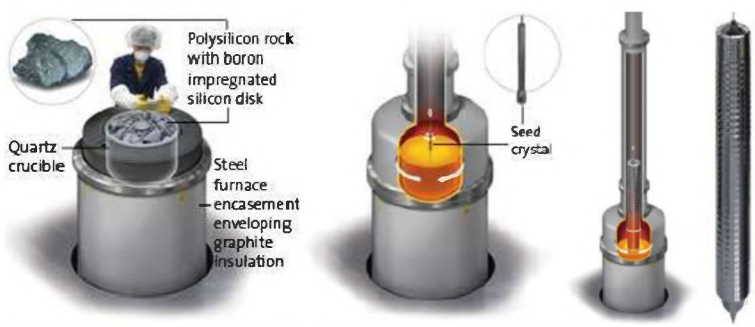
55 *Id.*

56 *Id.* at I-44 – I-45 (internal citations omitted).

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.

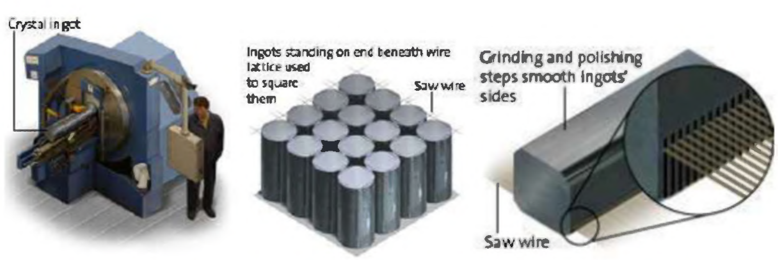
Once the crystal has cooled, it is processed into wafers. The top and tail (each end of the cylindrical crystal) are cut off . . . . The remaining portion of the crystal (or ingot) is cut into equal length pieces and then it is squared. In squaring, the rounded sides of the ingot are cut into four flat 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.[57]

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, retrieved July 15, 2017.

Figure I-15
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, retrieved July 15, 2017.

Source: USITC Pub. 4874 at I-46, excerpts attached **Exhibit 18**.

[57] *Id.* at I-45 (internal citations omitted).

The second stage involves forming the refined polysilicon into ingots. The third stage involves slicing the ingots into wafers. These processes often result in high yield losses which add significantly to the overall costs. The ingot and wafer production processes are different for monocrystalline and multicrystalline cells.

For multicrystalline ingots:

> {T}he 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.[58]

According to an industry expert, "{t}he wafer is the most critical component with respect to PV module performance."[59]

The fourth stage involves processing the wafers into CSPV cells.[60] The cell manufacturing process varies by company and technology.[61] In addition, some firms use a highly automated

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58 *Id.* at I-46 – I-47 (internal citations omitted). *See also* Expert Report at 7-9, attached at **Exhibit 1**.

59 Expert Report at 7, attached at **Exhibit 1**.

60 A-SMACC submits that wafers from China that have already been doped and contain a p/n junction, which are then shipped to Vietnam for finishing prior to export to the United States, are already in-scope merchandise and should be subject to duties, consistent with the Department's recent scope rulings. *See* Memorandum from Lauren Caserta, Int'l Trade Compliance Analyst, Off. VII, AD/CVD Operations, through Melissa G. Skinner, Senior Director, Off. VII, AD/CVD Operations, to James Maeder, Deputy Assistant Sec'y for AD/CVD Operations, re: *Final Scope Ruling on the Antidumping and Countervailing Duty Orders on Crystalline Silicon Photovoltaic Cells from the People's Republic of China: ET Solar Inc.* (June 15, 2021) (PUBLIC VERSION) ("ET Solar Scope Ruling"), attached at **Exhibit 19**; Memorandum from Peter Shaw, Int'l Trade Compliance Analyst, AD/CVD Operations, through Melissa G. Skinner, Senior Director, Off. VII, AD/CVD Operations, to James Maeder, Deputy Assistant Sec'y for AD/CVD Operations, re: *Antidumping and Countervailing Duty Orders on Crystalline Silicon Photovoltaic Cells from the People's Republic of China, and Certain Crystalline Silicon Photovoltaic Products from Taiwan: The Solaria Corporation Scope Ruling* (Apr. 8, 2021) ("Solaria Scope Ruling"), attached at **Exhibit 20**. To the extent such merchandise is not already considered subject, and to the extent that Chinese wafers that do not yet contain a p/n junction and/or other Chinese inputs are being used in the production processes described herein, such merchandise is circumventing the Orders.

61 USITC Pub. 4874 at I-47, excerpts attached at **Exhibit 18**.

manufacturing process, while others mix automation and manual labor in their production processes.[62] The main steps in the process are as follows:

- **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 . . . .
- **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."[63]
- **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, 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.
- **Co-firing:** The CSPV cells then enter a furnace, where the "high temperature causes the silver paste to become imbedded in the surface of the silicon layer, forming a reliable electrical contact."
- **Testing and sorting:** The final step in the process is the testing and sorting of the CSPV cells based on their characteristics and efficiency.[64]

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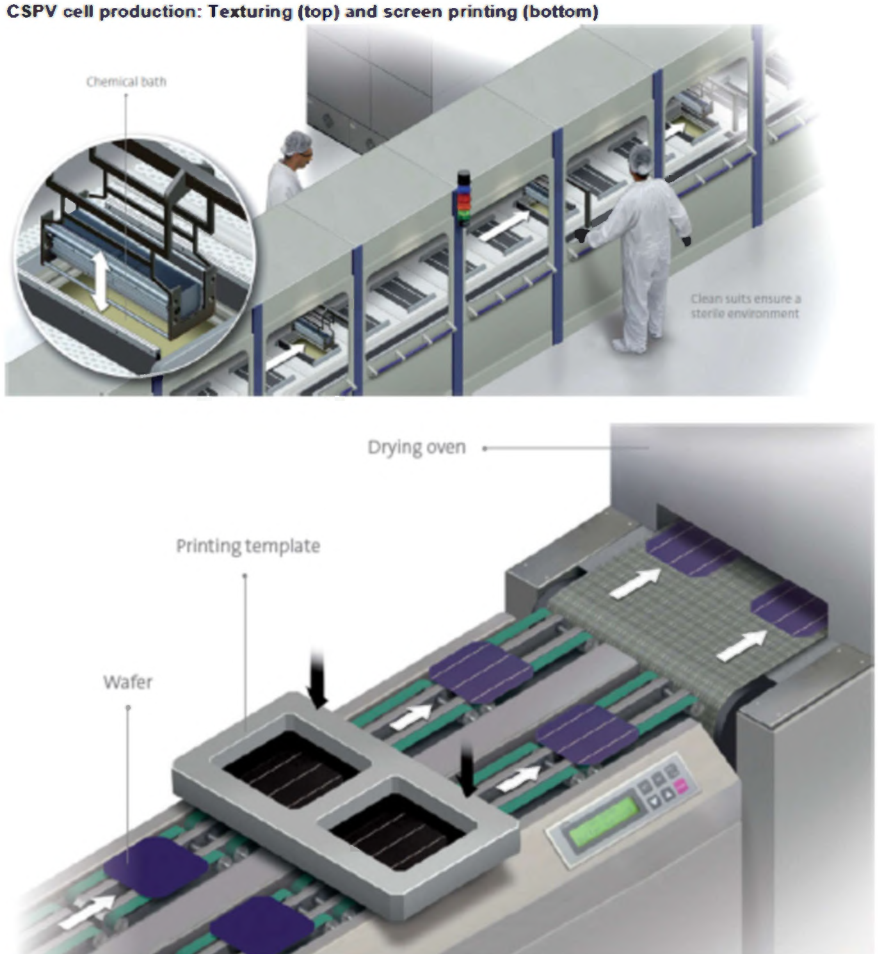
62 *Id.*

63 Based on the Commerce Department's scope rulings, by this point in the process (creation of the P/N junction), the wafer is now considered a solar cell and therefore merchandise subject to the scope of these investigations.

64 USITC Pub. 4874 at I-47 (internal citations omitted), excerpts attached at **Exhibit 18**.

CSPV cell production: Texturing (top) and screen printing (bottom)



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

Source: USITC Pub. 4874 at I-48, excerpts attached **Exhibit 18**.

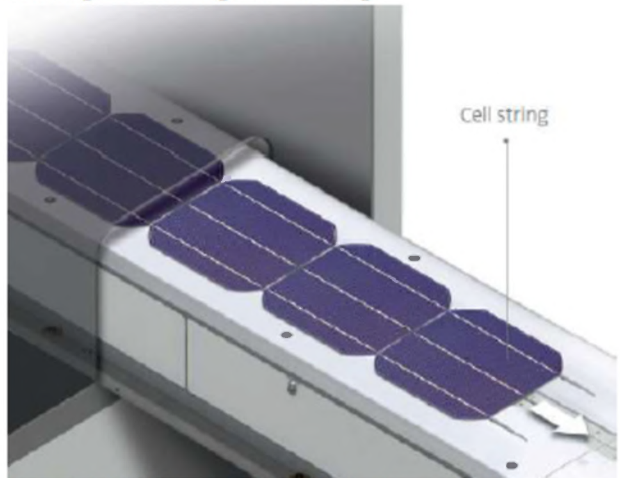
The fifth and last stage involves assembling the CSPV cells into modules. The extent of automation and manual labor involved in module assembly varies depending on the producer.[65] Generally during the assembly process:

> 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 {EVA}. 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. Frames are then usually

65 *Id.* at I-49.

attached to the laminate, and a junction box is attached to the back. In the final step, modules are cleaned and inspected.[66]

Soldering CSPV cells together into strings



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

Source: USITC Pub. 4874 at I-49, excerpts attached **Exhibit 18**.

III. IMPORTS OF CSPV CELLS AND MODULES COMPLETED IN VIETNAM ARE CIRCUMVENTING THE ORDERS

Congress has provided the Department with the necessary tools to combat the circumvention of AD/CVD duties.[67] The statute expressly contemplates that it may be necessary to include within the scope of an AD/CVD order merchandise that has been completed or assembled in another foreign country before being imported into the United States. Specifically, section 781(b)(1) of the Act provides with respect to merchandise assembled or completed in a third country that if (A) the merchandise imported into the United States is of the same class or kind as merchandise produced in the foreign country that is subject to the existing order; (B) before importation into the United States, such merchandise is completed or assembled in another foreign country from merchandise which is (i) subject to such order, or (ii) produced in the foreign country

66 *Id.* (internal citations omitted).

67 *See Deacero S.A. de C.V. v. United States*, 817 F.3d 1332, 1337 (Fed. Cir. 2016).

with respect to which such order applies; (C) the process of assembly or completion in the third country is minor or insignificant; (D) the value of the merchandise produced in the foreign country to which the order applies is a significant portion of the total value of the merchandise exported to the United States; and (E) the Department determines that action is appropriate to prevent evasion of such order, the agency may include such imported merchandise within the scope of the existing order, after taking into account any advice provided by the Commission pursuant to section 781(e) of the Act.[68]

While A-SMACC recognizes that the Department has previously found that solar cells/modules produced in a third country (Vietnam) from raw wafers imported from China without a p/n junction are not subject to the scope of the Orders, as the Department has previously explained, the agency's practice for determining substantial transformation in country-of-origin determinations is distinct from its practice under section 781 of the Act of determining whether merchandise being completed or assembled into a product in a third country is circumventing an AD/CVD order.[69] For instance, in *Cold-Rolled Steel from Korea*, the Department found that because the analyses are distinct, a finding that the process of finishing hot-rolled steel or cold-rolled steel into corrosion-resistant steel products constitutes substantial transformation does not preclude finding that the process is minor or insignificant in an analysis under section 781(b) of

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68 *See* 19 U.S.C. §1677j(b)(1). The legislative history to section 781(b) of the Act indicates that Congress intended Commerce to make circumvention determinations on a case-by-case basis, in recognition that the facts of individual cases and the nature of specific industries are widely variable. *See* Preliminary Decision Memorandum accompanying *Certain Cold-Rolled Steel Flat Products From the Republic of Korea*, 84 Fed. Reg. 32, 875 (Dep't Commerce July 10, 2019) (affirm. prelim. deter. of anti-circumvention inquiries on the antidumping duty and countervailing duty orders) ("CR from China PDM") at 11 (citing S. Rep. No. 103-412, 81-82 (1994)).

69 Issues and Decision Memorandum accompanying *Certain Cold-Rolled Steel Flat Products From the Republic of Korea*, 84 Fed. Reg. 70,934 (Dep't Commerce Dec. 26, 2019) (affirm. final deter. of circumvention of the antidumping and countervailing duty orders) ("Cold-Rolled from Korea IDM") at cmt. 9; *see also* Issues and Decision Memorandum accompanying *Diamond Sawblades and Parts Thereof From the People's Republic of China*, 84 Fed. Reg. 33,920 (Dep't Commerce July 16, 2019) (final deter. of anti-circumvention inquiry) at cmt. 4.

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the Act.[70] In fact, the Court of Appeals for the Federal Circuit has explained that if the Department "applies the substantial transformation test and concludes that the imported article has a country of origin different from the country identified in an AD or CVD order, then {the Department} can include such merchandise within the scope of an AD and CVD order only if it finds circumvention under {section 781(b) of the Act}."[71]

In determining whether the process of assembly or completion in the third country is minor or insignificant, the Department must take into account: (A) the level of investment in the foreign country; (B) the level of research and development in the foreign country; (C) the nature of the production process in the foreign country; (D) the extent of production facilities in the foreign country, and; (E) whether the value of the processing performed in the foreign country represents a small proportion of the value of the merchandise imported into the United States.[72]

The statute also directs the Department to consider additional factors in determining whether to include merchandise assembled or completed in a foreign country under the order at issue, such as the pattern of trade, including sourcing patterns; whether the manufacturer or exporter of the merchandise that is subject to the order at issue or produced in the country with respect to which such order applies is affiliated with the person who uses that merchandise to assemble or complete in the foreign country the merchandise that is subsequently imported into the United States; and whether imports into the third country of the merchandise that is subject to

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[70] Cold-Rolled from Korea IDM at 43.

[71] *Id.* at 47 (citing *Bell Supply Co. v. United States*, 888 F.3d 1222, 1230 (Fed. Cir. 2018)).

[72] 19 U.S.C. § 1677j(b)(2). Although the Department must consider all five factors in its analysis, no single factor is dispositive, and the agency's practice is to evaluate each of these five factors as they exist in the third country, depending on the totality of the circumstances of the particular inquiry. *See* 19 C.F.R. § 351.225(h); *U.K. Carbon and Graphite Co. v. United States*, 931 F. Supp. 2d 1322, 1335 (Ct. Int'l Trade 2013) ("The Court notes that the five factors {in 19 U.S.C. § 1677j(b)(2)(A)-(E)} are to be separately taken into consideration, as appropriate, and their totality weighed."); CR from China PDM at 11.

the order at issue or produced in the country with respect to which such order applies have increased after initiation of the underlying investigation which resulted in the issuance of the order at issue.[73] An assessment of these statutory factors demonstrates that the CSPV cells and/or modules completed in Vietnam by Trina Solar Vietnam, Canadian Solar Vietnam, CSUN Vietnam, Boviet Solar, GCL-Si Vietnam, Vina Solar, LONGi, and Jinko Solar Vietnam using Chinese-origin components are circumventing, and thus should be included within the scope of, the Orders.

A. The Merchandise Imported into the United States is of the Same Class or Kind as Merchandise Produced in China that is Subject to the Orders

The merchandise imported into the United States completed by Trina Solar Vietnam, Canadian Solar Vietnam, CSUN Vietnam, Boviet Solar, GCL-Si Vietnam, Vina Solar, LONGi and Jinko Solar Vietnam in the third country are CSPV cells and/or modules that are identical to the CSPV cells and modules from China that are subject to the Orders. Chinese-origin components are being shipped to Vietnam to be completed into CSPV cells and modules for the express purpose of avoiding AD/CVD duties. But for the desire to circumvent the Orders, the final production stages for the CSPV cells and modules would take place in China. Specifically, [ ] indicate that Canadian Solar Vietnam, CSUN Vietnam, Boviet Solar, GCL-Si Vietnam, Vina Solar, LONGi, and Jinko Solar Vietnam exported merchandise described as solar cells, solar modules, mono solar modules, or bifacial solar modules to the United States, which meet the description of merchandise subject to the Orders.[74] Similarly, sources indicate that Trina

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73 *See* 19 U.S.C. §1677j(b)(3).

74 [ ] Data, attached at **Exhibit 10**. [ ].

Solar Vietnam exports solar cells and modules to the United States, which also meet the description of subject merchandise.[75]

B. The CSPV Cells and Modules Imported into the United States are Completed in Vietnam Using Chinese-Origin Components Prior to Importation into the United States

Evidence reasonably available to A-SMACC demonstrates that before importation into the United States, Chinese-origin components are being completed into CSPV cells and/or modules in Vietnam. As detailed above, the production process for CSPV products generally includes the following main five stages: (1) polysilicon is refined, (2) the polysilicon is formed into ingots, (3) the ingots are sliced into wafers, (4) the wafers are converted to CSPV cells, and (5) the CSPV cells are assembled into modules. A-SMACC understands that certain companies are completing the production of CSPV cells and/or modules in the third country using Chinese-origin components in multiple ways to avoid AD/CVD duties. These include completing the production process through polysilicon refinement, ingot formation and the production of the wafers in China, after which the wafers are converted to CSPV cells in Vietnam using additional and substantial Chinese-origin components. At this point, the companies may export the completed CSPV cells to the United States or assemble the cells into modules using additional and substantial Chinese-origin components. In addition, the companies may be taking some of the preliminary steps for converting wafers to cells within China, after which only the remaining cell production steps and module assembly take place in the third country, again using additional and substantial Chinese-

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75 Matthew Mercure, *Trina Solar Delivers First 210 mm Vertex Modules to North American Market*, Solar Industry (May 24, 2021), attached at **Exhibit 21**; *see also* Christian Roselund, *The Long View: An Interview With Steven Zhu Of Trina Solar*, PV Magazine (Oct. 2, 2019), attached at **Exhibit 22**; *see also* David Baker, *How One Solar Company is Defying Trump's Trade Tariffs*, Al Jazeera (June 7, 2019), attached at **Exhibit 23**. While Trina Solar is [ ], the company may be [ ]. *See* [ ] Data, attached at **Exhibit 10**.

origin components, before the companies export the completed CSPV cells and/or modules to the United States. A-SMACC believes that the vast majority of the materials and equipment for the process of converting the Chinese wafers to CSPV cells are being sourced from China, including but not limited to: silane, phosphorus oxychloride (POCI3), aluminum and/or silver paste. Similarly, the vast majority of the materials and equipment for the process of converting the CSPV cells to modules are also being sourced from China, including but not limited to: solar glass, EVA, backsheet, aluminum frames, and junction boxes.

First, A-SMACC provides evidence indicating that each of the companies that is subject to this request obtains Chinese-origin wafers and/or cells to complete into CSPV cells or modules in the third country.

- **Trina Solar** built a solar cell and module processing facility in Phong Phu, Vietnam in 2017[76] and another in Khanh Hoa, Vietnam in 2020.[77] Trina Solar does not produce polysilicon, ingots, or wafers in Vietnam.[78] Thus, the Vietnamese facilities must source wafers (produced from polysilicon ingots) from elsewhere. According to an industry publication, Trina Solar produces wafers in China, in addition to cells and modules.[79] Trina Solar's 2020 auditor's report also identifies Chinese company Lijiang Longji silicon material Co., Ltd as an "important associate" of the company whose nature of business is the manufacturing and sales of silicon rod.[80] Trina Solar also recently entered into a three-year polysilicon supply agreement with China's Daqo New Energy Corp for the supply of between 30,000 tonnes and 37,600 tonnes of high-purity mono-grade polysilicon for the period November 2020-December 2023.[81] The company also

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76 *Trina Solar Invests In Vietnam's Largest Solar PV Cell Plant*, Silicon Semiconductor (Feb. 9, 2017), excerpts attached at **Exhibit 24**.

77 David Wagman, *Trina Solar Begins Production of 550 W Modules at Vietnam Facility*, PV Magazine (May 25, 2021), excerpts attached at **Exhibit 25**.

78 [ ], excerpts attached at **Exhibit 11**; *see also* Ivan Shumkov, *Trina Solar's New Factory in Vietnam Produces First Cells, Modules*, Renewables Now (May 24, 2021), attached at **Exhibit 26**; Anu Bhambhani, *Trina Solar's New 800 MW Facility Touted as Largest PV Cell and Module Factory in Vietnam*, Taiyang News (Jan. 10, 2017), attached at **Exhibit 27**.

79 [ ], excerpts attached at **Exhibit 11**.

80 Trina Solar 2020 Auditor's Report at 136, excerpts attached at **Exhibit 15**.

81 *Daqo Seals 3-Year Polysilicon Supply Deal with Trina Solar*, Renewables Now (Nov. 30, 2020), attached at **Exhibit 28**.

shored up its short-term wafer supply line with the purchase of 1.2 billion wafers over a procurement period between January 2021 and December 2021 from Chinese manufacturer Zhonguan for $990 million.[82]

Trina Solar has indicated that its Vietnamese facility is an export platform. For instance, a company representative previously stated that Trina Solar supplies U.S. orders from Thailand and Vietnam.[83] Additionally, the Chairman and CEO of Trina Solar stated that the Trina Solar projects in the pan-Asia region align the company with the Chinese government's "One Belt, One Road" initiative.[84] Based on such statements, it is reasonable to assume that Trina Solar is retaining as much of the subsidized supply chain as possible in China for the cells and modules that it is completing in Vietnam, including obtaining Chinese wafers produced from Chinese polysilicon and other components for cells and modules from or through its Chinese affiliates. Notably, Trina Solar recently signed three joint venture agreements with another Chinese manufacturer, Tongwei Co., to gain "bigger advantages than simple vertical integrations within themselves."[85] Together the two Chinese companies entered into a long term procurement cooperation framework agreement investing in a "a high-purity crystalline silicon project with an annual output of 40,000 tons, a ingot project of an annual output of 15GW, a wafer cutting project of an annual output of 15GW, and a high-efficiency crystalline silicon cell project with an annual output of 15GW."[86] The three projects have operational starts ranging between September 2021 through September 2022.[87] The total investment was about $2.3 billion and Trina Solar holds 35% of the shares in each joint venture.[88] Tongwei claimed that Trina Solar or its affiliates would enjoy prioritized supply of high purity c-Si, silicon rods and cells produced by all project companies.[89] The evidence thus indicates that Trina Solar sources these components from China.

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82 Carrie Xiao, *Trina Solar Seals 1.2 Billion Wafer Supply Deal with Zhonghuan Semiconductor*, PV Tech (Nov. 23, 2020), attached at **Exhibit 29**.

83 Christian Roselund, *The Long View: An Interview With Steven Zhu Of Trina Solar*, PV Magazine (Oct. 2, 2019), attached at **Exhibit 22**.

84 *Trina Solar Launches Operations at Thailand Manufacturing Facility and Signs a US$143 Million Syndicated Financing Facilities Agreement,* Trina Solar (Mar. 28, 2016), attached at **Exhibit 30**.

85 *Annual Production Capacity 15GW! Trina Solar and Tongwei Co., Ltd. Join Forces to Further Upgrade the 210 Integrated Industrial Chain*, Trina Solar (Nov. 16, 2020), attached at **Exhibit 31**.

86 *Id.*

87 Carrie Xiao, *Trina, Tongwei Unveil Major, Multi-Billion-Dollar Solar Silicon, Wafer and Cell Alliance*, PV Tech (Nov. 18, 2020), attached at **Exhibit 32**.

88 *Annual Production Capacity 15GW! Trina Solar and Tongwei Co., Ltd. Join Forces to Further Upgrade the 210 Integrated Industrial Chain*, Trina Solar (Nov. 16, 2020), attached at **Exhibit 31**.

89 Carrie Xiao, *Trina, Tongwei Unveil Major, Multi-Billion-Dollar Solar Silicon, Wafer and Cell Alliance*, PV Tech (Nov. 18, 2020), attached at **Exhibit 32**.

- **Canadian Solar** began operations at a leased processing facility in Haiphong City, Vietnam in 2016. Canadian Solar appears to process both cells and modules in Vietnam;[90] however, Canadian Solar Vietnam must source its wafers (produced from polysilicon ingots) from elsewhere. A number of Canadian Solar's subsidiaries in China produce ingots and wafers, in addition to cells and modules.[91] Canadian Solar states that it is "one of the world's largest solar power companies and a leading vertically-integrated provider of solar power products,"[92] and also that it "intend{s} to use substantially all of the silicon wafers that {it} manufacture{s} to supply {its} own solar cell plants and to use substantially all of the solar cells that {it} manufacture{s} to produce {its} own solar module products."[93] Canadian Solar also reports that the company purchases silicon raw materials, silicon wafers, and solar cells from a limited number of third-party material suppliers in China.[94] The company's major silicon wafer suppliers in 2020 included Chinese companies Longi and Zhenjiang Rende New Energy Science Technology Co., Ltd.[95]

  Given the above, it is likely that Canadian Solar Vietnam obtains from or through its affiliates Chinese wafers manufactured from Chinese ingots to complete the production of cells and modules in Vietnam. While Canadian Solar does not appear to refine polysilicon itself, the company indicates that it purchases silicon raw material. Given China's dominance in the polysilicon market, as discussed below, it is reasonable to assume that the company purchases polysilicon from Chinese suppliers for its own Chinese wafer production, as well as purchasing wafers directly from Chinese entities. In fact, Canadian Solar appears to purchase polysilicon from GCL Poly, a Chinese polysilicon producer.[96]

- **CSUN** has a facility in Vietnam where it processes solar cells and modules. CSUN does not appear to manufacture polysilicon, ingots or wafers in Vietnam[97] and must source wafers (produced from polysilicon ingots) elsewhere. CSUN's parent company – the Chinese conglomerate CEEG – owns other subsidiaries that specialize in the production of these materials in China. For example, CEEG (Nanjing) Semiconductor Materials CO. Ltd., in Jiangning, China manufactures solar energy components including ingots and wafers, and CEEG (Jiangxi) Jingde Semiconductor New Materials CO. Ltd., in Jingdezhen, China "integrat{es} the Polycrystalline

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90 Canadian Solar 2020 Financial Statements at 68, attached at **Exhibit 2**.

91 *Id.*

92 *Id.* at 34.

93 *Id.* at 35.

94 *Id.* at 20.

95 *Id.*

96 Nathan Vanderklippe, *Canadian Solar Denies Use of Forced Labour at Its Solar Farm in Western China*, The Globe and Mail (Jan. 28, 2021), attached at **Exhibit 33**.

97 [ ], excerpts attached at **Exhibit 11**.

silicon's R&D, production and sale together."[98] CEEG (Jiangxi) claims to have "formed a complete photovoltaic industrial chain, including the poly silicon, pulling slice, solar cell, component and applicating system, with CEEG's other subordinate companies, which is an important strategic deployment for the CEEG to follow the national energetic developing policy, basing on the energy saving, environmental protection industry."[99] The evidence thus indicates that CSUN Vietnam sources its wafers from its sister companies in China that have been produced from Chinese polysilicon and ingots.

- **Boviet Solar**, a solar cell and module company in Bac Giang, Vietnam, is a subsidiary of the Chinese company Boway – a "scientific and international company integrating new materials, new energy and other industries."[100] Boviet Solar in Vietnam does not manufacture polysilicon, ingots or wafers,[101] and must source wafers (produced from polysilicon ingots) elsewhere. Boway, as a fully integrated materials and energy parent company based in China, is the likely source of these materials. Boway operates in various segments, one of which "is involved the research, development, manufacture and sales of solar cells and components. The main products include polysilicon, monocrystalline silicon cells and components."[102] Given Boway's expertise in this space and vertically integrated operation, it is reasonable to conclude that ingots are among the components produced by their own facilities or sourced from other Chinese suppliers along with wafers and glass. For instance, Boviet Solar's U.S. distribution center boldly claims on the company website that "Boviet Solar USA sources the world for top quality solar components. Just as scale is no barrier, neither is geography. {. . .} wafer and glass from China; manufacturing in Vietnam."[103] The company also specifies that its "high-quality silicon wafers come from one of the largest photovoltaic material manufacturers."[104] Taken together, Boviet Solar admits than its solar cells and modules manufactured in Vietnam use wafers from one photovoltaic material manufacturer in China. In a blog post entitled "Why Solar Panel Manufacturing Location Matters: A Look Into Boviet's Facility in Vietnam," the company helpfully explains why it has "strategically headquartered its solar panel manufacturing operations in Vietnam." According to the company's blog, one reason why its manufacturing is based out of Vietnam is because "Vietnam is not a U.S. listed Anti-dumping and Countervailing

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98 CEEG Website Excerpts, attached at **Exhibit 34**.

99 *Id.*

100 Boway Group Website Excerpts, attached at **Exhibit 6**.

101 [ ], excerpts attached at **Exhibit 11**; *see also* Boviet Solar Website Excerpts, attached at **Exhibit 35**.

102 Reuters Website Excerpt, attached at **Exhibit 36**.

103 Boviet Solar USA Website Excerpts, attached at **Exhibit 37**.

104 *Id.*

region. No tariffs influence Boviet's U.S. business, and those cost-savings ultimately trickle down to the buyer."[105]

- **GCL-Si** has one solar cell facility in Vietnam and is a subsidiary of the Chinese energy conglomerate GCL. Again, GCL has ties to the Chinese government. GCL-Si Vietnam does not produce polysilicon, ingots, or wafers so the company must source wafers (produced from polysilicon ingots) elsewhere. The likely source is the other Chinese subsidiaries of its parent company. One such sister-company, GCL-Poly Energy Holdings Limited, claims to be the "world's leading polysilicon producer and wafer supplier."[106] GCL-Poly "began operations with the technology-intensive material of polysilicon and gradually expanded to the downstream aspects of silicon ingots and wafers to complete its product structure."[107] GCL-Si Vietnam began production in July 2017. Among the reasons for its formation, Shu Hua, President of GCL-Si noted that the Vietnam facility "will offer a strong support to the high-efficient cell supply and contribute to cost-down {sic} as well as {a}voiding anti-dumping issues."[108] Given the ease of access GCL-Si Vietnam enjoys to a steady stream of polysilicon, ingots and wafers from its Chinese sister-company that leads the world in the manufacturing of those materials, it is reasonable to conclude that much of the wafers for GCL-Vietnam's solar cells are manufactured in China from Chinese polysilicon and ingots.

- **Vina Solar,** the wholly owned Vietnamese subsidiary of LONGi is engaged in the processing and sale of solar cells and modules.[109] Vina Solar is not one of LONGi's production bases of mono ingots and wafers.[110] The company's production of ingots and wafers appears to be predominantly based in China. Specifically, LONGi appears to manufacture ingots and/or wafers at eight different locations in China and one in Malaysia.[111] In fact, before LONGi acquired Vina Solar, LONGi contracted to supply

105 *Why Solar Panel Manufacturing Location Matters: A Look into Boviet's Facility in Vietnam*, Boviet Solar USA (Aug. 28, 2017), attached at **Exhibit 13** (emphasis added).

106 GCL New Energy 2020 Annual Report, excerpts attached at **Exhibit 38**.

107 GCL-Poly Website Excerpts, attached at **Exhibit 39**.

108 *GCL-Si Starts Operation of 600MW Solar Cell Plant in Vietnam*, ENF Solar (Aug. 1, 2017), attached at **Exhibit 40** (emphasis added).

109 LONGi Group 2020 Annual Report Excerpts at 32-33, attached at **Exhibit 9**. As noted above, Vina Cell is listed in LONGi's annual reports as manufacturing and selling PV cells and Vina Solar as manufacturing and selling PV modules; *see id.* at 33.

110 *Id.* at 13. "At present, the Company's production bases of mono ingots and wafers are mainly concentrated in Shaanxi (Xi'an), Ningxia (Yinchuan, Zhongning), Yunnan (Lijiang, Baoshan, Qujing, Chuxiong), Jiangsu (Wuxi) and Malaysia (Kuching); mono cell production bases mainly in Shaanxi (Xi'an), Ningxia (Yinchuan), Jiangsu (Taizhou), Malaysia (Kuching) and Vietnam (Bac Giang); and module production bases mainly in Anhui (Chuzhou), Zhejiang (Quzhou and Jiaxing), Jiangsu (Taizhou), Shaanxi (Xi'an and Xianyang), Shanxi (Datong), Malaysia (Kuching) and Vietnam (Bac Giang)" (emphasis added).

111 *Id.* at 32-33.

Vina Solar with 1 billion wafers for $540 million.[112] As such, the information reasonably available indicates that for a substantial portion (if not all) of the CSPV modules exported from Vietnam, LONGi obtains Chinese-origin wafers. While LONGi does not appear to refine polysilicon itself,[113] LONGi's suppliers of silicon material include a large number of Chinese suppliers.[114] According to industry publication [ ], LONGi's [ ].[115]

LONGi has been clear about its plans for Vina Solar. According to industry articles, "LONGi management said that the Vina Solar acquisition provided the fastest route to key large markets, notably the US as its only current overseas manufacturing operations were in Malaysia with limited capacity and limited capacity to expand."[116] When LONGi acquired Vina Solar, it was reported to have "ambitions for a central manufacturing hub to target significant expansion of non-tariff module shipments to the US and India."[117] Based on the information above, Vina Solar appears to be serving that function as that hub for "non-tariff" module shipments to the U.S. using polysilicon from its Chinese suppliers and ingots and wafers from its Chinese affiliates.

LONGi itself also appears to be completing the production of CSPV cells and/or modules in Vietnam. While LONGi recently acquired Vina Solar, A-SMACC believes based on industry knowledge that LONGi has arrangements with module manufacturers in Vietnam for contract manufacturing. For instance, [ ] data show [ ] July 2020 (when LONGi acquired Vina Solar). For those imports of cells and/or modules from Vietnam where LONGi is the producer and/or exporter, the information above suggests that LONGi is circumventing the Orders in the same manner – by providing Chinese wafers produced from Chinese polysilicon and ingots to be completed into cells/modules in Vietnam, to circumvent the Orders. The specific module manufacturers that LONGi

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112 *LONGi Lands Order for 1.31 Billion Mono-Si Wafers*, EnergyTrend (July 19, 2019), attached at **Exhibit 41**.

113 LONGi Group 2020 Annual Report Excerpts at 13, attached at **Exhibit 9**.

114 *Id.* at 49-51, 68-69. The LONGi companies also appear to purchase silicon material from non-Chinese suppliers to supplement its supply from Chinese suppliers. *See* Mark Osborne, *LONGi Secures Major Polysilicon Supply Deal from OCI Malaysia and 46GW of Solar Glass from Flat Glass*, PV Tech (Feb. 10, 2021), attached at **Exhibit 42**. *See also* Expert Report at 6, attached at **Exhibit 1**.

115 [ ], excerpts attached at **Exhibit 43**.

116 Mark Osborne, *LONGi Details Plans for Vina Solar After Recent Acquisition Deal*, PV Tech (Mar. 4, 2020), attached at **Exhibit 44**.

117 *Id.*

may have contracts with and their sourcing patterns are not reasonably available to A-SMACC.

- **Jinko Solar Vietnam** is a subsidiary of one of the largest solar module manufacturers in the world.[118] Specifically, Jinko Solar Group is a producer of solar products – including silicon ingots, wafers, solar cells, and modules, with its production predominantly based in China.[119] While information regarding Jinko Solar's operations in Vietnam is not reasonably available to A-SMACC, the evidence indicates that Jinko Solar is completing the production of solar modules in Vietnam using Chinese-origin components. Specifically, [ ] data show [ ].[120] While the [ ] outside of Vietnam, the country of origin [ ]. In addition, Jinko Solar reports that it has a subsidiary in Vietnam that was incorporated in September 2019, although it does not appear to identify any production facility in Vietnam.[121] There are reports that Jinko Solar has also invested $498 million in a solar cell plant in Vietnam, expected to begin operations in October 2021.[122] Based on the above, it is reasonable to assume that Jinko Solar's shipments of solar modules from Vietnam include modules made from Chinese-origin components from its Chinese affiliates, including Chinese-origin wafers, that have undergone minor processing in Vietnam before being exported to the United States to circumvent the Orders. It is possible that Jinko Solar is also obtaining Chinese-origin cells to assemble into modules. Again, Jinko Solar's production is primarily based in China – producing silicon ingots, wafers, and solar cells in three different facilities in China (in addition to modules).[123] While Jinko Solar does not appear to refine polysilicon itself,[124] a substantial portion if not all of the virgin

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[118] Jinko Solar Website Excerpts, attached at **Exhibit 45**; Jinko Solar Annual Report at 86, excerpts attached at **Exhibit 12**.

[119] Jinko Solar Annual Report at 67, excerpts attached at **Exhibit 12**.

[120] [ ] Data, attached at **Exhibit 10**.

[121] Jinko Solar Annual Report at 66-67, 86, excerpts attached at **Exhibit 12**.

[122] Hoang Phong, *Hong Kong Firm Invests $498-mln in Vietnam Solar Cell Plant*, VN Express International (Apr. 2, 2021), attached at **Exhibit 46**.

[123] Jinko Solar Annual Report at 67, excerpts attached at **Exhibit 12**. Jinko Solar also has relatively small facilities in Malaysia for solar cells and modules. *See id.*

[124] Jinko Solar has stated that it produces monocrystalline silicon ingots using silicon materials, consisting of virgin polysilicon feedstock and recovered silicon materials of various grades. The company also has stated that it processes recoverable silicon materials into recovered silicon materials. The company indicates that it purchases solar grade virgin polysilicon and recoverable silicon materials for its production. *Id.*

> polysilicon that it obtains to produce silicon ingots comes from Chinese suppliers.[125] For instance, industry publication [ ] reports that [ ].[126] And Jinko Solar has publicly stated that it has built a "vertically integrated solar power product value chain, manufacturing from silicon wafers to solar modules."[127] The company has also has stated that it "leverage{s} {its} vertically integrated platform and cost-efficient manufacturing capabilities in China to produce high quality products at competitive costs," and that its "solar cell and silicon wafer operations support {its} solar module production."[128]
>
> In fact, the evidence indicates that Jinko Solar is circumventing the Orders in a similar manner through its solar cell and module processing facility in Penang, Malaysia.[129] Jinko Solar does not produce polysilicon, ingots, or wafers in Malaysia.[130] Thus, the Malaysian facility must source all of these materials from elsewhere. As noted above, Jinko Solar produces silicon ingots and wafers in a number of facilities in China.[131] And given the company's public statements noted above about its vertically integrated solar product value chain and its leverage of this vertical integration and cost-efficient manufacturing capabilities in China, the evidence reasonably suggests that Jinko Solar also obtains the upstream components used to complete the production of CSPV cells and modules in Malaysia from its Chinese affiliates.

A-SMACC submits that the CSPV cells and/or modules completed in Vietnam by Trina Solar Vietnam, Canadian Solar Vietnam, China Sunergy Vietnam, Boviet Solar, Vina Solar, LONGi, GCL-Si Vietnam, and Jinko Solar Vietnam using Chinese-origin wafers, cells and/or other inputs are circumventing the Orders. As demonstrated above, reasonably available evidence indicates that the companies subject to this request likely obtain Chinese-origin CSPV wafers – "the most critical component with respect to PV module performance."[132] In the case of

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125 Jinko Solar has stated that it purchases solar grade virgin polysilicon from both domestic suppliers and foreign suppliers. *Id.* at 69.

126 [ ], excerpts attached at **Exhibit 43**.

127 Jinko Solar Annual Report at 88, excerpts attached at **Exhibit 12**.

128 *Id.* at 63.

129 *Id.* at 67.

130 *Id.*

131 *Id.*

132 Expert Report at 7, attached at **Exhibit 1**.

Jinko Solar, as discussed above, the company may be importing Chinese solar cells to be assembled into modules in Vietnam. To the best of A-SMACC's knowledge, there is only very limited production of wafers in Vietnam, with just one company with wafer capacity.[133] According to [ ], [ ], compared to [ ].[134] Even if these wafers were being used to produce cells and modules in Vietnam, they would be insufficient to supply Vietnam's substantially greater cell conversion/module assembly capacity.

Indeed, China's dominance in the CSPV supply chain generally and in the polysilicon and wafer markets in particular is well known. China's production of polysilicon increased more than 450 percent from 2010 to 2018 and accounted for 58 percent of global production in 2019.[135] By last year, China accounted for approximately 80 percent of solar-grade polysilicon production worldwide.[136] Similarly, China's production of wafers increased more than 850 percent from 2010 to 2018 and accounted for <u>93 percent of global production</u> in 2018.[137] China's production of CSPV cells and modules both increased almost 700 percent from 2010 to 2018 and accounted for 73 percent and 72 percent of global production in 2018, respectively.[138] China's dominance of the solar supply chain has only increased even further more recently. For instance, the following

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133 John Parnell, *JA Solar Secures Finance for 1.5GW Wafer Facility in Vietnam*, PV Tech (July 11, 2018), attached at **Exhibit 47**.

134 [ ], excerpts attached at **Exhibit 11**.

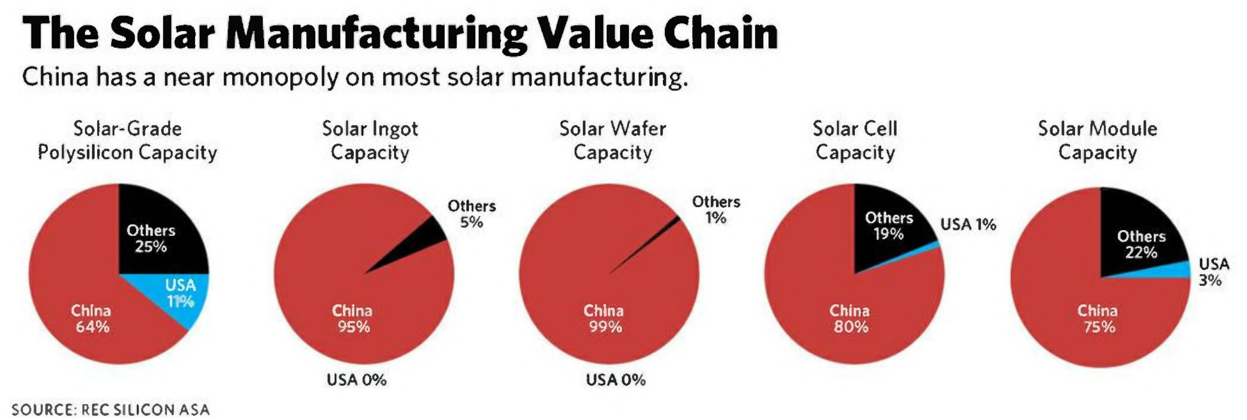
135 USITC Pub. 5021 at F-16, excerpts attached at **Exhibit 14**.

136 Expert Report at 4, attached at **Exhibit 1**.

137 USITC Pub. 5021 at F-20, excerpts attached at **Exhibit 14**.

138 *Id.* at F-22, F-24.

graphic demonstrates that China has a near monopoly on most solar manufacturing, with estimates based on capacity:[139]



In fact, according to [ ], an industry publication, in 2020, China's capacity for polysilicon was [ ], while the rest of the world's capacity (including U.S. capacity), combined, was [ ], *i.e.*, China's share was approximately [ ] percent of total global capacity.[140] For ingots and wafers, China's capacity in 2020 was [ ], while the rest of the world's capacity was [ ], *i.e.*, China's share was [ ] percent of total global capacity.[141] According to another industry publication, BloombergNEF, the top ten polysilicon producers supplied 83 percent of the market in 2019,[142]

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139 Joan Fitzgerald, *The Case for Taking Back Solar*, The American Prospect (Mar. 24, 2021), attached at **Exhibit 48**.

140 [ ], excerpts attached at **Exhibit 11**. *See also* Expert Report at 4, attached at **Exhibit 1** (estimating that China accounted for 84 percent of global polysilicon capacity in 2020). As the Department is aware, U.S. companies are unable to ship polysilicon to China due to trade restrictions in China. [ ].

141 [ ], excerpts attached at **Exhibit 11**. [ ].

142 *Solar PV Trade and Manufacturing: A Deep Dive*, BloombergNEF (Feb. 2021) at 1, excerpts attached at **Exhibit 16**.

with seven of those producers being Chinese.[143] According to the CPIA, the top ten wafer manufacturers are all located in mainland China.[144] BloombergNEF also reports that the top ten wafer producers supplied 95 percent of the market in 2019, with all of the companies being based in China, except for Canadian Solar (which is a Chinese company headquartered in Canada but with the vast majority of its production facilities in China).[145]

In addition to CSPV wafers and/or cells, A-SMACC has reason to believe that all, or the majority, of the other materials used to convert the Chinese wafers to cells and then assemble the cells into modules in Vietnam are obtained from China. Again, based on information reasonably available to A-SMACC, these materials include silane, phosphorus oxychloride (POCI3), aluminum and/or silver paste for converting the wafers to cells, and solar glass, EVA, backsheet, aluminum frames, and junction boxes for assembling the cells into modules. China is also a major supplier of these other components for CSPV cells and modules. Indeed, industry publications confirm that the vast majority of the key components for solar panel assembly in Vietnam are now being produced in China.[146] According to BloombergNEF, "{b}esides ample supply of components along the PV value chain such as cells and wafers, China is also home to the largest manufacturers of key materials such as PV glass and aluminum frames."[147] China's market share of solar glass has stayed above 90 percent in the global market for years.[148] Two Chinese producers

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143 *Id.* at 9.

144 Expert Report at 7, attached at **Exhibit 1**.

145 *Solar PV Trade and Manufacturing: A Deep Dive*, BloombergNEF (Feb. 2021) at 12, excerpts attached at **Exhibit 16**; Canadian Solar 2020 Financial Statements at F-73, excerpts attached at **Exhibit 2**.

146 *Solar PV Trade and Manufacturing: A Deep Dive*, BloombergNEF (Feb. 2021) at 16, excerpts attached at **Exhibit 16**.

147 *Id.* at 20.

148 Hong Wang, *New Policies Set to Ease China Solar Glass Production Constraints Amidst Soaring Costs*, PV Tech (Nov. 19, 2020), attached at **Exhibit 49**.

alone, Xinyi Solar and Flat Glass, were projected to supply more than 50 percent of the market in 2020.[149] In addition, the world's largest solar silver paste suppliers have their factories in China.[150] Producers like Canadian Solar, LONGi (parent company of Vina Solar and itself a circumventing company), and Jinko Solar also own subsidiaries or are engaged in joint ventures that produce aluminum frames, junction boxes, and EVA in China.[151]

In addition, while the exact sourcing patterns for the companies that are subject to this request are not reasonably available to A-SMACC, publicly available evidence indicates that these companies are in fact sourcing many of the other materials for completing CSPV cells and assembly into modules from China. For instance, Canadian Solar has Chinese subsidiaries that produce junction boxes and EVA,[152] in addition to aluminum frames.[153] Boviet Solar openly advertises that it sources glass for its solar modules from China.[154] And in 2020, Trina Solar "and its 8 subsidiaries" signed a procurement contract worth around $324 million for 85 million square meters of photovoltaic glass from the Chinese manufacturer Changzhou Almaden Co., Ltd. to be provided between November 2020 and December 2022.[155] It is likely that Trina Solar is sourcing this component for its Vietnamese manufacturing bases through their respective procurement contracts with Chinese manufacturers.

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149 *Solar PV Trade and Manufacturing: A Deep Dive*, BloombergNEF (Feb. 2021) at 18, excerpts attached at **Exhibit 16**.

150 *Id.* at 14.

151 *Id.* at 18.

152 Canadian Solar 2020 Financial Statements F-73, attached at **Exhibit 2**.

153 *Solar PV Trade and Manufacturing: A Deep Dive*, BloombergNEF (Feb. 2021) at 18, excerpts attached at **Exhibit 16**.

154 Boviet Solar USA Website Excerpts, attached at **Exhibit 37**.

155 *Trina Solar Will Purchase 85 Million Square Meters of Photovoltaic Glass from Almaden*, Trina Solar (Nov. 17, 2020), attached at **Exhibit 50**. While the specific subsidiaries are not named, this may include Trina Solar Vietnam.

Similarly, LONGi Group's 2020 annual report also indicates that the group purchases glass and aluminum frames from Chinese suppliers, in addition to certain suppliers from other countries.[156] Industry publication [ ] also notes that LONGi had [ ].[157] Given the affiliation, it is likely that both LONGi's Vietnamese subsidiary, Vina Solar, as well as LONGi itself (for its contract manufacturing) relied on such purchases of Chinese glass and aluminum frames. Industry articles indicate that other of LONGi's subsidiaries outside of China sourced, in addition to glass and aluminum frames, EVA solar film, backsheets, packaging materials and chemicals from China, in addition to other countries.[158] Since Vina Solar and LONGi have the same need for these materials and also appears to lack the capacity to produce them or otherwise obtain them in Vietnam,[159] it is likely that LONGi and Vina Solar will similarly source these components through LONGI's established Chinese supply chains.

While the sourcing patterns for other components for solar cells and modules for CSUN Vietnam are not reasonably available to A-SMACC, as noted above, the company's Chinese sister-companies tout "a complete photovoltaic industrial chain, including the poly silicon, pulling slice, solar cell, component and applicating system, with CEEG's other subordinate companies, which is an important strategic deployment for the CEEG to follow the national energetic developing

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156 LONGi Group 2020 Annual Report Excerpts at 69-70, attached at **Exhibit 9**.

157 [ ], excerpts attached at **Exhibit 51**.

158 Jack Wong, *China-Based LONGi to Invest RM100mil More in Malaysia*, The Star (Nov. 20, 2017), attached at **Exhibit 52**.

159 Mark Osborne, *LONGi Details Plans for Vina Solar After Recent Acquisition Deal*, PV Tech (Mar. 4, 2020), attached at **Exhibit 44**.

policy, basing on the energy saving, environmental protection industry."[160] Thus, it is very likely that CSUN Vietnam benefits from its parent company's "complete photovoltaic industrial chain" and strategically sources the other components for CSPV cell and module completion from this ready network of Chinese sister subsidiaries.

GCL-Si undoubtedly benefits from a similar relationship with its parent company, GCL, which "owns a completely integrated PV industrial chain"[161] and has ties to the Chinese government. One of the other companies under the GCL umbrella, GCL-Poly, is a "globally leading developer and manufacturer of high-efficiency PV materials," [162] and manufactures polysilicon, ingots and wafers across several factories in China.[163] The company also claims to "ha{ve} a firm hold on the direction of development of these materials, consistently maintaining its position as a trailblazer in the areas of polysilicon and silicon wafer technology."[164] GCL-Poly "began operations with the technology-intensive material of polysilicon and gradually expanded to the downstream aspects of silicon ingots and wafers to complete its product structure."[165] Clearly a leader in field of polysilicon, ingot, and wafer design and manufacturing, GCL-Poly touts its use of "GCL Group's massive-scale," and "industry-leading polysilicon production technique" and celebrates its many patents including a China Patent Award –the highest patent award in China.[166] Furthermore, the company directly links "{t}he Group's polysilicon and wafer production costs"

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160 CEEG Website Excerpts, attached at **Exhibit 34**.

161 GCL Website Excerpts, attached at **Exhibit 7**.

162 GCL-Poly Website Excerpts, attached at **Exhibit 39**.

163 GCL-Poly 2019 Annual Report at 3, excerpts attached at **Exhibit 53**. *See also* Expert Report at 4, 9, attached at **Exhibit 1**.

164 GCL-Poly Website Excerpts, attached at **Exhibit 39**.

165 *Id.*

166 *Id.*

to "its ability to control raw material costs, lower energy consumption, achieve economies of scale in its operations and streamline production processes."[167] The evidence indicates, therefore, that GCL-Si Vietnam sources the additional components for its cell and module production operations in Vietnam from its industry-leading materials manufacturing sister-company in China, especially given China's dominance in the CSPV supply chain. Additionally, GCL-Si is itself investing $2.5 billion between 2020 and 2023 in the construction of a solar manufacturing megacomplex in Hefei, China.[168] "The megacomplex will include wafer, cell, module and all component manufacturing such as junction box, backsheets, glass, EVA and aluminium frames."[169]

Articles indicate that Jinko Solar has purchased solar glass from Chinese manufacturer Flat Glass.[170] In December 2020, for instance, it was announced that Flat Glass will supply CNY14.2 billion ($2.2 billion) worth of products, or 338 million square meters of PV glass, to Shanghai-based Jinko Solar and five of its affiliates over the next three years.[171] It is estimated that this will be used to make 59 GW of PV modules.[172]

Given China's dominance in the CSPV supply chain generally and the fact that these companies' production is mainly based in China as discussed below, it is reasonable to believe that these companies obtain the other components to complete the production of cells and modules from Chinese suppliers. It is likely that these companies' facilities in Vietnam obtain these

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167 GCL-Poly 2019 Annual Report at 26, excerpts attached at **Exhibit 53**.

168 Jules Scully, *GCL-SI to Start Production at First Phase of 60GW Module Factory in September*, PV Tech (June 2, 2021), attached at **Exhibit 54**.

169 *Id.*

170 Vincent Shaw & Max Hall, *Chinese PV Industry Brief: More Manufacturing Capacity from Trina, GCL Integration and Eging PV*, PV Magazine (Jan. 5, 2021), attached at **Exhibit 55**.

171 Tang Shihua, *China's Flat Glass Hits Limit Up on USD2.2 Billion PV Glass Deal With Jinko Solar*, Yicai Global (Dec. 31, 2020), attached at **Exhibit 56**.

172 *Id.*

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components from and/or through their Chinese affiliates to complete the production of solar cells/modules.

A-SMACC obtained Vietnamese import data from a subscription database made available by Global Trade Information Services ("GTIS") for the period from 2019 through May 2021,[173] as well as open source data from the United Nations Comtrade Database for the period from 2011 through 2018.[174] The data clearly demonstrates that in the decade after the petitions for the underlying investigations were filed in 2011, Vietnamese imports of Chinese wafers and many components and chemicals used in the manufacturing process for CSPV cells and modules have increased significantly. For instance, in 2020, the volume of Vietnam's imports of goods under HS code 3818.00 from China, which covers wafers and chemical compounds that have been doped, amounted to more than 11 million kilograms, a 45 percent increase in just one year from approximately 7.6 million kilograms in 2019. Similarly, the data show that the volume of imports of HS code 8544.42, which covers junction boxes used in solar modules, increased over 98 percent from just 2019 to 2020, and the volume of imports of HS code 7314.19, which covers screen frames used in solar module assembly, more than doubled from 2019 to 2020. A summary of 2019-2020 GTIS data for components and inputs appears at **Exhibit 57**.[175]

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[173] *See* Global Trade Information Services Vietnamese Import Data ("GTIS Data"), attached at **Exhibit 57**. Vietnamese import data from GTIS is not available prior to 2019.

[174] *See* UN Comtrade Database Vietnamese Import Data, attached at **Exhibit 58**. While the GTIS Data, above, is reported as volume in kilograms, the most complete set of Vietnamese import data from Comtrade is reported as value in USD. These HS codes are examples and may not be the best or only appropriate codes for these goods.

[175] Some of the HS codes are basket categories and may include other goods. Nonetheless, that imports of merchandise under these HS codes from China increased substantially following the imposition of the Orders further corroborates other information discussed in this petition demonstrating that the subject companies are importing Chinese materials to complete the production of cells/modules in Vietnam. These HS codes are examples and may not be the best or only appropriate codes for these goods.

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The Comtrade data demonstrates that this upward trend in Vietnamese imports of Chinese wafers, components, and chemicals used in the manufacturing process for CSPV cells and modules extends back to 2011. For instance, in 2018, the value of Vietnam's imports of goods under HS code 3818.00 from China, which covers wafers and chemical compounds that have been doped, was more than $153 million, an astronomical 159,000 percent increase in just eight years from approximately $96,000 in imports under the same HS code in 2011. Over the same 2011-2018 period, the value of Vietnamese imports from China under HS 7007.19 covering solar glass increased almost 2,500 percent from almost $6 million in 2011 to more than $150 million in 2018; the value of imports under HS 8541.40 covering PV cells and modules increased 2,600 percent from approximately $24 million in 2011 to nearly $650 million in 2018; and the value of imports under 8544.42 covering junction boxes used in solar modules nearly doubled from approximately $72 million to approximately $140 million. As evidenced by the above data, for the decade following the filing of the original petitions in 2011, Vietnamese imports of Chinese wafers and many components and chemicals used in the manufacturing process for CSPV cells and modules have increased significantly and, at times, astronomically. A summary of 2011-2018 Comtrade data for components and inputs appears at **Exhibit 58**.[176]

Trina Solar Vietnam, CSUN Vietnam, Boviet Solar, GCL-Si Vietnam, Vina Solar, and Jinko Solar Vietnam are subsidiaries of large vertically integrated Chinese CSPV producers that tout their global dominance. LONGi is itself one of those Chinese producers itself. Canadian Solar is similarly affiliated with numerous Chinese producers and suppliers capable of supplying

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[176] Note again that some of the HS codes are basket categories and may include other goods. Nonetheless, that imports of merchandise under these HS codes from China increased substantially following the imposition of the Orders further corroborates other information discussed in this petition demonstrating that the subject companies are importing Chinese materials to complete the production of cells/modules in Vietnam. These HS codes are examples and may not be the best or only appropriate codes for these goods.

the requisite materials for cell and module production. As such, it is even more likely that a substantial portion of the components for completing the production of CSPV cells and assembling into modules in the third country are obtained through the parent or affiliated Chinese companies. In fact, industry publication [ ] reports that certain module manufacturers have in-house production facilities for certain components for module assembly.[177] [ ] announced in [ ] a factory for the production of frames for [ ].[178] As the Commission has previously noted, Chinese CSPV cell and module producers have benefited not only from policies through which they directly received support, but also through policies directed at the supply chain.[179] For instance, just recently, Chinese engineering company Triumph Group, a unit of state-owned conglomerate China National Building Materials Group Corporation, signed an agreement with the government of Suqian City, Jiangsu Province, to build a solar glass factory at the Grand Canal Suqian Port Industrial Park.[180] The Triumph Group is also the controlling shareholder of state-owned manufacturer Luoyang Glass, another producer of solar glass.[181] The European Commission previously identified subsidy rates of 3.2 percent to 16.7 percent for participating producers of solar glass in a countervailing duty investigation.[182] Chinese producers of aluminum extrusions (which include module frames) benefit from a range of government policies to support the aluminum industry.[183] The Chinese

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[177] [ ], excerpts attached at **Exhibit 51**.

[178] *Id.*

[179] USITC Pub. 5021 at F-47, excerpts attached at **Exhibit 14**.

[180] Vincent Shaw & Max Hall, *Chinese PV Industry Brief: New Solar Glass Factory in Jiangsu, Longi Maintains Wafer Prices Unchanged*, PV Magazine (June 25, 2021), attached at **Exhibit 59**.

[181] *Id.*

[182] USITC Pub. 5021 at F-47 – F-48, excerpts attached at **Exhibit 14**.

[183] *Id.*

government has also supported energy intensive polysilicon production through reduced electricity rates and other policies.[184] For example, LDK received significant electricity fee subsidies from the Financial Bureau of Xin Yu Economic Zone for its polysilicon production operations.[185] Similarly, Daqo received reduced electricity rates from the government in Xinjiang as part of the approval for the expansion of its polysilicon manufacturing plant and in 2018, received "unrestricted cash government subsidies" totaling $13.1 million.[186] By obtaining the bulk of their raw materials (including the critical wafer input) from China, these companies with minor Vietnamese finishing facilities are benefiting from the same Chinese government subsidies that subsidize Chinese producers directly. The evidence discussed above establishes that Chinese producers are completing CSPV cells and modules in Vietnam from merchandise manufactured in China before exporting them to the United States.

C. The Completion of the CSPV Cells and Modules in Vietnam is Minor and Insignificant

1. The Level of Investment in Vietnam is Minimal

In determining the relative level of total investment, as the Department has done in recent proceedings, the agency should compare the level of investment in Vietnam for a facility to complete the production of CSPV cells and/or assemble cells into modules to the investment required to produce CSPV cells/modules using a fully integrated production process.[187]

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184 *Id.*

185 *Id.*

186 *Id.*

187 *See, e.g.*, Issues and Decision Memorandum accompanying *Certain Cold-Rolled Steel Flat Products From the Republic of Korea*, 84 Fed. Reg. 70,934 (Dep't Commerce Dec. 26, 2019) (affirm. final deter. of circumvention of the antidumping duty and countervailing duty orders) ("CR from Korea IDM") at 62-65. The statute does not instruct the Department to use a particular analysis when evaluating the level of investment in the foreign country for purposes of Section 781(b)(2)(A) of the Act, and the Department may determine an appropriate analysis to apply. The Department has explained that its "past practice has been to compare the total investment required (as well as, separately, the

The resources and investment needed to produce CSPV cells/modules using a fully integrated process are very significant. For an integrated supplier covering polysilicon to ingot/wafer, the required capital investment would likely exceed $1.7 billion for a 20 GW supply of polysilicon, ingot, and wafers.[188]

Industry publications confirm that the investment required for the upstream production processes through the wafer stage is much more significant than the investment required for the final cell and module finishing stages. For instance, according to BloombergNEF, "{t}echnical hurdles are highest for plants that make polysilicon and wafers. These plants are also costly to build and take longest to construct. Cell and module factories can be built faster . . ."[189] In fact, "{v}ertical integration, high factory capex and technical hurdles have made the wafer market the most consolidated segment of the PV value chain."[190] Indeed, "{w}afer factories require high upfront capital expenditure and bear many technical hurdles, which makes it difficult for new factories to be built outside of China."[191]

research and development, production process, and facilities) from the beginning of the production process in the country subject to an {AD or CVD} order to the investment required (as well as, separately, the research and development, production process, and facilities) to finish the final product in a third country, rather than to compare the investments (as well as, separately, the research and development, production process, and facilities) required to perform the same finishing steps in each country." In doing so, the Department has emphasized that this reflects the agency's concerns with circumvention being achieved by shifting one or more of the last few minor or insignificant steps of the production process to a third country. *See id.* at 64.

188 Expert Report at 9, attached at **Exhibit 1**. This assumes 30,000 tons of polysilicon required for 10 GW of wafers using the assumptions as detailed in the NREL PV Manufacturing Report. This equates to a 60,000 ton polysilicon facility meeting the supply requirements 20 GW ingot/wafer facility.

189 *Solar PV Trade and Manufacturing: A Deep Dive*, BloombergNEF (Feb. 2021) at 1, excerpts attached at **Exhibit 16**.

190 *Id.* at 10.

191 *Id.* at 11.

Building a new polysilicon production facility also requires substantial investment. Recent announcements place the cost for a new facility in the range of $1.4 billion per 100,000 tons.[192] For instance, in 2018, Daqo New Energy announced a new 35,000 ton polysilicon facility in Xinjiang, China, with the capital expenditure quoted as approximately $502M.[193] In 2020, Tongwei Group announced a new 40,000 ton facility in Yunnan Province, China covering approximately 800 acres, with the capital expenditure noted as $563M.[194] In March 2021, Xinte Energy Co Ltd announced a new project to build a 100,000-tonne per year high-purity polysilicon production plant in Inner Mongolia, northern China, with the total investment estimated to be around CNY 8.799 billion ($1.36 billion).[195] The expansions noted above are supported by long-term supply contracts with Chinese PV Suppliers.[196] For instance, JA Solar and LONGi Group have 5-year contracts with Xinte for 97,200 and 270,000 tons of polysilicon, respectively.[197]

In addition to being capital intensive, polysilicon manufacturing is also energy intensive.[198] The CPIA quoted the average power consumption for a polysilicon production facility at 70 kWh/kg, which equates to 7,000 GWh of power for a 100,000 ton factory.[199] Actual investments by producers confirm the large investment required for polysilicon production facilities. For instance, GCL-Poly – sister company of GCL-Si – invested $826 million in constructing a 60,000

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192 Expert Report at 6, attached at **Exhibit 1**.

193 *Id.*

194 *Id.*

195 Sladjana Djunisic, *Xinte Energy Proposes to Build 100,000-Tonne-Per Year Polysilicon Production Plant*, Renewables Now (Mar. 2, 2021), attached at **Exhibit 60**.

196 Expert Report at 6, attached at **Exhibit 1**.

197 *Id.*

198 *Id.*

199 *Id.*

tonne polysilicon plant in China in 2017.[200] In Tennessee, Dow/Hemlock invested $1.2 billion to build a polysilicon production facility, with a $3 billion expansion originally planned.[201] In contrast, "{b}uilding a new module factory has low technical hurdles compared with wafer and polysilicon."[202] In fact, BloombergNEF notes that "{g}iven low technical and financial barriers, it is also easier for module companies to open shop in other countries in response to tariffs or other policy developments. Once duties on Chinese solar cells were imposed by the {United States}, large integrated manufacturers built both cell and module assembly plants across Southeast Asia."[203] This is precisely what is happening here – moving the relatively low-investment portions of the process to third countries like Vietnam to evade the AD/CVD orders while maintaining the high-investment portions of the process in China, causing injury to the domestic industry.

The substantial level of investment required for the production of CSPV products through the completion of wafers is confirmed by the actual investment of Chinese producers. For instance, LONGi Green Energy Co. Ltd. – Vina Solar's parent company and itself a company circumventing through Vietnam – announced in 2019 plans for a new 15 GW ingot and wafer production facility in China, which is expected to cost around $643 million.[204] Trina Solar, as noted above, recently engaged in a joint venture for "a high-purity crystalline silicon project with an annual output of 40,000 tons, a ingot project of an annual output of 15GW, a wafer cutting project of an annual

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200 Ian Clover, *GCL-Poly Investing $826m in Construction of 60,000 MT Polysilicon Plant in China*, PV Magazine (Apr. 6, 2017), attached at **Exhibit 61**.

201 *Hemlock Semiconductor Corporation*, Wikipedia (last accessed July 6, 2021), attached at **Exhibit 62**.

202 *Solar PV Trade and Manufacturing: A Deep Dive*, BloombergNEF (Feb. 2021) at 19, excerpts attached at **Exhibit 16**.

203 *Id.*

204 Mark Osborne, *LONGi Investing US$875 Million in 2020 Production Capacity Expansion Plans*, PV Tech (Apr. 17, 2019), attached at **Exhibit 63**.

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output of 15GW, and a high-efficiency crystalline silicon cell project with an annual output of 15GW."[205] The total investment was about $2.3 billion.[206] China's GCL-Poly Energy Holdings Ltd. – sister company of GCL-Si Vietnam – announced in 2018 plans to build a 20 GW monocrystalline silicon manufacturing facility for the research and development, production and sale of monosilicon ingots in Qujing at a total cost of CNY 9 billion (USD 1.43 billion).[207] While the exact investment levels are not reasonably available to A-SMACC, Canadian Solar and Jinko Solar likely made similarly substantial investments for their integrated operations to produce ingots and wafers in China. As discussed above, the available evidence indicates that Boviet Solar's parent company Boway produces polysilicon, ingots and wafers in China,[208] and CSUN Vietnam's parent company CEEG also produces polysilicon, ingots and wafers in China.[209] The companies likely made substantial investments for such operations in China, in accordance with the investments made by other Chinese producers for the same types of operations.

For all the companies subject to this request, the investment for the production of polysilicon, ingots and wafers is being made in China. Accordingly, the Department should compare the level of investment required for the first three stages of production for cells/modules in China to the investment required for the final two stages of production taking place in Vietnam.

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205 Carrie Xiao, *Trina, Tongwei Unveil Major, Multi-Billion-Dollar Solar Silicon, Wafer and Cell Alliance*, PV Tech (Nov. 18, 2020), attached at **Exhibit 32**.

206 *Annual Production Capacity 15GW! Trina Solar and Tongwei Co., Ltd. Join Forces to Further Upgrade the 210 Integrated Industrial Chain*, Trina Solar (Nov. 16, 2020), attached at **Exhibit 31**.

207 Ivan Shumkov, *GCL-Poly Energy Plans 20-GW Ingot Factory in China*, Renewables Now (Apr. 11, 2018), attached at **Exhibit 64**.

208 Reuters Website Excerpt, attached at **Exhibit 36**.

209 CEEG Website Excerpts, attached at **Exhibit 34**.

As indicated above, the level of investment required to build a polysilicon production facility can range between $502 million and $3 billion. For instance, Chinese polysilicon supplier and solar cell producer Tongwei recently signed an agreement with the government of Leshan City and the Wuhua district for a new polysilicon manufacturing site with a capacity of 200,000 metric tons and the total investment around RMB14 billion ($2.1 billion).[210] This is corroborated by industry publications. Specifically, according to BloombergNEF, the cost of building a new factory in China for polysilicon manufacturing is estimated to be about $15 million per thousand tons, or $39 million per gigawatt.[211] Even these levels of investment are likely highly subsidized by the Chinese government. For instance, GCL-Poly, a Chinese polysilicon producer, has close ties to the China People's Liberation Army and the Chinese government.[212] Similarly, TBEA Co., Ltd, the parent company of Xinte Energy,[213] another Chinese polysilicon supplier, states on its website that it "actively practices the national strategy of 'the Belt and Road initiative' and is 'devoted to sharing the advanced electricity construction experience of China with the world.'"[214]

By comparison, the level of investment required in Vietnam to simply finalize the CSPV cells and assemble the cells with other Chinese-origin components into modules is much lower.

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210 Vincent Shaw & Max Hall, *Chinese PV Industry Brief: Tongwei Plans 200,000 MT Polysilicon Factory*, PV Magazine (July 2, 2021), attached at **Exhibit 65**.

211 *Solar PV Trade and Manufacturing: A Deep Dive*, BloombergNEF (Feb. 2021) at 8, excerpts attached at **Exhibit 16**. While this provides an average cost per gigawatt and is informative, as discussed above, many polysilicon production facilities appear to be much larger, indicating that polysilicon facilities generally need to be built on a larger scale and thus would require much larger investments to initially build the facility. In addition, it is the level of investment required for polysilicon, ingot, and wafer production combined (*i.e.*, the production stages taking place in China) that should be compared with the investment required to complete CSPV cells and modules in the third country.

212 Steven Mufson, *China's Growing Share of Solar Market Comes at a Price*, Washington Post (Dec. 16, 2011), attached at **Exhibit 66**.

213 *TBEA Announces Plan of Domestic Listing of Its Subsidiary Xinte Energy*, PVTIME (Jan. 15, 2021), attached at **Exhibit 67**.

214 TBEA Website Excerpts, attached at **Exhibit 68**.

For instance, the capital costs are in the range of $40 million to $50 million per GW of production capacity for cell manufacturing facilities, and recent announcements of new module production facilities indicate capital costs in the range of $20 million to $30 million for module-only factories, making this the least capital-intensive step in the supply chain.[215]

The actual investments in Vietnam by the companies subject to this circumvention petition confirm the much smaller investment levels for cell and/or module production facilities compared to the investment required for integrated production facilities in China that engage in the upstream production processes. For instance, in just six and a half months starting in May 2016, Trina Solar built a 800 MW cell and module facility in Vietnam for a total investment of $100 million.[216] In 2018, Trina Solar signed a $30 million credit facility with Vietin Bank to help finance the production of company's 1GW plant in Bac Giang, Vietnam.[217] Information reasonably accessible to A-SMACC does not indicate whether the entire project was financed through that loan. Trina Solar also recently built a production plant in Thai Nguyen, Vietnam with 3 GW cell and 4.5 GW module capacity.[218] The cost of construction of that facility is not reasonably accessible to A-SMACC, but the "fully automated plant" targeting the "North American market" was operational in May 2021 just five months after breaking ground in December 2020.[219]

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215 Expert Report at 10, 13, attached at **Exhibit 1**.

216 *Trina Solar's New 800 MW Facility Touted As Largest PV Cell And Module Factory' In Vietnam*, Taiyang News (Jan. 10, 2017), attached at **Exhibit 27**.

217 *Trina Solar in Vietnam: Secures US$30M Agreement with VietinBank, Provides Modules to Country's Largest Private PV Project,* Trina Solar (Oct. 9, 2018), attached at **Exhibit 69**.

218 David Wagman, *Trina Solar Begins Production of 550 W Modules at Vietnam Facility*, PV Magazine (May 25, 2021), attached at **Exhibit 25**.

219 *Id.*

In 2016, Canadian Solar secured investments of $70 million to finance the development of its module production facility in Vietnam.[220] It is not clear from information reasonably accessible to the A-SMACC whether that loan covered the full cost of construction. The cost of Boviet Solar's initial 200 MW cell and module production facility in Vietnam is likewise not reasonably accessible to the A-SMACC, but the company likely made a similar level of investment as the other companies described above given the similarity in facility capacity.[221] The investment made by GCL-Si for its operations in Vietnam is not reasonably available to A-SMACC. However, GCL-Si put a 600 MW solar cell factory into operation in Vietnam in 2016.[222] The company thus likely made similar levels of investment to launch its operations in Vietnam as the other companies described above, given the similarity in facility capacity. Neither the initial investment made by CSUN in its Vietnam facility nor the size of that facility is reasonably available to A-SMACC. But industry sources indicate that beginning in [ ], CSUN's manufacturing based in Vietnam had a [ ] year-end cell capacity of [ ] and module capacity of [ ]; both figures have [ ].[223] Therefore, like GCL-Si, the company likely made similar levels of investment to launch its operations in Vietnam as the other companies described above, [ ]. Finally, while the initial investment made by Vina Solar for its cell and module plant in Vietnam is likewise not reasonably available to A-SMACC, the entire, operational plant has 2GW of p-Type PERC solar cell capacity

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[220] Joshua Hill, *Canadian Solar Secures $70 Million Investment In Vietnam Production Facility*, CleanTechnica (Jan. 30, 2016), attached at **Exhibit 70**.

[221] Boviet Solar Website Excerpts, attached at **Exhibit 35**.

[222] *GCL-Si Starts Cperation cf 600MW Solar Cell Plant in Vietnam*, ENF Solar (Aug. 1, 2017), attached at **Exhibit 40**.

[223] [ ], excerpts attached at **Exhibit 11**.

and 7GW of module assembly capacity and was acquired by LONGi in 2020 for $253 million.[224] The investment made by LONGi for its contract manufacturing in Vietnam is not reasonably available to A-SMACC. Nor is information regarding the specific module manufacturers that LONGi has contracts with and those companies' investments in Vietnam. Presumably, however, LONGi made minimal to no investment for its contract manufacturing and entered into such contracts because it did not want to make the investment in Vietnam at the time those contracts were entered into. In addition, [ ], it is reasonable to assume that any companies that LONGi contracts with made substantially smaller investments in Vietnam compared to LONGi's massive investments in China.[225] Again, while information regarding Jinko Solar's operations in Vietnam is not reasonably to A-SMACC, any investment made by Jinko Solar to complete the production of solar cells/modules in Vietnam is likely similarly minimal.

While not required, in addition to the fact that these companies' investments in Vietnam for cell and module production are much smaller scale than the companies' investments in China for the upstream production processes, the Chinese companies' investments in China for production facilities that solely produce cells and modules appear to be generally much larger scale than the finishing facilities in Vietnam. For instance, in 2019, Vina Solar's parent company, LONGi, announced investment plans for two 5 GW mono module plants and one 5 GW mono

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224 Mark Osborne, *LONGi Details Plans for Vina Solar After Recent Acquisition Deal*, PV Tech (Mar. 4, 2020), attached at **Exhibit 44**.

225 Taking into consideration all of the Vietnamese companies named in [ ]. In contrast, the same data indicate that in China, [ ]. [ ], excerpts attached at **Exhibit 11**.

solar cell plant in various cities in China, with the expected level of investment for each ranging between RMB1.839 billion ($269.2 million) and RMB2.462 billion ($348.4 million).[226] LONGi Group's 2020 annual report also indicates that the company has a number of cell and/or module production facilities in China with capacities ranging between 3 GW and 7.5 GW.[227] Trina Solar is building a 10 GW module assembly plant in China that will cost around RMB2.5 billion ($386 million), and also announced late last year that it is building an 8.5 GW solar cell plant in China at a cost of RMB3 billion ($459.4 million).[228] Earlier this year, Canadian Solar announced its single largest solar cell and module assembly plant complex. The 10 GW cell and module assembly project is expected to require a total investment of RMB3.6 billion ($557 million).[229] According to industry publication [ ], as of year-end 2020 CSUN's cell production capacity in China was roughly [ ] its cell production in Vietnam, and its module production capacity across its Chinese production facilities was close to [ ] what it produced in its Vietnam facility.[230] Similarly, GCL-Si has [ ] module production facilities across China with a combined cell production output in 2020 of [ ], compared to [ ] in Vietnam with production output in 2020 of [ ].[231] Clearly, the Chinese companies have made a minimal investment in the third country, demonstrating that the companies intended for the completion of the subject merchandise in the third country to be minor

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226 Mark Osborne, *LONGi Approves 10GW of Module and 5GW of New Solar Cell Capacity Expansion Plans*, PV Tech (Oct. 15, 2019), attached at **Exhibit 71**.

227 LONGi Group 2020 Annual Report Excerpts at 31-32, attached at **Exhibit 9**.

228 Mark Osborne, *Trina Solar Plans 10GW Module Assembly Plant in Yancheng*, PV Tech (Mar. 2, 2021), attached at **Exhibit 72**.

229 Mark Osborne, *CHINA ROUND-UP: Solar Manufacturing Capacity Announcements Continue from SMSL Members*, PV Tech (Jan. 4, 2021), attached at **Exhibit 73**.

230 [ ], excerpts attached at **Exhibit 11**.

231 *Id.*

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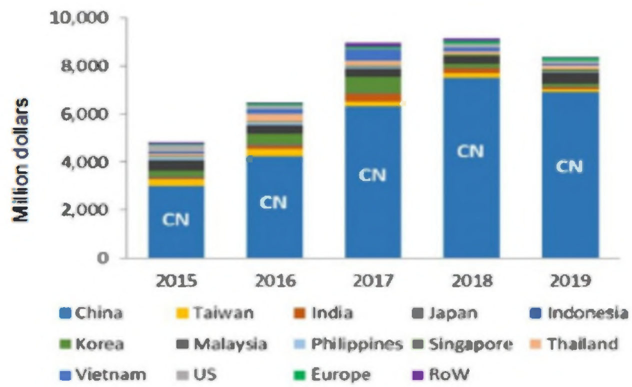
and insignificant, further showing that these companies are engaging in circumvention of the Orders as contemplated by section 781(b) of the Act. An assessment of global capital expenditures for ingots, wafers, CSPV cells, and modules as a whole is telling and shows that China's share of global capital expenditures dwarfs the rest of the world.

CSPV products: Global capital expenditures for ingots, wafers, CSPV cells, and CSPV modules, 2015-19



Notes: 2019 data are projections. Given declining costs for building plants, decreases in spending do not necessarily translate to lower capacity additions in GW terms.

Source: Colville, Finlay, "Solar PV Capex Trending at US$9 billion Annually as New GW Fabs in China Slash Investments Required," *PV Tech*, December 10, 2019, https://www.pv-tech.org/editors-blog/solar-pv-capex-trending-at-us9-billion-annually-as-new-gw-fabs-in-china-sla, retrieved December 18, 2019.

Source: USITC Pub. 5021 at F-26 – F-27, excerpts attached at **Exhibit 14**.

2. <u>The Level of Research and Development in Vietnam is Minimal</u>

The level of research and development in Vietnam to complete the production of CSPV cells and assemble cells into modules with Chinese-origin components is minimal. Rather than researching and developing their own technology, these companies are predominantly importing technology from China. Indeed, the CPIA Report for 2019 states that "the key equipment of PERC cell production equipment has basically completed domestication," which indicates that most of the equipment is from Chinese suppliers.[232] This follows a trend from many other industries, where

[232] Expert Report at 11, attached at **Exhibit 1**.

China-based companies take over not only the market for the end product (PV modules), but also the capital equipment used to manufacture the same.[233] From a manufacturing perspective, it is a best practice to use the same manufacturing equipment regardless of where the factory is located. Thus, it is highly likely that most new cell conversion facilities built outside of China also use production equipment sourced from China.[234] The CPIA also stated that "all domestic component production equipment has been localized," indicating that all of the module production equipment is available from local Chinese suppliers.[235] Given that the companies in the third country here are subsidiaries of large vertically integrated CSPV producers, the third country companies undoubtedly relied on the parent companies' R&D in building the production facilities in the third country and implementing production processes.

In contrast to the little to no research and development activities taking place in Vietnam, the research and development expenditures within China of Chinese integrated producers of CSPV cells/modules that engage in the upstream production processes generally are extensive. For example, by the end of the reporting period for its 2020 annual report, LONGi Group had obtained a total of 1,001 issued patents and invested RMB2.592 billion (approximately $397.2 million)[236] in R&D, with RMB499,103,854.57 (approximately $76.5 million)[237] in R&D expenses in just the reporting period for its 2020 annual report.[238] The company did not list R&D in its description of

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233 *Id.*

234 *Id.*

235 *Id.* at 13.

236 Using an exchange rate of 6.5250 RMB per U.S. dollar from December 31, 2020. *Foreign Exchange Rates - H.10: Historical Rates for the Chinese Yuan Renminbi*, Federal Reserve (July 6, 2021), attached at **Exhibit 74**.

237 *Id.*

238 LONGi Group 2020 Annual Report Excerpts at 17, attached at **Exhibit 9**.

the "principal business" for Vina Cell or Vina Solar[239] LONGi Group is known for investing heavily in R&D spending. For instance, LONGi Group set a solar industry R&D expenditure record in 2017, spending more in that year than any solar manufacturer to date.[240] Given that the vast majority of LONGi Group's manufacturing facilities are in China, it is likely that all or most of the company's R&D occurs in China.[241] It is reasonable to assume that LONGi has not invested in any R&D in Vietnam for its contract manufacturing. Furthermore, given LONGi's record spending in R&D, any R&D conducted by the Vietnamese companies that LONGi contracts with is likely minimal, if not non-existent.

Like LONGi, the GCL group invests heavily in R&D primarily through its subsidiary GCL-Poly. GCL-Poly has filed more than 1,100 invention and utility patents and has five provincial R&D centers focusing on various stages of polysilicon and wafer production throughout China.[242] GCL-Poly also has a National and Local Joint Engineering Research Center for Advanced Silicon Material Preparation Technology, a National Postdoctoral Research Station, a Provincial Key Laboratory of Silicon-based Electronic Materials and a Provincial Academician Workstation, and a certified GCL Testing Technology Center – all presumably in China.[243] GCL-Si itself is building a massive $2.5 billion fully integrated production facility that will also do some R&D in China.[244] In contrast to the tremendous amount of R&D GCL conducts in China, information reasonably accessible to A-SMACC provides no indication that GCL-Si Vietnam conducts R&D.

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239 *See id.* at 33.

240 Mark Osborne, *LONGi Sets Solar Industry Record for R&D Spending*, PV Tech (Apr. 9, 2018), attached at **Exhibit 75**.

241 LONGi Website Excerpts, attached at **Exhibit 76**.

242 GCL-Poly Website Excerpts, attached at **Exhibit 39**.

243 *Id.*

244 Emiliano Bellini, *World's Biggest PV Module Factory*, PV Magazine (Mar. 30, 2020), attached at **Exhibit 77**.

Instead, GCL-Si Vietnam almost certainly benefits from the R&D conducted across the GCL family of subsidiaries in China.

Similarly, CSUN Vietnam is part of the large CEEG family of companies. The director of CSUN's R&D is based out of the Nanjing, China headquarters and "keeps the world record 25% in laboratory photoelectric conversation efficiency of P-type silicon solar cell, and a research team headed by him pursuits the high efficiency, developing the technology to improve the ratio on production line continually, in order to lead the whole industry."[245] Like LONGi and GCL, CEEG appears to conduct substantial R&D annually across its subsidiaries, but no information reasonably available to A-SMACC indicates that any of this R&D is conducted by CSUN Vietnam. Instead, it is likely that CSUN Vietnam benefits from R&D conducted across CEEG's empire of Chinese subsidiaries.

Additionally, Canadian Solar Vietnam is not listed as having a principal activity of R&D in the parent company's financial statements, unlike some of Canadian Solar's subsidiaries in China.[246] In total, R&D expenses for Canadian Solar's consolidated operations amounted to approximately $45.2 million in 2020.[247] Similarly, the nature of Trina Solar Vietnam's business does not include R&D in the parent company's financial statements, unlike some of the Chinese operations.[248] In total, Trina Solar reported R&D expenses of over RMB363 million for is consolidated operations for 2020.[249] While the amount Boviet Solar spends on R&D is not reasonably accessible to A-SMACC, it is likely that Boviet Solar draws heavily on the R&D

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245 China Sunergy Website Excerpts, attached at **Exhibit 3**.

246 Canadian Solar 2020 Financial Statements at F-73, attached at **Exhibit 2**.

247 *Id.* at 64.

248 Trina Solar 2020 Auditor's Report at 131-133, attached at **Exhibit 15**.

249 *Id.* at 7.

capacity and resources of its vast Chinese parent company Boway. According to Boviet Solar's website, "Boviet acquires excellent R&D, production, marketing and QC teams and brings in the highly automatic solar cell and module production lines and inspection facilities from Germany, Spain, Japan and China."[250] Jinko Solar has publicly stated that its "{r}esearch and development expenses consist primarily of silicon materials used in {its} research and development activities and salaries, bonuses and other benefits for research and development personnel, and depreciation of equipment for research and development."[251] In 2018, 2019, and 2020, Jinko Solar Group's R&D expenses were RMB366.6 million, RMB324.4 million, and RMB389.2 million ($59.6 million), respectively.[252] A-SMACC was unable to find any evidence of Jinko Solar engaging in research and development in Vietnam.

3. <u>The Production Process in Vietnam Involves Minimal Additional Processing</u>

Again, in evaluating the production process in Vietnam, the Department should compare that process to the production operations of an integrated Chinese CSPV producer up through the stage at which the wafers or cells are sent to Vietnam for further minor processing. As detailed above, there are five main stages in the production process for CSPV products.[253] For most of the subject companies, A-SMACC understands that all of the manufacturing process up through the production of the wafers is taking place in China. Again, to the extent that the wafers are also undergoing some of the cell conversion steps in China before being exported to the third country

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250 Boviet Solar Website Excerpts, attached at **Exhibit 35**.

251 Jinko Solar Annual Report at 94, excerpts attached at **Exhibit 12**.

252 *Id.* at 124.

253 USITC Pub. 4874 at I-43, excerpts attached at **Exhibit 18**.

to be completed into cells and assembled into modules,[254] the production process in the third country would be even more minimal.

As can be seen in the description of the manufacturing process above, the production process up through the wafers, starting from the initial raw polysilicon stage, is much more substantial than the process of converting the wafers to cells and assembling modules. While the process of converting wafers to CSPV cells is not trivial – either in terms of capital or workforce – the production process up through the wafers is much more substantial in terms of production activities, investment, research, and expense, and is technologically complex.

Again, some of the companies do not appear to refine polysilicon themselves and instead start with the production of ingots in their Chinese facilities, and Trina Solar may temporarily source both polysilicon and ingots and start at the wafer stage in its Chinese facilities pending the completion of its polysilicon and ingot joint Chinese ventures.[255] The Department should still take into account the initial raw polysilicon and ingot stages of production for all companies subject to this petition when comparing the production processes in China and in the third country. As discussed above, reasonably available evidence indicates that the Chinese companies source polysilicon and/or ingots from their own Chinese subsidiaries or other Chinese suppliers to produce the wafers or cells that are exported to Vietnam to be completed into CSPV cells or modules. In other words, reasonably available evidence indicates that the production processes

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[254] Again, A-SMACC submits that wafers from China that have already been doped and contain a p/n junction, which are then shipped to Vietnam for finishing prior to export to the United States, are already in-scope merchandise and should be subject to duties, consistent with the Department's recent scope rulings. *See* ET Solar Scope Ruling, attached at **Exhibit 19**; Solaria Scope Ruling, attached at **Exhibit 20**. To the extent such merchandise is not already considered subject, and to the extent that Chinese wafers that do not yet contain a p/n junction are being used in the production processes described herein, such merchandise is circumventing the Orders.

[255] Carrie Xiao, *Trina, Tongwei Unveil Major, Multi-Billion-Dollar Solar Silicon, Wafer and Cell Alliance*, PV Tech (Nov. 18, 2020), attached at **Exhibit 32**.

for the initial raw polysilicon, ingot, and wafer stages all nonetheless take place in China, and potentially the cell stage, while the final processing into cells or modules occurs in Vietnam.

Furthermore, as detailed below, the final steps of the production process that occur in Vietnam accounts for a relatively small proportion of the cost of production.

4. <u>The Production Facilities in Vietnam are Limited</u>

The facilities completing the CSPV cells and assembling the modules in Vietnam are limited compared to the integrated production facilities in China that also engage in the upstream production processes. Indeed, the companies subject to this request appear to have much more production space in their Chinese facilities than their facilities in the third country. Specifically, LONGi's production facilities in China appear to be much larger than its Vina Solar facility in Vietnam. While the exact floor size of LONGi's factories in China is not reasonably accessible to the A-SMACC, based on LONGI's 2020 Annual Report, the company has eight factories in China dedicated to the production of ingots and/or wafers.[256] The largest of those ingot and wafer factories in Yinchuan, China had total assets of 7,747,006,500 RMB (over $1 billion).[257] In contrast, LONGi only has two facilities in Vietnam dedicated to solar cells and modules.[258] LONGi reported total assets of 2,172,215,400 RMB (approximately $330 million) for Vina Cell (manufacture and sales of PV cells)[259] – about one-third of the assets of the Chinese ingot and wafer factory. For Vina Solar, the number is even lower, with LONGi reporting total assets of 1,853,415,200 RMB (approximately $280 million).[260] Even LONGi's module factories appear to be substantially larger

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256 LONGi 2020 Annual Report at 33, excerpts attached at **Exhibit 9**.

257 *Id.*

258 *Id.*

259 *Id.*

260 *Id.*

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in China than in Vietnam. In 2020, Vina Solar's total year end production capacity in Vietnam for modules was [ ].[261] In contrast, the total year end production capacity for LONGi's Chinese facilities for modules was [ ].[262] LONGi also had capacity for production of wafers and cells in China of [ ] and [ ], respectively, as of the end of 2020.[263]

This is most likely true with respect to LONGi's contract manufacturing as well. Again, according to [ ], in total Vietnam [ ] in 2020 and [ ]. In contrast, the same data indicate that in China, [ ] in 2020 and [ ].[264]

Canadian Solar leases one manufacturing facility in Vietnam that is 15,784 square meters.[265] In contrast, Canadian Solar Manufacturing (Luoyang) Inc., another subsidiary of Canadian Solar which is based in China and is engaged in the manufacture of solar modules, ingots, and wafers, has manufacturing facilities with a total area of 75,527 square meters.[266] And Canadian Solar has at least nine subsidiaries based in China involved in the production of solar cells, modules, ingots, and/or wafers.[267] Overall, Canadian Solar appears to have had at least [

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261 [ ], excerpts attached at **Exhibit 11**.

262 *Id.*

263 *Id.*

264 *Id.*

265 Canadian Solar 2020 Financial Statements at 53, attached at **Exhibit 2**.

266 *Id.* at F-73, 53.

267 *Id.* at F-73.

] wafer capacity, [ ] cell capacity, and [ ] module capacity in China compared to just [ ] module capacity in Vietnam, as of 2020.[268]

Similarly, while the sizes of Trina Solar's facilities are not reasonably available to A-SMACC, Trina Solar appears to have had at least [ ] wafer capacity, [ ] cell capacity, and [ ] module capacity in China overall, compared to [ ] cell capacity and [ ] module capacity in Vietnam as of 2020.[269]

Similarly, while the factory sizes of GCL's and CSUN's polysilicon, ingot and wafer factories in China are not reasonably available to A-SMACC, those factories are likely also of a similar large size as the upstream manufacturing facilities evidenced above. Even GCL's and CSUN's cell and module facilities in China appear to be substantially larger. GCL's Vietnam facility's 2020 year end cell production capacity was [ ] compared to the company's cell production capacity in China, [ ].[270] And CSUN's Vietnam facility's 2020 year end cell and module production was [ ] and [ ] compared to the company's cell and module production capacity in China, [ ] and [ ] respectively.[271] Boviet Solar's Vietnam facility's 2020 year end cell and module production was [ ] and [ ] respectively.[272] While the size of Boviet Solar's sister-company manufacturing polysilicon, ingot and wafer in China is not reasonably accessible to the A-SMACC, it is likely that those upstream facilities in China are larger than its cell and module production plant in Vietnam given the information above. Again, while information regarding Jinko Solar's Vietnam operations are not

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268 [ ], excerpts attached at **Exhibit 11**.

269 *Id.*

270 *Id.*

271 *Id.*

272 *Id.*

reasonably available to A-SMACC, any cell/module processing facility is likely to be similarly limited compared to the integrated producer's Chinese production facilities.

In addition, industry publications confirm that "{t}echnical hurdles are highest for plants that make polysilicon and wafers. These plants are also costly to build and take longest to construct. Cell and module factories can be built faster and can respond quicker to technological trends and policy developments like import tariffs,"[273] and that "{w}afer factories require high upfront capital expenditure and bear many technical hurdles, which makes it difficult for new factories to be built outside of China."[274] In contrast, "{c}ell manufacturing is more versatile compared to wafers and polysilicon and has lower technical hurdles."[275] Similarly, "{b}uilding a new module factory has low technical hurdles compared to wafer and polysilicon."[276] In fact, due to the "low technical and financial barriers, it is also easier for module companies to open shop in other countries in response to tariffs or other policy developments."[277]

The production facilities needed for the initial raw polysilicon stage are also very sophisticated. Again, while some of the companies do not appear to refine polysilicon themselves and instead start with the production of ingots in their Chinese facilities, the Department should also take into account the initial raw polysilicon stage of production in comparing the extent of the production facilities in China and in the third country given that the Chinese companies finishing in Vietnam appear to source large amounts of polysilicon from Chinese suppliers. For instance,

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273 *Solar PV Trade and Manufacturing: A Deep Dive*, BloombergNEF (Feb. 2021) at 1, excerpts attached at **Exhibit 16**.

274 *Id.* at 11.

275 *Id.* at 13.

276 *Id.* at 19.

277 *Id.*

the modified Siemens method of production of polysilicon, which most of China-based polysilicon production is based on, is a mature, large-scale, chemical manufacturing process.[278] Most new production facilities have been constructed China, with new factories on the scale of 100,000 tons per year planned for the near future.[279] This equates to almost 275 tons per day at full capacity – a very large-scale operations.[280]

5. The Value of the Processing Performed in Vietnam Represents a Small Proportion of the Value of the Merchandise Imported into the United States

For CSPV products, the production of the wafers, from the initial raw polysilicon stage, is the most critical component with respect to PV module performance and represents the highest percentage of the bill of materials ("BOMs").[281] Canadian Solar itself reports that "{s}olar wafers are the most important material for making solar cells," and that "{s}olar ingots are the most important material for making solar wafers."[282] Even for the cost of converting wafers to cells and the cost of assembling modules from CSPV cells, the cost of the materials is the most substantial proportion of the cost. Again, A-SMACC believes that all, or most, of those materials are also obtained from China.

This general cost breakdown is confirmed by industry publications. For instance, according to BloombergNEF, with the imposition of tariffs on Chinese equipment, the majority of CSPV products imported into the United States arrive from Southeast Asia (which should include Vietnam) post-assembly, but "70% of the actual value of that equipment accrues to China where

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278 Expert Report at 4, attached at **Exhibit 1**.

279 *Id.*

280 *Id.*

281 *Id.* at 7.

282 Canadian Solar 2020 Financial Statements at 54, attached at **Exhibit 2**.

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key, pre-assembly steps in the making of the equipment take place, including production of solar-grade silicon, ingots, wafers and cells."[283] For this reason, generally, production costs in "Southeast Asian nations account for just 27% of the value of a typical PV module exported to the U.S., despite those nations being most likely to be the last port of call before final, assembled equipment arrives in the U.S.," reiterating that most of the plants assembling modules in Southeast Asia are owned by Chinese firms.[284] BloombergNEF further reports generally, as of year-end 2019, that "{o}ver half of the cost of making monocrystalline silicon wafers into cells comes from the purchase of materials such as silver (Ag) and aluminum (Al) pastes {}. Front silver paste alone is the single largest cost component and accounted for 33% of total cost."[285] Similarly, for the "{b}est-in-class cash cost for cell-to-module for mono c-Si modules made by large firms as of year-end 2019" the cost of the materials (aluminum frame, glass, EVA, backsheet, junction box, and other materials) constituted 83 percent of the total cost.[286] BloombergNEF also notes that "{w}hether a silicon-based module is assembled on U.S. soil or abroad, about half its total value is accounted for by non-silicon raw materials such as silver paste, glass and back sheets," with the "vast majority of suppliers of these materials {being} concentrated in China."[287] As a result, the publication notes that despite the U.S. tariffs on Chinese-made PV cells and modules, China continues to accrue the largest share of value from modules installed in the United States – regardless of where the equipment is assembled.[288] While A-SMACC does not have access to the

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283 *Solar PV Trade and Manufacturing: A Deep Dive*, BloombergNEF (Feb. 2021) at 22, excerpts attached at **Exhibit 16**.

284 *Id.*

285 *Id.* at 14.

286 *Id.* at 18.

287 *Id.* at 23.

288 *Id.*

specific production costs of the companies subject to this petition, A-SMACC believes that the general cost breakdowns discussed above are typical in the industry and would apply to the merchandise completed in Vietnam subject to this petition.

A-SMACC also provides a value-added analysis that demonstrates that the value of the processing in the third country represents a small proportion of the value of the CSPV modules imported into the United States. The Commission has previously found that for both CSPV cells and modules, the most substantial component of the total cost of goods sold is the total raw material cost.[289] For cells, while the total raw material cost reflects a combination of polysilicon, wafers, and all other raw material costs, the main underlying raw material input is wafers made from polysilicon.[290] A BOM cost breakdown for a [ ] cell manufactured in [ ] demonstrates that the [ ] wafer, sourced from China, represents the largest cost portion at [ ] percent.[291] A BOM cost breakdown for a [ ] module manufactured in [ ] shows that the BOM cost is dominated by the cell cost, which is primarily comprised of the wafer cost.[292] A BOM breakdown if the cells are excluded from the calculation shows that the glass, frame, EVA, and junction box account for [ ] percent of the module cost.[293] It is understood that due to the extensive supply chain in China, many Chinese module suppliers use materials sourced from China for module production, even if the factory is in a different country.[294] These calculations are discussed in further detail in the expert report attached to this

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289 USITC Pub. 4874 at I-11 n.45, excerpts attached at **Exhibit 18**.

290 *Id.*

291 Expert Report at 11, attached at **Exhibit 1**.

292 *Id.* at 14.

293 *Id.*

294 *Id.*

submission. To the extent that some of the production steps to convert the wafers to CSPV cells occur in China, prior to being exported to the third country for finishing, the value of processing in the third country would constitute an even smaller proportion.

These calculations are corroborated by LONGi's overall module production costs in its annual reports.[295] LONGi is vertically integrated from ingot/wafer through module production, such that these costs are representative of the overall industry.[296] LONGi breaks down its production costs across six categories: (1) raw materials; (2) manufacturing overhead; (3) direct labor; (4) energy or power; (5) depreciation; and (6) contract costs.[297] The last category, contract costs, was introduced in 2020 and represents contract performance costs and contract acquisition costs.[298] An analysis of the production cost breakdown over the past three years (2018 through 2020) for LONGi's PV products (encompassing all of the production steps from ingot/wafer production through modules) is provided in the expert report attached to this submission.[299] This breakdown shows that the most significant cost category is raw materials at an average of 73 percent of the overall production cost, which encompasses ingot, wafer, cell, and module production.[300] LONGi reported the production of 26,602 MW of modules in 2020, 8,365 MW in 2019, and 7,276 in 2018.[301] The percentages of the various cost categories are consistent despite the differences in production volume.[302] In particular, the raw material cost is very consistent at

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295 *Id.* at 14-15.

296 *Id.*

297 *Id.*

298 *Id.*

299 *Id.*

300 *Id.* at 15.

301 *Id.* at 14-15.

302 *Id.*

roughly 73 percent of overall production costs over this period.[303] Considering the BOM analysis for cells and modules, the material costs related to silicon wafers and cells dominate the overall module production costs.[304] Further, considering the significant capital investment required for polysilicon, ingot, and wafer production, it is clear that overall module production costs are strongly impacted by the dominance of raw materials produced in China, even if the cell and module factories are located in other Southeast Asia countries.[305]

In evaluating this factor, the Department has emphasized in recent circumvention proceedings that Congress has redirected the agency's focus away from a rigid numerical calculation towards a more qualitative focus on the nature of the production process.[306] For instance, in *Corrosion-Resistant Steel Products from China*, the Department noted that a qualitative analysis, which indicated that the primary direct material inputs (*i.e.*, hot-rolled steel or cold-rolled steel) used by producers in the third country to produce the merchandise subject to the anti-circumvention inquiry (*i.e.*, corrosion-resistant steel) was manufactured and supplied by producers in the country subject to an existing AD/CVD order on corrosion-resistant steel (China), and that significant costs in addition to the direct material inputs were not incurred, would be sufficient to determine that the value of processing in the third country constitutes a small portion

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303 *Id.*

304 *Id.*

305 *Id.*

306 *See* Preliminary Decision Memorandum accompanying *Certain Corrosion-Resistant Steel Products From the People's Republic of China*, 82 Fed. Reg. 58,170 (Dep't Commerce Dec. 11, 2017) (affirm. prelim. deter. of anti-circ. inquiries on the antidumping duty and countervailing duty orders) at 21 ("CORE Circumvention Prelim Decision Memo"); *see also* Preliminary Decision Memorandum accompanying *Diamond Sawblades and Parts Thereof From the People's Republic of China*, 83 Fed. Reg. 57,425 (Dep't Commerce Nov. 15, 2018) (prelim. affirm. deter. of circ.) at 11 ("DSB Circumvention Prelim Decision Memo").

of the value of the merchandise exported to the United States.[307] Similarly, in *Diamond Sawblades from China*, with respect to diamond sawblades that were being assembled or completed in a third country with Chinese cores and Chinese segments, *i.e.*, where all the direct material inputs were of Chinese origin, and the processing performed in the third country involved only laser-welding and finishing, which the Department found to be less complex, intensive, or multi-step processes than the production of the cores and segments, the Department found that a qualitative analysis supported its finding that the proportion of the processing value added in the third country is small.[308]

Like these prior proceedings, here, reasonably available evidence indicates that the primary direct material inputs used to complete CSPV cells in Vietnam, *i.e.*, wafers, silane, phosphorous oxychloride (POCI3), aluminum and/or silver paste, and the additional components used to assemble the CSPV cells into modules, *i.e.*, solar glass, EVA, backsheet, aluminum frames, and junction boxes, were sourced from China, the country subject to the Orders. Accordingly, a qualitative analysis itself would also be sufficient to conclude that the value of processing in Vietnam represents a small proportion of the value of the merchandise imported to the United States.

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307 *See* CORE Circumvention Prelim Decision Memo at 22. The Department had also obtained the information necessary to evaluate the value added by the processing in the third country and concluded that the quantitative finding supported the Department's qualitative finding. *See id.*

308 *See* DSB Circumvention Prelim Decision Memo at 11. There was also information on the record regarding the cost of production of diamond sawblades manufactured in the third country and the value of diamond sawblades sold to the United States and the Department also calculated the value of processing performed in the third country to preliminarily find that the value of processing performed in the third country as a proportion of the value of the merchandise imported into the United States is small for the products at issue in the inquiry. *See id.* at 13.

D. The Value of the Merchandise Produced in China is a Significant Portion of the Total Value of the Merchandise Exported to the United States

As discussed above, the value of the processing in Vietnam represents a minority of the value of the merchandise imported into the United States, for both cells and modules. In contrast, the overwhelming majority of the production and costs are accounted for by the Chinese components that are completed and assembled in Vietnam. Again, the Commission has also previously found that for both CSPV cells and modules, the most substantial component of the total cost of goods sold is the total raw material cost.[309] For cells, while the total raw material cost reflects a combination of polysilicon, wafers, and all other raw material costs, the main underlying raw material input is wafers made from polysilicon.[310] This demonstrates that the value of the merchandise produced in China accounts for a significant portion of the total value of the merchandise ultimately exported to the United States.

E. The Department Should Include CSPV Cells and Modules from Vietnam in the Scope of the Orders to Prevent Evasion and Further Supply Chain Destruction

Given the facts and evidence presented above, there is a reasonable basis to conclude that CSPV cells and modules are being completed in Vietnam by Trina Solar Vietnam, Canadian Solar Vietnam, CSUN Vietnam, Boviet Solar, GCL-Si Vietnam, Vina Solar, LONGi, and Jinko Solar within the meaning of 19 U.S.C. § 1677j(b) such that they should be included in the scope of the Orders to prevent evasion and further supply chain destruction. Chinese producers have developed a circumvention scheme that involves moving the very end of the production process for CSPV products, which entails minor processing, to a third country for the express purpose of avoiding

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[309] USITC Pub. 4874 at I-11 n.45, excerpts attached at **Exhibit 18**.

[310] *Id.*

 PUBLIC VERSION

AD/CVD duties while retaining as much of the subsidized supply chain and labor as possible in China. In fact, it is widely recognized in the industry that following the imposition of AD/CVD duties on Chinese-made solar cells, Chinese integrated producers started building cell and module assembly plants across Southeast Asia, while continuing to rely heavily on Chinese inputs.[311] Industry publications report that most U.S. solar installations today use modules from plants located in Vietnam, Malaysia, and Thailand, and most module-assembly plants that ship from Southeast Asia to the United States are Chinese-owned.[312] The circumventing companies have indicated as much themselves. For instance, in a form CSUN filed with the SEC in 2015, the company states the following: "To mitigate the negative effects resulting from {AD} and {CVD} duties, we have relocated or plan to relocate certain of our manufacturing capacities to other regions, such as . . . Vietnam (targeting Asian and U.S. market)."[313] Industry articles reported on this strategy stating that "CSUN had previously established solar cell production facilities and assembly operations in Vietnam with relocated equipment from its China facilities to circumvent US duties on Chinese solar cells and modules. The company had already established a JV solar cell and module assembly plant in Turkey that circumvented later imposed EU duties."[314]

In a blog post titled "Why Location Matters," Boviet Solar states that one reason why it chose to strategically locate manufacturing in Vietnam is because "Vietnam is not a U.S. listed Anti-dumping and Countervailing region. No tariffs influence Boviet's U.S. business, and those

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311 *Solar PV Trade and Manufacturing: A Deep Dive*, BloombergNEF (Feb. 2021), excerpts attached at **Exhibit 16**.

312 *Id.*

313 China Sunergy Co., Ltd. 2015 Annual/Transition Report at 18, excerpts attached at **Exhibit 5**.

314 Mark Osborne, *China Sunergy to Begin Solar Module Production in Sacramento, California*, PV Tech (Feb. 14, 2017), attached at **Exhibit 78**.

cost-savings ultimately trickle down to the buyer."[315] Similarly, Shu Hua, President of GCL-Si explained that the company's Vietnam facility "will offer a strong support to the high-efficient cell supply and contribute to cost-down {sic} as well as {a}voiding anti-dumping issues."[316] Likewise, "LONGi management said that the Vina Solar acquisition provided the fastest route to key large markets, notably the US as its only current overseas manufacturing operations were in Malaysia with limited capacity and limited capacity to expand."[317]

It is imperative that the Department confirm that the completion of CSPV cells and modules in a third country using components manufactured in China will not take the finished product outside the scope of the Orders. An affirmative determination here is critical to put an end to these blatant attempts to avoid paying the requisite AD/CVD duties on CSPV cells and modules from China and to provide the domestic industry with the full extent of trade relief that it deserves.

F. Additional Factors Considered by the Department

An assessment of the additional statutory factors that the Department considers in determining whether to include merchandise assembled or completed in a third country within the scope of an existing order further supports an affirmative determination of circumvention.

1. The Pattern of Trade Demonstrates Circumvention of the Orders

As discussed above, the import trends paint a clear picture of the circumvention taking place. Since the underlying investigations and imposition of the Orders, U.S. imports of CSPV

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[315] *Why Solar Panel Manufacturing Location Matters: A Look into Boviet's Facility in Vietnam*, Boviet Solar USA (Aug. 28, 2017), attached at **Exhibit 13**.

[316] *GCL-Si Starts Operation of 600MW Solar Cell Plant in Vietnam*, ENF Solar (Aug. 1, 2017), attached at **Exhibit 40**.

[317] Mark Osborne, *LONGi Details Plans for Vina Solar After Recent Acquisition Deal*, PV Tech (Mar. 4, 2020), attached at **Exhibit 44**.

cells and modules from China have decreased substantially.[318] At the same time, U.S. imports of CSPV cells and modules from Vietnam have skyrocketed, increasing from approximately $1.3 million in 2011 (the year of petition filing in the underlying investigations) to more than $1.6 billion in 2020.[319] These import trends are a strong indication that Chinese producers are circumventing the Orders by shipping Chinese-origin components to Vietnam for completion into CSPV cells or modules to be sold at dumped and subsidized prices in the United States.

2. <u>The Chinese Manufacturers/Exporters Subject to the Orders Are Affiliated with the Companies that Complete the CSPV Cells and Modules in Vietnam</u>

As discussed above, reasonably available evidence indicates that the companies in Vietnam are sourcing from their Chinese affiliates or parent companies, which are subject to the AD/CVD orders, at least some of the components used to complete the production of CSPV cells/modules in Vietnam, to circumvent the Orders. Specifically, Trina Solar Vietnam is a subsidiary of Trina Solar Co., Ltd.[320] Canadian Solar Vietnam is a subsidiary of Canadian Solar Inc. which has many subsidiaries involved in CSPV production in China.[321] CSUN Vietnam is the Vietnam base of CSUN Solar Tech Co., Ltd. which appears to also be called China Sunergy Co., Ltd. or China Sunergy (Nanjing) Co., Ltd. and is a subsidiary of the Chinese company China Electric Equipment Group.[322] Boviet Solar is a subsidiary of Boway Group Co., Ltd.[323] GCL-Si Vietnam is a subsidiary of GCL, which has ties to the Chinese government.[324] Vina Solar is a subsidiary of LONGi Green

318 Official Import Statistics, attached at **Exhibit 17**.

319 *Id.*

320 Trina Solar 2020 Auditor's Report, attached at **Exhibit 15**.

321 Canadian Solar 2020 Financial Statements, attached at **Exhibit 2**.

322 China Sunergy Website Excerpts, attached at **Exhibit 3**.

323 Boway Group Website Excerpts, attached at **Exhibit 6**.

324 GCL Website Excerpts, attached at **Exhibit 7**.

Energy Technology Co., Ltd.,[325] again which itself is one of the companies covered by this petition. And Jinko Solar Vietnam is a subsidiary of Chinese company JinkoSolar Holding Co., Ltd.[326]

3. **Imports of Chinese-Origin Components for CSPV Cells and Modules into Vietnam from China Have Increased Significantly After the Initiation of the Underlying Investigations**

Imports of Chinese-origin components for CSPV cells and modules into Vietnam have increased significantly after the initiation of the underlying investigations. Trina Solar Vietnam, Canadian Solar Vietnam, CSUN Vietnam, Boviet Solar, GCL-Si Vietnam, Vina Solar, and Jinko Solar Vietnam all established cell and module facilities in Vietnam after the imposition of the Orders in 2012. The exact timing of when LONGi began contract manufacturing in Vietnam is not reasonably available to A-SMACC. While information regarding Jinko Solar Vietnam's operations is not reasonably available to A-SMACC, Jinko Solar's financial statements confirm that the Vietnamese subsidiary was established in September 2019, *i.e.*, after the imposition of the Orders.[327] As discussed above, A-SMACC reasonably believes that these companies are importing most, if not all, of the components for converting wafers to CSPV cells and module assembly from China, in addition to obtaining Chinese-origin wafers or cells. Thus, by definition, there has been an increase in imports of Chinese-origin components into Vietnam since the underlying investigations.

This is supported by official import statistics. Specifically, the data indicate that there has been an increase in imports of Vietnamese imports of Chinese wafers, cells, and inputs including silver and aluminum paste, silane, junction boxes, and screen frames into Vietnam from China

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325 LONGi Group 2020 Annual Report Excerpts, attached at **Exhibit 9**.

326 Jinko Solar Annual Report at 86, attached at **Exhibit 12**.

327 *Id.*

since 2011, the year of filing of the petitions in the underlying investigations.[328] This upward trend of imports of Chinese-origin components into Vietnam, which is consistent with the other evidence demonstrating that these companies are sourcing these components from China, is further evidence of circumvention of the Orders.

* * *

REQUEST FOR PROPRIETARY TREATMENT

Pursuant to 19 C.F.R. § 351.304(a)(1)(i) of the Department's regulations, we request business proprietary treatment for the bracketed information in the narrative of this submission and exhibits as detailed below. Disclosure of this information, which is not otherwise publicly available, would cause substantial harm to the competitive position of the submitter and would impair the ability of the Department to obtain information in the future necessary to fulfill its statutory functions. In particular, A-SMACC requests business proprietary treatment for the identities of the companies that are part of A-SMACC, as disclosure of this information could lead to retribution against these companies and cause substantial harm.

Pursuant to section 351.304(b)(1) of the Department's regulations, A-SMACC agrees in principle to permit disclosure of business proprietary information contained in these petitions under an appropriately drawn administrative protective order ("APO"). A-SMACC respectfully reserves the right, however, to comment on all APO applications prior to disclosure. A public

[328] GTIS Data, attached at **Exhibit 57**. Some of the HS codes are basket categories and may include other goods. Nonetheless, that imports of merchandise under these HS codes from China increased substantially following the imposition of the Orders further corroborates other information discussed in this petition demonstrating that the subject companies are importing Chinese materials to complete the production of cells/modules in Vietnam. These HS codes are examples and may not be the best or only appropriate codes for these goods.

version of this submission has been prepared and is being filed pursuant to the Department's regulations at 19 C.F.R. § 351.304(c)(1).

(1) **Pages 63 and Exhibit 1**: *Business or trade secrets concerning the nature of a product or production process* (19 C.F.R. § 351.105(c)(1)) and/or *Production costs (but not the identity of the production components unless a particular component is a trade secret*) (19 C.F.R. § 351.105(c)(2)).

(2) **Exhibit 1**: *The names of particular persons from whom business proprietary information was obtained* (19 C.F.R. § 351.105(c)(9)).

(3) **Pages 1-5, 21-23, 25, 26, 28-32, 35, 40, 48-50, 58, 59, EL-1, EL-4, Client Certifications, and Exhibits 10, 11, 43, 51**: *Any other specific business information the release of which to the public would cause substantial harm to the competitive position of the submitter* (19 C.F.R. § 351.105(c)(11)).

If you have any questions regarding this submission, please do not hesitate to contact us.

Respectfully submitted,

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Laura El-Sabaawi, Esq.
Elizabeth S. Lee, Esq.
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Counsel to American Solar Manufacturers Against Chinese Circumvention

COMPANY CERTIFICATION

I, [ ], representative of the American Solar Manufacturers Against Chinese Circumvention, certify that I prepared or otherwise supervised the preparation of the attached submission, *Request for Circumvention Ruling Pursuant to Section 781(b) of the Tariff Act of 1930*, filed on August 16, 2021, pursuant to the Antidumping and Countervailing Duty Orders on *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China* (Case Nos. A-570-979 and C-570-980). I certify that the public information and any business proprietary information of the American Solar Manufacturers Against Chinese Circumvention contained in this submission is accurate and complete to the best of my knowledge. I am aware that the information contained in this submission may be subject to verification or corroboration (as appropriate) by the U.S. Department of Commerce. I am also aware that U.S. law (including, but not limited to, 18 U.S.C. 1001) imposes criminal sanctions on individuals who knowingly and willfully make material false statements to the U.S. Government. In addition, I am aware that, even if this submission may be withdrawn from the record of the AD/CVD proceeding, the U.S. Department of Commerce may preserve this submission, including a business proprietary submission, for purposes of determining the accuracy of this certification. I certify that a copy of this signed certification will be filed with this submission to the U.S. Department of Commerce.

[ ]

Date: August 16, 2021

COMPANY CERTIFICATION

I, [ ], a member company of the American Solar Manufacturers Against Chinese Circumvention, certify that I prepared or otherwise supervised the preparation of the attached submission, *Request for Circumvention Ruling Pursuant to Section 781(b) of the Tariff Act of 1930*, filed on August 16, 2021, pursuant to the Antidumping and Countervailing Duty Orders on *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China* (Case Nos. A-570-979 and C-570-980). I certify that the public information and any business proprietary information of [ ] contained in this submission is accurate and complete to the best of my knowledge. I am aware that the information contained in this submission may be subject to verification or corroboration (as appropriate) by the U.S. Department of Commerce. I am also aware that U.S. law (including, but not limited to, 18 U.S.C. 1001) imposes criminal sanctions on individuals who knowingly and willfully make material false statements to the U.S. Government. In addition, I am aware that, even if this submission may be withdrawn from the record of the AD/CVD proceeding, the U.S. Department of Commerce may preserve this submission, including a business proprietary submission, for purposes of determining the accuracy of this certification. I certify that a copy of this signed certification will be filed with this submission to the U.S. Department of Commerce.

[ ]

Date: August 16, 2021

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I, [ ], a member company of the American Solar Manufacturers Against Chinese Circumvention, certify that I prepared or otherwise supervised the preparation of the attached submission, *Request for Circumvention Ruling Pursuant to Section 781(b) of the Tariff Act of 1930*, filed on August 16, 2021, pursuant to the Antidumping and Countervailing Duty Orders on *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China* (Case Nos. A-570-979 and C-570-980). I certify that the public information and any business proprietary information of [ ] contained in this submission is accurate and complete to the best of my knowledge. I am aware that the information contained in this submission may be subject to verification or corroboration (as appropriate) by the U.S. Department of Commerce. I am also aware that U.S. law (including, but not limited to, 18 U.S.C. 1001) imposes criminal sanctions on individuals who knowingly and willfully make material false statements to the U.S. Government. In addition, I am aware that, even if this submission may be withdrawn from the record of the AD/CVD proceeding, the U.S. Department of Commerce may preserve this submission, including a business proprietary submission, for purposes of determining the accuracy of this certification. I certify that a copy of this signed certification will be filed with this submission to the U.S. Department of Commerce.

[ ]

Date: August 16, 2021

COMPANY CERTIFICATION

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[ ]

Date: August 16, 2021

REPRESENTATIVE CERTIFICATION

I, Timothy C. Brightbill, with Wiley Rein LLP, counsel to the American Solar Manufacturers Against Chinese Circumvention, certify that I have read the attached submission, *Request for Circumvention Ruling Pursuant to Section 781(b) of the Tariff Act of 1930*, filed on August 16, 2021, pursuant to the Antidumping and Countervailing Duty Orders on *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China* (Case Nos. A-570-979 and C-570-980). In my capacity as counsel for this submission, I certify that the information contained in this submission is accurate and complete to the best of my knowledge. I am aware that U.S. law (including, but not limited to, 18 U.S.C. 1001) imposes criminal sanctions on individuals who knowingly and willfully make material false statements to the U.S. Government. In addition, I am aware that, even if this submission may be withdrawn from the record of the AD/CVD proceeding, the U.S. Department of Commerce may preserve this submission, including a business proprietary submission, for purposes of determining the accuracy of this certification. I certify that a copy of this signed certification will be filed with this submission to the U.S. Department of Commerce.

Signature: Timothy C. Brightbill
Timothy C. Brightbill

Date: August 16, 2021

CERTIFICATE OF SERVICE

PUBLIC SERVICE

Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China
A-570-979 & C-570-980
Anti-Circumvention Inquiry

I certify that a copy of this public submission was served on the following parties, via electronic service, on August 16, 2021.

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EXHIBIT LIST		
Exhibit No.	**Description**	**Security**
1	Expert Report	Public Version
2	Canadian Solar Inc., United States Securities and Exchange Commission, Form 20-F (for the fiscal year ended December 31, 2020) (excerpt)	Public
3	China Sunergy Website Excerpts	Public
4	CSUN Solar Tech. Co., Ltd. Website Excerpts	Public
5	China Sunergy Co., Ltd. 2015 Annual/Transition Report (excerpt)	Public
6	Boway Group Website Excerpts	Public
7	GCL Website Excerpts	Public
8	Vietnam Photovoltaic Technology Website Excerpts	Public
9	LONGi Group 2020 Annual Report (excerpt)	Public
10	[ ] Data	Public Version
11	[ ] (excerpt)	Public Version
12	JinkoSolar Holding Co., Ltd., United States Securities and Exchange Commission, Form 20-F (for the fiscal year ended December 31, 2020) (excerpt)	Public
13	*Why Solar Panel Manufacturing Locations Matter: A Look into Boviet's Facility in Vietnam*, Boviet Solar USA (Aug. 28, 2017)	Public
14	*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, USITC Pub. 5021 (Feb. 2020) (Monitoring) (excerpt)	Public
15	Trina Solar 2020 Auditor's Report	Public
16	*Solar PV Trade and Manufacturing: A Deep Dive*, BloombergNEF (Feb. 2021) (excerpt)	Public
17	Official Import Statistics	Public

EXHIBIT LIST		
Exhibit No.	**Description**	**Security**
18	*Crystalline Silicon Photovoltaic Cells and Modules from China*, Inv. Nos. 701-TA-481 and 731-TA-1190, USITC Pub. 4874 (Mar. 2019) (Review) (excerpt)	Public
19	Memorandum from Lauren Caserta, Int'l Trade Compliance Analyst, Off. VII, AD/CVD Operations, through Melissa G. Skinner, Senior Director, Off. VII, AD/CVD Operations, to James Maeder, Deputy Assistant Sec'y for AD/CVD Operations, re: *Final Scope Ruling on the Antidumping and Countervailing Duty Orders on Crystalline Silicon Photovoltaic Cells from the People's Republic of China: ET Solar Inc.* (June 15, 2021) (PUBLIC VERSION)	Public
20	Memorandum from Peter Shaw, Int'l Trade Compliance Analyst, AD/CVD Operations, through Melissa G. Skinner, Senior Director, Off. VII, AD/CVD Operations, to James Maeder, Deputy Assistant Sec'y for AD/CVD Operations, re: A*ntidumping and Countervailing Duty Orders on Crystalline Silicon Photovoltaic Cells from the People's Republic of China, and Certain Crystalline Silicon Photovoltaic Products from Taiwan: The Solaria Corporation Scope Ruling* (Apr. 8, 2021)	Public
21	Matthew Mercure, *Trina Solar Delivers First 210 mm Vertex Modules to North American Market*, Solar Industry (May 24, 2021)	Public
22	Christian Roselund, *The Long View: An Interview With Steven Zhu Of Trina Solar*, PV Magazine (Oct. 2, 2019)	Public
23	David Baker, *How One Solar Company is Defying Trump's Trade Tariffs*, Al Jazeera (June 7, 2019)	Public
24	*Trina Solar Invests In Vietnam's Largest Solar PV Cell Plant*, Silicon Semiconductor (Feb. 9, 2017)	Public
25	David Wagman, *Trina Solar Begins Production of 550 W Modules at Vietnam Facility*, PV Magazine (May 25, 2021)	Public
26	Ivan Shumkov, *Trina Solar's New Factory in Vietnam Produces First Cells, Modules*, Renewables Now (May 24, 2021)	Public

EXHIBIT LIST		
Exhibit No.	**Description**	**Security**
27	Anu Bhambhani, *Trina Solar's New 800 MW Facility Touted as Largest PV Cell and Module Factory in Vietnam*, Taiyang News (Jan. 10, 2017)	Public
28	*Daqo Seals 3-Year Polysilicon Supply Deal with Trina Solar*, Renewables Now (Nov. 30, 2020)	Public
29	Carrie Xiao, *Trina Solar Seals 1.2 Billion Wafer Supply Deal with Zhonghuan Semiconductor*, PV Tech (Nov. 23, 2020)	Public
30	*Trina Solar Launches Operations at Thailand Manufacturing Facility and Signs a US$143 Million Syndicated Financing Facilities Agreement,* Trina Solar (Mar. 28, 2016)	Public
31	*Annual Production Capacity 15GW! Trina Solar and Tongwei Co., Ltd. Join Forces to Further Upgrade the 210 Integrated Industrial Chain*, Trina Solar (Nov. 16, 2020)	Public
32	Carrie Xiao, *Trina, Tongwei Unveil Major, Multi-Billion-Dollar Solar Silicon, Wafer and Cell Alliance*, PV Tech (Nov. 18, 2020)	Public
33	Nathan Vanderklippe, *Canadian Solar Denies Use of Forced Labour at Its Solar Farm in Western China*, The Globe and Mail (Jan. 28, 2021)	Public
34	CEEG Website Excerpts	Public
35	Boviet Solar Website Excerpts	Public
36	Reuters Website Excerpts	Public
37	Boviet Solar USA Website Excerpts	Public
38	GCL New Energy 2020 Annual Report (excerpt)	Public
39	GCL-Poly Website Excerpts	Public
40	*GCL-Si Starts Operation of 600MW Solar Cell Plant in Vietnam*, ENF Solar (Aug. 1, 2017)	Public
41	*LONGi Lands Order for 1.31 Billion Mono-Si Wafers*, EnergyTrend (July 19, 2019)	Public

EXHIBIT LIST		
Exhibit No.	**Description**	**Security**
42	Mark Osborne, *LONGi Secures Major Polysilicon Supply Deal from OCI Malaysia and 46GW of Solar Glass from Flat Glass*, PV Tech (Feb. 10, 2021)	Public
43	[ ] (excerpt)	Public Version
44	Mark Osborne, *LONGi Details Plans for Vina Solar After Recent Acquisition Deal*, PV Tech (Mar. 4, 2020)	Public
45	Jinko Solar Website Excerpts	Public
46	Hoang Phong, *Hong Kong Firm Invests $498-mln in Vietnam Solar Cell Plant*, VN Express International (Apr. 2, 2021)	Public
47	John Parnell, *JA Solar Secures Finance for 1.5GW Wafer Facility in Vietnam*, PV Tech (July 11, 2018)	Public
48	Joan Fitzgerald, *The Case for Taking Back Solar*, The American Prospect (Mar. 24, 2021)	Public
49	Hong Wang, *New Policies Set to Ease China Solar Glass Production Constraints Amidst Soaring Costs*, PV Tech (Nov. 19, 2020)	Public
50	*Trina Solar Will Purchase 85 Million Square Meters of Photovoltaic Glass from Almaden*, Trina Solar (Nov. 17, 2020)	Public
51	[ ]	Public Version
52	Jack Wong, *China-Based LONGi to Invest RM100mil More in Malaysia*, The Star (Nov. 20, 2017)	Public
53	GCL-Poly 2019 Annual Report (excerpt)	Public
54	Jules Scully, *GCL-SI to Start Production at First Phase of 60GW Module Factory in September*, PV Tech (June 2, 2021)	Public
55	Vincent Shaw & Max Hall, *Chinese PV Industry Brief: More Manufacturing Capacity from Trina, GCL Integration and Eging PV*, PV Magazine (Jan. 5, 2021)	Public

EXHIBIT LIST		
Exhibit No.	**Description**	**Security**
56	Tang Shihua, *China's Flat Glass Hits Limit Up on USD2.2 Billion PV Glass Deal With Jinko Solar*, Yicai Global (Dec. 31, 2020)	Public
57	Global Trade Information Services Vietnamese Import Data	Public
58	UN Comtrade Database Vietnamese Import Data	Public
59	Vincent Shaw & Max Hall, *Chinese PV Industry Brief: New Solar Glass Factory in Jiangsu, Longi Maintains Wafer Prices Unchanged*, PV Magazine (June 25, 2021)	Public
60	Sladjana Djunisic, *Xinte Energy Proposes to Build 100,000-Tonne-Per Year Polysilicon Production Plant*, Renewables Now (Mar. 2, 2021)	Public
61	Ian Clover, *GCL-Poly Investing $826m in Construction of 60,000 MT Polysilicon Plant in China*, PV Magazine (Apr. 6, 2017)	Public
62	*Hemlock Semiconductor Corporation*, Wikipedia (last accessed July 6, 2021)	Public
63	Mark Osborne, *LONGi Investing US$875 Million in 2020 Production Capacity Expansion Plans*, PV Tech (Apr. 17, 2019)	Public
64	Ivan Shumkov, *GCL-Poly Energy Plans 20-GW Ingot Factory in China*, Renewables Now (Apr. 11, 2018)	Public
65	Vincent Shaw & Max Hall, *Chinese PV Industry Brief: Tongwei Plans 200,000 MT Polysilicon Factory*, PV Magazine (July 2, 2021)	Public
66	Steven Mufson, *China's Growing Share of Solar Market Comes at a Price*, Washington Post (Dec. 16, 2011)	Public
67	*TBEA Announces Plan of Domestic Listing of Its Subsidiary Xinte Energy*, PVTIME (Jan. 15, 2021)	Public
68	TBEA Website Excerpts	Public
69	*Trina Solar in Vietnam: Secures US$30M Agreement with VietinBank, Provides Modules to Country's Largest Private PV Project*, Trina Solar (Oct. 9, 2018)	Public

EXHIBIT LIST		
Exhibit No.	**Description**	**Security**
70	Joshua Hill, *Canadian Solar Secures $70 Million Investment In Vietnam Production Facility*, CleanTechnica (Jan. 30, 2016)	Public
71	Mark Osborne, *LONGi Approves 10GW of Module and 5GW of New Solar Cell Capacity Expansion Plans*, PV Tech (Oct. 15, 2019)	Public
72	Mark Osborne, *Trina Solar Plans 10GW Module Assembly Plant in Yancheng*, PV Tech (Mar. 2, 2021)	Public
73	Mark Osborne, *CHINA ROUND-UP: Solar Manufacturing Capacity Announcements Continue from SMSL Members*, PV Tech (Jan. 4, 2021)	Public
74	*Foreign Exchange Rates - H.10: Historical Rates for the Chinese Yuan Renminbi*, Federal Reserve (July 6, 2021)	Public
75	Mark Osborne, *LONGi Sets Solar Industry Record for R&D Spending*, PV Tech (Apr. 9, 2018)	Public
76	LONGi Website Excerpts	Public
77	Emiliano Bellini, *World's Biggest PV Module Factory*, PV Magazine (Mar. 30, 2020)	Public
78	Mark Osborne, *China Sunergy to Begin Solar Module Production in Sacramento, California*, PV Tech (Feb. 14, 2017)	Public

EXHIBIT 1

EXPERT REPORT FOR CRYSTALLINE SILICON PV MANUFACTURING

SECRETARY OF COMMERCE

Anti-Circumvention Inquiry
DOC Case Nos. A-570-979/C-570-980
Prepared for Wiley Rein LLP

[ ]
[ ]
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Expert Report
August 13, 2021

DECLARATION

I, [ ] declare that this Report was prepared on behalf of Wiley Rein LLP ("Wiley") in connection with its request for an anti-circumvention inquiry ("ACV Inquiry") concerning certain imports of crystalline silicon photovoltaic ("CSPV") cells and modules from the People's Republic of China ("China").

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Expert Report
August 13, 2021

Introduction

This report examines the crystalline silicon PV manufacturing supply chain in China from polysilicon to PV module production. The manufacturing supply chain includes five major steps, as shown in Figure 1.

- Polysilicon manufacturing
- Ingot manufacturing
- Wafer manufacturing
- Cell manufacturing
- PV module manufacturing

China's growth in the PV industry since 2010 is detailed in Table 1. While attention has been focused on the cell and module production steps, China also dominates polysilicon and wafer production, at 80 percent and 95 percent of the world's production in 2020, respectively.

Table 1
China Production Metrics Across the Crystalline Silicon PV Industry (1)

Year	Polysilicon (metric tons)	Wafers (MW)	Cells (MW)	Modules (MW)
2010	45,000	11,000	10,800	10,800
2011	84,000	20,000	21,000	21,000
2012	71,000	26,000	23,000	23,000
2013	84,600	29,500	25,100	27,400
2014	136,000	38,000	33,000	35,600
2015	165,000	48,000	41,000	45,800
2016	194,000	64,800	51,200	53,700
2017	242,000	91,700	72,000	75,000
2018	259,000	109,200	87,200	85,700
2019	342,000	134,600	108,600	98,600
2020	392,000	161,300	134,800	124,600

(1) Annual production metrics as detailed by the China Photovoltaic Industry Association ("CPIA") Development Road Map of China's Photovoltaic Industry for 2018, 2019 and 2020 (collectively, the "CPIA Development Reports"). Reports downloaded from http://www.chinapv.org.cn/road_map.html on 6/27/2021.

Figure 1
Supply Chain for the Crystalline Silicon PV Industry

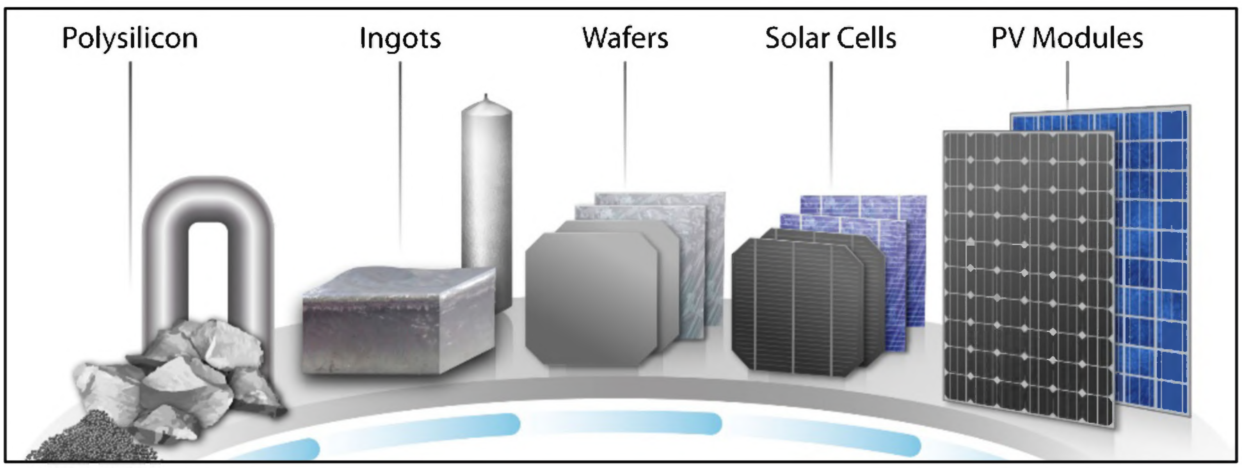


Image Credit: "Crystalline Silicon Photovoltaic Module Manufacturing Costs and Sustainable Pricing: 1H 2018 Benchmark and Cost Reduction Road Map" Source: NREL Technical Report TP-6A20-72134 Revised February 2020 (the "NREL PV Manufacturing Report")

Polysilicon Production

Market Overview

China was the leading global producer of polysilicon feedstock in 2020, accounting for roughly 80 percent of solar-related polysilicon production and 84 percent of production capacity. China-based polysilicon production was 392,000 metric tons ("MT") versus 525,000 MT worldwide. Seven of the top ten polysilicon manufacturers were located in China as shown in Table 2. This concentration of polysilicon manufacturing represents a large expansion in China over the last 10 years. In contrast, China had only one of the top ten polysilicon manufacturers in 2011, representing only 11 percent of worldwide production capacity.

Table 2
Global Top 10 Polysilicon Manufacturers by Actual Production in 2020 (1)

Rank	Company	Manufacturing Locations	Total Capacity (2) (metric tons)
1	Tongwei Co., Ltd.	China	96,000
2	Wacker Chemie AG	Germany/USA	85,000
3	Daqo New Energy Corp.	China	80,000
4	GCL-Poly Energy Holdings Ltd.	China	100,000
5	Xinte Energy Co., Ltd.	China	80,000
6	Xinjiang East Hope New Energy Co., Ltd.	China	60,000
7	OCI Company Ltd.	S. Korea/Malaysia	36,500
8	Asia Silicon (Qinghai) Co., Ltd.	China	22,000
9	Hemlock Semiconductor Operations LLC	USA	18,000
10	Inner Mongolia Dongli PV Electronics Co., Ltd.	China	12,000

(1) As reported on the Beunreuter Research website accessed from https://www.bernreuter.com on 8/10/2021.
(2) Reported annual capacity at the end of 2020. Table rankings are by actual polysilicon shipments, not production capacity.

Manufacturing Process

Most polysilicon production in China is based on a modified Siemens method, with less than three percent attributed to the fluidized bed reactor ("FBR") method. An overview of the modified Siemens method is provided here, with the understanding that some manufacturers may vary slightly from this process.

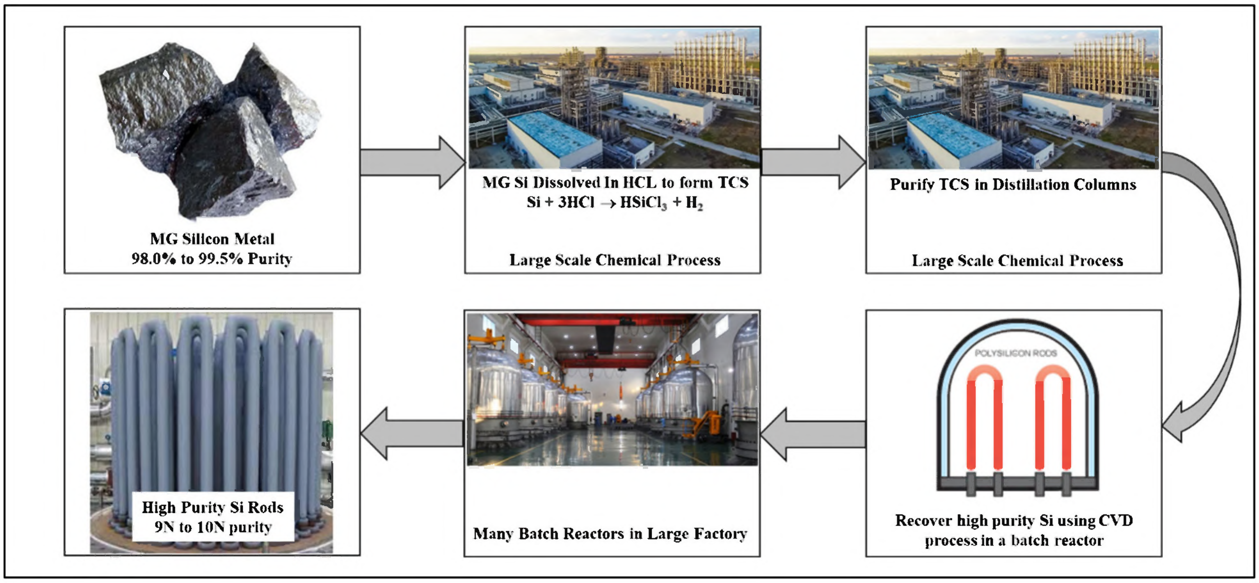
The modified Siemens method is a large-scale, mature chemical manufacturing process. Most new production facilities have been constructed in China, with new factories on the scale of 100,000 tons per year planned for the near future. This equates to 275 tons per day at full capacity, representing a very large-scale operation.

A schematic of the modified Siemens process is shown in Figure 2. The following description is a general overview of the process, as reported by China-based polysilicon manufacturers. In the modified Siemens process, metallurgical grade ("MG") silicon is converted to volatile chlorosilane and distilled before converting it to high-purity silicon via a chemical vapor deposition ("CVD") process.

The modified Siemens process is comprised of three distinct manufacturing steps:

- Trichlorosilane ("TCS") gas production
- TCS purification by distillation
- Deposition of high purity silicon by CVD

Figure 2
Modified Siemens Process for Polysilicon Manufacturing



<u>TSC Production</u>

TCS is formed from MG-Si and liquid chlorine though an in-house, integrated manufacturing process. In the first step, liquid chlorine is vaporized to chlorine gas. The chlorine gas is routed to a furnace where it is reacted with hydrogen to form hydrogen chloride ("HCl"). TCS is formed from the combination of MG-Si in powder form and HCl gas in a hydrochlorination process.

<u>Distillation</u>

In the distillation step, TCS is purified to form high-purity feedstock. In the distillation process, the TCS components are separated based on the differences in their respective boiling points. Impurities in the raw TCS gas from the MG-Si feedstock, such as boron, phosphorous and metal halides are separated out, resulting in a high-purity TCS.

<u>Deposition</u>

In the deposition step, the high-purity TCS is vaporized, mixed with hydrogen gas and fed into a batch CVD reactor. The mixed gas passes over thin silicon filament rods heated to 1,100°C. High-purity silicon is deposited on the surface of the rods via a CVD process. The TCS and hydrogen are continuously fed into the reactor until the desired diameter of polysilicon rod is achieved.

The resulting product is high-purity silicon rods which are broken into chunks and sealed in plastic bags with inert gas for shipment. Compared to the incoming MG-Si feedstock at roughly 99.0 percent purity, the purity of the resulting polysilicon rods is much higher. We note that when referring to purity, 99.99999 percent purity is referred to as "seven-nines" or 7N purity, 99.999999 percent as 8N purity and so on.

Generally, grades of polysilicon are as follows:

- Solar grade for multi-crystalline Si ("multi-Si") wafers: 7N to 8N purity
- Solar grade for monocrystalline silicon ("mono-Si) wafers: 9N to 10N purity
- Electronics grade for semiconductor wafers: 10N to 11N purity

Capital Cost, Energy Use and Productivity

The capital cost requirements for polysilicon are the most significant in the PV module supply chain, with recent announcements placing the cost for a new facility in the range of $1,400M USD per 100,000 tons.

- In 2018, Daqo New Energy ("Daqo") announced a new 35,000 ton polysilicon facility in Xinjiang, China. The capital expenditure was quoted as approximately $502M USD.
- In 2020, Tongwei Group ("Tongwei") announced a new 40,000 ton facility in Yunnan Province, China covering 800 approximately acres. The capital expenditure was noted as $563M USD.
- In 2021, Xinte Energy ("Xinte") announced plans to build a new 100,000 ton facility in Baotou, Inner Mongolia, China with an associated capital expenditure of $1,350M USD.

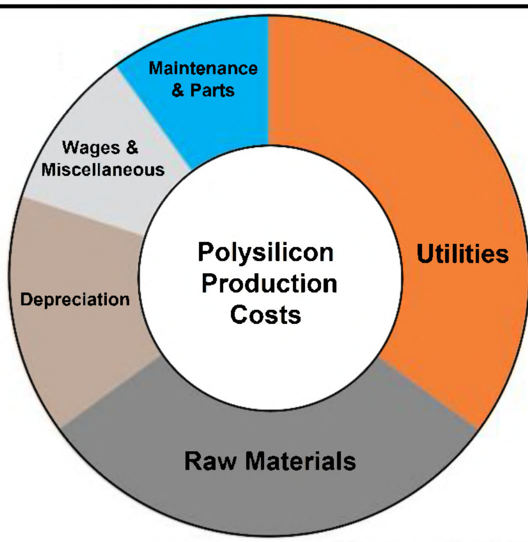
The expansions noted above are supported by long-term supply contracts with Chinese PV suppliers. For example, JA Solar and Longi Group have 5-year contracts with Xinte for 97,200 and 270,000 tons of polysilicon, respectively.

A cost breakdown for polysilicon production is shown in Figure 3, as reported by Daqo in its 2020 annual report. Daqo is a top ten supplier with most of its production dedicated to high-purity polysilicon, so it is a good representative for the Chinese polysilicon industry. Daqo reports spending roughly one percent of revenues on R&D, with all of its manufacturing and R&D facilities located in China.

Utilities are the largest portion of the production cost (35%), followed by raw materials (30%), equipment depreciation (15%), wages (10%) and maintenance/parts (10%). Polysilicon factories are located in regions with low and/or subsidized energy costs as indicated by the following quote: "Currently electricity is the largest component of our polysilicon production costs. In our polysilicon manufacturing facilities in Xinjiang, because of the abundant coal resources, the local electricity rate is much lower than in most areas in China" (Daqo New Energy, 2020 Annual Report). CPIA quoted the average power consumption at 70 kWh/kg-Si, which equates to 7,000 GWh of power for a 100,000 ton factory. This is roughly three times higher power consumption than the next greatest process step, ingot production.

The major raw materials are MG-Si, liquid chlorine, nitrogen, calcium oxide and hydrogen. Although not addressed in this Report, we note that MG-Si from China has been subject to anti-dumping actions.

Figure 3
Polysilicon Production Cost Breakdown



Production Cost Breakdown

- Utilities: 35%
- Raw Materials: 30%
- Depreciation: 15%
- Wages & Miscellaneous: 10%
- Maintenance & Parts: 10%

(1) As reported in Daqo's 2020 annual report (Form 20-F SEC filing)

Ingot and Wafer Manufacturing

Market Overview

China accounted for 95 percent of the worldwide production of wafers in 2019 according to CPIA, with all of the top ten wafer manufacturers in China. Similar statistics were reported by the International Energy Agency ("IEA") PV Power Systems Program ("PVPS") in its 2020 report on the PV market industry (the "IEA Report") available at https://iea-pvps.org/trends-reports/. The wafer is the most critical component with respect to PV module performance and represents the highest percentage of the bill of materials ("BOM") cost, as will be discussed in more detail later in the Report.

Mono-Si wafers manufactured via the Czochralski ("Cz") process accounted for over 90 percent of the PV market in 2020. Multi-Si wafers produced using the directional solidification ("DS") process had the majority market share prior to 2019. However, there has been a rapid adoption of mono-Si wafers over the last few years. The Cz process has been used for decades in the semiconductor industry to manufacture electronic grade wafers for integrated circuits.

Manufacturing Process

Multicrystalline Silicon Wafers

A schematic of the DS process is shown in Figure 4. Polysilicon feedstock is loaded into a rectangular quartz crucible and placed into a vacuum furnace. The feedstock is melted, annealed and cooled to form a large, rectangular multi-Si ingot. The multi-Si ingots formed by the DS process have lower purity and more grains compared to single crystal mono-Si ingots formed by the Cz process. After ingot formation, the crucible is removed, and the ingot edges are cropped. The ingot is sawed into bricks, which are ground, polished, glued to a glass substrate and sawed into individual wafers.

Figure 4

Direct Solidification Method for multi-Si Wafers for PV Manufacturing

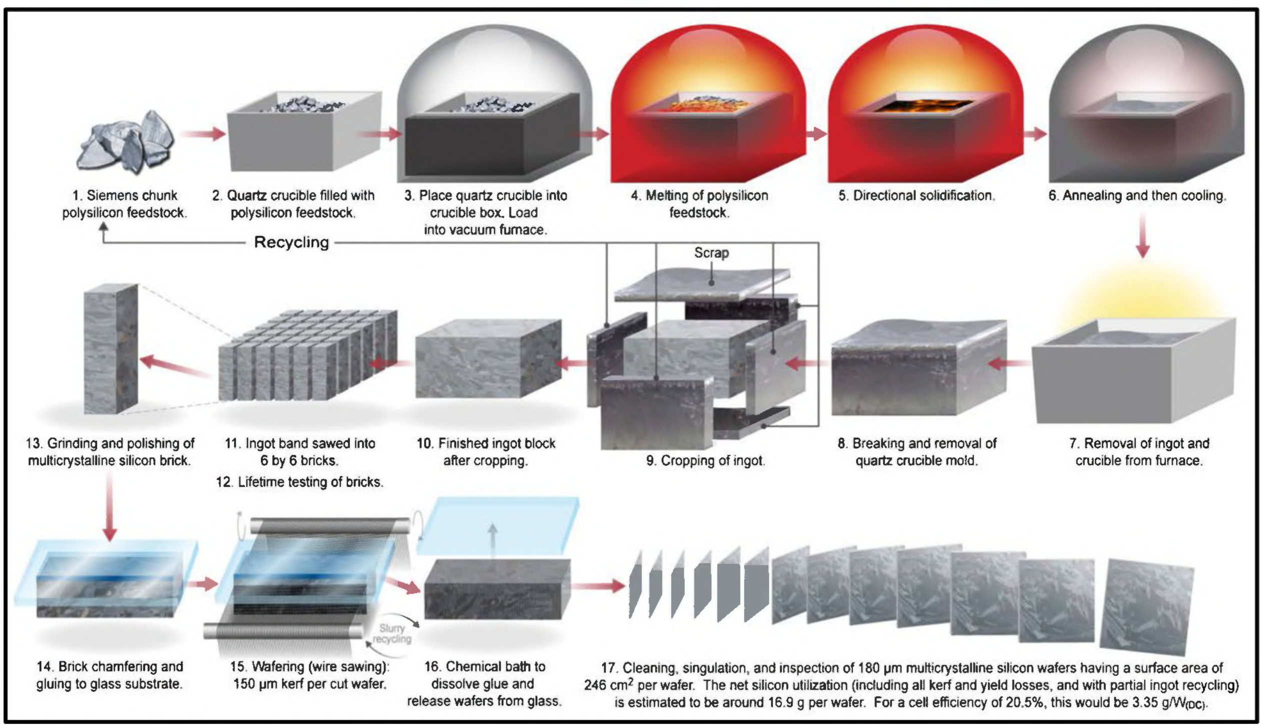


Image Credit: NREL PV Manufacturing Report

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Though not discussed in detail in this Report, there has been a trend towards larger wafer sizes over the last few years. The standard wafer size for multi-Si wafers was 156 mm on a side with rounded corners, referred to as the "M0" wafer size. Wafers denoted by "M" in the name refer to pseudo-square wafers with rounded corners. Wafers denoted by "G" in the name refer to fully-square wafers.

M3 wafers are pseudo square with a length of 158.75 mm, slightly larger than M0 wafers. A wafer with a larger area produces more power given the same material properties. Hence, bigger is better when it comes to wafer size. The "G1" wafer size is also 158.75 mm on a side but has an area that is 0.7 percent larger than the M3 wafer due to its fully square shape. The largest wafers under consideration are "G12" wafers, which are fully-square and 210 mm on a side. This wafer size is 80 percent larger than the M3 size, representing a simple and straightforward method to increase module power. The trend towards larger wafer sizes is expected to increase the shift away from multi-Si wafers, as additional capital investments will be required to adjust and optimize the DS process for larger wafers.

Monocrystalline Silicon Wafers

A schematic of the Cz process for mono-Si wafers is shown in Figure 5. Polysilicon chunks are loaded into a round crucible. The polysilicon is slowly melted and dopants are added. A seed crystal is introduced into the melt and pulled up while being rotated to form an ingot of high purity, single-crystal silicon. The process is referred to as "crystal pulling" and is slower compared to the DS process.

The crystal pulling process results in a long, cylindrical boule of single-crystal silicon. The ends are removed and the boule is formed into a brick, all by sawing. The resulting brick is ground, polished, glued to a glass substrate and sliced into wafers.

Figure 5
Czochralski Method in PV Manufacturing for mono-Si Wafers

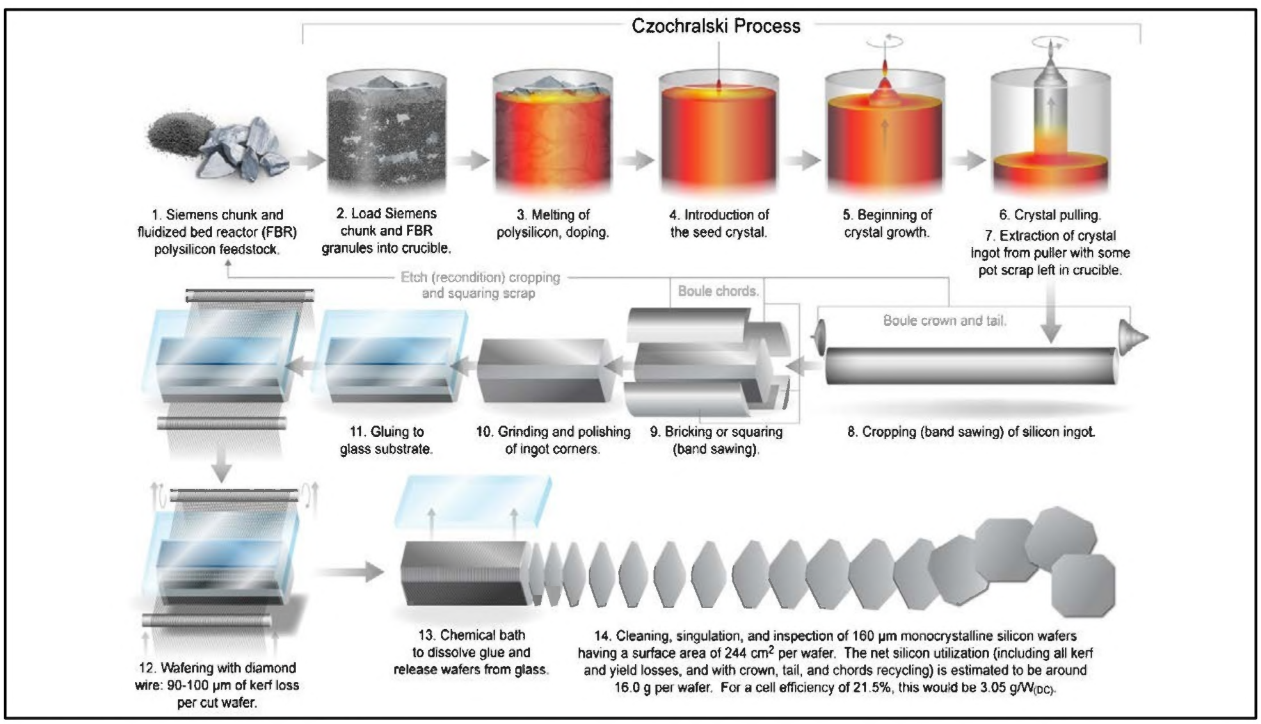

Image Credit: NREL PV Manufacturing Report

CPIA reported the charging rate for a single furnace as 1,900 kg in 2020. This is higher than the reported charging rate for the DS process at 1,100 kg. While the Cz process is slower and consumes more energy, the resulting mono-Si wafers are of higher quality and purity compared to multi-Si wafers.

Most silicon wafers are "p-type" material doped with gallium, representing a shift from the boron-doped wafers used previously. The next major transition in the wafer market is expected to be towards n-type wafers, which have even higher performance, but currently represent less than 5 percent of the market.

Capital Cost, Energy Use and Productivity

The capital cost requirements for ingot/wafer production are the second highest in the PV module supply chain. Recent announcements place the cost for a new ingot/wafer facility in the range of $45M to $70M USD per GW for Cz-based mono-Si production facilities in the 15 GW to 20 GW size range in China (*i.e.*, a range of $645M to $1,400M in total).

- In 2018, GCL-Poly announced plans to build a 20 GW mono-Si ingot facility in Yunnan Province at a capital cost of $1,430M USD.
- In 2019, LONGi announced plans to construct a new 15 GW ingot/wafer facility in the Yinchuan Economic and Technological Development Zone, Ningxia Province for a capital cost of $645M USD.

For an integrated supply covering polysilicon to ingot/wafer, the required capital investment would exceed $1,700M USD for a 20 GW supply of polysilicon, ingot and wafers. This assumes 30,000 tons of polysilicon required for 10 GW of wafers using the assumptions as detailed in the NREL PV Manufacturing Report. This equates to a 60,000 ton polysilicon facility meeting the supply requirements 20 GW ingot/wafer facility.

The power consumption of the Cz process is 26 kWh/kg-Si, roughly four times that of the DS process. Similar to polysilicon production facilities, ingot facilities also tend to be located in areas with cheap and/or subsidized electricity. Specific power consumption data is not readily available for cell conversion and module assembly. However, it is widely accepted that highly intense power requirements of polysilicon and ingot/wafer production steps substantially exceed that of cell conversion and module assembly.

Cell Manufacturing

Market Overview

China accounted for 78 percent of global cell production in 2019, as detailed in the CPIA and IEA Reports. CPIA reported twenty manufacturers in China with manufacturing capacities above 2 GW and four above 10 GW. The large number of cell manufacturers compared to polysilicon and ingot/wafer manufacturers is indicative of a lower entry barrier at this stage of the supply chain.

Over the last few years, the market has shifted towards passivated emitter and rear contact ("PERC") cells, which have higher efficiency compared to traditional aluminum back side field ("Al-BSF") cells. According to the CPIA, the market share of PERC cells reached 86 percent in 2020, with traditional Al-BSF cells falling to under 10 percent.

The trend towards PERC technology and larger wafers has driven the requirement for both new cell manufacturing facilities and upgrades to existing ones.

Cell Manufacturing Process

In the cell manufacturing process, incoming silicon wafers undergo a series of processing steps to create the current-generating PV device structure and metal interconnects to collect the current. The manufacturing process flow is shown in Figure 6.

The major steps in the PERC cell manufacturing process are as follows:

- Wet etch process to clean the wafer, remove saw damage and texture the surface
- Emitter formation by a batch phosphorous oxychloride (“$POCL_3$”) diffusion process
- Phosphosilicate glass (“PSG”) removal and edge isolation step by wet chemical process
- Silicon nitride (“SiN”) anti-reflective coating and rear aluminum oxide (“Al_2O_3”) passivation
- Laser contact opening on the back side of the wafer
- Metallization formation via screen printing and firing (rear-side pads and front grid lines)
- Electrical test and sort

Figure 6
PERC Cell Manufacturing Steps

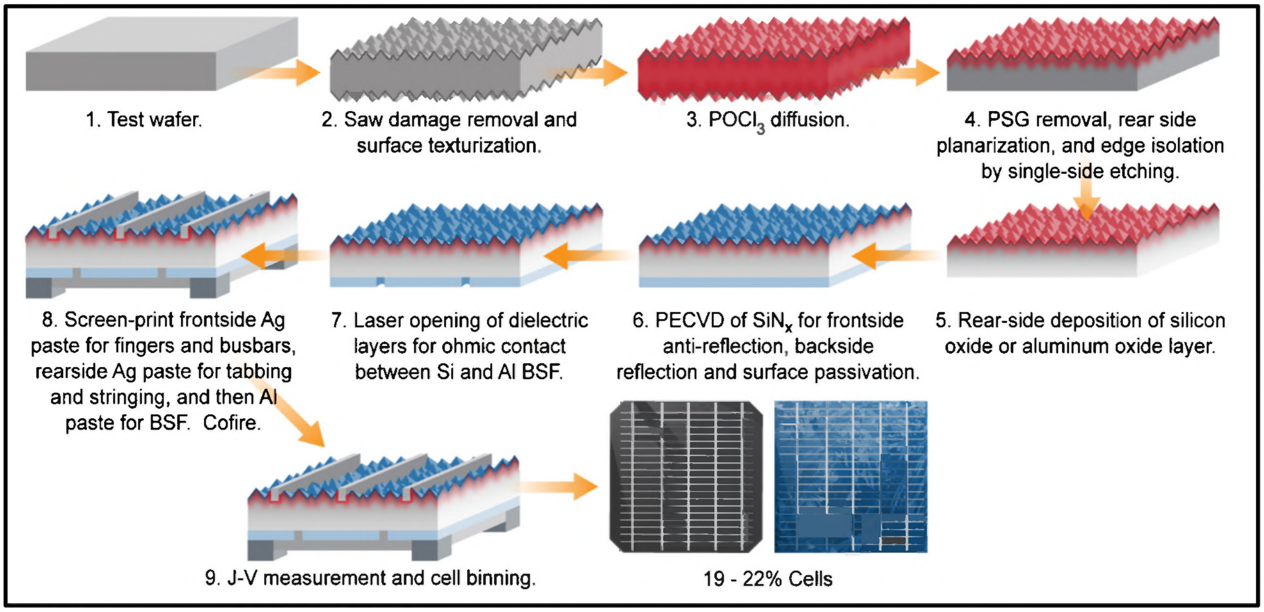

Image Credit: NREL PV Manufacturing Report

Capital Cost and Productivity

The large majority of global cell manufacturing capacity is in China, with recent manufacturing capacity additions in nearby Southeast Asian countries such as Malaysia, Vietnam and Thailand. Reported capital costs for cell factories are in the range of $40M USD to $50M USD per GW of capacity, with higher costs associated with new facilities for larger size (210 mm) mono-Si wafers.

Recent announcements of cell manufacturing facilities include the following:

- JA Solar’s construction of a 3.6 GW cell facility in Hebei Province, China at a cost of $166M USD.
- JA Solar’s plans to build a 6 GW cell facility in Jiangsu, China at capital cost of $254M USD.
- Trina Solar’s announced plans for an investment of approximately 2.498 billion RMB ($383M USD) for a new cell facility with a design capacity of 7.5 GW.

The capital costs noted above are consistent with those reported by CPIA, which were roughly $43M USD per GW of cell production capacity. We note that some of the reported costs are for new facilities while others are associated with expansions and upgrades of existing facilities.

The CPIA Report for 2019 states that "the key equipment of PERC cell production equipment has basically completed domestication" which indicates that most of the equipment is from Chinese suppliers. This follows a trend from many other industries, where China-based companies take over not only the market for the end product (PV modules), but also the capital equipment used to manufacture the same.

From a manufacturing perspective, it is a best practice to use the same manufacturing equipment regardless of where the factory is located. Thus, it is highly likely that most new cell manufacturing facilities built outside of China also use production equipment sourced from China.

Bill of Material Cost Breakdown

In order to understand the cost breakdown for PV cells, we examined a detailed BOM for a [ ] cell manufactured in [ ] as shown in Table 3. We note that this information was provided confidentially. The [ ] wafer, sourced from China, represents the largest cost portion at [ ] percent. Considering that China's wafer capacity represented 95 percent of global production of wafers in 2020, it is highly likely that most cells processed in southeast Asia use wafers sourced from China. Even this [ ].

Table 3
[ ] Cell BOM Cost Breakdown

Item	Process Step	Cost Fraction (%)	Comment
Wafer	Incoming Material	[ ]	[ ]
Ag Paste	Metallization	[ ]	[ ]
Screens	Metallization	[ ]	[ ]
Chemicals	Texturing	[ ]	[ ]
Chemicals	Edge Isolation	[ ]	[ ]
Chemicals	Passivation/Diffusion	[ ]	[ ]
Gases	Facility Scrubber	[ ]	[ ]
Al Paste	Metallization	[ ]	[ ]
Packaging	Shipping	[ ]	[ ]

Module Manufacturing

Market Overview

According to the CPIA and IEA Reports, China accounted for over 70% of global module production in 2020, with three manufacturers exceeding 10 GW of production and the top suppliers accounting for 55 percent of module production. Chinese suppliers have followed the recent trend of opening module assembly facilities in nearby Southeast Asian countries such as Malaysia, Vietnam and Thailand.

The major technology trends in the module market have been towards the use of half-cells, mono-Si PERC cells, larger module sizes and bifacial module. The CPIA Reports state that half-cell modules represented over 70 percent of the market share in 2020.

Module Manufacturing Process

Figure 7 shows the basic elements of a crystalline silicon PV module and Figure 8 shows the basic manufacturing steps. The basic manufacturing process has not changed appreciably in recent years. The only major change with respect to module factories has been the scale, with many new factories well above 1 GW in production capacity.

Figure 7
Key Elements of a PV Module

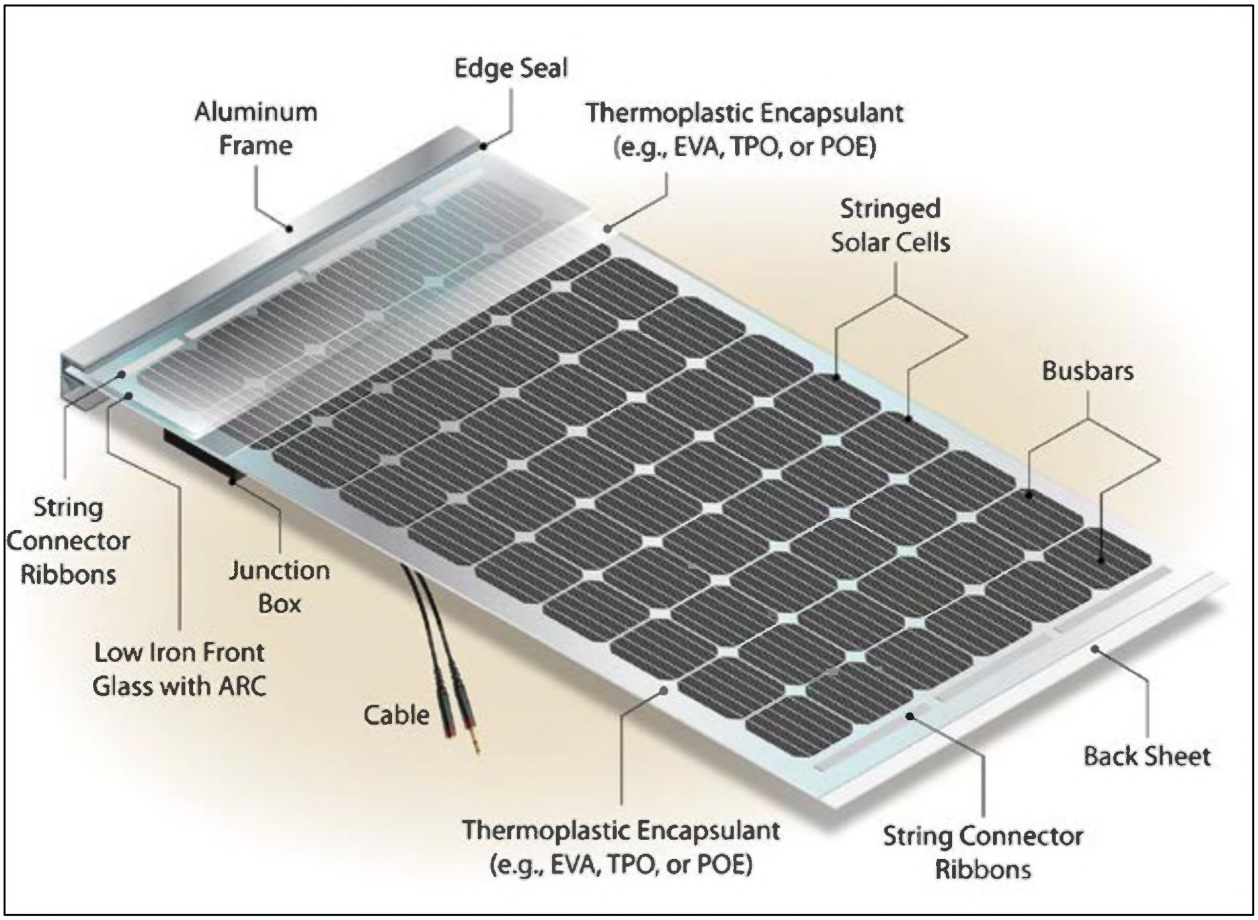

Image Credit: NREL PV Manufacturing Report

PV cells are soldered together to form cell strings. The cell strings are connected to bus bars and the resulting assembly is laminated between two layers of ethylene vinyl acetate ("EVA") encapsulant, a back sheet and a tempered glass plate. The EVA protects the cell matrix from the environment and bonds the laminate together. The frame and tempered glass provide mechanical strength. Silicone is placed within the frame to secure the laminate and provide additional strength. A junction box is mounted to the back of the module with silicone to allow for an electrical connection to the cell strings within the module.

The recent changes at the cell level (PERC cells, half-cells, larger cells, bifacial cells) have not had an appreciable change to the module structure or manufacturing process. In the case of bifacial cells, this has driven the use of either glass-glass packaging or transparent back sheets, but neither of these changes has required a significant change to manufacturing processes or costs.

Figure 8
PV Module Manufacturing Process

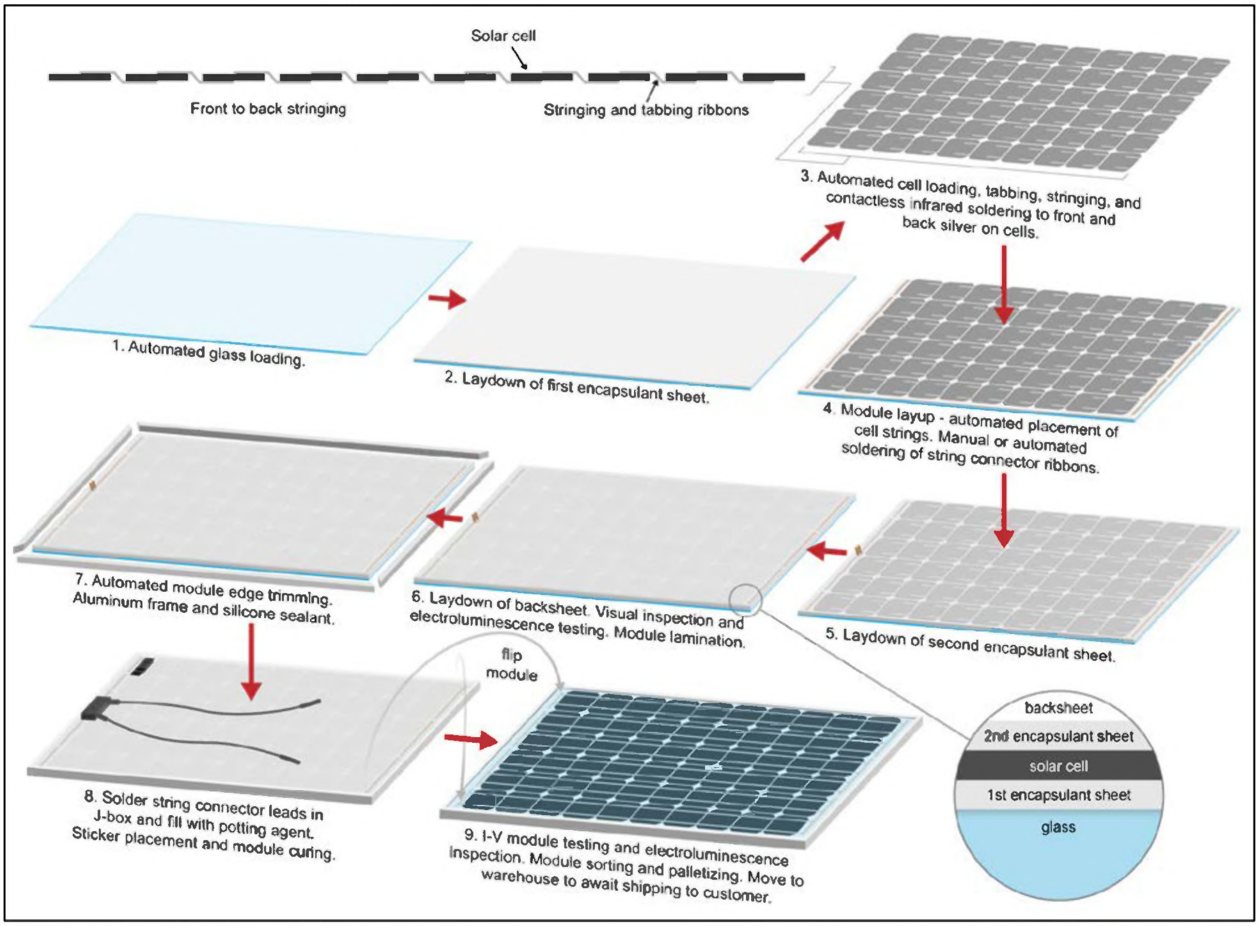

Image Credit: NREL PV Manufacturing Report

Capital Cost and Productivity

Recent announcements of new module production facilities indicate capital costs in the range of $20M USD to $30M USD per GW for module-only factories, which makes this the least capital-intensive step in the supply chain.

Recent announcements of module manufacturing facilities include the following:

- JA Solar plans to build a 6 GW module facility in Yangzhou, China at a cost of $122M USD.
- JA Solar plans to build a 3.5 GW module factory in Viet Yen, Vietnam at a cost of $103M USD.

We note that the CPIA reported lower capital costs at roughly 6.45 billion RMB ($10M USD) per GW of module production capacity. CPIA also stated that "all domestic component production equipment has been localized" indicating that all of the module production equipment is available from local Chinese suppliers. Some of the cost differences may be due to the factory size, location, level of automation and whether it is a new facility or an expansion of an existing one.

Bill of Material Cost Breakdown

In order to understand the cost breakdown of the materials that comprise the modules, we examined a detailed BOM for [ ] modules manufactured in [ ]. We note that this information was provided confidentially. In examining the module BOM cost breakdown, we looked at several different utility-scale modules, all using [ ] cells.

The breakdown in Table 4 shows that the BOM cost is dominated by the cell cost, which, as discussed earlier, is primarily comprised of the wafer cost. We note that this was calculated on a per piece cost basis, not a $/W_{DC}$ basis, which greatly simplifies the analysis. The BOM provided for our review included the high-volume pricing for each item, as well as the quantity of each item used in a module.

Table 4 includes the BOM breakdown if the cells are excluded from the calculation. In this case, the glass, frame and EVA and junction box account for over [ ]% of the module cost. It is our understanding that, due to the extensive supply chain in China, many Chinese module suppliers use materials sourced from China for module production, even if the factory is in a different country. It is notable that the cost attributed to the silicon wafer in this analysis represents the large majority of the module cost. [

].

Table 4
Module BOM Cost Breakdown

Material	Cost Fraction With Cells (%)	Cost Fraction without Cells (%)
Cell (Si Wafer) (2)	[ ]	-
Cell (Non-Wafer) (3)	[ ]	-
Glass	[ ]	[ ]
Frame	[ ]	[ ]
EVA	[ ]	[ ]
Junction Box	[ ]	[ ]
Back Sheet	[ ]	[ ]
Interconnects	[ ]	[ ]
Silicone Sealant	[ ]	[ ]
Shipping and Labeling	[ ]	[ ]

(1) Does not include certain variable costs (labor, electricity, maintenance), certain fixed costs (depreciation) or fixed operating expenses (R&D and SG&A).
(2) The portion of the cell cost attributable to the wafer cost only.
(3) Non-wafer cell costs include all materials and consumables used in the cell manufacturing process, except for the cost of the wafer itself. This includes all items detailed in Table 2, except for the wafer.

Overall Module Production Costs

LONGi reports overall module production costs in its annual reports. LONGi is vertically integrated from ingot/wafer through module production, so these costs are representative of the overall industry. LONGi breaks down its production costs across six categories as follows: (1) raw materials, (2) manufacturing overhead, (3) direct labor, (4) energy or power, (5) depreciation and (6) contract costs. The last category, contract costs, was introduced in 2020 and represents contract performance costs and contract acquisition costs.

Table 5 lists the production cost breakdown over the last three years (2018 through 2020) for LONGi's PV products. This encompasses all of the production steps from ingot/wafer production through modules.

The most significant cost category is raw materials at an average of 73 percent of the overall production cost, which encompasses ingot, wafer, cell and module production. LONGi reported the production of 26,602 MW of modules in 2020, 8,365 MW in 2019 and 7,276 MW in 2018. We note that the percentages of the various cost categories are consistent despite the differences in production volume. In particular, the raw material cost is very consistent at roughly 73 percent of overall production costs over this period.

Considering the BOM analyses for cells and modules, it is clear that the material costs related to silicon wafers and cells dominate the overall module production costs. Further, considering the significant capital investment required for polysilicon, ingot and wafer production, it is clear that overall module production costs are strongly impacted by the dominance of raw materials produced in China, even if the cell and module factories are located in other Southeast Asia countries.

LONGi reported research and development ("R&D") expenditures of approximately 5 percent of operating income over the same period. Consistent with most Chinese manufacturers, all of its R&D facilities are located in China.

Table 5
PV Production Cost Breakdown for Ingot/Wafer Through Module Production [(1)]

Cost Category	2020 Production Costs x1,000 RMB	2020 Production Costs % of Total	2019 Production Costs x1,000 RMB	2019 Production Costs % of Total	2018 Production Costs x1,000 RMB	2018 Production Costs % of Total
Raw Materials	30,571,853	74.3	16,924,598	72.4	12,525,291	73.3
Mfg Overhead	3,576,563	8.7	2,595,724	11.1	1,621,781	9.5
Direct Labor	2,196,334	5.3	1,260,063	5.4	961,563	5.6
Energy (power)	1,799,552	4.4	1,318,800	5.6	930,440	5.4
Depreciation	1,597,218	3.9	1,290,179	5.5	1,056,620	6.2
Contract Costs	1,405,108	3.4	0	0.0	0	0.0
Total	41,145,629	100.0	23,389,364	100.0	17,095,694	100.0

(1) As publicly reported in LONGi Energy annual reports for 2018, 2019 and 2020.

Conclusions

Based on the information reviewed and as detailed herein, we are of the opinion that:

- Factories located in China account for a large majority of polysilicon production for the global solar industry with 80 percent of worldwide production in 2020.
- Factories located in China account for a large majority of the wafers produced for the global solar industry with 95 percent of worldwide production in 2020.
- The silicon wafer cost is the most significant portion of the cell BOM cost, indicating a significant impact from China-based polysilicon and wafer supply chains on cell production costs.
- The BOM cost attributable to wafers is the most significant portion of the module BOM cost, indicating a significant impact from the China-based polysilicon and wafer supply chains.
- A typical BOM for modules produced in [ ] included multiple significant cost items sourced from China, including the frame, EVA encapsulants, junction box, interconnects and silicone sealant.

- There is reason to believe that the target companies in Southeast Asia may source even more inputs from China, including, for example solar glass. This further increases the total module cost proportion attributable to Chinese raw materials, with such inputs likely constituting the vast majority of the value in modules produced by the target companies in Southeast Asia.
- Raw materials represent a significant majority (over 70 percent) of the overall module production costs, including manufacturing overhead (indirect costs), direct labor, energy and depreciation.
- The capital investment costs for a new polysilicon production facility in China have been reported in the range of $1,400M USD for a 100,000 ton facility. The polysilicon production facilities are larger, require more investment, are more energy intensive and are more complex to design and operate compared to cell and module manufacturing facilities.
- The capital investment costs for new mono-Si ingot/wafer factories in China have been reported in the range of $450M USD to $700M USD for 10 GW of capacity. Thus, the investment costs for the polysilicon and ingot/wafer portions of the solar production process substantially exceed the investment costs for the cell conversion and module assembly portions.
- Considering all of the above factors, along with the prevalence of the raw materials produced in China (polysilicon, wafers, glass, frame, EVA encapsulants, junction box, interconnects and silicone sealant), it is our belief that a significant majority of production costs for Southeast Asian third-county producers can be attributed to manufacturing stages that take place in China.

I declare under penalty of perjury under the laws of the United States of America that to the best of my knowledge, the foregoing is true and correct.

Executed in [ ] on August 13, 2021.

[ ]

[ ]

Expert Report
August 13, 2021

REMAINDER

OF EXHIBIT NOT CAPABLE OF PUBLIC SUMMARY

EXHIBIT 2

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

Form 20-F

(Mark One)

☐ **REGISTRATION STATEMENT PURSUANT TO SECTION 12(b) OR 12(g) OF THE SECURITIES EXCHANGE ACT OF 1934**

OR

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
For the fiscal year ended December 31, 2020

OR

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
For the transition period from to

OR

☐ **SHELL COMPANY REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
Date of event requiring this shell company report

Commission file number: 001-33107

CANADIAN SOLAR INC.

(Exact name of Registrant as specified in its charter)

N/A

(Translation of Registrant's name into English)

British Columbia

(Jurisdiction of incorporation or organization)

545 Speedvale Avenue West
Guelph, Ontario, Canada N1K 1E6

(Address of principal executive offices)

Huifeng Chang, Chief Financial Officer
545 Speedvale Avenue West
Guelph, Ontario, Canada N1K 1E6
Tel: (1-519) 837-1881
Fax: (1-519) 837-2550

(Name, Telephone, E-mail and/or Facsimile number and Address of Company Contact Person)

Securities registered or to be registered pursuant to Section 12(b) of the Act:

Title of Each Class	Trading Symbol	Name of Each Exchange on Which Registered
Common shares with no par value	CSIQ	The NASDAQ Stock Market LLC (The NASDAQ Global Select Market)

Securities registered or to be registered pursuant to Section 12(g) of the Act:

None

(Title of Class)

Securities for which there is a reporting obligation pursuant to Section 15(d) of the Act:

None

(Title of Class)

Indicate the number of outstanding shares of each of the issuer's classes of capital or common stock as of the close of the period covered by the annual report.

59,820,384 common shares issued and outstanding which were not subject to restrictions on voting, dividend rights and transferability, as of December 31, 2020.

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☒ No ☐

If this report is an annual or transition report, indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934. Yes ☐ No ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer or an emerging growth company. See definition of "accelerated filer," "large accelerated filer" and "emerging growth company" in Rule 12b-2 of the Exchange Act. (Check one):

Large accelerated filer ☒	Accelerated filer ☐	Non-accelerated filer ☐
		Emerging growth company ☐

If an emerging growth company that prepares its financial statements in accordance with U.S. GAAP, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards† provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark which basis of accounting the registrant has used to prepare the financial statements included in this filing: U.S. GAAP ☒

International Financial Reporting Standards as issued by the International Accounting Standards Board ☐ Other ☐

If "Other" has been checked in response to the previous question, indicate by check mark which financial statement item the registrant has elected to follow. Item 17 ☐ Item 18 ☐

If this is an annual report, indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No ☒

(APPLICABLE ONLY TO ISSUERS INVOLVED IN BANKRUPTCY PROCEEDINGS DURING THE PAST FIVE YEARS)

Indicate by check mark whether the registrant has filed all documents and reports required to be filed by Sections 12, 13 or 15(d) of the Securities Exchange Act of 1934 subsequent to the distribution of securities under a plan confirmed by a court. Yes ☐ No ☐

† The term "new or revised financial accounting standard" refers to any update issued by the Financial Accounting Standards Board to its Accounting Standards Codification after April 5, 2012.

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☒ Yes ☐ No

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Our dependence on a limited number of suppliers of silicon wafers, cells and silicon, and the limited number of suppliers for certain other components, such as silver metallization paste, solar module back-sheet, and ethylene vinyl acetate encapsulant, could prevent us from delivering our products to our customers in the required quantities or in a timely manner, which could result in order cancellations and decreased revenues.

We purchase silicon raw materials, silicon wafers and solar cells, from a limited number of third-party material suppliers. In 2020, we purchased a significant portion of the silicon wafers and solar cells used in our solar modules from third parties. Our major silicon wafer suppliers in 2020 included Longi and Zhenjiang Rende New Energy Science Technology Co., Ltd. Our major suppliers of solar cells in 2020 included Aiko Solar Energy Co., Ltd ("Aiko Solar") and Tongwei Solar Co., Ltd. These suppliers may not always be able to meet our quantity requirements, or keep pace with the price reductions or quality improvements, necessary for us to price our products competitively. Supply may also be interrupted by accidents, disasters or other unforeseen events beyond our control. The failure of a supplier, for whatever reason, to supply silicon wafers, solar cells, silicon raw materials or other essential components that meet our quality, quantity and cost requirements in a timely manner could impair our ability to manufacture our products or increase our costs. The impact could be more severe if we are unable to access alternative sources on a timely basis or on commercially reasonable terms, and could prevent us from delivering our products to our customers in the required quantities and at prices that are profitable. Problems of this kind could cause order cancellations, reduce our market share, harm our reputation and cause legal disputes with our customers.

We are developing and commercializing higher conversion efficiency cells, but we may not be able to mass-produce these cells in a cost-effective way, if at all.

Higher efficiency cell structures are becoming an increasingly important factor in cost competitiveness and brand recognition in the solar power industry. Such cells may yield higher power outputs at the same cost to produce as lower efficiency cells, thereby lowering the manufactured cost per watt. The ability to manufacture and sell solar modules made from such cells may be an important competitive advantage because solar system owners can obtain a higher yield of electricity from the modules that have a similar infrastructure, footprint and system cost compared to systems with modules using lower efficiency cells. Higher conversion efficiency solar cells and the resulting higher output solar modules are one of the considerations in maintaining a price premium over thin-film products. However, while we are making the necessary investments to develop higher conversion efficiency solar power products, there is no assurance that we will be able to commercialize some or any of these products in a cost-effective way, or at all. In the near term, such products may command a modest premium. In the longer term, if our competitors are able to manufacture such products and we cannot do the same at all or in a cost-effective way, we will be at a competitive disadvantage, which will likely influence our product pricing and our financial performance.

We may be subject to unexpected warranty expense that may not be adequately covered by our insurance policies.

We warrant, for a period up to twelve years, that our solar products will be free from defects in materials and workmanship.

We also warrant that, for a period of 25 years, our standard polycrystalline modules will maintain the following performance levels:

- during the first year, the actual power output of the module will be no less than 97.5% of the labeled power output;
- from the second year to the 24th year, the actual annual power output decline of the module will be no more than 0.7%; and
- by the end of the 25th year, the actual power output of the module will be no less than 80.7% of the labeled power output.

We have lengthened this warranty against decline in performance to 30 years for our bifacial module and double glass module products.

We believe that our warranty periods are consistent with industry practice. Due to the long warranty period, however, we bear the risk of extensive warranty claims long after we have shipped our products and recognized revenue. We began selling specialty solar products in 2002 and began selling standard solar modules in 2004. Any increase in the defect rate of our products would require us to increase our warranty reserves and would have a corresponding negative impact on our results of operations. Although we conduct quality testing and inspection of our solar module products, these have not been and cannot be tested in an environment simulating the up-to-30-year warranty periods. In particular, unknown issues may surface after extended use. These issues could potentially affect our market reputation and adversely affect our revenues, giving rise to potential warranty claims by our customers. As a result, we may be subject to unexpected warranty costs and associated harm to our financial results as long as 30 years after the sale of our products.

Our principal executive office and principal place of business is located at 545 Speedvale Avenue West, Guelph, Ontario, Canada N1K 1E6. Our telephone number at this address is (1-519) 837-1881 and our fax number is (1-519) 837-2550. Our agent for service of process in the United States is CT Corporation System, located at 111 Eighth Avenue, New York, New York 10011.

All inquiries to us should be directed at the address and telephone number of our principal executive office set forth above. Our website is www.canadiansolar.com. The information contained on or accessible through our website does not form part of this annual report.

B Business Overview

Overview

We are one of the world's largest solar power companies and a leading vertically-integrated provider of solar power products, services and system solutions with operations in North America, South America, Europe, South Africa, the Middle East, Australia and Asia.

We design, develop and manufacture solar ingots, wafers, cells, modules and other solar power products. Our solar power products include standard solar modules and specialty solar products. We are incorporated in Canada and conduct most of our manufacturing operations in China and Southeast Asia. Our products include a range of solar modules built to general specifications for use in a wide range of residential, commercial and industrial solar power generation systems. Specialty solar products consist of customized solar modules that our customers incorporate into their own products and complete specialty products, such as portable solar home systems. We sell our products primarily under our "Canadian Solar" brand name.

In recent years, we have increased our investment in, and management attention on our energy business. Our Global Energy segment primarily comprises solar power project development and sale, solar power projects operation and sales of electricity globally outside of China, and our CSI Solar segment comprises solar power project development and sale, solar power projects operation, and sale of electricity in China. While we plan to continue to monetize our current portfolio of solar power projects in operation, we also intend to grow our energy business by building up our project pipeline. In March 2015, we acquired Recurrent Energy, LLC, or Recurrent, a leading solar energy developer with solar power projects located principally in California and Texas, and thereby significantly increased our solar project pipeline. As of January 31, 2021, our project backlog (formerly called late-stage, utility-scale, solar project pipeline), which refers to projects that have passed their Cliff Risk Date and are expected to be built in the next one to four years, totaled approximately 3.8 gigawatt peak, or GWp, with 728 megawatt peak, or MWp, in North America, 2,229 MWp in Latin America, 312 MWp in Asia Pacific excluding China, 429 MWp in EMEA, and 125 MWp in China. The Cliff Risk Date depends on the country where a project is located and is defined as the date on which the project passes the last of the high-risk development stages (usually receipt of all required environmental approvals, interconnection agreements, FITs and PPAs. As of January 31, 2021, our project pipeline (formerly called our early-to-mid-stage, utility-scale, solar project pipeline) totaled 14.8 GW. In addition to our project backlog and project pipeline, as of January 31, 2021, we had 1,563 MWp of solar projects in construction; and a portfolio of solar power projects in operation totaling 493 MWp with an estimated resale value of approximately $620 million. As of January 31, 2021, our battery storage project pipeline totaled 6.5 GWh, 1,388 MWh of backlog, 913 MWh in construction, and 3 MWh in operation. As of January 31, 2021, our battery storage solutions pipeline totaled 3.6 GWh, 1,400 MWh in high probability forecast, and 861 MWh contracted or in construction. Contracted/in construction projects are expected to be delivered within the next 12 to 18 months. Forecast projects include those that have more than 75% probability of being contracted within the next 12 months, and the remaining pipeline includes projects that have been identified but have a below 75% probability of being contracted. See "—Sales, Marketing and Customers-Global Energy Segment-Solar Project Development and Sale" and "-Sales, Marketing and Customers-Global Energy Segment-Operating Solar Power Projects and Sales of Electricity" for a description of the status of our solar power projects in operation.

We believe that we offer one of the broadest crystalline silicon solar power product lines in the industry. Our product lines range from modules of medium power output to high efficiency, high-power output multi-crystalline and mono-crystalline modules, as well as a range of specialty products. We currently sell our products to a diverse customer base in various markets worldwide, including the U.S., Japan, China, Vietnam, Brazil, Spain, Australia, Germany, Mexico, Canada and the Netherlands. Our customers are primarily distributors, system integrators, project developers and installers/EPC companies.

We employ a flexible vertically integrated business model that combines internal manufacturing capacity with direct material purchases of both cells and wafers. We believe this approach has benefited us by lowering the cost of materials of our solar module products. We also believe that this approach provides us with greater flexibility to respond to short-term demand increases.

As of December 31, 2020, we had:

- 16.1 GW of total annual solar module manufacturing capacity, approximately 12.5 GW of which is located in China, 3.6 GW in Southeast Asia and the rest in other regions;

- 9.6 GW of total annual solar cell manufacturing capacity, approximately 3.2 GW of which is located in Southeast Asia and the rest in China;
- 6.3 GW of total annual wafer manufacturing capacity located in China; and
- 2.1 GW of total annual ingot manufacturing capacity located in China.

We intend to use substantially all of the silicon wafers that we manufacture to supply our own solar cell plants and to use substantially all of the solar cells that we manufacture to produce our own solar module products. We also intend to use some of the solar modules we produce in our energy projects. Our solar module manufacturing costs in China, including purchased polysilicon, wafers and cells, decreased from 20.4 cents per watt in December 2018 to 18.8 cents per watt in December 2019, and increased to 21.9 cents per watt in December 2020. Despite the recent increase, we expect to continue to decrease the manufacturing costs for our production of wafers, cells and modules in the long run.

We intend to continue to focus on reducing our manufacturing costs by improving solar cell conversion efficiency, enhancing manufacturing yields and reducing raw material costs.

Our Products and Services

Our business consists of the following two business segments: CSI Solar segment and Global Energy segment. Our CSI Solar Segment involves the design, development, manufacturing and sale of a wide range of solar power products, including solar modules, solar system kits, battery energy storage solutions, China energy (including solar projects, EPC services and electricity revenue in China), and other materials, components and services (including EPC). Our Global Energy Segment primarily consists of global solar and energy storage power projects (excluding China), O&M and asset management services, global electricity revenue (excluding China), as well as other development services.

Products Offered in Our CSI Solar Segment

Standard Solar Modules

Our standard solar modules are arrays of interconnected solar cells in weatherproof encapsulation. We produce a wide variety of standard solar modules, ranging from 3W to over 665W in power and using mono-crystalline or multi-crystalline cells in several different design patterns, including shingled cells. We introduced the industry’s first module product using 166mm wafers, in comparison with the conventional 156.75mm wafers. We also first introduced the highest power 665W module using 210mm wafers in mass production. Our mainstream solar modules include CS7N (132 half-cells, 210mm wafer), CS7L (120 half-cells, 210mm wafer), CS6W (144 half-cells, 182mm wafer), CS3Y (156 half-cells, 166mm wafer), CS3W (144 half-cells, 166mm wafer), CS3N (132 half-cells, 166mm wafer), CS3L (120 half-cells, 166mm wafer), BiHiKu7 (bifacial module, 210mm wafer), BiHiKu6 (bifacial module, 182mm wafer), BiHiKu5 (bifacial module, 166mm wafer), BiHiKu (bifacial module, 166mm wafer), and HiDM CS1Y all-black modules. The mainstream modules are designed for residential, commercial and utility applications. The small modules are for specialty applications.

We launched our Quartech modules in March 2013. Quartech modules use 4-busbar solar cell technology which improves module reliability and efficiency. CS6P (6 × 10 cell layout) Quartech modules have power output between 255 W and 270 W, which enables us to offer customers modules with high power. We launched and started shipping Dymond modules in October 2014. Dymond modules are designed with double-glass encapsulation, which is more reliable for harsh environments and ready for 1500V solar systems.

We launched and started shipping SmartDC modules in September 2015. SmartDC modules feature an innovative integration of our module technology and power optimization for grid-tied PV applications. By replacing the traditional junction-box, SmartDC modules eliminate module power mismatch, mitigate shading losses and optimize power output at module-level. SmartDC modules also provide module-level data to minimize operational costs and to permit effective system management.

In March 2016, we launched our new Quintech SuperPower mono-crystalline modules. Quintech SuperPower mono-crystalline modules are made of cells with PERC technology and significantly improve module efficiency and reliability. CS6K (6 × 10 cell layout aligned with mainstream dimensions) Quintech SuperPower mono modules have a power output between 285 W and 300 W with high efficiency and high reliability. We started commercial production of Quintech CS6K and CS6U modules in 2016. These modules have features such as 5 busbar cells, standardized module dimensions and cell and module improvements, resulting in higher wattage production and better performance. These modules are intended for broad base introduction, which covers mono-crystalline cells, multi-crystalline cells and mono-crystalline PERC cells.

C Organizational Structure

The following table sets out our major subsidiaries, including their place of incorporation and our ownership interest, as of February 28, 2021.

Name of entity	Place of incorporation	Ownership interest
Canadian Solar Solutions Inc.	Canada	100 %
Canadian Solar (Australia) Pty Limited	Australia	100 %
Canadian Solar O and M (Ontario) Inc.	Canada	100 %
Canadian Solar Projects K.K.	Japan	100 %
Canadian Solar UK Projects Ltd.	United Kingdom	100 %
Recurrent Energy, LLC	USA	100 %
Canadian Solar Energy Singapore Pte. Ltd.	Singapore	100 %
Canadian Solar Netherlands Cooperative U.A.	Netherlands	100 %
Canadian Solar Construction (Australia) Pty Ltd	Australia	100 %
CSUK Energy Systems Construction and Generation JSC	Turkey	100 %
Canadian Solar Argentina Investment Holding Ltd.	United Kingdom	100 %
Canadian Solar New Energy Holding Company Limited	Hong Kong	100 %
Canadian Solar Energy Holding Singapore Pte. Ltd.	Singapore	100 %
CSI Solar Co., Ltd. (formerly known as "CSI Solar Power Group Co., Ltd.")	PRC	79.59 %
Canadian Solar Manufacturing (Luoyang) Inc.	PRC	100 %*
Canadian Solar Manufacturing (Changshu) Inc.	PRC	100 %*
CSI Cells Co., Ltd.	PRC	100 %*
Canadian Solar (USA) Inc.	USA	100 %*
Canadian Solar Japan K.K.	Japan	100 %*
Canadian Solar EMEA GmbH	Germany	100 %*
Canadian Solar International Limited	Hong Kong	100 %*
Suzhou Sanysolar Materials Technology Co., Ltd.	PRC	100 %*
Canadian Solar South East Asia Pte. Ltd.	Singapore	100 %*
Canadian Solar Brazil Commerce, Import and Export of Solar Panels Ltd.	Brazil	100 %*
Canadian Solar Construction (USA) LLC	USA	100 %*
CSI Solar Manufacturing (Funing) Co., Ltd. (formerly known as "CSI&GCL Solar Manufacturing (Yancheng) Inc.")	PRC	100 %*
Changshu Tegu New Material Technology Co., Ltd.	PRC	100 %*
Changshu Tlian Co., Ltd.	PRC	100 %*
Canadian Solar Manufacturing Vietnam Co., Ltd.	Vietnam	100 %*
Canadian Solar Energy Private Limited	India	100 %*
Canadian Solar MSS (Australia) Pty Ltd.	Australia	100 %*
Canadian Solar Manufacturing (Thailand) Co., Ltd.	Thailand	99.99992 %*
Canadian Solar Sunenergy (Baotou) Co., Ltd.	PRC	100 %*
Canadian Solar Middle East DMCC	United Arab Emirates	100 %*
CSI Investment Management (Suzhou) Co., Ltd.	PRC	100 %*
CSI New Energy Development (Suzhou) Co., Ltd. (formerly known as "Suzhou Gaochuangte New Energy Development Co., Ltd.")	PRC	90 %*
CSI Cells (Yancheng) Co., Ltd.	PRC	70 %*
CSI Modules (Jiaxing) Co., Ltd.	PRC	100 %*
CSI Wafer (Luoyang) Co., Ltd.	PRC	100 %*
Canadian Solar SSES (Canada) Inc.	Canada	100 %*
Canadian Solar SSES (UK) Ltd	United Kingdom	100 %*

* Major subsidiaries within the scope of CSI Solar are held through CSI Solar Co., Ltd. of which CSI holds 79.59% equity rights of CSI Solar Co., Ltd.

D Property, Plant and Equipment

The following is a summary of our material properties, including information on our manufacturing facilities and office buildings as of the date of this annual report on Form 20-F:

- CSI Changshu Manufacturing has the land use right to two pieces of land of approximately 40,000 square meters and 180,000 square meters, respectively, in Changshu, on which we have built manufacturing facilities with a total floor area of approximately 164,817 square meters. We have obtained certificates of property ownership for all of CSI Changshu Manufacturing's facilities.

- CSI Luoyang Manufacturing has a land use right to a piece of land of approximately 35,345 square meters in Luoyang (Phase I), on which we have built manufacturing facilities of approximately 6,761 square meters. The certificates for property ownership were granted in June 2008. In the same year of 2008, CSI Luoyang Manufacturing obtained the land use right to a piece of land adjacent of approximately 79,685 square meters (Phase II), on which we have built manufacturing facilities of approximately 29,811 square meters. The floor area of Phase II is approximately 29,811 square meters. The certificates for property ownership were granted in September 2013. Subsequently in 2016, CSI Luoyang Manufacturing obtained the land use right to another piece of land of 159,961 square meters (Phase III), on which we have constructed manufacturing facilities with the floor area of approximately 38,955 square meters. We obtained the certificates for property ownership of Phase III in March 2018.
- CSI Cells has the land use right to a piece of land of approximately 65,661 square meters in Suzhou. We completed the construction of our first solar cell manufacturing facilities of 14,077 square meters (Phase I) on this site in the first quarter of 2007 and subsequently obtained the certificate of property ownership. The Phase II cell manufacturing facilities, with 30,102 square meters of workshop space, were completed in 2009. The Phase III cell manufacturing facilities, with a total floor area of approximately 21,448 square meters of manufacturing and office space, were completed in August 2011. We obtained the certificates of property ownership for Phase II and Phase III in September 2019. CSI Cells merged with CSI Solar New Energy (Suzhou) Co., Ltd. in 2012, and obtained the land use right to another piece of land of approximately 10,000 square meters in Suzhou and the certificate of property ownership for approximately 4,833 square meters of floor area.
- CSI Solar Manufacturing (Yan Cheng) Inc. has leased the cell manufacturing facilities of approximately 26,921 square meters on a piece of land of approximately 66,667 square meters (Phase I) since 2015. It has the right and expects to purchase these facilities and obtain the property ownership and land use right between 2021 and 2022. In 2016, CSI Solar Manufacturing obtained the land use right to a piece of land of approximately 133,333 square meters (Phase II and Phase III), on which we have built cell manufacturing facilities with a total floor area of approximately 26,093.42 square meters. The commercial operations have commenced since then and we obtained the certificates for property ownership of Phase II and Phase III cell manufacturing facilities in August 2018. In 2017, CSI Solar Manufacturing obtained the land use right of approximately 33,664 square meters for the construction of Phase IV facilities, on which and former land, we are building manufacturing facilities with a total floor area of approximately 55,640 square meters and expected to obtain the certificate of property ownership by the end of 2022.
- In Baotou of Inner Mongolia, Canadian Solar Sunenergy (Baotou) Co., Ltd. have obtained the land use right of a piece of land of approximately 224,997 square meters, on which we have built poly ingots manufacturing facilities with a floor area of approximately 18,000 square meters. The production of poly ingots manufacturing has commenced since May 2017. We have also started the construction of other facilities producing mono ingots with a floor area of approximately 61,728 square meters on the same land.
- In Suzhou, Canadian Solar Sunenergy (Suzhou) Co., Ltd. (Canadian Solar Sunenergy (Suzhou) Co., Ltd. has been merged with CSI Cells Co., Ltd.) has obtained the land use right to a piece of land of approximately 60,000 square meters and owns the module manufacturing facility thereon with a floor area of 28,355 square meters, which commenced production in the first quarter of 2017.
- CSI Cells (Yancheng) Co., Ltd. has the land use right to a piece of land of approximately 133,857 square meters (Phase I) located in National Yancheng Economic Technical Development Zone of Yancheng City. The floor area of cell manufacturing facilities (Phase I) is approximately 62,910.15 square meters. A part of the cell manufacturing facilities has completed construction and commenced operations since September 2018 and the entire Phase I facilities commenced operations in May 2019. In the same year of 2019, we made an advanced payment to purchase the Phase II land of approximately 64,436 square meters and have obtained the land use right in September 2020.
- CSI Modules (DaFeng) Co., Ltd. obtained the land use right to a piece of land of 200,006 square meters in Yan-Cheng Da-Feng Economic Development District in 2017. The module production facility of 78,133 square meters (Phase I) completed construction and the production began in September 2018. We obtained the certificate of property ownership for Phase I in January 2020. On the same piece of land, we are building manufacturing facilities with a total floor area of approximately 68,066 square meters (Phase II) since the fourth quarter of 2020.
- CSI Modules (JiaXing) Co., Ltd. obtained the land use right to a piece of land of 165,057 square meters in 2018. On which we have constructed manufacturing facilities with the floor area of approximately 124,042 square meters.
- CSI New Energy Development (Suzhou) Co., Ltd. (formerly known as Suzhou Gaochuangte New Energy Development Co., Ltd.) and its wholly-owned subsidiary obtained the land use right to a piece of land of 598 square meters in 2018 and own the office building thereon with a floor area of 1,972 square meters.

- In Ontario, we lease approximately 14,851 square meters of operation facilities in Guelph, Ontario, Canada for a term of ten years commencing September 1, 2010. We also lease a warehouse of 7,912 square meters and an office building of 1,146 square meters on the same premises as the Guelph, Ontario, Canada operation facilities for the same term. In December 2019, we have renewed the leases for three years from 2020 to 2023.
- In Vietnam, we lease approximately 15,784 square meters of manufacturing facilities in Haiphong City, Vietnam since 2015 and have renewed for another three years commencing August 7, 2018. The production has begun since 2016.
- In Thailand, Canadian Solar Manufacturing (Thailand) Co., Ltd. has a land of 179.2 Rai (286,732 square meters) with the ownership certificate obtained. A module manufacturing facility of 29,723 square meters and a cell manufacturing facility of 19,139 square meters were built and the production commenced in the third quarter of 2016 and in April 2017, respectively. The construction of another cell manufacturing facility with a floor area of 18,100 square meters and a module manufacturing facility with a floor area of 15,460 square meters were completed and the production commenced in the third quarter of 2019.

Except as disclosed in the "Item 3. Key Information—D. Risk Factors-Risks Related to Doing Business in China," we believe we have obtained the environmental permits necessary to conduct the business currently carried on by us at our existing manufacturing facilities. For more details, see "B. Business Overview—Environmental Matters."

ITEM 4A UNRESOLVED STAFF COMMENTS

None.

ITEM 5 *OPERATING AND FINANCIAL REVIEW AND PROSPECTS*

The following discussion and analysis of our financial condition and results of operations should be read in conjunction with our consolidated financial statements and the related notes thereto included elsewhere in this annual report on Form 20-F. This discussion may contain forward-looking statements based upon current expectations that involve risks and uncertainties. Our actual results may differ materially from those anticipated in these forward-looking statements as a result of various factors, including those set forth under "Item 3. Key Information—D. Risk Factors" or in other parts of this annual report on Form 20-F. For discussion of 2018 items and year-over-year comparisons between 2019 and 2018 that are not included in this annual report on Form 20-F, refer to "Item 5. - Operating and Financial Review and Prospects" found in our Form 20-F for the year ended December 31, 2019, that was filed with the Securities and Exchange Commission on April 28, 2020.

In 2020, the Company reached a strategic decision to pursue a listing of its module and systems business in China, and resulted in a change of reportable business segments to CSI Solar segment and Global Energy segment. The prior period segment information has been recast to conform to the current period's presentation. Refer to "Item 5. Operating and Financial Review and Prospects—A. Operating Results—Segment Reporting" for further details.

A Operating Results

Factors Affecting Our Results of Operations

The most significant factors that affect our financial performance and results of operations are:

- solar power products pricing;
- costs of silicon raw materials and solar ingots, wafers and cells relative to the selling prices of modules;
- government subsidies and the availability of financing for solar projects;
- industry and seasonal demand;
- impact of assets impairment;
- solar power project development and sale and EPC and development services;
- antidumping, countervailing and other duty costs and true-up charges; and
- foreign exchange.

Solar Power Products Pricing

Before 2004, all of our net revenues were generated from sales of specialty solar modules and products. In 2004, we began selling standard solar modules. In 2019, we generated 77.5% of our net revenues from our CSI Solar segment, which includes solar modules, solar system kits, battery energy storage solutions, China energy (including solar projects, EPC services and electricity revenue in China), and other materials, components and services (including EPC), and 22.5% from our Global Energy segment, which includes global solar and energy storage power projects (excludes China), O&M and asset management services, global electricity revenue (excludes China), as well as other development services . In 2020, we generated 79.1% of our net revenues from our CSI Solar segment and 20.9% from our Global Energy segment.

Our standard solar modules are priced based on the actual flash test result or the nameplate capacity of our modules, expressed in watts-peak. The actual price per watt is affected by overall demand for modules in the solar power market and increasingly by the total power of the module. Higher-powered modules usually command slightly higher prices per watt.

We price our standard solar modules based on the prevailing market price at the time we enter into sales contracts with our customers, taking into account the size of the contract, the strength and history of our relationship with the customer and the costs of silicon raw materials and solar ingots, wafers and cells. During the first few years of our operations, the average selling price for standard solar modules rose year-over-year across the industry, primarily because of high demand. During the period from 2004 to 2008, the average selling price of our standard solar modules ranged from $3.62 to $4.23. Following a price peak in the third quarter of 2008, the industry-wide average selling price of standard solar modules has declined sharply as competition increased. In 2017 and 2018, the average selling price of our standard solar modules was approximately $0.40 per watt and $0.34 per watt, respectively; and, in 2019 and 2020, it was approximately $0.29 per watt and $0.25 per watt, respectively. We expect the averaging selling price of our standard solar modules to continue to decline, albeit at a more moderate rate.

Costs of Silicon Raw Materials and Solar Ingots, Wafers and Cells Relative to the Selling Prices of Modules

We produce solar modules, which are an array of interconnected solar cells encased in a weatherproof frame, and products that use solar modules. Solar cells are the most important component of solar modules. Our solar cells are currently made from mono-crystalline and multi-crystalline solar wafers through multiple manufacturing steps. Solar wafers are the most important material for making solar cells. Solar ingots are the most important material for making solar wafers. If we are unable to procure silicon raw materials and solar ingots, wafers and cells at reduced prices in line with the decreasing selling prices of our solar modules, our revenues and margins could be adversely impacted, either due to higher manufacturing costs than our competitors or write-downs of inventory, or both. Our market share could decline if our competitors are able to offer better pricing than we are.

Government Subsidies and the Availability of Financing for Solar Projects

Over the past few years, the cost of solar energy has declined and the industry has become less dependent on government subsidies and economic incentives. However, governments in some of our largest markets have expressed their intention to continue supporting various forms of “green” energies, including solar power, as part of broader policies towards the reduction of carbon emissions. The governments in many of our largest markets, including the United States, Japan and the European Union, continue to provide incentives for investments in solar power that will directly benefit the solar industry. We believe that the near-term growth of the market still depends in large part on the availability and size of such government subsidies and economic incentives.

For a detailed discussion of the impact of government subsidies and incentives, possible changes in government policy and associated risks to our business, see “Item 3. Key Information—D. Risk Factors—Risks Related to Our Company and Our Industry—Governments may revise, reduce or eliminate subsidies and economic incentives for solar energy, which could cause demand for our products to decline.” and “Item 4. Information on the Company—B. Business Overview—Sales, Marketing and Customers.”

For a detailed discussion of the impact of the availability and cost of debt or equity for solar power projects and our customers’ ability to finance the purchase of our products or to construct solar power projects, see “Item 3. Key Information—D. Risk Factors—Risks Related to Our Company and Our Industry—The execution of our growth strategy depends upon the continued availability of third-party financing arrangements for our customers, which is affected by general economic conditions. Tight credit markets could depress demand or prices for solar power products and services, hamper our expansion and materially affect our results of operations.”

Income tax expense includes (a) deferred tax expense, which generally represents the net change in the deferred tax asset or liability balance during the year plus any change in valuation allowances; (b) current tax expense, which represents the amount of tax currently payable to or receivable from a taxing authority; and (c) non-current tax expense, which represents the increases and decreases in amounts related to uncertain tax positions from prior periods and not settled with cash or other tax attributes. We only recognize tax benefits related to uncertain tax positions when such positions are more likely than not of being sustained upon examination. For such positions, the amount of tax benefit that we recognize is the largest amount of tax benefit that is more than fifty percent likely of being sustained upon the ultimate settlement of such uncertain tax position. We record penalties and interests associated with the uncertain tax positions as a component of income tax expense.

We use the flow-through method to account for investment tax credits earned on qualifying projects placed into service. Under this method the investment tax credits are recognized as a reduction to income tax expense in the year the credit arises. The use of the flow-through method also results in a basis difference from the recognition of a deferred tax liability and an immediate income tax expense for reduced future tax depreciation of the related assets. Such basis differences are accounted for pursuant to the income statement method.

Recently Issued Accounting Pronouncements

See note 2(ak) Recently issued accounting pronouncements in the notes to our consolidated financial statements, included herein.

Results of Operations

The following table sets forth a summary, for the periods indicated, of our consolidated results of operations and each item expressed as a percentage of our total net revenues. Our historical results presented below are not necessarily indicative of the results that may be expected for any future period.

	For the years ended December 31,			
	2019		2020	
	(in thousands of $, except percentages)			
Net revenues	$ 3,200,583	100.0 %	3,476,495	100.0 %
CSI Solar segment	2,591,154	80.9 %	3,105,044	89.3 %
Global Energy segment	718,735	22.5 %	726,167	20.9 %
Elimination	(109,306)	(3.4)%	(354,716)	(10.2)%
Cost of revenues	2,482,086	77.6 %	2,786,581	80.2 %
CSI Solar segment	1,977,502	61.8 %	2,496,153	71.8 %
Global Energy segment	604,856	18.9 %	577,052	16.6 %
Elimination	(100,272)	(3.1)%	(286,624)	(8.2)%
Gross profit	718,497	22.4 %	689,914	19.8 %
CSI Solar segment	613,652	19.1 %	608,891	17.5 %
Global Energy segment	113,879	3.6 %	149,115	4.3 %
Elimination	(9,034)	(0.3)%	(68,092)	(2.0)%
Operating expenses:				
Selling and distribution expenses	180,326	5.6 %	224,243	6.5 %
General and administrative expenses	242,783	7.6 %	225,597	6.5 %
Research and development expenses	47,045	1.5 %	45,167	1.3 %
Other operating income, net	(10,536)	(0.3)%	(25,523)	(0.7)%
Total operating expenses	459,618	14.4 %	469,484	13.5 %
Income from operations	258,879	8.1 %	220,430	6.3 %
Other income (expenses)				
Interest expense	(81,326)	(2.5)%	(71,874)	(2.1)%
Interest income	12,039	0.4 %	9,306	0.3 %
Gain (loss) on change in fair value of derivatives, net	(22,218)	(0.7)%	50,001	1.4 %
Foreign exchange gain (loss)	10,370	0.3 %	(64,820)	(1.9)%
Investment income (loss)	1,929	0.1 %	(8,559)	(0.2)%
Other expenses, net	(79,206)	(2.5)%	(85,946)	(2.5)%
Income before income taxes and equity in earnings of unconsolidated investees	179,673	5.6 %	134,484	3.9 %
Income tax benefit (expense)	(42,066)	(1.3)%	1,983	0.1 %
Equity in earnings of unconsolidated investees	28,948	0.9 %	10,779	0.3 %
Net income	166,555	5.2 %	147,246	4.2 %
Less: Net income (loss) attributable to non-controlling interests	(5,030)	(0.2)%	543	0.0 %
Net income attributable to Canadian Solar Inc.	171,585	5.4 %	146,703	4.2 %

The short-term borrowings will mature during the period from the first quarter of 2021 to the fourth quarter of 2021 and bear interest ranging from 0.08% to 5.66% per annum. The credit facilities contain no specific extension terms but, historically, we have been able to obtain new short-term borrowings with similar terms shortly before they mature.

In January 2016, we signed a $60.0 million loan facility agreement with International Finance Corporation, or IFC, a member of World Bank Group to fund the construction of our solar cell and module production facilities in Vietnam and other countries approved by IFC. The loan was fully repaid in December 2020.

In 2016, we entered into a financing agreement with the Export Development Canada, or EDC, pursuant to which EDC agreed to provide bank guarantees or letters of credit of up to $100 million to support our global project development. Royal Bank of Canada and Toronto Branch of China Construction Bank Corporation serve as fronting banks for the facility. In September 2018, we renewed the agreement with EDC and increased the facility amount to $125 million with a more focused support for project development activities in North America, Latin America, Europe, Asia and Australia. Since September 2019, Credit Agricole Corporate and Investment Bank (Canada Branch) has joined as one of the fronting banks. In July 2020, the guarantee was renewed with an extended facility amount totaling $150 million.

In 2016, we obtained a syndicated three-year loan facility of JPY9.6 billion ($85.2 million) with Sumitomo Mitsui Banking Corporation, or SMBC, acting as the lead arranger and 13 other participating financial institutions. The facility is unsecured and loan proceeds may be used to develop our solar project pipeline in Japan and for general corporate working capital purposes. In October 2020, the facility agreement was renewed with 11 participating financial institutions led by SMBC at a term of two years and a facility amount of JPY9.1 billion ($88.2 million).

In January 2017, we obtained a five-year syndicated credit facility of $210 million with the Siam Commercial Bank Public Company Limited, or SCB, acting as the lead arranger and China Minsheng Banking Corporation Ltd, as one of the lenders. As of February 28, 2021, $96.4 million of the facility has been used to finance the construction of our solar cell and module manufacturing facilities in Thailand. Under the same facility agreement, we obtained a working capital facility of THB3.54 billion ($119.0 million) from SCB to support the operations of our manufacturing company in Thailand and $96.8 million was drawn as of February 28, 2021.

In March 2017, we entered into a three-year credit agreement of JPY4.0 billion ($35.5 million) with Sumitomo Mitsui Finance and Leasing Company, Limited, or SMFL, a member of Sumitomo Mitsui Financial Group. The facility received commitments from five finance leasing institutions. In April 2019, we renewed the agreement with a syndicate of four finance leasing institutions led by SMFL and expanded the facility to JPY5.35 billion ($48.0 million). In September 2019, we further expanded the facility to JPY6.85 billion ($63.0 million) and the facility will mature in March 2022. As of February 28, 2021, JPY3.3 billion ($31.4 million) was utilized in the development of our solar power projects in Japan.

In April 2017, we completed our second non-recourse project bond placement of JPY5.4 billion ($47.9 million) with Goldman Sachs Japan Co., Ltd. to finance the construction of the 19.05 MWp Gunma Aramaki solar power project in Japan. The project bond has a dual-tenor maturity of 1.5 years and 20.3 years, representing the initial and extended tenor respectively, within a single-tranche of bond. The bond pays a fixed coupon of 1.2875% per annum during the initial tenor and, if extended at our option, 1.3588% per annum thereafter. The project reached COD in December 2017 and the bond was assumed by the buyer upon the completion of project sale in December 2020.

In May 2017, we secured a five-year non-recourse project financing of AUD65 million ($50.8 million) with Bank of Tokyo-Mitsubishi UFJ, Ltd. and Clean Energy Finance Corporation for two solar farm power projects, the 17 MW Longreach project and the 30 MW Oakey 1 project, both in Queensland, Australia. In October 2017, we entered into a binding contract with Foresight Solar Fund Limited, or Foresight, pursuant to which Foresight agreed to acquire 49% interests in Longreach and Oakey. The sale of 49% interests was completed in the first quarter of 2018 and we have an option and intend to sell the remaining 51% interests to Foresight within three years after project COD. The Longreach project and the Oakey 1 project reached COD in November 2019 and February 2020, respectively.

Appendix 1

Major Subsidiaries of CSI

The following table sets forth information concerning CSI's major subsidiaries:

Subsidiary	Place and Date of Incorporation	Attributable Equity Interest Held	Principal Activity
Canadian Solar Solutions Inc.	Canada June 22, 2009	100 %	Developing solar power project and manufacture of solar modules
Canadian Solar (Australia) Pty Limited	Australia February 3, 2011	100 %	Developing solar power projects
Canadian Solar O and M (Ontario) Inc.	Canada May 10, 2011	100 %	Solar farm operating and maintenance services
Canadian Solar Projects K.K.	Japan May 20, 2014	100 %	Developing solar power projects
Canadian Solar UK Projects Ltd.	United Kingdom August 29, 2014	100 %	Developing solar power projects
Recurrent Energy, LLC	USA March 31, 2015	100 %	Developing solar power projects
Canadian Solar Energy Singapore Pte. Ltd.	Singapore October 29, 2015	100 %	Development & ownership of solar PV projects
Canadian Solar Netherlands Cooperative U.A.	Netherlands November 8, 2016	100 %	Project holding and financing
Canadian Solar Construction (Australia) Pty Ltd	Australia July 04, 2017	100 %	Providing engineering, procurement and construction services
CSUK Energy Systems Construction and Generation JSC	Turkey October 30, 2017	100 %	Project development and management services
Canadian Solar Argentina Investment Holding Ltd.	United Kingdom January 23, 2018	100 %	Developing solar power projects
Canadian Solar New Energy Holding Company Limited	Hong Kong March 20, 2019	100 %	Project investment, financing, trading of solar modules
Canadian Solar Energy Holding Singapore Pte. Ltd.	Singapore April 22, 2019	100 %	Development & ownership of solar PV projects
CSI Solar Co., Ltd. (formerly known as "CSI Solar Power Group Co., Ltd.")	PRC July 7, 2009	79.59 %	Investment holding and trading
Canadian Solar Manufacturing (Luoyang) Inc.	PRC February 24, 2006	100 %*	Manufacture of solar modules, ingots and wafers
Canadian Solar Manufacturing (Changshu) Inc.	PRC August 1, 2006	100 %*	Production of solar modules
CSI Cells Co., Ltd.	PRC August 23, 2006	100 %*	Manufacture of solar cells
Canadian Solar (USA) Inc.	USA June 8, 2007	100 %*	Sales and marketing of modules
Canadian Solar Japan K.K.	Japan June 21, 2009	100 %*	Sales and marketing of modules
Canadian Solar EMEA GmbH	Germany August 21, 2009	100 %*	Sales and marketing of modules
Canadian Solar International Limited	Hong Kong March 25, 2011	100 %*	Sales and marketing of modules
Suzhou Sanysolar Materials Technology Co., Ltd.	PRC August 17, 2011	100 %*	Production of solar module materials
Canadian Solar South East Asia Pte. Ltd.	Singapore September 19, 2011	100 %*	Sales and marketing of modules
Canadian Solar Brazil Commerce, Import and Export of Solar Panels Ltd.	Brazil November 14, 2012	100 %*	Sales and marketing of solar modules, and providing solar energy solution
Canadian Solar Construction (USA) LLC	USA May 20, 2014	100 %*	Solar farm operating and maintenance services
CSI Solar Manufacturing (Funing) Co., Ltd. (formerly known as "CSI&GCL Solar Manufacturing (Yancheng) Inc.")	PRC May 29, 2014	100 %*	Research and development, manufacture and sales of solar cells, and solar power project development
Changshu Tegu New Material Technology Co., Ltd.	PRC September 2, 2014	100 %*	EVA solar packaging film research and development, production and sales
Changshu Tlian Co., Ltd.	PRC December 26, 2014	100 %*	Junction box and connector research, development, production and sales
Canadian Solar Manufacturing Vietnam Co., Ltd.	Vietnam June 25, 2015	100 %*	Production of solar modules
Canadian Solar Energy Private Limited	India May 06, 2015	100 %*	Sales and marketing of modules
Canadian Solar MSS (Australia) Pty Ltd.	Australia August 03, 2015	100 %*	Sales and marketing of modules
Canadian Solar Manufacturing (Thailand) Co., Ltd.	Thailand November 20, 2015	99.99992 %*	Cells and module production
Canadian Solar Sunenergy (Baotou) Co., Ltd.	PRC August 18, 2016	100 %*	Production of solar modules, ingots and wafers
Canadian Solar Middle East DMCC	United Arab Emirates March 28, 2017	100 %*	Sales and marketing of modules
CSI Investment Management (Suzhou) Co., Ltd.	PRC May 5, 2017	100 %*	Investment management & asset management
CSI New Energy Development (Suzhou) Co., Ltd. (formerly known as "Suzhou Gaochuangte New Energy Development Co., Ltd.")	PRC June 12, 2017	90 %*	Design, engineering construction and management of solar power projects
CSI Cells (Yancheng) Co., Ltd.	PRC May 18, 2017	70 %*	Production of solar cells
CSI Modules (Jiaxing) Co., Ltd.	PRC November 3, 2017	100 %*	Production of solar modules
CSI Wafer (Luoyang) Co., Ltd.	PRC November 27, 2017	100 %*	Production of solar cells and wafers
Canadian Solar SSES (Canada) Inc.	Canada Nov 27, 2019	100 %*	System solution and energy storage
Canadian Solar SSES (UK) Ltd	United Kingdom December 18, 2019	100 %*	Intellectual property holding

* Major subsidiaries within the scope of CSI Solar are held through CSI Solar Co., Ltd. of which CSI holds 79.59% equity rights of CSI Solar Co., Ltd.

EXHIBIT 3

Solar Industry

China Sunergy(Nanjing) Co., Ltd.

China Sunergy(Nanjing) Co., Ltd was found in 2004. It is a international high tech enterprise for the leading Photovoltaic technology, specializing in the R&D, manufacture, sale and after-sale service of solar cells, and is committed to supply the green and clean solar energy for the global customers continually.
The CTO Doctor Jianghua Zhao keeps the world record 25% in laboratory photoelectric conversation efficiency of P-type silicon solar cell, and a research team headed by him pursuits the high efficiency, developing the technology to improve the ratio on production line continually, in order to lead the whole industry. The company was publicly listed on the NASDAQ exchange in May, 2007, as the first enterprise in Nanjing.
At present, Nanjing CSUN has own the 13 solar energy cells production lines, and the cells' output is over 400MW in 2011. Now the market and service networks are spread in the Europe, the America, the Australia and the Asia, etc, and the products are widely used in the traffic projects and city building all over the world.
Let the sun shine into hundreds of thousands of homes; leave the green from the generation to generation, that is our green dream.

products:

CSUN210-54P

CSUN220-54M

CSUN250 -60M

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Group news

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EXHIBIT 4

About Us

Products

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Contact Us

Language

We are Amazing Manufacturer

CSUN Solar Tech Co., Ltd.

CSUN is a global leading R&D and manufacturer of high- performance PV materials and solar panels.It leads the research direction of high-performance PV technology around the world. In past decade, CSUN has already supplied over 15GW solar panels to the worldwide.

CSUN possess 2.5GW design production capacity of solar panels with 7 manufacturing centers in China, USA, Turkey, South Korea and Vietnam. On the strength of its continuous technological innovation, well-established global sales and customer service network, CSUN has covered USA, Germany, Spain, Australia, India and some other key markets around the world.

140+

Certification

17 year

Industry Experience

1,200

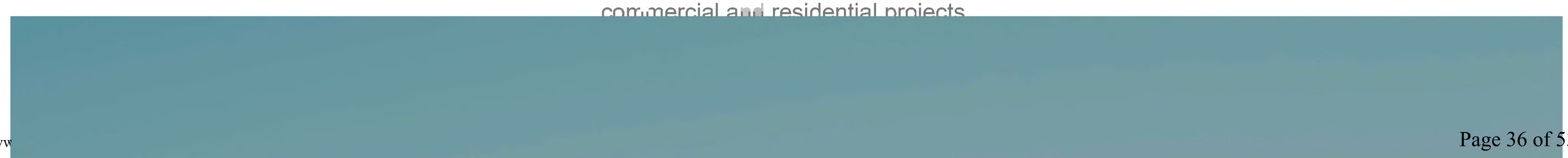
Experience Workers

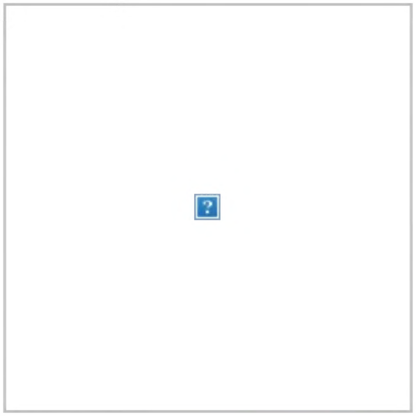
200,000

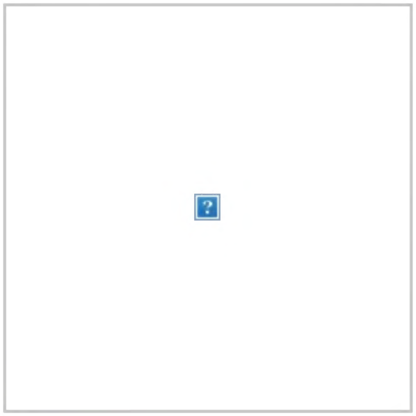
Factory Size

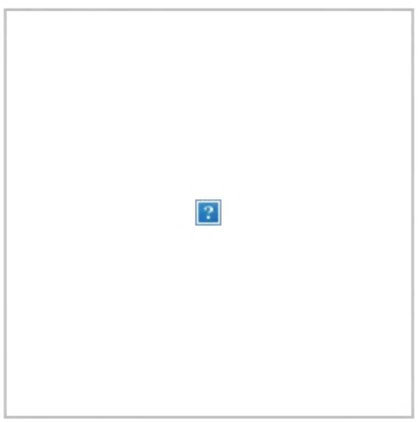
Project Gallery

CSUN has developed and supplied with a range of Full-cell series, Half-cell series, Bifacial series, Paving series and Shingled series, which have been widely applied in Large-scale PV projects, commercial and residential projects.









We Are Trusted By Global Customers

Projects Products Contact

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CSUN Serial Number Verification

Company* | Email*

Serial Number* | Captcha*

Securily Code*

Submit

Feel free to contact us

Name* | Email*

Company* | Phone

Submit

EXHIBIT 5

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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, DC 20549

FORM 20-F

(Mark One)
☐ **Registration statement pursuant to Section 12(b) or 12(g) of the Securities Exchange Act of 1934**

or

☒ **Annual report pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934**
For the fiscal year ended December 31, 2015.

or

☐ **Transition report pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934**
For the transition period from to

or

☐ **Shell company report pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934**
Date of event requiring this shell company report

Commission file number: 001-33433

CHINA SUNERGY CO., LTD.

(Exact name of Registrant as specified in its charter)

N/A

(Translation of Registrant's name into English)

Cayman Islands

(Jurisdiction of incorporation or organization)

No. 123 Focheng West Road
Jiangning Economic & Technical Development Zone
Nanjing, Jiangsu 211100, People's Republic of China

(Address of principal executive offices)

Tingxiu Lu, (86 25) 5276 6666,
tingxiu.lu@chinasunergy.com,

No. 123 Focheng West Road
Jiangning Economic & Technical Development Zone
Nanjing, Jiangsu 211100, People's Republic of China

(Name, Telephone, E-mail and/or Facsimile number and Address of Company Contact Person)
Securities registered or to be registered pursuant to Section 12(b) of the Act:

Title of each class	Name of each exchange on which registered
American Depositary Shares, each representing 18 ordinary shares, par value $0.0001 per share	**N/A**

Securities registered or to be registered pursuant to Section 12(g) of the Act:

None
(Title of Class)

Securities for which there is a reporting obligation pursuant to Section 15(d) of the Act:
None
(Title of Class)

Indicate the number of outstanding shares of each of the Issuer's classes of capital or common stock as of the close of the period covered by the annual report.

267,287,253 ordinary shares, par value $0.0001 per share, as of December 31, 2015.

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☐ No ☒

If this report is an annual or transition report, indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934. Yes ☐ No ☒

Indicate by check mark whether the registrant: (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company. See definition of "accelerated filer and large accelerated filer" in Rule 12b-2 of the Exchange Act. (Check one):

Large accelerated filer ☐ Accelerated filer ☐ Non-accelerated filer ☒ Smaller reporting company ☐

Indicate by check mark which basis of accounting the registrant has used to prepare the financial statements included in this filing:

U.S. GAAP ☒ International Financial Reporting Standards as issued by the International Accounting Standards Board ☐ Other ☐

If "other" has been checked in response to the previous question, indicate by check mark which financial statement item the registrant has elected to follow. Item 17 ☐ Item 18 ☐

If this is an annual report, indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No ☒

(APPLICABLE ONLY TO ISSUERS INVOLVED IN BANKRUPTCY PROCEEDINGS DURING THE PAST FIVE YEARS)

Indicate by check mark whether the registrant has filed all documents and reports required to be filed by Sections 12, 13 or 15(d) of the Securities Exchange Act of 1934 subsequent to the distribution of securities under a plan confirmed by a court. Yes ☐ No ☐

On December 5, 2014, Canada initiated anti-dumping and countervailing investigations on imports of crystalline silicon PV modules from China. As of the date of this annual report, the final determination has not been released yet. On June 3, 2015, the Canada Border Services Agency, or CBSA, released final determinations of dumping and subsidization which found dumping calculated by way of a Ministerial Specification based on a Non Market Economy finding applicable to all cooperative exporters and ascertained a Canadian Solar-specific subsidies rate of RMB0.014 per Watt. On July 3, 2015, the Canadian International Trade Tribunal determined that a Canadian industry was not negatively affected as a result of imported modules but was threatened with negative impact. As a result of these findings, definitive duties have been imposed on imports of Chinese solar modules into Canada starting on July 3, 2015.

We are one of the China-based companies who produce and export crystalline silicon PV modules and key components to the European Union. Our revenues from sales in the European countries, as a percentage of our total net revenues, represent 47.2%, 30.7% and 18.3% in 2013, 2014 and 2015, respectively. While we are exempted from paying any anti-dumping and anti-subsidy duties to the European Union starting from August 6, 2013, the increased selling price and the reduced consumption on the European market under the price undertaking could bring significant uncertainties to our business in the European market. For example, some of our customers in Europe are unwilling to purchase our products at a higher price or to accept other restrictions imposed on us by the price undertaking. In addition, if we breach or withdraw from the price undertaking, or the European Commission withdraws its acceptance of the price undertaking, the anti-dumping and anti-subsidy duties will automatically apply to us. Thus, there can be no assurance that our entry into and performance of the price undertaking will eliminate potential material adverse effects of anti-dumping and anti-subsidy duties on our business in Europe and our results of operation. In addition, we cannot assure you that there will not be similar actions taken in the future in other countries or areas against Chinese-made solar power products. If other countries or areas initiate anti-dumping or anti-subsidy investigation against Chinese exporters or imposes anti-dumping or anti-subsidy measures, including increasing tariffs on solar power product imported from China, or price undertaking, our export to such countries or areas could be materially and adversely affected. We are actively taking measures to alleviate the negative effects caused by the tariffs, including exploring new markets and securing additional order from customers located outside of the United States, the European Union and those countries that initiated anti-dumping and anti-subsidy proceedings. However, if our efforts to develop new markets fail and we are not able to gain additional orders from other customers to replace orders from these countries, our revenue could be materially and adversely affected.

To mitigate the negative effects resulted from anti-dumping and countervailing duties, we have relocated or plan to relocate certain of our manufacturing capacities to other regions, such as Turkey (targeting primarily EU and U.S. markets, using solar cells from South Korea, Vietnam or other regions), South Korea and Vietnam (targeting Asian and U.S. market) and the United States (also targeting U.S. market), which are not subject to anti-dumping and countervailing duties in their primary target markets. Our policy is to require all of our export sales to comply with these international trade practices. However, we cannot guarantee that the government agencies in the jurisdictions in which actions are brought will reach the same conclusion. Violations of anti-dumping and countervailing duty laws can result in additional duties imposed on imports of our products into these countries, which increase our costs of accessing potential markets. If duties are imposed on our products, we would have to adjust our business strategy for selling into these jurisdictions, including moving part of our manufacturing operations overseas. Any change in our business strategy would create a number of operational and legal uncertainties. Any of the above scenarios could materially and adversely impact our sales, thereby limiting our opportunities for growth.

If we are unable to maintain a high utilization rate of our manufacturing capacity, our operating margins may decline substantially.

Our ability to achieve profitability depends in part on our ability to maintain a high utilization rate of our manufacturing capacity. With the slowed growth of the solar power market, it is more difficult for us to obtain enough orders for the solar power products that we are capable of producing. If we are unable to obtain sufficient orders for our products, procure sufficient raw materials, or if we experience any material equipment failure, then we will not be able to maintain a high utilization rate of our manufacturing capacity. As we incur fixed costs associated with our facilities and equipment whether they are being utilized, operating at less than full utilization results in expenses without corresponding revenue, which may reduce our operating margins.

Because the markets in which we compete are highly competitive and many of our competitors have greater resources than we do, we may not be able to compete successfully and we may lose or be unable to gain market share.

The market for solar power products is highly competitive and continually evolving. We expect to face increased competition, which may result in price reductions, reduced margins or loss of market share. Our competitors include crystalline based solar cell and module manufacturers such as SunPower Corporation, Trina Solar Limited, Yingli Green Energy Holding Company Limited, Canadian Solar Inc., Hanwha SolarOne Co., Ltd., Jinko Solar Holding Co., Ltd. and ReneSola Ltd. Many of our existing and potential competitors have substantially greater financial, technical, manufacturing and other resources than we do. Their greater size in some cases provides them with a competitive advantage with respect to manufacturing costs due to their economies of scale and their ability to purchase raw materials at lower prices. Many of our competitors also have more established distribution networks and larger customer bases. In addition, they have well-established relationships with our customers and have extensive knowledge of our target markets. As a result, they may be able to devote greater resources to the research, development, promotion and sale of their products or respond more quickly to evolving industry standards and changes in market conditions than we can. It is possible that new competitors or alliances among existing competitors will emerge and rapidly acquire significant market share, which would harm our business. If we fail to compete successfully, our business would suffer and we may lose or be unable to gain market share.

EX-8.1 8 v455917_ex8-1.htm EXHIBIT 8.1

Exhibit 8.1

List of Subsidiaries of China Sunergy Co., Ltd. (the "Registrant")

1. China Sunergy Co., Ltd., incorporated in the British Virgin Islands.
2. China Sunergy (Hong Kong) Co., Limited., incorporated in Hong Kong.
3. China Sunergy (Nanjing) Co., Ltd., incorporated in the People's Republic of China.
4. China Sunergy Europe GmbH, incorporated in Germany.
5. CEEG (Shanghai) Solar Science Technology Co., Ltd., incorporated in the People's Republic of China.
6. CEEG (Nanjing) Renewable Energy Co., Ltd., incorporated in the People's Republic of China.
7. Lianyungang Yuanhui Solar Power Co., Ltd., incorporated in the People's Republic of China.
8. China Sunergy (US) Clean Tech Inc, incorporated in the United States of America.
9. China Sunergy (Yangzhou) Co., Ltd., incorporated in the People's Republic of China.
10. CSUN Trading (Hong Kong) Co., Limited, incorporated in Hong Kong.
11. China Sunergy Luxembourg S.A., incorporated in Luxembourg.
12. CSUN Holding (Luxembourg) S.a.r.l, incorporated in Luxembourg.
13. CSUN Renewable Energy (France) S.a.r.l, incorporated in France.
14. CSUN Eurasia Energy Systems Industry and Trade Inc., incorporated in Turkey.
15. CSUN Eurasia Energy Technologies Industry and Trade Inc., incorporated in Turkey.
16. CSUN Holding UK Ltd., incorporated in the United Kingdom.
17. AEE Renewables UK 6 Limited Company, incorporated in the United Kingdom.
18. CSUN Australia Pty. Ltd., incorporated in Australia.
19. CSUN (Japan) Solar Energy Co., Ltd., incorporated in Japan.
20. CEEG NANJING SOLAR CO.,LTD, incorporated in the People's Republic of China.
21. China Sunergy (Nanjing) Power Science &Technology Co., Ltd., incorporated in the People's Republic of China.
22. Juancheng Xinze Solar Electric Power Co., Ltd., incorporated in the People's Republic of China.
23. CSUN Energy Solutions Australia Pty. Ltd., incorporated in Australia.
24. CSUN Energy Investment Inc., incorporated in Turkey.
25. Korea Sunergy Co., Ltd., incorporated in South Korea.

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26. Nanjing Jinshuige Renewable Energy Co., Ltd., incorporated in the People's Republic of China.

27. CSUN Solar Mea, incorporated in the United Arab Emirates.

28. CSUN – Solar International Limited (Hong Kong), incorporated in Hong Kong.

29. CSUN Energy (Shanghai) Co., Ltd., incorporated in the People's Republic of China.

30. Nanjing Sunrise Solar Technology Co., Ltd., incorporated in the People's Republic of China.

31. Solaireviet Co., Ltd., incorporated in the People's Republic of Vietnam.

32. CSUN Eurasia Energy Investment Inc., incorporated in Turkey.

EXHIBIT 6

Boway Group

Our company

Boway Group Co.,Ltd. ("Boway Group") has experienced 30 years of rapid yet solid development since being founded in 1987. The firm now has six R&D and manufacturing bases worldwide - each with its own specialty yet jointly sharing a large capital cooperation platform. In this way, Boway Group leverages the advantages of both vast resources and unique skill sets. Areas of particular expertise span the development and output of new energy equipment, new materials, precision EDM wires, precision machine parts, and high-end sanitary hardware among others.

Through true teamwork and true continuous improvement across all staff in all functional areas group-wide, Boway Group has ascended to and is noted as being among the top ranks of the high-tech manufacturing world. The Chinese government has recognized as much, conferring upon Boway the “National Accredited Laboratory of China” designation for new alloy material third-party certification. Boway serves as both a Unit Director and Technical Commission member of the International Wrought Copper Council (IWCC). Subsidiaries of Boway, Boway Alloy, and Boway Materialise are China’s National Key High & New Technology Enterprises. In Vietnam, Boviet Solar is the nation’s largest new photovoltaic brand, and Italisa is the world’s top OEM/ODM high-end sanitary hardware manufacturer.

Boway Group is powered by the fine efforts of more than 6,000 employees worldwide, including more than

800 professionals. Those employees work within holdings that include Ningbo Boway Alloy Material Co., Ltd. (listed in the main board of Shanghai Stock Exchange (Ticker: 601137); Boviet Solar Technology (Vietnam) Co., Ltd.; Boviet (USA) LLC.;Ningbo Bode Hightech Co.Ltd; Ningbo Powermetal Industry Co., Ltd.; Italisa (Vietnam) Co., Ltd.; and Ningbo Boway Investment Co., Ltd. On Sep. 30, 2015, Boway Group purchased 100% stock equity of German Berkenhoff GmbH successfully. Boway Group manufactures products at six wholly-owned industrial parks **(Boway Yunlong , Boway Binhai, Bode Hightech, Boway Vietnam, German Heuchelheim and German Herborn),** with a total 751,000 sq. meters (186 acres) of land.

Boway Group companies own hundreds of patents around the globe, with many more currently in various stages of approval in various nations. The number already granted totals 62unique invention patents in China and 109 in other countries, including many in Europe and one in the United States. Further evidence of corporate heft rests in the fact that the firm has specifically drawn up over 18 national standards and 5 industry standards to date, and that Boway Group has been granted an AAA credit rating by the Chinese banking sector for 18 consecutive years.

Bode Hightech
Industrial Park

Boway Binhai
Industrial Park

Boway Yunlong
Industrial Park

Vietnam Bac Giang
Industrial Park

Germany Heuchelheim
Industry Park

Germany Herborn
Industry Park

Our Industries

Boway Group is committed to substantive innovation and development on new non-ferrous alloy materials, new energy, precision EDM wires, and precision machine parts among other areas, striving to enhance manufacturing precision, efficiency, and overall quality.

Ningbo Boway Alloy Material Co., Ltd. (Ticker: 601137) specializes in R&D and manufacture of high precision, high performance non-ferrous alloy rods, wires and strips, as well as functional, environment-friendly, energy-saving and substitute alloys which are widely used in more than 30 industries - high-speed rail, telecommunications, automotive manufacturing, shipbuilding, engineering machinery, precision moulds, lead frames, and so forth.

The company's output has been successfully applied to the Shenzhou spacecraft series 1-10, Chang'e 1-2 detectors and Tiangong-1 aircraft. This is in addition to R&D and production of environment-friendly, lead-free brass alloy cutting products and other new lead-free materials; cost and resource saving titanium-zirconium copper zinc alloys; and low-conductivity, energy efficient brass alloy materials.

Boviet Solar’s international high-level R&D talent focuses on new energy offerings such as “nano-tech textured" and "back passivation cell” technologies, which greatly enhance the energy conversion efficiency of crystalline silicon cells and modules. By achieving the highest productivity in electronic and photovoltaic product manufacturing, Boviet is now a globally trusted, first-line US brand.

Based on the century-old enterprise of Beckenhof in Germany, Bode Hightech , a subsidiary of Boway Group, is committed to the research and innovation of the high-end precision cutting wire industry and continues to promote the development of high-end precision filaments in the world. Leading the development of the brand, to provide customers around the world with precision cutting wire processing technology as a whole solution to enhance the accuracy of modern industrial manufacturing! Bode Hightech's Bechenhof company has a long history of 128 years, is the world's leading, world-renowned industry precision cutting wire industry, the inventor and leader, with the "bedra" brand is the industry's first brand in precision Cutting the accumulation of silk has accumulated rich experience in manufacturing.

Powermetal Industry produces high-end automobiles, telecommunications, hydraulics and other precision machine parts, and in fact, one of the largest professional precision metal products companies in the world. Employing the most advanced technology and machinery, top-quality raw materials, sophisticated QC/QA and strict “lean” management, Powermetal Industry provides precision machine parts processing services to top automotive, telecom, and hydraulic brands internationally.

Italisa (Vietnam) is committed to the perpetual creation and OEM / ODM manufacture of the world's best high-end sanitary hardware. Italisa is now building a sound marketing service system in more than 20 countries across Europe, North America, and the Middle East.

Through a deliberate model to enact true synergy among these various bases, and guided by Boway Group's development strategy, our capital cooperation brings consistent and substantial returns - financial and otherwise - to all pertinent stakeholders. The areas of new materials, new energy, and precision EDM wire technology continue to be our main development areas, with new avenues being considered constantly - yet only as they stand jointly to benefit the firm, our clients, and the society at large.

Our management

Incorporating systematic, comprehensive management heavily influenced by the integration of a top-flight German "hidden champion" enterprise, Boway Group undergoes continuous improvement daily not only in operations processes, but in strategy, finance, HR, R&D, marketing, and all other areas.

ISO9002:1994 was implemented in 1997, the enterprise cultural management system substantially improved in 2004, and our world-class service center built in 2007. 2008 saw our SAP information management system introduced and the OA system was comprehensively upgraded. That same year, the firm also received both ISO 14001:2004 environmental management system and ISO 9001:2008 quality management system certifications.

More recently, in 2014, a comprehensive HR management information system was introduced, and the company passed both the OHSAS (Occupational Safety and Health Management System) 18001:2007 certification. GB/T29490-2013 Intellectual property management system certification was granted in 2015.

Our future

Boway Group adheres to a business philosophy of “Outpace Ourselves and Pursue Distinction.” Careful market study, strong research, innovation cooperation, and capital strength, all combined with active brand building, strengthened project and operations management, and improved work efficiency are characteristics that have led and will continue to lead to such excellence.

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Message from the Chairman

Dear all,

On behalf of all staff of Boway Alloy, I would like to express my sincere greetings to our clients and people from all walks of life who care and development of Boway.

Boway Alloy is committed to developing new materials and new energies that promote the scientific and technological progress of our society, development of the industry and promoting the progress of the times. We adhere to the value of "virtue as the essence, innovation as the as the honor", insist the enterprise spirit of " cooperating sincerely, innovating, challenging the future", stand in the forefront of scienc have an insight into the global industrial development, develop new products which meet the requirement of social development wi innovation, and contribute to the development of society as well as the progress of science & technology.

We are embracing the global digital revolution with enthusiasm and striving to build a self-evolving digital enterprise with continuous in digital R&D, we will integrate global resources and continuously develop new products needed by the society and customers, so as t customers to be successful. Through digital manufacturing, we will provide our high-end customers from the manufacturing sector .... products and be trusted strategic partner of our customers. Through digital marketing, we will provide personalized application solutions. industrial bases in China, North America, Europe and Southeast Asia, we will provide localized and rapidly responsive value-added services for c different regions of the world and continuously create value for global customers.

In the era of rapid development of science and technology, digital revolution and industrial change, we are willing to work with friends from all to create a better future and share a better life!

Company Introduction

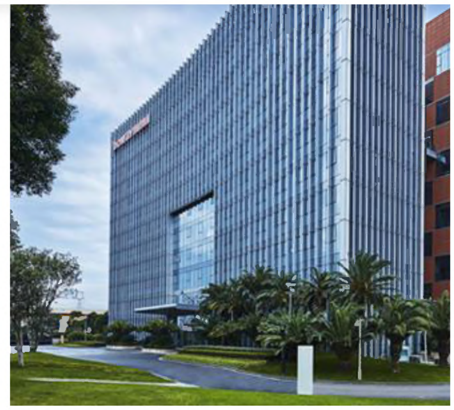
About Us

Ningbo Boway Alloy Material CO.,LTD (hereinafter referred to as Boway) was founded in 1993 and listed on the main board of Shanghai Stoc (stock code: 601137) in January 2011. After nearly 30 years of rapid and healthy development, it has nine manufacturing bases in China, Germ and Vietnam. Boway has become a scientific and international company integrating new materials, new energy and other industries.

Boway is the national first batch of "innovative enterprise" and "national technology innovation demonstration enterprise", has the re development innovation platform of "enterprise technology centers recognized by the nation", "national post-doctoral scientific "national laboratory", "national united engineering research center" , and also Boway is the national "high-tech enterprise", the Member of International Nonferrous Metals Fabrication Industry Association(IWCC) .

OA CRM EHR English

promote digital marketing, digital R&D, digital manufacturing, digital supply chain, and digital service, build a digital ecosystem in an all-round way, and establish a self-evolving digital enterprise with continuous innovation ability.



With standing in the forefront of science and technology, and aiming at "scientific and technological innovation, leading the industry" , Boway conduct market research and product R&D. Last years Boway has completed more than 50 projects of new material innovation and 185 patents, and leaded or participated in formulating more than 17 national standards, 5 industry standards. Create value for customers, lead the industry development, and promote the age progress.

Global Manufacturing Base

Boway has 9 manufacturing bases over the world, including Boway Yunlong, Boway Binhai, Heuchelheim Germany, Herborn Germany, Ontario C Bac Giang Vietnam, etc., to provide high-quality products, as well as personalized and localized services in response to different needs of custon the world.

Our Management

Adhering to the German spirit, German technology, German standards and German management, with consideration on the actual situa enterprise, Boway applies the systematic, rigorous and digital management system to R&D, production, marketing, human resources, finance, op other aspects, building a perfect management system. At the same time, it keeps on improving the management level through continuous promoting rapid and healthy development of the company!

In 1997, brought in ISO9002:1994

In 2004, perfected the corporate culture management system

In 2007, built the customer service center to improve the ability of service

In 2008, brought in SAP information management system to implement informatized management

In 2010, promoted lean manufacturing

In 2019, PLM applied, and CRM to optimize customer operation and maintenance management
In 2020, the first year of digital transformation, we will build self-evolving digital R&D, digital manufacturing, digital marketing, digital supply c service and digital management with continuous innovation ability to forge a digital enterprise.

Our Future

Boway Alloy is committed to leading the industry development and promoting the progress of times. With the goal of "scientific and te innovation, leading the future", it develops new products to promote scientific and technological progress of the society, provides professional solutions to help customers succeed, and provides high quality products to continuously add value for global customers.

Organization

View Now

Corporate Culture

Promote the progress of times: we rely on the strong c scientific and technological innovation, constantly de performance products to meet the needs of social de lead the development of the industry, and promote the times.
Intelligence creates the future: with intelligence, effective solutions and quality services to serve the deve the society, open up wider prospects and create a better
Share good life: All Boway people work together to c realize dreams, and share a healthy, safe and harmoniou

Details

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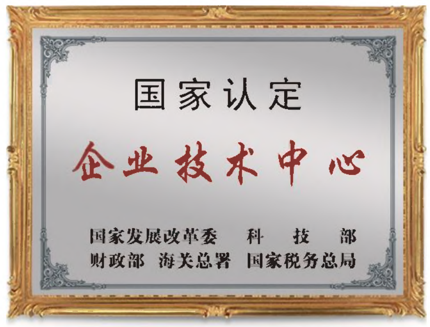
Honors

Boway Alloy is committed to the development of new alloy materials. Each honor inspires Boway people to keep exploring and forging ahead.



2017Year

In September 2017, awarded the "National Enterprise Technology Center"

Our Clients

Through years of efforts, new alloy materials and new energy products researched, developed and innovated by Boway has bee distributed throughout countries and regions including China, the United States, Germany, France, Japan, South Korea and India. China-centered international market system covering Asia, Europe, North America and other regions is taking shape.

Our products and services have been recognized by many fortune 500 companies such as Siemens, Panasonic, TOTO, Samsung an CalCom Solar.

Today, Boway Alloy continues to serve the manufacturing industry, constantly improve its capacity of R&D, innovation an manufacturing, and provide customers with product solutions via the series, multi-variety, multi-brand and rich product lines. Wit R&D collaboration and customization, Boway Alloy solves the special-interest, personalized needs of and continues to create value fc customers.

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Boway Alloy

Boway Wo

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Yunlong Manufacturing Base

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Binhai Manufacturing Base

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Development Zone, Yinzhou Dist., Ningbo
City, Zhejiang Province, China.

service@bowayalloy.com

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Products News Sitemap Copyright Statement

EXHIBIT 7

Group Overview

Golden Concord Holdings Limited (Herein after referred to as GCL Group) is a top tech-led energy conglomerate that specializes in new and clean energy, with div developments in electric power, PV manufacturing, natural gas, industrial park, integrated circuit materials, mobile energy and new electric ecology as its main bus assets across China, Africa, Middle East, North America, Southeast Asia and Europe, with multiple listed companies in A-shares and H-shares. GCL ranks among global new energy Top 500 enterprises, and top 1 in the new energy sector of top 500 Chinese enterprises for many years continuously. In 2019, it ranks the 166th Chinese enterprises, the 16th of the Top 100 leaders in strategic emerging industries, the 68th among Top 500 manufacturing companies in the aforementioned lis among Top 500 Chinese private enterprises, and 24th among Top 500 private manufacturing enterprises.

ZHU Gongshan, Chairman of the GCL Group, also serves as a member of the 12th National Committee of the Chinese People's Political Consultative Conference 12th Jiangsu Provincial CPPCC Standing Committee, Chairman of the Global Green Energy Industry Council, Chairman of the Global Solar Council, and Vice Cha China Electricity Council. Mr. Zhu is the Executive Chairman of Environment and Energy Committee of International Chamber of Commerce China, Vice President Overseas Chinese Entrepreneurs Association, Vice President of China Overseas Development Association, Vice Chairman of Jiangsu Federation of Industry and Honorary President of Jiangsu Residents (HK) Association, Executive Vice President of Federation of Hong Kong Jiangsu Community Organization. He has receiv as the " China Enterprise Reform Medal for 40 Years of Reform and Opening-up", "Man of the Energy Reform for 40 Years of Reform and Opening-up", "Top Energ for 40 Years of Reform and Opening-up ", "Top Ten Outstanding Contributors of New Energy Industry in the 70th Anniversary of New China", "Top Ten Meritorious Entrepreneur of Energy in the 70th Anniversary of New China", etc.

GCL Group adheres to the new energy security strategy proposed by General Secretary Xi Jinping, focusing on promoting high-quality development, accelerating production and consumption revolution, helping to build a clean, low-carbon, safe and efficient energy system, and striving to be a positive practitioner of the new strategy revolving around "Four Revolution and One Collaboration".

Dating from 1990, GCL has been following the leadership of CPC and leading green growth with the red genes. In guide of Xi Jinping Thought on Socialism with C Characteristics for a New Era, GCL acts out the new development philosophies in practice. In the organization, there are 12 CPC committees, 5 CPC branch comr CPC divisions and 3,000 CPC members. GCL has attached great importance to the pioneer role of Party members and stronghold function of Party organizations. been continuously made on the Party's ideas, organizations, principles, regimens and anti-corruption initiative. It is highly motivated in applying the Party's roadma and policies. Education programs around "Two Studies, One Action" run through all Party activities. With the new development philosophies guiding production anc GCL's growth has been infused with strong fresh impetus.

As the pioneer of Chinese power enterprise of diversified ownership, GCL entered the electric power industry with diversified sources of investment, and created n industrial precedents regarding project construction intensity, technological innovation and operational efficiency. Following the trend of global energy revolution, G promote the transition of electric power business from traditional to distributed and mobile energy, and transform from a generator to an integrated clean energy se As the industry leader of clean energy capacity, GCL clean energy businesses have been growing continuously, with power generation installations of various type thermoelectric, natural gas, PV, wind, biomass and garbage power generations.

In the field of intelligent energy, through the smart integration of Energy Internet and power digitalization that connect power network, heat network, natural gas pip information network, GCL has delivered quick response and interconnected deployment of energy micro-grid and regional energy network, with the support of big platform. By leveraging its advantages in distributed energy, "Six-in-One" micro-grid and integrated control platform of power demand side, GCL has built an energ platform that manages "supply-network-sale-use-cloud" and a digitalized power factory, and taken the lead in expanding incremental network distribution and powe projects are recognized as showcases in new energy micro-grid, incremental power distribution network, multi-energy integrated optimization, and "Internet +" intel

By following closely to the reform of the national power system, actively participating in the ownership diversification of state-owned and central enterprises, and le trend of Energy Internet, GCL has been extending its power business into the service front, transforming itself from a generator into green energy service provider, value co-creator in the connected power network. In the mobile energy and electric service market, GCL sets its footprints in new energy materials and electrocher end lithium-ion materials as the source, and aims to build an international high-end lithium battery industry cluster. It integrates electricity and green travel services cloud technology to carry out integrated operation of charging port, vehicles and electricity, for establishing a new green electric ecosystem.

GCL owns a completely integrated PV industrial chain that covers silicon material, silicon wafer, cell, module, system integration and PV power station developmer It serves as the chairman of the Global Solar Energy Council and the Asian Photovoltaic Industry Association. Relying on GCL's polysilicon production methods an

GCL Sun Charity Foundation

Since its establishment, GCL Gro…

"Since its establishment, GCL Group has never stopped in its philanthropy efforts. Despite in one of the most difficult periods of the global economy, we did not lower our budget for corporate social responsibility because we believe that GCL is crucial to the sustainability development of humanity. GCL will continue to grow with our society."

Chairman of GCL Group
Founder and Honorary Chairman of
GCL Sun Charity Foundation
Zhu Gongshan

proprietary & controllable core technologies, it further lessened the power consumption by 64%, and lowered the cost of polysilicon by 90% in 10 years. The produ and market share of silicon material and wafer maintain industrial leading position for consecutive years. In the field of battery and module manufacturing, since the Chaori Solar in 2014, it took GCL three years to rank top ten in the world. GCL actively implements the parallel path of mono and polycrystalline, and leads the PV technological progress and cost reduction through technological research and innovation, cooperation with domestic and overseas facilities and acquisitions, to pro grid parity.

By leveraging its comprehensive advantages in silicon materials and collaborations with China Integrated Circuit Industry Investment Fund, GCL has undertaken th Major Science and Technology Special Project 02", made its move in the semiconductor and integrated circuit industry by acquiring SunEdison, a high-quality sem silicon material pioneer in the world, and obtained or be authorized 1,481 semiconductor-related patents in total, establishing itself as the only domestic enterprise patents from semiconductor silicon materials to wafers. GCL takes the lead in China in setting up a 5,000-ton electronic-grade polysilicon production line exclusive circuit in 2015, and officially launched electronic-grade polysilicon in November 2017, facilitating the international validation and export of the first batch of high-pur material for integrated circuit in July 2018. It broke the monopoly of foreign technology and market, filled the production gap in domestic semiconductor-level raw m became the first Chinese company to export high-purity silicon materials for integrated circuits to the international market. It is the world's third largest semiconduct material producer after American company Hemlock and German company Wacker. Semiconductor equipment and materials are positioned in the upstream of the industry as necessary tools and materials for the production of semiconductor chips, and the basis of modern semiconductor manufacturing technology. GCL brace respond to the "national mission" and solved the long-standing bottleneck in integrated circuit materials in China, to provide sustainable high-end fundamental mate "China Chip". Simultaneously, it enters into other semiconductor fields including equipment, large silicon wafers, silicon-based electronic specialty gases, etc. to ma breakthroughs.

Echoing the "Belt and Road Initiative" and "Go Global Strategy", internationalization of GCL has taken initial shape. It has set up branches in over 10 countries in A Africa and North America with more than 10 power and manufacturing projects deployed, and developed natural gas industrial chain covering natural gas prospect storage, transport, all the way to the terminal use and service. The Ethiopia-Djibouti Oil & Gas Project, jointly developed by GCL and large central enterprises and institutions, is the largest energy projects in Belt and Road footprints in Africa, and a priority project of capacity cooperation between China & Ethiopia. The project of 117,000 km2 with natural gas resources amounted to 5 trillion m3. The annual LNG output of 10 million tons is planned to be developed in three phases. In June has produced the first barrel of high-quality crude oil. This project has been enlisted as a key project in the Belt and Road Projects Pool by National Development a Commission, and the No. 1 national construction project by Ethiopia and Djibouti, making it the long-term supply base for high-quality clean energy, to bring new in economic and social prosperity of East African countries and the construction of "Beautiful China".

Innovation is the all-time primary driver for GCL. Innovation in management, model, culture and other aspects are driven by its technological innovation. With the G Research Institute and General Design Institute as coordinating bodies, 8 domestic R&D branches as supporting organs, R&D centers in the U.S. and Japan as th points of international research resources, a GCL innovation and research system is now in place. The GCL think-tank consists of 8 academicians from the Chines Sciences. Led by experts from the national Thousand Talents Program and Chinese Academy of Engineering, the research team is made of over 2,500 researcher and abroad working in over 70 R&D facilities, including academician workstations, post-doctoral workstations, internationally certified labs and engineering centers over 3,000 patents and copyrights, leading or participating in the formulation of over 60 sets of international, national and industrial standards, GCL has filled techn and hit international frontier in various areas.

Sticking to corporate social responsibility and persisting in green development, GCL commits itself to the philanthropic course and engages in disaster and poverty actions. Up to now, GCL's donations had amounted to 280 million. Responding to the national call for precise poverty alleviation, GCL takes an active part in PV po projects by investing in PV power station, from which 42,000 poverty-ridden families have benefited. In addition, GCL has built over 200 libraries in the rural area, c and provinces, 200 schools and 20,000 students, donated 150,000 books and travelled more than 20,000 km. GCL annually releases Corporate Social Responsib discloses its economic, environmental and public responsibilities in a spontaneous, timely and complete manner. In 2017, its annual corporate responsibility report five stars, the highest accreditation by Chinese Academy of Social Sciences. The clean energy directly or indirectly produced by GCL greatly reduces raw coal con emission of carbon dioxide and sulfur dioxide. GCL propels to build a beautiful China by living the green, low-carbon, cyclical development vision. With these effort "Philanthropy of Jiangsu" award twice from the Jiangsu Provincial Government.

He who remembers how he started gets to the end. Adhering to the idea that Bringing Green Power to Life and Focusing on green growth for a sustainable improv environments, abiding by the Corporate Spirit of Entrepreneurship, Innovation, Competition, Transcendence, and Core Values of Value-oriented, innovation-driven, collaboration-grounded, with the Fundamental Law as management charter, GCL deepens its corporate reform and accelerates strategic transformation, to ride the characterized by global clean energy development, commercialization of power systems, integration between energy and digitalization and electric transportation. (its responses to the demand side of energy to echo with the supply side reform. GCL pushes its comprehensive transformation forward from "clean energy produce energy integrated service providers" with a market and customer-oriented, technology and capital-driven, talent and industry-based strategy. GCL strives to be a re leading global new and clean energy enterprise, and to realize the GCL Dream - Powerful GCL, Prosperous Staff and Complimented by Society.

GCL Group

Golden Concord Holdings Limited (GCL Group), registered in Hong Kong, is a diversified energy conglomerate that specializes in new and clean energy covering various industrial fields of electric power, PV manufacturing, natural gas, industrial park, integrated circuit materials, mobile energy and new electric ecology.

Golden Concord Holdings Limited GO

EXHIBIT 8

SOLAR FEEDS

Knowledge Base

Top 12 Solar Manufacturers in Vietnam

0

October 6, 2020 8:20 am

The climate of Vietnam is a fascinating thing. Because of the differences in latitude and the marked variety in topographical relief, the country's climate tends to vary greatly for each region. However, even though that is the case, there is still one thing that all the regions share to some extent — and that is all of them do receive massive amounts of sun, with some regions getting more than the others.

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The sunny quality of Vietnam's climate is actually a good sign right now because it means that this country can be a place where the solar industry can thrive. And the solar industry will thrive because there is already a growing demand for renewable energy nowadays and solar is arguably the most popular choice for renewable energy.

In fact, a testament to the rise of the solar industry in Vietnam is the fact that there are currently a number of solar manufacturers in the country. Here are some of the most well-known ones that you can check out.

Allesun New Energy

>> Allesun New Energy | Reviews, product prices, contact, CEO

Incorporated in May 2006, Allesun New Energy is a company that specializes in making solar cells and solar modules, with current capacities being 300mw for solar cells and 500mw for solar modules. The company has its headquarters in San Jose, U.S.A., but it also owns two marketing or sales companies in Canada and the U.S.A. and two manufacturers in Vietnam and India.

Allesun's PV modules are manufactured with the supervision of the ISO90001 standard. As a result, they have obtained TUV/Intertek (IEC CE) and CSA (UL) certificates.

Boviet Solar Technology

>> Boviet Solar Technology | Reviews, product prices, contact, CEO

Boviet Solar Technology Co., Ltd. is a Tier 1 integrated solar cell and module manufacturer with 1 GW annual production capacity. Aside from that, Boviet is also an investor for solar projects worldwide.

Boviet acquires excellent R&D, production, marketing and QC teams, and brings in the highly automatic solar cell and module production lines and inspection facilities from Germany, Spain, Japan, and China. The company's products include high-efficiency monocrystalline and polycrystalline modules, including half-cut cell modules, double glass modules, and shingled cell modules. The products have been certified by CE, TUV, ETL, UL, MCS, and many more. Aside from that, Boviet modules passed the third party reliable tests and were ranked as Top Performer in PV Module Reliability Scorecard by PVEL/DNV GL.

Dehui Solar Power

>> Dehui Solar Power | Reviews, product prices, contact, CEO

Dehui Solar Power Co., Ltd. is an emerging force in the renewable energy industry. The company has been passionate about building a vertical supply chain, including solar cells, PV modules, energy storage systems, and project development to share value for a green future. Backed by production facilities in Vietnam, Dehui serves global customers with excellent products and services. In particular, the company's solar cells and solar modules have a capacity of 1.5GW and 2GW, respectively.

Green Wing Solar Technology

>> Green Wing Solar Technology | Reviews, product prices, contact, CEO

Green Wing Solar Technology Co., Ltd. is a young, active, and developing manufacturer of PV modules. The company is located in Vietnam but is aiming to have the products reach countries all over the world. GW Solar is constantly making effort to provide the best high-efficiency PV products and supreme value-added services to customers, to build up a good corporation focusing on the premium market as well as the low market in terms of maintenance demanding. Additionally, GW Solar's products and solutions are available for residential, commercial and industrial, and ground-mounted.

IREX Energy

IREX Energy Joint Stock Company is a company whose foundation is inherited from SolarBK Group, which is one of the Vietnamese enterprises that specialize in researching and developing the products and solutions using renewable energy. IREX Energy is well-equipped with high automation machinery and modern facilities. In fact, in 2017, IREX Energy expanded the business by investing in a complex high-tech renewable energy factory in Phu My (Ba Ria — Vung Tau Province).

As a result of the company's dedication to well-equipped facilities, IREX Energy is able to manufacture and to provide single solar cells as well as full solutions. IREX Energy's market is not only in Asia but is also in the U.S., the Netherlands, Turkey, Tunisia, and Europe.

Additionally, IREX Energy joined InterSolar in San Francisco (the U.S.A.) in 2016, thus establishing IREX U.S.A. This new company focuses on a one-stop-shop business model, offering not only solar PV models but also providing full-package for PV system solutions in the U.S. market.

Red Sun Energy

>> Red Sun Energy | Reviews, product prices, contact, CEO

Red Sun Energy Joint Stock Company is a joint initiative between Ho Chi Minh City and the Rhone-Alpes region of France, and it is one of the solar companies that has laid the foundations for the Vietnamese solar cell industry.

In 2009, Red Sun started up a factory to produce solar panels in Duc Hoa Industrial Park in the southern province of Long An, Vietnam. The products manufactured in this factory can produce a 5-megawatt peak (MWp) or 4 million kilowatt-hours (kWh) of electricity every year. Additionally, around 40% of the solar panels will be sold on the home market while the rest will be exported to other countries.

Solar Power Vietnam Technology

>> Solar Power Vietnam Technology | Reviews, product prices, contact, CEO

Solar Power Vietnam Technology JSC is one of the leading solar panel manufacturers in Vietnam. In particular, the company produces monocrystalline and polycrystalline solar panels with current capacities that range from 3W to 320W.

Located in the suburban area of Ho Chi Minh City, Vietnam, Solar Power Vietnam makes use of solar cells from Solar World (Germany) and Suniva (the U.S.A.). As a result, the company is able to produce the best quality solar panels for the customers.

Venergy Solar Industry

>> Venergy Solar Industry | Reviews, product prices, contact, CEO

Founded in October 2017 and located in Binh Xuyen II Industrial Park, Binh Xuyen district, Vinh Phuc province, Venergy Solar Industry Co., Ltd. is a company that aims to solve the problem of climate change and develop an advanced solar technology to help achieve their goal. Venergy Solar produces quality-ensured PV modules that are suitable for all system types: residential, commercial, industrial, and utility. The company offers the standard module as well as the Eclipse module, which is a new and innovative PV module that increases efficiency, improves reliability and aesthetics, and reduces BOS cost.

Vietnam Green Energy Technology

>> Vietnam Green Energy Technology | Reviews, product prices, contact, CEO

Established in 2017, Vietnam Green Energy Technology Co., Ltd. is a company that specializes in processing and manufacturing solar panels. The company's factory is over 20,000 m2 in Tien Son Industrial Zone, Bac Ninh Province, Vietnam. VGE's present market focuses on exporting mainly to Europe (Turkey, the Netherlands, England, etc.), North America (Canada and the U.S.A.), and India. The company is also interested in developing a domestic market, including solar power plant projects.

VSUN Solar

>> VSUN Solar | Reviews, product prices, contact, CEO

Invested by Fuji Solar, VSUN Solar is a solar solution provider that offers reliable and high-efficiency solar products and technology globally. The company began operating in Japan in 2006, and it later spreads to North America, Southeast Asia, Europe, the Middle East, and Africa.

VSUN's R&D is based in Tokyo, with sales offices in San Jose (U.S.A.), Frankfurt (Germany), and Shanghai (China), as well as a production base in Bac Giang province (Vietnam) and Zhejiang province (China).

Vina Solar Technology

>> Vina Solar Technology | Reviews, product prices, contact, CEO

Also known as Vietnam Photovoltaic Technology, Co., Ltd., Vina Solar was established in 2014, and in 2016, the supporting Vietnam Battery Technology Co., Ltd. was established to improve the industrial chain layout and further enhance the core competitiveness of the company. Vina Solar's primary products are solar modules and solar cells.

Vina Solar has the PV module design capacity of 4.5GW and the cell design capacity of 1.8GW. As a result, the company's output value is US$1 billion.

Focus Production Trading Service

>> Focus Production Trading Service | Reviews, product prices, contact, CEO

Focus Production Trading Service Co., Ltd. is a solar company that is located in Tan Thanh Ward, Tan Phu District, HCMC. The company's primary products include inverter and charge controllers.

Takeaway

Despite a wide variety of climate conditions in Vietnam, the country is still incredibly rich in sunlight. Because of this, Vietnam is a promising place for the solar industry to thrive.

And the solar industry truly is starting to grow in Vietnam. There are now numerous enterprises that focus on manufacturing high-quality solar products, including solar panels, solar mounts, and other solar accessories, for residential, commercial, and industrial purposes. The twelve companies mentioned above are some of the most well-known solar manufacturers in Vietnam. For that reason, if anyone in Vietnam is interested in going solar, they could do that with no problem at all.

If you reside in Vietnam right now and you want to buy solar products for your home or your workplace, then you should contact the companies mentioned above. They're a good place to begin your solar journey.

Willie Jiang

In the fight against the climate crisis, Willie Jiang believes that content marketing can push the energy revolution along at a faster pace. Having helped countless brands grow their organic traffic by 10X and became the CMO of SolarFeeds.com, he is sharing his insights with the solar energy industry. If you want to publish your articles on SolarFeeds Magazine, click here.

For buyer

How it works

Post a project

Solar supply scout

OEM product inquiry

Book a demo

For supplier

How it works

List your company

Premium listings

Get featured as an expert

Book a demo

Resource

Help & Support (coming)

Blog & SF Magazine

Solar Panel

Solar Inverter

Solar Racking

Solar Battery

Company

About

Investor relation

Contact

Press & Media

Write for us

Careers

Connect with us

is@www.solarfeeds.com

EXHIBIT 9

Ticker Symbol: 601012 Stock Name: LONGi

LONGi Green Energy Technology Co., Ltd.
Annual Report 2020

Kindly reminder: The annual report 2020 in English is for reference only. The Report in Chinese shall prevail in case of any discrepancy between the two versions.

Section I Definitions

I. Definitions

For the purpose of this Report, the following terms shall have the meanings given thereto below unless the context otherwise requires:

Definitions of frequently used terms		
LONGi or the Company	refers to	LONGi Green Energy Technology Co., Ltd., renamed from Xi'an LONGi Silicon Materials Corp. in February 2017
Wuxi LONGi	refers to	Wuxi LONGi Silicon Materials Co., Ltd., a wholly-owned subsidiary of the Company
Yinchuan LONGi	refers to	Yinchuan LONGi Silicon Materials Co., Ltd., a wholly-owned subsidiary of the Company
Ningxia LONGi	refers to	Ningxia LONGi Silicon Materials Co., Ltd., a wholly-owned subsidiary of the Company
LONGi (H.K.)	refers to	LONGi (H.K.) Trading Limited, a wholly-owned subsidiary of the Company
LONGi (Kuching)	refers to	LONGi (Kuching) Sdn. Bhd., a wholly-owned subsidiary of LONGi (H.K.)
Lijiang LONGi	refers to	Lijiang LONGi Silicon Materials Co., Ltd., a wholly-owned subsidiary of the Company
Baoshan LONGi	refers to	Baoshan LONGi Silicon Materials Co., Ltd., a wholly-owned subsidiary of the Company
Chuxiong LONGi	refers to	Chuxiong LONGi Silicon Materials Co., Ltd., a wholly-owned subsidiary of the Company
Huaping LONGi	refers to	Huaping LONGi Silicon Materials Co., Ltd., a wholly-owned subsidiary of the Company
Tengchong LONGi	refers to	Tengchong LONGi Silicon Materials Co., Ltd., a wholly-owned subsidiary of the Company
Qujing LONGi	refers to	Qujing LONGi Silicon Materials Co., Ltd., a wholly-owned subsidiary of the Company
LONGi Solar	refers to	LONGi Solar Technology Co., Ltd., a wholly-owned subsidiary of the Company
Taizhou LONGi Solar	refers to	Taizhou LONGi Solar Technology Co., Ltd., a wholly-owned subsidiary of LONGi Solar
Zhejiang LONGi Solar	refers to	Zhejiang LONGi Solar Technology Co., Ltd., a wholly-owned subsidiary of LONGi Solar
Chuzhou LONGi Solar	refers to	Chuzhou LONGi Solar Technology Co., Ltd., a wholly-owned subsidiary of LONGi Solar
Ningxia LONGi Solar	refers to	Ningxia LONGi Solar Technology Co., Ltd., a wholly-owned subsidiary of LONGi Solar
Yinchuan LONGi Solar	refers to	Yinchuan LONGi Solar Technology Co., Ltd., a wholly-owned subsidiary of LONGi Solar
LONGi Technology (Kuching)	refers to	LONGi Technology (Kuching) Sdn. Bhd., a wholly-owned subsidiary of LONGi Solar
Germany LONGi	refers to	LONGi Solar Technologie GmbH, a wholly-owned subsidiary of the Company
LONGi (U.S.)	refers to	LONGi Solar Technology (U.S.) Inc., a wholly-owned subsidiary of the Company

Jiangsu LONGi Solar	refers to	Jiangsu LONGi Solar Technology Co., Ltd., a wholly-owned subsidiary of LONGi Solar
Xianyang LONGi Solar	refers to	Xianyang LONGi Solar Technology Co., Ltd., a wholly-owned subsidiary of LONGi Solar
Shaanxi LONGi Solar	refers to	Shaanxi LONGi Solar Technology Co., Ltd., a wholly-owned subsidiary of LONGi Solar
Jiaxing LONGi Solar	refers to	Jiaxing LONGi Solar Technology Co., Ltd., a wholly-owned subsidiary of LONGi Solar
Xi’an LONGi Solar	refers to	Xi’an LONGi Solar Technology Co., Ltd., a wholly-owned subsidiary of LONGi Solar
Yinchuan LONGi PV	refers to	Yinchuan LONGi PV Technology Co., Ltd., a wholly-owned subsidiary of the Company
Ningbo EZ	refers to	Ningbo Jiangbei EZ New Energy Technology Co., Ltd., a wholly-owned subsidiary acquired by the Company in July 2020
Vina Cell	refers to	Vina Cell Technology Company Limited, a wholly-owned subsidiary acquired by the Company in July 2020
Vina Solar	refers to	Vina Solar Technology Company Limited, a wholly-owned subsidiary acquired by the Company in July 2020
Datong LONGi Solar	refers to	Datong LONGi Solar Technology Co., Ltd., a wholly-owned subsidiary of LONGi Solar
Clean Energy	refers to	Xi’an LONGi Clean Energy Co., Ltd., a wholly-owned subsidiary of the Company
LONGi New Energy	refers to	Xi’an LONGi New Energy Co., Ltd., a wholly-owned subsidiary of the Company
Longxing New Energy	refers to	Huludao Longxing New Energy Co., Ltd., a wholly-owned subsidiary of Clean Energy
Longle Solar	refers to	Guangzhou Longle Solar Technology Co., Ltd., a wholly-owned subsidiary of LONGi New Energy
Ningde LONGi Solar	refers to	Ningde LONGi Solar Energy Co., Ltd., a wholly-owned subsidiary of LONGi New Energy
Lechang Solar	refers to	Xiangcheng Lechang Solar Energy Co., Ltd., a wholly-owned subsidiary of LONGi New Energy
Jinli New Energy	refers to	Xinyang Jinli New Energy Equipment Co., Ltd., a wholly-owned subsidiary of LONGi New Energy
Xinwei New Energy	refers to	Xuzhou Xinwei New Energy Technology Co., Ltd., a wholly-owned subsidiary of LONGi New Energy
Datong Clean Energy	refers to	LONGi Green & Clean Energy Co., Ltd. in Yunzhou District, Datong City, a wholly-owned subsidiary of Clean Energy
Guangling Clean Energy	refers to	Guangling Longxing Green & Clean Energy Co., Ltd., a wholly-owned subsidiary of Clean Energy
Xuanli Solar	refers to	Hami Liushuquan Xuanli Solar Power Generation Co., Ltd., a wholly-owned subsidiary of Clean Energy
Tongxin LONGi	refers to	Tongxin LONGi New Energy Co., Ltd., a joint stock company of Wuxi LONGi and Ningxia LONGi
LONGi Tianhua	refers to	Zhongning LONGi Tianhua New Energy Co., Ltd., a joint stock company of Ningxia LONGi
Daqing New Energy	refers to	Daqing Huiqing New Energy Co., Ltd., a joint stock company of Clean Energy
Zhongning New	refers to	Zhongning LONGi Solar New Energy Co., Ltd., a joint stock company of

Energy		Clean Energy
Zhaozhou New Energy	refers to	Zhaozhou Longhui New Energy Co., Ltd., a joint stock company of Clean Energy
Pingmei LONGi	refers to	Pingmei LONGi New Energy Technology Co., Ltd., a joint stock company of the Company
Sichuan Yongxiang	refers to	Sichuan Yongxiang New Energy Co., Ltd., a joint stock company of the Company
Tongchuan Xiaguang	refers to	Tongchuan Xiaguang New Energy Power Generation Co., Ltd., a joint stock company of the Company
Yidao New Energy	refers to	Yidao New Energy Technology (Quzhou) Co., Ltd., formerly a joint stock company of the Company, and transferred its equity in September 2020
Yunnan Tongwei	refers to	Yunnan Tongwei High Purity Crystal Silicon Co., Ltd., a joint stock company of the Company
Zhejiang MTCN	refers to	Zhejiang MTCN Technology Co., Ltd., a joint stock company of the Company
LERRI Solar (India)	refers to	LERRI Solar Technology (India) Private Limited, a wholly-owned subsidiary of the Company
Japan LONGi	refers to	LONGi Solar Technology K.K., a wholly-owned subsidiary of the Company
LONGi Venture Capital	refers to	Xi’an LONGi Green Energy Venture Capital Management Co., Ltd., a wholly-owned subsidiary of the Company
LONGi Green Energy Architecture	refers to	Xi'an LONGi Green Energy Architecture Technology Co., Ltd., a wholly-owned subsidiary of LONGi Venture Capital
Ruicheng Lvlong	refers to	Ruicheng Lvlong Clean Energy Co., Ltd., a holding subsidiary of Clean Energy
LONGi Engineering	refers to	LONGi Green Energy Solar Engineering Co., Ltd., a wholly-owned subsidiary of LONGi New Energy
Intelligent Technology	refers to	Xi’an LONGi Intelligent Technology Co., Ltd., a wholly-owned subsidiary of the Company
LONGi (Netherlands)	refers to	LONGi (Netherlands) Trading B.V., a wholly-owned subsidiary of LONGi (H.K.)
Lufeng LONGi	refers to	Lufeng LONGi Silicon Materials Co., Ltd., a wholly-owned subsidiary of the Company
Mono silicon	refers to	A single crystal in which the silicon atoms in the whole silicon crystal are arranged periodically, made of high purity polysilicon and mainly obtained by czochralski technique and float zone process
Wafer	refers to	A square or octagonal slice cut from a mono ingot or poly ingot
Ingot	refers to	A rod-like mono silicon grown from poly silicon by czochralski (CZ) and float zone (FZ), with a morphology of single crystal
Cell	refers to	Solar cell, a device that converts the solar radiant energy into electric energy through semiconductor materials using the principle of photoelectric conversion, also known as a "PV cell"
Module	refers to	The solar module consisting of a plurality of solar power generation units by means of series and parallel connection. Its function is to amplify the solar power generation units with low power into a photoelectric device that can be used alone. With high power, it can be used alone to charge all kinds of batteries, or used in series or parallel as the power generation unit of off-grid or grid-connected solar power supply system
MW	refers to	Megawatt, a unit of power for solar cells, 1 megawatt = 1,000 kilowatts

GW	refers to	Gigawatt, a unit of power for solar cells, 1 gigawatt = 1,000 megawatts
Cell conversion efficiency	refers to	The ratio of the optimum output power of a solar cell to the solar radiant power projected onto its surface
SSE	refers to	Shanghai Stock Exchange
CSRC	refers to	China Securities Regulatory Commission
Company Law	refers to	The *Company Law of the People's Republic of China*
Articles of Association	refers to	The *Articles of Association of LONGi Green Energy Technology Co., Ltd.*
Reporting period	refers to	January 1, 2020 to December 31, 2020
RMB	refers to	RMB Yuan, unless otherwise specified herein

Note: In this Report, any discrepancy between the sum of sub-items and the mantissa of the total is caused by rounding.

Section II Company Profile and Key Financial Indicators

I. Company Information

Legal name in Chinese	隆基绿能科技股份有限公司
Abbreviated name in Chinese	隆基股份
Legal name in English	LONGi Green Energy Technology Co., Ltd.
Abbreviated name in English	LONGi
Legal Representative	Li Zhenguo

II. Contacts and Contact Details

	Board Secretary	Representative of Securities Affairs
Name	Liu Xiaodong	Wang Hao
Contact address	No. 8369 Shangyuan Road, Economic and Technological Development Zone, Xi'an	No. 8369 Shangyuan Road, Economic and Technological Development Zone, Xi'an
Tel	029-81566863, 029-86519912	029-81566863, 029-86519912
Fax	029-86689601	029-86689601
E-mail	longi-board@longigroup.com	longi-board@longigroup.com

III. Basic Information

Registered address	No. 388 Middle Aerospace Road, Chang'an District, Xi'an
Postal code	710100
Office address	No. 8369 Shangyuan Road, Economic and Technological Development Zone, Xi'an
Postal code	710018
Website	http://www.longigroup.com
E-mail	longi-board@longigroup.com

IV. Information Disclosure and Location for Annual Report Collection

Name of media selected by the Company for information disclosure	China Securities Journal, Shanghai Securities News, Securities Times, and Securities Daily
Website designated by CSRC for publishing the Annual Report	www.sse.com.cn
Location for Annual Report collection	Office of the Board of Directors

V. Company's Stock

The Company's stock				
Class of stock	Listing exchange	Stock name	Ticker symbol	Abbreviated name before change
A-share	Shanghai Stock Exchange	LONGi	601012	N/A

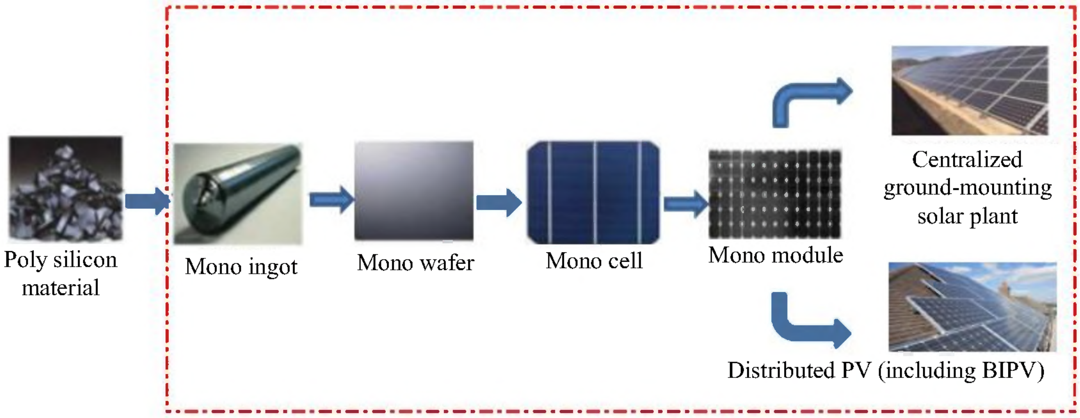
VI. Other Related Information

Accounting firm engaged by the Company (domestic)	Name	PwC Zhongtian Certified Public Accountants (Special General Partnership)
	Office address	11/F, PwC Center, Tower 2, Link Square, No. 202 Hubin Road, Huangpu District, Shanghai
	Name of signatory	Zhang Jiayan and Han Tao

Section III Overview of the Company's Business

I. Principal Business and Operation Mode of the Company and Industry Situation during the Reporting Period

The Company is committed to driving the transition of low-carbon energy, long focused on providing global customers with high-efficiency mono solar power generation solutions, and mainly specialized in the R&D, production and sales of mono ingots, wafers, cells and modules, in an effort to provide product and system solutions to development of centralized ground-mounting solar power systems and distributed roof-top solar power systems. At present, the Company's production bases of mono ingots and wafers are mainly concentrated in Shaanxi (Xi'an), Ningxia (Yinchuan, Zhongning), Yunnan (Lijiang, Baoshan, Qujing, Chuxiong), Jiangsu (Wuxi) and Malaysia (Kuching); mono cell production bases mainly in Shaanxi (Xi'an), Ningxia (Yinchuan), Jiangsu (Taizhou), Malaysia (Kuching) and Vietnam (Bac Giang); and module production bases mainly in Anhui (Chuzhou), Zhejiang (Quzhou and Jiaxing), Jiangsu (Taizhou), Shaanxi (Xi'an and Xianyang), Shanxi (Datong), Malaysia (Kuching) and Vietnam (Bac Giang). It offers PV solar plant development and system solutions in many places at home and abroad. During the reporting period, the principal business and operation model did not change significantly compared with a year earlier. The position of the principal business and products in the PV industry chain is as shown below:



Note: The red box in the figure above shows the Company's business scope in the industrial chain.

The PV industry during the reporting period has been elaborated in the "Discussion and Analysis of Business Situation", as detailed in Section IV of this Report.

II. Notes to Material Changes in the Company's Major Assets during the Reporting Period

√ Applicable □ Not Applicable

See "II (III) Analysis of assets and liabilities" in Section IV of this Report for details.

The foreign assets are RMB 15.920 billion, accounting for 18.17% of the total assets.

III. Analysis of Core Competitiveness during the Reporting Period

√ Applicable □ Not Applicable

(I) Forward-looking strategic planning and high-efficiency strategy implementation capabilities

LONGi's core management has long been engaged in and had an insight into the PV industry and mono field, in possession of forward-looking strategic planning capability. In 2006, LONGi has, after in-depth analysis on technical routes in the PV industry, chosen the most potential mono route for minimized LCOE as its specialization, and centralized the resources, long engaged in the R&D, production and sales of mono products, and made innovative breakthroughs in a number of mono PV technology nodes. Led by LONGi, the market share of mono products has increased rapidly in the and high-efficiency products and services to the market, LONGi has accelerated the pace of production capacity construction to ensure the market supply of mono products, pursued the increase of market share, and realized the rapid growth of business performance. During the reporting period, LONGi achieved an operating revenue of RMB 54.583 billion, up 65.92% year on year; the net profit attributable to the parent company reached RMB 8.552 billion, up 61.99% year on year; basic EPS was RMB 2.27, a year-on-year rise of 54.42%; the weighted average return on equity after deducting non-recurring profit or loss was 25.93%, an increase of 2.84 percentage points, and the net cash flow from operating activities was RMB 11.015 billion, up 35.02% year on year. In 2020, we have mainly done the following:

(I) Deepened the globalization strategy and implemented global operations effectively

During the reporting period, LONGi continued to advance the globalization strategy and facilitate the effective implementation of global operations. The annual overseas revenue was RMB 21.461 billion, up 70% year on year. In 2020, LONGi deepened the capacity building of global sales organization, further promoted the localization and echelon of talents, deepened the principle of localized management, empowered to stimulate the organizational vitality, further expanded the overseas sales areas, and significantly increased the market share in key countries and regions; in terms of overseas production capacity construction, LONGi acquired Ningbo EZ, enhanced the technical transformation and efficiency improvement of the bases in Malaysia and Vietnam, and effectively guaranteed the production capacity supply in the overseas market.

(II) Adhered to the customer value-oriented product strategy and solutions, and increased rapidly the market share of mono products

During the reporting period, with the core of enhancing customer values and relying on the quality, cost and brand advantages, LONGi effectively met customers' market demand for mono products. The sales of main products (i.e., mono wafers and modules) increased significantly over the same period last year, bringing steady growth of operating revenue and profit. In 2020, LONGi achieved the shipments of 58.15GW mono wafers, including the external sales of 31.84GW, a year-on-year increase of 25.65%, and 26.31GW for self-use; the shipments of mono modules were 24.53GW, including the external sales of 23.96GW, up 223.98% year on year, and 0.57GW for self-use. In addition, LONGi- continued to improve its EPC system development capability, completed the promotion and marketing of BIPV products, named "LONGi Roof". In 2020, LONGi reached a strategic cooperation agreement with-large energy groups, implemented differentiated marketing strategies for different markets, enhanced the customer communication with product and brand advantages, and rapidly increased the market share of module products; it strengthened the supply capacity of raw and auxiliary materials and the guarantee of production capacity, giving priority to ensuring the performance capacity of order delivery; besides, it kept expanding the advantages of product performance, quality consistency and stability, so that brand advantage and product premium ability were highlighted. In 2020, the global market share of LONGi's module products was about 19%, a significant increase of 11 percentage points from 2019. Led by LONGi, the global market share of mono products has increased rapidly, and mono products have replaced poly ones. The market share of mono products has risen to 90.2% in 2020, an increase of more than 20 percentage points from 2019, according to the *2020 China PV Industry Development Roadmap* released by the China Photovoltaic Industry Association (CPIA).

(III) Continuously implemented the product leadership strategy, and achieved remarkable results in the product and service upgrades

In 2020, LONGi continued to deepen the product leadership strategy, create value for customers, lead the technological innovation with high targets, constantly promote the reduction of product costs as well as the efficiency and quality improvement, maintain high R&D inputs, and introduce the high value results into mass production, with sufficient reserves of new products and technologies. By the end of the reporting period, LONGi had obtained a total of 1,001 issued patents and invested RMB 2.592 billion in R&D, accounting for 4.75% of its operating revenue. In terms of ingot pulling and

(V) Investment analysis

1. General analysis of equity investments in external entities

√ Applicable □ Not Applicable

With the advent of grid parity, plus the positive policy for carbon neutrality in various countries, the market demand of the PV industry will enter a new stage of rapid development. During the reporting period, LONGi promoted steadily the implementation of high-efficiency capacity expansion projects in each link, and increased the layout of high-efficiency mono cell capacity. In addition, to further improve the layout of overseas capacity, LONGi acquired Vina Cell and Vina Solar in July 2020 to consolidate its competitiveness in the global market.

(1) Significant equity investment

√ Applicable □ Not Applicable

On June 30, 2020, LONGi signed a *Share Purchase Agreement* with Wang Zhaofeng, Yang Yongzhi, Zhao Xuewen and Ningbo Chaofang Industrial Investment Partnership (Limited Partnership), under which LONGi purchased 100% of the equity of Ningbo EZ in cash, at the benchmark price of RMB 1.78 billion. Depending on their performance, the performance commitment companies (Target Company and its subsidiaries, sub-subsidiaries, joint stock companies) should pay the floating consideration or performance-based compensation to LONGi. The equity delivery of the underlying assets was completed on July 31, 2020 (please refer to LONGi's Announcement No. L2020-070 on July 1, 2020 for details). The target production base acquired is located in Vietnam, which further improved LONGi's global capacity layout.

(2) Significant non-equity investment

√ Applicable □ Not Applicable

S/N	Description	Sponsor	Estimated total investment approved by competent authorities (RMB Hundred Million)	Project progress	Source of funds
1	5GW High-efficiency Mono Module Project of Chuzhou LONGi Solar	Chuzhou LONGi Solar	22.62	Fully put into production	Raised funds + self-pooled funds
2	5GW High-efficiency Mono Cell Project of Ningxia LONGi Solar	Ningxia LONGi Solar	30.5	Fully put into production	Raised funds + self-pooled funds
3	6GW Mono Ingot Project (Phase II) of Baoshan	Baoshan LONGi	17.49	Fully put into production	Self-pooled funds
4	6GW Mono Ingot Project (Phase II) of Lijiang	Huaping LONGi	19.37	Fully put into production	Self-pooled funds
5	10GW Mono Wafer Project (Phase II) of Chuxiong	Chuxiong LONGi	14.86	Fully put into production	Self-pooled funds
6	1.25GW Mono Cell Project of Kuching	LONGi Technology (Kuching)	9.57	Fully put into production	Self-pooled funds

7	15GW Mono Ingot and Wafer Project of Yinchuan	Yinchuan LONGi PV	45.86	Fully put into production	Raised funds + self-pooled funds
8	5GW Mono Module Project of Taizhou	Jiangsu LONGi Solar	17.9	Fully put into production	Self-pooled funds
9	5GW Mono Module Project of Xianyang	Xianyang LONGi Solar	18.39	Fully put into production	Self-pooled funds
10	5GW Mono Module Project (Phase II) of Chuzhou	Chuzhou LONGi Solar	20.21	Fully put into production	Self-pooled funds
11	5GW Mono Cell Project of Xi'an Jingwei New Town	Shaanxi LONGi Solar	24.62	Fully put into production	Raised funds + self-pooled funds
12	5GW Mono Module Project of Jiaxing	Jiaxing LONGi Solar	19.48	Fully put into production	Self-pooled funds
13	10GW Mono Ingot Project of Tengchong	Tengchong LONGi	18.37	Partially put into operation	Self-pooled funds
14	7.5GW Mono Cell Project (Phase I) of Xi'an Aerospace Base	Xi’an LONGi Solar	32.26	Fully put into production in the Q1 2021	Self-pooled funds
15	10GW Mono Ingot and Wafer Project of Qujing	Qujing LONGi	23.27	Partially put into operation	Self-pooled funds
16	3GW Mono Cell Project of Ningxia LONGi Solar	Ningxia LONGi Solar	13.97	Under construction and expected to be put into production in Q4 2021	Raised funds (note) + self-pooled funds

Note: The *Proposal on the Closing of Investment Projects Raised by Rights Offering in 2018 and the Use of the Carryover and Surplus Funds for New Projects and Permanent Replenishment of Working Capital* were passed at the 20th Meeting of the Fourth Board of Directors in 2020 and the First Extraordinary General Meeting in 2021. It's hereby agreed to invest RMB 1.2 billion of surplus funds from 5GW High-efficiency Mono Cell Project of Ningxia LONGi Solar in the construction of 3GW Mono Cell Project of Ningxia LONGi Solar, and the remaining RMB 16.98882 million for the permanent replenishment of working capital.

(3) Financial assets measured at fair value

√ Applicable □ Not Applicable

See "XI. Disclosure of Fair Value" in Section XI of this Report for details.

(VI) Sales of material assets and equities

□ Applicable √ Not Applicable

(VII) Analysis of major holding and joint-stock companies

√ Applicable □ Not Applicable

1. Major holding subsidiaries

Unit: RMB Ten Thousand

Name	Principal business	Registered capital	Total assets	Net assets	Operating revenue	Operating profit	Net profit

Ningxia LONGi	Manufacturing and sales of ingots	25,000	273,134.82	162,893.32	185,455.55	49,579.34	43,742.21
Huaping LONGi	Manufacturing and sales of ingots	30,000	156,617.99	89,824.21	287,578.85	70,966.10	60,486.87
Yinchuan LONGi	Manufacturing and sales of ingots and wafers	100,000	774,700.65	661,170.46	794,724.08	193,270.75	170,664.31
Wuxi LONGi	Manufacturing and sales of wafers	20,000	114,700.04	99,558.74	45,560.20	3,153.27	1,491.41
Lijiang LONGi	Manufacturing and sales of ingots	80,000	200,213.43	138,963.45	307,392.75	60,878.24	51,840.17
Baoshan LONGi	Manufacturing and sales of ingots	100,000	414,346.59	281,332.68	597,271.34	146,429.55	124,765.13
Chuxiong LONGi	Manufacturing and sales of wafers	50,000	372,355.03	195,606.54	1,063,717.92	118,796.57	101,277.17
Yinchuan LONGi PV	Manufacturing and sales of ingots and wafers	5,000	609,055.25	377,659.49	271,966.79	38,471.63	34,965.34
LONGi Solar	Manufacturing and sales of PV cells and modules	200,000	3,686,980.35	996,583.94	3,334,038.32	-13,401.88	-2,345.15
LONGi New Energy	Development and operation of PV distributed solar plants	140,000	369,115.55	177,447.82	95,145.05	15,572.39	13,115.98
Clean Energy	Development and operation of PV centralized solar plants	50,000	434,326.25	202,584.83	120,098.59	66,729.08	57,021.61
LONGi (H.K.)	Import & export of mono silicon and polysilicon raw materials and products	HKD 779 million	485,538.66	221,802.69	678,209.17	20,771.59	20,743.52
LONGi (Kuching)	Manufacturing and sales of ingots, wafers, cells and modules	MYR 978.162 million	217,043.67	170,100.81	180,720.92	18,740.46	15,761.96
Vina Cell	Manufacturing and sales of PV cells	USD 68.4357 million	217,215.24	136,542.19	138,796.47	22,946.17	22,263.86
Vina Solar	Manufacturing and sales of PV modules	USD 91.0193 million	185,341.52	82,670.31	87,241.27	8,628.62	7,123.95

Notes: ① Allowing for many subsidiaries, the financial data of LONGi Solar, Clean Energy and New Energy shall be presented in the consolidated statements, and other companies in the individual statements.

② Vina Cell and _Vina Solar have been incorporated into the consolidated statements of the Company since August 2020, and their operating revenue, operating profit and net profit are the totals from August to December 2020.

2. Major joint stock companies

Unit: RMB Ten Thousand

Name	Principal business	Shareholding	Registered capital	Total assets	Net assets	Net profit
Zhongning	Solar energy development and	30%	30,000	148,349.84	38,955.73	19.32

New Energy	investment					
Tongxin LONGi	Investment & development of energy projects, and operation management of power projects	49%	15,952	74,412.67	34,524.89	2,297.82
Sichuan Yongxiang	Manufacturing and sales of non-metallic mineral products and PV equipment components	15%	280,000	486,615.74	191,618.14	52,239.95
Pingmei LONGi	Production and sales of cells and modules	19.8%	90,000	259,485.21	122,772.33	12,694.90
Tongchuan Xiaguang	Development and operation of PV power - projects	51%	43,000	176,193.71	54,060.14	8,842.92
Daqing New Energy	Development, investment, construction and operation of PV power -projects	30%	13,246	76,705.28	24,840.68	3,158.38
Zhaozhou New Energy	Development, investment and construction of PV power - projects	30%	11,841	64,048.04	17,229.59	2,396.88

Note: The Company holds 51% of shares in Tongchuan Xiaguang, but has no control over Tongchuan Xiaguang according to the Articles of Association, and thus not included in the consolidated range.

(VIII) Structured entities controlled by the Company

□ Applicable √ Not Applicable

III. Discussion and Analysis on the Company's Future Development

(I) Industry structure and trend

√ Applicable □ Not Applicable

1. Competitive landscape

In 2020, the market competition among PV enterprises was increasingly fierce, subject to the pandemic and the prominent contradiction between supply and demand in the industrial chain. Major vendors have basically listed, with market share concentrated quickly to leading quality enterprises. PV enterprises have presented complementary coexistence of vertical integration and specialization in local fields, evidenced by constantly emerging new techniques and accelerated product upgrading. In the context of the certainty of PV industry demand and energy transition, a number of enterprises have successively launched huge capacity expansion plans, and more and more enterprises outside the industry have poured into the PV industry, thus keeping the future market competition increasingly fierce. The major competitive landscape is as follows:

(1) With the rapid improvement of industry concentration and the obvious differentiation of market profitability, the comprehensive competitiveness of enterprises will become the focus of attention

With the rapid technological progress and intensified market competition in the industry, the "Matthew Effect" is obvious in the PV industry, giving rise to the market polarization. Relying on talents, capital, technology, scale, brand, supply chain management and other advantages, leading enterprises are always able to maintain a high rate of capacity utilization and profitability, so that they may have the capability of continuous R&D investment and equipment upgrading, improve constantly their competitive edges and market shares, and present a significant siphonic effect of talents, thus forming a virtuous cycle. In contrast, enterprises with weak competitiveness cannot keep up with the pace of technological progress in the industry, and meantime are lack of funds for technological upgrading or equipment renewal, thus gradually losing competitiveness and falling into business difficulties, and finally phasing out of the market. In this way, the concentration ratio has been constantly increased. In recent years, the improved concentration of industrial chains has proved the formation of the above competitive pattern, as shown in the figure below:

3. Matters not disclosed in the interim announcement

√ Applicable □ Not Applicable

Unit: Yuan Currency: RMB

Counterparty	Affiliated relation	Type	Contents of related party transaction	Pricing principle	Price	Amount	Proportion in the similar transaction amount (%)	Settlement way	Market price	Reasons for great differences between transaction price and market reference price
Dalian Linton NC Machine Co., Ltd.	Others	Purchasing of goods	Production equipment	Reference market price	/	1,368,036,459.23	13.51	Cash transaction	/	Not applicable
Sichuan Yongxiang New Energy Co., Ltd.	Others	Purchasing of goods	Poly silicon material	Reference market price	/	1,307,765,734.50	11.35	Cash transaction	/	Not applicable
Pingmei LONGi New Energy Technology Co., Ltd.	Others	Purchasing of goods	Outsourced processing of cells	Reference market price	/	1,106,844,550.38	35.50	Cash transaction	/	Not applicable
Linton Kayex Technology Co., Ltd.	Others	Purchasing of goods	Production equipment	Reference market price	/	766,584,070.18	7.57	Cash transaction	/	Not applicable
Yingkou Jinchen Machinery Co., Ltd.	Others	Purchasing of goods	Production equipment	Reference market price	/	104,561,940.24	1.03	Cash transaction	/	Not applicable
Shenyang LONGi Electromagnetic Technology Co., Ltd.	Others	Purchasing of goods	Production equipment	Reference market price	/	44,402,592.80	0.44	Cash transaction	/	Not applicable
Shanghai Fuchuan Intelligent Technology Co., Ltd.	Others	Purchasing of goods	Production equipment	Reference market price	/	41,301,942.83	0.41	Cash transaction	/	Not applicable
Dalian Weikaite Technology Co., Ltd.	Others	Purchasing of goods	Production equipment	Reference market price	/	30,361,238.95	0.30	Cash transaction	/	Not applicable
Sichuan Yongxiang New Energy Co., Ltd.	Others	Purchasing of goods	Spare parts	Reference market	/	30,203,469.02	3.44	Cash transaction	/	Not applicable

				price						
Yidao New Energy Technology (Quzhou) Co., Ltd.	Others	Purchasing of goods	Cell	Reference market price	/	14,539,470.18	0.47	Cash transaction	/	Not applicable
Dalian Linton NC Machine Co., Ltd.	Others	Purchasing of goods	Spare parts	Reference market price	/	2,638,520.27	0.30	Cash transaction	/	Not applicable
Ningxia Zhongjing Semiconductor Materials Co., Ltd.	Others	Purchasing of goods	Poly silicon material	Reference market price	/	2,547,590.45	0.02	Cash transaction	/	Not applicable
Shenyang LONGi Electromagnetic Technology Co., Ltd.	Others	Purchasing of goods	Spare parts	Reference market price	/	2,075,740.46	0.24	Cash transaction	/	Not applicable
Bao Grid Shanghai Energy Technology Co., Ltd.	Others	Purchasing of goods	Others	Reference market price	/	918,875.13	0.18	Cash transaction	/	Not applicable
Ningxia Zhongjing Semiconductor Materials Co., Ltd.	Others	Purchasing of goods	Spare parts	Reference market price	/	736,968.68	0.08	Cash transaction	/	Not applicable
United Nations Quality Detection Group Co., Ltd.	Others	Receiving of labor services	Testing services	Reference market price	/	343,962.26	0.07	Cash transaction	/	Not applicable
Shanghai Fuchuan Intelligent Technology Co., Ltd.	Others	Purchasing of goods	Spare parts	Reference market price	/	146,643.54	0.02	Cash transaction	/	Not applicable
Suzhou Yingzhen Intelligent Technology Co., Ltd.	Others	Purchasing of goods	Spare parts	Reference market price	/	31,465.49	0.00	Cash transaction	/	Not applicable
Yingkou Jinchen Machinery Co., Ltd.	Others	Purchasing of goods	Spare parts	Reference market price	/	13,800.39	0.00	Cash transaction	/	Not applicable
Tongchuan Xiaguang New Energy Power Generation Co., Ltd.	Others	Sales of goods	Solar plant construction and services	Reference market price	/	152,440,125.26	11.50	Cash transaction	/	Not applicable
Datong Xinrong Oulong Clean Energy Co., Ltd.	Others	Sales of goods	Solar plant construction and services	Reference market price	/	135,383,317.76	10.22	Cash transaction	/	Not applicable
Hunyuan Chenglong Clean Energy Co., Ltd.	Others	Sales of goods	Solar plant construction and	Reference market	/	121,215,174.60	9.15	Cash transaction	/	Not applicable

			services	price						
Pingmei LONGi New Energy Technology Co., Ltd.	Others	Sales of goods	Wafer	Reference market price	/	107,709,341.06	0.76	Cash transaction	/	Not applicable
Yidao New Energy Technology (Quzhou) Co., Ltd.	Others	Sales of goods	Wafer	Reference market price	/	59,069,925.77	0.42	Cash transaction	/	Not applicable
Pingmei LONGi New Energy Technology Co., Ltd.	Others	Sales of goods	Module	Reference market price	/	38,041,096.53	0.11	Cash transaction	/	Not applicable
Ningxia Zhongjing Semiconductor Materials Co., Ltd.	Others	Sales of goods	Utilities	Reference market price	/	11,625,763.72	1.43	Cash transaction	/	Not applicable
Trina Solar (Vietnam) Science&Technology Co., Ltd.	Others	Sales of goods	Others	Reference market price	/	4,708,934.91	0.58	Cash transaction	/	Not applicable
Linton Kayex Technology Co., Ltd.	Others	Sales of goods	Module	Reference market price	/	2,509,503.12	0.01	Cash transaction	/	Not applicable
Linton Kayex Technology Co., Ltd.	Others	Sales of goods	Solar plant construction and services	Reference market price	/	1,817,592.30	0.14	Cash transaction	/	Not applicable
Xi'an Zhongjing Semiconductor Materials Co., Ltd.	Others	Sales of goods	Utilities	Reference market price	/	1,284,878.95	0.16	Cash transaction	/	Not applicable
Pingmei LONGi New Energy Technology Co., Ltd.	Others	Sales of goods	Technical services	Reference market price	/	1,082,379.51	0.13	Cash transaction	/	Not applicable
Sichuan Yongxiang New Energy Co., Ltd.	Others	Sales of goods	Square silicon core	Reference market price	/	619,469.03	0.08	Cash transaction	/	Not applicable
Ningxia Zhongjing Semiconductor Materials Co., Ltd.	Others	Sales of goods	Others	Reference market price	/	473,373.26	0.06	Cash transaction	/	Not applicable
Sichuan Yongxiang New Energy Co., Ltd.	Others	Sales of goods	Others	Reference market price	/	249,666.62	0.03	Cash transaction	/	Not applicable
Xi'an Zhongjing Semiconductor Materials Co., Ltd.	Others	Sales of goods	Others	Reference market	/	198,514.22	0.02	Cash transaction	/	Not applicable

				price						
Zhaozhou Longhui New Energy Co., Ltd.	Others	Sales of goods	Module	Reference market price	/	126,159.29	0.00	Cash transaction	/	Not applicable
Dalian Linton NC Machine Co., Ltd.	Others	Sales of goods	Auxiliary materials	Reference market price	/	88,495.58	0.01	Cash transaction	/	Not applicable
Dalian Linton NC Machine Co., Ltd.	Others	Sales of goods	Others	Reference market price	/	67,141.94	0.01	Cash transaction	/	Not applicable
Xinyi Zhongda Energy Saving Technology Co., Ltd.	Others	Sales of goods	Solar plant construction and services	Reference market price	/	20,047.17	0.00	Cash transaction	/	Not applicable
Shenyang LONGi Electromagnetic Technology Co., Ltd.	Others	Sales of goods	Others	Reference market price	/	1,800.00	0.00	Cash transaction	/	Not applicable
Linton Kayex Technology Co., Ltd.	Others	Sales of goods	Others	Reference market price	/	1,760.00	0.00	Cash transaction	/	Not applicable
Shanghai Fuchuan Intelligent Technology Co., Ltd.	Others	Sales of goods	Others	Reference market price	/	1,480.00	0.00	Cash transaction	/	Not applicable
Ningxia Zhongjing Semiconductor Materials Co., Ltd.	Others	Rendering of services	Housing	Reference market price	/	1,768,217.36	0.22	Cash transaction	/	Not applicable
Ningxia Zhongjing Semiconductor Materials Co., Ltd.	Others	Rendering of services	Equipment	Reference market price	/	56,952.00	0.01	Cash transaction	/	Not applicable
Total				/	/	5,464,616,144.94	/	/	/	/
Details of large sales returns					N/A					
Description of related party transactions					The aforesaid related party transactions facilitate the development and execution of the Company's daily business and meet the objective needs of normal production & operation and capacity expansion, without any damage to the interests of the Company and other shareholders, especially minority stockholders, nor impacts on the independence of the Company and dependence on related parties.					

(3) Provision for impairment of entrusted asset management

□ Applicable √ Not Applicable

2. Entrusted loans

(1) Overall situation

□ Applicable √ Not Applicable

Others

□ Applicable √ Not Applicable

(2) Individual situation

□ Applicable √ Not Applicable

Others

□ Applicable √ Not Applicable

(3) Provision for impairment

□ Applicable √ Not Applicable

3. Others

□ Applicable √ Not Applicable

(IV) Other material contracts

√ Applicable □ Not Applicable

(1) Progress of material contracts for daily operations disclosed by the Company as of the end of the reporting period

S/N	Contract type	Contents	Name of contracting parties	Contract performance period	Number of contracts	Date of signing	Progress
1	Long-term purchase contract	Silicon material procurement	The Company, Yinchuan LONGi, Lijiang LONGi, and Ningxia LONGi etc.; OCI Company Ltd. and its subsidiary OCIM Sdn. Bhd.	March 2018 to February 2021	64,638t	2018-2-5	Executed as of the disclosure date of this Report
2	Long-term purchase contract	Silicon material procurement	Yinchuan LONGi, Ningxia LONGi, Lijiang LONGi, and Huaping LONGi etc.; Xinjiang Daqo New Energy Co., Ltd.	January 1, 2020 to December 31, 2022	112,800t	2019-8-6	In progress
3	Long-term purchase contract	Silicon material procurement	Yinchuan LONGi, Ningxia LONGi, and Lijiang LONGi etc.; Sichuan Yongxiang Co., Ltd., Sichuan Yongxiang Poly-Silicon Co., Ltd. and Inner Mongolia Tongwei Silicon Co., Ltd.	May 2018 to December 2020	55,000t	2018-5-22	Executed
4	Long-term purchase contract	Silicon material procurement	Yinchuan LONGi, Ningxia LONGi, and Lijiang LONGi etc.; Xinte Energy Co., Ltd., Xinjiang Xinte Crystal Silicon Technology Co., Ltd.	January 2019 to December 2021	91,080t	2018-7-27	The procurement amount for 2019-2020 has been completed, and the procurement amount for

							2021 shall be implemented in accordance with the long-term order framework contract in Item 5 of this table
5	Long-term purchase contract	Silicon material procurement	Yinchuan LONGi, Ningxia LONGi, Lijiang LONGi, Huaping LONGi, Yinchuan LONGi, Qujing LONGi, and Tengchong LONGi etc.; Xinte Energy Co., Ltd.	January 2021 to December 2025	Not less than 270,000t	2020-12-14	Executed in 2021
6	Long-term purchase contract	Glass procurement	LONGi Solar, Zhejiang LONGi Solar, Taizhou LONGi Solar, Yinchuan LONGi Solar, Chuzhou LONGi Solar, Datong LONGi Solar, LONGi (H.K.), and LONGi (Kuching); Flat Glass Group Co., Ltd., Anhui Flat Solar Glass Co., Ltd., Zhejiang Jiafu Glass Co., Ltd., and Flat Glass (Vietnam) Co., Ltd.	July 1, 2019 to December 31, 2021	161,600,000m^2	2019-5-15	The procurement amount for 2019-2020 has been completed, and the procurement amount for 2021 shall be implemented in accordance with Item 7 of this table
7	Long-term purchase contract	Glass procurement	LONGi Solar, Zhejiang LONGi Solar, Taizhou LONGi Solar, Jiangsu LONGi Solar, Chuzhou LONGi Solar, Xianyang LONGi Solar, Jiaxing LONGi Solar, Yinchuan LONGi Solar, Datong LONGi Solar, LONGi Green Energy Architecture, LONGi (H.K.), LONGi (Kuching), and Vina Solar; Flat Glass Group Co., Ltd., Anhui Flat Solar Glass Co., Ltd., Zhejiang Jiafu Glass Co., Ltd., Flat Glass (Vietnam) Co., Ltd. and Flat Glass (Hong Kong) Co., Ltd.	February 8, 2021	123,780,000m^2 to be purchased in 2021, and 46GW modules to be purchased from 2022 to 2023	February 8, 2021	Executed in 2021
8	Long-term purchase contract	Glass procurement	LONGi Solar, Zhejiang LONGi Solar, Taizhou LONGi Solar, Yinchuan LONGi Solar, Chuzhou LONGi Solar, Datong LONGi Solar, LONGi (H.K.), and LONGi (Kuching); IRICO Group New Energy Company Limited and IRICO (Hefei) Photovoltaic Co., Ltd.	July 3, 2019 to December 31, 2021	68,500,000m^2	2019-7-3	In progress
9	Long-term	PV	LONGi Solar, Zhejiang	Q3 2019 to	47.1 million	2019-7-22	Due to

	purchase contract	aluminum frame	LONGi Solar, Taizhou LONGi Solar, Yinchuan LONGi Solar, Chuzhou LONGi Solar, Datong LONGi Solar, LONGi (H.K.), and LONGi (Kuching); Jiangsu Akcome Science & Technology Co., Ltd.	Q4 2021	sets		business changes of the other party, the two parties negotiated to terminate this contract in April 2020. The actual quantity was 8.33 million sets
10	Long-term purchase contract	PV aluminum frame	LONGi Solar, Zhejiang LONGi Solar, Taizhou LONGi Solar, Yinchuan LONGi Solar, Chuzhou LONGi Solar, Datong LONGi Solar, LONGi (H.K.), and LONGi (Kuching); Yingkou Changtai Aluminum Co., Ltd.	Q3 2019 to Q4 2021	49,700,000 sets	2019-7-22	In progress
11	Long-term purchase contract	Glass procurement	LONGi Solar, Zhejiang LONGi Solar, Taizhou LONGi Solar, Yinchuan LONGi Solar, Chuzhou LONGi Solar, Datong LONGi Solar, LONGi (H.K.), LONGi (Kuching), Xianyang LONGi Solar, Jiangsu LONGi Solar, Jiaxing LONGi Solar, and LONGi Green Energy Architecture; Wujiang CSG Glass Co., Ltd. and Dongguan CSG Solar Glass Co., Ltd.	July 31, 2020 to July 31, 2025	Estimated to be about RMB 5.7 billion at the market price when the contract is signed	2020-7-31	In progress
12	Long-term purchase contract	Silicon material procurement	Yinchuan LONGi, Ningxia LONGi, and Yinchuan LONGi PV etc.; Asia Silicon (Qinghai) Co., Ltd.	September 1, 2020 to August 31, 2025	124,800t	2020-8-18	In progress
13	Long-term sales contract	Wafer sales	LONGi; Vina Cell Technology Company Limited, Shanghai EZ New Energy Technology Co., Ltd.	January 2019 to December 2021	1.31 billion	2019-7-15	In July 2020, the Company acquired 100% of the equity of the counterparty, and the related transactions were transformed into those between subsidiaries
14	Long-term sales contract	Wafer sales	LONGi and Shanxi Lu'an Solar Technology Co., Ltd.	January 2020 to December 2022	2.1 billion	2019-8-9	In progress
15	Long-term sales contract	Wafer sales	LONGi; Chint New Energy Technology (Haining) Co., Ltd.,	January 2020 to December	660 million	2019-9-9	In progress

			Zhejiang CHINT Solar Technology Co., Ltd. and Hangzhou Mintai Import and Export Trading Co., Ltd.	2022			
16	Long-term sales contract	Wafer sales	LONGi and Jolywood (Taizhou) Solar Technology Co., Ltd.	January 2020 to December 2022	800 million	2019-9-16	In progress
17	Long-term sales contract	Wafer sales	LONGi and Jiangsu Runergy New Energy Technology Co., Ltd.	January 1, 2020 to December 31, 2022	3.82 billion	2020-1-10	In progress
18	Long-term sales contract and supplementary contract	Wafer sales	LONGi and Tongwei Solar (Chengdu) Co., Ltd.	January 1, 2020 to December 31, 2022	5.8 billion	2020-1-22 2020-9-10	In progress
19	Long-term sales contract	Sales of modules	LONGi Solar and a U.S. ground-mounting solar power system developer	2019-2022	Estimated to be about RMB 600 million at the market price when the contract is signed	2018-7-17	In progress

(2) Progress of investment agreements disclosed by the Company as of the end of the reporting period

S/N	Investment target	Parties	Date of signing	Investment scale	Project progress
1	5GW Mono Module Project of Chuzhou	LONGi Solar and Management Committee of Chuzhou Economic and Technological Development Zone	2018-1-4	5GW mono modules	Fully put into production
2	6GW Mono Ingot Project (Phase II) of Baoshan	LONGi, Baoshan Municipal People's Government and People's Government of Longling County	2018-3-28	6GW mono ingots	Fully put into production
3	6GW Mono Ingot Construction Project (Phase II) of Lijiang	LONGi and Lijiang Municipal People's Government	2018-4-3	6GW mono ingots	Fully put into production
4	10GW Mono Wafer Project (Phase II) of Chuxiong	LONGi, People's Government of Chuxiong Yi Autonomous	2018-4-15	10GW mono wafers	Fully put into production

EXHIBIT 10

ENTIRE EXHIBIT NOT CAPABLE OF PUBLIC SUMMARY

EXHIBIT 11

ENTIRE EXHIBIT
NOT CAPABLE OF
PUBLIC SUMMARY

EXHIBIT 12

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 20-F

(Mark One)

☐ **REGISTRATION STATEMENT PURSUANT TO SECTION 12(b) OR 12(g) OF THE SECURITIES EXCHANGE ACT OF 1934**

OR

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the fiscal year ended December 31, 2020.

OR

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

OR

☐ **SHELL COMPANY REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

Date of event requiring this shell company report

For the transition period from to

Commission file number: 001-34615

JinkoSolar Holding Co., Ltd.

(Exact name of Registrant as specified in its charter)

N/A
(Translation of Registrant's name into English)

Cayman Islands
(Jurisdiction of incorporation or organization)

1 Jingke Road
Shangrao Economic Development Zone
Jiangxi Province, 334100
People's Republic of China
(86-793) 846-9699
(Address of principal executive offices)

Haiyun (Charlie) Cao, Chief Financial Officer
1 Jingke Road
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Tel: (86-793) 846-9699
Fax: (86-793) 846-1152
E-mail: charlie.cao@jinkosolar.com
(Name, Telephone, E-mail and/or Facsimile number and Address of Company Contact Person)

Securities registered or to be registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
American Depositary Shares, each representing four ordinary shares, par value US$0.00002 per share	JKS	New York Stock Exchange
Ordinary shares, par value US$0.00002 per share*		

* Not for trading, but only in connection with the listing of the American depositary shares on New York Stock Exchange.

Securities registered or to be registered pursuant to Section 12(g) of the Act:

None
(Title of Class)

Securities for which there is a reporting obligation pursuant to Section 15(d) of the Act:

None
(Title of Class)

Indicate the number of outstanding shares of each of the issuer's classes of capital or common stock as of the close of the period covered by the annual report.

187,434,469 ordinary shares, excluding 455,217 ADSs representing 1,820,868 ordinary shares reserved for future grants under our share incentive plans and conversion of our convertible notes and 2,945,840 ordinary shares as treasury stock, as of December 31, 2020.

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act.

Yes ☒ No ☐

If this report is an annual or transition report, indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934.

Yes ☐ No ☒

Note – Checking the box above will not relieve any registrant required to file reports pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934 from their obligations under those Sections.

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days.

Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files).

Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer or an emerging growth company. See definition of "large accelerated filer," "accelerated filer" and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer ☒ Accelerated filer ☐ Non-accelerated filer ☐

Emerging growth company ☐

If an emerging growth company that prepares its financial statements in accordance with U.S. GAAP, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards† provided pursuant to Section 13(a) of the Exchange Act. ☐

† The term "new or revised financial accounting standard" refers to any update issued by the Financial Accounting Standards Board to its Accounting Standards Codification after April 5, 2012.

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☒

Indicate by check mark which basis of accounting the registrant has used to prepare the financial statements included in this filing:

U.S. GAAP ☒	International Financial Reporting Standards as issued by the International Accounting Standards Board ☐	Other ☐

If "Other" has been checked in response to the previous question, indicate by check mark which financial statement item the registrant has elected to follow.

Item 17 ☐ Item 18 ☐

If this is an annual report, indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act).

Yes ☐ No ☒

(APPLICABLE ONLY TO ISSUERS INVOLVED IN BANKRUPTCY PROCEEDINGS DURING THE PAST FIVE YEARS)

Indicate by check mark whether the registrant has filed all documents and reports required to be filed by Sections 12, 13 or 15(d) of the Securities Exchange Act of 1934 subsequent to the distribution of securities under a plan confirmed by a court. Yes ☐ No ☐

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We sell our products in major export markets and China. As of December 31, 2020, we had nine production facilities globally and 23 oversea subsidiaries in Japan, South Korea, Vietnam, India, Turkey, Germany, Italy, Switzerland, the United States, Mexico, Brazil, Chile, Australia, Portugal, Canada, Malaysia, the United Arab Emirates, Kenya and Denmark. As of the same date, we also had global sales teams in China, the United Kingdom, France, Spain, Bulgaria, Greece, Ukraine, Jordan, Saudi Arabia, Tunisia, Morocco, Kenya, South Africa, Costa Rica, Colombia, Panama, Kazakhstan, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam, Poland and Argentina to conduct sales, marketing and brand development for our products around the world. In addition, as of December 31, 2020, we had an aggregate of over 2,000 customers in over 100 countries and regions for our solar modules, including distributors, project developers and system integrators.

Our solar cells and modules utilize advanced solar technologies, such as the passivated emitter rear cell (“PERC”) technology and half cell technology, and have achieved industry-leading conversion efficiency. In 2018, 2019 and 2020, the average conversion efficiency rate of our solar cells using our P-type monocrystalline silicon wafers was 21.9%, 22.3% and 22.9%, respectively. In 2018, 2019 and 2020, the average conversion efficiency rate of our N-type monocrystalline solar cells was 22.8%, 23.3% and 23.5%, respectively. We believe that both of these average conversion efficiency rates were consistently higher than industry average. In May 2018, our P-type monocrystalline solar cells broke the world record by hitting conversion efficiency rate of 23.95%. In December 2018, our N-type monocrystalline solar cells reached the conversion efficiency rate of 24.2%. In June 2019, our P-type monocrystalline solar cells and N-type monocrystalline solar cells reached the maximum conversion efficiency rate of 24.38% and 24.58%, respectively. In July 2020, the maximum conversion efficiency rate of our N-Type monocrystalline solar cells reached 24.79%.

Our high-quality manufacturing capabilities have enabled us to produce solar cells and modules meeting the industry’s highest performance standards. All of our solar modules sold in Europe are CE, IEC, TÜV, and MCS certified, all of our solar module sold in India are BIS certified, all of our solar modules sold in North America are UL certified and our monocrystalline solar modules sold in China are CQC certified. In 2013, our solar modules passed TÜV Nord’s Dust & Sand Certification Test, demonstrating their suitability for installation in desert regions, and we also unveiled our “Eagle II” solar modules, which represent a new standard for performance and reliability. In May 2017, we became one of the first Chinese PV manufacturers to pass the intensive UV test according to IEC 61345 from TÜV Rheinland. In July 2017, we guaranteed that all our standard PV modules meet IEC 62804 double anti-PID standards. In May 2018, our entire portfolio of PV modules passed the Potential Induced Degradation resistance test as required by TÜV Nord’s IEC TS 62804-1 standards. In March 2019, we received the 5th “All Quality Matters Award” from TÜV Rheinland.

We leverage our vertically integrated platform and cost-efficient manufacturing capabilities in China to produce high quality products at competitive costs. Our solar cell and silicon wafer operations support our solar module production. As of December 31, 2020, we had an integrated annual capacity of 22 GW for mono wafers, 11 GW for solar cells and 31 GW for solar modules. Our manufacturing facilities are primarily located in five provinces across China, Florida of the United States and Penang of Malaysia, providing convenient and timely access to key resources and suppliers.

We no longer have any downstream solar power projects in China after we disposed of our downstream solar power projects business in China in the fourth quarter of 2016, but still have two overseas solar power projects which are located in Mexico and Argentina.

Our Products and Services

Our product mix has evolved rapidly since our inception, as we have incorporated more of the solar power value chain through the expansion of our production capabilities and acquisitions. We currently manufacture a series of products from silicon wafers to solar modules. Our principal product is solar modules, but we also sell silicon wafers and solar cells from time to time to meet our customers’ demand. In 2020, sales of solar modules, silicon wafers and solar cells represented 92.7%, 1.3% and 1.0%, respectively, of our total revenues. In addition, we also sell small volumes of recovered silicon materials to optimize the utilization of our production capacity.

The following table sets forth details of our sales volume by product for the periods indicated:

Products	2018 (MW)	2019 (MW)	2020 (MW)
Silicon wafers	1,168.6	2,383.3	1,583.7
Solar cells	364.9	478.1	670.6
Solar modules	11,170.5	14,207.5	18,770.6

In August 2020, we launched our new generation of 610W Tiger Pro High-efficiency monocrystalline TR solar module and our BIPV solutions, Building Integrated Photovoltaics product series, which were unveiled at SNEC 2020 in Shanghai.

On August 21, 2020, we were ranked as a top solar brand in debt financed projects and named a most "bankable" PV manufacturer by Bloomberg New Energy Finance. Forty-nine global solar module manufacturers were ranked based on Bloomberg New Energy Finance's global survey of key PV stakeholders assessing which module brands used in projects are most likely to obtain non-recourse debt financing from commercial banks.

In September 2020, we supplied Trung Nam Group with 611MW of Tiger bifacial transparent backsheet modules, which were installed at the Thuan Nam solar power plant project in Vietnam. Located in Thuan Nam, the Thuan Nam solar power plant project was one of the largest solar power projects by capacity that were using bifacial modules in both Vietnam and Southeast Asia.

In November 2020, we supplied 541 MW Tiger Series modules for the first phase of the Xuan Thien project in Vietnam. This project was considered as one of the largest solar power projects in Southeast Asia. This project demonstrates the latest PV development and energy transformation in Southeast Asia.

Solar Cells

We commenced production of solar cells in July 2009 following our acquisition of Zhejiang Jinko. The efficiency of a solar cell converting sunlight into electricity is represented by the ratio of electrical energy produced by the solar cell to the energy from sunlight that reaches the solar cell. The conversion efficiency of solar cells is determined to a large extent by the quality of silicon wafers used to produce the solar cells. In 2018, we led the industry in the resizing of the 158 mm x 158 mm solar cell. In 2019, we released solar cells of larger size and incorporating the tilling ribbon technology, which greatly increased the power of the components and brought more benefits to customers. In 2020, we developed and mass produced highly efficient P-type monocrystalline solar cells of 163 mm x 163 mm and 182 mm x 182 mm, and constructed an industry-leading production line for N-type monocrystalline solar cells. In December 2020, our maximum mass production efficiency of P-type monocrystalline solar cells and N-type monocrystalline solar cells reached 23.2% and 24.2%, respectively.

In May 2018, our P-type monocrystalline solar cells broke the world record by hitting conversion efficiency of 23.95%.

In December 2018, our N-type multicrystalline solar cells broke the world record by hitting conversion efficiency of 22.12%.

In December 2018, our N-type monocrystalline solar cells reached the conversion efficiency of 24.2%.

In June 2019, our P-type monocrystalline solar cells and N-type monocrystalline solar cells reached the maximum conversion efficiency of 24.38% and 24.58%, respectively.

In September 2020, the maximum solar conversion efficiency of our large-area N-type monocrystalline silicon solar cells reached 24.9%, which was confirmed by the Institute for Solar Energy Research in Hamelin (ISFH) in Germany and set a world record for large-size contact-passivated solar cells.

Silicon Wafers

We commenced production of monocrystalline silicon wafers and multicrystalline silicon wafers in March 2008 and July 2008, respectively.

In 2018, we developed P-type and N-type monocrystalline silicon wafers with high quality and low oxygen content of 158 mm x 158 mm. In 2019, we developed technologies for silicon wafers of larger size, which resolved technical difficulties such as non-destructive cutting and concentric circle defects, and combined with N4/N5 technology, greatly improved the quality and efficiency of N-type monocrystalline silicon wafers while reducing its cost. In 2020, we developed and mass produced high quality silicon wafers of 182 mm x 182 mm, and conducted research on silicon wafers of 210 mm x 210 mm or larger size. We optimized Outer-furnace Czochralski technology and charging technology and developed and verified N7/N8 technology, which greatly improved the quality and efficiency of silicon wafers while increasing manufacturing capacity and reducing costs.

Recovered Silicon Materials

We commenced processing of recoverable silicon materials into recovered silicon materials in June 2006. We are able to process and recover a broad range of recoverable silicon materials, which enables us to reduce our overall silicon material costs and improve product quality and yield.

Except as indicated otherwise, we own the facilities completed and under construction and own the right to use the relevant land for the durations described below (including capacities and major equipment):

Products	Location	Facility No.	Plant Size (square meters)	Duration of Land Use Right	Major equipment
Silicon Ingots and Wafers	Shangrao Economic Development Zone, Jiangxi	1	68,397	(i) March 16, 2010 to February 3, 2057; (ii) December 9, 2009 to September 23, 2058; (iii) July 6, 2009 to August 10, 2059; (iv) July 10, 2009 to February 7, 2057; (v)January 6, 2009 to August 10, 2059	Monocrystalline furnaces, multicrystalline furnaces, wire saws, wire squarers
Silicon Ingots	Yili,Xinjiang	2	165,333	(i) May 28,2016 to May 27, 2026;(ii) January 1,2017 to December 31, 2029	Monocrystalline furnaces
	Leshan, Sichuan	12	279,469	May 31, 2019 to May 30, 2069	
Solar Cells	Yuanhua Town, Haining, Zhejiang	3	107,865	(i) November 23, 2009 to June 6, 2057; (ii) October 29, 2009 to May 26, 2058; (iii) August 17, 2010 to July 25, 2060	Diffusion furnaces, sintering furnaces, PECVD antireflection coatings manufacturing equipment, automatic printers
	Penang, Malaysia	4	8,191	January 1, 2015 to December 31, 2022	
Solar Modules	Shangrao Economic Development Zone, Jiangxi	5	134,950	July 6, 2009 to August 10, 2059	Laminating machine, solar cell module production line before and after component lamination, automatic glue spreads' working station, solar cell module testing devices
	Yuanhua Town, Haining, Zhejiang	6	98,497	September 9, 2016 to September 8, 2066	
	Yuanhua Town, Haining, Zhejiang	7	89,543	(i) October 29, 2009 to May 26, 2058; (ii) August 17, 2010 to July 25, 2060; (iii) September 15, 2010 to August 29, 2060	
	Penang, Malaysia	8	12,679	January 1, 2015 to December 31, 2022	
	Yuhuan, Zhejiang	9	92,540	September 9, 2016 to September 8, 2066	
	Yuanhua Town, Haining	10	140,647	March 22,2018 to March 15, 2068	
	Jacksonville, Florida	11	26,538	May 1, 2018 to April 30, 2028	
	Chuzhou, Anhui	13	289,091	April 13, 2020 to April 12, 2070	
	Yiwu, Zhejiang	14	281,089	March 12, 2020 to March 12, 2020	

As of December 31, 2020, short-term borrowings of RMB926.4 million (US$142.0 million) and long-term borrowings of RMB908.7 million (US$139.3 million) were secured by land use rights, plant and equipment. We believe our current land use rights, existing facilities and equipment are adequate for our current requirements.

Major Plans to Construct, Expand or Improve Facilities

We have entered into purchase and other agreements for purchase of additional manufacturing equipment and expansion of our production capacities. Our capital commitments under these contracts amounted to RMB3.63 billion (US$555.6 million) as of December 31, 2020, of which RMB3.24 billion (US$496.4 million) will be due in 2021 and RMB386.2 million (US$59.2 million) will be due after one year but within five years. We may terminate these agreements or revise their terms in line with our new plan and as a result, may be subject to cancellation, late charges and forfeiture of prepayments. See "Item 3. Key Information—D. Risk Factors—Risks Related to Our Business and Industry—We may continue to undertake acquisitions, investments, joint ventures or other strategic alliances, and such undertakings may be unsuccessful." and "Item 3. Key Information—D. Risk Factors—Risks Related to Our Business and Industry—We may face termination and late charges and risks relating to the termination and amendment of certain equipment purchases contracts."

Manufacturing Process

Silicon Ingot Manufacturing

We produce monocrystalline silicon ingots in electric furnaces. We place silicon materials, consisting of virgin polysilicon feedstock and recovered silicon materials of various grades according to formulas developed in-house into a quartz crucible in the furnace, where the silicon materials are melted. While heating the silicon materials, we pump a stream of argon, a chemically inert gas, into the furnace to remove the impurities vaporized during the heating process and to inhibit oxidation, thus enhancing the purity of the silicon ingots. A thin crystal "seed" is dipped into the molten silicon to determine the crystal orientation and structure. The seed is rotated and then slowly extracted from the molten silicon, which adheres to the seed and is pulled vertically upward to form a cylindrical silicon ingots consisting of a single large silicon crystal as the molten silicon and crucible cool. We have modified some of our monocrystalline furnaces to allow us to apply our furnace reloading production process, which enables us to increase the size of our silicon ingots while lowering our unit production costs by enhancing the utilization rate of our furnaces and reducing unit costs of consumables and utilities. After the silicon ingot is pulled and cooled, we square the silicon ingots in our squaring machines into blocks.

Raw Materials

The principal raw material used in our manufacturing process is virgin polysilicon. We also use recoverable silicon materials in our production. In 2018, 2019 and 2020, virgin polysilicon accounted for over 90%, and recoverable silicon materials accounted for 3.5%, 5.7% and 5.0%, respectively, of our total silicon raw material purchases by value. We procure our raw materials from diversified sources. In 2020, purchases from foreign suppliers and domestic suppliers accounted for 75.2% and 24.8% of our total silicon raw material purchases, respectively.

In 2018, 2019 and 2020, our five largest suppliers provided 56.4%, 55.9% and 66.5%, respectively, of our total silicon purchases by value. In 2018, three of our suppliers individually accounted for more than 10%, and our largest supplier accounted for 15.5% of our total silicon purchases by value. In 2019, one of our suppliers individually accounted for more than 10%, and our largest supplier accounted for 23.3% of our total silicon purchases by value. In 2020, three of our suppliers individually accounted for more than 10%, and our largest supplier accounted for 19.6% of our total silicon purchases by value. In 2018, 2019 and 2020, our five largest group suppliers accounted for 62.9%, 68.6% and 70.0%, respectively, of our total silicon purchases by value. In 2018, three of our group suppliers individually accounted for more than 10%, and our largest group supplier accounted for 22.0% of our total silicon purchases by value. In 2019, four of our group suppliers individually accounted for more than 10%, and our largest group supplier accounted for 25.2% of our total silicon purchases by value. In 2020, four of our group suppliers individually accounted for more than 10%, and our largest group supplier accounted for 19.6% of our total silicon purchases by value. A "group supplier" refers to an aggregation of our suppliers that are within the same corporate group.

Our supply contracts generally include prepayment obligations for the procurement of silicon raw materials. As of December 31, 2020, we had RMB1.0 billion (US$153.7 million) of advances to suppliers.

In November 2020, we and our subsidiary Sichuan Jinko signed a long-term purchase agreement with certain subsidiaries of Tongwei Co., Ltd. The raw materials procurement would ensure a stable supply of polycrystalline silicon in line with our strategic and operational plans. Under the agreement, we locked in nearly 100,000 metric tons of polycrystalline silicon, and both parties could negotiate additional purchases. The price for any additional order would be negotiated and determined based on market conditions.

Virgin Polysilicon

We purchase solar grade virgin polysilicon from both domestic and foreign suppliers. We purchase our virgin polysilicon through spot market purchases to take advantage of decreasing virgin polysilicon prices.

Recoverable Silicon Materials

We purchase pre-screened recoverable silicon materials from our suppliers which are delivered to our facilities for chemical treatment, cleaning and sorting into recovered silicon materials. Currently, we purchase most of our recoverable silicon materials on the spot market.

Ancillary Materials

We use metallic pastes as raw materials in our solar cell production process. Metallic pastes are used to form the grids of metal contacts that are printed on the front and back surfaces of the solar cells through screen-printing to create negative and positive electrodes. We procure metallic pastes from third parties under monthly contracts. In addition, we use EVA, tempered glass, aluminum frames and other raw materials in our solar module production process. We procure these materials from third parties on a monthly basis.

ITEM 4A. UNRESOLVED STAFF COMMENTS

None.

ITEM 5. OPERATING AND FINANCIAL REVIEW AND PROSPECTS

A. Operating Results

We are a global leader in the PV industry based in China. We have built a vertically integrated solar power product value chain, manufacturing from silicon wafers to solar modules. We sell most of our solar modules under our own "JinkoSolar" brand, with a small portion of solar modules on an OEM basis. We also sell silicon wafers and solar cells not used in our solar module production. As of December 31, 2020, we had an integrated annual capacity of 22.0 GW for mono wafers, 11.0 GW for solar cells and 31.0 GW for solar modules.

Our revenues were RMB25.04 billion, RMB29.75 billion and RMB35.13 billion (US$5.38 billion) in 2018, 2019 and 2020, respectively. We had net income of RMB405.6 million, RMB924.4 million and RMB335.3 million (US$51.4 million) in 2018, 2019 and 2020 respectively.

Principal Factors Affecting Our Results of Operations

We believe that the following factors have had, and we expect that they will continue to have, a significant effect on the development of our business, financial condition and results of operations.

Industry Demand

Our business and revenue growth depends on the industry demand for solar power and solar power products. Demand for solar power and products depends on various factors including the global macroeconomic environment, pricing, cost-effectiveness, performance and reliability in comparison to alternative forms of energy, and the impact of government regulations and policies. Solar power is one of the fastest-growing sources of energy and is driven by factors such as cost-competitiveness, reliability as a predictable energy source, and growing commitments by various governments to combat climate change.

Operating Expenses

Our operating expenses include selling and marketing expenses, general and administrative expenses, research and development expenses and impairment of long-lived assets.

Selling and Marketing Expenses. Our selling and marketing expenses consist primarily of shipping and handling expenses, warranty cost, exhibition costs, salaries, bonuses and other benefits for our sales personnel as well as sales-related travel and entertainment expenses. In 2018, 2019 and 2020, our selling and marketing expenses were RMB1.71 billion, RMB2.25 billion and RMB2.47 billion (US$379.2 million), respectively.

General and Administrative Expenses. General and administrative expenses consist primarily of salaries and benefits for our administrative, finance and human resources personnel, amortization of land use rights, office expenses, entertainment expenses, business travel expenses, professional service fees, disposal and impairment of long-lived assets as well as provision for bad debts. In 2018, 2019 and 2020, our general and administrative expenses were RMB779.4 million, RMB1.06 billion and RMB1.41 billion (US$216.0 million), respectively.

Research and Development Expenses. Research and development expenses consist primarily of silicon materials used in our research and development activities and salaries, bonuses and other benefits for research and development personnel, and depreciation of equipment for research and development. In 2018, 2019 and 2020, our research and development expenses were RMB366.6 million, RMB324.4 million and RMB389.2 billion (US$59.6 million), respectively.

Impairment of long-lived assets. Impairment of long-lived assets consist primarily as a result of the obsolescence of certain equipment for upgrade in our wafer and cell production line and impairment for one of our overseas solar power projects. In 2018, 2019 and 2020, we recognized impairment of long-lived assets of RMB14.5 million, RMB68.3 million and RMB114.2 million (US$17.5 million), respectively.

Interest Expenses, Net

Our interest expenses consist primarily of interest expenses with respect to the issuance of convertible senior notes, long-term bonds, short-term and long-term borrowings from banks and other lenders. In 2018, 2019 and 2020, we incurred interest expenses of RMB429.3 million, RMB605.9 million and RMB705.2 million (US$108.1 million), net of interest income of RMB83.5 million, RMB171.0 million and RMB216.6 million (US$33.2 million), respectively. Interest expense capitalized during the construction period of property, plant and equipment, and project assets in 2018, 2019 and 2020 were RMB51.2 million, RMB43.8 million and RMB29.3 million (US$4.5 million), respectively.

Government Grants

From time to time we apply for and receive government incentives in the form of subsidies from local and provincial governments. Government grants which are not subject to any condition and are not related to assets are recognized as subsidy income when received. The governments grant subsidies to encourage and support large-scale enterprises and high technology enterprises based in the relevant locations to upgrade their technology and develop the overseas market. We record such subsidies as subsidy income as there are no further obligations on us. The amount of government subsidies we receive may vary from period to period and there is no assurance that we will continue to receive government subsidy in the future. In 2018, 2019 and 2020, our government subsidy income, which was not assets-related, was RMB52.2 million, RMB63.0 million and RMB192.0 million (US$29.4 million), respectively.

Government grants related to assets are initially recorded as other payables and accruals. These grants will be deducted from the carrying amount when the assets are ready for use and approved by related government. We received government grants related to assets of RMB8.1 million, RMB24.9 million and RMB20.0 million (US$3.1 million) in 2018, 2019 and 2020, respectively.

Exchange (Loss)/Gain, Net

In 2018, we incurred foreign exchange gain of RMB33.7 million, primarily due to appreciation of the U.S. dollars against Renminbi. In 2019, we incurred foreign exchange gain of RMB8.8 million, primarily due to the appreciation of the U.S. dollars against the Renminbi. In 2020, we incurred foreign exchange loss of RMB336.5 million (US$51.6 million), primarily due to deprecation of the U.S. dollars against the Renminbi.

We believe that the continual improvement of our research and development capability is vital to maintaining our long-term competitiveness. In 2018, 2019 and 2020, our research and development expenses were RMB366.6 million, RMB324.4 million and RMB389.2 million (US$59.6 million), respectively. We intend to continue to devote management and financial resources to research and development as well as to seek cooperative relationships with other academic institutions to further lower our overall production costs, increase the conversion efficiency rate of our solar power products and improve our product quality.

Intellectual Property

As of the date of this annual report, we have been granted 1,012 patents by the State Intellectual Property Office of the PRC, including 873 utility model patents, 129 invention patent and 10 design patents. We also have 428 pending patent applications. These patents and patent applications relate to the technologies utilized in our manufacturing processes. We intend to continue to assess appropriate opportunities for patent protection of critical aspects of our technologies. We also rely on a combination of trade secrets and employee and third-party confidentiality agreements to safeguard our intellectual property. Our research and development employees are required to enter into agreements that require them to assign to us all inventions, designs and technologies that they develop during the terms of their employment with us. For information related to intellectual property claims that we have involved, see “Item 8. Financial Information—A. Consolidated Statements and Other Financial Information—Legal and Administrative Proceedings.”

We filed trademark registration applications with the PRC Trademark Office, World Intellectual Property Organization, or WIPO and trademark authorities in other countries and regions. As of the date of this annual report, we have been granted 332 trademarks in the PRC, such as “”, “” and “”, and 27 trademarks in Hong Kong and Taiwan, including “”, and “”.We also have 102 trademarks registered in WIPO. We have pending trademark applications of 90 trademarks in 48 countries and regions, including Brazil, Qatar, Saudi Arabia, Thailand, Indonesia, the United Arab Emirates, Australia, Singapore, Panama, Kazakhstan, Kenya, South Africa, Nicaraguan, El Salvador, Sri Lanka, India, Chile, the United States, European Union, Israel. In addition, we have registered 22 trademarks in the United States, 16 trademarks in Canada and 16 trademarks in Europe.

D. Trend Information

Other than as disclosed elsewhere in this annual report, we are not aware of any trends, uncertainties, demands, commitments or events for 2019 that are reasonably likely to have a material effect on our net revenues, income, profitability, liquidity or capital resources, or that would cause reported consolidated financial information not necessarily to be indicative of future operating results or financial conditions.

E. Off-balance Sheet Arrangements

Other than disclosed in this annual report, we have no other outstanding financial guarantees or other commitments to guarantee the payment obligations of our related parties. We have not entered into any derivative contracts that are indexed to our shares and classified as shareholder’s equity or that are not reflected in our consolidated financial statements. Furthermore, we do not have any retained or contingent interest in assets transferred to an unconsolidated entity that serves as credit, liquidity or market risk support to such entity. We do not have any variable interest in any unconsolidated entity that provides financing, liquidity, market risk or credit support to us or that engages in leasing, hedging or research and development services with us. We have not entered into nor do we expect to enter into any off-balance sheet arrangements .

Employment Agreements

We have entered into employment agreements with each of our executive officers. These employment agreements became effective on the signing date and will remain effective through 2020. We may terminate an executive officer's employment for cause, at any time, without prior notice or remuneration, for certain acts of the officer, including, but not limited to, failure to satisfy our job requirements during the probation period, a material violation of our regulations, failure to perform agreed duties, embezzlement that causes material damage to us, or conviction of a crime. An executive officer may terminate his or her employment for cause at any time, including, but not limited to, our failure to pay remuneration and benefits or to provide a safe working environment pursuant to the employment agreement, or our engagement in deceptive or coercive conduct that causes him or her to sign the agreement. If an executive officer breaches any terms of the agreement, which leads to, including, but not limited to, termination of the agreement, resignation without notice, or failure to complete resignation procedures within the stipulated period, he or she shall be responsible for our economic losses and shall compensate us for such losses. We may renew the employment agreements with our executive officers.

D. Employees

As of December 31, 2018, 2019 and 2020, we had a total of 12,565, 15,195 and 24,361employees, respectively. The increase in our number of employees in 2020 was mainly attributable to the expansion of our manufacturing facilities in China. As of December 31, 2020, we had 24,361 full-time employees, including 21,661 in manufacturing, 1,078 in research and development, 394 in sales and marketing and 1,228 in administration. Substantially all of these employees are located in China with a small portion of employees based in the United States, Europe and other countries and regions.

We believe we maintain a good working relationship with our employees, and we have not experienced any labor disputes or any difficulty in recruiting staff for our operations. In October 2013 and 2014, we were named one of the Top 100 Best Employers in China in 2013 by the World Executive Journal in conjunction with the World HR Laboratory, Bossline and CEO-ZINE. JinkoSolar was awarded HR Asia Best Companies to Work for in Asia Awards – China Edition, in 2018, 2019 and 2020. With the corporate culture of equality, accountability, commitment, and driving excellence, we were acknowledged for the best practices in human resource management.

Our employees are not covered by any collective bargaining agreement. In line with the expansion of our operations, we plan to hire additional employees, including additional accounting, finance and sales, marketing personnel as well as manufacturing and engineering employees.

In line with local customary practices, we have made contributions to the social insurance funds which met the requirement of the local minimum wage standard, instead of the employees' actual salaries as required, and have not made full contribution to the housing funds. We estimate the aggregate amount of unpaid social security benefits and housing funds to be RMB560.2 million, RMB595.3 million and RMB605.8 million (US$92.8 million), respectively, as of December 31, 2018, 2019 and 2020. See "Item 3. Key Information—D. Risk Factors—Risks Related to Doing Business in China—Our failure to make payments of statutory social welfare and housing funds to our employees could adversely and materially affect our financial condition and results of operations."

E. Share Ownership

The following table sets forth information with respect to the beneficial ownership of our shares as of the date of this annual report by:

- each of our directors and executive officers; and

EXHIBIT 13

August 28, 2017 · Blog (https://www.bovietsolarusa.com/category/blog/)

Why Solar Panel Manufacturing Location Matters: A Look into Boviet's Facility in Vietnam

TOP-DOWN, BOTTOM UP DEVELOPMENT:

Why Solar Panel Manufacturing Location Matters: A Look into Boviet's Facility in Vietnam

Supply chain visibility is an absolute must for companies in the infrastructure space. As solar panel manufacturing becomes disparate—especially when production capabilities are global—risk and failure rates arise.

Manufacturing in Vietnam has given Boviet Solar USA, a subsidiary of The Powerway Group, a unique lens into automation and risk management through complete supply chain control. Unlike other solar panel manufacturers, where R&D maintains a degree of separation from production, Boviet invests heavily in closed-loop innovation. There are no gaps between ideation, experimentation, and execution. Customer and market feedback reach every stage of development.

IMG_0161.jpg

New black frame solar panels being introduced outside of Boviet's Vietnam campus.

To ensure the most efficient, visible supply chain, Powerway Group has strategically headquartered its solar panel manufacturing operations in Vietnam. Here are a few reasons why:

1. All-inclusive production facilities enable highly automated manufacturing techniques that are conducive to a standard level of quality while saving money on manufacturing costs.
2. Complete facilities provide low production costs at a high quality, turning focus to process optimization and product advancement.
3. Vietnam is not a U.S. listed Anti-dumping and Countervailing region. No tariffs influence Boviet's U.S. business, and those cost-savings ultimately trickle down to the buyer.

In the following interview, Jason Luo, Product Manager based in Vietnam, elaborates on Boviet's approach to innovation and how manufacturing in Vietnam supports those goals.

Powerway-VietnamCampus.jpg

Aerial view of Vietnam campus

What role does manufacturing play in Boviet's innovation process?

Jason: Manufacturing is the engine that drives Boviet's innovation. It transforms laboratory research into new products and production processes that generate profits and make the world a better place.

As engineers and manufacturers develop new technologies, they build the capabilities to extend and innovate in new fields. Those innovations give manufacturers the performance or cost edge they need to compete in a crowded international marketplace.

We have purchased new and advanced equipment, and we pay great attention to the energy saving and environmental protection during the whole production and logistics process.

What makes Boviet's manufacturing facility different from those of other leading solar panel companies?

CYMERA_20170509_112623.jpg

Jason: We adopt the world's most advanced automatic production line and experienced management team to achieve scale manufacturing. Boviet Solar Technology Co., Ltd has 700MW annual production capacity for both solar cell and module. In 2016, Boviet was the largest integrated PV panel manufacturer in Vietnam.

Our manufacturing process blends automation with human creativity across R&D, production, marketing, quality control and inspection across facilities in Germany, Spain, Japan, and China. This enables the company to expand manufacturing capabilities at a rapid pace, by upgrading the production line. For example, we've advanced the Passivated Emitter Rear Cell (PERC) process, meaning that we've improved the flow of electrons in solar cell modules. The goal is to continuously iterate and improve upon module efficiency.

Vietnam is a country that is well-entwined within global supply chain systems. Raw materials and product sales are already globalized. We use the SAP system and establish cooperative relationships with our suppliers. We have the safety of raw-material and product in stock to guarantee timely delivery and keep up with production demands. At the same time, we are able to provide customization options for our customers.

Our production facility reduces pollution by minimizing natural resource use. We recycle and reuse what was considered waste, thereby reducing emissions.

How does owning the manufacturing facility improve financing options for commercial customers?

Jason: We are able to provide a higher level of quality, production stability, and customization to our clients. We have purchased new and advanced equipment, and we pay great attention to the energy saving and environmental protection during the whole production and logistics process. With predictability in our costs and workflows, we can enhance our customers' financing capabilities.

This enables us to control our own process for employee recruitment and training.

We invest heavily in employee training to ensure that every manufacturing employee has the opportunity to propose quality and deliver upon product quality improvements. More than 95% of employees are local workers who influence local culture through training and guidance.

We embrace simplicity and diversity and we believe great, world-changing ideas can come from anyone, anywhere in our organization. Owning our own facility gives us the freedom and flexibility to innovate.

Our long-term goal is to take the lead in the development of the solar industry and to promote the scientific and technological progress of the times and in the meantime to establish a world premium brand, Boviet Solar USA.

CYMERA_20170509_113909.jpg

CYMERA_20170509_114055.jpg

CYMERA_20170509_113220.jpg

Manufacturing is the engine that drives Boviet's innovation. It transforms laboratory research into new products and production processes that generate profits and make the world a better place. As engineers and manufacturers develop new technologies, they build the capabilities to extend into and innovate in new fields. Those innovations give manufacturers the performance or cost edge they need to compete in a crowded international marketplace.

A fully automated production line and modern management values result in the development of new technologies simpler.

CYMERA_20170509_114149.jpg

Want to Learn More About Our Facility?

Our team would love to share photos, answer questions, and tell you more about it. Get in touch with our consulting team at info@bovietsolarusa.com (mailto:info@bovietsolarusa.com), and we'll schedule a time to connect.

Archives

Boviet Solar State-of-the-art Solar Panels Rated Top Performer in 2021 PVEL Scorecard 3rd Year in a Row (https://www.bovietsolarusa.com/boviet-solar-state-of-the-art-solar-panels-rated-top-performer-in-2021-pvel-scorecard-3rd-year-in-a-row/)
May 25, 2021

- Press (https://www.bovietsolarusa.com/category/press/)

2017 Solar Job Boom Reveals Mainstream U.S. Industry (https://www.bovietsolarusa.com/2017-solar-job-boom-reveals-mainstream-u-s-industry/)
August 18, 2018

- Blog (https://www.bovietsolarusa.com/category/blog/)

Boviet Solar USA Celebrates 30th Anniversary of Parent Company Powerway Group (https://www.bovietsolarusa.com/boviet-solar-usa-celebrates-30th-anniversary-parent-company-powerway-group/)
October 25, 2017

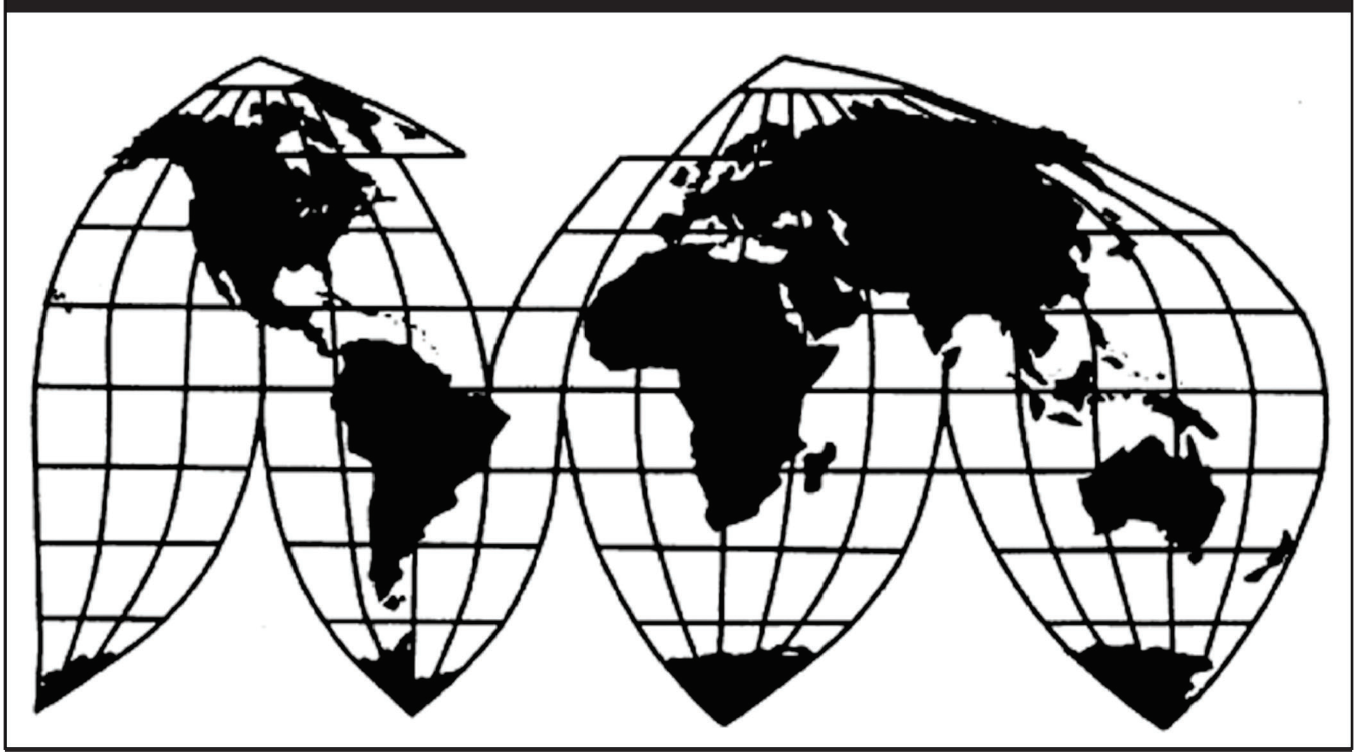
EXHIBIT 14

Crystalline Silicon Photovoltaic Cells, Whether or Not Partially or Fully Assembled Into Other Products: Monitoring Developments in the Domestic Industry

Investigation No. TA-201-075 (Monitoring)

Publication 5021 **February 2020**

U.S. International Trade Commission



Washington, DC 20436

Antidumping and countervailing duty investigations on primary raw materials

There are no antidumping or countervailing duty orders currently in effect on U.S. imports of polysilicon, the primary raw material in the production of CSPV cells.

Section 232 investigations (Commerce)[34]

Steel

The relevant HTS subheadings within the scope of this safeguard remedy, 8541.40.60, 8501.31.80, 8501.32.60, 8501.61.00, and 8507.20.80, were not included in the enumeration of certain steel products subject to the additional 25-percent *ad valorem* duties under Section 232 of the Trade Expansion Act of 1962, as amended.[35] However, steel is used in balance of systems components (such as tracking systems on which modules are mounted) for solar installations.[36] [37] Table I-1 presents a summary of current Section 232 tariffs on U.S. imports of steel, by country.

Table I-1
Steel mill articles: Section 232 tariffs summary

Country	Effective date	Ad valorem duty rate	Absolute quotas
Argentina	May 31, 2018	Exempt	180,000 metric tons
Australia	May 31, 2018	Exempt	Exempt
Brazil	May 31, 2018	Exempt	4,193,157 metric tons
Canada	May 20, 2019	Exempt	Exempt
European Union	May 31, 2018	25%	N/A
Korea	April 30, 2018	Exempt	2,631,012 metric tons
Mexico	May 20, 2019	Exempt	Exempt
Turkey	May 21, 2019	25%	N/A
All other countries	March 8, 2018	25%	N/A

Source: U.S. Customs and Border Patrol website: https://www.cbp.gov/trade/programs-administration/entry-summary/232-tariffs-aluminum-and-steel, updated on May 29, 2019.

[34] See appendix E for additional details.
[35] 83 FR 11625, March 15, 2018.
[36] NEXTracker Webpage, https://www.nextracker.com/product-services/solar-storage/nx-horizon/, retrieved October 22, 2019.
[37] See U.S. notes 16(a) and 16(b), subchapter III of chapter 99.

Table I-3
CSPV cells: Safeguard TRQ measure on cells

Item	Safeguard duty on first 2.5 GW of imported cells	Safeguard duty on imported cells exceeding 2.5 GW (percent)
February 7, 2018 - February 6, 2019	--	30
February 7, 2019 - February 6, 2020	--	25
February 7, 2020 - February 6, 2021	--	20
February 7, 2021 - February 6, 2022	--	15

Source: 83 FR 3541, January 25, 2018.

Import duties under the safeguard measure

The safeguard measure imposed an increase in duties on imports of CSPV modules for a period of four years, with annual reductions in the rates of duty in the second, third, and fourth years. The additional duty is imposed on the declared value of CSPV modules, including the cost or value of the non-cell portions of the modules (such as aluminum frames). Table I-4 presents the import duties under the safeguard measure on CSPV modules.

Table I-4
CSPV modules: Safeguard measure on modules

Item	Safeguard duty on imported modules (percent)
February 7, 2018 - February 6, 2019	30
February 7, 2019 - February 6, 2020	25
February 7, 2020 - February 6, 2021	20
February 7, 2021 - February 6, 2022	15

Source: 83 FR 3541, January 25, 2018.

Tariff treatment

The subject merchandise is provided for in subheading 8541.40.60 of the Harmonized Tariff Schedule of the United States ("HTS"), and has been free of duty under the general duty column since at least 1987. Within subheading 8541.40.60, the subject merchandise was included in statistical reporting numbers 8541.40.6020 ("solar cells, assembled into modules or made up into panels") and 8541.40.6030 ("solar cells, other") through June 30, 2018. As of July 1, 2018, a superior text for crystalline silicon photovoltaic cells (described in statistical note 11 to chapter 85) applies to two subordinate reporting categories, 8541.40.6015 (“assembled into modules or made up into panels”) and 8541.40.6025 (“other”).[53]

Under subheading 9903.45.22, imports of cells in excess of the prescribed TRQ quantity subject to the safeguard measure are currently subject to a general duty rate of 25 percent ad valorem (unless the product of an exempt country); under subheading 9903.45.25 all covered modules from nonexempt countries are currently subject to the safeguard duty rate of 25 percent ad valorem.

These articles may also be imported as parts or subassemblies of goods provided for in subheadings 8501.31.80, 8501.61.00, and 8507.20.80.[54] Inverters or batteries with CSPV cells attached are provided for under HTSUS subheadings 8501.61.00 and 8507.20.80, respectively. In addition, CSPV cells covered by the reviews may also be classifiable as DC generators of subheading 8501.31.80, when such generators are imported with CSPV cells attached. Goods classified in subheadings 8501.31.80 and 8501.61.00 have general duty rates 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. The following statistical reporting numbers were added on March 1, 2018: 8501.31.8010 (covering DC generators of an output not exceeding 750 W: photovoltaic generators of a kind described in statistical note 9 to subchapter 85),[55] 8501.32.6010 (DC generators of an output exceeding 750 W but not exceeding 75 kW: photovoltaic generators of a kind described in statistical note 9), 8501.61.0010 (AC generators (alternators): photovoltaic

[53] Statistical Note 11: For the purposes of statistical reporting numbers 8541.40.6015 and 8541.40.6025, the term "crystalline silicon photovoltaic cells" means crystalline silicon photovoltaic cells of a thickness equal to or greater than 20 micrometers, having a p/n junction (or variant thereof) formed by any means, whether or not the cell imported under statistical reporting number 8541.40.6025 (or subassemblies thereof imported under statistical reporting number 8541.40.6015) 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. Such cells include photovoltaic cells that contain crystalline silicon in addition to other photovoltaic materials. This includes, but is not limited to, passivated emitter rear contact cells, heterojunction with intrinsic thin-layer cells, and other so-called hybrid cells.

[54] The subject cells may be presented as integral elements of subassemblies of components or of goods of these three subheadings, even if not treated as “parts” for tariff purposes.

[55] Statistical Note 9 to chapter 85 provides as follows: For the purposes of heading 8501, photovoltaic generators consist of panels of photocells combined with other apparatus, e.g., storage batteries and electronic controls (voltage regulator, inverter, etc.) and panels or modules equipped with elements, however simple (for example, diodes to control the direction of the current), which supply the power directly to, for example, a motor, an electrolyser. In these devices, electricity is produced by means of solar cells which convert solar energy directly into electricity (photovoltaic conversion).

The industry in China

This section compiles data and information on the historical development of the Chinese industry. The data used here are primarily compiled from databases and data sets that offer long-term historical data on the industry in China. As most sources report data from 2010, the text will focus on 2010 to 2018 or 2019. Longer term data, as available, are in tables and charts. *** data for 2019 are as of ***.

Supply chain

Polysilicon

China's production of polysilicon increased more than 450 percent during 2010–18, rising from 45,000 metric tons in 2010 to 259,000 metric tons in 2018 (figure F-1).[16] China accounted for 58 percent of global production in 2019.[17]

[16] CPIA, "China Photovoltaic Industry Development Roadmap," 2019, p. 2, http://www.chinapv.org.cn/road_map.html, retrieved November 4, 2019; Fang, Lv, Xu Honghua, Wang Sicheng, Li Hailing, Ma Liyun, and Li Ping "National Survey Report of PV Power Applications in China 2018," IEA PVPS, 2019, p. 18, http://www.iea-pvps.org/?id=93, retrieved December 19, 2019.

[17] IEA PVPS, *Trends in Photovoltaic Applications 2019*, Report IEA PVPS T1-36:2019, p. 59, http://www.iea-pvps.org/?id=256, retrieved December 19, 2019.

Figure F-3
Polysilicon: Chinese polysilicon production capacity and share of global capacity, 2010–19

* * * * * * *

Source: ***.

Wafers

The production of wafers in China increased more than 850 percent during 2010–18, rising from 11 GW in 2010 to 107 GW in 2018 (figure F-4).[21] Capacity utilization in China in 2018 was 73 percent.[22] China accounted for 93 percent of global wafer production in 2018.[23]

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[21] CPIA, "China Photovoltaic Industry Development Roadmap," 2019, p. 2, http://www.chinapv.org.cn/road_map.html, retrieved November 4, 2019; Fang, Lv, Xu Honghua, Wang Sicheng, Li Hailing, Ma Liyun, and Li Ping "National Survey Report of PV Power Applications in China 2018," IEA PVPS, 2019, p. 19, http://www.iea-pvps.org/?id=93, retrieved December 19, 2019.

[22] Capacity utilization for 2018 is calculated based on capacity reported to the IEA to ensure comparability with production data, while *** capacity data are presented below for time series and comparison to global capacity purposes. Fang, Lv, Xu Honghua, Wang Sicheng, Li Hailing, Ma Liyun, and Li Ping "National Survey Report of PV Power Applications in China 2018," IEA PVPS, 2019, p. 19, http://www.iea-pvps.org/?id=93, retrieved December 19, 2019.

[23] IEA PVPS, *Trends in Photovoltaic Applications 2019*, Report IEA PVPS T1-36:2019, p. 59, http://www.iea-pvps.org/?id=256, retrieved December 19, 2019.

Figure F-5
Wafers: Wafer production capacity in China and share of global capacity held by China, 2010–19

* * * * * * *

Source: ***.

CSPV cells and modules

Cells

Production of cells in China increased almost 700 percent during 2010–18, rising from 11 GW in 2010 to 85 GW in 2018 (figure F-6). The share of global production held by China increased from 9 percent in 2005 to 43 percent in 2010, then reached 73 percent in 2018.[25] The capacity utilization rate in 2018 was 66 percent.[26]

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[25] Data for China and the world include thin film products. CPIA, "China Photovoltaic Industry Development Roadmap," 2019, p. 3, http://www.chinapv.org.cn/road_map.html, retrieved November 4, 2019; China data prior to 2010 and data for the rest of the world for all years is from IEA PVPS, *Trends in Photovoltaic Applications*, 2006–2019 editions, http://www.iea-pvps.org/?id=256, retrieved December 19, 2019; Fang, Lv, Xu Honghua, Wang Sicheng, Li Hailing, Ma Liyun, and Li Ping "National Survey Report of PV Power Applications in China 2018," IEA PVPS, 2019, p. 19, http://www.iea-pvps.org/?id=93, retrieved December 19, 2019.

[26] Capacity utilization for 2018 is calculated based on capacity reported to the IEA to ensure comparability with production data, while *** capacity data are presented below for time series and comparison to global capacity purposes. Fang, Lv, Xu Honghua, Wang Sicheng, Li Hailing, Ma Liyun, and Li Ping "National Survey Report of PV Power Applications in China 2018," IEA PVPS, 2019, p. 19, http://www.iea-pvps.org/?id=93, retrieved December 19, 2019.

Figure F-7
CSPV cells: CSPV cell production capacity in China and share of global capacity held by China, 2010–19

* * * * * * *

Source: ***.

Modules

PV module production in China increased almost 700 percent during 2010–18, rising from 11 GW in 2010 to 83 GW in 2018 (figure F-8). The share of global module production held by China increased from 14 percent in 2005 to 50 percent in 2010, then rose to 72 percent in 2018.[28] The capacity utilization rate for module production in China was 64 percent.[29]

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[28] Data include thin film products. CPIA, "China Photovoltaic Industry Development Roadmap," 2019, p. 3, http://www.chinapv.org.cn/road_map.html, retrieved November 4, 2019; China data prior to 2010 and data for the rest of the world for all years is from IEA PVPS, *Trends in Photovoltaic Applications*, 2006–19 editions, http://www.iea-pvps.org/?id=256, retrieved December 19, 2019; Fang, Lv, Xu Honghua, Wang Sicheng, Li Hailing, Ma Liyun, and Li Ping "National Survey Report of PV Power Applications in China 2018," IEA PVPS, 2019, p. 20, http://www.iea-pvps.org/?id=93, retrieved December 19, 2019.

[29] Capacity utilization for 2018 is calculated based on capacity reported to the IEA to ensure comparability with production data, while *** capacity data are presented below for time series and comparison to global capacity purposes. Fang, Lv, Xu Honghua, Wang Sicheng, Li Hailing, Ma Liyun, and Li Ping "National Survey Report of PV Power Applications in China 2018," IEA PVPS, 2019, p. 20, http://www.iea-pvps.org/?id=93, retrieved December 19, 2019.

Figure F-9
CSPV modules: CSPV module production capacity in China and share of global capacity held by China, 2010–19

*　　*　　*　　*　　*　　*　　*

Source: ***.

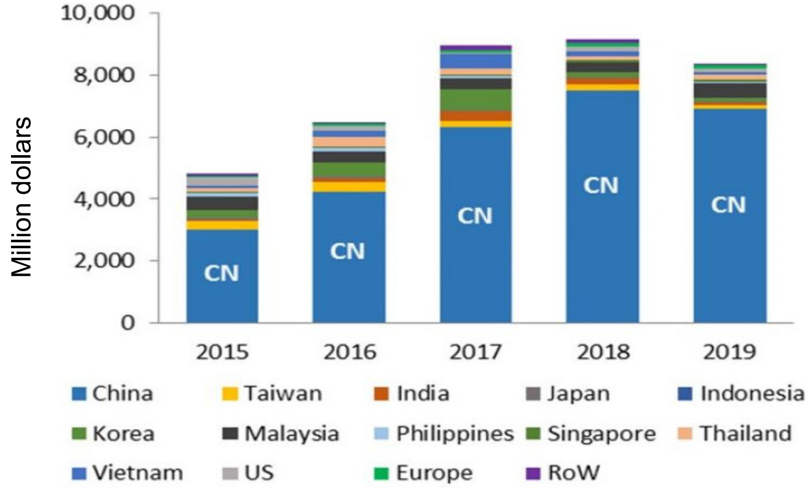
Capital expenditures

Reflecting the large increase in capacity shown above, China accounted for most of the approximately $9 billion in global CSPV capital expenditures (including ingots, wafers, cells, and modules) in 2018, and China’s share increased during 2015–18 (figure F-10). Examining cells specifically, China’s share of global capital expenditures increased from less than 60 percent in 2015 to more than 80 percent in 2018 (figure F-11).[31]

[31] Colville, Finlay, “Solar PV Capex Trending at US$9 billion Annually as New GW Fabs in China Slash Investments Required,” *PV Tech*, December 10, 2019, https://www.pv-tech.org/editors-blog/solar-pv-capex-trending-at-us9-billion-annually-as-new-gw-fabs-in-china-sla, retrieved December 18, 2019.

Figure F-10

CSPV products: Global capital expenditures for ingots, wafers, CSPV cells, and CSPV modules, 2015-19

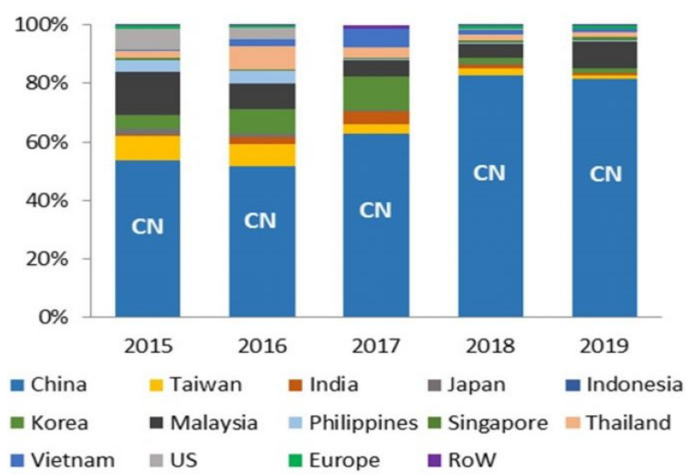


Notes: 2019 data are projections. Given declining costs for building plants, decreases in spending do not necessarily translate to lower capacity additions in GW terms.

Source: Colville, Finlay, "Solar PV Capex Trending at US$9 billion Annually as New GW Fabs in China Slash Investments Required," *PV Tech*, December 10, 2019, https://www.pv-tech.org/editors-blog/solar-pv-capex-trending-at-us9-billion-annually-as-new-gw-fabs-in-china-sla, retrieved December 18, 2019.

Figure F-11

CSPV cells: Share of global capital expenditures for CSPV cells



Notes: 2019 data are projections.

Source: Colville, Finlay, "Solar PV Capex Trending at US$9 billion Annually as New GW Fabs in China Slash Investments Required," *PV Tech*, December 10, 2019, https://www.pv-tech.org/editors-blog/solar-pv-capex-trending-at-us9-billion-annually-as-new-gw-fabs-in-china-sla, retrieved December 18, 2019.

Other grants

CSPV manufacturers in China receive a range of other grants and funding from government sources. For example, Trina reported receiving "unrestricted cash government subsidies" during 2009-15 of $25 million.[77] Longi listed more than 130 projects under the category of "government subsidy" for which the company had a balance at the start of the year or received money in 2018.[78]

Supply chain

CSPV cell and module producers benefited not only from the policies through which they directly received support, but also through policies directed at the supply chain. For example, the European Commission identified subsidy rates of 3.2 percent to 16.7 percent for participating producers of solar glass in its countervailing duty investigation.[79] Chinese producers of aluminum extrusions (which include module frames) benefit from a range of government policies to support the aluminum industry.[80] The Chinese government has

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[77] Trina, "Form 20-F," Annual filing to the Securities and Exchange Commission for the fiscal year ended December 31, 2011, p. F-19. https://www.sec.gov/Archives/edgar/data/1382158/000110465912022420/a12-6567_120f.htm, retrieved December 28, 2019; Trina, "Form 20-F," Annual filing to the Securities and Exchange Commission for the fiscal year ended December 31, 2012, April 2, 2013, p. F-21, https://www.sec.gov/Archives/edgar/data/1382158/000110465913026502/a12-29784_120f.htm, retrieved December 28, 2019; Trina, "Form 20-F," Annual filing to the Securities and Exchange Commission for the fiscal year ended December 31, 2015, April 19, 2016, p. F-18, https://www.sec.gov/Archives/edgar/data/1382158/000110465916112305/a16-1508_120f.htm, retrieved December 28, 2019.

[78] LONGi Green Energy Technology Co., Ltd., *Annual Report 2018*, April 30, 2019, pp. 249–262, https://en.longigroup.com/uploadfile/network/2019/07/20190702100700106.pdf, retrieved December 24, 2019.

[79] European Commission, Commission Implementing Regulation (EU) No 471/2014 of 13 May 2014 imposing definitive countervailing duties on imports of solar glass originating in the People's Republic of China, *Official Journal of the European Union*, May 14, 2014, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32014R0471, retrieved December 30, 2019.

[80] USITC, *Aluminum: Competitive Conditions Affecting the U.S. Industry*, Publication No. 4703, Investigation No. 332-557, June 2017, pp. 253–267, https://www.usitc.gov/publications/332/pub4703.pdf, retrieved December 30, 2019.

supported energy intensive polysilicon production[81] through reduced electricity rates, and other policies. For example, LDK "received regularly significant electricity fee subsidies from the Financial Bureau of Xin Yu Economic Zone" for its polysilicon production operations.[82] Daqo received reduced electricity rates from the government in Xinjiang as part of the approval for the expansion of its polysilicon manufacturing plant.[83] In 2018, Daqo also received "unrestricted cash government subsidies" totaling $13.1 million.[84]

CSPV demand policies

Early off-grid policies

Initial solar policies in China focused on increasing deployment in rural, off-grid areas. ***.[85] In addition, ***

[81] For a discussion of antidumping and countervailing duties on imports of polysilicon from the EU, Korea, and the United States, see the supply chain section above.

[82] European Union, Council Implementing Regulation No 1239/2013 of 2 December 2013, *Official Journal of the European Union*, December 5, 2013, L 325/120, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013R1239&from=EN, received December 24, 2019.

[83] Bellini, Emiliano, "Daqo Gets Government Approval and Cheaper Power for Poly Production Expansion," *PV Magazine*, May 25, 2018, https://www.pv-magazine.com/2018/05/25/daqo-gets-government-approval-and-cheaper-power-for-poly-production-expansion/, retrieved December 30, 2019.

[84] Daqo, "Form 20-F," Annual report to the Securities and Exchange Commission for the fiscal year ended December 31, 2018, April 17, 2019, p. F-14, https://www.sec.gov/Archives/edgar/data/1477641/000114420419020070/tv517398_20f.htm, retrieved December 30, 2019.

[85] ***.

EXHIBIT 15

Auditor’s Report

Trina Solar Co., Ltd

RSM CHINA CPA LLP

CHINA·BEIJING

Contents

Consolidated Statement of Profit or Loss and Other Comprehensive Income

for the year ended 31 December 2020

Prepared by: Trina Solar Co., Ltd. Unit: Yuan Currency: RMB

Item	Note	2020	2019
I. Revenue		**29,417,973,429.28**	**23,321,695,860.30**
Including: operating revenue	5.44	29,417,973,429.28	23,321,695,860.30
II. Cost of sales		**27,841,626,944.62**	**22,339,284,589.72**
Including: operating cost	5.44	24,718,988,909.31	19,253,889,104.71
Taxes and surcharges	5.45	96,555,877.57	131,641,572.07
Selling and distribution expenses	5.46	1,015,210,429.07	1,381,708,838.96
General and administrative expenses	5.47	1,109,044,516.47	924,344,988.16
Research and development expenses	5.48	363,486,752.98	293,772,742.94
Finance costs	5.49	538,340,459.22	353,927,342.88
Including: Interest expense		429,292,425.28	443,275,665.18
Interest income		94,222,766.13	80,979,620.43
Add: Other income	5.50	82,603,383.83	50,035,699.64
Investment income/(losses)	5.51	385,521,100.26	102,649,599.01
Including: Investment income from associates and joint ventures		86,863,105.42	177,568,894.26
Gains /(losses) from derecognition of financial assets measured at amortised cost		-	-
Income /(losses) from net exposure hedging		-	-
Gains/(losses) from changes in fair values	5.52	14,999,639.99	23,926,893.98
Impairment loss of credit	5.53	-219,780,218.99	-245,327,164.96
Impairment loss of asset	5.54	-328,886,479.96	-72,792,870.04
Gains/(losses) from disposal of assets	5.55	-77,364,985.98	-3,614,360.72
III. Profit/(loss) from operations		**1,433,438,923.81**	**837,289,067.49**
Add: Non-operating income	5.56	30,583,786.11	44,516,290.42
Less: Non-operating expenses	5.57	57,131,977.98	11,992,993.02
IV. Profit/(loss) before tax		**1,406,890,731.94**	**869,812,364.89**
Less: Income tax expenses	5.58	173,750,987.14	167,567,096.32
V. Net profit/(loss) for the year		**1,233,139,744.80**	**702,245,268.57**
(I) Net profit/(loss) by continuity			
Net profit/(loss) from continuing operation		1,233,139,744.80	702,245,268.57
Net profit/(loss) from discontinued operation		-	-
(II) Net profit/(loss) by ownership attribution			
Attributable to owners of the parent		1,229,276,756.49	640,595,151.46
Attributable to non-controlling interests		3,862,988.31	61,650,117.11
VI. Other comprehensive income for the year, after tax		**-138,234,542.59**	**34,875,125.21**
(a) Attributable to owners of the parent		-130,156,309.74	32,273,552.07
(i) Items that will not be reclassified subsequently to profit or loss		-	-
1. Exchange differences on translating foreign operations of parent		-	-
(ii) Items that may be reclassified subsequently to profit or loss		-130,156,309.74	32,273,552.07
1. Exchange differences on translating foreign operations of subsidiaries		-130,156,309.74	32,273,552.07
(b) Attributable to non-controlling interests		-8,078,232.85	2,601,573.14
VII. Total comprehensive income for the year		**1,094,905,202.21**	**737,120,393.78**
Attributable to owners of the parent		1,099,120,446.75	672,868,703.53
Attributable to non-controlling interests		-4,215,244.54	64,251,690.25
VIII. Earnings per share:			
Basic earnings per share		0.64	0.36
Diluted earnings per share		0.64	0.36

For business combination under common control, net profit of the acquiree before the combination is: RMB -379,542.49, net profit of acquiree in last reporting period is : RMB 0.

Legal Representative: Chief Financial Officer: Finance Manager:

6.3 Disposal of Subsidiaries

No significant subsidiaries were disposed during the reporting period.

7. INTERESTS IN OTHER ENTITIES

7.1 Interests in Subsidiaries

(a) Composition of corporate group

By the end of 2020, the Company directly and indirectly held a total of 388 subsidiaries, including 161 domestic subsidiaries and 227 overseas subsidiaries, 14 directly held subsidiaries and 374 indirectly held subsidiaries, among which the important subsidiaries are as follows:

Entity name	Principal place of business	Registration place	Nature	Shareholding (%)	Acquisition method
Trina Solar (Changzhou) Science & Technology Co.,Ltd	Changzhou, Jiangsu	Changzhou, Jiangsu	Component production and sales	100	Merger acquisition of enterprises under the same control
Trina Solar Energy (Shanghai) Co.,Ltd	Minhang District, Shanghai	Minhang District, Shanghai	Component sales	100	Merger acquisition of enterprises under the same control
Yancheng Trina Solar Guoneng Science & Technology Co.,Ltd	Yancheng, Jiangsu	Yancheng, Jiangsu	Component production and sales	51	Merger acquisition of enterprises under the same control
Changzhou Trina PV Electricity Generation Sys Ltd	Changzhou, Jiangsu	Changzhou, Jiangsu	EPC	100	Merger acquisition of enterprises under the same control
Jiangsu Trina Solar Electric Power Development Co., Ltd.	Changzhou, Jiangsu	Changzhou, Jiangsu	Investment holding	100	Merger acquisition of enterprises under the same control
Jiangsu Trina Solar Electric Power Development Holdings Ltd.	Changzhou, Jiangsu	Changzhou, Jiangsu	Investment holding	100	Merger acquisition of enterprises under the same control

Yingshang Runneng New Energy Co., Ltd	Fuyang, Anhui	Fuyang, Anhui	Power station project development	100	Merger acquisition of enterprises under the same control
Tibet Trina Solar PV System Integration Co;Ltd	Lhasa, Tibet	Lhasa, Tibet	Power station project development	100	Establishment
Hefei Trina Solar Technology Co., Ltd	Hefei, Anhui	Hefei, Anhui	Component production and sales	100	Merger acquisition of enterprises under the same control
Yijun Tianxing new energy Co., Ltd	Tongchuan, Shaanxi	Tongchuan, Shaanxi	Power station project development	100	Establishment
Pingshun Guohe photovoltaic power generation Co., Ltd	Changzhi, Shanxi	Changzhi, Shanxi	Power station project development	99.86	Establishment
SuQian Tianlan PV Electricity Co,. LTD	Suqian, Jiangsu	Suqian, Jiangsu	Component production and sales	100	Establishment
Trina Solar (Singapore) Science & Technology Pte. Ltd	Singapore	Singapore	Investment holding	100	Merger acquisition of enterprises under the same control
Trina Solar Science & Technology (Thailand) Ltd.	Thailand	Thailand	Production and sale of batteries	100	Merger acquisition of enterprises under the same control
Trina Solar (Vietnam) Science & Technology Co., Ltd	Vietnam	Vietnam	Production and sale of components and batteries	100	Merger acquisition of enterprises under the same control
Trina Solar (Australia) Pty Ltd.	Australia	Australia	Component sales	100	Merger acquisition of enterprises under the same control
Trina Solar Energy Development Pte. Ltd.	Singapore	Singapore	Component sales	100	Merger acquisition of enterprises under the same control
Trina Solar Japan Energy Co.,Ltd	Japan	Japan	Power station project development	100	Merger acquisition of enterprises under the same control

Trina Solar (Schweiz) AG	Switzerland	Switzerland	Component sales	100	Merger acquisition of enterprises under the same control
Trina Solar (Spain) S.L.U.	Spain	Spain	Component sales	100	Merger acquisition of enterprises under the same control
TRINA SOLAR (LUXEMBOURG) OVERSEAS SYSTEMS S.à r.I.	Luxembourg	Luxembourg	Investment holding	100	Merger acquisition of enterprises under the same control
Trina Solar (Netherlands) B.V.	Netherlands	Netherlands	Production and sale of batteries	100	Merger acquisition of enterprises under the same control
Nclave Renewable, S.L.	Spain	Spain	Production and sale of holder	100	Merger Acquisition of Enterprises under Different Control
Trina Solar (U.S.), Inc.	U.S.A	U.S.A	Component sales	100	Merger acquisition of enterprises under the same control
Trina Solar (Suqian) photoelectric Co., Ltd	Suqian, Jiangsu	Suqian, Jiangsu	R&D, manufacturing and sales of solar cells and modules;	100	Establishment
Yancheng Trina Solar Guoneng Science & Technology Co.,Ltd	Yancheng, Jiangsu	Yancheng, Jiangsu	Component production and sales	51	Merger acquisition of enterprises under the same control
Trina Solar (Yiwu) Technology Co., Ltd	Yiwu, Zhejiang	Yiwu, Zhejiang	Component research and development, production and sales	100	Establishment

7.2 Information about joint ventures and associates of the Company

(a) Important associates of the Company:

(i) Important associates of the Company in 2020:

Company name	Principal place of business	Registered address	Nature of business	Proportion of equity interest by the Company (%)		Measurement methods
				Direct	Indirect	
Associates						
Lijiang Longji silicon material Co., Ltd	Lijiang, Yunnan	Lijiang, Yunnan	Manufacturing and sales of silicon rod	25.00		Equity method

(ii) Important associates of the Company in 2019:

Items	30 September 2020 / 1.1-9.30 2020	30 December 2019 / 2019
	Lijiang Longji silicon material Co., Ltd	Lijiang Longji silicon material Co., Ltd
Current assets	1,678,991,332.81	1,565,944,558.63
Non-current assets	1,053,419,047.10	1,082,766,809.32
Total assets	2,732,410,379.91	2,648,711,367.95
Current liabilities	625,051,590.14	778,131,598.99
Non-current liabilities	255,732,742.40	365,481,542.82
Total liabilities	880,784,332.54	1,143,613,141.81
Non-controlling interests	740,650,418.95	602,039,290.46
Total owner's equity attributable to parent company	1,110,975,628.42	903,058,935.68
Share of net assets calculated by shareholding ratio	462,906,511.84	376,274,556.54
Revenue	2,153,201,675.22	3,041,951,877.56
Net profit/(loss)	345,918,235.75	685,103,982.55
Other comprehensive income	-	-
Total comprehensive income	345,918,235.75	685,103,982.55
Dividends received from the joint venture	158,609,085.37	-

Note (1): On 16 October 2020, the board of directors of Lijiang Longji silicon material Co., Ltd. made the "Proposal on the deliberation of the transfer of shares of Lijiang Longji silicon material Co., Ltd. by Trina Solar Energy Co., Ltd.", which agreed that the amount of the audited net assets deducting the dividends as of 30 September 2020 would be taken as the pricing base, and multiplied by the proportion of the equity held by it as the consideration for equity transfer. Since 1 October 2020, the Company no

EXHIBIT 16

Solar PV Trade and Manufacturing

A Deep Dive

February 2021

BloombergNEF

Contents

Table of tables

Section 1. Executive Summary

172GW

Crystalline silicon PV module manufacturing capacity build since 2017

83%

Polysilicon supplied by top 10 firms in 2019

$0.20/Watt

Monocrystalline silicon module price in 3Q 2020

The following is an in-depth examination of current solar photovoltaic (PV) manufacturing and trade trends produced under an ongoing partnership between BloombergNEF and the Energy Security & Climate Change Program at the Center for Strategic and International Studies in Washington. This report focuses exclusively on the PV industry and offers a deeper-dive look at current global competitive dynamics. Similar reports covering the wind and battery storage sectors have been published separately and are available for download at both CSIS.org and BNEF.com.

1. The PV manufacturing value chain consists of five main components: polysilicon, ingots, wafers, cells and modules.
2. The quality of Chinese products across all value chain segments is improving. The trade dispute between the U.S. and China that began in 2012 prompted Chinese companies to up their game and Chinese companies are now leading innovators in the space.
3. The greatest level of market consolidation exists farthest up the PV production chain. The top 10 polysilicon and wafer firms supplied 83% and 95% of the market in 2019, respectively.
4. Technical hurdles are highest for plants that make polysilicon and wafers. These plants are also costly to build and take longest to construct. Cell and module factories can be built faster and can respond quicker to technological trends and policy developments like import tariffs.
5. Major polysilicon makers in South Korea have recently ceased domestic production because they can no longer compete against new, more efficient factories in China. Since 2017, 91% of new polysilicon processing capacity (on a nameplate basis) has been built in China. In the U.S., the newest factory was built in 2016 by Wacker-Chemie in Tennessee.
6. Since 2010, over 220GW of new wafer manufacturing capacity has been brought online. Almost all of this was built in China where there is over 227GW of commissioned nameplate capacity, compared with just 18GW in all other countries combined.
7. The market for solar cells is much less consolidated. In 2019, the top 10 cell producers supplied 59% of the market. Leading cell makers are vertically-integrated companies that own wafer and/or module manufacturing as well. This allows them to exert better cost control and manage output certainty.
8. Module assemblers rely heavily on supply of external components such as PV-quality glass and aluminum frames. A local module assembly industry in a country can benefit from these adjacent industries being located nearby.
9. Given low technical and financial barriers, companies have historically proven relatively agile at responding to tariffs or other policy developments. After the U.S. imposed duties on Chinese-made solar cells, for instance, large integrated manufacturers built both cell and module assembly plants across Southeast Asia. The tariffs had limited success in boosting domestic manufacturing in the U.S.

10. The U.S. surge in demand for PV equipment over the past decade has not been accompanied by a similar rise in domestic PV manufacturing across the value chain. Instead, the U.S. has relied on imports, first from China then from Southeast Asia.
11. The U.S. has relied heavily on other countries to fulfil its demand for solar cells and modules. Countries of origin for imported cells and modules fluctuate with different U.S. government trade actions.
12. Most U.S. solar installations today use modules manufactured at plants located in Vietnam, Malaysia and Thailand that are owned by Chinese firms.
13. Whether a silicon-based module is assembled on U.S. soil or abroad, about half its total value is accounted for by non-silicon raw materials mainly produced in China. As a result, despite U.S.-imposed tariffs on Chinese-made PV cells and modules, China continues to accrue the largest share of value from modules installed in the U.S. – regardless of where the equipment gets assembled.

The manufacturing process at a glance

Polysilicon is the key feedstock for the production of solar cells. Its raw material, silicon dioxide (SiO_2), is high purity quartz sand and one of the most common minerals on Earth. The purification process that transforms raw silicon into hyper pure polysilicon, or "solar-grade" silicon that is suitable for PV, occurs in two stages.

The first involves taking the sand and heating with a clean type of charcoal or coke. This results in 98% pure silicon, also known as "metallurgical grade silicon". The next step is to heat the metallurgical grade silicon with acid to convert it to a gas called silane. The gas is then put into a hot reactor vessel, with some cooler 'seeds' of silicon crystal, and condenses to form pure rods of silicon, which are broken into chunks.

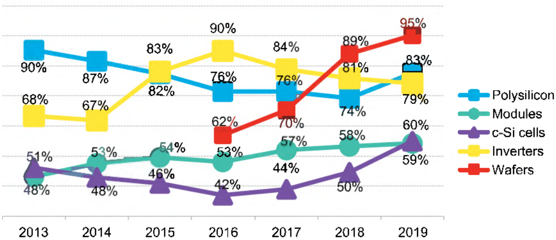
After the polysilicon arrives at the ingot factory as a sack of chunks, it is shaped into either multicrystalline or monocrystalline ingots by melting it and allowing it to cool slowly into solids. To create higher-value monocrystalline (mono) ingots, the crystal must grow very slowly into a single perfect block. Multicrystalline is made much faster by allowing interlocking crystals to form multiple nodes. Ingots are then sliced into wafers and doped with either phosphorus (p-type) or boron (n-type), which change their electrical properties by making either free electrons or electron holes that respond when excited by light.

Mono is a more efficient, yet costly product. However, as outlined later in this report, the costs for mono have fallen at a faster pace. Most ingot factories also contain wafer-manufacturing capabilities. This report has assumed wafer manufacturing data to include ingot capacity as well. The doped wafers are electrically connected and sealed into cells, then finally strung and finally assembled into the modules that go onto roofs or into open spaces.

Market overview

Generally speaking, the further up the PV production chain, the more consolidated the market is (Figure 2). The top ten polysilicon and wafer firms supplied 83% and 95% of the market in 2019, respectively. Polysilicon and wafers have higher technical hurdles and factories are more expensive and time-consuming to build. Cell and module factories can be built relatively quickly and can respond faster to market trends and policy moves such as the imposition of import tariffs.

Figure 2: Share of market supplied by the top ten firms across the PV value chain



Source: BloombergNEF

Inner Mongolia supplied 65% of the market in 2020 at costs significantly below the annual marginal cost of $6.6/kg.

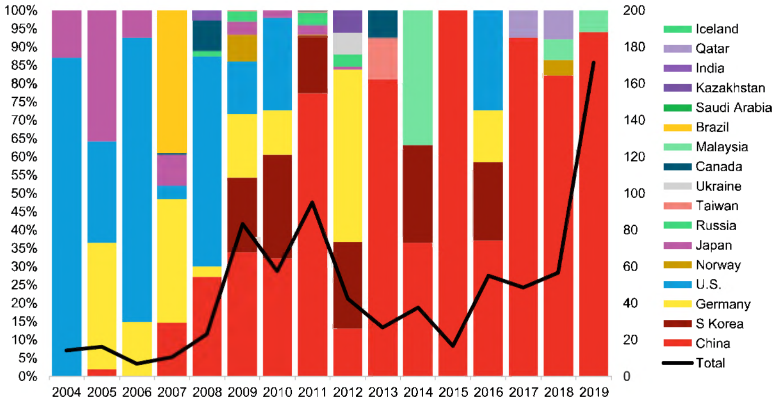
Global polysilicon manufacturing capacity

Chinese polysilicon firms added 74,000 tons of new nameplate capacity in 2011. Up to around 2012 however, Chinese products did not satisfy quality requirements from many wafer makers and could not compete against U.S. and German equipment. The story changed after China retaliated against U.S. import tariffs on Chinese cells and modules in 2012, by levying duties on U.S. polysilicon. Chinese polysilicon makers used the trade dispute to scale up and gain the experience to produce higher quality polysilicon.

Since 2017, 91% of new global polysilicon nameplate production capacity has been built in China (Figure 6). The current cost of building a new factory in China runs at about $15 million per thousand tons, or $39 million per gigawatt. Factory capex has come down over time, but high technical hurdles remain.

Tongwei, Daqo, Xinte, GCL and East Hope alone added over 80% of new capacity in China since 2017 (261,000 tons). In the U.S., the newest factory was built back in 2016 by Wacker-Chemie in Tennessee with a capacity of 20,000 tons. OCI, headquartered in South Korea, has faced stiff competition from China for its domestic-made polysilicon. The firm built its newest plant in Malaysia in 2014 and has recently closed all of its South Korean manufacturing.

Figure 6: Annual polysilicon factory additions per country of factory location and capacity in tons (right)



Source: BloombergNEF

Annual polysilicon production

Chinese polysilicon output

Chinese ingot and wafer makers at one time relied on international polysilicon companies in Germany and the U.S. for high-quality polysilicon. However, this foreign dependence has shrunk over time and China imported only 20% of the polysilicon it used in PV production in 1H 2020. Meanwhile, German and South Korean polysilicon producers rely heavily on exporting to China.

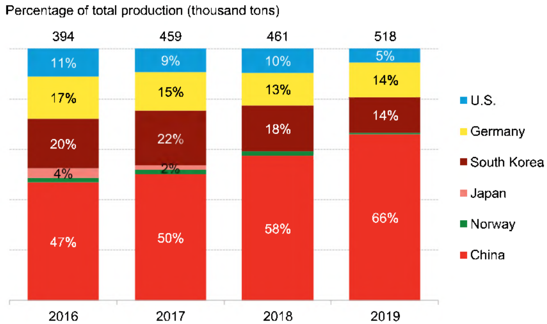
Seven of the world's top 10 polysilicon producers in 2019 were Chinese (Figure 7). After adding 60,000 tons of new capacity in 2019 under a partnership with Longi Green Energy Technology, Tongwei became the largest Chinese polysilicon maker in 2019 with 64,464 tons. This represented a 234% increase in output compared with 2018 and can be attributed to having the lowest production costs. Tongwei's ambitions go even further; the firm is building two new factories totalling 75,000 tons along with Longi Green Energy Technology.

International players – Germany, South Korea, the U.S. and Norway

International players, especially Wacker-Chemie in Germany, still do a better job than Chinese companies at avoiding undesired contamination during both the breaking up of rods into smaller pieces and the packaging process. As the market moves toward mono wafers, polysilicon of higher purity is required. Chinese firms have raised their quality standards since 2017, but are still not at the same level of Wacker's product.

Wacker was the biggest producer of polysilicon in 2019 and increased its output by 20% to 72,000 tons. As well as supplying the solar industry, the firm also sells to the electronics semiconductor industry. The company owns three factories, two in Germany and one in Tennessee. The U.S. plant, affected by Chinese import tariffs on U.S. polysilicon, made 12,000 tons with a total capacity of 20,000 tons in 2019.

Figure 7: Annual polysilicon production by country of company headquarters



Source: BloombergNEF

South Korean firm OCI was the second-largest producer of polysilicon in 2019 thanks to a capacity expansion of its Malaysian plant. However, like other Korean manufacturers such as Hankook Silicon (bankrupt in 2018) and Hanwha Chemical, OCI had to shutter its 52,000-ton factory in South Korea in early 2020. OCI and Hanwha's plant closures in 2020 will leave South Korea with no active polysilicon capacity due to high electricity prices and Chinese import tariffs on South Korean polysilicon.

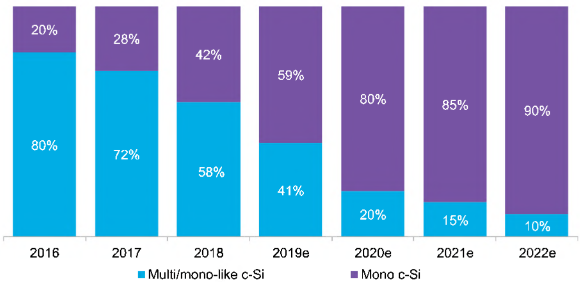
Hemlock Semiconductor's plant in Michigan produced 25,000 tons of polysilicon in 2019 vs. a total nameplate capacity of 35,000 tons. Cheap electricity in China, tariffs on U.S. polysilicon imports and improved quality across Chinese product have make it increasingly hard for Hemlock to find buyers in China, where almost all PV wafer makers are based. However, the U.S. firm still has some long-term supply contracts outstanding and owns ingot production in Taiwan. Product from that plant is shipped to some Chinese wafer makers.

3.2. Wafers

The share of monocrystalline wafers used in PV cells has surged since 2017 at the expense of multicrystalline. The market share for mono was expected to exceed multi in 2019, with almost 60% of the total. From 2020 on, the overwhelming majority of silicon wafer production is expected to be monocrystalline (Figure 8).

The surge in mono products can be explained by a combination of both supply and demand forces. On the supply side, new Chinese polysilicon factories built after 2017 have finally met the necessary product quality required for monocrystalline silicon wafers. On the demand side, cell manufacturers have switched to monocrystalline because it yields higher cell efficiencies.

Figure 8: Market split between mono and multi silicon wafer products



Source: BloombergNEF

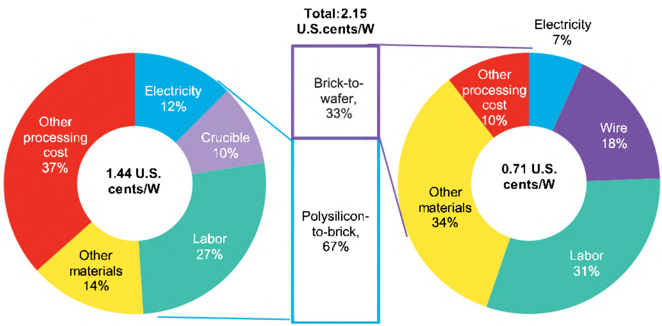
High barriers to entry caused market consolidation

Vertical integration, high factory capex and technical hurdles have made the wafer market the most consolidated segment of the PV value chain. While some wafer makers also make cells, most cell makers have limited or no wafer capacity, preferring to outsource this step of the value chain.

Best-in-class cost structure

Best-in-class cash costs for processing silicon into mono and multi wafers were 2.15 cents Watt in 2019 (Figure 9). The corresponding cost for producing multi wafers was 1.73 cents per Watt. Polysilicon ingots are cut into bricks before being further sliced into wafers. Major costs are labor, electricity and crucibles. The lowest cost mono and multi producers typically enjoy lower crucible costs thanks to in-house crucible production. Monocrystalline silicon is more expensive to make due to the use of premium polysilicon, as well as higher processing and labor costs in the polysilicon-to-brick conversion.

Figure 9: Best-in-class cash costs of making polysilicon into mono wafers by the end of 2019



Source: BloombergNEF

Wafer manufacturing capacity

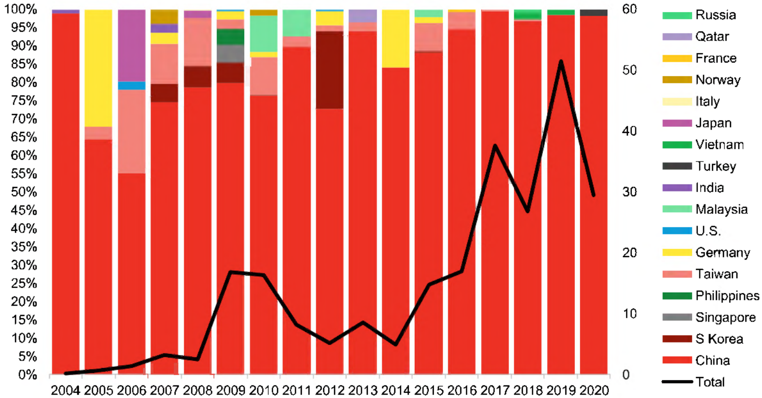
Since 2010, over 220GW of new wafer manufacturing capacity has been brought online. Almost three quarters of this was built after 2016. With minor exceptions, all of these new factories are located in China. China has over 227GW/year of commissioned wafer nameplate capacity as of 2020, compared with just 18GW/year across the rest of the world.

Nearly all the PV industry's demand for polysilicon comes from China. For the country, having control over wafer manufacturing has been critical on its path to global dominance of the PV supply chain. Wafer factories require high upfront capital expenditure and bear many technical hurdles, which makes it difficult for new factories to be built outside of China.

Wafers are an essential piece of the final cell and module composition. Given the current state of global polysilicon oversupply, wafer makers enjoy strong market and purchasing power. International polysilicon makers have struggled since China managed to supply most of its domestic wafer needs with locally manufactured polysilicon (Figure 10).

At the same time, wafers are a large part of the cost breakdown for solar cells and modules. Many large cell and module companies such as Trina Solar, Jinko Solar or Canadian Solar own wafer factories as well. Meanshile, Longi Green Energy Technology is a wafer maker that has entered cell and module production. Cell and module producers compete fiercely to supply high-efficiency solar panels at competitive costs. Therefore, securing reliable supply of mono wafers is crucial for large incumbents.

Figure 10: Annual wafer factory additions per country of factory location and yearly GW



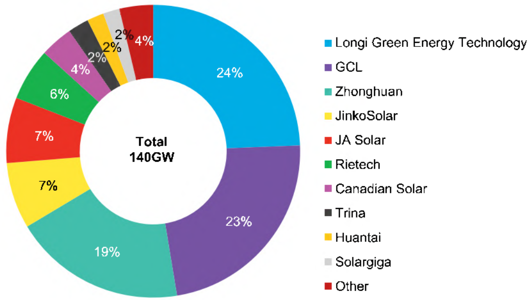
Source: BloombergNEF

Annual wafer production

In 2019, the top ten wafer makers supplied 95% of the market, up from 62% in 2016 (Figure 11). With the exception of Canadian Solar, which is headquartered in Canada but has factories in China, all of the companies were based in China. A total 140GW worth of wafers were made in 2019. The three biggest players alone (Longi, GCL and Zhonghuan) supplied 66% of the market.

In 2018, almost the entire wafer market flipped to using diamond wire saws to cut the wafers. The change meant thinner wafers and less losses of valuable silicon ingot. It also gave monocrystalline cells a decisive advantage over multicrystalline. Mono wafer specialist Longi Green Energy Technology, which had expanded into cell and module production to prove the viability of mono, became the biggest wafer producer in 2019 and increased its output by 68% from 20GW in 2018 to 34GW in 2019. This growth followed the latest expansions of its Chinese factories in Ningxia, Shaanxi and Yunnan, which has brought Longi's total nameplate capacity to 55GW in 2020. The integrated solar company has already announced plans for an additional 40GW of capacity and is currently building another 12GW.

Figure 11: Top ten solar wafer manufacturers by annual production, 2019



Source: BloombergNEF. Note: All 10 firms are headquartered in China, with the exception of Canadian Solar though the company has extensive manufacturing plants in China.

3.3. Cells

Compared with polysilicon and wafers, the solar cells segment of the value chain is far less consolidated. In 2019, the top ten cell producers supplied 59% of the market. Leading cell makers are often vertically integrated companies that own wafer and/or module manufacturing as well, but may buy outsourced wafers if the spot price is lower than their cost of production.

Cell manufacturing is more versatile compared to wafers and polysilicon and has lower technical hurdles. A multicrystalline cell factory can be upgraded to monocrystalline passivated emitter rear contact (PERC) production, for example, while a multi wafer factory would need significant investment to make mono wafers.

In addition, compared with wafers and polysilicon, it is easier to temporarily halt production lines across cell factories and quickly ramp them back up again. Over the last decade, there has been overcapacity global cell manufacturing, particularly as older capacity has been slow to retire.

Different cell types, efficiencies and costs

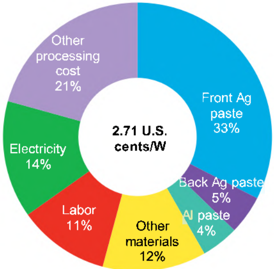
Mono PERC cells have become the market standard over the last two years at the expense of multi Al-BSF cells. Wide market adoption of different cell products is a factor of both efficiency and cost, where higher cell efficiencies command higher prices.

Historically, multicrystalline dominated the market because its lower efficiency was offset by lower costs. However, the additional cost of making mono PERC cells has decreased over time, to the point where better efficiencies of mono cells outweigh their higher expenses. The introduction of diamond wire saws in 2018, and the move to PERC designs, brought the production cost of mono below the cost of multi for the top players.

Cell cost breakdown

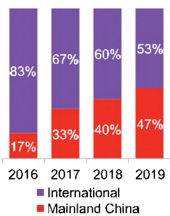
Over half of the cost of making monocrystalline silicon wafers into cells comes from the purchase of materials such as silver (Ag) and aluminum (Al) pastes (Figure 12). Front silver paste alone is the single largest cost component and accounted for 33% of total cost. It is used to form the electrical contacts on the front side of the cell.

Figure 12: Best-in-class cash costs of making silicon wafers into mono PERC cells as of year-end 2019



Source: BloombergNEF, company filings, industry sources.

Figure 13: Front Ag paste supply by company origin



Source: BloombergNEF

The largest silver paste suppliers have their factories in China. In addition to lower labor costs, there is an advantage of being located close to cell manufacturers. However, the majority of silver paste is still produced by non-Chinese companies. DuPont (U.S.), Heraeus (Germany), Samsung SDI (South Korea) and Gigasolar (Taiwan) supplied over 50% of the market in 2019 (Figure 13).

Global crystalline silicon solar cell manufacturing

Era of tariffs

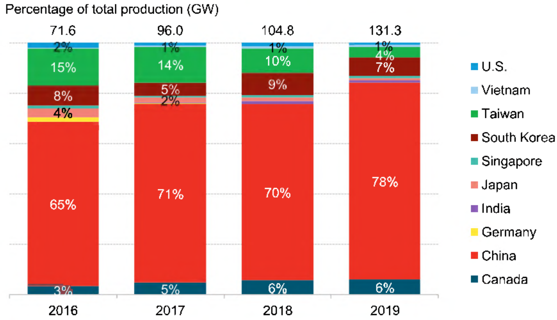
In 2011, there was about 49GW/year of cumulative solar cell manufacturing capacity worldwide, of which 71% was located in China. A year later, U.S. imposed antidumping (AD) and countervailing duty (CVD) tariffs on Chinese cells. Manufacturers then turned to Taiwanese cell makers to avoid the duties. However, the U.S. government responded in early 2015 by imposing tariffs on Taiwanese cells too.

U.S. trade restrictions on China and Taiwan triggered a rapid expansion of cell production across Southeast Asian countries in 2015 and 2016. Hanwha made the most aggressive move and built a 1.6GW plant in Malaysia in 2015, followed by other early movers such as JA Solar and JinkoSolar. Since 2015, cell makers have added almost 24GW of nameplate capacity across Southeast Asia.

Tariffs on China and Taiwan also benefited Hanwha's South Korean manufacturing, which grew from 600MW in 2015 to 3.7GW just three years later. However, in 2018, the U.S. imposed its Section 201 and 301 tariffs on crystalline silicon cells from outside China, which included Southeast Asia and South Korea. The first 2.5GW batch of cell imports is however tariff-free.

Taiwanese cell makers also lost market share in the Indian market as a result of 2018 safeguard duties against PV cell and module imports, set in an attempt to boost local PV manufacturing in India.

Figure 15: Annual cell production by country of headquarters (not factory location)



Source: BloombergNEF

Large cell makers own other parts of the value chain as well

Seven of 2019's top 10 cell manufacturers owned wafer manufacturing capacity as well. Vertical integration and industry partnerships across the PV supply chain are common among big players to have some control over production costs.

Tongwei, which was the largest Chinese polysilicon maker in 2019, topped the list of cell makers in the same year with 13.4GW of output, 105% more than in the previous year. The firm just closed a supply contract with Longi's wafer factories for about 13.5GW, which gives it supply certainty. In exchange, Tongwei will supply a fixed amount of polysilicon to Longi's wafer plants.

Other top producers such as JA Solar, Longi, Canadian Solar and Hanwha also achieved record cell outputs in 2019 as they expanded factories and moved new manufacturing to Southeast Asia.

3.4. Modules

Module makers are heavily reliant on the supply of external components such as PV glass and aluminum frames. Recent glass supply shortages have increased production costs for module makers and caused disruptions across module production lines.

Despite U.S. tariffs on Chinese-made cells and modules, China continues to expand its global dominance. Big, Chinese integrated solar firms participate in multiple segments of the PV value chain, which allows them to have better cost control and supply certainty. In addition, most of the key components for panel assembly are now being produced in China.

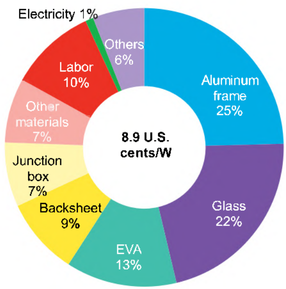
Compared with more upstream manufacturing components, module assembly quality and costs are influenced by the supply of this equipment. As a result, securing reliable supply of high-quality product is essential for module manufacturers. Large players, such as Longi, secure stable supplies by signing volume contracts that span two to three years. These agreements offer some discount but are still exposed to spot price fluctuations of raw materials like glass and aluminum. Longi has closed contracts for 47GW worth of PV glass and 44GW of aluminum frames. The company plans to spend over $2.6 billion on these agreements between 2019 and 2025. Other module makers, such as Canadian Solar and Jinko Solar, have gone further and own subsidiaries that produce frames, junction boxes and EVA. In April 2020, Longi also announced the creation of a joint venture for the production of 10GW worth of frames.

The price of external materials is determined by production costs and suppliers' gross margins. Both variables are exposed to spot prices of commodities and supply-demand market dynamics. In 2020, glass supply was pinched by a sharp rise in demand for bifacial modules, which use 25-56% more glass than traditional monofacial modules. Bifacial demand has spiked since 2018 when such modules accounted for just 3% of the installed market. By 2019, that had grown to 18% and was expected to reach 35% in 2020, and 60% in 2021.

Glass manufacturers have not invested in factories to keep up with the changes in product required by module makers, who are switching to bifacial dual-glass modules that require thinner glass, and are making larger product. Glass prices have risen by 71% since July 2020 as glass manufacturers struggle to meet demand. (The Chinese government has also tried to control overcapacity in glass production through quotas, but this is really a minor contributor to the glass shortage).

As a response to shortages, PV glass giants Xinyi Solar and Flat Glass are expected to add a total of 2.1 million tons of capacity in 2020 and an additional 1.4 million tons in 2021. These two Chinese producers alone will supply over 50% of the market in 2020.

Figure 18: Best-in-class cash cost for cell-to-module for mono c-Si modules made by large firms as of year-end 2019



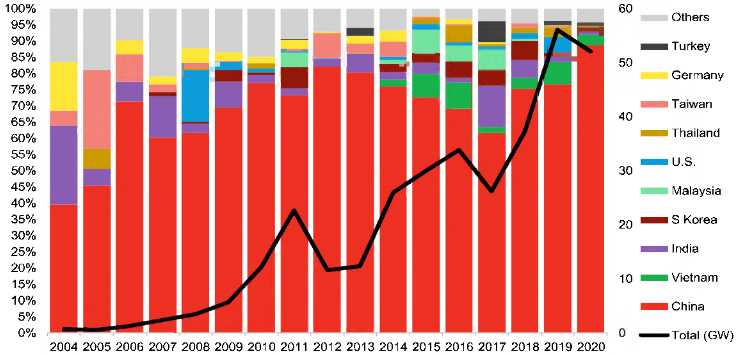
Source: BloombergNEF. Note: Most costly components in "other materials" are ribbons and adhesives. Packaging cost is categorized into "others".

Global c-Si module manufacturing capacity

Module factories have low technical hurdles

Since 2017, almost 172GW/year of c-Si module manufacturing capacity has been built globally, 134GW of it in China (Figure 19). Building a new module factory has low technical hurdles compared with wafer and polysilicon.

Figure 19: Crystalline-silicon module factory additions per country of factory location and yearly GW



Source: BloombergNEF

Large module makers have been regularly upgrading their production lines to adjust for new cell structures and other technological needs. Factories that lack the most modern equipment can become obsolete quickly in the current competitive market environment.

Factory locations track policy developments

Given low technical and financial barriers, it is also easier for module companies to open shop in other countries in response to tariffs or other policy developments. Once duties on Chinese solar cells were imposed by the U.S., large integrated manufacturers built both cell and module assembly plants across Southeast Asia. Since 2015, Longi has added over 7.4GW/year of module factories in Malaysia and Vietnam, followed by Hanwha (6.3GW/year) and Canadian Solar (2.7GW/year).

India's local content rules for its national solar auctions require cells and modules to be produced domestically. This condition spurred local manufacturing in the country. Over 11GW/year of crystalline silicon module capacity has been added since 2009 in India, of which 6.8GW/year were built after 2016. Indian module makers have also benefitted from U.S. tariffs on Chinese product, as well as their own government's duties on imports from China and Malaysia in 2018.

In the U.S., about 3.6GW/year of module assembly capacity has come online since 2017. Hanwha built a 1.7GW/year module assembly factory in Georgia in 2019, where it uses its own cells imported under the 2.5GW tariff-free cap. JinkoSolar and LG built 0.5GW and 0.4GW of annual module capacity in 2019, respectively. The two firms import their own cells for assembly in the U.S. under the 2.5GW tariff-free cap, from their facilities in Malaysia and South Korea. In 2018, over 1.3GW/year of new module factories were announced in the U.S. by firms including Sunpreme, Solaria or Mission Solar. However, no significant construction milestones have been achieved to date.

More module assembly capacity is expected online over the next couple of years, with the vast majority of it planned for China.

Annual module production

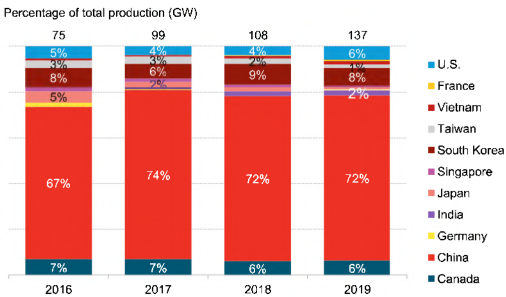
Compared with the 313GW/year of commissioned crystalline silicon module assembly capacity, around 137GW worth of modules (44%) were actually made in 2019. Many of the factories built several years ago have halted production or are waiting to be upgraded because their product is no longer competitive. Other have stopped production altogether.

About 118GW of solar modules were installed in projects across the world in 2019. The majority of the remaining 19GW of modules produced were "safe-harbored" in the U.S. (purchased on paper) for tax credit purposes.

China's global dominance in module production has not diminished over time (Figure 20). Besides ample supply of components along the PV value chain such as cells and wafers, China is also home to the largest manufacturers of key materials such as PV glass and aluminum frames. Overall, integrated Chinese solar manufacturers have been able to expand their production lines across the entire PV value chain due to the proliferation of other adjacent industries in China. For another country to keep up with Chinese PV output, a network of industries would need to be significantly expanded or built from scratch. Even still, it is unclear whether these new factories could be cost-competitive against China.

In 2019, India- and Vietnam-based module makers benefited from U.S. import tariffs on China and were able to grow their U.S. sales. First Solar and SunPower, the largest U.S. manufacturers, also profited from the tariffs and sold 5.7GW and 2.55GW worth of modules in 2019, respectively.

Figure 20: Annual module production by country of headquarters (not factory location)



Source: BloombergNEF

Section 4. U.S. PV cell and module trade trends

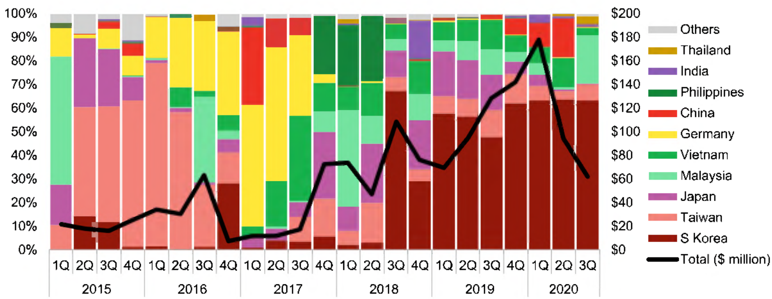
Given its limited PV manufacturing capabilities, the U.S. has heavily relied on other countries to fulfil its demand for solar cells and modules. The countries of origin of U.S. imported cells and modules have varied over the years in the wake of various U.S. government trade actions.

PV cell imports

After imposing anti-dumping and countervailing duties against Chinese-made cells in 2012, U.S. module makers began to predominantly import cells from Taiwan (Figure 21). Cell imports plummeted in 4Q 2016 after tariffs were imposed on Taiwan in 2015. Module makers continued to import Taiwanese cells despite the tariffs through 4Q 2016, because tax credits for solar projects in the U.S. were expected to step down after 2016. To circumvent the tariffs, Chinese and Taiwanese cell makers started building factories across Southeast Asia around 2015, which started exporting to the U.S. in 2017.

Starting in 3Q 2018, South Korea became the single biggest exporter of solar cells to the U.S. Hanwha's 1.7GW/year and LG's 0.5GW/year module factories in the U.S. were two of the main destinations. Despite the set of new tariffs that were lifted in 2018, U.S. module factories have continued to import South Korean and Southeast Asian cells under the 2.5GW tariff-free cap. A total of 1.7GW was imported in 2020 through September.

Figure 21: U.S. PV quarterly cell imports by country and value ($ million)



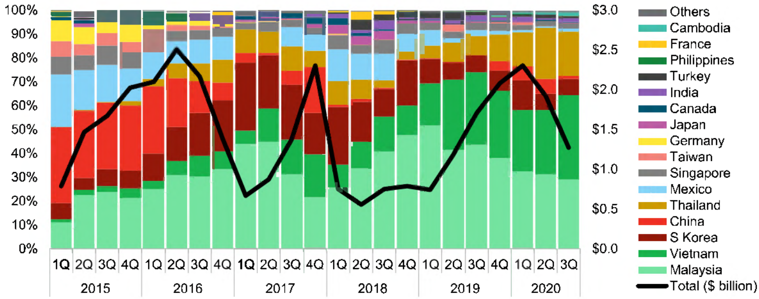
Source: BloombergNEF

PV module imports

Most U.S. solar installations today use imported modules from Vietnam, Malaysia and Thailand. Most module-assembly plants that ship from Southeast Asia to the U.S. are Chinese-owned. The U.S. imported about 20GW of modules between January-September 2020.

Module assembly in Southeast Asian countries and South Korea remains still considerably cheaper than in the U.S. Despite the 2012 AD and CVD duties imposed on Chinese cells, plenty of solar modules continued to arrive from China until 2016. As outlined earlier, Chinese module makers found a loophole under which they imported Taiwanese-made cells to China and assembled them into modules to sell the final product tariff-free into the U.S.

Figure 22: U.S. PV quarterly module imports by country and value ($ billion)



Source: BloombergNEF

Value break-out of projects built in the U.S.

The U.S. imported 21GW of PV modules and cells in 2019. That far exceeded the 11.5GW of projects actually built that year as installers sought to "safe harbor" (stockpile) equipment ahead of a looming step-down in the value of the U.S. Investment Tax Credit (ITC) subsidy. The U.S. imported a further 20GW of PV modules through the first three quarters of 2020, well above the 16GW of solar BloombergNEF that ultimately got built. This continuing stockpiling of PV equipment suggests that most, if not nearly all, projects commissioned in the U.S. in 2020 and 2021 will be outfitted with equipment assembled abroad.

In the wake of tariffs the U.S. imposed on equipment made in China, the majority of goods the U.S. imports arrive from Southeast Asia post-assembly. However, 70% of the actual value of that equipment accrues to China where key, pre-assembly steps in the making of the equipment take place, including production of solar-grade silicon, ingots, wafers and cells. For this reason, Southeast Asian nations account for just 27% of the value of a typical PV module exported to the U.S., despite those nations being most likely to be the last port of call before final, assembled equipment arrives in the U.S. (Figure 24). One other important fact: most of the plants assembling modules in Southeast Asia are actually owned by Chinese firms.

For the minority of modules installed in U.S. projects after having been assembled on U.S. soil, 26% of the value is accrued locally, mainly in the form of the labor and electricity used to put together the PV panels (Figure 23). Even for this equipment, however, the majority of the value creation (60%) still accrues to China. China-based firms produce 80% of the world's refined polysilicon, as well as virtually all wafers and non-silicon materials that go into the final cells that U.S. module-makers import. In the rare cases where cells are also manufactured in the U.S., the share of value creation only marginally increases, to 29% and does so at the expense of countries other than China.

BloombergNEF assumes just 2.5GW of the approximately 16GW installed in the U.S. in 2020 was assembled on U.S. soil. Module makers in the U.S. mainly imported cells from South Korea and Southeast Asia up to 2.5GW but no higher because that is the quota the U.S. government has set for tariff-free imports from those nations. Were the current U.S. tariffs on imported PV cells to be lifted, most modules installed in the U.S. would come directly from China or Southeast Asia, given the significantly lower all-in production costs those nations offer.

Figure 23: Value break-out of a typical crystalline silicon PV module assembled on U.S. soil (based on cash costs)

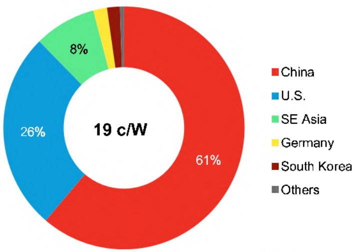
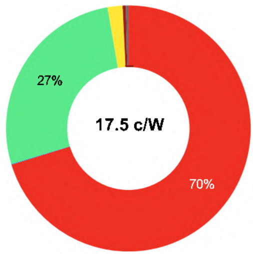


Figure 24: Value break-out of a typical crystalline silicon PV module imported from Southeast Asia (based on cash costs)



Source: BloombergNEF Note: Value creation distributed by country for modules assembled in the U.S. based on cash costs. Cash costs exclude tariffs, depreciation and transport fees, as well as profit margins. Cash costs components include: polysilicon, silicon-to-wafer production, non-silicon raw materials, wafer-to-cell production, non-cell raw materials and cell-to-module assembly.

Whether a silicon-based module is assembled on U.S. soil or abroad, about half its total value is accounted for by non-silicon raw materials such as silver paste, glass and back sheets. The vast majority of suppliers of these materials are concentrated in China. As a result, despite U.S.-imposed tariffs on Chinese-made PV cells and modules, China continues to accrue the largest share of value from modules installed in the U.S. – regardless of where the equipment gets assembled.

EXHIBIT 17

U.S. Imports of Solar Cells and Modules

	Calendar Year											YTD (Jan. - May.)	
Value in USD	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2020 YTD	2021 YTD
China	$1,206,523,519	$2,839,189,943	$1,717,275,514	$1,171,671,947	$1,634,023,148	$1,733,411,447	$1,531,623,484	$555,986,638	$24,226,640	$101,328,641	$392,701,212	$281,159,627	$7,364,374
Malaysia	$148,104,636	$576,448,485	$1,512,044,764	$1,251,732,146	$896,650,224	$1,315,646,602	$2,530,530,775	$1,617,247,949	$871,258,814	$1,747,571,029	$2,301,534,368	$920,337,268	$958,773,408
Vietnam	$666,295	$1,289,311	$939,641	$157,663	$7,407,974	$176,289,341	$529,802,567	$799,546,882	$430,446,324	$1,112,823,566	$1,644,893,917	$592,905,296	$681,078,299
Thailand	$2,706	$336,806	$12,447	$374,043	$750,568	$40,858,231	$531,950,499	$444,186,822	$198,237,338	$581,498,157	$1,464,662,606	$630,965,033	$532,622,709
Total Imports	$2,691,842,297	$5,051,086,913	$5,213,699,297	$3,721,106,255	$4,286,778,297	$6,083,041,778	$8,487,012,753	$5,336,523,598	$2,971,618,569	$5,064,313,077	$7,575,398,069	$3,256,288,125	$2,752,966,064
Chinese % of total imports	44.8%	56.2%	32.9%	31.5%	38.1%	28.5%	18.0%	10.4%	0.8%	2.0%	5.2%	8.6%	0.3%
Malaysian % of total imports	5.5%	11.4%	29.0%	33.6%	20.9%	21.6%	29.8%	30.3%	29.3%	34.5%	30.4%	28.3%	34.8%
Vietnamese % of total imports	0.0%	0.0%	0.0%	0.0%	0.2%	2.9%	6.2%	15.0%	14.5%	22.0%	21.7%	18.2%	24.7%
Thai % of total imports	0.00%	0.01%	0.0%	0.0%	0.0%	0.7%	6.3%	8.3%	6.7%	11.5%	19.3%	19.4%	19.3%

Source: USITC (DataWeb), HTSUS subheadings 8541.40.6020 and 8541.40.6030 through June 30, 2018 and 8541.40.6015 and 8541.40.6025 as of July 1, 2018 per USITC pub. 5021 at I-15, I-16.

Chinese Import Share Decrease 2011-2020	-86.17%
Malaysia Import Share Increase 2011-2020	299.26%
Vietnam Import Share Increase 2011-2020	127479.30%
Thailand Import Share Increase 2011-2020	434768.32%

Imports For Consumption | Monthly data for 2010

Data Row Count 42

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
First Unit of Quantity	Argentina	number	0	200	410	250	200	0	350	0	243	820	0	447
First Unit of Quantity	Australia	number	50	187	14	248	48	2,573	22	11	500	3	0	0
First Unit of Quantity	Austria	number	0	0	0	24	0	0	0	0	0	0	0	4,419
First Unit of Quantity	Belgium	number	32	0	0	7,213	0	7	63	0	0	33,620	0	177
First Unit of Quantity	Brazil	number	0	0	0	0	0	0	0	500	0	0	0	0
First Unit of Quantity	Canada	number	2,738	3,913	14,645	11,916	2,504	1,326	142	291	104	1,497	836	10,056
First Unit of Quantity	China	number	866,958	1,106,474	721,191	524,109	1,296,376	1,016,663	4,109,179	725,677	1,284,490	1,631,210	1,836,306	2,252,969
First Unit of Quantity	Croatia	number	0	0	0	0	0	5,000	166	0	0	0	0	0
First Unit of Quantity	Czech Republic	number	153,000	145,000	201,550	0	0	0	0	0	0	0	856	778
First Unit of Quantity	Denmark	number	0	0	0	44	0	0	0	0	0	89	25	44
First Unit of Quantity	France	number	36	5	0	0	0	0	0	17,676	0	0	4	0
First Unit of Quantity	Gabon	number	0	0	0	0	0	0	0	0	0	0	0	2,500
First Unit of Quantity	Germany	number	1,089,177	1,008,022	653,258	1,235,957	995,217	1,297,286	906,000	718,782	1,068,429	1,920,157	1,068,408	1,845,839
First Unit of Quantity	Hong Kong	number	1,704	500	1,677	401	2,803	1,040	55,279	1,394	0	10	7,786	400
First Unit of Quantity	Hungary	number	0	0	0	0	0	9,300	0	0	0	0	0	0
First Unit of Quantity	India	number	3,272	293	681	746	853	3,283	4,251	8,656	22,237	19,987	29,655	28,656
First Unit of Quantity	Indonesia	number	0	0	0	0	0	0	0	0	0	0	1	0
First Unit of Quantity	Ireland	number	0	0	0	0	0	0	4	0	0	0	0	0
First Unit of Quantity	Israel	number	13	0	0	0	25	540	0	33	0	0	0	0
First Unit of Quantity	Italy	number	720	0	71	506	0	7	2,776	0	26	1,098	5,370	8,668
First Unit of Quantity	Japan	number	62,102	59,422	487,343	334,750	519,242	600,419	452,671	159,825	249,066	189,252	571,249	1,004,578
First Unit of Quantity	Luxembourg	number	0	0	0	0	0	0	0	0	0	0	0	2
First Unit of Quantity	Malaysia	number	33,600	2,363,270	3,209,406	2,124,935	31,023	35,104	27,248	11,262,684	2,365,280	47,095	287,533	140,292
First Unit of Quantity	Mexico	number	103,995	72,773	78,043	81,627	62,461	149,008	176,108	90,459	139,065	121,685	161,624	179,534
First Unit of Quantity	Netherlands	number	0	4,545	0	20	0	0	0	0	0	0	1,004	1,915
First Unit of Quantity	New Zealand	number	200	0	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Norway	number	8,700	13,000	18,500	23,100	0	0	0	0	0	0	0	0
First Unit of Quantity	Philippines	number	7,406	6,041	179	3,964	87,980	7,460	25,566	11,724	7,409	17,197	5,185	4,816
First Unit of Quantity	Poland	number	0	15	29	0	69	6	0	0	19	0	0	0
First Unit of Quantity	Portugal	number	1	0	0	0	0	18	0	0	14,000	0	0	0
First Unit of Quantity	Russia	number	0	2,200	1,950	0	0	0	0	0	0	0	0	2,000
First Unit of Quantity	Singapore	number	142	56	0	2,247	14,880	6,964	13,613	28,045	26,320	38,640	18,920	38,153
First Unit of Quantity	South Africa	number	0	0	0	0	0	0	0	0	0	0	2,222	0
First Unit of Quantity	South Korea	number	0	31,066	61,654	35,943	78,029	118,657	113,522	118,915	71,134	123,919	158,817	27,145
First Unit of Quantity	Spain	number	260	1,826	0	3,333	2,177	13,214	72	59,492	39,851	11,350	11,339	201
First Unit of Quantity	Sweden	number	1,920	15,600	0	8,580	4,680	7,800	3,900	0	1	0	22,010	0
First Unit of Quantity	Switzerland	number	57	0	1,010	47	35,652	0	100,000	81,420	39	1	0	10
First Unit of Quantity	Taiwan	number	731,479	1,830,952	1,639,803	1,282,661	2,938,422	1,375,714	1,954,915	3,834,910	2,503,231	2,359,377	1,333,209	2,166,166
First Unit of Quantity	Thailand	number	0	0	0	0	0	50	0	0	0	0	0	0
First Unit of Quantity	Turkey	number	0	0	157	0	156	0	0	542	312	0	0	156
First Unit of Quantity	United Kingdom	number	662	4	29,927	1,232	10,308	2,102	2,002	5,223	66,423	1,476	39,580	2,005
First Unit of Quantity	Vietnam	number	0	0	0	0	0	0	0	2,438	0	0	988	0
Total:			3,068,224	6,665,364	7,121,498	5,683,853	6,083,105	4,653,541	7,947,849	17,128,697	7,858,179	6,518,483	5,562,927	7,721,926

Imports For Consumption | Monthly data for 2011

Data Row Count 38

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
First Unit of Quantity	Argentina	number	0	440	100	0	0	290	0	0	0	200	0	0
First Unit of Quantity	Australia	number	73	240	80	0	18	252	142	30	100	10	86	9,982
First Unit of Quantity	Austria	number	0	0	0	0	35	0	0	0	6,920	0	1	0
First Unit of Quantity	Belgium	number	0	0	1	0	0	0	3,010	0	0	0	180	31,725
First Unit of Quantity	Brazil	number	0	0	5,158	0	0	0	0	153,600	0	0	0	0
First Unit of Quantity	Canada	number	1,015	5,801	972	1,362	1,365	779	15,786	4,754	5,470	16,398	245	28,336
First Unit of Quantity	China	number	3,010,475	1,654,556	3,938,754	2,719,413	3,088,745	9,437,628	13,543,321	7,199,507	6,506,662	6,561,864	9,883,708	3,094,684
First Unit of Quantity	Croatia	number	0	0	0	0	0	601	0	0	370	0	0	0
First Unit of Quantity	Czech Republic	number	597	555	0	0	1,054	0	0	20	0	0	8	0
First Unit of Quantity	Denmark	number	82	0	16	0	0	0	0	0	0	0	0	18
First Unit of Quantity	France	number	0	20	0	2,691	64	0	2,000	4	5	4	13	0
First Unit of Quantity	Germany	number	1,582,320	1,666,507	2,646,079	4,255,295	3,899,109	829,756	1,819,515	675,248	967,251	388,883	119,692	98,750
First Unit of Quantity	Hong Kong	number	0	0	1,500	1,232	3,300	510	660	10,279	0	2,004	6,441	3,676
First Unit of Quantity	Hungary	number	0	0	38	0	0	0	0	0	0	0	0	0
First Unit of Quantity	India	number	25,864	36,719	38,070	111,188	25,355	10,251	12,795	2,359	70	31,689	58,256	46
First Unit of Quantity	Israel	number	0	0	1	1	4	7	0	240	6	0	700	3
First Unit of Quantity	Italy	number	0	5,011	90	0	0	76	1,225	0	20,950	4	334	0
First Unit of Quantity	Japan	number	857,242	930,626	286,947	1,095,882	1,946,223	1,534,057	1,229,808	1,430,350	879,740	1,105,988	578,388	267,948
First Unit of Quantity	Malaysia	number	144,096	200,758	8,461	133,418	101,702	482,088	473,240	875,577	556,340	5,050,669	5,695,506	914,613
First Unit of Quantity	Mexico	number	164,009	134,646	104,098	76,606	111,747	121,219	68,831	112,142	108,313	84,676	141,181	161,515
First Unit of Quantity	Netherlands	number	1	125	7	0	50,503	0	1,165	0	901	2,392	1,883	0
First Unit of Quantity	New Zealand	number	0	0	0	0	0	0	0	0	0	0	0	1,158
First Unit of Quantity	Norway	number	0	0	0	0	0	0	0	11	40	0	0	0
First Unit of Quantity	Philippines	number	184,442	475,510	1,065,697	1,124,201	1,601,652	1,225,445	1,107,931	1,818,438	1,804,671	2,176,434	2,118,531	1,768,624
First Unit of Quantity	Poland	number	3	58	17	49	9	0	40	0	24	40	0	0
First Unit of Quantity	Portugal	number	0	0	0	0	0	0	0	0	1,056	0	356	0
First Unit of Quantity	Russia	number	0	1,500	0	5	18	0	0	0	0	0	0	0
First Unit of Quantity	Singapore	number	22,960	21,160	0	41,916	19,624	11,190	4,480	33,360	11,200	24,080	1,015,074	23,520
First Unit of Quantity	Slovakia	number	1	0	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	South Korea	number	175,954	258,974	92,955	295,037	11,841	225,629	68,233	450,117	22,948	26,741	143,185	72,434
First Unit of Quantity	Spain	number	125,067	3	4,182	290	166	490	31	75	3,272	3,093	0	0
First Unit of Quantity	Sweden	number	50	0	15	0	2,001	0	0	0	0	1	0	0
First Unit of Quantity	Switzerland	number	9	0	0	0	0	16	0	0	39	4,302	0	0
First Unit of Quantity	Taiwan	number	1,698,348	1,603,162	1,534,133	837,579	1,255,099	1,633,032	1,749,361	931,103	680,266	323,147	533,254	2,687,389
First Unit of Quantity	Thailand	number	0	84,660	0	0	768,480	0	0	0	0	0	0	33
First Unit of Quantity	Turkey	number	50	0	0	0	0	0	100	0	0	0	0	176
First Unit of Quantity	United Kingdom	number	1,720	12	8,302	5,899	2,334	8,891	3,554	2,421	1,536	2,924	3,172	1,325
First Unit of Quantity	Vietnam	number	988	988	494	650	494	0	468	468	0	0	972	459
Total:			7,995,366	7,082,031	9,736,167	10,702,714	12,890,942	15,522,207	20,105,696	13,700,103	11,578,150	15,805,543	20,301,166	9,166,414

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Data Row Count 40

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
First Unit of Quantity	Argentina	number	80	0	0	368	0	100	100	0	0	0	0	0
First Unit of Quantity	Australia	number	3,871	0	0	175	47	40	60	0	149	40	116	204
First Unit of Quantity	Austria	number	0	0	0	55	0	159	150	57	52	0	20,913	72
First Unit of Quantity	Belgium	number	15	2,845	5,634	2,750	2	0	1,501	2,406	0	0	0	0
First Unit of Quantity	Canada	number	63,743	17,057	89,161	39,917	1,158	42	4,315	40,728	3,926	164,768	254	581
First Unit of Quantity	China	number	6,190,281	2,052,059	3,661,624	755,617	1,578,632	1,505,343	533,524	394,133	730,818	956,497	462,122	225,543
First Unit of Quantity	Czech Republic	number	252	14,165	4,224	22,115	3,391	0	0	663	0	0	0	963
First Unit of Quantity	Finland	number	0	0	0	0	0	0	0	0	0	1	0	0
First Unit of Quantity	France	number	2	0	111	0	0	0	3,788	0	0	0	0	0
First Unit of Quantity	Germany	number	156,038	1,350,632	56,368	67,460	14,634	53,899	36,623	327,087	144,460	159,746	404,397	204,003
First Unit of Quantity	Hong Kong	number	8,051	20	3,260	774	1,672	4,170	1,649	2,240	600	1,072	745	2,000
First Unit of Quantity	Hungary	number	0	0	0	0	0	0	0	20,000	0	0	0	0
First Unit of Quantity	India	number	2,086	16,995	32	42	63	0	6,111	6,452	9,221	824	553	7,414
First Unit of Quantity	Israel	number	10	16	0	3	3	12	34	26	1	0	0	0
First Unit of Quantity	Italy	number	0	12	6	178	24	12	150	45	12	22	40	0
First Unit of Quantity	Jamaica	number	0	0	0	0	0	0	0	0	0	2	0	0
First Unit of Quantity	Japan	number	1,027,141	2,059,518	1,053,378	1,262,881	298,395	388,094	437,573	454,680	378,939	909,061	700,798	928,133
First Unit of Quantity	Lithuania	number	0	0	0	0	0	0	0	16,464	6,272	6,272	12,544	12,544
First Unit of Quantity	Macau	number	0	150	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Malaysia	number	1,010,823	1,300,705	1,476,798	849,894	1,306,125	1,288,147	3,088,020	3,053,080	2,042,899	2,625,740	3,200,524	2,779,976
First Unit of Quantity	Mexico	number	119,906	172,558	106,706	46,270	146,727	113,160	160,051	160,770	127,269	83,736	85,427	36,676
First Unit of Quantity	Netherlands	number	65	0	0	0	643	401	1	1	0	6	0	2
First Unit of Quantity	New Zealand	number	0	139	200	0	1,776	500	500	0	0	0	0	0
First Unit of Quantity	Norway	number	0	0	0	0	0	0	0	0	0	0	6	0
First Unit of Quantity	Philippines	number	1,561,201	2,003,146	1,464,669	1,586,212	2,022,239	1,470,408	2,126,087	81,780	56,660	356,072	32,122	55,680
First Unit of Quantity	Poland	number	0	38	27	0	30	0	0	0	0	0	0	0
First Unit of Quantity	Portugal	number	5	0	0	0	228	0	0	0	0	0	0	0
First Unit of Quantity	Saudi Arabia	number	0	0	0	0	0	2	0	0	0	0	0	0
First Unit of Quantity	Singapore	number	26,880	20,160	36,100	19,600	31,927	21,840	43,120	30,800	29,680	52,640	21,280	872,231
First Unit of Quantity	Slovakia	number	0	0	0	0	0	0	58	0	0	0	0	0
First Unit of Quantity	South Korea	number	455,616	766,713	552,572	317,574	216,129	308,613	325,802	138,243	115,086	155,135	150,746	199,610
First Unit of Quantity	Spain	number	10,058	23,266	20,153	38,297	8,803	3,111	450	960	960	31,366	13	979,928
First Unit of Quantity	Sweden	number	0	3,512	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Switzerland	number	6,000	0	0	0	2	0	0	0	1	4	0	0
First Unit of Quantity	Taiwan	number	1,940,728	5,550,809	2,874,698	4,538,443	3,694,694	2,629,866	3,236,389	3,026,364	2,237,586	1,925,602	1,834,258	682,510
First Unit of Quantity	Thailand	number	0	0	12,200	0	0	0	0	0	5	0	0	0
First Unit of Quantity	Turkey	number	0	0	0	14	0	0	0	0	0	0	190	0
First Unit of Quantity	United Arab Em	number	6,000	0	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	United Kingdom	number	2,105	6,362	2,176	2,094	2,117	2,496	1,506	1,345	1,124	1,347	0	576
First Unit of Quantity	Vietnam	number	1,296	0	1,728	864	0	432	0	864	2,984	5,354	0	0
Total:			12,592,253	15,360,877	11,421,825	9,551,597	9,329,461	7,790,847	10,007,562	7,759,188	5,888,704	7,435,307	6,927,048	6,988,646

Imports For Consumption | Monthly data for 2013

Data Row Count 37

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
First Unit of Quantity	Argentina	number	0	0	0	100	250	0	0	0	0	0	0	0
First Unit of Quantity	Australia	number	162	0	0	99	0	127	159	0	54	640	88	127
First Unit of Quantity	Austria	number	527	80	55	0	20	0	0	100	0	0	0	0
First Unit of Quantity	Belgium	number	0	0	0	0	3	0	254	0	0	0	0	107
First Unit of Quantity	Canada	number	34,500	684	7,165	435	167	168	18,639	614	12,852	23,876	8,818	596
First Unit of Quantity	Chile	number	0	0	0	0	0	0	0	0	0	50	0	0
First Unit of Quantity	China	number	333,033	353,647	362,701	483,344	2,678,170	721,550	1,155,081	947,163	922,346	733,547	822,813	1,057,937
First Unit of Quantity	Costa Rica	number	0	0	0	0	0	0	0	0	0	30,938	0	0
First Unit of Quantity	Czech Republic	number	0	0	2,990	6,110	2,184	2,912	0	0	0	0	0	0
First Unit of Quantity	Denmark	number	0	0	0	0	2,400	1,920	240	480	25	0	0	0
First Unit of Quantity	Finland	number	0	0	20	0	0	2	0	0	0	0	0	0
First Unit of Quantity	France	number	0	0	0	1	0	0	39,377	0	88	0	117	28
First Unit of Quantity	Germany	number	145,179	36,797	482,506	28,138	16,786	299,179	869,183	584,317	840,956	282,085	1,984	921,072
First Unit of Quantity	Greece	number	0	0	0	0	0	0	0	0	208	0	0	0
First Unit of Quantity	Hong Kong	number	600	11,200	0	1,810	12	1,654	6,482	0	25,000	1,170	17,360	21,408
First Unit of Quantity	India	number	413	560	16	0	858	1,275	699	333	1,180	20	577	0
First Unit of Quantity	Israel	number	0	10	0	0	0	0	0	0	118	1	13	0
First Unit of Quantity	Italy	number	33	0	8	24	462	31	3,066	26	65	41	123	4
First Unit of Quantity	Japan	number	306,638	121,701	331,918	58,794	63,677	230,652	29,655	24,334	14,758	27,679	23,852	31,829
First Unit of Quantity	Jordan	number	0	0	0	0	50	0	0	0	0	0	0	0
First Unit of Quantity	Lithuania	number	18,816	12,544	0	6,272	12,544	12,544	12,544	12,544	0	12,544	6,272	9,408
First Unit of Quantity	Malaysia	number	5,731,456	3,651,388	5,138,186	16,969,056	3,914,486	2,409,746	3,306,848	3,341,884	3,993,632	3,857,587	2,522,292	3,456,206
First Unit of Quantity	Mexico	number	68,361	72,053	86,282	88,354	91,401	115,810	120,584	102,431	110,041	116,759	119,702	98,682
First Unit of Quantity	Netherlands	number	0	50	0	0	16	0	0	0	0	0	0	0
First Unit of Quantity	Norway	number	0	0	0	0	0	0	9,222	0	0	0	0	0
First Unit of Quantity	Philippines	number	16,450	30,918	83,395	310,180	21,612	710,776	45,551	32,452	51,478	48,727	18,890	36,860
First Unit of Quantity	Poland	number	0	0	38	0	0	12	0	0	0	0	0	0
First Unit of Quantity	Singapore	number	1,120	13,440	78,860	41,852	8,980	16,240	43,480	26,546	39,775	11,440	21,020	11,760
First Unit of Quantity	South Korea	number	272,995	467,767	143,381	320,369	14,581	9,629	12,222	13,837	20,668	11,296	31,072	111,709
First Unit of Quantity	Spain	number	94,994	319,713	188,798	14,209	0	1,295	0	0	0	44	0	28
First Unit of Quantity	Sweden	number	0	0	0	448	0	0	0	0	0	0	0	0
First Unit of Quantity	Switzerland	number	0	0	0	0	0	1	0	0	1	0	0	0
First Unit of Quantity	Taiwan	number	1,245,456	703,615	732,894	951,539	496,976	707,579	576,253	659,469	764,689	1,100,128	719,557	735,649
First Unit of Quantity	Thailand	number	0	0	2	0	0	0	600	9,384	4,992	4,992	4,992	4,992
First Unit of Quantity	Turkey	number	0	3	0	60	0	0	0	168	0	0	0	0
First Unit of Quantity	United Kingdom	number	13	857	21	5,332	10,688	4,979	5,072	1,226	1,990	23,960	41	0
First Unit of Quantity	Vietnam	number	0	0	0	0	0	0	7,051	0	0	0	0	0
Total:			8,270,746	5,797,027	7,639,236	19,286,526	7,336,323	5,248,081	6,262,262	5,757,308	6,804,916	6,287,524	4,319,583	6,498,402

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Data Row Count 37

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
First Unit of Quantity	Australia	number	330	126	69	166	170	1	182	131	24	224	153	0
First Unit of Quantity	Belgium	number	0	0	0	0	79	0	10	0	0	0	0	0
First Unit of Quantity	Cambodia	number	0	0	0	0	0	0	0	308	1,736	200	3,731	0
First Unit of Quantity	Canada	number	6,707	4,499	46	224	15,342	165,166	29,890	3,311	3,973	7,659	10,013	40,699
First Unit of Quantity	China	number	541,533	659,970	967,645	822,822	1,358,386	1,127,380	4,430,252	595,341	1,084,473	454,122	937,756	787,788
First Unit of Quantity	Czech Republic	number	0	0	0	0	0	1,456	728	0	0	0	0	26
First Unit of Quantity	Denmark	number	0	960	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	France	number	0	0	0	7	0	0	6	4	0	53	0	414
First Unit of Quantity	Germany	number	1,631,660	2,124,587	555,527	428,678	592,160	482,131	1,116,743	1,149,609	792,022	1,037,651	1,555,170	1,125,059
First Unit of Quantity	Hong Kong	number	4,708	6,374	5	335	1,200	465	0	2,690	1,000	250	2,700	0
First Unit of Quantity	India	number	80	1,014	1,400	1,150	831	1,210	38,846	21,282	53,751	49,051	42,324	8,674
First Unit of Quantity	Ireland	number	0	0	0	0	0	0	0	0	0	0	0	5
First Unit of Quantity	Israel	number	0	0	0	0	0	0	0	29	52	177	16	0
First Unit of Quantity	Italy	number	54	53	0	322	1,000	38	904	0	0	5,138	169	1,046
First Unit of Quantity	Japan	number	35,901	62,243	53,384	34,330	14,440	276,079	296,720	1,122,745	1,052,344	814,012	825,100	354,231
First Unit of Quantity	Lithuania	number	0	0	6,272	6,272	6,272	12,544	6,272	6,272	12,544	6,272	0	0
First Unit of Quantity	Malaysia	number	3,838,402	2,576,721	3,539,151	3,490,395	2,220,072	3,489,323	2,812,020	3,574,218	2,533,105	2,754,371	2,973,824	2,835,435
First Unit of Quantity	Mexico	number	96,611	113,360	106,589	103,866	63,926	89,211	144,118	138,419	182,609	207,882	211,224	215,566
First Unit of Quantity	New Zealand	number	0	0	0	0	0	0	0	84	0	0	0	0
First Unit of Quantity	Norway	number	0	0	0	0	0	0	0	0	0	0	17,718	0
First Unit of Quantity	Philippines	number	339,836	35,352	88,989	20,557	493,753	6,253	8,243	80	359,819	1,634	77,863	531,458
First Unit of Quantity	Poland	number	0	0	0	0	0	0	0	0	3,687	0	0	24
First Unit of Quantity	Portugal	number	0	0	0	0	0	0	0	0	0	0	1,400	0
First Unit of Quantity	Qatar	number	0	0	0	6	0	0	0	0	0	0	0	0
First Unit of Quantity	Romania	number	170	0	0	0	0	0	0	0	0	0	0	151
First Unit of Quantity	Serbia	number	0	0	43	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Singapore	number	8,960	11,200	18,955	7,280	3,360	6,160	36,321	27,440	43,992	33,125	65,268	73,108
First Unit of Quantity	South Korea	number	14,544	107,165	78,482	197,237	47,076	153,397	73,642	50,481	66,572	95,295	106,074	313,906
First Unit of Quantity	Spain	number	265	0	0	79	0	126	13,519	0	0	0	0	0
First Unit of Quantity	Sweden	number	0	0	0	0	0	0	0	0	0	0	1,120	0
First Unit of Quantity	Switzerland	number	0	0	0	3	0	0	27	0	0	2,500	0	0
First Unit of Quantity	Taiwan	number	755,329	911,808	951,746	747,398	1,483,162	4,219,523	2,242,329	914,556	831,822	3,747,538	3,657,679	4,232,047
First Unit of Quantity	Thailand	number	4,992	0	4,992	0	3,840	6,144	2,208	3,840	1,608	15,972	4,992	8,998
First Unit of Quantity	Turkey	number	0	0	1	0	0	0	7,700	2,100	3,380	17,015	4,578	2,548
First Unit of Quantity	United Arab Em	number	0	0	0	17	0	0	0	0	0	0	0	0
First Unit of Quantity	United Kingdom	number	0	0	7,525	71	568	15,973	1,408	12,678	832	21,243	0	8,202
First Unit of Quantity	Vietnam	number	0	0	0	0	0	0	0	1,400	3,350	11,906	2,672	20,746
Total:			7,280,082	6,615,432	6,380,821	5,861,215	6,305,637	10,052,580	11,262,088	7,627,018	7,032,695	9,283,290	10,501,544	10,560,131

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Data Row Count 41

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
First Unit of Quantity	Australia	number	277	20	0	157	144	0	150	0	0	230	30	0
First Unit of Quantity	Belgium	number	4	117	0	0	0	395	450	0	0	0	0	0
First Unit of Quantity	Belize	number	0	2,959	3,016	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Canada	number	26,202	16,582	7,915	46,806	60,992	60,568	42,662	40,158	90,049	52,175	72,792	64,841
First Unit of Quantity	China	number	383,342	491,541	892,770	965,370	958,562	1,166,039	1,028,381	1,427,184	8,870,134	1,523,475	1,840,463	2,755,929
First Unit of Quantity	Cyprus	number	0	57,064	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Denmark	number	0	0	0	0	0	0	0	1	0	0	0	0
First Unit of Quantity	Dominican Rep	number	0	0	0	0	0	0	0	0	0	0	0	1
First Unit of Quantity	Estonia	number	0	0	5	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Finland	number	0	0	0	0	0	0	0	0	0	0	33,231	0
First Unit of Quantity	France	number	0	0	0	32	0	64	624	171	698	17,754	28	164
First Unit of Quantity	Germany	number	147,166	90,699	1,476,709	273,202	180,118	304,927	199,895	279,233	633,899	685,739	664,986	899,247
First Unit of Quantity	Hong Kong	number	140	0	0	5,514	0	1,338	420	5,200	400	2,500	2,900	11,300
First Unit of Quantity	Hungary	number	0	32,358	0	0	0	60,000	160,000	0	0	0	0	0
First Unit of Quantity	India	number	32,635	41,010	36,037	9,671	113,432	138,522	97,447	7,055	10,268	5,635	72,227	7,800
First Unit of Quantity	Indonesia	number	0	600	0	0	95	0	0	1,948	1,432	2,279	1,126	4,259
First Unit of Quantity	Ireland	number	0	0	0	0	0	0	0	1,000	0	0	0	0
First Unit of Quantity	Israel	number	31	0	14	8	0	43	0	0	0	33	0	0
First Unit of Quantity	Italy	number	78	51	27	1,769	1,916	449	505	1,616	45	710	207	142
First Unit of Quantity	Japan	number	1,026,487	1,443,101	422,478	1,398,385	555,836	1,343,235	599,511	444,379	684,049	579,051	264,767	987,836
First Unit of Quantity	Lithuania	number	0	6,272	6,272	6,272	0	0	0	0	0	0	0	0
First Unit of Quantity	Malaysia	number	2,036,669	2,304,542	2,260,568	2,115,331	1,447,519	3,299,978	1,582,254	2,180,966	4,554,331	1,420,347	2,699,887	2,047,187
First Unit of Quantity	Mexico	number	119,227	232,388	234,518	273,486	224,233	324,975	273,821	325,008	369,275	341,298	357,018	321,984
First Unit of Quantity	Netherlands	number	0	0	0	0	744	0	0	21	5	638	616	940
First Unit of Quantity	New Zealand	number	0	110	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Norway	number	17,235	3,452	4,581	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Pakistan	number	0	0	0	0	0	0	250	0	0	0	0	0
First Unit of Quantity	Philippines	number	21,293	208,236	101,490	1,208	2,349	6,841	47,118	12,471	106,553	130,209	276,310	172,085
First Unit of Quantity	Poland	number	0	0	0	32	0	0	0	0	0	22	0	0
First Unit of Quantity	Portugal	number	0	0	0	0	0	0	43,050	0	1,904	0	0	0
First Unit of Quantity	Singapore	number	96,124	63,963	180,406	202,997	138,468	158,357	199,824	238,488	261,329	231,784	241,718	258,303
First Unit of Quantity	Slovakia	number	0	0	0	0	0	0	12	0	0	0	0	0
First Unit of Quantity	South Korea	number	42,750	207,262	178,134	258,859	305,694	277,464	185,475	278,812	433,272	456,388	503,713	443,502
First Unit of Quantity	Spain	number	0	0	0	225	343	0	344	320	18	0	1,838	0
First Unit of Quantity	Switzerland	number	0	0	0	0	0	0	8,118	0	0	0	0	5,601
First Unit of Quantity	Taiwan	number	826,577	494,776	940,464	1,147,355	775,388	1,174,212	796,911	1,151,674	1,638,269	3,074,043	4,352,910	3,019,155
First Unit of Quantity	Thailand	number	14,128	1,236	7,256	16,940	18,120	27,902	13,546	22,336	8,708	46,864	86,849	97,221
First Unit of Quantity	Turkey	number	649	0	4,728	25,386	15,165	254,944	7,191	1,680	24,176	13,054	14,321	2,760
First Unit of Quantity	United Arab Em	number	0	0	10	25	210	39	15	36	58	115	0	48
First Unit of Quantity	United Kingdom	number	10,064	4,083	2,754	3,471	1	0	10,970	32	0	0	640	1,690
First Unit of Quantity	Vietnam	number	5,775	22,020	25,643	61,123	85,339	269,708	108,823	82,413	172,058	156,336	207,595	884,900
Total:			4,806,853	5,724,442	6,785,795	6,813,624	4,884,668	8,870,000	5,407,767	6,502,202	17,860,930	8,740,679	11,696,172	11,986,895

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Data Row Count 43

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
First Unit of Quantity	Australia	number	240	0	30	0	0	0	0	0	0	0	0	146
First Unit of Quantity	Austria	number	0	0	0	0	30	0	0	0	0	0	0	0
First Unit of Quantity	Bangladesh	number	0	0	400	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Belgium	number	0	0	0	0	0	0	0	10	16	0	0	0
First Unit of Quantity	Br Virgin Is	number	0	0	0	0	0	135	0	0	0	0	0	0
First Unit of Quantity	Canada	number	68,430	72,374	71,144	80,442	36,774	47,987	63,400	46,464	53,660	56,285	54,019	52,307
First Unit of Quantity	China	number	1,411,657	1,636,512	1,933,846	1,928,817	1,414,583	1,615,853	857,140	804,708	1,857,411	650,980	369,250	232,070
First Unit of Quantity	Colombia	number	0	0	0	1,000	0	0	0	0	0	0	0	0
First Unit of Quantity	Denmark	number	0	0	0	0	0	960	0	0	0	0	0	0
First Unit of Quantity	France	number	0	0	0	14,240	9,248	8,412	26,409	1,007	0	2,830	600	144
First Unit of Quantity	Germany	number	1,510,631	1,751,243	635,067	2,527,393	743,357	1,753,230	4,506,946	3,013,446	2,863,659	200,589	906,009	272,078
First Unit of Quantity	Honduras	number	0	0	0	0	0	0	0	0	300	0	0	0
First Unit of Quantity	Hong Kong	number	6,000	1,500	200	0	0	15,702	1,421	3,424	3,000	0	16,500	2,000
First Unit of Quantity	Hungary	number	0	0	0	0	0	0	37,589	0	58,000	0	0	0
First Unit of Quantity	India	number	12,244	4,301	3,139	3,489	57,693	8,227	5,342	10,247	20,006	2,935	4,459	3,535
First Unit of Quantity	Indonesia	number	1,240	1,360	2,339	390	1,116	2,136	1,088	1,786	1,945	1,205	28,315	1,300
First Unit of Quantity	Israel	number	13	22	0	0	0	0	0	0	0	0	20	0
First Unit of Quantity	Italy	number	52	2,312	21	398	685	6,459	11,210	2,710	6,824	6,048	2,778	189
First Unit of Quantity	Japan	number	108,572	221,607	329,033	152,069	163,724	220,190	169,837	338,344	349,736	324,402	155,202	78,718
First Unit of Quantity	Latvia	number	0	0	30	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Lithuania	number	14,000	24,600	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Malaysia	number	2,335,770	1,118,720	3,246,897	3,060,045	2,229,568	2,352,364	6,492,976	15,039,513	10,085,942	7,720,115	6,645,917	3,580,121
First Unit of Quantity	Mauritius	number	0	0	0	0	0	0	10,868	0	0	0	0	0
First Unit of Quantity	Mexico	number	442,320	274,183	207,302	266,626	284,103	251,109	232,565	271,915	304,459	289,127	209,764	180,124
First Unit of Quantity	Netherlands	number	2,420	1,879	0	2,520	1,680	2,520	0	0	0	0	0	0
First Unit of Quantity	Peru	number	0	0	0	0	0	0	0	0	0	3,400	0	0
First Unit of Quantity	Philippines	number	228,636	97,624	125,531	55,444	289,518	46,444	31,995	24,290	150	22,301	3,637	34,640
First Unit of Quantity	Poland	number	0	0	23,400	928	0	3,542	30	146	23,030	700	4,980	700
First Unit of Quantity	Portugal	number	0	0	0	0	0	0	0	0	0	6,450	4,800	11,400
First Unit of Quantity	Romania	number	0	0	0	0	0	0	0	0	0	0	0	102
First Unit of Quantity	Singapore	number	249,350	235,118	213,590	235,464	366,864	749,587	336,224	492,592	146,671	430,379	156,526	113,830
First Unit of Quantity	Slovakia	number	0	0	0	0	0	0	0	0	0	0	0	86
First Unit of Quantity	South Africa	number	7,700	26,950	35,200	8,250	22,000	13,750	0	0	0	26,950	0	6,700
First Unit of Quantity	South Korea	number	519,696	512,919	847,205	566,474	609,059	774,360	904,657	1,197,793	934,422	1,122,423	1,491,134	752,584
First Unit of Quantity	Spain	number	7,362	69,473	600	1,389	2,970	0	2,960	1,455	2	4	0	0
First Unit of Quantity	Sweden	number	0	0	0	0	0	0	0	4	0	0	0	0
First Unit of Quantity	Taiwan	number	3,400,925	4,415,257	3,940,059	3,720,018	2,653,790	3,924,122	5,170,966	3,073,351	1,245,020	486,304	294,579	222,098
First Unit of Quantity	Thailand	number	203,601	132,859	168,194	316,688	319,875	381,702	582,577	292,287	431,421	326,175	361,770	244,115
First Unit of Quantity	Togo	number	0	0	0	0	0	0	0	0	26	0	0	0
First Unit of Quantity	Turkey	number	552	100	6,624	8,180	0	1,543	0	192	0	5,303	8,440	0
First Unit of Quantity	United Arab Em	number	0	0	43	0	0	0	0	140	61	25	0	0
First Unit of Quantity	United Kingdom	number	0	11	44	24	19,634	0	41,027	50	9,648	0	0	16,161
First Unit of Quantity	Vietnam	number	375,181	136,330	255,075	689,672	1,264,977	1,504,325	1,558,908	1,350,156	774,565	539,823	557,302	249,178
Total:			10,906,592	10,737,254	12,045,013	13,639,960	10,491,248	13,684,659	21,046,135	25,966,030	19,169,974	12,224,753	11,276,001	6,054,326

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Data Row Count 38

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
First Unit of Quantity	Australia	number	0	0	0	162	0	0	0	40	130	0	0	100
First Unit of Quantity	Austria	number	42	14	0	300	0	0	0	2,000	0	0	0	0
First Unit of Quantity	Belgium	number	0	0	0	0	100	0	0	0	0	0	1	0
First Unit of Quantity	Brazil	number	22	0	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Bulgaria	number	0	0	0	0	0	0	0	0	0	0	3,333	0
First Unit of Quantity	Canada	number	33,509	34,739	35,421	58,709	41,223	59,156	57,705	50,899	72,677	109,502	212,436	201,405
First Unit of Quantity	China	number	155,702	181,092	81,699	71,949	59,748	151,737	142,416	310,354	635,976	2,400,056	1,949,130	512,053
First Unit of Quantity	Denmark	number	0	0	0	0	5,436	24	0	1	960	956	0	0
First Unit of Quantity	France	number	1,212	160	0	144	452	2,806	664	5,974	4,077	464	1,102	1,864
First Unit of Quantity	Germany	number	1,528,081	594,056	2,735,637	2,288,963	1,035,939	983,795	1,195,603	1,085,406	992,358	942,962	361,898	383,360
First Unit of Quantity	Hong Kong	number	17,000	10,200	300	32	758	0	0	6,890	0	0	0	0
First Unit of Quantity	Hungary	number	20	102,500	0	0	100,000	34,850	0	15,000	0	0	0	0
First Unit of Quantity	India	number	12,270	29,921	11,460	3,626	4,150	6,420	27,854	27,661	14,517	26,389	57,679	104,102
First Unit of Quantity	Indonesia	number	4,344	1,916	2,186	6,308	21,333	3,910	4,156	18,721	10,259	11,080	11,572	14,231
First Unit of Quantity	Ireland	number	0	0	0	0	110	16	0	0	0	101	0	0
First Unit of Quantity	Israel	number	12	0	200	0	0	0	0	0	0	0	11	0
First Unit of Quantity	Italy	number	130	232	73	2,741	143	169	57	466	147,369	9,593	5,109	6,970
First Unit of Quantity	Japan	number	205,306	134,599	139,887	174,959	59,262	157,155	188,076	158,581	472,850	1,591,373	9,277,530	7,292,695
First Unit of Quantity	Lithuania	number	0	0	0	3,027	0	6	0	0	0	15,300	148,500	45
First Unit of Quantity	Malaysia	number	1,124,234	1,130,041	1,691,304	1,032,541	1,656,323	1,030,113	1,237,337	2,096,230	1,747,247	1,864,933	2,557,558	6,484,692
First Unit of Quantity	Maldives	number	0	560	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Mexico	number	12,211	16,353	33,433	6,101	1,262	3,321	30,328	216,180	231,755	212,436	274,650	178,112
First Unit of Quantity	Netherlands	number	840	15,000	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Philippines	number	0	300	23,400	1,050	7,782	450	1,965	3,168	38,400	7,500	1,296,617	8,262,420
First Unit of Quantity	Poland	number	12	700	0	0	0	0	50	80	840	410,070	33,576	13,728
First Unit of Quantity	Portugal	number	0	3,273	0	0	2	0	0	0	0	0	0	0
First Unit of Quantity	Singapore	number	58,665	55,384	56,838	34,052	57,326	192,300	95,630	164,170	132,771	480,671	178,902	122,212
First Unit of Quantity	Slovakia	number	0	0	0	0	0	0	861	0	0	0	0	0
First Unit of Quantity	South Africa	number	0	0	0	0	0	0	20	0	2	0	0	0
First Unit of Quantity	South Korea	number	616,356	430,616	555,168	1,001,581	445,109	645,958	840,663	619,936	920,166	982,439	2,436,900	870,039
First Unit of Quantity	Spain	number	50	0	131	0	35	0	235	0	1	0	0	0
First Unit of Quantity	Switzerland	number	0	0	0	0	29	1	0	4,751	122	130	8,299	0
First Unit of Quantity	Taiwan	number	2,331,288	664,004	882,957	590,541	57,899	107,435	25,995	413,265	3,114,892	7,354,434	2,403,637	1,657,016
First Unit of Quantity	Thailand	number	105,821	174,103	514,589	209,086	287,841	257,264	410,482	409,617	394,233	565,673	355,640	396,839
First Unit of Quantity	Turkey	number	0	0	0	0	0	0	0	0	3,077	0	21,875	0
First Unit of Quantity	United Arab Em	number	0	24,640	45,268	1	23	0	0	0	0	0	0	0
First Unit of Quantity	United Kingdom	number	35	80,648	1	21,853	0	16,162	18,547	31	3,196	3,929	20,990	425
First Unit of Quantity	Vietnam	number	162,815	103,094	469,611	430,912	1,284,906	1,268,632	3,269,530	2,133,491	2,088,099	6,991,256	4,630,087	1,745,567
Total:			6,369,977	3,788,145	7,279,563	5,938,638	5,127,191	4,921,680	7,548,174	7,742,912	11,025,974	23,981,247	26,247,032	28,247,875

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Data Row Count 32

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
First Unit of Quantity	Australia	number	120	0	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Austria	number	7	0	0	4	20	0	0	0	0	0	0	0
First Unit of Quantity	Belgium	number	0	0	0	0	0	100	0	0	0	0	0	0
First Unit of Quantity	Brazil	number	12	0	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Canada	number	110,799	47,494	750	14,080	33,777	12,402	0	0	0	0	0	0
First Unit of Quantity	China	number	234,408	59,859	143,886	159,687	245,211	179,148	0	0	0	0	0	0
First Unit of Quantity	Denmark	number	1	0	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Dominican Rep	number	0	0	0	0	250	0	0	0	0	0	0	0
First Unit of Quantity	Egypt	number	0	0	0	0	1	0	0	0	0	0	0	0
First Unit of Quantity	France	number	2,288	76	750	2,054	14,241	11	0	0	0	0	0	0
First Unit of Quantity	Germany	number	31,430	101	2,180	115	293,614	0	0	0	0	0	0	0
First Unit of Quantity	Hong Kong	number	0	6	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Hungary	number	101	0	0	0	4	0	0	0	0	0	0	0
First Unit of Quantity	India	number	107,335	111,712	30,917	15,332	26,703	27,200	0	0	0	0	0	0
First Unit of Quantity	Indonesia	number	12,256	13,172	12,392	2,070	24,402	10,654	0	0	0	0	0	0
First Unit of Quantity	Ireland	number	1	0	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Italy	number	876	103	5,733	2,647	1,414	5,342	0	0	0	0	0	0
First Unit of Quantity	Japan	number	6,333,820	667,382	230,022	207,338	2,188,798	597,565	0	0	0	0	0	0
First Unit of Quantity	Lithuania	number	145,000	150,000	0	0	26,000	0	0	0	0	0	0	0
First Unit of Quantity	Malaysia	number	15,663,620	4,396,340	933,946	2,783,667	1,639,617	1,792,944	0	0	0	0	0	0
First Unit of Quantity	Mexico	number	269,076	124,285	32,992	130,351	96,502	69,607	0	0	0	0	0	0
First Unit of Quantity	Netherlands	number	2,953	0	0	0	0	0	0	0	0	0	0	0
First Unit of Quantity	Philippines	number	8,589,807	2,692,017	6,756	1,364,549	1,597,049	892,305	0	0	0	0	0	0
First Unit of Quantity	Poland	number	0	0	0	2,151	0	0	0	0	0	0	0	0
First Unit of Quantity	Singapore	number	95,231	163,266	155,258	62,220	24,268	112,170	0	0	0	0	0	0
First Unit of Quantity	South Korea	number	1,833,883	400,643	366,067	325,515	230,500	1,300,335	0	0	0	0	0	0
First Unit of Quantity	Spain	number	0	0	0	16	0	25	0	0	0	0	0	0
First Unit of Quantity	Taiwan	number	1,567,712	1,158,141	572,260	1,529,982	2,453,127	1,937,084	0	0	0	0	0	0
First Unit of Quantity	Thailand	number	929,705	1,748,068	141,048	85,025	167,375	191,074	0	0	0	0	0	0
First Unit of Quantity	Turkey	number	0	299,718	11,646	221,397	42,980	70,586	0	0	0	0	0	0
First Unit of Quantity	United Kingdom	number	12,851	30	0	0	3,158	380	0	0	0	0	0	0
First Unit of Quantity	Vietnam	number	5,561,524	2,623,399	780,335	1,009,824	3,724,320	1,748,052	0	0	0	0	0	0
Total:			41,504,816	14,655,812	3,426,938	7,918,024	12,833,331	8,946,984	0	0	0	0	0	0

Imports For Consumption | Monthly data for 2019

Data Row Count 0

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Total:			0	0	0	0	0	0	0	0	0	0	0	0

Imports For Consumption | Monthly data for 2020

Data Row Count 0

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Total:			0	0	0	0	0	0	0	0	0	0	0	0

Imports For Consumption | Monthly data for 2021

Data Row Count 0

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR
Total:			0	0	0	0

Imports For Consumption | Monthly data for 2010

Data Row Count 42

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Landed Duty-Paid Value	Argentina	number	0	16,120	41,653	19,008	18,056	0	28,016	0	45,986	73,360	0	40,365
Landed Duty-Paid Value	Australia	number	14,449	43,003	2,097	95,839	13,843	19,697	11,443	10,598	7,752	2,781	0	0
Landed Duty-Paid Value	Austria	number	0	0	0	5,753	0	0	0	0	0	0	0	80,617
Landed Duty-Paid Value	Belgium	number	23,136	0	0	522,346	0	8,165	16,218	0	0	274,909	0	9,994
Landed Duty-Paid Value	Brazil	number	0	0	0	0	0	0	0	21,199	0	0	0	0
Landed Duty-Paid Value	Canada	number	68,169	45,302	127,294	153,834	279,270	111,619	30,225	45,102	34,338	148,586	212,940	81,657
Landed Duty-Paid Value	China	number	49,142,851	46,506,895	66,948,898	45,501,928	59,716,403	95,200,812	83,200,334	120,513,209	146,276,989	115,603,047	189,691,527	188,220,626
Landed Duty-Paid Value	Croatia	number	0	0	0	0	0	3,090	17,357	0	0	0	0	0
Landed Duty-Paid Value	Czech Republic	number	986,650	718,492	988,516	0	0	0	0	0	0	0	41,100	23,340
Landed Duty-Paid Value	Denmark	number	0	0	0	27,956	0	0	0	0	0	66,279	11,620	27,277
Landed Duty-Paid Value	France	number	25,879	2,478	0	0	0	0	0	70,125	0	0	2,147	0
Landed Duty-Paid Value	Gabon	number	0	0	0	0	0	0	0	0	0	0	0	23,273
Landed Duty-Paid Value	Germany	number	6,509,729	3,907,147	4,387,498	7,357,606	4,960,449	7,528,365	6,391,167	5,538,864	8,756,763	12,705,761	7,588,494	10,359,527
Landed Duty-Paid Value	Hong Kong	number	24,378	33,255	84,277	21,787	171,205	80,368	95,274	57,209	0	6,061	138,853	47,196
Landed Duty-Paid Value	Hungary	number	0	0	0	0	0	9,332	0	0	0	0	0	0
Landed Duty-Paid Value	India	number	500,026	117,331	167,134	357,091	365,780	548,521	619,845	2,313,675	6,257,576	3,417,162	7,603,880	8,606,047
Landed Duty-Paid Value	Indonesia	number	0	0	0	0	0	0	0	0	0	0	2,559	0
Landed Duty-Paid Value	Ireland	number	0	0	0	0	0	0	9,273	0	0	0	0	0
Landed Duty-Paid Value	Israel	number	2,612	0	0	0	5,274	235,380	0	8,037	0	0	0	0
Landed Duty-Paid Value	Italy	number	402,281	0	7,865	7,236	0	8,000	38,685	0	6,940	36,015	49,913	44,065
Landed Duty-Paid Value	Japan	number	15,751,462	17,558,832	21,729,804	19,926,736	21,147,004	21,989,101	22,854,941	23,520,394	26,461,938	27,944,638	43,262,884	46,650,203
Landed Duty-Paid Value	Luxembourg	number	0	0	0	0	0	0	0	0	0	0	0	4,399
Landed Duty-Paid Value	Malaysia	number	4,252,955	12,960,652	27,957,306	9,835,199	4,200,116	4,299,842	2,981,134	27,690,569	45,662,287	5,819,883	1,708,873	735,820
Landed Duty-Paid Value	Mexico	number	42,964,575	30,016,946	35,021,578	30,136,389	24,172,821	42,530,161	38,956,182	36,267,486	50,396,160	44,181,801	53,199,668	53,481,590
Landed Duty-Paid Value	Netherlands	number	0	3,727,380	0	3,855	0	0	0	0	0	0	22,047	19,874
Landed Duty-Paid Value	New Zealand	number	3,440	0	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Norway	number	20,083	29,976	41,702	103,876	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Philippines	number	2,316,261	611,014	54,261	3,433,078	2,123,898	107,091	2,837,762	5,271,642	4,850,768	3,747,030	2,859,434	41,351
Landed Duty-Paid Value	Poland	number	0	16,857	4,611	0	23,594	3,068	0	0	16,538	0	0	0
Landed Duty-Paid Value	Portugal	number	4,680	0	0	0	0	11,162	0	0	3,822	0	0	0
Landed Duty-Paid Value	Russia	number	0	3,229	6,176	0	0	0	0	0	0	0	0	2,464
Landed Duty-Paid Value	Singapore	number	17,282	5,675	0	852,611	5,221,679	2,652,255	4,175,596	8,244,467	10,075,031	15,237,185	7,425,023	15,346,112
Landed Duty-Paid Value	South Africa	number	0	0	0	0	0	0	0	0	0	0	22,230	0
Landed Duty-Paid Value	South Korea	number	0	377,057	603,282	916,336	798,569	1,486,311	1,119,924	1,754,887	3,639,081	5,177,391	5,039,703	1,569,895
Landed Duty-Paid Value	Spain	number	152,235	284,323	0	575,889	350,500	26,320	34,672	315,574	472,255	70,750	340,483	125,716
Landed Duty-Paid Value	Sweden	number	807,933	6,252,371	0	3,131,313	1,713,422	2,824,072	1,424,724	0	2,063	0	88,405	0
Landed Duty-Paid Value	Switzerland	number	11,373	0	25,048	26,281	141,351	0	335,218	578,636	17,456	7,409	0	16,051
Landed Duty-Paid Value	Taiwan	number	22,025,527	23,092,583	18,444,799	18,684,250	29,616,691	17,618,071	24,628,541	28,816,650	29,719,532	26,595,447	17,559,209	19,962,204
Landed Duty-Paid Value	Thailand	number	0	0	0	0	0	2,706	0	0	0	0	0	0
Landed Duty-Paid Value	Turkey	number	0	0	51,423	0	39,240	0	0	62,703	47,250	0	0	19,707
Landed Duty-Paid Value	United Kingdom	number	43,333	24,245	73,414	40,308	49,939	120,146	54,738	61,300	224,329	37,123	63,791	70,420
Landed Duty-Paid Value	Vietnam	number	0	0	0	0	0	0	0	520,806	0	0	145,489	0
Total:			146,071,299	146,351,163	176,768,636	141,736,505	155,129,104	197,423,655	189,861,269	261,683,132	332,974,854	261,152,618	337,080,272	345,609,790

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Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Landed Duty-Paid Value	Argentina	number	0	41,080	9,200	0	0	24,528	0	0	0	14,000	0	0
Landed Duty-Paid Value	Australia	number	6,964	73,940	17,093	0	4,302	63,576	30,820	11,020	34,551	3,820	31,133	3,659,456
Landed Duty-Paid Value	Austria	number	0	0	0	0	46,645	0	0	0	27,581	0	3,353	0
Landed Duty-Paid Value	Belgium	number	0	0	8,370	0	0	0	26,484	0	0	0	104,547	4,026,070
Landed Duty-Paid Value	Brazil	number	0	0	54,081	0	0	0	0	500,820	0	0	0	0
Landed Duty-Paid Value	Canada	number	84,201	189,988	337,699	459,709	111,792	152,194	132,209	82,088	112,798	158,390	98,296	7,118,728
Landed Duty-Paid Value	China	number	167,550,195	196,726,190	206,732,894	196,462,034	225,816,024	241,808,804	217,422,166	232,805,560	249,605,952	212,905,632	277,903,194	413,451,298
Landed Duty-Paid Value	Croatia	number	0	0	0	0	0	23,048	0	0	16,496	0	0	0
Landed Duty-Paid Value	Czech Republic	number	22,656	16,635	0	0	31,590	0	0	3,093	0	0	3,361	0
Landed Duty-Paid Value	Denmark	number	14,639	0	26,640	0	0	0	0	0	0	0	0	5,776
Landed Duty-Paid Value	France	number	0	22,654	0	376,568	19,644	0	22,011	2,057	4,629	2,433	12,799	0
Landed Duty-Paid Value	Germany	number	10,389,549	8,099,363	13,911,733	23,479,386	20,107,433	8,084,352	13,549,268	6,652,955	5,270,779	3,218,718	4,033,555	1,621,027
Landed Duty-Paid Value	Hong Kong	number	0	0	29,453	110,155	298,243	15,525	6,364	167,801	0	171,954	1,884,960	741,438
Landed Duty-Paid Value	Hungary	number	0	0	10,496	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	India	number	2,627,426	7,830,307	11,796,240	5,551,178	7,066,403	1,562,544	4,958,576	612,615	121,976	125,668	607,091	20,528
Landed Duty-Paid Value	Israel	number	0	0	9,863	9,945	12,534	4,738	0	16,519	5,134	0	3,110	8,250
Landed Duty-Paid Value	Italy	number	0	60,988	24,202	0	0	98,696	37,621	0	81,398	2,731	11,747	0
Landed Duty-Paid Value	Japan	number	45,190,294	46,178,944	44,124,497	41,222,926	41,304,186	42,503,837	28,095,016	15,004,141	10,236,681	48,230,656	20,761,940	21,751,815
Landed Duty-Paid Value	Malaysia	number	790,468	1,150,574	796,988	19,336,144	12,873,983	57,814,407	56,572,883	99,664,596	60,778,656	128,570,103	92,199,384	45,900,299
Landed Duty-Paid Value	Mexico	number	36,708,330	42,025,909	35,237,338	32,459,542	46,179,817	41,924,582	30,999,293	40,309,349	49,587,277	44,104,026	53,116,961	62,052,836
Landed Duty-Paid Value	Netherlands	number	3,780	22,051	10,592	0	232,050	0	520,192	0	53,109	892,528	705,469	0
Landed Duty-Paid Value	New Zealand	number	0	0	0	0	0	0	0	0	0	0	0	13,957
Landed Duty-Paid Value	Norway	number	0	0	0	0	0	0	0	18,390	19,041	0	0	0
Landed Duty-Paid Value	Philippines	number	1,514,772	5,831,336	19,480,283	7,415,367	28,179,194	33,005,806	27,232,558	22,804,139	20,305,402	27,935,041	31,420,738	18,861,583
Landed Duty-Paid Value	Poland	number	2,758	23,032	4,023	21,485	6,573	0	15,961	0	9,422	41,604	0	0
Landed Duty-Paid Value	Portugal	number	0	0	0	0	0	0	0	0	155,831	0	54,995	0
Landed Duty-Paid Value	Russia	number	0	4,942	0	5,473	3,074	0	0	0	0	0	0	0
Landed Duty-Paid Value	Singapore	number	9,009,526	7,407,336	0	2,776,775	7,145,566	3,721,908	1,576,920	9,916,224	3,530,507	6,739,214	7,422,886	5,505,334
Landed Duty-Paid Value	Slovakia	number	3,186	0	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	South Korea	number	6,089,025	7,134,662	7,422,104	9,090,085	1,554,655	4,531,287	863,357	3,301,528	758,478	1,785,880	6,799,774	5,277,455
Landed Duty-Paid Value	Spain	number	133,489	4,991	332,364	33,119	88,193	16,960	18,915	36,706	116,393	23,009	0	0
Landed Duty-Paid Value	Sweden	number	3,365	0	27,218	0	20,913	0	0	0	0	5,697	0	0
Landed Duty-Paid Value	Switzerland	number	6,855	0	0	0	0	23,780	0	0	25,717	1,605,664	0	0
Landed Duty-Paid Value	Taiwan	number	23,887,362	18,952,529	12,169,019	8,465,629	6,643,713	7,600,631	11,890,903	6,776,024	11,776,289	14,892,505	12,955,595	25,116,294
Landed Duty-Paid Value	Thailand	number	0	93,082	0	0	199,632	0	0	0	0	0	0	44,092
Landed Duty-Paid Value	Turkey	number	15,675	0	0	0	0	0	36,950	0	0	0	0	100,119
Landed Duty-Paid Value	United Kingdom	number	37,792	25,232	49,836	265,257	49,040	57,301	48,019	42,327	58,373	130,881	121,421	23,098
Landed Duty-Paid Value	Vietnam	number	157,636	153,081	149,285	151,464	147,285	0	142,764	138,435	0	0	126,090	123,271
Total:			304,249,943	342,068,846	352,771,511	347,692,241	398,142,484	443,038,504	394,199,250	438,866,387	412,692,470	491,560,154	510,382,399	615,422,724

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Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Landed Duty-Paid Value	Argentina	number	8,956	0	0	31,282	0	8,853	5,100	0	0	0	0	0
Landed Duty-Paid Value	Australia	number	1,425,224	0	0	47,802	18,393	29,321	23,480	0	48,630	9,370	40,884	28,021
Landed Duty-Paid Value	Austria	number	0	0	0	8,783	0	19,030	14,236	153,783	143,001	0	204,031	201,487
Landed Duty-Paid Value	Belgium	number	24,642	193,626	360,081	184,270	3,004	0	109,649	163,872	0	0	0	0
Landed Duty-Paid Value	Canada	number	8,473,341	4,790,614	22,402,195	10,014,442	129,614	11,560	33,347	48,160	932,949	637,969	41,156	164,410
Landed Duty-Paid Value	China	number	425,622,383	403,107,292	210,454,738	62,325,589	123,071,519	100,035,420	69,959,787	65,007,292	112,776,280	73,768,165	50,472,707	20,674,342
Landed Duty-Paid Value	Czech Republic	number	8,495	3,077,640	941,719	4,950,187	1,058,072	0	0	20,655	0	0	0	177,350
Landed Duty-Paid Value	Finland	number	0	0	0	0	0	0	0	0	0	9,541	0	0
Landed Duty-Paid Value	France	number	2,112	0	69,803	0	0	0	15,700	0	0	0	0	0
Landed Duty-Paid Value	Germany	number	17,496,232	37,449,121	7,630,139	6,172,378	3,682,484	7,677,551	3,083,612	10,107,568	36,525,279	20,230,045	33,680,813	17,310,417
Landed Duty-Paid Value	Hong Kong	number	1,880,759	2,855	128,791	91,010	156,828	344,831	99,554	16,358	6,982	119,588	17,961	76,950
Landed Duty-Paid Value	Hungary	number	0	0	0	0	0	0	0	2,403	0	0	0	0
Landed Duty-Paid Value	India	number	156,862	6,841,157	20,834	19,087	21,627	0	883,409	1,418,051	1,785,799	215,954	84,060	160,848
Landed Duty-Paid Value	Israel	number	2,662	4,780	0	8,550	9,250	15,380	39,900	10,528	9,140	0	0	0
Landed Duty-Paid Value	Italy	number	0	12,312	2,620	27,729	5,553	4,598	3,163	11,819	16,621	7,769	18,211	0
Landed Duty-Paid Value	Jamaica	number	0	0	0	0	0	0	0	0	0	3,676	0	0
Landed Duty-Paid Value	Japan	number	41,329,436	20,200,993	7,997,899	8,342,728	5,611,914	18,492,575	24,710,787	19,943,044	5,461,998	7,753,057	6,749,685	6,105,923
Landed Duty-Paid Value	Lithuania	number	0	0	0	0	0	0	0	33,101	13,208	13,208	26,416	26,416
Landed Duty-Paid Value	Macau	number	0	6,093	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Malaysia	number	107,581,929	122,411,791	127,401,954	85,413,701	135,377,695	113,245,018	165,482,884	147,629,304	154,969,027	154,125,474	124,803,990	73,601,997
Landed Duty-Paid Value	Mexico	number	40,568,986	65,503,463	51,201,224	22,469,529	48,462,513	48,223,765	42,634,681	48,148,619	47,483,153	29,039,691	24,075,874	14,628,535
Landed Duty-Paid Value	Netherlands	number	9,740	0	0	0	148,536	109,066	4,594	3,646	0	8,608	0	9,901
Landed Duty-Paid Value	New Zealand	number	0	2,385	3,413	0	30,068	8,510	8,504	0	0	0	0	0
Landed Duty-Paid Value	Norway	number	0	0	0	0	0	0	0	0	0	0	4,657	0
Landed Duty-Paid Value	Philippines	number	18,641,832	38,749,787	67,650,151	42,339,708	41,458,406	39,235,519	45,814,718	25,099,000	25,054,503	31,080,945	11,636,254	7,660,564
Landed Duty-Paid Value	Poland	number	0	22,973	8,124	0	9,071	0	0	0	0	0	0	0
Landed Duty-Paid Value	Portugal	number	3,380	0	0	0	61,845	0	0	0	0	0	0	0
Landed Duty-Paid Value	Saudi Arabia	number	0	0	0	0	0	5,615	0	0	0	0	0	0
Landed Duty-Paid Value	Singapore	number	6,445,460	4,757,007	4,608,062	4,384,321	6,484,208	4,446,283	8,339,144	6,122,651	5,690,678	9,186,998	3,655,830	6,014,143
Landed Duty-Paid Value	Slovakia	number	0	0	0	0	0	0	2,538	0	0	0	0	0
Landed Duty-Paid Value	South Korea	number	18,862,412	15,467,762	12,481,520	11,069,452	13,715,338	12,874,568	12,693,670	23,940,398	7,127,876	8,260,228	2,950,800	2,104,929
Landed Duty-Paid Value	Spain	number	39,958	974,644	5,214,048	5,593,157	2,381,360	619,971	121,163	238,038	239,400	47,939	6,293	3,993,606
Landed Duty-Paid Value	Sweden	number	0	14,407	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Switzerland	number	90,075	0	0	0	5,871	0	0	0	3,209	4,627	0	0
Landed Duty-Paid Value	Taiwan	number	19,524,024	38,600,839	46,848,479	43,793,119	47,239,183	32,375,039	20,836,670	50,967,968	27,936,168	33,950,521	45,599,877	16,403,555
Landed Duty-Paid Value	Thailand	number	0	0	4,971	0	0	0	0	0	7,476	0	0	0
Landed Duty-Paid Value	Turkey	number	0	0	0	8,339	0	0	0	0	0	0	86,984	0
Landed Duty-Paid Value	United Arab Em	number	11,878	0	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	United Kingdom	number	40,761	81,244	66,478	49,233	72,263	47,815	44,838	28,863	34,434	12,573	0	16,907
Landed Duty-Paid Value	Vietnam	number	116,473	0	210,452	99,025	0	91,141	0	96,876	145,948	179,726	0	0
Total:			708,368,012	762,272,785	565,707,695	307,443,421	429,214,615	377,921,429	394,965,128	399,211,997	426,411,759	368,665,672	304,156,483	169,360,301

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Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Landed Duty-Paid Value	Argentina	number	0	0	0	8,500	18,000	0	0	0	0	0	0	0
Landed Duty-Paid Value	Australia	number	55,089	0	0	22,319	0	40,223	50,963	0	18,475	169,643	34,434	34,547
Landed Duty-Paid Value	Austria	number	376,607	8,848	5,096	0	2,301	0	0	9,301	0	0	0	0
Landed Duty-Paid Value	Belgium	number	0	0	0	0	9,388	0	33,118	0	0	0	0	41,492
Landed Duty-Paid Value	Canada	number	3,037,375	75,032	144,883	74,004	123,133	119,871	444,319	146,541	818,204	231,538	103,714	137,225
Landed Duty-Paid Value	Chile	number	0	0	0	0	0	0	0	0	0	4,850	0	0
Landed Duty-Paid Value	China	number	35,477,765	46,304,004	52,777,557	61,606,768	82,290,203	112,004,788	127,724,540	147,776,446	139,939,201	118,110,205	122,934,497	124,725,973
Landed Duty-Paid Value	Costa Rica	number	0	0	0	0	0	0	0	0	0	122,521	0	0
Landed Duty-Paid Value	Czech Republic	number	0	0	582,632	1,210,573	486,474	621,120	0	0	0	0	0	0
Landed Duty-Paid Value	Denmark	number	0	0	0	0	62,504	50,003	6,251	12,500	2,217	0	0	0
Landed Duty-Paid Value	Finland	number	0	0	8,267	0	0	2,297	0	0	0	0	0	0
Landed Duty-Paid Value	France	number	0	0	0	6,296	0	0	156,038	0	14,178	0	31,671	41,064
Landed Duty-Paid Value	Germany	number	11,761,047	1,043,086	1,727,125	1,286,765	2,577,344	3,001,490	4,077,356	2,099,508	3,290,112	3,817,074	160,779	3,999,988
Landed Duty-Paid Value	Greece	number	0	0	0	0	0	0	0	0	52,047	0	0	0
Landed Duty-Paid Value	Hong Kong	number	30,255	153,150	0	86,811	3,906	70,223	128,740	0	78,976	8,914	2,941,154	3,784,549
Landed Duty-Paid Value	India	number	69,826	89,434	9,729	0	165,128	65,186	99,244	26,424	177,476	24,816	104,637	0
Landed Duty-Paid Value	Israel	number	0	6,361	0	0	0	0	0	0	7,026	3,409	4,006	0
Landed Duty-Paid Value	Italy	number	18,523	0	3,325	8,884	20,394	32,060	31,773	9,105	36,681	15,261	47,593	7,367
Landed Duty-Paid Value	Japan	number	2,971,317	2,308,598	2,469,798	1,457,301	1,822,421	2,732,598	796,260	1,197,659	1,932,957	2,606,631	634,093	1,638,936
Landed Duty-Paid Value	Jordan	number	0	0	0	0	6,820	0	0	0	0	0	0	0
Landed Duty-Paid Value	Lithuania	number	38,685	25,790	0	12,895	25,790	25,790	25,790	25,790	0	25,790	12,895	19,392
Landed Duty-Paid Value	Malaysia	number	107,132,008	74,967,182	152,310,485	152,310,125	113,694,776	92,447,932	125,558,096	108,070,917	92,606,536	95,563,339	41,967,750	95,103,000
Landed Duty-Paid Value	Mexico	number	26,079,011	26,969,756	35,124,737	33,077,824	35,087,980	43,209,713	47,047,560	37,678,475	38,084,870	41,169,579	44,129,275	31,781,599
Landed Duty-Paid Value	Netherlands	number	0	7,596	0	0	14,500	0	0	0	0	0	0	0
Landed Duty-Paid Value	Norway	number	0	0	0	0	0	0	38,743	0	0	0	0	0
Landed Duty-Paid Value	Philippines	number	1,906,968	8,236,897	4,750,221	6,632,157	6,559,875	10,367,284	14,145,272	7,534,557	5,092,415	15,694,553	5,825,733	11,572,822
Landed Duty-Paid Value	Poland	number	0	0	10,397	0	0	6,525	0	0	0	0	0	0
Landed Duty-Paid Value	Singapore	number	168,967	2,025,362	11,638,262	5,896,852	1,386,776	2,547,712	6,907,297	4,308,254	6,679,267	1,954,344	3,420,064	2,049,432
Landed Duty-Paid Value	South Korea	number	8,328,623	5,049,686	2,381,830	1,743,876	1,562,310	1,552,278	1,820,926	2,427,135	3,701,874	2,028,983	3,546,470	2,343,021
Landed Duty-Paid Value	Spain	number	4,980,863	4,820,473	6,614,156	3,433,900	0	356,864	0	0	0	15,195	0	4,271
Landed Duty-Paid Value	Sweden	number	0	0	0	109,535	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Switzerland	number	0	0	0	0	0	6,536	0	0	4,777	0	0	0
Landed Duty-Paid Value	Taiwan	number	15,085,294	24,822,879	42,546,556	32,912,473	41,290,694	57,575,569	31,779,875	54,448,570	71,235,340	75,522,907	72,913,557	53,012,467
Landed Duty-Paid Value	Thailand	number	0	0	7,463	0	0	0	7,957	112,883	60,637	60,529	60,529	64,045
Landed Duty-Paid Value	Turkey	number	0	2,572	0	17,160	0	0	0	88,487	0	0	0	0
Landed Duty-Paid Value	United Kingdom	number	2,707	33,402	16,204	22,464	12,685	46,076	71,840	24,150	35,644	95,016	9,101	0
Landed Duty-Paid Value	Vietnam	number	0	0	0	0	0	0	157,663	0	0	0	0	0
Total:			217,520,930	196,950,108	313,128,723	301,937,482	287,223,402	326,882,138	361,109,621	365,996,702	363,868,910	357,245,097	298,881,952	330,361,190

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Data Row Count 37

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Landed Duty-Paid Value	Australia	number	111,857	53,672	56,818	76,217	97,539	5,545	63,503	40,665	29,148	31,708	46,547	0
Landed Duty-Paid Value	Belgium	number	0	0	0	0	42,593	0	5,362	0	0	0	0	0
Landed Duty-Paid Value	Cambodia	number	0	0	0	0	0	0	0	46,091	142,868	13,817	455,390	0
Landed Duty-Paid Value	Canada	number	227,266	147,092	29,069	66,712	2,802,631	2,159,135	6,186,841	358,664	597,724	1,735,315	2,113,239	2,460,931
Landed Duty-Paid Value	China	number	79,692,724	109,094,937	174,681,880	148,398,861	241,759,521	190,699,353	165,571,641	85,952,365	165,747,073	65,430,146	98,866,717	108,127,930
Landed Duty-Paid Value	Czech Republic	number	0	0	0	0	0	268,484	134,542	0	0	0	0	5,340
Landed Duty-Paid Value	Denmark	number	0	23,594	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	France	number	0	0	0	2,280	0	0	4,625	2,712	0	12,200	0	138,343
Landed Duty-Paid Value	Germany	number	3,969,610	5,350,376	1,687,138	4,058,318	1,575,813	8,954,880	6,558,720	16,355,179	17,008,238	22,311,740	21,853,269	13,763,391
Landed Duty-Paid Value	Hong Kong	number	832,191	1,096,291	9,025	26,450	58,589	72,876	0	204,299	48,411	10,696	5,880	0
Landed Duty-Paid Value	India	number	19,326	164,464	212,632	171,248	135,059	218,130	6,347,565	3,806,335	4,257,310	9,508,031	8,567,503	1,671,016
Landed Duty-Paid Value	Ireland	number	0	0	0	0	0	0	0	0	0	0	0	10,327
Landed Duty-Paid Value	Israel	number	0	0	0	0	0	0	0	8,366	2,470	18,667	5,089	0
Landed Duty-Paid Value	Italy	number	22,855	20,886	0	74,524	71,508	8,254	66,029	0	0	281,687	35,179	149,706
Landed Duty-Paid Value	Japan	number	970,635	1,157,045	694,945	394,911	879,704	4,032,385	3,584,318	8,801,834	4,810,370	7,906,525	8,690,654	10,413,834
Landed Duty-Paid Value	Lithuania	number	0	0	12,895	12,707	12,707	25,414	12,707	12,707	25,414	12,707	0	0
Landed Duty-Paid Value	Malaysia	number	91,588,402	84,234,478	108,684,566	82,454,587	78,407,309	75,656,617	95,494,687	85,077,365	54,392,497	23,847,427	55,865,911	60,946,378
Landed Duty-Paid Value	Mexico	number	35,660,250	39,436,675	39,532,744	38,515,188	23,076,880	32,092,038	42,926,079	42,326,013	55,837,168	53,909,751	50,303,352	52,595,603
Landed Duty-Paid Value	New Zealand	number	0	0	0	0	0	0	0	4,524	0	0	0	0
Landed Duty-Paid Value	Norway	number	0	0	0	0	0	0	0	0	0	0	70,515	0
Landed Duty-Paid Value	Philippines	number	17,244,377	11,733,804	10,907,924	6,891,929	8,330,762	1,092,526	1,442,074	36,187	2,400,949	487,160	1,032,130	6,169,830
Landed Duty-Paid Value	Poland	number	0	0	0	0	0	0	0	0	15,050	0	0	7,266
Landed Duty-Paid Value	Portugal	number	0	0	0	0	0	0	0	0	0	0	232,250	0
Landed Duty-Paid Value	Qatar	number	0	0	0	3,044	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Romania	number	4,445	0	0	0	0	0	0	0	0	0	0	3,970
Landed Duty-Paid Value	Serbia	number	0	0	9,600	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Singapore	number	1,465,861	1,841,139	3,276,525	1,214,378	562,808	1,054,659	6,426,838	5,019,526	7,901,017	4,842,628	11,844,773	12,141,866
Landed Duty-Paid Value	South Korea	number	2,478,370	2,689,740	4,685,523	3,116,733	8,934,308	13,288,869	12,607,269	9,001,012	8,805,319	18,296,935	16,843,638	10,068,989
Landed Duty-Paid Value	Spain	number	8,381	0	0	2,735	0	26,648	57,075	0	0	0	0	0
Landed Duty-Paid Value	Sweden	number	0	0	0	0	0	0	0	0	0	0	195,807	0
Landed Duty-Paid Value	Switzerland	number	0	0	0	4,543	0	0	6,110	0	0	4,950	0	0
Landed Duty-Paid Value	Taiwan	number	49,859,377	56,726,672	102,749,644	88,558,086	170,028,137	39,857,920	107,998,184	6,625,967	27,893,869	51,082,464	35,198,549	25,276,591
Landed Duty-Paid Value	Thailand	number	60,637	0	60,637	0	46,644	74,630	31,360	46,644	19,532	198,591	61,027	150,866
Landed Duty-Paid Value	Turkey	number	0	0	6,075	0	0	0	1,372,802	380,058	684,503	3,342,060	804,749	521,104
Landed Duty-Paid Value	United Arab Em	number	0	0	0	4,820	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	United Kingdom	number	0	0	30,250	14,985	8,007	650,645	44,078	54,753	26,372	138,232	0	34,358
Landed Duty-Paid Value	Vietnam	number	0	0	0	0	0	0	0	246,500	584,250	2,056,633	452,500	4,068,091
Total:			284,216,564	313,770,865	447,327,890	374,063,256	536,830,519	370,239,008	456,942,409	264,407,766	351,229,552	265,480,070	313,544,668	308,725,730

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Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Landed Duty-Paid Value	Australia	number	73,752	25,465	0	57,520	39,984	0	118,849	0	0	79,429	11,578	0
Landed Duty-Paid Value	Belgium	number	2,233	40,706	0	0	0	8,323	6,124	0	0	0	0	0
Landed Duty-Paid Value	Belize	number	0	12,686	12,505	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Canada	number	2,341,755	3,601,912	1,602,341	7,326,179	7,819,152	10,460,841	5,244,863	5,868,005	6,540,463	9,466,942	7,489,170	9,389,103
Landed Duty-Paid Value	China	number	49,817,386	74,766,606	131,278,968	138,088,062	112,883,555	173,120,060	141,246,118	182,692,257	158,850,939	183,400,710	194,469,423	192,797,363
Landed Duty-Paid Value	Cyprus	number	0	238,984	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Denmark	number	0	0	0	0	0	0	0	2,558	0	0	0	0
Landed Duty-Paid Value	Dominican Rep	number	0	0	0	0	0	0	0	0	0	0	0	9,516
Landed Duty-Paid Value	Estonia	number	0	0	6,500	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Finland	number	0	0	0	0	0	0	0	0	0	0	131,675	0
Landed Duty-Paid Value	France	number	0	0	0	10,141	0	23,456	244,892	60,641	250,778	222,245	20,190	22,505
Landed Duty-Paid Value	Germany	number	13,984,217	14,413,781	42,550,217	30,390,320	28,845,669	46,382,839	26,384,715	21,476,988	33,147,743	50,879,743	46,383,797	54,431,619
Landed Duty-Paid Value	Hong Kong	number	5,344	0	0	36,058	0	48,393	5,663	21,575	5,604	13,571	28,081	20,861
Landed Duty-Paid Value	Hungary	number	0	5,966	0	0	0	10,862	28,880	0	0	0	0	0
Landed Duty-Paid Value	India	number	2,737,073	1,614,969	1,120,461	1,952,467	1,243,696	750,788	1,408,568	360,241	461,030	521,290	863,872	314,855
Landed Duty-Paid Value	Indonesia	number	0	53,340	0	0	6,185	0	0	126,093	99,557	185,906	84,003	290,744
Landed Duty-Paid Value	Ireland	number	0	0	0	0	0	0	0	20,517	0	0	0	0
Landed Duty-Paid Value	Israel	number	10,021	0	4,656	6,568	0	13,138	0	0	0	14,565	0	0
Landed Duty-Paid Value	Italy	number	23,625	8,463	5,827	330,830	124,025	77,258	99,042	101,120	17,619	137,500	40,357	16,206
Landed Duty-Paid Value	Japan	number	3,772,269	3,813,032	2,899,016	12,139,270	4,167,530	13,869,672	12,698,801	4,310,855	11,757,311	32,214,896	4,802,875	9,038,667
Landed Duty-Paid Value	Lithuania	number	0	12,707	12,707	12,707	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Malaysia	number	27,323,575	26,882,554	48,127,053	140,284,554	98,849,442	114,126,400	105,797,527	159,083,458	148,681,005	121,753,131	143,577,043	181,160,860
Landed Duty-Paid Value	Mexico	number	40,639,507	56,500,906	65,445,048	74,840,044	66,615,058	80,936,756	74,600,643	87,448,499	92,175,186	92,528,629	97,337,260	82,916,456
Landed Duty-Paid Value	Netherlands	number	0	0	0	0	10,172	0	0	3,472	6,845	111,609	221,298	159,047
Landed Duty-Paid Value	New Zealand	number	0	9,488	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Norway	number	68,603	3,797	5,039	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Pakistan	number	0	0	0	0	0	0	55,396	0	0	0	0	0
Landed Duty-Paid Value	Philippines	number	1,920,489	4,339,162	4,184,937	5,792	630,047	2,043,090	14,170,773	3,706,697	11,100,738	10,294,340	12,670,666	20,351,158
Landed Duty-Paid Value	Poland	number	0	0	0	6,801	0	0	0	0	0	5,518	0	0
Landed Duty-Paid Value	Portugal	number	0	0	0	0	0	0	73,587	0	377,185	0	0	0
Landed Duty-Paid Value	Singapore	number	14,323,097	12,168,346	34,189,019	37,533,152	24,201,589	30,586,619	39,255,240	43,870,782	51,469,651	44,610,320	45,310,725	49,013,434
Landed Duty-Paid Value	Slovakia	number	0	0	0	0	0	0	4,907	0	0	0	0	0
Landed Duty-Paid Value	South Korea	number	8,116,923	15,544,477	33,165,340	20,465,573	25,695,926	25,455,886	30,812,922	51,924,320	40,158,213	54,421,441	52,813,763	45,697,012
Landed Duty-Paid Value	Spain	number	0	0	0	45,424	12,317	0	72,078	3,519	3,508	0	407,479	0
Landed Duty-Paid Value	Switzerland	number	0	0	0	0	0	0	32,224	0	0	0	0	19,135
Landed Duty-Paid Value	Taiwan	number	10,755,623	24,152,750	20,873,952	22,774,464	18,495,122	37,119,678	29,096,080	27,803,997	41,954,111	37,354,874	39,787,823	32,318,514
Landed Duty-Paid Value	Thailand	number	384,218	15,013	311,858	843,091	1,585,069	1,587,483	626,477	679,132	516,882	5,114,199	11,714,773	17,480,036
Landed Duty-Paid Value	Turkey	number	109,995	0	955,126	5,012,815	3,129,504	2,647,789	1,461,468	263,010	4,889,682	2,573,971	2,848,002	516,248
Landed Duty-Paid Value	United Arab Em	number	0	0	3,250	8,274	69,542	13,772	5,587	8,303	13,629	35,508	0	14,564
Landed Duty-Paid Value	United Kingdom	number	78,832	31,440	17,793	24,768	2,967	0	43,445	48,012	0	0	127,345	315,172
Landed Duty-Paid Value	Vietnam	number	1,020,055	3,952,864	4,661,923	9,058,655	13,039,301	13,593,786	16,917,993	10,361,506	18,684,897	24,322,589	29,695,555	30,980,217
Total:			177,508,592	242,209,414	391,433,536	501,253,529	407,465,852	552,876,889	500,512,862	600,245,557	621,162,576	670,262,926	690,836,753	727,273,292

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Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Landed Duty-Paid Value	Australia	number	85,004	0	10,066	0	0	0	0	0	0	0	0	55,214
Landed Duty-Paid Value	Austria	number	0	0	0	0	44,032	0	0	0	0	0	0	0
Landed Duty-Paid Value	Bangladesh	number	0	0	39,360	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Belgium	number	0	0	0	0	0	0	0	5,481	11,156	0	0	0
Landed Duty-Paid Value	Br Virgin Is	number	0	0	0	0	0	31,575	0	0	0	0	0	0
Landed Duty-Paid Value	Canada	number	11,503,826	9,353,158	8,314,964	10,551,577	4,528,779	5,848,067	8,384,219	5,757,272	7,621,152	8,132,554	5,044,893	3,695,954
Landed Duty-Paid Value	China	number	173,514,584	210,495,292	216,773,926	174,330,621	180,334,617	174,634,939	107,670,171	105,912,305	79,274,844	48,951,540	32,007,989	27,722,656
Landed Duty-Paid Value	Colombia	number	0	0	0	3,310	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Denmark	number	0	0	0	0	0	20,613	0	0	0	0	0	0
Landed Duty-Paid Value	France	number	0	0	0	5,240,245	3,414,534	3,182,434	3,284,830	382,251	0	11,658	49,052	13,357
Landed Duty-Paid Value	Germany	number	22,949,248	12,602,996	9,330,406	14,567,670	13,797,497	15,546,655	19,931,806	20,721,119	19,420,252	10,775,387	3,553,634	630,041
Landed Duty-Paid Value	Honduras	number	0	0	0	0	0	0	0	0	21,039	0	0	0
Landed Duty-Paid Value	Hong Kong	number	19,137	2,625	8,089	0	0	1,755,114	12,007	46,034	20,121	0	37,984	29,117
Landed Duty-Paid Value	Hungary	number	0	0	0	0	0	0	6,953	0	20,359	0	0	0
Landed Duty-Paid Value	India	number	1,061,133	413,905	198,421	498,866	444,712	471,238	370,778	1,103,826	1,283,886	317,463	136,564	440,683
Landed Duty-Paid Value	Indonesia	number	45,611	137,012	329,097	40,521	138,555	129,969	77,603	76,244	333,340	134,471	242,770	124,328
Landed Duty-Paid Value	Israel	number	4,794	6,768	0	0	0	0	0	0	0	0	5,671	0
Landed Duty-Paid Value	Italy	number	12,557	95,481	10,445	65,477	144,568	469,574	392,370	116,628	210,952	65,258	127,268	85,981
Landed Duty-Paid Value	Japan	number	2,698,591	9,246,620	12,216,608	1,440,742	9,429,193	8,684,352	3,744,039	16,556,680	19,582,036	17,637,404	5,126,704	7,368,889
Landed Duty-Paid Value	Latvia	number	0	0	4,825	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Lithuania	number	26,734	42,147	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Malaysia	number	204,653,973	136,202,160	201,258,186	252,995,352	275,980,554	280,206,599	226,346,240	254,546,483	217,995,670	220,465,640	158,172,299	101,707,619
Landed Duty-Paid Value	Mauritius	number	0	0	0	0	0	0	2,086,656	0	0	0	0	0
Landed Duty-Paid Value	Mexico	number	101,980,769	78,734,698	68,645,948	80,375,287	80,989,396	76,765,107	71,016,169	84,146,435	74,348,513	43,129,764	49,751,724	44,754,498
Landed Duty-Paid Value	Netherlands	number	492,440	362,040	0	443,453	284,207	451,000	0	0	0	0	0	0
Landed Duty-Paid Value	Peru	number	0	0	0	0	0	0	0	0	0	35,784	0	0
Landed Duty-Paid Value	Philippines	number	20,690,333	10,782,749	33,451,774	15,203,376	22,117,086	11,399,239	10,048,662	558,877	12,601	997,185	19,034	25,893
Landed Duty-Paid Value	Poland	number	0	0	4,095,617	241,380	0	708,616	5,997	22,957	4,367,554	70,109	726,071	70,109
Landed Duty-Paid Value	Portugal	number	0	0	0	0	0	0	0	0	0	1,132,880	846,720	2,017,680
Landed Duty-Paid Value	Romania	number	0	0	0	0	0	0	0	0	0	0	0	13,955
Landed Duty-Paid Value	Singapore	number	46,698,322	32,341,051	33,213,402	23,058,114	37,334,150	44,561,513	43,065,985	26,822,549	21,632,028	19,830,003	19,850,459	11,772,049
Landed Duty-Paid Value	Slovakia	number	0	0	0	0	0	0	0	0	0	0	0	5,747
Landed Duty-Paid Value	South Africa	number	1,390,656	4,842,276	6,126,328	1,447,271	3,835,538	2,378,711	0	0	0	4,040,355	0	1,014,378
Landed Duty-Paid Value	South Korea	number	62,040,705	76,298,737	111,202,794	105,111,507	114,333,898	147,984,860	132,151,224	138,843,683	134,710,363	121,115,033	101,686,312	85,829,610
Landed Duty-Paid Value	Spain	number	37,536	354,687	7,135	844,721	586,152	0	574,830	268,399	6,715	2,498	0	0
Landed Duty-Paid Value	Sweden	number	0	0	0	0	0	0	0	3,185	0	0	0	0
Landed Duty-Paid Value	Taiwan	number	30,396,747	31,986,228	36,520,736	23,473,751	29,796,670	24,382,932	24,391,531	20,280,776	12,571,563	2,903,309	4,437,511	4,639,387
Landed Duty-Paid Value	Thailand	number	15,107,732	24,943,274	28,540,482	54,401,212	44,471,435	59,865,002	54,971,259	46,844,570	66,781,906	51,940,229	50,508,417	33,574,981
Landed Duty-Paid Value	Togo	number	0	0	0	0	0	0	0	0	4,506	0	0	0
Landed Duty-Paid Value	Turkey	number	53,560	43,934	1,238,996	1,550,801	0	342,974	0	48,416	0	21,075	1,322,460	0
Landed Duty-Paid Value	United Arab Em	number	0	0	6,626	0	0	0	0	8,226	17,107	6,732	0	0
Landed Duty-Paid Value	United Kingdom	number	0	11,075	6,204	11,727	81,573	0	163,825	4,228	44,077	0	0	64,125
Landed Duty-Paid Value	Vietnam	number	20,260,915	22,804,212	32,101,217	38,091,509	54,273,159	60,886,709	63,799,418	83,475,881	48,590,458	43,460,685	39,274,358	22,784,046
Total:			715,724,907	662,103,125	803,651,652	803,988,490	876,360,305	920,707,792	772,496,572	806,552,505	708,882,198	595,177,016	472,927,894	348,440,297

Imports For Consumption | Monthly data for 2017

Data Row Count 38

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Landed Duty-Paid Value	Australia	number	0	0	0	52,143	0	0	0	3,490	42,613	0	0	34,544
Landed Duty-Paid Value	Austria	number	2,543	19,081	0	3,572	0	0	0	7,009	0	0	0	0
Landed Duty-Paid Value	Belgium	number	0	0	0	0	10,321	0	0	0	0	0	3,059	0
Landed Duty-Paid Value	Brazil	number	11,537	0	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Bulgaria	number	0	0	0	0	0	0	0	0	0	0	13,650	0
Landed Duty-Paid Value	Canada	number	3,507,317	4,328,510	3,456,408	6,976,408	5,335,649	8,200,054	8,427,555	7,160,066	11,238,147	16,555,895	28,804,242	30,094,344
Landed Duty-Paid Value	China	number	11,907,668	8,716,640	4,498,709	2,455,851	2,582,672	2,611,763	2,502,498	20,752,936	58,485,528	215,246,170	178,319,515	47,906,688
Landed Duty-Paid Value	Denmark	number	0	0	0	0	21,979	23,650	0	2,500	19,564	20,208	0	0
Landed Duty-Paid Value	France	number	190,858	30,300	0	15,910	63,302	146,753	180,061	896,071	37,825	115,230	181,352	558,256
Landed Duty-Paid Value	Germany	number	2,896,430	978,663	3,172,579	3,933,158	2,327,194	1,593,009	2,323,360	2,178,360	1,914,102	1,846,012	539,476	709,173
Landed Duty-Paid Value	Hong Kong	number	33,326	145,145	7,542	35,842	2,343	0	0	902,139	0	0	0	0
Landed Duty-Paid Value	Hungary	number	6,344	36,466	0	0	29,549	6,415	0	2,895	0	0	0	0
Landed Duty-Paid Value	India	number	363,316	225,336	133,443	155,131	374,980	162,303	180,956	310,541	495,715	3,263,324	10,857,007	14,351,900
Landed Duty-Paid Value	Indonesia	number	244,281	176,334	185,909	461,884	477,826	301,670	329,771	783,256	471,682	285,242	615,719	833,682
Landed Duty-Paid Value	Ireland	number	0	0	0	0	11,297	16,535	0	0	0	7,755	0	0
Landed Duty-Paid Value	Israel	number	3,551	0	24,069	0	0	0	0	0	0	0	10,200	0
Landed Duty-Paid Value	Italy	number	12,576	43,952	11,439	100,842	27,226	32,209	7,947	24,684	10,363,494	5,176,212	663,296	882,986
Landed Duty-Paid Value	Japan	number	4,363,733	1,095,013	1,524,630	5,023,612	2,960,306	9,131,126	585,910	3,387,655	4,348,451	5,880,422	19,288,892	27,157,587
Landed Duty-Paid Value	Lithuania	number	0	0	0	21,833	0	10,267	0	0	0	14,305	321,301	2,749
Landed Duty-Paid Value	Malaysia	number	61,094,939	61,798,480	172,741,121	106,474,574	171,689,686	111,896,828	128,190,795	148,992,596	150,253,973	161,777,932	178,583,906	163,753,119
Landed Duty-Paid Value	Maldives	number	0	129,552	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Mexico	number	50,558	33,339	44,866	282,624	150,509	188,983	6,898,520	51,707,642	53,832,855	49,471,790	65,855,170	41,422,421
Landed Duty-Paid Value	Netherlands	number	133,626	133,517	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Philippines	number	0	3,419	95,193	4,076	87,866	2,921	248,464	21,744	111,904	30,995	2,507,192	17,762,995
Landed Duty-Paid Value	Poland	number	12,887	70,109	0	0	0	0	10,442	11,940	118,740	7,489,745	6,074,132	2,195,900
Landed Duty-Paid Value	Portugal	number	0	582,111	0	0	7,650	0	0	0	0	0	0	0
Landed Duty-Paid Value	Singapore	number	6,350,685	6,328,222	6,623,307	4,034,543	6,931,639	23,533,217	11,420,824	18,908,800	14,531,245	22,324,825	21,016,322	16,542,085
Landed Duty-Paid Value	Slovakia	number	0	0	0	0	0	0	3,960	0	0	0	0	0
Landed Duty-Paid Value	South Africa	number	0	0	0	0	0	0	3,292	0	9,690	0	0	0
Landed Duty-Paid Value	South Korea	number	60,484,592	58,596,067	72,768,821	45,894,452	66,666,490	84,306,987	106,347,776	87,236,248	121,634,369	123,619,887	146,825,597	135,022,647
Landed Duty-Paid Value	Spain	number	10,111	0	3,272	0	5,200	0	42,163	0	6,057	0	0	0
Landed Duty-Paid Value	Switzerland	number	0	0	0	0	5,875	6,367	0	109,568	122,495	128,706	36,864	0
Landed Duty-Paid Value	Taiwan	number	1,769,446	2,485,857	1,916,168	1,074,820	770,990	376,061	484,732	955,706	2,478,156	8,511,057	4,122,608	1,412,824
Landed Duty-Paid Value	Thailand	number	13,103,049	20,136,469	33,303,631	22,760,475	28,650,812	25,634,266	43,668,472	43,770,192	50,300,047	67,393,761	42,235,869	53,229,779
Landed Duty-Paid Value	Turkey	number	0	0	0	0	0	0	0	0	424,511	0	3,157,500	0
Landed Duty-Paid Value	United Arab Em	number	0	4,102,400	7,526,880	7,450	2,278	0	0	0	0	0	0	0
Landed Duty-Paid Value	United Kingdom	number	30,931	319,880	5,485	93,630	0	66,734	73,900	7,464	16,042	30,601	95,681	15,083
Landed Duty-Paid Value	Vietnam	number	7,450,655	4,130,480	27,188,516	38,791,440	42,650,417	43,484,727	55,688,540	76,304,284	77,051,607	132,769,567	159,124,905	134,911,744
Total:			174,034,959	174,645,342	335,231,988	238,654,270	331,844,056	311,732,845	367,619,938	464,437,786	558,308,812	821,959,641	869,253,455	688,800,506

Imports For Consumption | Monthly data for 2018

Data Row Count 32

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Landed Duty-Paid Value	Australia	number	42,070	0	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Austria	number	8,910	0	0	5,559	2,780	0	0	0	0	0	0	0
Landed Duty-Paid Value	Belgium	number	0	0	0	0	0	4,220	0	0	0	0	0	0
Landed Duty-Paid Value	Brazil	number	4,470	0	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Canada	number	15,146,578	6,727,033	124,875	1,487,217	4,501,505	1,476,658	0	0	0	0	0	0
Landed Duty-Paid Value	China	number	6,001,519	1,017,211	1,455,628	1,575,214	2,452,389	3,875,356	0	0	0	0	0	0
Landed Duty-Paid Value	Denmark	number	2,200	0	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Dominican Rep	number	0	0	0	0	54,890	0	0	0	0	0	0	0
Landed Duty-Paid Value	Egypt	number	0	0	0	0	2,400	0	0	0	0	0	0	0
Landed Duty-Paid Value	France	number	413,029	13,388	110,888	179,320	1,859,374	2,943	0	0	0	0	0	0
Landed Duty-Paid Value	Germany	number	3,448,137	72,676	18,405	54,041	380,383	0	0	0	0	0	0	0
Landed Duty-Paid Value	Hong Kong	number	0	3,468	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Hungary	number	3,069	0	0	0	3,938	0	0	0	0	0	0	0
Landed Duty-Paid Value	India	number	14,080,864	1,790,450	521,424	1,351,126	2,920,319	2,715,861	0	0	0	0	0	0
Landed Duty-Paid Value	Indonesia	number	193,399	351,719	531,442	358,429	638,064	438,033	0	0	0	0	0	0
Landed Duty-Paid Value	Ireland	number	8,997	0	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Italy	number	139,150	20,504	753,300	339,558	221,979	739,152	0	0	0	0	0	0
Landed Duty-Paid Value	Japan	number	27,996,212	4,495,770	3,449,033	8,955,903	7,538,740	16,380,215	0	0	0	0	0	0
Landed Duty-Paid Value	Lithuania	number	327,355	337,407	0	0	57,024	0	0	0	0	0	0	0
Landed Duty-Paid Value	Malaysia	number	121,112,001	51,981,584	58,881,850	59,736,151	65,917,143	91,155,891	0	0	0	0	0	0
Landed Duty-Paid Value	Mexico	number	61,486,816	29,048,496	9,686,160	26,907,718	25,682,946	18,261,921	0	0	0	0	0	0
Landed Duty-Paid Value	Netherlands	number	12,280	0	0	0	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Philippines	number	15,407,988	4,780,816	116,655	3,003,645	7,751,125	1,887,654	0	0	0	0	0	0
Landed Duty-Paid Value	Poland	number	0	0	0	24,007	0	0	0	0	0	0	0	0
Landed Duty-Paid Value	Singapore	number	12,448,663	18,096,599	16,443,912	6,019,503	2,625,230	14,640,812	0	0	0	0	0	0
Landed Duty-Paid Value	South Korea	number	108,531,332	35,731,132	46,190,910	47,867,075	31,724,411	22,653,347	0	0	0	0	0	0
Landed Duty-Paid Value	Spain	number	0	0	0	4,002	0	32,247	0	0	0	0	0	0
Landed Duty-Paid Value	Taiwan	number	2,283,407	1,788,075	826,013	3,301,665	3,489,319	2,623,752	0	0	0	0	0	0
Landed Duty-Paid Value	Thailand	number	48,335,315	12,778,712	14,905,449	9,129,672	21,542,994	24,835,824	0	0	0	0	0	0
Landed Duty-Paid Value	Turkey	number	0	1,485,765	1,727,512	3,969,939	12,586,356	9,055,635	0	0	0	0	0	0
Landed Duty-Paid Value	United Kingdom	number	63,820	7,083	0	0	16,527	105,187	0	0	0	0	0	0
Landed Duty-Paid Value	Vietnam	number	59,637,770	18,357,456	4,072,301	17,064,526	20,524,711	44,737,483	0	0	0	0	0	0
Total:			497,135,351	188,885,344	159,815,757	191,334,270	212,494,547	255,622,191	0	0	0	0	0	0

Imports For Consumption | Monthly data for 2019

Data Row Count 0

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Total:			0	0	0	0	0	0	0	0	0	0	0	0

Imports For Consumption | Monthly data for 2020

Data Row Count 0

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Total:			0	0	0	0	0	0	0	0	0	0	0	0

Imports For Consumption | Monthly data for 2021

Data Row Count 0

Data Type	Country	Quantity Description	JAN	FEB	MAR	APR
Total:			0	0	0	0

0

Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	0	0	0	0	0	0	0	0	0	0	0	0	

0

Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	0	0	0	0	0	0	0	0	0	0	0	0	

0

Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	0	0	0	0	0	0	0	0	0	0	0	0	

0

Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	0	0	0	0	0	0	0	0	0	0	0	0	

0

Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	0	0	0	0	0	0	0	0	0	0	0	0	

0

Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	0	0	0	0	0	0	0	0	0	0	0	0	

0

Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	0	0	0	0	0	0	0	0	0	0	0	0	

0

Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	0	0	0	0	0	0	0	0	0	0	0	0	

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Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Belgium	number	0	0	0	0	0	0	0	29	0	0	0	0
Canada	number	0	0	0	0	0	0	32,278	29,196	9,761	37,155	12,369	5,552
China	number	0	0	0	0	0	0	124,713	73,809	69,369	57,014	195,447	52,814
Croatia	number	0	0	0	0	0	0	0	0	0	40	0	0
Denmark	number	0	0	0	0	0	0	0	0	720	0	0	0
France	number	0	0	0	0	0	0	6,144	3,072	415	52	488	1,142
Germany	number	0	0	0	0	0	0	428	6,466	15	25	0	0
Hong Kong	number	0	0	0	0	0	0	17	0	0	0	0	0
India	number	0	0	0	0	0	0	27,626	6,973	23,178	75,134	38,176	7,274
Indonesia	number	0	0	0	0	0	0	5,527	2,050	1,224	3,216	4,940	1,523
Italy	number	0	0	0	0	0	0	5,252	2,386	11,717	5,914	9,857	5,626
Japan	number	0	0	0	0	0	0	143,790	99,047	169,323	279,544	43,838	83,572
Malaysia	number	0	0	0	0	0	0	372,203	448,728	533,935	795,881	831,542	968,479
Mexico	number	0	0	0	0	0	0	180,436	131,878	109,639	119,921	103,327	65,655
Philippines	number	0	0	0	0	0	0	7,592	1,219	6,000	0	3,822	3,072
Russia	number	0	0	0	0	0	0	0	0	0	0	25	0
Singapore	number	0	0	0	0	0	0	163,523	112,465	157,887	179,700	106,682	62,021
South Korea	number	0	0	0	0	0	0	595,284	1,166,442	848,748	1,121,616	683,906	318,436
Spain	number	0	0	0	0	0	0	0	156	0	1	10	24
Switzerland	number	0	0	0	0	0	0	0	0	0	0	0	72
Taiwan	number	0	0	0	0	0	0	96,832	313,262	370,974	272,620	139,093	126,392
Thailand	number	0	0	0	0	0	0	66,890	64,014	105,438	133,135	78,240	64,481
Turkey	number	0	0	0	0	0	0	28,465	28,008	30,402	26,364	24,620	34,854
United Kingdom	number	0	0	0	0	0	0	0	1,195	0	483	10	0
Vietnam	number	0	0	0	0	0	0	473,747	483,824	399,615	450,515	529,747	367,449
		0	0	0	0	0	0	2,330,747	2,974,219	2,848,360	3,558,330	2,806,139	2,168,438

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Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Australia	number	0	0	0	8	0	0	0	0	1	0	0	0
Austria	number	668	0	0	0	0	0	0	0	0	0	10	0
Belgium	number	0	0	0	38	0	0	0	0	0	0	182	0
Bulgaria	number	0	0	1	0	0	0	7	0	0	0	0	8
Burma	number	0	0	0	0	0	0	0	120	0	405,244	3,025	0
Cambodia	number	0	0	0	0	1,544	0	0	12,000	7,905	36,330	44,613	40,533
Canada	number	24,887	7,324	12,263	15,758	29,426	25,539	19,805	55,100	51,046	65,068	53,938	79,258
China	number	89,027	30,024	145,379	49,150	67,080	72,284	53,704	240,789	3,519,405	3,699,311	5,778,975	5,277,496
Croatia	number	0	0	0	0	0	0	0	0	12,000	0	0	0
France	number	0	6,544	631	0	39	0	12	0	4	52	0	0
Germany	number	10	0	0	2,000	18	187	0	89	202	10,075	1,199	25
India	number	5,395	4,747	10,736	7,192	166,472	10,739	41,114	62,090	120,498	180,182	198,841	161,939
Indonesia	number	12,600	5,016	6,038	2,395	19,358	8,184	672	12,840	1,028	4,460	5,321	3,076
Italy	number	4,320	3,170	10,250	5,132	4,590	9,872	8,837	5,624	14,024	5,968	9,517	6,048
Japan	number	125,358	208,930	83,572	125,358	200,681	1,535,092	149,063	10,137,600	3,688,897	3,495,924	1,175,040	2,992,057
Jordan	number	0	26	0	0	0	0	0	27	1,188	4,158	12,475	122
Malaysia	number	1,560,719	625,691	600,769	1,619,674	1,873,877	1,424,334	1,502,289	5,119,154	4,582,787	2,307,953	3,066,786	5,268,975
Mexico	number	79,343	66,294	69,071	44,430	50,897	33,220	56,516	94,734	144,632	128,402	51,554	70,198
Netherlands	number	0	1	0	0	0	16	0	0	0	0	0	0
Nicaragua	number	0	0	0	0	0	0	0	0	0	12,000	0	0
Philippines	number	23,020	21,616	17,391	9,800	110,486	5,798	31,760	1,072	1,376	197,619	7,529	19,943
Poland	number	0	0	0	0	0	700	0	0	0	0	0	323
Russia	number	0	0	0	0	0	0	0	629	0	0	0	0
Singapore	number	56,909	121,600	132,813	57,095	122,057	193,262	229,313	155,756	226,042	222,768	231,390	284,782
Slovenia	number	0	0	0	0	0	0	0	500	0	0	0	0
South Korea	number	1,358,869	2,706,681	2,013,770	1,520,287	3,146,180	3,341,332	1,160,896	10,968,212	27,147,064	19,446,678	43,320,345	28,387,469
Spain	number	0	0	486	15	0	0	0	0	0	0	0	192
Sweden	number	0	0	0	0	0	0	140	0	0	0	0	0
Switzerland	number	0	0	0	0	0	0	0	0	320	0	0	0
Taiwan	number	135,250	298,336	223,391	619,968	1,128,196	473,293	2,595,253	4,720,288	4,786,571	6,710,000	5,765,906	6,689,826
Thailand	number	33,611	169,318	189,703	243,378	375,652	316,102	319,159	617,312	406,330	474,205	555,641	625,512
Turkey	number	40,782	57,174	42,193	113,392	170,264	127,302	80,066	127,424	42,498	21,504	10,340	10,509
United Kingdom	number	10	0	7	0	0	0	2	1	2	0	1	0
Vietnam	number	417,293	247,405	583,175	588,944	804,684	1,255,603	2,131,580	6,321,926	5,066,033	4,562,374	4,437,284	3,903,758
		3,968,071	4,579,897	4,141,639	5,024,014	8,271,501	8,832,859	8,380,188	38,653,287	49,819,853	41,990,275	64,729,912	53,822,049

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Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Australia	number	0	0	0	0	0	0	0	0	0	2	0	0
Austria	number	18	16	220	0	0	0	0	0	24	0	0	0
Bangladesh	number	0	0	0	60	0	0	0	0	0	0	0	0
Belgium	number	0	0	0	0	0	0	0	0	0	450	0	0
Brazil	number	0	0	856	0	0	0	0	0	0	1,995	0	0
Burma	number	4,564	1,544	9,883	3,752	5,440	300	686,716	6,743	4,368	2,600	1,630	5,098
Cambodia	number	25,229	47,608	90,549	43,790	60,725	88,552	153,765	94,739	268,226	148,556	219,167	304,520
Canada	number	47,781	42,696	59,171	49,220	57,884	49,279	44,387	68,153	46,982	103,990	38,010	26,718
China	number	1,584,333	13,592,747	8,707,287	1,989,742	18,423,125	1,118,737	146,270	178,620	80,726	2,538,631	152,378	50,375
France	number	0	0	0	0	0	0	0	131	64	410	420	8
Georgia	number	0	0	0	0	0	0	0	0	260	0	0	0
Germany	number	511	310	2	0	0	99	839	1,077	0	291	0	158
Haiti	number	0	0	0	0	0	0	0	0	0	4,050	0	0
Hungary	number	3,000	0	0	0	0	0	0	0	0	0	0	0
India	number	354,321	16,930	22,956	30,688	3,120	6,062	18,940	14,922	17,778	54,207	6,756	26,905
Indonesia	number	4,514	5,800	2,243	5,439	240	8,884	12,734	6,464	7,682	13,912	0	8,542
Italy	number	9,460	15,502	37,906	28,382	18,408	1,666	1,371	62,266	2,913	20,972	30,614	4,656
Japan	number	805,535	5,389,416	2,509,781	603,625	0	4,200	0	12,600	0	0	0	17
Jordan	number	4,158	122	122	122	0	0	0	594	0	594	2,376	0
Lithuania	number	0	0	0	0	0	0	0	0	0	0	1,097	0
Malaysia	number	6,632,556	4,669,502	2,069,295	1,607,567	2,445,028	8,955,469	1,636,559	14,517,433	8,592,941	7,181,988	5,619,314	5,491,764
Mexico	number	108,557	33,132	28,565	12,676	5,966	32,961	50,205	46,705	35,885	52,025	68,110	60,865
Netherlands	number	1	0	0	35	0	4	0	15	1	0	0	2
Philippines	number	26,754	30,026	60,719	15,467	38,980	73,264	8,657	100	3,200	0	42,175	32,620
Poland	number	68	0	840	0	1,676	110	68	1,680	0	0	0	1,680
Singapore	number	181,483	237,368	190,333	191,198	143,321	142,986	126,553	165,006	102,525	145,596	172,445	108,157
South Korea	number	41,093,959	25,538,684	25,398,850	32,835,796	12,020,192	11,783,496	18,424,475	16,465,008	13,343,445	29,012,089	21,755,921	17,796,467
Spain	number	0	0	0	0	50	0	0	0	0	0	0	0
Sweden	number	9	0	0	0	0	0	0	0	0	0	0	0
Switzerland	number	0	0	0	0	8	0	0	0	0	0	0	0
Taiwan	number	5,337,778	2,958,791	3,726,232	680,828	1,550,289	1,229,644	2,015,269	2,593,957	1,825,455	2,617,376	2,868,692	2,540,329
Thailand	number	794,785	709,187	1,212,184	1,102,777	2,184,733	1,438,761	3,405,969	1,733,171	1,674,042	831,259	567,218	2,108,700
Turkey	number	36,060	105,293	84,240	72,180	163,288	56,712	55,795	61,100	30,065	43,615	0	0
Ukraine	number	0	0	0	0	0	0	9,912	1,416	708	0	5,664	0
United Arab Em	number	0	0	0	0	0	0	0	0	0	0	0	3
United Kingdom	number	0	0	0	0	0	0	0	4	1	0	0	98
Vietnam	number	4,595,829	2,459,997	8,697,412	8,853,574	4,579,470	1,714,790	1,800,057	2,666,725	2,460,773	2,888,038	5,485,226	3,124,952
		61,651,263	55,854,671	52,909,646	48,126,918	41,701,943	26,705,976	28,598,541	38,698,629	28,498,064	45,662,646	37,037,213	31,692,634

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Country	Quantity Description	JAN	FEB	MAR	APR	MAY
Armenia	number	0	520	520	1,040	0
Australia	number	0	0	1,634	0	0
Burma	number	400	161,950	450	3,850	0
Cambodia	number	334,421	192,125	176,275	277,922	234076
Canada	number	28,378	37,151	319,390	27,872	36203
China	number	63,997	65,895	69,607	38,922	90635
France	number	384	0	320	0	0
Germany	number	0	0	1,530	3,535	0
Hungary	number	0	613	0	0	0
India	number	12,022	6,184	29,986	3,980	5801
Indonesia	number	4,518	8,268	2,772	3,988	4364
Italy	number	6,008	2,187	5,144	3,020	3416
Japan	number	0	2,940	31,396	17,453	20277
Malaysia	number	10,968,475	4,999,451	23,078,042	5,262,029	14786765
Mexico	number	0	100	44,933	896	9962
Netherlands	number	0	0	1	0	0
Philippines	number	48,600	13,623	11,716	7,154	45790
Poland	number	0	32	855	1,790	895
Singapore	number	127,573	110,033	551,004	117,534	232193
South Korea	number	16,406,122	12,812,265	17,757,434	28,255,123	18054355
Spain	number	0	550	0	64	127
Taiwan	number	2,545,966	2,028,310	2,223,552	1,483,090	2006831
Thailand	number	805,741	19,182,751	2,765,496	1,946,252	3259544
Turkey	number	9,295	22,360	16,558	44,120	25502
Ukraine	number	0	3,186	5,664	0	0
United Kingdom	number	0	0	3	0	0
Vietnam	number	5,701,716	3,977,228	6,183,748	8,761,091	6066769
		37,063,616	43,627,722	53,278,030	46,260,725	44883505

0

Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0		0	0	0	0	0	0	0	0	0	0	0	

0

Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0		0	0	0	0	0	0	0	0	0	0	0	

0

Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0		0	0	0	0	0	0	0	0	0	0	0	

0

Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0		0	0	0	0	0	0	0	0	0	0	0	

0

Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0		0	0	0	0	0	0	0	0	0	0	0	

0

Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0		0	0	0	0	0	0	0	0	0	0	0	

0

Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0		0	0	0	0	0	0	0	0	0	0	0	

0

Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0		0	0	0	0	0	0	0	0	0	0	0	

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Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Belgium	number	0	0	0	0	0	0	0	11,260	0	0	0	0
Canada	number	0	0	0	0	0	0	3,215,262	2,896,158	896,439	3,182,724	1,041,689	432,108
China	number	0	0	0	0	0	0	807,295	2,786,308	1,163,235	1,062,312	1,063,365	966,808
Croatia	number	0	0	0	0	0	0	0	0	0	8,554	0	0
Denmark	number	0	0	0	0	0	0	0	0	12,363	0	0	0
France	number	0	0	0	0	0	0	756,900	379,750	88,675	22,568	79,084	89,935
Germany	number	0	0	0	0	0	0	109,292	108,376	5,251	12,178	0	0
Hong Kong	number	0	0	0	0	0	0	2,427	0	0	0	0	0
India	number	0	0	0	0	0	0	3,370,178	285,620	2,153,524	8,737,372	4,339,999	658,198
Indonesia	number	0	0	0	0	0	0	292,309	197,108	66,722	91,117	210,671	62,604
Italy	number	0	0	0	0	0	0	764,673	288,818	1,552,163	626,853	1,836,992	678,112
Japan	number	0	0	0	0	0	0	4,586,861	4,683,239	5,561,775	9,980,712	1,678,248	2,894,924
Malaysia	number	0	0	0	0	0	0	52,110,179	49,654,452	69,863,087	56,343,183	94,600,206	99,903,087
Mexico	number	0	0	0	0	0	0	47,856,551	30,196,267	21,590,976	21,639,447	20,684,384	15,543,690
Philippines	number	0	0	0	0	0	0	27,267	51,026	9,799	0	336,052	380,460
Russia	number	0	0	0	0	0	0	0	0	0	0	3,200	0
Singapore	number	0	0	0	0	0	0	24,034,156	14,730,286	21,072,436	23,421,318	13,835,190	7,939,737
South Korea	number	0	0	0	0	0	0	34,585,792	63,805,378	65,901,551	73,002,342	70,255,786	36,456,532
Spain	number	0	0	0	0	0	0	0	37,945	0	30,433	14,996	8,103
Switzerland	number	0	0	0	0	0	0	0	0	0	0	0	12,843
Taiwan	number	0	0	0	0	0	0	2,633,939	2,411,430	1,603,815	1,394,007	3,539,413	1,226,010
Thailand	number	0	0	0	0	0	0	9,324,949	8,660,621	13,444,507	17,623,714	10,158,423	7,497,158
Turkey	number	0	0	0	0	0	0	2,347,062	2,391,154	2,736,368	2,053,547	1,674,266	2,401,394
United Kingdom	number	0	0	0	0	0	0	0	296,403	0	119,282	4,325	0
Vietnam	number	0	0	0	0	0	0	50,315,409	55,586,184	49,160,246	52,110,761	36,279,314	22,600,163
		0	0	0	0	0	0	237,140,501	239,457,783	256,882,932	271,462,424	261,635,603	199,751,866

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Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Australia	number	0	0	0	5,950	0	0	0	0	4,622	0	0	0
Austria	number	9,442	0	0	0	0	0	0	0	0	0	2,984	0
Belgium	number	0	0	0	11,234	0	0	0	0	0	0	18,897	0
Bulgaria	number	0	0	2,375	0	0	0	30,055	0	0	0	0	36,075
Burma	number	0	0	0	0	0	0	0	6,900	0	364,132	364,246	0
Cambodia	number	0	0	0	0	158,609	0	0	809,678	528,085	2,394,012	3,105,518	3,642,663
Canada	number	2,025,392	538,135	685,057	976,775	1,964,094	1,447,394	1,168,996	3,507,230	3,284,590	3,645,157	3,594,925	4,836,939
China	number	1,114,956	500,473	644,505	426,438	1,488,841	534,193	414,540	518,239	4,715,994	36,788,024	6,697,366	47,485,072
Croatia	number	0	0	0	0	0	0	0	0	6,710	0	0	0
France	number	0	771,913	112,923	0	9,157	0	7,068	0	3,933	16,401	0	0
Germany	number	5,087	0	0	135,566	17,163	37,600	0	32,721	17,088	897,026	52,048	8,558
India	number	635,737	401,381	665,519	748,621	1,248,979	393,461	3,976,333	7,359,156	14,420,604	18,815,289	22,479,690	17,595,864
Indonesia	number	6,565	64,199	701,231	87,456	895,267	947,222	80,178	375,214	17,901	242,308	117,884	353,568
Italy	number	576,701	398,038	942,280	238,339	458,052	870,871	269,036	524,377	630,954	566,621	877,588	527,624
Japan	number	4,367,434	7,424,736	2,903,142	4,408,459	7,088,151	4,360,367	4,441,363	10,766,857	3,972,676	3,781,598	1,075,722	2,808,307
Jordan	number	0	3,719	0	0	0	0	0	4,263	105,495	555,441	1,692,118	52,748
Malaysia	number	59,670,779	68,996,871	74,433,458	95,389,019	135,656,847	138,928,869	152,603,296	193,538,704	197,109,570	201,662,140	255,346,936	174,234,540
Mexico	number	17,893,547	15,421,550	16,065,206	7,472,977	8,615,814	6,406,374	11,982,611	17,563,357	11,689,310	17,824,923	8,635,350	11,530,066
Netherlands	number	0	2,392	0	0	0	3,395	0	0	0	0	0	0
Nicaragua	number	0	0	0	0	0	0	0	0	0	1,425,750	0	0
Philippines	number	183,526	184,082	228,983	143,531	763,318	452,643	1,892,678	16,172	31,293	1,236,213	756,576	2,166,117
Poland	number	0	0	0	0	0	66,746	0	0	0	0	0	52,400
Russia	number	0	0	0	0	0	0	0	5,422	0	0	0	0
Singapore	number	6,205,508	11,190,172	11,631,754	5,194,468	12,071,239	20,937,242	24,676,621	16,359,669	23,830,664	22,359,213	23,293,143	29,923,108
Slovenia	number	0	0	0	0	0	0	0	70,000	0	0	0	0
South Korea	number	31,466,038	48,305,068	44,925,473	41,673,263	61,566,619	44,892,368	49,031,878	70,839,250	69,845,019	91,483,893	94,207,691	92,530,542
Spain	number	0	0	155,826	5,534	0	0	0	0	0	0	0	76,172
Sweden	number	0	0	0	0	0	0	16,946	0	0	0	0	0
Switzerland	number	0	0	0	0	0	0	0	0	63,447	0	0	0
Taiwan	number	926,286	2,537,821	4,586,579	20,547,946	28,214,534	4,445,665	5,911,823	6,273,541	5,586,403	7,435,342	10,013,896	18,771,661
Thailand	number	3,320,313	17,638,262	21,335,262	28,088,891	44,477,383	44,573,653	46,599,744	57,337,929	54,094,797	77,483,968	88,377,523	98,170,432
Turkey	number	2,798,104	5,114,937	2,993,145	11,758,590	19,988,175	16,096,332	10,304,302	16,091,736	5,147,167	2,810,557	1,248,621	1,189,808
United Kingdom	number	3,960	0	72,500	0	0	0	15,861	12,043	22,950	0	7,422	0
Vietnam	number	9,401,578	19,586,814	39,254,230	38,324,499	77,890,482	129,348,848	114,688,538	129,903,678	140,420,158	136,141,457	128,693,485	149,169,799
		140,610,953	199,080,563	222,339,448	255,637,556	402,572,724	414,743,243	428,111,867	531,916,136	535,549,430	627,929,465	650,659,629	655,162,063

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Country	Quantity Description	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Australia	number	0	0	0	0	0	0	0	0	0	6,850	0	0
Austria	number	2,181	22,359	16,720	0	0	0	0	0	3,481	0	0	0
Bangladesh	number	0	0	0	80,500	0	0	0	0	0	0	0	0
Belgium	number	0	0	0	0	0	0	0	0	0	76,872	0	0
Brazil	number	0	0	51,099	0	0	0	0	0	0	163,125	0	0
Burma	number	496,139	66,806	423,889	329,523	293,471	19,761	1,116,908	433,311	309,245	152,893	132,053	307,344
Cambodia	number	2,521,923	4,810,587	9,281,435	4,018,336	5,467,757	7,708,314	13,959,467	8,305,396	21,884,962	13,682,761	16,168,010	22,367,331
Canada	number	2,763,346	1,706,134	2,866,745	2,845,090	6,115,153	3,661,947	1,719,180	6,313,012	2,580,065	8,376,789	979,005	1,053,758
China	number	19,108,123	69,641,176	98,258,782	47,959,671	86,358,648	33,667,335	8,539,980	13,868,575	4,599,090	6,554,777	3,065,221	1,079,834
France	number	0	0	0	0	0	0	0	14,800	7,200	50,182	51,182	5,679
Georgia	number	0	0	0	0	0	0	0	0	38,655	0	0	0
Germany	number	30,743	54,389	2,006	0	0	4,410	40,330	43,530	0	15,755	0	44,909
Haiti	number	0	0	0	0	0	0	0	0	0	4,712	0	0
Hungary	number	4,450	0	0	0	0	0	0	0	0	0	0	0
India	number	11,011,033	1,884,744	2,720,830	3,200,167	464,918	802,481	2,457,097	1,103,569	1,495,336	5,882,983	755,049	3,444,382
Indonesia	number	254,073	135,132	72,290	130,126	27,771	472,247	832,211	465,906	330,034	974,360	0	602,398
Italy	number	1,124,750	1,223,448	9,419,709	6,958,705	4,538,273	131,940	145,117	4,461,215	224,516	4,025,799	6,766,559	486,388
Japan	number	822,601	5,235,831	2,398,681	651,534	0	78,371	0	232,171	0	0	0	12,863
Jordan	number	505,300	52,748	52,748	52,748	0	0	0	47,179	0	49,719	233,410	0
Lithuania	number	0	0	0	0	0	0	0	0	0	0	75,194	0
Malaysia	number	211,840,355	199,719,092	225,832,162	210,670,842	193,866,820	111,794,243	185,477,692	201,662,224	192,582,422	171,666,170	202,683,177	193,739,169
Mexico	number	8,834,186	5,309,398	4,792,322	2,053,746	892,345	5,257,271	8,373,176	8,309,669	7,209,356	10,488,822	13,614,718	13,501,179
Netherlands	number	2,070	0	0	29,355	0	20,308	0	2,845	2,707	0	0	5,593
Philippines	number	2,639,246	2,642,827	6,148,260	2,691,231	384,427	104,548	501,872	11,112	7,601	0	84,005	255,610
Poland	number	45,268	0	109,621	0	234,810	67,050	41,390	263,326	0	0	0	226,240
Singapore	number	19,379,626	24,662,993	19,419,760	20,207,984	16,027,206	15,928,342	14,084,890	18,448,006	11,898,912	16,958,757	20,624,230	13,418,907
South Korea	number	134,313,077	122,804,293	161,847,207	83,303,910	46,417,524	68,284,446	63,908,809	65,641,771	56,705,423	101,532,963	64,697,525	72,144,998
Spain	number	0	0	0	0	14,950	0	0	0	0	0	0	0
Sweden	number	3,311	0	0	0	0	0	0	0	0	0	0	0
Switzerland	number	0	0	0	0	6,178	0	0	0	0	0	0	0
Taiwan	number	10,470,385	7,635,625	21,458,394	2,464,813	1,750,215	1,676,406	2,896,961	4,058,342	2,839,872	2,484,302	2,297,404	3,476,929
Thailand	number	112,195,056	93,729,210	158,974,708	153,463,220	153,281,677	137,614,642	109,873,611	142,216,144	117,510,540	84,589,408	70,536,326	130,678,064
Turkey	number	4,386,643	12,181,072	9,748,136	8,394,052	19,018,105	6,694,076	6,497,780	7,023,971	3,476,106	5,027,250	0	0
Ukraine	number	0	0	0	0	0	0	1,166,249	166,607	84,891	0	657,124	0
United Arab Em	number	0	0	0	0	0	0	0	0	0	0	0	90,838
United Kingdom	number	0	0	0	0	0	0	0	17,950	8,164	0	0	13,177
Vietnam	number	126,316,578	123,700,738	153,030,092	120,921,814	133,905,525	129,696,111	184,178,403	145,280,203	113,144,417	148,498,829	142,186,039	124,035,168
		669,070,463	677,218,602	886,925,596	670,427,367	669,065,773	523,684,249	605,811,123	628,390,834	536,942,995	581,264,078	545,606,231	580,990,758

27

Country	Quantity Description	JAN	FEB	MAR	APR	MAY
Armenia	number	0	116,170	84,242	168,480	0
Australia	number	0	0	61,690	0	0
Burma	number	25,320	198,508	50,463	129,536	0
Cambodia	number	5,355,740	12,573,160	13,062,484	24,376,160	23496322
Canada	number	943,694	1,024,923	1,778,525	1,672,089	1631540
China	number	1,302,452	2,296,055	1,343,494	1,442,573	1591107
France	number	38,401	0	49,281	0	0
Germany	number	0	0	93,315	142,050	0
Hungary	number	0	9,331	0	0	0
India	number	1,377,156	402,591	3,581,078	164,007	317249
Indonesia	number	227,800	677,824	238,541	373,454	141656
Italy	number	603,807	279,287	518,667	351,985	302757
Japan	number	0	53,350	68,327	134,133	468062
Malaysia	number	203,276,012	215,060,282	220,333,634	224,718,812	227909660
Mexico	number	0	6,592	118,654	30,465	166104
Netherlands	number	0	0	2,720	0	0
Philippines	number	191,337	3,245,572	2,391,137	1,524,026	1417296
Poland	number	0	19,860	125,512	299,124	104949
Singapore	number	16,074,197	12,997,741	25,847,745	15,269,104	29969649
South Korea	number	78,226,153	69,893,446	83,870,087	70,032,688	52397948
Spain	number	0	110,025	0	17,175	22007
Taiwan	number	3,323,701	2,585,255	4,157,990	2,745,826	7258390
Thailand	number	94,515,452	79,026,197	156,972,984	134,149,889	158320362
Turkey	number	1,039,004	2,489,756	1,777,252	4,711,400	2692980
Ukraine	number	0	311,612	556,660	0	0
United Kingdom	number	0	0	2,961	0	0
Vietnam	number	105,492,518	119,161,399	205,317,913	191,321,138	166701952
		512,012,744	522,538,936	722,405,356	673,774,114	674909990

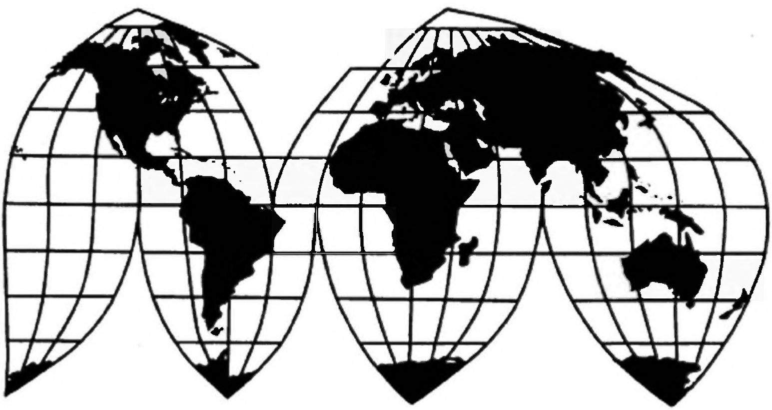
EXHIBIT 18

Crystalline Silicon Photovoltaic Cells and Modules from China

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

Publication 4874 **March 2019**

U.S. International Trade Commission



Washington, DC 20436

9777 on Adjusting Imports of Steel and Aluminum into the United States.[43] Under these Presidential Proclamations, in addition to reporting the regular Chapters 72 and 73 of the Harmonized Tariff Schedule ("HTS") classification for the imported steel merchandise and the regular Chapter 76 of the HTS classification for the imported aluminum merchandise, importers shall report the following HTS classification for imported merchandise subject to the additional duty: 9903.80.01 (25 percent ad valorem additional duty for steel mill products) and 9903.85.01 (10 percent ad valorem additional duty for aluminum products). These duty requirements are effective with respect to goods entered, or withdrawn from warehouse for consumption, on or after March 23, 2018.[44]

As explained in the section entitled "The product" of this report, both steel and aluminum are raw material inputs in the production of CSPV cells and modules.[45]

SUMMARY DATA

Table I-1 presents a summary of data from the terminal years of the original investigations and the current full five-year reviews. Figure I-1 presents apparent U.S. consumption data for 2009-17.[46] Data from the original investigations and these current five-year reviews are not comparable in the following respects. First, the import component of apparent U.S. consumption in 2017 is derived from adjusted official U.S. import statistics and may include items that are not in scope.[47] In these reviews, 47 importers that accounted for approximately 26.2 percent of U.S. imports of CSPV cells and modules from China and 56.4 percent of U.S. imports from nonsubject countries in 2017 submitted usable questionnaire

[43] 83 FR 13355 and 83 FR 13361, March 28, 2018; 83 FR 20683 and 83 FR 20677, May 7, 2018; 83 FR 25849 and 25857, June 5, 2018; 83 FR 40429, August 15, 2018; and 83 FR 45019 and 45025, September 4, 2018.

[44] *Section 232 Tariffs on Aluminum and Steel Duty on Imports of Steel and Aluminum Articles under Section 232 of the Trade Expansion Act of 1962*, https://www.cbp.gov/trade/programs-administration/entry-summary/232-tariffs-aluminum-and-steel, retrieved December 12, 2018.

[45] For both CSPV cells and modules, total raw material cost is the most substantial component of total COGS. For cells, total raw material cost reflects a combination of polysilicon, wafers, and all other raw material costs; however, the main underlying raw material input for CSPV cells is wafers made from polysilicon.

[46] Complete summaries of these data from the final *CSPV 1* investigations for 2009-11, January-June 2011, and January-June 2012 appear in appendix C. Select data from *CSPV 3* are also presented in appendix C.

[47] Import statistics for 2017 were adjusted to remove the following: (1) known imports of modules that contained U.S.-produced cells and (2) an estimated amount of thin film products (based on the ratio of total imports held by thin film products in July and August 2018 under HTS statistical reporting numbers 8541.40.6035 and 8541.40.6045). However, the adjusted import statistics presented may include additional items that are specifically excluded from the scope of these orders.

THE PRODUCT

Description and applications

Description[64]

CSPV cells (figure I-2) use crystalline silicon to convert sunlight to electricity and are the basic elements of a module. They 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.[65] Most CSPV cells, as of 2017, were 156.0 mm by 156.0 mm (6.14 inches by 6.14 inches) or 156.75 mm by 156.75 mm (6.17 inches by 6.17 inches).[66] As of 2017, CSPV cells typically have wattages[67] ranging from 4 watts to more than 5 watts per cell. 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[68] convert sunlight into electricity for on-site use or for distribution through the electric grid.

(*...continued*)
Assembled Into Modules, From the People's Republic of China: Countervailing Duty Order, 77 FR 73017, December 7, 2012.

[64] This section is primarily from *Crystalline Silicon Photovoltaic Cells (Whether or not Partially or Fully Assembled into Other Products), Inv. No. TA-201-75*, USITC Publication 4739, November 2017, pp. I-11–17 and I-31–I-38. Citations to direct quotes, pictures, and data were retained.

[65] 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.

[66] International Technology Roadmap for Photovoltaic ("ITRPV"), Results 2017 Including Maturity Report, Ninth Edition, September 2018, pp. 40–41, http://www.itrpv.net/.cm4all/uproc.php/0/ITRPV%20Ninth%20Edition%202018%20including%20maturity%20report%2020180904.pdf?cdp=a&_=165a39bbf90, retrieved December 18, 2018.

[67] This report discusses data in terms of watts ("W"), kilowatts ("kW" (equal to 1,000 watts)), megawatts ("MW" (1,000 kW)), and gigawatts ("GW" (1,000 MW)).

[68] In addition to CSPV products, there is commercial production of thin film photovoltaic products (which are not included in the scope of the investigation). Thin film cells and modules use a several micron thick layer of a photosensitive semiconductor material such as amorphous silicon ("a-Si"), cadmium telluride ("CdTe"), copper indium (gallium) (di)selenide ("CIS" or "CIGS") to convert sunlight to electricity.

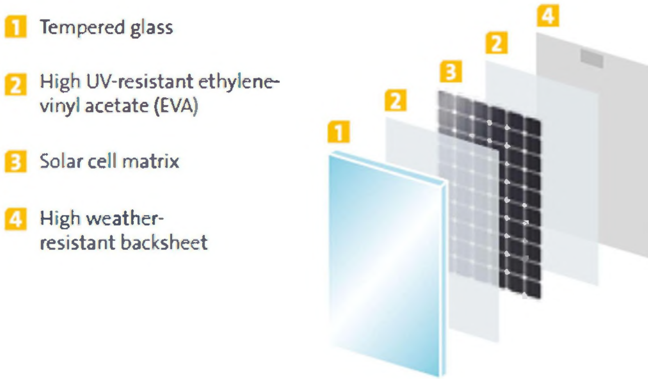
Figure I-2
CSPV cells

Source: SolarWorld Website, http://www.solarworld.de/en/group/from-sand-to-module/solar-cells/, retrieved July 6, 2017.

CSPV laminates consist of the CSPV cells that are connected, encapsulated in an ethyl vinyl acetate ("EVA") film,[69] and covered with a glass front sheet and a back sheet (figure I-3). The back sheet is most commonly a plastic film composite, though glass is also used in some applications such as bifacial modules.

[69] There are other encapsulation materials that are used, but EVA accounted for more than 90 percent of the market in 2017. ITRPV, Results 2017 Including Maturity Report, Ninth Edition, September 2018, p. 19.

Figure I-3
Layers of a typical CSPV laminate



Source: SolarWorld, "SolarWorld Quality," brochure, May 2014, p. 10, https://www.solarworld-usa.com/~/media/www/files/brochures/sw-01-7182us-flyer-solarworldquality.pdf.

CSPV modules typically consist of the laminate that is "framed" in aluminum, and then attached to a junction box. 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.[70] 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). Typical on-grid modules have 60, 72, or 96 CSPV cells, though in some instances CSPV cells are cut in half resulting in 120 or 144 half-cut CSPV cells (figure I-4).[71] CSPV 60-cell modules are, on average 65 inches long and 39 inches wide, and are typically 1.5 to 2 inches in depth. CSPV 60-cell modules commonly weigh between 33 to 51 pounds. CSPV 72-cell

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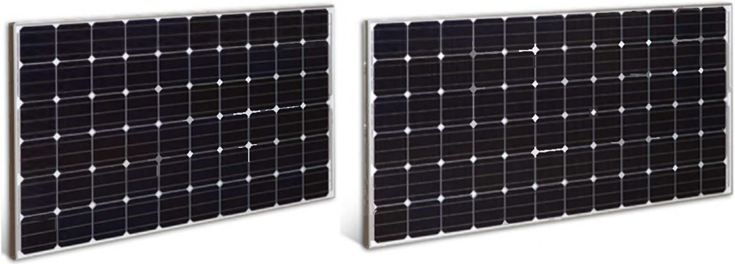
[70] Photovoltaics ("PV") do not include solar water heat and concentrated solar power ("CSP"). While PV uses a photosensitive semiconductor material to convert sunlight directly to electricity, solar water heat uses sunlight to heat water and CSP uses reflected sunlight to generate steam or a vapor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

[71] Schwartz, Joe, "High-Power c-Si PV Module Specifications," *SolarPro*, Issue 10.3, May/June 2017, pp. 48–59, https://solarprofessional.com/articles/products-equipment/modules/high-power-c-si-pv-module-specifications-2017#.WV-8AP6Wx-A, retrieved December 18, 2018.

Figure I-4
CSPV 60-cell module (left) and 72-cell module (right)



Source: Suniva, Suniva Optimus Series Monocrystalline Solar Modules, OPT Series: OPT 72 cell modules (silver frame), brochure, January 18, 2017, http://suniva.com/documents/[SAMD_0060]%20Suniva%20Optimus%2060%20Silver%20OCOF%20Rev%205%202017%2001%2018.pdf, retrieved December 18, 2018; Suniva, Suniva Optimus Series Monocrystalline Solar Modules, OPT Series: OPT 60 cell modules (silver frame), brochure, January 18, 2017, http://suniva.com/documents/[SAMD_0051]%20Suniva%20Optimus%2072%20cell%2038mmOCOF%20-%20Rev%209%20-%202017%2001%2018.pdf, retrieved December 18, 2018.

modules are generally around 78 inches long, 39 inches wide, and 1.5 to 2 inches thick.[72] CSPV 72-cell modules generally weigh from 45 to 61 pounds.[73]

The two main types of CSPV cells and modules are monocrystalline silicon and multicrystalline (or polycrystalline) silicon, though there are various products within these two categories. 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 modules.[74] For example, efficiencies for 72-cell or more multicrystalline modules listed in SolarPro's 2017 module specifications range

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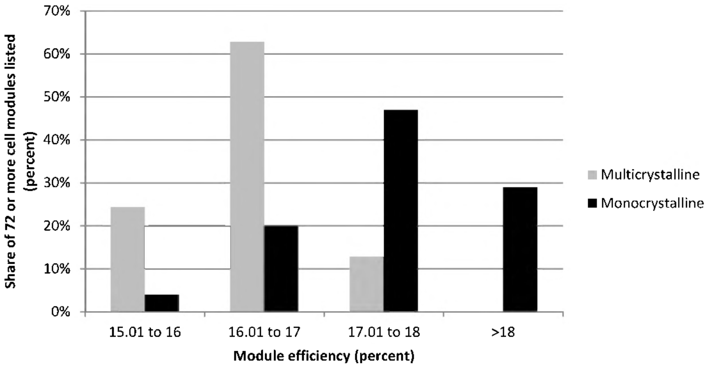
[72] EnergySage, "What is the Average Solar Panel Size and Weight?" n.d., http://news.energysage.com/average-solar-panel-size-weight/, retrieved July 7, 2017.

[73] Schwartz, Joe, "High-Power c-Si PV Module Specifications," *SolarPro*, Issue 10.3, May/June 2017, 48–59, https://solarprofessional.com/articles/products-equipment/modules/high-power-c-si-pv-module-specifications-2017#.WV-8AP6Wx-A, retrieved December 18, 2018.

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

from 15.2 to 17.8 percent, while efficiencies for monocrystalline modules range from 15.5 to 21.5 percent (figure I-5).[75]

Figure I-5
CSPV: Efficiencies of modules (72 or more cells, 300 or more watts) listed in SolarPro's 2017 module specifications



Note.--According to *SolarPro*, its 2017 list of CSPV module specifications includes "232 models with rated outputs of 300 W STC and greater from 29 manufacturers. The included models are listed and available for deployment in US-based projects. This c-Si specifications table is not intended to be exhaustive or all-inclusive; rather, our goal is to present comparative information on a wide cross-section of high-power PV solutions for utility, commercial and select residential projects." For comparison purposes, the data presented here include the models with 72 or more CSPV cells and for which a module efficiency was included.

Source: Schwartz, Joe, "High-Power c-Si PV Module Specifications," SolarPro, Issue 10.3, May/June 2017, pp. 48–59, https://solarprofessional.com/articles/products-equipment/modules/high-power-c-si-pv-module-specifications-2017#.WV-8AP6Wx-A, retrieved December 18, 2018.

[75] Schwartz, Joe, "High-Power c-Si PV Module Specifications," *SolarPro*, Issue 10.3, May/June 2017, pp. 48–59, https://solarprofessional.com/articles/products-equipment/modules/high-power-c-si-pv-module-specifications-2017#.WV-8AP6Wx-A, retrieved December 18, 2018.

The average output of 60-cell multicrystalline modules listed in SolarPro's 2017 module specifications was 268 watts and the average output of monocrystalline modules was 293 watts.[76] The average output of 72-cell multicrystalline modules listed in SolarPro's 2017 module specifications was 319 watts, while the average power output of 72-cell monocrystalline modules was 340 watts.[77]

The conversion efficiency of CSPV modules has increased over time, with the median efficiency of modules installed in U.S.-distributed systems, for example, increasing from 15.4 percent in 2012 to 17.3 percent in 2016 (figure I-6). The median efficiency of multicrystalline[78] modules (the only type for which separate data were available) installed in U.S. distributed systems increased from 14.7 percent to 16.8 percent during 2012–16.[79] Larger sized CSPV modules have also become more common, with 72-cell modules accounting for around 30 percent of global production in 2017.[80]

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[76] Schwartz, Joe, "60-Cell PV Modules Specifications (2017)," *SolarPro*, Issue 10.6, November/December 2017, pp. 42–53, http://solarprofessional.com/articles/products-equipment/modules/60-cell-pv-modules-specifications-2017#.W4_wns5JGUk, retrieved December 18, 2018.

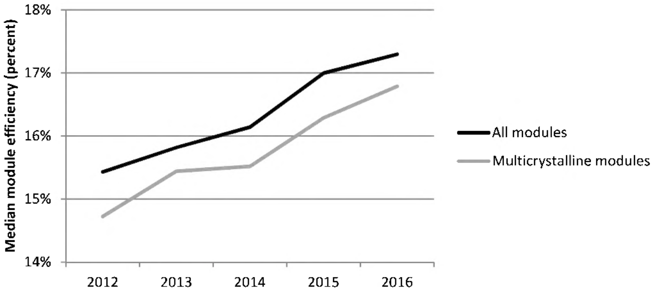
[77] *SolarPro's* module specifications only include modules of 300 watts or more. Data presented here for 72 cell modules include those with 144 half-cut cells. Schwartz, Joe, "High-Power c-Si PV Module Specifications," *SolarPro*, Issue 10.3, May/June 2017, pp. 48–59, https://solarprofessional.com/articles/products-equipment/modules/high-power-c-si-pv-module-specifications-2017#.WV-8AP6Wx-A, retrieved December 18, 2018.

[78] See "Description and uses" section of this report for further information on multicrystalline (or polycrystalline) silicon and monocrystalline silicon cells and modules.

[79] Data for all products may include some thin-film modules. Barbose, Galen and Naïm Darghouth, *Tracking the Sun X: The Installed Price of Residential and Non-Residential Photovoltaic Systems in the United States*, Data file, Lawrence Berkeley National Laboratory, September 2017, https://emp.lbl.gov/publications/tracking-sun-10-installed-price, retrieved December 18, 2018.

[80] ITRPV, Results 2017 Including Maturity Report, Ninth Edition, September 2018, p. 48.

Figure I-6
CSPV: Median efficiency of modules installed in U.S.-distributed systems, by year of installation



Note.--The "all modules" category may include some thin film products. This figure does not include 2017 data since data in the 2018 *Tracking the Sun* report are not comparable to earlier years.

Source: Barbose, Galen and Naïm Darghouth, *Tracking the Sun X: The Installed Price of Residential and Non-Residential Photovoltaic Systems in the United States*, Data file, Lawrence Berkeley National Laboratory, September 2017, https://emp.lbl.gov/publications/tracking-sun-10-installed-price, retrieved December 18, 2018; Barbose, Galen and Naïm Darghouth, *Tracking the Sun XI: Installed Price Trends for Distributed Photovoltaic Systems in the United States*, Lawrence Berkeley National Laboratory, September 2018, pp. 14–15, https://emp.lbl.gov/tracking-the-sun, retrieved December 18, 2018.

Within the broad areas of monocrystalline and multicrystalline products, there are a number of cell and module technologies. The production of passive emitter rear contact ("PERC") and related technologies is rapidly increasing, and these technologies accounted for more than 20 percent of cell production in 2017.[81] Manufacturers have also increased the number of busbars used in cells, with cells containing five or more busbars accounting for about 30 percent of global production in 2017.[82] Select cell and module technologies are described below:

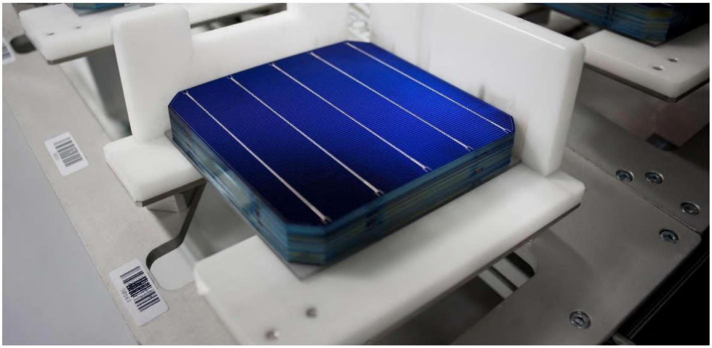
- **Back contact cells:** Some manufacturers place metal contacts onto the rear side of the cell, creating back (or rear contact) cells. This provides several advantages such as reduced shading, improved cell interconnection, and better aesthetics.
- **Bifacial:** Bifacial cells convert light that hits both the front and back of the CSPV cell into electricity. 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 PERC or heterojunction technologies discussed below. When incorporated into

[81] ITRPV, Results 2017 Including Maturity Report, Ninth Edition, September 2018, p. 42.
[82] Ibid., p. 35.

modules, they use a transparent back sheet or rear glass layer to allow reflected sunlight on the rear of the CSPV cell. Bifacial cells increase energy production, but are also more expensive to produce.

- **Busbars:** Manufacturers are increasing the number of busbars in PV cells, which results in higher efficiency and greater power output (figure I-7). Some manufacturers have eliminated busbars, which can provide benefits such as reducing electrical losses and increasing the surface area of the cell that can absorb sunlight.

Figure I-7
CSPV cell containing five busbars



Source: SolarWorld Website, https://www.solarworld-usa.com/newsroom/media-downloads, retrieved September 4, 2017.

- **Frameless modules:** Some PV modules do not use a frame, which reduces costs. These modules typically use glass as the rear layer to ensure mechanical stability.
- **Half-cut cells:** Some manufacturers have switched to modules with half-cut cells. These are standard cells that are cut in half, such that a standard 60-cell 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.
- **Heterojunction:** Heterojunction cells, which include heterojunction with intrinsic thin layer (HIT), add thin layers of photosensitive semiconductor materials (typically amorphous silicon) on top of a monocrystalline wafer. These additional layers increase the absorption of sunlight, and the overall efficiencies of the CSPV cells. They also perform better in hot climates than typical monocrystalline cells. They are more expensive to produce and are difficult to scale up to commercial production, however, so only a few companies currently produce this technology.

- **n-type mono:** In the production of most types of monocrystalline CSPV wafers, the silicon is doped with boron 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 cell production process, a positive layer is added to create the p/n junction. n-type cells can be more expensive to produce, but have a number of benefits, such as higher conversion efficiencies, no light-induced degradation, and the potential use of less pure wafers.
- **Passive Emitter Rear Contact (PERC):** 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. Existing CSPV cell production lines can be reconfigured to produce PERC cells with the addition of two steps. Therefore, the changeover to PERC technology is relatively straightforward, though there are some challenges with PERC technology such as the potential for more rapid cell degradation. Related technologies include Passivated Emitter Rear Totally Diffused (PERT) and Passivated Emitter Rear Locally Diffused (PERL).

In addition to standard size 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 (figure I-8).

CSPV modules are also used in off-grid applications. In many instances, 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 modules as a house that is grid-connected. However, there are 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) (figure I-9). 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 modules have different wattages than modules used in grid-connected applications.

Figure I-12
La Ola PV plant, a utility CSPV system on Lanai, Hawaii

Source: Photo courtesy of DOE/NREL, credit Jamie Keller, https://www.nrel.gov/.

As noted above, there are 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). These systems often have additional BOS components, such as a battery and charge controller, though inverters are not needed for all off-grid applications.

Manufacturing processes[90]

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-13). 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.[91] The ingot and wafer production process differs for monocrystalline and multicrystalline cells, as discussed below.

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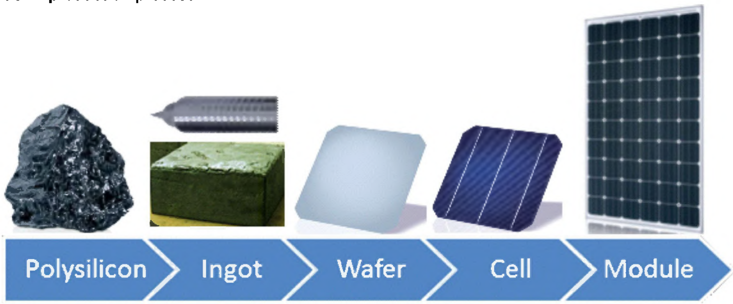
[90] This section is derived from *Crystalline Silicon Photovoltaic Cells (Whether or not Partially or Fully Assembled into Other Products), Inv. No. TA-201-75,* USITC Publication 4739, November 2017, pp. I-18–24. Citations to direct quotes, pictures, and data were retained.

[91] SolarWorld, "Real Value," 2016, https://www.solarworld-usa.com/why-choose-solarworld/the-solarworld-standard#Product_certifications, retrieved December 18, 2018.

Figure I-13
CSPV production process



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.

Source: SolarWorld, "Energy for You and Me" brochure, pp. 6–7, 9; ingot photo courtesy of DOE/NREL, credit John Wohlgemuth, Solarex, https://www.nrel.gov/.

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, which accounted for more than 85 percent of global production in 2017, and fluidized bed reactor ("FBR") technology, which accounts for most of the remaining market.[92]

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 the 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

[92] ITRPV, Results 2017 Including Maturity Report, Ninth Edition, September 2018, p. 8.

when they are sufficiently large. As they do so, new seed granules and gas are introduced into the chamber and the process continues."[93] 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[94] 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-14). 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-15). 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.

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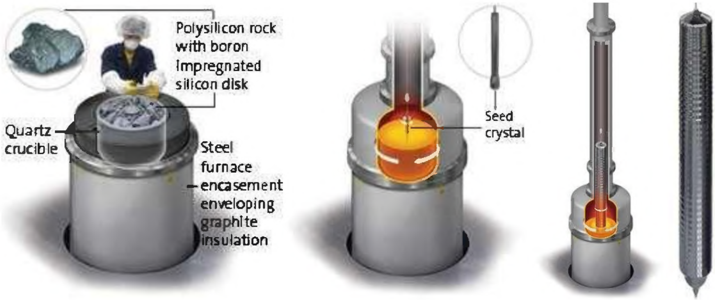
[93] REC Silicon website, http://www.recsilicon.com/technology/rec-silicons-fluidized-bed-reactor-process, retrieved June 12, 2017.

[94] This discussion will focus on the Czochralski process, which accounted for more than 95 percent of production in 2016. ITRPV, 2016 Results, March 2017, p. 19, http://www.itrpv.net/.cm4all/iproc.php/ITRPV%20Eighth%20Edition%202017.pdf?cdp=a, retrieved December 18, 2018.

Figure I-14

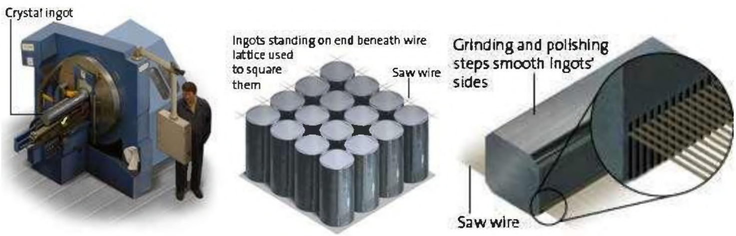
Czochralski process, crucible loading/charging (left), seed crystal (second from left), crystal growing (second from right), and finished crystal (right)



Source: SolarWorld Website, https://www.solarworld-usa.com/solar-101/making-solar-panels, retrieved July 15, 2017.

Figure I-15

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, retrieved July 15, 2017.

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[95]

The monocrystalline and multicrystalline wafers, which are 180 to 200 micrometers thick, are next processed into CSPV cells. 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: [96]

- **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-16).
- **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."[97]
- **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.
- **Co-firing:** The CSPV cells then enter a furnace, where the "high temperature causes the silver paste to become imbedded in the surface of the silicon layer, forming a reliable electrical contact."[98]
- **Testing and sorting:** The final step in the process is the testing and sorting of the CSPV cells based on their characteristics and efficiency.

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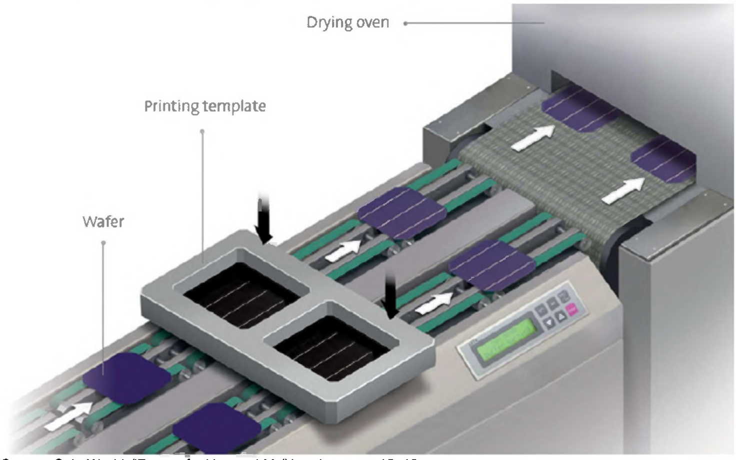
[95] The cell manufacturing process varies by company and technology.

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

[97] SolarWorld, "Energy for You and Me" brochure, p. 12.

[98] JA Solar, "Form 20-F," April 16, 2013, p. 41.

Figure I-16
CSPV cell production: Texturing (top) and screen printing (bottom)

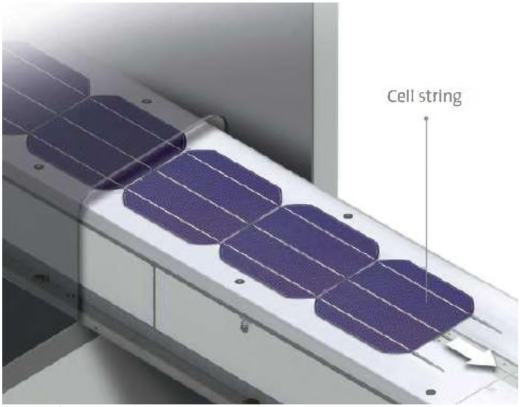


Source: SolarWorld, "Energy for You and Me" brochure, pp. 12–13.

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 (figure I-17). A piece of glass is placed on the production line, on top of which is added a piece of ethyl vinyl acetate ("EVA"). 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.

Figure I-17
Soldering CSPV cells together into strings



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

DOMESTIC LIKE PRODUCT ISSUES

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. In the previous *CSPV 1* and *CSPV 2* antidumping and countervailing duty determinations, the Commission found one domestic like product consisting of CSPV cells and

EXHIBIT 19

UNITED STATES DEPARTMENT OF COMMERCE
International Trade Administration
Washington, D.C. 20230

A-570-979
C-570-980
Scope Inquiry: ET Solar
~~Business Proprietary Information~~ **Public Version**
E&C/OVII: LC

June 15, 2021

MEMORANDUM TO: James Maeder
Deputy Assistant Secretary
for Antidumping and Countervailing Duty Operations

THROUGH: Melissa G. Skinner
Senior Director, Office VII
Antidumping and Countervailing Duty Operations

FROM: Lauren Caserta LNC
International Trade Compliance Analyst, Office VII
Antidumping and Countervailing Duty Operations

RE: Final Scope Ruling on the Antidumping and Countervailing Duty Orders on Crystalline Silicon Photovoltaic Cells from the People's Republic of China: ET Solar Inc.

I. SUMMARY

On March 30, 2021, the Department of Commerce (Commerce) issued a preliminary scope ruling regarding solar modules imported by ET Solar Inc. (ET Solar) that are manufactured in Vietnam using certain components fabricated in the People's Republic of China (China).[1] At ET Solar's request,[2] the relevant scope inquiry was initiated to determine whether the solar modules at issue are covered by the antidumping duty (AD) and countervailing duty (CVD) orders on crystalline silicon photovoltaic cells (solar cells) from China.[3] Commerce examined the plain

[1] *See* Memorandum, "Preliminary Scope Ruling on the Antidumping and Countervailing Duty Orders on Crystalline Silicon Photovoltaic Cells from the People's Republic of China: ET Solar Inc.," dated March 30, 2021 (Preliminary Scope Ruling).
[2] *See* ET Solar's Letter, "Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China: Request for Scope Ruling on Certain Solar Modules Manufactured in Vietnam," dated June 4, 2020 (Incomplete Scope Request); *see also* ET Solar's Letter, "Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China: Supplemental Questionnaire," dated July 14, 2020 (Supplemental Scope Response).
[3] *See Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China: Amended Final Determination of Sales at Less Than Fair Value, and Antidumping Duty Order*, 77 FR 73018 (December 7, 2012) and *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China: Countervailing Duty Order*, 77 FR 73017 (December 7, 2012) (collectively, *Orders*).

language of the orders and performed a substantial transformation analysis to determine the country-of-origin of the merchandise at issue. Based on these analyses, Commerce preliminarily found that ET Solar's imported solar modules were within the scope of the *Orders*.[4]

II. BACKGROUND

On June 4, 2020, Commerce received an incomplete request from importer ET Solar to determine whether certain solar modules imported from Vietnam to the United States that contain unfinished solar cells from China are outside the scope of the *Orders*.[5] Commerce reviewed the information contained in this initial submission and determined it to be insufficient to make a scope determination with respect to the merchandise imported by ET Solar. On June 30, 2020, Commerce issued a supplemental questionnaire to ET Solar requesting further information and documentation regarding the complete production process for the merchandise at issue, which takes place partially in China and partially in Vietnam.[6] ET Solar submitted its supplemental response and additional documentation between July 2, 2020, and July 14, 2020.[7] Pursuant to 19 CFR 351.225(e), on August 27, 2020, Commerce initiated a formal scope inquiry and provided parties with 20 days to submit comments and factual information relating to this scope inquiry and 10 days to submit rebuttal comments.[8] Commerce received no comments in response to this initiation.

On January 21, 2021, Commerce issued a request for additional information pertaining to the five factors normally considered when using a substantial transformation analysis to determine a product's country of origin.[9] Commerce received responses from ET Solar and the American Alliance for Solar Manufacturing (the Alliance).[10]

Based on the information provided by ET Solar and the Alliance, Commerce issued its Preliminary Scope Ruling, as well as the source documentation (*e.g.*, prior scope rulings, excerpts from the petition, and a prior ruling issued by U.S. Customs and Border Protection) relied on in its preliminary analysis, on March 30, 2021.[11] Interested parties were invited to

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[4] *See* Preliminary Scope Ruling.
[5] *See* Incomplete Scope Request.
[6] *See* Commerce's Letter, "ET Solar Scope Ruling Request: Supplemental Questionnaire," dated June 30, 2020.
[7] *See* Supplemental Scope Response; *see also* ET Solar's Letter, "Scope Ruling Request in Crystalline Silicon Photovoltaic Cells from China: Submission of Form 7501 for APO Application," dated July 2, 2020.
[8] *See* Commerce's Letter, "Crystalline Silicon Photovoltaic Cells from the People's Republic of China: Initiation of Scope Inquiry on Certain Solar Modules Imported from Vietnam Containing Components Manufactured in the People's Republic of China," dated August 27, 2020.
[9] *See* Memorandum, "Crystalline Silicon Photovoltaic Cells from the People's Republic of China: Request for Additional Information," dated January 21, 2021; *see also* Memorandum, "Crystalline Silicon Photovoltaic Cells from the People's Republic of China: Deadline Correction for Additional Information Request," dated January 22, 2021.
[10] *See* ET Solar's Letter, "Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China: Response to Request for Information," dated February 12, 2021; and the Alliance's Letter, "Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China: Response to Request for Information," dated February 12, 2021.
[11] *See* Preliminary Scope Ruling and associated attachments.

comment on the Preliminary Scope Ruling.[12] On May 12, 2021, Commerce received a case brief from ET Solar.[13] On May 19, 2021, Commerce received a rebuttal brief from the Alliance.[14]

Commerce has reviewed and analyzed all evidence and arguments on the administrative record and continues to find that the solar modules imported by ET Solar are subject to the scope of the *Orders*. Commerce's analysis for the final scope ruling is unchanged from the analysis contained in the Preliminary Scope Ruling. We have provided our responses to the interested parties' comments on the Preliminary Scope Ruling in the "Discussion of the Issues" section of this memorandum.

III. SCOPE OF THE *ORDERS*

The merchandise covered by these *Orders* 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.

These *Orders* cover 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, *etc*hing, 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 these *Orders*.

Excluded from the scope of these *Orders* 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 these *Orders* are crystalline silicon photovoltaic cells, not exceeding 10,000mm^2 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.

Modules, laminates, and panels produced in a third-country from cells produced in China are covered by these *Orders*; however, modules, laminates, and panels produced in China from cells

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[12] *See* Memorandum, "Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China: Scope Ruling Request from ET Solar: Briefing Schedule," dated May 5, 2021.
[13] *See* ET Solar's Letter, "Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China: Final Scope Case Brief," dated May 12, 2021 (ET Solar's Case Brief).
[14] *See* the Alliance's Letter, "Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China: Scope Rebuttal Brief," dated May 19, 2021 (Alliance's Rebuttal Brief).

produced in a third-country are not covered by these *Orders*.

Merchandise covered by these *Orders* is currently classified in the Harmonized Tariff Schedule of the United States (HTSUS) under subheadings 8501.61.0000, 8507.20.80, 8541.40.6015, 8541.40.6020, 8541.40.6025, 8541.40.6030, 8541.40.6035, 8541.40.6045, and 8501.31.8000. These HTSUS subheadings are provided for convenience and customs purposes; the written description of the scope of these *Orders* is dispositive.

IV. DESCRIPTION OF MERCHANDISE SUBJECT TO THIS REQUEST

The merchandise at issue is solar modules that are assembled in Vietnam and imported into the United States by ET Solar, located in Pleasanton, CA.[15] Multiple companies located in China, Hong Kong, and Vietnam are involved in the supply and production chains for the finished modules, which consist of individual solar cells fabricated from silicon wafers.[16]

According to ET Solar, the production process for the modules at issue begins in China, where silicon wafers are manufactured and processed by [ ].[17] First, silicon wafers are cleaned and textured before a phosphorous dopant is diffused into the boron-doped wafer to form a p/n junction.[18] [ ] then removes a thin layer of silicon from the edge of the unfinished cell to separate the positive and negative layers created during the diffusion process, and applies an anti-reflective coating to the front of the cell that optimizes its ability to absorb sunlight.[19] These cells are then purchased by a Vietnamese company, Ha Noi Solar Technology Company Limited (Ha Noi Solar), through a Hong Kong supplier, [ ].[20] The unfinished cells undergo further processing at Ha Noi Solar, where aluminum and silver pastes are printed onto the surface of the cell to create an electrical grid capable of collecting the energy generated by the cell.[21] Ha Noi Solar then dries, sinters, tests, and sorts the cells, which are subsequently sold to companies that produce solar modules made up of multiple cells.[22]

To fabricate the modules at issue, finished solar cells are purchased from Ha Noi Solar by KRSolar Technology Co., Ltd. (KRSolar), an intermediary company [ ], and sold to Green Wing Solar Technology Co., Ltd. (GW Solar), a module production company located in Vietnam.[23] KR Solar also provides GW Solar with all other raw materials necessary to produce finished solar modules.[24] GW Solar then solders cells together, adds glass and an ethyl vinyl acetate (EVA) coating, and arranges cells into a matrix before sealing and laminating

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[15] *See* Incomplete Scope Request at 2-3.
[16] *Id*.
[17] *Id*. at 2.
[18] *See* Supplemental Scope Response at 2-3 and Exhibit 14.
[19] *Id*.
[20] *See* Incomplete Scope Request at 2; *see also* Supplemental Scope Response at 2 and Exhibit 14.
[21] *See* Incomplete Scope Request at 2 and 9; *see also* Supplemental Scope Response at 2 and Exhibit 14.
[22] *See* Incomplete Scope Request at 3 and 9; *see also* Supplemental Scope Response at 2 and Exhibit 14.
[23] *See* Incomplete Scope Request at 2-3; *see also* Supplemental Scope Response at 2 and Exhibit 14.
[24] *See* Incomplete Scope Request at 3; *see also* Supplemental Scope Response at 2, 4, and Exhibits 6 and 14.

them.[25] Frames and junctions boxes are then affixed to the joined cells, and the finished modules are cleaned and inspected before being sold back to KR Solar.[26] ET Solar then purchases the finished solar modules from KR Solar for importation to the United States.[27]

V. LEGAL FRAMEWORK

When a request for a scope ruling is filed, Commerce examines the scope language of the order(s) at issue and the description of the product contained in the scope ruling request.[28] Pursuant to Commerce's regulations, Commerce may also examine other information, including the description of the merchandise contained in the petition, the records from the investigations, and relevant prior scope determinations made for similar products.[29] If Commerce determines that these sources are sufficient to decide the matter, it will issue a final scope ruling stating whether the merchandise is covered by the order(s).[30]

Where the descriptions of the merchandise in the sources described in 19 CFR 351.225(k)(1) are not dispositive, Commerce will consider the five additional factors set forth at 19 CFR 351.225(k)(2). These factors are: (i) the physical characteristics of the merchandise; (ii) the expectations of the ultimate purchasers; (iii) the ultimate use of the product; (iv) the channels of trade in which the product is sold; and (v) the manner in which the product is advertised and displayed. The determination as to which analytical framework is most appropriate in any given scope proceeding is made on a case-by-case basis after consideration of all evidence before Commerce.

Because AD and CVD orders apply to merchandise from particular countries, determining the country where the merchandise is produced is fundamental to proper administration and enforcement of the AD and CVD statute. The scope of an AD or CVD order is limited to merchandise that originates in the country covered by the order.[31] Commerce has explicitly stated that the scope of an AD order is "defined by the type of merchandise and the country-of-origin."[32]

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[25] *See* Incomplete Scope Request at 3; *see also* Supplemental Scope Response at 2 and Exhibit 14.
[26] *Id*.
[27] *Id.*
[28] *See Walgreen Co. v. United States*, 620 F.3d 1350, 1357 (Fed. Cir. 2010).
[29] *See* 19 CFR 351.225(k)(1).
[30] *See* 19 CFR 351.225(d).
[31] *See Stainless Steel Plate in Coils from Belgium: Final Results of Antidumping Duty Administrative Review*, 69 FR 74495 (December 14, 2004) (*SSPC from Belgium*) and the accompanying Issues and Decision Memorandum at Comment 4.
[32] *See Notice of Final Determination of Sales at Less Than Fair Value: Certain Cold-Rolled Carbon Steel Flat Products from Argentina*, 58 FR 37062 (July 9, 1993), where Commerce stated that "{the} scope of an antidumping or countervailing duty order is defined by the type of merchandise and by the country of origin (*e.g.*, widgets from Ruritania). For merchandise to be subject to an order it must meet both parameters, *i.e.*, product type and country of origin. In determining country of origin for scope purposes, Commerce applies a 'substantial transformation rule.'" This language was quoted by the Court of International Trade in *Advanced Tech & Materials Co., Ltd. v. United States*, 35 C.I.T. 1380, 1384 (CIT 2011) and *Ugine and ALZ Belgium*, *N.V. v. United States*, 517 F. Supp 2d 1333, 1345 (CIT 2007).

In determining the country-of-origin of a product, Commerce's practice has been to conduct a substantial transformation analysis.[33] The Court of International Trade (CIT) has upheld Commerce's "substantial transformation" analysis as a means to carry out its country-of-origin analysis.[34] The CIT states that "{the} 'substantial transformation' rule provides a yardstick for determining whether the processes performed on merchandise in a country are of such significance as to require that the resulting merchandise be considered the product of the country in which the transformation occurred."[35] Because the scope request addressed modules assembled in a third country that contain unfinished solar cells manufactured in China, we have used a substantial transformation analysis to determine whether the merchandise imported by ET Solar should be covered by the scope of the *Orders*.

VI. DISCUSSION OF THE ISSUES

Comment 1: Whether the Chinese-Origin Components Imported to Vietnam for Use in the Manufacture of the Modules at Issue are Solar Cells under the Scope of the *Orders*

ET Solar's Arguments:

- The scope of the *Orders* references "crystalline silicon photovoltaic *cells*" and "modules, laminates, and panels produced in a third-country from *cells* produced in China."[36] However, the plain language of the *Orders* does not specifically reference silicon wafers imported from China. Thus, the *Orders* would not apply to the merchandise at issue, which contains silicon wafers imported from China.[37]
- The scope of the *Orders* includes "crystalline silicon photovoltaic cells, and modules, laminates, and panels," which accordingly fall within the same class or kind of merchandise.[38] However, the term "silicon wafers" is presumed to have been deliberately excluded from this description by Commerce because the scope was not intended to cover silicon wafers.[39]
- Because of the presumably deliberate exclusion of the term "solar wafer" from the description of the scope of the *Orders*, Commerce cannot now determine that silicon wafers fall within the same class or kind of merchandise as solar cells, modules, laminates, and panels within the context of the substantial transformation analysis.[40]

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[33] *See*, *e.g.*, *Notice of Final Determination of Sales at Less Than Fair Value: Glycine from India*, 73 FR 16640 (March 28, 2008), and accompanying Issues and Decision Memorandum at Comment 5; *see also SSPC from Belgium* and accompanying Issues and Decision Memorandum at Comment 4.

[34] *See E.I. DuPont De Nemours & Company v. United States*, 8 F. Supp. 692, 695 (CIT 1993) as "noting that in determining if merchandise exported from an intermediate country is covered by an antidumping order, Commerce identified the country of origin by considering whether the essential component is substantially transformed in the country of exportation."

[35] *Id*.

[36] *See* ET Solar's Case Brief at 3 (emphasis in the original).

[37] *Id*. at 3-4.

[38] *Id*. at 4.

[39] *Id*. at 4-5.

[40] *Id*.

The Alliance's Arguments:

- The scope of the *Orders* clearly defines solar cells as having "a p/n junction formed by any means, *whether or not* the cell has undergone other processing" that includes, but is not limited to, the addition of metallization materials and conductor patterns.[41]
- Commerce previously noted in the Preliminary Scope Ruling that "it is the addition of a p/n junction that transforms a silicon wafer into a solar cell, even if the cell itself lacks certain additional processing that must be performed before cells can be used to transmit or channel electricity once they are assembled into solar modules or panels."[42]
- Despite ET Solar's attempt to reclassify the product produced in China and exported to Vietnam as a "solar wafer," this product is already a Chinese solar cell because it contains a p/n junction formed when phosphorous is diffused into the boron-infused silicon wafers in China.[43]
- Commerce should reject ET Solar's attempt to classify the product imported from China for further processing in Vietnam as a "wafer" simply because this word is not referenced in the language of the scope. Commerce should instead continue to find that the scope description of the *Orders* is dispositive and clearly contemplates the coverage of solar cells with p/n junctions formed in China prior to third-country processing.[44]
- In the Preliminary Scope Ruling, Commerce correctly determined that both the upstream product produced in China and the downstream product finished in Vietnam were of the same class or kind of product.[45] Regardless of whether the word "wafer" appears in the scope language of the *Orders*, the merchandise imported into Vietnam from China is considered to be a solar cell because it contains a p/n junction.[46]
- The merchandise imported into Vietnam from China is necessarily of the same class or kind of merchandise as fully finished solar cells and solar modules produced in Vietnam because they all contain a p/n junction.[47] Both the unfinished solar cells produced in China and the finished solar cells produced in Vietnam would also fall under the same HTSUS subheading as a result.[48]

Analysis:

Commerce agrees with the Alliance that the products exported from China and imported by Ha Noi Solar to be used in the construction of ET Solar's imported modules are solar cells, rather than solar wafers, in the context of the *Orders*. Consistent with the Preliminary Scope Ruling, Commerce finds that the process of imbuing silicon wafers with a p/n junction results in the creation of solar cells – albeit unfished solar cells – capable of converting sunlight into electricity via the photovoltaic effect.[49]

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[41] *See* the Alliance's Rebuttal Brief at 3.
[42] *Id*.
[43] *Id*.
[44] *Id*. at 3-4.
[45] *Id*. at 4.
[46] *Id*.
[47] *Id*.
[48] *Id*. at 5.
[49] *See* Preliminary Scope Ruling at 8-9, 11.

ET Solar's arguments regarding the plain language of the *Orders* as well as the class or kind component of the substantial transformation analysis are contingent upon its classification of the merchandise exported from China as "solar wafers" rather than "solar cells." However, the scope of the *Orders* clearly defines solar cells as "having a p/n junction formed by any means, whether or not the cell has undergone other processing, including, but not limited to, cleaning, *etc*hing, coating, and/or the addition of materials (including, but not limited to, metallization and conductor patterns) to collect and forward the electricity that is generated by the cell." The information placed on the record by ET Solar clearly indicates that a p/n junction is present in both the unfinished merchandise exported from China and the finished merchandise exported from Vietnam.[50] Thus, both types of merchandise are classified as solar cells under the plain language of the scope of the *Orders*, and would fall within the same class or kind of merchandise in the context of a substantial transformation analysis.

Comment 2: Whether Third Country Manufacturing Changes the Important Qualities or Use of the Merchandise at Issue

ET Solar's Arguments:

- As part of its substantial transformation analysis, Commerce must consider whether processing in the country of export changes the important qualities or use of the component at issue.[51] Commerce claims that a cell's p/n junction imparts the essential quality of a solar cell, which is its ability to convert sunlight into electricity via the photovoltaic effect.[52] However, ET Solar has already demonstrated in its previous responses that the wafers exported from China cannot yet generate electricity and are, therefore, useless from a commercial and consumer standpoint.[53]
- The ability to generate power is the most important quality and use of a finished solar cell, and the record demonstrates that this quality is fully imparted during the manufacturing process in Vietnam. Commerce should, thus, find that the silicon wafers subject to this inquiry are outside the scope of the *Orders*.[54]

The Alliance's Arguments:

- Commerce has previously concluded that the essential component of the solar cell is the p/n junction, which was formed in China prior to further processing in Vietnam.[55] ET Solar argues that the merchandise was substantially transformed in a third country because the process enabling electricity to be forwarded from the cell occurred in Vietnam. However, this ignores the plain language of the *Orders*, which clearly identifies a solar cell as containing a p/n junction "whether or not the cell has undergone other processing, including but not limited to … addition of other materials … to collect and forward the electricity that is generate by the cell."[56]

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[50] *See* Preliminary Scope Ruling at 8-9.
[51] *See* ET Solar's Case Brief at 5.
[52] *Id*.
[53] *Id*. at 5-6.
[54] *Id*. at 6.
[55] *See* the Alliance's Case Brief at 5.
[56] *Id*. at 5-6.

- ET Solar has acknowledged that the p/n junction of the solar cell is formed in China. Because the essential component of the solar cell is the ability to generate power and this ability is conferred by the p/n junction formed in China, Commerce should continue to find that the merchandise imported from China was not substantially transformed in Vietnam.[57]

Analysis:

Commerce agrees with the Alliance that the essential component of the solar cell is the p/n junction that was formed in China, and that this component is present in both the unfinished merchandise exported from China and the finished merchandise exported from Vietnam. Consistent with the Preliminary Scope Ruling, Commerce finds that the final processing of these solar cells in a third country does not change the important qualities or use of the essential components contained in the merchandise at issue.[58]

ET Solar argues that the essential component of a solar cell is the cell's ability to "generate power," which happens once metallic grids and ohmic contacts are added to a silicon wafer containing a p/n junction (*i.e.*, an unfinished solar cell) that allow electricity to be channeled out of a cell. However, Commerce has previously determined that the p/n junction is responsible for creating the conditions that induce the photovoltaic effect that ultimately generates electricity, and that the metallic grids and contacts are only responsible for channeling this electricity out of the cell. As determined during the investigation, the addition of a dopant, "which is a trace impurity element diffused into a thin layer of the wafers' surface to impart an opposite electrical orientation to the cell surface, creates the positive/negative junction that is needed for the conversion of sunlight into electricity, which is the purpose of solar cells."[59] Furthermore, Commerce has determined in a previous scope ruling that the presence of a p/n junction is the factor which ultimately separates a non-subject solar wafer from a subject solar cell:

> In sum, the raw material purchased from China by Irex, partially processed solar wafers, does not fall within this scope because there is not yet a p/n junction. Since there is not yet a p/n junction, the raw material is not a photovoltaic cell from China within the meaning of the scope of the Orders. Therefore, based on the record evidence and descriptions submitted by SunSpark and the language of the scope of the Orders, the merchandise at issue in this scope inquiry is not within the scope of the Orders.[60]

The essential component of the merchandise at issue is not defined solely by reference to end-use or commercial utility, and the plain language of the *Orders* clearly covers certain unfinished solar cells that may require additional processing steps before they are assembled into working

[57] *Id*. at 6.
[58] *See* Preliminary Scope Ruling at 11.
[59] *See* Memorandum, "Scope Clarification: Antidumping and Countervailing Duty Investigation of Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China," dated March 19, 2012.
[60] *See* Memorandum, "Antidumping and Countervailing Duty Orders on Crystalline Silicon Photovoltaic Cells from the People's Republic of China: SunSpark Technology Inc. Scope Ruling," dated October 23, 2020.

modules, implying that the essential component of a solar cell, module, or panel is completed before the final steps of processing necessary for consumer use. By analogy, a car is useless to a consumer without tires or a steering wheel, but it is doubtful that the addition of tires or a steering wheel to an otherwise complete car could reasonably be considered "substantial transformation." Moreover, the scope's explicit reference to both finished and unfinished products contradicts the notion that the essential component must be determined by reference to consumer utility, rather than to a solar cell's role as an intermediate product. Accepting ET Solar's rationale would result in a policy whereby substantial transformation would occur whenever final steps are taken in a third country that, however minor, are necessary for the consumer's use of the product. Thus, Commerce finds that further processing in Vietnam does not change the essential component of the solar cells at issue.

Comment 3: Whether the Nature of the Third-Country Processing in Vietnam is Substantial and Sophisticated

ET Solar's Arguments:

- As part of its substantial transformation analysis, Commerce must consider whether processing in the exporting country was substantial or sophisticated.[61] The record demonstrates that a number of companies are involved in the production of the merchandise at issue. Ha Noi Solar purchases unfinished silicon wafers from a Hong Kong supplier that are sourced from a manufacturer in China. Ha Noi Solar then transforms the wafers into fully functional solar cells in Vietnam.[62]
- The third-country manufacturing process requires four pieces of machinery: a serigraphy machine, a drying machine, a sintering machine, and a testing machine.[63] Wafers undergo a metallization process to form metallic grids and ohmic contacts on their surface. These contacts are critical points at which electricity generated and channeled across the wafer's surface is collected. Without the metallic grid created by the metallization process, the merchandise remains a non-functional silicon wafer.[64]
- Both sides of a wafer must be metallized and dried, then sintered to solidify the dry metal pastes onto the wafers. Once the wafers have been sintered, they have officially transitioned from solar wafers to unfinished solar cells.[65] In order to finish the solar cells and ready them for assembly into modules, they must be tested, classified, and sorted according to their efficiency ratings. Once this process is complete, the solar cell is deemed "finished."[66]
- The third-party information submitted to the record by the petitioners attempts to compare the manufacturing processes undertaken in China and Vietnam, but it does not contravene the fact that both processes are substantial and sophisticated.[67] The record clearly demonstrates that third-country processing in Vietnam is substantial and

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[61] *See* ET Solar's Case Brief at 6.
[62] *Id*.
[63] *Id*.
[64] *Id*. at 6-7.
[65] *Id*. at 7.
[66] *Id*.
[67] *Id*. at 7-8.

sophisticated, which counsels in favor of finding the merchandise at issue to be outside the scope of the *Orders*.[68]

The Alliance's Arguments:

- In the Preliminary Scope Ruling, Commerce correctly determined that the extent of manufacturing that takes place in China is "more capital intensive and critical to the functioning of a finished solar cell" than the third-country manufacturing in Vietnam. ET Solar does not dispute this finding in its case brief and, instead, argues that this does not necessarily mean that the processes occurring in Vietnam were not significant in their own right.[69]
- The most effective way for Commerce to consider meaningfully the sophistication of the processing steps completed in two countries is to compare them, and this methodology is typical of the considerations made by Commerce in a substantial transformation analysis. Commerce should continue to find that the "more capital-intensive and critical" processing steps that take place in China should weigh in favor of finding that the solar cells were not substantially transformed in Vietnam.[70]
- Commerce should also consider the fact that ET Solar does not dispute the disparity between Chinese and Vietnamese processing when determining which is more capital-intensive and critical to the formation of the solar cell.[71]

Analysis:

Consistent with the Preliminary Scope Ruling, Commerce continues to find that while the processes performed in Vietnam help enable the solar cell to harness the electricity it produces, the steps performed in China to create the conditions necessary to induce the photovoltaic effect are more complex and extensive by comparison. This indicates that the merchandise exported from China and imported into Vietnam by Ha Noi Solar was not substantially transformed by third-country processing.

ET Solar does not dispute the finding that the manufacturing processes undertaken in China are more substantial and sophisticated than those taking place in Vietnam. Rather, ET Solar argues that the manufacturing processes of both countries may be categorized as substantial and sophisticated, and that this conclusion should preclude a comparison of their relative intensities for the purposes of Commerce's substantial transformation analysis. However, ET Solar does not offer a convincing explanation as to why these processes should not be compared as part of Commerce's substantial transformation analysis.

In the Preliminary Scope Ruling, Commerce determined that the steps necessary to impart the essential character of a solar cell take place in China.[72] These steps include the diffusion of phosphorous into the boron-doped wafer to form the cell's p/n junction, the edging process which fully separates the positive and negative layers created during the diffusion process, and

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[68] *Id*. at 8.
[69] *See* the Alliance's Rebuttal Brief at 6.
[70] *Id*. at 6-7.
[71] *Id*. at 7.
[72] *See* Preliminary Scope Ruling at 12.

the application of an anti-reflective coating to increase its ability to absorb sunlight.[73] The capital-intensive and critical steps performed in China, therefore, include the formation of the p/n junction which induces the photovoltaic effect, as well as the physical changes that support light absorption and the viability of the electrical paths inside the cell. As demonstrated by the information on the record, these steps take place before the cells are exported to Ha Noi Solar in Vietnam. By contrast, the steps performed in Vietnam (including metallization, sintering, testing, and sorting) only transform an unfinished solar cell into a finished solar cell by enabling the cell to channel the energy it creates. Ultimately, the steps performed in Vietnam do not encompass the formation of the essential component that defines both finished and unfinished solar cells. The scope language itself makes the p/n junction the defining characteristic of a "solar cell" within the meaning of the *Orders*, regardless of whether the cell has undergone further processing and, therefore, we cannot agree with ET Solar's arguments about substantial and sophisticated processing in Vietnam.

Comment 4: Whether the Cost of Production and Value Added to the Merchandise at Issue in the Third Country is Significant

ET Solar's Arguments:

- Commerce does not have an established threshold for determining whether the cost of processing in a third country by itself represents a substantial transformation. However, Commerce has previously found in *Peer Bearing Co. – Changshan* that a 38 percent increase to the cost of production counsels in favor of finding that substantial transformation has occurred, even when this added cost is less than the cost incurred in the subject country.[74]
- ET Solar has already submitted evidence to the record demonstrating that the total additional cost of production in Vietnam is near the level found determinative in *Peer Bearing Co. – Changshan*, while the total added value imparted in Vietnam is significantly higher. Both the cost of production and added value attributed to processing in Vietnam are significant, and the latter is substantial in both absolute and relative terms.[75]
- A complete analysis of this factor points to the conclusion that the wafers imported into Vietnam and incorporated into ET Solar's modules are substantially transformed in Vietnam.[76]

The Alliance's Arguments:

- Commerce should consider the limited cost of production and value added during processing in Vietnam as weighing in favor of finding that no substantial transformation has occurred. Alternatively, Commerce should continue to find that the portion of production costs attributed to Vietnamese processing does not outweigh the four other components of the substantial transformation analysis.[77]

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[73] *Id*.
[74] *See* the Alliance's Rebuttal Brief (citing *Peer Bearing Co. – Changshan v. United States*, 128 F. Supp.3d 1286, 1296 (CIT 2015) (*Peer Bearing Co. – Changshan*)).
[75] *Id*.
[76] *Id*.
[77] *See* the Alliance's Rebuttal Brief at 7.

- In [ ], Commerce previously found that third-country processing that accounts for [ ] percent of the cost of production did not indicate that substantial transformation occurred when considered with other factors.[78] ET Solar claims that the total added cost of production in Vietnam is "roughly [ ] percent." In this determination, Commerce states that it is "[ ]."[79]
- ET Solar cites *Peer Bearing Co. – Changshan* to support its claims regarding the cost of production and value added in Vietnam. While the CIT ultimately affirmed Commerce's revised determination that substantial transformation occurred in Thailand, Commerce noted in its determination that a third-country cost of manufacturing of 38 percent "was not so significant as to outweigh the other factors which the Department must take into account."[80] The CIT also noted that "even if this 38 percent value-added calculation were *disregarded*, the record still would contain substantial evidence to support the ultimate determination that the {product at issue was substantially transformed}."[81]
- In *Peer Bearing Co. – Changshan*, the evidence supporting the other four factors of the substantial transformation analysis included the fact that none of the parts made in China and exported to a third country for further processing "possessed the physical properties, mechanical properties, or essential character" of the completed product. As such, the facts of *Peer Bearing Co. – Changshan* differ significantly from ET Solar's inquiry, in which the essential characteristic of the merchandise – the p/n junction – is imparted in China.[82]
- Evidence on the record exists that undermines ET Solar's cost of production estimate. The expert witness cited by the Alliance estimated that the cost of production attributable to production occurring in Vietnam [ ] of the total cost of production, with [ ] attributable to production occurring in China.[83]
- The circumstances of ET Solar's inquiry are more analogous to *Bell Supply Co. v. United States*, in which the CIT found that the proprietary cost of manufacturing at issue was outweighed by the fact that the "essential component" of the unfinished and finished products was conferred in China prior to further processing in a third country.[84] Thus, Commerce should continue to find that the cost of production and value added during further processing should not overcome other record evidence that substantial transformation has not occurred.

Analysis:

Consistent with the Preliminary Scope Ruling and the arguments put forth by the Alliance, Commerce continues to find that the cost of production and value added in Vietnam do not

[78] *Id.* (citing [ ]).
[79] *Id*. at 7.
[80] *Id*. at 8 (citing *Peer Bearing Co. – Changshan* at 1291).
[81] *Id*.
[82] *Id*. at 1293.
[83] *See* the Alliance's Rebuttal Brief at 8-9.
[84] *Id*. at 9 (citing *Bell Supply Co. v. United States*, 393 F. Supp. 3d 1229 (Ct. Int'l Trade 2019) (*Bell Supply Co. v. United States*) at 1243).

account for a portion of the overall solar cell production costs and price that is sufficient to outweigh the conclusions drawn from the other four factors of the substantial transformation analysis.[85] As noted by ET Solar in its case brief, Commerce does not have an established threshold for determining whether a certain cost in a third country, by itself, represents substantial transformation. Thus, Commerce has the discretion to weigh the non-insignificant portion of production costs and final prices that can be attributed to further processing in Vietnam against the other components of the overall analysis. ET Solar does not put forth any arguments in its case brief that lead Commerce to reconsider the importance of the cost of production and value-added factor when compared with the totality of factors under consideration for the merchandise at issue.

Comment 5: Whether the Level of Investment Imparted to the Merchandise at Issue in Vietnam is Significant

ET Solar's Arguments:

- Commerce affirmed in the Preliminary Scope Ruling that it has set no quantitative threshold for what qualifies as a significant level of investment for its substantial transformation analysis framework.[86] In *Peer Bearing Co. – Changshan*, the CIT held that a scenario in which processing in a subject country requires relatively more types of production equipment than processing in a third country does not necessarily support a finding that a third-country level of investment is not significant.[87]
- ET Solar has already demonstrated on the record that the baseline capital required to purchase the equipment and machinery necessary for the manufacturing process amounts to [ ].[88] This number represents a massive level of investment, and does not account for factory overhead, maintenance, labor, and raw material costs associated with processing in Vietnam.[89]
- Commerce must give greater weight to the specific investment data provided by ET Solar than the "general third-party musings regarding processes occurring in the subject country" provided by the Alliance. The record demonstrates that the level of investment attributed to processing in Vietnam is significant.[90]

The Alliance's Arguments:

- ET Solar cites *Peer Bearing Co. – Changshan* to support its claim that initial processing in a country that requires a greater amount of production equipment than further processing in a third country does not necessarily mean that a third-country level of investment is not significant.[91] However, that case can be distinguished from the facts of ET Solar's scope inquiry because the former involved Commerce's total reliance on qualitative data to support its initial determination that the relative levels of investment did not justify a finding of substantial transformation, as noted by the CIT.[92] ET Solar

[85] Preliminary Scope Ruling at 12-13.
[86] *See* ET Solar's Case Brief at 9.
[87] *Id*.
[88] *Id*.
[89] *Id*.
[90] *Id*.
[91] *Id*.
[92] *Id*. at 9-10.

did not provide a baseline for the cost of processing equipment in China, but the Alliance provided quantitative data regarding relative rates of capital depreciation that allow for a comparative calculation of relative investment levels.[93]

- The information provided by the Alliance demonstrates that the capital investment required for Chinese-based processing is substantially higher than that required for the processing that occurs in Vietnam.[94] Commerce should continue to find that the solar cell production processes that take place in China "are more technologically complex and capital-intensive than in Vietnam" and "require higher levels of capital investment."[95]

Analysis:

Consistent with the Preliminary Scope Ruling and the arguments put forth by the Alliance, Commerce continues to find that the information on the record demonstrates that the solar cell production processes occurring in China are more technologically complex and capital-intensive than in Vietnam, and thus require higher levels of capital investment.[96] In *Bell Supply Co. v. United States*, the CIT affirmed Commerce's comparison of the capital investment required for downstream processing as a proxy for the degree of transformation in a third country.[97] As noted in the CIT's determination:

> The greater the investment, the analysis goes, the greater the transformation of the product. This approach is reasonable, so as not to evaluate the level of investment in a vacuum. Different industries have different barriers to entry – a small capital investment in one industry might be significant in another. Therefore, in order to contextualize the investment in further processing, it is reasonable to compare the level of investment required at different processing stages within the same industry.[98]

ET Solar failed to provide a discussion of levels of investment in China that might serve as a basis for comparing initial China-based production stages with the further processing stages undertaken in Vietnam, and did not make any arguments in its case brief that lead Commerce to reconsider its determination regarding level of investment in the context of the substantial transformation analysis. Thus, Commerce continues to find that the level of investment associated with third-country processing in Vietnam is not indicative of a substantial transformation of the merchandise at issue.

VII. CONCLUSION

Based on the totality of the evidence and the comments made by both parties on the plain language of the orders and the five criteria of the substantial transformation analysis, Commerce

[93] *Id*. at 10.
[94] *Id*.
[95] *Id*. at 9.
[96] Preliminary Scope Ruling at 13-14.
[97] *See Bell Supply Co. v. United States* at 23.
[98] *Id*.

continues to find that the unfinished Chinese solar cells used to produce the imported modules described by ET Solar in its scope inquiry are not substantially transformed as a result of the production processes undertaken in Vietnam. Accordingly, we continue to find that the modules at issue, as described in ET Solar's scope request, are within the scope of the *Orders*.

VIII. RECOMMENDATION

We recommend determining that the merchandise produced in Vietnam using certain Chinese-manufactured solar cells and imported by ET Solar is covered by the scope of the *Orders*. If you accept this recommendation, we will issue this final scope ruling.

☒ Agree ☐ Disagree

6/15/2021

X James Maeder

Signed by: JAMES MAEDER

James Maeder
Deputy Assistant Secretary
for Antidumping and Countervailing Duty Operations

EXHIBIT 20

UNITED STATES DEPARTMENT OF COMMERCE
International Trade Administration
Washington, D.C. 20230

A-570-979, C-570-980, A-583-853
Scope Inquiry
Solar Cells and Products
Public Document
E&C/OVII: PS

April 8, 2021

MEMORANDUM TO: James Maeder
Deputy Assistant Secretary
for Antidumping and Countervailing Duty Operations

THROUGH: Melissa G. Skinner
Senior Director, Office VII
Antidumping and Countervailing Duty Operations

FROM: Peter Shaw
International Trade Compliance Analyst
Antidumping and Countervailing Duty Operations

SUBJECT: Antidumping and Countervailing Duty Orders on Crystalline Silicon Photovoltaic Cells from the People's Republic of China, and Certain Crystalline Silicon Photovoltaic Products from Taiwan: The Solaria Corporation Scope Ruling

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I. Summary

On January 19, 2021, the Department of Commerce (Commerce) received a scope ruling request from The Solaria Corporation (Solaria),[1] requesting that Commerce find Solaria's PowerXT photovoltaic (PV) cells and modules, manufactured in the Republic of Korea (Korea), are not included in the scope of the antidumping duty (AD) and countervailing duty (CVD) orders on crystalline silicon photovoltaic (CSPV) cells, whether or not assembled into modules from the People's Republic of China (China), and the AD order on certain crystalline silicon photovoltaic products from Taiwan (collectively, the *Orders*).[2] On the basis of our analysis of Solaria's

[1] *See* Solaria's Letter, "Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, from the People's Republic of China (A-570-979 and C-570-980); and Certain Crystalline Silicon Photovoltaic Products from Taiwan (A-583-853): Scope Ruling Request for Modules and Cells Manufactured In and Imported From Korea," dated January 15, 2021 (Solaria's Scope Request). We note that these requests were filed after 5pm on Friday, January 15, 2021. Because of that and the fact that Monday, January 18, 2021 was a Federal holiday and Commerce was closed, the filed date of these letters for purposes of calculating Commerce's deadlines is Tuesday, January 19, 2021.

[2] *See Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, from the People's Republic of China: Amended Final Determination of Sales at Less Than Fair Value, and Antidumping Duty Order*, 77 FR 73018 (December 7, 2012); and *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, from the People's Republic of China: Countervailing Duty Order,* 77 FR 73017 (December 7, 2012) (collectively, *China Solar I Orders*); *see also Certain Crystalline Silicon Photovoltaic Products from Taiwan: Antidumping Duty Order,* 80 FR 8596 (February 18, 2015) (*Taiwan Order*) (collectively, *Orders*).

request and the sources described in 19 CFR 351.225(k)(1), we determine that Solaria's PowerXT PV cells and modules are included in the scope of the *Orders*.

II. Background

On December 7, 2012, Commerce published the China Solar I Orders and on February 18, 2015, Commerce published the Taiwan Order.[3] On October 7, 2020, Solaria submitted a request for Commerce to issue a scope ruling that its PowerXT PV cells and modules are not included in the scope of the *Orders*.[4] On November 13, 2020, Commerce determined that the request was missing certain information that was necessary for Commerce to make a scope ruling and, accordingly, we rejected Solaria's scope request and issued a supplemental questionnaire to Solaria requesting additional information.[5] On January 19, 2021, Solaria submitted its responses to Commerce's supplemental questionnaire and refiled its original scope ruling request.[6]

On February 24, 2021, we extended the deadline for issuing a final scope ruling until April 19, 2021.[7] On April 1, 2021, we received comments from the American Alliance for Solar Manufacturing (the petitioner).[8]

III. Scope of the *Orders*

China Solar I Orders

The merchandise covered by the orders 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 orders cover 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,

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[3] *See China Solar I Orders*; *see also Taiwan Order*.
[4] *See* Solaria's Letter, "Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China (A-570-979 and C-570-980); and Certain Crystalline Silicon Photovoltaic Products from Taiwan (A-583-853): Scope Ruling Request for Modules and Cells Manufactured In and Imported from Korea," dated October 7, 2020.
[5] *See* Commerce's Letter, "Scope Ruling Request on Solaria's Modules and Cells Manufactured in Korea, Supplemental Questionnaire," dated November 13, 2020.
[6] *See* Solaria's Scope Request.
[7] *See* Memorandum, "Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, from the People's Republic of China and Certain Crystalline Silicon Photovoltaic Products from Taiwan – Solaria's Scope Ruling Request: Extension," dated February 24, 2021.
[8] *See* Petitioner's Letter, "Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China, and Certain Crystalline Silicon Photovoltaic Products from Taiwan: Response to Solaria's Scope Ruling Request," dated April 1, 2021.

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 orders.

Excluded from the scope of the orders 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 the orders are crystalline silicon photovoltaic cells, not exceeding 10,000 mm^2 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 the orders are panels with surface area from 3,450 mm^2 to 33,782 mm^2 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.

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.

Modules, laminates, and panels produced in a third country from cells produced in China are covered by the orders; however, modules, laminates, and panels produced in China from cells produced in a third country are not covered by the orders.

Merchandise covered by the orders is currently classified in the HTSUS under subheadings 8501.61.0000, 8507.20.80, 8541.40.6020, 8541.40.6030, and 8501.31.8000. These HTSUS subheadings are provided for convenience and customs purposes; the written description of the scope of the orders is dispositive.

Taiwan Order

The merchandise covered by this order is crystalline silicon photovoltaic cells, and modules, laminates and/or panels consisting of crystalline silicon photovoltaic cells, whether or not partially or fully assembled into other products, including building integrated materials.

Subject merchandise includes 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.

Modules, laminates, and panels produced in a third-country from cells produced in Taiwan are covered by this order. However, modules, laminates, and panels produced in Taiwan from cells produced in a third country are not covered by this 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 10,000mm^2 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 cells. 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.

Further, also excluded from the scope of this order are any products covered by the existing antidumping and countervailing duty orders on crystalline silicon photovoltaic cells, whether or not assembled into modules, from China.[9]

Also excluded from the scope of this order are modules, laminates, and panels produced in China from crystalline silicon photovoltaic cells produced in Taiwan that are covered by an existing proceeding on such modules, laminates, and panels from China.

Additionally, excluded from the scope of this order are solar panels that are: (1) less than 300,000 mm^2 in surface area; (2) less than 27.1 watts in power; (3) coated across their entire surface with a polyurethane doming resin; and (4) joined to a battery charging and maintaining unit (which is an acrylonitrile butadiene styrene (ABS) box that incorporates a light emitting

[9] *See China Solar I Orders*.

diode (LED)) by coated wires that include a connector to permit the incorporation of an extension cable. The battery charging and maintaining unit utilizes high-frequency triangular pulse waveforms designed to maintain and extend the life of batteries through the reduction of lead sulfate crystals. The above-described battery charging and maintaining unit is currently available under the registered trademark "SolarPulse."

Merchandise covered by the order is currently classified in the HTSUS under subheadings 8501.61.0000, 8507.20.8030, 8507.20.8040, 8507.20.8060, 8507.20.8090, 8541.40.6015, 8541.40.6020, 8541.40.6030, 8541.40.6035, and 8501.31.8000. These HTSUS subheadings are provided for convenience and customs purposes; the written description of the scope of the order is dispositive.

IV. Legal Framework

When a request for a scope ruling is filed, Commerce examines the scope language of the order(s) at issue and the description of the product contained in the scope ruling request.[10] Pursuant to Commerce's regulations, Commerce may also examine other information, including the description of the merchandise contained in the petition, the record from the investigation, and prior scope determinations made for the same product.[11] If Commerce determines that these sources are sufficient to decide the matter, we will issue a final scope ruling as to whether the merchandise in question is covered by an order.[12]

Conversely, where the descriptions of the merchandise in the sources described in 19 CFR 351.225(k)(1) are not dispositive, Commerce will consider the five additional factors set forth at 19 CFR 351.225(k)(2). These factors are: (i) the physical characteristics of the merchandise; (ii) the expectations of the ultimate purchasers; (iii) the ultimate use of the product; (iv) the channels of trade in which the product is sold; and (v) the manner in which the product is advertised and displayed. The determination as to which analytical framework is most appropriate in any given scope proceeding is made on a case-by-case basis after consideration of all evidence before Commerce.

V. Description of Merchandise Subject to this Scope Request

The products subject to this scope ruling request are Solaria's Power XT PV cells and modules. Solaria imports fully assembled solar modules from Korea, manufactured from Solaria's proprietary PowerXT PV cells. The PowerXT PV cells are, according to Solaria, solar cells manufactured in Korea using partially processed solar wafers, or feedstock, produced in China and Taiwan.[13] The feedstock is a crystalline silicon wafer measuring approximately 0.025 square meters, and possesses certain attributes such as material dopants, chemical etching, and anti-reflective coatings. The feedstock possesses a p/n junction as well as an asymmetric metallization pattern that renders the feedstock useless when used in conventional solar panels. According to Solaria, the feedstock is transformed into PowerXT PV cells and incorporated into modules through Solaria's proprietary PowerXT manufacturing process in Korea, resulting in a

[10] *See Walgreen Co. v. United States*, 620 F.3d 1350, 1357 (Fed. Cir. 2010).
[11] *See* 19 CFR 351.225(k)(1).
[12] *See* 19 CFR 351.225(d).
[13] *See* Solaria's Scope Request at Attachment A, 3-4.

solar module that has superior performance and aesthetics.[14] The solar modules Solaria imports from Korea are classifiable under HTS subheading 8541.40.6015.

VI. Arguments from Solaria

Solaria's Scope Request[15]

- The language of the scope covers, and is limited to, crystalline silicon photovoltaic cells manufactured in China or Taiwan and modules manufactured outside of China or Taiwan, from CSPV cells manufactured in China or Taiwan.[16]
- Solaria's PowerXT cells are manufactured in Korea using proprietary manufacturing technology and dedicated equipment, which utilizes unique crystalline solar cell wafer feedstock from China or Taiwan.[17]
- The feedstock does not and cannot function as a conventional solar cell. The feedstock does not have a functional p/n junction and cannot be interconnected into a useful solar panel in its original state.[18]
- The language of the scope states that the products covered by the *Orders* are solar cells "having a p/n junction … to collect and forward the electricity that is generated by the cell."[19] The feedstock lacks a functional p/n junction and is, therefore, physically incapable of converting sunlight into electricity. It is only the end result of the PowerXT manufacturing process that allows the cell to be capable of generating electricity.[20]
- Solaria's feedstock material is not a functional solar cell that can be interconnected into a useful solar panel, in contrast with solar PV cells contemplated by and covered by the scope of the *Orders*.[21] The feedstock cannot be used to manufacture solar panels without the substantial transformation that occurs in Korea.[22]
- Solaria's PowerXT cells are formed by cutting the feedstock into five distinct and separate strips of wafer cell material, and making a direct large-area electrical p/n junction within the PowerXT cell, between the top of one wafer cell strip with the bottom of another wafer cell strip by slightly overlapping them.[23]
- Solaria's feedstock is unique because Solaria's goal is not to maximize the efficiency of the feedstock, but rather to optimize the efficiency of the PowerXT PV cell. Furthermore, Solaria's feedstock is unique in its color uniformity requirements.[24]
- There is no commercial market for Solaria's feedstock material because it cannot be used by any other customer due to Solaria's patented design. Solaria must purchase the entire production distribution from its suppliers.[25]
- Solaria's solar modules are produced from PV cells manufactured in Korea.[26]

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[14] *Id.* at Attachment A, 5-7.
[15] *Id.* at Attachment A, 4-25.
[16] *Id.* at Attachment A, 6.
[17] *Id.*
[18] *Id.*
[19] *Id.*
[20] *Id.*
[21] *Id.* at Attachment A, 8.
[22] *Id.*
[23] *Id.* at Attachment A, 10.
[24] *Id.* at Attachment A, 12-13.
[25] *Id.* at Attachment A, 14.
[26] *Id.* at Attachment A, 15.

- Manufacturing PowerXT cells requires an integrated shingling and bussing manufacturing line that consists of three pieces of equipment that perform five processes.[27] The processes include: laser scribing, singulation, adhesive dispense, curing, and ribbon wire bonding, after which, the feedstock is physically and electrically transformed into a functioning solar cell.[28]
- Solaria addresses the criteria of 19 CFR 351.225(k)(2), as follows:
  - **Physical Characteristics:** The feedstock has different physical characteristics from conventional solar cells. The feedstock possesses asymmetric metallization patterns and does not have a functional p/n junction. Solaria transforms the feedstock through a five-step process requiring three sets of equipment in order for the feedstock to go through substantial physical and electrical transformation.[29]
  - **The Expectations of the Ultimate Purchasers:** The ultimate consumer for the feedstock is Solaria itself, as the feedstock is highly customized and specialized, it cannot be converted into functional PV cells outside of Solaria's manufacturing process.[30]
  - **The Ultimate Use of the Product:** The feedstock cannot be used to manufacture conventional solar panels without Solaria's manufacturing process. In particular, Solaria's manufacturing goal is not to maximize efficiency of the feedstock, but rather to optimize the efficiency of Solaria's PowerXT PV cell. This runs counter to traditional solar cell manufacturing goals.[31]
  - **The Channels of Trade in Which the Product are Sold:** There is no commercial market for Solaria's feedstock because there is no practical use of the feedstock outside of Solaria's manufacturing process. There are no channels of trade for the feedstock.[32]
  - **The Manner in Which the Product is Advertised and Displayed:** The feedstock is a patented, highly customized, and specialized material with no commercial market, therefore there is no advertising or display of the feedstock.[33]

Solaria's Supplemental Response[34]

- Solaria substantially transforms the non-functional feedstock it purchases from China and Taiwan into functioning PV cells through a unique, multi-step manufacturing process using specially designed custom equipment in Korea.[35]
- Given the amount of processing, capital investment, costs incurred, and value-addition created by Solaria's manufacturing locations in Korea, Solaria believes Korea is the correct country of origin for the products Solaria imports into the United States.[36]
- The downstream product, Solaria's PowerXT solar cell, is capable of converting sunlight into electricity, whereas the upstream product, the feedstock, cannot. Because the physical characteristics and functions of the PowerXT solar cell and feedstock are not the same, they are not the same class or kind of merchandise.[37]

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[27] *Id.* at Attachment A, 16.
[28] *Id.* at Attachment A, 20.
[29] *Id.* at Attachment A, 22.
[30] *Id.* at Attachment A, 23.
[31] *Id.*
[32] *Id.* at Attachment A, 24.
[33] *Id.*
[34] *Id.* at Attachment B, 1-22.
[35] *Id.* at Attachment B, 1.
[36] *Id.* at Attachment B, 2.
[37] *Id.* at Attachment B, 2-3.

- Solaria's processing in Korea changes the important physical qualities of the feedstock, and results in a functioning solar cell capable of converting sunlight into electricity and, therefore, capable of module assembly.[38]
- During the manufacturing process in Korea, the feedstock loses its identity as a square wafer material with visible metallization patterns. The new monolithic, rectangular, and functional solar cells are ready for module assembly.[39]
- The nature and sophistication of the PowerXT cell production is significant. The process is covered by over 250 patents and is a unique process not used by other solar companies. This process is more expensive and capital-intensive than conventional solar cell manufacturing and module assembly.[40]
- The cost of production and value added to make Solaria's PowerXT cell in Korea is six cents per watt. This is 67 percent more than the cost of conventional solar cells. The feedstock is only 40 percent of the total cost of the PowerXT cell.[41]
- The advanced manufacturing process employs proprietary and specialized materials, including metal interconnects and electrically-conductive adhesives, a custom production line, specialized facilities, and skilled assembly labor.[42]
- The level of additional capital investment to produce PowerXT cell is significant. The capital investment required for converting feedstock to functional cells is almost identical to that for manufacturing conventional solar cells.[43]
- Solaria defines a p/n junction to be functional if it is capable of transmitting power that can be collected and utilized in a product. Given that the feedstock does not have a functional p/n junction, it is not physically capable of generating electricity unless the feedstock undergoes PowerXT manufacturing.[44]
- Solaria states that the feedstock cannot generate "energy" when struck by sunlight, and defines energy as power over time, *i.e.*, kWh.[45]
- The feedstock material has traditional solar cell dopants of boron and phosphorus, which are deposited in the feedstock in China or Taiwan. A non-functional p/n junction is formed in China or Taiwan, and a functional p/n junction is formed in Korea.[46]
- The functional p/n junction is formed only when the feedstock is cut into 5 separate strips and the strips are overlapped slightly one over the other. This overlapping process creates a large-format solar PV cell and the functional p/n junction is formed between the strips. This process occurs in Korea.[47]
- Solaria's two-step manufacturing process was not contemplated at the time of the *China Solar I Orders*. The manufacturing process began development and commercialization in 2014.[48]
- Commerce noted Solaria excluded a portion of the scope definition, which references "whether or not the cell has undergone other processing to collect and forward the electricity

[38] *Id.* at Attachment B, 3.
[39] *Id.* at Attachment B, 4-6.
[40] *Id.* at Attachment B, 7.
[41] *Id.* at Attachment B, 8.
[42] *Id.* at Attachment B, 9.
[43] *Id.* at Attachment B, 10.
[44] *Id.* at Attachment B, 13-14.
[45] *Id.* at Attachment B, 14-15.
[46] *Id.* at Attachment B, 15-16.
[47] *Id.* at Attachment B, 16.
[48] *Id.* at Attachment B, 17.

that is generated by the cell."[49] Solaria states that regardless of whether or not a portion of the scope language has been excluded, the issue is the same. The scope covers solar "cells" whose "essential" function is to convert sunlight into electricity. Without a functional p/n junction, the feedstock cannot do that, and is not a "cell" as described in the scope of the *Orders*.[50]

- The p/n junction in the feedstock is non-functional because no viable end product can be manufactured from it. The p/n junction in the feedstock has no capability to produce electricity, as any standard interconnect process would create an electrical short. This is because the metallic busbars that carry the electrical current created from the p/n junction are formed on the top and bottom, but are specifically offset from each other to facilitate cutting and overlapping of the strips from the feedstock. This offset prevents any practical method to carry the current effectively, thus rendering the p/n junction non-functional.[51]
- The p/n junction can only be activated by forming a new p/n junction from the top of one PV strip to the bottom of another PV strip after the feedstock is cut and further processed in Korea.[52]

VII. Analysis

In a scope inquiry, Commerce first examines the scope language of the order, the description of the merchandise contained in the Petition, records of the underlying investigations, the International Trade Commission (ITC) Report, and the description of the merchandise in the scope ruling request. We find that the description of the products, the scope language, and the Petitions[53] are, together, dispositive as to whether the products at issue are subject merchandise, in accordance with 19 CFR 351.225(k)(1). Accordingly, for this determination, we find it unnecessary to consider the additional factors specified in 19 CFR 351.225(k)(2). We find that Solaria's PowerXT PV cells and modules meet the criteria for "modules, laminates, and panels produced in a third-country from cells produced in China{/Taiwan}," and therefore determine Solaria's PowerXT cells and modules to be covered by the scope of the *Orders*.

The *Orders* define the subject merchandise as "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."[54] The scope language further specifies that the *Orders* cover:

> 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

[49] *Id.* at Attachment B, 18.
[50] *Id.*
[51] *Id.* at Attachment B, 20.
[52] *Id.*
[53] *See* Petitioner's Letter, "Petition for the Imposition of Antidumping and Countervailing Duties: Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, from the People's Republic of China", dated October 19, 2011 at Exhibit II-19, 3 (China Solar I Petition); *see also* Petitioner's Letter, "Petition for the Imposition of Antidumping and Countervailing Duties: Certain Crystalline Silicon Photovoltaic Products from the People's Republic of China and Taiwan," dated December 31, 2013 at 15 (Taiwan Petition) (collectively, Petitions).
[54] *See Orders.*

and conductor patterns) to collect and forward the electricity that is generated by the cell.[55]

The *Orders* also stipulate that "{m}odules, laminates, and panels produced in a third-country from cells produced in China{/Taiwan} are covered by this investigation; however, modules, laminates, and panels produced in China{/Taiwan} from cells produced in a third-country are not covered by this investigation."[56]

Accordingly, the plain language of the scope presents two key factors for analysis in regard to Solaria's feedstock, PowerXT cells and modules, and whether or not they are covered by the *Orders*. Specifically, Commerce will consider whether or not: (1) the feedstock has a p/n junction; and (2) if the modules are produced in a third country from cells that were produced in China or Taiwan. In accordance with 19 CFR 351.225(k)(1), in considering these factors, Commerce will evaluate the descriptions of the merchandise contained in the Petitions, the initial investigations, and any prior scope determinations by Commerce or the ITC.

Positive/Negative Junction

In considering whether Solaria's feedstock imported from China or Taiwan satisfies the criteria of having a p/n junction, we analyzed whether the feedstock meets the definition of a solar cell as defined by the scope language, the Petitions, and the scope clarification memo (SCM)[57] accompanying the final determination in the investigation of solar cells from China. The SCM provided a narrative description of the cell conversion process, where silicon wafers are processed into solar cells capable of generating electricity.[58]

> Solar cells are made from crystalline silicon wafers. A dopant, which is a trace impurity element diffused into a thin layer of the wafers' surface to impart an opposite electrical orientation to the cell surface, **creates the positive/negative junction that is needed for the conversion of sunlight into electricity**, which is the purpose of solar cells.[59] (emphasis added)

As the SCM states, once a wafer is doped and an opposite electrical orientation is imparted on the surface, it results in the creation of a p/n junction. When sunlight strikes the cell, the positive and negative charge carriers are released, causing electrical current to flow.[60] It is at this point

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[55] *Id*.
[56] *Id*.
[57] *See* Memorandum, "Scope Clarification: Antidumping and Countervailing Duty Investigations of Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, from the People's Republic of China," dated March 19, 2012 (SCM). We note that in *Certain Crystalline Silicon Photovoltaic Products from Taiwan: Final Determination of Sales at Less Than Fair Value,* 79 FR 76966 (December 23, 2014) (*Taiwan Solar Products*), and accompanying Issues and Decision Memorandum (IDM) Commerce determined that its analysis in the China Solar I Orders, regarding the processing of solar cells into solar modules, was equally applicable for the purpose of solar cells produced in Taiwan and used in the manufacturing of solar modules in Taiwan or third countries other than China. *Id.* at 20-21.
[58] *See* SCM at 6.
[59] *Id.*; *see also Taiwan Solar Products* IDM at 18-19.
[60] *See Crystalline Silicon Photovoltaic Cells and Modules from China: Investigation Nos. 701-TA-481 and 731-TA-1190 (Prelim),* USITC Publication 4295, dated December 2011 (ITC Solar Cells and Modules Prelim) at 6.

that the cell is capable of generating electricity from sunlight.[61] In Exhibit 2 of Attachment B of its scope request, Solaria submitted production flowcharts, narrative descriptions, and image representations of the silicon wafer, feedstock, and PowerXT cell and module manufacturing processes.[62] According to the silicon wafer manufacturing process provided by Solaria, at step three of this process, the silicon wafer is doped with boron.[63] Additionally, at step three of the feedstock manufacturing process flowchart, phosphorus, a dopant of opposite electrical orientation of the wafer, is diffused into the wafer.[64] Thus, it is at this step in the feedstock manufacturing process, after the wafer has been fully doped, that a p/n junction is created. As specified in the SCM, a solar cell is capable of converting sunlight into electricity once the p/n junction at this step is created.[65] As noted in the exhibit, the steps involved to form the p/n junction take place in the suppliers' manufacturing facilities in China or Taiwan, and not in Korea.[66]

Solaria's interpretation of the scope language refers to cells "having a p/n junction … to collect and forward the electricity that is generated by the cell." Solaria claims that the feedstock it purchases from China or Taiwan is not capable of transmitting power that can be collected and utilized due to its non-functioning p/n junction and, therefore the feedstock is excluded by the language of the scope.[67] We disagree with this interpretation. Solaria omitted, from that quote by the use of ellipses, language that states the *Orders* cover cells whether or not the cell has undergone other processing to collect and forward the electricity that is generated by the cell. Thus the full quote is: "This 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."[68] As previously stated, Solaria's feedstock has a p/n junction formed in China or Taiwan, and is capable of converting sunlight into electricity. The feedstock undergoes further processing in Korea in order for it to be capable of collecting and forwarding the electricity that is generated by the cell. By the language of the scope, this further processing is irrelevant in determining whether or not the cell is included in the scope. Per the language of the *Orders*, the SCM, and the Petitions, Solaria's feedstock possesses a p/n junction capable of converting sunlight into electricity prior to import into Korea.

Solaria states that the feedstock it purchases from China or Taiwan does not and cannot function as a CSPV cell due to its lack of a "functional" p/n junction and inability to generate electricity.

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[61] *See Crystalline Silicon Photovoltaic Cells and Modules from China: Investigation Nos. 701-TA-481 and 731-TA-1190 (Final),* USITC Publication 4360, dated November 2012 (ITC Solar Cells and Modules Final) at I-9.
[62] *See* Solaria Scope Request at Attachment B, Exhibit 2, 4-9. We note that in Exhibit 2, at page 5 "Feedstock processing" Solaria made three previously undisclosed alterations to the provided figure sourced from the National Renewable Energy Lab. *See* Solaria's Letter, "Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China (A-570-979 and C-570-980); and Certain Crystalline Silicon Photovoltaic Products From Taiwan (A–583–853): Comments to Clarify and Correct Factual Information on the Record," dated March 26, 2021.
[63] *Id*. at 4
[64] *Id.* at 6.
[65] *See* SCM at 6.
[66] *See* Solaria Scope Request at Attachment B, Exhibit 2, 6; and Attachment B, 15.
[67] *Id.* at Attachment B, 18.
[68] *See* SCM at 3.

As described above, Solaria's feedstock possesses a p/n junction formed in China or Taiwan, and is capable of converting sunlight into electricity. The fact that the cell may not collect or forward electricity prior to processing in Korea does not render the p/n junction useless or immaterial. In addition, the Petitions detail the complete solar cell manufacturing process, including the final steps of the cell conversion process following the creation of the p/n junction.[69] The process includes coating the solar cells with silicon nitride, and the addition of conductive metals such as silver to form electrically conducive channels that channel electricity generated by the cell into electricity collection points.[70] Solaria's feedstock processing flowchart describes the feedstock undergoing these steps in China or Taiwan.[71] Specifically, step six of the feedstock processing flowchart describes the deposition of silicon nitride on both sides, and step eight of the flowchart describes the "front and rear screen-printing of metal pastes for electrode formation, and firing." Furthermore, silver is included in the added materials section at this step. As noted in Solaria's feedstock processing exhibit, these steps take place in China or Taiwan, and not in Korea.[72] The Petitions explicitly state that following these steps, the individual cell is completed and that "the next production step involves the assembly of cells into modules or panels."[73] Based on the language of the Petitions, the silicon wafer has completed its conversion into a solar cell, and therefore, despite Solaria's reference to its feedstock, Solaria's feedstock is indeed a finished solar cell once it has completed these production steps.

Solaria argues that the feedstock cannot function as a CSPV cell due to its patented asymmetric metallization patterns that render the feedstock material useless in conventional solar PV panels.[74] This is because the busbars that are processed onto the feedstock are purposefully misaligned on the top from the bottom, in order to facilitate cutting and overlapping of the strips from the feedstock.[75] According to Solaria, the offset renders the p/n junction non-functional, and only by cutting and overlapping the strips to create a large-area electrical p/n junction can the solar cell generate electricity from sunlight.[76] This process occurs in Korea and creates a shingled solar module. We have concluded above that the feedstock already has a functional p/n junction prior to further manufacturing in Korea and, therefore, is capable of converting sunlight into electricity. Furthermore, the language of the scope specifically states that the addition of materials, including metallization and conductor patterns, to collect and forward the electricity that is generated by the cell, is not relevant in determining whether the cell is within the scope of the *Orders*.[77] Accordingly, the addition of Solaria's patented asymmetric metallization patterns is not relevant in determining whether the cell is within scope. Therefore, we find that the feedstock can function as a CSPV cell due to its p/n junction.

Country-of-Origin

The *Orders* specify that solar modules produced in a third country from cells produced in China or Taiwan are covered by the scope.[78] As explained in the previous section, we find that the

[69] *See* Petitions.
[70] *See* China Solar I Petition at Exhibit II-19, 3.
[71] *See* Solaria Scope Request at Attachment B, Exhibit 2, 6.
[72] *See* China Solar I Petition at Exhibit II-19, 3.
[73] *Id*.
[74] *See* Solaria Scope Request at Attachment A, 6.
[75] *Id*. at Attachment B, 20.
[76] *Id*. at Attachment B, 20; Attachment A, 10.
[77] *See Orders*.
[78] *Id*.

feedstock imported into Korea are solar cells produced in China or Taiwan. Therefore, the solar modules Solaria produces in Korea using these cells are within the scope of the *Orders*.

We disagree with Solaria that the production process taking place in Korea constitutes substantial transformation. We determine that the product leaving China or Taiwan is a solar cell and that the PowerXT cell and assembly process performed in Korea constitutes module assembly and does not substantially transform the solar cell such that it changes the country of origin of the cell. We addressed the scenario of module assembly taking place in a third country in the investigations.[79]

Solaria describes its PowerXT cell and module assembly as an eight-step process, where steps one through four are described as cell assembly and steps five through eight are module assembly.[80] The four steps of the PowerXT cell assembly include: (1) starting feedstock; (2) singulation; (3) strip formulation; and (4) module layup. Step three, strip formulation, is described by Solaria as applying electrically-conductive adhesives onto the strips and curing the strips to solidify the adhesives and create a monolithic cell structure.[81] Step four, module layup, is described as the placing and attaching of an end-ribbon wire to connect individual PowerXT cells together.[82] We find these two steps to be part of module assembly and, thus; according to the SCM, do not rise to the level of what is needed to substantially transform a solar cell. Thus, the only remaining steps of the PowerXT cell assembly are: (1) the starting feedstock; and (2) singulation. The first is, on its face, not transformative, as it is the start of the process, and the second step, singulation, is described as laser scribing to create a partial incision and then cutting the feedstock into five rectangular strips.[83] We find that the singulation, or the cutting of the feedstock, in and of itself, does not substantially transform Solaria's "feedstock" or solar cells and, thus, does not change their country of origin. Solaria itself noted in its scope request that Commerce has concluded the essential component of solar modules/panels is the solar cell, because the purpose of solar modules is to convert sunlight into electricity and that process occurs in the solar cell.[84] This essential component was formed in the solar cell during the cell conversion process in China or Taiwan. The process of cutting and overlapping the strips does not change the basic nature of the solar cell and does not transform its essential components. Furthermore, we note the ITC has stated that modules are made from "cells that are conductively connected to one another in the form of a string or matrix."[85] Solaria's process of applying electrically-conductive adhesives onto the strips (strip formation), and attaching a ribbon wire to place the strips into strings, is the process of conductively connecting cells into a string or matrix

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[79] *See* SCM at 7-8.
[80] *See* Solaria Scope Request at Attachment B, Exhibit 2, 9. We note that in the Scope Request at Attachment A, 17-20, Solaria describes the PowerXT cell manufacturing process in five steps. At Attachment B, 12-13, Solaria describes the PowerXT cell manufacturing process in eight steps. According to Attachment B, Exhibit 2, Step 4, Module Layup, the feedstock undergoes the placement and tabbing of strings into a complete circuit, which requires the added material of copper ribbons. This corresponds to the last step of the PowerXT cell manufacturing process as described in Attachment A, 17-20, and Attachment B, 12-13.
[81] *See* Solaria Scope Request at Attachment A, 18-19.
[82] *Id*. at Attachment A, 19; Attachment B, 12.
[83] *Id*. at Attachment A, 17-18.
[84] *See* Solaria Scope Request at Attachment B, 17 (citing *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules, from the People's Republic of China: Final Determination of Sales at Less Than Fair Value, and Affirmative Final Determination of Critical Circumstances, in Part,* 77 FR 63791 (October 17, 2012) and accompanying IDM at Comment 1); *see also* Taiwan Solar Products and accompanying IDM at 19.
[85] *See* ITC Solar Cells and Modules Prelim at 6.

(module layup) and, therefore, consists of module assembly and not a process by which the solar cell is substantially transformed.

According to the ITC, following the connection of cells together to form a string or matrix, a sealant such as ethyl vinyl acetate (EVA) is added to strengthen and weatherproof the cells before laminating the cells in a vacuum. The laminate is then "attached to a frame, and a junction box is mounted on the back."[86] Solaria's module assembly process, as listed in steps five through eight of the PowerXT cell and module assembly flowchart, are described here.[87] Step five consists of the lamination of the circuit including, the addition of EVA; step six is the aluminum framing of the laminate; and step seven is the attachment of the junction box. Step eight is immaterial, as it consists of testing, inspection, and sticker placement.[88] Additionally, according to the Petitions, the "petitioner, Trina Solar, a mandatory respondent, and the ITC all describe module assembly as stringing together 60 or 72 solar cells, laminating them, and fitting them in a glass-covered aluminum frame."[89] Again we find these steps are encompassed in steps one through eight of Solaria's self-described "PowerXT Cell and Module Assembly."[90] Accordingly, these steps would better be described as module assembly.

As stated in the SCM, module assembly "does not substantially alter the essential nature of solar cells, nor does it constitute significant processing such that it changes the country of origin of the cell, as it is an assembly process that only strings cells together, adding a protective covering and aluminum base."[91] Therefore, we disagree that Solaria's PowerXT cell and module assembly process substantially transforms the solar cell such that it changes the country of origin of the cell. We find that Solaria's PowerXT modules are produced in Korea from cells produced in China or Taiwan, and are covered by the *Orders*.

VIII. Recommendation

For the reasons discussed above, and in accordance with 19 CFR 351.225(d) and 19 CFR 351.225(k)(1), we recommend finding that Solaria's PowerXT cells and modules meet the criteria for "modules, laminates, and panels produced in a third-country from cells produced in China{/Taiwan}" and, therefore, are covered by the scope of the *Orders.* Because we reached this final scope ruling on the basis of the sources described in 19 CFR 351.225(k)(1), including the plain language of the scope, as explained above, we have not examined the criteria under 19 CFR 351.225(k)(2).

If the recommendation in this memorandum is accepted, we will serve a copy of this memorandum on all interested parties on the scope service list via FEDEX in lieu of first-class mail, as directed in 19 CFR 351.225. We will also issue the appropriate instructions to U.S.

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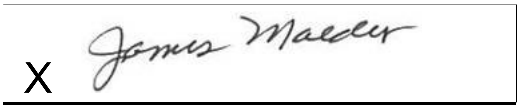
[86] *See* ITC Solar Cells and Modules Final at 6.
[87] *See* Solaria Scope Request at Attachment B, Exhibit 2, 9.
[88] *Id*.
[89] *See* SCM at 8.
[90] *See* Solaria Scope Request at Attachment B, Exhibit 2, 9.
[91] *See* SCM at 8; *see also* Taiwan Final IDM at 21 ("we believe that {Commerce's} analysis in *Solar I* {regarding the fact that module assembly does not constitute substantial transformation} is equally applicable to this investigation.")

Customs and Border Protection stating that we found Solaria's PowerXT cells and modules to be within the scope of the *Orders*.

☒ Agree

☐ Disagree

4/8/2021



Signed by: JAMES MAEDER

James Maeder
Deputy Assistant Secretary
  for Antidumping and Countervailing Duty Operations

EXHIBIT 21

Trina Solar Delivers First 210 mm Vertex Modules to North American Market

By **Matthew Mercure** - May 24, 2021

[Trina Solar Co. Ltd.](#), a provider of photovoltaic (PV) and smart energy solutions, says its first batch of Trina Solar 210 mm cells and Vertex modules have shipped from the company's overseas factory in Thai Nguyen, Vietnam.

This shipment marks Trina Solar's commencement of the full-capacity delivery of its high-power 210 mm Vertex 550 W modules globally, making Trina Solar the first solar company to deliver 210 modules to the North American market.

Trina Solar broke ground on its Thai Nguyen plant in December 2020 and completed construction in five months. The new factory has a capacity for 3 GW of cells and 4.5 GW of 210 modules. On May 15, the facility successfully manufactured the first batch of 210 mm Vertex 550 W high-power modules. Plans for Vertex 400 W and 670 W module production are now on the agenda in the Vietnam-based plant, which can boost the annual capacity to an equivalent of 3.5 GW of 210 cells and 5 GW of 210 modules, respectively.

For the solar PV industry, Trina Solar's Vietnam plant represents the first overseas factory that manufactures advanced 210 cells and 550 W modules. This fully automated facility strengthens Trina Solar's efficient global delivery of Vertex modules, and can better satisfy demand for 210 products across North America. With energy analysts forecasting strong growth for utility-scale solar projects across the U.S. in the coming decade, Trina Solar says its 210 mm 550 W modules can help project developers and financiers achieve great project value.

Currently, Trina Solar runs multiple 210 Vertex cell and module factories in China and Vietnam, which are expected to produce more than 50 GW of modules by the end of the year.

EXHIBIT 22

The long view: an interview with Steven Zhu of Trina Solar

In this interview Trina Solar's President of America Steven Zhu provides a longer perspective on the current U.S.-China trade war, and also speaks to the evolution of Trina's offerings in the U.S. market.

OCTOBER 2, 2019 **CHRISTIAN ROSELUND**

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Photo: pv magazine

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pv magazine: You've been working with Trina for 15 years. You've certainly had a very long view of what's gone on in the U.S. market. Can you tell me a little bit about what you've seen over this time and what you think the big picture is?

Zhu: The overall U.S. market – the way I'm looking at it is that it is very sustainable very strong and the economy is very good. Renewable energy does have a lot of support from all the different perspectives: from investors, from EPC, and the United States always focuses on the new technology and the most advanced technology also. The U.S. is the biggest tracker used for all the utility projects. It has very broad usage for the commercial or residential rooftops. So all of these actually make the U.S. market very strong, very sustainable.

For the U.S. market you have to stay in here, build up a long history and contacts in order to win this market. You don't expect the same kind of thing could happen in other markets, even the Chinese market. So although the size of the Chinese market is bigger than the United States, sometimes the policy changes very drastically. And compared with the European market, there are a lot of a smaller countries, and each one has individual policies. It's not like the United States, that has both the size and the stability and the sustainability.

pv magazine: So this is interesting, especially right now given that we have 25% tariffs under Section 201, and this escalating trade war with China. When you look at situations like the trade war do you see these as major problems for the U.S. market or just another road bump? How do you think these will be viewed in the longer picture?

Zhu: In the longer picture, there's no doubt the U.S. and Chinese relationship will recover and will move on. It's certainly a bumpy area right now. People are trying to figure it out; how we'd be able to keep possibly reducing the cost for the total system and help the solar to be broadly used in the U.S. market.

Trina deployed capacity outside China five years ago. So we supply U.S. orders from Thailand and Vietnam. That is all the preparation work that we are doing. Like I said; the United States is a long-term market. You have to keep on doing things a little bit here and a little bit there, in order to make the final result very sustainable – matching up with the U.S. market overall.

There's no doubt that China has the biggest solar investment and the capacity also. But on the other hand the United States is very healthy on the renewable energy portfolio requirements/policies. It has very stable policies, very stable economies. I believe the market in the United States is one of the best in the world.

pv magazine: So to get to individual market segments: When you look at the residential market the commercial and industrial market and the big utility scale market for the large ground mounted plants, which of these to you and to Trina is most interesting the United States? And why?

Zhu: Currently we sell most of our product into the utility-scale market. Although we started the deployment on the distribution side and the residential market. Almost from the beginning, eight years ago, 10 years ago we began supplying the residential and the commercial side.

We work with distributors, most of the time as the major suppliers to them. Now with our solution business we're gradually providing some system integration solutions to some of the commercial projects to help them to get the project easier to take off, lower the cost and raise the returns. The utility sector is still one of the major sectors and we are helping developers and investors to get the project settled down from year to year. Let them see the roadmaps of our technology like we mentioned before. We are not only focusing on modules as a single individual component. We are trying to put modules, trackers and inverters all together in order to contribute more to the industry.

pv magazine: So should we expect a distinct branded product from Trina the way that SunPower has its Equinox and its Oasis power plant solution? Should we expect something that's a that's branded like that that's a distinct product?

Zhu: Yes, absolutely.

But we are not going to tapping to the EPC business mostly focusing on the procurement side of the EPC. U.S. EPC companies are very strong at the engineering design, at the construction resources. So we are going to partner with them but we are very good at the procurement side on the supply chain side; we have owned a tracker company since last year, as you know. And we own the module capacity, 2 gigawatt and still going up.

And so we have the chance to put all those things together and design as a whole package for the system instead of individual components because as you know the market situation sometimes is not exactly what you want when you try to buy things, to get the best from the market.

pv magazine: So is this the Trina Pro that you're talking about.

Zhu: Yes, exactly. That's the solution business we're talking about. Trina Pro is one of the solution for the utility-sector projects and we do have commercial C&I teams currently working on the smaller system integration – also to help the commercial side. But Trina Pro is the major one.

pv magazine: So this is interesting because what I've been seeing in the industry is I've been seeing more of these complete solutions but also move away from EPC; for instance for solar just got out of EPC – even a lot of the developers are withdrawing from EPC. Do you see this trend as well and why do you think this is happening?

Zhu: A lot of investors and developers gradually start to be stronger and stronger so that they have the ability to do the preliminary design. Therefore a lot of equipment requirements can be settled down at the beginning stage of the project instead of the last stage of the procurement.

So back to the old times, it used to be EPC's job to do all the designs and then buy the stuff at the end. But now people are seeing with the project to be more mature and more standardized, they are able to work with the supplier directly at the beginning to have a long term roadmap.

Because normally the design phase stars almost a year ahead of the final commissioning. So you have to know the technology one year down the road, what's going to happen with the solar growth speed, these kind of factors have to be taking into account, when you bid the project and when you commit.

So Trina Pro is exactly for that purpose to group all the major components together, link them better, do the engineering for the compatibility issues and do the streamlining of the supply chain management so you don't have to get the module first and then the racking arriving later to shorten your construction time.

The way we are looking at it it really helps EPC a lot also; To reduce their total EPC costs and maintain the same margin and make their work easier and less risky. So to help the project itself also.

pv magazine: This is interesting because it almost seems as the E&P are going over to the developer and EPCs are becoming more simply construction companies. Is that fair or is this something else?

Zhu: Well there's still a lot of work that EPC Company has to do you know regarding the layout regarding the commissioning regarding the great design transformer column and all these kind of things we are trying to help from the hardware side of it.

Because a lot of time EPC company, traditionally EPC companies don't control the supply chains. They don't own the manufacturer. They don't know the roadmaps down the way. They don't know the cost trend, supply and demand situation. So by the time at the end, when they try to buy this stuff a lot of times it's already too late.

This year is a good example. We are in an extreme shortage situation and a lot of people cannot find modules anymore. So that's going to cost the project with a lot of risk and commission delays and put an extra cost into the project. So that's why we are seeing these kind of costs between the major suppliers if they have a solution business together with the EPC.

Obviously we are not getting into the EPC business. It requires like you know a strong enduring force of very good construction resources – all of these kind of capabilities. It took a long time to build this also. So we are willing to work with EPC companies on the Trina Pro solutions.

pv magazine: So the ITC is stepping down after 2022, 2023 there is no more ITC or it remains at 10%. And what we're seeing by the market forecasters is they're expecting the U.S. market to dip after that, and Wood Mackenzie is predicting a very slow growth following this. They're not the only market analyst which is suggesting the market will slow with the ITC at 10%. Do you see this same thing, or do you expect the market to grow more quickly? What do you see after the ITC expires?

Zhu: Well the U.S. market is a free market right now so it has a lot of healing powers. Even the policy has changed; as a matter of fact, you know as we look at the project cost that a major portion 25% is going to Section 201 tariffs. So right now the ITC is stepping down. At the same pace as the tariff. The tariff is dropping from 25%, 20%, 15% and eventually will be gone.

So that's matching the pace of the ITC stepping down. So from the system cost point of view I don't see a major drop. It's going to be a major drop in matching up with the drop of the ITC. So the project returns will relatively stay the same.

On the other hand, from the demand side the renewable energy portfolio requirements are still dragging all of the investment, all the attention, all the technology towards expand the solar market. So I have strong confidence that this market will be one of the best and promising markets in the world.

pv magazine: With or without the ITC?

Zhu: With or without the ITC. Like I said; If people are interested they could extend the ITC or they could even come up with a new solution to help the project or help the market going faster.

Without the ITC we know the costs for solar came down more than 95% in the last 20 years. Right now is the way I'm looking at it, solar is cheaper than the traditional energy already, if we calculate all of the pollutions and environmental recovery cost. So energy demand is rising and solar will meet a bigger and bigger portion of demand. Right now the portion is still very small, so there is a lot of room to grow. With energy storage coming online later that will make that renewable energy even more robust and will help to fit the current requirements to meet energy demand.

Interview conducted by pv magazine U.S. Editor Christian Roselund

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CHRISTIAN ROSELUND

Christian Roselund served as US editor at pv magazine from 2014 to 2019. Prior to this he covered global solar policy, markets and technology for Solar Server, and has written about renewable energy for CleanTechnica, German Energy Transition, Truthout, The Guardian (UK), and IEEE Spectrum.

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Solarman

REPLY

October 2, 2019 at 11:19 pm

Truly, when the World is beginning to embrace solar PV and it looks like energy storage will become an intrinsic part of that equation, packaged systems will bring costs down as more and more people see their family, friends and neighbors adopt the technology.

One night in a Northern California town (Calistoga) under a utility “mandated” PSPS, not knowing when the power will be turned back on, will drive solar PV and ESS as ‘the’ system to have. Folks in Africa and India are adopting pico and micro solar PV systems with battery storage to light their homes, charge there electronics devices that keep them in touch with the World.

This momentum is the testament for something people have called a “disruptive technology”. I’m glad that I have been around at this time to watch this change and use the technology myself. From the 1960’s there was the chant of “power to the people”, often a “political” outcry. Now it is truly (Power to the People) who buy and use the technology. Bring it on!

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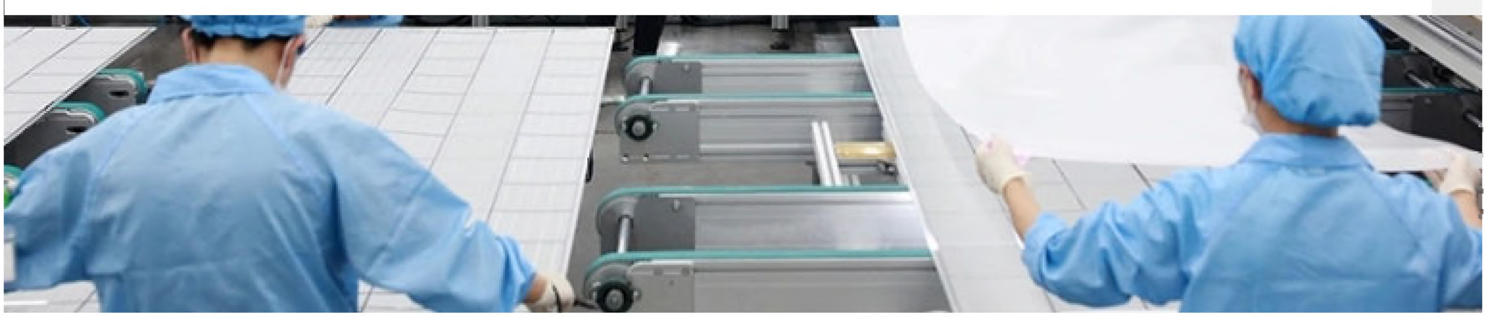
EXHIBIT 23



Despite some higher costs and ongoing trade uncertainty, Chinese companies want to keep providing the US with solar panels [Reuters]

By David R. Baker | Bloomberg

7 Jun 2019

China's Trina Solar Ltd., one of largest panel manufacturers, says it's well insulated from the growing trade dispute with the U.S.

The reason: the last trade dispute with the U.S.

KEEP READING

EU and US call truce in Trump-era trade war

When the U.S. imposed anti-dumping penalties on solar panels imported from China under President Barack Obama, Trina built factories in Thailand and Vietnam to serve American customers, said Steven Zhu, Trina's president for the Americas region. Hence, none of the modules Trina sends to the U.S. come from China. Other solar companies, he said, have developed similar workarounds, limiting the current trade spat's effects.

"The impact on U.S. solar — you won't see that much," Zhu said in an interview Friday. "What happens has already happened."

Output from Trina's Thailand and Vietnam factories are subject to a 20% U.S. tariff that President Donald Trump has already imposed on solar imports. But it's not big enough to move manufacturing to the U.S., Zhu said.

"We did the calculation before, and still keep evaluating," he said. "The operation cost is still a little bit higher, in terms comparing with Thailand, Vietnam and even Mexico."

Despite uncertainty over trade, Zhu said he expects solar sales to continue to grow, including in the U.S. Texas, he said, is now the hottest domestic market for large-scale solar installations, eclipsing California.

SOURCE: BLOOMBERG

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EXHIBIT 24

Trina Solar Invests In Vietnam's Largest Solar PV Cell Plant

Thursday 9th February 2017

News

On 6 January 2017, Trina Solar officially opened a solar photovoltaic (PV) cell plant in Van Trung Industrial

Park, Pac Giang Province, Vietnam. With its annual production capacity of 1GW, it becomes Vietnam's largest solar photovoltaic cell manufacturing site. With a total investment of US$ 100 million and an area of approximately 42,000 square metres, Trina Solar Technology (Vietnam) Co., Ltd. is equipped with 14 of the most advanced cell production lines in the world, producing a variety of mono- and multi-crystalline cells to fulfill the US and European market demand. Construction of the new plant started from May 2016. After just six and a half months, at the end of November, the initial production capacity of 700MW was achieved "“ a new industry record. This factory created nearly 1,000 local jobs. For Trina Solar, the project is another key development in Southeast Asia after the completion of the manufacturing facilities in Malaysia and Thailand.

Jifan Gao, Trina Solar Chairman and Chief Executive Officer, said: "The Vietnam project fully embodies Trina Solar's spirit of striving for success and our entrepreneurial mentality. It took only a few months to build a barren grassland into a clean and orderly plant and reach full production capability.

Our production of solar modules in Vietnam will serve the Vietnamese and ASEAN markets, as well as the US and European markets. While Trina Solar's business keeps growing, the need for overseas investment and globalization of our manufacturing footprint increases at the same time.

Trina Solar's new project in Vietnam is not only the success of our manufacturing manufacturing globalization, but also for the introduction of advanced manufacturing technology to Vietnam, creating nearly 1,000 jobs locally. As an important member of the ASEAN Community, Vietnam has rapid economic growth, and actively participates in China's 'One Belt, One Road' strategy implementation. With a successful start and win-win corporation between China and Vietnam, we are confident and looking forward to the future of Trina Solar's cell factory in Vietnam."

Yang Yongzhi, general manager of Vinasolar, the local joint venture partner, said, "Our partnership with Trina Solar is not only in module manufacturing, but also at the investment level of cell manufacturing. The excellent corporate culture of both companies ensures that the project has been realized in the shortest possible time, from construction to full production. This is a great encouragement to all PV companies developing in Vietnam. With a great partner like Trina Solar, we are very confident to create better results in Vietnam."

In recent years, Trina Solar follows China's national "One Belt, One Road" strategy, being market-oriented and accelerating overseas expansion. In 2012, Trina Solar established its regional headquarters of Asia Pacific, Middle East and Africa in Singapore. In 2015, the company started to cooperate with Malaysian factories to expand overseas production capacity; in March 2016, the Thailand plant with a total investment of US$ 160 million was put into operation; in January 2017, the company announced the opening of its cell factory in Vietnam.

EXHIBIT 25

Trina Solar begins production of 550 W modules at Vietnam facility

Trina Solar broke ground on its Thai Nguyen plant in December, and completed construction in five months.

MAY 25, 2021 **DAVID WAGMAN**

HIGHLIGHTS MODULES & UPSTREAM MANUFACTURING UNITED STATES

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From pv magazine USA

The first batch of Trina Solar 210mm cells and Vertex modules for the North American market have been produced at the company's Vietnam production facility.

Trina Solar broke ground on its Thai Nguyen plant in December, and completed construction in five months. The factory has a capacity for 3 GW of cells and 4.5 GW of 210 modules. On May 15, the facility manufactured the first batch of 210mm Vertex 550W modules. Plans for Vertex 400W and 670W module production are now in the works for the plant, which can boost the annual capacity to an equivalent of 3.5 GW of 210 cells and 5 GW of 210 modules, respectively.

The fully automated plant represents one of the first overseas factories that manufacture 210 cells and 550 W modules.

Currently, Trina Solar runs multiple 210 Vertex cell and module factories in China and Vietnam. Altogether, they are expected to produce more than 50 GW of modules by the end of 2021.

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David Wagman is a senior editor at pv magazine USA. David is a seasoned energy journalist and editor.
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EXHIBIT 26

Solar

Trina Solar's new factory in Vietnam produces first cells, modules

May 24 (Renewables Now) - China's Trina Solar Co Ltd (SHA:688599) today announced the successful manufacture of the first batch of 210 mm cells and 550-W Vertex modules in its new factory in Vietnam.


Source: Trina Solar Co Ltd

The company started building the fully-automated facility in Thai Nguyen in December 2020 and finalised its construction in five months. The plant has the capacity to produce 3 GW of cells and 4.5 GW of modules a year and Trina Solar intends to expand this to 3.5 GW and 5 GW, respectively.

The newly produced modules will be delivered to the North American market. The company also plans to manufacture Vertex modules of 400 W and 670 W in the same Vietnamese facility.

Overall, Trina Solar now operates Vertex cell and module factories in China and Vietnam with an anticipated panel production of over 50 GW by the end of the year.

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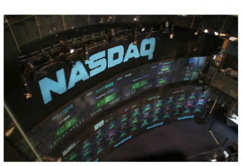

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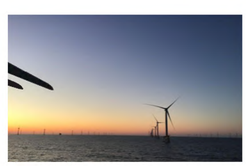

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EXHIBIT 27

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Business

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Trina Solar Starts Vietnam Factory

Trina Solar's New 800 MW Facility Touted As Largest PV Cell And Module Factory' In Vietnam

05:37 PM (Beijing Time) - 10. January 2017

photo-trina-stand-igem-2016-10

While Vietnam has turned into a big solar cell and module production hub for many Chinese PV companies as of recently, Trina Solar's newly 800 MW cell and module capacity is the country's largest as of today. Pictured are Trina modules on display at the recent IGEM trade show in Malaysia.

KEY TAKEAWAYS

- Trina Solar has commissioned its PV factory at Quang Chau Industrial Park in Vietnam
- The cell and module factory has an annual capacity of 800 MW, which reportedly has come up with an investment of $100 million
- After Malaysia, Vietnam is now coming up as one of the most sought after locations for Chinese solar power companies to set up their manufacturing units

Trina Solar has begun production of solar panels at its newly opened Vietnam factory. The facility with capacity of 800 MW annually is located in Quang Chau Industrial Park in Viet Yen district, northern Bac Giang province, reported The Voice of Vietnam.

The online edition of state news agency of China, Xinhua said that this facility of Chinese module maker Trina Solar is the 'largest PV cell and module factory in Vietnam'. Sharing pictures clicked on January 6, 2017 at the new facility, Xinhuanet reported that this facility is located in Bac Giang province of Vietnam. Trina has reportedly invested $100 million on the same.

Nonetheless, there has been no official word on it from Trina Solar as yet. The US listed Trina has recently received shareholder approval to go private and apparently it is not publishing press releases on every new item anymore. While it did announce a new cell record in December, media reported that Trina will be collaborating with fellow Chinese companies, Longi Silicon Materials and the Tongwei Group to start a 5 GW monocrystalline silicon ingot production plant (see **Longi, Trina & Tongwei To Build Ingot Factory**). Trina is slated to own 25% of this new facility with an investment of $28.8 million.

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(04. January 2021)

Trina Solar To Purchase 85 Million Sq. Mtr. PV Glass
Trina Solar To Purchase 85 Million Sq. Mtr. Photovoltaic Glass From Changzhou Almaden For RMB 2.1 Billion For 210mm Vertex Modules
(19. November 2020)

After Malaysia, Vietnam is now coming up as one of the most sought after locations for Chinese solar power companies to set up their manufacturing units. Some of the biggest names, including Trina Solar, JinkoSolar and the like have voluntarily withdrawn from the European Commission's minimum import price (MIP) undertaking which slaps anti-dumping and anti-subsidy duties on solar panels produced in China. Most of them are keen to operate from locations beyond China to be able to circumvent these duties and even more the customs in the much larger US solar market.

A few days back, PV Module maker GCL System Integration Technology Co., Ltd. (GCL-SI) announced it will be developing 600 MW new solar cell manufacturing capacity in Vietnam.

In November 2016, another tier I Chinese module manufacturer, JA Solar, broke ground on its manufacturing facility in Vietnam (see **JA Solar Starts Work On Vietnam Factory**). This is also located in Quang Chau Industrial Zone.

A US based solar research and development company Natcore Technology Inc., secured a contract to develop a 200 MW solar park in Vietnam. Along with setting up the park, the project will also include setting up a laboratory facility and a solar panel manufacturing facility (see **200 MW Solar Park In Vietnam**).

Canadian Solar already announced 1 year ago, in January 2016, when it received $70 million in financing from the International Finance Corporation (IFC), that some of that money would be used to expand production in Vietnam, where it now operates a module facility.

However, some of the recent announcements for new production capacities in Vietnam are associated with Vina Solar, a Vietnam-based OEM manufacturer, which produces both cells and modules.

Anu Bhambhani
Anu Bhambhani is the Senior News Editor of TaiyangNews

Write, follow the author.

EXHIBIT 28

Solar

Daqo seals 3-year polysilicon supply deal with Trina Solar

Trina Solar module. Owner: Mark Wolff

November 30 (Renewables Now) - China's Daqo New Energy Corp (NYSE:DQ) has entered into a three-year polysilicon supply agreement with photovoltaic (PV) panels maker Trina Solar Co Ltd (SHA:688599).

Daqo New Energy said today it has agreed to supply between 30,000 tonnes and 37,600 tonnes of high-purity mono-grade polysilicon in the period November 2020-December 2023. The two parties will negotiate actual prices on a monthly basis according to market conditions.

"We are pleased to enter into a long-term partnership with Daqo New Energy. This will help us better execute our strategy, which is to provide advanced solar PV products and solutions with higher efficiency so as to address fast growing demand in solar PV market, drive grid parity and benefit society through green energy," said Jifan Gao, Chairman of Trina Solar.

Earlier this month, Trina Solar also announced it had ordered more than 1.2 billion 210mm monocrystal silicon wafers from Tianjin Zhonghuan Semiconductor Co for delivery between January 2021 and December 2021. That contract is worth about CNY 6.552 billion (USD 994.6m/EUR 831m).

(CNY 1.0 = USD 0.152/EUR 0.127)

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EXHIBIT 29

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Trina Solar seals 1.2 billion wafer supply deal with Zhonghuan Semiconductor

By Carrie Xiao (https://www.pv-tech.org/author/carriexiao/)

November 23, 2020

Cell Processing (https://www.pv-tech.org/industry-segments/cell-processing/), Manufacturing (https://www.pv-tech.org/industry-segments/manufacturing/), Materials (https://www.pv-tech.org/industry-segments/materials/)

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Trina Solar has bolstered its solar wafer supply line with the signing of a 1.2 billion wafer deal with Zhonguan Semiconductor, valued at RMB6.5 billion (US$990 million).

Under the terms of the deal, Zhonghuan subsidiary Huan'ou International will sell 1.2 billion G12, 210mm wafers throughout next year, among the largest orders for 210mm mono wafers to date.

Zhonghuan released the large-area size G12 wafers in H2 last year and since then, the PV industry and supply chain has changed dramatically.

The extra-large, diamond wire-cut mono square wafer, with a side length of 210mm, is 80.5% larger than the conventional M2 wafer, which contributes to higher photoelectric conversion efficiency and production efficiency.

The deal struck between Zhonghuan and Trina represents yet further success of the G12 wafer and, speaking at a signing ceremony held at Trina's headquarters in Changzhou, Trina chairman Jifan Gao said the supply contract would provide strong support for the manufacturers 210mm cell and module capacity plan.

According to Haoping Shen, general manager at Zhonghuan, the company has been pursuing a long-term and steady development strategy to stay competitive in the wafer market. According to PV Tech analysis, by the end of 2020, Zhonghuan's G12 wafer production capacity is set to reach 19GW, and 50GW in 2021 as a result of capacity released from a Phase IV expansion project.

In Q3 2020, Zhonghuan's revenue was RMB4.7 billion (US$715 million), of which the vast majority – RMB3.7 billion (US$563 million) – was from wafer supply.

Signing of the contract came in the same week that Trina unveiled a raft of other supply chain arrangements, including the formation of a landmark joint venture with polysilicon and solar cell manufacturer Tongwei (https://www.pv-tech.org/news/trina-tongwei-unveil-major-multi-billion-dollar-solar-silicon-wafer-and-cell-alliance), and two further deals with solar glass provider Almaden and wafer manufacturer Wuxi Shangji (https://www.pv-tech.org/news/trina-solar-signs-major-wafer-and-glass-supply-deals-as-vertex-production-ramps).

210mm (https://www.pv-tech.org/tag/210mm/), g12 wafer (https://www.pv-tech.org/tag/g12-wafer/), solar wafer (https://www.pv-tech.org/tag/solar-wafer/), trina solar (https://www.pv-tech.org/tag/trina-solar/), upstream manufacturing (https://www.pv-tech.org/tag/upstream-manufacturing/), wafer supply (https://www.pv-tech.org/tag/wafer-supply/), zhonghuan semiconductor (https://www.pv-tech.org/tag/zhonghuan-semiconductor/)

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EXHIBIT 30

Trinasolar (https://www.trinasolar.com/us)

Trina Solar Launches Operations at Thailand Manufacturing Facility and Signs a US$143 million Syndicated Financing Facilities Agreement

2016.03.28

CHANGZHOU, China, March 28, 2016 /PRNewswire/ -- Trina Solar Limited (NYSE: TSL) ("Trina Solar" or the "Company"), a global leader in photovoltaic ("PV") modules, solutions, and services, today announced the official launch of operations at its new manufacturing facility in Thailand. The Company also announced that it has signed a financing facilities agreement for an aggregate amount of approximately US$143 million with a consortium of banks led by The Siam Commercial Bank Public Company Limited (SCB), one of the top three domestic banks in Thailand.

The manufacturing facility, located in Rayong, Thailand, has entered production using Trina Solar's "Honey" state of the art high-efficiency assembly line method. Annualized production capacity for modules at the facility is 500 MW, and could be further ramped up to over 600 MW depending on overseas market demand. Annualized production capacity for cells is 700 MW. So far, the facility has achieved every milestone on schedule, from groundbreaking to production to serving the Company's overseas markets, which is expected to occur by the end of March.

To finance the capital expenditure of the new production facility, Trina Solar has signed a syndicated loan agreement for a total of US$100 million with SCB and China Minsheng Banking Corporation Ltd. (CMBC), maturing in June 2020. In addition, according to the agreement, the Company has been granted a line of credit by SCB for THB 1.53 billion (approximately US$43 million), which will be used for working capital.

"We are pleased to announce the official launch of our new facility in Thailand as scheduled. The investment in Thailand fits our strategy of prudent capacity expansion in select overseas markets to deliver industry leading products to customers in the US and Europe in particular as we strive to increase the profitability of the company," said Mr. Jifan Gao, Chairman and CEO of Trina Solar.

"The US$143 million in financing agreement in support of our Thai operations is a great vote of confidence from both SCB and CMBC in our brand and our overseas expansion strategy. We look forward to cooperating further with these two first tier banks in our other strategic initiatives," said Mr. Gao.

"This and other major Trina Solar's projects in the pan-Asia region also align the Company with the Chinese government's key strategic initiative, 'One Belt, One Road,' connecting Asian economies for their mutual benefit. We are also pleased to help further advance the development of clean energy in more countries around the world," concluded Mr. Gao.

Mr. Arthid Nanthawithaya, Chief Executive Officer and Deputy Chairman of the Executive Committee of SCB, stated, "We are fully committed to supporting inbound investment from China and we are honored to work with the world's number one solar module manufacturer, Trina Solar, with its important investment in Thailand. This is our first solar financing project and we partnered with Trina Solar because of its solid growth history, vast growth potential, strong financial position, and highly professional team. We believe that the effort will not only help boost Thailand's economy and create job opportunities, but will also align well with the Thai government's policy and our bank's strategy of promoting clean energy. We look forward to more cooperation with Trina Solar in the future."

Mr. Jinfeng Ren, the general manager of the Global Finance Department of CMBC, added, "The US$100 million syndicated loan that CMBC and SCB extended to Trina Solar marks a starting point for the cooperation between the two banks and the world's number one solar module manufacturer. The project not only shows our readiness to provide strong financial support for Chinese enterprises as they 'go out' and invest overseas, but it should also raise the confidence of overseas financial institutions in terms of the investment potential of Chinese companies."

About The Siam Commercial Bank Public Company Limited (SCB)

As the first Thai Bank, with unique heritage of having been established by Royal Charter in 1907, SCB has provided exemplary banking services to its customers for more than 100 years. SCB is the leading universal banking group in Thailand, meeting the various needs of its customer with a wide array of financial products and services and it has the largest footprint (by branch) and highest market capitalization of all Thai financial institutions.

About China Minsheng Banking Corporation Ltd.

Established on January 12, 1996 in Beijing, China Minsheng Banking Corporation Ltd. is a national joint-stock commercial bank with investments mainly from non-state-owned enterprises (NSOEs), and is a standard join-stock financial institution founded in strict compliance with the rules and regulations under the Company Law and the Commercial Banking Law. The Company differentiates itself from other state-owned banks and commercial banks as a combination of involvement of diversified economic sectors in the financial sector in China and application of normative modern enterprise system. As a pilot program of China's banking reform, the Company forges ahead with unremitting efforts to explore its businesses, expand its asset size, improve its profitability and maintain rapid and health growth. It has made proactive contributions to the reform and innovation of the Chinese banking industry.

About Trina Solar Limited

Trina Solar Limited (NYSE:TSL) is a global leader in photovoltaic modules, solutions and services. Founded in 1997 as a PV system integrator, Trina Solar today drives smart energy together with installers, distributors, utilities and developers worldwide. The company's industry-leading position is based on innovation excellence, superior product quality, vertically integrated capabilities and environmental stewardship. For more information, please visit **www.trinasolar.com (http://www.trinasolar.com/)**.

Safe Harbor Statement

This announcement contains forward-looking statements within the meaning of the safe harbor provisions of the Private Securities Litigation Reform Act of 1995. All statements other than statements of historical fact in this announcement are *forward-looking statements, including but not limited to, the Company's ability to raise additional capital to finance its activities; the effectiveness, profitability and marketability of its products; the future trading of the securities of the Company; the Company's ability to operate as a public company; the period of time for which the Company's current liquidity will enable the Company to fund its operations; general economic and business conditions; demand in various markets for solar products; the volatility of the Company's operating results and financial condition; the Company's ability to attract or retain qualified senior management personnel and research and development staff; and other risks detailed in the Company's filings with the Securities and Exchange Commission. These forward-looking statements involve known and unknown risks and uncertainties and are based on current expectations, assumptions, estimates and projections about the Company and the industry in which the Company operates. The Company undertakes no obligation to update forward-looking statements to reflect subsequent occurring events or circumstances, or changes in its expectations, except as may be required by law. Although the Company believes that the expectations expressed in these forward looking statements are reasonable, it cannot assure you that such expectations will turn out to be correct, and the Company cautions investors that actual results may differ materially from the anticipated results.*

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To view the original version on PR Newswire, visit:**http://www.prnewswire.com/news-releases/trina-solar-launches-operations-at-thailand-manufacturing-facility-and-signs-a-us143-million-syndicated-financing-facilities-agreement-300241820.html (http://www.prnewswire.com/news-releases/trina-solar-launches-operations-at-thailand-manufacturing-facility-and-signs-a-us143-million-syndicated-financing-facilities-agreement-300241820.html)**

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23.Trina Solar's PV Modules Operational in Largest Solar Project in the Philippines (/us/news/trina-solars-pv-modules-operational-largest-solar-project-philippines)

03.Trina Solar Announces Fourth Quarter and Full Year 2015 Results (/us/news/trina-solar-announces-fourth-quarter-and-full-year-2015-results)

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EXHIBIT 31

Annual production capacity 15GW! Trina Solar and Tongwei Co., Ltd. join forces to further upgrade the 210 integrated industrial chain

2020.11.16

On November 17, 2020, Trina Solar Co., Ltd. announced that its cooperation with Tongwei Co., Ltd. has reached a new level. The cooperation involves three investments and a long term procurement cooperation framework agreement. Gao Jifan, Chairman of Trina Solar, said that the two leading companies focused on 210 products and cooperated to make the 210 industrial ecosystem stronger and bigger. Joint ventures and cooperation among strong players, who complements each other, have bigger advantages than simple vertical integrations within themselves.

In terms of investments, Trina Solar signed a "joint venture agreement" with Tongwei's Sichuan Yongxiang Co., Ltd. and Tongwei Solar Co., Ltd. respectively, to jointly establish a project company and jointly invest in a high-purity crystalline silicon project with an annual output of 40,000 tons, a ingot project of an annual output of 15GW, a wafer cutting project of an annual output of 15GW, and a high-efficiency crystalline silicon cell project with an annual output of 15GW. The total investment is about 2.3 billion US dollar. Trina Solar's shareholding ratio in each project company is 35%.

Wu Qun, secretary of the board of directors of Trina Solar, said that these major project investments were part of Trina Solar's strategic development plan. Trina Solar and Tongwei both have outstanding advantages in their roles for the industrial chain. They have reached the consensus on 210 series modules, and these cooperations will further strengthen their strategic partnership. Through joint efforts of all industry partners, the 210 product industry chain has matured, which is now more conducive for deeper integration. Trina Solar plans for a production capacity of photovoltaic module to be no less than 50GW by the end of 2021, most of which are 210 module production capacities. In the future, the company will continue to strengthen its scale advantages of advanced module production capacity based on large-size cells.

In terms of procurements, Trina Solar intends to purchase Tongwei's Sichuan Yongxiang Polysilicon Co., Ltd., Sichuan Yongxiang New Energy Co., Ltd., Inner Mongolia Tongwei High Purity Crystal Silicon Co., Ltd., and Yunnan Tongwei High Purity Crystal Silicon Co., Ltd. between January 2021 and December 2023 for approximately 72,000 tons of polysilicon products in total.

Ms. Chen Ye, Assistant Vice President of Procurement Supply Chain Management of Trina Solar, said that Trina Solar and Tongwei had a good relationship and Trina Solar was very pleased to deepen cooperation with its strategic partners. This long term procurement will facilitate timely and effective responses to changes in the market, ensuring strong and long-term stability of the company's supply chain. On the 2nd of this month, we signed a 20GW silicon wafer procurement contract with Wuxi Shangji Automation Co., Ltd. On the 15th, we signed an 85 million square meter photovoltaic glass procurement contract with Changzhou Almaden Co., Ltd. These long term procurements will provide strong support for the production capacity of Vertex Series 210 ultra-high-power modules.

11
NOV

14.Trina Solar will purchase 85 million square meters of photovoltaic glass from Almaden

18.Trina Solar Purchases 1.2 Billion units of 210mm Monocrystal Silicon Wafers in Cooperation with Zhonghuan

30.A joint initiative to promote the standardization of 210mm-size silicon wafer, modules in the photovoltaic industry

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Trina, Tongwei unveil major, multi-billion-dollar solar silicon, wafer and cell alliance

By Carrie Xiao (https://www.pv-tech.org/author/carriexiao/)

November 18, 2020

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Trina Solar and Tongwei have unveiled a multi-billion-dollar collaboration which will see the two companies invest in and co-develop multi-gigawatt solar supply facilities.

Announcing a major joint venture agreement late yesterday, Trina and Tongwei said the two companies will establish projects to develop high-purity c-Si silicon rods and high-efficiency c-Si cells and wafers.

Trina signed the JV with two subsidiaries of Tongwei – YongXiang CO and Tongwei Solar – and the JV will collaborate on and jointly invest in facilities producing high-quality polysilicon, polysilicon rods, solar wafers and cells, with a total investment value of RMB15 billion (US$2.3 billion).

Those projects are detailed in the chart below.

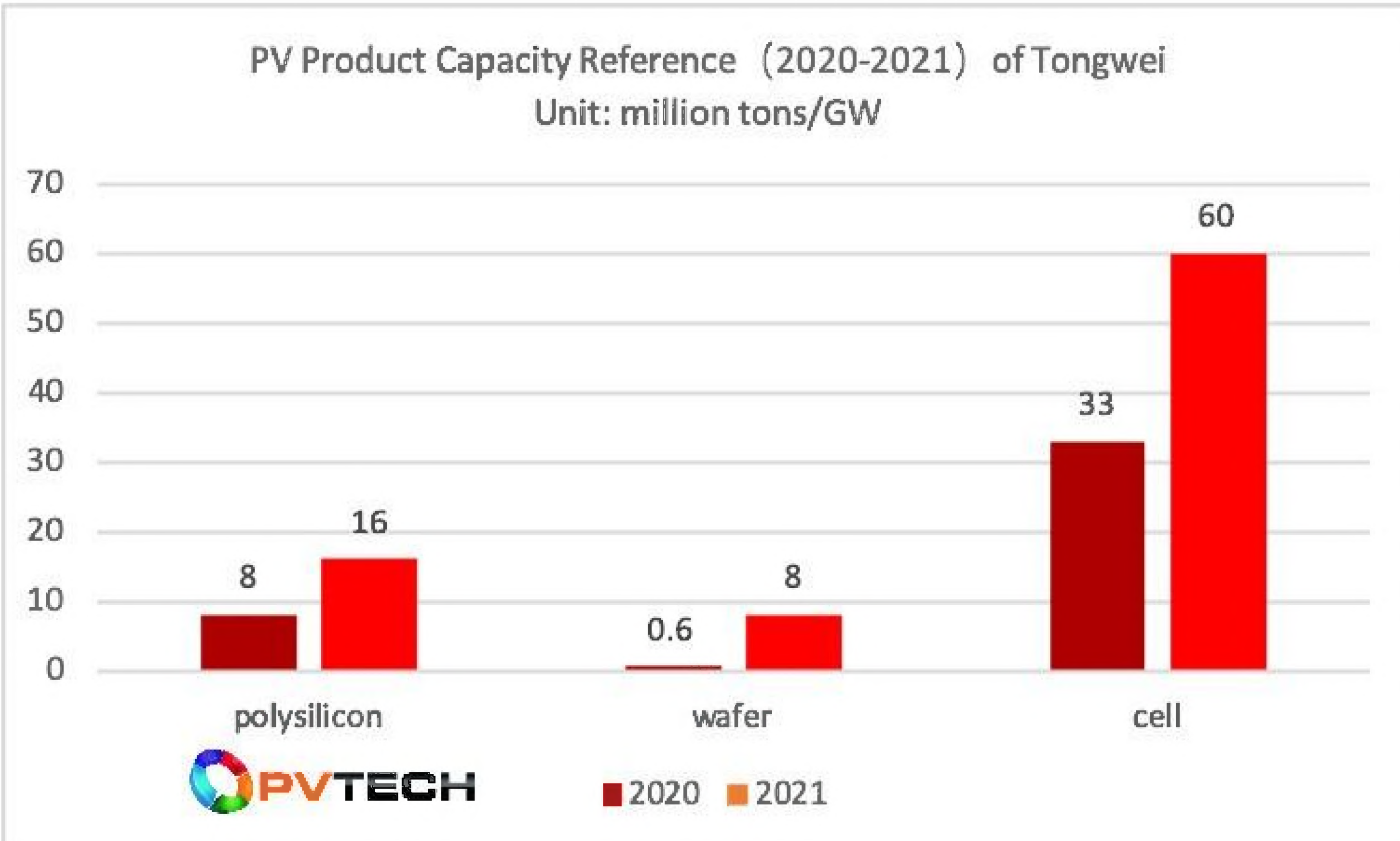
Tongwei-Trina Alliance	Capacity	Total investment (RMB)	Location	Share structure	Operational start
Polysilicon	40,000 tons	4 billion	Baotou	Tongwei 65%, Trina 35%	By September 2022
Silicon rods	15GW	5 billion	Leshan	Tongwei 65%, Trina 35%	Phase I by September 2021, 7.5GW；Phase IIBy March 2022，7.5GW
Wafers	15GW	1.5 billion	Jintang County	Tongwei 65%, Trina 35%	Phase I by September 2021, 7.5GW；Phase II By March 2022，7.5GW
Cells	15GW	4.5 billion	Jintang County	Tongwei 65%, Trina 35%	By October 2021,15GW

Tongwei will take a 65% share in the projects and has provided an initial registered capital of RMB3.9 billion, while Trina solar will take a 35% share with a total registered capital of around RMB2.1 billion.

Tongwei claimed that Trina Solar or its affiliates would enjoy prioritised supply of high purity c-Si, silicon rods and cells produced by all project companies.

According to Trina Solar, the joint investment agreement would help reduce the company's procurement costs and guarantee long-term stability of the supply chain. In the meantime, it would facilitate sharing upstream profits to enhance the company's profitability. The agreement was aligned with the company's strategic plan for future development.

In addition to polysilicon, the Tongwei-Trina cooperation was also underscored by the large-scale expansion of wafer capacity. Wafers have been the common weakness between the two, as could be seen from the supply chain layouts featuring quite limited or zero wafer capacities. It was of great significance to bridge this gap.



Wafer capacities of both companies are now expected to surge thanks to this cooperation. The supply chain is to be interconnected to support silicon, wafer and cell integration to achieve optimised cost advantages, the companies said.

Wu Qun, secretary of the board of directors of Trina Solar, said that these major project investments were necessitated by Trina Solar's strategic development planning.

Trina Solar and Tongwei had marked advantages in all segments throughout the industry chain. By reaching consensus on the 210 series, this cooperation would strengthen the strategic partnership between the two.

The joint efforts had helped to foster a mature 210 series supply chain and led to deepened integration. The planned PV module capacity would top 50GW for Trina Solar, the majority of which would go to 210 modules, and Trina Solar would continue to consolidate its advantage in massive production of advanced modules made from big cells.

Trina Solar also confirmed it had signed a framework agreement with Tongwei which will see the former procure 72,000 metric tons (MT) of polysilicon from four Tongwei subsidiaries between 2021 and 2023.

Trina said it was eyeing guaranteed silicon supply in signing the contract, having witnessed pricing volatility and supply constraints in the polysilicon market earlier this year.

Prices under the contract will be negotiated on a monthly basis, with the final contract value set to be dependent on those monthly market prices.

The announcement coincided with two major supply deals also signed by Trina Solar (https://www.pv-tech.org/news/trina-solar-signs-major-wafer-and-glass-supply-deals-as-vertex-production-ramps), securing its supply of both wafers and solar glass.

210mm wafer (https://www.pv-tech.org/tag/210mm-wafer/), cells (https://www.pv-tech.org/tag/cells/), fabs and facilities (https://www.pv-tech.org/tag/fabs-and-facilities/), manufacturing (https://www.pv-tech.org/tag/manufacturing/), polysilicon (https://www.pv-tech.org/tag/polysilicon/), tongwei (https://www.pv-tech.org/tag/tongwei/), trina solar (https://www.pv-tech.org/tag/trina-solar/), trina-tongwei alliance (https://www.pv-tech.org/tag/trinatongwei-alliance/), upstream (https://www.pv-tech.org/tag/upstream/), wafers (https://www.pv-tech.org/tag/wafers/)

EXHIBIT 33

Canadian Solar denies use of forced labour at its solar farm in western China

NATHAN VANDERKLIPPE › ASIA CORRESPONDENT
BEIJING
PUBLISHED JANUARY 28, 2021

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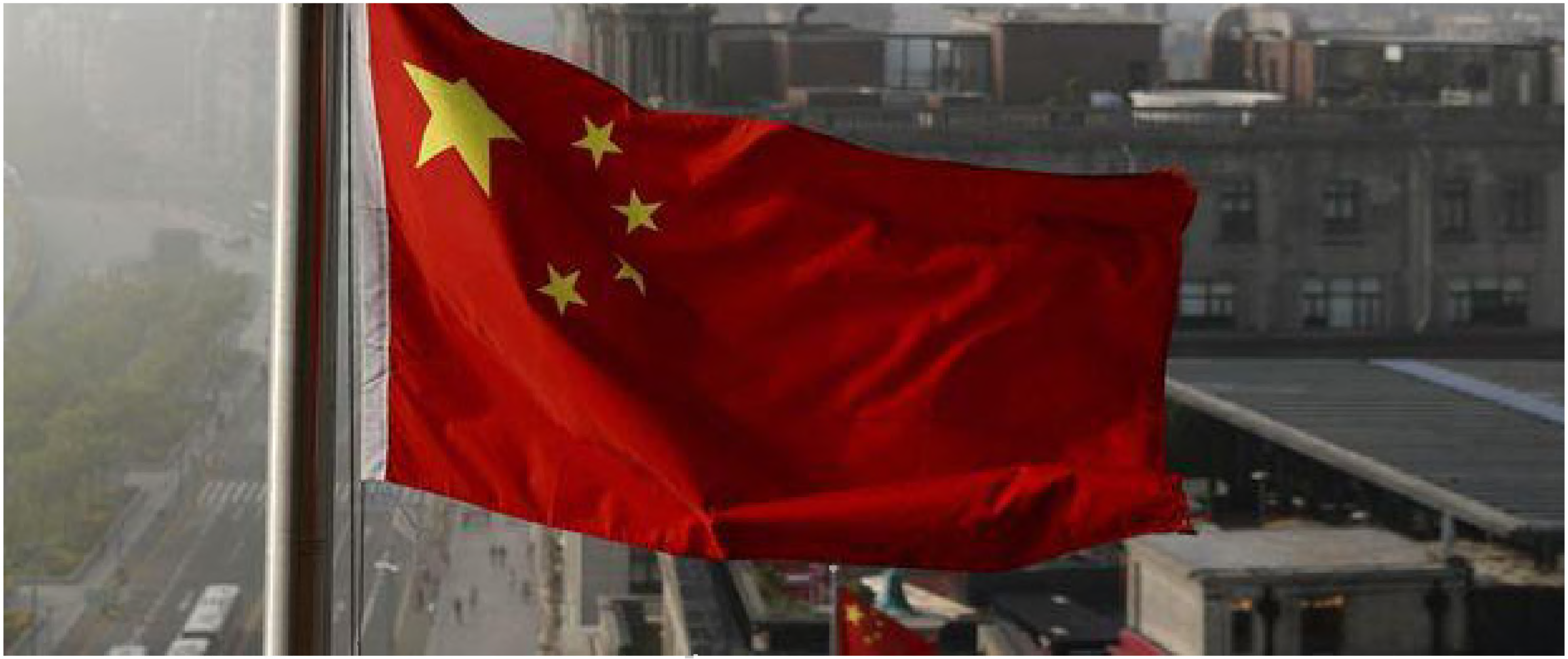

A Chinese national flag near office buildings in Shanghai, China on April 14, 2016.

ANDY WONG/THE ASSOCIATED PRESS

A Canadian company that operates a large solar farm in China's western Xinjiang area has denied the existence of forced labour in its supply chain, and says the international spotlight on conditions in the region hurts local Muslims by making companies more reticent to hire them.

Canadian Solar's 100-hectare solar farm near Tumxuk is situated in Xinjiang, a region that has come under intense scrutiny after years of government policies that have included forcibly indoctrinating large numbers of people and, Western researchers and governments say, subjecting them to forced labour. Many are ethnic Uyghurs, a minority Muslim group the Chinese government has accused of harbouring extremism.

But no Uyghurs are employed at the 30-megawatt Canadian Solar operation, which the company calls by its Chinese name, Tumushuke, according to Isabel Zhang, the company's Suzhou-based associate director for investor relations and strategic analysis.

Canadian firms operate in China's Xinjiang region

Canadian Solar employs one person at Tumxuk and six subcontractors who work in operations and maintenance. "All of them are ethnic Han," Ms. Zhang said in an interview with The Globe and Mail. Han are the majority group in China that make up more than 90 per cent of the population.

Canadian Solar does not "support forced labour or engage in forced labour," she said, nor is it "aware of any forced labour in our company or the whole supply chain."

The Chinese government, too, denies the use of forced labour in Xinjiang, saying workers in Xinjiang sign contracts.

And Ms. Zhang said international attention to the issue stands to hurt, rather than help, people in the region.

"Certainly the media narrative is not helpful for companies that don't support forced labour, that wouldn't engage in forced labour – because we would really think twice if we are employing Uyghur labour," she said, adding, "in a way, that's actually bad for the Uyghur ethnicity."

Evidence for involuntary employment in Xinjiang come from numerous official documents about transfers of "rural surplus labourers" as well as the existence of manufacturing plants alongside, and sometimes inside, fenced detention facilities.

Indicators of forced labour have prompted the U.S. to ban all imports of cotton and tomatoes from Xinjiang, and to sanction companies and industrial parks. The U.S. National Security Council has accused Xinjiang of employing "modern-day slavery." As the Trump administration wound down earlier this month, the U.S. State Department accused China of committing genocide in Xinjiang.

Canada has said it will require a “Xinjiang Integrity Declaration” from companies seeking federal trade commission assistance in China. Ottawa has also released a business advisory warning that companies face both legal risk and “reputational damage related to their supply chains if it is discovered that they are sourcing from entities that employ forced labour.”

Canadian resources companies have invested hundreds of millions of dollars in Xinjiang. Among them is Dynasty Gold Corp., which confirmed it has invested more than US$12-million into a gold mine in Karamay.

The company is now engaged in a legal fight over its ownership over the property, but said in a statement that, during its development, “the company employed over 150 workers and support staff at its peak, where equitable compensation was provided to all. Many ethnicities, including Uyghur, were represented in all ranks of the work force. All protocols and cultural practices were followed, including special holidays for religious practice.”

In interviews, Uyghurs have described being forced to work, often for little money, at menial jobs out of keeping with their own skills.

Canadian Solar does not have any policies on hiring Uyghurs, Ms. Zhang said. Nor does the company have any immediate plans to divest from an operation it has maintained for what Ms. Zhang called commercial reasons. “We are certainly looking at our supply chain and really evaluating our options,” she said.

Cheap electricity has made Xinjiang an important lynchpin in the global solar industry, attracting large-scale manufacturing of photovoltaic-grade polysilicon, a primary material in solar cells. China makes more than 70 per cent of the world’s polysilicon for solar panels, and more than half of China’s output comes from Xinjiang.

Four of the world’s top six polysilicon manufacturers operate in Xinjiang – and all have ties to forced labour, a report from consultancy Horizon Advisory has found. Those companies “appear actively to participate in the resettlement of ethnic Uyghurs from poor areas of Xinjiang” and “contribute to and implement ‘re-education programs that impose political and military training on resettled populations,” Horizon found.

Among them is GCL Poly, whose Xinjiang subsidiary has reported accepting more than 60 so-called "surplus labourers." GCL did not respond to a request for comment.

In 2019, GCL said it had signed a major agreement to supply four photovoltaic companies, including Canadian Solar.

Ms. Zhang said the company doesn't believe "there is forced labour in our industry."

However, Canadian Solar has "recently" begun working with polysilicon makers to investigate and develop "auditing processes for our supply chain, and certifications," she said. She would not say when that work might produce results.

Numerous international audit groups have said publicly they will no longer work in Xinjiang, where authorities have used tools of surveillance and law enforcement to interfere with visits by outsiders.

"I would have very little confidence that you could have an independent vetting authority on the ground at this point," Horizon co-founder Nathan Picarsic said in an interview.

Horizon has not documented "direct indicators" of Canadian Solar using forced labour, he said.

But "denial of potential for forced labour throughout the supply chain, I think at this point defies belief. And if they want to be reiterating the Chinese Communist Party's line on this, that seems like an uncomfortable position to be in over the long term."

Seeking to create a certification for companies with supply chains in Xinjiang to ensure no forced labour is "extremely irresponsible," because it risks creating a veneer of legitimacy in a region where it is the government itself – rather than a few bad corporate actors – that has organized labour violations, said Adrian Zenz, a U.S.-based scholar and senior fellow in China Studies at the Victims of Communism Memorial Foundation, who has written extensively on forced labour.

"If you have a totalitarian state, there is no safe context where Uyghurs can be interviewed," he said, adding that the idea of a polysilicon certification "disregards or fails to understand the context we're talking about there – and is morally irresponsible."

Canadian Solar's Ms. Zhang said the company also has no knowledge of whether the electricity it generates has powered facilities used to forcibly indoctrinate Uyghurs. China does not allow private direct electricity sales, and anything generated from the Tumxuk project "is fed directly into the China state grid," Ms. Zhang said.

The Tumxuk solar project is located a few kilometres from a vocational training centre, whose course of study includes 126 hours a year of "moral and practical" classes in subjects such as history and religious unity.

The Australian Strategic Policy Institute has also used satellite imagery and government documents to identify five facilities for forcible indoctrination and detention around Tumxuk, which has a population of 250,000. The nearest is 2,500 metres from a solar installation. With watchtowers and internal fencing, it is "a very large facility of at least 20 wings under construction as of May 2020," ASPI reports.

The facility's perimeter wall, studded with watchtowers, extends roughly 600 metres alongside the main route from the Tumxuk solar site into the city's urban area.

But Canadian Solar is "not aware of any vocational centre," Ms. Zhang said. "You can tell me that my neighbour is a thief. But I don't know if my neighbour is a thief or not."

EXHIBIT 34

CEEG

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CEEG(Nanjing) New Energy CO., Ltd

CEEG(Nanjing) New Energy CO., Ltd is engaged in R&D, production, marketing ,construction and service of the component of solar cells. It is located in Science and Technology Parks of CEEG in Nanjing, was merged by CSUN as the subordinate company in 2010, and the CSUN is the listed company in NASDAQ of the USA. The company selects high-performance single crystal and polycrystalline solar cells to produce series of solar energy components, and the products own such advantages as high efficiency, high power, high reliability, long life and so on. It has 26,000 square meters of plant, more than 1200 staffs, and 500MW of production capacity against components used in PV cells. It has the best technology and equipment in the world, and has a strong sales network in the United States, Germany, Spain, Italy, Czech Republic, the South East Asian and other countries and regions.
The company's operating concept is to provide customers with high quality products, excellent service, and great value, and to create renewable clean energy for the human society. It is based on R&D, seeing production technology as a fundamental and emphasizing on the talents, and committed to become the first class leader supplier of renewable energy in the world.

products:


CSUN210-54P


CSUN220-54M


CSUN250 -60M

Contact details:

Add: 6, Shuige Road, Jiangning, Nanjing, China
Tel: +86-25-52766666
Email:info@ceeg.cn
Zip: 211153

Group news

- CEEG becomes the certificated ...
- China Sunergy, China Electric ...
- Deepening China-Africa friends...
- China Sunergy (Nanjing) Co., L...
- The leaders from DuPont Co. Lt...
- CEEG will join hands with the ...

Contact Us

Sales Hotline:
+86-25-52095670-8022
(Transformer sales)
+86-25-52766666-6681/6683/6684 (PV)
Fax:86-25-52095816
E-mail:transformer@ceeg.cn

CEEG 中电电气 China Electric Equipment Group

Company 中文

News Downloads Contact us

Please call us
+86-25-52095670-8022 Transformer sales
+86-25-52766666-6681/6683/6684 PV

Home | Products | Solution | Services and Support | CEEG | Human Resource | Online quote

all

CEEG > Industry introduction > Solar Industry   Return

CEEG

- About CEEG
- **Industry introduction**
  - Power Transformers
  - Solar Industry
  - Power Electronics
  - Insulation Materials
- Awards
- Milestones
- Partners
- Video/Brochure
- Corporate Social Responsibility
- Corporate Culture

Solar Industry

- · CEEG(Nanjing) New Energy CO., Ltd
- · **CEEG (Jiangxi) Jingde Semiconductor New Materials CO., Ltd**
- · CEEG (Nanjing) Semiconductor Materials CO., Ltd
- · China Sunergy(Nanjing) Co., Ltd.
- · CEEG(Shanghai) Solar Science & Technology CO., Ltd
- · CEEG Solar Energy Research Institute Co., Ltd

CEEG (Jiangxi) Jingde Semiconductor New Materials CO., Ltd

CEEG (Jiangxi) Jingde Semiconductor New Materials CO., Ltd was set up in April, 2008,located in high technology industrial development zone in Jingdezhen, the Chinese city for thousands of years.

The company has a registered capital of 500 million RMB, integrating the Polycrystalline silicon's R&D, production and sale together. It has formed a complete photovoltaic industrial chain, including the poly silicon, pulling slice, solar cell, component and applicating system, with CEEG's other subordinate companies, which is an important strategic deployment for the CEEG to follow the national energetic developing policy, basing on the energy saving, environmental protection industry.

The company has introduced the first class technology and equipment, to manufacture the first class quality product. It adopts the third advanced generation of improved Siemens technology; it adopts the large flow and high deposition speed of large reduction furnace technology; it innovate the high-efficient circulating producing process; it uses the Siemens DSC control system; it introduces the American CDI tail gas recovery technology for the basic realization of zero emission standards. The product's quality is stable at the solar first-class; the purity is up to nine 9(99.9999999%), and the solar energy's level three product accounts for more than 98%.

CEEG (Jiangxi) Jingde Semiconductor New Materials CO., Ltd inherits the "foresight, creation, responsibility", the core value of CEEG, devoting to create the first class manufacturing plant of Polycrystalline silicon in China, even in the whole world.

products:

Polysilicon

Contact details:

Add: No. 6 Wutong Avenue, Jingdezhen High- and New-Tech Industrial Development Zone, Jiangxi, China
Tel: 0798-838500 0798-8389768
Zip: 333000

Group news

- CEEG becomes the certificated ...
- China Sunergy, China Electric ...
- Deepening China-Africa friends...
- China Sunergy (Nanjing) Co., L...
- The leaders from DuPont Co. Lt...
- CEEG will join hands with the ...

Contact Us

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+86-25-52095670-8022
(Transformer sales)
+86-25-52766666-6681/6683/6684 (PV)
Fax:86-25-52095816
E-mail:transformer@ceeg.cn

weibo | Home | Sitemap | Legal Statement

EXHIBIT 35

The brand in vietnam

Location： Home->Company->Boviet Solar

About Us

Boviet Solar Technology Co., Ltd. which focuses on solar cell and panel manufacturing, is located in Bac Giang, Vietnam and covers an area of 70,000 square meters. Boviet Solar, of which the registered capital is over 50 million US dollars, has 700 employees in the factory. With 200MW annual production capacity in the1st Phase, Boviet now is the largest PV manufacturer in Vietnam.

Boviet acquires excellent R&D, production, marketing and QC teams and brings in the world's leading solar cell and module production lines and inspection facilities from Germany and Spain. Our products include monocrystalline and polycrystalline series modules with various solutions; besides, Boviet modules are credited with properties of high conversion efficiency, high stability and reliability.

Our aim is "Innovate technology, infinite energy". We hope to promote the future of green energy through continuous technology innovation.

Production Facilities

If you have any question, please contact us.We will reply as soon as possible.

Certificate

English | Deutsch | Vietnamese

BOVIET

The brand in vietnam

HOME | COMPANY | PRODUCTS | NEWS | CONTACT

News

MORE

Boviet Solar State-of-the-art Solar Panels R...

San José, Calif., USA., May 26, 2021 — Boviet Solar Technology Co. Ltd., (the "Company", or "Boviet Solar"), one of the world's m...

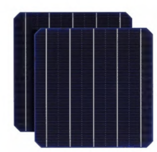
- Boviet Solar State-of-the-art Solar Panels Rated Top Performer in 2021
- Boviet Solar was ranked as Top Performer by PVEL/DNV GL in 2020
- Boviet Solar was ranked as Top Performer

Products

MORE


Shingled Module


Mono Perc


Solar Cell


Solar Cell

About Us

MORE

Boviet Solar is a Tier 1 integrated solar cell and module manufacturer with 1,5GW annual production capacity, equipped with highy automatic production lines. Boviet is also an investor for solar projects worldwide.

Boviet acquires excellent R&D, production, marketing and QC teams and brings in the highly automatic solar cell and module production lines and inspection facilities fromGermany, Spain, Japan and China. Our products include high efficiency monocrystalline and polycrystalline modules, including half-cut cell modules, double glass modules and shingled cell modules which are certified by CE, TUV, ETL, UL, MCS., etc. Boviet modules passed the 3rd party reliable tests and were ranked as Top Performer in PV Module Reliability Scorecard by PVEL/DNV GL . Boviet Solar solar panels are mainly delivered to North America, Europe and other markets.

Our aim is "Innovate technology, infinite energy". We hope to promote the future of green energy through continuous technology innovation.

Production base

Add: B5, B6, Song Khe Industrial Zone, Noi Hoang District Bac Giang Province, Vietnam.
Tel: 0084-240-3766288
Fax: 0084-240-3766288
E-mail: support@boviet.com

Marketing & Sales

Add: No.1777,Eastern Section, Yinzhou Avenue,Ningbo.
P.C.:315137
Tel: 0086-574-82829336
Fax:0086-574-82829292
E-mail: marketing@boviet.com; kevin.shen@boviet.com

About Us | Contact Us | Sitemap

EXHIBIT 36

Ningbo Boway Alloy Material Co Ltd

601137.ss

LATEST TRADE	CHANGE	VOLUME	TODAY'S RANGE
11.92 CNY	0.22 (+1.88%)	10,635,711	11.56 - 12.05

52 WEEK RANGE
9.10 - 17.90

As of 3:00 AM EDT Jul 09 on the Shanghai Stock Exchange · Minimum 15 minute delay

Profile News Key Developments Charts People Financials Key Metrics Events All

Advanced Charting ›

Previous Close	11.70
Open	11.64
Volume	10,635,711
3M AVG Volume	127.84
Today's High	12.05
Today's Low	11.56
52 Week High	17.90
52 Week Low	9.10
Shares Out (MIL)	777.33
Market Cap (MIL)	9,417.34
Forward P/E	16.80
Dividend (Yield %)	1.43

Latest Developments

More ›

22 days ago

Ningbo Boway Alloy Material Says 337 Probe Will Not Have Material Impact To Operations

3 months ago

Ningbo Boway Alloy Material's Board Elects Chairman

6 months ago

Ningbo Boway Alloy Material Plans To Buy Back Company Shares

Key Stats

1.25 mean rating - 4 analysts

SELL HOLD BUY

REVENUE (MM, CNY)

2018	2019	2020	2021(E)
6.1K	7.6K	7.6K	9.6K

EPS (CNY)

2018	2019	2020	2021(E)
0.540	0.640	0.570	0.725

Price To Earnings (TTM)	18.38
Price To Sales (TTM)	1.21
Price To Book (MRQ)	1.76
Price To Cash Flow (TTM)	--
Total Debt To Equity (MRQ)	62.34
LT Debt To Equity (MRQ)	6.06
Return On Investment (TTM)	7.56
Return On Equity (TTM)	4.79

About Ningbo Boway Alloy Material Co Ltd

NINGBO BOWAY ALLOY MATERIAL COMPANY LIMITED is a China-based company principally involved in the research, development, manufacture and sales of new materials and international new energy. The Company operates through two main segments. The New Materials segment is mainly involved in the research, development, manufacture and sales of non-ferrous alloy rod and wire materials. The International New Energy segment is involved in the research, development, manufacture and sales of solar cells and components. The main products include polysilicon, monocrystalline silicon cells and components.

products include polysilicon, monocrystalline silicon cells and components.

INDUSTRY

Metal Mining

CONTACT INFO

Taiping Bridge

Yunlong Town, Yinzhou District
NINGBO, ZHJ
315135
China

+86.574.82829383
https://www.bowayalloy.com/

EXECUTIVE LEADERSHIP

Shicai Xie
Chairman of the Board

Ming Zhang

President, Director

Xianbang Wang
Chief Financial Officer

Jihua Cai
Chief Engineer

Yongsheng Wang
Secretary of the Board, Director

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EXHIBIT 37

GET STARTED (/PRODUCTS/FREE-CONSULTATION/) | STOCK CODE: 601137

THE COMPANY · WHY BOVIET · PRODUCTS (HTTPS://WWW.BOVIETSOLARUSA.COM/PRODUCTS/)

· DOWNLOADS (HTTPS://WWW.BOVIETSOLARUSA.COM/DOWNLOADS/)

· CONTACT US (HTTPS://WWW.BOVIETSOLARUSA.COM/CONTACT-US/)

We Scour the Earth to Maximize the Sun

Boviet Solar USA, sources the world for top quality solar components. Just as scale is no barrier, neither is geography. Engineering from Germany; backsheet from Japan; wafer and glass from China; manufacturing in Vietnam.

WAFER

Our high-quality silicon wafers come from one of the largest photovoltaic material manufacturers.

GLASS

A highly recognized industrial supplier manufactures glass for Boviet's modules that has high light transmittance, stability, flatness and strength.

BACKSHEET

We use backsheet which maximizes the properties of aluminum to improve reliability and weather resistance.

EVA

Our EVA film was developed over a 10-year period to improve module efficiency and is PID-free.

FRAMING

An industry leading supplier designs and manufactures our aluminum frame and mounting components.

Potential Customers

Want to know more? Submit product inquiries, sales questions or general queries here:

More information (https://www.bovietsolarusa.com/contact-us/)

Existing Customers

For warranty or replacement-related issues, please contact our technical service representative directly or submit a Warranty Claim using the following link:

More information (https://www.bovietsolarusa.com/contact-us/)

Get Started

Let's talk about how Boviet Solar USA can help you more precisely – and quickly – serve your customers without sacrificing quality.

More information (https://www.bovietsolarusa.com/free-consultation/)

Boviet

About us (https://www.bovietsolarusa.com/the-company/about-us/)
Product Origins (https://www.bovietsolarusa.com/why-boviet/product-origins/)
Our Manufacturing Process (https://www.bovietsolarusa.com/why-boviet/our-manufacturing-process/)
Our Technologies (https://www.bovietsolarusa.com/why-boviet/our-technologies/)
Case Studies (https://www.bovietsolarusa.com/products/case-studies/)
Downloads (https://www.bovietsolarusa.com/downloads/)

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Locations (https://www.bovietsolarusa.com/locations/)
Sign Up Now (https://www.bovietsolarusa.com/locations/free-consultation/)
What's New (https://www.bovietsolarusa.com/press/)

Press

Boviet Solar State-of-the-art Solar Panels Rated Top Performer in 2021 PVEL Scorecard 3rd Year in a R...
2017 Solar Job Boom Reveals Mainstream U.S. Industry (https://www.bovietsolarusa.com/2017-solar-jo...
Boviet Solar USA Celebrates 30th Anniversary of Parent Company Powerway Group (https://www.boviet...
How innovators are uniting energy, economics, and adoption. (https://www.bovietsolarusa.com/innovat...
The Key to Solar Integration is Modernization (https://www.bovietsolarusa.com/key-solar-integration...

Social Media

Facebook (https://www.facebook.com/Boviet-Solar-USA-535179819972751/)
Linkedin (https://www.linkedin.com/company/boviet-solar-usa)
Twitter (https://twitter.com/Boviet_Solar)
Google+ (https://plus.google.com/108339594295635633909)
YouTube (https://www.youtube.com/channel/UCf2rAh9iPvboasSJ261iGDw)

Newsletter

Email SEND

Terms & Conditions (https://www.bovietsolarusa.com/terms-conditions/) ·
Privacy (https://www.bovietsolarusa.com/privacy/)

EXHIBIT 38

GCL New Energy Holdings Limited
協鑫新能源控股有限公司

(Incorporated in Bermuda with limited liability) (Stock Code: 451)

Bringing Green Power to Life

2020
Annual Report

About GCL New Energy

GCL New Energy Holdings Limited is a new energy company focusing on solar power generation, and the world's leading polysilicon producer and wafer supplier, GCL-Poly Energy Holdings Limited (3800.HK) holds 53.3% of its equity interests.

GCL New Energy has become a solar power generation company with strong development and research capabilities as well as intelligent operations for facilitating the establishment of new electricity system with focus on new energy since the development of its solar power generation business. Since 2018, GCL New Energy has been proactively promoting the asset-light strategic transformation, striving to seize the prominent development opportunities brought by the domestic energy transformation, and taking the role as a practitioner and promoter of "Bringing Green Power to Life".

As of 31 December 2020, GCL New Energy operated 157 subsidiary solar power plants across 24 provinces in China, together with 2 solar power plants in the US, the total installed capacity was approximately 5.0GW. GCL New Energy continues to enhance the technologies for the operation, maintenance and management of its solar power plants and was awarded as the country's first "5A" certified operation and maintenance service unit in early 2020 with its operation and management outsourcing services to become increasingly mature.

Forward-looking statements contained in this Annual Report relating to the forecast business plans, prospects, financial forecasting, and growth strategies of the Group. These forward-looking statements are based on current beliefs, expectations, assumptions and premises regarding the industry and market in which it operates, some of which are subjective or beyond our control. Underlying these forward-looking statements is a large number of risks and uncertainties and may not be realised in future. In light of the risks and uncertainties, the inclusion of forward-looking statements in this Annual Report should not be regarded as representations by the Board or the Company that the plans and objectives will be achieved, and investors should not place undue reliance on such forward-looking statements.

EXHIBIT 39

About GCL-Poly

Company Profile

About Us

History & Milestones

Awards & Recognition

Corporate Governance

CSR

Cultural Philosophy

Nav: > EN > ABOUT GCL-POLY > COMPANY PROFILE > ABOUT US

About Us

GCL-Poly Energy Holdings Limited was founded in Hong Kong in October 2006, listed in November 2007 (3800.HK), included in the Hang Seng Composite Index and the HSML 100 Index in 2010, and put on the Forbes Global 2000 list in May 2012. The company is based in Hong Kong with administrative centers in Suzhou and Xuzhou; representative and branch offices in Xinjiang, Yangzhou, Changzhou, Wuxi, Funing, Ningxia, Sichuan, Beijing, and Taipei; and R&D centers in San Francisco, the Suzhou Industrial Park, and Xuzhou.
With "bringing green energy to life" as its mission, GCL-Poly is a globally leading developer and manufacturer of high-efficiency PV materials. It has a firm hold on the direction of development of these materials, consistently maintaining its position as a trailblazer in the areas of polysilicon and silicon wafer technology.

Since being founded, GCL-Poly has been market-oriented and professional. It began operations with the technology-intensive material of polysilicon and gradually expanded to the downstream aspects of silicon ingots and wafers to complete its product structure. The company uses GCL Group's massive-scale, industry-leading polysilicon production technique and has won a China Patent Award. Its silane-based fluidized-bed technology is protected with proprietary intellectual property rights. Moreover, its self-developed wet-method black silicon technology has driven the market in a high-efficiency, low-cost direction.

GCL-Poly has accomplished much in the area of PV materials, devoting itself to the industrial application of such cutting-edge technologies as those of cast mono ingots and black silicon. GCL-Poly's GCL Cast Mono cells are a result of the company's many outstanding achievements: low production costs, a high conversion efficiency rate, low light attenuation, and flexibility in size, all of which satisfy demands for custom projects and allow for more centralized resistivity distribution and high-adaptivity PERC cell production technology. These achievements have been strongly affirmed by the market.

GCL-Poly views its personnel as its most important resource. Its development team boasts the best experts and professionals in the PV field. The team leadership is composed of Chinese and foreign experts. Its backbone consists of young scholars with backgrounds rich in research experience abroad. In addition, experts with master's degrees and PhDs serve as a strong pillar of support. Our patents cover each major aspect of our polysilicon production process, forming a complete system of intellectual property protection. In addition, we have intelligent production plants and are exploring Industry 4.0 production modes. GCL-Poly subsidiary Jiangsu Zhongneng has been rated as a new high-tech company at the national level, an innovative enterprise of Jiangsu, and a new-energy industry base with special features for China's Torch Program.

GCL-Poly is actively responding to General Secretary Xi Jinping's "four revolutions and one cooperation" new strategy for safe energy. The company has always placed importance on energy technology innovation, energy conservation, and emissions reduction so as to lower energy consumption per unit of production for the PV manufacturing process while boosting production technology and the product conversion efficiency rate, which will in turn drive the entire industry's advancement. As a PV-industry enterprise that has experienced technological advancement, industrial upgrading, market evolution, and a reshaping of the industry structure, GCL-Poly will embrace a new era of development with even greater strength and in a healthier, more ordered manner.

About GCL-Poly
- Company Profile
- CSR
- Cultural Philosophy

News center
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- GCL-Poly in the media
- Industry trends
- Glossary

PV products
- PV silicon
- Si particles
- PV silicon wafers

Research & Development
- Cutting-edge technology
- R&D team

Relationship
- Investment in GCL-Poly
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- Stock Information
- Announcements & Circulars
- Lost share certificates notice
- Contact Share Registrar

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- jobs
- Contact us

Website map Contact us Privacy clause

Mail：ir@gcl-power.com.hk
TEL：0516-123456789
ADD：No. 88, Yangshan Road, Xuzhou Economic Development Zone Jiangsu Province

Cn | Tw

Home | About us | News center | PV products | Research & Development | Investor Relationship | Contac

Research & Development

Cutting-edge technology

R&D team

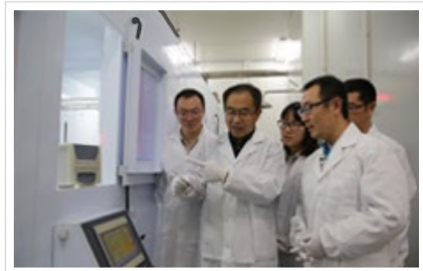
Nav: > EN > TECHNOLOGICAL INNOVATION > R&D TEAM

R&D team

R&D Center

oSuzhou GCL Industrial Application Research Institute

oPolysilicon Technology R & D Center



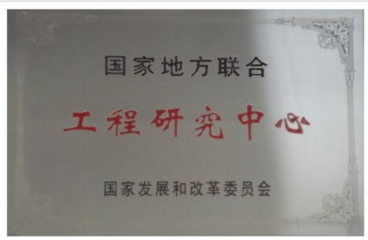
oSlicing Technology R & D Center

oGCL Software Control Equipment Research Center

oSolar Material R & D Center

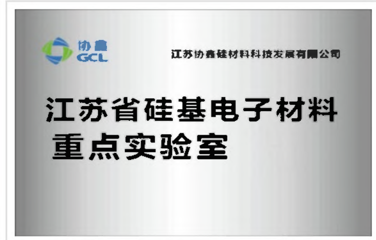
R&D Team

GCL-Poly's scientific research team has the most outstanding photovoltaic experts and scholars, and has formed a three-level technical talent echelon，including Chinese and foreign experts as technology leaders, young scholars with profound overseas research background as backbone, and PhD and master graduates from famous universities as reserve force. GCL-Poly will also continue to attract first-class talents worldwide, commit to building a world-class R&D team, attach importance to the introduction and training of various R&D personnel, and build a broad platform for the growth and development of R&D personnel.

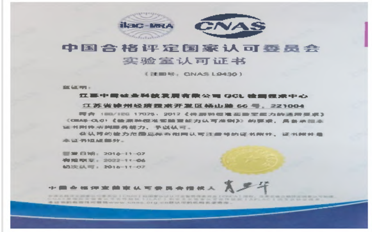


oNational and Local Joint Engineering Research Center for Advanced Silicon Material Preparation Technology

oNational Postdoctoral Research Station



oJiangsu Provincial Key Laboratory of Silicon-based Electronic Materials



oJiangsu Provincial Academician Workstation

oCNAS Certified GCL Testing Technology Center

Other technical centers are as follows: Provincial Quartz Crucible Engineering Research Center

Provincial Hydrochlorination Technology Engineering Center

Provincial Polysilicon Material Engineering Technology Research Center

Provincial Polycrystalline Black Wafer Engineering Technology Research Center

Provincial Square Silicon Core Engineering Technology Research Center

Technical achievements

GCL-Poly has filed more than 1,100 invention and utility model patents, including more than 650 granted patents, involving FBR granular silicon, improved Siemens polysilicon production method, high-efficiency polycrystalline silicon wafer, cast-mono, CCz, silicon wafer slicing process, MCCE and other technical fields. So many important granted patents has provided strong support for GCL's independent intellectual property, of which related R&D achievements have won two Chinese patent awards and four Jiangsu science and technology awards.

Technical communication

GCL-Poly has established and maintained long-term and stable cooperative relationships with international and domestic first-class universities and research institutions. Through the extensive communication and cooperation, our company will always maintain the vitality of innovation.

Our friendly communication and cooperation partners are as follows:

Chinese Academy of

Stanford University

Leuven University

Kyushu University

Southeast University

About GCL-Poly

- Company Profile
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News center

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- PV silicon
- Si particles
- PV silicon wafers

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Contact Us

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Website map Contact us Privacy clause

Mail: ir@gcl-power.com.hk

TEL: 0516-123456789

ADD: No. 88, Yangshan Road, Xuzhou Economic Development Zone Jiangsu Province

EXHIBIT 40

GCL-SI Starts Operation of 600MW Solar Cell Plant in Vietnam

Published on 1 Aug 2017

GCL System Integration Technology Co., Ltd. (GCL-SI) announced that its solar cell plant of 600MW production capacity in Vietnam has started operation on 27th July.

"GCL's high-efficiency PERC production line in Vietnam, based on the localized management, will offer a strong support to the high-efficient cell supply and contribute to cost-down as well as voiding anti-dumping issues," Shu Hua, the president of GCL-S noted.

Dong Shuguang, executive director of GCL-SI said, "the company has been working on improving the efficiency of Polysilicon PERC products in the recent years. By the beginning of 2017, it has achieved an average efficiency of 20.3% for Black Silicon PERC products. The result is estimated to surpass 20.5% by the end of 2017. The average power output for this model is close to 290W, completely meeting the latest standard of Top Runner. Besides, the cost in Vietnam has advantage compared with domestic, the products could be sent back to China to meet the domestic demand."

Source: GCL System Integration Technology Co., Ltd.
ENF Profiles For Companies Mentioned in This Article

GCLSI (Solar Components): https://www.enfsolar.com/gclsi
GCLSI (Solar Panels): https://www.enfsolar.com/gclsi

EXHIBIT 41

LONGi Lands Order for 1.31 Billion Mono-Si Wafers

published: 2019-07-19 14:42 | editor: et_editor | category: News

LONGi on July 16 announced that it has inked contracts with the Vietnamese PV Cell manufacturer Vina Solai
which is valued at US$540 million, is equivalent to 17% of the company's entire 2018 sales, according to the c

The contracts are valid from July 1, 2019 through December 31, 2021. The shipment volume is expected to re
stands at US$0.415/piece, which is higher than the official quote of US$0.405/ piece on the company's websit

Both the Chinese company and its customer will sign monthly sales orders during the contract period to deterr
help LONGi stabilize its business and expand its market share.

Keywords:

EXHIBIT 42

≡ LOGIN SUBSCRIBE (HTTPS://WWW.PV-TECH.ORG/PV-TECH-PREMIUM/)

PVTECH (https://www.pv-tech.org)

Search ...

NEWS (HTTPS://WWW.PV-TECH.ORG/CATEGORY/NEWS/)

LONGi secures major polysilicon supply deal from OCI Malaysia and 46GW of solar glass from Flat Glass

By Mark Osborne (https://www.pv-tech.org/author/markosborne/)

February 10, 2021

Companies (https://www.pv-tech.org/industry-segments/companies/), Fab & Facilities (https://www.pv-tech.org/industry-segments/fab-facilities/), Financial & Legal (https://www.pv-tech.org/industry-segments/financial-legal/), Manufacturing (https://www.pv-tech.org/industry-segments/manufacturing/), Markets & Finance (https://www.pv-tech.org/industry-segments/markets-finance/), Materials (https://www.pv-tech.org/industry-segments/materials/), Modules (https://www.pv-tech.org/industry-segments/modules/)

Asia & Oceania (https://www.pv-tech.org/regions/asia-oceania/)

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LinkedIn
Reddit
Email

Leading monocrystalline wafer producer LONGi Green Energy has signed a three-year high-purity polysilicon supply deal from OCI Malaysia, while securing 46GW of PV glass from China's Flat Glass Co.

The deal with FLat will lock in glass availability for LONGi Solar's module assembly plants.

According to the agreement, the material procurement starts from March 2021, will run through to the end of 2024 and is worth approximately RMB6.36 billion (US$ 988.2 million), based on current ASPs of RMB92,500/MT (US$14,373.84).

LONGi has been securing a number of key polysilicon supply contracts due to polysilicon capacity constraints in China and the expanding customer demand for p-type mono wafers.

LONGi subsidiary and major 'Solar Module Super League' (SMSL) member LONGi Solar has targets of shipping around 45GW of PV modules in 2021.

46GW solar flat glass contract

LONGi Solar has also announced a new solar flat glass procurement contract with Flat Glass Group, securing front glass (3.2mm thickness) and rear glass (2.0mm thickness) capable of supporting 46GW of PV module production between 2022 to the end of 2023, worth approximately RMB10.4 billion (US$1.62 billion).

The glass supply is for LONGi Solar's 13 module assembly subsidiaries, including operations in Vietnam.

Solar glass has been in short supply since the second-half of 2020, due to Chinese government restrictions on new capacity expansions, due to general building glass overcapacity of around 30%, compared to demand.

However, restrictions were lifted specifically for solar specific glass sizes and thicknesses, due to the chronic shortages that limited PV module shipments since. New capacity is expected to come on-stream later in 2021 and beyond to meet growing demand and reduce ASPs which have led to profit margin decline for a number of PV module manufacturers.

flat glass co (https://www.pv-tech.org/tag/flat-glass-co/), longi solar (https://www.pv-tech.org/tag/longi-solar/), longii green energy technology (https://www.pv-tech.org/tag/longii-green-energy-technology/), oci company (https://www.pv-tech.org/tag/oci-company/), polysilicon (https://www.pv-tech.org/tag/polysilicon/), polysilicon pricing (https://www.pv-tech.org/tag/polysilicon-pricing/), polysilicon production (https://www.pv-tech.org/tag/polysilicon-production/), solar flat glass (https://www.pv-tech.org/tag/solar-flat-glass/)

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PV Tech Premium

Tackling solar's polysilicon crisis, part two: No blind price cuts, technology is king and collaborate to reduce waste (https://www.pv-tech.org/tackling-solars-polysilicon-crisis-part-two-no-blind-price-cuts-technology-is-king-and-collaborate-to-reduce-waste/)

June 10, 2021

In the second part of a two-part feature on the solar industry's response to polysilicon price increases, Carrie Xiao hears from industry leaders about the importance of technology innovation, efforts to reduce waste and the need to avoid cutting prices blindly just to appease customers.

EXHIBIT 43

ENTIRE EXHIBIT NOT CAPABLE OF PUBLIC SUMMARY

EXHIBIT 44

NEWS (HTTPS://WWW.PV-TECH.ORG/CATEGORY/NEWS/)

LONGi details plans for Vina Solar after recent acquisition deal

By Mark Osborne (https://www.pv-tech.org/author/markosborne/)

March 4, 2020

Cell Processing (https://www.pv-tech.org/industry-segments/cell-processing/), Companies (https://www.pv-tech.org/industry-segments/companies/), Fab & Facilities (https://www.pv-tech.org/industry-segments/fab-facilities/), Financial & Legal (https://www.pv-tech.org/industry-segments/financial-legal/), Manufacturing (https://www.pv-tech.org/industry-segments/manufacturing/), Markets & Finance (https://www.pv-tech.org/industry-segments/markets-finance/), Materials (https://www.pv-tech.org/industry-segments/materials/),

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Leading monocrystalline wafer producer, LONGi Green Energy has provided greater insight into its plans for Vietnam-based PV manufacturer, Vina Solar after the acquisition is completed, including ambitions for a central manufacturing hub to target significant expansion of non-tariff module shipments to the US and India.

In an investor conference call, after announcing the recent planned acquisition of Vina Solar (https://www.pv-tech.org/news/longi-solar-strikes-deal-to-buy-vietnam-based-oem-vina-solar) for RMB 1.78 billion (US$253 million), LONGi said that the OEM or foundry business model Vina Solar was based on would be kept in place for at the least the next few years, due to around 70% of solar cell and module assembly capacity having already been secured by existing customers, primarily key 'Solar Module Super League' (SMSL) members such as JinkoSolar, JA Solar and Canadian Solar.

LONGi said that Vina Solar had 3GW of primarily p-Type PERC solar cell capacity and 7GW of module assembly capacity, with an unspecified capacity to handle larger wafer sizes and half cut cells.

The business was also said to be operating at a profit, with net profit in the first nine months of 2019 reaching RMB 248 million (US$35.8 million). Vina Solar was said to have strong pre-bookings through 2020 and 2021, primarily for the US market. Vietnam has not been included in two US tariff rounds.

Vina Solar is also a major supplier of modules, either own-branded or OEM in the Vietnam market, which has rapidly become a major South East market. LONGi said Vina Solar's market share in Vietnam was over 50%.

LONGi's ambitions

LONGi management said that the Vina Solar acquisition provided the fastest route to key large markets, notably the US as its only current overseas manufacturing operations were in Malaysia with limited capacity and limited capacity to expand.

Although the initial priority it to continue to serve the OEM business and customers, many are also customers of LONGi, the company is expected to update cell and module lines to align with its SMSL subsidiary, LONGi Solar's PERC cell conversion efficiencies and module options. Vina Solar was said to have similar basic PERC cell technology with LONGi Solar.

The key reason for the acquisition was to further expand capacity for overseas markets that have accounted for around 60% of LONGi Solar's module shipments in 2019 and for 2020 and beyond. With many markets expected to be above 1GW as well as the US market expected to install well over 20GW per annum over the next few years, LONGi requires a new large overseas manufacturing hub. LONGi Solar is targeting around 3GW of module shipments to the US in 2020, management said in the conference call.

The Vina Solar acquisition is also being treated separately to the current capacity expansion plans that have been announced this year in China. The China-based expansion plans are unaffected by the Vina Solar acquisition.

breakthroughs boost efficiency and energy yield for large scale PV (https://app.livestorm.co/solar-media/longis-hi-mo-n-n-type-topcon-breakthroughs-boost-efficiency-and-energy-yield-for-large-scale-pv?utm_source=pvtech&utm_medium=event-listings)

28 July 2021

LONGi has launched its Hi-MO N module, the company's first bifacial module with N-type TOPCon cells, designed to deliver ultra- high value and lower LCOE to utility-scale PV power plants. This PV TechTalk Product Series webinar will provide an overview of the module's technology and how the introduction of n-type technologies will provide efficiency and performance gains for solar project developers.

c-si manufacturing (https://www.pv-tech.org/tag/csi-manufacturing/), china (https://www.pv-tech.org/tag/china/), longi green energy technology (https://www.pv-tech.org/tag/longi-green-energy-technology/), longi solar (https://www.pv-tech.org/tag/longi-solar/), monocrystalline wafer (https://www.pv-tech.org/tag/monocrystalline-wafer/), perc (https://www.pv-tech.org/tag/perc/), pv modules (https://www.pv-tech.org/tag/pv-modules/), solar cell (https://www.pv-tech.org/tag/solar-cell/), vietnam (https://www.pv-tech.org/tag/vietnam/), vina solar (https://www.pv-tech.org/tag/vina-solar/)

EXHIBIT 45

JinKO Solar

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Global Presence

9+

Global Factories

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Covered Countries

Jinkosolar Worldwide Offices

Worldwide Region

Jinko Solar Global Sales & Marketing Center

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EXHIBIT 46

Companies

Hong Kong firm invests $498-mln in Vietnam solar cell plant

By **Hoang Phong** April 2, 2021 | 09:38 am GMT+7

Quang Yen coastal economic zone is seen from above. Photo by VnExpress/Minh Cuong.

Hong Kong-based Jinko Solar Technology Ltd has received an investment license for a $498 million photovoltaic cell plant in Quang Ninh.

This is the first investment project to be granted a license in the Quang Yen coastal economic zone since the government decided to establish the area last year.

Work on the plant covering 32.6 hectares at the Song Khoai industrial park in Quang Yen Town is scheduled to start late this month.

It is expected to begin operations this October, creating more than 2,000 jobs for local workers. The plant expects to earn nearly $1.3 billion in annual revenues.

Jinko Solar is one of the largest and most advanced manufacturers of solar panels in the world, holding 12.6 percent of the global market share.

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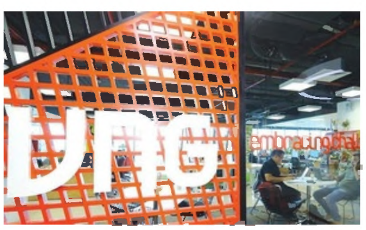


EXHIBIT 47

NEWS (HTTPS://WWW.PV-TECH.ORG/CATEGORY/NEWS/)

JA Solar secures finance for 1.5GW wafer facility in Vietnam

By John Parnell (https://www.pv-tech.org/author/johnparnell/)

July 11, 2018

Fab & Facilities (https://www.pv-tech.org/industry-segments/fab-facilities/), Manufacturing (https://www.pv-tech.org/industry-segments/manufacturing/)

Asia & Oceania (https://www.pv-tech.org/regions/asia-oceania/), Southeast Asia (https://www.pv-tech.org/regions/southeast-asia/), Southeast Asia & Oceania (https://www.pv-tech.org/regions/southeast-asia-oceania/)

JA Solar has closed financing for the equipment at a 1.5GW wafer plant in Vietnam.

The company has secured a US$68.4 million loan, with a seven-year term, from China Minsheng Bank.

The finance will be provided to JA Solar (https://www.pv-tech.org/tags/ja+solar) Vietnam with a guarantee from the parent company.

The company's annual report claimed that 500MW of capacity at the Vietnam facility would be up and running by the end of 2018. As of the end of 2017, the company had wafer capacity of 2.7GW, 6.5GW of cell and 7GW of module capacity.

EXHIBIT 48

THE AMERICAN PROSPECT IDEAS, POLITICS & POWER

The Case for Taking Back Solar

Installing a lot more solar is part of the path to clean, renewable energy. But we also need to be producing the entire supply chain.

BY JOAN FITZGERALD MARCH 24, 2021

FEATURECHINA

A Chinese worker assembles solar panels in Jiangxi province. The U.S. cannot preference its domestic solar manufacturers without rebuffing the World Trade Organization.

Solar has been the fastest-growing source of electric power in the United States for several years. The cost of energy produced by solar photovoltaic panels declined by 82 percent between 2010 and 2019 and became cheaper than coal and natural gas in 2018. Solar now comprises 3 percent of total electricity generation, totaling 43 percent of new generating capacity in 2020. But almost all of the panels and their component parts are made in China. That has to change.

We need to re-create a solar panel manufacturing industry for national-security, economic, environmental, and ethical reasons. Building a solar manufacturing industry will require changes in our current trade policy, as well as coordinated procurement to require a domestic solar supply chain, and R&D support for accelerating the development of more efficient panels. These interconnected elements also need to be linked to job training and placement for people with employment barriers and those losing their jobs in the transition from renewable to fossil fuel industry jobs.

More from Joan Fitzgerald

The United States employs about 250,000 workers in the solar industry—about 162,000 in installation and 34,423 in manufacturing. The remainder are in operations and maintenance and other supportive jobs. If we combine a strategy to transition to renewables with one to build a domestic solar industry and supply chain, employment could increase dramatically. A ten-gigawatt increase in production would add 62,500 direct and 75,000 total manufacturing jobs and would increase installation employment as well.

But China currently dominates in manufacturing all components of solar modules. A solar module begins with refined and melted polysilicon. A hair-thin wafer of the polysilicon forms the basis of a solar cell, which converts light energy to electricity. There are several types of cell structures, the most common being single cell (monocrystalline) and polycrystalline, which is used in what are called thin-film solar panels because they are built from flexible materials. China dominates in the production of each element—the refined silicon, the wafers, the cells, and the completed module enclosed in glass and metal or all glass (bifacial panels).

China's Shady Solar Strategy

China has a long-term strategic vision for dominating essential industries—and solar is one of them. In 2016, I wrote in the *Prospect* about how China used a combination of subsidies and free land to attract U.S. solar companies. They stipulated, however, that they couldn't sell their products in China, which violated free-trade principles and the promises China made to other WTO countries in its WTO accession protocols, but the U.S. government did not make an issue of it and many U.S. companies found it to be an offer they couldn't refuse.

China started developing its own solar industry and dumped products on the world market at below-cost prices—something that also violates trade law. By 2011, prices began falling dramatically and many U.S. and German producers couldn't compete. Now, China produces 75 percent of solar modules globally.

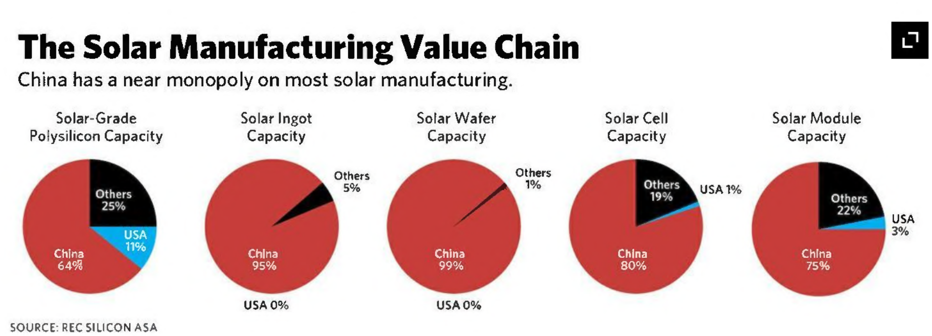
It's a similar story with polysilicon. The U.S. was the world's leader in polysilicon production until China used similar policies to gain dominance. A polysilicon plant uses an energy-intensive process that refines metallurgical-grade silicon to the high purity levels needed for solar cells and semiconductors. Although it took China a while to develop the manufacturing knowledge to be competitive, once it did the industry took off. In 2017, China imposed stiff tariffs on American and South Korean polysilicon, which meant the growing Chinese solar panel production sector had to use domestic polysilicon.

Investment and tariffs have been effective—China's polysilicon industry, all of it in western China, has grown 27-fold in the past ten years. Since 2017, 91 percent of new capacity worldwide has been in China. Two-thirds of the world's polysilicon market will be controlled by five companies in China and Hong Kong by 2021.

And it's the same story with wafers and cells. The U.S. currently has almost no production capacity for cells, while China produces 80 percent of the world's output. In 2020, China accounted for 99 percent of global wafer production, 80 percent of global cell production, and 75 percent of global module production—all substantial increases over its market share in 2010.

A March 2020 U.S. International Trade Commission report estimates that U.S. cell production dropped 75 percent between 2016 and 2018. U.S. cell imports jumped from 308 megawatts from January–June 2018 to 951 megawatts during that same period in 2019, an increase that coincided with the ramping up of new domestic module manufacturing.

Many U.S. states, cities, companies, and individuals are installing solar to avoid carbon emissions. They would be surprised to know that the majority of the solar panels installed in the United States come from dirty coal–fired factories and that some components of their panels are made with forced labor.



SOURCE: REC SILICON ASA

About 45 percent of the world's solar-quality polysilicon is produced in the Xinjiang region of China. Transforming silica into silicon for solar panels is an energy-intensive process that relies on electricity produced from dirty coal. Further, some manufacturers in western China have been accused of dumping toxic wastewater produced in the process into rivers. These practices produce significant air and water pollution that affects agricultural production and human health in the central and western regions of China where it is commonly produced.

The Australian Strategic Policy Institute has documented detention, re-education, and forced labor of Muslims in the Xinjiang region, where many inputs to solar panels are produced. A 2021 Horizon Advisory report names Chinese solar giants Daqo New Energy, East Hope Group, GCL-Poly, and Jinko Solar among the companies in the Xinjiang region using forced labor.

These companies are still exporting to the United States. American law bans importation of goods produced with forced labor, and there is considerable evidence that many of these goods make their way into the solar supply chain. The U.S. has banned cotton and tomato imports from the region and placed restrictions on hair products and computer inputs from Xinjiang, but to date, not polysilicon or other components of solar panels produced in the region.

The China Photovoltaic Industry Association not only denies the use of forced labor in the industry but uses threatening language to warn against restricting imports: "We also solemnly tell some American association and companies that if they intend to use this as an excuse to restrict and suppress relevant parties and companies in China, interfere with normal business cooperation and competition, and seek personal gain from it, they will not only violate international trade rules and market economic principles, but also destroy them."

U.S. Solar Policy: Fits and Starts

In dramatic contrast with China's policy for supporting every element of the solar production industry, U.S. policy has been scattershot. Rather than engage in long-term industrial planning, the main federal approach to support the solar industry has been tax credits, offered intermittently, while the Department of Energy has funded research and the government intermittently has subsidized some production and installation.

At the state and municipal level, we have a hodgepodge of renewable mandates and subsidies focused on installation. The main policy instrument is the renewable portfolio standard (RPS), which requires utilities to purchase a set percentage of their power from renewable sources by a set date. Currently, 38 states plus Washington, D.C., have an RPS (or similar program). While state subsidies have supported the record-breaking growth of solar energy deployment, they have done nothing to support manufacturing of solar components.

The American Recovery and Reinvestment Act (ARRA) of 2009 demonstrates the effectiveness of a direct federal subsidy of the clean-energy sector. Of its total investment of $840 billion, ARRA spent $92 billion on clean-energy technologies, including clean-energy generation, grid modernization, electric vehicles, transit, energy efficiency, and workforce training to support these industries.

To jump-start projects, the $25.7 billion invested for clean-energy generation paid developers 30 percent of their project costs in cash rather than as a tax credit between 2009 and 2015. Another $4.6 billion was provided for guaranteed loans to companies investing in renewable energy. Although Solyndra became the poster child for those arguing that the government can't pick winners, total interest payments to the government from the loans exceeded losses from loans by $30 million. The program invested in 183 projects, which leveraged private investment of nearly $5.4 billion. Of the 183 clean-energy projects, 58 went to solar equipment manufacturers, totaling $1.1 billion. Before the stimulus, solar provided less than 1 percent of the nation's electricity. As a result of the stimulus, solar more than doubled to 2.3 percent.

We need that scale of investment, and more, to expand domestic solar capacity. Currently, there are 21 solar panel manufacturers in the United States, 15 of which are American-based.

> "China has a long-term vision for dominating strategic industries—and solar is one of them.

Some existing U.S. companies demonstrate how to reclaim domestic supply chains by building on established regional competence. When Tempe, Arizona–based First Solar opened its first factory in Perrysburg Township, Ohio, in 2001, it was the country's largest solar panel manufacturer. It was part of a solar boom in the Toledo area, building off research at the University of Toledo and historical strength in glass technology and manufacturing. Eighteen years later, the company opened a second factory nearby to produce its new Series 6 line. Representing a cumulative investment of over $1 billion, the new factory expanded First Solar's domestic capacity to 1.9 gigawatts. This larger line of panels is designed for commercial, industrial, and utility-scale uses.

The new plant added about 500 jobs, with the company now employing approximately 1,450 employees at both Ohio factories. The factory was in production 18 months after breaking ground, illustrating how quickly the country could ramp up domestic production. The company has said that it will exit 2021 with 2.6 gigawatts of capacity in Ohio as a result of process improvements.

First Solar sources all of its inputs for its production in Ohio from a diverse range of suppliers that, notably, does not include companies in China. "We operate a diversified supply chain and, wherever possible, source domestically produced content," said Mike Koralewski, First Solar's chief manufacturing officer. "Solar manufacturing at scale is a significant job creator, but its real impact often gets lost in the narrow focus on jobs directly created on the factory floor. Our manufacturing operations in Ohio indirectly support as many as 7,000 supply-chain jobs across America."

First Solar's expansion motivated the NSG Group to build a $265 million specialty coated-glass plant nearby with about 70 percent of its production going to First Solar. The 511,000-square-foot facility employs 110 hourly workers and 40 in salaried positions. It's the first glass furnace to be built in the United States in four decades. NSG, in turn, sources materials such as soda ash from Wyoming and sand from Michigan.

The cadmium telluride (CdTe) based thin-film panels First Solar makes are the second-most prevalent type of solar panel after crystalline. They are comparable or better than crystalline panels, and because they don't use silicon they are easier and cheaper to produce and have a lower carbon footprint. The company also leads the industry internationally in providing recycling of its modules, which it has been doing for the past decade. Recycling recovers more than 90 percent of the CdTe from every module, which can be used repeatedly. First Solar is the only solar manufacturer to achieve the coveted EPEAT ecolabel of the Green Electronics Council for energy and water efficiency of the production process and use of recycled material.

First Solar is a member of the Ultra Low-Carbon Solar Alliance, launched in October 2020 with the goal of increasing market demand for solar panels manufactured with low embedded carbon. Its members include ten solar companies representing the full spectrum of the solar value chain.

The Alliance hopes to have a third-party-verified embodied-carbon-specific ecolabel intended to complement existing sustainable-product labels. To be certified, a solar module company and its suppliers have to submit to lifecycle analysis to disclose their embedded carbon emissions.

France already has a version of this certification in place, and the European Commission is considering a requirement that all PV modules include carbon footprint information.

A solar array in Palm Springs, California. China produces around three-quarters of solar modules globally.

Alliance Executive Director Michael Parr is talking to federal and state agencies and other large purchasers of solar to encourage a preference for modules with the ecolabel. The strategy does not violate trade agreement rules against preferencing domestic suppliers because any company is eligible to seek certification. An ecolabel will initially privilege U.S. and European producers since there's roughly twice as much embodied energy in Chinese modules, according to Parr. And it wouldn't raise the price of solar projects—more than 60 percent of the embodied carbon in a given project is in the polysilicon and wafer, which is only about 6 to 8 percent of its cost.

While preferencing certified ecolabel producers is one approach to building a clean domestic solar supply chain, we also need a combination of trade policy, procurement policy under Buy American, manufacturing tax credits, and continued research and development.

The Trade Policy Conundrum

Members of the World Trade Organization (WTO) agree not to discriminate among trading partners and to treat imported and locally produced goods equally. That means the U.S. can't give preference to domestically made renewable-energy products and also follow WTO rules. One or the other has to give.

Other nations have used targeted industrial policies, and have been the subject of complaints by—of all nations—China. (Do as I say, not as I do.) China actually won a major case in which the WTO ruled in its favor. In 2013, Japan and the European Union mostly won a case against Ontario for paying higher prices for solar energy from locally produced equipment. In 2016, the U.S. brought a case against India before the WTO for its buy-local provisions for cells and modules. India retaliated by bringing a case against eight U.S. states with solar subsidies and buy-local policies. The WTO ruled against the U.S. and required changes in the policies. But with Trump having refused to appoint WTO appellate judges, enforcement of rulings is effectively impossible.

Several manufacturing advocates told me that the U.S. should give preference to domestic solar despite the fact that it violates the WTO. It took two years after Japan and the EU brought the case against Ontario for the WTO disputes settlement mechanism to issue its first ruling. The party can then appeal the decision, and if still found in violation, the party can protest the sanctions. If sanctions are applied, they don't start retroactively from when the rule was broken, but only after the final decision has been rendered. All this assumes that the WTO has appellate-system judges to hear appeals. Last week, the Biden administration indicated that it would not appoint a judge, putting all trade cases on hold. At some point, the president will need to decide whether domestic industrial goals take priority over a badly flawed trading system that his predecessors of both parties have long promoted, at the expense of U.S. manufacturing.

> Our dependence on China for solar deployment is no less dire than our dependence on its semiconductors.

While deliberately violating WTO rules may seem extreme, our dependence on China for solar deployment is no less dire than our dependence on semiconductors, on which the Biden administration is beginning to act. Due to increased demand for computers and other tech products during the pandemic, along with Trump's banning imports from Chinese companies suspected of using semiconductor technology for spying, the nation is experiencing a shortage of semiconductors that are in many consumer goods. Because the industry is so vital to the U.S. economy, Biden is expected to sign an executive order soon to offer financial support to the industry. This same sense of urgency should apply to the solar supply chain.

The tariffs that the Trump administration placed on foreign solar modules, under Sec. 201 of the Trade Act, which allows retaliation against dumped imports, motivated three foreign producers (Hanwha Q Cells, Jinko, and LG) to open U.S. module plants in response to the tariffs. While the Solar Energy Industries Association (SEIA) claims the U.S. lost 62,000 jobs and $19 billion in investment due to the higher prices of solar modules resulting from these tariffs, these figures are misleading. In fact, Wood McKenzie counted 19 gigawatts of new solar capacity in 2020, a 43 percent increase from 2019.

The SEIA posture reflects the fact that it is more a creature of companies that install solar (which want low prices) than those committed to domestic manufacturing (which resist unfair Chinese-subsidized competition). Short term, there is a tension between the goal of installing more solar at the lowest possible price and the goal of expanding domestic production. But long term, if the U.S. can rebuild supply chains and domestic technological leadership, prices will keep falling.

Putting It All Together

One tool a president can use is the Buy American Act of 1933, which imposes domestic-production rules on federal procurement and federal grants to states and counties for procurement. Another is the Buy America Act (the two are often confused). The latter is a set of rules that apply to purchases of iron, steel, and manufactured goods used in Department of Transportation–funded infrastructure projects.

The Buy America rules for DOT spending haven't been committed under our free-trade agreements and don't allow waivers for trading partners that are signatories of free-trade agreements with the U.S., while the Buy American Act does. Currently, the WTO Agreement on Government Procurement (GPA) gives the other 47 countries in the agreement the same Buy America status as domestic producers. President Biden's Buy America executive order calls for renegotiating those rules, as did Katherine Tai in her confirmation hearing to become the United States trade representative.

In practice, the U.S. can unilaterally exclude certain goods from GPA in trade agreements with a simple declaration that we are taking this category of goods out of commitments. We should do that with the solar supply chain. As one trade restriction supporter noted, "We can't let trade policy be set in Geneva."

Infrastructure build-out can promote domestic solar production. The Coalition for a Prosperous America proposes public investment in electric charging infrastructure for the national highway system using domestic solar and battery storage equipment. The proposal points out that the Federal-Aid Highway Program, with average annual spending of $40 billion between 2016 and 2020, is exempt from the WTO government procurement agreement. The U.S. also needs a major public investment in battery storage.

Congress should also reinstate the Department of Energy 48C Advanced Manufacturing Tax Credits offered under the American Recovery and Reinvestment Act to offset subsidized producers in China. This credit provided a 30 percent investment tax credit to clean-energy manufacturers and required that they pay prevailing wages. The value of the credits could be adjusted to target producers that locate in places that will be hard-hit as the fossil fuel industry declines and in environmental-justice communities. These credits should be extended over decades to create a sustained investment environment that produces innovation.

These disparate initiatives on research, installation, domestic production, trade, and incentives for utilities to shift to solar cry out for a coherent and coordinated national strategy. President Biden's commitment to a green transition, a large-scale infrastructure investment, and a turning away from past, America-last trade policies, creates the opportunity. Now we need to put it all together.

JOAN FITZGERALD

Joan Fitzgerald is a professor in the School of Public Policy and Urban Affairs at Northeastern University. Her latest book is 'Greenovation: Urban Leadership on Climate Change.'

EXHIBIT 49

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New policies set to ease China solar glass production constraints amidst soaring costs

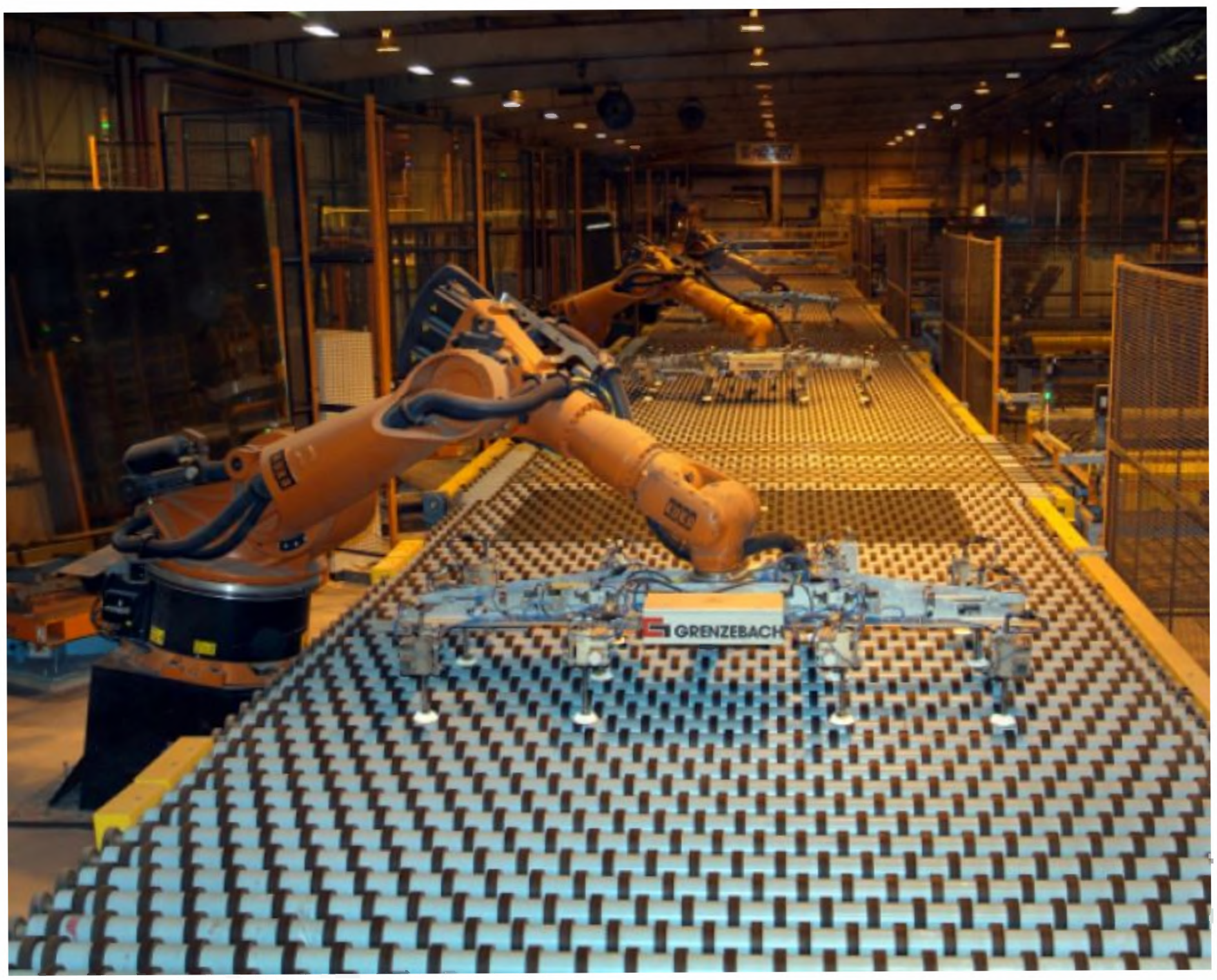
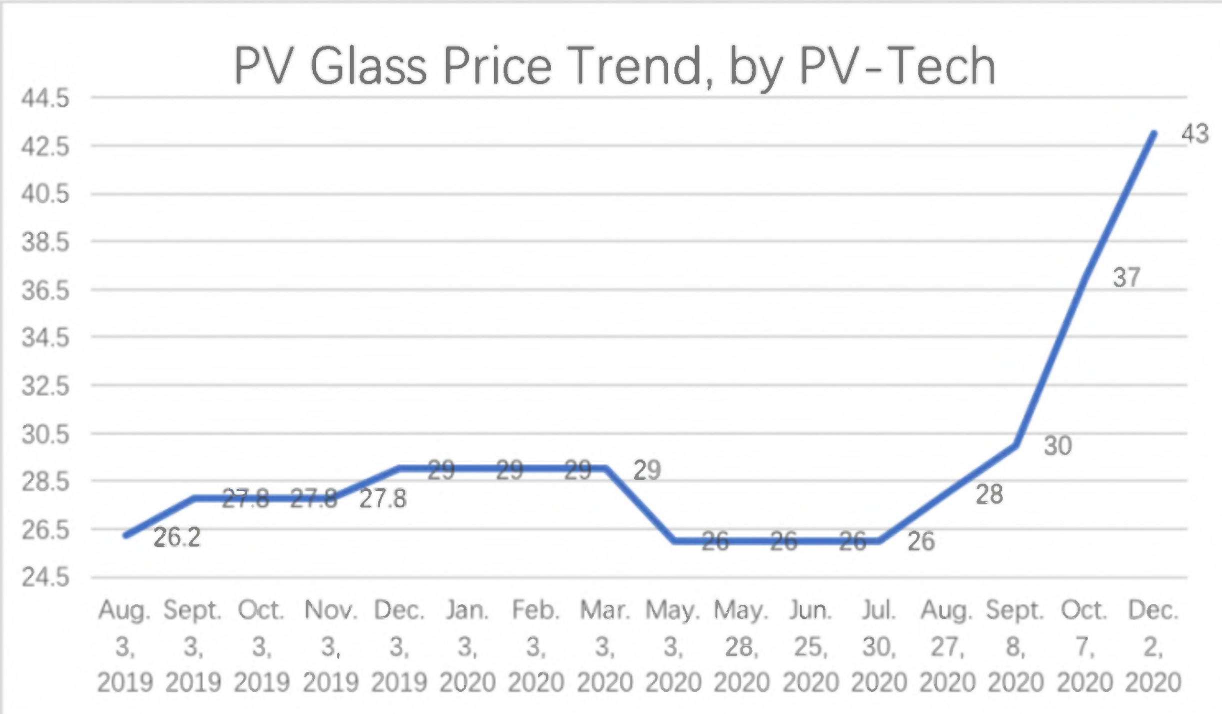


Image: AGC.

Quotes for PV glass have soared this month, reaching a price of RMB43/m^2 according to prices compiled by PV InfoLink, with some small-scale suppliers even quoted prices of RMB50/m^2.

The table below shows the price movement of mainstream PV glass since last August.



Graph 1: PV Glass Price Trend, PV Tech

Historic data indicates that while PV glass prices in China remained within the range of RMB20-3/㎡ between 2013 and 2019, it has soared in the second half of this year saw a total of 80% price rise, compared to that of July. Some small manufacturers even quote a price as high as RMB50/㎡, as supply cannot meet demand.

According to institutions like the China Photovoltaic Industry Association (CPIA), packaging accounts for nearly 50% of the total cost of modules, among which glass accounts for 19% of that packaging cost. A module manufacturer in China has done a calculation: a 166 uni-facial module requires 2.2 ㎡ of glass on average which, based on the current price, costs almost RMB100, equivalent to a cost of RMB0.2/W, effectively double the RMB0.1/W it cost in July.

In the long term, with solar installations increasing around the globe and the rising demand for thinner glass due to the permeability of double-glass modules, along with the development of thin-film solar glass industry driven by the popularisation of green buildings, the market demand for glass is likely to stay high.

Leading glass enterprises expand capacity to seize the momentum

China's market share of solar glass has stayed above 90% for years on the global market. The top 5 glass producers - namely Xinyi Solar, Flat Group, Caihong Group, CNBM and CSG Holdings - shared 68.5% of the market in 2019.

Against the supply-demand tension, leading glass enterprises vied for earlier improvements in technology and capacity to further boost their respective market shares. CSG, for example, intends to invest RMB494 million (US$75 million) in a low-E glass production line that can manufacture 2.1

million square meters of insulating glass and 3.5 million square meters of coated glass per year. Flat plans to invest a total of RMB2.17 billion (US$330 million) in projects like its module cover glass phase 2 project with an annual capacity of 750,000 tons and a backsheet glass project with an annual capacity of 42 million square meters.

Capacity expansion plans

Company	**Current Capacity**	**Investment (billion RMB)**	**Capacity Planned**
Xinyi Solar	Unknown	Unknown	One additional thousand-ton level production line planned for each season in 2021-2022
CSG A	Five electronic glass production lines	0.494	2.1 million square meters of insulating glass, 3.5 million square meters of coated glass per year
		3.15	Four 1,200-ton solar glass production lines in light-weight, high transparency panel manufacturing base at its Anhui Solar Facillity, construction to be finished in 24 months
Flat	Solar glass 5,290 tons/day	2.17	Module cover glass phase 2 project with an annual capacity of 750,000 tons
Caihong New Energy	Unknown	0.5	5 deep processing lines for ultra-thin, dual-film, big-size photoelectric glass
		Unknown	Plans to build a solar glass kiln and supporting facility with pull volume 750 tons/day
Luoyang Glass	Unknown	0.186	Add a 32.4-million-square-meter backsheet glass deep processing production line
Almaden	Unknown	0.877	Construction of a smart deep processing line for big-size, high-power, ultra-thin solar glass, technological improvement， construction of a smart deep-processing line for BIPV anti-glare coated glass
		Unknown	An annual capacity of 100 million square meters of special photoelectric glass to be achieved upon the completion of Fengyang Base Project

Company	Current Capacity	Investment (billion RMB)	Capacity Planned
Kibing Glass	Unknown	1.373	1,200t/d high-transparency backsheet material and deep processing in Shaoxing
		1.027	1,200t/d high-transparency module substrate material production line in Zixing
Topray Solar	Four glass lines, daily melt volume 900T/D	Unknown	Technological improvement for 2 240-ton solar glass production lines in Chencheng, which produce 18 million square meters of 1.8-2.5 mm glass annually

Leading module companies "lock" orders in advance

Statistics show China now has over 11,000 solar glass-related enterprises registered, and the number is still growing. As of December 2019, China's solar glass capacity stood at 25,360 t/d, with 6,900 t/d to be added in 2020.

However, as some overseas projects failed to meet capacity expectations due to the impact of COVID-19, and with China's solar industry working flat out in Q4 2020, downstream enterprises are overwhelmed, especially by the spiralling glass price.

Flat recently revealed that it expects solar glass shortages of around 15% next year. "With a completely open policy, the supply-demand balance will not be achieved earlier than 2022," it said.

Against such uncertainties in the glass market, some leading module enterprises that have close collaboration with the glass sector advanced orders for what they look set to need in the future. This August, LONGi announced a long-term purchase agreement for RMB 6.5 billion of solar glass signed between a subsidiary of CSG and 12 subsidiaries of LONGi.

As early as March this year, Caihong New Energy signed a Strategic Cooperation Agreement with JA Solar, supplying JA with about RMB2.1 billion of products including glass.

And yesterday (18 November), Trina Solar confirmed a major purchase order with Almaden (https://www.pv-tech.org/news/trina-solar-signs-major-wafer-and-glass-supply-deals-as-vertex-production-ramps), procuring 85 million m2 of solar glass at a purchase price of RMB2.1 billion (US$320 million).

Larger entites are therefore signing alliances in order to cement their lead, while other module manufacturers are said to be "sighing with expectation" over the ongoing supply and pricing constraints.

At the beginning of November, six leading solar enterprises in China appealed to the state with a joint statement (http://www.pv-tech.org/news/major-chinese-module-manufacturers-call-for-government-intervention-over-out-of-control-glass-prices) for fewer restraints on glass production expansion. In fact, China's Ministry of Industry and Information Technology (MIIT) approved the displacement of existing capacity by new solar glass projects at the end of October. Conducive to the advancement and restructure of the industry, it helps the glass industry use excess capacity as well as avoiding disorganized expansion.

The industry has also welcomed some good news earlier this month. An MIIT official responded to the statement on 7 November, confirming that the Ministry is working on a revision of policies to properly ease the limit on capacity displacement conditions. *PV Tech* understands the authority is drafting a document on promoting a healthy and sustainable development of the solar glass industry. A policy different from that of traditional float glass is expected to release new capacity soon, ease the supply-demand tension, and thus prevent the price from increasing further.

Tags: china (https://www.pv-tech.org/tags/china), pv glass (https://www.pv-tech.org/tags/pv+glass), trina solar (https://www.pv-tech.org/tags/trina+solar), tongwei (https://www.pv-tech.org/tags/tongwei), almaden (https://www.pv-tech.org/tags/almaden), ja solar (https://www.pv-tech.org/tags/ja+solar), longi (https://www.pv-tech.org/tags/longi), cng (https://www.pv-tech.org/tags/cng), flat (https://www.pv-tech.org/tags/flat), upstream (https://www.pv-tech.org/tags/upstream), manufacturing (https://www.pv-tech.org/tags/manufacturing), materials (https://www.pv-tech.org/tags/materials)

EXHIBIT 50

Trina Solar will purchase 85 million square meters of photovoltaic glass from Almaden

2020.11.17

On November 15, 2020, Trina Solar Co., Ltd. and its 8 subsidiaries (hereinafter collectively referred to as "Trina Solar") and Changzhou Almaden Co., Ltd. (abbreviated as "Almaden") signed the procurement contract of photovoltaic glass.

According to the contract, from November 1, 2020 to December 31, 2022, Trina Solar will purchase a total of 85 million square meters of photovoltaic glass from Almaden. The estimated total contract value is about 2.1 billion yuan (tax included).

Ms. Chen Ye, Assistant Vice President of Purchasing Supply Chain Management of Trina Solar, said that we were very pleased to sign this procurement contract when photovoltaic glass was in such high demand. The cooperation can further increase the output of modules and better meet clients' needs.

Zhou Mingxing, general manager of Almaden Solar Glass Division, said that Trina Solar is a leader in the industry and an excellent partner. We will supply quality products with the required quantity in a timely manner in accordance to the contract, and hope to continue to deepen cooperation with Trina Solar in the future.

The photovoltaic glass purchased this time will be mainly used for the production of Trina Solar's Vertex ultra-high-power module products. The Vertex series modules are based on 210 silicon wafers and adopt advanced technologies such as multi-busbars, non-destructive cutting and high-density packaging. They are characterized by low voltage and high string power, which significantly improve the performance of anti-cracking and hot spot resistance. It is excellent in reducing system costs and cost per KWh. The Vertex series are the photovoltaic products for the future, and the key to lower prices for photovoltaic power generation.

At present, the Vertex series has a lot of production lines with a complete supply chain. It provides customized product solutions for different application scenarios. It has received widespread attention and are welcomed by the global market, as proven by over 2GW worth of orders globally. A production capacity of nearly 10GW has been reached for the Vertex Module this year. To meet the increasing market demands, Trina Solar plans to increase its production capacity to 21GW by 2021 and 31GW by 2022.

11
NOV

27.A joint initiative to promote the standardization of 210mm-size silicon wafer, modules in the photovoltaic industry

26.Strong player added to the distribution market, Trinasolar Vertex S 400W+ passes IEC reliability certification test

20.Trina Solar Renews the Global Brand for Its Tracker Business

19.Trina Solar Purchases 1.2 Billion units of 210mm Monocrystal Silicon Wafers in Cooperation with Zhonghuan

18.Annual production capacity 15GW! Trina Solar and Tongwei Co., Ltd. join forces to further upgrade the 210 integrated industrial chain

10.A Joint Call for Promoting the Health Development of PV Module Market

03.Trina Solar Launches 405W+ Vertex S Module Series with an Expected Capacity of 15GW in 2023

02.First Half-Year Momentum Continues as Revenues and Profits Rise Steadily

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EXHIBIT 52

China-based LONGi to invest RM100mil more in Malaysia

By **JACK WONG**

BUSINESS

Monday, 20 Nov 2017 12:00 AM MYT

KUCHING: China-based Xi'an LONGi Silicon Materials Corp (LONGi) will invest about RM100mil next year in expanding the company's various manufacturing facilities in Samajaya Free Industrial Zone (SFIZ), Kuching, to boost the production capacity of solar panels.

LONGi – the world's largest manufacturer of solar-grade mono-crystalline silicon products – has invested some RM1.3bil in SFIZ since spreading its wing to Sarawak with the acquisition of US-based SunEdison's silicon wafer production facility in SFIZ for US$63mil in March last year.

The facility has a capacity of 600MW.

According to LONGi (Kuching) Sdn Bhd chief executive officer Ngieng Sii Jing, the company's major investments last year were in the construction of new m
solar wafer plant, a passivated emitter rear cell solar c
plant.

"The first solar ingot was produced in December last y
by May, this year, making the company an integrated s

“We are ramping up in stages the production of the various plants,” he told StarBiz.

LONGi Kuching is the first in the world to have a full supply chain for mono-crystalline silicon products in one single location. Kuching is also LONGi’s first overseas operation.

Ngieng said the ingots were supplied to the wafer plant while the produced wafers supplied to the cells plant.

The solar cells will then be sold to the module plant, which produces the solar panels.

LONGi Kuching made another major acquisition in June, taking over the solar manufacturing plant owned by Comtec Solar International (M) Sdn Bhd for 200 million yuan (RM130mil).

China-based Comtec Solar is a pure-play mono-crystalline solar ingot and wafer manufacturer.

“With the acquisition,Comtec Solar gives us an additional 700MW capacity. We refurbished the plant and upgraded its cooler system. The plant re-started o

LONGi also acquired the former factory of Sanmina-S(the production of printed circuit boards (PCB) in SFIZ. it shifted operation to its new facility in Wuxi, China

The old factory has been converted for solar productic some 42 ha.

Ngieng said next year’s proposed investment in the ex| new equipment, and in new warehouse facilities and o| production capacity.

“The proposed expansion will increase the ingot plant’

"With full operation of the various manufacturing facilities,we expect to achieve annual sales of RM2bil by next year," added Ngieng

He said the company would sell solar wafers and cells if there is any surplus after meeting its own requirements.

LONGi Kuching currently exports only solar panels to the United States, Canada and Europe.

The company ships out between 300 and 360 containers per month and ships in a similar number of containers per month of raw materials.

The raw materials, like glass panels, aluminium frames, EVA solar film (a key material for solar panel lamination), backsheets, packaging materials and chemicals, were sourced from China and other countries.

Ngieng said LONGi Kuching had qualified a Chinese firm, which owns a glass factory in Melaka, for the supply of raw materials. The company expects to source polysilicon – an essential raw material for solar cells – from South Korea's OCI Co Ltd-owned plant in Samalaju Industrial Park, Bintulu once the latter has met with the quality standard set by LONGi. OCI acquired the polycrystalline silicon plant from Japan's Tokuyama about six months ago.

"We are trying to bring our China suppliers to set up manufacturing plants in SFIZ. We are also helping to develop local suppliers."

Acording to Ngieng, LONGi, listed on the Shanghai Stock Exchange, commanded 42% share in the global market in mono-crystalline silicon as at the end of 2016.

He said the global demand for solar panels has seen exponential growth in the past several years, reaching 100 GW last year from 90 GW in 2015.

LONGi Kuching, which currently has a workforce of ab
by next year.

TAGS / KEYWORDS:

Business , Xi'an Longi , Samajaya , Solar , Ngieng Sii Jing , Invest

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Business

Did you find this article insightful?

EXHIBIT 53

GCL

GCL-Poly Energy Holdings Limited
保利協鑫能源控股有限公司

(Incorporated in the Cayman Islands with limited liability)
(Stock Code: 3800)

ANNUAL REPORT 2019

Bringing Green Power to Life

PERFORMANCE HIGHLIGHTS

	For the year ended 31 December			
	2019 RMB'000	2018 RMB'000	Change RMB'000	% of change
Revenue				
Sales of wafer	**8,787,186**	11,679,412	(2,892,226)	(24.8%)
Sales of electricity	**6,541,503**	6,117,249	424,254	6.9%
Sales of polysilicon	**2,324,761**	1,579,383	745,378	47.2%
Processing fees	**811,472**	629,228	182,244	29.0%
Others (comprising the sales of ingots and modules)	**784,699**	560,163	224,536	40.1%
	19,249,621	20,565,435	(1,315,814)	(6.4%)
Loss for the year attributable to owners of the Company	**(197,207)**	(693,399)	496,192	(71.6%)

	RMB Cents	RMB Cents	Change RMB Cents	% of change
Loss per share				
— Basic	**(1.05)**	(3.81)	2.76	(72.4%)
— Diluted	**(1.05)**	(3.84)	2.79	(72.7%)

	RMB million	RMB million	Change RMB million	% of change
Adjusted EBITDA*	**7,180**	8,003	(823)	(10.3%)

* Definition of adjusted EBITDA is disclosed in the "Management Discussion and Analysis" Section.

	As at 31 December			
	2019 RMB'000	2018 RMB'000	Change RMB'000	% of change
Extracts of consolidated statement of financial position				
Equity attributable to owners of the Company	**22,250,159**	21,865,556	384,603	1.8%
Total assets	**100,436,959**	112,493,764	(12,056,805)	(10.7%)
Bank balances and cash, pledged and restricted bank and other deposits*	**8,515,445**	10,836,690	(2,321,245)	(21.4%)
Indebtedness**	**55,372,519**	62,588,163	(7,215,644)	(11.5%)
Key financial ratios				
Current ratio	**0.53**	0.54	(0.01)	(1.9%)
Quick ratio	**0.51**	0.52	(0.01)	(1.9%)
Net debt to equity attributable to owners of the Company	**210.6%**	236.7%	(0.26)	(10.9%)

* Amount includes pledged deposit at related companies of RMB38,000,000 (2018: RMB142,194,000) and bank balances and cash classified as assets held for sale of nil (2018: RMB44,873,000).

** Indebtedness includes loans from related companies, bank and other borrowings, lease liabilities/obligations under finance leases, notes and bonds payables.

Cost and Segment Gross Profit

The Group's polysilicon and wafer production costs mainly depend on its ability to control raw material costs, lower energy consumption, achieve economies of scale in its operations and streamline production processes. Benefited from the decrease in cost of raw material, the commencement in production from Xinjiang factory and further increase in production volume, the overall manufacturing cost decreased. The Group will continue to push forward cost reduction and control measures.

Despite the increase in sales volume of polysilicon and wafer, and the decrease in manufacturing cost, average selling prices of polysilicon and wafers dropped following the implementation of the 531 PV New Policy, Solar Material business recorded segment gross profit of RMB423 million for the year ended 31 December 2019, as compared with a profit of RMB995 million for the year ended 31 December 2018 which indicate a significant decrease in performance of Solar Material business.

Solar Farm Business

Overseas Solar Farms

As at 31 December 2019, the solar farm business includes 18 MW of solar farms in the United States. Besides, 150 MW solar farms in South Africa, which was partnered with CAD Fund and with the total effective ownership of 9.7% owned by the Group.

PRC Solar Farms

As at 31 December 2019, the solar farm business also includes 10 solar farms in the PRC and its installed capacity and attributable installed capacity were remained unchanged at 353.0 MW and 289.3 MW, respectively.

Sales Volume and Revenue

For the year ended 31 December 2019, the electricity sales volume of the solar farm business in overseas and the PRC were 27,931 MWh and 488,869 MWh respectively (2018: 30,473 MWh and 492,950 MWh, respectively).

For the year ended 31 December 2019, revenue for the solar farm business was approximately RMB490 million (2018: RMB497 million).

EXHIBIT 54

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GCL-SI to start production at first phase of 60GW module factory in September

By Jules Scully (https://www.pv-tech.org/author/jscully/)

June 2, 2021

Cell Processing (https://www.pv-tech.org/industry-segments/cell-processing/), Fab & Facilities (https://www.pv-tech.org/industry-segments/fab-facilities/), Manufacturing (https://www.pv-tech.org/industry-segments/manufacturing/), Materials (https://www.pv-tech.org/industry-segments/materials/), Modules (https://www.pv-tech.org/industry-segments/modules/)

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The GCL Energy Center in Suzhou, Jiangsu Province. Image: GCL-SI.

The first phase of GCL System Integration Technology's (GCL-SI) 60GW module factory in Hefei, in China's Anhui Province, is on track to start production this September.

The 'Solar Module Super League' member last year revealed plans for the megacomplex (https://www.pv-tech.org/gcl-si-building-60gw-integrated-solar-module-megacomplex-in-hefei-city/), which will be focused on producing 210mm modules and is also capable of manufacturing 182mm modules to meet market demand.

Consisting of a total spend of US$2.5 billion, the factory is being built over four phases between 2020 and 2023, with GCL-SI recently announcing a US$122 million investment (https://www.pv-tech.org/gcl-si-pumps-us122-million-into-kick-starting-construction-of-new-60gw-hefei-plant/) into Hefei GCL Integrated New Energy Technology Co to accelerate construction.

The megacomplex will include wafer, cell, module and all component manufacturing such as junction box, backsheets, glass, EVA and aluminium frames.

GCL-SI is also said to be making "steady progress" with a 2.5GW 'shingled' (cell) module assembly plant, which was originally planned to be built in Funing, Hebei Province, but is now being incorporated into the Hefei hub (https://www.pv-tech.org/gcl-si-cancels-original-plans-for-2-5gw-shingled-module-assembly-plant/).

Elsewhere, the company is also building a 10GW solar cell manufacturing base in Leshan (https://www.pv-tech.org/china-round-up-solar-manufacturing-capacity-announcements-continue-from-smsls/), Sichuan Province, with the first, 5GW phase expected to be completed by the end of 2021. The production facility will mainly manufacture cells such as PERC, TOPCon and heterojunction, with the base also featuring a research and development centre for heterojunction and perovskite-based laminate cells.

While there has been a recent surge in logistics costs and raw material prices (https://www.pv-tech.org/raw-material-shortages-causing-solar-module-bidding-prices-to-rise-in-china/), GCL-SI CEO Thomas Zhang said demand for the company's products is still growing in Europe and the US.

c-si manufacturing (https://www.pv-tech.org/tag/c-si-manufacturing/), china (https://www.pv-tech.org/tag/china/), gcl system integration technology (https://www.pv-tech.org/tag/gcl-system-integration-technology/), module manufacturing (https://www.pv-tech.org/tag/module-manufacturing/), pv modules (https://www.pv-tech.org/tag/pv-modules/)

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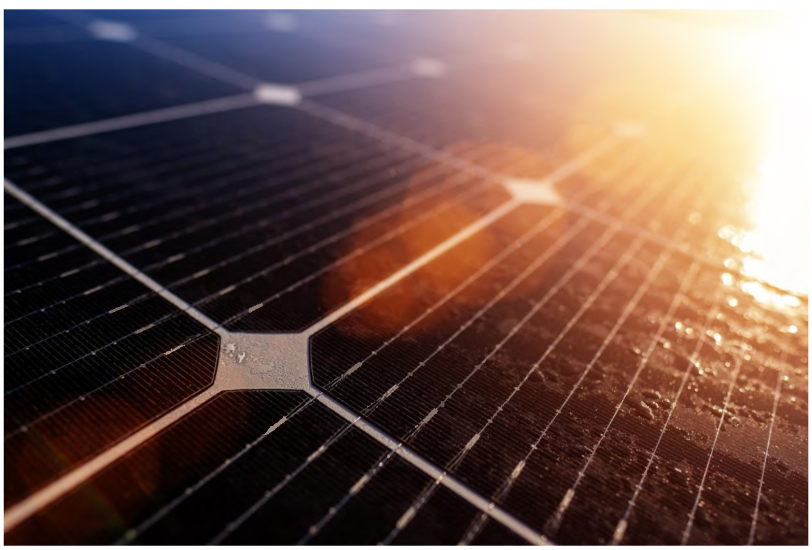
EXHIBIT 55

Chinese PV Industry Brief: more manufacturing capacity from Trina, GCL Integration and Eging PV

Plans to set up new cell and module capacities have been announced by the three manufacturers. Trina intends to add 10 GW of cell capacity to its manufacturing site in the Sichuan province, while GCL Integration wants to build an 8.5 GW monocrystalline solar cell factory in the Jiangsu province.

JANUARY 5, 2021 **VINCENT SHAW AND MAX HALL**

INVERTERS MARKETS MODULES & UPSTREAM MANUFACTURING CHINA



Trina Solar is planning to build a $652 million cell factory in the Sichuan province.

Image: Bru-nO/Pixabay

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Shenzhen-listed module manufacturer GCL Integration (GCL) announced last week it has signed an agreement with the government of Leshan City, in Sichuan province, for the construction of a 10 GW solar cell factory. The facility is expected to be built in two 5 GW phases with a total investment of RMB4.3 billion ($652 million). The first phase is expected to be completed by the end of 2021 while the second phase is scheduled for completion in June 2022. On Monday, the company also announced a capital increase of RMB790 million. These funds will be used to accelerate the construction of a 60 GW module factory that GCL is planning to build in Hefei city, Anhui province. Construction of the first, 15 GW phase was launched in December, with completion scheduled by June.

Shanghai-listed PV module maker and EPC contractor Eging PV announced last week a plan to increase its cell and module capacity. The company's existing factory in Jintan, Jiangsu province, will be upgraded and its module capacity will reach 3 GW while the cell capacity will be raised to 2 GW. The manufacturer will invest RMB1.5 billion in this new plan.

Panel provider Trina Solar had decided to build a new 8.5 GW monocrystalline solar cell factory in Yancheng City, Jiangsu province. The planned investment in the factory, which is expected to begin manufacturing activity within 24 months, amounts to around RMB3 billion. The new manufacturing facility will increase the company's planned annual production capacity in Yancheng City to 18.5 GW by 2023.

Module manufacturer JinkoSolar has agreed to buy up to 338 million square meters of solar glass from Chinese manufacturer Flat Glass. This amount would be enough to produce around 59 GW of modules up to 2023. The purchase price will be negotiated on a monthly basis.

Panel producer JA Solar has agreed to buy 32,400-43,200 metric tons of polysilicon from Xinjiang-based manufacturer Daqo. Shipments will be made up to December 2023. Also, in this case, the purchase price will be negotiated on a monthly basis.

Project developer and module provider Canadian Solar announced last week the sale of its 30% stake in Big Fish SPV S.r.l. and Iron SPV S.r.l. to Italian renewable energy company Falck Renewables. The two companies own solar plants with a combined capacity of 290 MW located in Italy. The financial terms of the transaction were not revealed.

Galloping sales of gas-guzzling SUVs in China ensured conventional vehicle sales by **manufacturer BYD** continued to outpace "new energy vehicles", according to the company's full-year sales figures. A near 44% year-on-year rise in SUV sales, to 174,298 units, added up to a 2% annual rise in oil-fueled vehicle sales as other conventional models suffered during the Covid-19 pandemic. Battery electric vehicle sales for BYD fell 11% year-on-year, to 130,970 units, and the plug-in hybrid figures fell 33% but the company saw a 44% uptick in e-bus sales, to 9,125 units.

The government of Huazhou City, in Guangdong province, announced, last week, a plan to invest RMB650 million in a 150 MW solar project across several locations. The plant will combine power generation with farming, fishery and agriculture. It is estimated the whole project will provide 160 GWh per year.

Hong Kong-listed BEWG Clean Energy Group announced an agreement with the government of Wannian county, Jiangxi province, to develop a 500 MW agrivoltaic project in the region.

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AUTHORS

More articles from Vincent Shaw

Max worked for **pv magazine** between 2012 and 2015 on a part-time basis and returned to the fold full-time in July 2018. An old-school print journalist, he has also worked in environmental consultancy, education, local government, infrastructure, aerospace, forensic science and sport.
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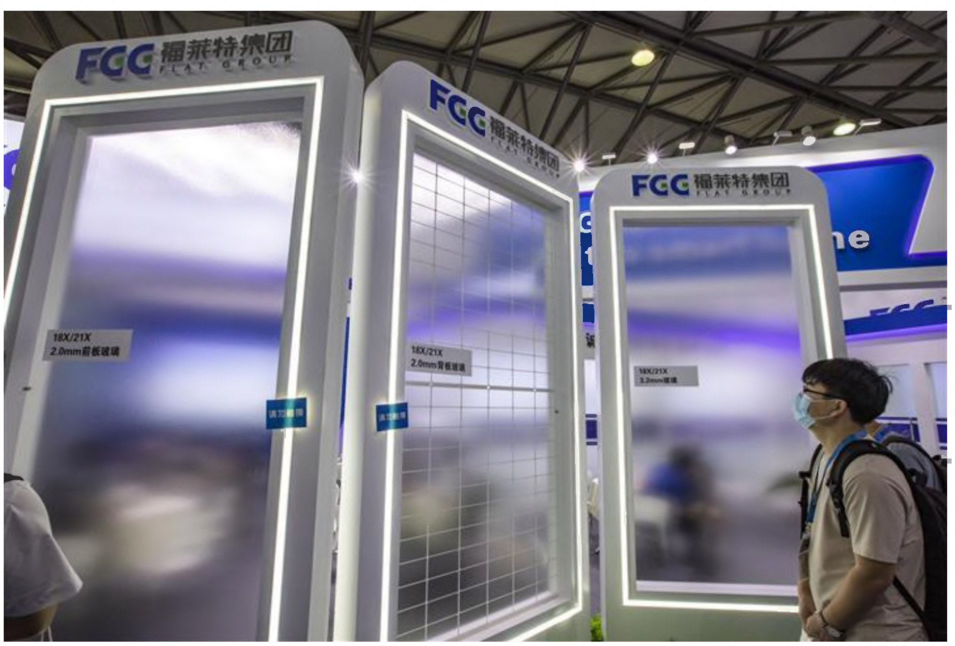
EXHIBIT 56

China’s Flat Glass Hits Limit Up on USD2.2 Billion PV Glass Deal With Jinko Solar

TANG SHIHUA

DATE: DEC 31 2020 / SOURCE: YICAI



China’s Flat Glass Hits Limit Up on USD2.2 Billion PV Glass Deal With Jinko Solar

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(Yicai Global) Dec. 31 -- Shares in Flat Glass Group hit the exchange-imposed daily limit today on the news that China's second biggest maker of photo-voltaic glass will supply CNY14.2 billion (USD2.2 billion) worth of products to Jinko Solar Holdings, the world's largest solar panel manufacturer.

Jiaxing, Zhejiang province-based Flat Glass [SHA:601865] shot up 10 percent to close at CNY39.90 (USD6.10).

Flat Glass and four of its units will supply 338 million square meters of PV glass to Shanghai-based Jinko Solar and five affiliates, including one in Malaysia, over the next three years at an average price of CNY42 (USD6.40) per square meter, Flat Glass said yesterday. It is estimated this will be used to make 59 gigawatts of photovoltaic cell modules.

Flat Glass will also invest CNY4.35 billion (USD664.3 million) to build five industrial furnaces with a melting capacity of 1,200 tons in Chuzhou, eastern Anhui province to expand its production capacity and better meet growing demand for larger photovoltaic components, it added yesterday. Furnaces have cost advantages and can produce customized products more easily, it added.

Flat Glass is predicting net profit of between CNY1.48 billion (USD226 million) and CNY1.64 billion this year, more than double that of last year as the price of PV glass surges, the firm said on Dec. 29.

The average cost of a 3.2-millimeter-thick pane of PV glass has jumped 48 percent since the start of the year to CNY43 (USD6.60) per square meter as of Dec. 23, according to market research firm PV InfoLink.

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Editor: Kim Taylor

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Keywords: Supply Deal,Capacity Expansion,Solar Gla
ss,Solar Power,Jink Solar,Flat Glass

EXHIBIT 57

Vietnamese imports of CSPV cell and module components from China

QUANTITY			CALENDAR YEAR		
Name	**HS Code**	**Unit**	**2019**	**2020**	**% Change 2019-2020**
Nitrogen	280430	KG	428,909	371,798	-13.3%
Silicon	280469	KG	7,625,223	9,287,816	21.8%
Phosphorus oxychloride	281212	KG	5,542	18,360	231.3%
Silane	285000	KG	78,566	116,355	48.1%
Wafers	381800	KG	7,574,370	11,011,065	45.4%
Mono and DWS additives	391000	KG	13,646,943	17,474,002	28.0%
Solar glass	700719	KG	360,910,446	###########	560.3%
Screen frame	731419	KG	202,899	444,767	119.2%
Copper wire	740819	KG	3,863,717	8,750,759	126.5%
Module wires and cross connectors	740931	KG	56,916	153,368	169.5%
PV Cells, Modules, and LEDs	854140	KG	###########	###########	-9.6%
Junction boxes	854442	KG	28,523,407	56,677,945	98.7%
VALUE			**CALENDAR YEAR**		
Name	**HS Code**	**Unit**	**2019**	**2020**	**% Change 2019-2020**
Nitrogen	280430	USD	97,224	132,076	35.8%
Silicon	280469	USD	12,560,044	15,880,688	26.4%
Phosphorus oxychloride	281212	USD	377,581	1,241,678	228.9%
Silicone sealant and potting	321410	USD	15,299,508	12,354,021	-19.3%
Wafers	381800	USD	163,582,695	345,015,436	110.9%
Mono and DWS additives	391000	USD	62,719,108	55,725,568	-11.2%
Solar glass	700719	USD	337,623,770	588,346,954	74.3%
Screen frame	731419	USD	441,453	719,195	62.9%
Copper wire	740819	USD	30,754,232	62,317,092	102.6%
Module wires and cross connectors	740931	USD	575,327	1,750,909	204.3%
PV Cells, Modules, and LEDs	854140	USD	###########	###########	75.9%
Junction boxes	854442	USD	235,679,915	423,142,845	79.5%

Source: Global Trade Information Services, accessed Jul. 15, 2021.

EXHIBIT 58

Vietnamese imports of CSPV cell and module components from China

VALUE			CALENDAR YEAR								
Name	**HS Code**	**Unit**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**% Change 2011-2018**
Nitrogen	280430	USD	27,470	11,827	14,895	16,900	23,870	152,941	198,635	86,309	214.2%
Silicon	280469	USD	1,897,149	1,869,150	2,455,721	3,976,561	6,351,648	8,506,044	10,153,846	16,077,296	747.4%
Phosphorus oxychloride	281212	USD	0	0	0	0	0	0	0	244,400	--
Silicone sealant and potting	321410	USD	2,932,092	2,743,611	2,725,431	3,203,148	4,147,736	4,528,225	6,805,974	14,680,618	400.7%
Wafers	381800	USD	96,041	25,950	1,240	530,660	58,766,599	211,898,617	153,179,437	153,179,437	159393.8%
Mono and DWS additives	391000	USD	7,135,364	8,867,182	10,063,269	10,359,766	14,503,615	21,315,560	35,616,254	45,290,531	534.7%
Solar glass	700719	USD	5,823,435	4,708,848	5,692,195	8,082,836	34,569,065	110,168,206	116,857,950	150,165,535	2478.6%
Copper wire	740819	USD	16,960,570	17,229,699	12,993,749	17,220,222	18,048,704	19,680,228	26,319,658	27,039,359	59.4%
Module wires and cross connectors	740931	USD	290,753	119,772	31,601	76,285	50,921	42,075	109,185	310,648	6.8%
PV Cells, Modules, and LEDs	854140	USD	24,024,501	46,369,648	35,484,978	52,964,964	64,428,664	93,173,966	164,249,867	649,504,283	2603.5%
Junction boxes	854442	USD	72,156,326	113,610,808	134,089,098	145,734,243	155,279,987	163,353,853	172,439,201	141,194,522	95.7%

Source: United Nations (Comtrade), accessed Jul. 20, 2021.

EXHIBIT 59

Chinese PV Industry Brief: New solar glass factory in Jiangsu, Longi maintains wafer prices unchanged

Triumph Group is planning to build a $1.71 billion PV glass factory in Suqian City, Jiangsu Province. Longi has maintained unchanged the prices of its wafers for July.

JUNE 25, 2021 **VINCENT SHAW AND MAX HALL**

HIGHLIGHTS MARKETS MARKETS & POLICY CHINA

Cell production at a Longi Solar facility.

Image: Longi Solar

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Chinese engineering company Triumph Group, a unit of state-owned conglomerate China National Building Materials Group Corporation, has signed an agreement with the government of Suqian City, Jiangsu Province, to build a solar glass factory at the Grand Canal Suqian Port Industrial Park. The company said in a statement it wants to invest RMB 11 million (around $1.71 billion) in the new manufacturing facility and that it expects to begin construction "soon." The Triumph Group is also the controlling shareholder of state-owned manufacturer Luoyang Glass.

The National Development and Reform Commission (NDRC) of China's Shaanxi Province released a new draft regulation for the deployment of PV in 2021. According to the new provisions, all future systems will have to integrate some battery storage to stabilize power injection. The storage system will have to be able to store and provide electricity for at least two hours and will have to feature a 10-year lifecycle with 5,000 charge and discharge cycles.

Monocrystalline module producer Longi has held its wafer prices for July. The price for p-type M6 products, measuring 166/223mm and with a thickness of 175um, is RMB4.89 (US$0.75) per piece and the price for p-type G1 (158.75/223mm and 175um) is RMB4.79 per piece. P-type M10 products, measuring 182/247mm and with a thickness of 175um will cost RMB5.87. All prices remained unchanged from the previous release.

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Construction begins on Spain's first gigafactory

21 JUNE 2021

The factory is located in Noblejas, in the province of Toledo, Castilla–La Mancha, and is planned to reach a capacity of 10 GWh by 2025. June 21, 202...

A light-on-detail statement published on the website of the **Africa Solar Industry Association** on Tuesday claimed JinkoSolar will supply 2.6 MW of its panels to SGCC – which **pv magazine** second stage bid to install seven mini grids in towns and villages in Ethiopia under the World Bank-funded Lighting Africa program. The statement said Jinko had supplied 1 MW of products to SGCC for the first stage of the program, with the sites owned by the Ethiopian Power Distribution Company. The statement claimed the first round of sites, which were installed by April, were the "first off-grid PV project in East Africa" and the "first demonstration project of the World Bank's Lighting Africa program." However, the Lighting Africa website states the initiative was launched in Kenya in 2009.

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AUTHORS

More articles from Vincent Shaw

Max worked for **pv magazine** between 2012 and 2015 on a part-time basis and returned to the fold full-time in July 2018. An old-school print journalist, he has also worked in environmental consultancy, education, local government, infrastructure, aerospace, forensic science and sport.

More articles from Max Hall

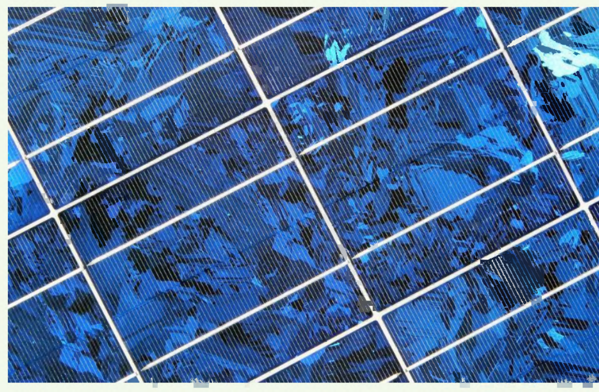
EXHIBIT 60

Renewables Now

Solar

Xinte Energy proposes to build 100,000-tonne-per year polysilicon production plant

March 2 (Renewables Now) - Chinese solar products maker Xinte Energy Co Ltd (HKG:1799) said that its board of directors unanimously approved the project to build a 100,000-tonne-per year high-purity polysilicon production plant in Inner Mongolia, northern China.



Solar modules. Author: Marco Bellucci. License: Creative Commons, Attribution 2.0 Generic

Given the amount of money needed for the undertaking -- the total investment is estimated at around CNY 8.799 billion (USD 1.36bn/EUR 1.13bn), tax inclusive, and the capital at CNY 5 billion -- the decision to proceed will be left to the shareholders, Xinte Energy explained.

The polysilicon producer plans to source the money from own funds, external funding, introduction of independent strategic investors, banks loans or finance leases.

With the PV power generation becoming cheaper by the year, the company expects the demand for polysilicon to increase significantly, but adds that the production of this material is highly energy intensive. According to Xinte Energy, electricity expenses currently account for more than 30% of the costs to produce polysilicon.

Estimating that the proposed plant would need over 6 billion kWh per year, the company said that it has opted to build the facility in Tumed Right Banner industrial park in Baotou City of the Inner Mongolia region. This location would allow the plant

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About the author

Sladjana Djunisic

Sladjana has significant experience as a Spain-focused business news reporter and is now diving deeper into the global renewable energy industry. She is the person to seek if you need information about Latin American renewables and the Spanish market.

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EXHIBIT 61

GCL-Poly investing $826m in construction of 60,000 MT polysilicon plant in China

The clean energy company is spending RMB 5.68 billion on the creation of the poly plant, which will comprise 40,000 tonnes of new production capacity and 20,000 tonnes of relocated capacity from the firm's existing facility in Xuzhou.

APRIL 6, 2017 **IAN CLOVER**

MANUFACTURING | MODULES & UPSTREAM MANUFACTURING | CHINA

The new GCL-Poly 20 GW ingot facility will dramatically boost the company's mono ingot production capacity.

Image: Dave Tacon/Polaris

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China's GCL-Poly is to invest RMB 5.68 billion (US$826 million) in the construction of a 60,000 tonne polysilicon production facility in Xinjiang, China.

The project will comprise 40,000 tonnes of new capacity and 20,000 tonnes of 'relocated' capacity from GCL-Poly's existing production facility in Xuzhou, which will duly be closed once the new Xinjiang facility is up and running.

GCL-Poly will finance one third of the investment with capital from internal resources, with the remainder of the funds coming via debt finance. The company said in a press statement that it is in active discussions with potential investors regarding the project, although thus far no cooperation agreements have been signed.

The first phase of construction – comprising 20,000 tonnes of capacity, is expected to be completed by the second quarter of 2018, with phase two (an additional 20,000 tonnes) penciled for completion by the end of next year.

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The final phase, which would include the transfer of 20,000 tonnes production capacity from Xuzhou to Xinjiang, is scheduled to be completed by the end of 2020. Once fully completed, GCL-Poly says that its annual polysilicon production capacity will rise to 115,000 tonnes by 2020.

Lower expected energy and tariff costs in China will also enable GCL-Poly to contribute to the reduction of polysilicon production costs, the company added.

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IAN CLOVER

Ian joined the pv magazine team in 2013 and specializes in power electronics (inverters) and battery storage. Ian also reports on the UK solar market, having worked as a print and web journalist in Britain for various multimedia companies, covering topics ranging from renewable energy and sustainability to real estate, sport and film.

More articles from Ian Clover

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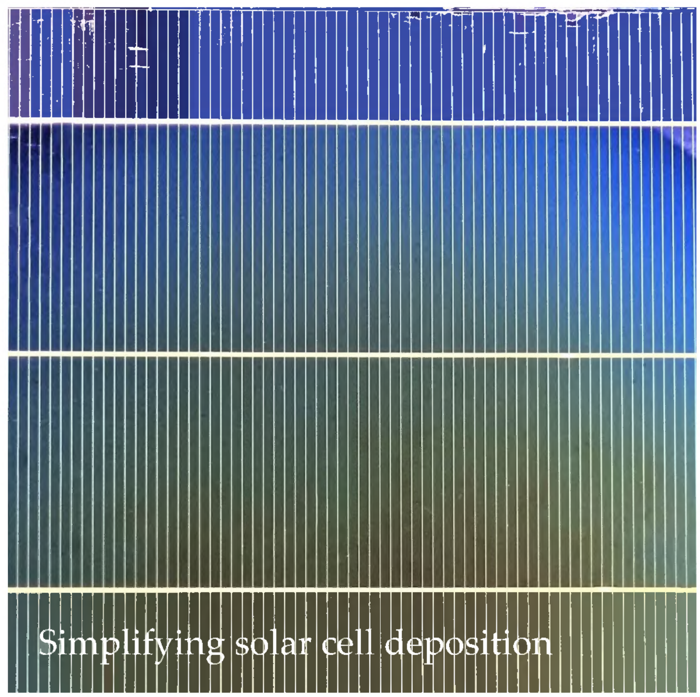

EXHIBIT 62

WIKIPEDIA

Hemlock Semiconductor Corporation

Hemlock Semiconductor Corporation is the largest producer of polysilicon in the United States. It is owned by Corning Inc. and Shin-Etsu Handotai, founded in 1961, and named after Hemlock, Michigan, the location of its factory. Its current facilities produce some 36,000 tons of polycrystalline silicon, ranking it among the top five producers worldwide.[1]

Polycrystalline silicon, also called polysilicon, is a high purity, polycrystalline form of silicon, used as a raw material by the solar photovoltaic and electronics industry.

Contents

Former Tennessee facility

The company expanded with the Japanese joint venture partners Shin-Etsu Chemical and Mitsubishi Materials, for a new $1.2 billion plant opening near Clarksville, Tennessee. Though it officially opened in 2012, chemicals were never inventoried and no product was made. The plant was under negotiations in 2011 for a further $3 billion expansion, to keep pace with manufacturing competition from China.[2]

In December 2014, Hemlock Semiconductor Corporation announced the permanent closure of the $1.2 billion Tennessee plant, due to adverse conditions from industry oversupply and ongoing challenges from global trade disputes. Many of the approximately fifty employees in Tennessee were offered employment positions in Michigan at the Hemlock Semiconductor or Dow Corning facilities, and the rest received severance packages.[3]

In December 2015, Google announced that they will buy the facility, and invest more than $600 million to turn it into their 15th datacenter.[4]

End Of Dow Corning Joint Venture

Dow Corning announced that June 1, 2016 would be "day one" such that [5] Dow Chemical Company will assume 100% ownership of the Dow Corning Corporation, concluding the 73-year joint venture between Dow Chemical and Corning Inc..

Hemlock Semiconductor continues as an independently run entity with two shareholders: Corning Inc. owns 80.5%, and Shin-Etsu Chemical owns 19.5%.[6]

See also

- Dow Corning Corporation — *joint venture*.
- Corning Inc.
- Dow Chemical Company
- Shin-Etsu Chemical

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3. Hscpoly.com: Hemlock Semiconductor Corp. manufacturing-facility-closure (http://www.hscpoly.com/content/hsc_comp/hsc-tennessee-manufacutring-facility-closure.aspx)
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EXHIBIT 63

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LONGi investing US$875 million in 2020 production capacity expansion plans

By Mark Osborne (https://www.pv-tech.org/author/markosborne/)

April 17, 2019

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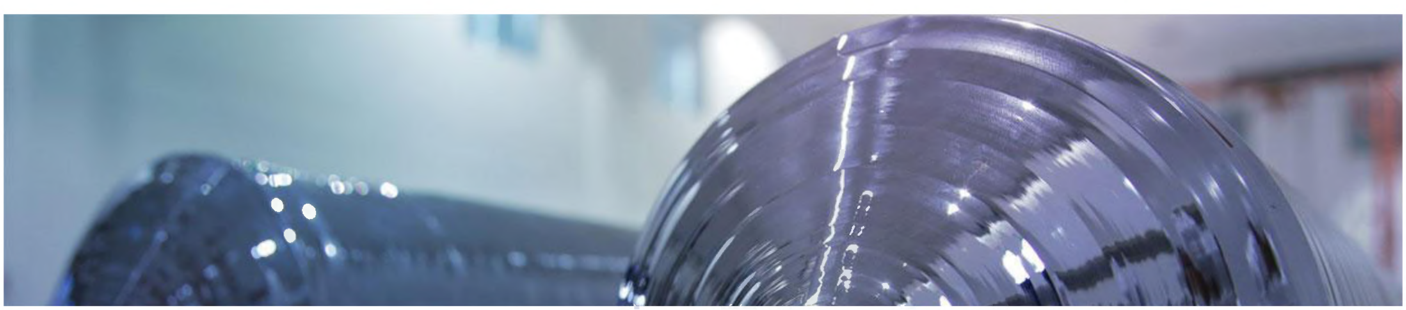
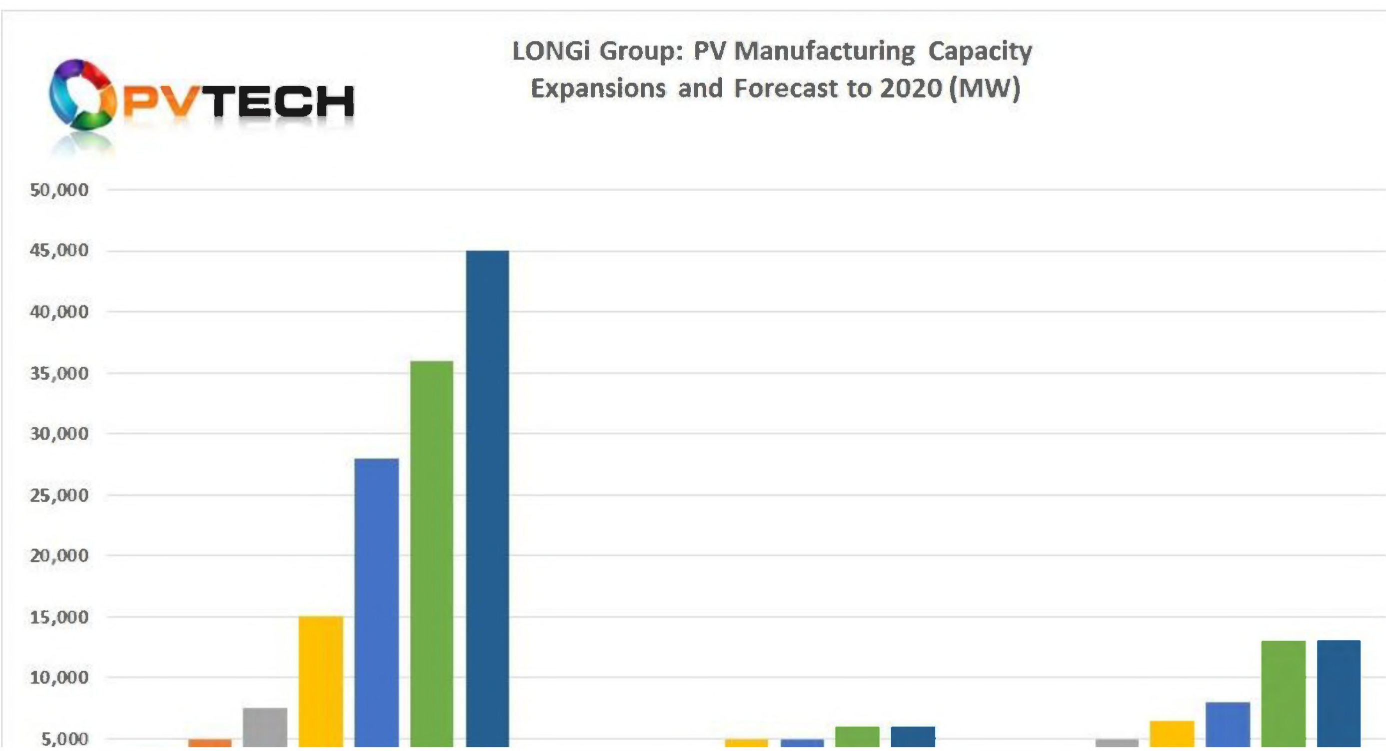


Leading monocrystalline wafer producer and 'Solar Module Super League' (SMSL) member LONGi Green Energy Technology is planning to invest around US$875.7 million in expanding its Czochralski-based monocrystalline silicon (mono-Si) ingot and wafer capacity by 15GW, while expanding mono-Si solar cell capacity by an initial 3GW in 2020.

LONGi said it had signed a strategic agreement with the Yinchuan Economic and Technological Development Zone for the new 15GW ingot and wafer production facility, which is expected to cost around US$643 million. The facility is expected to gradually start ramping production in the second half of 2020.

The company had recently announced plans to invest approximately US$773 million (https://www.pv-tech.org/news/longi-investing-us773-million-in-significantly-expanding-mono-ingot-and-waf) in expanding mono-Si ingot capacity at two production sites in China, which included 6GW in Baoshan and 6GW in Lijiang. LONGi also announced at the same time a 10GW expansion of mono-Si wafer production as part of a Phase 2 expansion at facilities in Chuxiong.

These previously announced expansions would take mono-Si ingot cumulative nameplate capacity to 38GW in 2019. LONGi had previously announced plans to take ingot capacity to 45GW by the end of 2020.

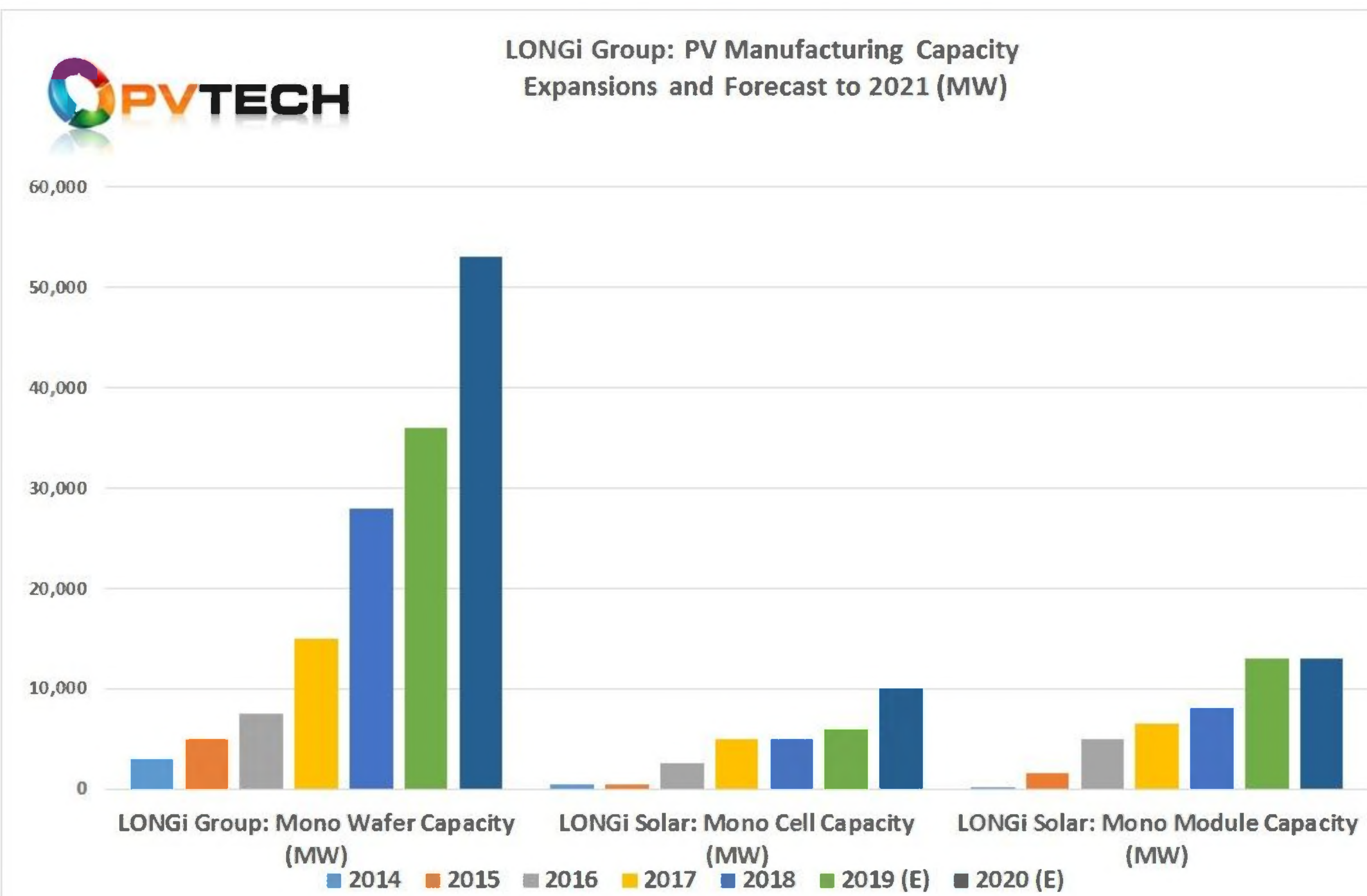


The new 15GW plans would take mono-Si ingot and wafer nameplate capacity to 53GW after 2020.

LONGi also announced that its subsidiary, SMSL member LONGi Solar would establish a mono-Si solar cell plant in Yinchuan. Initial capacity would be 3GW at a cost of around US$233 million. The facility would have a nameplate capacity of 5GW. The initial production ramp would be in the first half of 2020.

The company had recently announced a new 1GW mono-Si cell plant (https://www.pv-tech.org/news/longi-investing-us773-million-in-significantly-expanding-mono-ingot-and-waf) would be built in Malaysia at the Shama Jaya Free Industrial Park, Kuching City, Sarawak, Malaysia at a cost of approximately (US$125.5 million).

Combined with the latest expansions planned in China, LONGi Solar's mono-Si cell nameplate capacity would reach 10GW by the end of 2020.



LONGi's Hi-MO N: N-type TopCon breakthroughs boost efficiency and energy yield for large scale PV (https://app.livestorm.co/solar-media/longis-hi-mo-n-n-type-topcon-breakthroughs-boost-efficiency-and-energy-yield-for-large-scale-pv?utm_source=pvtech&utm_medium=event-listings)

28 July 2021

LONGi has launched its Hi-MO N module, the company's first bifacial module with N-type TOPCon cells, designed to deliver ultra- high value and lower LCOE to utility-scale PV power plants. This PV TechTalk Product Series webinar will provide an overview of the module's technology and how the introduction of n-type technologies will provide efficiency and performance gains for solar project developers.

c-si manufacturing (https://www.pv-tech.org/tag/csi-manufacturing/), china (https://www.pv-tech.org/tag/china/), longi solar (https://www.pv-tech.org/tag/longi-solar/), longii green energy technology (https://www.pv-tech.org/tag/longii-green-energy-technology/), malaysia (https://www.pv-tech.org/tag/malaysia/), monocrystalline wafer (https://www.pv-tech.org/tag/monocrystalline-wafer/), p-type mono perc (https://www.pv-tech.org/tag/ptype-mono-perc/), pv celltech (https://www.pv-tech.org/tag/pv-celltech/), solar cell (https://www.pv-tech.org/tag/solar-cell/)

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Risen Energy to set up US$10.2bn solar manufacturing plant in Malaysia (https://www.pv-tech.org/risen-energy-to-set-up-us10-2bn-solar-manufacturing-plant-in-malaysia/)

June 28, 2021

Risen Energy will spend MYR42.2bn (US$10.2 billion) over 15 years on a new solar manufacturing plant in Malaysia, representing

EXHIBIT 64

Solar

GCL-Poly Energy plans 20-GW ingot factory in China

Published
Apr 11, 2018 15:01 CEST

Author
Ivan Shumkov

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April 11 (Renewables Now) - China's GCL-Poly Energy Holdings Ltd (HKG:3800) intends to build a 20-GW monocrystalline silicon manufacturing facility for the research and development, production and sale of monosilicon ingots.

Ingot casting workshop. Source: GCL-Poly Energy Holdings Ltd

Under a non-legally binding deal with the local government, the company has agreed to construct this facility in Qujing at a total cost of CNY 9 billion (USD 1.43bn/EUR 1.16bn). It will implement the project through a joint venture with its strategic partners.

The Qujing government and the Management Committee of the Qujing Economic and Technological Development Zone are expected to facilitate the construction of the complex in

Polysilicon and multicrystalline wafer manufacturer GCL-Poly noted that it plans to allow the joint venture to use its CCZ constant czochralski monosilicon technology in the production at the new site.

(CNY 1.0 = USD 0.159/EUR 0.129)

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CIT arranges USD 68.4m for solar plant purchase in Texas
Jul 15, 2021 15:16 CEST

About the author

Ivan Shumkov

Ivan is the mergers and acquisitions expert in Renewables Now with a passion for big deals and ambitious capacity plans.

More articles by the author

EXHIBIT 65

Chinese PV Industry Brief: Tongwei plans 200,000 MT polysilicon factory

The new polysilicon factory will be located in Leshan City and will be built thanks to an investment of $2.1 billion.

JULY 2, 2021 **VINCENT SHAW AND MAX HALL**

HIGHLIGHTS INVERTERS MARKETS MARKETS & POLICY MODULES & UPSTREAM MANUFACTURING CHINA

One of Tongwei's factories in China.

Image: Tongwei

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Polysilicon supplier and solar cell maker **Tongwei** announced on Thursday it signed an agreement with the government of Leshan City and the Wuhua district for a new polysilicon manufacturing site with a capacity of 200,000 metric tons. According to the statement, the total investment for this polysilicon capacity is RMB 14 billion, around $2.1 billion. Construction of the facility will take place in two phases of 100,000 MT each, with phase I estimated to be completed and commissioned by the end of 2022, followed by phase II. Tongwei has a total 80,000 MT polysilicon capacity and 150,000 MT under construction. By the end of 2022, the company will have a total polysilicon capacity of 330,000 MT, including the new expansion plan, and the figure will grow to 430,000 when phase II of the project is finished.

Chinese glass group G-Crystal announced on Thursday that its Malaysian unit completed construction and commissioned its glass production lines for thin-film PV panel products. Work on the facility started in 2018 with a planned capacity of 500 metric tons of PV glass per day. The company has signed a supplement agreement with First Solar for the next 10 years, G-Crystal added.

In its latest market observation, released Wednesday, **Taiwan-based market research company** **PV InfoLink** reports that the price of polysilicon remained stable from last week. The main deal price is around RMB 200 ($30.90) per kilo, with no change from last week. Due to lower capacity utilization on the wafer side, the high quote of poly was rejected by downstream users. Cost pressure eventually spread from downstream modules and cells to wafers. Due to high inventory and lower capacity utilization, wafer orders dried and wafer makers had to cut prices, especially on large-sized wafers like 182 mm and 210 mm, both of which suffered around 10% reductions. Cell prices also dropped slightly due in part to higher pressure from high inventory and the likelihood of a potential deal with module makers. Module prices also dropped because of upstream cost cutting. However, generally the market is still cool with high prices and low consumption.

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2 JULY 2021

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Independent shareholders at **state-controlled manufacturer** **Luoyang Glass** will vote on the proposed RMB 182 million ($28.2 million) acquisition of glassmaker Qinhuangdao North Glass Co Ltd at an extraordinary general meeting on July 21. Luoyang wants to acquire a 60% stake in the target company from the China Yaohua Glass Group Co Ltd warehousing and sales entity which is itself controlled by Luoyang's ultimate owner, China National Building Material Group. The deal would remove duplication and competition for Luoyang, which said the investment would also enable it to "optimize the layout of its photovoltaic glass business segment" and "expand production."

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AUTHORS

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EXHIBIT 66

Business

China's growing share of solar market comes at a price

By Steven Mufson
December 16, 2011

China was mentioned 59 times when Energy Secretary Steven Chu testified last month before a House subcommittee on the U.S. loan guarantee program for renewable-energy projects.

"Countries like China are playing to win in the solar industry," Chu said.

"My big thing is that I worry about China," said Rep. Brian P. Bilbray (R-Calif.).

"The Chinese are eating our lunch," said Rep. John D. Dingell (D-Mich.).

Yet if Chinese solar companies are eating our lunch, they're also choking on it. Growth in global solar manufacturing capacity is outpacing global demand, and prices of solar energy products are plunging. And while U.S. politicians portray Chinese firms as heavily subsidized rivals gobbling up global market share, Chinese solar companies are suffering from some of the same ills afflicting their U.S. competitors.

Some of China's biggest companies are losing money, shelving capital expenditure plans and looking to conserve dwindling reserves of cash. To avoid going deeper into debt, they have borrowed only a tiny fraction of $34 billion in loans available to them from the China Development Bank.

For consumers, the cutthroat competition is a good thing. Wholesale solar panel prices have dropped as much as 50 percent this year, and retail prices are less than half what they were five years ago. Industry experts say that the day is near when solar can compete against other energy sources without subsidies. In certain places and at certain times of day, it's already viable. Meanwhile, analysts say, if China wants to subsidize solar products, Americans can buy more of them.

For some U.S. companies, China's expanding industry has meant more jobs. Cheap panels fuel greater sales — and installation accounts for more than half of U.S. solar industry jobs.

Moreover, the United States has a trade surplus with China in solar goods, led by exports of polysilicon, the raw material needed to make photovoltaic cells, which in turn are the building blocks for solar panels.

The United States also exports the solar manufacturing machinery. Applied Materials, which made its name in the semiconductor business, beat analysts' expectations earlier this year thanks to sales of equipment for making solar cells. To promote sales, the Santa Clara, Calif., company has set up a research center in the

Chinese city of Xian and moved its chief technology officer there. "Now we are doing for the green economy what we did for the Information Age," the company says on its Web site.

GT Advanced Technologies, which sells furnaces and other equipment for making the polysilicon and ingots used in making solar cells, does 98 percent of its business in Asia, much of it in China. "We compete very effectively as a U.S.-based corporation in spite of the fact that my Chinese competitors sell at half my price," said Tom Gutierrez, chief executive of the New Hampshire-based firm. "We beat them through technology and innovation."

But U.S. solar panel manufacturers and people who believe that solar manufacturing can become part of a new "clean technology" economy are unhappy. They believe that the flood of Chinese solar cells is a textbook case of dumping — an economic term to describe when foreign companies overwhelm a market with cheap goods to drive competitors out of business. Later, after gaining control of that market, the foreign companies can jack up prices.

Chinese panels are selling for less than $1 a watt, while those made elsewhere sell for about 20 percent more, according to Bloomberg New Energy Finance.

China supplies nearly half of U.S. solar panel imports — 44.6 million units in the first eight months of the year, up from 3.8 million in 2008, according to an anti-dumping petition filed by a group of U.S. firms. Those sales rocketed to $1.69 billion through August of this year from $233.3 million in 2008.

The biggest of those panel makers, Suntech, promotes its products in ads that show two panels hooked up to an electric American flag. "Now Power America, from America," the ad says, even though only 2 percent of Suntech's manufacturing capacity is in the United States.

But volume doesn't guarantee profits and for Chinese solar companies, it has been a painful rise to the top ranks of the global market. Suntech, JA Solar and LDK Solar, the top Chinese solar panel makers, reported losses for the third quarter and warned investors the outlook was grim. JA Solar reported operating losses and a writedown on the value of its inventory. Suntech, which lost $116.4 million in the third quarter, said it expected shipments to drop 10 percent in the fourth quarter.

"This will be challenging for all solar companies," Suntech chief executive Shi Zhengrong said during a conference call with investors in November. Many of China's more than 100 solar cell firms and 300 solar module companies with lower-quality products could close down.

In addition, Chinese solar panel makers are facing possible tariffs as the U.S. International Trade Commission weighs charges in the dumping case. In a 6 to 0 vote Dec. 5, the ITC found a "reasonable indication" that Chinese imports are "materially injuring" the U.S. industry. It is considering whether to impose duties, and at what level.

In a Nov. 22 conference call about its quarterly earnings, JA Solar chief executive Fang Peng said the company might move some of its finishing operations to other countries, such as South Korea or Taiwan, so that its panels would not be considered imports from China. "To be prudent we need to have a work-around solution," chief financial officer Min Cao said.

"China is not pricing its products to make money," said Timothy Brightbill, a lawyer at Wiley Rein who is representing U.S. solar panel makers in the dumping case. "It's pricing its products to try to dominate this market."

A new type of Chinese industry?

There is a measure of irony in the growth of the Chinese solar industry. In its new five-year economic plan, unveiled in March, China's government has singled out 35 sectors, including solar and other types of renewable energy, as priorities for creating a cleaner, technology-based economy, one with a healthier balance between domestic demand and exports.

"We have to develop our green economy," Cheng Siwei, former vice chairman of the standing committee of the National People's Congress, said at a Brookings Institution event Nov. 1.

Yet Barry Naughton, an economics professor at the University of California at San Diego, noted that China is, in fact, re-creating "the old pattern of economic development." Like many Chinese industries from the past, the solar industry is supported by subsidies and loans from state-owned banks; it imports equipment, thrives on low-margin, high-volume exports and often violates basic environmental standards in disposing of waste. In September, riot police clashed with about 500 people who damaged vehicles and stormed a Jinko Solar plant, which they said had dumped toxic waste in a local river.

The U.S. economy, by contrast, focuses on jobs that add more value — research, design and equipment manufacture — and it captures profits at the retail level.

"I'm worried that what we see in China is . . . a pattern where existing technologies — sometimes mature, sometimes not — are ramped up rapidly, expanded quickly, because they have access to government support," Naughton said. "That kind of support has a danger because it distorts the overall global environment for these newly emerging technologies — technologies that are important for all of us."

Joanna Lewis, a professor of science, technology and international affairs at Georgetown University, adds that "the part of the process that China excels in is energy-intensive and not environmentally friendly." She adds that solar is "clean, green technology, but only after you manufacture it" — and not if it's all exported.

While China talks about boosting its domestic market, its solar panel manufacturing capacity is 32 times greater than domestic consumption. Solar last year accounted for just 0.006 percent of China's electrical power, Naughton said.

"Solar panel manufacturers in China are not so much in a technology business as a commodity one," Massachusetts Institute of Technology professor Edward Steinfeld and MIT researcher Jason Lee wrote in an unpublished paper. “They get into the game by buying expensive assembly line equipment (mostly from American suppliers). They produce a product identical to that of their many other Chinese competitors, and then they try to hang on by producing at massive scale and tiny profit margins.”

Solar subsidies

Yet this is a business that few political leaders in America are ready to concede.

“I’m not going to surrender to other countries technological leads that could end up determining whether or not we’re building a strong middle class in this country,” President Obama said Oct. 6 in discussing the bankruptcy of Solyndra, a solar panel maker that received $535 million of federal loan guarantees.

He added, “There are going to be times where it doesn’t work out, but I’m not going to cave to the competition when they are heavily subsidizing all these industries.”

Seven U.S. solar cell and module makers have banded together to form the Coalition for American Solar Manufacturing, a new group, to file the dumping case. Many of them thought the existing trade group, the Solar Energy Industries Association, would not back the petition because its chairman is an executive at Suntech, the Wuxi, China-based company that also has a small facility in Goodyear, Ariz. On Dec. 12, the German-based company SolarWorld quit the SEIA board, saying in a letter that it “no longer serves the interest of our company.”

Over time, academic exchanges and trade have kept the Chinese and U.S. solar industries entwined. For example, Fang Peng, the chief executive of JA Solar, earned his doctorate at the University of Minnesota, then held technology and management posts at Applied Materials, working on semiconductors. Suntech’s chief financial officer earlier worked at Disney, Bechtel and Price Waterhouse, and its supply chain head got his MBA at Michigan State.

But the dumping plaintiffs say it isn’t just experience that has given Chinese firms a leg up. “We’re really quite efficient,” said Ben Santarris, a spokesman for the U.S. unit of SolarWorld. “However, it is very difficult for us to compete with the Communist Party of China.”

SolarWorld’s petition cites likely sources of government aid to Chinese solar panel makers, such as grants given to exporters by China’s Export Product Research and Development Fund and cut-rate insurance from a state-owned firm. It alleges that firms such as Suntech and LDK Solar might get help under programs designed to foster “famous brand names,” from the central government and the province of Jiangxi, where both firms are based.

Many subsidies are given out at the local or provincial level. The dumping petition points to Shandong’s $340 million energy fund for solar water heaters, Hunan’s call for a 150 percent tax deduction for solar research and development, and Yunnan’s grants and low-interest loans.

Georgetown's Lewis notes that a Hunan company called Sunzone bought industrial land from the Chinese government at one-third the official rate, then listed the land on its books at full value.

A Suntech filing with the Securities and Exchange Commission in May says most of its subsidiaries qualify as "high and new technology enterprises" and therefore pay a 15 percent corporate income tax rate instead of 33 percent.

U.S. solar companies and lawmakers also point to the $34 billion in credit that the China Development Bank has offered to the big five panel makers. But JA Solar, which in September 2010 announced that the bank would provide $4.7 billion in financing, told Bloomberg News last month that it has not drawn down any of that amount. Suntech has used less than 10 percent of its $7 billion facility, said Andrew Beebe, the company's chief commercial officer. Other firms have also balked at the bank's offer for the time being.

The China Development Bank's interest rates have been "market rates," according to Beebe and SEC filings by Chinese solar firms listed on the New York Stock Exchange. Beebe says Suntech paid as little as 4.5 percent over the past couple of years and more than 6 percent this year. That is about three times as high as the rates Solyndra was paying for five-year loans from the Federal Financing Bank.

SEC filings reveal other advantages for Chinese firms. Suntech describes a guarantee it gave for a loan of 554 million euros provided by China Development Bank to a project developer called Solar Puglia, which Suntech had acquired. When Solar Puglia's power projects were not connected to the grid by Jan. 30, 2011, China Development Bank was entitled to demand immediate payment; it did not.

Another key trade dispute: The price and availability of polysilicon. China has imposed a quota on exports of polysilicon, the key ingredient of most solar panels. That has kept the price of silicon in China artificially low. In 2008, the price of polysilicon spiked as high as $450 a kilogram (2.2 pounds). Solyndra's panels did not use silicon, an appealing feature at that time, and Energy Department officials said they could not foresee a plunge in polysilicon prices.

But GCL Poly, a company with ties to the People's Liberation **Army** and the Chinese government, was already revving up production, providing half of the needs of Chinese exporters by late 2010, according to a report by the research group Fathom China. Today the price of polysilicon has crashed to less than $30 a kilogram. It's off 30 percent in the past month alone, the lowest level since around 2003, according to Bloomberg New Energy Finance group. GT's Gutierrez says companies can make polysilicon today at less than $25 a kilogram, after depreciation expenses.

Most of China's policies until now have been export-oriented, and Chinese companies' fortunes have risen and fallen with the size of subsidies in Germany, Italy and Spain.

Beijing's National Development and Reform Commission for years showed little interest in subsidizing domestic solar use, and a "Golden Sun" project subsidized by the ministries of finance and construction was plagued by corruption, poor planning and inferior products, Fathom China said. Ningxia province, beset by dust and pollution, found that every one of its 160,000 panels needed to be wiped clean four times a year. And the coal-dominated electricity grid is not suited to accommodate large amounts of fluctuating solar power.

But in the new five-year plan, the Chinese government has set a goal of generating 20 gigawatts of electricity with solar by 2020. That would represent just 1 percent of China's expected power generation, but it would be roughly equal to the world's total installed capacity. That could mean subsidies similar to Europe's "feed-in tariffs," which guarantee artificially high prices to solar energy producers. Such subsidies could tilt Chinese solar panel production toward the Chinese domestic market, potentially a positive development for U.S. manufacturers.

Will the best win?

China isn't the only one handing out subsidies.

Indeed, Chinese authorities have said they would investigate U.S. subsidies to solar manufacturers. Those include a 30 percent production tax credit, investment tax credits, research and development grants, and the Energy Department's recent loan guarantees. In addition, renewable energy standards in about 30 states are requiring electric utilities to boost the share of renewables in their power-generation portfolios, essentially forcing them to buy solar even if at higher prices, a subsidy hidden in utility rates paid by consumers.

"The support we have received in China is no different and perhaps significantly less than what we've seen many companies in the United States and Europe, and Germany in particular, receive," said Suntech's Beebe.

Meanwhile the U.S. solar industry is divided over the dumping case.

Some U.S. companies opposed to the dumping case note that SolarWorld received aid from Oregon to set up a solar cell factory there and that it will receive assistance from the government of Qatar for a joint venture producing polysilicon there. SolarWorld said that it has taken $11 million of Oregon tax credits, but added that those credits are "available to companies of all nationalities" and offset "less than 2 percent" of its more than $500 million investment in Oregon.

A SolarWorld spokesman said that the company does not "argue that subsidies are inherently improper," but rather "that it is illegal for one country's subsidies to fund its producers in mounting a predatory export drive that hobbles domestic producers of a foreign market — exactly what China has done."

The Coalition for Affordable Solar Energy, by contrast, includes firms involved in installation, which accounts for 52 percent of the solar industry jobs, the group says. For them, cheap panels mean more demand, regardless of where the panels come from. (SolarWorld says that installers, not consumers, have profited from falling panel prices.)

Then there are solar manufacturers that use thin-film technology, which is cheaper, though less efficient, than photovoltaic panels using crystalline polysilicon. First Solar, an Arizona company with plants in Germany, Malaysia and Ohio, is the industry leader and building a plant in Arizona. General Electric is spending $600 million to open a thin-film plant in Colorado.

GE's Victor Abate, vice president of renewables, said in an interview: "The price of solar had to come down for it to become mainstream. . . . The question is, can you compete? And that depends on technology. The best technology is going to win here."

"It's a race," DeLine said of solar panel manufacturing, "and it's not just the Chinese."

Steven Mufson

Steven Mufson covers the business of climate change for The Washington Post. Since joining The Post in 1989, he has covered economic policy, China, diplomacy, energy and the White House. Earlier, he worked for The Wall Street Journal. In 2020, he shared the Pulitzer Prize for a climate change series "2C: Beyond the Limit." Follow

EXHIBIT 67

TBEA Announces Plan of Domestic Listing of Its Subsidiary Xinte Energy

JANUARY 15, 2021 BY BENJAMIN IN FINANCE

PVTIME - TBEA Co., Ltd. (hereinafter referred to as the "Company") reviewed and approved the previously discussed "Proposal for Planning of Domestic Listing of the Company's Holding Subsidiary " during its second interim board meeting of 2021 earlier this week.

In order to seize the opportunity for the continuous improvement of the global new energy industry, optimize the company's capital structure, further expand and strengthen the company's presence in the new energy industry, the company plans to proceed with the preparatory work needed for the domestic listing of its subsidiary Xinte Energy Co., Ltd. (hereinafter referred to as "Xinte Energy").

UPCOMING SOLAR EVENTS

No event found!

XINTE 新特能源

1. Basic information of the entity to be listed in China

Xinte Energy is a solar-grade polysilicon producer and PV project contractor. Xinte Energy provides polysilicon production, sales of electricity, engineering and construction contracting, inverter manufacturing, and PV wafer and module manufacturing. Its financial data (consolidated) for the past two years are as follows:

	2019	2018
Total Assets	4,170,511.60	3,569,970.30
Net Assets	1,384,867.70	1,129,005.60
Operating Income	872,211.30	1,205,374.20
Operating Profit	90,311.50	154,631.60
Net Profit	51,679.30	111,064.20
Net Profit Attributable to the Parent Company	40,264.20	110,779.70

(Unit: 10,000 Yuan)

Note: the above data are prepared in accordance with international financial reporting standards and have been audited.

Xinte Energy was listed on the Main Board of the Hong Kong Stock Exchange on December 30, 2015, under the stock code 1799.HK. Presently, Xinte Energy has a total share capital of 1.2 billion shares, including 313,475,630 H shares, accounting for 26.12% of the total share capital; and 886,524,370 domestic shares, accounting for 73.88% of the total share capital. The company directly holds 783,921,287 domestic shares of Xinte Energy, accounting for 65.33% of the total share capital, and is the controlling shareholder of Xinte Energy. The company's wholly-owned subsidiary TBEA (Hong Kong) Co., Ltd. holds 1,223,200 H shares of Xinte Energy, accounting for 0.10% of the total share capital.

2. Authorization for domestic listing

The company is planning for the domestic listing of Xinte Energy and have started the preparatory work. The company's board of directors authorizes the company and Xinte Energy's management to initiate the preparatory work for Xinte Energy's domestic listing, including but not limited to the feasibility plan demonstration, the organization of the preparation of the listing plan, and the signing of relevant agreements involved in the planning process and other listing-related matters. After formulating the domestic listing plan, the relevant listing plan and other matters related to the listing will be submitted to the company and Xinte Energy's board of directors as well as the general meeting of shareholders for review.

3. Opinions of independent directors

The independent directors have expressed their opinions on the matter and believe that the company's domestic listing of Xinte Energy is in line with the company's strategic planning and long-term development, and there is no situation that harms the interests of the company and shareholders, especially small and medium shareholders. After the listing plan is determined, the company will perform the corresponding decision-making procedures in accordance with relevant laws and regulations, and review the relevant proposals for the domestic listing. It has been agreed that the company will start the preparatory work for the domestic listing of its holding subsidiary Xinte Energy Co., Ltd.

4. Opinions of the board of supervisors

The company's board of supervisors believes that the company's domestic listing of Xinte Energy is in line with the company's strategic planning and long-term development, and does not harm the interests of the company and shareholders, especially small and medium shareholders; and have agreed to start the preparatory work for the domestic listing of the company's controlling subsidiary Xinte Energy Co., Ltd.

5. Impact on the company

The company is a service provider that provides system solutions for the global energy industry. It is a national-level high-tech enterprise and large-scale energy equipment manufacturing enterprise. Its main business includes power transmission and transformation, new energy, and energy. Xinte Energy is the holding subsidiary of the company's new energy business segment and involved in the production of polysilicon, and engineering and construction contracting services for photovoltaic and wind power projects. Xinte Energy maintains a high degree of independence between its business areas and operating methods from other businesses of the company. The specific effects of Xinte Energy's domestic listing are as follows:

a) Proportion of net profit

According to the "Audit Report" (XYZH/2020URA30048) issued by ShineWing Certified Public Accountants (Special General Partnership), the company's net profit attributable to shareholders of the parent company in 2019 was 2.018 billion yuan, of which Xinte Energy's attributable to Shareholders of the parent company accounted for 13.05% of the net profit.

b) Proportion of net assets

According to the "Audit Report" (XYZH/2020URA30048) issued by ShineWing Certified Public Accountants (Special General Partnership), as of December 31, 2019, the company’s net assets attributable to shareholders of the parent company were 34.884 billion yuan, of which the new Xinte Energy's net assets attributable to shareholders of the parent company accounted for 21.43%.

c) Impact on the company's business

The company’s main business includes power transmission and transformation, new energy, and energy. Xinte Energy is the holding subsidiary of the company's new energy business segment and is involved in the production of polysilicon, and engineering and construction contracting service for photovoltaic and wind power projects. Xinte Energy maintains a high degree of independence between its business areas and operating methods from other businesses of the company. The domestic listing of Xinte Energy will not have a substantial impact on the continued operation of the company's other businesses.

d) Impact on the company's profitability

The domestic listing of Xinte Energy and the creation of a new financing platform are in line with the company's strategic planning and long-term development. The listing will enhance Xinte Energy’s financial strength, optimize its industrial layout, enhance the competitiveness and profitability of the new energy industry, and achieve better development of the new energy industry.

6.Rick warning

Xinte Energy's domestic listing plan is still in the preliminary planning stage. After the company's management has completed the preliminary preparations, the company's board of directors will need to determine whether Xinte Energy's domestic listing complies with the "Regulations on Pilot Domestic Listing of Subsidiaries of Listed Companies", etc. Laws, regulations, and regulatory documents require resolutions need to be submitted to the company's shareholders' meeting for approval. There will still be various uncertain factors in the implementation of this domestic listing, which may affect the listing planning and decision-making of Xinte Energy. There is a certain degree of uncertainty in this domestic listing.

In response to the above risks, the company will perform its information disclosure obligations in a timely manner based on the progress of the project. Investors are kindly requested to pay attention to the relevant risks.

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Risen Energy at Bloomberg Summit London: Asset Securitization Can Reduce the Leverage Cost of Energy Finance

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EXHIBIT 68

TBEA: a service provider of systematic solutions for global energy industry

TBEA is an active participant in the three national strategy new industries of "high-end power transmision and transformation equipment manufacturing, renewable energy and new materials" and has successfully established three listed companies: TBEA (stock code 600089), Xinjiang Joinworld Company Limited (stock code 600888) and Xinte Energy (stock code HK1799).

The Company actively practices the national strategy of "the Belt and Road initiative" and is devoted to sharing the advanced electricity construction experience of China with the world. The Company has provided green technology and smart environment-friendly, stable and efficient energy equipment to more than 70 countries, including the United States, Russia, Brazil, Mongolia, Tajikistan, Kyrgyzstan, Pakistan, etc. and supplied the turnkey project and systematic solutions from survey to design, construction, installation and debugging and to training, operation and maintenance to promote the construction of green and efficient power supply and grid, benefit the people of various countries and promote the economic development of local areas.

1000kV Shanxi Southeast – Nanyang –Jingmen extra-high voltage model project

Pakistan 100 MW photovoltaic power station constructed by TBEA

New materials such as electronic aluminum foil and electrode aluminum foil are used in the field of rail transit, electronic information technology and automotive lightweight fields etc.

2×660MW Zhundong Power Plant to transmit
Xinjiang electricity outside

Distribution of TBEA industry parks

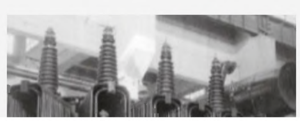
The Company has 14 manufacturing industry parks in China and 3 bases abroad.

Xinjiang Headquarters Science and Technology R&D Base (Changji, Xinjiang)

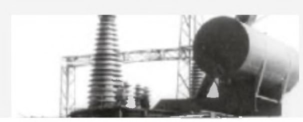
years; as a participant, TBEA runs all the way up to now from the first equipment in China to the first one in the world.

1938

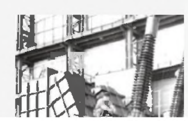
1955



1959

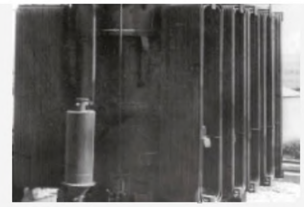


1973



In 1938, TBEA developed the first power transformer in China

In 1955, TBEA developed the first 110kV transformer in China



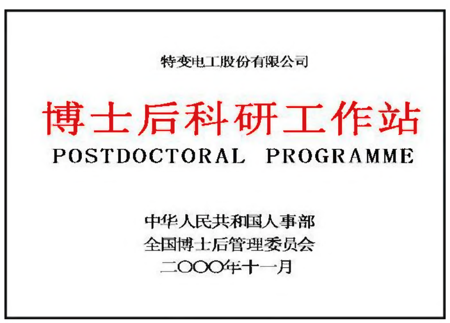
In 1959, TBEA developed the first 220kV transformer in China

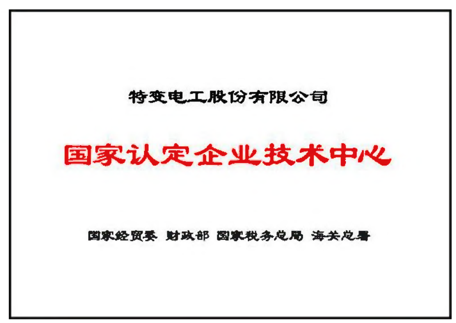
In 1973, TBEA developed the 330kV transfo China

1938 1955 1959 197

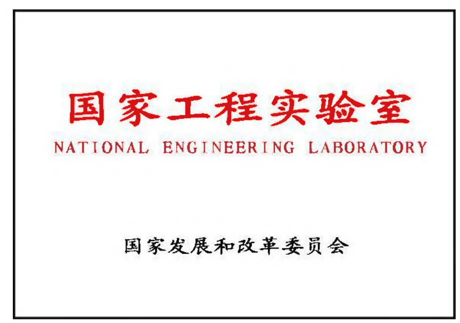
Honors and qualifications

Academician Workstation





Enterprise Technology Center



Engineering Laboratory

Postdoctoral Science Research Workstation

China National Science and Technology Progress Award

Ranking No. 228 in the World's top 500 mechanical companies

Ranking No.327 in China's top 500 enterprises

Ranking No.7 in top 100 of Chinese industrial machinery companies

Ranking No.133 in China's top 500 private enterprises

Ranking No.80 in Top 250 International Contractors listed by ENR

The business scope of TBEA covers over 70 countries and regions and over 20,000 employees are working for the Company.

In 2015, the total capital of the whole company reached 88.7 billion RMB and the sales revenue was more than 50 billion RMB. The Company has built the only national level UHV transformer engineering technology research center, four national level engineering labs, five national level enterprise technology centers, post doctor research work stations and academician work stations, which have formed a science and technology innovation platform where production, academy and research are integrated. The Company has won the honors of 1 special award, 4 class I awards and 1 class II award of national scientific and technological progress prize, China Industry Awards, National High-tech Enterprise, National Technology Innovation Model Enterprise, etc.

The development of TBEA has won high praises along the Belt and Road.

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EXHIBIT 69

Trina Solar in Vietnam: Secures US$30M Agreement with VietinBank, Provides Modules to Country’s Largest Private PV Project

18/09/10 Industry News,Trina Success

Trina Solar has recently signed a US$30 million credit facility with VietinBank — Vietnam’s largest listed bank by capital — which will be used to finance the production of the company’s plant in the northeast province of Bắc Giang. The agreement marks the bank’s first credit facility given to a Chinese solar PV company, proving the private sector’s confidence in Trina Solar’s capability.

At the time of its commencement in early 2017, the plant was the largest solar PV cell manufacturing facility in Vietnam with a single-site capacity of more than 1 GW, creating more than 1,000 jobs for the local economy. Beyond this agreement, Trina Solar hopes to extend its partnership with VietinBank to further boost investments in Vietnam’s downstream stations and ECP (Engineering, Procurement and Construction) services.

This move comes shortly after Trina Solar announced that it would be supplying 258 MW monocrystalline PERC double glass modules to the largest private solar PV project in Vietnam. This 264-hectare power station in Phan Rang-Tháp Chàm is the first combined wind and solar power generation plant in the country and is backed by leading Vietnamese investment firm Trung Nam Group. It is expected to be completed in June 2019.

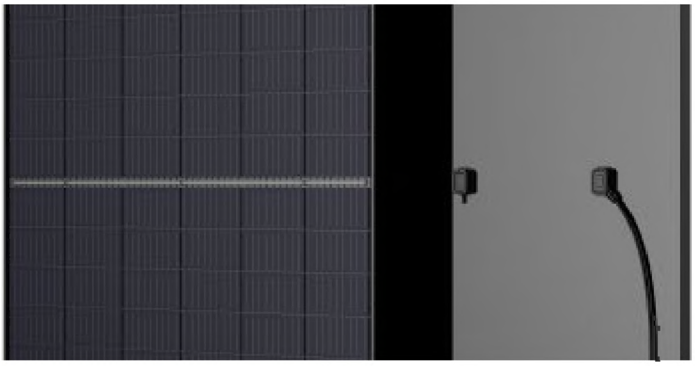
Trung Nam Group’s decision to partner Trina Solar for its first PV power plant investment was a well-thought through one and is a clear indicator of their trust in the company’s ability to deliver. With a deep understanding of the local PV market and its expertise as a global leader in solar innovation, Trina Solar will continue to play a pivotal role in Vietnam’s transformation towards a renewab energy ecosystem.

Both developments in Vietnam are a small part of Trina Solar's expansion plans in the Asia Pacific region and beyond. In addition to continuous growth in the US and European markets, Trina Solar also has formidable presence and influence in emerging markets in Southeast Asia, the most recent being Malaysia and Thailand. As of end 2017, Trina Solar's accumulated shipments have exceeded 32 GW, ranking top internationally in terms of production scale and market share. The company aims to continue being the world's leading provider of integrated solar energy solutions with a vision of bringing renewable energy to any and all.

Relevant Topics

The Results Are In: DNV GL Confirms TrinaPro's Higher Energy Gains

2020/06/11

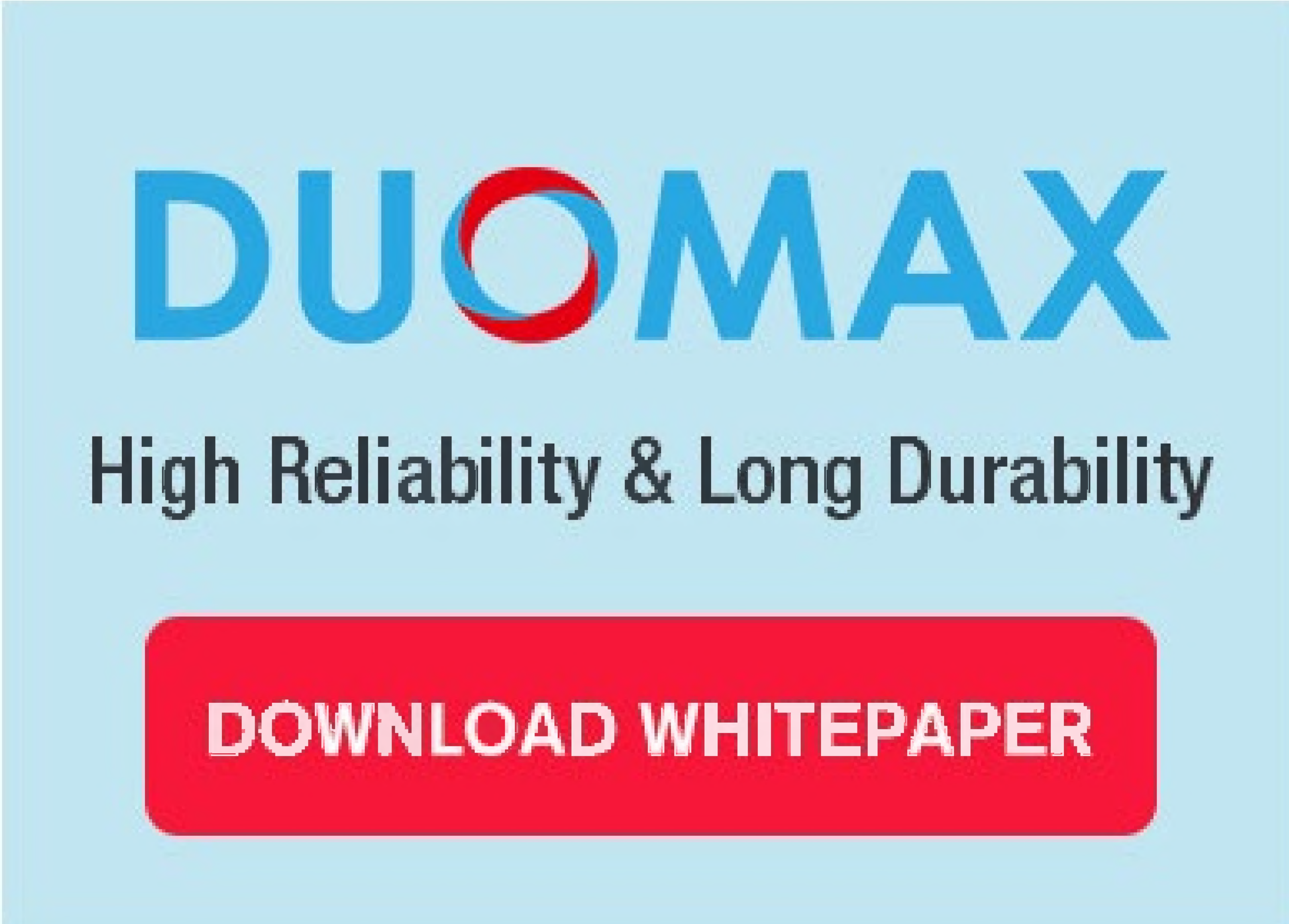


All-Black Modules Offer a Different Look for the Australian Residential Market

2020/05/06

2019 Milestones – Projects

2020/01/28



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2:30pm to 4:00pm GMT+7, 21 July 2021

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3:00pm GMT+8, 29 July 2021

[Virtual Conference] Vietnam Solar Week 2021
2:30pm GMT+7, 12 August 2021

[Webinar] Vietnam Eyes Green Growth in Buildings
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EXHIBIT 70

CLEAN POWER

Canadian Solar Secures $70 Million Investment In Vietnam Production Facility

By Joshua S Hill Published January 30, 2016

3 Comments

Canadian Solar has announced that it has secured investments worth $70 million to support the development of a module production facility in Vietnam.

Canadian Solar, one of the world's largest solar power companies, made the announcement Thursday, revealing that it had entered into agreements with the International Finance Corporation (IFC) to receive a package of up to $70 million in loans and equity investment. Specifically, the package from IFC — a member of the World Bank Group and the largest global development institution focused solely on the private sector in emerging markets — includes loans to Canadian Solar worth up to $60 million and a subscription of up to $10 million in common shares of Canadian Solar.

Canadian Solar-2

"We are delighted to secure support from IFC. This partnership is another milestone that enhances our leading position in the global solar power industry," said Dr. Shawn Qu, Chairman and Chief Executive Officer of Canadian Solar. "With IFC's commitment, we are able to expand our production capacity to meet the increasing demand for solar energy worldwide. We look forward to continuing our cooperation with IFC to accelerate the adoption of solar energy around the world, especially in developing economies, and to mitigate climate change."

Canadian Solar announced that the investments were intended for the development of a module production facility in Vietnam, as well as the expansion of solar cell and/or module production in other emerging markets.

"The solar industry is at an exciting juncture, where rapid cost declines have made it a scalable option for emerging markets," said Alzbeta Klein, Director, IFC Manufacturing, Agribusiness and Services. "IFC views this transaction as a first step in a long-term partnership with Canadian Solar, a global leader in the industry, and we look forward to collaborating on business models that will enable low-carbon energy access."

Canadian Solar had an impressive run through 2015, with a better-than-expected third quarter continuing strong growth throughout the year, including increased shipments and revenue. The much-ballyhooed COP21 climate agreement lit a fire under a number of renewable energy companies' shares, which was bolstered in Canadian Solar's case with a rush towards the end of the year which saw the company's shares rise around 23%.

TRENDING

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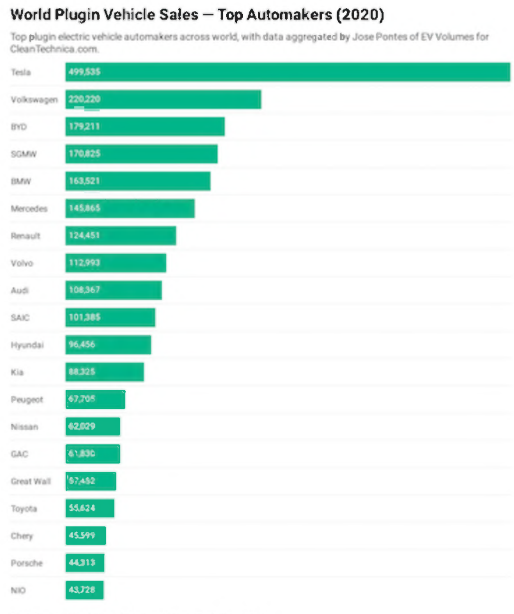
EV SALES CHARTS, GRAPHS, & STATS



In this article: canadian solar, emerging markets, IFC, International Finance Corporation, Vietnam, World Bank Group

WRITTEN BY

Joshua S Hill

I'm a Christian, a nerd, a geek, and I believe that we're pretty quickly directing planet-Earth into hell in a handbasket! I also write for Fantasy Book Review (.co.uk), and can be found writing articles for a variety of other sites. Check me out at about.me for more.

Comments

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Johnna Crider May 22, 2021

$98 Million Solar Farm Pitched In Louisiana

Johnna Crider March 21, 2021

EXHIBIT 71

NEWS (HTTPS://WWW.PV-TECH.ORG/CATEGORY/NEWS/)

LONGi approves 10GW of module and 5GW of new solar cell capacity expansion plans

By Mark Osborne (https://www.pv-tech.org/author/markosborne/)

October 15, 2019

Cell Processing (https://www.pv-tech.org/industry-segments/cell-processing/), Companies (https://www.pv-tech.org/industry-segments/companies/), Fab & Facilities (https://www.pv-tech.org/industry-segments/fab-facilities/), Financial & Legal (https://www.pv-tech.org/industry-segments/financial-legal/), Manufacturing (https://www.pv-tech.org/industry-segments/manufacturing/), Markets & Finance (https://www.pv-tech.org/industry-segments/markets-finance/), Modules (https://www.pv-tech.org/industry-segments/modules/)

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LONGi Green Energy Technology Co, the largest monocrystalline wafer producer, has approved future PV module and solar cell manufacturing plans of 10GW and 5GW, respectively.

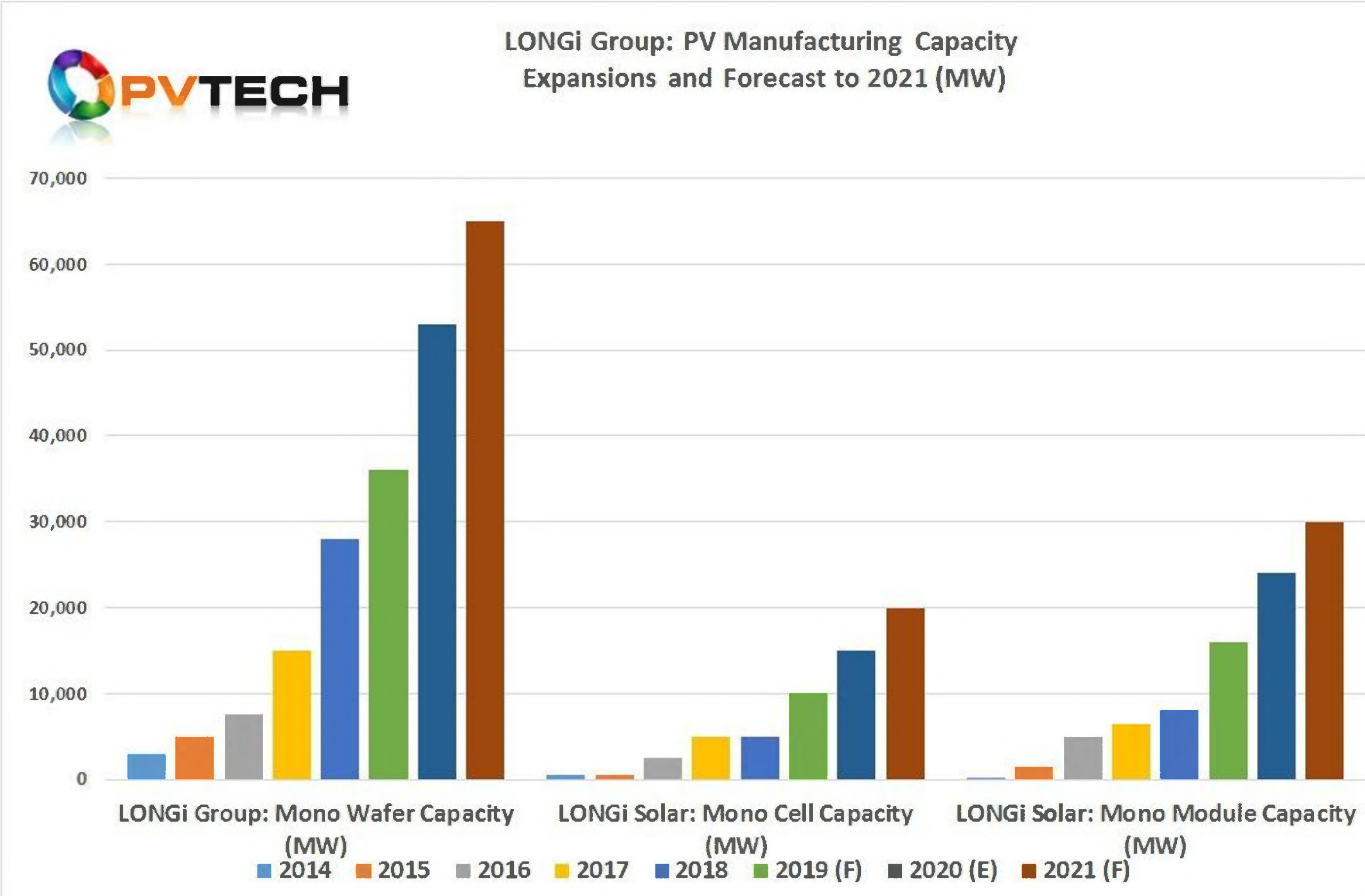
LONGi's Board of Director have approved the investment of approximately RMB 2.021 billion (US$ 286 million) in the construction of a 5GW mono module plant in Zhangzhou, China, dubbed Luzhou Phase II. The project is expected to take around 15 months to complete.

The company also approved another 5GW mono module plant in Xianyang, China in the Xianyang High-tech Industrial Development Zone. The capital expenditure and working capital for the project is expected to be in the region of RMB 1.839 billion (US$ 269.2 million) and take around 15 months to complete.

The third planned investment relates to a new 5GW mono solar cell plant to be located in Xi'an Xincheng City, China at a cost of approximately RMB 2.462 billion (US$ 348.4 million). The project is expected to take around 24 months, according to LONGi.

LONGi did not disclose in documents when the projects were expected to start construction and be completed.

The company has already announced separate plans to take cumulative PV module nameplate capacity to 23GW in 2020.



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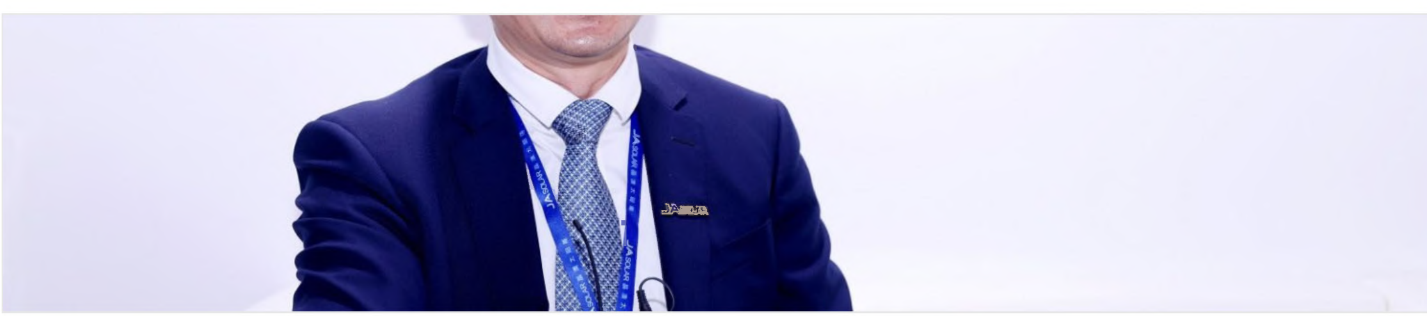

(https://www.pv-tech.org/how-ja-solar-is-responding-to-materials-price-increases/)

PV Tech Premium

How JA Solar is responding to materials price increases

EXHIBIT 72

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NEWS (HTTPS://WWW.PV-TECH.ORG/CATEGORY/NEWS/)

Trina Solar plans 10GW module assembly plant in Yancheng

By Mark Osborne (https://www.pv-tech.org/author/markosborne/)

March 2, 2021

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'Solar Module Super League' (SMSL) member Trina Solar is to establish a 10GW large-area, high-efficiency PV module assembly plant at the Yancheng Economic and Technological Development Zone, north of Shanghai.

Trina Solar said that the 10GW facility would cost around RMB2.5 billion (US$386 million) and take two years to build and commission.

The SMSL manufacturer had already announced plans late last year to establish an 8.5GW solar cell plant in Yancheng at a cost of RMB3 billion (US$459.4 million), although timelines were not confirmed.

Several other major upgrade and expansion plans were also announced by the company for manufacturing operations in Yancheng in 2020 (https://www.pv-tech.org/trina-solar-adding-8-5gw-vertex-solar-cell-plant-to-capacity-expansions-plans/), including 10GW of solar cell capacity for its 210mm wafer-based modules.

Trina Solar is expected to report at the end of March annual 2020 operating income of approximately RMB25.5 billion (US$4.57 billion), a 26.5% increase from the prior year period.

Net profit is expected to around RMB1.23 billion (US$ 185.4 million), an increase of 92.25% over the previous year.

PV module shipments are estimated to be in the region of 15GW for 2020

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EXHIBIT 73

NEWS (HTTPS://WWW.PV-TECH.ORG/CATEGORY/NEWS/)

CHINA ROUND-UP: Solar manufacturing capacity announcements continue from SMSL members

By Mark Osborne (https://www.pv-tech.org/author/markosborne/)

January 4, 2021

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Asia & Oceania (https://www.pv-tech.org/regions/asia-oceania/)

A round-up of the latest solar manufacturing capacity announcements in China continued unabated during the festive season, leading up to the beginning of 2021.

JA Solar: 20GW large-area wafer plant expansion

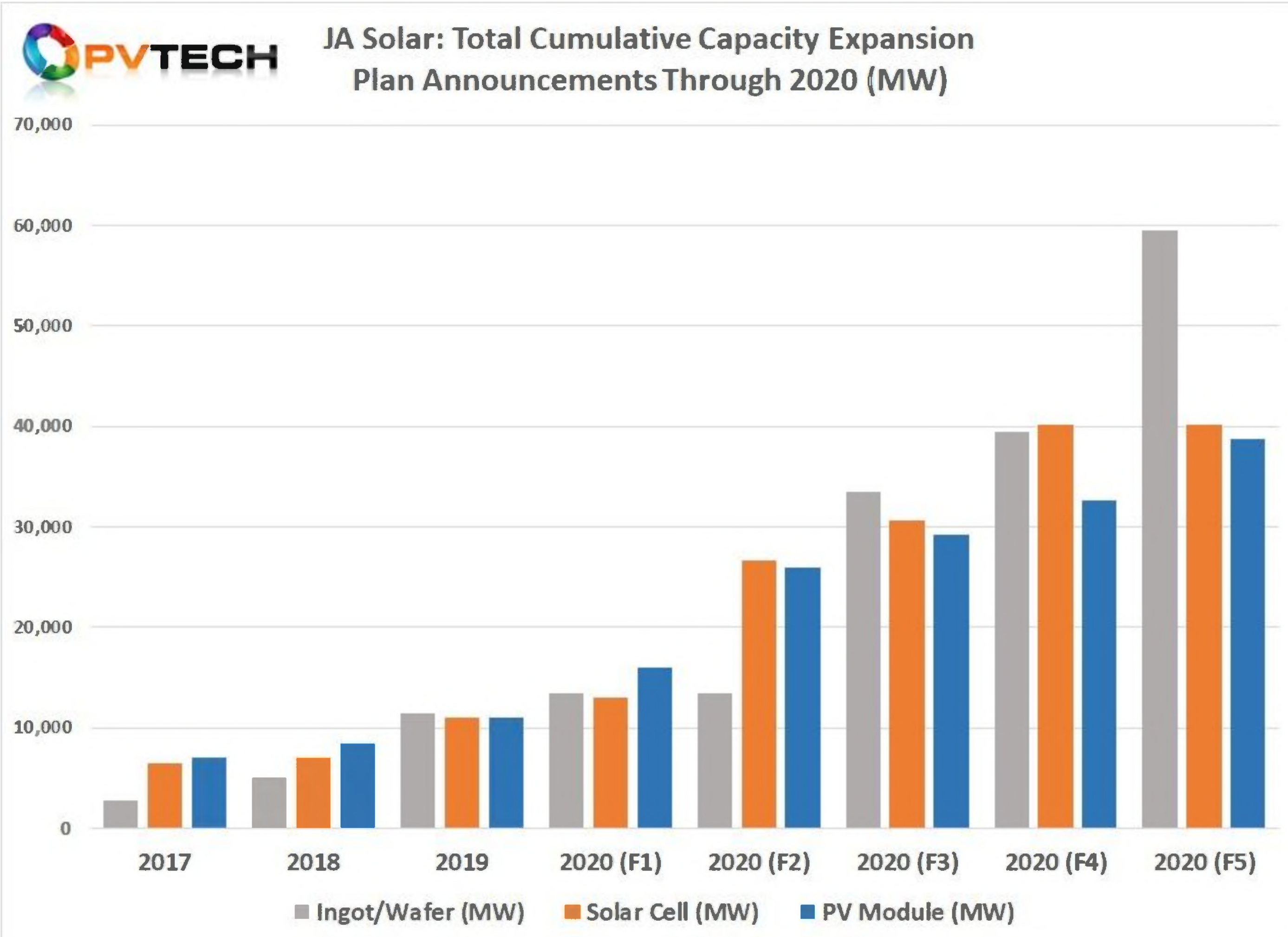
'Solar Module Super League' (SMSL) member JA Solar finished 2020 by revealing plans to build a 20GW ingot and wafering plant in in Baotou Equipment Manufacturing Industrial Park, Baotou City, Qingshan District, Inner Mongolia.

JA Solar's Phase III 20GW Baotou plant expansion is expected to cost around RMB5.8 billion (US$897 million), although timelines for the construction and possible phased ramps were not disclosed.

The SMSL manufacturer had previously announced a number of capacity expansions in 2020 (https://www.pv-tech.org/editors-blog/ja-solars-capacity-expansion-announcements-in-2020-top-104gw-across-wafer-cell-and-modules), including a 6GW PV module assembly expansion in December 2020. (https://www.pv-tech.org/news/ja-solar-adds-6gw-module-assembly-plant-to-extensive-2020-expansion-plan-announcements)

The latest ingot and wafer expansions follow-on from an announcement made in August 2020 for the Phase II (20GW) plans in Baotou. The two expansion announcements in December (See chart F5 section) is the fifth major grouping of expansions announced by JA Solar in 2020.

JA Solar's ingot and wafer capacity expansion announcements in 2020 have topped 46GW, according to *PV Tech*'s analysis of ongoing PV manufacturing expansion plans.



GCL-SI: 10GW solar cell manufacturing base

GCL System Integration Technology Co (GCL-SI) signed an agreement on 30 December, 2020 with the Leshan Municipal People's Government and Leshan High-tech Industrial Development Zone Management Committee to build a 10GW solar cell manufacturing base.

The last capacity expansion announcement from GCL-SI was back in March 2020 (https://www.pv-tech.org/news/gcl-si-building-60gw-integrated-solar-module-megacomplex-in-hefei-city) when the SMSL member announced a 60GW integrated 210mm wafer/cell and module assembly manufacturing hub in Feidong County in Hefei City, Anhui Province, China. These plans continue to be in the planning stage, according to previous financial updates.

The new 10GW cell plant in Leshan was said to cost a total of RMB4.3 billion (US$665.3 million) and will be constructed in two phases.

The first phase of the construction of a 5GW cell plant, with an industrial land area of about 160 mu, is expected to be completed by the end of 2021. The second 5GW phase is expected to be put into full production before the end of the first half of 2022, according to the statement.

Canadian Solar: 10GW cell and module assembly plant

Canadian Solar was reported to have announced its single largest solar cell and module assembly plant complex in the Suqian Industrial Park, Jiangsu Province, China.

The 10GW cell and module assembly project was expected to require a total investment of RMB3.6 billion (US$557 million).

The first phase will include a 5GW module assembly plant including 10 high-efficiency module production lines that will be put into production in September 2021. The second phase (5GW) was said to be scheduled to start construction in August 2021 with completion and production ramp in August 2022.

The combined project was said to be controlled by a subsidiary, Canadian Solar Power Group Co.

Separately, Canadian Solar was reported to have signed an agreement with the Funing, Yancheng, Jiangsu province government to build a new wafering plant with a capacity of 10GW at a cost of RMB 1.9 billion (US$155 million), built over two phases.

The first phase of the project was said to start construction in January 2021 and be operational in June 2021. Canadian Solar already operates cell and module manufacturing facilities in Funing.

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EXHIBIT 74

Foreign Exchange Rates - H.10

RSS Data Download

Effective June 24, 2019, the Federal Reserve Board staff will make a change to the indexation of the daily Broad, AFE, and EME dollar indexes. For more information, see the "Technical Q&As".

Release Date: Tuesday, July 06, 2021

Historical Rates for the Chinese Yuan Renminbi

(Rates in currency units per U.S. dollar except as noted by an asterisk)

3-JAN-00	8.2798
4-JAN-00	8.2799
5-JAN-00	8.2798
6-JAN-00	8.2797
7-JAN-00	8.2794
10-JAN-00	8.2794
11-JAN-00	8.2795
12-JAN-00	8.2796
13-JAN-00	8.2798
14-JAN-00	8.2797
17-JAN-00	ND
18-JAN-00	8.2793
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27-JAN-00	8.2783
28-JAN-00	8.2781
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26-AUG-15	6.4083
27-AUG-15	6.4053
28-AUG-15	6.3890
31-AUG-15	6.3760
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3-SEP-15	6.3549
4-SEP-15	6.3549
7-SEP-15	ND
8-SEP-15	6.3657
9-SEP-15	6.3768
10-SEP-15	6.3770
11-SEP-15	6.3735
14-SEP-15	6.3664
15-SEP-15	6.3685
16-SEP-15	6.3694
17-SEP-15	6.3645
18-SEP-15	6.3628
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30-OCT-15	6.3180
2-NOV-15	6.3180
3-NOV-15	6.3180
4-NOV-15	6.3357

28-OCT-20	6.7279
29-OCT-20	6.7140
30-OCT-20	6.6919
2-NOV-20	6.6899
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5-NOV-20	6.6027
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12-NOV-20	6.6114
13-NOV-20	6.6039
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25-NOV-20	6.5750
26-NOV-20	ND
27-NOV-20	ND
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9-DEC-20	6.5410
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14-DEC-20	6.5480
15-DEC-20	6.5388
16-DEC-20	6.5323
17-DEC-20	6.5321
18-DEC-20	6.5395
21-DEC-20	6.5493
22-DEC-20	6.5426
23-DEC-20	6.5400
24-DEC-20	ND
25-DEC-20	ND
28-DEC-20	6.5346
29-DEC-20	6.5300
30-DEC-20	6.5208
31-DEC-20	6.5250
1-JAN-21	ND
4-JAN-21	6.4601
5-JAN-21	6.4550
6-JAN-21	6.4617

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LONGi sets solar industry record for R&D spending

By Mark Osborne (https://www.pv-tech.org/author/markosborne/)

April 9, 2018

Cell Processing (https://www.pv-tech.org/industry-segments/cell-processing/), Companies (https://www.pv-tech.org/industry-segments/companies/), Fab & Facilities (https://www.pv-tech.org/industry-segments/fab-facilities/), Financial & Legal (https://www.pv-tech.org/industry-segments/financial-legal/), Manufacturing (https://www.pv-tech.org/industry-segments/manufacturing/), Markets & Finance (https://www.pv-tech.org/industry-segments/markets-finance/), Materials (https://www.pv-tech.org/industry-segments/materials/), Modules (https://www.pv-tech.org/industry-segments/modules/), Thin-Film (https://www.pv-tech.org/industry-segments/thinfilm/)

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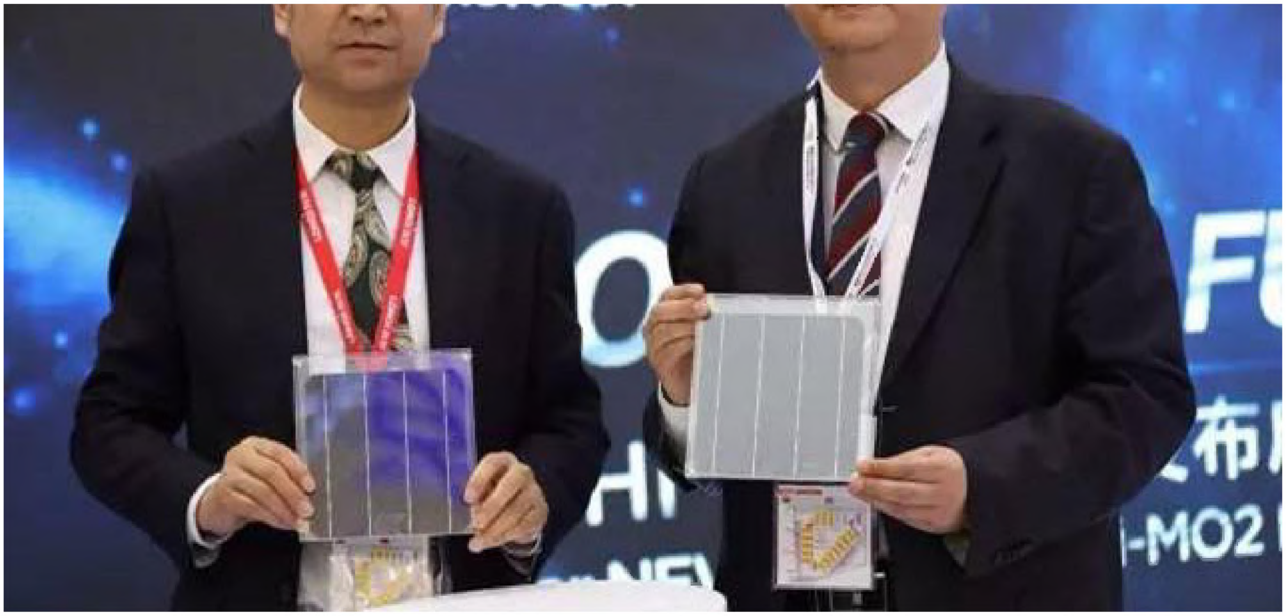
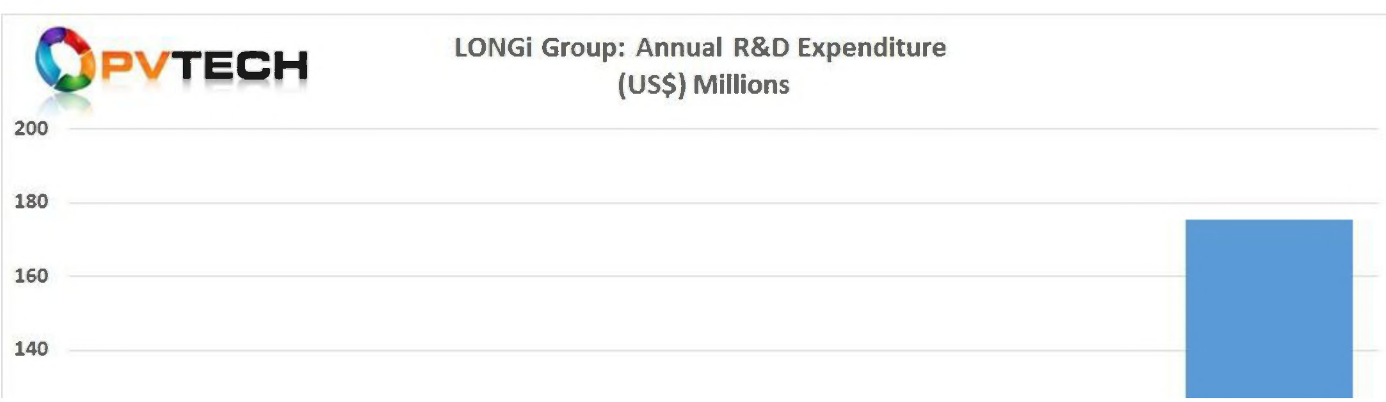


Leading integrated high-efficiency monocrystalline module manufacturer and 'Silicon Module Super League' (SMSL) member (https://www.pv-tech.org/editors-blog/top-10-module-suppliers-in-2017) LONGi Green Energy Technology set a new solar industry R&D expenditure record in 2017, not only surpassing the two historical leaders, First Solar and SunPower, but also spending more in one year than any PV manufacturer to date.

According to LONGi's recently released 2017 annual financial report, total R&D expenditure in 2017 almost doubled to RMB 1.1 billion (US$175.7 million), up 96.67% from US$89.2 million in 2016. LONGi reported total revenue of RMB 16.362 billion (US$2.59 billion) in 2017, up almost 42% from the previous year. Therefore, R&D spending accounted for 6.77% of revenue in 2017.

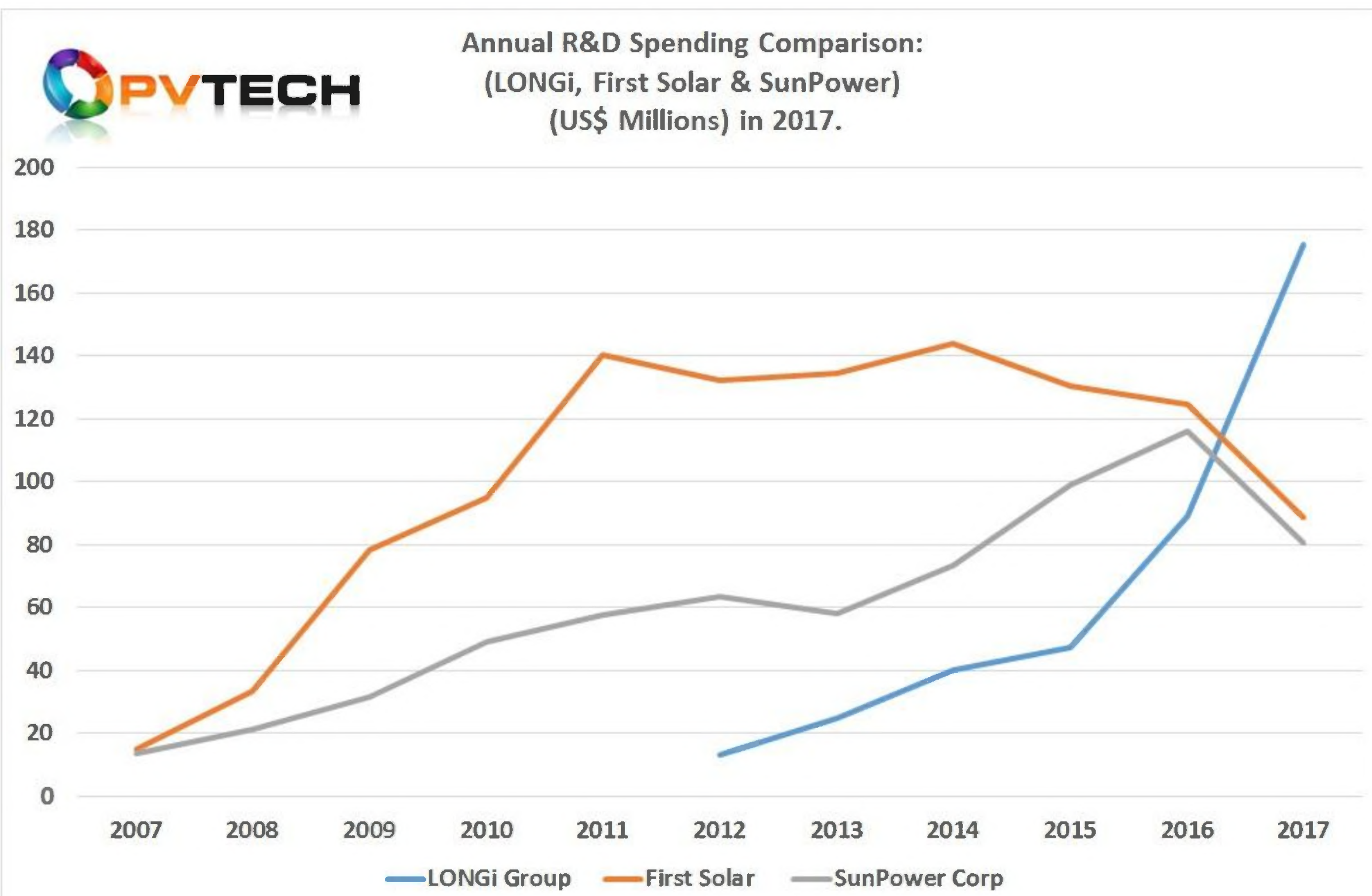
According to PV Tech's long-standing analysis of R&D spending (http://https://www.pv-tech.org/editors-blog/10-years-of-rd-spending-analysis-of-12-key-pv-module-manufacturers) of leading PV module manufacturers, only SunPower has come close when in 2015, R&D spending accounted for 6% of revenue and First Solar topped 5.1% in 2011.

However, one of the key metrics is that LONGi surpassed perennial top ranked R&D spenders, First Solar and SunPower, respectively, by a significant margin. Both US headquartered companies cut R&D spending in 2017, the first time for SunPower in four years, while First Solar trimmed R&D spending for the third consecutive year.



In contrast, LONGi has increased R&D spending for six years in row and has maintained a high-level of R&D investment over the last four years.

Initially, LONGi was a dedicated monocrystalline ingot and wafer producer but notably since 2015, the company started production of monocrystalline solar cells and modules. Focused on high-efficiency PERC (Passivated Emitter Rear Cell) technology, R&D spending almost doubled each year since 2016.



However, in reporting R&D expenditure of US$175.7 million, LONGi also set a new annual solar industry spending record, according to PV Tech's analysis.

First Solar had previously held the record at US$143.9 million, set in 2014. First Solar remains the leader in R&D spending on a cumulative basis, reaching over US$1.11 billion between 2007 and 2017.

SunPower remains second ranked at over US$663 million in the same time period. However, LONGi has jumped ahead of several other PV manufacturers to take the third ranked position with over US$390 million in cumulative R&D spending since 2012.

c-si manufacturing (https://www.pv-tech.org/tag/csi-manufacturing/), first solar inc (https://www.pv-tech.org/tag/first-solar-inc/), longi solar (https://www.pv-tech.org/tag/longi-solar/), longii green energy technology (https://www.pv-tech.org/tag/longii-green-energy-technology/), monocrystalline wafer (https://www.pv-tech.org/tag/monocrystalline-wafer/), perc (https://www.pv-tech.org/tag/perc/), pv celltech (https://www.pv-tech.org/tag/pv-celltech/), solar cell (https://www.pv-tech.org/tag/solar-cell/), sunpower corporation (https://www.pv-tech.org/tag/sunpower-corporation/)

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EXHIBIT 76

LONGi Global Network

EXHIBIT 77

World’s biggest PV module factory

GCL System Integration plans to build a 60 GW solar module factory in China’s Anhui province, with a total investment of approximately $2.5 billion.

MARCH 30, 2020 EMILIANO BELLINI

HIGHLIGHTS MODULES & UPSTREAM MANUFACTURING CHINA

The president of GCL System Integration, Luo Xin.

Image: GCL System Integration

Share

Chinese module manufacturer GCL System Integration (GCL SI), a unit of Golden Concord Group Ltd. (GCL), plans to build a 60 GW solar module factory in in eastern China's Anhui province, according to a statement filed to the Shenzhen Stock Exchange last week.

The project will be developed in four phases, with the first 15 GW stage to be launched this year, the company said. It will build the other phases by the end of 2023, depending on sales and production capacity.

Overall, the entire project will likely require an investment of RMB 18 billion ($2.53 billion), with around RMB 5 billion to be invested in the first phase. GCL SI did not provide any additional technical and financial details about the plan. Upon completion, the facility will be the largest solar panel factory in the world, the company claimed.

GCL SI currently owns and operates five module factories throughout mainland China and one in Vietnam, with a combined capacity of 6 GW, according to its website.

EMILIANO BELLINI

Emiliano joined pv magazine in March 2017. He has been reporting on solar and renewable energy since 2009.
More articles from Emiliano Bellini

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EXHIBIT 78

NEWS (HTTPS://WWW.PV-TECH.ORG/CATEGORY/NEWS/)

China Sunergy to begin solar module production in Sacramento, California

By Mark Osborne (https://www.pv-tech.org/author/markosborne/)

February 14, 2017

Cell Processing (https://www.pv-tech.org/industry-segments/cell-processing/), Fab & Facilities (https://www.pv-tech.org/industry-segments/fab-facilities/), Manufacturing (https://www.pv-tech.org/industry-segments/manufacturing/), Materials (https://www.pv-tech.org/industry-segments/materials/), Modules (https://www.pv-tech.org/industry-segments/modules/)

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Updated: China-headquartered solar cell and module manufacturer China Sunergy (CSUN) said in a joint statement (http://www.business.ca.gov/Newsroom/ArticleId/15/chinese-solar-company-selects-mcclellan-park-in-sacramento-for-first-us-facility) with the California Governor's Office of Business and Economic Development (GO-Biz) that it was establishing a solar module assembly facility at the McClellan Business Park near Sacramento, California.

An existing 140,000 square-foot building at the former McClellan Air Force base has been leased to CSUN, which was said to have the nameplate capacity to produce 400MW of modules per annum and would provide over 200 'job opportunities locally'.

The module assembly plant would be highly-automated and 'operations' expected to start as early as May, 2017. GO-Biz noted that it had started negotiations with CSUN in July, 2016 to assist with the site selection process.

"We are delighted make solid steps toward introducing CSUN-branded and Made-in-America solar modules to local customers," stated Tingxiu Lu, Chairman and CEO of China Sunergy. "Our new state-of-the-art facility will have a positive impact on the Company's strategy of expanding its market share in the U.S market and benefiting the development of local economy through the jobs created and investment made."

"This lease transaction was completed after China Sunergy's national search for a suitable facility," said Ken Giannotti, Senior Vice President of McClellan Park. "We would like to thank Sacramento County Economic Development Department, Sacramento Employment and Training Agency (SETA), Greater Sacramento Economic Council, Sacramento Municipal Utility District (SMUD) and the California Governor's Office of Business and Economic Development for their critical roles in completing the transaction."

CSUN had previously established solar cell production facilities and sub-contracting module assembly operations in South Korea and Vietnam with relocated equipment from its China-based facilities to circumvent US anti-dumping duties on Chinese and Taiwanese made solar cells and modules. The company had already established a JV solar cell and module assembly plant in Turkey that circumvented later imposed EU anti-dumping duties.

To complete the circumvention of US duties, CSUN is likely to import solar cells from its facilities in South Korea and Vietnam.

The company is only the third Chinese headquartered PV manufacturer to establish module production in the US after former global leader Suntech Power Holdings closed its small module assembly plant in Arizona in 2013.

Diversified renewable energy firm Shunfeng International Clean Energy (SFCE), which previously acquired Suntech from bankruptcy, acquired a majority stake in US based Suniva (http://www.pv-tech.org/news/suniva-completes-250mw-capacity-expansion-at-georgia-headquarters) in 2015, which has manufacturing facilities in Georgia and Michigan. China-based module manufacturer Seraphim Solar started operating a module assembly plant (http://www.pv-tech.org/news/seraphim_solar_banking_on_20_year_solar_boom_in_us) in Jackson, Mississippi in 2016.

The major Chinese PV manufacturers, included in the 'Silicon Module Super League' (SMSL), such as JinkoSolar, Trina Solar, JA Solar and GCL established manufacturing operations in Southeast Asia to circumvent US and EU anti-dumping duties.

Korean headquartered SMSL member Hanwha Q CELLS, which has production facilities in China and Malaysia also established major operations in South Korea to supply gigawatts of solar modules to the US market.

CSUN has had a chequered past, running into financial difficulties (http://www.pv-tech.org/news/china_sunergy_returns_to_nasdaq_compliance_but_major_financial_problems_rem) and an accounting scandal (http://www.pv-tech.org/news/csun_co_founder_gets_ceo_job_again_following_resignation) that led to the company being de-listed from the NASDAQ (http://http://www.pv-tech.org/news/csun-ordered-to-de-list-from-nasdaq) Stock Market in early 2016. The company did not filed accounts during 2016 and its stock is traded of the US OTC market.

Update: According to one local news report (http://www.bizjournals.com/sacramento/news/2017/02/09/chinese-solar-company-to-establish-mcclellan-plant.html), CSUN plans to complete renovation work on the existing facilities at a cost of around US$10 million in advance of tool install of two automated module assembly lines in the April-May timelines.

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US Senate passes bill to ban all products originating from Xinjiang (https://www.pv-tech.org/us-senate-passes-bill-to-ban-all-products-originating-from-xinjiang/)

July 15, 2021

Legislation that would ban the import of all products from China's Xinjiang region into the US has taken a critical step forward, passing the US Senate.

INTERNATIONAL TRADE ADMINISTRATION

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Bar Code: **4152582**

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Case Title: Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules From People Republic of China

Case Segment: CIRC - Anti Circumvention Inquiry

Segment Begin Date:

Segment End Date:

Segment Specific Information: Request New Segment

Document Info:

Security Classification: Public Version

BPI Document Submission Barcode: 4152553

Document Type: Letter

Filed On Behalf Of (collective entity): American Solar Manufacturers Against Chinese Circumvention

Manual Submission: No

Comments:

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4152582-02	Vietnam CIRC Petition, Part 2 - PV Vietnam Solar I Circumvention Petition, Part 2.pdf (190)
4152582-03	Vietnam CIRC Petition, Part 3 - PV Vietnam Solar I Circumvention Petition, Part 3.pdf (88)
4152582-04	Vietnam CIRC Petition, Part 4 - PV Vietnam Solar I Circumvention Petition, Part 4.pdf (103)
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Case Segment: CIRC - Anti Circumvention Inquiry

Segment Begin Date:

Segment End Date:

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Manual Submission: No

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