SUNPOWER®

March 16, 2018

VIA REGULATIONS.GOV

Edward Gresser
Chair, Trade Policy Staff Committee
Office of the United States Trade Representative
1724 F Street, N.W.
Washington, DC 20258

RE: Request by SunPower Corporation to Exclude Solar Cells and Solar Modules Based on Copper-Plated Interdigitated Back Contact Technology from the Solar Products Safeguard Measure (USTR-2018-0001)

Dear Mr. Gresser:

Pursuant to the notice published by the Office of the United States Trade Representative ("USTR") in the *Federal Register* on February 14, 2018 (*Procedures to Consider Additional Requests for Exclusion of Particular Products from the Solar Products Safeguard Measure,* 83 Fed. Reg. 6670), I am writing on behalf of SunPower Corporation and its affiliates (collectively, "SunPower"), as its President and Chief Executive Officer. Specifically, I respectfully request that two products be excluded from the safeguard measures imposed by the President by Presidential Proclamation 9693, 83 Fed. Reg. 3541 (Jan. 25, 2018) (the "Safeguard Measures"). Should you have any questions or require additional information, please do not hesitate to contact me. I appreciate your consideration.

Sincerely,

Tom Werner
President and Chief Executive Officer
SunPower Corporation
Tom.Werner@sunpower.com

Enclosed: Executive Summary
Product Exclusion Request
Appendix 1
Appendix 2
Appendix 3
Exhibits 1-11

EXECUTIVE SUMMARY

Copper-plated, interdigitated back contact (IBC) technology is fundamentally different than other solar technologies, whether silicon-based or otherwise. Moreover, solar cells and solar modules derived from copper-plated, IBC technology offer a combination of features, performance, and physical characteristics that are not available from other solar products. Therefore, we respectfully request that the USTR, in consultation with the U.S. Department of Commerce and the U.S. Department of Energy, considers based on the information provided in detail in this submission to:

Exclude solar cells based on copper-plated, IBC technology from the Safeguard Measures.[1] Solar cells based on copper-plated, IBC technology include: *Crystalline silicon photovoltaic solar cells with:*

(i) *Total-area efficiency of greater than 22 percent;*

(ii) *No metal visible on the front of cell; and*

(iii) *More than 100 interdigitated fingers of tin-coated solid copper adhered to the back of the cell, with the copper portion of the metal fingers having a thickness of greater than 0.01 mm.*

Exclude solar modules based on copper-plated, IBC technology from the Safeguard Measures. Solar modules comprised exclusively of cells based on copper-plated, IBC technology from the Safeguard Measures include: *Crystalline silicon photovoltaic solar modules with:*

(i) *Total-area efficiency of greater than 20 percent;*

(ii) *No metal visible on the front of the panel with the exception that metal visible in a frame at the periphery of the panel is permitted; and*

(iii) *The solar cells comprising the module have more than 100 interdigitated fingers of tin-coated solid copper adhered to the back of the cells, with the copper portion of the metal fingers having thickness greater than 0.01 mm.*

Make the product exclusions described above retroactive to February 7, 2018, the effective date of the Safeguard Measures, and direct U.S. Customs and Border Protection ("CBP") to refund any tariffs paid on the above-described products as a consequence of the Safeguard Measures.

The following reasons justify granting this exclusion request:

[1] The Safeguard Measures consist of: (1) a tariff-rate quota on imports of CSPV cells not partially or fully assembled into other products, with an unchanged rate of duty for the within-quota quantity and an increase in the rate of duty applicable to articles entered in excess of that quantity; and (2) an increase in the rate of duty on imports of other CSPV products, as provided for in the Proclamation's annex.

I. Justification for Excluding Solar Cells and Solar Modules Based on Copper-plated, IBC Technology from the Safeguard Measures

A. Solar Cells and Solar Modules Based on Copper-plated, IBC Technology Deliver a Unique Combination of Features and Benefits.

The distinctive design and architecture embodied in copper-plated, IBC technology, coupled with the exclusive materials, equipment, and processes used to implement it, enables the production of solar cells and solar modules with a unique combination of features and benefits.

1. *Superior Efficiency and Greater Power Production.*

Solar cells based on copper-plated, IBC cell technology convert sunlight into electricity significantly more efficiently than other solar cells. In addition, copper-plated, IBC cells work better than other solar cells in low light and at higher temperatures; and, solar cells based on copper-plated, IBC technology better mitigate the impact of shading—all of which result in greater power production upon installation and over time, beyond the increases associated with higher conversion efficiency alone.

Likewise, both as consequence of the cells used as well as critical design features unique to them, solar modules based on copper-plated, IBC technology are significantly more efficient than other solar modules and generate substantially more power.

2. *Superior Durability, Flexibility, and Reliability.*

Not only do high-efficiency solar cells based on copper-plated, IBC technology produce greater power than other solar cells, they also are substantially more durable. Solar cells based on copper-plated, IBC technology, which utilize tin-coated copper, resist corrosion and degradation far better than other solar cells. Because of this, solar cells based on copper-plated, IBC technology continue to perform year after year, even in the harshest conditions.

Moreover, solar cells based on copper-plated, IBC technology are incredibly resistant to cracking. Even if a cell based on copper-plated, IBC technology does break, it won't shear, but will continue to perform, as its copper metal foundation holds the cell together and prevents "dead zones" (areas of isolated silicon that do not contact metal). By comparison, other solar cells break more easily, and cracks result in significant performance losses.

In addition, as the result of both the cells used and key innovations at the module level, solar modules based on copper-plated, IBC technology are the most reliable solar modules available.

3. *The Absence of Visible Metal on the Front of Solar Products Based on Copper-plated, IBC Technology Translates into Better Aesthetics and Better Performance.*

Unlike conventional CSPV solar products, which use screen-printed pastes on the front and back of the solar cells, resulting in visible metal "stripes" across the front, solar products based on copper-plated, IBC technology have no metal on the front. Instead, they have an all-black front, without metallic grid lines or metallic busbars visible. These aesthetic differences are vital drivers of value for many purchasers – indeed, many residential buyers would forego purchasing solar if there was not a product that met their aesthetic needs. However, the metal stripes on the front of conventional, front-contact CSPV products also reflect light, which reduces the amount of light available for conversion into energy. Therefore, the metal-free front of solar products based on copper-plated, IBC technology provides both aesthetic and performance benefits.

B. The Exclusion of Solar Cells and Solar Modules Based on Copper-plated, IBC Technology Benefits American Consumers, the American Economy, and the Domestic Industry, Without Undermining the Objectives of the Safeguard Measures and Can Easily Be Administered by the U.S. Customs and Border Protection (CBP).

1. *Solar Cells and Solar Modules Based on Copper-plated, IBC Technology Only are Available from One Source and There is No Adequate Substitute.*

Because the process to produce solar products based on copper-plated, IBC technology is complex, it requires special materials. For SunPower, these include ultra-pure polysilicon sourced from Hemlock, based in Michigan, and Wacker, based in Tennessee; expensive, custom equipment, much which is built by American companies; and more than twice as many manufacturing steps compared to conventional, front-contact crystalline silicon photovoltaic (CSPV) products. Additionally, many of these steps are proprietary or patent-protected and the product of substantial domestic investment in research and development done in the U.S. Combined, these provide a significant number of U.S. jobs and economic investment.

Therefore, the constellation of unique features and benefits exclusive to solar cells and solar modules based on copper-plated, IBC technology only are available from one source and cannot be obtained from any other solar products.

2. *Domestic Investment in Connection with the Research and Development of Copper-Plated, IBC Technology Accounts for a Substantial Portion of the Total Domestic Investment on Solar Technology.*

While copper-plated, IBC technology and the products derived from it represent a small percentage of the total number of products available in the domestic solar marketplace, domestic investment in connection with the research and development of copper-plated, IBC technology accounts for a substantial portion of the total domestic investment on solar technology. Copper-Plated, IBC technology represents the leading edge of solar technology and it will play an

important role in the development of the next generation of innovative solar products, as well as the storage and grid-integration technologies that will shape the future of the energy infrastructure in the United States.

More importantly, copper-plated IBC technology was conceived and developed in the U.S., by engineers, scientists and technologists employed by an American company. The patented technology and manufacturing processes associated with it are American assets. Restricting the availability of this technology and know-how in the U.S. and curtailing domestic investment in research and development by failing to exclude solar cells and solar modules based on copper-plated, IBC technology will create a vacuum for foreign-owned companies, with intellectual property developed overseas, to fill.

3. *Granting This Exclusion Request Furthers the Objectives of the Safeguard Measures and Addresses the Unintended Negative Consequences of the Trade Relief Afforded to the Domestic Solar Industry.*

Both the Safeguard Measures and the tariffs imposed in connection with the antidumping and countervailing-duty actions that preceded it, targeted artificially-low-priced, solar products—products based on the conventional solar technology employed by the petitioners in those actions—that were being dumped in the U.S. market in increasing amounts by companies that were also subsidized by the Chinese government and benefitted from unfair trading practices. Solar products based on copper-plated, IBC comprise a small percentage of total solar imports, have not been imported in materially increasing quantities, have not benefitted from unfair trade practices, and have struggled to compete against products targeted in past trade actions.

In fact, the *ad valorem* tariffs that form the basis of both the Safeguard Measures and the remedies imposed pursuant to the earlier trade actions disproportionately impact products based on copper-plated, IBC technology due to the exceptionally high prices of such products, which are driven by higher-cost raw materials and considerably more complex manufacturing processes. Therefore, granting this exclusion request furthers the objectives of the Safeguard Measures, while addressing an unintended negative consequence of the remedies imposed in past trade actions.

4. *The Exclusion of Solar Cells and Solar Modules Based on Copper-plated IBC Technology Can Easily Be Implemented and Administered by CBP.*

The distinctive appearance of solar products based on copper-plated, IBC technology, coupled with the fact that they only are available from one source, means that the exclusion easily can be implemented and administered by CBP.

We believe our case for an exclusion is compelling and we believe that SunPower is an American success story who's being disproportionately impacted by the tariff-based remedies.

We are a leading innovator that has made significant research and development investments in the U.S. and we have helped to stimulate the American economy with many thousands of jobs and billions of dollars in economic activity. While the tariffs have contributed to layoffs for SunPower, those job losses would be materially reversed and manufacturing and research and development jobs added, should we receive an exclusion. In particular, an exclusion for both our Copper-Plated IBC Cells and Copper-Plated Modules would free SunPower to devote substantial resources that otherwise would be dedicated to satisfying its additional customs duty liability to investments in next-generation research and development in the United States, as well as the establishment of U.S. manufacturing facilities dedicated to SunPower's P-Series modules, for which an exclusion is not being requested.

REQUEST FOR PRODUCT EXCLUSION

SunPower hereby respectfully submits this request that two products be excluded from the safeguard measures imposed by the President by Presidential Proclamation 9693, 83 Fed. Reg. 3541 (Jan. 25, 2018) (the "Safeguard Measures").[2] These products are described as follows:

- **High Efficiency Copper-Plated Interdigitated Back Contact Crystalline Silicon Photovoltaic Cells (the "Copper-Plated IBC Cells")**, described as follows: "Crystalline silicon photovoltaic solar cells with the following characteristics: (A) Total-area efficiency of greater than 22 percent, (B) No metal visible on the front of cell, and (C) More than 100 interdigitated fingers of tin-coated solid copper adhered to the back of the cell, with the copper portion of the metal fingers having a thickness of greater than 0.01 mm."

- **High Efficiency Crystalline Silicon Photovoltaic Modules Comprised Exclusively of High Efficiency Copper-Plated Interdigitated Back Contact Crystalline Silicon Photovoltaic Cells (the "Copper-Plated IBC Modules" and, together with the Copper-Plated IBC cells, the "Copper-Plated IBC Products")**, described as follows: "Crystalline silicon photovoltaic solar modules with the following characteristics: (A) Total-area efficiency of greater than 20 percent , (B) No metal visible on the front of the panel with the exception that metal visible in a frame at the periphery of the panel is permitted, and (C) The solar cells comprising the panel have more than 100 interdigitated fingers of tin-coated solid copper adhered to the back of the cells, with the copper portion of the metal fingers having thickness greater than 0.01 mm."

In support of this request to exclude Copper-Plated IBC Products from the Safeguard Measures, we explain in greater detail below that:

- Copper-Plated IBC Products are physically distinct from all other solar products available in the domestic market, including the lower cost, principally, Asian-manufactured, Front-Contact CSPV Products that were responsible for the injury suffered by the domestic solar manufacturers in this proceeding. These distinguishing physical features are easily

[2] SunPower further requests that, if granted, the requested product exclusion be made retroactive to February 7, 2018, the effective date of the Safeguard Measures, and that U.S. Customs and Border Protection ("CBP") be directed to refund to SunPower any tariffs paid as a consequence of the Safeguard Measures. The imposition of *ad valorem* tariffs on the importation of Copper-Plated IBC Modules disproportionately impacts the importers of such items, including SunPower, because of the higher price and value of their products, which are driven by higher cost raw materials and manufacturing processes.

ascertained by U.S. Customs and Border Protection (CBP) such that the requested exclusion for the Copper-Plated IBC Products could be administered without difficulty.

- Copper-Plated IBC Cells have never been manufactured in the U.S., except by SunPower, and are not manufactured by any other company anywhere in the world. Indeed, Copper-Plated IBC Cells only are manufactured in facilities wholly-owned and operated by SunPower.[3] These facilities utilize special, customized equipment—designed by SunPower and built to SunPower specifications (often by U.S. companies)—unique materials (such as SunPower-developed coatings), and in many cases SunPower-patented manufacturing processes. Only SunPower, in the custom facilities that it owns and operates, can manufacture Copper-Plated IBC Cells.
- There are no conventional Front-Contact CSPV Cell and Front-Contact CSPV modules that are complete substitutes for Copper-Plated IBC Cells and Copper-Plated IBC Modules.[4]
- Copper-Plated IBC Products comprise a small fraction of the total solar market. The manufacturing capacity for Copper-Plated IBC Products is less than 1 percent of the total global manufacturing capacity for photovoltaic products. Furthermore, because of the complexity of manufacturing Copper-Plated IBC Cells, as well as capital cost per unit capacity and longer lead times required for the establishment or modification of Copper-Plated IBC Cell production facilities as compared to Front-Contact CSPV Cell production

[3] It is important to note that SunPower's manufacturing facilities—which currently are located in the Philippines, Malaysia, and Mexico—were established well before the antidumping and countervailing duty investigations that preceded the Section 201 investigation were initiated.

[4] Copper-Plated IBC Modules have several unique characteristics that prevent substitution by other types of modules. Those characteristics include unique voltage and current operating points, higher efficiency, distinctive appearance, unmatched degradation and durability (and a warranty consistent with those characteristics), unique reverse-bias behavior, and, in some cases, unique sizes and/or mounting features.

facilities, SunPower does not anticipate that its market share will materially increase during the next few years, even if the USTR were to grant the requested Copper-Plated IBC Products exclusions. Likewise, it is unlikely that any another company would be in a position to manufacture commercially marketable quantities of Copper-Plated IBC Products during the initial four-year duration of the Safeguard Measures.

Moreover, excluding the IBC Products will not undermine the remedial objectives of the Safeguard Measures or the Administration's broader trade-policy objectives; instead, excluding Copper-Plated IBC Products will benefit the domestic CSPV manufacturing industry and the broader American economy. Specifically, the requested exclusions are expected to trigger investment in U.S. manufacturing, substantial research and development expenditures in the U.S., and spur job growth throughout the solar manufacturing supply chain through enhanced demand, beginning with the two U.S. polysilicon suppliers that SunPower relies upon to source the ultra-pure polysilicon required to fabricate Copper Plated IBC Cells, Hemlock Semiconductor Group ("Hemlock") of Michigan and Wacker Polysilicon ("Wacker") of Tennessee.

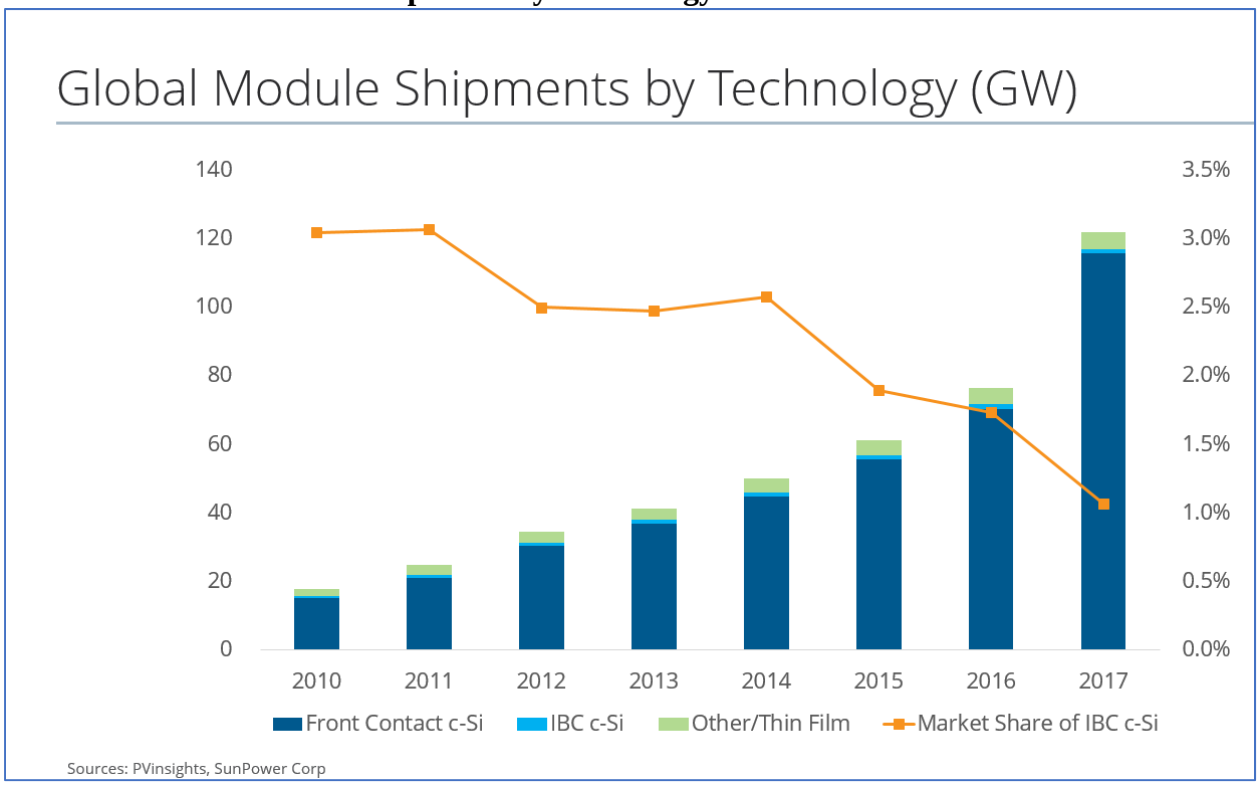
Our submission is divided into five main sections. In the first section below, we put Copper-Plated IBC Products in the context of all photovoltaic products. In the second section (as well as the attached appendices), we describe the unique technological features exhibited by, and the specific role within the domestic solar market played by, Copper-Plated IBC Products, that justify their exclusion from the Safeguard Measures. In the third section, we explain that the unique technological features exhibited by Copper-Plated IBC Products are the result of specialized raw materials, proprietary and, in many cases, patented manufacturing processes, and SunPower-specific manufacturing equipment. In the fourth section, we examine the factors set forth by the USTR for consideration in connection with a product exclusion request, which favor the exclusion

of Copper-Plated IBC Products. Finally, in the last section, we describe the positive impact that excluding the Copper-Plated IBC Products would have on the long-term competitiveness of domestic solar manufacturing supply chain, and we provide additional information in support of granting our exclusion request.

I. UNDERSTANDING THE SOLAR TECHNOLOGY LANDSCAPE AND THE ORIENTATION OF COPPER-PLATED IBC PRODUCTS WITHIN THAT LANDSCAPE

The overwhelming majority of solar panels produced globally and consumed in the domestic markets are comprised of front-contact CSPV cells. The balance is comprised of thin-film photovoltaic panels, which already are excluded from the Safeguard Measures, and IBC panels (with Copper-Plated IBC Modules the majority of this category). Chart I-1 below shows the global shipments of each of these three categories of solar panels, by year, from 2010-2017. It also shows the global market share of IBC products shipped during this same period.

Chart I-1: Global Module Shipments by Technology



Different consumers of solar modules have different needs, with some consumers requiring the higher efficiency,[5] better aesthetics, and/or higher durability of Copper-Plated IBC Modules. Further description of these three categories is as follows:

1. Front-Contact CSPV Products. This category represents approximately 95 percent of solar products produced globally and a large majority of the solar products imported into the U.S. Front-contact cells have metal on the front and the back of the cell to collect current, with a doped region on the front of the cell (of one polarity) and an opposing doped region on the back of the cell (of the opposite polarity). The overwhelming majority of Front-Contact CSPV Products utilize cells with p-type wafers with an aluminum back surface field or with a passivated rear emitter (these latter cells are commonly referred to as PERC cells). This category includes the technologies used by the two domestic solar manufacturers that advocated for the Safeguard Measures, as well as the technologies used by the manufacturers in the countries targeted during the antidumping and countervailing duty investigations that preceded the Section 201 investigation.[6]
2. Thin-Film Solar Products. Thin-film technology and the products derived from it fell outside of the scope of the antidumping and countervailing duty investigations that preceded the Section 201 investigation, as well as the Section 201 investigation itself.

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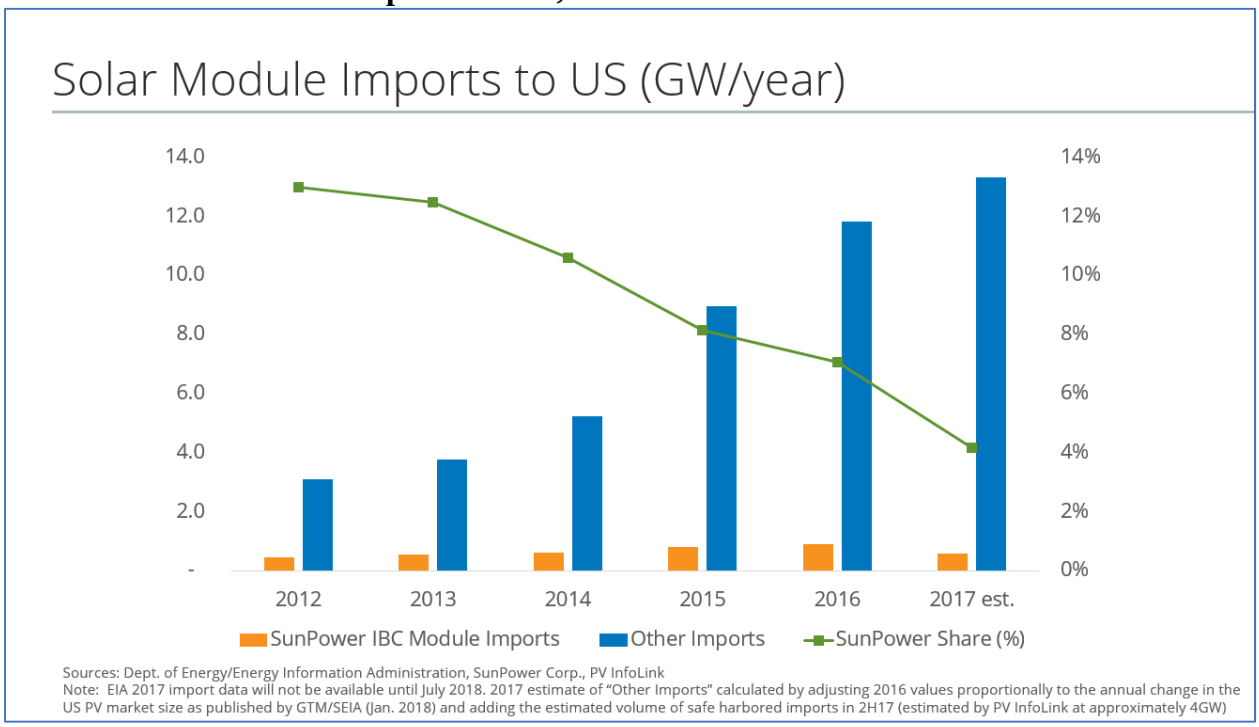
[5] Efficiency is the power output of a device at Standard Test Conditions (STC), divided by the area of the device. Some customers are also interested in high expected energy production of a panel per unit area of the panel. Efficiency is the largest determinant of that energy production, with the other factors being 1) starting energy production in the users' environment per rated Watt of the panel, and 2) the degradation rate of the panel. Copper-plated IBC have the highest rated efficiency, and they further have among the highest rated energy/Watt and the lowest degradation rate – thus the energy output per unit area advantage of Copper-Plated IBC Modules is even greater than the efficiency advantage.

[6] We note that SunPower also makes a front-contact CSPV solar product called Performance Series ("P-Series"). While distinct from conventional Front-Contact CSPV modules due to proprietary shingling technology, the efficiency, appearance, and price of the P-Series modules are similar to the majority of the market. Because SunPower has concluded its P-Series modules are sufficiently differentiated from the majority of the market, SunPower is not seeking an exclusion for this product.

These unique-technology products, which comprise approximately 4 percent of the U.S. market, are excluded from the Safeguard Measures.

3. Interdigitated Back Contact CSPV Products. This category, which includes the Copper-Plated IBC Products for which exclusions are requested, [7] represent approximately 1 percent of the global market. As shown in Chart I-2, IBC products represent a higher proportion – about 4 percent – of the U.S. market, primarily because of SunPower's focus on marketing and selling its IBC products in its home market.

Chart 1-2: Solar Module Imports to U.S., 2012-2017



IBC Products are characterized by unique technology and are produced using complex and proprietary manufacturing processes that require custom-manufactured equipment, distinct from both Front-Contact CSPV Products and Thin-Film Solar Products. IBC cells and

[7] See Appendix 3 for a discussion of current and potential manufacturers of IBC Products.

modules are a highly differentiated, niche subcategory of CSPV products having in common a silicon wafer as the platform upon which the solar cell is created. Critically, however, IBC cells use a higher quality n-type silicon wafer and have a significantly more complex architectural structure than Front-Contact CSPV Cells—specifically, the current-collecting metal and the opposingly doped regions are on the back of the cell, which are arranged in an alternating pattern.[8] Copper-Plated IBC Products are comprised of a type of IBC cell where the backside current-collecting metal is comprised of thick plated copper. Copper-Plated IBC Products have uniquely high performance and durability. For example, the copper plated metal results in a very high tolerance to cell breakage, which is a severe problem for most other types of CSPV cells. Copper-Plated IBC Products are in a variety of respects as different from Front-Contact CSPV Products as Thin Film Solar Products are from Front-Contact CSPV Products.

In the following section (as well as the attached appendices), we describe in detail the differences between Copper-Plated IBC Products and the Front-Contact CSPV Products manufactured in the U.S. and abroad, and why the unique technological, physical, and performance attributes of Copper-Plated IBC Products justify exclusion from the Safeguard Measures.

II. COPPER-PLATED IBC PRODUCTS FEATURE DISTINCT PHYSICAL AND PERFORMANCE ATTRIBUTES THAT JUSTIFY THEIR EXCLUSION FROM THE SAFEGUARD MEASURES

The needs of consumers within the domestic solar market are not uniform; and, not surprisingly, there are key differences in the technology used to create the solar products that serve those diverse needs. At the heart of each technology is some kind of solar cell—the fundamental

[8] By placing all of the metal contacts on the back the cell, the cell maximizes front side light capture and maximizes current conduction for electricity generation on the back side. By contrast, conventional CSPV cells have some metal contacts on the front side of the cell, which contributes to shading and optical losses. Please find attached as **Exhibit 1** a cross-sectional diagram of an IBC cell versus a conventional CSPV cell.

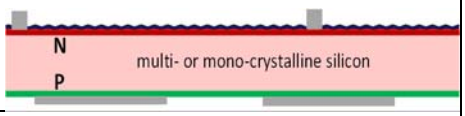
component that converts sunlight into electricity—and the most significant differences between technologies exist at the cell level.

However, key technological differences also exist at the module level, differences beyond the technology used in the cells contained within the module. As such, we are requesting that both Copper-Plated IBC Cells and Copper-Plated IBC Modules be excluded from the Safeguard Measures.

Therefore, in this section (as well as in attached appendices), we describe in detail the distinguishing physical and performance attributes that justify excluding Copper-Plated IBC Products from the Safeguard Measures. These attributes, which distinguish Copper-Plated IBC Products from other Front-Contact CSPV Products, fall broadly into the following three categories: (i) industry-leading total area efficiency; (ii) the absence of any metallic grid lines or metallic busbars on the front face of the cells; and (iii) the use of precision-aligned, thick, tin-coated solid copper "fingers" adhered to the back of the cells, which dramatically enhance their durability and the durability of the modules into which they are assembled.

For ease of reference in connection with our more detailed discussion of each of these three unique attributes of Copper-Plated IBC Products, please find below a table highlighting the key differences as between Copper-Plated IBC Products, as exemplified by Copper-Plated IBC Cells, and other Front-Contact CSPV Products, as exemplified by more conventional Front-Contact CSPV cells.

	High Efficiency, Copper-Plated IBC CSPV Cell	**Front-Contact CSPV Solar Cell**
Cell Efficiency	22 to 26%	17 to 21%

Front-Side Appearance	No metal on front of cell 	Screen printed metal on front 
Cell Cross-Section		
Cell Architecture	Over 100 precision-aligned alternating n- and p-doped fingers on the back	One type of doping on front of cell and opposite type on the back,
Technology / Processing	> 20 steps In the case of SunPower, unique equipment, proprietary and, in many cases, patented manufacturing processes; more than $500M R&D	~10 steps Generic equipment and processes
Contact Patterning / Metallization	Laser patterning and electroplated ductile copper and tin metal	Simple screen printing and baked on metal pastes

Please also find a more detailed discussion of the unique physical attributes of Copper-Plated IBC Products for purposes of the administration of an exclusion by CBP at **Appendix 1** and a more detailed description of the Copper-Plated IBC Products currently being produced by SunPower at **Appendix 2**.

A. Copper-Plated IBC Products Exhibit Industry-Leading Total Area Efficiency

The first key difference between Copper-Plated IBC Cells and Copper-Plated IBC Modules and conventional, front-contact, p-type CSPV cells and modules is their performance—Copper-

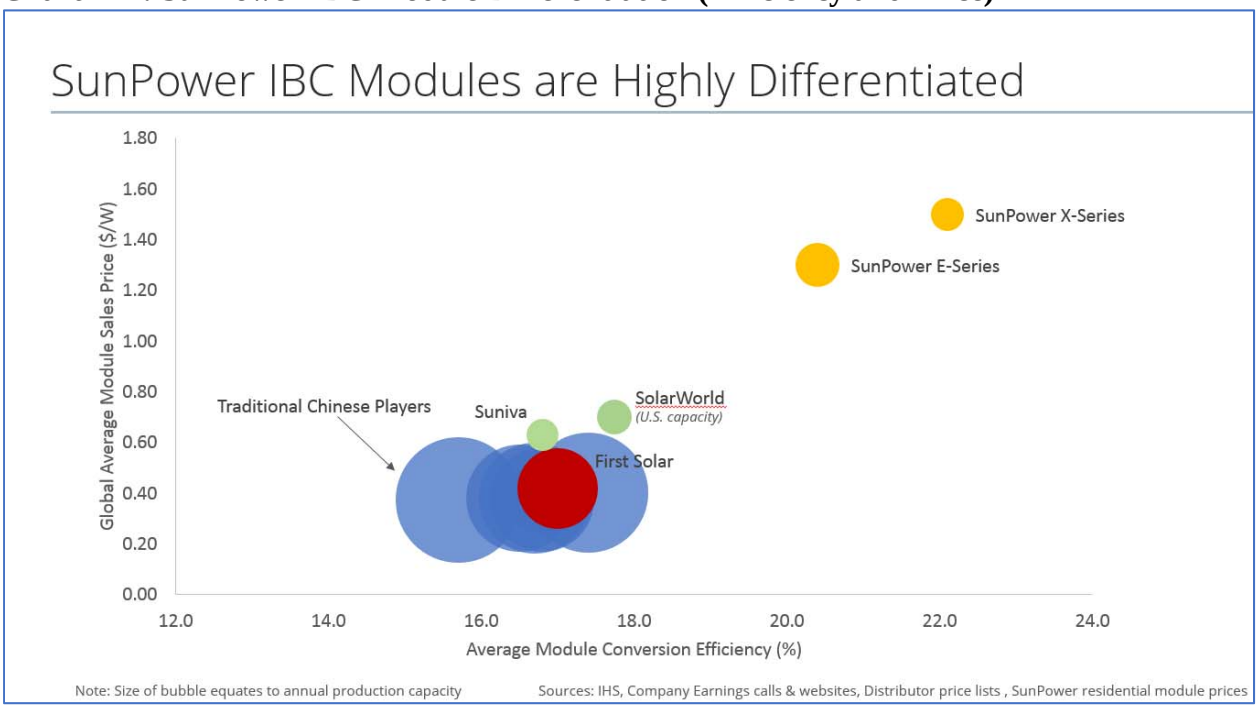
Plated IBC Cells and Copper-Plated IBC Modules, specifically those manufactured by SunPower, are the highest-efficiency modules available on the market, at greater than 22 percent for Copper-Plated IBC Cells and greater than 20 percent for Copper-Plated IBC Modules. Efficiency in this context is the rated power of the cells or modules, divided by the area of the product, divided by 1000 W/m^2, which as detailed below, would be a relatively simple calculation for CBP to perform based on information provided by the importer at the time of entry (alternatively, USTR and CBP could direct that efficiency be included in the customs entry documents).

The unique efficiency-based characteristics of the Copper-Plated IBC Cells and Copper-Plated IBC Modules manufactured by SunPower can be seen in the graph below (Chart I-3). The graph shows the estimated efficiency, and price to U.S. dealers, and annual production capacity (as bubble size in chart) of SunPower's Copper-Plated IBC Modules versus modules based on conventional CSPV technology that are produced and sold by the domestic solar manufacturers that participated in the Section 201 investigation and the top five Chinese module manufacturers.[9] Notably, due to their substantially greater efficiency and other characteristics, Copper-Plated IBC Modules can sell for over twice the price of conventional solar modules subject to Safeguard Measures, with the added upfront costs defrayed by gains in the levelized cost of energy realized over the exceptional useful life (up to 40 years) of Copper-Plated IBC Modules and by customers'

[9] Estimates of China Manufacturers' average sales prices ("ASPs") are from PVInsights data as of November 2017, adjusted for region, plus a 15 percent distributor markup; ASPs of SolarWorld Americas, Inc. ("SolarWorld") and Suniva, Inc. ("Suniva") products are SunPower estimates based on reports of distributor pricing; SunPower IBC Module prices are cash list prices to approved dealers. Average efficiencies are SunPower estimates, based on company-provided datasheets and third-party reports. Bubble size in the chart is proportionate to production volume, with SolarWorld estimated at 500MW based on PV Magazine, *SolarWorld Americas is up for sale*, Christian Roselund (Aug. 17, 2017) *available at*: https://pv-magazine-usa.com/2017/08/17/solarworld-america-is-up-for-sale/; Suniva volume estimated at 450MW based on PV-Tech, *Suniva completes 250 MW capacity expansion at Georgia headquarters* (with the expansion, "Suniva currently has 450MW of monocrystalline solar cell and module production.") (*available at:* https://www.pv-tech.org/news/suniva-completes-250mw-capacity-expansion-at-georgia-headquarters).

willingness to pay a meaningful premium for SunPower's brand equity, created by over 9 gigawatts of successful installations.[10]

Chart II-1: SunPower IBC Module Differentiation (Efficiency and Price)



Copper-Plated IBC Cells and Copper-Plated IBC Modules also lead the industry in reliability, as discussed in greater detail below.[11]

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[10] As detailed below, the differences in value represented in the price differences shown in the below graph are attributable to more than just the three distinguishing elements unique to Copper-Plated IBC Products. For example, as noted above, the higher price also is derived from the additional reliability from SunPower's learning gained by spending more than $100M spent on reliability research in the U.S., the use of high-purity, monocrystalline, n-type polysilicon sourced in the U.S. from Hemlock and Wacker, the use of a proprietary encapsulant, the use of patented cell-to-cell and busbar interconnects, the use of custom-designed manufacturing equipment and twice and many manufacturing steps as are required for conventional CSPV products, and industry-leading quality control. These and other value-producing elements are not specifically enumerated above because the product descriptions as written are sufficient to differentiate Copper-Plated IBC Products from the products subject to the Safeguard Measures.

[11] *See Fraunhofer PV Durability Initiative for Solar Modules: Part 3*, PVTech Power Magazine, 2015, at **Exhibit 2**. (ranking SunPower's X-Series and E-Series IBC Modules at number 1).

Based on their efficiency alone, Copper-Plated IBC Products simply constitute a different class of product than modules based on conventional CSPV cells and, therefore, merit exclusion from the Safeguard Measures.

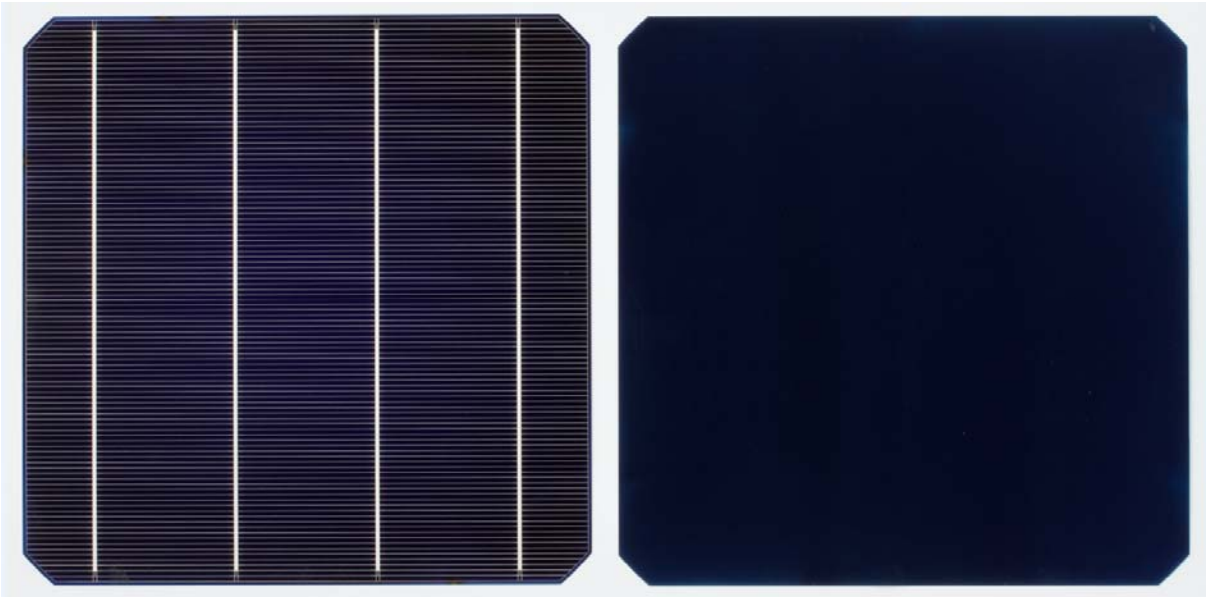
B. Copper-Plated IBC Products Have No Visible Metal on the Front Face

Unlike conventional Front-Contact CSPV Products, which use screen-printed pastes on the front and back of the solar cells, Copper-Plated IBC Products have no metal on the front; instead, Copper-Plated IBC Products feature an all-back-contact, interdigitated metal design, with thick electroplated copper metallization and solid-metal architecture.[12] This design results in an all-black front, as shown above and below, insofar as there are no metallic grid lines and no metallic busbars visible on the front of Copper-Plated IBC Cells, and no metal, apart from the frame, visible on the front of Copper-Plated IBC Modules. These aesthetic differences are vital drivers of value for many purchasers – indeed, many residential buyers would forego purchasing solar if there was not a product which met their aesthetic needs – and would be easy for CBP to discern upon inspection.

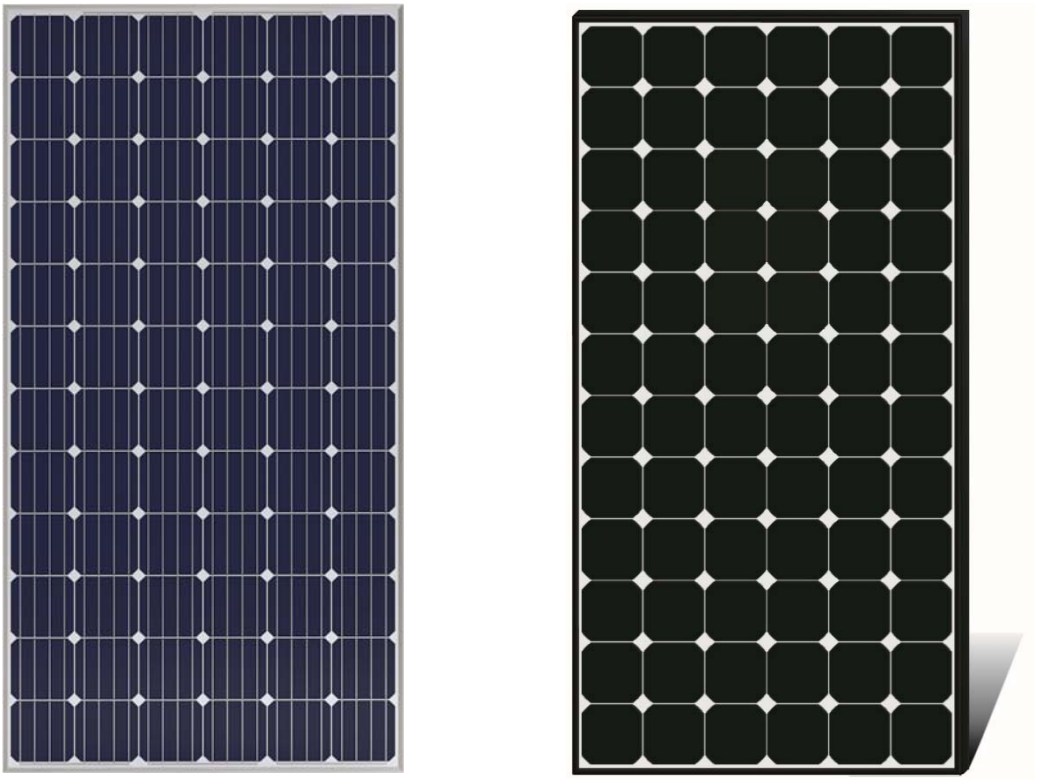
The photographs below clearly show the differences as between the front face of a conventional Front-Contact CSPV Cell (left) and Copper-Plated IBC Cell (right) as between the front face of a conventional Front-Contact CSPV Module (left) and a Copper-Plated IBC Module (right).

[12] Copper-Plated IBC Products also utilize specially-designed coatings and a unique texturing process and Copper-Plated IBC Cells feature two interdigitated diffused areas.

Front Face of Front-Contact CSPV Cell (Left) and Copper-Plated IBC Cell (Right)



Front Face of Front-Contact CSPV Module (Left) and Copper-Plated IBC Module (Right)



C. Copper-Plated IBC Products Feature a Unique, Proprietary Copper Back Plate

Finally, unlike Front-Contact CSPV Products, Copper-Plated IBC Products feature precision-aligned, thick, tin-coated solid copper[13] fingers adhered to the back of the cells. As a result, the manufacturing of Copper-Plated IBC Products is significantly more complex than the manufacturing of other Front-Contact CSPV Products and the process for copper plating Copper-Plated IBC Products in the case of SunPower is patented. Specifically, there are more than 100 interdigitated fingers of alternating polarity, each metal finger must have high-precision alignment with the doped fingers of alternating polarity within the cell, and there can be no locations of shunting between any of the fingers. In contrast, in conventional CSPV cells the front of the cell is of one polarity and the rear of the cell is the other polarity. This precision alignment of thick plated copper fingers is vital to both the efficiency and reliability performance of the product. Specifically, copper is both strong and malleable such that even if a cell breaks it does not "shear" due to the copper plating, thereby eliminating "dead zones" of isolated silicon that does not touch metal.

The use of this thick layer of ductile copper, firmly attached to the cell by electroplating, is a key differentiator as the two largest contributors to the failure of modules with conventional CSPV cells in the field are metal corrosion and cracking of cell interconnects. As a result, the high durability and low degradation rate for Copper-Plated IBC Products creates tremendous value.[14]

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[13] Please note that copper is an earth abundant metal and not a precious metal.

[14] Additional information can be found in SunPower Module Degradation Rate, (a 61-page whitepaper on the reliability and degradation rate of SunPower IBC-cell products) (*available at* https://us.sunpower.com/sites/sunpower/files/media-library/white-papers/wp-sunpower-module-degradation-rate.pdf); *see also generally Photovoltaic Failure and Degradation Modes*, Progress in Photovoltaics: Research and Applications (Jan. 4, 2017), at **Exhibit 3**.

By plating the cells with thick copper and using cell interconnects with in-plane strain relief that bond directly to the plated metal, these failures are essentially eliminated for Copper-Plated IBC Products. The thick metal also provides resistance to cell cracking. In fact, a key selling approach for Copper-Plated IBC Products is to intentionally break a Copper-Plated IBC Cell to show that the pieces stay together because of the thick copper, and then break a standard cell to show that the pieces do not stay together (which would result in severe problems with the performance of a module). Differences in the visual appearance of the back of cells is shown in **Appendix 2**.

The use of copper is an important differentiator in another respect. Virtually all conventional front-contact cells use silver paste for cell interconnects. The CSPV industry has scaled globally to the point where CSPV module manufacturing represents approximately 7 percent of total demand,[15] so silver availability could become a constraint for growth. As stated in the just-released International Technology Roadmap for Photovoltaic (ITRPV):

> Metallization pastes/inks containing silver (Ag) and aluminum (Al) are the most process-critical and most expensive non-silicon materials used in current c-Si cell technologies. Paste consumption therefore needs to be reduced.
>
> . . . .
>
> Because silver will remain expensive due to world market dependency, it is extremely important to continue all efforts to lower silver consumption as a means of achieving further cost reductions.
>
> . . . .
>
> Copper (Cu), as less expensive material, applied with plating technologies, is the envisioned substitute. It is still assumed that it will be introduced in mass production, but the market share is considered more conservative . . . Technical issues related to reliability and adhesion have to be resolved before alternative metallization techniques can be introduced. Appropriate equipment and processes also need to be made ready for mass production.[16]

[15] Henry Sanderson, "Solar Power Driving New Demand for Silver," Financial Times, May 13, 2016. Available at: https://www.ft.com/content/010da6e2-1863-11e6-b197-a4af20d5575e

[16] International Technology Roadmap for Photovoltaic: 2017 Results (March 2018), at 10-12. Available at: http://www.itrpv.net/Reports/Downloads/

Thus, the use of silver-free copper plating as a distinctive feature of Copper-Plated IBC Cells and Copper-Plated IBC Modules is an industry-leading innovation that could prove to be a substantial advantage in the race to continue scaling up production of CSPV technology over time.

III. COPPER-PLATED IBC PRODUCTS ARE MANUFACTURED USING UNIQUE RAW MATERIALS, PROPRIETARY AND, IN SOME CASES, PATENTED PROCESSES, AND CUSTOM-MANUFACTURED EQUIPMENT

The industry-leading efficiency exhibited by Copper-Plated IBC Products begins with unique raw materials, and the visually unique attributes of Copper-Plated IBC Products described above are the result of proprietary and certain patented architectural features and processes, as well as the use of custom-manufactured equipment.

As noted above, SunPower's Copper-Plated IBC Products require the use of ultra-pure polysilicon sourced from Hemlock and Wacker in the U.S., which allows for higher temperature processing and substantially increased efficiency, but also require highly specialized coatings, diodes, encapsulants, glass, and metallization. Indeed, because the performance of materials ordered to the same specifications varies greatly from one manufacturer to another and because the interaction of these raw materials is critical to module longevity, SunPower takes up to two years to qualify each of its suppliers.

Furthermore, to achieve the visual differences described above, but also industry-leading durability, efficiency, and reliability, SunPower relies on extensive research and development efforts undertaken in the U.S. (more than $500 million to date) and proprietary and certain patented architectural features and manufacturing processes, many of which require custom-manufactured equipment unique to SunPower, which are described in greater detail below. Indeed, SunPower has been granted over 20 U.S. patents on the architectural features and

manufacturing processes for its Copper-Plated IBC Products. Moreover, out of SunPower's more than 500 U.S. patents granted and more than 300 U.S. patents pending, SunPower has over 80 U.S. patents granted and over 70 U.S. patents pending related to Copper-Plated IBC technology.

- The front face of SunPower's Copper-Plated IBC Products feature a patented anti-reflective coating that enhances optical absorption. Furthermore, SunPower has patented a method for high temperature processing for efficient dopant diffusion that enhances cell efficiency and has patented a method for improved emitter diffusion that reduces electrical losses;
- The front face of SunPower's Copper-Plated IBC Products feature patented "cloaking" tape that obscures any metal that might otherwise be visible between the cells;
- The front face of SunPower's Copper-Plated IBC Modules features patented metal busbars between solar cell strings and the junction box and between solar cell strings themselves, as well as patented cell interconnect technology that includes thermal stress relief features and patent-pending encapsulant material tailored to prevent polarization. In the case of the interconnect technology, SunPower uses solder pads on the edge of the cell to minimize point stresses and, instead of ribbons, uses short tabs with built-in expansion and contraction, which similarly minimizes fatigue. By contrast, conventional CSPV cells are connected by soldering metal ribbons to cells. Because the metal ribbons expand and contract more than the silicon, these cells are susceptible to point stresses, fatigue, and the eventual failure of the solder connection, ribbons, or cell, which contributes to power loss because there are 'dead zones" of isolated silicon and hotspots that degrade the module; and

- The solid copper backing of SunPower's Copper-Plated IBC Cells and tailored etching process that support the formation of the copper backing also are patented and allow for additional current collection across the back of the cell, as well as structural rigidity and flexibility, the latter of which is critical to certain unique solar applications, as discussed below. These cells also feature a patented back aluminum layer to reflect light back into the cell. The angling of the fingers likewise is patented and increases the area for current collection surrounding the surface pads. In addition, as noted above, the copper is tin-coated, which improves corrosion resistance.

The above-described architectural features and manufacturing processes also contribute to the ability of SunPower's Copper-Plated IBC Products to: (i) generate more power in low light and at high temperatures; (ii) minimize the effects of shading; (iii) resist moisture, which typically is attributable to poorly performing back sheets and encapsulants and can lead to cell corrosion, delamination, and inverter faults; (iv) resist voltage stress; (v) prevent encapsulant browning, which reduces the amount of light that reaches the cell; (vi) prevent diode failure, which creates hotspots under shading; and (vii) prevent degradation of the anti-reflective properties of the glass.

IV. EXAMINATION OF THE OTHER CRITERIA FOR EXCLUSION SET FORTH BY THE USTR

In the *Federal Register* notice establishing the procedures for the USTR to consider additional requests for the exclusion of products from the Safeguard Measures, the USTR set forth a number of additional factors and information that the interagency evaluators of product exclusion requests might take into account. We address each of these below.

A. Names and Locations of Any Producers, in the U.S. and Foreign Countries, of Copper-Plated IBC Products

The record developed during the course of the Section 201 investigation confirmed that there are no domestic sources for IBC products, a finding that was not disputed either by SolarWorld or Suniva. Indeed, the ITC in its report noted as follows: "Three importers and one purchaser reported that interdigitated back contact (IBC) solar cells are not domestically produced and are not interchangeable with front□contact CSPV products."[17] Moreover, there are no manufacturers anywhere in the world of Copper-Plated IBC Products, as described above, other than SunPower. SunPower manufactures Copper-Plated IBC Cells at SunPower-owned and -operated fabrication facilities in Malaysia and the Philippines, as well as in limited quantities at its U.S. pilot line; and assembles Copper-Plated IBC Modules at SunPower-owned and -operated module facilities in Mexico and in France, although the capacity at the latter facility is limited and dedicated to the European market.

B. Total U.S. Consumption of Copper-Plated IBC Products, if Any, by Quantity and Value for Each Year from 2014 to 2017, the Projected Annual Consumption for Each Year from 2018 to 2022, and Any Related Information About the Types of Consumers

As shown in Table IV-1 below, for the years between 2014 and 2017, U.S. consumption of Copper-Plated IBC Cells declined,[1] which reflected the conversion of SunPower's U.S. module manufacturing facilities to research and development facilities and manufacturing facilities for SunPower's P-Series CSPV modules. The P-Series modules utilize conventional front-contact CSPV cells connected to one another by being "shingled." This is a novel technology, which

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17 *See* Crystalline Silicon Photovoltaic Cells (Whether or not Partially or Fully Assembled into Other Products), Investigation No. TA-201-75, ITC Publication 4739 (Nov. 2017), Volume II, at V-16.

[1] Please note that the consumption data is inclusive of certain cells that do not satisfy the efficiency criterion set forth above for purposes of the IBC Cell exclusion.

SunPower deploys in a unique method associated with its acquisition of the U.S. company Cogenra. Although SunPower is the only company to have deployed this technology in high-volume production, SunPower does not believe it merits exclusion due to the use of conventional (*i.e.*, front-contact) CSPV cells.

1. Consumption of Copper-Plated IBC Cells, 2014-2017

As shown in Table IV-1 below, for the years between 2014 and 2017, U.S. consumption of Copper-Plated IBC Cells declined,[18] which reflected the conversion of SunPower's U.S. module manufacturing facilities to research and development facilities and manufacturing facilities for SunPower's P-Series CSPV modules. The P-Series modules utilize conventional front-contact CSPV cells connected to one another by being "shingled." This is a novel technology, which SunPower deploys in a unique method associated with its acquisition of the U.S. company Cogenra. Although SunPower is the only company to have deployed this technology in high-volume production, SunPower does not believe its P-Series panels merit exclusion due to the use of conventional (*i.e.*, front-contact) CSPV cells. In addition, a small percentage of Copper-Plated IBC Cells (less than 1 MW) were sold by SunPower to customers in the U.S. for use in off-grid and specialty applications of the types already excluded from the Safeguard Measures (*e.g.* certain off-grid and consumer products).[19]

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[18] Please note that the consumption data is inclusive of certain cells that do not satisfy the efficiency criterion set forth above for purposes of the IBC Cell exclusion.

[19] As detailed below, SunPower sells Copper-Plated IBC Cells in the Unites States for a limited number of specialty applications, including space vehicles, military equipment, and solar racing cars, where high energy density is required. Such specialty applications do not utilize modules with the same form, fit, or function as SunPower's Copper-Plated IBC Modules. These applications are limited to less than 150 W, though typically are even smaller, and are designed to lower reliability standards for a shorter lifetime than SunPower's Copper-Plated IBC Modules. In 2017, SunPower sold less than 1 MW of cells into these specialty applications.

Table IV-1: U.S. Consumption of Copper-Plated IBC Cells

	2014	2015	2016	2017
MW per year	90	22	< 1	< 1
$M per year	80 – 150	20 – 40	< 2	< 2

2. Consumption of Copper-Plated IBC Modules, 2014-2017

As shown in Table IV-2 below, for the years between 2014 and 2017, U.S. consumption of Copper-Plated IBC Modules increased between 2014 and 2016, but declined to 552 MW in 2017.

Table IV-2: U.S. Consumption of Copper-Plated IBC Modules

	2014	2015	2016	2017
MW per year	789	709	989	552
$M per year	720 – 1040	640 – 960	720 – 1200	400 – 600

3. Projected Annual Consumption for Each Year from 2018 to 2022

Assuming that USTR grants the requested exclusions for Copper-Plated IBC Cells and Copper-Plated IBC Modules, SunPower projects that annual consumption of Copper-Plated IBC Products in the U.S. between 2018 and 2022 would increase in accordance with the projections in Table IV-3 below. SunPower's Copper-Plated IBC Products would continue to be sold primarily to residential and commercial customers for which industry-leading efficiency, high durability and long-term reliability and performance are factors driving purchasing decisions.

Table IV-3: Project Annual Consumption of Copper-Plated IBC Modules

	2018	2019	2020	2021	2022
Predicted Volume (MW/year)	600	700	800	950	1050

C. Details Concerning the Typical Use or Application of Copper-Plated IBC Products

More efficient modules mean that fewer modules are needed. Many SunPower customers, such as Campbell Soup, Macy's, Target, FedEx, Johnson & Johnson, Walmart, and the U.S. Air Force, face space constraints in their deployment of photovoltaic technology, such as limitations

in available roof space or parking lots.[20] Others have challenging topography. For these customers, the availability of Copper-Plated IBC Products—with their greater output, lower balance-of-system and labor costs, and lower electricity costs over time—often determines whether a project moves forward or is abandoned.[21] Moreover, as detailed above, the efficiency and reliability of the Copper-Plated IBC Products manufactured by SunPower are unrivaled in the industry.[22] Because of this, and because project viability frequently depends upon features and performance that only SunPower's cells and modules provide, customers willingly pay significant price premiums and have done so for many years.

In addition, while the vast majority of the Copper-Plated IBC Cells manufactured by SunPower are intended for consumption by SunPower in connection with the assembly of the Copper-Plated IBC Modules assembled by SunPower, the Copper-Plated IBC Modules manufactured by SunPower also are critical for certain off-grid and other specialty applications, which often require that the solar component be flexible, such as: (i) the unmanned, remotely piloted, solar-powered, high-altitude aircraft operated by the National Aeronautics and Space Administration ("NASA") and NASA's GROVER rover, an autonomous, GPS-guided, solar-operated robot that carries a ground-penetrating radar to examine the layers of Greenland's ice

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20 *See* SunPower, SunPower Case Studies: Commercial Solar Energy Partnerships (*available at*: https://us.sunpower.com/commercial-solar/case-studies/). (describing the more than 17 million SunPower modules deployed in commercial installations worldwide, listing some of our many customers, and explaining why 40 percent of the top-25 corporate solar consumers choose SunPower products); *see also*, SEIA, *Solar Means Business 2015: Top U.S. Corporate Solar Users*.

21 *See* Tessero, Baker Electric Solar, ITC Remedy Hearing Transcript, at 259-260. In addition, for utility-scale customers facing system-design challenges—such as sites with difficult topography—where balance-of-system and installation costs are paramount, SunPower often is the only option.

22 *See*, *e.g.*, *Facts About Solar Technology from SunPower* (**Exhibit 4**).

sheet;[23] (ii) solar-powered aircraft and racecars,[24] and solar-powered vessels;[25] and (iii) solar-powered passenger vehicles, such as the Ford C-MAX Solar Energi Concept.[26]

D. Total U.S. Production of Copper-Plated IBC Products for Each Year from 2014 to 2017, if Any

Copper-Plated IBC Products historically have been produced in limited quantities in the U.S. With respect to Copper-Plated IBC Cells, SunPower estimates that between 2014 and 2017 production in the U.S. amounted to less than 1 MW. SunPower, the sole producer of Copper-Plated IBC Cells in the U.S., manufactured these cells for research purposes. With respect to Copper-Plated IBC Modules, U.S. production volume for Copper-Plated IBC Modules in 2014 was approximately 88 MW and in 2015 was approximately 20 MW. In 2016 and 2017, U.S. production of Copper-Plated IBC Modules was eliminated. However, a pilot line opened in August 2017 may lead to increased U.S. production of Copper-Plated IBC Modules.

E. The Identity of Any U.S.-Produced Substitute for Copper-Plated IBC Products, Total U.S. Production of the Substitute for Each Year from 2014 to 2017, and the Names of Any Producers of the Substitute

Copper-Plated IBC Cells, as described above, cannot be substituted with Conventional CSPV Cells. These are proprietary cells that are unique to proprietary modules and require specialized stringers and equipment not available to other solar manufacturers.

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23 *See* https://us.sunpower.com/blog/2016/03/28/sunpower%E2%80%99s-nasa-projects-prove-our-solar-reliable/.

24 *See* https://us.sunpower.com/blog/2016/07/12/solar-powered-airplane-showcases-benefits-renewable-energy/.

25 *See* https://us.sunpower.com/blog/2016/07/28/sunpower-solar-cells-set-record-largest-solar-powered-boat-world/.

26 *See* https://media.ford.com/content/fordmedia/fna/us/en/news/2014/01/02/let-the-sun-in--ford-c-max-solar-energi-concept-goes-off-the-gri.html.

In addition, due to their exceptional efficiency, durability, and reliability, Copper-Plated IBC Modules, as described above, cannot be substituted for other Front-Contact CSPV Products. Independent, third-party research repeatedly has confirmed[27] that: "For more than 30 years, [SunPower has] designed, manufactured, and installed the world's highest efficiency solar technology."[28] The efficiency of SunPower's cells and modules—especially when coupled with their industry-leading reliability[29]—is more than an advertising claim. It is a critical differentiating factor in the marketplace and the key to many customers' ability to benefit from clean, cost-competitive solar energy. Indeed, as described below, there are certain applications for which the Copper-Plated IBC Modules manufactured by SunPower are the only solution.

F. Whether Copper-Plated IBC Products or Substitutes for Copper-Plated IBC Products May Be Obtained from a U.S. Producer

Please refer to Sections IV.A and IV.E, above.

G. Whether Qualification Requirements Affect SunPower's Ability to Use Domestic Products

Please refer to Section IV.C, above.

H. Whether Copper-Plated IBC Products Are Under Development by a U.S. Producer Who Will Imminently Be Able to Produce Them in Marketable Quantities

It is highly unlikely that Copper-Plated IBC Products would be manufactured in marketable quantities in the U.S. during the initial four-year period of relief afforded by the Safeguard Measures. Based on SunPower's experience, for one of our competitors to build a sufficiently

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27 *See* National Renewable Energy Laboratory, *Research Cell Efficiency Records* (Sept. 2015) (*available at*: https://energy.gov/eere/sunshot/downloads/research-cell-efficiency-records) (**Exhibit 5).** *See also* GTM, *SunPower Holds World Record for Most Efficient Rooftop Solar Panel, Again* (June 27, 2016) (**Exhibit 6**); Energy Sage, *What Are the Most Efficient Solar Panels on the Market?* (Jan. 1, 2018) (**Exhibit 7**).

28 ITC Remedy Hearing Transcript, at 223.

29 *See Fraunhofer PV Durability Initiative for Solar Modules: Part 3*, PVTech Power Magazine, (2015) (ranking SunPower's X-Series and E-Series Modules at number 1) (**Exhibit 2**).

robust manufacturing facility for Copper-Plated IBC Cells likely would take three years to ramp after development of an IBC cell, which itself is a time-consuming endeavor, and would be extraordinarily capital intensive. And, in the case of the Copper-Plated IBC Products manufactured by SunPower, there can be no manufacturing of a competitive product absent SunPower entering into patent licensing arrangements.

Please find a more detailed discussion of the lack of additional producers of Copper-Plated IBC Products, and limited number of global producers of any IBC Products, at **Appendix 3**.

I. Inventories of Copper-Plated IBC Products in the U.S.

SunPower estimates that current U.S. inventories of Copper-Plated IBC Cells amount to 83 MW and current U.S. inventories of Copper-Plated IBC Modules amount to 136 MW. In light of these limited inventories, there is no credible basis to assert that the remedial objectives of the Safeguard Measures are being compromised.

J. Whether Excluding Copper-Plated IBC Products from the Safeguard Measures Would Result in a Benefit or Advantage to the Long-Term Competitiveness of the Solar Manufacturing Supply Chain in the U.S., Including by Fostering Research and Development, Supporting Manufacturing Innovation, or by Leading to the Development of Differentiated Products that Command Higher Prices

Please refer to Section V, below.

K. The Ability of CBP to Administer the Exclusion

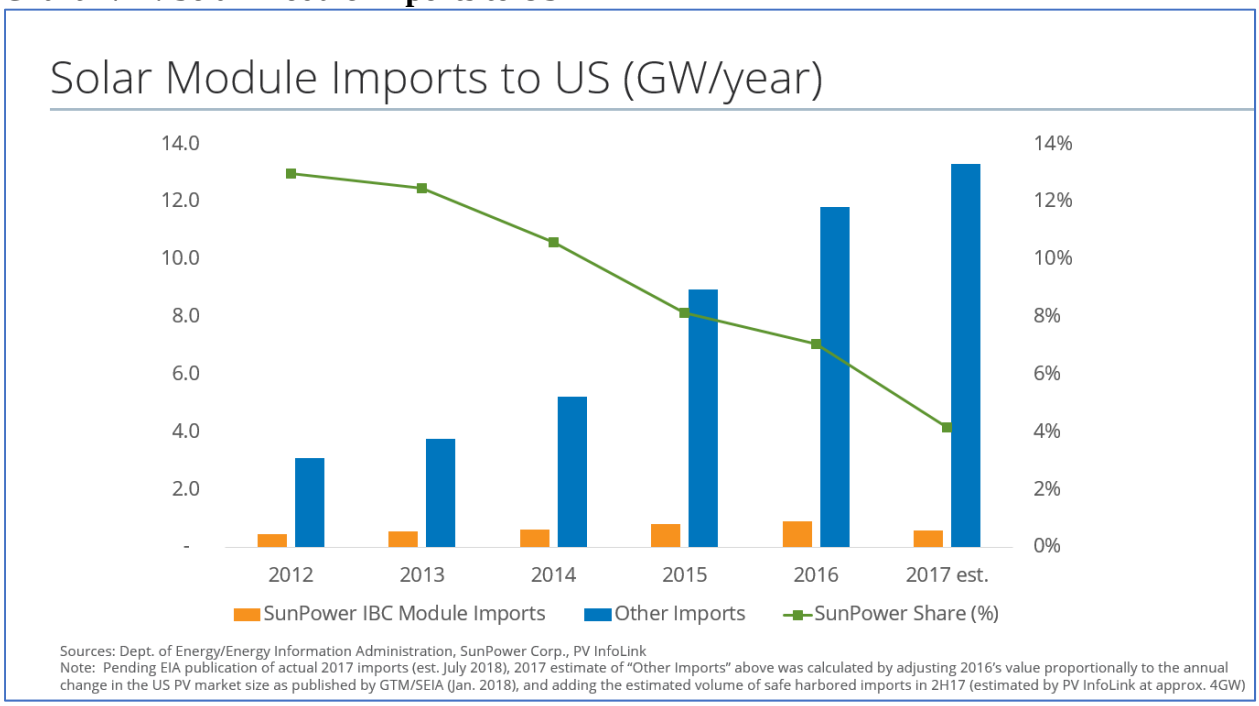
Please refer to **Appendix 2**.

L. Any Other Information or Data that Interested Persons Consider Relevant to an Evaluation of the Request

As Chart IV-1 below demonstrates, imports of Copper-Plated IBC Modules for which a product exclusion is being requested into the U.S. during the period investigated in connection with the Section 201 investigation accounted for a small fraction of the wattage imported into the

U.S. In addition, imports of the Copper-Plated IBC Modules for which a product exclusion is being requested only marginally increased during that same time period, while imports of Front-Contact CSPV Products surged.[30] These data demonstrate that Copper-Plated IBC Products have not been, and, assuming the requested product exclusions are granted, would not be, a material threat to the domestic solar manufacturing industry.

Chart IV-1: Solar Module Imports to US



30 Sources: Dept. of Energy/Energy Information Administration, SunPower Corp., PV InfoLink
Note: Pending EIA publication of actual 2017 imports (est. July 2018), 2017 estimate of "Other Imports" above was calculated by adjusting 2016's value proportionally to the annual change in the U.S. PV market size as published by GTM/SEIA (Jan. 2018), and adding the estimated volume of safe harbored imports in 2H17 (estimated by PV InfoLink at approx. 4GW).

V. EXCLUDING COPPER-PLATED IBC PRODUCTS WILL NOT HAVE ANY MEANINGFUL ADVERSE IMPACT ON THE DOMESTIC SOLAR MANUFACTURERS INVOLVED IN THE SECTION 201 INVESTIGATION, BUT WOULD RESULT IN A BENEFIT TO THE LONG-TERM COMPETITIVENESS OF THE U.S. SOLAR MANUFACTURING SUPPLY CHAIN

When considering exclusion requests, including this request to exclude Copper-Plated IBC Products, the imposition of Safeguard Measures should be understood as part of a process that formally began in 2011, a process that has triggered severe unintended consequences for SunPower despite its significance to the U.S. solar industry. As detailed below, however, the exclusion of Copper-Plated IBC Products would redress the harm caused by these unintended consequences, would not meaningfully affect the domestic solar manufacturers that historically have sought trade relief, and would foster continued U.S. research and development and corresponding innovation in solar, as well as domestic manufacturing and employment.

A. The Exclusion of Copper-Plated IBC Products Would Address the Unintended Consequences of the Trade Relief Afforded to the Domestic Solar Manufacturing Industry

In 2011, much of the domestic solar industry was struggling to compete against artificially-low-priced Front-Contact CSPV Products dumped in the U.S. market by companies that were subsidized by the Chinese government and that benefitted from other unfair trading practices. In response, SolarWorld filed the first antidumping and countervailing duty trade case (referred to herein as "Solar I") with the International Trade Commission (the "ITC") and the U.S. Department of Commerce. However, the antidumping and countervailing duties imposed as the result of Solar I[31] were considered by SolarWorld to be ineffective, as the foreign companies targeted by the action simply adjusted their operations to circumvent the duties.

[31] *See* 77 Fed. Reg. 73017 (Dec. 7, 2012) (Countervailing Duty Order); 77 Fed. Reg. 73018 (Dec. 7, 2012) (Antidumping Duty Order).

Therefore, in 2013, SolarWorld requested that the ITC and the U.S. Department of Commerce institute a second antidumping and countervailing duty trade case (referred to herein as "Solar II"). Solar II resulted in the imposition of additional duties that also were considered by the domestic solar manufacturing industry to be ineffective.[32] In fact, the quantity of Front-Contact CSPV Products being imported into the U.S. dramatically increased during the period following the publication of the Solar II antidumping and countervailing duty orders;[33] and, as the result of this increase and other factors, the domestic solar manufacturing industry fell further behind. Therefore, in another effort to obtain relief, pursuant to Section 201 of the Trade Act of 1974, Suniva, later joined by SolarWorld, requested the initiation of the Section 201 investigation that gave rise to the Safeguard Measures.

While well-intentioned, Solar I, Solar II, and the Section 201 investigation giving rise to the Safeguard Measures have had unintended negative consequences for those American companies, like SunPower, that have demonstrated the greatest ability to compete against the foreign manufacturers and exporters of conventional Front-Contact CSPV Products and the trade practices that created the situation that the domestic solar manufacturing industry now finds itself in. SunPower never has benefitted from Chinese subsidization, and has not engaged in production shifting to avoid the imposition of antidumping and countervailing duties. Yet, these trade actions have impaired the ability of SunPower to produce the distinctive, American-designed technology and products best positioned to compete against foreign competition; and they have jeopardized

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[32] *See* 80 Fed. Reg. 8592 (Feb. 18, 2015) (Countervailing Duty Order); 80 Fed. Reg. 8592 (Feb. 18, 2015) (Antidumping Duty Order).

[33] *See* Crystalline Silicon Photovoltaic Cells (Whether or not Partially or Fully Assembled into Other Products), Investigation No. TA-201-75, ITC Publication 4739 (Nov. 2017), Volume II, at Table II-1, which shows dramatic increases in imports in both calendar years 2015 and 2016.

the ability of American consumers to obtain the products that meet their needs—products unavailable from any other source; products for which there is no substitute; and products that did not contribute to the harm suffered by the domestic solar manufacturing industry during the past eight years.

Therefore, recognizing the objectives of the Safeguard Measures and the trade actions that preceded their imposition, we ask that you exclude Copper-Plated IBC Products from the Safeguard Measures. We submit that excluding Copper-Plated IBC Products is justified based, as described above, on the distinctiveness of their technology and their domestic unavailability, as well as the absence of any substitutes; and, we assert that, as detailed below, their exclusion ultimately will benefit the domestic solar industry, American consumers, and the overall American economy, without adversely affecting the domestic solar manufacturers involved in the Section 201 investigation, undermining the effectiveness of the Safeguard Measures, or otherwise impairing the ability of the Administration to achieve its objectives.

B. The Exclusion of Copper-Plated IBC Products Will Not Adversely Affect the Petitioning Domestic Solar Manufacturers, But Will Benefit the U.S. Solar Economy and the Broader U.S. Economy

Excluding Copper-Plated IBC Products would not impact the petitioning domestic solar manufacturers in the Section 201 investigation in any meaningful way. As explained in this request and throughout the Section 201 investigation process, imports of Copper-Plated IBC Products were limited and decreasing during the period of investigation and, if excluded, will continue to comprise a small share of total solar imports. Furthermore, imports of Copper-Plated IBC Products are not projected to represent a meaningful percentage of the global solar market during the remedy period.[34]

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[34] *See International Technology Roadmap for Photovoltaic, 2016 Results* (Ninth Edition, March 2018), at 37 (**Exhibit 8**).

Adequate substitutes for Copper-Plated IBC Products are not available from any source other than SunPower—not from the petitioning domestic solar manufacturers, any other domestic solar manufacturers, or any foreign-owned producers—and will not likely become available in the market during the initial four-year period of relief afforded by the Safeguard Measures. Copper-Plated IBC Products, based on their unique technological and market features, simply are different than other available solar products. Therefore, excluding Copper-Plated IBC Products would not undermine the objectives of the Safeguard Measures.

In addition, as explained in greater detail below, excluding Copper-Plated IBC Products is in the best interests of the U.S., as failing to do so would produce significant negative consequences for the domestic industry, American consumers, and the American economy. For example, if Copper-Plated IBC Products are not available, potential solar customers will be forced out of the market because they require Copper-Plated IBC Products in order to make their solar projects technically and economically viable. Also, SunPower and others have highlighted the significant number of American jobs created in connection with Copper-Plated IBC Products and the substantial domestic investments associated with the research and development of Copper-Plated IBC Products. The future of these American jobs and the continued domestic investments required to research and develop Copper-Plated IBC Products will be in jeopardy if Copper-Plated IBC Products remain subject to the Safeguard Measures. Indeed, SunPower, which is disproportionately impacted by the *ad valorem* tariffs set forth in the Proclamation due to its higher-cost and premium-priced cells and modules, recently has implemented layoffs, but those job losses would be materially reversed and manufacturing and research and development jobs created should the USTR exclude Copper-Plated IBC Products. Specifically, as noted above, an exclusion for Copper-Plated IBC Cells would encourage SunPower to establish or expand U.S.

module manufacturing facilities; while an exclusion for both Copper-Plated IBC Cells and Copper-Plated Modules would enable SunPower to devote resources that otherwise would be dedicated to satisfying its additional customs duty liability to instead invest in (i) next-generation research and development in the U.S.; (ii) the establishment of U.S. advanced manufacturing facilities dedicated to SunPower's P-Series modules, for which an exclusion, as noted above, is not being requested; and (iii) the integration of storage with its solar products to enhance grid modernization efforts by the electricity industry. Thus, excluding both Copper-Plated IBC Cells and Copper-Plated IBC Modules would have a maximally beneficial multiplier effect, but in the case of an exclusion, whether for cells or for modules, SunPower will expand existing and/or establish new module manufacturing operations in the U.S.

Any exclusion of Copper-Plated IBC Products would reverberate positively throughout the U.S. solar industry, from SunPower's many U.S. suppliers, including its U.S. polysilicon suppliers, Hemlock and Wacker, through to its extensive dealer network, which, together with SunPower and its upstream suppliers and downstream power plant, construction, operations and maintenance personnel, account for approximately 17,500 jobs. Please refer to the Chart V-1 below, which depicts the solar manufacturing value chain for SunPower in the U.S., including suppliers in Arizona, Florida, Georgia, Michigan, Missouri, Nevada, Ohio, Pennsylvania, Tennessee, and Texas, among others.

Chart V-1: SunPower Value Chain

Furthermore, SunPower is making significant investments in both its next-generation IBC technology, which is crucial to maintaining the company's global leadership in CSPV cell and module innovation; and in battery storage and energy management technologies. The broader adoption of battery storage and energy management are crucial to enabling solar power to gain a substantial share of the overall U.S. electricity market, since absent the cost-effective availability of these adjacent technologies, the variability of solar energy creates challenges that make integrating it into the nation's electricity grids increasingly challenging and expensive.[35]

Copper-Plated IBC Products represent the leading edge of solar technology. They are the foundation of the next generation of innovative solar products and play an important role in the development of the storage and grid-integration technologies that will shape the future of the energy infrastructure in the U.S. More importantly, Copper-Plated IBC Products were conceived

[35] See E. Ela, V. Diakov, E. Ibanez, and M. Heaney, "Impacts of Variability and Uncertainty in Solar Photovoltaic Generation at Multiple Timescales," National Renewable Energy Laboratory (2013).

and developed in the U.S. by American engineers and scientists employed by an American company. The patented technology and manufacturing processes associated with Copper-Plated IBC Products are American assets. Restricting the availability of this technology and know-how in the U.S. and curtailing domestic investment in research and development by failing to exclude Copper-Plated IBC Products will create a vacuum for foreign-owned companies, with intellectual property developed overseas, to fill. We do not want to see future technological leadership in the fastest-growing segment of the energy industry ceded to foreign competitors.

Lastly, while invented, developed, and perfected in the U.S., the majority of the Copper-Plated IBC Products manufactured by SunPower are assembled in facilities, owned and controlled by SunPower, that are located in Mexico; and, they enter the U.S. pursuant to provisions contained in the North American Free Trade Agreement ("NAFTA"). Given the high price of Copper-Plated IBC Products relative to other available solar products and the costly specialized material requirements necessary to produce them (as described above), assembly in Mexico ensures that SunPower can continue to make Copper-Plated IBC Products, and the American technology they embody, available to domestic consumers, while also continuing to expand its domestic manufacturing capabilities.

In addition, pursuant to Article 802(6) of the NAFTA, the Government of Mexico immediately is entitled to seek compensation and suspend trade concessions with the U.S. in response to the Safeguard Measures. In fact, the Government of Mexico already has publicly announced its intention to seek such compensation and, failing that, retaliation. According to current estimates, these offsetting trade concessions could have a roughly $1 billion impact on the American economy in the first year alone. This impact would not be limited to the domestic solar industry, as the Government of Mexico can target any industry for the suspension of trade

concessions, as it has in the past.[36] Therefore, failing to exclude Copper-Plated IBC Products, which would blunt the magnitude of trade concessions to which Mexico is entitled, risks imperiling even more American jobs across the U.S. economy.

For the reasons set forth above, SunPower respectfully requests that the USTR, in consultation with the U.S. Department of Commerce and U.S. Department of Energy, exclude both Copper-Plated IBC Cells and Copper-Plated IBC Modules from the Safeguard Measures. Should you have any questions or require any additional information in support of this product exclusion request, please do not hesitate to contact the undersigned.

Respectfully submitted,

Tom Werner
President and Chief Executive Officer
SunPower Corporation

Appendices (3); Exhibits (11)

[36] For example, on March 18, 2009, Mexico took retaliatory measures, consistent with its NAFTA obligations, against the U.S. for the cancellation of the Department of Transportation's cross-border long-haul trucking program. The announcement raised tariffs on 89 different products ranging from agriculture goods to jewelry on U.S. exports valued at $2.4 billion.

APPENDIX 1

PHYSICAL ATTRIBUTES OF COPPER-PLATED IBC CELLS AND COPPER-PLATED IBC MODULES FOR PURPOSES OF ADMINISTRATION OF COPPER-PLATED IBC CELLS AND COPPER-PLATED IBC MODULES EXCLUSION BY CBP

The foregoing product exclusion request for Copper-Plated IBC Cells and Copper-Plated IBC Modules specifically was written to ease the burden of administration for CBP. Of course, as a threshold matter, only SunPower currently is capable of manufacturing products that meet all three of the exclusion criteria set forth above, which should provide CBP with a useful point of reference, and likely only one other company in the world, LG Solar (described in greater detail in **Appendix 3**), is capable of manufacturing products that meet two of the three elements.

More importantly, each of the three exclusion criteria are easily ascertainable by CBP, either through straightforward calculation, as in the case of total area efficiency, or by visual inspection, as in the case of the absence of metal on the front face of the imported cell or module and the use of copper plating on the rear face of the imported cell or module. Each of these three exclusion criteria is discussed in greater detail below and the visual and architectural attributes of Copper-Plated IBC Cells and Copper-Plated IBC Modules are depicted in greater detail in **Exhibit 9**.

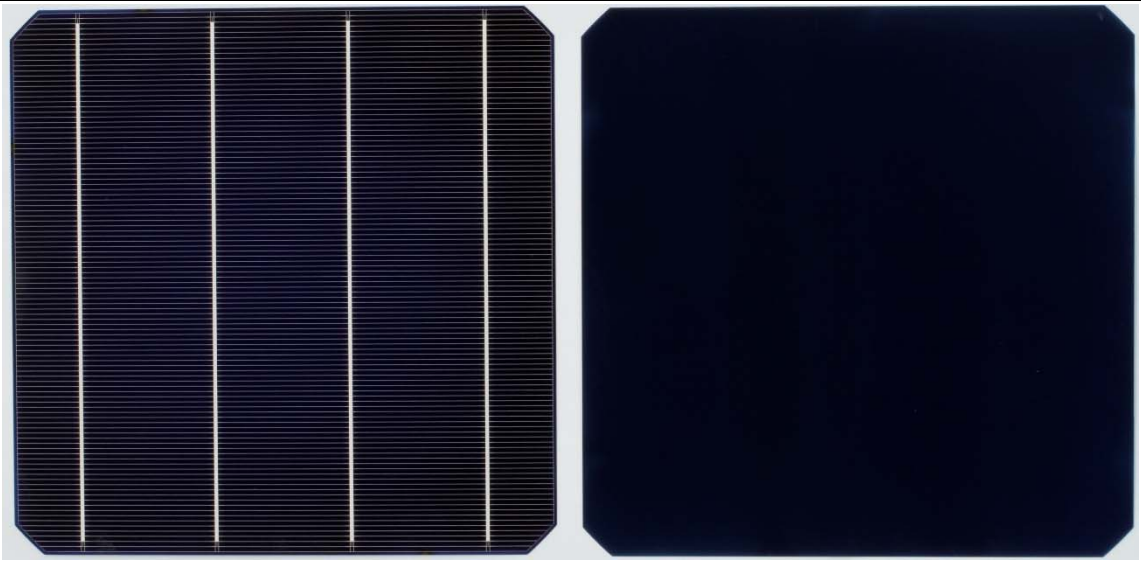
Total Area Efficiency

The only data needed to determine the efficiency of an imported cell or module product is the rated wattage and the area. CBP simply can divide the rated wattage by the area of the product (in m^2) and divide again by 1000 W/m^2. Thus, for example, for a module with a rated power of 200 Watts, and an area of 1 m^2, the efficiency would be 20% (200 watts / 1 / 1000 = 20%). The efficiency value itself, or the data necessary to support this calculation, very well already may be available on the commercial invoice or a datasheet that could accompany the

entry, or CBP could require that the entry documents include this information, much like wattage now is required to ensure that CBP can effectively administer the tariff rate quota on imported cells.

No Metal on the Front Face of the Cell or Module

CBP immediately will be able to determine upon visual inspection which imported cells satisfy the second criterion for exclusion. For example, below please find pictures of the front of a conventional CSPV cell (on the left) and the front of an IBC cell which meets the exclusion criterion (on the right). An IBC cell has no features at all on the front of the cell, while a conventional front-contact cell typically will have visible metallic grid-lines and busbars. (Note: a conventional front contact cell which has not yet been metallized will not have features on the front of the cell, but such a cell would not meet the efficiency criterion for exclusion).



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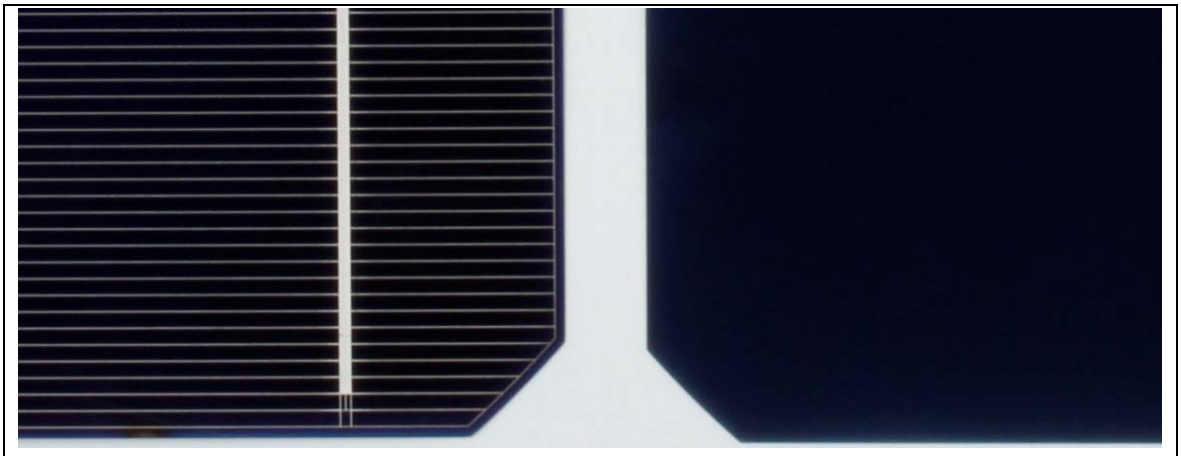
Conventional front-contact cell on left has metal on the front (the horizontal grid lines and the vertical busbars). The IBC cell on right has no metal on the front.



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A close-up section of the previous picture: Conventional front-contact cell on left has metal on the front (the horizontal grid lines and the vertical busbars). The IBC cell on right has no metal on the front.

For the Copper-Plated IBC Module exclusion, the second criterion for exclusion is that there is no metal visible on the front of the module, except the metal that comprises the frame. Below please find pictures of the front of a module comprised of conventional front-contact cells (in this case a SolarWorld module, on the left) versus a SunPower module that would meet the criterion for exclusion. To meet the criterion for exclusion, the module must use only cells without metal on the front, *and* it must have masked all other visible metal, such as cell interconnects and busbars.

	
SolarWorld module with metal showing at locations other than the module frame	SunPower module with a black back sheet with no metal visible other than the frame at the periphery

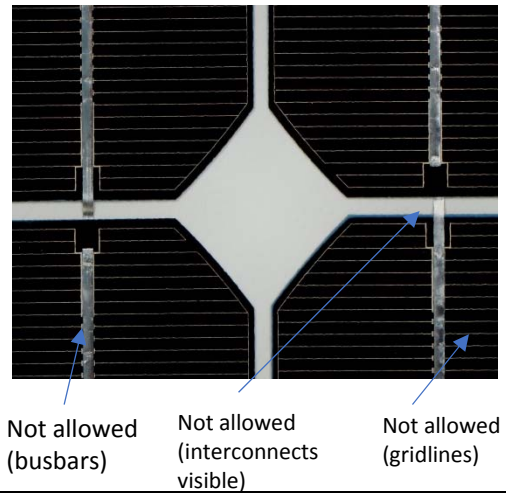
	
SolarWorld module with metal showing at locations other than the module frame	SunPower module with a white back sheet with no metal visible other than the frame at the periphery

Allowed (frame)

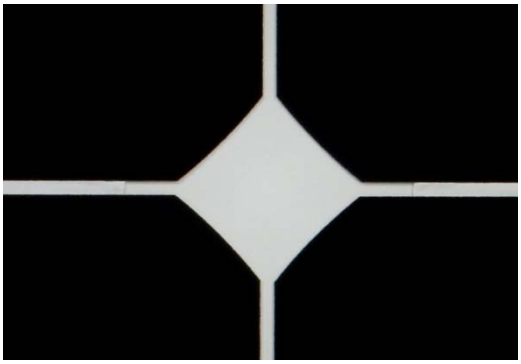
Not allowed (busbars)

Not allowed (gridlines)

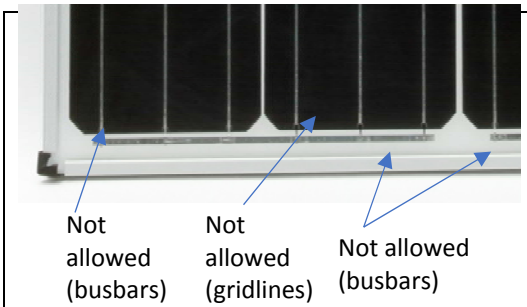
Top of SolarWorld module with a black back sheet (fails the criterion of no metal visible except the frame at periphery)[37]



Zoom in on SolarWorld module – fails no metal visible criteria



Zoom in on SunPower module (no metal visible – meets criterion)



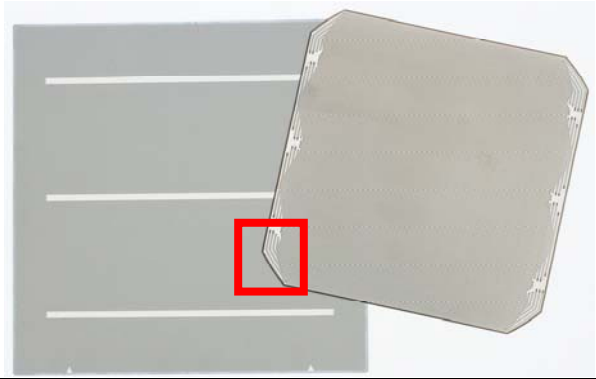
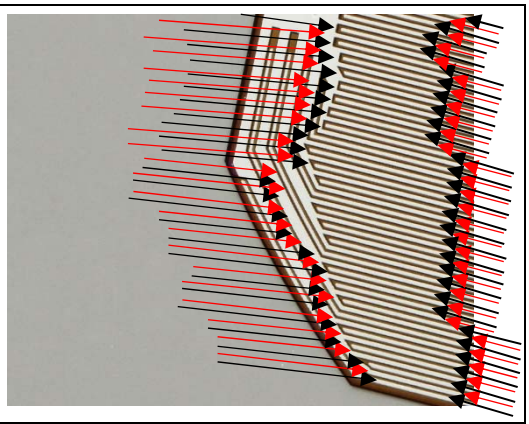
[37] Photo from https://www.solarworld-usa.com/~/media/www/files/datasheets/sunmodule-plus-285-290-mono-black.pdf. Accessed March 3, 2018.

Lower left corner of SolarWorld module fails the criterion due to metal visible on the cells and around the cells	Lower left corner of SunPower module meets the criterion (only metal visible is the frame at the periphery of the module, which in this case is black, but it can be a silver color)

Interdigitated Fingers of Tin-Coated Solid Copper

The third criterion for exclusion is that the cells have "more than 100 interdigitated fingers of tin-coated solid copper adhered to the back of the cell, with the copper portion of the metal fingers having thickness greater than 0.01 mm", and the third element of the panel criteria is that the cells in this panel have this same feature. This is the only criterion which is not trivial to administer, but it is no more difficult than what is implied by an exclusion criterion dictated by chemical composition. To evaluate this criterion for exclusion, CBP first would look at the back of the cell to see if there are very narrow interdigitated fingers. A SunPower cell typically has over 200 of such fingers.

The following shows a picture of the back of one of these cells:

	
Comparison of backs of cells (on left: a conventional aluminum BSF multicrystalline 156 mm cell; on right: IBC 125 mm cell)	Zoom in on red box of picture on the left. In this case, there are 56 fingers just in this zoomed-in area. Red and black arrows point out the interdigitated fingers.

If the first two criteria for exclusion are satisfied, to definitively verify that the third criterion also is satisfied would entail a cross-section-SEM that would confirm whether the metal in the fingers is tin-coated solid copper, and the thickness of the copper is at least 0.01 mm (10 microns). The term "solid" copper differentiates it from metal that would be the result of sintered paste, and this can be easily seen in a cross-section-SEM.

In the case of Copper-Plated IBC Modules, the same procedure would apply. Access to the cells can easily be gained by scraping away the back sheet or sending the module to a testing lab which can do a core sample.

APPENDIX 2

DESCRIPTION OF SUNPOWER CELLS AND MODULES CAPTURED BY THE PROPOSED EXCLUSIONARY LANGUAGE FOR COPPER-PLATED IBC CELLS AND COPPER-PLATED IBC MODULES

SunPower specifically has requested that the USTR exclude Copper-Plated IBC Cells and Copper-Plated IBC Modules from the Safeguard Measures. Copper-Plated IBC Cells and Copper-Plated IBC Modules are described for purposes of this product exclusion request as follows:

- **High Efficiency Copper-Plated Interdigitated Back Contact Crystalline Silicon Photovoltaic Cells**, described as follows: "Crystalline silicon photovoltaic solar cells with the following characteristics: (A) Total-area efficiency of greater than 22 percent, (B) No metal visible on the front of cell, and (C) More than 100 interdigitated fingers of tin-coated solid copper adhered to the back of the cell, with the copper portion of the metal fingers having a thickness of greater than 0.01 mm."

- **High Efficiency Crystalline Silicon Photovoltaic Modules Comprised Exclusively of High Efficiency Copper-Plated Interdigitated Back Contact Crystalline Silicon Photovoltaic Cells,** described as follows: "Crystalline silicon photovoltaic solar modules with the following characteristics: (A) Total-area efficiency of greater than 20 percent , (B) No metal visible on the front of the panel with the exception that metal visible in a frame at the periphery of the panel is permitted, and (C) The solar cells comprising the panel have more than 100 interdigitated fingers of tin-coated solid copper adhered to the back of the cells, with the copper portion of the metal fingers having thickness greater than 0.01 mm."

As can be seen above, the product descriptions use total area efficiency, which is calculated by first dividing the rated watts by the area in square meters and then dividing by 1,000 W/m^2. Wattage and area already have been accepted as criteria for exclusion, as exemplified by the products already excluded by the Proclamation. Using efficiency (which is calculated from wattage and area) eases the burden on USTR and CBP because it reduces the number of variants to track while ensuring the differentiation from products subject to Safeguard Measures, and will allow for changes in details not important to the differentiation.

There is already precedent for having a product exclusion cover variations of wattage and size; the Presidential Proclamation 9693 of January 23, 2018 (83 FR 3541) excluded "certain particular products," and the first such excluded product listed was as follows:

> "10 to 60 watt, inclusive, rectangular solar panels, where the panels have the following characteristics: (A) Length of 250 mm or more but not over 482 mm or width of 400 mm or more but not over 635 mm, and (B) surface area of 1000 cm^2 or more but not over 3,061 cm^2), provided that no such panel with those characteristics shall contain an internal battery or external computer peripheral ports at the time of entry."

Just as the accepted product exclusion description above covers a range of product wattages (10 to 60 watts) and sizes (1000 cm^2 to 3061 cm^2), Copper-Plated IBC Products each cover a range of product wattages and sizes.

SunPower currently manufactures a number of cells and modules that, as detailed below, would satisfy the criteria for exclusion set forth above for Copper-Plated IBC Cells and Copper-Plated IBC Modules.

Copper-Plated IBC Cells

	Wattage	Dimensions	Area (m^2)	Efficiency	Current capacity
Gen II[38]	3.4 – 3.6	0.125 m^2	0.015506	22% - 22.9%	650 MW/year
Gen III[39]	3.6 – 4.0	0.125 m^2	0.015506	23% - 26%	400 MW/year
Gen IV	5.9 – 6.7	0.1617 m^2	0.025787	23% - 26%	0.2 MW/year

[38] Please find a datasheet for this cell attached as **Exhibit 10**.

[39] Please find a datasheet for this cell attached as **Exhibit 11**.

Copper-Plated IBC Modules

					Total-area rated DC Efficiency	
Variant	Rated DC Wattage Range	Length (m)	Width (m)	Nominal area (m^2)	lowest rated power	highest rated power
E20-96	327 - 335	1.559	1.046	1.631	20.0%	20.5%
E20-128	435 - 440	2.067	1.046	2.162	20.1%	20.3%
X21-96	340 - 370	1.559	1.046	1.631	20.8%	22.6%
X21-128	460 - 470	2.067	1.046	2.162	21.3%	21.7%
NGT-60	365 - 395	1.671	1.017	1.699	21.4%	23.2%
NGT-66	400 - 425	1.935	1.017	1.866	21.4%	22.8%
NGT-72	430 - 460	1.999	1.017	2.033	21.3%	23.1%

Notes:

- Some of the above modules (*e.g.*, X21-96) have AC options, where a microinverter is attached to the module. In these cases, the efficiency is determined using the DC rated power of the panel.
- Some of the above modules have black back sheet variants, and the low end of the rated DC wattage range offered often is the result of use of a black back sheet.

Please also note that:

- The E20 modules are from the previous generation of cells; SunPower currently has approximately 650 MW/year of manufacturing capacity for E-Series modules.
- The X21 modules are from the most recently deployed generation of cells. SunPower currently has 400 MW/year of manufacturing capacity for X-Series modules.
- The NGT60 and NGT72 modules represent SunPower's Next Generation Technology. These modules use a larger cell size, which was developed in our Silicon Valley pilot line. First deployment into large scale manufacturing will be later this year.

APPENDIX 3

OVERVIEW OF GLOBAL PRODUCERS OF IBC CELLS AND MODULES GENERALLY

SunPower has spent over 30 years and over $500M in R&D to develop the technology to manufacture Copper-Plated IBC Products covered in this exclusion request. These products are, as noted above, manufactured in factories that are 100 percent owned and operated by SunPower, and the product architecture and manufacturing processes have extensive patent protection.

Furthermore, as noted above, to SunPower's knowledge, there has never been any production of Copper-Plated IBC Products other than by SunPower anywhere in the world and there is no production capacity other than SunPower's anywhere in the world for Copper-Plated IBC Products.

Finally, as noted above, SunPower does not believe that any company would have the wherewithal to manufacture Copper-Plated IBC Products during the four-year pendency of the Safeguard Measures. Indeed, as detailed below, there are only a few former and only one current global manufacturers of generic Copper-Plated IBC Cells and Modules.

LG Solar manufactures an IBC cell product in Korea, with reports of approximately 150 MW of annual capacity. To our knowledge, this is the only other company besides SunPower that manufactures an IBC product in marketable quantities. However, while LG Solar has announced 150 MW of IBC cell capacity, the LG Solar Copper-Plated IBC Cells do not use the thick, plated copper[40] used by SunPower. Rather, LG Solar Copper-Plated IBC Cells use sintered pastes (a granular metal paste found in conventional front-contact cells). SunPower's copper plating process adds significant process complexity and results in a unique cell that is protected from corrosion and has a strongly-adhered solid foundation of ductile metal conductors that inhibit breakage—this is core to the value proposition SunPower's Copper-Plated IBC Cells.

AU Optronics (AUO) used to be a joint venture partner of SunPower. Their part ownership of a factory making Copper-Plated IBC Cells with SunPower technology gave them rights to take up to 20 percent of the output of the cell factory for use in their own modules (with 80 percent of the cells going to SunPower), but with restrictions on where AUO could sell those modules (notably,

[40] Per presentation by Hyun Jung Park at PVCellTech in Penang, Malaysia on 13 March, 2018.

they were not allowed to sell in the U.S.). SunPower purchased AUO's stake in the joint venture in 2016, and now has 100 percent ownership of the factory.

Beamreach (formerly named Solexel) was a start-up in California which attempted to develop an IBC cell and panel. SunPower is very familiar with Beamreach, having invested $10M in the company in the hope that their approach, which was different from SunPower's, would result in a lower-cost cell process. Unfortunately, SunPower lost that $10M with Beamreach's bankruptcy. Given our knowledge of the company and their technology, we know that their cells were quite distinct from ours and would not have met the efficiency or the solid copper elements of the product exclusion description. Key differences between SunPower and Beamreach cells were in the cell structure and processes. SunPower cells have copper-plating on the wafer which allows for processes that produce industry-leading performance. SunPower has 25 percent efficient cells in mass production[41] versus Beamreach's champion R&D cell of 21.2 percent.[42] Beamreach also tried to make use of more standard equipment, which did ease the burden of development compared to SunPower's approach, but at a cost in performance. Furthermore, Beamreach never reached production-level of any type of IBC cell.

While Forbes estimates that nine out of 10 start-ups fail, Beamreach illustrates the difficulty of developing and taking to production any IBC cell. Beamreach failed despite 10 years of work and a total of $250M invested in the company.

Trina Solar: Trina Solar, in China, has announced a champion cell of 25 percent on IBC technology from the State Key Laboratory, which is on their manufacturing campus. However, Trina has consistently said that they have taken an approach of printed silver metallization because they think copper plating would be too expensive. They are also only at the R&D or pilot scale having said that they believe IBC is too expensive, even with their printed silver paste based process, for all but niche segments.

ECN and Yingli: ECN, a Dutch research institute, and Yingli, a Chinese solar company, announced what they believed would be a low-cost method for IBC solar cells, but the process uses screen printing,[43] instead of the high-tech plating required for the third exclusion criterion. It is also does not satisfy the efficiency criterion, and it has not yet gone into production.

Jolywood: A company in China, Jolywood, announced the intention to build capacity for back contact cells and modules, but announcements and published patent applications show that Jolywood's technology would not meet the product exclusion elements. Additionally, despite a press report about their intention to build 2.1 GW of IBC capacity, the company appears to be

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41 https://www.pv-tech.org/news/sunpower-hits-average-cell-conversion-efficiencies-of-25-at-fab-4.

42 https://www.greentechmedia.com/articles/read/solexel-thin-silicon-solar-startup-lands-31m-more-in-vc-funding#gs.ezYccxs.

43 https://www.ecn.nl/news/item/ultrasimple-process-for-mass-production-of-ibc-silicon-solar-cells/. "ECN and equipment manufacturer Tempress have developed a new production process for interdigitated back contact (IBC) n-type solar cells with conventional screen print tools and efficiency above 21%", and "only screen printing technology for patterning and metallization."

focused on building capacity for 2.1 GW of n-type front-contact bifacial technology[44] which would not meet any of the three elements of the exclusion. At the PV Expo which was held in Japan the week of February 28 to March 2, 2018, Jolywood only displayed front-contact-cell products, and in their presentation at PVCellTech on March 13, 2018, they said they were only at the R&D phase of IBC development.

Other R&D efforts: The first IBC solar cell was developed more than 35 years ago at Stanford University by Richard Swanson, who then founded SunPower in 1985 to commercialize Copper-Plated IBC Cells. SunPower first went into high volume production of Copper-Plated IBC Cells and Modules in 2004. Because of the high efficiency of Copper-Plated IBC Cells and the subsequent success of SunPower, there has been much research on Copper-Plated IBC Cells through the years, and there have been several announcements of R&D results on IBC Cells from multiple institutes and companies, among them imec, ISFH, Panasonic, Kaneka, Natcore, Fraunhofer ISE, CEA-INES, Hanwha,[45] and International Solar Energy Research Center Konstanz. To our knowledge, however, none of them would meet the product exclusion criteria, and just as importantly, even if they have developed a process that would meet the product elements, is low cost, and does not violate SunPower's extensive patent portfolio, it would be extremely difficult for any of them to scale to a significant volume over the 4-year adjustment period of the tariffs.

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44 http://en.jolywood.cn/, and http://en.jolywood.cn/category/company-news/; https://www.pv-magazine.com/2017/02/20/jolywood-breaks-ground-on-2-1-gw-bifacial-cell-factory/; for the product: http://www.jolywood.cn/wp-content/uploads/2017/06/JW-T72N-EN-1.pdf.

45 For example, Hanwha Q Cells gave a talk on a concept for IBC based on Aluminum metallization (http://www.uspvmc.org/proceedings/2ndAnnualCSiWorkshop0710/11.%20Alluminum%20IBC%20Cells.pdf). The concept was developed by Hanwha's R&D team in the U.S., however Hanwha closed their U.S. R&D center in 2014.