



Domestic Solar Manufacturing and New U.S. Tariffs

On January 23, 2018, President Trump signed a presidential proclamation imposing emergency tariff restrictions, known as safeguards, over the next four years on U.S. imports of crystalline silicon photovoltaic (PV) cells and modules. The proclamation also included an annual 2.5 gigawatt tariff-free quota for solar cells; however, imports of solar modules are to face tariffs regardless of volume.

On February 7, 2018, the initial solar equipment tariff is to be 30%. Thereafter, the tariffs are to decline yearly, bottoming out at 15%. The temporary solar tariffs are set to expire on February 6, 2022, but the President may extend them for a maximum of another four years.

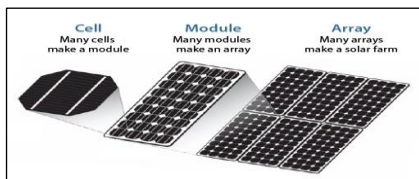
The proclamation, one of the first trade actions by the Trump Administration, stems from a petition filed by two U.S.-based but foreign-owned solar equipment manufacturers and a subsequent ruling by the U.S. International Trade Commission (ITC) that imports have caused injury to domestic producers.

Solar Photovoltaic Manufacturing

The proclamation concerns PV cells and modules made with crystalline silicon, which is the main technology used by solar manufacturers (accounting for more than 90% of global PV production) and used to produce solar energy.

Manufacturing such products does not require assembly of complex machinery and thousands of parts; most PV systems have no moving parts at all. Solar cells, the basic components of a PV system, are assembled into modules, also known as panels, and modules in turn are connected to one another in arrays (see **Figure 1**) that feed energy into a building’s electrical system or a utility’s power grid.

Figure 1. Solar (PV) Cell, Module, and Array



Source: Adapted by CRS from SamlexSolar.

Solar modules are often described as a commodity, meaning they can be mass-manufactured and their quality is similar among most manufacturers. Large producers have a cost advantage because of economies of scale.

Major capital investments are needed to build or upgrade a PV manufacturing facility. PV production is highly automated. Domestic module manufacturers have told the ITC that labor costs accounted for about 7% of production costs in 2016. Domestic transportation costs for finished modules produced in the United States are in the range of 2%-3% of value. The costs of materials, capital equipment, and research and development account for much of the rest.

U.S. Demand for Solar Equipment

Over 1.3 million PV systems (with 14.8 gigawatts of capacity) were installed in the United States in 2016, more than four times the level of 2012. A number of factors account for the growing domestic demand for PV products, including falling cell and module prices, the solar investment tax credit, state standards that require utilities to generate power from renewable sources, and higher efficiency.

Domestic Solar Manufacturing

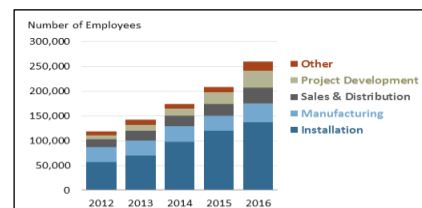
Domestic PV manufacturing has expanded in recent years. An August 2017 ITC report found that between 2012 and 2016, production capacity of U.S. PV module manufacturers rose 34%, and domestic production expanded by 24%. Nonetheless, falling prices have made it difficult for domestic PV manufacturers to operate profitably. From January 1, 2012, to July 2017, more than two dozen domestic PV producers were in bankruptcy or shuttered their U.S. operations. Approximately 20 solar PV manufacturing facilities were in operation domestically as of July 2017, according to the ITC.

Cell and module production occurs mostly outside the United States. In 2015, U.S. production accounted for 2% of worldwide cell and module production, according to the International Energy Agency.

Solar Manufacturing Employment

A relatively small share of the 260,000 solar jobs in the United States is in manufacturing; most jobs are in the design, sales, and installation of solar systems. About 38,100 workers—roughly 15% of all jobs in the solar industry—were employed in producing solar equipment in November 2016, according to the Solar Energy Industries Association (SEIA), an industry trade group (see **Figure 2**). Of the manufacturing jobs, SEIA estimates 2,000 people are employed in solar cell and module production. SEIA, which opposes the safeguards, projects they will raise the cost of cells and modules, leading to a lower number of installations and the loss of 23,000 jobs.

Figure 2. U.S. Solar Energy Industry Employment



Source: SEIA, National Solar Job Census, 2016.

Imports of Solar Cells and Modules

According to one estimate, imports of solar cells and modules supplied 88% (roughly 13 gigawatts) of U.S. domestic demand in 2017. Because of the domestic solar industry’s high dependence on imported cells and modules,

other solar energy users—from utilities to homeowners—could see costs increase as imported solar equipment becomes more expensive.

The value of imported solar cells and modules rose 60% from 2012 to 2016, from roughly \$5 billion to \$8.3 billion annually. Since 2012, imports of solar equipment have risen every year, except for a sharp decline in 2013, following the imposition in 2012 of stiff U.S. antidumping and countervailing duties on Chinese-manufactured solar cells. In 2015, the United States imposed additional duties on PV producers from China and Taiwan.

Because of these restrictive trade actions, solar PV imports from other countries have increased in recent years. As a result, the vast majority of the products that face U.S. solar safeguard tariffs are produced in, and exported from, countries other than China and Taiwan. In particular, PV cell and module shipments from South Korea to the United States rose to a record high of \$1.3 billion in 2016. PV imports from Mexico totaled about \$822 million in 2016. Taken together, in 2016, South Korea and Mexico supplied a quarter of total U.S. PV imports.

Safeguard Import Restrictions

The Trump Administration imposed the new safeguard tariffs under Section 201 of the U.S. Trade Act of 1974 (19 U.S.C. §2251), which allows domestic industries that claim to have been seriously injured or threatened with severe injury from rising imports to petition the ITC for temporary import relief. Such investigations are rare; the last one was in 2002, when the George W. Bush Administration imposed steel safeguard duties to protect the domestic steel industry.

The proclamation supports the petition by two foreign-owned, U.S.-based companies: Suniva (a privately held PV producer currently in bankruptcy and now majority owned by a Chinese firm) and SolarWorld Americas (until recently, a subsidiary of a German-headquartered firm which filed for insolvency in 2017).

SolarWorld Americas operates the largest solar cell and module plant in the United States. The co-petitioners claimed an effective import remedy would protect the remaining U.S. manufacturing capacity and lead to the creation of over 100,000 jobs across all segments of the industry. However, the 30% tariff remedy was less than the 50% rate the two co-petitioners had requested, in addition to quotas. No estimates are available on the number of factory jobs that might be supported by the actual tariff.

According to the proclamation, the products covered by the safeguard tariffs are broadly defined, and include solar cells, whether or not assembled into modules, as well as parts of solar cells; direct-current generators with solar cells attached; and inverters or batteries with crystalline silicon PV cells attached. Excluded from the trade action are certain types of PV products, such as thin-film modules. This exclusion can provide a limited source of tariff-free equipment for project developers and installers.

The proclamation also includes an exemption from the annual tariff for the first 2.5 gigawatts of imported solar cells. The quota is to be allocated among all countries on a first-come, first-served basis, according to U.S. Customs and Border Protection. Importers are to be required to report the electricity power output attributable to such cells and provide accompanying information.

The new tariffs are to be applied to cells and modules from major solar-PV-producing countries. The restrictions do not exclude countries that have free trade agreements with the United States, such as South Korea, Canada, and Mexico. In the cases of China and Taiwan, the new safeguard tariffs are to be assessed on top of existing antidumping and countervailing duties. Other than Thailand and the Philippines, developing countries individually accounting for less than 3% of total imports are exempt from the solar safeguard import restrictions.

The U.S. Trade Representative is responsible for rules and procedures for companies to request product exclusions. This could leave out certain niche or specialty products, which are either not produced by the domestic industry or are produced in insufficient quantities to satisfy U.S. demand, such as solar-powered backpacks and lanterns, high-efficiency panels, or even imported 72-cell solar modules for utility-scale solar projects. In addition, the safeguard measure requires a review by the ITC roughly halfway through the four-year tariff period.

Such trade measures may invite retaliatory action by other countries. South Korea has said it would consider filing a case against the United States at the World Trade Organization (WTO), Taiwan has requested WTO consultations, Mexico has said it will use all legal resources in response to the U.S. trade action, and the European Union is reportedly evaluating the impact and legality of the U.S. tariffs.

Effects on the U.S. Solar Energy Industry

Despite a growing market for solar energy equipment, domestic production capacity can meet only about 20% of U.S. solar market demand, according to SEIA. Generation of utility-scale solar from photovoltaic installations quintupled between 2013 and 2017, according to the Energy Information Administration, although PV solar still accounts for only about 1% of all utility-scale generation.

Utility-scale projects accounted for more than 70% of all PV capacity installed in 2016. This segment of the PV market may be most affected by the safeguards. On average, modules account for around 30% of the installed cost of a utility-scale solar system, according to the ITC. Hence, if the safeguards raise the cost of cells and modules by approximately one-third, for example, the cost of building a large-scale solar generation project would be expected to rise roughly 10%. If higher costs for solar equipment lead project sponsors to favor other sources of electric generation, such as wind and natural gas, total U.S. demand for cells and modules may decrease.

However, foreign producers are believed to have shipped large quantities of cells and modules to the United States in late 2017 in anticipation of the safeguards, potentially delaying the effects of the higher tariffs. Incentives designed to lower the cost of solar project development, such as the Investment Tax Credit, remain in place through 2022.

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