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U.S. Solar Manufacturing and Global Competition

In spring 2017, two U.S. solar equipment producers petitioned the United States International Trade Commission (ITC) to consider a global safeguard on solar photovoltaic (PV) cells and modules, claiming that they were being seriously injured by increasing imports. In September 2017, the ITC unanimously agreed that certain types of PV imports were a substantial cause of serious injury to U.S. producers. In November 2017, the ITC sent the President a report recommending a combination of actions on foreign-made solar equipment.

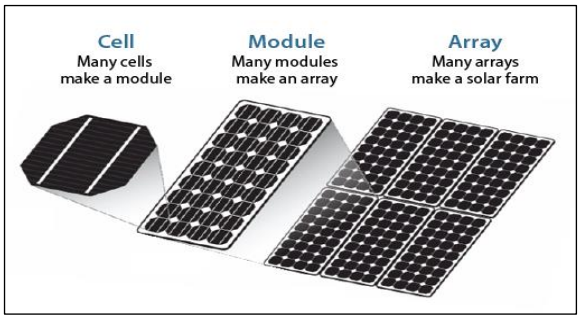
The President is to respond by January 12, 2018. He has complete discretion over the size, scope, and duration of any trade remedy, or he may opt to take no action. The President is to explain his actions and reasons to Congress in writing.

Solar PV Manufacturing

The ITC ruling concerns crystalline silicon photovoltaic (CSPV) modules used to produce solar energy on the premises of many homes, businesses, and public buildings. Solar PV manufacturing does not require complex machinery and thousands of parts; most PV systems have no moving parts at all. Solar cells, the basic building blocks 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**).

Solar modules are often described as a commodity, meaning they can be mass-manufactured. Large producers have a cost advantage because of economies of scale.

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



Source: Adapted by CRS from SamlexSolar.

Still, large multimillion-dollar 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. Several factors account for the growing domestic demand for PV products, including the following:

- Falling cell and module prices. According to GTM Research, in 2016 module and cell prices dropped 25% and 23%, respectively.
- The solar investment tax credit. The credit was set to expire in 2016, but was extended through the Consolidated Appropriations Act of 2016 (P.L. 114-113). The credit is scheduled to be reduced from the current 30% of solar module costs to 10% for commercial projects and to 0% for residential projects in 2022.
- State renewable portfolio standards. Twenty-nine states mandate an increase in the production of electricity from solar and other renewable resources.
- Higher efficiency. Crystalline silicon PV modules convert, on average, 12%-22% of incoming sunlight into electricity. As efficiency has improved, PV installations have become more cost-effective relative to some other sources of electric power.

Global and Domestic PV Production

Global Trends

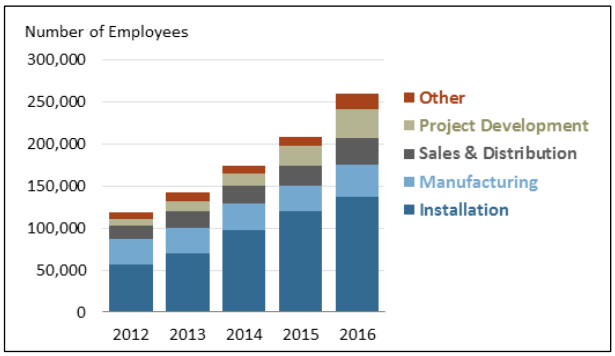
PV cell and module manufacturing is highly competitive. The United States accounted for 2% of global cell and module production in 2015, according to the International Energy Agency. By comparison, China accounted for more than two-thirds of the 63 gigawatts of worldwide module production in 2015, followed by Malaysia, South Korea, Japan, and Germany.

According to one estimate, imports of solar cells and modules are expected to supply 88% of U.S. domestic demand in 2017. PV modules represented more than 90% of global PV production in 2016; the remainder involves thin-film technologies, which have a different production process.

Domestic Trends

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 24.2%. About 38,100 workers were employed in solar manufacturing in November 2016, 28% more than in 2012, according to the Solar Energy Industries Association (SEIA), an industry trade group (see **Figure 2**).

Figure 2. U.S. Solar Energy Industry Employment



Source: SEIA, National Solar Job Census, 2016.

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.

Imports of Solar Cells and Modules

Figures from the U.S. government show the value of imported solar cells and modules rose 60% from 2012 to 2016, from roughly $5 billion to $8.3 billion. Since 2012, imports of solar equipment have risen every year, except for a sharp decline in 2013. That decline may have been related to the imposition of U.S. antidumping and countervailing duties on Chinese-manufactured solar cells in 2012, which resulted in double- and triple-digit tariffs on imports of PV products from China. In 2015, the United States imposed additional duties on PV producers from China and Taiwan.

After the United States applied these duties on solar cells and modules made in China and Taiwan, solar PV imports from other countries increased. 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, compared to $140 million in 2012. PV imports from Mexico jumped 71% from 2012 to 2016, totaling about $822 million in 2016. Taken together, South Korea and Mexico supplied a quarter of total U.S. PV imports last year, compared to 12.5% in 2012.

Global PV Safeguard Investigation

The ITC investigation was conducted under a section of the U.S. Trade Act of 1974 (19 U.S.C. §2251) known as Section 201—Global Safeguards. Section 201 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. Under the law, plant closings, significant unemployment, or falling market share may offer evidence of serious injury. Section 201 investigations are rare; the last one was in 2001, when the George W. Bush Administration sought to protect the domestic steel industry.

The investigation's scope excludes some types of PV products, such as so-called thin-film modules. The world's largest maker of thin-film modules, First Solar, is based in the United States and has manufacturing facilities in the United States and Malaysia.

Section 201 Petitioners

Suniva, a privately held CSPV producer currently in bankruptcy, petitioned for the safeguard investigation in April 2017. Suniva, now majority-owned by a Chinese firm, operates a solar PV manufacturing plant in Georgia, and it recently shuttered its factory in Michigan. SolarWorld Americas joined the petition in May 2017. Until recently, its parent company had been SolarWorld, a German-headquartered company, which filed for insolvency in 2017. SolarWorld Americas operates the largest solar cell and module plant in the United States. In 2016, SolarWorld Americas employed about 740 people in the United States.

Presidential Options

Because the ITC affirmatively determined the U.S. CSPV industry has been seriously injured, the President, if he decides to take action, has several choices under Section 201: a higher duty rate; a quantitative restriction or quota; trade adjustment assistance for workers and firms; international negotiations; or some other steps to limit imports of certain types of solar equipment for up to four years. The temporary safeguard action, if approved, could be renewed, up to a maximum of eight years.

Safeguard measures are not country-specific; thus, there could be a ban on all imports of CSPV cells and modules. A presidential order instituting such a ban could exclude some U.S. free-trade agreement partners, such as Canada, whose exports have not been found to injure U.S. manufacturers, while covering others, such as South Korea and Mexico, because the ITC found substantial injury from South Korean and Mexican imports.

Effects on the U.S. Solar Energy Industry

Proponents claim the provisional safeguard would stabilize solar PV equipment prices, ensure market share for domestic manufacturers, increase U.S. production of solar cells and modules, and potentially add as many as 45,500 solar manufacturing jobs, depending on the Section 201 remedy. Another reason for the safeguard, supporters assert, is that foreign dominance in PV manufacturing poses a national security threat, which could make U.S. access to this energy source less secure. SolarWorld Americas and Suniva have also suggested an executive order requiring federal agencies to use only U.S.-produced modules.

Opponents, including SEIA, point out that most of domestic employment in the PV solar industry is in the design, sales, and installation of solar systems, not in manufacturing. Critics argue that restrictions on imports of PV cells and modules under Section 201 would raise the cost of solar installations, adversely affecting employment and harming consumers. According to SEIA, solar system installation, sales and distribution, project development, and finance employed more than 220,000 workers in 2016, far more than were employed in manufacturing. SEIA claims the domestic solar industry could lose 88,000 jobs if the President imposes a trade remedy.

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