

SolarWorld: Was Chinese Competition Unfair in US Markets for Solar Panels?

Wednesday, 19 October 2011, was a busy day for Ron Kirk. As the US Special Trade Representative, he was President Obama's main adviser on international trade issues. President Obama was scheduled to sign three new free trade agreements – with South Korea, Colombia and Panama – on Friday the 21st, and the last-minute negotiations around the signing ceremony were nearly as intense as the negotiations over the substance of the agreements.



October 21: President Barack Obama signs the Free Trade Agreements in the Oval Office of the White House. From left are, Deputy Labor Secretary Seth Harris, Labor Secretary Hilda Solis, US Trade Representative Ron Kirk, Rep. Dave Camp, R-Mich., and United Steelworkers Vice President Thomas Conway. (AP)

Ron received a heads-up from the Secretary of the US Department of Commerce that Wednesday: Solar World Industries Americas, the largest producer of solar panels in the US, had filed a petition with the Enforcement and Compliance unit of the Department of Commerce alleging that Chinese firms were competing unfairly in selling solar panels to US consumers. The US government was now on the clock: it needed to investigate these claims and impose any necessary remedies in response to these petitions.

The US Special Trade Representative has to coordinate this US government response. There's no time to enjoy the signing ceremony (well, OK, maybe one picture): Ron Kirk needed to get to work.

Ron Kirk, the USTR.

Ron Kirk is the US Special Trade Representative (USTR) for the Obama Administration. He is a lawyer by training and politician by avocation: University of Texas School of Law, staff member to Senator Lloyd Bentsen, Secretary of State of Texas during the governorship of Ann Richards, mayor of the city of Dallas. When Barack Obama became President, he nominated Ron Kirk for the USTR position. Kirk was confirmed by the US Senate with a 92-5 vote.

As USTR, Kirk is a Cabinet member who serves as the president's principal trade advisor, negotiator, and spokesperson on trade issues. The office of USTR is part of the Executive Office of the President. Through an interagency structure, the office of USTR coordinates trade policy, resolves disagreements, and frames issues for presidential decision.

The first Obama administration has been an exciting time for US international trade policy. Free trade agreements were hammered out and approved by Congress with South Korea, Colombia and Panama. The President proposed and the Congress approved extensions to the Generalized System of Preferences. The Trade Adjustment Agreement, a Federal program to assist US workers who have lost their jobs through foreign competition with their employer, has been rethought and reapproved. There were two rounds of successful negotiations of the Trans-Pacific Partnership trade agreement with 12 Asian and Western Hemisphere economies. All this occurred in the first three years of the Presidency!

President Obama has been attuned to the impact of unfair trade practices on the profitability of US corporations, with special attention to the impact of imports from the Peoples' Republic of China (PRC) on domestic profitability and employment. Kirk has advised the President on appropriate retaliation to competition from Chinese firms in the steel, wood furniture, and automobile tire industries among others during the period 2009-2011.

The "Unfair Competition" Provisions of the WTO Agreement

The World Trade Organization (WTO) is a multilateral organization created in 1995 to reduce and eventually eliminate government-generated barriers to international trade. It grew out of the international community's generally positive experience with the General Agreement on Tariffs and Trade (GATT), a multilateral treaty of tariff and trade-barrier elimination first ratified in 1947 and successful in a series of "Rounds" in reducing the size and variability of tariffs levied by developed and advanced developing countries on their imports. Signatories to the GATT agreed to provide "Most Favored Nation" (MFN) status to other signatories, and in a series of negotiating "rounds" lowered MFN import tariffs to historically low levels. As more countries signed the GATT, or later joined the WTO, world trade was predominantly subject to these low MFN tariffs. In the case of solar panels, the MFN tariff on imports is zero percent – there is tariff-free trade in these panels.

The WTO agreement also makes provisions for retaliation against unfair trade. Within the context of the WTO agreements, the President has the power to:

- Impose retaliatory tariffs in response to unfair competition by foreign firms. These tariffs are called anti-dumping duties.
- Impose retaliatory tariffs in response to export subsidies given by foreign governments. These tariffs are called countervailing duties.

In these cases, the President will need to calculate these tariffs precisely to offset the unfair competition or export subsidy. If the foreign firm or government believes that the retaliatory tariff is too large, it has the right to appeal the President's action in a Dispute Settlement hearing facilitated through the WTO.

The President also has the right to impose "safeguards" tariffs on foreign goods when there is a temporary surge in imports of a specific product that threatens large-scale unemployment at domestic producers of this product. This surge of imports need not be unfair, but it must threaten large-scale unemployment in the industry. Safeguards tariffs are explicitly short-term, with a scheduled final phase-out of the tariff once the import surge has ended.

Any US government investigation of unfair trade competition is undertaken in response to a petition from a US producer. That petition will provide preliminary evidence of the unfair trade practice, but the US Department of Commerce and US International Trade Commission will undertake independent investigations of the size and material impact of these practices in the US market.

Solar World

Solar World Industries Americas is the petitioner in the 2011 case. In its petition, it alleges two forms of unfair trade practice by the Chinese. First, it alleges that Chinese firms are engaged in selling their products at a price below the production cost of the good: this is called "dumping". Second, it alleges that the Chinese government is providing impermissible export subsidies to its firms to lower their production costs in an anti-competitive manner.

The company's history began in 1975 in southern California. Bill Yerkes developed Solar Technology International and established its technological leadership in solar power generation. The company was purchased by (successively) ARCO Energy, Siemens and Shell. In 2002 Shell Solar was in turn purchased by Solar World AG, an industry leader in solar cell and solar panel production. Solar World AG is a solar-energy generation corporation formed in Germany in 1999, with its own history of leadership in solar power generation in Europe.

The US-based operations of Shell Solar became Solar World Industries Americans, a fully owned subsidiary of Solar World AG. In 2007 Solar World purchased a solar-energy manufacturing plant in Hillsboro, Oregon from Komatsu and concentrated its production activities in the Western Hemisphere in that plant. It operated the equivalent of four production plants on a 103-acre campus, maintaining 500 megawatts worth of photovoltaic cell production capacity. It employs

1000 workers in both production and management positions. By October 2011, it was the largest solar-panel producer in the US.

Producing solar panels.

A solar panel is an assembled array of solar cells. Solar cells use crystalline silicon to convert sunlight to electricity. These cells are assembled into an array, or panel, of 60 to 72 cells. Each panel is about six feet long, three feet wide and two inches thick. These panels can either be ground-mounted or rooftop-mounted; they can be integrated into the electricity power grid or can be deployed off-grid.

There are five principal stages in the solar-panel value chain.

- Polysilicon is refined into chunks. This is accomplished by (1) heating a mixture of quartz and carbon to 1800 degrees Celsius, combining this with hydrogen chloride gas, and then reheating the mixture to about 1000 degrees Celsius in a reactor with silicon rods. The chunks develop gradually over a week of intense heat into polysilicon of great purity.
- Polysilicon is formed into ingots. The chunks are melted within a furnace heated to 1400 degrees Celsius. A seed crystal is inserted into the molten polysilicon and slowly withdrawn to produce a single long crystal. This crystal is allowed to cool into an ingot.
- The ingots are sliced into wafers. The two ends of the ingot are sliced away and discarded. The body of the ingot is “squared” by slicing away four sides of the ingot. Very thin wafers are then cut from the “squared” ingot.
- The wafers are converted into cells. The wafers are cleaned, and then the two sides of the wafer are treated chemically to give a positive-negative junction. The wafers are then printed with metal “fingers” to facilitate the collection of electricity.

This manufacturing process is highly automated, capital intensive and technologically sophisticated, requiring skilled technicians and employees with advanced degrees.

- The cells are combined into an array, or solar panel. The cells are laid out in a rectangular grid sufficient to provide the desired wattage generation. The cells are soldered together, laminated in a vacuum and cured. They are then mounted in a frame

Module assembly accounts for the majority of labor costs in the production process.

Table 1 illustrates the evolution of employment, wages and unit costs in the US solar-panel industry. Employment rose from 2009 to the first half of 2011, but declined in the second half of the year and in the first half of 2012. Hourly wages rose as well throughout this period to a high of \$20.63 per hour in the first half of 2012. Unit labor cost fell throughout the period 2009 – 2012;

while wages rose throughout this period, the technological increases in solar cells and solar panels ensured that the labor cost per kilowatt of capacity was falling.

Table 1: US Workers and Labor Costs for Solar Panels					
For US producers of solar panels:	2009	2010	2011	Jan-June	Jan-June
				2011	2012
Production and related workers	1180	1866	1856	1999	1516
Millions of Hours worked	2.72	4.1	4.1	2.5	1.6
Wages paid (millions)	\$47.66	\$77.05	\$82.84	\$47.20	\$32.82
Hourly wages	\$17.53	\$18.79	\$20.22	\$18.94	\$20.63
Productivity (KW/hr)	0.1	0.1	0.2	0.1	0.2
Unit labor cost (per KW)	\$253.54	\$168.96	\$124.37	\$128.67	\$113.80

Source: International Trade Commission, 2012

US Government Support for Solar-Panel Manufacturing

The US government has traditionally supported domestic energy production through granting tax preferences. This began in 1916, and until 2005 was targeted to stimulation of domestic production of oil and gas. In 2006 this balance shifted: an increasing share of these tax credits were allocated to encouraging energy produced from renewable sources (such as wind and sun). By 2011, 78 percent of the budgetary cost of federal energy-related tax preferences was granted for energy efficiency and renewable energy development.

The American Recovery and Reinvestment Act (ARRA) (also known as “the Obama stimulus”) included a number of provisions to provide incentives for spending on renewable-energy production. One, the section 1603 Treasury grant, allows the owner of commercial solar property to receive a grant equal to 30 percent of eligible project cost, in lieu of taking an investment tax credit. Applicants were eligible for a 1603 award only if they commenced construction on projects by December 31, 2011 and completed construction by December 31, 2016. A second, the US Department of Energy loan guarantee program (known as the section 1705 program), guaranteed the loans taken out by selected renewable energy producers for bringing their innovations to the market. The first recipient of a loan guarantee in 2009 was Solyndra, the solar-energy start-up that began with promise but declared bankruptcy in 2011.

Energy-related tax preferences given in 2011 totaled \$20.5 billion, of which \$6.0 billion were received by renewable-energy firms. In some cases, these are corporate or income tax credits for generating electricity from wind or solar technology; in other cases, they are 1603 Treasury grants. During the period 2009-2011 the Department of Energy made section 1705 loan guarantees of \$16.1 billion; the Congressional Budget Office estimates that the subsidy cost of these guarantees was \$2.4 billion.

The US Market for Solar Panels.

US demand for solar panels has grown exponentially in recent years. As Table 2 illustrates, shipments of solar panels from any (domestic or foreign) source have grown more than five-fold between 2009 and 2011. There are three dominant purchasers of solar panels: households (residential), businesses (commercial) and public utilities (utilities). Growth of demand by all three groups has been very rapid.

Table 2: Shipments of Solar Panels to US Purchasers					
	in gigawatt of capacity				
	Residential	Commercial	Utilities	Other	Total
2009	195.4	241.5	30.4	36.4	503.7
2011	715.2	1346	631.7	16.6	2709.5

Source: Solar Photovoltaic Cell/Module Shipments Report 2011, US EIA, 2012.

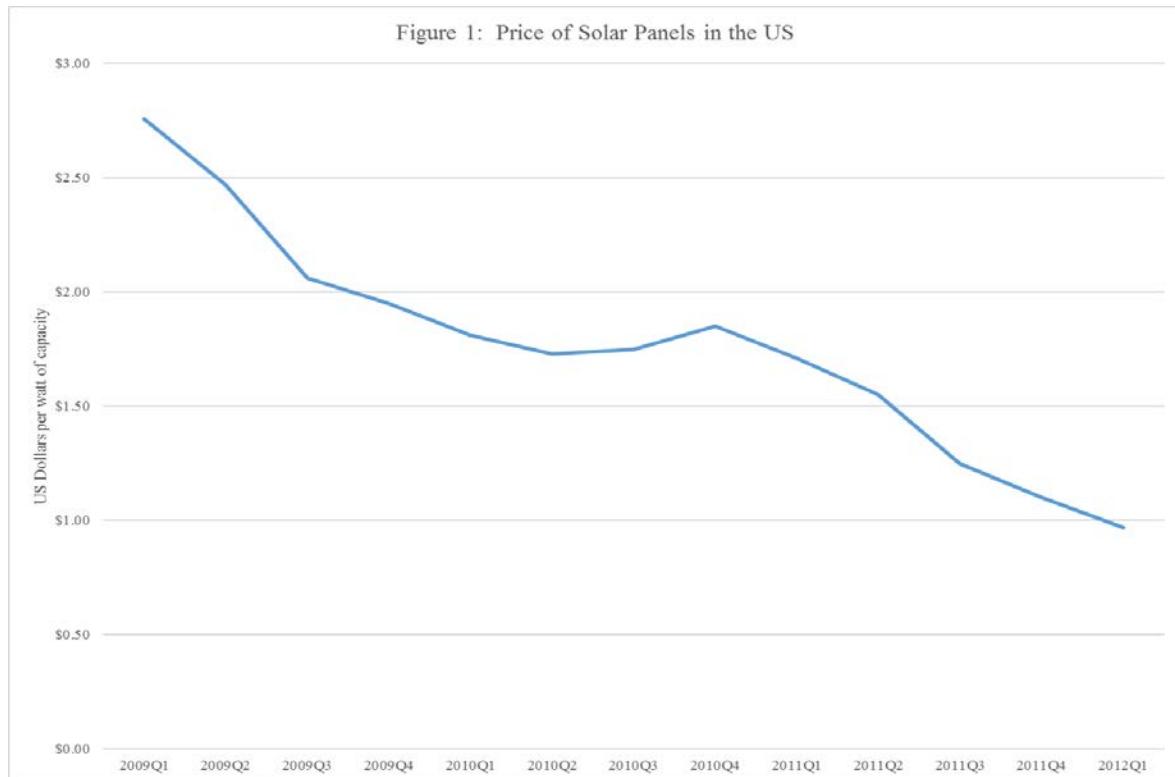
The purchase and sale of solar panels on the US market in 2011 is valued at \$3 billion. These panels can generate 2.7 million kilowatts (KW) of electricity. There are 14 firms that produce solar panels in the US. Forty-nine US firms report importing solar panels in 2011 for installation for US consumers and utilities. These solar panels have two primary uses in the US: rooftop solar installations for homes and businesses, and integrated solar power generation by utilities.

US producers of solar panel have increased their production capacity over the past few years. As Table 3 indicates, US firms have the capacity to produce just over 1 gigawatt of solar-panel generation capacity in 2011. Their actual production was 0.67 gigawatts of power-generation capacity in solar panels, for a capacity utilization percentage of 66 percent in 2011. This was slightly lower than capacity utilization in previous years.

Table 3: US Producers of Solar Panels			
	Capacity	Production	Capacity Utilization
	MW	MW	percent
2009	266.8	188.0	70.5
2010	597.0	456.0	76.4
2011	1015.7	666.5	65.6

Source: US International Trade Commission, 2012

The observed price of solar panels has fallen continually through the past few years. As Figure 1 illustrates, the price (in dollars per watt of installed power generation capacity) was \$2.75 in the first quarter of 2009, but since that time has declined. In the fourth quarter of 2011, the comparable price is \$1.10.



Source: Solar Photovoltaic Cell/Module Shipments Report 2016

This decline in price tracks well the decline in unit labor cost of US production reported in Table 1.

Economists who have studied the market for solar panels in the US have found that the price elasticity of demand is somewhat inelastic and the price elasticity of supply is very elastic. The specific elasticities are reported in Table 4.

Table 4: Elasticities in the Solar Panel Market			
	Supply	Demand	Substitution (of US for Chinese product)
	5	-0.9	3

Source: US International Trade Commission, 2012

The elasticity of substitution examines the substitutability of Chinese solar panels for US solar panels in the decisions of US-based purchasers. As is evident in Table 4, a one-percent increase in the ratio of US price to China price leads to a three-percent increase in the ratio of purchases of China panels to US panels.

Solar Panel Imports: from China and Elsewhere.

There has been substantial import penetration into the US market for solar panels during this period. Table 5 illustrates this evolution for the period 2009 – 2012. US producers shipped four times more solar-panel electricity-generating capacity in 2011 than in 2009, but China shipped ten times more capacity in the same time period. All other exporters to the US also increased their shipments by nearly three times over that period. China was the dominant exporter, with over 80 percent of total exports to the US in 2011, but that share dropped to 67 percent for the first half of 2012.

While China is a large exporter to the US market for solar panels, the US is not an especially large importer of China's solar panels. China's aggregated production of solar panels by year is broken down in Table 6 into internal consumption (re-use by the producing firm), home market (sales in China), export to the US and exports to other markets. China's annual production created solar panels with capacity equal to 4.8 gigawatt in 2009; by 2011 it created panels with capacity equal to 15.4 gigawatt. In the first half of 2012 it created solar panels with capacity almost equal to its production in all of 2010.

Table 5: Solar Panel Imports into the US

				Jan-June	Jan-June
		2009	2010	2011	2011
Quantity (MW capacity)					
China		120.6	636	1346.7	532.3
All other exporters		118.3	245.7	317.2	153.2
Value (\$ millions)					
China		236.2	1049.6	1799.6	851
All other exporters		293.5	480.3	539.8	475.1
Unit value (\$/MW)					
China		1.96	1.65	1.34	1.6
All other exporters		2.48	1.96	1.7	1.86
Share of quantity (percent)					
China		50.5	72.1	80.9	77.7
All other exporters		49.5	27.9	19.1	22.3
Share of value (percent)					
China		44.6	68.6	76.9	64.2
All other exporters		55.4	31.4	23.1	35.8
Memo: US producers' US shipments					
Quantity (MW capacity)		108.3	331.2	453.4	243.3
Value (\$ millions)		255.8	586.0	790.5	422.6

Table 6: China's reported capacity, production, shipments and inventories of modules

	(in MW)			Jan-June	Jan-June
			2009	2010	2011
Capacity		4814.0	9843.8	15368.8	6969.8
Production		2627.0	6734.2	11239.9	5256.1
Inventories		174.1	369.9	582.7	508.2
Shipments		2529.1	6541.4	11324.3	5107.4
Internal consumption		31.7	114.2	299.3	43.9
Home market		177.7	393.8	1692.6	416.3
Exports to US		135.0	751.3	1664.1	551.3
Exports to others		2184.8	5282.1	7668.3	4096.0
Shares of total shipments to:					
Internal consumption		1.3	1.7	2.6	0.9
Home market		7.0	6.0	14.9	8.2
Exports to US		5.3	11.5	14.7	10.8
Exports to others		86.4	80.7	67.7	80.2

Profitability of US Producers.

During this period, the US producers of solar panels were not profitable (at least on average). As Table 7 illustrates, the raw material (silicon) costs of production continued to rise as a share of costs of goods sold. Labor costs fell as a share of cost of goods sold, while other factory costs also declined as a share of total costs. As is evident from the Total Net Sales row, the revenue per watt (or average price) is declining rapidly for these producers – even more rapidly than the price of the silicon input.

Table 7: Results of operations of solar-panel manufacturers, US respondents (average)

		2009	2010	2011	2011	Jan-June
						Jan-June
Raw Material costs	percent of COGS	65.6	73.9	81.5	81.5	80.3
Direct labor	percent of COGS	9.5	8.6	6.2	6.9	8.4
Other factory	percent of COGS	24.9	17.5	12.2	11.6	11.3
Total net sales	\$/W	2.57	1.92	1.7	1.83	1.12
Cost of goods sold						
Raw materials	\$/W	1.73	1.41	0.153	1.48	0.94
Direct Labor	\$/W	0.25	0.16	0.12	0.13	0.99
Other factory	\$/W	0.66	0.33	0.23	0.21	0.13
Grossprofit/loss	\$/W	-0.06	0.02	-0.17	0.01	-0.05
SG&A expenses	\$/W	0.23	0.16	0.26	0.18	0.13
Operating income/loss	\$/W	-0.29	-0.14	-0.43	-0.17	-0.18
SG&A: Selling, general and administrative						

Source: International Trade Commission, 2012

In the end, US producers had operating losses on average in 2009, 2010 and 2011. The year 2011 is in fact the least profitable; while labor costs and other factory costs were falling over time, the average price per watt capacity of the panel declined even more quickly.

There were other signals of an unforgiving market environment for US solar-energy companies. Solyndra, an early recipient of a loan guarantee under President Obama's 1705 Clean Energy program, declared bankruptcy in August 2011. According to Lipton and Broder (2011), "Administration officials lay the blame for Solyndra's problems in part on the global collapse in the price of solar energy components, which forced the company to sell its innovative solar panels at less than it cost to make them." Solyndra used an innovative technology not reliant on silicon; it was well-situated to compete if the global price of silicon stayed high, but was not competitive once the price of silicon fell precipitously.

Ron Kirk's task.

Now that the signing ceremony is over, Ron has to focus on the SolarWorld petition for relief from unfair competition from Chinese firms. Should the US accuse the Chinese government and Chinese solar-panel firms of unfair competition?

President Obama is a stickler for process. What are the steps we'll go through? Is there evidence to support the imposition of retaliatory tariffs at each step?

Calculation of Implicit Export Subsidies in Chinese Production of Solar Panels
(as published by US Department of Commerce on 9 October 2012):

Period of Investigation: 1 Jan to 31 December 2010

Chinese firms taken as indicative of export-subsidy incentives: Suntech and Trina

Surrogate country: Thailand

Implicit export subsidies found, by type and recipient. Measured as percent of sales price.

1. Golden Sun Demonstration Program: grants for solar-panel generation projects.

Trina: 0.09 percent

2. Preferential policy lending

Suntech: 1.95 percent; Trina: 0.89 percent

3. Purchase price of polysilicon

Suntech: 0.29 percent; Trina: 1.14 percent

4. Land provision

Suntech: 0.15 percent; Trina: 0.67 percent

5. Electricity price:

Suntech: 0.52 percent; Trina: 0.50 percent

6. "Two Free, Three Half" Income tax forgiveness

Suntech: 0.13 percent

7. Preferential tax program for High-Tech Enterprises

Suntech: 0.28 percent; Trina: 1.32 percent

8. R&D Tax Break

Suntech: 0.17 percent; Trina: 0.02 percent

9. Tariff and VAT exemptions for imported equipment

Suntech: 0.35 percent; Trina: 0.31 percent

10. VAT Rebates on Chinese-made equipment

Trina: 0.01 percent

11. Discovered Grants:

Suntech: 0.40 percent; Trina: 0.48 percent

Total of previous eleven programs:

Suntech: 4.24 percent; Trina: 5.43 percent

12. Export Buyer's Credits:

Suntech: 10.54 percent; Trina: 10.54 percent

Proposed countervailing duties for Chinese imported solar panels: Suntech, 14.78 percent; Trina, 15.97 percent .

Source: USDOC (2012)

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