

Why China is Dominating the Solar Industry

Written by Joan Russow

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Between 2008 and 2013, China's solar-electric panel industry dropped world prices by 80 percent

By [John Fialka](#) [ClimateWire](#) on December 19, 2016

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"They fundamentally changed the economics of solar all over the world," said Amit Ronen, director of the Solar Institute of George Washington University, one of many scholars following the intense competition in the emerging \$100 billion industry that supports the world's growing solar energy demands.

China's move eclipsed the leadership of the U.S. solar industry, which invented the technology, still holds many of the world's patents and led the industry for more than three decades. Just how China accomplished that and why it did is still a matter of concern and debate among U.S. experts.

One clear result is that the U.S. solar industry was hit hard by plunging prices and can no longer supply more than a third of rapidly growing U.S. appetite for solar panels, according to a recent Department of Energy report exploring "opportunities and challenges" of solar manufacturing.

China's new dominance of nearly all aspects of solar use and manufacturing-markets that are predicted to expand by 13 percent a year, according to the report-came through a "unique, complex and interdependent set of circumstances" that is not likely to be repeated.

But if the United States innovates, cuts costs and nurtures newer technologies, it might emerge

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as the world's second largest solar panel manufacturer by 2020, the report concludes.

The timeline of China's rise began in the late 1990s when Germany, overwhelmed by the domestic response to a government incentive program to promote rooftop solar panels, provided the capital, technology and experts to lure China into making solar panels to meet the German demand.

"The Chinese took it and basically ran with it," said Donald Chung, one of the authors of the DOE report, who studies the solar industry for DOE's National Renewable Energy Laboratory in Golden, Colo.

AN INDUSTRY PROPELLED BY TAX CREDITS

China, according to Chung, had "dabbled" in solar energy only as a source of electricity to help impoverished rural areas remote from its power grid. But then some of its pioneering companies became intrigued by the income that manufacturing solar panels for export to Germany might bring in. When Spain and Italy began their own rapidly expanding solar incentives, adding to the demand, China began scouring the world, hiring more solar experts and shopping for machinery and polysilicon supplies to meet the expected surge of orders for solar panels.

According to some veterans in the U.S. solar industry, China bought solar companies and invited others to move to China, where they found cheap, skilled labor. Instead of paying taxes, they received tax credits.

Chung notes that China's government was also generous in other ways. Making solar panels is difficult. To make them efficiently, the business requires large, semiautomated factories.

"It is not easy to add small bits of capacity to meet growing demands; you have to add it in big chunks," he said. He called it a "yo-yo effect" that tends to create more and more capacity. That made solar still more attractive to China.

China's solar companies have shareholders who want profits, Chung said. But the government

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"has other constituencies that are demanding jobs and factories to be put up." That pressure came from provincial and local governments that found, according to DOE, that the federal government was willing to chip in as much as \$47 billion to help build its solar manufacturing into what it calls a "strategic industry."

Expanding renewable energy became one of seven categories of business that receive special attention including loans and tax incentives under China's five-year plans.

The result was that in building up the world's largest solar manufacturing industry, one that became the price leader in most aspects of the world's market-beginning with cheaper solar panels-China had helped create a worldwide glut. There were roughly two panels being made for every one being ordered by an overseas customer.

According to Ronen, the expert from George Washington University, China then decided to follow Germany's lead again, developing its own "feed-in tariff" that paid handsome prices for electricity generated by rooftop solar. The result was a surge in domestic demand for solar.

The demand was so great that in two years, by 2015, China's domestic market bypassed Germany's to be the largest in the world.

China tried to reduce the subsidy this year by setting a deadline for ending it, but that spurred another surge in domestic buying. "China put in 20 gigawatts in the first half of this year. The entire U.S. capacity is around 31 GW. The Chinese market appears enormous," said Ronen.

‘THEY THINK THEY CAN WIPE OUT ALL THE COMPETITION’

China dominates the solar market in PV installation as well as total installed capacity, with the United States a distant third and fourth, respectively. Photo courtesy of the International Energy Agency.

U.S. experts are divided on where China's policies on solar energy appear to be headed. Some think it's a matter of government policies that ran out of control. After spending 30 years in the

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U.S. solar industry and in DOE watching solar markets, Ken Zweibel has recently retired, but he worries that there may be more to it than that. He calls it "black box economics."

"If there was ever a situation where the Chinese have put their whole governmental system behind manufacturing, it's got to be solar modules," Zweibel said. "I think they think they can wipe out all the competition in the world. It makes all kinds of sense if you have the staying power."

Wyatt Metzger, a principal scientist at NREL, takes a more benign view. "They have a centralized government and terrible pollution problems. They understand the need to get away from coal and to invest in clean energy," he said.

Whatever the reasoning was behind China's massive investment in solar module manufacturing, the impact on its U.S. competitors has not been benign. SunEdison of Belmont, Calif., filed for bankruptcy in April. The stocks of two other leading companies, First Solar and SunPower, were in the triple digits a decade ago. Now they are treading water, floating between 13 and 6 percent of their former values.

"What's left of the solar universe is showing severe signs of stress, and given the tricky accounting and the prevalence of China-based companies among the panelmakers, that stress may very well be understated," wrote Jim Collins in a recent market analysis for *Forbes* magazine.

"People tend to view negatively that China has taken over [solar] module market share," said David Mooney, director of NREL's strategic energy analysis center. "It would have been better if that capacity had stayed in the U.S."

"Another side of the coin, from my perspective," he said, is 250,000 American jobs in the solar panel assembly, installation and maintenance business, many of which wouldn't have happened without the push from China that dramatically lowered solar module prices.

"Those jobs can't be outsourced," he said.

COULD CHINA CREATE A GLOBAL GRID?

Moreover, China's plan for the global growth of the solar market is still a work in progress. In October, Liu Zhenya, former chairman of China's state-owned power company, State Grid Corp., came to the United Nations to shed more light on his nation's evolving solar ambitions, which he said are part of a plan aimed at organizing a global power grid that could transmit 80 percent renewable energy by 2050.

He calls his idea the Global Energy Interconnection. His speech invited U.N. support for a new international group to plan and build the grid. It's called the Global Energy Interconnection Development and Cooperation Organization (GEIDCO), and China has named Liu its chairman. He ticked off the reasons for a global grid that would transmit solar, wind and hydroelectric-generated power from places on Earth where they are abundant to major population centers, where they are often not.

He gave three reasons for his new mission. Expanding energy demands will exhaust coal, oil and natural gas supplies over the next 110 years. Environmental pollution from fossil fuels will exacerbate serious pollution and health problems. And world leaders need a mechanism to cut the world's greenhouse gas emissions by half to prevent a potential 4-degree-Celsius rise in the Earth's average temperature, a possibility that Liu called "seriously threatening human survival."

His grid's development would take shape in three phases. First, Liu explained, individual nations would redesign their own power electric grids. He noted that China's effort is already underway, generating 140 GW of wind power and 70 GW of solar power, "more than that of any country of the world." By completing a network of long-distance, high-voltage direct-current power lines to move renewable power from the north to the south and from the east to the west, China could finish its new grid by 2025, he predicted.

The second phase, Liu described, would be an international effort to build regional grids that would be able to transmit substantially more power across national borders in Northeast and Southeast Asia, between Africa and Eurasia, and between nations in both North and South America. The third phase would build power lines and undersea cables that would connect the regional grids. The upshot would create what he called a "win-win situation" by generating clean electricity in places like Africa and Central America that are among the richest when it comes to sunshine, and selling the clean energy to major cities that have the biggest need for it.

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The process would also bring more energy and energy-generating income to poorer nations, to help them develop. "In the Americas, we will speed up the development of Canada's hydropower and clean energy in southwestern and central U.S. and northern Mexico to be delivered to load [demand] centers in [the] East and West coasts of North America," he said.

There would be plenty of work for "all global players" to coordinate the effort, to share and innovate new technology, and to develop global standards and rules for cooperation, Liu promised. He closed his U.N. presentation with a glimpse of a future world where a combination of renewable energy, a network of high-voltage direct-current transmission lines and "smart grid" operating systems can serve the planet the way the human "blood-vascular system" serves the human body.

When the global grid is completed, "the world will turn into a peaceful and harmonious global village with sufficient energy, green lands and blue sky," he predicted.

Just how much harmony China's GEIDCO proposal might generate remains to be seen, but a U.N. press release noted that the meeting was attended by representatives of 70 organizations, including government organizations, businesses and universities. The U.S. delegation included people from DOE's Argonne National Laboratory and Stanford University. During his visit to the United States, Liu also met separately with representatives of the Electric Power Research Institute, which serves American utilities.

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