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# **A Crisis or An Opportunity? The Trade War between the US and China in the Solar PV Sector**

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## **Abstract**

*Since early 2018, the US – China ‘trade war’ has increased tariffs on a wide range of Chinese products, including solar panels. The tension between the US and China in solar sector, if left unchecked, will not only harm the bilateral relationship between the two trade powers but also impede climate change mitigation as higher costs will slow down the deployment of solar products.*

*The article begins by tracing the rapid development of the solar energy sector in China, before reviewing US trade measures to counteract the increased imports and protect its domestic industry. The article then proceeds to examine the World Trade Organization (WTO) rules, finding that China is likely to prevail in the dispute on claims made under the General Agreement on Tariffs and Trade and the Agreement on Safeguards. However, while WTO litigation may be a necessary step it is not sufficient. China must also take the opportunity to solve deeply-rooted problems in its solar industry, namely solar overcapacity and heavy reliance on export markets in a limited number of countries that render Chinese solar manufacturing susceptible to trade restrictions imposed by other countries. Addressing these issues will not only remove a major irritant to the US and other trading partners but would also solidify the position of the industry within the country.*

*The article recommends two options for China: first, explore domestic market potential for solar energy so as to absorb manufacturing capacity. The key here lies in progressively scaling up domestic solar consumption, which is essential in promoting China’s solar development in a healthy and sustainable manner. Second, strengthen ties with countries along the Belt and Road Initiative (BRI) in solar trade and investment. Exporting Chinese solar technologies and building solar power infrastructure in BRI countries not only alleviates China’s over-dependence on a limited number of advanced economies’ markets but also contributes to ‘greening’ the BRI and global climate change mitigation.*

**Keywords:** US–China Trade War, Protectionism, Solar, World Trade Organization, Safeguards, Belt and Road, Climate Change

## 1. Introduction

Since China's accession to the World Trade Organization (WTO) in 2001, its trade relations with the United States (US) have been characterized as growing but periodically contentious and fragile.<sup>1</sup> Under the Trump administration, the US-China trade relationship is undergoing a fundamental change underscored by distrust and deep friction.<sup>2</sup> The 'brazen unilateralism' of Trump's 'America First' trade policy-making has led to trade friction on a scale that has not been seen since the Great Depression.<sup>3</sup> Given the sheer size of the US-China trade volume and respective economies, the downward spiral of imposing trade restrictions, which invites retaliatory countermeasures will cause lasting damage to both countries. More systemically, the unilateral and discriminatory trade measures almost certainly run afoul of WTO rules which seek to provide transparency, stability and predictability to international trade.

Starting from early 2018, the US has put in place increased tariffs on a wide range of products imported from China, including solar cells and modules<sup>4</sup> – the focus of this article. In light of the huge potential of solar energy development to boost economic growth, enhance energy security and address climate change and air pollution problems,<sup>5</sup> a large number of countries have attached strategic importance to solar energy and begun developing a domestic industry in this area. Statistics estimate that the investment in the solar industry could reach as high as US\$2 trillion between 2015 and 2040.<sup>6</sup>

As a relative latecomer to the industry – especially when compared to advanced economies such as Germany, Japan and the US – China began scaling up the development of solar energy only in the early 2000s. In the intervening period, China has experienced unprecedented expansion of the domestic solar industry and upgrading of the value chain. Chinese manufacturing of various components along the photovoltaic (PV) supply chain, such as cells and modules, has surpassed 50% of global output, while its total PV exports

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<sup>1</sup> For a review of US-China trade relations over the past decade, see Edward Chen, 'US-China Trade Relations and Economic Distrust' (2014) 47(3) *Chinese Economy* 57; Dong Wang, 'China's Trade Relations with the United States in Perspective' (2010) 39(3) *Journal of Current Chinese Affairs* 165.

<sup>2</sup> Jiangyu Wang, 'Between Power Politics and International Economic Law: Asian Regionalism, the Trans-Pacific Partnership and the US-China Trade relations' (2018) 30(2) *Pace International Law Review* 383, 434; Li Cheng, 'The US – China Relationship: Trading Blows' (3 May 2018, Brookings), <<https://www.brookings.edu/on-the-record/the-u-s-china-relationship-trading-blows/>>, accessed 12 January 2019.

<sup>3</sup> Simon Evenett and Johannes Fritz, 'Brazen Unilateralism: the US – China Tariff War in Perspective' (Centre for Economic Policy Research Press 2018) 8.

<sup>4</sup> Solar cells and modules constitute part of solar photovoltaics (PV). Compared with other solar technologies, such as solar thermal, solar heating and cooling, solar PV has become much more widely used. See International Energy Agency, *How Solar Energy Could be the Largest Source of Electricity by Mid-Century* (29 September 2014), <<https://www.iea.org/newsroom/news/2014/september/how-solar-energy-could-be-the-largest-source-of-electricity-by-mid-century.html>>, accessed 12 January 2019.

<sup>5</sup> See Intergovernmental Panel on Climate Change, *Renewable Energy Sources and Climate Change Mitigation: Special Report of the Intergovernmental Panel on Climate Change* (IPCC 2011) 369-372.

<sup>6</sup> Seb Henbest, 'New Energy Outlook 2017' (Bloomberg New Energy Finance 2017) 10.

reached US\$13.1 billion in 2017.<sup>7</sup> The surge of Chinese solar PV exports has contributed to a precipitous decline in the price of solar products, causing significant hardship for manufacturers in other major solar producer countries, including the US.<sup>8</sup> Against this background, solar technology has become a trade battleground between the US and China. The increases of tariff in solar sector are not merely a trade-oriented issue but also involve considerations from political economy sides. In addition, imposing tariff on solar products will implicate climate-related action since the cost of solar installation will be driven up and deployment slowed down, which underpins the ‘next generation of trade and environment conflicts’.<sup>9</sup>

This article proceeds as follows. Section Two begins by reviewing the historical development of Chinese solar industry, with a focus on the driving forces of its success. In so doing, the section highlights two major problems which are deeply embedded in China’s solar development: capacity surplus and over-reliance on export markets in a limited number of countries. Section Three examines how the US has engaged in the use of trade restrictive measures towards Chinese solar products and discusses the root causes. Section Four introduces China’s WTO complaint against the US for the tariff increases and provides a legal analysis of the relevant WTO obligations and rules. The section also explains that, even if successful at the WTO, China cannot merely rely on the multilateral system for its continued success. Section Five proposes two options which could alleviate the US-China trade tensions in solar sector and contribute to healthy and sustainable development for China’s solar industry. First, Chinese governments at the national and subnational levels need to enlarge domestic solar market by crafting supportive policy framework that is responsive to changing solar development circumstances. Second, China needs to explore the untapped potential of Belt and Road Initiative (BRI) countries so as to diversify overseas market for Chinese solar energy; in essence, China must decouple away from the US and a select few other markets to broaden its export base. Section Six concludes.

## **2. China’s Unprecedented Growth of Solar Manufacturing Capacity**

The natural place to begin an analysis of the US tariff increases towards Chinese solar products is through the development of China’s solar industry and its growth pattern. China’s solar development has been discussed extensively in the literature in several different fields, including policy, economics and political economy.<sup>10</sup> In the main,

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<sup>7</sup> Ministry of Industry and Information Technology of the People’s Republic of China, ‘The Operation of China’s PV Industry in 2017’ (January 24, 2018), <<http://www.miit.gov.cn/n1146290/n4388791/c6031974/content.html>>, accessed 2 December 2018.

<sup>8</sup> According to the IRENA statistics, solar PV module prices have fallen by around 80% since 2009. See IRENA, *IRENA Renewable Cost Database*, <<https://www.irena.org/costs>>.

<sup>9</sup> The concept of ‘next generation of trade and environment conflicts’ was developed in Mark Wu and James Salzman, *The Next Generation of Trade and Environment Conflicts: The Rise of Green Industrial Policy* (2014) 108(1) *Northwestern University Law Review* 401.

<sup>10</sup> See i.e., Gang Chen, ‘China’s Solar PV Manufacturing and Subsidies from the Perspective of State Capitalism’ (2015) 33(10) *Copenhagen Journal of Asian Studies* 90; Sufang Zhang, Philip Andrews-Speed and Meiyun Ji, ‘The Erratic Path of the Low-Carbon Transition in China: Evolution of Solar PV Industry’ (2014) 67 *Energy Policy* 903; Sufang Zhang and Yongxiu He, ‘Analysis on the Development and Policy of Solar PV Power in China’ (2013) 21 *Renewable and Sustainable Energy Reviews* 393; Ping Huang et al, ‘How China Became a Leader in Solar PV: An Innovation System Analysis’ (2016) 64 *Renewable and Sustainable Energy Reviews* 777; Zhenyu Zhao, Shuangying Zhang and Jian Zuo, ‘A Critical Analysis of the

government intervention, innovation and taking advantage of increasing demand in the West have been identified as the primary drivers. For example, Zhang and Gallagher portray China's success in the solar area as being 'a rapid innovation follower', which has relied on four facilitative factors: incentive deployment policies in overseas markets; mobilization of experts with a global perspective, the flexibility of Chinese manufacturing and supportive policy measures from national and local governments.<sup>11</sup> Similar opinions can be identified in Nahm and Steinfeld's work, in which they underscore the importance of improving manufacturing-related innovation and facilitating technology commercialization.<sup>12</sup> Chen refers to the powerful role of China's 'state capitalism' in shaping an enabling environment for national advantages and increasing the industrial competitiveness over foreign counterparts in the solar sector.<sup>13</sup> Gallagher focuses on local governments in China and identifies access to finance, particularly low-cost capital provided by these governments as key driving forces in promoting solar PV development.<sup>14</sup>

Dating back to the early stage of solar development in China in the early-1990s, the central government's priority was to provide electricity to rural areas without connection to the grid systems. Schemes such as the Brightness Program, the Township Electrification Program and the Village Electrification Program are illustrative in this regard.<sup>15</sup> However, such schemes remained small in scale and did not contribute much to the development of the domestic manufacturing or innovative solar energy sector. Since the early 2000s, substantial growth and innovation in China's solar manufacturing emerged following Europe's enactment of solar market supportive measures (such as feed-in tariffs) that created considerable demand.<sup>16</sup> Swiftly responding to the huge potential present in the EU market, a number of private Chinese PV manufacturing firms established and progressively improved the supply chain.<sup>17</sup> Local governments, notably those in the provinces of Jiangsu, Jiangxi and Zhejiang have provided a wide range of incentive policies to assist the

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Photovoltaic Power Industry in China – From Diamond Model to Gear Model' (2011) 15(9) *Renewable and Sustainable Energy Reviews* 4963; Shuying Zhong, Chi Liu and Liqiong Qin, 'Solar Industry Development and Policy Support in China' (2011) 5 *Energy Procedia* 768; Liqun Liu et al, 'Solar Energy Development in China – A Review' (2010) 14(1) *Renewable and Sustainable Energy Reviews* 301. Zou Hongyang et al, 'Market Dynamics, Innovation, and Transition in China's Solar Photovoltaic (PV) Industry: A Critical Review' (2017) 3(69) *Renewable and Sustainable Energy Reviews* 199.

<sup>11</sup> Fang Zhang and Kelly Gallagher, 'Innovation and Technology Transfer Through Global Value Chains: Evidence from China's PV Industry' (2016) 7(94) *Energy Policy* 191, 200.

<sup>12</sup> Jonas Nahm and Edward Steinfeld, 'Scale-Up Nation: China's Specialization in Innovative Manufacturing' (2014) 2(54) *World Development* 288, 294-299.

<sup>13</sup> Gang Chen, 'From Mercantile Strategy to Domestic Demand Stimulation: Changes in China's Solar PV subsidies' (2015) 21(1) *Asia Pacific Business Review* 96, 103-109.

<sup>14</sup> Kelly Gallagher, *The Globalization of Clean Energy Technology Lessons from China* (MIT Press 2014) 90-92.

<sup>15</sup> See, National Development and Reform Commission, 'The Research Report on China's Solar PV Industry Development' (October 2004), <<http://zsdh.library.sh.cn:8080/FCKeditor/filemanager/upload/jsp/UserImages/1216361096343.pdf>>.

<sup>16</sup> Jos Sijm, 'The Performance of Feed-in Tariffs to Promote Renewable Electricity in European Countries' (November 2002, ECN Project on Renewable Electricity Trends in European Countries), <[http://www.ecn.nl/docs/library/report/2002/c02083.pdf?origin=publication\\_detail](http://www.ecn.nl/docs/library/report/2002/c02083.pdf?origin=publication_detail)>.

<sup>17</sup> Sufang Zhang and Yongxiu He, 'Analysis on the Development and Policy of Solar PV Power in China' (2013) 21 *Renewable and Sustainable Energy Reviews* 393, 395.

expansion of solar manufacturing.<sup>18</sup> Thus, a combination of the huge overseas market and a favorable local environment paved the way for a miraculous growth of Chinese PV industry in the last two decades.

Prospects for the industry were dented, however, as a result of the global financial crisis in 2008 and the ensuing phase-out of favorable solar market policies in the EU. Later on, governments in the US and the EU initiated anti-dumping investigations on Chinese solar exports and imposed high tariffs to squeeze Chinese manufacturers' market share.<sup>19</sup> As a result, solar exports from China experienced a precipitous drop of demand in major overseas markets, and the manufacturing firms faced a life and death moment.

In rescuing China's solar manufacturing firms amid a time of crisis, the central government began crafting policy measures to increase domestic demand on a large-scale, which until that time had been virtually ignored. In 2009, the Ministry of Finance developed two initiatives – namely the Solar Roofs Program and the Golden Sun Demonstration Project – aimed to absorb manufacturing capacity by subsidizing the installation of solar PV projects national wide.<sup>20</sup> China's 12<sup>th</sup> Five-Year Plan (FYP) also for the first time acknowledged the solar industry as one of the 'strategic emerging industries'.<sup>21</sup> This represents a watershed moment for solar development in China, as it marks the period in which China shifted from favoring (and heavily supporting) wind energy to solar.<sup>22</sup> As a result of policy incentives, the installation of solar PV in China grew from 300 MW in 2009 to 8300 MW in 2012.<sup>23</sup> Without slowing down in the following years, the newly installed and cumulative installed solar PV capacity in China reached 53 GW and 130 GW in 2017, accounting for 51.8% and 32.2% of total global capacity.<sup>24</sup>

Having been incentivized by surging domestic installation and a wide range of supportive measures, Chinese solar firms quickly recovered from the double hit (financial crisis and implementation of trade remedies) and regained massive momentum in expanding the

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<sup>18</sup> *Ibid.*

<sup>19</sup> Ministry of Commerce People's Republic of China, 'Timeline: China-EU, China-US Tug of War on Solar Duties' (19 June 2013), <[http://english.mofcom.gov.cn/article/zt\\_solar/column2/201307/20130700218603.shtml](http://english.mofcom.gov.cn/article/zt_solar/column2/201307/20130700218603.shtml)>.

<sup>20</sup> For more information on the two programs, see, <[http://www.mof.gov.cn/zhengwuxinxi/caizhengwengao/2009niancaizhengbuwengao/caizhengwengao200907/200911/t20091118\\_233416.html](http://www.mof.gov.cn/zhengwuxinxi/caizhengwengao/2009niancaizhengbuwengao/caizhengwengao200907/200911/t20091118_233416.html)>.

<sup>21</sup> The seven strategic emerging industries as listed in the 12<sup>th</sup> Five-Year Plan were: advanced materials, renewable and alternative energy, information technology, innovative equipment manufacturing, biotechnology, energy conservation and environmental protection, new energy vehicles. This Plan called for 80% of solar production equipment to be developed domestically by 2015 and set ambitious targets for solar cell efficiencies. For the full text, please see, <[http://www.gov.cn/zwgg/2012-07/20/content\\_2187770.htm](http://www.gov.cn/zwgg/2012-07/20/content_2187770.htm)>.

<sup>22</sup> For instance, in the 2006 Renewable Energy Law, which was passed in 2006, wind energy targets were set more ambitious than solar energy targets.

<sup>23</sup> See European Photovoltaic Industry Association, Global Market Outlook for Photovoltaic 2013-2017 (2017), <<https://resources.solarbusinesshub.com/solar-industry-reports/item/global-market-outlook-for-photovoltaics-2013-2017>>.

<sup>24</sup> Liu Yuanyuan, 'China's Solar PV Module Exports Reached 37.9 GW in 2017' (12 March 2018, Renewable Energy World), <<https://www.renewableenergyworld.com/articles/2018/03/china-s-pv-module-exports-reached-37-9-gw-in-2017.html>>, accessed 13 August 2018.

manufacturing capacity.<sup>25</sup> Although solar installation in China has experienced rapid growth, it still cannot keep up with the increasing pace of the manufacturing capacity. The existence of an asymmetry between solar deployment and solar manufacturing capacity often leads to overcapacity and an upsurge of exports.<sup>26</sup> Statistics show that China, as the world's largest solar manufacturer, exported more than 90% of global total PV products in 2012 and around 70% in 2018.<sup>27</sup> Facing the dominance of Chinese solar products in global market, the EU, Japan, Mexico and the US circulated a joint statement at the WTO criticizing China's PV exportation as trade distorting and an impediment to solar industrial growth in other countries.<sup>28</sup>

The asymmetry in Chinese solar development will not be easily remedied for several reasons, one of the most notable ones is the implementation gap between goals set by central government and outcomes delivered by local ones.<sup>29</sup> The Chinese central government has realized the severity of overcapacity and heavy reliance on overseas markets, while local governments remain enthusiastic about boosting solar manufacturing and exportation, as driven by short term economic goals.<sup>30</sup> For this reason, some local governments simply dismiss the central government guideline. In short, the excess solar capacity and insufficient domestic demand have become increasingly problematic and led to tensions between China and other producer countries in solar sector.

### **3. US-China Trade Tensions in the Solar Sector and the Implications**

The current round of trade friction between the US and China in the solar PV sector began when two American solar manufacturers filed a petition in 2017 urging the US International Trade Commission to establish that solar imports have 'injured' the US industry and recommending the implementation of safeguards.<sup>31</sup> In due course, the US President approved applying safeguard tariffs for the next four years, which include a 30% tariff in

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<sup>25</sup> At the same time, Chinese solar firms have also begun establishing plants outside of China, predominantly in Vietnam, Malaysia and Thailand. Mark Osborne, 'Key Solar Manufacturing Location Trends in 2016' (9 January 2017 PVTech), <<https://www.pv-tech.org/news/key-solar-manufacturing-location-trends-in-2016>>.

<sup>26</sup> See i.e. Joanna Lewis, 'The Rise of Renewable Energy Protectionism: Emerging Trade Conflicts and Implications for Low Carbon Development' (2014) 14(4) *Global Environmental Politics* 10, 23-24; Sufang Zhang et al, 'Interactions Between Renewable Energy Policy and Renewable Energy Industrial Policy: A Critical Analysis of China's Policy Approach to Renewable Energies' (2013) 62 *Energy Policy* 342.

<sup>27</sup> See Jeffrey Ball et al, *The New Solar System: China's Evolving Solar Industry and Its Implications for Competitive Solar Power in the United States and the World* (Stanford Steyer-Taylor Center for Energy Policy and Finance 2017) 110.

<sup>28</sup> See WTO, Committee on Subsidies and Countervailing Measures - The contribution of the WTO to the G20 call for action to address certain measures contributing to overcapacity, WTO Document G/SCM/W/569, WTO Document G/SCM/W/569.

<sup>29</sup> Jonas Nahm, 'Exploiting the Implementation Gap: Policy Divergence and Industrial Upgrading in China's Wind and Solar Sectors' (2017) 9(231) *China Quarterly* 705, 708-710.

<sup>30</sup> *Ibid*, 711.

<sup>31</sup> USTR, 'Section 201 Cases: Imported Large Residential Washing Machines and Imported Solar Cells and Modules: Fact Sheet', <<https://ustr.gov/sites/default/files/files/Press/fs/2017%20Cases%20Fact%20Sheet.pdf>>. Around two-thirds of solar imports came from Malaysia, China and South Korea in 2016. Chinese solar companies have a remarkable presence in Malaysia since they have set up manufacturing in this country in the recent years to avoid trade remedies imposed by the US since 2014.

the first year, 25% in the second, 20% in the third and 15% in the fourth year.<sup>32</sup> A few months later, Trump decided to add an additional 25% tariff on imported Chinese solar cells and modules on the basis of Section 301 of the US Trade Act of 1974.<sup>33</sup>

These measures were just the latest in a feud dating back to 2011 when the US Department of Commerce found that Chinese manufacturers had dumped cut-price solar products to the US market and imposed anti-dumping duties ranging from 31% to 250% on Chinese solar cell and modules in 2012.<sup>34</sup> Later in 2014, the anti-dumping duties on Chinese solar exports were adjusted to range from 28% to 44%.<sup>35</sup> The use of high anti-dumping duties had led to a drastic shrink of Chinese solar exports in the US market from \$4 billion in 2011 to \$1.8 billion in 2015.<sup>36</sup>

The repetitive use of trade remedies by the US against Chinese solar exports corresponds to China's solar manufacturing growth and heavy reliance on exportation, as discussed in Section Two. Excess capacity by itself might not be a big problem but it is likely to irritate trading partners when their domestic industries' interests are harmed by excessive levels of imports.<sup>37</sup> Before the surge of solar manufacturing in China, economist Dani Rodrik points to China's capability to develop 'an export basket that is significantly more sophisticated' than what would be normally expected for a country at China's income level.<sup>38</sup> In this vein, Rodrik contends that China has to rely heavily on a few advanced economies for exportation, which would exert significant pressure on producers in those countries.<sup>39</sup> The growth of Chinese solar manufacturing and its heavy reliance on overseas markets in the US and the EU is a telling example. The 2018 USTR Report on China's WTO Compliance criticizes that Chinese solar excess capacity has harmed US interests in numerous ways,

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<sup>32</sup> See USTR, 'President Trump Approves Relief for US Washing Machine and Solar Cell Manufacturers' (22 January 2018), < <https://ustr.gov/about-us/policy-offices/press-office/press-releases/2018/january/president-trump-approves-relief-us#>>. It is noted that the first 2.5 GW of imported solar cells will be exempt from the safeguard tariff in each of those four years.

<sup>33</sup> See USTR, 'Update Concerning China's Acts, Policies and Practices Related to Technology Transfer, Intellectual Property, and Innovation' (20 November 2018) < <https://uschinatradewar.com/files/2018/12/USTR-FULLL-301-Report-Update.pdf>>.

<sup>34</sup> See U.S. Department of Commerce, 'Fact Sheet: Commerce Finds Dumping and Subsidization of Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled into Modules from the People's Republic of China' (2012), < [http://ia.ita.doc.gov/download/factsheets/factsheet\\_prc-solar-cells-ad-cvd-finals-20121010.pdf](http://ia.ita.doc.gov/download/factsheets/factsheet_prc-solar-cells-ad-cvd-finals-20121010.pdf)>.

<sup>35</sup> See U.S. Department of Commerce, 'Fact Sheet: Commerce Preliminarily Finds Dumping of Imports of Certain Crystalline Silicon Photovoltaic Products from China and Taiwan' (2014), <<https://enforcement.trade.gov/download/factsheets/factsheet-multiple-certain-crystalline-silicon-photovoltaic-products-ad-cvd-final-121614.pdf>>.

<sup>36</sup> Sufang Ke, 'The US 201 Section Investigation is Expected to have Limited Implications on Chinese Solar Firms' (30 January 2018, Forward The Economist), < <https://www.qianzhan.com/analyst/detail/220/180130-1c9d036e.html>>.

<sup>37</sup> Joel Trachtman, 'U.S. – Chinese Trade: Interface and Lawfare' (May 2017) Robert Schuman Centre for Advanced Studies Research Paper No. RSCAS 2017/11, < [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2973292](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2973292)>, 2.

<sup>38</sup> Dani Rodrik, 'What's So Special About China's Exports' (2006) 14(9) *China & World Economy* 1, 16-17.

<sup>39</sup> *Ibid.*



such as the sweeping bankruptcy of US solar companies.<sup>40</sup> However, whether using restrictive trade measures can improve the competitiveness of US solar manufacturers and solve overcapacity problem in China remains questionable.<sup>41</sup> What follows is an assessment of the implications (mainly negative) that US tariff increases can have from economic, political and climate perspectives.

Owing to the emergence of a highly-integrated global value chain the tariff increases will have an effect on all facets of the solar sector. Solar production line includes not just the manufacturing of cells and modules but also upstream products, such as polysilicon, wafers, ancillary equipment and downstream sector, such as installation, sales and distribution.<sup>42</sup> The increasingly interconnected global supply chain means growing trade in solar parts and components, which are often sourced from different countries around the globe, and impact beyond the intended product and market.<sup>43</sup>

The tariff increases can adversely impact the solar value chain in two ways. First, the upstream polysilicon manufacturers are susceptible to restriction since China could impose retaliatory tariffs on their products. There is historical evidence in this regard, China's import tariffs imposed on US polysilicon exports in 2013 as a countermeasure to the US trade remedies had effectively shut off US manufacturers from the world's largest market.<sup>44</sup> The share of US polysilicon in the global market dropped from 29.1% in 2010 to 11.3% in 2017.<sup>45</sup> Second, installers in the downstream sector, which relies on cheap Chinese exports to reduce costs will have to deal with the increase of price or ultimately transfer the cost to the (often American) consumers.<sup>46</sup> Due to the limited US solar manufacturing capacity at this stage, the potential supply shortages for solar cells and modules cannot be ruled out.<sup>47</sup> The US Solar Energy Industry Association (SEIA) estimated that about 23,000 jobs would be lost and more than US\$ 2.5 billion of investments in large solar installation projects will

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<sup>40</sup> See USTR, '2018 Report to Congress on China's WTO Compliance' (February 2019), <<https://ustr.gov/sites/default/files/2018-USTR-Report-to-Congress-on-China%27s-WTO-Compliance.pdf>>, 17-20.

<sup>41</sup> European Commission, Transatlantic Trade in Turbulent Times – Speech by Cecilia Malmström, European Commissioner for Trade, Brussels, 19 July 2018, <[http://europa.eu/rapid/press-release\\_SPEECH-18-4604\\_en.htm](http://europa.eu/rapid/press-release_SPEECH-18-4604_en.htm)>.

<sup>42</sup> Bob Caebaugh and Max St. Bown, 'Industrial Policy and Renewable Energy: Trade Conflicts' (2012) 5(1) *Journal of International and Global Economic Studies* 1.

<sup>43</sup> Richard Baldwin, 'Global Supply Chains: Why They Emerged, Why They Matter, and Where They Are Going' in Deborah Elms and Patrick Low (eds) *Global Value Chains in A Changing World* (WTO 2013) 24.

<sup>44</sup> 'Will New Tariffs Hurt the US Solar-Power Industry?' (November 13, 2017) *Wall Street Journal*, <<https://www.wsj.com/articles/will-new-tariffs-hurt-the-u-s-solar-power-industry-1510628400>>, accessed 21 November 2018.

<sup>45</sup> *Ibid.*

<sup>46</sup> Jonas Nahm, 'Renewable Futures and Industrial Legacies: Wind and Solar Sectors in China, Germany, and the United States' (2017) 19(1) *Business and Politics* 68, 71.

<sup>47</sup> Lance Brasher, 'Trade Barriers on Solar Cells and Modules to Significantly Impact US Solar Industry' (23 January 2018, Skadden), <<https://www.skadden.com/insights/publications/2018/01/2018-insights/trade-barrier-on-solar-cells-and-modules>>, accessed 12 January 2019.

be cancelled or delayed.<sup>48</sup> The firm opposition from solar project developers in the US to the use of tariffs on imported solar products is illustrative.

Although the counterargument could be made that tariff increases and the resulting higher costs of imports can drive overseas solar companies to build manufacturing capacity in the US and thus create jobs,<sup>49</sup> the reality appears to be not so convincing. As of April 2019, only one Chinese solar manufacturer (Jinko Solar) has established its first US factory with the capacity to build 400MW of solar modules annually in Florida.<sup>50</sup> Another Korean company (Hanwha Q Cells) also is operating a module assembly facility in the US with 1.7 GW capacity.<sup>51</sup> The majority of solar companies that consider relocation to avoid tariffs tend to dismiss the US as a desirable destination and rather choose other low-wage countries, particularly these in the Southeast Asia, as their manufacturing or assembly base.<sup>52</sup> The prospect of attracting overseas solar companies to the US seems to be rather dim.

It is a small group of domestic solar manufacturers, together with politically influential congressman that have united to form a coalition favoring greater protectionism over free trade, despite the existence of a large number of firms that strongly oppose the imposition of additional trade barriers.<sup>53</sup> From a broader political perspective, some high-level US administration officials tend to view trade tensions as part of the larger US – China geopolitical competition and welcome trade restrictions as a way of curbing China’s growth and influence.<sup>54</sup> The possibility of leaving trade protection in solar area for too long cannot be discounted and it will make the removal extremely difficult.

While the focus of most commentators is on the economic and geopolitical interests that are vulnerable to the US – China trade war, it is important to also remember that the increased tariffs on solar PV products is harming efforts to mitigate climate change. Facilitating the development of renewable energy as an alternative to fossil fuels has been identified and highlighted as one of the most effective approaches to solve climate change.<sup>55</sup> To be effective, the industry must progressively reduce the cost of renewable energy in order to compete with fossil fuel. However, imposing tariffs on solar imports would drive up the price of solar generation and slow down the diffusion of solar technology to the

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<sup>48</sup> SEIA, ‘President’s Decision on Solar Tariffs is A Loss for America’ (22 January 2018), < <https://www.seia.org/news/presidents-decision-solar-tariffs-loss-america>>, accessed 19 January 2019.

<sup>49</sup> Michael Zhang, ‘Faced with Crippling Tariffs, How Are China’s Solar Producers Planning to Survive?’ (9 February 2018, Forbes), < <https://www.forbes.com/sites/outofasia/2018/02/09/faced-with-crippling-tariffs-how-are-chinas-solar-producers-planning-to-survive/#4919bdfb4631>>, accessed 20 August 2018.

<sup>50</sup> ‘Jinko Solar to Begin Manufacturing Solar Panels in Florida’ (30 March 2018) [https://www.jinkosolar.com/press\\_detail\\_1629.html](https://www.jinkosolar.com/press_detail_1629.html).

<sup>51</sup> ‘Hanwha Q Cells Korea to Build Photovoltaic Manufacturing Facility in Georgia, USA’ (30 May 2018), < [https://www.hanwha.com/en/news\\_and\\_media/press\\_release/hanwha-q-cells-korea-to-build-photovoltaic-manufacturing-facility-in-georgia-usa.html](https://www.hanwha.com/en/news_and_media/press_release/hanwha-q-cells-korea-to-build-photovoltaic-manufacturing-facility-in-georgia-usa.html)>.

<sup>52</sup> IRENA, *Renewable Energy Market Analysis: Southeast Asia* (IRENA 2018) 26-27.

<sup>53</sup> Llewelyn Hughes and Jonas Meckling, ‘The Politics of Renewable Energy Trade: The US-China Solar Dispute’ (2017) 6 (105) *Energy Policy* 256, 257-258.

<sup>54</sup> Evenett and Fritz (n 3) 11.

<sup>55</sup> IPCC, *Renewable Energy Sources and Climate Change Mitigation: Summary for Policymakers and Technical Summary* (IPCC 2011) 7.

detriment of climate action. Even the mere initiation of trade investigations could have a chilling effect on trade and investment in solar because the predictability and stability of the market would be undermined. The US installation of solar capacity in 2018 saw a decline from capacity additions in 2017, particularly when it comes to utility solar projects that suffered disruption, delay and even cancelation due to the uncertainty leading up to tariff increases.<sup>56</sup> As the world's second largest carbon emitter, the US has to undertake a strong commitment to cut carbon emissions and play a positive role in mitigating climate change.<sup>57</sup> The increases of tariff on solar imports by the US represent another climate-hostile move, following Trump's decision to withdraw from the Paris Agreement.<sup>58</sup>

In response to the US tariff increases, China quickly imposed retaliatory tariffs on the US exports worth US\$60 billion,<sup>59</sup> which has deepened the trade war and is unlikely to compensate the actual victims of US tariff increases, namely, solar manufacturers in China. The 'tit-for-tat' tactics, although frequently invoked in trade history, works to the detriment of both sides, particularly import-dependent and export-dependent companies as well as consumers. In addition, the vicious spiral of increasing tariffs and retaliating by two big trading powers would threaten the rules-based multilateral trading system and potentially invite other countries to take beggar-thy-neighbor steps.

Moderately positive messages were circulated during the G20 Buenos Aires meeting between President Trump and President Xi and the leaders agreed to suspend new tariffs for three months while negotiations continue,<sup>60</sup> although at the time of writing it is still difficult to predict the endgame of the trade war. What is clear is that as the trade war between the US and China extends in time, scope and depth, deeply entangled political economy considerations which underlie the bilateral relationship make it more difficult to resolve the underlying and systematic differences and seek a truce.

#### **4. Possible Solution at the WTO Dispute Settlement?**

In August 2018, China formally initiated the first step in the WTO dispute settlement process by requesting consultations with the US<sup>61</sup> over the tariffs imposed on imported PV products, whether or not partially or fully assembled into other products (including, but not limited to, modules, laminates, panels, and building-integrated materials).<sup>62</sup> In its request

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<sup>56</sup> Solar Energy Industries Association, *Solar Market Insight Report 2018 Year in Review* (13 March 2019), <<https://www.seia.org/research-resources/solar-market-insight-report-2018-year-review>>, accessed 19 March 2019.

<sup>57</sup> See IEA, *Global Energy & CO2 Status Report*, <<https://www.iea.org/geco/emissions/>>.

<sup>58</sup> See Statement by President Trump on the Paris Climate Accord, <<https://www.whitehouse.gov/briefings-statements/statement-president-trump-paris-climate-accord/>>.

<sup>59</sup> Tom Mitchell, Emily Feng and Xinning Liu, 'China Retaliates Against New US Tariffs As Trade War Escalates' (19 September 2018, *Financial Times*), <<https://www.ft.com/content/a12104b6-bb14-11e8-94b2-17176fbf93f5>>, accessed 12 December 2018.

<sup>60</sup> Julian Borger, 'Donald Trump and Xi Jinping Declare Trade Truce at G20' (2 December 2018, *Guardian*), <<https://www.theguardian.com/world/2018/dec/02/donald-trump-and-xi-jinping-declare-trade-truce-at-g20>>, accessed 3 December 2018.

<sup>61</sup> See WTO, *United States – Safeguard Measure on Imports of Crystalline Silicon Photovoltaic Products*, Request for Consultations by China, WT/DS562/1 G/L/1257 G/SG/D60/1 16 August 2018.

<sup>62</sup> See Proclamation 9693 of January 23, 2018 – To Facilitate Positive Adjustment to Competition from Imports of Certain Crystalline Silicon Photovoltaic Cells (Whether or Not Partially or Fully Assembled into

for consultation, China claims that the US safeguards are inconsistent with Article XXII of the *General Agreement on Tariffs and Trade 1994* ('GATT 1994') and Article 14 of the *Agreement on Safeguards*.<sup>63</sup>

The WTO safeguard regime was initially built on Article XIX of GATT and overhauled under the Agreement on Safeguards in 1995.<sup>64</sup> Safeguard measures act as a safety valve in the trading system in that WTO Members can temporarily retract a liberalization commitment should it result in a sudden surge of imports and provide short-term protection (which can include both tariffs and quotas) to an industry harmed by foreign competition.<sup>65</sup> Safeguard measures can be imposed initially for a maximum of four years with the possibility of another four year extension.<sup>66</sup>

Unlike anti-dumping and countervailing duties, safeguard measures do not target 'unfair trade' and do not require a finding of any particular action on the part of the exporter or government of exporting country nor identify particular exporters as targets. Fairly traded goods from all countries are potentially subject to safeguard measures, which deters circumvention by targeted exporters via third-country exports. On the other hand, it increases the number of countries that may litigate against the US at the WTO Dispute Settlement Body.<sup>67</sup> Safeguard measures are often employed by Members to pursue protectionist objectives, with Palmetier arguing that while safeguards may provide a benefit to those in the affected industry the protection comes at the expense of consumers and those in the exporting industry.<sup>68</sup> In Vermulst and Graafsma's view, safeguards are put into use

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Other Products) and for Other Purposes" (83 FR 3541). See also Public Report, Crystalline Silicon Photovoltaic Cells (Whether or not Partially or Fully Assembled into Other Products), Inv. No. TA-201-75, USITC Pub. 4739 (Nov. 2017), a summary of which was published in the U.S. Federal Register on 21 November 2017 under citation "82 FR 55393".

<sup>63</sup> China contends that at least 13 separate aspects of the safeguard measures are inconsistent with various provisions of the GATT and Safeguards Agreement, most notably that the US (1) failed to establish that 'the increases in imports and the conditions of importation of the products covered by the measures at issue were the result of "unforeseen development" and of the effect of the US obligations under the GATT'; (2) did not 'make a proper determination, including a reasoned and adequate explanation, that the subject imports increased 'in such quantities and under such conditions' to cause serious injury to the domestic industry'; (3) did not establish that the domestic industry was suffering from "serious injury or threat of serious injury"; (4) did not properly define the "domestic industry" and compare those producers to the foreign producers producing "like or directly competitive products" to the subject imports; and (5) failed to comply with transparency and other procedural aspects of the Safeguards Agreement.

<sup>64</sup> See Simon Lester, Bryan Mercurio and Arwel Davies, *World Trade Law* (3<sup>rd</sup> ed, Hart Publishing 2018) Chapter 12.

<sup>65</sup> Chad Bown and Mark Wu 'Safeguards and Perils of Preferential Trade Agreements: *Dominican Republic – Safeguard Measures*' (2014) *World Trade Review* 13(2) 179, 180-181.

<sup>66</sup> See WTO Agreement on Safeguards, Articles 7.1 and 7.2.

<sup>67</sup> Korea also initiates WTO Dispute complaint against US safeguard tariffs on solar cells. See *United States – Safeguard Measure on Imports of Crystalline Silicon Photovoltaic Products*, WT/DS545/1 G/L/1234 G/SG/D51/1 16 May 2018. Other WTO members - the Philippines, the European Union, Singapore, Switzerland, Norway and Malaysia have expressed concerns about the US safeguard tariffs on imported solar cells.

<sup>68</sup> David Palmetier, 'Safeguard, Anti-dumping, and Countervailing Duty Disputes in the Transatlantic Partnership: How to Control 'Contingency Protection' More Effectively' in Ernest Ulrich Petersmann and Mark Pollack (eds) *Transatlantic Economic Disputes: The EU, the US, and the WTO* (Oxford University Press 2003) 170.

for the interests of inefficient producers.<sup>69</sup> While countries have traditionally preferred the use of Anti-Dumping measures countervailing duties over safeguards,<sup>70</sup> the latter's resurgence may represent the preference of blatant protectionism and rising anti-trade sentiments in the US.

The WTO lays out requirements for safeguards to be legitimate and consistent with trade rules: (1) that the product at issue is being imported into its territory in increased quantities, absolute or relative to domestic production; (2) as a result of unforeseen developments and of the effect of the obligations incurred by the Member under the GATT; (3) under such conditions as to cause or threaten to cause serious injury to the domestic industry that produces like or directly competitive products. When any of the three elements is missing, there is no emergency triggering the need for a safeguard measure. The fairly strict terms for when a safeguard may be invoked ensures that WTO Members do not use this safety valve in an abusive manner. Whether the US followed closely the requirements decides whether the application of a safeguard is WTO-consistent and pass the challenge in Dispute Settlement proceedings.

For a number of reasons, China is likely to prevail in the dispute. For instance, there is evidence to suggest that contrary to XIX:1(a) of the GATT, the US did not consider the 'unforeseen development' requirement in its initial report. Indeed, the Appellate Body has repeatedly decided that national authorities must demonstrate 'unforeseen development' as a matter of fact before applying a safeguard measure.<sup>71</sup> Moreover, it will be difficult for the US to defend its methodology against the standards set out in Article 4.2(b) of the Safeguard Agreement, which requires a causation analysis. The US will have difficulty in proving that the injurious effects of factors other than increased imports are not included in the injury assessment ascribed to increased imports, as reflected in the existing WTO jurisprudence that outlawed the US safeguard measures.<sup>72</sup> Procedurally, the US did not provide the interested parties with sufficient opportunities to participate in the investigation.<sup>73</sup>

Furthermore, as noted above, around the same time that China filed its WTO complaint challenging the US safeguard measures, the US announced an additional 25 percent tariff on Chinese solar cells and modules under Section 301 of the US Trade Act of 1974. Section 301 gives great flexibility to the US administration to self-initiate an investigation and to unilaterally impose tariffs on another country.<sup>74</sup> But the revival of an 'obsolete' US trade

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<sup>69</sup> Edwin Vermulst and Folkert Graafsma, 'EU Safeguard Law and Practices: 1995-2018' (2018) 13(9) *Global Trade and Customs Journal* 355.

<sup>70</sup> Chad Bown, 'Why Are Safeguards under the WTO So Unpopular' (2002) 1(1) *World Trade Review* 47.

<sup>71</sup> Appellate Body Report, *United States – Safeguard Measures on Imports of Fresh Chilled or Frozen Lamb Meat from New Zealand and Australia*, WT/DS177-178/AB/R (1 May 2001), paras. 72-73; Appellate Body Report, *Korea – Definitive Safeguard Measure on Imports of Certain Dairy Products*, WT/DS98/AB/R (Dec. 1999), para 75.

<sup>72</sup> See, Douglas Irwin, 'Causing Problems? The WTO Review of Causation and Injury Attribution in U.S. Section 201 Cases' (2003) 2(3) *World Trade Review* 297, 299; Terence Stewart and Elizabeth Drake, 'How the WTO Undermines US Trade Remedy Enforcement' (February 2017), <[http://s3-us-west-2.amazonaws.com/aamweb/uploads/research-pdf/WTOReport\\_R3.pdf](http://s3-us-west-2.amazonaws.com/aamweb/uploads/research-pdf/WTOReport_R3.pdf)>.

<sup>73</sup> See (n 63).

<sup>74</sup> Lynne Puckett and William Reynolds, 'Rules, Sanctions and Enforcement under Section 301: At Odds with the WTO?' (1996) 90(4) *American Journal of International Law* 675, 676.

law is problematic in that it undermines the commitment to a rules-based multilateral trading system with the threat of unilateral action.<sup>75</sup>

Unsurprisingly, China has also requested consultation with the US at the WTO over the use of Section 301.<sup>76</sup> The author argues that the US Section 301 measure would likely be ruled as inconsistent with the WTO rules for following reasons. First, the US measure constitutes a breach of Article 23 of the Dispute Settlement Understanding (DSU), the jurisprudence of which explicitly implies the illegality of unilateral self-help.<sup>77</sup> Second, the US measure is inconsistent with the GATT Article II, which limits tariffs to a maximum bound rate as per the US' tariff schedule. Third, the US measure also violates the Most Favored Nation clause under the GATT Article I since the measures only apply to China.

Thus, not only can China defend its interests by filing of the claims at the WTO, but it also has a strong interest in making use of the dispute settlement system even if the US chooses to walk away from the platform that it created.<sup>78</sup> However, this article argues that China cannot rely solely on the WTO to remedy the violation and remove trade barriers in solar sector. The WTO is facing an institutional crisis as the US has refused to reappoint Appellate Body members, and the tribunal of seven is now down to three members.<sup>79</sup> By next year, the Appellate Body will not even have enough members to hear an appeal. Under such circumstances, the resolution of any dispute currently ongoing at the WTO is uncertain as the proper functioning of the system is at best jeopardized and at worst on the verge of collapse.

Even in the best scenario that the US withdraws the tariffs upon the adoption of DSB recommendations and rulings, it takes years to litigate and consumes significant resources.<sup>80</sup> The rapidly changing solar technology and markets will make the passage of time costly. Additionally, the WTO does not provide for retrospective relief or contain a requirement to make reparation for the damage caused in the past –the so-called 'remedy gap'<sup>81</sup> – means that impaired trade interests of Chinese solar manufacturers during the

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<sup>75</sup> See Chad Bown, 'Rogue 301: Trump to Dust Off another Outdated US Trade Law?' (3 August 2017, Peterson Institute of International Economics), <<https://piie.com/blogs/trade-investment-policy-watch/rogue-301-trump-dust-another-outdated-us-trade-law>>, accessed 23 December 2018.

<sup>76</sup> See WTO, *United States – Tariff Measures on Certain Goods from China*, WT/DS543/1.

<sup>77</sup> See WTO Analytical Index DSU – Article 23 Jurisprudence; Steve Charnovitz, 'The Section 301 Action Against China' (23 July 2018, International Economic Law and Policy Blog), <<https://worldtradelaw.typepad.com/ielpblog/2018/07/the-section-301-action-against-china-fed-reg-filing-by-steve-charnovitz.html>> accessed 12 March 2019.

<sup>78</sup> Bryan Mercurio and Mitali Tyagi, 'China's Evolving Role in WTO Dispute Settlement: Acceptance, Consolidation and Activation' (2012) 3 *European Yearbook of International Economic Law* 89.

<sup>79</sup> Jennifer Hillman, 'Three Approaches to Fixing the World Trade Organization's Appellate Body: The Good, the Bad and the Ugly?' (Institute of International Economic Law 2018), <<https://georgetown.app.box.com/s/966hfv0smran4m31biblgszj42za40b>>, accessed 12 January 2019.

<sup>80</sup> For general discussion of the DSU and proposals for reform, see Bryan Mercurio 'Why Compensation Cannot Replace Trade Retaliation in the WTO Dispute Settlement Understanding' (2009) 8(2) *World Trade Review* 315.

<sup>81</sup> For scholarly discussions on the issue of 'remedy gap' in trade remedies, see Rachel Brewster, 'The Remedy Gap: Institutional Gap, Retaliation, and Trade Law Enforcement' (2011) 80(1) *George Washington Law Review* 102.

period when the US tariffs are in place cannot be repaired. In a worse-case scenario, the US will simply dismiss the WTO rulings, which would then allow China to counteract the harm by increasing tariff rates or using other forms of countermeasures against US exports. As the epitome of mercantilism, countermeasures is not an economically efficient approach and works to the detriment of both sides' trading interests.<sup>82</sup>

In a nutshell, China is correct in litigating against the US at the WTO in order to reinforce the rule of law in international trade amid a time when the system is facing a crisis. However, merely relying on the WTO Dispute Settlement System is far from being able to effectively contain the US unilateralism or ensure the long-term development of China's solar industry for given present circumstances. Therefore, China must look outside of the WTO regime and craft measures that can reduce or even eliminate the detrimental impacts that Chinese solar manufacturers have to suffer during trade conflicts and ensure the sustainable development of solar energy in China.

## **5. Converting Crisis to Opportunity? A Way Forward**

As a major irritant to both the Obama and Trump administrations, China's solar capacity surplus and over-reliance on exportation also hinders the sustainability of its own solar development by generating uncertainties and instabilities to the industry. Even if resolving the trade tensions with the US through negotiation or at the WTO dispute settlement can prove to be viable, they are at best a short-term fix. The possible trade frictions between China and other major solar producer countries cannot be eliminated and will likely surface as long as China maintains the heavy reliance on exportation of excessive solar capacity. India's recent imposition of safeguard measure against imported solar panels (China supplies around 90%) serves as an example.<sup>83</sup> Therefore, China must convert crisis into opportunity by systematically tackling these problems and embarking on a more sustainable solar development path.

This Section proposes two approaches: the first is to explore untapped domestic potential by boosting solar energy consumption, which will absorb more solar industrial capacity and reduce China's reliance on exportation. The second is to seek opportunities in BRI countries, particularly those with abundant solar radiation and increasing energy demand – developing countries in South Asia and Africa seem the logical target as they have persistently suffered from power poverty and solar resources are under-utilized in these regions. The two approaches, if carried out successfully would not only put the industry on a sustainable path but also contribute to climate change mitigation.

### **5.1 Boost Domestic Market Potential for Solar Energy**

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<sup>82</sup> Joost Pauwelyn, 'Enforcement and Countermeasures in the WTO: Rules Are Rules – Toward A More Collective Approach' (2000) 94(2) American Journal of International Law 335, 343; Hendrik Horn and Petros C. Mavroidis, 'Remedies in the WTO Dispute Settlement System and Developing Country Interests' (11 April 1999, World Bank Institute), < <http://wwwl.worldbank.org/wbiep/trade>>, 9-12.

<sup>83</sup> See India's Directorate General of Trade Remedies initiated safeguard investigation concerning solar products exported to India, < [http://www.dgtr.gov.in/sites/default/files/Solar-Final\\_Finding-English\\_0.pdf](http://www.dgtr.gov.in/sites/default/files/Solar-Final_Finding-English_0.pdf)>, accessed 12 March 2019.

As the world's largest energy consumer, China boasts substantial potential of energy demand in the coming years.<sup>84</sup> Given China's developmental growth and ongoing environmental issues, it will be important for China to increase the market potential for solar as a clean source of energy. This part recommends increasing domestic consumption of solar energy to absorb solar manufacturing capacity and promote sustainable development of solar energy in China.

Given that the power sector is by far the single biggest market for energy in China,<sup>85</sup> the key to unlock market potential for solar energy is to increase the demand and consumption of solar-sourced power. Despite the rapid growth of solar installation capacity in China, the share of power sourced from solar energy in overall power generation only reached 1.8% in 2017.<sup>86</sup> Merely installing solar energy without being translated into utilization is unlikely to create a large and stable domestic solar market from a long term perspective.

As discussed in Section Two, governments in China have formulated solar energy targets and supportive measures solely contingent on installation capacity. For instance, the 2011 nationwide solar feed-in tariffs have incentivized project developers to install solar energy without due attention being paid to dispatch and utilization.<sup>87</sup> As a result, sweeping installation has occurred in the western regions where solar radiation is abundant yet power demand is low due to less population and underdeveloped economy.<sup>88</sup> In addition, a shortage of long-distance grid infrastructure that can connect solar power to central and eastern provinces where high demand for power locate exacerbates the abandonment of power generated from solar energy – the so-called curtailment.<sup>89</sup> China must act to address the underutilization of solar power and shape an enabling environment for increasing solar demand and consumption. Two options merit attention in this regard: one is to revise outdated law and policy in solar energy; the other is to formulate new policy measures to accommodate evolving circumstances in this sector.

In terms of revising outdated and inefficient solar measures, China's National Development and Reform Commission (NDRC), Ministry of Finance and National Energy

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<sup>84</sup> IEA, World Energy Outlook 2017: China, <<https://www.iea.org/weo2017/>>.

<sup>85</sup> BP Statistical Review of World Energy 2018 (June 2018), <<https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf>>, 6.

<sup>86</sup> China Energy Portal, '2017 Electricity and Other Energy Statistics' (6 February 2018), <<https://chinaenergyportal.org/en/2017-electricity-energy-statistics/>>, accessed 12 March 2019.

<sup>87</sup> National Development and Reform Commission, 'Notice of the National Development and Reform Commission on Improving the Feed-in Tariffs of Solar PV' (2011), <[http://www.ndrc.gov.cn/zfwz/xzfdj/jggg/201108/t20110801\\_426507.html](http://www.ndrc.gov.cn/zfwz/xzfdj/jggg/201108/t20110801_426507.html)>. The national feed-in tariff for solar PV is RMB 1.15/kWh for projects approved by July, 2011, but not completed before the end of the year. Projects approved after July, 2011 or approved before July, 2011 but starting with operation after 31 December 2011 will get a tariff of RMB 1/kWh

<sup>88</sup> Zeng Ming and others, 'Overall Review of Renewable Energy Tariff Policy in China: Evolution, Implementation, Problems and Countermeasures' (2013) 9(25) Renewable and Sustainable Energy Reviews 260, 269.

<sup>89</sup> Chinese solar power generators face the worst curtailment rate in the world, with the national average curtailment ratio in 2016 at 10%. See, Yiyi Zhou and Sophie Lu, 'China's Renewables Curtailment and Coal Assets Risk Map' (25 October 2017) Bloomberg New Energy Finance, <[https://data.bloomberglp.com/bnef/sites/14/2017/10/Chinas-Renewable-Curtailment-and-Coal-Assets-Risk-Map-FINAL\\_2.pdf](https://data.bloomberglp.com/bnef/sites/14/2017/10/Chinas-Renewable-Curtailment-and-Coal-Assets-Risk-Map-FINAL_2.pdf)>.



Administration (NEA) issued a statement halting subsidies for utility-scale solar projects and reducing feed-in tariffs to a great extent on May 31, 2018.<sup>90</sup> This adjustment was ostensibly designed to slow down unlimited expansion of installation that in many cases cannot be efficiently translated to utilization and lead to power curtailment.

On the other hand, the central government in China has formulated a series of new policy measures with an aim to encourage solar deployment in an efficient and cost-effective manner. The NEA has launched a reverse auction – the so-called ‘Top Runner’ program since 2016, which mandates solar developers that offer to build and operate projects with the lowest cost would be selected and provided with long-term power purchase agreements (PPAs).<sup>91</sup> The objective is to set a higher standard and encourages developers to achieve technological progress, make solar energy more competitive and reduce the burden on the government budget.<sup>92</sup> The government also has introduced a mandatory renewable power quota system, which lays out detailed targets for each region, starting on January 1, 2019.<sup>93</sup> Under the system, each province must establish a yearly renewable energy quota that is calculated on the basis of their longer-term 2030 renewable energy target (non-hydro) in line with the existing national target of achieving 35% of electricity consumption through renewables by 2030.<sup>94</sup> These policy measures represent the shift of policy priority to quality-oriented growth of solar power and the emphasis on the demand side in China.

This article argues that the crafting and pass of rational policy measures in solar energy sector is only the starting point. In order to achieve success, the government must also ensure effective implementation of these policies. In this case, local governments and stakeholders in solar deployment, particularly grid companies with strong political clout, have an important role to play. While these stakeholders should take the policies seriously and work towards full compliance, the central government must be strict in ensuring the policies are not only binding but have ‘teeth’ in the sense that non-compliance will attract penalties strong enough to detract would be violators.

Shifting from quantitative growth, with a sole requirement on increased installation capacity, to qualitative growth which requires higher solar power utilization and consumption will increase domestic market potential for solar energy and thus, solar products. It also will meaningfully contribute to materializing climate pledges made by China under the Paris Agreement.<sup>95</sup> In this regard, the trade war with the US in solar sector

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<sup>90</sup> For more information on the 531 policy, see National Development and Reform Commission of People’s Republic of China, ‘The Notice on 2018 Solar PV Power Generation Issues’ (31 May 2018), <[http://www.nea.gov.cn/2018-06/01/c\\_137223460.htm](http://www.nea.gov.cn/2018-06/01/c_137223460.htm)>.

<sup>91</sup> National Energy Administration, ‘The Notice on Promoting the Implementation of the PV Top Runner Program and Requirements for 2017 PV Top Runner Base Construction’ (22 September 2017), <[http://zfxgk.nea.gov.cn/auto87/201709/t20170922\\_2971.htm](http://zfxgk.nea.gov.cn/auto87/201709/t20170922_2971.htm)>.

<sup>92</sup> *Ibid.*

<sup>93</sup> NEA, ‘The Notice on implementing Renewable Power Quota Scheme’ (15 November 2018), <[http://www.nea.gov.cn/2018-11/15/c\\_137607356.htm](http://www.nea.gov.cn/2018-11/15/c_137607356.htm)>.

<sup>94</sup> *Ibid.*

<sup>95</sup> See China’s Nationally Determined Contributions submitted to the Paris Agreement, United Nations Framework Convention on Climate Change, <<https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/China%20First/China's%20First%20NDC%20Submission.pdf>>, accessed 1 March 2019.

can serve as a warning to Chinese governments at the central and local levels and force them to adjust policy making to boost domestic market for solar energy.

## 5.2 Explore Opportunities in BRI Countries

Along with China's rise as a trade power, China has slowly but steadily become a large outbound foreign investor in renewable energy sector. While developed countries, such as the US, Germany, Italy and Australia have been the biggest recipients of Chinese renewable energy investment,<sup>96</sup> the unveiling of the BRI<sup>97</sup> has driven investment in an increasing number of developing countries along the BRI. Overseas renewable energy investments primarily consist of building power plants and grid systems as well as establishing manufacturing facilities. In 2017, the Chinese central government sought to advance renewable energy by issuing 'Guidance on Promoting Green Belt and Road', which highlights the significance renewable energy to the overall strategy and Initiative.<sup>98</sup>

Supplying the BRI countries with solar technologies represents a good opportunity for China to diversify its export destinations and deflect trade that is curbed from the US to these markets. In fact, more than half of BRI countries set renewable energy targets in their Nationally Determined Contributions submitted to the Paris Agreement, most of which focus on electricity generation in this sector.<sup>99</sup> These targets can provide a useful benchmark in measuring the potential scope of solar energy growth in these countries as well as charting an investment roadmap – a country with an ambitiously drafted renewable energy target tends to be more appealing to investors than one with lower target.

The recently released Belt and Road Big Data Report shows that Pakistan has become most involved in cooperation projects with China among all BRI countries.<sup>100</sup> During 2010 to 2017, Pakistan was also the top recipient of Chinese foreign investment in the renewable energy sector among the BRI countries with US \$1.9 billion.<sup>101</sup> Under the China-Pakistan Economic Corridor (CEPC), Chinese companies have completed a massive solar power

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<sup>96</sup> Xiaomei Tan et al, 'China's Overseas Investments in the Wind and Solar Industries: Trends and Drivers' (World Resources Institute 2013), <[https://wriorg.s3.amazonaws.com/s3fs-public/pdf/chinas\\_overseas\\_investments\\_in\\_wind\\_and\\_solar\\_trends\\_and\\_drivers.pdf?\\_ga=2.76737501.932714939.1547024531-1952520546.1547024531](https://wriorg.s3.amazonaws.com/s3fs-public/pdf/chinas_overseas_investments_in_wind_and_solar_trends_and_drivers.pdf?_ga=2.76737501.932714939.1547024531-1952520546.1547024531)>, 2.

<sup>97</sup> The high profile BRI, earlier known as One Belt One Road, represents a strategic economic and trade network for Chinese goods and service, stretching across Asia, the Middle East, Africa, and Europe Sea, the official statement on BRI issued by China's National Development and Reform Commission is available at: <[http://en.ndrc.gov.cn/newsrelease/201503/t20150330\\_669367.html](http://en.ndrc.gov.cn/newsrelease/201503/t20150330_669367.html)>.

<sup>98</sup> See Chinese Ministry of Environmental Protection, 'Guidance on Promoting Green Belt and Road' (8 May 2017), <<https://eng.yidaiyilu.gov.cn/zchj/qwfb/12479.htm>>.

<sup>99</sup> Lihuan Zhou et al, 'Moving the Green Belt and Road Initiative: From Words to Actions' (November 2018) World Resources Institute Working Paper, <[https://wriorg.s3.amazonaws.com/s3fs-public/moving-green-belt-and-road-initiative-from-words-to-actions.pdf?\\_ga=2.77690708.1139904327.1544150519-1176719366.1543405288](https://wriorg.s3.amazonaws.com/s3fs-public/moving-green-belt-and-road-initiative-from-words-to-actions.pdf?_ga=2.77690708.1139904327.1544150519-1176719366.1543405288)>, 9.

<sup>100</sup> Gao Zhan, 'Belt and Road Big Date Report 2018 Released' (September 20, 2018, Chinaorg), <[http://www.china.org.cn/china/2018-09/20/content\\_63681157.htm](http://www.china.org.cn/china/2018-09/20/content_63681157.htm)>, accessed 6 December 2018.

<sup>101</sup> Simon Nicholas, 'China is Investing Heavily in European Wind, Asian Superpower's Renewable Energy Ambitions Go Beyond Its Belt and Road Footprint' (August 2018, Institute for Energy Economics and Financial Analysis), <[http://ieefa.org/wp-content/uploads/2018/08/China\\_Research\\_Brief\\_August-2018.pdf](http://ieefa.org/wp-content/uploads/2018/08/China_Research_Brief_August-2018.pdf)>, 2.

plant: Quaid-e-Azam Solar Power Park features 1000MWp capacity, which commenced generation in 2015 and has become the first utility-scale, grid connected solar power plant in the country.<sup>102</sup> Quaid-e-Azam Solar Power Park contains Chinese technology and hardware, including 100 MW of PV modules delivered by Chinese JA Solar.<sup>103</sup> Similar examples can be found in Africa. For instance, the Garissa solar power plant, the largest in Kenya, has been completed recently by a consortium of three Chinese companies (with Jinko Solar supplying all the PV modules )<sup>104</sup> with a concessional loan worth US\$ 135.7 provided by the China Export Import Bank.<sup>105</sup> Upon completion, Chinese companies signed a 25-year Power Purchase Agreement with Kenya Power under a Feed-in Tariff policy.<sup>106</sup>

The abovementioned examples are not exhaustive but merely illustrative that potential opportunities widely exist for Chinese solar manufacturers and project developers to reap the benefits from BRI countries with abundant solar resources and increasing energy demand. The construction of solar power infrastructure along the BRI countries provides opportunities for Chinese solar manufacturing firms to export their products. Statistics shows the supply of Chinese solar products to the BRI markets increased from 18.49% in 2007 to 27.43% in 2016.<sup>107</sup> The total value of Chinese solar exports entering the BRI countries reached US\$ 8 billion in 2017.<sup>108</sup>

In order to facilitate investment in solar power infrastructure in the BRI countries China must ensure that those recipient countries have put in place import-friendly trade laws. Trade in solar products between China and the BRI countries must be smooth and relatively free of tariff and non-tariff barriers in order to ensure efficient development and bring the most benefits to both the developers and recipient countries. This will be a significant hurdle to overcome, as at present most target BRI countries have in place high barriers to trade. Moreover, China lacks a comprehensive trade and/or investment agreement with many key BRI markets.

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<sup>102</sup> Zofeen Ebrahim, 'China Helps Pakistan Build World's Largest Solar Farm' China Dialogue (September 7, 2015), available at: <https://www.chinadialogue.net/article/show/single/en/8160-China-helps-Pakistan-build-world-s-largest-solar-farm>, accessed 17 October 2018. The total cost of this solar farm is around US\$130 million.

<sup>103</sup> *Ibid.*

<sup>104</sup> Jinko Solar, 'Jinko Solar Cooperate with CJIL to Develop Kenya's Largest Solar Power Plant' (September 27, 2012), <[https://www.jinkosolar.com/press\\_detail\\_295.html?lan=en](https://www.jinkosolar.com/press_detail_295.html?lan=en)>, accessed 3 January 2019.

<sup>105</sup> For more information, see Kenya Rural Electrification Authority, 'The 54.6 MW Garissa Solar Power Plant', <[https://www.rea.co.ke/index.php?option=com\\_content&view=article&id=53&Itemid=234](https://www.rea.co.ke/index.php?option=com_content&view=article&id=53&Itemid=234)>, accessed 3 January 2019.

<sup>106</sup> *Ibid.*

<sup>107</sup> Jing Shuai et al, 'Are China's Solar PV Products Competitive in the Context of the Belt and Road Initiative' (2018) 09(120) Energy Policy 559, 563.

<sup>108</sup> Tim Buckley, Simon Nicholas and Melissa Brown, 'China in 2017 Continued to Position Itself for Global Clean Energy Dominance' (January 9, 2018) Institute for Energy Economics and Financial Analysis, <<http://ieefa.org/wp-content/uploads/2018/01/China-Review-2017.pdf>>, 10.

China should seek to address this through three tracks. First, China should seek to complete existing multilateral mechanisms which could serve to facilitate BRI trade. Chief among these initiatives is the ongoing negotiation of an Environmental Goods Agreement (EGA) at the WTO.<sup>109</sup> Although negotiating countries have not precisely identified and agreed on the scope of goods that the EGA will cover, there is already agreement among these countries that most solar products would qualify as environmentally friendly goods and thus benefit from duty free access. China must not only seek to ensure its products are included within the scope of the agreement and conclude it as quickly as possible, it must also attempt to convince key BRI partner countries to sign on to the agreement. These initiatives represent a window of opportunity that China can seize to liberalize trade in solar products with BRI countries, which will improve the competitiveness of solar exports and reduce the cost of solar installation. Second, China should seek to negotiate and/or upgrade its network of trade agreements along the BRI. Furthermore, reaching agreement with BRI countries to reduce or eliminate trade barriers on solar products could in turn send a positive signal to the trading community and even serve as a template for the ongoing EGA negotiation. Both of these initiatives will take time, and thus not yield benefits for many years. Thus, a third track for China would be for companies involved in the exportation and installation of solar energy products to negotiate binding contracts with host governments which include tariff waivers. While not as secure as and certainly not a replacement for more comprehensive trade agreements, investment contracts could serve as a short-term solution to expedite solar installation while the trade agreements are being negotiated.

China's investment in and trade with BRI countries in the solar sector would not only provide a desirable route to deal with Chinese industrial overcapacity but also assist host countries to reduce energy poverty and carbon emissions. As the biggest carbon emitter and one of the world's leading renewable energy champions, China is well positioned to export its cutting-edge solar technologies to the BRI countries. This not only will benefit China in geopolitical and economic terms but also contribute to 'greening' the BRI and embracing the Sustainable Development Goals.<sup>110</sup> While constructing a favorable investment and trade environment in BRI countries in solar sector will be a challenge, it is worth China's time and efforts to do so.

## **6. Concluding Remarks**

In a short span of time, China has transformed itself to a global leader with respect to solar manufacturing capacity, the growth of which is unprecedented. But there are challenges ahead, namely capacity surplus and over-reliance on a limited number of advanced economies for exportation purpose. The imposition of tariff increases on Chinese solar products by the US since the early 2018 should serve as a wake-up call to the Chinese solar industry and government to address the overcapacity issue. Otherwise, the prospects for avoiding tensions between China and other trading partners, particularly major solar producer countries do not seem promising. Even if the US removes tariffs, there is still

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<sup>109</sup> The EGA has 18 participants representing 46 WTO Members negotiating eliminate tariffs on a number of important environment-related products, <[https://www.wto.org/english/tratop\\_e/envir\\_e/ega\\_e.htm](https://www.wto.org/english/tratop_e/envir_e/ega_e.htm)>.

<sup>110</sup> The goals that can be embraced are: Sustainable Development Goal 7: affordable and clean energy, Sustainable Development Goal 11: sustainable cities and communities and Sustainable Development Goal 13: climate action.

possibility that other countries impose trade restrictions on Chinese exports, such as India's recent use of safeguard measures on solar imports.

While it is easy to simply call on China to respond to the US protectionism by raising barriers on US products, China and the US now are in an increasingly interdependent trade relationship and neither side can afford a lingering period of head-on confrontation. It would be unwise for China to engage in 'tit-for-tat' retaliation as it will not only fail to compensate exporters but also harm import-dependent companies and consumers in China. Moreover, China benefits a functioning multilateral rules-based trading system, and unilateral countermeasures against the US would threaten the trading system.

In order to reduce or even eliminate the negative effects of the trade war on China's solar industry, this article proposes a few options for China to consider going forward. First, it is advisable that China makes use of the WTO Dispute Settlement System challenging the tariffs imposed by the US on Chinese solar exports, since to do so would defend its rights under the international trade rules and possibly induce the US to remove WTO-inconsistent tariffs. As a progressively active user of the WTO Dispute Settlement Body, China needs to respect and make proper use of it particularly in a time of backlash against multilateralism and rising anti-trade sentiments. Nevertheless, given that US has threatened to withdraw from the WTO and is currently blocking the appointment of new Appellate Body members, the resolution of any dispute at this stage is uncertain and likely to be delayed. In addition, even if China prevails in the dispute, it would have to wait years before the process completes, and Chinese solar manufacturing companies would have had to pay for the tariff increases and not receive any compensation due to the 'remedy gap' existing in the WTO rules.

For this reason, China's action at the WTO can be regarded as a necessary but not a sufficient step. China must reflect on the core problems underlying its solar industry and decide upon a direct and forceful strategy to ensure sustainable growth into the future. This article has proposed two recommendations: first, China must seek ways to increase domestic market for solar energy to absorb more manufacturing capacity. Although solar installation in China has maintained a steady growth, the underlying problems, such as high rate of curtailment would slow down the development of solar energy in a mid to long term. Law and policy making at both central and local levels can contribute to resolving the blockages in a multitude of ways, such as mandating solar energy purchase obligations to boost demand and consumption. Second, China should explore untapped potential for solar development in the BRI countries, particularly these with abundant solar sources and increasing energy demand in order to diversify its export destinations. One of the most effective options is to strengthen trade and investment ties with the BRI countries in developing solar projects.

Far from being only a negative, the trade war with the US can serve as an impetus to act – the trade war could result in the problems currently underlying the solar industry in China being pushed to the surface and attracting more attention from policymakers. It presents an opportunity to Chinese government and solar industry to address overcapacity and avoid aggravation of the current crisis in a timely manner. The loss that Chinese solar exporters will have to bear in the trade conflict could be potentially outweighed by the desirable outcome yielded from the reorientation of its solar development, increased domestic

demand and more diversified export markets in the BRI countries. Moreover, the development of a sustainable path for Chinese solar energy, together with solar technologies being exported to BRI countries, would meaningfully contribute to climate change mitigation and sustainable development from a global perspective.