



Volume 17 (2019) | ISSN 1932-1821 (print) 1932-1996 (online)
DOI 10.5195/taxreview.2019.104 | <http://taxreview.law.pitt.edu>

HOW CAN GREEN TAX LAWS SPUR GREEN BEHAVIOR? AN ANALYSIS OF THE INFLUENCE OF CHINESE TAX POLICY ON GREEN BEHAVIOR

Zhigang Hong & Danshera Wetherington Cords



This work is licensed under a Creative Commons Attribution-NonCommercial-No Derivative Works 3.0 United States License.



This journal is published by the [University Library System](#) of the [University of Pittsburgh](#) as part of its [D-Scribe Digital Publishing Program](#), and is cosponsored by the [University of Pittsburgh Press](#).

HOW CAN GREEN TAX LAWS SPUR GREEN BEHAVIOR? AN ANALYSIS OF THE INFLUENCE OF CHINESE TAX POLICY ON GREEN BEHAVIOR

Zhigang Hong & Danshera Wetherington Cords***

“Clear waters and green mountains are as good as mountains of gold and silver.”¹

I. INTRODUCTION

Tax law and policy² can be important and effective tools for influencing economic behavior, including manufacturing and consumption. Industrialization has caused carbon and greenhouse gas emissions that have contributed to climate change. The resulting threats to the sustainability of current ecosystems and standards of living threaten the survival of many species. As a result, many countries joined the 1992 U.N. Framework Convention on Climate Change, which stated as one of its reasons that the signatories were “[c]oncerned that human activities have been substantially increasing the atmospheric concentrations of greenhouse gases, that these increases enhance the natural greenhouse effect, and that this will result on

* Associate Professor of Law, Law School, Shanghai International Business & Economics, Shanghai, China.

** Professor of Law, Albany Law School. I would like to thank Professor Stephen E. Gottlieb, Jay and Ruth Caplan Distinguished Professor, Emeritus for his insightful and helpful comments this Article, Sam Waterbury '20 for valuable research assistance, as well as Albany Law School for its continuing support of my scholarship. Any errors or omissions are of course solely my own.

¹ Xi Jinping, President, People’s Republic of China, Keynote Address at the United Nations Office at Geneva: Work Together to Build a Community of Shared Future for Mankind (Jan. 18, 2017) (transcript available at http://www.xinhuanet.com/english/2017-01/19/c_135994707.htm?from=singlemessage [<https://perma.cc/ZMN4-4EL8>]).

² Throughout this Article, “tax policy” will be used to encompass the ideas of both tax law and tax policy, as both are often used interchangeably in China. The law is often stated in terms of policy, but enforced with the same effect law would have in Western countries.

average in an additional warming of the Earth's surface and atmosphere and may adversely affect natural ecosystems and humankind.”³

The first industrial revolution started in Western Europe and spread to the United States during the mid-1700s. Through the mid-1800s, discoveries made over the span of more than one hundred years gradually improved human conditions. These industrial discoveries ultimately have caused uncontrolled carbon emissions, resulting in great damage to the environment, which will continue if not addressed quickly.

After opening its doors to the world in the 1970s, China rapidly became a leading world economy. As a latecomer to industrialization, China was able to capitalize on Western technology, allowing for more rapid expansion. Coupled with its enormous population, this expansion resulted in environmental deterioration occurring more quickly than it had in Western nations.⁴ As a result, China has experienced uncontrolled CO₂ and greenhouse gas emissions, as well as natural resource depletion and deteriorating air, soil, and water quality.⁵ The rapid environmental deterioration and depletion of critical resources has limited China's ability to continue its exponential economic development.⁶

To reduce carbon emissions, many Western nations have used a variety of tools, including tax laws, to some effect. “Examining the results of carbon taxes implemented in other countries can approximate an ex post evaluation of a proposal. Finland, Sweden, Denmark, the Netherlands, and Norway have all imposed carbon taxes for at least ten years. Belgium, Austria, and

³ United Nations Framework Convention on Climate Change, Mar. 21, 1994, 1771 U.N.T.S. 107.

⁴ Yi Wen, *China's Rapid Rise: From Backward Agrarian Society to Industrial Powerhouse in Just 35 Years*, 24 REGIONAL ECONOMIST 8, 14 (2016). Like Western nations during their early industrial development days, China has relied heavily on coal-fired electricity production facilities. Between 1990 and 2015, more than seventy percent of all electricity was generated in coal-fired plants, which create enormous amounts of carbon and greenhouse gas emissions. *China Electricity Production from Coal Sources*, WORLD BANK OPEN DATA, <https://perma.cc/Q6S3-W3RL> (last visited Nov. 10, 2019) (citing data from IEA Statistics). In 1990, 70.039% of energy production came from coal-fired plants and continued to grow until 2007, when coal-fired electricity hit 80.954% of China's energy, and began to fall generally. *Id.*

⁵ UNITED NATIONS DEV. PROGRAMME CHINA, CLIMATE CHANGE AND DEVELOPMENT IN CHINA: 3 DECADES OF UNDP SUPPORT 10–13 (2012).

⁶ *Id.* at 12.

Germany impose taxes on energy use.”⁷ Just as tax laws have encouraged traditional industrial development, green tax policy can be used to reduce carbon and other greenhouse gas emissions. China has also used tax policy to reduce harm caused by continued economic growth.⁸ Significant progress is being made to reduce carbon emissions⁹: the water is getting clearer, the air quality is improving,¹⁰ and new energy resources are being developed and utilized.¹¹

In recent months, U.S. politicians, starting with newly elected Representative Alexandria Ocasio-Cortez and, most recently, Democratic presidential candidate Senator Bernie Sanders, have proposed radical changes in the laws, which they have called the Green New Deal.¹² Under these proposals, the United States would be expected to reduce its carbon emissions to a net-zero level by 2030, develop 100% renewable energy, and do so in an economically responsible manner, creating tens of millions of

⁷ Roberta Mann, *Waiting to Exhale?: Global Warming and Tax Policy*, 51 AM. U. L. REV. 1135, 1210 (2002).

⁸ See, e.g., Viola Zhou, *Are China's New Green Taxes Tough Enough to Fight Pollution?*, SOUTH CHINA MORNING POST (Dec. 16, 2017, 11:53 AM), <https://www.scmp.com/news/china/policies-politics/article/2124482/are-chinas-new-green-taxes-tough-enough-fight-pollution>.

⁹ Zhang Zhihao, *Nation Hits Carbon Emissions Goal Early*, CHINA DAILY (Nov. 17, 2018), <https://www.chinadaily.com.cn/a/201811/17/WS5bef57f8a310eff30328941a.html>. According to the Ministry of Science and Technology's 2018 *Global Ecological Environment Sensing Report*, China's carbon emission was reduced to its 2020 target in 2017. *Id.* When measured by kilograms, the carbon emissions had fallen forty-six percent between 2005 and 2017, per unit of GDP. *Id.*

¹⁰ See Press Release, Greenpeace Int'l, *Latest Air Pollution Data Ranks the World's Cities Worst to Best* (Mar. 5, 2019), <https://www.greenpeace.org/international/press-release/21193/latest-air-pollution-data-ranks-worlds-cities-worst-to-best/>. Beijing's air quality improved twelve percent from 2017 to 2018, dropping it to the 122nd most polluted city in the world, a substantial improvement. *Id.*

¹¹ Hannah Ritchie & Max Roser, *Energy Production & Changing Energy Resources*, OUR WORLD IN DATA (July 2018), <https://ourworldindata.org/energy>. Renewable energy—including biomass, hydropower, solar, wind, geothermal and marine energy, but excluding nuclear power—accounted for 22.61% of China's total power production in 2014, up from 16.18% in 2005. *Id.* As of 2016, primary electricity and other energy accounted for 6.7% of total energy consumption. *Id.*

¹² Alexa Diaz, *Bernie Sanders Has a Green New Deal. Ocasio-Cortez Has One. Gracetti Too. Here's How They Compare*, L.A. TIMES (Aug. 22, 2019, 12:35 PM), <https://www.latimes.com/politics/story/2019-08-22/green-new-deal-bernie-aoc-los-angeles-garcetti-overview>.

well-paying new jobs.¹³ The estimated cost of these proposals is in the trillions of dollars over the long term.¹⁴ These goals are admirable, ambitious, and, given their short time horizon and extraordinary expense, have largely been deemed to be unrealistic.

This Article examines recent Chinese tax policies relating to new energy industries and analyzes how they could inform future tax policy in both China and the United States. As part of its effort to improve its environment, in recent years, China has enacted tax laws and regulations for environmental protection and to control greenhouse gas emission output, including an environmental protection tax¹⁵ and some provisions of the enterprise income tax,¹⁶ the value-added tax (VAT),¹⁷ and the vehicle purchase tax (VPT).¹⁸

¹³ See H.R. Res. 109, 116th Cong. (2019); Bernie Sanders, *The Green New Deal*, BERNIE, <https://berniesanders.com/issues/the-green-new-deal/> (last visited Nov. 24, 2019); *Green New Deal*, GREEN PARTY US, https://www.gp.org/green_new_deal (last visited Nov. 24, 2019).

¹⁴ See Sanders, *supra* note 13 (stating that the plan includes direct public investment of \$16.3 trillion).

¹⁵ Environmental Protection Tax Law of the People's Republic of China (enacted by Standing Comm. Nat'l People's Cong., Dec. 25, 2016, effective Jan. 1, 2018), *translated in* 2017 China Law LEXIS 1511 (revised by Standing Comm., Nat'l People's Cong., Oct. 26, 2018, effective Oct. 26, 2018), 2018 China Law LEXIS 794.

¹⁶ Enterprise Income Tax Law of the People's Republic of China (enacted by Nat'l People's Cong., Mar. 16, 2007, effective Jan. 1, 2008), art. 28. High- and new-technology enterprises that require key state support are subject to the reduced enterprise income tax rate of fifteen percent. *Id.*; see also Law of the People's Republic of China on the Promotion of Small and Medium-Sized Enterprises (enacted by Standing Comm. Nat'l People's Cong., June 29, 2002, effective Jan. 1, 2003), 2002 China Law LEXIS 4426 (amended by Standing Comm. Nat'l People's Cong., Sept. 1, 2017, effective Jan. 1, 2018), ch. 2, art. 11, 2017 China Law LEXIS 1201 (adopting reductions or exemptions from enterprise income tax for small and micro enterprises); Circular of State Administration of Taxation on Issues Concerning Implementation of Preferential Income Tax Treatment for Hi-Tech Enterprises (promulgated by State Administration of Taxation, Apr. 22, 2009, effective Jan. 1, 2008), Guo Shui Han [2009] No. 203 (providing transitional fifteen percent enterprise income tax rate for certain accredited high-tech enterprises); 1 YANG YANG, *THE INVESTOR'S GUIDE TO THE CHINESE TAX SYSTEM* § 8.02[3] (2019). The Chinese Enterprise Tax allows companies recognized as high-tech enterprises the enterprise tax rate to be reduced to fifteen percent; this tax rate is available for three years, once the company is recognized as a high-tech enterprise. YANG, *supra*, § 8.02[3].

¹⁷ See Law of the People's Republic of China on the Promotion of Small and Medium-Sized Enterprises (adopting reductions or exemptions from enterprise income tax for small and micro enterprises).

¹⁸ See generally Tan Xinyu, *New Regulation Fixes Vehicle Tax Woes*, CHINA DAILY (May 27, 2019, 1:45 PM), <https://www.chinadaily.com.cn/a/201905/27/WS5ceb798ca3104842260bdfd2.html> [<https://perma.cc/2BKR-Q6V7>].

Some of these have been successful, but others have failed to achieve their goals. This Article examines only two examples of Chinese tax policies that have been adopted in conjunction with subsidies to reduce CO₂ and other greenhouse gas emissions: incentives provided to the photovoltaic (PV) energy industry and the new energy vehicle (NEV) industry.

These are particularly instructive for at least two reasons. First, both programs have been initially successful, but in later stages the PV program is failing while the NEV program continues to be successful. Second, the United States has attempted temporary programs in both areas that have been less comprehensive and have never been made available on an unlimited or unconditional basis.

II. CHINESE GREEN DEVELOPMENT AND ITS GREEN TAX POLICIES

Growing quickly to be the world's second largest economy, China developed serious environmental problems.¹⁹ Since recognizing the need to protect its environment in the 1970s, China has developed a variety of tax policies intended to promote green development and consumption (collectively, green tax policies), which can be divided into three periods.

In the first period, which lasted through 1990, the focus was on recycling. In the 1970s, the State Council provided enterprise income tax reductions or exemptions to enterprises recycling the “three wastes”: waste gas, waste water, and waste residue.²⁰ Interim regulations under the enterprise income tax were promulgated in the 1980s to further these

¹⁹ *The World Bank in China*, WORLD BANK, <https://www.worldbank.org/en/country/china/overview> [<https://perma.cc/GM44-EY9Z>] (last visited Jan. 18, 2020). It has engaged in activities and subsidies designed to try to mitigate environmental harm for over sixty years. NAT'L RENEWABLE ENERGY LAB., RENEWABLE ENERGY IN CHINA: FINANCIAL INCENTIVES 1 (2004) (discussing subsidies offered from the 1950s through the early 2000s. The early subsidies focused on direct payments, in the 1950s and 1960s the state created a special fund to develop hydropower. The 1970s saw subsidies for provision of power to rural areas and cleaner fuels. In the 1980s, there was a move to multiple types of financial support and subsidies for hydropower for rural areas. The 1990s provided a turn to a more systemic approach to increased clean power, including environmental protection and sustainable development, with increased support for wind, solar, and biomass power; the state also started to move away from supply-side subsidies and toward tax incentives and other consumer incentives.).

²⁰ Provisions on Comprehensive Utilization of “Three Wastes” in Industry (promulgated by the St. Plan. Comm., Apr. 14, 1977, effective Apr. 14, 1977), art. 7, ST. COUNCIL REG. NO. 39 (tax reductions and exemption amounts were decided by the local provinces).

incentives.²¹ Collective enterprises that used industrial “three wastes” in production were exempt from income tax for up to three years beginning in the first year in which the enterprise earned a profit.²²

The second period, 1991 through 2015, added laws to encourage energy conservation, emission reduction, and environmental pollution prevention.²³ Tax incentives to promote green business were included in laws like the Income Tax Law of the People’s Republic of China for Foreign-Invested Enterprises and Foreign Enterprises²⁴ and the Circular on Issues Concerning VAT, Business Tax, and Enterprise Income Tax Policies for the Promotion of the Development of the Energy-Conservation Service Industry.²⁵

China recognizes that its pollution levels are unsustainable for the health and welfare of its people in the long term,²⁶ and it has already adopted some laws, including tax laws, to improve its environment.²⁷ In 2002, to protect the

²¹ See Provisional Regulations of the People’s Republic of China on Private Enterprises (promulgated by St. Council, June 25, 1988, effective July 1, 1988), *translated in* 1988 China Law LEXIS 289.

²² Rules for the Implementation of the Interim Regulations on Collective Enterprise Income Tax (promulgated by the Ministry of Fin., July 23, 1985, effective July 23, 1985), art. 20 [hereinafter *Collective EIT*].

²³ See, e.g., Cleaner Production Promotion Law of the People’s Republic of China (enacted by Standing Comm. of the Nat’l People’s Cong., June 29, 2002, effective Jan. 1, 2003), <http://www.chinalawedu.com/new/23223a23228a2010/20101222shangf12223.shtml> [https://perma.cc/2EDB-44EQ] (providing generally for cleaner production methods, chapter four of this law provides tax and other financial incentives for better environmental practices, recycling, and production methods as required by this law, and article 35 specifically provides “With respect to products produced from wastes and materials reclaimed from wastes, the taxation authorities shall reduce or exempt these from Value-Added Tax in accordance with relevant national regulations.”).

²⁴ Income Tax Law of the People’s Republic of China for Foreign-Invested Enterprises and Foreign Enterprises (enacted by Nat’l People’s Cong., Apr. 9, 1991, effective July 1, 1991), art. 12, *translated in* 1991 China Law LEXIS 733.

²⁵ Circular on Issues Concerning VAT, Business Tax, and Enterprise Income Tax Policies for the Promotion of the Development of the Energy-Conservation Service Industry (promulgated by the Ministry of Fin., Dec. 30, 2010, effective Jan. 1, 2011), CAI SHUI [2010] No. 110, *translated in* 2010 China Law LEXIS 2495; see also Law of the People’s Republic of China on Foreign-Funded Enterprises (promulgated by the Ministry of Comm., Mar. 16, 2007, effective Mar. 16, 2007), art. 5(5) [https://perma.cc/3DTM-8FCR] (“No application . . . shall be approved if the proposed enterprise . . . may result in environmental pollution.”).

²⁶ See, e.g., Xi Jinping, *supra* note 1.

²⁷ China also argues that developing nations, and less developed nations, such as itself, require assistance from the fully developed nations. See, e.g., Xie Zhenhua, Vice Chairman, Nat’l Dev. & Reform

environment and tackle climate change, China adopted a national ecological strategy.²⁸ In 2005, China adopted its Renewable Energy Law (REL).²⁹ In 2015, this evolved into the green development strategy.³⁰ At the same time, China began to make greater use of tax policy to address environmental issues, with mixed success. Some of these policies have been successful and others have not. These experiences can provide useful guides for the evolution of future tax policy in furtherance of green development.

In 2016, China began the third period of green tax policy, enacting the Environmental Protection Tax Law.³¹ This is the first act specifically

Comm'n, Remarks at the High Level Segment of COP16 & CMP6 in Cancun, Mexico (Dec. 8, 2010), https://unfccc.int/files/meetings/cop_16/statements/application/pdf/101208_cop16_hls_china.pdf [<https://perma.cc/KD8Q-6HSM>] (“Developed countries are expected to provide finance, technology, capacity building support to developing countries through international cooperation, which is in line with the interests of the whole of humankind. China will continue to provide assistance within its ability to other developing countries through south-south cooperation, especially though least developed countries.” (emphasis added)). The foundation for this argument is that developed nations are in a better position to help mitigate the damage of climate change because they had more time to develop, reaped greater rewards from development, and developed more ways to mitigate the harms of industrial development. Indeed, the Paris Climate Change Agreement provides:

developed country Parties should continue to take the lead in mobilizing climate finance from a wide variety of sources, instruments and channels, noting the significant role of public funds, through a variety of actions, including supporting country-driven strategies, and taking into account the needs and priorities of developing country Parties. Such mobilization of climate finance should represent a progression beyond previous efforts.

Paris Agreement to the United Nations Framework Convention on Climate Change, art. 9, para. 3, T.I.A.S. No. 16-1104.

²⁸ See Jiang Zemin, Gen. Sec’y, Communist Party of China, Report to the 16th National Congress of the Communist Party of China: Build a Well-Off Society in an All-Around Way and Create a New Situation in Building Socialism with Chinese Characteristics (Nov. 8, 2002) (transcript available at https://www.fmprc.gov.cn/mfa_eng/topics_665678/3698_665962/t18872.shtml [<https://perma.cc/T79X-4GYC>]) (arguing that China’s development needs to be consistent with sound ecology).

²⁹ Renewable Energy Law of the People’s Republic of China (enacted by Standing Comm. Nat’l People’s Cong., Feb. 28, 2005, effective Jan. 1, 2006, rev’d Dec. 26, 2009, effective Apr. 1, 2010), http://www.npc.gov.cn/zgrdw/englishnpc/Special/CombatingClimateChange/2009-08/25/content_1515301.htm [<https://perma.cc/H59X-QE4J>] (last visited Jan. 20, 2020).

³⁰ Xi Jinping, President, People’s Republic of China, Speech at the Second Meeting of the Fifth Plenary Session of the 18th CPC Central Committee (Oct. 29, 2015) (transcript available at <http://cpc.people.com.cn/n1/2016/0101/c64094-28002398.html> [<https://perma.cc/42ED-C4F9>]); see also Jeff Kearns et al., *China’s War on Pollution Will Change the World*, BLOOMBERG (Mar. 9, 2018), <https://www.bloomberg.com/graphics/2018-china-pollution/>.

³¹ Chen Jia, *Environmental Tax to Help China Fight Pollution*, CHINA DAILY (Jan. 11, 2018, 6:54 AM), <http://www.chinadaily.com.cn/a/201801/11/WS5a5699b7a3102e5b173740b4.html> [<https://>

addressing environment protection and greenhouse gas emissions through the tax system, squarely bringing China into the era of green tax regulation.³²

Notwithstanding its efforts to control greenhouse gases, China's greenhouse gas emissions have grown.³³ China's air quality has been ranked as one of the worst in the world.³⁴ In 2018, China produced 10,291.9 million tons of CO₂ emissions, or 7.5 tons per capita, up from 8,776 million tons, or 6.5 tons per capita, in 2010.³⁵ This compares to the U.S. production of 5,254.3 million tons of CO₂ emissions, or 16.2 tons per capita, in 2018, which was down from 5,395.5 million tons, or 17.2 tons per capita, in 2010.³⁶

China's green development strategy may be a more achievable version of the Green New Deal that is currently being discussed the United States.³⁷

perma.cc/NRW4-JBJW] (noting that when the tax took effect in 2018, it replaced the old pollution discharge fee with an environmental protection tax).

³² *Id.*

³³ David Stanway, *China Greenhouse Gas Emissions Soar 50% During 2005–2014: Government Data*, REUTERS (July 14, 2019); *see also Global Greenhouse Gas Emission Data*, U.S. ENVTL. PROT. AGENCY, <https://perma.cc/MGN8-NL93> (last updated Apr. 13, 2017) (stating that, in 2014, China produced thirty percent of the world's CO₂ emissions, while the United States produced fifteen percent, the EU nine percent, India seven percent, the Russian Federation five percent, Japan four percent, and all other countries thirty percent; CO₂ emissions account for sixty-five percent of global greenhouse gas emissions); Julien Ponthus, *China to Cap Rising Emissions by 2030 in Boost to Paris U.N. Deal*, REUTERS (June 30, 2015, 8:11 AM), <https://www.reuters.com/article/us-france-china-climatechange-idUSKCN0PA1G420150630> [<https://perma.cc/X3KQ-VBKP>] (discussing China's commitment during the Paris Climate Accords to stop the increase in its greenhouse gas emissions no later than 2030, but its failure to commit to the level at which its emissions would peak).

³⁴ *Top 10 Countries with the Worst Air Pollution Index*, WORLD AIR QUALITY INDEX PROJECT, <https://aqicn.org/rankings/> [<https://perma.cc/R3GD-4J5G>] (last visited Feb. 2, 2020). The World Air Quality Index measures air quality on a daily basis. *Id.* Therefore, on a given day China's place on the index may vary. *Id.* On February 2, 2020, France, Turkey, India, Israel, and Bolivia all had worse air quality, at 804, 500, 425, 373, 302 (2.5 ppm), while China measured 256 (2.5 ppm). All of these are incredibly unhealthy. *Id.*

³⁵ *China: Environment and Infrastructure Indicators*, U.N. DATA, <http://data.un.org/en/iso/cn.html> (last visited Nov. 24, 2019).

³⁶ *United States: Environment and Infrastructure Indicators*, U.N. DATA, <http://data.un.org/en/iso/cn.html> (last visited Nov. 24, 2019).

³⁷ *But see* SAM GEALL, LOWY INST., CLEAR WATERS AND GREEN MOUNTAINS: WILL XI JINPING TAKE THE LEAD ON CLIMATE CHANGE? (2017) (arguing that the Chinese have taken an aggressive position to become a leader on climate change; it will have to change its international policies on investment in coal-powered energy before it will become a leader in the reduction of carbon emissions to reverse or prevent climate change).

The green development strategy includes the goal of a sustainable environment, economy, and society.³⁸ At the same time, it acknowledges that while environmental resources are free, their use or forbearance come at the cost of economic development.³⁹ Under the envisioned strategy, green development means a combination of low carbon emission, green production coupled with green consumption, and green lifestyles.⁴⁰ However, it attempts to set attainable goals.⁴¹

In addition to specifically targeted green tax incentives, some general tax incentives also have the effect of green tax incentives. Thus, the development of green technology often qualifies for tax incentives intended to incentivize the development of high-tech industries by providing benefits for research and development. Although these results were not specifically intended when the general tax law was enacted, working in conjunction with green tax preferences and subsidies, they may make the reduction of carbon emissions more desirable and economically feasible. Moreover, in most cases, they are not at odds with the objectives of these kinds of tax incentives.

We discuss below how specifically targeted Chinese green tax laws, general tax laws, and industry incentives worked together in the development of the PV energy industry and NEV industry. As we demonstrate, long-term planning and commitment to the development of a clean energy industry is essential to the successful use of any such policies. Premature withdrawal of support or poorly conceived programmatic design can lead to long-term failure, notwithstanding short- and mid-term successes.

³⁸ *Id.* at 4–5.

³⁹ *See id.* at 11 (stating that overseas investment development must promote the sustainable use of resources).

⁴⁰ *Id.* at 2, 7.

⁴¹ Ponthus, *supra* note 33.

A. Chinese Policies to Promote Solar Energy

Renewable energy, which includes solar (PV) energy,⁴² is a key component of any green development strategy.⁴³ The REL adopted tax incentives and subsidies to incentivize the development of many types of renewable energy, including PV energy.⁴⁴ These incentives were designed to increase the availability of lower-cost, cleaner fuel that will make more energy available at lower costs and help make these industries cost effective to develop and profitable to operate. A brief discussion of the subsidies and their interaction with the tax preferences is therefore helpful to understand the extent to which some of the incentives have worked to develop mature, well-functioning segments of clean energy industries.

1. Tax Incentives for the PV Energy Industry

The REL creates an entitlement to tax benefits for certain renewable energy development projects; the state shall “grant[] tax benefits to projects listed in the renewable energy industrial development guidance catalogue.”⁴⁵ Tax incentives are available in the enterprise income tax and the VAT. The Ministry of Finance (MOF) and the State Administration of Taxation (SAT) have the primary responsibility for implementing tax policy and determining

⁴² Renewable energy also includes energy derived from wind, hydroelectric, geothermal and other sources that are not subject to exhaustion in the way that coal, petroleum, and other exhaustable power supplying resources are. However, this Article discusses only PV power.

⁴³ See GEALL, *supra* note 37, at 7 (noting that China is investing \$100 billion per year in renewable energy projects and will build thirty-six percent of the world’s solar capacity between 2016 and 2021).

⁴⁴ Renewable Energy Law of the People’s Republic of China (enacted by Standing Comm. Nat’l People’s Cong., Feb. 28, 2005, effective Jan. 1, 2006, rev’d Dec. 26, 2009, effective Apr. 1, 2010), chs. I, III, V, VI, http://www.npc.gov.cn/zgrdw/englishnpc/Special/CombatingClimateChange/2009-08/25/content_1515301.htm [<https://perma.cc/H59X-QE4J>] (last visited Jan. 20, 2020); see also LANEY ZHANG, RENEWABLE ENERGY LAW AMENDED (2009), <http://www.loc.gov/law/foreign-news/article/china-renewable-energy-law-amended/> [<https://perma.cc/9RM6-ARHR>] (last visited Jan. 20, 2020) (discussing the changes made to the Renewable Energy Law, including the changes to the penalty structure, as a result of the 2009 amendments to the law).

⁴⁵ Renewable Energy Law, art. 26. This list, which includes a variety of PV projects, was issued by the National Development and Reform Commission on November 29, 2005. Circular of the National Development and Reform Commission on Printing and Distributing Catalog for the Guidance of the Industrial Development of Renewable Energy (promulgated by Nat’l Dev. & Reform Comm’n, Nov. 29, 2005, effective Nov. 29, 2005), app. 24–35, Fa Gai Energy [2005] No. 2517, <http://www.asianlii.org/cn/legis/cen/laws/cotndarcopadcfgotidore1433/> [<https://perma.cc/Y7QC-8GMM>] [hereinafter *Catalog for the Development of Renewable Energy*].

the eligibility standards for tax programs, but also to work with other relevant departments.⁴⁶

The PV generation industry is one of the industries that is eligible under the industrial development guidance catalogue.⁴⁷ Under the regulations implementing Article 26 of the REL, income from the operation of a listed key public infrastructure project, such as a PV energy project, is exempted from the enterprise income tax for years one through three, after which the project is only subject to one-half the enterprise income tax for years four through six.⁴⁸ In addition, the Standing Committee of the National People's Congress recently reduced the enterprise income tax rate on PV high-tech energy enterprises to fifteen percent, from the standard twenty-five percent rate.⁴⁹

Further, current law entitles all enterprises engaged in research and development to an additional deduction equal to fifty percent of the actual research and development expenses that are not incurred for the creation of an intangible asset, in addition to the deduction for current expenses.⁵⁰ As a result, all enterprises engaging in research and development, including those developing new, tangible PV technology are entitled to a deduction of 150%

⁴⁶ Renewable Energy Law.

⁴⁷ The other eligible industries are: wind energy, biomass energy, geothermal energy, ocean power, and hydropower. *Catalog for the Development of Renewable Energy*, *supra* note 45.

⁴⁸ Implementation Regulations for the Corporate Income Tax Law of the People's Republic of China (promulgated by St. Council, Dec. 6, 2007, effective Jan. 1, 2008), ch. IV, art. 87, Decree St. Council [2007] No. 512 (repealing the Implementation Regulations for the Corporate Income Tax Law of the People's Republic of China for Foreign Investment Enterprises and Foreign Enterprises promulgated by the State Council on 30 June 1991 and the Implementation Regulations for the Provisional Regulations of the People's Republic of China on Corporate Income Tax promulgated by the Ministry of Finance on Feb. 4, 1994), <http://www.great-tax.com/en/more.asp?id=1946> [<https://perma.cc/MQ9V-23MZ>] (last visited Jan. 31, 2020).

⁴⁹ Electric Power Law of the People's Republic of China (enacted by Standing Comm. of the Nat'l People's Cong., Dec. 29, 2018, effective Dec. 29, 2018), ch. IV, art. 28, *translated in* 2018 China Law LEXIS 1165 at 10–11 (revising the Enterprise Income Tax Law).

⁵⁰ Circular on Improving the Policy on Extra Pretax Deduction of Research and Development Expenses (promulgated by Ministry of Fin., State Admin. of Taxation, and Ministry of Sci. & Tech., Nov. 2, 2015, effective Jan. 1, 2016), ch. I, art. 1, CAI SHUI [2015] NO. 119, *translated in* 2015 China Law LEXIS 1988, at 3 [hereinafter *Pretax Deduction*].

of their research and development costs.⁵¹ For taxable years 2018 and 2019, this additional deduction is increased to seventy-five percent for small and medium-sized enterprises, allowing 175% of the actual expenses of research and development not associated with the creation of intangible assets.⁵² Intangibles are not deductible, but the same percentages may be amortized over ten years.⁵³

Beginning in July 2013, the VAT was also modified to encourage the utilization and consumption of solar electricity. These incentives involve the adoption of three VAT deductions and exemptions. The first provided a fifty percent refund or exemption of VAT on sales of self-produced PV energy from October 1, 2013, through December 31, 2015.⁵⁴ This exemption was extended on July 25, 2016, allowing the exemption through December 31, 2018.⁵⁵

The second VAT incentive was announced by the SAT and MOF in January 2013. This program allowed a fifty percent refund of the VAT on all self-made electrical products using solar energy and was available from all applicable financial bureaus and SAT offices.⁵⁶

Third, the MOF announced that its payments from four government-managed funds self-used PV energy would be exempted from the VAT.⁵⁷

⁵¹ *Id.*

⁵² Circular on Increasing the Proportion of Extra Pre-Tax Deductions of Research and Development Costs for Medium- and Small-Sized Tech Firms (promulgated by the St. Admin. of Taxation, May 2, 2017, effective May 2, 2017), art. I, CAI SHUI [2017] NO. 34, *translated in 2017 China Law LEXIS 1498* at 1–2.

⁵³ *Id.*; see *Pretax Deduction*, *supra* note 50.

⁵⁴ Circular on the Value-Added Tax Policy for Photovoltaic Power Generation (promulgated by St. Admin. of Taxation and Ministry of Fin., Sept. 23, 2013, effective Oct. 1, 2013), CAI SHUI [2013] NO. 66, *translated in 2013 China Law LEXIS 667*.

⁵⁵ Circular of the Ministry of Finance and the State Administration of Taxation on Continuing to Implement the Value-Added Tax Policy on Photovoltaic Power Generation (promulgated by St. Admin. of Taxation, July 25, 2016, effective July 25, 2016), CAI SHUI [2016] NO. 81, *translated in 2016 China Law LEXIS 458* at 1.

⁵⁶ Circular on the Value-Added Tax Policy for Photovoltaic Power Generation, *supra* note 54.

⁵⁷ Notice on Issues Concerning the Spontaneous Use of Distributed Photovoltaic Power and the Exemption of Government Funds (promulgated by the Ministry of Fin., Nov. 19, 2013, effective Nov. 19, 2013), 2013 CAI ZONG [2013] NO. 103, http://www.gov.cn/zwqk/2013-11/26/content_2535142.htm [<https://perma.cc/G5GL-N4JN>] (last visited Jan. 24, 2020) (identifying as tariff surcharges for renewable

2. Subsidies to the PV Industry

Like other countries, China adopted direct subsidies to encourage the manufacture and purchase of PV building components and the creation of a PV energy distribution industry. Government subsidies are needed at the early development and adoption stages because startup costs are significant, especially in relation to the cost of continued reliance on existing coal-based energy sources, and have been used in many countries including the United States,⁵⁸ members of the European Union,⁵⁹ South Korea,⁶⁰ and Japan.⁶¹

In 2009, China started its Golden Sun Demonstration Project⁶² and Solar Roof Program.⁶³ These programs created subsidies for PV building projects

energy the funds for the construction of major national water conservancy projects, for late-stage support for resettlement of large and medium-sized reservoirs, and for repaying loans to rural power grids).

⁵⁸ See, e.g., U.S. ENERGY INFO. ADMIN., DIRECT FEDERAL FINANCIAL INTERVENTIONS AND SUBSIDIES IN ENERGY IN FISCAL YEAR 2016 (2018) (including tax incentives, direct expenditures, grants, loans, and other assistance for research and development, and Department of Energy loan guarantees). In 2016, the Energy Information Agency (EIA) estimated that energy-related tax expenditures in the United States totaled approximately \$8.8 billion, which was only about forty-four percent of the tax expenditures made in 2013. *Id.* at 19. Approximately fifty-nine percent of those tax expenditures were directed toward renewable energy sources. *Id.* The EIA reported that this reduction in expenditures reflected a general reduction in subsidies provided by the United States for renewable energy. *Id.*

⁵⁹ See, e.g., *China Joins Other Countries in Reducing Subsidies for Solar Power*, INST. FOR ENERGY RES. (June 27, 2018), <https://www.instituteeforenergyresearch.org/renewable/solar/china-joins-countries-reducing-subsidies-solar-power/> (discussing the fact that numerous countries with subsidies for the creation of photovoltaic power began reducing those subsidies in 2010).

⁶⁰ *Feed-in Tariffs for New and Renewable Energy*, KOR. ENERGY AGENCY, https://www.energy.or.kr/renew_eng/new/renewable.aspx (last visited Nov. 29, 2019).

⁶¹ AGENCY FOR NAT. RES. & ENERGY, STRATEGIC ENERGY PLAN 37–46 (2018), https://www.enecho.meti.go.jp/en/category/others/basic_plan/pdf/4th_strategic_energy_plan.pdf (Japan) (discussing the feed-in tariffs enacted in 2012, the long-term need to develop new energy resources, and changes required after Fukushima disaster); see also Peter Fairley, *Can Japan Recapture Its Solar Power?*, MIT TECH. REV. (Dec. 18, 2014), <https://www.technologyreview.com/s/533451/can-japan-recapture-its-solar-power/> (discussing timeline of Japan's solar development, including incentives for residential solar installation that ended in 2004 and creating a feed-in tariff in 2014).

⁶² Press Release, Ministry of Sci. & Tech. of China, MOF, MOST and NEA Launch Golden Sun Project (Aug. 7, 2009) (project to start Sept. 1, 2009) (available at <https://perma.cc/8FH7-XX4M>) (last visited Dec. 1, 2019).

⁶³ Implementation Opinions on Accelerating the Application of Solar Photovoltaic Buildings (promulgated by Ministry of Fin. and Ministry of Housing & Urban-Rural Dev., Mar. 23, 2009, effective Mar. 26, 2009) 2009 CAI JIAN [2009] NO. 128, <http://www.shui5.cn/article/ad/23367.html> [<https://perma.cc/L3TV-SGTR>] (last visited Feb. 1, 2020) [hereinafter *Implementation Opinions*].

under the REL.⁶⁴ Each type of project has a different subsidy, objective, and standards.⁶⁵

The Golden Sun Demonstration Project subsidies encouraged investment in large PV generation projects, providing a seventy percent subsidy for the total investment in qualified PV generation projects in both remote areas and areas without electricity, and a fifty percent subsidy for total investments in other qualified independent PV generation projects.⁶⁶ This subsidy is available to five different types of projects.⁶⁷

The Solar Roof Program provides incentives to develop technical standards and procedures for the installation of PV products that integrate the use of PV energy during new construction, as well as its integration and use in existing buildings.⁶⁸ These subsidies are determined based on the

⁶⁴ Renewable Energy Law of the People's Republic of China (promulgated by Standing Comm. Nat'l People's Cong., Feb. 28, 2005, effective Jan. 1, 2006, rev'd Dec. 26, 2009, effective Apr. 1, 2010), chs. I, V, VI, http://www.npc.gov.cn/zgrdw/englishnpc/Special/CombatingClimateChange/2009-08/25/content_1515301.htm [<https://perma.cc/H59X-QE4J>] (last visited Jan. 20, 2020).

⁶⁵ *Id.* chs. V, VI.

⁶⁶ *Implementation Opinions*, *supra* note 63, at ch. II, art. 4(c).

⁶⁷ Qualifying projects: (1) demonstrate user-side, grid-connected PV generation in large industrial, mining, and commercial enterprises or public welfare institutions without changing their existing conditions; (2) use PV power to increase the power supply capacity in remote areas and/or supply power to people without electricity; (3) large-scale, grid-connected PV power generation projects in areas rich in solar energy resources; (4) industrialization demonstration projects for key PV power generation technologies; and (5) building basic capacity for PV power generation. *Id.*

⁶⁸ Interim Measures for the Administration of Financial Subsidy Funds for Solar Photovoltaic Building Applications (promulgated by Ministry of Fin., Mar. 23, 2009, effective Mar. 23, 2009), art. IV, CAI JIAN [2009] NO. 129, http://www.gov.cn/zwgk/2009-03/26/content_1269258.htm [<https://perma.cc/7PN3-YW7L>] [hereinafter *Interim Measures*].

electricity generated.⁶⁹ The program was intended to prioritize projects in schools, hospitals, government agencies, and public buildings.⁷⁰

Distribution subsidies also encourage consumption of all available PV energy.⁷¹ With such a feed-in-tariff, the central government pays a fixed amount as determined by amount of electricity generated.⁷² At a fixed price per kilowatt hour (kwh), based on the on-grid electricity price, the cost of power generation, and the price of PV electricity.⁷³

Under the Solar Roof Program, PV panel owners can sell surplus electricity to power-grid enterprises, while still receiving the subsidy.⁷⁴ The rapid growth of available solar energy in China has resulted in excess supply.⁷⁵ As planned, as the PV energy supply has grown, the subsidy has

⁶⁹ Circular of the National Development and Reform Commission, the Ministry of Finance, and the National Energy Administration on Matters Concerning Photovoltaic Power Generation in 2018 (promulgated by Nat'l Dev. & Reform Comm'n, Ministry of Fin., and Nat'l Energy Admin., May 31, 2018, effective May 31, 2018), arts. II, III, FA GAI NENG YUAN [2018] NO. 823, 2018 China Law LEXIS 314, at 3–5 (providing that the subsidy amount is determined by the type of project and will be adjusted annually based on industry development); *see also* National Development and Reform Commission on Improving the On-Grid Price Mechanism of Photovoltaic Power Generation (promulgated by Nat'l Dev. & Reform Comm'n, Apr. 4, 2019, effective July 1, 2019), CAI SHUI [2019] NO. 761 [hereinafter *On-Grid Price*]. In 2019, the Ministry of Finance announced modifications to the subsidies to “guide new energy investment in a scientific and reasonable way, realize efficient utilization of resources, promote fair competition and survival of the fittest, promote the healthy and sustainable development of photovoltaic power industry, and improve the feed-in tariff mechanism of photovoltaic power generation.” *Id.*

⁷⁰ *Interim Measures*, *supra* note 68, art. II.

⁷¹ Notice on the Implementation of Distributed Photovoltaic Power Generation in Accordance with the Electricity Subsidy Policy and Other Related Issues (promulgated by Ministry of Fin., July 24, 2013, effective July 24, 2013), CAI JIAN [2013] NO. 390, http://jjs.mof.gov.cn/zhengwuxinxi/tongzhigonggao/201307/t20130731_971420.html [<https://perma.cc/VR3N-Y7RC>].

⁷² *Id.* art. 1(2)–(4).

⁷³ *Id.*

⁷⁴ *On-Grid Price*, *supra* note 69; *see also* Zhang Shidong & Eric Ng, *Chinese Solar Power Stocks Plunge as Government Moves to Contain Industry Size*, SOUTH CHINA MORNING POST (June 4, 2018, 1:26 PM), <https://www.scmp.com/business/companies/article/2149131/chinese-solar-power-stocks-plunge-government-moves-contain>.

⁷⁵ *See Guide to Chinese Climate Policy: Solar Power*, COLUM. U., <https://chineseclimatepolicy.energypolicy.columbia.edu/en/solar-power> (last visited Dec. 24, 2019) (noting that recent solar policy has targeted overcapacity in markets). In 2018, the curtailment rate for PV power was down to three percent. Zheng Xin, *Glowing Year for the Solar Power Sector*, CHINA DAILY (Feb. 12, 2019), <http://www.chinadaily.com.cn/a/201902/12/WS5c620fd4a3106c65c34e8cc8.html>.

decreased in stages from RMB 0.42/kwh in 2013 to the current rate of RMB 0.18/kwh for a residential installation and RMB 0.1/kwh for a business building installation.⁷⁶

China is currently passing the cost of some of the subsidies it has given for PV production and to develop the PV industry along to consumers as a surcharge on consumers' power bills; it is using surcharges to pay for the deficit in its renewable energy fund.⁷⁷ However, the surcharge does not cover the cost of the subsidies, which has resulted in deficits in the funds. The subsidy was expected to be replaced by a quota system that would require the regions to purchase more of their electricity from renewable sources.⁷⁸

3. Evaluation of the Chinese Green Tax Policies for the PV Energy Industry

A close examination of the growth of the PV energy production, PV panel production, and PV distribution industries through China's use of tax incentives and subsidies offer a number of lessons for other countries seeking to develop their clean energy industries. China's tax incentives and subsidies have successfully stimulated the development of these parts of its PV energy industry.⁷⁹ However, these policies failed to concurrently incentivize technological advancement. Quality took a backseat to quantity under these policies.⁸⁰

As a result of the subsidies, China's PV production exceeded that of Germany in 2015, making it the world's largest producer of PV power.⁸¹ It

⁷⁶ *On-Grid Price*, *supra* note 69; *see also China Confirms 2019 Feed-in Tariffs*, PV INFOLINK (May 2, 2019), <https://en.pvinfoink.com/post-view.php?ID=183>.

⁷⁷ Shidong & Ng, *supra* note 74.

⁷⁸ David Stanway & Muyu Xu, *China Solar Firms Urge Government to Rethink Capacity Cap. Subsidy Cut: Letter*, REUTERS (June 7, 2018, 2:06 AM), <https://www.reuters.com/article/us-china-solar/china-solar-firms-urge-govt-to-rethink-capacity-cap-subsidy-cut-letter-idUSKCN1J30G6>.

⁷⁹ John Fialka, *Why China Is Dominating the Solar Industry*, SCI. AM. (Dec. 19, 2016), <https://www.scientificamerican.com/article/why-china-is-dominating-the-solar-industry>.

⁸⁰ Jinyue Yan et al., *City-level Analysis of Subsidy-Free Solar Photovoltaic Electricity Price, Profits and Grid Parity in China*, 4 NATURE ENERGY 709, 709 (2019) ("The 531 New Policy subsidy cuts in 2018 in China were a clear signal from the government that the solar PV industry needed to become less dependent on subsidies and shift its focus from scale growing to quality improvement.").

⁸¹ *Id.*

is expected that its PV power production will be as great as that of the rest of the world combined by 2024, notwithstanding expectations that expansion will slow.⁸² In addition, China's PV panel manufacturers reduced the price of solar panels to the rest of the world by eighty percent between 2008 and 2013.⁸³ This demonstrates the degree to which tax incentives can be used to quickly and effectively create PV production and production capacity.

As a result of China's recent tax incentive and subsidy rollbacks, businesses throughout the Chinese solar power industry are experiencing an existential crisis that will require heroic changes to their business models to ensure their survival.⁸⁴ The design of the incentives and subsidies for the PV energy industry has not required that it evolve from its origins where government programs spurred investments driven almost entirely by tax and subsidy payments.⁸⁵ There are three primary reasons that the unanticipated withdrawal of support may be catastrophic for the continued growth of solar energy as a means to continue the reduction of carbon emissions in China.

First, large, government-sponsored incentives provided economic stability for a fledgling, insecure, capital-intensive, high-tech industry, drawing investors who might not otherwise participate in that marketplace. These incentives were very high, and businesses are dependent on this support as a result of their anticipated continuation.⁸⁶ One analysis of the industry found that the twenty-seven listed Chinese PV companies reported a total of RMB 180.73 billion in revenues and RMB 13.03 billion in net

⁸² Charlotte Edmond, *China's Lead in the Global Solar Race—At a Glance*, WORLD ECON. F. (June 19, 2019), <https://www.weforum.org/agenda/2019/06/chinas-lead-in-the-global-solar-race-at-a-glance/>.

⁸³ Fialka, *supra* note 79.

⁸⁴ See Vincent Shaw, *China's Hard Change Towards Grid Parity*, PV MAG. (June 8, 2019), <https://www.pv-magazine.com/2019/06/08/the-weekend-read-chinas-hard-change-towards-grid-parity/> (discussing the consequences to the industry of changes in incentive policy designed to eliminate disparities between the cost of solar and traditional power).

⁸⁵ *Id.*

⁸⁶ Jill Baker, *Solar Leader China Is Slashing Its Subsidies on Solar Power—What You Need to Know*, FORBES (June 18, 2018, 12:38 AM), <https://www.forbes.com/sites/jillbaker/2018/06/18/solar-leader-china-is-slashing-its-subsidies-on-solar-power-what-you-need-to-know/#4d7141062f9a>.

profits in 2017, a net profit of 7.21%.⁸⁷ In 2017, the five largest photovoltaic companies received subsidies exceeding 7.3% of their total PV revenue.⁸⁸ Thus, if all of the subsidies were suddenly cancelled or were rapidly phased out, it is likely that at least some of these enterprises could face immediate bankruptcy.⁸⁹ Given these numbers, it is likely that many other businesses would suffer as much if not more. Adequate time for restructuring is essential for these companies to survive.⁹⁰

Second, the construction of dedicated PV production facilities, construction with integrated PV power, and retrofitting existing construction to use PV energy have been much more costly than building coal-based energy plants.⁹¹ Most consumers require subsidies to reduce the cost of installing PV power until the cost declines to the point where it is the same as using traditional energy sources. The reduction in the subsidy for distributed PV power announced in 2018 pulled the legs out from under the PV adopters that had installed PV for their power needs and with an intent to sell their excess capacity to the state grid. The reduction in subsidy means a significantly lower internal rate of return for those who had made an investment under the Solar Roof Program did so in anticipation that they would recover costs based on a subsidy for the distributed PV power at a rate

⁸⁷ 27 PV Companies Last Year Earned More Than 10 Billion Yuan in Subsidies (27 家光伏企业去年盈利超百亿 补贴金额占比较小), Baidu (June 8, 2018, 12:22 AM), <http://baijiahao.baidu.com/s?id=1602632299142047405&wfr=spider&for=pc> [<https://perma.cc/HK8W-9D3J>] [hereinafter *PV Companies*]. Most other Chinese industries have rate of return of less than five percent, making this a good industry. *The Average After-Tax Profit Margin of Chinese Manufacturing Enterprises Is 3.3%*, IFENG NEWS (June 21, 2017), http://finance.ifeng.com/a/20170621/15471225_0.shtml.

⁸⁸ *PV Companies*, *supra* note 87.

⁸⁹ See Stanway & Xu, *supra* note 78.

⁹⁰ See Shidong & Ng, *supra* note 74 (stating that the solar industry will endure a painful reshuffle before companies can benefit from the change to subsidy laws).

⁹¹ Chen Gang, *China's Solar PV Manufacturing and Subsidies from the Perspective of State Capitalism*, 33 COPENHAGEN J. ASIAN STUD. 90, 99–100 (2015). *But see* Megan Mahajan, *Plunging Prices Mean Building New Renewable Energy Is Cheaper Than Running Existing Coal*, FORBES (Dec. 3, 2018, 7:40 AM), <https://www.forbes.com/sites/energyinnovation/2018/12/03/plunging-prices-mean-building-new-renewable-energy-is-cheaper-than-running-existing-coal/#28a66c7b31f3> (discussing market changes that are reducing the costs of PV power in the United States, changing the calculus on the installation of PV energy over traditional coal-fired energy).

set by targeted power generation.⁹² This was a benefit for users with distributed PV power. The benefit and rate of recovery was even greater for those PV installers with excess capacity because they could receive the benefit of the kwh generation subsidy, as well as payment from the state grid for sale of any excess power generated to the state power grid.⁹³

For example, in 2017, a Shanghai homeowner who installed PV power with excess capacity received a payment of RMB 0.42/kwh for distributed PV power and a total payment of RMB 0.82/kwh for excess capacity that they sold to the power grid,⁹⁴ compared to the average cost of RMB 0.734/kwh for electricity from the power grid, and their self use is equivalent to saving the cost of electricity.⁹⁵ However, the incentives changed dramatically when the government subsidy was reduced to RMB 0.32/kwh in May 2018,⁹⁶ and even further in July 2019, when the subsidy was reduced to RMB 0.18/kwh.⁹⁷ These reductions significantly extend the time required to recover the additional cost of installing PV power, if the cost is to be

⁹² See *supra* notes 67–68, 82 and accompanying text. Distributed PV power is the power generated by PV installations and used by the generator in lieu of power from the electric grid.

⁹³ See *supra* notes 67–68, 82 and accompanying text.

⁹⁴ Lan Lin Xiaosheng, *Photovoltaic Power Generation Sells to the State Grid to Make Money and the Electricity Price Is About 0.4 Yuan/kwh*, OFWEEK: SOLAR (July 11, 2017, 8:34 AM), <https://solar.ofweek.com/2017-07/ART-260009-8120-30152618.html> (local subsidy for installing PV power is approximately RMB 0.42/kwh to RMB 0.47/kwh and power grid price approximately RMB 0.4/kwh); Notice on Pricing Policy for Photovoltaic Power Projects in 2018 (release by Nat'l Dev. & Reform Comm'n, effective Dec. 19, 2017), 2017 DEV. & REFORM PRICE REG. 2196 (RMB 0.42/kwh government subsidy) [hereinafter *Pricing Policy*].

⁹⁵ See *2017 Shanghai Electricity Fee Standard*, CNGOLD.ORG, <http://energy.cngold.org/nybk/dianli/c5265591.html> (last visited Mar. 9, 2020) (Shanghai sales electricity price table, table 3 electricity price table of Shanghai residents).

⁹⁶ Notice on Matters Related to Photovoltaic Power Generation in 2018 (promulgated by Ministry of Fin., May 31, 2018, effective May 31, 2018), 2018 NAT'L DEV. & REFORM COMM'N 823, http://www.ndrc.gov.cn/zcfb/zcfbtz/201806/t20180601_888637.html [hereinafter *PV Power Generation*].

⁹⁷ *On-Grid Price*, *supra* note 69; see also *China Confirms 2019 Feed-in Tariffs*, PV INFOLINK (May 2, 2019), <https://en.pvinfoink.com/post-view.php?ID=183>.

recovered at all.⁹⁸ However, the cost of installation has gone down substantially.⁹⁹

Third, the central government's incentives have not been structured in such a manner that they have created adequate incentives to fully develop the industry from top to bottom. Rather, the incentives encourage research, development, and growth in only some sectors, primarily those with lower barriers to entry and lower or easier to obtain investment, which results in low added value and profit.¹⁰⁰ Although the incentives are generous, they have resulted in redundant construction of battery and midstream component production, including manufacturing solar panels, batteries and their components, as well as significant overproduction of generation capacity.¹⁰¹ This has resulted in lagging innovation,¹⁰² because these enterprises do not tap the upstream or downstream innovation and supply chain aspects of the industry.¹⁰³

Recently announced changes to the PV incentives put the CO₂ emission reduction gains at risk. By providing little notice that it will be drastically reducing the tax incentives and subsidies, the government places the future growth of the PV industry, PV energy capacity, and its potential to reduce China's greenhouse gas emissions at risk. The harm to the long-term outlook for China's PV energy industry, such as it is, demonstrates the necessity of a long-term plan to ensure the continued viability of industries that grow out of these incentives.

⁹⁸ See, e.g., *PV Power Generation*, *supra* note 96, at ch. II, art. ii (noting that projects connected to the grid before May 31 are included in the national scale and those not included nationally will be supported by local governments).

⁹⁹ Liu Bin, *China's Solar Industry Is at a Crossroads*, CHINADIALOGUE (Aug. 13, 2018), <https://www.chinadialogue.net/article/show/single/en/10775-China-s-solar-industry-is-at-a-crossroads> [<https://perma.cc/XY8D-T4MT>] (“Li Chuangjun, deputy head of the new and renewable energy department at the National Energy Administration agrees that the cost of solar is reaching parity with conventional technologies.”).

¹⁰⁰ *Analysis of the Development and Characteristics of China's PV Industry from 2008 to 2014*, CHINA INDUS. INFO. NETWORK (Oct. 19, 2015), <https://m.chyxx.com/view/350574.html> [hereinafter *China's PV Industry*].

¹⁰¹ *Id.*

¹⁰² *Id.*

¹⁰³ *Id.*

When well designed, tax incentives and subsidies become less necessary, as producing conventional energy becomes less efficient and the cost of solar and other renewable energy becomes more economical. Indeed, this equilibrium is near.

However, the expectations created by the nature and structure of the tax incentives and subsidies, development of PV industries along the supply chain from research and development of PV production technology to PV supply has been uneven. Because the technological gains are uneven throughout the supply chain and placed at risk by subsidy changes, it is clear that incentives must be designed to ensure industries develop through the entire supply chain. Incentives should focus not only on installation and production, but also on remaining on the cutting edge of the technology needed to move toward goals of zero greenhouse gas emissions.

Moreover, the investment horizon and expected returns are unlikely to be realized by many of those who pioneered the PV technology. This creates an existential crisis for this industry and future renewable energy technologies relying on anticipated future incentives and subsidies that may be suddenly terminated.

B. Chinese Green Tax Policies for the NEV Industry

Traditional gasoline- or diesel-consuming (i.e., conventional) vehicles produce significant CO₂ and other greenhouse gas emissions.¹⁰⁴ NEVs help reduce CO₂ emissions resulting from an expanding driving public.¹⁰⁵ This is especially true in China, where the purchase and use of vehicles is rapidly increasing. China currently accounts for about seventy-six percent of all cars purchased worldwide, and the number of cars purchased annually continues to grow.¹⁰⁶ Therefore, it is important to encourage consumers to purchase

¹⁰⁴ *Reducing Pollution with Electric Vehicles*, OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, <https://www.energy.gov/eere/electricvehicles/reducing-pollution-electric-vehicles> (last visited Nov. 29, 2019).

¹⁰⁵ *Id.*

¹⁰⁶ Nathaniel Bullard & Colin McKerracher, *Opinion, Dispelling the Myths of China's EV Market*, BLOOMBERG (Feb. 8, 2019, 12:41 PM), <https://www.bloomberg.com/opinion/articles/2019-02-08/china-s-electric-vehicles-put-traditional-engines-on-notice> (data taken from China Association of Automotive Manufacturers).

low-carbon emission vehicles, like NEVs, over conventional vehicles, especially in big cities like Shanghai and Beijing.¹⁰⁷ In 2017, ten cities accounted for 55.1% of Chinese NEV purchases.¹⁰⁸

The NEV sector is growing rapidly in China, year over year.¹⁰⁹ In 2018, electric vehicles accounted for about seven percent of all new car purchases in China, which represented a 118% growth in the electric vehicle market since 2011.¹¹⁰ In the first quarter of 2019, more than 360,000 electric vehicles were purchased in China, sixty percent more than the same period in 2018.¹¹¹ However, NEV sales in China slowed later in 2019, with total annual sales reaching just over 1.2 million for the year.¹¹² In addition, China has become the largest producer of NEVs in the world.¹¹³ This is facilitated by China's position as a leading manufacturer of EV batteries, a key component of NEV

¹⁰⁷ Michael Standaert, *China Pushes EVs but Needs Local Governments to Follow Suit*, BLOOMBERG ENVIRONMENT (June 10, 2019, 11:48 AM), <https://news.bloombergenvironment.com/environment-and-energy/china-pushes-evs-but-needs-local-governments-to-follow-suit> (discussing a National Development and Reform Commission, Ministry of Environmental Protection, and Ministry of Commerce announcement made on June 6, 2019).

¹⁰⁸ Zhang Lianyi, "2017 China New Energy Passenger Car Report": *Half of the Market Is Harvested in the Top Ten Cities, and the Proportion of Pure Electric Vehicles Is High*, D1EV (Jan. 12, 2018, 6:45 AM), <https://www.d1ev.com/news/shichang/62730> (noting that Beijing and Shanghai ranked first and second).

¹⁰⁹ David Reid, *China's Electric Vehicle Sales Will Continue Boom Despite Subsidy Cuts*, FITCH SAYS, CNBC (Apr. 8, 2019, 7:12 AM), <https://www.cnbc.com/2019/04/08/fitch-says-chinese-electric-vehicle-sales-to-boom-despite-subsidy-cuts.html> (noting that electric car sales increased sixty-two percent in 2018, to 1.3 million vehicles).

¹¹⁰ Bullard & McKerracher, *supra* note 106 (stating that the rate at which China is purchasing new energy cars, and particularly EV cars, is growing exponentially).

¹¹¹ Standaert, *supra* note 107; cf. Jim Collins, *China's Electric Car Boom Is Already Running Out of Gas*, FORBES (June 14, 2019, 11:09 AM), <https://www.forbes.com/sites/jimcollins/2019/06/14/chinas-electric-car-boom-is-already-running-out-of-gas/#73b35f3ddcb5> (arguing that, however strong the market for NEV may be, it cannot overcome the generally weakening market for cars in China).

¹¹² Mark Kane, *Chinese NEV Market Slightly Declined in 2019: Full Report*, INSIDEEVS (Feb. 4, 2020, 6:04 AM), <https://insideevs.com/news/396291/chinese-nevs-market-slightly-declined-2019/> [<https://perma.cc/5NNY-BSAL>].

¹¹³ Paul Bledsoe, *America Is Losing the World's Biggest Manufacturing and Climate Race: Electric Vehicles*, FORBES (Apr. 8, 2019, 9:25 AM), <https://www.forbes.com/sites/paulbledsoe/2019/04/08/america-is-losing-the-worlds-biggest-manufacturing-and-climate-race-electric-vehicles/#8e17b2911e15> (discussing how China produces forty percent of the electric vehicles worldwide); Zheng Xin, *Inspired by New Policy, New Energy Vehicles on a Roll*, CHINA DAILY (Sept. 10, 2018, 9:59 AM), http://www.chinadaily.com.cn/cndy/2018-09/10/content_36882173.html.

technology. China holds sixty percent of the world market of lithium-ion battery production.¹¹⁴

The growth in the NEV industry has been driven by green tax policies. The Development Plan of Energy Saving and New Energy Automobile Industry (2012–2020), adopted in 2012, provided tax incentives and subsidies to encourage technological innovation in energy conservation and the development of NEVs.¹¹⁵ It also provided for the State Council and National Energy Administration to

conduct research on and improve tax policy system for automobiles. Enterprises engaged in the production of energy-saving and new-energy automobiles as well as key components may, upon being identified as having the qualifications for high-tech enterprise income tax concessions, be entitled to relevant preferential policies in accordance with the law. The income obtained by enterprises engaged in the production of energy-saving and new-energy automobiles as well as key components from technology development, transfer, and related consulting and service businesses may be entitled to business tax exemption policy subject to relevant regulations.¹¹⁶

To accelerate the deployment of NEVs, in 2014, the General Office of the State Council issued its Guiding Opinions on Accelerating the Popularization and Application of Alternative Fuel Vehicles (2014 Guiding Opinions).¹¹⁷ The 2014 Guiding Opinions provided a number of tax preferences and exemptions intended to accelerate the development of the NEV industry from research and development of the technology, manufacture, and then retail sale/purchase of the vehicles to consumers.¹¹⁸ These incentives included an exclusion from tax for the vehicle purchase tax (VPT) for pure electric, plug-

¹¹⁴ Julia Pyper, *China Poised to Dominate EV Battery Manufacturing*, GREENTECH MEDIA (May 2, 2019), <https://www.greentechmedia.com/squared/electric-avenue/china-poised-to-dominate-ev-battery-manufacturing>.

¹¹⁵ Development Plan for Energy-Saving and New Energy Automotive Industry (2012–2020) (promulgated by St. Council, Nat'l Energy Admin., June 28, 2012, effective June 28, 2012), art. V, § 2, 2012 GUO FA [2012] No. 22, *translated in* 2012 China Law LEXIS 2112 [hereinafter *Development Plan*].

¹¹⁶ *Id.*

¹¹⁷ Guiding Opinions of the General Office of the State Council Accelerating the Popularization and Application of Alternative Fuel Vehicles (promulgated by Gen. Office of St. Council, July 14, 2014, effective July 14, 2014), 2014 GUO BAN FA NO. 35, *translated in* 2014 China Law LEXIS 790, at 15 [hereinafter *Guiding Opinions*].

¹¹⁸ *See id.* art. 1, ¶¶ 1–2.

in (including add-on) hybrid electric, and fuel-cell vehicles purchased between September 1, 2014, and December 31, 2017.¹¹⁹ Further study of the vehicle and vessel tax (VVT) for energy-conserving vehicles and NEVs has been ordered.¹²⁰ In addition, the central government has ordered the regions to create open and competitive markets for alternative fuel vehicles and to eliminate barriers to entry by promulgating uniform standards for battery charging stations.¹²¹ The central government has adopted a vehicle excise tax policy to encourage the purchase of NEVs.¹²²

Many of the incentives for the purchase and manufacture of NEVs are scheduled to expire at the end of 2020.¹²³ However, unlike the incentives and subsidies provided for the development and adoption of PV energy, the expiration of these incentives is subject to phase outs and, in most cases, have been clearly announced well in advance.¹²⁴

1. Tax Incentives for NEVs

Ordinarily vehicle purchasers must pay the VAT, the VVT, the VPT, and an excise tax. The VAT applies to the purchase of most goods.¹²⁵ On the purchase of a vehicle, the VPT is imposed at a rate of ten percent of the purchase price, exclusive of the VAT.¹²⁶ The VVT is a fixed-rate tax imposed

¹¹⁹ *Id.* art. 5, ¶ 17.

¹²⁰ *Id.*

¹²¹ *Id.* arts. 5, ¶ 17; 6, ¶ 20.

¹²² *Id.* art. 5, ¶ 15.

¹²³ *See id.* (“The relevant departments shall lose no time in studying and finalizing the supporting fiscal policies for the popularization and application of alternative fuel vehicles from 2016 to 2020.”)

¹²⁴ Zeng Jinhua, *New Policy for New Energy Vehicle Financial Subsidies Introduced—Adhere to the “Support for Superiority” and Crack the “Subsidy Dependency.”* ECON. DAILY (Mar. 27, 2019, 7:30 AM), http://www.gov.cn/zhengce/2019-03/27/content_5377064.htm; *see also* Notice on Further Improving the Fiscal Subsidy Policies to Promote the Use of New-Energy Vehicles (promulgated by Ministry of Fin., Mar. 26, 2019, effective Mar. 26, 2019), CAI JIAN [2019] NO. 138, http://jjs.mof.gov.cn/zhengwuxinxi/zhengcefagui/201903/t20190326_3204190.html [hereinafter *Improving Subsidies*].

¹²⁵ *See* Richard Hoffman, *China’s VAT System*, BEIJING REV. (Aug. 3, 2009), http://www.bjreview.com.cn/business/txt/2009-08/03/content_210354.htm.

¹²⁶ Interim Regulations of the People’s Republic of China on Vehicle Purchase Tax (promulgated by St. Council, Oct. 22, 2000, effective Jan. 1, 2001), art. 5, 2000 ST. COUNCIL 294, *translated in* 2000 China Law LEXIS 3215, at 2 [hereinafter *Interim Regulations*].

on all vehicle purchases, based on the size of the vehicle.¹²⁷ Finally, the excise tax is levied on each vehicle sold based on vehicle cylinder capacity.¹²⁸ Although paid by the manufacturer, excise taxes are passed on to consumers.¹²⁹

Currently, there are tax incentives available with respect to each of the taxes to encourage the purchase and manufacture of NEVs. Three of these incentives encourage the purchase of NEVs, the fourth benefits NEV manufacturers. Purchasers of NEVs, which have significantly reduced CO₂ and greenhouse gas emissions, receive substantial tax benefits, making the cost of NEVs more competitive with the cost of conventional vehicles.

First, effective January 1, 2012, the VVT exempted zero-emission NEVs and reduced the tax to one-half the regular tax for low-carbon emission NEVs.¹³⁰ On July 1, 2019, the exemption from the VVT was extended through December 31, 2020.¹³¹

Second, beginning in September 2014, NEVs were exempted from the VPT,¹³² but this exemption is scheduled to expire at the end of 2020.¹³³ This

¹²⁷ The rates are RMB 60 to RMB 5,400 per vehicle depending on vehicle type, RMB 8 to RMB 180 per ton depending on vehicle type, RMB 16 to RMB 180 per ton for vessels, and RMB 600 to RMB 2000 per meter for yachts. *The Most Complete and Practical 2019 Latest VAT Rate Table*, STATE ADMIN. OF TAX'N, <http://www.chinatax.gov.cn/n810341/n2340339/c4180655/content.html>.

¹²⁸ See ALAN YAM & REX CHAN, PRICEWATERHOUSECOOPERS, GLOBAL AUTOMOTIVE TAX GUIDE 95, 96 (2014).

¹²⁹ *Interim Regulations*, *supra* note 126.

¹³⁰ Circular on Vehicle and Vessel Tax Policies on Energy-Saving or New Energy Vehicles and Vessels (promulgated by St. Admin. of Taxation, Mar. 6, 2012, effective Mar. 6, 2012), art. I, CAI SHUI [2012] No. 19, *translated in* 2012 China Law LEXIS 1848, at 1.

¹³¹ *China Continues Tax Exemptions on New Energy Vehicles Purchases*, STATE ADMIN. OF TAX'N (Jan. 7, 2019), <https://perma.cc/QR9K-GUKC>.

¹³² *China Continues Tax Exemptions on New Energy Vehicles Purchases*, STATE ADMIN. OF TAX'N (Jan. 7, 2019), <https://perma.cc/QR9K-GUKC>.

¹³³ Announcement of the Ministry of Finance, the State Administration of Taxation, the Ministry of Industry & Information Technology, and the Ministry of Science & Technology on the Exemption of Vehicle Purchase Tax on New Energy Automobiles (promulgated by the Ministry of Fin., the St. Admin. of Taxation, the Ministry of Indus. & Info. Tech., and the Ministry of Sci. & Tech., Dec. 26, 2017, effective Dec. 26, 2017), art. I, 2017 ANNOUNCEMENT OF MINISTRY OF FIN., STATE ADM. OF TAX'N, MINISTRY OF INDUS. & INFO., AND MINISTRY OF SCI. & TECH. 172, *translated in* 2017 China Law LEXIS 1204, at 1.

exemption reduces the cost of an NEV by ten percent, exclusive of the VAT.¹³⁴

Third, excise tax preferences are given to certain NEVs, lowering NEV prices.¹³⁵ The standard rates range from one percent to forty percent for conventional vehicles.¹³⁶ NEVs with no cylinder, including electric and fuel-cell vehicles, are not subject to the excise tax.¹³⁷ Like the exemption from the VPT and the VVT, the fact that a NEV is not subject to the excise tax significantly reduces the price, creating a significant competitive advantage, or at least eliminating some price disparities, over conventional vehicles.

In addition to the specific tax incentives adopted to encourage the sale/purchase of NEVs, NEV enterprises receive enterprise income tax preferences. They are entitled to the same additional fifty percent deduction for research and development costs as the solar energy industry, the increased amortization for research and development of intangibles, and a preferential fifteen percent rate if the business is recognized as a high-tech enterprise.¹³⁸ These tax incentives provide mechanisms for research and development of new technology without increasing the price to consumers of the new technologies.¹³⁹ These enterprise income tax preferences encourage investment in research and development of new manufacturing technology.

¹³⁴ See *Interim Regulations*, *supra* note 126, art. 5, translated in 2000 China Law LEXIS 3215, at 2.

¹³⁵ LORENZO RICCARDI, CHINESE TAX LAW AND INTERNATIONAL TREATIES 53–55 (2013).

¹³⁶ *Id.* (one-liter cylinder capacity vehicles are subject to a one percent tax, four liters and above are subject to a forty percent tax, and medium and light commercial buses are subject to the five percent tax rate regardless of cylinder capacity).

¹³⁷ Circular on Vehicle and Vessel Tax Preferential Policies for Energy-Saving Vehicles and New Energy Vehicles and Vessels (promulgated by the Ministry of Fin., the St. Admin. of Taxation, the Ministry of Indus. & Info. Tech., and the Ministry of Transp., July 10, 2018, effective July 10, 2018), CAI SHUI [2018] NO. 74, translated in 2018 China Law LEXIS 549; see also Provisional Regulations of the People's Republic of China on Excise Tax (promulgated by St. Council, Nov. 10, 2008, effective Nov. 10, 2008), Decree St. Council [2008] No. 539 (providing annex tax rate table).

¹³⁸ *China's PV Industry*, *supra* note 100; Edmond, *supra* note 82; *Pricing Policy*, *supra* note 94; *PV Power Generation*, *supra* note 96.

¹³⁹ *China's PV Industry*, *supra* note 100.

2. Subsidies for NEVs

Subsidies also have been used to stimulate NEV consumption by reducing prices, making them more competitive with conventional vehicles. The MOF regulates the subsidies.¹⁴⁰ Consumers pay the subsidized price for NEVs, and the central government then reimburses the manufacturer for the subsidy amount.¹⁴¹ In 2016, manufacturers received up to RMB 55,000 for all-electric cars, RMB 30,000 for plug-in hybrid cars, and RMB 200,000 per unit for fuel-cell cars.¹⁴² In 2017 and 2018, this was reduced by twenty percent from the 2016 level, and in 2019 and 2020 it was scheduled to be reduced forty percent from the 2016 level.¹⁴³ Although a reduction in the subsidies in 2019 was anticipated, on March 26, 2019, the MOF announced the subsidy was being reduced by fifty percent to more quickly reduce the industry's reliance on subsidies.¹⁴⁴ The subsidy is to be phased out entirely in 2020.¹⁴⁵

Local governments have also given subsidies for the growth of the NEV industry, but not in excess of half of the subsidies provided by the central

¹⁴⁰ Notice on the Promotion and Application of Financial Support Policies for New Energy Vehicles from 2016 to 2020 (promulgated by Ministry of Fin., Ministry of Sci. & Tech., Ministry of Indus. & Info. Tech., and Dev. & Reform Comm'n, Apr. 29, 2015, effective Apr. 29, 2015), CAI JIAN [2015] No. 134, http://jjs.mof.gov.cn/zhengwuxinxi/zhengcefagui/201504/t20150429_1224515.html.

¹⁴¹ See *China's Jan-Aug. NEV Production up 328%*, CHINA DAILY (Sept. 6, 2014, 6:09 PM), http://www.chinadaily.com.cn/business/motoring/2014-09/06/content_18559028.htm.

¹⁴² *China Announced 2019 Subsidies for New Energy Vehicles*, INT'L COUNCIL ON CLEAN TRANSP. (June 2019), https://theicct.org/sites/default/files/publications/ICCT_China_Nev_Subsidy_20190618.pdf. Large subsidies were also given for NEV buses and heavy vehicles. *Id.*

¹⁴³ See *id.*

¹⁴⁴ *China Cuts Electric-Car Subsidies, Shares of Top EV Makers Drop*, BLOOMBERG (Mar. 26, 2019, 8:31 AM), <https://www.bloomberg.com/news/articles/2019-03-26/china-scales-back-subsidies-for-electric-cars-to-spur-innovation> (maximum subsidy limited to RMB 25,000).

¹⁴⁵ *Improving Subsidies*, *supra* note 124.

government.¹⁴⁶ And local governments are urged to eliminate their subsidies for NEVs entirely.¹⁴⁷

The reason given by the Chinese government to reduce subsidies was to address concerns that the NEV industry was not innovating sufficiently and was instead relying too heavily on the government subsidies.¹⁴⁸ The concerns mirror those raised in the solar energy area, but the action was neither unexpected nor unannounced.

3. Evaluation of the Green Policies for the NEV Industry

The green tax policies adopted to incentivize the NEV industry are more market driven than those adopted with respect to the PV energy industry. NEV subsidies have been more focused on driving consumer behavior and developing innovative products. They have also encouraged consumers to purchase NEVs in increasing numbers.

China faces two problems as its wealth grows. The size of its driving population is also growing. China's carbon emissions and traffic congestion have resulted in significant restrictions on the issuance of vehicle licenses and registrations. Vehicle ownership is a status symbol. Tax and economic subsidies are strong incentives to purchase NEVs, but may not be sufficient to create the same status associated with certain similarly priced, conventional-fuel vehicles. However, consumers who are able to purchase a car, and then are able to drive it, will achieve a greater status than consumers who are unable to obtain permission to drive a car, whatever is purchased. However, green tax incentives and subsidies, coupled with vehicle licensing and registration permission, may be sufficient to change consumer decisions, and, in turn, manufacturing behavior. Recognizing this, the central government has called for local and provincial governments to lift traffic and

¹⁴⁶ Notice on Adjusting the Financial Subsidy Policy for the Promotion and Application of New Energy Vehicles (promulgated by the Ministry of Fin., Ministry of Indus. & Info. Tech., and Dev. & Reform Comm'n, Dec. 29, 2016, effective Jan. 1, 2017), art. I, § 2, CAI JIAN [2016] NO. 958, <http://www.miit.gov.cn/n1146295/n1652858/n165293>; see also Circular of the General Office of the Shanghai Municipal People's Government on Forwarding the Interim Measures of Shanghai Municipality for Encouraging the Purchase and Use of New Energy Vehicles (promulgated by Gen. Office of the Shanghai Mun. People's Gov't, Mar. 4, 2016, effective Mar. 4, 2016), HU FU BAN FA [2016] NO. 7.

¹⁴⁷ *Improving Subsidies*, supra note 124.

¹⁴⁸ *China Cuts Electric-Car Subsidies*, supra note 144.

registration restrictions on NEVs in an effort to encourage the purchase of NEVs.¹⁴⁹

Although the NEV incentives are not permanent, the government has been transparent in its signaling to the market its planned phaseouts and intended termination of the incentives.¹⁵⁰ When the central government adjusted its schedule for phasing out the incentives, it was a matter of degree, not an unanticipated withdrawal of support.¹⁵¹ Moreover, as discussed earlier, the reason for the cut was to address concerns that the NEV industry was not innovating sufficiently and was instead relying too heavily on the government incentives.¹⁵² These steps should help the industry to avoid the pitfalls that the PV industry has encountered, allowing the NEV industry to mature into a market-based industry.

III. U.S. GREEN TAX POLICIES AND THE “GREEN NEW DEAL” RESOLUTION

There is a widely held belief in the United States that radical steps are necessary to make substantial gains to reduce CO₂ and other greenhouse gas emissions that are causing global warming. Although many steps have been taken to accomplish this goal, there is still a long way to go. The current U.S. administration is very resistant to addressing climate change science and has rolled back many earlier efforts to reduce CO₂ and greenhouse gas emissions.¹⁵³ Earlier efforts decreased CO₂ emissions from 5.9 billion metric

¹⁴⁹ See also Circular of the General Office of the Shanghai Municipal People’s Government on Forwarding the Interim Measures of Shanghai Municipality for Encouraging the Purchase and Use of New Energy Vehicles, *supra* note 146 (providing special limits on the number of vehicle licenses, priority for special operating limits, and preferences and special traffic conveniences); *China Continues Tax Exemptions on New Energy Vehicles Purchases*, ST. ADMIN. OF TAX’N (July 1, 2019), <https://perma.cc/QR9K-GUKC>; see also Standaert, *supra* note 107 (“For a lot of consumers, [license plate registration] is often the first restraint, even before the price, even before the driver’s license.” quoting Thibaud Andre, research manager at Daxue Consulting) (additionally noting that traffic restrictions often limit the days on which odd or even plates can drive during peak hours or during high pollution times).

¹⁵⁰ *Improving Subsidies*, *supra* note 124.

¹⁵¹ *Id.*

¹⁵² *China Cuts Electric-Car Subsidies*, *supra* note 144.

¹⁵³ STATE ENERGY & ENVTL. IMPACT CTR., NYU SCH. OF LAW, CLIMATE & HEALTH SHOWDOWN IN THE COURTS: STATE ATTORNEYS GENERAL PREPARE TO FIGHT 2 (2019); Livia Albeck-Ripka & Kendra Pierre-Louis, *Environmental Laws Under Siege. Here’s Why We Have Them*, SEATTLE TIMES (Apr. 27, 2018, 5:10 PM), <https://www.seattletimes.com/nation-world/environmental-laws-under-siege->

tons in 2008 to approximately 5.4 billion metric tons in 2018.¹⁵⁴ However, recent rollbacks in emission standards and the opening of oil drilling fields previously unavailable put the gains in remediating environmental harm at significant risk.¹⁵⁵

On February 7, 2019, Representative Alexandria Ocasio-Cortez introduced House Resolution 109, Recognizing the Duty of the Federal Government to Create a Green New Deal.¹⁵⁶ This resolution called on Congress to commit to achieving net-zero carbon emissions, creating millions of high-wage jobs, investing in infrastructure, and other goals through fair, just, and sustainable measures within ten years.¹⁵⁷

Despite the ignominious treatment of the Green New Deal in Congress, climate change is a matter of national concern as has been demonstrated by decades of legislation and policy devoted to developing clean energy and limiting human-caused damage to the environment. However, its reception was likely inevitable given its ambitious and perhaps unrealistic goals.¹⁵⁸

heres-why-we-have-them/<https://www.seattletimes.com/nation-world/environmental-laws-under-siege-heres-why-we-have-them/>; Nadja Popovich et al., *85 Environmental Rules Being Rolled Back Under Trump*, N.Y. TIMES (Sept. 12, 2019), <https://www.nytimes.com/interactive/2019/climate/trump-environment-rollbacks.html>; *Environmental Protections on the Chopping Block*, ENVTL. INTEGRITY PROJECT, <http://www.environmentalintegrity.org/trump-watch-epa/regulatory-rollbacks/> (last visited Dec. 4, 2019).

¹⁵⁴ T. Wang, Global CO₂ Emissions by Select Country 2008–2018, STATISTA (Dec. 4, 2019), <https://www.statista.com/statistics/270499/co2-emissions-in-selected-countries>.

¹⁵⁵ Zeke Hausfather, *Analysis: How Trump's Rollback of Vehicle Fuel Standards Would Increase US Emissions*, CARBON BRIEF (July 10, 2019, 4:22 PM), <https://www.carbonbrief.org/analysis-how-trumps-rollback-of-vehicle-fuel-standards-would-increase-us-emissions>; see, e.g., Ellen Knickmeyer & Cathy Bussewitz, *EPA Moves to Revoke Rules on Oil Industry Methane Leaks*, SEATTLE TIMES (Aug. 29, 2019, 4:32 AM), <https://www.seattletimes.com/business/new-rollback-for-climate-changing-releases-from-oilfields/>.

¹⁵⁶ H.R. Res. 109, 116th Cong. (2019).

¹⁵⁷ *Id.* The House Resolution was referred to the House Subcommittee on Energy and Mineral Resources on February 12, 2019. See *id.* Senate Majority Leader Mitch McConnell brought the Green New Deal to the Senate floor on a cloture motion that garnered a vote of fifty-seven nays and no ayes, with forty-three senators voting “present,” effectively rendering the resolution dead on arrival. 165 CONG. REC. S1971 (2019).

¹⁵⁸ Press Release, Senator Angus King, King Statement on Green New Deal Resolution (Mar. 26, 2019), <https://www.king.senate.gov/newsroom/press-releases/king-statement-on-green-new-deal-resolution>; see James Temple, *Let's Keep the Green New Deal Grounded in Science*, MIT TECH. REV.

China's experiences may teach that goals must be realistic, market-based, and timed to coincide with reasonable expectations of growth and development to succeed. In its past green tax incentives, the United States has taken a much more measured approach than the Green New Deal would adopt.¹⁵⁹

Like China, the United States has provided tax incentives for PV installations and NEV purchases.¹⁶⁰ Solar installation tax credits have been available in the United States since 2006.¹⁶¹ In that time, the solar industry has grown by 10,000%, and solar installation has averaged fifty-two percent annual growth.¹⁶² The cost of solar panels has dropped seventy percent in the last ten years.¹⁶³ The United States currently allows a tax credit equal to thirty percent of the cost of installation of qualified solar electric property, solar water heating property, small wind energy property, geothermal heat pump property, and fuel cell property.¹⁶⁴ This is a substantial incentive for residential and business property owners, which is scheduled to begin phasing out in 2019 and expire in 2023.¹⁶⁵ In addition, to encourage building of PV (and other clean energy) generation facilities, the federal income tax provides qualified producers a tax credit of \$0.015/kwh produced for ten

(Jan. 18, 2019), <https://www.technologyreview.com/s/612780/lets-keep-the-green-new-deal-grounded-in-science/>.

¹⁵⁹ See Brentin Mock, *How Can the Green New Deal Deliver Environmental Justice?*, CITYLAB (Feb. 12, 2019), <https://www.citylab.com/environment/2019/02/green-new-deal-climate-change-environmental-justice/582406/> (discussing past U.S. green strategies and the Green New Deal's proposed changes).

¹⁶⁰ Because of the more dispersed nature of the U.S. tax system, we only discuss federal tax issues. However, we do note that there are many state and local tax incentives and subsidies available for the use of green energy and consumption. See, e.g., *Drive Clean Rebate for Electric Cars*, N.Y. STATE, <https://www.nyserda.ny.gov/All-Programs/Programs/Drive-Clean-Rebate/How-it-Works> (last visited Mar. 6, 2020) (discussing tax rebates available to New York residents on the purchase of an electric vehicle).

¹⁶¹ Solar Energy Indus. Ass'n, *Solar Investment Tax Credit (ITC)* (2019), <https://www.seia.org/sites/default/files/2019-07/SEIA-ITC-Factsheet-2019-July.pdf>.

¹⁶² *Id.*

¹⁶³ Solar Energy Indus. Ass'n, *Solar Energy Research Data: Solar Industry Growing at a Record Pace* (2019), <https://www.seia.org/solar-industry-research-data>.

¹⁶⁴ I.R.C. §§ 25D(a) (individuals), 48(a) (businesses).

¹⁶⁵ *Id.* §§ 25D(g), 48(a)(6).

years from the date the facility is placed in service.¹⁶⁶ These credits are reduced by the amount of grants, tax-exempt bonds, subsidized energy financing and other credits.¹⁶⁷

The U.S. consumer incentives available for NEVs are much more limited. Beginning in 2009, purchasers of qualified plug-in electric vehicles were permitted a tax credit of between \$2,500 and \$7,500.¹⁶⁸ The credit is limited to 200,000 vehicles per manufacturer before it begins to phase out. In the second calendar quarter following the calendar quarter in which the phaseout limit is reached, the credit is reduced to fifty percent for the next two quarters, and then it is reduced to twenty-five percent for the third and fourth quarters.¹⁶⁹ The tax credit is then eliminated.

Research tax credits may be available to help companies that develop new technologies, including products and technologies that produce a cleaner, greener environment.¹⁷⁰ Although versions of this credit have been available for decades, in 2015, the Protecting Americans from Tax Hikes (PATH) Act made the twenty percent research and development credit permanent.¹⁷¹ More important, in making this credit permanent, Congress made it easier for startups and small and medium-sized businesses to take advantage of this credit.¹⁷² This credit is not limited to specific industries or products, but rather is available to businesses that develop new technology, even if the improvements and developments are incremental.¹⁷³

These incentives have led to innovations in clean energy, NEVs, and other clean consumption. These incentives have also been coupled with other

¹⁶⁶ *Id.* § 45(a). Qualified production facilities are those that sell energy to unrelated parties and do not qualify for the thirty percent energy credit. *Id.*

¹⁶⁷ *Id.* § 45(b)(3).

¹⁶⁸ Emergency Economic Stabilization Act of 2008, Pub. L. No. 110-343, § 205, 122 Stat. 3765, 3835 (codified at I.R.C. § 30D).

¹⁶⁹ I.R.C. § 30D(e).

¹⁷⁰ I.R.C. § 41(a).

¹⁷¹ Consolidated Appropriations Act, Pub. L. No. 114-114, § 121(a), 129 Stat. 2242, 3049 (2016).

¹⁷² *Id.* § 121(b)–(c), 129 Stat. at 3049.

¹⁷³ U.S. DEP'T OF TREASURY, RESEARCH AND EXPERIMENTATION (R&E) CREDIT 1–2 (2016), <https://www.treasury.gov/resource-center/tax-policy/tax-analysis/Documents/RE-Credit.pdf>; see also GARY GUENTHER, CONG. RESEARCH SERV., RL31181, RESEARCH TAX CREDIT: CURRENT LAW AND POLICY ISSUES FOR THE 114TH CONGRESS, at 4 (2015).

federal and state policies. However, these policies, like the Chinese green policies, have suffered from the fault of being temporary or limited in scope. Recent rollbacks in environmental protection regulations will further reduce the possibility of eliminating greenhouse gas emissions. The United States should observe the lessons of China and other countries as it moves forward to reduce its emissions.

IV. EXPERIENCES AND LESSONS FROM CHINESE TAX POLICIES ON GREEN CONSUMPTION

Over the last decade China has rededicated itself to improving its environment by fostering clean technologies. One mechanism it has used is green tax policies. However, the central government has not relied entirely on tax policy and subsidies. To support new energy industries, it has ensured that manufacturers have adequate land and infrastructure, and the necessary resources. The government has also made clear to businesses within related industries that support is dependent on developing new energy technology and reduction of greenhouse emissions.¹⁷⁴

The green policies with respect to PV energy and NEVs provide many lessons for China and other countries trying to reduce greenhouse gas emissions. Although the green tax policies adopted with respect to both industries have aspects designed to encourage consumer participation, the tax incentives directed toward the PV energy industry have been poorly designed to ensure the long-term health of the industry, have not fully considered the future innovation of the technology, and have not focused on the need to efficiently expand the market. The central government has coordinated its green tax policy for NEVs with its other policies to ensure that the industry is not hampered in its development by better communicating its expectations and the limitations of its support. Thus, the NEV incentives have demonstrated concern with innovation and the effective development of the market.

As a result of generous incentives, China is the largest PV panel manufacturer in world.¹⁷⁵ However, the PV energy incentives have provided greater benefits to supply-side inputs, which has encouraged investment over

¹⁷⁴ *Development Plan*, *supra* note 115.

¹⁷⁵ Fialka, *supra* note 79.

demand. This has resulted in low value-added research, redundant construction, and subsidy-dependent development. There is now overproduction of solar panels and curtailment of PV energy. Although producers have profited from many projects, consumers have received little in long-term benefits. The Chinese tax incentive policies for the PV energy industry have failed because they have neglected to take account of market power.

The NEV incentives have been more successful because they are market driven. To support the NEV industry, the government has not only adopted good tax policy, but it has worked to coordinate other relevant policy areas to implement this and its other green tax policies. It has also adopted tax policies that have appropriately integrated market power. This is a more successful use of tax policy to successfully develop a market; the NEV incentives have successfully increased production and encouraged demand.

Neither of these green tax policies are permanent.¹⁷⁶ Because it is not possible for a government to pay for green consumption indefinitely, both sets of programs must end at some point.

Based on the state of the Chinese PV industries, it is clear that many investors and consumers of Chinese PV energy have engaged in speculative behavior. The recently announced termination of the tax incentives and subsidies show that the policies have not resulted in good long-term business models. Chinese PV manufacturers are struggling in the global market and PV energy generators are being left to their own devices in a market that will not support their outsized costs. Thus, the results of China's PV tax policies are mixed. They have led to rapid growth, which has not been entirely efficient.

Although the NEV tax policies are also temporary, they have been enacted in a forward-looking manner, containing phaseouts that allow manufacturers and consumers to plan and make rational decisions with clear expectations. The NEV policies have been designed to allow both industry and consumers to clearly understand the timing of future reductions in subsidies and tax preferences.

If properly designed, the investment of government resources in the form of tax incentives can result in innovation of zero-emission and low-

¹⁷⁶ *Improving Subsidies*, *supra* note 124.

emission processes and products, consumer demand for such products, and, as a result, the manufacture of these products in a seamless manner at the lowest cost to the government. Incentives that encourage innovation may make products more desirable and reliable. Purchase subsidies and tax preferences may be used to make pricing more competitive. The NEV incentives have been successful with respect to the manufacture and purchase of NEVs, but have not been as successful with respect to innovation. The PV incentives have been successful with respect to the manufacture of solar panels and the generation of solar panels, but have not been successful with respect to developing independence from the incentives. Thus, these green tax incentives could both be improved.

V. CONCLUSION

Government policy reflects the values of our society. If the government does not have the resolve to engage in green development, greening the country and society will be very difficult, and a zero-greenhouse-gas-emission goal will not be possible. The government's ability to mobilize industry and consumers plays an important role in the implementation of green policies. In the early stages of a green industry, more subsidies and tax incentives may be necessary to spur investment and consumption, because the new industry may be more costly than the older technology as a result of the need for new research, technology, and equipment. However, the industry must also become competitive and self-sustaining.

The ultimate aim is to create a sustainable green-consumption lifestyle. This requires the development of industries that can exist and will evolve without continuing tax incentives and subsidies. Market-driven approaches more effectively accomplish these goals, but such green tax policies are more difficult to design and implement because it is more carefully targeted.

Governments play an important role in green development. China's experience with the PV and NEV industries demonstrates that for green tax policy to effectively spur green behavior, the policy must be market-driven and forward thinking. The goals of a green tax must be realistic and must signal to the market both its goals and its timing. The continuation or cancelation of green tax policy must be thoughtful and forward thinking. Changes must be clearly signaled to the market and eliminations made pursuant to a phaseout, as is being accomplished with the VPT. This will allow consumers and manufacturers to plan for the withdrawal of support.

An effective clean energy policy must balance both consumption and investment. A policy intended solely to promote investment may result in unsustainable development. Moreover, stability and predictability are key components to encouraging green behavior. Short-term and temporary policies will not stimulate confident investment decisions. Long-term planning, with transparency to the market regarding the timing of government withdrawal of incentives would allow businesses and consumers to plan their investments with confidence, creating an expectation that future green projects will also be successful. To the extent that temporary policies are going to be used to develop green industries the PV energy and NEV incentives in both China and the United States demonstrate that planning is the key to success.

The Green New Deal as described is an outstanding aspiration, but to achieve such an ambitious goal, careful attention to the structure of the underlying law and policy is essential, especially if sustainable industries and job growth are to be accomplished.