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China's Renewable Energy Law: A Platform for Green Leadership?

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CHINA'S RENEWABLE ENERGY LAW: A PLATFORM FOR GREEN LEADERSHIP?

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> *We know the country that harnesses the power of clean, renewable energy will lead the 21st century. And yet, it is China that has launched the largest effort in history to make their economy energy-efficient.*[1]

> *China may soon be simultaneously the greenest and the blackest place on earth. The country is poised to be at once the world's leader in alternative energy—and its leading emitter of* CO_2.[2]

INTRODUCTION

China is making large investments in solar and wind power technology as a cornerstone of its climate change policy. It has shown that it can build solar and wind energy farms in a hurry and has exceeded the targets announced in recent years for new capacity. If it met the even more audacious goals it has announced for 2020 and beyond, it would be a world leader in renewable energy. China has extensive regions where

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[1] Address Before a Joint Session of the Congress on the State of the Union, 2009 DAILY COMP. PRES. DOC. 105 (Feb. 24, 2009).

[2] Christina Larson, *The Great Paradox of China: Green Energy and Black Skies*, YALE ENV'T 360 (Aug. 17, 2009), http://e360.yale.edu/content/feature.msp?id=2180.

solar[3] and wind[4] could generate electricity at low costs. A 2009 study by researchers from Harvard and Tsinghua universities concluded that wind power could accommodate all of the increased demand for electricity projected for 2030 in China.[5] As Secretary of Energy Steven Chu testified before the Senate in 2009, "China has already made its choice. China is spending about $9 billion a month on clean energy."[6] In 2008, the Chinese government invested 3.8 billion RMB (approximately $560 million) in green technology, representing an annual growth of over twenty percent.[7] By 2009, China overtook the United States in annual spending on renewables, although it still remained behind in terms of total installed capacity.[8] Chinese firms are both greentech makers and overseas investors.[9] In 2009,

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[3] ALEXANDRA KRAVETZ, GREEN CROSS INT'L, 2008 GLOBAL SOLAR REPORT CARDS 32 (2008), *available at* http://www.globalgreen.org/docs/publication-96-1.pdf (last visited Oct. 19, 2010) ("An estimated 2/3rds of the country receives solar radiation in excess of 4.6 kWh/m2/day. China's annual solar power potential has been estimated to be 19,536,000 TWh. Capturing 1% of this resource, and utilizing it with 15% efficiency, could supply as much electricity as the whole world currently consumes in 18 months.") (quoting WORLD ENERGY COUNCIL, 2007 SURVEY OF ENERGY RESOURCES 402 (2007)).

[4] Peter Fairley, *China's Potent Wind Potential*, TECH. REV. (Sept. 14, 2009), http://www.technologyreview.com/energy/23460/page1 ("[There are] extensive regions where [wind power] can be generated at costs similar to the government-set energy rates earned by established wind farms, which range from 0.38 to 0.55 Chinese yuan (6 cents to 8 cents) per kilowatt-hour (kWh).").

[5] Michael B. McElroy et al., *Potential for Wind-Generated Electricity in China*, 325 SCIENCE 1378, 1379 (2009); Fairley, *supra* note 4 (discussing the study and noting that "wind-farm operators could profitably generate 6.96 trillion kWh of wind energy—more than double China's annual power consumption of 3.4 trillion kWh and comparable to the projected total demand by 2030"); a recent comprehensive GIS analysis of wind power's potential for China confirms this result, yielding an astonishing total of 13,227 GW of possible generation. ENERGY FOUNDATION, CHINA SUSTAINABLE ENERGY PROGRAM, WIND GIS ANALYSIS FOR CHINA 6 (2009), *available at* http://www.efchina.org/FReports.do?act=detail&id=277.

[6] *Clean Energy Jobs and American Power Act: Hearing on S. 1733 Before the S. Comm. on Env't and Pub. Works*, 111th Congress (2009) (statement of Steven Chu, Secretary of Energy).

[7] *New Energy Industry Highlight of Post-Crisis Economy*, ENERGY CHINA FORUM (Oct. 30, 2009), http://energychinaforum.com/news/27651.shtml. Chinese currency is called Renminbi ("RMB"). *See General Information of Chinese Currency RMB*, CHINA TODAY, http://www.chinatoday.com/fin/mon (last visited Oct. 19, 2010).

[8] Simon Rogers, *How China Overtook the US in Renewable Energy*, GUARDIAN.CO.UK (Mar. 25, 2010), http://www.guardian.co.uk/news/datablog/2010/mar/25/china-renewable-energy-pew-research (table showing that China spent $34.6 billion to the United States' $18.6 billion in 2009).

[9] *Wind Investment in Texas Shows China's Clout in Field*, ENERGY CHINA FORUM (Nov. 2, 2009), http://www.energychinaforum.com/news/27703.shtml [*hereinafter Wind Investment*

the China-based Shenyang Power Group announced a $1.5 billion joint venture to develop a 36,000-acre wind farm in Texas with the U.S. Renewable Energy Group and Austin-based Cielo Wind Power.[10]

To the casual observer, it must seem that China is leaping far ahead of the rest of the world in deploying green technology, and hardly a week goes by without some American alluding to a new greentech "arms race" with the Chinese.[11] No less a towering environmental figure in the United States than Robert F. Kennedy, Jr. has stated, "the Chinese are treating the energy technology competition as if it were an arms race."[12] At times, this commentary is meant to prod policymakers in the United States to move more quickly to promote renewables than we have done in recent years.[13] We have struggled for nearly a decade to develop one offshore wind farm, which, ironically, Kennedy himself opposed.[14] It is easy to contrast our laggardly pace with that of China, which has come so far in a short time. At other times, however, the rhetoric about China and greentech seems as simplistic and overheated as the pervasive claims in the 1980s that Japan was going to dominate the world's manufacturing sector.[15] We know how (not so) well that prediction turned out.[16]

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in Texas]; Robert F. Kennedy, Jr., *The New Arms Race*, HUFFINGTON POST (Nov. 19, 2009), http://huffingtonpost.com/robert-f-kennedy-jr/the-new-arms-race_b_364211.html ("China's investments in solar technology have so powerfully stimulated the growth of a Chinese solar market that Chinese solar panel manufacturers now far outnumber American ones . . . .").

[10] *Wind Investment in Texas*, *supra* note 9. *See infra* notes 372-75 and accompanying text (discussing criticism of this project in the United States).

[11] *See, e.g.*, Bruce Usher, *Red China, Green China*, N.Y. TIMES, May 6, 2010, at A27, *available at* http://www.nytimes.com/2010/05/07/opinion/07Usher.html (observing that "[b]y giving China more time to develop its capacity while neglecting our own, America is not just losing the clean-tech race, it's forfeiting it").

[12] Kennedy, Jr., *supra* note 9.

[13] *Id.* ("We can only prevail with robust investment in and support of U.S.-based greentech innovation.").

[14] Dan Honan, *Robert F. Kennedy Jr Stands Firm in His Opposition to Cape Wind*, NANTUCKET INSIDER BLOG (May 12, 2010), http://plumtv.com/blogs/nantucket-insider/robert-f-kennedy-jr-stands-firm-in-his-opposition-to-cape-wind.

[15] *See, e.g.*, Keith Bradsher, *China Leading Global Race to Make Clean Energy*, N.Y. TIMES, Jan. 30, 2010, at A1, *available at* http://www.nytimes.com/2010/01/31/business/energy-environment/31renew.html ("[China's] efforts to dominate renewable energy technologies raise the prospect that the West may someday trade its dependence on oil from the Mideast for a reliance on solar panels, wind turbines and other gear manufactured in China.").

[16] Both the overheated rhetoric about Japanese prowess and the subsequent economic troubles that undercut it are chronicled ably in RICHARD KATZ, JAPAN: THE SYSTEM THAT SOURED: THE RISE AND FALL OF THE JAPANESE ECONOMIC MIRACLE (1998). For example,

As this rhetoric suggests, much of what passes for analysis on China's push to develop renewables is short-sighted and reductionist. This should surprise no one who is familiar with one of the world's least open societies. China's national government features a dense bureaucracy with redundant and overlapping agencies that are perpetually reshuffled in complex reorganizations.[17] The Chinese Communist Party controls the central government, and its closed nature makes it hard for the outside observer to evaluate governmental actions.[18] Add in a lack of documents translated into English, and a fair amount of guesswork becomes required just to discern what is taking place. A perennial problem is government vaporware.[19] Announcements often omit important details about how laws and programs will be implemented[20] or promise programs and initiatives that are delayed or never see the light of day.[21]

It is exceedingly tempting to descend into stereotyping about a monolithic "Red Menace" aiming to dominate the world's economy. Of course, some do see China's growth in renewables as a threat.[22] Many Western commentators focus on the growth of China's greentech manufacturing sector and its potential impact on trade.[23] Protectionism in China's domestic greentech industries is a continuing concern, and, as I discuss below, it has led to claims, as most prominently made in a recent investigation commenced by the United States Trade Representative ("USTR"), that multinational companies face obstacles to cracking the Chinese market.[24] Some Western observers also see Chinese firms as competition at

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refer to excerpts from Chapter One. *Id.* at ch. 1, *available at* http://www.businessweek.com/chapter/katz.htm.

[17] *See infra* notes 127–39 and accompanying text.

[18] *See infra* notes 109–21 and accompanying text.

[19] *See infra* notes 306–08 and accompanying text.

[20] *See, e.g.*, *infra* note 198 and accompanying text (discussing the national fund for renewable energy R&D); *infra* notes 228–33 and accompanying text (discussing the Golden Sun solar subsidy program).

[21] One of many examples of this is the announcement of a solar feed-in tariff in 2009, which as of mid-2010 was not forthcoming. *See infra* notes 306–08 and accompanying text.

[22] *See, e.g.*, Thomas L. Friedman, *The New Sputnik*, N.Y. TIMES, Sept. 27, 2009, at WK 12, *available at* http://www.nytimes.com/2009/09/27/opinion/27friedman.html.

[23] *See, e.g.*, Christina Larson, *Are America's Fears of a Greentech Race with China Unfounded?*, GREEN ECON. POST (Feb. 22, 2010), http://greeneconomypost.com/us-greentech-race-with-china-8167.htm [hereinafter Larson, *Fears of a Greentech Race*] (stating that "[t]he first essential fact to be aware of is that most news stories about China's greentech gains are about manufacturing").

[24] Press Release, Office of the United States Trade Representative, Executive Office of the President, United States Launches Section 301 Investigation into China's Policies

home, focusing on potential imports of Chinese technology into the United States at the expense of domestic companies and the economy.[25] This important subject is worth a full treatment in its own right, as it is inextricably bound up in a much broader discussion about multilateral trade relations. I will touch upon it briefly in this article.

For now, it is worth noting that growth in China's renewable power sector need not be viewed as a zero-sum game. Precisely the opposite may well be true. Chinese and Western companies have begun to collaborate in ways that might lead to explosive and sustained growth in both nations' greentech industries,[26] which shows that the realities of the economic relationship between the United States and China are much more complex than they are often made out to be. Similarly, I contend in this article that continued expansion of renewable energy in China is complex because it faces substantial technical and legal challenges similar in some respects to those faced in the United States. I will embark on an in-depth analysis of those challenges, set against the legal, political, and financial environment for renewable energy deployment in China.

Beginning with China's governmental structure, I note that its unique characteristics pose special challenges for increasing the deployment of renewable energy. There are some similarities with renewable energy laws and policies elsewhere. China has legal mechanisms comparable to those of the United States and Europe to encourage renewable

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Affecting Trade and Investment in Green Technologies (Oct. 15, 2010) *available at* http://www.ustr.gov/node/6223 [hereinafter United States Trade Representative].

[25] *See infra* notes 375–76 and accompanying text (discussing objections to the joint venture wind power project proposed in Texas).

[26] Larson, *Fears of a Greentech Race*, *supra* note 23 (quoting Shanghai-based American entrepreneur Richard Brubaker's statement that "[t]he clean-tech war is overblown from the start" and observing that "the green-tech 'race' is not one that one side wins and the other loses, but a scenario where partnerships are sought out and the final equation doesn't have to be a zero-sum game"); *see also Joined at the Hip: The US-China Clean Energy Relationship*, COMMODITIES NOW (May 19, 2010), http://www.commodities-now.com/news/environmental-markets/2782-joined-at-the-hip-us-china-clean-energy-relationship.html (comments of Michael Liebreich, CEO of Bloomberg New Energy Finance):

> It is easy to paint clean energy trade between the US and China in terms of winners and losers, but the relationship defies simplistic assumptions[.] For instance, while China has made significant inroads into the US photovoltaic market, Chinese modules are often manufactured using machines designed by US firms. Similarly, US made wind turbines almost always contain parts sourced from China. The two nations may be in competition, but the big win for both of them would be to drive the cost of a clean power generation below the cost of fossil fuels.

energy, including a strong Renewable Energy Law,[27] government plans,[28] regulations,[29] and aggressive mandates.[30] As with much about modern China, however, one must look beyond tough, apparently rigid words on paper to see a process that appears much more like ongoing policy experimentation. In particular, several recent reorganizations of governmental bodies responsible for energy policy-making have failed to create a streamlined structure of decision-making authority.[31] The top-down nature of China's communist government also creates ongoing difficulties in translating national commands into action in China's provinces.[32]

Substantial technical and financial challenges also lie ahead. China is increasing its deployment of solar and wind power but must do more to connect new plants to the electricity grid and must upgrade its transmission infrastructure to handle the increased load from both conventional fossil-fuel plants and new renewable generation.[33] While the Renewable Energy Law requires that China's grid companies purchase power from renewable power generators, the available evidence suggests that there has been some resistance to this mandate.[34] Recent amendments to the Renewable Energy Law create a stronger purchase obligation and may lessen this problem.[35] The pricing structure for purchased power has been inconsistent, leading to criticism from China's renewable power industry.[36]

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[27] Renewable Energy Law of the People's Republic of China (promulgated by the Standing Comm. Nat'l Peoples Cong., Feb. 28, 2005, effective Jan. 1, 2006), ST. COUNCIL GAZ. Issue 11, Serial No. 1154 (China), *translated at* http://www.ccchina.gov.cn/en/NewsInfo.asp?NewsId=5371 [hereinafter REL 2006], amended by Decision of the Standing Committee of the National People's Congress on Amending the Law of the People's Republic of China on Renewable Energy (promulgated by the Standing Comm. Nat'l People's Cong., Dec. 26, 2009, effective Apr. 1, 2010), 2009 China Law LEXIS 671 (China) [hereinafter Amended REL 2009].

[28] China's Energy Conditions and Policies (promulgated by the Information Office of the St. Council, Dec. 26, 2007, effective Dec. 26, 2007), *available at* http://en.ndrc.gov.cn/policyrelease/P020071227502260511798.pdf (China).

[29] *See* Amended REL 2009, *supra* note 27; *see also* REL 2006, *supra* note 27.

[30] *See* Amended REL 2009, *supra* note 27.

[31] *See* Michael Meidan et al., *Shaping China's Energy Policy: Actors and Processes*, 18 J. CONTEMP. CHINA 591, 592–607 (2009).

[32] *See, e.g.*, Srini Sitaraman, *Regulating the Belching Dragon: Rule of Law, Politics of Enforcement, and Pollution Prevention in Post-Mao Industrial China*, 18 COLO. J. INT'L ENVT. L. & POL'Y 267, 309–11 (2007).

[33] *See* Jing Yang, *China's Wind Farms Come with a Catch: Coal Plants*, WALL ST. J., Sept. 28, 2009, at A17; *see also* Larson, *supra* note 2.

[34] Sitaraman, *supra* note 32, at 309–11.

[35] *See* Amended REL 2009, *supra* note 27.

[36] *See infra* Part VI.B.

Here too, through a process of policy experimentation, China may create a more stable investment climate for the industry.

Will China become the world's leader in renewable power generation? That remains to be seen.

I. RENEWABLES AS A "GREEN" TO CHINA'S "BLACK"

As the quote that begins this article observes, China's environmental problems are severe and growing.[37] It continues to struggle with poor air and water quality,[38] and it is a primary contributor to global warming.[39] China's share of greenhouse gas ("GHG") emissions has increased dramatically in recent years, and it is now the largest emitter of GHGs in the world.[40] The electric power sector creates approximately thirty percent of China's GHG emissions,[41] as over seventy percent of China's electricity is still generated from coal, a major source of carbon dioxide emissions.[42] China's coal production has more than doubled since

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[37] *See* Larson, *supra* note 2.

[38] *Id*.

[39] *See* Keith Bradsher, *China Fears Warming Effects of a Rising Consumer Class*, N.Y. TIMES, July 5, 2010, at A1.

[40] ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, DOE/EIA-0384(2008) ANNUAL ENERGY REVIEW 2008, at 343 (2009), *available at* http://www.eia.gov/FTPROOT/multifuel/038408.pdf (stating that in 2006, China emitted 6,018 million metric tons ("MMT") of carbon dioxide ("CO_2") to the United States' 5,903 MMT); *see also* MCKINSEY & CO., CHINA'S GREEN REVOLUTION: PRIORITIZING TECHNOLOGIES TO ACHIEVE ENERGY AND ENVIRONMENTAL SUSTAINABILITY 29 (2009), http://www.mckinsey.com/locations/greaterchina/mckonchina/reports/china_green_revolution.aspx. While China's total GHG emissions have surpassed those of the United States, China's emissions are still lower on a per capita basis, and China sought to exploit that fact in international climate negotiations. *See* News Release, Nat'l Dev. & Reform Comm'n of the People's Republic of China, China's Position on the Copenhagen Climate Change Conference (May 20, 2009), http://en.ndrc.gov.cn (follow "China's Position on the Copenhagen Climate Change Conference (2009-05-21)" hyperlink) (stating the Chinese negotiation position that "[d]eveloped countries shall take responsibility for their historical cumulative emissions and current high per capita emissions to change their unsustainable way of life and to substantially reduce their emissions").

[41] MCKINSEY & CO., *supra* note 40, at 10 (chart showing that in 2005, China's power sector was responsible for 2.0 gigatons of CO_2 equivalent emissions out of a total of 6.8 gigatons).

[42] Lin Liyu, *China's Power Generation Goes Greener with Total Capacity Up 10%*, CHINA VIEW (Jan. 7, 2010, 5:35 PM), http://news.xinhuanet.com/english/2010-01/07/content_12771880.htm (coal-fired power accounted for 74.6 percent of the nation's 874 million kilowatts of electricity generation capacity in 2009); *see also* ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, INDEPENDENT STATISTICS AND ANALYSIS, COUNTRY ANALYSIS BRIEFS: CHINA 13 (2009), *available at* http://www.eia.doe.gov/cabs/China/pdf.pdf [hereinafter EIA CHINA BRIEF] (stating that "[c]oal makes up 70 percent of China's total primary energy consumption").

2000 to approximately three billion tons in 2008, making it one of the world's largest coal burners.[43] China's coal consumption makes up forty percent of the entire global total,[44] and this staggering number is likely to increase. As its standard of living improves, the nation's appetite for power is growing. According to one report, China needs to *quadruple* the amount of power generated in 2005 to meet its projected needs in 2030.[45] Given this reality, even exceptional progress on the green front will do little more than slow down China's trend toward increasing carbon emissions.[46] By one estimate, simply holding the increase in 2005 GHG emissions to ten percent by 2030 (fifty percent lower than currently projected emissions) would require China to generate eight percent of its power from solar technology.[47]

Taking action now is therefore vital. If China does not do more to address climate change, it will not matter whether the rest of the world pursues emissions-reduction strategies.[48] Two compelling comprehensive studies in 2009 showed that it would take very aggressive measures to slow or reverse the growth in China's GHG emissions.[49] The tall challenge

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[43] EIA CHINA BRIEF, *supra* note 42, at 13 (noting that "[i]n 2008, China consumed an estimated three billion short tons of coal, representing nearly 40 percent of the world total and a 129 percent increase since 2000").

[44] *Id.*

[45] *See* MCKINSEY & CO., *supra* note 40, at 37 (noting an increased demand for energy without any demand-reducing measures); *see also* ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, INTERNATIONAL ENERGY OUTLOOK 2010: HIGHLIGHTS (2010), *available at* http://www.eia.doe.gov/oiaf/ieo/pdf/highlights.pdf (noting that according to projections, "[t]he most rapid growth in energy demand from 2007 to 2035 occurs in nations outside the Organization for Economic Cooperation and Development").

[46] A good quick take on this issue featuring recent data can be found in Ann Carlson, *China's Growth in Energy Usage Truly Alarming*, LEGAL PLANET (May 7, 2010), http://legalplanet.wordpress.com/2010/05/07/chinas-growth-in-energy-usage-truly-alarming.

[47] *See* MCKINSEY & CO., *supra* note 40, at 11–13.

[48] As one long-time observer of China puts it, "China is on track to overwhelm the global effort to address climate change." *Challenges and Opportunities for U.S.-China Cooperation on Climate Change: Hearing Before the S. Comm. on Foreign Relations*, 111th Cong. 16 (2009) [hereinafter *Hearings*] (statement of Elizabeth Economy, C.V. Starr Senior Fellow and Director for Asia Studies, Council on Foreign Relations).

[49] These studies were performed by the McKinsey consulting firm and the United Kingdom's Tyndall Centre. *See* MCKINSEY & CO., *supra* note 40; TAO WANG & JIM WATSON, TYNDALL CENTRE FOR CLIMATE RESEARCH, CHINA'S ENERGY TRANSITION: PATHWAYS FOR LOW CARBON DEVELOPMENT 3–5 (2009), http://www.sussex.ac.uk/sussexenergygroup/documents/china_report_forweb.pdf.

Charles McElwee, in his discussion of the McKinsey study, summarized a conclusion that "if China continues to grow at an annual GDP growth rate of 7.8%," and it took a number of GHG-reducing measures it had already announced, "it will more than double its 2005 carbon emissions by 2030. (6.8 Gigatons of CO2e vs.14.5 Gigatons of CO2e)."

of addressing China's GHG emissions growth is complicated by rapid economic development and the correspondingly rapid rate of increase in GHG emissions,[50] a political system that continues to give incentives for growth over environmental protection,[51] and a still nascent environmental monitoring and enforcement system.[52] It is also unlikely that China will agree to any new international climate agreement that caps its emissions.[53] China intends to take emissions reducing measures without agreeing to a cap.[54] China's President, Hu Jintao, stated in November 2009 that China's

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Charles McElwee, *2050!?*, CHINA ENVTL. L. (Aug. 17, 2009), http://www.chinaenvironmentallaw.com/2009/08/17/2050.

[50] Edward Wong & Keith Bradsher, *China Proposes a Plan to Slow Greenhouse Gas, Follows Offer by U.S.: Beijing's Strategy Falls Short of Reductions Others Sought*, N.Y. TIMES, Sept. 27, 2009, at A1.

[51] Daniel Abebe & Jonathan S. Masur, *International Agreements, Internal Heterogeneity, and Climate Change: The "Two Chinas" Problem*, 50 VA. J. INT'L L. 325, 351 (2010) (discussing the Chinese government's emphasis on economic growth through performance evaluations of local government officials).

[52] *See id.* at 352 (discussing the Chinese government's difficulties in monitoring environmental compliance).

[53] *Id.* at 356–57 (discussing reasons why China may refuse to sign an international climate agreement).

[54] In May 2009, China demanded that "developed countries as a whole . . . reduce their GHG emissions by at least 40% below their 1990 level by 2020," and stated that China and other developing countries need not meet emissions targets but instead should only "take proactive measures to adapt to and mitigate climate change." Nat'l Dev. & Reform Comm'n, *supra* note 40. China sees its role as different from that of developed nations due to the historical differences between them:

> There's a difference between the United States position on how China should address climate change, and China's position on what it should do. It's been repeated many times, but the controversy surrounding historical vs. current emissions and gross vs. per capita emissions remains. Depending on how you read the numbers, China can either look really good or really bad. Also, there's the debate about whether China is a developed or a developing country. So, I think the challenges and the opportunities stem from that difference in stance. The US seems to believe that China should be doing as much as the US. China has indicated that—at least in this round of negotiations—no cap on emissions will be committed to.

China's Energy, China's Power: An Interview with China Energy Specialists, Elizabeth Balkan and Chris Brown, AIMEE BARNES (Oct. 19, 2009), http://www.aimeebarnes.com/2009/10/19.

The "Copenhagen Accord" reached in December 2009 did not impose emissions caps on any nations. *See* John Vidal et al., *Low Targets, Goals Dropped: Copenhagen Ends in Failure*, GUARDIAN.CO.UK (Dec. 19, 2009, 12:47 AM), http://www.guardian.co.uk/environment/2009/dec/18/copenhagen-deal. Following the Copenhagen summit, China avoided the term "associated with," but gave qualified approval to the Copenhagen Accord. Arthur Max, *China, India Join Copenhagen Accord, Last Major Emitters to Sign On*,

next five-year plan for development would include a new goal to reduce "carbon intensity" (CO_2 emissions per unit of gross domestic product) from 2005 levels by forty percent by 2020.[55]

The range of measures that China has taken to meet this goal is "vast,"[56] and includes a national government commitment to renewable energy.[57] The National Development and Reform Commission's ("NDRC")

HUFFINGTON POST (Mar. 9, 2010 2:24 PM), http://www.huffingtonpost.com/2010/03/09/china-india-join-copenhag_n_491640.html. At the same time, its Premier, Wen Jiaboa, rejected the notion among some nations that the Accord was a platform for further negotiations toward binding emissions caps, stating "'it is neither viable nor acceptable to start a new negotiating process' outside the framework of previous U.N. treaties." *Id.* (quoting Chinese Premier Wen Jiaboa).

[55] Edward Wong & Keith Bradsher, *China Joins U.S. in Pledge of Hard Targets on Emissions*, N.Y. TIMES, Nov. 26, 2009, at A1. Because the carbon intensity measures how much carbon it takes to produce a unit of economic output, "emissions would still increase, though the rate would slow." *Id.*

In mid-2010, there was also talk that China would impose a carbon tax as a means of reducing emissions, although that was "hardly a done deal." Deborah Seligsohn, *New Approaches to Climate Action in China: China Considers Carbon Tax Proposals*, CHINA FAQS (May 14, 2010), http://www.chinafaqs.org/blog-posts/new-approaches-climate-action-china-china-considers-carbon-tax-proposals.

[56] *Hearings*, *supra* note 48.

[57] *Hearings*, *supra* note 48, listing the following:

> [r]educing energy intensity (energy consumption per unit of GDP) by 20 percent during 2006–2010; *increasing the role of renewable energy within the primary energy mix to 10 percent by 2010 and 15 percent by 2020*; a top 1,000 program to improve the energy efficiency of the top 1,000 energy consuming enterprises in nine sectors (iron and steel, non-ferrous metal, chemicals, petroleum/petrochemicals, construction material, textiles, paper, coal mining and power generation); a fuel consumption tax on gasoline of 1 rmb per litre; replacing and adding to the country's stock of coal-fired power plants with more efficient models; and a massive afforestation program that has raised the level of forest coverage in the country from approximately 12 percent in 1998 to 18 percent in 2009.

(Emphasis added); *see also* Charles McElwee, *China and the US, Live Debate*, ECONOMIST (Nov. 24, 2009), http://www.economist.com/debate/days/view/421 ("China has already undertaken a number of actions to promote energy security and improve industrial efficiency, such as increasing the amount of renewable energy in its generation mix. . . . It repackaged these efforts and deemed them part of its climate change mitigation strategy."); Julian Wong & Andrew Light, *China Begins Its Transition to a Clean-Energy Economy*, CTR. FOR AM. PROGRESS (June 4, 2009), http:/www.americanprogress.org/issues/2009/06/china_energy_numbers.html (containing an excellent list of the measures underway to address climate change in China). *See generally* PEW CTR. ON GLOBAL CLIMATE CHANGE, CLIMATE CHANGE MITIGATION MEASURES IN THE PEOPLE'S REPUBLIC OF CHINA (2007), http://www.pewclimate.org/docUploads/International%20Brief%20-%20China.pdf.

2007 "National Climate Change Programme"[58] and the 2008 "White Paper"[59] contain specific commitments to renewable energy to help mitigate climate change impacts.[60] Toward that end, the NDRC's 2007 Medium and Long-Term Development Plan for Renewable Energy in China ("2007 Plan")[61] aims to satisfy fifteen percent of total primary energy consumption by 2020 with renewables.[62]

China's commitment to renewable energy extends to the transmission infrastructure needed to support it, in marked contrast to the slow progress of the United States in developing new transmission capacity.[63] As Secretary Chu noted, China is

> investing $44 billion by 2012 and $88 billion by 2020 in ultra-high-voltage transmission lines. These lines will allow China to transmit power from huge wind and solar farms

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[58] China's Nat'l Climate Change Programme (issued by the Nat'l Dev. and Reform Comm'n of the People's Republic of China, June 2007) ST. COUNCIL GAZ., Issue 20, Serial Number 1235, 30–36, *available at* http:/www.ccchina.gov.cn/WebSite/CCChina/UpFile/File188.pdf [hereinafter Nat'l Climate Change Programme].

[59] White Paper on China's Policies and Actions for Addressing Climate Change (issued by the Info. Office of the State Council of the People's Republic of China, Oct. 29, 2008) *translated at* http://www.gov.cn/english/2008-10/29/content_1134544.htm.

[60] *See, e.g.*, Nat'l Climate Change Programme, *supra* note 58, at 31:

> Implement the *Renewable Energy Law of the People's Republic of China* in a comprehensive manner. Develop supportive regulations and policies, prepare national and local programs for renewable energy development, identify development objectives and integrate renewable energy development into assessment indicator systems for the construction of resource-conservative and environmentally-friendly society. Through legislation and other approaches, domestic and international economic entities will be guided and encouraged to participate in renewable energy development and utilization, and clean energy development will be pursued.

[61] Medium and Long-Term Development Plan for Renewable Energy in China (issued by the Nat'l Dev. and Reform Comm'n of the People's Republic of China, Sept. 2007) 4–6, *available at* http://www.asiapacificpartnership.org/pdf/REDGTF/4th_meeting/China-_Medium _and_Long-Term_Development_Plan.pdf [hereinafter Medium and Long-Term Development Plan].

In addition to this translation, American environmental lawyer Charles McElwee, author of the popular blog *China Environmental Law*, maintains an English version of the 2007 Plan and many other important Chinese government documents on the blog website. *See* Charles McElwee, CHINA ENVTL. L., http://www.chinaenvironmentallaw.com (last visited Oct. 19, 2010).

[62] Medium and Long-Term Development Plan, *supra* note 61, at 5.

[63] *See generally* BOSSELMAN, EISEN, ROSSI, SPENCE & WEAVER, ENERGY, ECONOMICS AND THE ENVIRONMENT ch. 11 (3d ed. 2010) (discussing obstacles to increasing investment in transmission in the United States).

> far from its cities. While every country's transmission needs are different, this is a clear sign of China's commitment to developing renewable energy.[64]

Upgrading the existing transmission infrastructure is an important element of China's ability to continue to grow its renewable energy sector, and I will discuss it in more detail below.

II. CURRENT LANDSCAPE FOR NON-HYDRO RENEWABLES IN CHINA

As in the United States, renewables other than hydroelectric power currently account for only a small percentage of total electric generation in China.[65] At present, the major renewable energy source in China is hydropower.[66] The controversial Three Gorges Dam on the Yangtze River in Hubei province is the world's largest hydroelectric power station, with a projected total capacity of 22.5 gigawatts ("GW") when it is fully operational in 2011.[67] In 2008, according to data from the China Electricity Council, 586.7 terawatt-hours ("TWh") of electricity were generated from renewables in China.[68] While this accounted for seventeen percent of national power production,[69] that figure is somewhat misleading. The vast majority of the total (563.3 TWh) came from large and small hydroelectric power projects, with the remaining 22.0 TWh generated from wind, solar, and other renewables.[70]

The second largest source of renewable electric power in China is wind power, with 12.8 TWh generated in 2008.[71] China's installed wind capacity has skyrocketed from a mere 400 megawatts ("MW") in 2001[72]

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[64] Chu, *supra* note 6. See *infra* notes 274–90 and accompanying text for a discussion of China's efforts to upgrade its transmission infrastructure.

[65] RENEWABLE ENERGY POLICY NETWORK FOR THE 21ST CENTURY, RECOMMENDATIONS FOR IMPROVING THE EFFECTIVENESS OF RENEWABLE ENERGY POLICIES IN CHINA 7 (2009), http://www.ren21.net/pdf/Recommendations_for_RE_Policies_in_China.pdf [hereinafter RENEWABLE ENERGY POLICY]; ENERGY INFO. ADMIN.,U.S. DEP'T OF ENERGY, DOE-EIA-0226(2010/09), ELECTRIC POWER MONTHLY: September 2010, at 14 (2010).

[66] RENEWABLE ENERGY POLICY, *supra* note 65, at 6–7.

[67] EIA CHINA BRIEF, *supra* note 42, at 16. For a description of electricity units of measurement, see *Electric Conversions*, ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, http://www.eia.doe.gov/electricity/page/prim2/charts.html (last visited Oct. 19, 2010).

[68] RENEWABLE ENERGY POLICY, *supra* note 65, at 7. A terawatt is a unit of power equal to one trillion watts, or one million MW. *Id.* at 163.

[69] *Id.*

[70] *Id.*

[71] *Id.*

[72] Zheng Yisheng et al., *Rural Energy Policy in China*, CHINA ACAD. OF SOC. SCI. 14 (2009), *available at* http://iis-db.stanford.edu/evnts/3920/ZHENG_paper.pdf.

to 1.25 GW in 2005 and 12 GW in 2008,[73] which at the time represented 9.9% of the entire world total of wind power capacity.[74] New wind power projects in China are both off-grid and grid-connected, and with 200 MW of capacity installed at the end of 2008, small off-grid wind turbines are a small but growing source of power in China.[75] In contrast to the United States, where the Cape Wind project in Nantucket Sound off Massachusetts has faced one delay after another for nearly a decade,[76] offshore wind is off to a fast start in China. As recently as mid-2009, a Chinese observer noted that "[a]t present, offshore wind power in China is still at the exploratory demonstration phase lacking of practical experience."[77] One year later, the 34-turbine, 102 MW Shanghai Donghaiqiao ("East Sea Bridge") project was installed and expected to be in full operation later in 2010.[78] Several more offshore wind farms were planned for the near term, bringing expected near-term capacity additions to one GW,[79] more than twice Cape Wind's size.[80]

If the rapid rate of installed wind power capacity to date is not impressive enough, the nation's future plans for wind are breathtaking. China plans to build seven wind power "mega projects" with a minimum capacity of ten GW each by 2020 in Gansu, Hebei, Jilin, Jiangsu, Xinjiang, and Inner Mongolia provinces.[81] These projects would bring the nation's wind power capacity to approximately 120 GW,[82] or about seventy-five

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[73] RENEWABLE ENERGY POLICY, *supra* note 65, at 8.

[74] *See Wind is a Global Power Source*, GLOBAL WIND ENERGY COUNCIL (2009), http://www.gwec.net/index.php?id=13 (last visited Oct. 19, 2010) (showing total wind power capacity of the world to be 120.798 GW).

[75] RENEWABLE ENERGY POLICY, *supra* note 65, at 8.

[76] See BOSSELMAN ET AL., *supra* note 63, at 856–62 for a timeline and discussion of the state, local, and federal regulatory environment for the Cape Wind project from its inception through early 2010.

[77] He Dexin, *Wind Energy Development in China*, CHINESE WIND ENERGY ASS'N 43 (July 9, 2009), *available at* http://www.aka.fi/Tiedostot/Tiedostot/ENERGIA/Sino-Finnish%20seminar/H-Dexin_China.pdf.

[78] *China Launches Its First Offshore Wind Farm*, ENERGY CHINA FORUM (Mar. 1, 2010), http://www.energychinaforum.com/news/32098.shtml.

[79] Jeremy Hsu, *China Powering Up First Offshore Wind Farm*, POPULAR SCI. (Apr. 5, 2010), http://www.popsci.com/technology/article/2010-04/chinas-first-offshore-wind-farm-powering.

[80] *America's First Offshore Wind Farm on Nantucket Sound*, CAPE WIND ASSOC., http://www.capewind.org/article24.htm (last visited Oct. 19, 2010) (stating that Cape Wind would generate up to 420 MW of power).

[81] Dexin, *supra* note 77, at 52.

[82] Christian Zeppezauer & Connie Carnabuci, *A New Revolution: China Hikes Wind and Solar Power Targets*, RENEWABLE ENERGY WORLD INT'L MAGAZINE (Oct. 9, 2009), *available at* http://www.renewableenergyworld.com/rea/news/article/2009/10/a-new-revolution-china-hikes-wind-and-solar-power-targets.

percent of current world capacity.[83] A ten GW wind farm in Jiuquan, Gansu province, nicknamed "Three Gorges On the Land," received approval from the NDRC in April 2008.[84] This project in the Gobi Desert is planned to become a valuable resource for wind power.[85] Some experts also predict that offshore wind might produce as much as thirty GW of added generation by 2020.[86]

Current installed wind power capacity is still a small part of China's electric power generation sector, which more than doubled from 319 GW in 2000 to 792 GW in 2008 at a rate of twelve percent annually.[87] Moreover, wind capacity figures from China must be taken with a grain of salt. Wind power accounts for a smaller share of total generation than its share of installed capacity.[88] There are many reasons for this. Wind power installations put out less power than their rated capacity due to the intermittency of wind and other factors.[89] Historically, Chinese installations have not matched the performance of wind power installations elsewhere.[90] As one report notes, "[i]n 2006 and 2007, China's average capacity factor for wind was 0.16, whereas average capacity factors in OECD countries are typically between 0.20 and 0.30."[91] One article

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[83] In 2009, total worldwide installed wind power capacity was 159.2 GW. WORLD WIND ENERGY ASS'N, WORLD WIND ENERGY REPT. 2009, at 9 (2010), *available at* http://www.wwindea.org/home/.

[84] Lu Zhenhua, *Wind Power Growth in China's Deserts Ignored Financial Risks*, GUARDIAN.CO.UK (May 14, 2010), http://www.guardian.co.uk/environment/2010/may/14/wind-power-china-desert; *Sinoma Started Wind Blade Project in Jiuquan, Gansu Province*, CHINA WIND POWER NEWSLETTER (Trade Council of Den., Beijing, China), April 2009, at 10, *available at* http://www.windpower.org/download/409/China_Wind_Power_Newsletter_2009.pdf.

[85] Zhenhua, *supra* note 84.

[86] *See* Hsu, *supra* note 79.

[87] Dadi Zhou, *The Process of Sustainable Energy Development in China*, CARNEGIE ENDOWMENT FOR INT'L. PEACE (Aug. 7, 2009), http://www.carnegieendowment.org/publications/index.cfm?fa=view&id=23482.

[88] Li Qiyan, *Wind Power Dilemma: Money Blows Away*, CAIJING.COM.CN (Nov. 12, 2009), http://english.caijing.com.cn/2009-11-12/110310419.html [hereinafter Qiyan, *Wind Power Dilemma*] (stating that wind power makes up 0.45 % of actual generation in China, while its share of total installed capacity is 1.15 %).

[89] The Cape Wind project, for example, is expected to average 170 MW of wind power produced, compared to 468 MW of installed capacity. *Frequently Asked Questions*, CAPE WIND, http://www.capewind.org/FAQ-Category4-Cape+Wind+Basics-Parent0-myfaq-yes.htm (last visited Oct. 19, 2010).

[90] James H. Williams & Fredrich Kahrl, *Electricity Reform and Sustainable Development in China*, 6 ENVTL. RES. LETTERS 3, 6 (2008).

[91] *Id.* (calling this a "disturbing trend"). A "capacity factor" is a ratio that compares "a plant's actual production over a given period of time with the amount of power the plant would have produced if it had run at full capacity for the same amount of time," that is,

attributes this relatively low output figure to a legacy of protectionism in China's wind turbine industry and a lesser quality of domestically manufactured turbines until very recently.[92] As discussed below, China's wind power installations also experience problems with grid connections that reduce their availability to generate power.[93]

The next largest source of power generated from renewables is solar power.[94] Solar's share of electricity generation is increasing from a low base.[95] In 2005, total installed capacity of solar photovoltaic ("PV") power in China was about seventy MW, most of which supplied power to remote rural areas.[96] These areas, such as Xinjiang and Tibet, are rich in solar energy resources and represent a huge potential market for solar energy production.[97] Also, the Chinese government has sought for over a decade to use solar technology to help electrify the seven million households (30 million people) in rural China that have no access to electricity.[98]

China has had projects in place since 1998 for construction of desert power plants and rooftop PV systems connected to the grid.[99] In recent years, China has been moving forward much more aggressively with deployment of solar technology. The NDRC's 2007 Plan articulated a goal for the total capacity of solar power in China of 300 MW by 2010, and a 2020 goal of 1.8 GW, more than 25 times the 2005 total.[100] Recent reports indicated that the National Energy Administration has increased these targets to even more ambitious levels, with a two GW target for 2011

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the percentage of total possible output that the plant actually generates. *See Wind Web Tutorial*, AM. WIND ENERGY ASS'N, http://www.awea.org/faq/wwt_basics.html (last visited Oct. 19, 2010). For example, a plant with a rated (nameplate) capacity of 600 MW that produces 300 MW of electricity per hour has a capacity factor of 0.50.

[92] Richard Lim et al., *Winds of Change: How China's Government Supports Domestic Wind Energy Providers*, KELLOGG SCH. OF MGMT., NORTHWESTERN U. (Oct. 1, 2009), http://www.kellogg.northwestern.edu/Departments/International/InternationalFocus/Article/Winds_of_Change.aspx. See *infra* notes 369–70 and accompanying text for a discussion of this issue.

[93] This is illustrated graphically in Fairley, *supra* note 4 ("[p]otential output of 1.5 MW wind turbines is shown as a percentage of maximum output over time") showing lower capacity figures typically for projects located at greater distances from cities.

[94] RENEWABLE ENERGY POLICY, *supra* note 65, at 7.

[95] *Id.* at 10.

[96] Medium and Long-Term Development Plan, *supra* note 61, at 3.

[97] *See* KRAVETZ, *supra* note 3, at 32.

[98] *See generally* Michael Davidson, *Alternative Energy in China's Rural Development Strategy*, Presentation to Beijing Energy and Environment Roundtable (BEER) (Oct. 28, 2009) (on file with author).

[99] *Id.*

[100] Medium and Long-Term Development Plan, *supra* note 61, at 3, 9.

of installed solar PV and a new 2020 target of twenty GW.[101] To put this number in perspective, the installed solar thermal and PV capacity in the United States in 2008 was 539 MW, a fraction of the Chinese target.[102] The American company First Solar announced plans in 2009 to develop the world's largest solar plant in China, with a breathtaking capacity of two GW.[103] The First Solar project would be built in four phases over a twenty-five square-mile area near Ordos in Inner Mongolia, with project completion expected in 2019.[104]

China also makes very broad use of residential solar water heaters. Installed capacity reached 135 million square meters by the end of 2008.[105] Ten percent of all Chinese households have solar hot water heaters (for a total of 40 million installed units), which according to one estimate made up two-thirds of all the solar water heaters in the world.[106] Improvements in technology have made these units more cost-competitive in recent years,[107] and China plans for an astonishing thirty percent of its households to have installed heaters by 2020.[108]

III. OVERVIEW OF CHINA'S LEGAL SYSTEM AND ENTITIES RESPONSIBLE FOR RENEWABLES LAW AND POLICY

China's commitment to renewable energy includes substantial governmental laws, policies, and incentives promoting renewables.[109] The process of developing these laws is different in China than in Western democratic republics in which state, provincial, or local governments have substantial policy development roles.[110] China is a communist one-party

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[101] *China Hikes 2011 Solar Power Target*, PEOPLE'S DAILY ONLINE (July 3, 2009), http://english.peopledaily.com.cn/90001/90778/90857/90860/6692473.html.
[102] *Existing Capacity by Energy Source*, ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, (Jan. 21, 2010), http://www.eia.doe.gov/cneaf/electricity/epa/epat1p2.html.
[103] News Release, First Solar Corp., First Solar and Ordos Take Key Step Forward in 2GW China Project (Nov. 17, 2009), http://investor.firstsolar.com/phoenix.zhtml?c=201491&p=irol-newsArticle&ID=1356152&highlight.
[104] *Id.*; John Duce & Indira A.R. Lakshmanan, *First Solar to Build World's Largest Solar Power Plant in China*, BLOOMBERG (Sept. 9, 2009), *available at* http://www.bloomberg.com/apps/news?pid=newsarchive&sid=aHkwySMQijs0.
[105] RENEWABLE ENERGY POLICY, *supra* note 65, at 13.
[106] Wong & Light, *supra* note 57.
[107] RENEWABLE ENERGY POLICY, *supra* note 65, at 14.
[108] Wong & Light, *supra* note 57.
[109] *See* REL 2006, *supra* note 27.
[110] *China's State Organizational Structure*, CONG.-EXEC. COMM ON CHINA, http://www.cecc.gov/pages/virtualAcad/gov/statestruct.php (last visited Oct. 19, 2010).

state with a "top-down" structure featuring more centralized power in the national government than in the United States or Europe.[111] The national government carries out centralized economic planning and formulation of regulations that guide implementation of programs and initiatives in individual provinces.[112]

The National People's Congress ("NPC") is responsible for passing national laws.[113] One should not mistake the NPC for a popularly elected democratic assembly. Both the NPC and its local counterparts (Local People's Congresses) have limited accountability, and the Communist Party exercises control over the lawmaking process at every level.[114] Under the Chinese Constitution, the NPC is the "highest organ of state power," so laws adopted by the NPC or its Standing Committee are the highest law after the Constitution itself.[115] The NPC meets annually to review and approve major new policy directions and laws that are presented to it by the State Council and endorsed by the Chinese Communist Party's Central Committee.[116]

If the NPC is the rough equivalent of a national legislature, the State Council is the "highest organ of state administration" and therefore comparable to the executive branch of the United States federal government.[117] It executes laws, supervises the government bureaucracy, and carries out administrative functions.[118] The Chinese Constitution directs the State Council to assure that laws enacted by the NPC are promptly and properly executed, as one specifically enumerated power given to the State Council in the Constitution is the responsibility "to adopt administrative measures, enact administrative regulations and issue decisions and orders in accordance with the Constitution and other laws."[119] The State Council includes Ministries that serve as relevant central authorities for drafting energy regulations. In the case of renewables, Article 5 of the Renewable Energy Law[120] gives specific responsibility to the State Council.[121]

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[111] *Id.*
[112] *Id.*
[113] *Id.*
[114] *Id.*
[115] XIANFA ch. III, art. 57 (1982) (China), *available at* http://www.npc.gov.cn/englishnpc/Constitution/2007-11/15/content_1372965.htm (last visited Oct. 19, 2010).
[116] *Id.* at ch. III, art. 89; *China's State Organizational Structure*, *supra* note 110.
[117] XIANFA, ch. III, art. 85.
[118] *China's State Organizational Structure*, *supra* note 110.
[119] XIANFA ch. III, art. 89 § 1.
[120] REL 2006, *supra* note 27.
[121] REL 2006, *supra* note 27, at art. 5 ("Energy authorities of the State Council implement management for the development and utilization of renewable energy at the national level.").

Authority over China's energy sector at the national level is split among more than a dozen government agencies. The most important of these is the NDRC, the successor to the original State Planning Commission.[122] As noted above, the NDRC has overall responsibility for national macroeconomic policies,[123] as set forth in its series of Five-Year Plans. The "11th Five-Year Plan"[124] covers the time period from 2006 to 2010 and places importance on environmental and climate change objectives.[125] The NDRC's 2007 Plan contains policy guidance that supplements the detailed five-year plan.[126]

Within the NDRC, responsibility for energy policies belongs to several different organizations.[127] This continually presents coordination problems, not unlike those posed by fragmentation of energy jurisdiction in the United States.[128] As one observer puts it, with respect to energy policy, "the government has neglected to align the conflicting interests of the many parts under its control."[129] Various reorganizations over the years have not alleviated these problems.[130] A 1997 reshuffling transformed the Ministry of Electric Power into the State Power Corporation ("SPC"), with regulatory and financial functions transferred to other ministries, including the Ministry of Finance ("MoF") and NDRC.[131] The most recent reorganization of energy authorities took place in 2008,[132] in which "the NPC stopped short

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[122] Message from Chairman Zhang Ping, NAT'L DEV. AND REFORM COMM., http://en.ndrc.gov.cn/mfczp/default.htm (last visited Oct. 19, 2010).
[123] *Id.*
[124] NAT'L DEV AND REFORM COMM., THE OUTLINE OF THE 11TH FIVE-YEAR PLAN FOR NATIONAL ECONOMIC & SOCIAL DEVELOPMENT OF THE PEOPLE'S REPUBLIC OF CHINA (2006), *available at* http://en.ndrc.gov.cn/hot/t20060529_71334.htm [hereinafter 11TH FIVE-YEAR PLAN].
[125] Chapter six of the plan, "Building a Resource-Conserving and Environment-Friendly Society" contains a number of specific energy and environmental protection objectives. *Id.* at ch. 6.
[126] Nat'l Climate Change Programme, *supra* note 58, at 2.
[127] Erica S. Downs, *China's "New" Energy Administration*, CHINA BUS. REV., Nov.–Dec. 2008, at 42, *available at* http://www.brookings.edu/~/media/Files/rc/articles/2008/11_china_energy_downs/11_china_energy_downs.pdf.
[128] *Id.* ("China's fragmented energy bureaucracy has impeded energy governance because there is no single institution, such as a ministry of energy, with the authority to coordinate the interests of the various stakeholders.").
[129] Mark Hanson, *China's Energy Sector: Challenges to Reform* 8 (SAIS China Studies, Student Working Paper Series, Fall 2009), *available at* http://www.sais-jhu.edu/academics/regional-studies/china/pdf/China_Studies_Working_Paper_2010_Hanson.pdf.
[130] Downs, *supra* note 127, at 42 (noting that the "NEA is unlikely to be an exception" in terms of governmental ability to manage and coordinate activities in the energy sector).
[131] Williams & Kahrl, *supra* note 90, at 2.
[132] Downs, *supra* note 127, at 42.

of creating a unified organ to oversee the contentious issue of energy policy."[133] According to one report, the government considered a proposal to centralize energy authority in a "super-ministry," but did not take that route.[134] Instead, it made a modest reconfiguration that led to the creation of a "National Energy Administration" from the former "Energy Bureau" and other energy offices from the NDRC, and a new "National Energy Commission."[135] The new NEA was created at the vice-ministerial rank, a step above where the Energy Bureau had been, but below the ministerial level.[136] See Figure 1 for the portfolio of the new NEA.[137]

Before 2008, "[t]he Energy Bureau under the NDRC was initially crippled by competition for administrative power within the NDRC and with other preexisting organizations."[138] The situation does not appear to have improved much after the 2008 reorganization; as a vice-ministerial body, the NEA "still lacks the authority to effectively coordinate the interests of ministries, commissions, and state-owned energy companies."[139] In the 2008 reorganization, the NDRC retained one critical power: the authority to set energy prices.[140] This power is central to the NDRC's mission of controlling the economy, and it was unwilling to part with it.[141]

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[133] Julian L. Wong, *Bureaucratic Streamlining and Rule of Law*, GREEN LEAP FORWARD (Mar. 12, 2008), http://greenleapforward.com/2008/03/12/bureaucratic-streamlining-and-rule-of-law/.

[134] Julian Wong of the Center for American Progress, the author of the noted *The Green Leap Forward* blog on energy and environmental matters in China, sorts out the extremely confusing state of affairs after the 2008 reorganization in an article posted on his blog. Julian L. Wong, *The National Energy Commission: Myth-busting the "New Energy Super Ministry*," GREEN LEAP FORWARD (Feb. 9, 2009), http://greenleapforward.com/2010/02/04/the-national-energy-commission-myth-busting-the-new-energy-super-ministry/ (posing the question of whether the new "National Energy Commission" created at the same time as the NEA is intended to be a super-ministry, and positing that it is not).

[135] *Id.*

[136] Downs, *supra* note 127, at 43.

[137] *Id.*

[138] Hanson, *supra* note 129, at 4.

[139] *Id.*

[140] Charles McElwee, *China's NDRC Shakeup: Energy & Environment Implications*, CHINA ENVTL. L. (Aug. 2, 2008), http://www.chinaenvironmentallaw.com/2008/08/22/chinas-ndrc-shakeup-energy-environment-implications [hereinafter McElwee, *China's NDRC Shakeup*].

[141] Downs, *supra* note 127, at 44. As one commenter on the *China Environmental Law* blog site put it:

> You're right that some of the portfolio given to NEA is rather insignificant, but it may be a symbolic move to create a facade of independence for NEA.
>
> I'm not sure whether certain comments on the fact NDRC has "lost" power as a result of the restructuring are accurate. It has always viewed

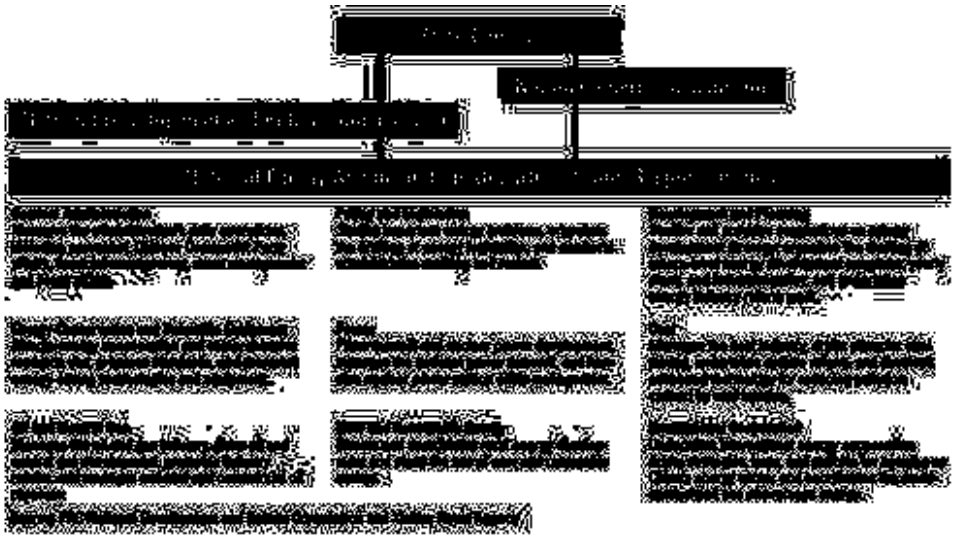

Figure 1. China's National Energy Administration (2008).

Other ministries with energy responsibilities include the MoF that administers economic incentive programs including a Renewable Energy Development Fund,[142] the Ministry of Agriculture ("MoA") that is jointly responsible with the NDRC for rural biomass development,[143] and the Ministry of Construction that has programs aimed at building efficiency and conservation.[144]

> its monopoly over pricing as its primary power in a system that has yet to fully rationalize energy prices. Cuts in personnel may have an impact on the range of portfolio NDRC can handle, but it seems to be largely in line with the State Council's intention to streamline some of these bloated bureaucracies.
>
> In short, in an economy that still puts a premium on planning and FYPs, a central planning commission will have wide latitude.

Damien, Comment to McElwee, *China's NDRC Shakeup*, *supra* note 140.

[142] RELAW ASSIST, RENEWABLE ENERGY LAW IN CHINA-ISSUES PAPER 36 (2007). *See infra* notes 198–99 and accompanying text (describing the establishment of the Fund after the adoption of the REL 2006 and the regulations governing it).

[143] RELAW ASSIST, *supra* note 142, at 12. Under the Rural Energy Development Plan regulation, the Ministry of Agriculture was assigned to draft a rural energy plan, covering renewable and conventional energy use and energy efficiency measures in rural areas. *Id.* at 13.

[144] *See, e.g.*, Geoffrey Lewis, *Ministry of Construction Green Building Evaluation Standard—The "Three Star System,"* CHINA GREEN BUILDINGS BLOG (Feb. 24, 2009),

The state-owned energy companies in China also wield considerable power in energy decision-making.[145] Until recently, China's electric utility sector consisted of a single, state-owned monopoly, the SPC.[146] In 2002, the State Council Electricity Reform Plan (comparable to "restructuring" in the United States) "unbundled the SPC into five generating companies and two grid companies."[147] The five generating companies remain controlled by the state.[148] The State Grid Corporation is state owned, and the Southern Power Grid Company is privately owned.[149] The head of the State Grid Corporation holds ministerial rank, which poses a problem for the NEA.[150] As one observer puts it, "energy companies often undercut Energy Bureau authority by holding face-to-face discussions with senior PRC leadership."[151] A new and supposedly independent government agency, the State Electricity Regulatory Commission ("SERC"), was established in 2003 to regulate the electricity grid.[152] However, because the NDRC has macroeconomic planning and pricing responsibilities, the SERC "lacks both the mandate and the resources to be a strong, effective regulator . . . [and] still plays a secondary regulatory role to the NDRC."[153]

At the local level, the Chinese Constitution provides for Local People's Congresses charged with legislating on specific matters relating to localities and drafting local regulations to implement certain NPC laws.[154] The principle of "democratic centralism,"[155] or concentrating decision-making power in the national government, means that "lower levels are always vulnerable to changes in direction and decisions originated at the central level of government . . . [and] are essentially extensions of central government authorities and thus are responsible to the

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http://chinagreenbuildings.blogspot.com/2009/02/ministry-of-construction-green-building.html (discussing a new Ministry of Construction rating system for green buildings).

[145] Downs, *supra* note 127, at 45 ("China's state-owned energy companies will likely remain the dominant drivers of projects and policies.").

[146] *State Grid Corporations of China (SG)*, CHINA CRS MAP, http://www.chinacsrmap.org/E_OrgShow.asp?CCMOrg_ID=971 (last visited Oct. 19,, 2010).

[147] Williams & Kahrl, *supra* note 90, at 2; CHUN CHUN NI, INST. OF ENERGY ECON., CHINA'S ELECTRIC POWER INDUSTRY AND ITS TRENDS 19 (2006), *available at* http://eneken.ieej.or.jp/en/data/pdf/326.pdf.

[148] NI, *supra* note 147, at 3.

[149] *Id.* (depicting ownership in a flow chart).

[150] Downs, *supra* note 127, at 43.

[151] *Id.*

[152] STATE ELECTRICITY REGULATORY COMM'N OF THE PEOPLE'S REPUBLIC OF CHINA, http://www.serc.gov.cn/english/index.htm (last visited Oct. 19, 2010).

[153] Williams & Kahrl, *supra* note 90, at 9.

[154] XIANFA ch. III, art. 95, 99, 100.

[155] *Id.* at ch. I, art.3.

'unified leadership' of the central organs."[156] Still, the provinces have an important role to play in promoting renewables, and some provincial governments have created specific policies under the central government's legal framework.[157] These contain "detailed provisions . . . for particular renewable energy technologies, financial support for pilot projects and preferential treatment in other areas such as land access."[158] Perhaps not surprisingly, individual provinces vary widely in their commitment to renewables, depending on such matters as whether they are rich in renewable resources.[159]

IV. OVERVIEW OF CHINA'S LEGAL MECHANISMS TO ENCOURAGE RENEWABLES PRIOR TO 2006

Before the adoption of the Renewable Energy Law in 2006, there were scattered efforts underway to promote renewable energy in China. There was no unified legal framework, and a variety of government agencies undertook individual initiatives.[160] The mid-1980s Integrated Rural Energy Programme aimed to bring electric service to the country's rural areas and included some promotion of small hydropower projects.[161] In 1987, the State Council's Energy Conservation Office established a low-interest loan fund that issued loans of about 120–130 million RMB (approximately $15 million) annually by 1996 and had funded up to eighty percent of seventy-four MW worth of wind power installations by that time.[162]

The first national document on renewable energy development was the State Council's 1994 "White Paper on Population, Environment, and Development in the 21st Century," which identified a "medium- to long-term guide for the economic and social development of renewable energy."[163] One year later, the SPC (now NDRC), State Economic and Trade Commission, and State Science and Technology Commission (now the Ministry of

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[156] *China's State Organizational Structure*, *supra* note 110.
[157] RELAW ASSIST, *supra* note 142, at 12, 14–15 (listing regulations of individual provinces).
[158] *Id.* at 12.
[159] *Id.*
[160] *See* RENEWABLE ENERGY POLICY, *supra* note 65, at 19 (noting that laws in this period provided "little guidance" on renewables). For a general discussion of national efforts in this time period, see *Renewables in China Today*, CCRE.COM.CN (June, 1, 2003), http://web.archive.org/web/20070819131611/http://www.ccre.com.cn/English/BG.htm (accessed by searching for Renewables in China Today in the Internet Archive index) (describing national efforts in this time period).
[161] *Renewables in China Today*, *supra* note 160.
[162] *Id.*
[163] *Id.*

Science and Technology) issued a "Program of New and Renewable Energy Development—1996–2010."[164] This first attempt to consider renewables in the economic planning process set goals for individual renewables technologies to be achieved by 2020,[165] which were echoed in the Ninth Five-Year Plan.[166] However, no specific national policy was formulated, and development of renewables was left to the initiatives in individual ministries.[167]

The year 1995 also saw an "Electric Power Law" and a "New Plant, New Price Policy" as part of continuing restructuring—like reform of the electric utility sector.[168] New investors in power generation (including owners of renewable energy facilities) could sell electricity to the power grid at prices set at levels sufficient to ensure repayment of their debts.[169] This led to prices for wind power greater than established levels.[170] Without a mandate for provincial grids to purchase the power, the program was only a minor success.[171] Between 1996 and 1999, the SPC conducted a "Brightness Program" that aimed to bring electricity to 23 million people in remote areas, deploying small-scale wind and PV technologies with an average capacity of 100 watts ("W") per capita and a total program planned capacity of 2.3 GW.[172] This program led to installation of about 5500 wind/PV hybrid home systems in Inner Mongolia by 2003, and 10,000 solar home systems, three PV mini-grid village systems, and six PV village systems of about six kilowatts ("kW") each in size by the end of 2001.[173]

In the early 2000s, more programs were established to promote renewables. NDRC's "Ride the Wind Program" of 2001 to 2005 sought to develop a domestic wind turbine industry that could compete with foreign manufacturers and aimed to reduce production costs and increase the percentage of domestically produced wind turbines at domestic installations from forty percent to seventy percent by the end of the Tenth Five-Year Plan period in 2005.[174] The NDRC also established the China Township

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[164] *Id.*
[165] *Id.*
[166] *Id.*
[167] *Renewables in China Today*, *supra* note 160.
[168] *Id.*
[169] *Id.*
[170] *Id.*
[171] *Id.* (noting that "[a]s a consequence of these high prices, provincial utilities have been reluctant to purchase more than a limited amount of electricity under these terms").
[172] MA SHENGHONG, RENEWABLE ENERGY DEV. CTR., INT'L CONFERENCE FOR RENEWABLE ENERGIES, BONN: THE BRIGHTNESS AND TOWNSHIP ELECTRIFICATION PROGRAM IN CHINA 8 (2004) (copy on file with author); Davidson, *supra* note 98, at 6.
[173] SHENGHONG, *supra* note 172, at 9–10; Davidson, *supra* note 98, at 7.
[174] NAT'L RENEWABLE ENERGY LAB., U.S. DEP'T OF ENERGY, NREL/FS-710-35787,

Electrification Program to move toward deployment of large-scale renewable energy facilities in rural areas.[175] This program aimed to supply power to 1065 townships in twelve provinces with small hydropower, PV, and PV/wind hybrid systems.[176] Over 4.5 billion RMB (about $700 million) of technology found its way into village-level systems through this program.[177] Some observers have noted benefits from this program, such as a boost to domestic manufacturing capacity of PV panels and other technology.[178] On the other hand, operation and maintenance issues hindered more widespread program success. Remote areas have seen battery failures and other problems, especially when the utility companies have not operated the energy facilities.[179]

In general, the pre-2006 era presented a mixed picture for the country's efforts to deploy renewables. Relatively small but promising new programs promoted renewable energy deployment.[180] As in the United States, however, electricity grid "reform" led to setbacks for these programs and prompted the government to examine whether it should implement different mechanisms for promoting renewables.[181] Several barriers remained to more widespread commercialization of renewables.[182] Among these was the lack of a binding requirement comparable to "renewable portfolio standards" ("RPS") then being developed in the United States, which require utilities to purchase power generated from renewables.[183] Studies of RPS in the pre-2006 era by Chinese researchers concluded it was

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RENEWABLE ENERGY IN CHINA (2004), *available at* http://www.nrel.gov/docs/fy04osti/35787.pdf. *See infra* notes 371–82 and accompanying text (discussing this requirement in the context of the effects of protectionism in the domestic wind turbine industry).

[175] W.L. Wallace et al., *Experience for Sustainable Development of Rural Energy in China*, NDRC/UNDP/GEF PROJECT MGMT. OFFICE 1 (2006), *available at* www.martinot.info/Wallace_et_al_rural_GWREF2006.pdf; SHENGHONG, *supra* note 172, at 12–14; Davidson, *supra* note 98, at 7.

[176] SHENGHONG, *supra* note 172, at 12; Wallace, *supra* note 175, at 1.

[177] Wallace, *supra* note 175, at 1.

[178] RENEWABLE ENERGY POLICY, *supra* note 65, at 11.

[179] Davidson, *supra* note 98, at 8; Wallace, *supra* note 175, at 7 (noting that to address the problems "the NDRC is considering several actions including: . . . transferring ownership of the systems to the provincial utility companies as the best option to insure a future commitment to professional management and servicing of the systems").

[180] *See* RENEWABLE ENERGY POLICY, *supra* note 65, at 6; SHENGHONG, *supra* note 172, at 6.

[181] *See* Williams & Kahrl, *supra* note 90, at 4, 5, 9.

[182] *See* Jie Fan et al., *Renewables Portfolio Standard and Regional Energy Structure Optimisation in China*, 33 ENERGY POL'Y 279, 280 (2005), *available at* http://www.sciencedirect.com (enter "Jie Fan" in the author search field; then select the article by its title).

[183] *See* BOSSELMAN ET AL., *supra* note 63, at 875–905 (discussing the growth of RPSs in the United States, and issues associated with their implementation).

both viable and necessary for China to establish a RPS-like mandate for purchases of electricity generated from renewables.[184] As one report noted, "it is clear that unless new instruments are developed to support the establishment of renewables in the national energy portfolio (such as an obligatory Renewables Portfolio Standard), renewables will face severe difficulties in the competitive environment of a post reform energy market."[185]

V. RENEWABLE ENERGY LAW AND OTHER LEGAL MECHANISMS TO ENCOURAGE RENEWABLES IN CHINA (2006–PRESENT)

The Renewable Energy Law of 2006 ("REL 2006")[186] ushered in a new era for the promotion of renewable energy in China, with a major overhaul and rewrite of existing legal authorities. As there were programs in place before its adoption, this was not the start of China's modern renewable energy era. However, the new law made several bold strides forward. First, it set out to create a national system for the development of renewable energy, targets for renewables in the electricity market, and a pricing mechanism.[187] Just as importantly, it officially encouraged the construction of renewable energy power facilities, making it a national priority to do so.[188]

A. Renewable Energy Law of 2006

The REL 2006 is a relatively brief framework that provides the national mandate to develop renewable energy, with specifics to follow from plans and regulations developed by agencies.[189] Article 2[190] defines eligible renewable energy sources as hydropower, wind power, solar energy, geothermal energy, and marine energy, but not nuclear power (which has been promoted and developed through separate laws and incentives).[191] Article 4 lists renewable energy as a priority area for development,[192] and

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[184] *See, e.g.*, Fan, *supra* note 182, at 279–87 (noting that "[t]he successful implementation of the RPS policy will achieve the goal of sharing the benefits and responsibilities of energy production between the different regions of China").
[185] *Renewables in China Today*, *supra* note 160.
[186] REL 2006, *supra* note 27.
[187] *Id.*
[188] *Id.* at arts. 13–16.
[189] *Id.* at arts. 7–8.
[190] *Id.* at art. 2.
[191] For a summary of China's domestic civilian nuclear efforts, see Philip Andrews-Speed, *China's Nuclear Power Sector on the Fast Track*, UNIV. OF DENDEE CEPMLP GATEWAY (Mar. 13, 2010), http://www.dundee.ac.uk/cepmlp/gateway/index.php?news=30794.
[192] REL 2006, *supra* note 27, at art. 4 ("The Government lists the development of utilization

Article 8 calls for the NDRC to implement a national renewable energy plan, including specific renewable energy targets,[193] which leaves it up to provincial planning agencies to develop more specific implementation plans.[194] Under Article 14, China's electricity grid corporations are obligated to interconnect with and purchase all the electricity generated by approved renewable energy facilities located in their service areas.[195] The NDRC was tasked to set purchase prices for renewables and adjust them from time to time as necessary.[196] Importantly, Article 19, which discusses pricing, did not establish specific criteria for setting grid purchase prices, which would be determined later.[197] The REL 2006 also creates a national fund to foster renewable energy development,[198] and lending and tax incentives for renewable energy projects.[199]

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of renewable energy as the preferential area for energy development and promotes the construction and development of the renewable energy market by establishing total volume for the development of renewable energy and taking corresponding measures.").

[193] *Id.* at art. 8 ("Energy authorities of the State Council shall, on the basis of the middle and long-term total volume target of renewable energy throughout the country, prepare national renewable energy development and utilization plan, which is to be implemented after being approved by the State Council.").

[194] *Id.*

[195] *Id.* at art. 14:

> Grid enterprises shall enter into grid connection agreement with renewable power generation enterprises that have legally obtained administrative license or for which filing has been made, and buy the grid-connected power produced with renewable energy within the coverage of their power grid, and provide grid-connection service for the generation of power with renewable energy.

[196] *Id.* at art. 19:

> Grid power price of renewable energy power generation projects shall be determined by the price authorities of the State Council in the principle of being beneficial to the development and utilization of renewable energy and being economic and reasonable, where timely adjustment shall be made on the basis of the development of technology for the development and utilization of renewable energy.

[197] *Id.*

[198] REL 2006, *supra* note 27, at art. 24; RELAW ASSIST, *supra* note 142, at 13. The MoF's Provisional Administrative Measures on the Renewable Energy Development Fund (2006) sets out the criteria for the use of the Fund, identifies "priority areas," and provides application and approval procedures. *Id.* at 12–13. The final regulation is the MoF's Regulation Governing the Use of the Renewable Energy Development Fund to Promote Renewable Energy Integration in Buildings (2006). *Id.* at 13. Specifics on what this fund is used for have often been hard to come by. RENEWABLE ENERGY POLICY, *supra* note 65, at 27 ("China's Renewable Energy Fund has been in place for approximately four years. However, it is unclear how much of this funding is distributed annually, what types of technology are eligible to apply for the funding, and what precisely the application procedure entails.").

[199] REL 2006, *supra* note 27, at arts. 25–26.

B. Implementing Plans, Regulations, and Programs

Shortly after adoption of the REL 2006, the central government began to create laws and programs to implement it. In its 2007 Plan, the NDRC set a goal of meeting ten percent of China's primary energy consumption with renewable energy by 2010, and fifteen percent by 2020.[200] As noted above, the 2007 Plan set targets for installed capacity of individual renewable energy technologies such as wind and solar PV.[201] Figure 2 details these targets, compared to actual power production in 2005:[202]

Figure 2. Renewable Energy Targets in China Under the 2007 Plan

Energy Source	**2005**	**2010**	**2020**
Hydro	115 GW	190 GW	300 GW
Wind	1.30 GW	5 GW	30 GW
Solar PV	0.07 GW	0.30 GW	1.80 GW
Solar hot water	80 million m2	150 million m2	300 million m2
Biomass power (from agricultural & forestry waste)	2 GW	5.5 GW	30 GW
Ethanol	0.80 million tons	2 million tons	10 million tons
Biodiesel	0.05 million tons	0.20 million tons	2 million tons

The initial wind target was quickly exceeded,[203] and in late 2009, there was talk of a new goal for 2020 that could be as much as 100 GW of installed capacity of wind power.[204] The solar target for 2020 was also in line to be increased to a significantly larger capacity of at least ten GW.[205]

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[200] Medium and Long-Term Development Plan, *supra* note 61, at 5.
[201] *Id.* at 7–10.
[202] Charles McElwee, *China's Renewable Energy Law*, CHINA ENVTL. L. (Mar. 27, 2008), http://www.chinaenvironmentallaw.com/2008/03/27 [hereinafter McElwee, *China's Renewable Energy Law*].
[203] *See supra* notes 68–74 and accompanying text; Zhenhua, *supra* note 84 ("By the end of 2008, 12.15 gigawatts worth had been constructed across 24 provinces—143% above target and two years ahead of schedule.").
[204] Zeppezauer & Carnabuci, *supra* note 82.
[205] Wong & Light, *supra* note 57; Queenie K.Y. Cheng & Kevin H.Y. Tsen, *China's Burgeoning Solar Power Sector*, MAYER BROWN (Nov. 16, 2009), http://www.mayerbrown

Assuming that formal plans are revised upward to these announced numbers, renewable power generators would account for a significant percentage of total electricity generation. However, seasoned China observers express caution about figures like these that are bruited about in the press,[206] noting that ambitious targets overestimate the actual amount of renewable power on the grid.[207] The government assigned each of the ten largest power companies—State-Owned Enterprises ("SOEs")[208] that generate sixty percent of China's electricity—a goal of generating three percent of their electricity from renewable sources by 2010.[209] By the end of 2008, only one company was poised to attain this goal.[210]

As noted above, Article 14 of the REL 2006 included requirements for mandatory interconnection for renewable energy facilities to China's electricity grid and for grid companies to purchase power within their coverage areas.[211] Two different national regulations implemented this Article by mandating interconnection and requiring grid companies to purchase the full amount of electricity generated by renewable power

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.com/publications/article.asp?id=7965&nid=6 ("NDRC's Energy Research Institute reported that the new goal for 2020 may be revised so that the installed capacity for solar power may amount to 10 GW or more.").

[206] *See, e.g.*, Charles McElwee, *A Mighty Wind*, CHINA ENVTL. L. (May 6, 2009), http://www.chinaenvironmentallaw.com/2009/05/06/a-mighty-wind/#more-1697 ("I'm not believing it until I see a formally amended copy of China's Medium & Long-Term Renewable Energy Development Plan."); Zeppezauer & Carnabuci, *supra* note 82 ("The plan has, however, not yet been published and its details remain opaque.").

[207] *See* Williams & Kahrl, *supra* note 90, at 1, 6; *see also* Kexin Liu, *Wising Up: Smart Grid as New Opening for U.S. China Energy Cooperation* (Aug. 2009) (copy on file with author); Zeppezauer & Carnabuci, *supra* note 82.

[208] *See* Lim, *supra* note 92.

[209] This "mandated market share" provision is featured in Medium and Long-Term Development Plan, *supra* note 61, at 11:

> In areas covered by large scale power grids, non-hydro renewable power generation's share of total power generation will reach 1 percent by 2010 and over 3 percent by 2020. Power generators with self-owned installed capacity of over 5 GW will be required to have a non-hydro renewable energy installed power capacity self-owned that accounts for 3 percent of their total capacity by 2010 and for over 8 percent of their total self-owned capacity by 2020.

See Polluting Power: China's Top Power Companies Ranked, GREENPEACE CHINA (July 28, 2009), http://www.greenpeace.org/china/en/news/china-power-ranked; Christina Larson, *A Climate Dilemma for China*, CENTER FOR PUBLIC INTEGRITY (Nov. 12, 2009), http://www.publicintegrity.org/investigations/global_climate_change_lobby/articles/entry/1801; Yu Tianyu, *A 'No Coal' Campaign in China*, CHINA DAILY (Aug. 10,2009), http://www.chinadaily.com.cn/bizchina/2009-08/10/content_8548125.htm.

[210] *Polluting Power*, *supra* note 209; Larson, *supra* note 209; Tianyu, *supra* note 209.

[211] REL 2006, *supra* note 27, at art. 14; *see supra* note 195 and accompanying text.

producers in their grid areas: the NDRC's "Regulation on the Administration of Power Generation from Renewable Energy" and the SERC's "Measures on Supervision and Administration of Grid Enterprises in the Purchase of Renewable Energy Power."[212] The NDRC's regulation set general rules for grid connection, including utility company and generator responsibilities.[213] The regulation mandated that *all* energy generated from renewable sources must be purchased and that utilities "must provide grid-connection services and related technical support."[214]

The REL 2006 also marked the inception of innovative power pricing arrangements based on Article 19, including fixed government pricing comparable to European-style feed-in tariffs ("FITs"),[215] and competitive tendering systems.[216] Fixed government pricing "offers renewable energy generators a guaranteed power price."[217] When coupled with the obligation to purchase power, a FIT is intended to stimulate the development of the renewable energy market by providing a stable long-term incentive for power production.[218] In other nations, the FIT has proven to be successful in stimulating industry development.[219] In a competitive tendering system, the government administers a bidding process for a contract for a predetermined amount of electricity generated from renewables.[220] The contractor with the lowest price bid wins the contract and supplies the power, assuming it meets other requirements.[221] The two systems of pricing have both been used in China, as discussed more fully below.

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[212] Regulation on the Administration of Power Generation from Renewable Energy (promulgated by the Nat'l Dev. and Reform Comm'n of the People's Republic of China, 2006) (non-authorized version), http://www.martinot.info/China_RE_Law_Guidelines_2_NonAuth.pdf; Measures on Supervision and Administration of Grid Enterprises in the Purchase of Renewable Energy Power (promulgated by the State Electric Regulatory Comm'n of the People's Republic of China, 2007) (Chinese language), *available at* http://www.gov.cn/ziliao/flfg/2007-08/01/content_702636.htm; *see also National Policy*, CHINA WIND POWER CTR., http://www.cwpc.cn/cwpc/en/node/6548#2r (listing and describing these regulations); Cheng & Tsen, *supra* note 205 (listing and describing these regulations).

[213] Cheng & Tsen, *supra* note 205.

[214] *Id.*

[215] For a discussion of FITs and the European and American experience with them, see BOSSELMAN ET AL., *supra* note 63, at 905–12.

[216] RELAW ASSIST, *supra* note 142, at 26.

[217] *Id.*

[218] *Id.*; KRAVETZ, *supra* note 3.

[219] *See* BOSSELMAN ET AL., *supra* note 63, at 906–07, 919 (citing positive results in European nations, including Germany and Denmark).

[220] RELAW ASSIST, *supra* note 142, at 26.

[221] *Id.*

Beyond seeking to integrate renewable energy production more fully with the electricity grid, the REL 2006 and subsequent regulations contain a number of financial incentives for power producers. Articles 20 through 23 establish cost-sharing arrangements to divide the costs of renewable energy generation and grid connection between utilities and electricity end users.[222] End users of electricity, other than Tibet residents and those in the agriculture sector, pay a small surcharge on their electric bills of 0.001 RMB per kWh (0.002 RMB per kWh for commercial and industrial users as of August 2008) to cover part of the difference between the price of coal-fired power and power generated from renewables.[223] Proceeds from the surcharge, which now total over $200 million annually, have supported renewable energy projects (as one observer notes, "mostly wind and biomass").[224] As for other financial incentives, while "China lags behind most countries in using tax measures to create incentives for renewable energy deployment,"[225] a VAT-based tax policy gives domestic wind power equipment manufacturers significant benefits,[226] and domestic wind power equipment manufacturers receive subsidies from the MoF.[227]

China has also developed programs that subsidize installations of new renewable energy equipment by end users.[228] In March 2009, the Ministry of Housing and Urban-Rural Development implemented a subsidy for rooftop and building-integrated PV ("BIPV") installations at 15 RMB (about $2.50) per watt for rooftop systems and 20 RMB per watt (about $3) for BIPV,[229] with an impressive 1.27 billion RMB (approximately $186 million) of subsidies distributed under this program in its first six months.[230] The "Golden Sun" program, started in 2009 by the MoF,

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[222] REL 2006, *supra* note 27 ("The excess between the expenses that power grid enterprises purchase renewable power on the basis of the price determined in Article 19 hereof and the expenses incurred in the purchase of average power price generated with conventional energy shall be shared in the selling price.").
[223] Wong & Light, *supra* note 57.
[224] *Id.* (citing figures from the SERC that the surcharge yielded $34.6 million in 2006, $106 million in the 1st through 3rd quarter of 2007, and $295.2 million in the 4th quarter of 2007 through the 2nd quarter of 2008).
[225] RENEWABLE ENERGY POLICY, *supra* note 65, at 22.
[226] *See, e.g.*, CHINA WIND POWER CTR., *supra* note 212.
[227] *Id.*; RENEWABLE ENERGY POLICY, *supra* note 65, at 20, 25.
[228] *The Golden Sun of China*, PV GROUP, http://www.pvgroup.org/events/ctr_031358 (last visited Oct. 19, 2010).
[229] *Id.*
[230] *China Urged to Introduce On-Grid Solar Power Tariff*, ENERGY CHINA FORUM (Oct. 30, 2009), http://www.energychinaforum.com/news/27645.shtml. By way of comparison, in the United States, individual states received funding under the American Recovery and Reinvestment Act for renewable energy and energy efficiency technology. The state of

Ministry of Science and Technology, and National Energy Administration, provides subsidies for utility-scale solar installations of 300 kW and up.[231] The subsidy is fifty percent of the total cost of on-grid systems and seventy percent of the total cost of off-grid systems in rural areas.[232] The program is capped at 680 MW, or 20 MW for each of China's thirty-four provinces and autonomous regions.[233]

C. 2009 Amendments to the Renewable Energy Law

In August 2009, a package of amendments to the Renewable Energy Law was submitted to the NPC for approval,[234] and the amendments were approved in December.[235] The package contained three major changes:[236]

(1) A call for more oversight of renewable energy projects from the national level (although this was already required, and detailed specifics were lacking on what this change would entail);[237]

(2) A requirement that the State Council and related governmental bodies develop a regulation to determine the specific amount of electricity to be purchased by grid companies;[238] and

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Virginia offered $2 per watt for installations up to ten kW in size, with a program maximum of $15 million. *See Virginia Residential and Commercial Solar and Wind Incentive Program*, VA DEP'T OF MINES, MINERALS, AND ENERGY http://www.dmme.virginia.gov/de/arra-public/RenewableEnergyRebateTerms.pdf (last updated Sept. 16, 2010).

[231] GREEN CROSS INT'L, 2009 GLOBAL SOLAR REPORT CARDS 29 (2009), *available at* http://www.globalgreen.org/docs/publication-108-1.pdf; *The Golden Sun of China*, *supra* note 228. In the program announcement, there was no clarity on whether subsidies were a one-off or a permanent program, or whether and how subsidized projects would be connected to the electricity grid. Zeppezauer & Carnabuci, *supra* note 82.

[232] *The Golden Sun of China*, *supra* note 228.

[233] *Id.*

[234] *China Considering Renewable Energy Development Fund*, CHINA VIEW (Aug. 24, 2009), http://news.xinhuanet.com/english/2009-08/24/content_11937062.htm.

[235] Charles McElwee, *China's Renewable Energy Law Amendments*, CHINA ENVTL. L. (Dec. 28, 2009), http://www.chinaenvironmentallaw.com/2009/12/28/chinas-renewable-energy-law-amendments [hereinafter McElwee, *China's Renewable Energy Law Amendments*]; Sara Schuman, *China Renews Its Commitment to Renewable Energy*, NRDC SWITCHBOARD (Feb. 1, 2010), http://switchboard.nrdc.org/blogs/bfinamore/china_renews_its_commitment_to.html (giving an excellent analysis of the amendments).

[236] McElwee, *China's Renewable Energy Law Amendments*, *supra* note 235.

[237] *Id.*

[238] *Id.*

(3) Changes to the national fund for research and development.[239]

Of these, the most potentially significant is the revised purchase obligation. Grid companies are already required under the REL 2006 and other existing regulations to purchase power from renewable energy producers.[240] However, they have resisted this at times, and the concept of developing a numerical purchase target is a tacit recognition that more compulsion is needed.[241] In 2008, Charles McElwee, an American environmental lawyer and editor of the highly regarded *China Environmental Law* blog, stated that the Renewable Energy Law was missing "(1) a specific assignment of responsibility to a political entity or the grid companies for achieving the renewable energy goals, and (2) the establishment of target achievement as a factor upon which local political official's job performance will be based."[242] McElwee noted that the lack of concrete purchase requirements tied to officials' performance indicators had created "resistance on the ground to grid access for certain renewable energy projects."[243]

It remains to be seen how well the new quota-like approach will work in practice. As of mid-2010, details of the new regulations relating to numerical purchase targets had not been set,[244] making it too soon to tell. McElwee points to another "significant change" made by the 2009 amendments to the previous law, which amended the penalty section of the REL 2006 (Articles 29 to 31).[245] Renewable power producers who are kept off the grid are now entitled to damages set at up to twice their economic

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[239] CHINA VIEW, *supra* note 234:

> Under the current surcharge, income will reach 4.5 billion yuan (689 million U.S. dollars) for 2009. The fund would continue to support scientific and technological research. It will also finance a pilot project for exploiting renewable energy, construction of renewable energy projects for domestic use in rural areas as well as independent power systems in remote areas and islands, localized equipment production and exploiting renewable energy, among other projects, says the draft amendment. Management of the fund will be worked out by finance, energy and pricing sectors of the State Council.

[240] McElwee, *China's Renewable Energy Law Amendments*, *supra* note 235.

[241] *See* McElwee, *China's Renewable Energy Law*, *supra* note 202.

[242] *Id.*

[243] *Id.; see also infra* notes 235–42 and accompanying text (discussing this issue).

[244] Stephen Leonelli, *Recent Climate Change News in the Chinese Media*, GREENLAW (May 19, 2010), http://www.greenlaw.org.cn/enblog/?p=2385 (citing comments made at a green technology forum in May 2010 by Dr. Ren Dongming of the NDRC).

[245] McElwee, *China's Renewable Energy Law Amendments*, *supra* note 235.

loss, double the previously available amount.[246] In the long run, this may prompt more compliance with the existing purchase obligation.

VI. CHALLENGES FOR RENEWABLE ENERGY IN CHINA

As it grows and matures, the renewable energy sector in China faces a host of challenges. Some relate to the regulatory environment in place after the REL 2006, a law that has been criticized as "not well-implemented."[247] In particular, China faces challenges in getting electricity produced from renewables to its electrical grid[248] and setting purchase prices for that power at sufficient levels to encourage investment in renewable energy technology.[249] Because subsidies provided under the international climate change regime are vital to domestic projects,[250] the uncertainty associated with continuation of that subsidy regime clouds the future of renewable energy deployment. Finally, preferential treatment of domestic companies in renewable power projects has led to charges of protectionism and suggestions that project development may be hampered in some cases by restrictive domestic content requirements.[251]

A. Challenges Relating to Grid Infrastructure and Interconnection of Small Power Producers

Wind farm and solar facilities in China are growing faster than the supporting grid infrastructure needed to support them. As of late 2009, roughly one-third of all installed wind turbines (representing four GW of capacity) were not yet connected to the nation's electrical grid.[252] In the Inner Mongolia region, a site of numerous wind projects, the Inner

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[246] *Id.*

[247] Christina Larson, *China Confronts Global Warming Dilemma*, CHRISTIAN SCI. MONITOR (Nov. 12, 2009), http://www.csmonitor.com/Environment/Global-Warming/2009/1112/china-confronts-global-warming-dilemma (citing Barbara Finamore of the Natural Resources Defense Council, an expert on China and renewable energy).

[248] *See* Liu, *supra* note 207, at 3.

[249] *See* Larson, *supra* note 247.

[250] *See* THOMAS R. HOWELL ET AL., DEWEY & LEBOEUF LLP, CHINA'S PROMOTION OF THE RENEWABLE ELECTRIC POWER EQUIPMENT INDUSTRY (2010), *available at* http://www.nftc.org/default/Press%20Release/2010/China Renewable Energy.pdf.

[251] *See infra* Part VI.D.

[252] *See* Jing Yang, *China's Wind Farms Come With a Catch: Coal Plants*, WALL ST. J. (Sept. 28, 2009), http://online.wsj.com/article/SB125409730711245037.html (quoting figures and arguing that the lack of connections will increase the need for conventionally generated power).

Mongolia Electric Power Industry Association ("EPIA") reported that nearly one-third of capacity sat idle.[253] Another source notes that "[n]early 150 million kilowatt hours of generated power went unused in the Guazhou and Yumen areas of Gansu because the grid could not absorb the power they produced. This represented 27 percent of Guazhou's and 33 percent [of] Yumen's actual wind power production."[254]

There are several reasons for this idling of wind power capacity. Technical challenges and other problems are hampering grid access for wind power producers.[255] As one observer sagely notes, "[t]here are currently structural and technical barriers which will restrain the growth of wind in some areas of China. It is simply not a matter of build it and they (the grid) will come."[256] A Chinese researcher notes that, "in 2008 all major Chinese wind power developers reported cases in which they were denied access to the grid due to various technical issues as well as lack of experience of the State Grid Corporation of China ("SGCC") in managing high-voltage transmission."[257] The simple lack of basic infrastructure required to connect wind power is often a problem.[258] The dearth of capacity to handle added electricity generated from renewables is a "major constraint."[259] China also faces a problem of geography. As in the United States, the best windy sites in China are often located far from dense urban areas and the power grid,[260] requiring extensive and expensive

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[253] Qiyan, *Wind Power Dilemma*, *supra* note 88; Zhenhua, *supra* note 84 (turbines sit in Inner Mongolia for as long as six months without being connected to the grid).
[254] Qiyan, *Wind Power Dilemma*, *supra* note 88; *see also* Zhenhua, *supra* note 84.
[255] Qiyan, *Wind Power Dilemma*, *supra* note 88; *see also* Zhenhua, *supra* note 84.
[256] McElwee, *A Mighty Wind*, *supra* note 206.
[257] *See* Liu, *supra* note 207, at 3.
[258] Zhenhua, *supra* note 84. The author discusses this problem and offers several examples, including the following:

> Guazhou's Beidaqiao wind farm has lost 17.7 million yuan (US$2.6 million) over two years of operation. 'The main reason is that grid capacity is inadequate and we have no choice but to limit output,' says manager Xu Qinghui. Only 50% to 60% of the 150 megawatts generated can normally be delivered to the grid, and at times as little as 30%.

Id.
[259] RENEWABLE ENERGY POLICY, *supra* note 65, at 26. The need for improved electricity delivery infrastructure in China is acute. As one observer notes, "[c]ompared with some countries' systems, which boast only 2–3% annual loss of generated power, China averages roughly 7% loss per year . . . and U.S. losses have reached 9% . . . in recent years." Elizabeth Balkan, *China's Smart Grid Ambitions Could Open Door to US-China Cooperation,* SOLVE CLIMATE NEWS (June 5, 2009), http://solveclimatenews.com/news/20090605/chinas-smart-grid-ambitions-could-open-door-us-china-cooperation.
[260] This is ably illustrated graphically in Dexin, *supra* note 77, at 17 ("Distribution Map of Wind Farm [sic] in China" showing current and planned wind farms and locations). *See*

investments in transmission lines to bring power to the grid.[261] An upgraded grid is increasingly viewed as "indispensable" to promoting China's continued development of renewables.[262]

Simply connecting to the existing grid can be a challenge. As one report notes, "[t]ransmission networks are not designed with large-scale renewable energy facilities in mind, and . . . there is limited training available to grid controllers on how to manage this form of power generation on the network."[263] The task of managing the grid is complex, and grid control in China operates very differently from the United States.

> Like many other countries with large geographical areas, China's electricity grid is regional rather than national, with six primary regional synchronous grids, each composed of provincial sub-grids . . . . [I]nter-regional and intra-regional transmission capacity is relatively constrained. *For practical purposes, many of China's grids operate at the level of provincial control areas.* In China the word 'utilities', in the sense of load serving entities (LSEs), most appropriately describes provincial grid companies, rather than national grid companies *per se*.[264]

The intermittency of wind power requires sophisticated dispatch operations to balance it with plants burning fossil fuels that operate continuously.[265] There are indications that Chinese grid controllers in areas such as Inner Mongolia have found this sort of balancing to be difficult.[266] This situation may change as grid companies come to grips more fully with the technical challenges of interconnection.[267] A worrisome problem

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also Zeppezauer & Carnabuci, *supra* note 82.

[261] *See* MCKINSEY & CO., *supra* note 40, at 39 (describing the infrastructure needed to complete a "significant expansion" of the power transmission and distribution grid).

[262] *Id.* at 53.

[263] RELAW ASSIST, *supra* note 142, at 24.

[264] Williams & Kahrl, *supra* note 90, at 9 (emphasis added).

[265] Qiyan, *Wind Power Dilemma*, *supra* note 88.

[266] *Id.* ("[P]ower grid scheduling is difficult, since the regional grid lacks the hydropower and natural gas power plants that help grid operators adjust power feeds when necessary to counteract the relative instability of wind power supplies. Rather, according to a wind power plant staffer in the region, grids can only rely on thermal power.").

[267] RENEWABLE ENERGY POLICY, *supra* note 65, at 26 ("Many grid companies are beginning to seek technical solutions to enable proper connectivity for large-scale wind farms and solar PV parks"); Lim, *supra* note 92 ("The government is shifting its emphasis from capacity to actual generation and connectivity to the electric grid, which should incentivize domestic manufacturers and developers to improve quality and reliability.").

reported from some areas of China is competition for access to the overstressed grid with conventional fuel plants.[268] With relatively few exceptions, wind power generators are located in the same parts of the country as conventional plants.[269] Grid controllers appear to be making some dispatch decisions that hamper the ability of wind power to reach the grid,[270] and one source estimates that in 2008 these restrictions kept 370 million kWh in wind power off the transmission grid.[271] One research report suggests that provincial grid controllers may even be deliberately disfavoring sources located in other provinces.[272] This proposition, if true, would be a major barrier to the growth of renewable power in China. Another observer cites statements from the Chinese wind power industry that generators are required to agree to curtailment provisions (requiring connections to be severed if necessary) in "clear violation" of the law.[273]

More sweeping changes may come from China's effort to develop a "smart grid"[274] under the "Strengthened Smart Grid" plan announced in 2009 by the State Grid Corporation.[275] The nascent American smart

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[268] *See* Qiyan, *Wind Power Dilemma*, *supra* note 88.
[269] *Id.*
[270] *Id.*
[271] *Id.*
[272] Williams & Kahrl, *supra* note 90, at 9 ("Provincial grid companies have historically favored provincially-owned generating units in allocating operating hours.").
[273] Schuman, *supra* note 235.
[274] A "smart grid" is "not a single entity, rather an umbrella term that covers modernization of both the transmission and distribution grids." Liu, *supra* note 207, at 3; *see, e.g.*, U.S. DEP'T OF ENERGY, SMART GRID SYSTEM REPORT iii (2009), *available at* http://www.oe.energy.gov/DocumentsandMedia/SGSRMain_090707_lowres.pdf (noting that in the U.S., "[t]he state of smart grid deployment covers a broad array of electric system capabilities and services enabled through pervasive communications and information technology, with the objective to improve reliability, operating efficiency, resiliency to threats, and our impact to the environment"). BOSSELMAN ET AL., *supra* note 63, at 984–95 describes the wide variety of efforts in the United States to establish technologies and best practices for a smart grid.
[275] Jerry Li, *From Strong to Smart: The Chinese Smart Grid and its Relation with the Globe*, ASIA ENERGY PLATFORM (Sept. 2009), *available at* http://aepfm.org/ufiles/pdf/Smart%20Grid%20-%20AEPN%20Sept.pdf, describes the three phases of the Strengthened Smart Grid plan:

> 2009–2010: Planning and Testing . . . establishing developmental plan, setting up technical & operational standards, developing technologies & equipment, performing trial tests;
>
> 2011–2015: Construction and Development . . . [building ultra high voltage lines], urban and rural grids construction, establishing the basic framework for smart grid operation control and interaction, achieving

grid plans put a heavy focus on integrating smart digital technology and distributed generation with the transmission grid while at the same time upgrading existing transmission infrastructure.[276] China's focus is somewhat different, as the word "strengthened" suggests. At present, "China's vision of the modernized grid is highly centralized in terms of generation while the U.S. approach has a higher dependence on distributional generation[.]"[277] China expects to build many new ultra-high voltage transmission ("UHV") lines to create a grid that can reliably transmit large amounts of electricity across the country.[278] The ambitious program of development, which Secretary Chu referred to in the Senate hearing,[279] calls for $44 billion in spending on UHV power lines.[280] Possible high voltage lines would connect Liaoning, Inner Mongolia, Gansu, Xinjiang, and Jiangsu provinces to consumers in eastern cities.[281]

The proposed scale of these expenditures is enormous. One part of the plan calls for 120 billion RMB (about $17.5 billion) to be spent to upgrade the grid in Gansu province for a wind farm to grow to twenty GW, and a comparable amount in Inner Mongolia to link to wind farms there.[282] A high voltage (750 kv) transmission line would span the entire nation, connecting Xiangyang, in China's northwest, to the country's eastern cities.[283] Together with this construction would be a massive effort to develop standards for a smart grid and deploy technologies needed for operation and control.[284] These technologies may be developed in part through cooperation

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> the projected advancements in technology and equipment production, mass deployment;
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> 2016–2020: Upgrading.

[276] *See generally* U.S. DEP'T OF ENERGY, *supra* note 274.
[277] Liu, *supra* note 207, at 5.
[278] Li, *supra* note 275, at 2–3 (describing the interest in UHV spanning over a decade in China, and listing UHV projects underway).
[279] *See* Chu, *supra* note 6.
[280] Chen Aizhu, *China to Spend $44 Bln by 2012 on UHV Power Lines*, REUTERS, May 21, 2009, *available at* http://in.reuters.com/article/oilRpt/idINPEK1781620090521; *see also* Wong & Light, *supra* note 57, at 4 (listing this as one initiative relating to China's efforts to address climate change).
[281] *China Plans to Develop National Smart Grid by 2020*, CS China Energy Update (U.S. Commercial Service, Beijing, China), Aug. 2009, at 13, http://www.export.gov/china/exporting_to_china/August%202009%20China%20Energy%20Newsletter.pdf.
[282] Fairley, *supra* note 4; *China Has Recorded Newly Added Installed Wind Power Capacity of 2.57 GW in the First Seven Months*, CHINA WIND POWER CTR., http://www.cwpc.cn/cwpc/en/node/5996 (last visited Oct. 19, 2010).
[283] Fairley, *supra* note 4; Zhenhua, *supra* note 84, at 4.
[284] Li, *supra* note 275, at 2–3.

with the United States as it embarks on its own smart grid effort.[285] For example, there is ongoing bilateral work through the "Joint US-China Cooperation on Clean Energy Smart Grid Cooperative."[286]

These and many more efforts will be required to enable China to grow rapidly in deploying renewable energy technology. Challenges remaining to be addressed include a lack of uniform technical standards and a lack of demand data so supply and demand can be managed efficiently.[287] As one report shows, the overall picture at present gives the impression of an overemphasis on building generation capacity over ensuring proper connectivity to the grid.[288] The problems with connecting to the grid are acute at present levels of solar and wind capacity, let alone the fantastic levels of growth projected for the next decade. Some point to overbuilding and a "bubble" or "glut" of wind turbines as the culprit.[289] This is an interesting issue—have China's governmental incentives resulted in *too much* investment in renewable energy facilities?[290]—and it may become a much bigger issue in the future.

B. Lack of a Sophisticated and Reliable Tariff System

China's system of pricing electricity generated from renewables has been criticized for not providing sufficient and stable incentives for renewable resource deployment.[291] A 2006 NDRC regulation, "Provisional

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[285] Liu, *supra* note 207, at 7 (discusses "Opportunities For US-China Cooperation on Smart Grid"); Balkan, *supra* note 259, also views the United States and China as potential "[p]artners in [s]mart [g]rid [e]xploration." A fuller description of ongoing bilateral efforts on smart grid technologies is beyond the scope of this article. However, it should be noted that this is one area in which the U.S.-China relationship in energy technology need not be a zero-sum game. *See supra* notes 17–20 and accompanying text (discussing how U.S. and China efforts in promoting greentech can be cooperative, not adversarial).

[286] The purpose of this effort is "to bring together Smart Grid experts across the world to work closely with China's two utilities and key influencers to jointly define Smart Grid in a way that makes sense in China." Press release, Joint U.S.-China Comm. on Clean Energy, Launch of Smart Grid Initiative to Meet China's Energy Challenge, (Nov. 10, 2008), *available at* http://www.juccce.com/documents/JUCCCE_Smart_Grid_press_release_081110.doc.

[287] Liu, *supra* note 207, at 6–7.

[288] Qiyan, *Wind Power Dilemma*, *supra* note 88. *See generally* Zhenhua, *supra* note 84.

[289] Qiyan, *Wind Power Dilemma*, *supra* note 88. *See generally* Zhenhua, *supra* note 84.

[290] *See generally* Zhenhua, *supra* note 84.

[291] *See* NRDC ECON. RES. INST., A STUDY OF ELECTRICITY TARIFF POLICY FOR PROMOTING ENERGY CONSERVATION AND RENEWABLE ENERGY DEVELOPMENT 5–6 (2005), *available at*

Administrative Measures on Pricing and Cost Sharing for Renewable Energy Power Generation (NDRC Price [2006] No. 7), established a method of fixed pricing."[292] This system was different from a European FIT, because the price paid to generators was not designed to yield a reasonable rate of return.[293] Instead, it was fixed at a level above the on-grid price of electricity generated from desulfurized coal.[294] At first, it applied only to biomass.[295] The biomass price was set at the provincial or local on-grid price of desulfurized coal, plus a government subsidy of 0.25 RMB ($0.03) per kWh, with the subsidy decreasing at an annual rate of two percent for projects approved after 2010.[296]

Solar project pricing has been "determined in the principle of reasonable costs plus reasonable profits by the price authorities of the State Council."[297] Solar industry companies and outside observers criticize this project-specific methodology. Prices set after project approval are not consistent signals to would-be investors in renewable energy projects because they are not determined in advance as are European-style FITs.[298] An industry organization calling for a tariff system concluded that "[w]ith today's [solar] system cost, national subsidy . . . is not enough to ensure a reasonable return on investment."[299] A 2007 study recommended working toward the setting of a national European-style FIT for each technology based on its specific characteristics, including generation potential, technology maturity, and geographic distribution.[300] In 2005, researchers at the NDRC recommended a standard tariff with these distinctions and

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http://www.efchina.org/csepupfiles/report/2006102695218562.184880057102.pdf/Pricing_IER_EN_final.pdf.

[292] Provisional Administrative Measures on Pricing and Cost Sharing for Renewable Energy Power Generation (promulgated by the Nat'l Dev't and Reform Comm. of the People's Republic of China, Jan. 4, 2006), *available at* http://www.cresp.org.cn/uploadfiles/2/969/ndrc%20price%202006%20document%20no.7.pdf [hereinafter Provisional Administrative Measures].

[293] This aspect of the design of European FITs is discussed in BOSSELMAN, ET AL., *supra* note 63, at 906–07.

[294] Provisional Administrative Measures, *supra* note 292, at art. 5.

[295] *Id.* at art. 7.

[296] *Id.*

[297] *Id.* at art. 9; see also Zeppezauer & Carnabuci, *supra* note 82, for a discussion of how this approach worked in practice.

[298] Zeppezauer & Carnabuci, *supra* note 82, at 2 ("Obviously, this approach does not provide a high level of certainty to investors as to whether a project will be approved; nor, once a project has been approved, as to whether it will receive a feed-in price allowing it to become profitable.").

[299] *The Golden Sun of China*, *supra* note 228, at 1.

[300] RENEWABLE ENERGY POLICY, *supra* note 65, at 27.

a price set at levels above the provincial on-grid prices for electricity to account for different costs in different provinces.[301]

In 2009, the NDRC priced the Dunhuang ten MW solar project at 1.09 RMB ($0.15) per kWh.[302] Later that year, the NDRC was expected to fix a benchmark on-grid price for solar power generation.[303] One source put the expected level at that of the Dunhuang project, calling it a "lowball" level.[304] Another expected a tariff of approximately 1.1–1.2 RMB ($0.17) per kWh, a level still not thought by the industry to be sufficiently high to attract new investment.[305] In April 2010, the NDRC set the price for four projects in northwestern Ningxia province at 1.15 RMB ($0.169) per kWh.[306] This action indicated that the NDRC would be using an open tender system to price individual projects, as the announced tariff had not yet been issued.[307] Pricing of solar projects thus retained its ad hoc character. In May 2010, Bruce Sohn, the President of First Solar, deemed approval of some form of subsidy rates to be critical to the future of the mammoth Ordos project, stating that "[w]e're missing a key area: clarity about what the price per kilowatt hour will be."[308]

Initially, China also rejected adopting a FIT for wind power, despite expectations in the wind power industry that the REL 2006 would lead to a tariff system.[309] The government handled pricing for wind power with

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[301] *See* NRDC ECON. RES. INST., *supra* note 291, at 7–9, 59–61.

[302] Li Qiyan, *Slow Sunrise for China's Solar Power Pricing*, CAIJING.COM.CN (Oct. 29, 2010), http://english.caijing.com.cn/2009-10-29/110297591.html [hereinafter Qiyan, *Slow Sunrise*]; Chris Brown, *China Sets On-Grid Tariff for Utility Solar Plants as Chinese Solar Stock Prices Jump*, CHINA SOLAR ENERGY (Apr. 14, 2010), http://chinasolarenergy.blogspot.com/2010/04/china-sets-on-grid-tariff-for-utility.html.

[303] *See* Brown, *supra* note 302.

[304] *See* Qiyan, *Slow Sunrise*, *supra* note 302 (quoting a "source at a Dunhuang power company" who states that, "[p]olicy for on-grid electricity decides the fate of power generation companies [and] [i]f 1.09 yuan per kilowatt hour is set as the benchmark price, the majority of photovoltaic enterprises will be unable to achieve profitability").

[305] *Solar Power On-Grid Price Likely to Come Out Before Year End at 1.1–1.2 Yuan/kWh*, ENERGY CHINA FORUM (Oct. 30, 2009), http://www.energychinaforum.com/news/27649.shtml (noting that "a number of companies still regard a price set at 1.1 to 1.2 yuan/kWh too low to accept, and when talking to the NDRC they argued that an on-grid solar power price 1.5 yuan/kWh would be reasonable").

[306] Brown, *supra* note 302.

[307] *Id.*

[308] *First Solar Faces Delay on China Plans Over Prices, Sohn Says*, BLOOMBERG BUS. WEEK (May 19, 2010), http://www.businessweek.com/news/2010-05-19/first-solar-faces-delay-on-china-plans-over-prices-sohn-says.html.

[309] Williams & Kahrl, *supra* note 90, at 6. (stating bluntly that "[w]ith the passage of the Renewable Energy Law, the wind industry had hoped to receive a fixed feed-in tariff to support a more stable growth environment. Those hopes did not materialize").

a competitive tender system for projects of fifty MW and larger.[310] The competitive bidding process took both considerations of power price and projects' domestic content into account as key criteria.[311] Under this system, pricing was determined for two different periods during the lifetime of a wind power project: one price for up to 30,000 full load hours of generation, and another after that "set as the average electricity price of the local grid at that time."[312] For smaller projects, provincial government agencies had the authority to approve and price them, and terms and conditions "are often negotiated on an individual basis."[313]

There were many problems with a competitive tendering approach. In several rounds of bidding between 2003 and 2009, winning bids were below the cost of generating electricity and resulted in under-pricing of power generated by renewables.[314] A SERC research report on wind power development in seven provinces found that the low prices were hampering wind power development.[315] Bidding rules were modified for the fifth round to discourage below-cost bids, which "improved the situation somewhat but did not fundamentally change it."[316] By contrast, prices in projects approved by local governments were occasionally much higher, in some cases as much as twice the price paid in the national bidding system, leading one study to conclude that the competitive tender system yielded both "disappointing performance in projects that have been underpriced *and* a high cost to society in projects that have been overpriced."[317]

The competitive bidding process was not linked to a resource planning and portfolio management process.[318] Multinational companies also criticized it for a lack of transparency and favoritism of SOEs.[319] SOEs are not required to make profits and can therefore underestimate their costs

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[310] RENEWABLE ENERGY POLICY, *supra* note 65, at 10.
[311] Zeppezauer & Carnabuci, *supra* note 82.
[312] *Id.*
[313] Williams & Kahrl, *supra* note 90, at 6.
[314] RENEWABLE ENERGY POLICY, *supra* note 65, at 10 ("[T]ariffs offered by winning concessions were too low to be viable.").
[315] *Infrastructure Woes Hamper China Wind Farms' Push for Profitability*, GUARDIAN.CO.UK. (July 27, 2009), http://www.guardian.co.uk/environment/2009/jul/27/network-windpower (citing the report).
[316] RENEWABLE ENERGY POLICY, *supra* note 65, at 10.
[317] Williams & Kahrl, *supra* note 90, at 6. Tariffs for projects competitively bid were as low as 0.41 yuan/kWh, and for projects authorized by provincial governments, tariffs were as high as 0.80 yuan/kWh. *Id.*
[318] RELAW ASSIST, *supra* note 142, at 31.
[319] Lim, *supra* note 92.

without fear of the consequences.[320] Pointing to results in which SOEs underbid other firms in wind power tender rounds, other companies decried a process that "do[es] little to stimulate development of a diverse market with multiple independent power producers"[321] because the "implicit default protection from the Chinese government" allowed SOEs "to sacrifice profitability on wind projects in favor of ensuring they can meet the government's looming capacity targets."[322] The close relationships between executives of the SOEs and the central government lead to accusations of collusive behavior.[323] A perhaps predictable result of these inefficiencies is that SOEs have done a poor job of evaluating wind resources and project costs.[324]

In 2009, the NDRC replaced the competitive tender system with a new feed-in tariff for wind that featured a zonal approach.[325] The "Circular on Refining the Policy for On-Grid Pricing of Wind Power (NDRC Price [2009] No. 1906)" established fixed prices that apply to onshore wind power projects approved after August 1, 2009.[326] The zonal approach creates four different regions in China, with different prices set for each area.[327] The prices are lower (0.51 RMB/kWh, or roughly $0.06/kWh) in regions such as Inner Mongolia, which have the most wind power capacity already on line and were thought to need smaller subsidies, than in regions with fewer wind resources (with prices $0.079–0.089/kWh).[328]

Even before any projects had been started under the new wind tariff system, it was praised as setting a more favorable and stable investment climate for wind power.[329] Still, China's solar and wind tariffs were only recently announced, and there are significant differences between

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[320] *See* RELAW ASSIST, *supra* note 142, at 35 (identifying the "competitive advantage of state-owned corporations which are supported by government subsidies, allowing them to put in lower bids for tendered projects than would be feasible for foreign, profit-oriented companies").
[321] *Id.* at 29.
[322] Lim, *supra* note 92.
[323] *Id.* (noting that "the government likely exerts more covert influence on sourcing decisions through SOE developers; many executives within these firms are former energy ministry officials, providing the government with informal influence channels").
[324] Williams & Kahrl, *supra* note 90, at 6.
[325] Zeppezauer & Carnabuci, *supra* note 82, at 2; Zhenhua, *supra* note 84.
[326] Chen & Tsen, *supra* note 205, at 2; *see also* Zeppezauer & Carnabuci, *supra* note 82, at 2.
[327] Zeppezauer & Carnabuci, *supra* note 82, at 2.
[328] Zhenhua, *supra* note 84.
[329] *See* CHINA WIND POWER CTR., *supra* note 212 ("[T]he benchmark electricity price method is conductive to regulate the mechanisms of market and price. With no vicious competition of low electricity prices, it is beneficial for the investors.").

their pricing signals. There is a need for further policy development in this area, and as one article notes, "China faces many challenges and lacks a solid foundation to establish an effective national FIT system."[330]

C. Clean Development Mechanism Concerns

The Clean Development Mechanism ("CDM"), established under Article 12 of the Kyoto Protocol,[331] is one of the "flexible mechanisms" available to nations obligated to reduce emissions under this international climate change agreement.[332] Under the CDM (Kyoto Annex B) nations with specific reduction targets[333] undertake projects in nations not obligated to reduce emissions and gain credits known as "Certified Emissions Reductions" ("CERs") for those projects toward their own reduction targets.[334] China is by far the biggest location of CDM projects in the world and has therefore been the primary beneficiary of CDM subsidies.[335] The number of CDM projects in China has increased dramatically, from 138 in 2006 to 1608 by the end of 2008.[336]

The added financial incentives from the CDM program can make a significant difference in assessing the viability of proposed projects. A European study of China and the CDM notes that "[s]upport provided by government policy [in China] is not sufficient to overcome the higher development cost of renewable energy,"[337] and concludes that "CER revenue can improve the profitability of the investment, making unprofitable projects profitable on the margin, and (in the longer term) support the scaling up of renewable energies."[338]

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[330] *The Golden Sun of China*, *supra* note 228.
[331] Kyoto Protocol to the United Nations Framework Convention on Climate Change, art. 12, Dec. 10, 1997, 37 I.L.M. 22, *available at* http://unfccc.int/kyoto_protocol/items/2830.php.
[332] *See Clean Development Mechanism*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items/2718.php (last visited Oct. 20, 2010).
[333] *Id.*
[334] *Id.*
[335] EU-CHINA CDM FACILITATION PROJECT, THE PRE-2012 CDM MARKET IN CHINA: POLICY CONTEXT AND CURRENT DEVELOPMENTS 29 (2009), *available at* http://www.euchina-cdm.org (follow "Pre-2012 CDM Market in China" hyperlink).
[336] *Id.* at 29, 31–32. The UNFCCC governing body keeps detailed statistics on CDM projects in a "CDM Registry." *CDM Registry*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://cdm.unfccc.int/Registry/index.html (last visited Oct. 20, 2010).
[337] EU-CHINA CDM FACILITATION PROJECT, *supra* note 335, at 27.
[338] *Id.* at 27–28.

CDM subsidies are particularly important to China's wind power industry.[339] One industry analyst claims most wind projects in China will not be financially viable without them.[340] Another researcher is less convinced, stating that developers need to start projects and expend large sums up front before they have certainty about the availability of CDM subsidies.[341] However, even that report notes that CDM subsidies may make up as much as ten percent of project costs, and at the margin, the availability of subsidies may be essential for some wind power projects in China.[342]

The relationship between China's wind tariffs and project viability caused considerable controversy recently when the CDM's governing body, the Executive Board ("CDM EB"), clashed with Chinese interests over determining whether specific projects were eligible for the subsidies.[343] A

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[339] Zeppezauer & Carnabuci, *supra* note 82 ("It is usually intended for renewable energy generation projects in China to be recognized and registered as Clean Development Mechanism projects . . . . This has been of particular relevance for wind power generation projects.").

[340] E-mail from Alexander U. Conrad, Principal & Managing Director, emidaASIA, to Joel B. Eisen, Professor of Law, University of Richmond School of Law (Nov. 2, 2009, 3:21 PM) (on file with author).

[341] JOANNA I. LEWIS, ENERGY FOUND. CHINA SUSTAINABLE ENERGY PROGRAM, THE EVOLVING ROLE OF CARBON FINANCE IN PROMOTING RENEWABLE ENERGY DEVELOPMENT IN CHINA 16 (2009) *available at* http://www.climateworks.org/download/?id=506d9e9f-65c9-4a09-b12a-9f979bede0a8.

> Renewable energy projects typically have a proportionally higher share of initial investment compared with conventional power generation projects. In addition, at the time at which the investment decision associated with the renewable energy project is made, there will most likely still be uncertainty associated with CDM project approval. As a result, the revenue from the CERs cannot necessarily be relied upon in the early stages of developing a project.

Id.

[342] *Id.* at 16.

> [W]hile the CDM could help tip a project that is on the borderline of being profitable towards profitability, this is unlikely to be a sufficient factor for determining whether to invest in the first place. Wind energy projects require a sizable upfront investment and take many years to yield sizable carbon reductions; therefore it is estimated that total CDM revenue will likely contribute less than 10 percent of the total project investment cost.

Id.

[343] *Id.* at 14–15 (observing that "the CDM Executive Board has highlighted 15 wind projects in China that must be reviewed due to inconsistencies in the documentation of the level of government subsidy or feed-in tariff").

complex process established under procedures of the CDM EB determines project eligibility.[344] Once a project has been approved by the NDRC, which is the "Designated National Authority" for China,[345] and registered with the CDM EB, the CERs yielded by that project can be sold or traded.[346] Each project sponsor must prepare a document that explains in detail how its future emissions reductions will be voluntary, real, additional, and will not induce leakage.[347]

This process has come under considerable fire for relying on "additionality": a determination that project emissions reductions will add to those already likely to occur.[348] This in turn requires a baseline projection of emissions that would have occurred without the subsidy provided by the CDM.[349] As commentators have noted, it is difficult, if not impossible, to prove the "counterfactual" that emissions reductions would not have happened but for the CDM's subsidy.[350] In his study of the CDM, Professor Michael Wara notes that in China's electricity sector "projects present extremely challenging regulatory decisions to the CDM EB because it must decide which projects would or would not have gone forward without the carbon finance funds."[351] He concludes that "the incentives created by the CDM are likely leading to no change in behavior except for widespread claims for credits."[352]

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[344] These procedures may be found at the website of the CDM EB. *EB Meetings*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://cdm.unfccc.int/EB/index.html (last visited Oct. 20, 2010).

[345] *Designated National Authorities*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://cdm.unfccc.int/DNA/view.html?CID=46 (last visited Oct. 20, 2010); EU-CHINA CDM FACILITATION PROJECT, *supra* note 335, at 21 (flow chart showing this information).

[346] *About CDM*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://cdm.unfccc.int/about/index.html (last visited Oct. 20, 2010).

[347] Michael Wara, *Measuring the Clean Development Mechanism's Performance and Potential*, 55 UCLA L. REV. 1759, 1770 (2008).

[348] *Id.* at 1770–71. For other discussions of additionality, see U.S. GOV'T ACCOUNTABILITY OFF., INTERNATIONAL CLIMATE CHANGE PROGRAMS: LESSONS LEARNED FROM THE EUROPEAN UNION'S EMISSIONS TRADING SCHEME AND THE KYOTO PROTOCOL'S CLEAN DEVELOPMENT MECHANISM (2008). *See generally* Steven Ferrey, *When 1 + 1 No Longer Equals 2: The New Math of Legal "Additionality" Controlling World and U.S. Global Warming Regulation*, 10 MINN. J.L. SCI. & TECH. 591 (2009).

[349] Wara, *supra* note 347, at 1771.

[350] *Id.* at 1769. Professor Wara claims that this and other deficiencies of the current CDM system are "leading to widespread strategic behavior" to game the system. *Id.* at 1797.

[351] *Id.* at 1790. A European study agrees, noting that "wrestling with issues related to 'additionality' in the context of a rapidly changing landscape of Chinese Climate and Energy policy add[s] a layer of complexity to discussions of future rules on CDM or equivalent." EU-CHINA CDM FACILITATION PROJECT, *supra* note 335, at 28.

[352] Wara, *supra* note 347, at 1798.

A comprehensive analysis of the CDM is beyond the scope of this article, and Professor Wara does not specifically address renewable energy projects. However, his claim does appear to be supported by the available evidence, at least with respect to wind power projects. The CDM EB has historically rejected few CDM projects proposed for China.[353] That can be seen either as reflecting good vetting of proposed projects at the national level, or as a simple reluctance to reject subsidy requests. It defies credulity to claim *all* projects would not have happened but for the availability of subsidies.[354] That claim is easily refuted by the governmental activity described throughout this article. China is actively developing laws and policies, putting in place financial incentives and tariffs, and taking other steps to promote renewables.[355] That makes it difficult to say that no proposed project would go forward without an extra international subsidy.[356]

This issue came to the fore in 2009, when the CDM EB questioned whether six Chinese wind projects should be included in the CDM.[357] The CDM EB called for more information on the new wind tariffs in China, which it intended to use to decide whether the proposed projects were additional.[358] Industry representatives called the decision "unsupported by evidence and taken behind closed doors,"[359] and criticized

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[353] EU-CHINA CDM FACILITATION PROJECT, *supra* note 335, at 21; LEWIS, *supra* note 341, at 15 ("[O]nly 7 renewable energy CDM projects (one wind project and six hydropower projects) have been rejected by the executive board due to additionality concerns."). This, of course, changed with the recent announcement that six wind projects would be rejected. *See infra* notes 354–60 and accompanying text.

[354] LEWIS, *supra* note 341, at 14 ("If a host country already has policies in place to promote renewable energy (e.g. a feed-in tariff subsidy or a mandatory RPS), for example, then it could be hard to prove that the project wouldn't have occurred without the CDM.").

[355] *See supra* Part III. *See generally* Shai Oster, *Chinese Law Aims to Increase the Use of Renewable Energy*, WALL ST. J. (Dec. 28, 2009), http://online.wsj.com/article/NA_WSJ_PUB:SB126192809041606467.html.

[356] LEWIS, *supra* note 341, at 14 (noting, for example, that "[t]he existence of a direct subsidy, such as a feed-in tariff, apparently can be used to question the financial additionality calculation of a project").

[357] *See* Karl-Erik Stromsta, *CDM Approves 32 Chinese Wind Farms; Rejects Six Others*, RECHARGE (Feb. 15, 2010), http://www.rechargenews.com/energy/wind/article206525.ece (discussing the decisions).

[358] EXEC. BD. OF THE CLEAN DEV. MECHANISM, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, CDM-EB-51, FIFTY-FIRST MEETING, REPORT VERSION 01.1, at 14–16 (2009), *available at* http://cdm.unfccc.int/EB/051/eb51rep.pdf (this report describes the findings of the CDM EB with respect to these projects); *see also* Stromsta, *supra* note 357 (discussing the decisions).

[359] *Blown Right Off Course? CDM Executive Board Turns Against Renewable Energy Development*, GLOBAL WIND ENERGY COUNCIL (Apr. 12, 2009), http://www.gwec.net/index

it as arbitrary.[360] This discussion is but one of many that suggest that there should be a sustained effort to determine what form the CDM will take after 2012, when the Kyoto Protocol first commitment period ends.[361] That discussion, of course, is in turn one aspect of a much more complex set of international negotiations about a follow-on treaty to the Kyoto Protocol. At present, "the insecurity surrounding post 2012 developments pose[s] a significant risk to investments in the CDM market,"[362] and it remains unclear what form the post-2012 subsidy regime will take. Resolving this set of issues will continue to be vitally important to the continued development of China's renewable energy industry.

D. Protectionism and Quality Concerns About China's Domestic Renewables Equipment Manufacturing Industry

As numerous press reports indicate, China is intent on developing its domestic renewables industries.[363] This was an explicit goal of the Medium and Long-Term Development Plan, which stated that "[b]y 2020, a relatively complete renewable energy technology and industry system will have been established, so that a domestic manufacturing capability based mainly on China's own IPRs will have been established, satisfying the needs for deploying renewable energy on a large scale in China."[364] The industry situation is changing rapidly, as domestic companies have matured into major enterprises capable of competing with the foreign

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.php?id=30&no_cache=1&tx_ttnews[tt_news]=235&tx_ttnews[backPid]=4&cHash=00b98ea04d.

[360] *See, e.g.*, *CDM: Questions About Chinese Wind Power Projects*, IETA NEWSLETTER (Int'l Emissions Trading Ass'n, Geneva, Switz.), July 2009, http://ymlp.com/zfLyC9.

> A flood of questions about the additionality of Chinese wind power projects due to some changes in government tariff rates over the past few years has led to a rather sudden and increasingly burdensome string of questions from the Secretariat and the CDM Executive Board that IETA has argued are both inappropriate procedurally and which, when answered as requested, still do not affect the additionality determination.

Id.

[361] *See generally* LEWIS, *supra* note 341.

[362] EU-CHINA CDM FACILITATION PROJECT, *supra* note 335, at 51.

[363] *See, e.g.*, Keith Bradsher, *Drawing Critics, China Seeks to Dominate in Renewable Energy*, N.Y. TIMES, July 14, 2009, at B1; Press Release, Jennifer Cummings, Nat'l Foreign Trade Council, New Study Details Chinese Government Polices to Promote Domestic Renewable Energy Sector & Implications for Foreign Firms (Mar. 15, 2010), *available at* http://www.nftc.org/newsflash/newsflash.asp?id=236&mode=View&articleid=3015.

[364] Medium and Long-Term Development Plan, *supra* note 61, at 5.

manufacturers who once dominated the field.[365] According to the NDRC, there are now more than seventy wind power equipment manufacturers, up from six in 2004.[366] One Chinese researcher confidently predicts that "[a]fter 5 years to 10 years' efforts, China will be not only the powerful country on wind power equipment manufacturing, but also the important country of [sic] exporting wind power equipment."[367]

Unfortunately, as with everything about renewable energy in China, simplistic statistics showing spectacular growth in the equipment manufacturing industry do not paint the full picture. There are continuing questions about whether China's domestic industry can provide quality products to support a rapid increase in deployment of renewable energy technology.[368] As recently as 2009, one observer noted "[w]ind-turbine manufacturers and wind-farm developers everywhere have faced teething problems, but China has perhaps faced more difficulties than most. Its wind farms are much less efficient than those in other leading countries [and] manufacturing defects have plagued Chinese equipment."[369] Another notes that Chinese wind turbines are less expensive but appear to have traded cost for some quality.[370] It may well be that industry growth and experience will yield better results in the near term, but one cannot be sure.

Encouraging a vibrant domestic renewables industry brings charges that a protectionist China is competing unfairly with other nations.[371] This

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[365] *See* Lim, *supra* note 92. The article points out that "[d]omestic players who once relied on joint ventures with foreign partners, are now poised to stand alone with sufficient in-house technology and expertise." *Id.*

[366] Qiyan, *Wind Power Dilemma*, *supra* note 88.

[367] Dexin, *supra* note 77, at 35.

[368] *See generally* JAVIER CAMPILLO & STEPHEN FOSTER, DEPT. OF PUB. TECH, MALARDALEN UNIVERSITY, SWEDEN, GLOBAL SOLAR PHOTOVOLTAIC INDUSTRY ANALYSIS WITH FOCUS ON THE CHINESE MARKET (2008), *available at* www.diva-portal.org/smash/get/diva2:127961/FULLTEXT01 (discussing a litany of challenges facing the Chinese PV manufacturing industry).

[369] Cyranoski, *infra* note 379, at 372.

[370] Lim, *supra* note 92. "Chinese-made turbines cost up to 20% less than those of multinational manufacturers. However, field data suggests that Chinese turbines significantly lag foreign products in quality, to the extent that the long-term revenue sacrificed from lower quality (as measured by turbine capacity factor) outweighs the upfront cost savings." *Id.*

[371] *See* Keith Johnson, *Protectionist Breezes: Wind-Power Companies Cry Foul on China*, WALL ST. J. ENVTL. CAPITAL BLOG (May 28, 2009, 12:02 PM), http://blogs.wsj.com/environmentalcapital/2009/05/28/protectionist-breezes-wind-power-companies-cry-foul-on-china; *China Uses Every Protectionist Policy Available to Build a Globally Dominant*

has become a major focus of U.S.-China relations over the past year.[372] In October 2010, The U.S. Trade Representative ("USTR") launched an investigation into subsidies in China's renewable energy industries, citing "export restraints, prohibited subsidies, discrimination against foreign companies and imported goods, technology transfer requirements, and domestic subsidies causing serious prejudice to U.S. interests."[373] What some view as a potential threat posed by a growing Chinese greentech industry was no better exemplified by the political storm over the proposed U.S.-China joint wind farm venture in Texas.[374] The announcement that a Chinese firm might supply wind power equipment in the United States elicited some harsh criticism from members of Congress who claimed the project would hurt domestic companies.[375]

At the same time, some in the United States claim that while Chinese manufacturers are rushing to cash in on increasing American demand for renewable energy technology, the Chinese government is keeping foreign manufacturers out of its own domestic market.[376] Officially, the Chinese government encourages investment by foreign companies in this sector and the NDRC and Ministry of Commerce ("MoC") have published a "Guiding Industry Catalogue for Foreign Investment" that identifies constructing and operating renewable energy projects as "encouraged industries" for foreign investment.[377] In 2009, however, the NDRC, MoF,

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Renewable Energy Industry, ALLBUSINESS.COM (Apr. 30, 2010), http://www.allbusiness.com/government/government-bodies-offices-us-federal-government/14441360-1.html.

[372] *See* ALLBUSINESS.COM, *supra* note 371.

[373] United States Trade Representative, *supra* note 24; Sewell Chan & Keith Bradsher, *U.S. to Investigate China's Clean Energy Aid*, N.Y. TIMES (Oct. 15, 2010), http://www.nytimes.com/2010/10/16/business/16wind.html.

[374] *See, e.g.*, Press Release, Senator Charles E. Schumer, Schumer, Casey, Brown & Tester Urge Obama Administration to Suspend Stimulus Program Funneling Billions of Dollars Overseas (Mar. 3, 2010), *available at* http://schumer.senate.gov/record.cfm?id=322732& (detailing efforts by four senators to block federal funding for the project).

[375] *See, e.g.*, *id.* China is not the only foreign country accused of taking over the wind power equipment industry and taking advantage of federal funds from the 2009 ARRA stimulus package. *See generally* Russ Choma, *Foreign Firms Dominate Wind Energy in U.S., Land Stimulus Dollars*, POLITICS DAILY (May 25, 2010), http://www.politicsdaily.com/2010/05/25/foreign-firms-dominate-wind-energy-in-u-s/ (discussing efforts of European firms participating in American projects).

[376] *See* Johnson, *supra* note 371.

[377] *China's 2007 Foreign Investment Guide*, CHINA BUS. REV. http://www.chinabusinessreview.com/public/0801/cmi.html (last visited Oct. 20, 2010). The English translation of this provision may be found at *Guiding Industry Catalogue for Foreign Investment*, FDI, http://www.fdi.gov.cn/pub/FDI_EN/Laws/law_en_info.jsp?docid=87372 (last visited Oct. 20, 2010) (listing "[c]onstruction and management of new energy power plants (solar energy, wind energy, magnetic energy, geothermal energy, tidal wave energy, biological mass

and MoC removed import subsidies and excluded polysilicon and wind turbines over two MW from a List of Encouraged Imported Technologies and Technology Products.[378] Until 2010, a major barrier remained in place to foreign investment in the wind power sector. A local content regulation required that seventy percent of wind turbine components be locally made and that the wind turbine generator be assembled in China.[379] The aim of this requirement was to encourage China's technology and manufacturing industry for wind turbines.[380] This goal has been met very quickly. In 2004, the market share of domestic companies in China was far lower than that of multinational turbine manufacturers,[381] but now it greatly exceeds that of foreign companies.[382]

Numerous foreign observers reported that the domestic content requirement and the lack of transparency in bidding on individual projects contribute to a difficult climate for foreign investment in domestic projects.[383] For example, several wind turbine manufacturers attempted to comply with the local content regulations by building facilities in China to assemble components there.[384] Still, they complain that even those firms

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energy, etc.)" among encouraged industries). The *China Environmental Law* site maintains an unofficial translation of this document, which confirms the listing. NRDC, CATALOGUE OF INDUSTRY GUIDELINES FOR FOREIGN INVESTMENT 31 (2007), *available at* http://www.chinaenvironmentallaw.com/wp-content/uploads/2008/04/guidance-catalogue-for-foreign-investment-2007.pdf.

[378] Qiyan, *Wind Power Dilemma*, *supra* note 88.

[379] Joanna I. Lewis, *Part of the Climate Change Problem . . . and the Solution? Chinese-Made Wind Power Technology and Opportunities for Dissemination*, BRESLAUER SYMPOSIUM, UNIV. OF CALIF. INT'L AND AREA STUDIES 8 (2005), *available at* http://escholarship.org/uc/item/8rt4q01k [hereinafter Lewis, *Part of the Climate Change Problem*] (discussing the development of local content requirements.) "Developers bidding on the most recent concession projects in September 2004 had to demonstrate the ability to utilize wind power technology that met a 70% local content requirement, while the first two projects required only 50% local content." *Id.* at 9. *See generally* David Cyranoski, *Beijing's Windy Bet*, NATURE, Jan. 22, 2009, at 372, *available at* http://www.nature.com/news/2009/210109/full/457372a.html (discussing issues arising from China's increased use of wind energy).

[380] Lewis, *Part of the Climate Change Problem*, *supra* note 379, at 7.

[381] *Id.* at 4 fig. 1. In 2004, the only major Chinese company in the wind turbine market was Goldwind, with a twenty-four percent market share. *Id.*

[382] Lim, *supra* note 92 (chart "Wind Turbine Generator Market Share in China-Domestic vs. Foreign"). The drop is indeed rapid. One article estimates that foreign manufacturers accounted for a seventy-five percent share of equipment in renewable energy projects in 2004, and that share may fall as low as five percent in 2010. *U.S. Urges China to Keep an Open Tech Policy*, CNET GREEN TECH (May 15, 2010), http://news.cnet.com/8301-11128_3-20005079-54.html.

[383] *See* Johnson, *supra* note 371.

[384] Lewis, *Part of the Climate Change Problem*, *supra* note 379, at 9.

that attempt to comply with the rules are often shut out of projects.[385] One Chinese researcher notes that "multinational manufacturers were disqualified on technical grounds within three days of bidding for wind farm contracts this spring, even as Chinese companies that had never built a turbine were approved."[386] The same researcher claims that the government banned virtually any installation of wind turbines with a capacity of less than 1000 kW, which would exclude the popular 850-kW designs of European manufacturers.[387] The head of a company based in India stated, "I cannot say it's deliberate, but the facts show that no turbine suppliers from international companies established here have been selected."[388]

A full examination of the impact of this issue on U.S.-China trade relations would be welcome. At the start of the 2010 trade mission to China to persuade the Chinese to buy American products, Secretary of Commerce Gary Locke stated, "China, given the incredible challenges that is has, should in my view be taking the best technology from wherever—whether it's China, the United States, Europe, Japan, anywhere else."[389] However, the USTR investigation has increased tension between the two nations[390] and contributed to a much less harmonious trade climate. It has also linked competition in greentech directly to much larger issues involving the economic relationship between the United States and China, such as concerns over currency manipulation.[391] For now, it is unclear whether the Chinese domestic market will eventually be more open to foreign technology. As China pursues the growth of its own domestic renewable energy equipment manufacturing industry and implements the programs and policies described in this article, the answer may become clearer over time.

CONCLUSION

The factors behind China's "hyper-growth" in the renewable energy sector "have significant, and somewhat controversial, implications for

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[385] *See* Ruonan Zheng, *China Builds High Wall to Guard Energy Industry*, CHINA WIND POWER CTR. (July 15, 2009), http://www.cwpc.cn/cwpc/en/node/5829.
[386] *Id.*
[387] *Id.*
[388] *Specter of Investment Protectionism Stalks China*, REUTERS, June 8, 2009, *available at* http://www.reuters.com/article/idUSTRE5571D320090608.
[389] *U.S. Urges China to Keep an Open Tech Policy*, *supra* note 382.
[390] Mark Drajem & Huang Zhe, *China Says U.S. Trade Complaint on Clean Energy Policy is 'Irresponsible,'* BLOOMBERG (Oct. 16, 2010, 2:58 AM), http://www.bloomberg.com/news/2010-10-16/china-says-u-s-trade-complaint-on-clean-energy-policy-is-irresponsible-.html (China's Ministry of Commerce calls the complaint "groundless" and "irresponsible.").
[391] *Id.*

China, global energy players, and the worldwide energy market."[392] Is China about to lead the world in deploying renewable energy technology? One would be tempted to say that the answer is an unqualified "yes," but the reality is that substantial challenges remain. China's government has taken strong measures to promote rapid growth of renewable energy technologies, but implementation lags behind the officially announced policies. My hope is that a richer understanding of this landscape will illustrate how China may succeed at turning to greentech to help satisfy its increasing demand for energy. In addition, this analysis will also prove useful to those interested in addressing climate change and improving relations between our two nations, because the reality of China's renewable energy deployment to date is much more nuanced than one would surmise from any juggernaut-like descriptions of China's progress.

[392] Lim, *supra* note 92.