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US-CHINA
MARKET REVIEW

SUMMER 2012

US-CHINA MARKET REVIEW

SUMMER 2012

A COLLABORATIVE REPORT BY:

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US-CHINA PROGRAM

The US-China Program (USCP) of the American Council On Renewable Energy (ACORE) is dedicated to increasing understanding of the U.S. and Chinese renewable energy markets and fostering public and private sector partnerships between our two countries.

ACORE members who are leading voices in the U.S. and Chinese renewable energy industries are invited to join USCP as partners. Our partners actively shape program direction through consultation with other partners, the USCP strategic advisors, and ACORE staff.

We thank the USCP partners for their special effort toward this Summer 2012 US-China Market Review.

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U.S. POLICY: INFORMATION DISCLOSURE REQUIREMENTS FOR U.S. FEDERAL GOVERNMENT APPROVAL OF INVESTMENTS BY CHINESE STATE-OWNED ENTERPRISES

Donald Ousterhout, Brendan McNallen, and John Zhang
Reed Smith LLP

I. OVERVIEW

Chinese companies may need to obtain certain federal government approvals to acquire interests in U.S. power generation facilities, including authority from the Federal Energy Regulatory Commission (FERC) to transfer market-based rate tariffs and certain other energy assets under Section 203 of the Federal Power Act (FPA 203), antitrust approval under the Hart-Scott-Rodino Antitrust Improvements Act of 1976 (HSR), and national security-related approval by the Committee on Foreign Investment in the United States (CFIUS). For each of these approvals, the acquirer must disclose certain information about its affiliates, which can create unique concerns for Chinese state-owned enterprises (SOEs) administered by the State-owned Assets Supervision and Administration Commission of the State Council of the People's Republic of China (SASAC).

Although not a shareholder of any SOE, SASAC acts as the administrator of many, often with substantial control. This article examines the disclosure obligations under these approval regimes for a Chinese SOE looking to acquire U.S. energy assets, specifically with respect to information that it must disclose about SASAC and SASAC-controlled assets that are not held by the acquirer.

An SOE looking to acquire U.S. energy assets will need to disclose its relationship with SASAC under each of the approval regimes, including the ability of SASAC to control the SOE. The SOE will also have the obligation to disclose the existence of U.S. energy assets held by other SASAC-controlled SOEs in connection with its FPA 203 application, but such assets will not need to be disclosed in connection with the HSR or CFIUS applications.

Among the approvals discussed, only the FPA 203 applications are required to be made public.

II. BACKGROUND ON SASAC AND DISCLOSURE CONCERNS

SASAC administers at least 117 SOEs across a wide range of industry sectors, including at least eight energy-related companies. Collectively, these companies own interests, directly or indirectly, in energy assets both inside and outside of China (including in the United States), comprising some of the largest energy portfolios in the world.

SASAC itself is not a shareholder of the SOEs, but does have powers generally reserved to the shareholders of a U.S. company. SASAC has the authority to "perform the responsibilities of an investor" for the SOEs that it manages, including appointing and removing executives and members of the board of directors, approving the articles of association of the SOE, and making decisions on major corporate matters.

One reason that an SOE would want U.S. regulators to view its assets in isolation from those of other SOEs is that each SOE generally manages its day-to-day affairs independently of other SOEs and SASAC and only major corporate matters require SASAC approval. Given that there is effectively no coordination among SOEs, despite their common administration by SASAC, the acquisition of U.S. energy assets by an SOE would not be expected to present an increased risk of aggregation of uncommitted capacity with energy assets held by other SOEs or, absent other factors, trigger antitrust or national security concerns. An acquiring SOE will therefore want regulators to view its assets in isolation to reduce the likelihood of regulators aggregating its assets with other SASAC-controlled assets.

In this article, we examine the disclosure requirements under the FPA 203, HSR, and CFIUS applications with respect to SASAC and assets under the control of SOEs other than the acquiring company.

III. FPA 203

Under FPA 203, certain acquisitions of electric energy assets in the United States require authorization from the FERC, including the acquisition of interests in most large power generation facilities with a value in excess of $10 million. The purpose of this regulation is to restrict the aggregation of electric industry assets that could have anti-competitive impacts on the electric industry and consumers.

For these acquisitions, an FPA 203 applicant must include in its application certain information about the applicant, its affiliates, and the electric industry assets it owns or controls in the U.S. For its U.S.-based assets, the applicant must include: (a) a description of such assets subject to FERC jurisdiction as well as certain assets in Canada or Mexico; (b) the percentage ownership and primary business of each energy affiliate; (c) organizational charts depicting the post-transaction structure of applicant's corporate group; and (d) a description and location of the wholesale power customers and unbundled transmission customers served by the applicant's corporate group.

For the FPA 203 application, the SOE will need to describe its ownership structure and the relationship between SASAC and the SOE, including information about SASAC's ability to manage the SOE, appoint and remove directors of the SOE, and otherwise control the SOE. The SOE may also need to disclose information on the uncommitted generating capacity in the U.S. of entities controlled by SASAC.

This interpretation is consistent with the approach taken by China Three Gorges Corporation (CTG), in a transaction by which CTG acquired a substantial interest in several wind-powered generating facilities located in the U.S. In its FPA 203 application and the corresponding FERC Order, CTG summarized the regulatory responsibilities of SASAC and SASAC's specific responsibilities in the administration of CTG, including its ability to appoint all nine members of CTG's board of directors. Further, the Order discusses other SOEs which own energy-related assets in the United States, including China Investment Corporation's ownership of a 15% interest in AES Corporation and the purchase by a subsidiary of China Huaneng Group of a 50% interest in InterGen.

IV. HSR

The purpose of HSR is to impose a waiting period to allow the Federal Trade Commission (FTC) and the Department of Justice (DOJ) to evaluate mergers and acquisitions in order to determine whether they present antitrust concerns prior to the effectiveness of the transaction. HSR requires certain parties engaged in the transaction to submit an application to the FTC and DOJ and observe a 30 day waiting period (subject to early termination) before closing the transaction.

For purposes of completing the HSR application, an applicant needs to identify and provide information about its "ultimate parent entity"—including financial statements, revenue information, and information on prior acquisitions. An "ultimate parent entity" is defined as an "entity" that is not controlled by any other, which includes the ownership of voting securities and the right to appoint a majority of members to its board of directors. However, the definition of "entity" (and therefore "ultimate parent entity") excludes any foreign state, government, or agency (other than a commercial entity engaged in commerce). Certain factors determine whether the SASAC constitutes a "government agency" (and not an entity engaged in commerce), including whether it was formed under specific legislation, the government appoints its directors and executives, and/or the government has the power to dissolve the organization.

SASAC is authorized by the State Council of the People's Republic of China by special decree. Its chief executives are appointed by the central government (it does not have a board of directors), and the government may dissolve SASAC. Based on the factors discussed above, the FTC and DOJ would likely not view SASAC as an "entity" and therefore not the "ultimate parent entity" of an acquiring SOE for purposes of HSR.

Furthermore, an applicant must disclose information about its "affiliates" and "associates." Under the HSR regulations, an "affiliate" is an entity that is controlled by the ultimate parent entity of such entity. Since the ultimate parent entity of an applicant will likely be viewed as the SOE itself (and not SASAC or the Chinese central government), other SOEs will not be affiliates under HSR.

An "associate" of the applicant must be an "entity" that is under common control or management by a separate entity that has the right, directly or indirectly, to manage the operations or investment decisions of the applicant. Since neither the Chinese central government nor SASAC is likely an entity for HSR purposes, neither SASAC nor other SOEs would be considered an associate of the applicant for HSR purposes.

As neither SASAC nor other SOEs would be either affiliates or associates, HSR-related disclosure will be largely limited to assets and activities of the SOE itself. The applicant will need to indicate in its HSR application that it is wholly-owned by the central government, but will not need to provide information about SASAC or other SOEs or their assets for purposes of HSR review.

V. CFIUS

CFIUS reviews transactions that could result in the control of a U.S. business by a foreign person in order to determine the effect on national security. Although CFIUS filings are not mandatory, they provide a "safe harbor" from the President of the United States' authority to reverse transactions found to impair national security.

CFIUS regulations require the disclosure of certain information about the each "parent" of the acquiring party, including a description of its business and information about its board of directors (including a curriculum vitae or similar professional synopsis for each member of the board of directors and certain personal identifier information). A "parent" for CFIUS purposes is a person that holds at least 50% of the outstanding voting interest in an entity, the right to at least 50% of the profits of an entity, or the right in the event of the dissolution to at least 50% of the assets of that entity.

With respect to Chinese SOEs, SASAC does not hold any interests in the SOEs that it administers. While SASAC does have the ability to appoint and remove members of each SOE's board of directors, each SOE is wholly-owned by the Chinese central government. Therefore, CFIUS should not view SASAC as a parent of an acquiring SOE for disclosure purposes.

Each applicant is required to disclose whether it is controlled by or acting on behalf of a foreign government and describe the ownership interests, ability of the foreign government to appoint principal officers to the board of directors, any contingent interests held in the acquiring person, and any other similar rights or powers. The applicant SOE will need to describe SASAC's control arrangement over the acquiring SOE, including that the SOE is wholly-owned directly by the Chinese central government and regulated by SASAC and that SASAC appoints members of the board of directors. Unlike the FPA 203 application, the applicant SOE will not be required to disclose information about other SOEs or assets under the CFIUS regulations.

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U.S. FINANCE: QUALIFIED ENERGY CONSERVATION BONDS AND THE POTENTIAL TO FINANCE CLEAN ENERGY

Julia Friedman and Sandy Fazeli
National Association of State Energy Officials (NASEO)

I. OVERVIEW

Qualified energy conservation bonds (QECBs) allow state and local governments to finance clean energy projects and programs. These federally subsidized bonds enable issuers to borrow low-interest capital to finance a wide range of eligible energy conservation projects. Nationally, the most common use of QECBs is to support capital expenditures reducing energy consumption in publicly-owned facilities. However, on-the-ground examples in California and Kansas demonstrate how these instruments are being used to increase installed capacity of renewable energy generation, a use which has gained traction especially in the Southwest.

Notwithstanding their flexibility and low cost, QECBs face significant challenges, limiting their uptake by state and local governments. As of June 2012, about one-fifth of QECBs had been issued, leaving over $2.5 billion in face value unissued. According to research undertaken by the National Association of State Energy Offices (NASEO) and the Energy Programs Consortium (EPC), barriers to QECBs' success at the state and local level include high transaction costs, debt aversion, and inexperience in administering energy bonds of this type. Pooling QECB issuances and administrative authority at the state level serves as a possible solution to mitigate these challenges and to ensure that these bonds reach localities and projects with the largest need and opportunity.

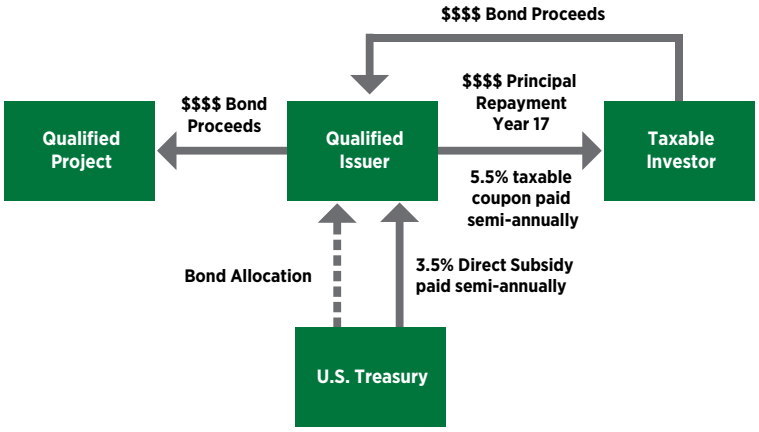
II. WHAT ARE QECBS?

Qualified Energy Conservation Bonds (QECBs) are a low-cost public financing tool for state and local governments to support clean energy projects and programs. First established by the Energy Improvement and Extension Act of 2008 at $800 million, QECBs grew fourfold in 2009 when the American Recovery and Reinvestment Act expanded the national bond cap to $3.2 billion. Should all of the bonds be issued, the cost to the federal government would include the $3.2 billion bond cap in addition to the Treasury's direct subsidy of the bonds. Ultimately, this total cost would depend on the Qualified Tax Credit Rate and maturity at the date of issue of each QECB, both of which fluctuate.[1]

Under the authorizing legislation, each state receives a formula allocation, which it then sub-allocates to local governments with populations of at least 100,000. Local governments may exercise the option to waive their allocations back to the state or issue the bonds to tax investors and use the proceeds of the issuance to fund energy conservation projects. By issuing tax credits or utilizing a direct cash subsidy from the federal government, the bond issuer can effectively buy down the interest rate of the bond.[2] QECBs serve as a long-term financing option, with bonds currently maturing after a period of up to 22 years.[3] Figure 1 illustrates the mechanics of a QECB transaction.

1 Refer to https://www.treasurydirect.gov/GA-SL/SLGS/selectQTCDate.htm for the most up-to-date qualified tax credit rates.
2 Elizabeth Bellis, "Energy Program Consortium Memorandum," NASEO, last modified February 6, 2012, accessed August 15, 2012, http://naseo.org/resources/financing/qecb/EPC_Memo.pdf.
3 "Qualified Tax Credit Bond Rates," U.S. Department of the Treasury, Bureau of Public Debt, accessed August 15, 2012, https://www.treasurydirect.gov/GA-SL/SLGS/selectQTCDate.htm.

FIGURE 1: STRUCTURE OF A QECB TRANSACTION[4]



In many states, the responsibility of implementing allocations and coordinating reallocations (should a local government waive its allocation) falls to the State Energy Office (SEO). SEOs and local governments abide by a number of guiding principles when allocating and issuing the bonds: a maximum of 30% of QECB allocations may be used for private activity purposes; at least 70% of QECBs to states and municipalities must finance governmental projects; proceeds from the issuance of QECBs must be spent within three years of issuance; up to 2% of bond proceeds can cover administrative costs of issuance; and QECBs may be issued for any "qualified conservation purpose" as defined by statute, including:[5,6]

- Capital expenditures for reducing energy consumption in publicly-owned buildings by at least 20%, implementing green community programs, rural development electricity production, or any qualified facility.
- Expenditures on research facilities and grants, supporting research in non-fossil fuels, technologies for the capture and sequestration of carbon dioxide, increasing the efficiency of existing technologies, automobile battery technologies and other technologies to reduce fossil fuel consumption, or technologies to reduce building energy use.
- Mass commuting facilities and facilities that reduce consumption of energy, including expenditures to reduce pollution from vehicles used for mass commuting.
- Demonstration projects promoting commercialization of green building technologies, conversion of agricultural waste for use in the production of fuel, advanced battery manufacturing technologies, technologies to reduce peak use of electricity, or technologies for the capture and sequestration of carbon dioxide.
- Public education campaigns promoting energy efficiency.

III. ON THE GROUND RESULTS: TWO EXAMPLES OF QECBS FINANCED RENEWABLE ENERGY PROJECTS

The most common use of QECBs, as of June 2012, has been capital improvements to reduce energy consumption in publicly owned buildings by at least 20% (such projects constitute 58% of all issuances). However, there are regional variations. In the Southwest, 75% of QECBs issued have been used to finance renewable energy installations. It should also be noted that QECB issuances in the Southwest (by total dollar amount and percent of allocated amount) are more than double any other region in the country, although this is largely due to the fact that

4 This example is taken from the U.S. Department of Energy's QECB Primer and uses a 6.00% taxable rate minus a 3.70% direct subsidy to yield a 2.3% net interest cost. It also uses a 17 year maturity. "Qualified Energy Conservation Bonds & New Clean Renewable Energy Bonds," U.S. Department of Energy, September 21, 2012, http://www1.eere.energy.gov/wip/pdfs/qecb_creb_primer.pdf.

5 Elizabeth Bellis, "Qualified Energy Conservation Bonds," Energy Programs Consortium, June 2012, http://www.energyprograms.org/wp-content/uploads/2012/03/QECB_Memo_6-8-2.pdf.

6 Pub.L. 110- 343.122 Stat. 1365 (2008).

California received a very large QECB allocation and has issued nearly three-quarters of its allocation.[7]

Examples from California and Kansas illustrate how QECBs are being used to increase installed capacity of renewable energy generation. California's QECB volume cap was set at $381 million. Approximately one-third of this was allocated to the Los Angeles Department of Water and Power (LADWP), a municipal utility providing drinking water and electric service to more than 3.8 million customers in Los Angeles. In August 2010, LADWP issued $131 million in bonds, maturing in 2027, to finance three projects. The Pine Tree Wind Turbine Expansion and Pine Tree Solar projects, respectively, added ten new turbines (15 megawatts (MW) of wind generation) to an existing wind farm in the Tehachapi mountains and 10 MW of solar generation (at 34.5 kV output) at the Pine Tree Wind Power Plant. The solar array is expected to generate 20 gigawatt hours (GWh) annually. Finally, the Adelanto solar project, the result of a partnership with SolarWorld, was announced in March 2011 and will result in an 11.6 MW direct current solar system (4.16 kV output). The project is expected to generate 22,400 MWh during its first year of operation and 515,700 MWh over a 25-year period. It will be built in Adelanto, California, on a 42-acre site approximately 65 miles north of Los Angeles.[8]

In Lawrence, Kansas, the Bowersock Mills & Power Company issued $8.7 million of QECBs to support the expansion of the hydroelectric plant at the Bowersock Dam. Previously, the facility had a production capacity of 2.35 MW daily, enough generation to power nearly 1,800 homes.[9] The QECBs, as part of a $23.8 million issuance that included other types of tax-subsidized bond financing, will support the construction of an additional plant at the site, increasing generation capacity by 5 MW. Issued in March 2011, the bonds will mature in 2025.

TABLE 1: RENEWABLE ENERGY AND ENERGY EFFICIENCY PROJECTS FINANCED WITH QECBS[10]

Issuer	Location	Date Issued	Maturity	Amount (millions)	QECB Direct Subsidy (%)[11]	Project Description
Hartford School District	Wisconsin	4/2011	4/2026	$2.23 (part of a $3.7 issuance)	3.850	Small Geothermal
Town of Scituate	Massachusetts	8/2011	unknown	$1.5	3.045	Small Wind
St. Louis County	Missouri	4/2011	12/2021	$10.3	3.654	Residential Energy Efficiency
Licking County	Ohio	9/2011	unknown	$2.1	3.220	Municipal Energy Efficiency
Boulder County	Colorado	11/2012	7/2020	$1.4	3.654	Commercial PACE Loan 10 Year Term

7 Elizabeth Bellis, "Qualified Energy Conservation Bonds," Energy Programs Consortium, June 2012, http://www.energyprograms.org/wp-content/uploads/2012/03/QECB_Memo_6-8-2.pdf.
8 "LADWP and SolarWorld Partner to Develop 11.6 Megawatt Solar Power System for Los Angeles," LADWP, last modified March 3, 2011, http://www.ladwpnews.com/go/doc/1475/986259/LADWP-and-SolarWorld-Partner-to-Develop-11-6-Megawatt-Solar-Power-System-for-Los-Angeles.
9 "About Bowersock," The BowersockMills & Power Co., accessed August 14, 2012, http://www.bowersockpower.com/about.
10 Rebekah Deeds King,"QECBs and renewable energy," message to the author, August 6, 2012, Email.
11 This number is the effective interest rate buy-down. Each subsidy is 70% of the Qualified Tax Credit Bond rate on the sale date of the bonds. Angela Wu, "Info Request – NASEO QECB article," message to the author, August 14, 2012, Email.

QECBs have been employed around the country to finance both renewable energy installations and energy efficiency improvements. Table 1 provides a snapshot of some of these projects.

IV. QECB CHALLENGES AND POTENTIAL SOLUTIONS

Despite the examples provided above, issuances of QECBs remain modest. Research and analysis conducted by NASEO and EPC found that as of June 2012 at least 111 projects financed with QECBs were completed in at least 23 states for a total of $671 million (21% of the total volume cap). This leaves, at face value, $2.5 billion of unspent bonds.[12]

As of June 2012, 33 states had not used any of their allocations, 12 had used less than one-third, six states had used more than half, and only two states—Kansas and Kentucky—have, or have nearly, spent their entire allocation.[13]

While there is no sunset provision in the authorizing federal legislation, some have raised concern that the underutilization of QECBs places this financing mechanism at risk of de-authorization as federal spending on energy efficiency and renewable energy is under scrutiny. Additional concerns that became apparent through NASEO and EPC's research include:[14]

- Inexperience of bond authority to determine the eligibility of projects, measure savings, administer bonds, and undertake other QECB processes;
- Debt aversion;
- High transaction costs, particularly in states with small allocation sizes or many jurisdictions with populations exceeding 100,000;
- Lack of information shared from IRS on QECB issuances at the national level; and
- Smaller demand for clean energy projects, due to the economic downturn.

NASEO and EPC identified (1) aggregating bond volume and (2) centralizing administration at the state level as solutions to help alleviate certain challenges. As of June 2012, approximately 72% of issuances to date resulted from state aggregation and administration. In states where local governments waive their allocation, the state allocation pool expands, enabling the state to either develop a larger state issuance or reallocate QECBs in greater, more cost-effective amounts for larger projects. With this approach, state governments may also shift resources from local governments that either cannot (because of bond volume caps) or choose not (due to debt aversion or other priorities) to issue QECBs to other local governments that can benefit. Finally, streamlining QECB administration at the state level facilitates information-sharing and access to expertise to help local governments move more quickly over the learning curve.

Other significant barriers originally facing bond issuers were uncertainty surrounding the 20% energy savings requirement and the definition of "green community programs" in the authorizing legislation. Petitions and requests by EPC, NASEO, and partner organizations succeeded in eliciting clarification from the IRS. The IRS's recent release of guidance on QECBs in July 2012 (Notice 2012-44) addresses this uncertainty by clarifying

12 Elizabeth Bellis, "Qualified Energy Conservation Bonds," Energy Programs Consortium, June 2012, http://www.energyprograms.org/wp-content/uploads/2012/03/QECB_Memo_6-8-2.pdf.
13 Ibid.
14 For more detail, consult: Diana Lin and Elizabeth Bellis, "NASEO Summary of Barriers for Increasing QECB Activity at the State and Local Levels," NASEO, February 2012, http://www.naseo.org/resources/financing/qecb/QECB_Barriers.pdf.

the eligibility criteria for green community programs and describing how a bond issuer should calculate energy consumption and savings.[15] Such guidance may result in higher levels of issuance over time.

V. MORE INFORMATION

NASEO and EPC continue to work with state and local governments to address the remaining issues and increase the use of QECBs for clean energy. Numerous QECB resources have been compiled at http://naseo.org/resources/financing/qecb/index.html. For additional information or examples of QECB-financed clean energy projects, please contact Sandy Fazeli, Program Manager at NASEO (sfazeli@naseo.org), or Elizabeth Bellis, Counsel at EPC (ebellis@energyprograms.org).

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National Association of State Energy Officials (NASEO) is a membership nonprofit founded 1986 and is the only national non-profit organization whose membership includes the governor-designated energy officials from each of the 56 states and territories. Members are senior officials from the State and Territory Energy Offices, as well as affiliates from the private and public sectors. States manage and invest more than $3 billion of their own funds derived from appropriations and system benefit charges each year.

15 "Notice 2012-44: Qualified Energy Conservation Bonds," Internal Revenue Service, July 9, 2012, http://www.irs.gov/irb/2012-28_IRB/ar11.html.

U.S. MARKET FOCUS: CHINESE PANEL MANUFACTURERS: STAYING COMPETITIVE IN THE U.S. MARKET

Matthew Fellmeth
Reznick Think Energy, LLC

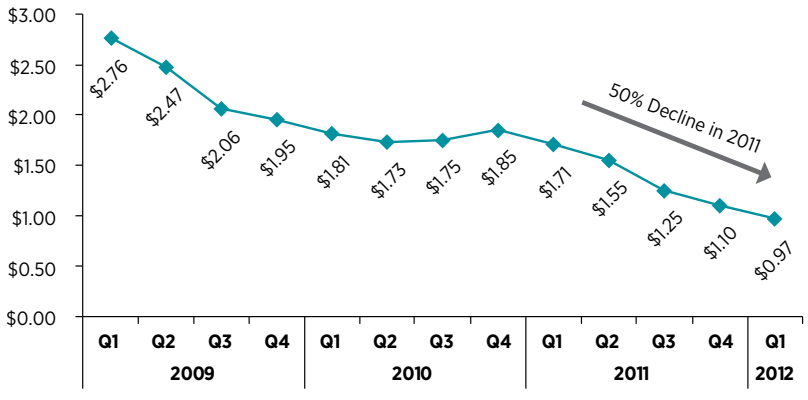
Since 2011, when photovoltaic (PV) panel prices began to fall, Chinese PV panel manufacturers have been under increasing pressure due to declining margins. According to the Chicago Tribune, PV panel prices dropped 50% in 2011 and continued to fall by 20% to date in 2012. Along with a substantial slide in PV panel prices, the U.S. Department of Commerce's (DOC) preliminary ruling on May 20th imposed a tariff ranging from 31% to 249.96% on Chinese solar modules imported into the U.S. The most recent import numbers for May 2012 reflect a 4.76% duty imposed by the DOC, but they do not fully reflect the impact of the DOC's latest decision. According to the Coalition for American Solar Manufacturing (CASM), the quantity of Chinese panels imported into the U.S. is down 45% in May 2012 as compared to May 2011. The expectation is that Chinese solar panel imports will continue to drop through 2012.

With the falling PV prices and federally imposed tariff decreasing U.S. market share and profit margins for U.S. sales, Chinese PV manufacturers have to look outside their core business to boost sales and revenue. This typically entails expanding up or down the value chain. Upstream cell production faces the same challenges as panel manufacturing: shrinking margins. Therefore, Chinese PV manufacturers must look downstream to project development. The ongoing debate about manufacturers diversifying downstream into project development has divided market participants into two camps: pro and con. But with careful planning, management buy-in, and understanding where in the project life-cycle to invest, manufacturers can develop a new business line and increase profits.

INVESTMENT: WHERE IN THE PROJECT LIFE-CYCLE?

Shovel-ready projects are ideal for investors, but to add value in the project life-cycle, Chinese PV manufacturers should look earlier in the development process. Manufacturers have two main choices when looking downstream to project development: project acquisition and original development.

FIGURE 2: AVERAGE C-SI MODULE PRICES IN THE U.S. 2009–2011 ($/Wp)



Source: GTM Research

Original development usually involves more risk, but also greater return, and allows the initiating party to control the entire life-cycle of the project development process. The initial investment into an original project can be substantial. First, a feasibility study will give a developer a clear assessment of the resources available in a given area or on a specific site. A feasibility study is an investment, whether in capital

or human resources, to determine the potential viability of a project. Secondly, the initiating party has to invest in environmental and interconnection studies, permitting, preliminary design, and initial power marketing. This development cycle has long lead times and high failure rates. Taking into account a manufacturer's traditional risk profile, original development might involve too much risk to be a viable option for manufacturers.

Project acquisition can involve less risk, but requires larger capital outlays and more due diligence to ensure project quality. When deciding where along the project development life-cycle to acquire projects, manufacturers have to weigh their willingness to take risk versus a willingness to spend investment capital. Manufacturers need to determine, for their specific risk profile, what the best place is during the project development cycle for project acquisition. As one might expect, the more risk the manufacturer is willing to take, the less expensive the project typically will be to acquire. Since the risk profile of a manufacturer and of a project developer are so different, there are processes and procedures that should be put in place to mitigate risk and educate the board and management on these risks and how they will be mitigated. Some of these processes and procedures include management education, building a viable project pipeline, and risk identification.

MANAGEMENT EDUCATION

First, manufacturers who are considering acquiring and developing projects should educate their management and board that this is not solely a path for panel placement; it is an additional business line whose operations and profits should not be tied to the number of panels placed. Management and board support for this type of business is critical and without it the new organization will fail. A manufacturer's development arm, while perceived to be an easy route for panel placement, cannot be treated that way. Yes, favor should be granted to the parent's panels, but in some instances using competitors' panels might give the project a higher return on investment. Allowing the project development activities to be a stand-alone business line is critical to the success and prosperity of this new venture.

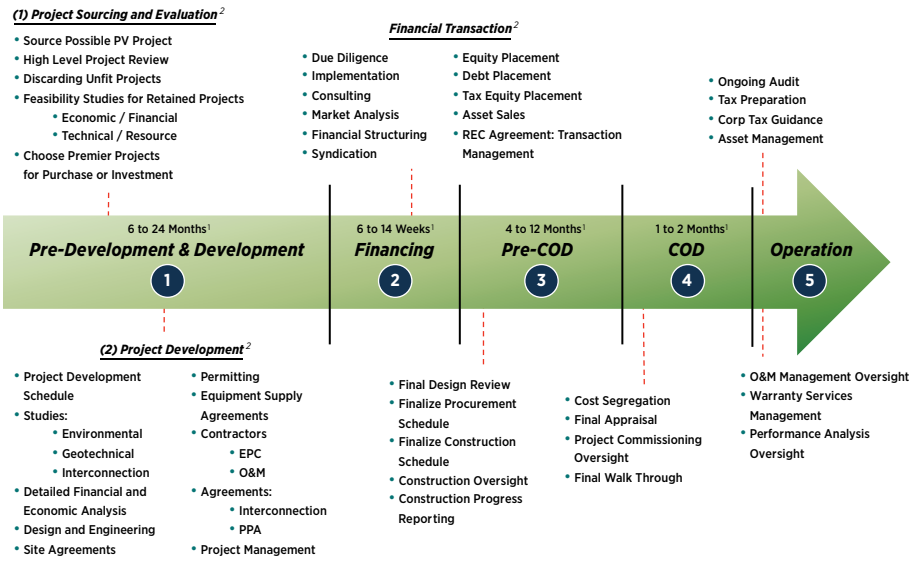
BUILDING A PROJECT PIPELINE AND IDENTIFYING RISKS

Second, the singular goal of establishing this new business line is increased earnings. To successfully increase earnings, the new business line must develop not only single projects, but also a pipeline of projects. Having a valued pipeline will show the board and management that there is long-term earnings potential from project development. Developing a pipeline will take time and patience, and to acquire a worthwhile pipeline the development team will have to sift through thousands of projects, reviewing each in detail and identifying possible risks. The development team not only has to review projects and identify risks, they also have to keep overhead costs as low as possible—quickly vetting possible project acquisitions, and recognizing risks and opportunities immediately. This should all be completed by a knowledgeable and experienced team. Thorough project vetting before acquisition is sometimes a lengthy and tedious process, but enough importance cannot be placed on it. Spending an extra few hours on vetting a project prior to acquisition can save hundreds of hours and millions of dollars later on. However, for project development to be successful, a manufacturer must have the ability to take on risk and supply development, construction, and bridge capital. Once a project is chosen, efficiency is paramount, and proper planning is the key: the team must understand what is needed to bring the project to financial close and ultimately to operation.

Risk identification is an integral part of project planning; being able to recognize and mitigate risk is learned through hands-on experience with project development. Identifying risks early on can have a huge positive effect on the project: not only reducing risk to the manufacturer, but also lowering total capital needed for development. Depending upon the maturity of the project, the development cycle can be months or years long, so being able to plan for long term risks and forecast market changes are necessary

skills to have on the project team. Figure 2 represents a typical development cycle with much of the risk, but not all of it, in phase one: pre-development and development. Proper planning during the early stages of development cannot be stressed enough to help reduce risks in the development of a solar project. During the planning process the project team will develop a detailed schedule, task responsibilities, and budget, allowing the team to schedule resources effectively and efficiently and bring the project to financial close. Organizations with the highest quality of planning and project management—both at a project and upper management level—have the highest probability of project success. Without a doubt, there will be issues with the development of any project, but with proper planning and an experienced team, most risks and project challenges can be overcome.

FIGURE 3: PROJECT DEVELOPMENT LIFE-CYCLE



1 Timeline is an approximation, each project's timeline will vary: sometimes greatly.
2 Lists are representative of the tasks that need to be completed and by no means comprehensive.

The keys to capitalizing on these advantages are a small but experienced team, outside resources, and effective project management. The goal is to minimize corporate investment and risk while creating the greatest financial value for the company. Manufacturers can build value for their companies by developing projects, but care must be taken to make efficient use of human and capital resources.

CONCLUSION

The idea of manufacturers developing projects is not a novel concept. On June 21st, 2012, according to PR Newswire, Canadian Solar Inc. announced the closing of a transaction where Canadian Solar acquired a majority interest in 16 solar projects representing approximately 190 MW to 200 MW in total. According to Ucilia Wang and Renewable Energy World, along with Canadian Solar, there are a handful of other manufacturers participating in project development. Manufacturers have a few advantages over most project developers, including access to capital from construction financing to development equity, the ability to utilize the investment tax credit, and the ability to obtain PV panels at or near cost, increasing project profit margins.

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CHINA MARKET REVIEW

CHINA POLICY: THE ROADMAP FOR ELECTRIC VEHICLES

Kerin Cantwell and Ingrid Cheng
Akin Gump Strauss Hauer & Feld LLP

China's central government has decided that the future of its automobile industry, one of the nation's most important, lies in electric vehicles. After nearly three decades of research and development and consistent, increasing support for the nascent electric vehicle industry, China's planners have, over the course of the last year, begun to implement a comprehensive package of monetary and other incentives, programs, and regulatory policies to achieve aggressive targets that are intended to result in electric vehicles dominating China's new vehicle industry by 2020. The push toward electric vehicles is driven by several national policy objectives: increasing energy security by reducing the country's reliance on imported oil, dramatically cutting pollution, reducing energy consumption, and increasing non-fossil fuel resources. The policies are also strategic economic measures to transform China's automobile industry (the world's largest) into an international competitor, taking advantage of China's strengths and natural resources to provide new areas of economic growth.

A NEW, DETAILED, AND EVOLVING POLICY FRAMEWORK FOR 2012–2020

The 12th Five Year Plan promulgated by China's National People's Congress in March 2011 (the "12th Five Year Plan"), which sets forth the central government's broad economic, development and social policy goals for the period from 2011 through 2015, is striking in its emphasis it on environmental protection, conservation, clean energy, and the creation of a "green" economy. One of the "new strategic industries" in the plan is the "new energy automobile industry," which includes plug-in hybrid electric vehicles (PHEVs), pure electric vehicles (EVs), and fuel cell vehicles.

Since late 2011, continuing through this summer, and probably for the forseeable future, various governmental agencies have promulgated a slew of new directives, programs, incentives, and additional policy statements in an effort to achieve the goals for PHEVs and EVs set forth in the 12th Five Year Plan and beyond. For example, in March 2012, the Ministry of Industry and Information

Technology (MIIT) issued a statement that pure electric vehicles will be the top priority of China's new energy automobile industry development goal.[16]

The State Council, China's highest administrative agency, published its comprehensive development plan for the new energy automotive industry in June 2012.[17] The plan states that the development of the component supply chain for batteries, motors, automotive electronics, lightweight materials, advanced internal combustion engines, and efficient transmissions will be accelerated, as will the construction of charging facilities, and that charging stations, the smart grid, and renewable energy will be developed in coordination with each other. The plan sets ambitious targets: annual production and sale of EVs of 500,000 per year by 2015, increasing to a cumulative sales volume of five million EVs by 2020, with production capacity of two million EVs per year by 2020. Battery prices are targeted to drop to 2 RMB per kilowatt hour (kWh) by 2015 and 1.5 RMB per kWh by 2020, and battery life is intended to achieve ten years by 2015.

The State Council's plan also takes into account various additional measures that will be necessary to create a sustainable EV market. For example, marketing and business models which incorporate leasing (of both cars and batteries), consumer financing, insurance, after-sales service, a network of charging facilities, a used car market, and battery recycling programs are part of the plan. The State Council's plan also addresses the need for nationwide standards for charging stations and vehicle charging interface. The plan encourages the financial services industry to arrange loans, debt offerings, stock offerings, and local-level venture funding for companies involved in the EV supply chain. The plan calls on various government departments to provide fiscal and tax incentives, export credit support, and inter-ministerial coordination. The State Council's plan states that government support and incentives are crucial in this early phase of the industry, but will give way to market forces as the industry matures.

Since late last year, national and local government departments have implemented monetary and non-monetary incentives and policies to encourage consumer adoption of EVs. At the national level, among other things, the MIIT has announced common standards for charging stations, and the Ministry of Finance (MOF) has waived sales tax on certain qualifying, domestically-manufactured EVs and fuel cell vehicles. Some cities that are participating in the EV pilot program have exempted EVs from license plate auctions and six days per week driving limitations, granted preferential parking, waived toll road fees, and provided electricity for EVs at a reduced price.

NEW ELECTRIC VEHICLE POLICY DRIVERS

There are several factors behind the new EV policy and incentives. One factor is energy security, as approximately half of China's oil is imported.[18] While environmental concerns certainly are a genuine national priority, the use of EVs will probably have less of an impact on environmental improvement than one might hope, given that approximately 70% of China's electricity is generated by coal. Another important factor behind the policy is economic: foreign car makers dominate the international internal combustion vehicle market; however, as the world moves toward cleaner vehicles, China has certain strategic advantages that could make it a dominant player in the international EV market. China is a major world producer of lithium ion batteries and electric motors, and has

16 Special Twelfth Five Year Plan for the Development of Electric Vehicle Technologies, promulgated by MIIT on March 27, 2012 (Guokefaji [2012] No. 195).

17 Circular of State Council on Printing and Distributing the Development Plan for Energy-Saving and New Energy Automotive Industry (2012–2020), promulgated by the State Council on June 28, 2012 (Guo Fa [2012] No.22).

18 World Bank. The China new energy vehicles program: challenges and opportunities, (Washington D.C.: World Bank, 2011), 12, accessed August 2, 2012, http://documents.worldbank.org/curated/en/2011/04/14082658/china-new-energy-vehicles-program-challenges-opportunities.

abundant resources of lithium and rare earth materials that go into EV component production.

While early government-sponsored research and development into EVs began in China in the early 1990s, the first central-government pilot program to promote their commercial use began in 2009 with the "10 Cities, 1,000 Vehicles Plan," which, by 2010, had expanded to 25 cities. Under this program, the purchase of EVs for public use, such as government fleets, taxis, and electric buses, were subsidized by the central government. The program did not apply to private purchases, and left infrastructure development, such as charging stations, to local governments to fund and construct. In a joint notice issued in May 2010,[19] by the MIIT, the National Development and Reform Commission (NDRC), the Ministry of Science and Technology (MOST) and the MOF, five cities were selected to implement a two-year pilot program for the promotion of the private EV market. Under this program, central government subsidies of up to 50,000 RMB for PHEVs and 60,000 RMB for EVs are available for direct private purchases. When combined with local subsidy programs in some cities, the combined EV purchase subsidies could be as high as 120,000 RMB. Media reports state that the pilot programs have not been as successful as hoped, and critics both inside and outside of China are skeptical whether the State Council's new targets can be achieved. However, the 2009 pilot program caught the attention of the World Bank, which it studied and reported on in April 2011.[20] Many of the World Bank's recommendations to promote consumer acceptance of EVs have been incorporated in the new policies and incentive programs enacted since the 12th Five Year Plan. Moreover, the government has implemented standards to address public concern about the safety of EVs.

HOW ARE THE POLICIES WORKING AND WHAT DOES THE FUTURE HOLD?

While EV sales in China to date reportedly have not met the targets set forth in the pilot programs, it is quite possible that the combination of policies introduced in the last year, which address the shortcomings of the pilot programs, could have the desired effect. Certainly tax and other financial incentives have been shown to work in China. In 2009 and 2010, the government implemented tax rebates for small vehicles and subsidies for trade-ins and rural buyers, which helped China's auto sales grow by 46% and 32%, respectively, in those years. When the stimulus policies expired, the automobile market grew by only 2.45%. A study by PricewaterhouseCoopers Autofacts Group from 2010 estimated that, by 2016, alternative fuel vehicles production in China (which includes traditional hybrids, PHEVs, and EVs) could reach 400,000, but that with strong government incentives and lower pricing, production could reach 700,000.[21] The strong government policies and incentives are now here, and government officials have announced that more are on the way. The policies and incentives address the obstacles to EV market penetration in a holistic way, from research and development though the supply chain to the consumer, and this combination could very well help meet the country's ambitious goals for EVs. Already this year Chinese industry players and foreign investors have jumped into the mix: one large Chinese automobile manufacturer entered into a joint venture with a U.S. company to market Chinese EVs overseas; another entered into a battery-swapping venture with the China Southern Grid and a foreign battery supplier, and a U.S. battery maker has agreed to supply batteries and build a research and engineering facility for a Chinese automobile manufacturer.

19 Notice Concerning the Demonstration Work of Promoting New Energy Vehicles in the Private Market, jointly issued by MOF, MIIT, MOST and NDRC on May 31, 2010 (Caijian [2010]230).

20 World Bank, The China new energy vehicles program: challenges and opportunities, 1–31.

21 PricewaterhouseCoopers, The US-China cleantech connection: shaping a new commercial diplomacy, (2011), 7, accessed August 2, 2012, http://www.pwc.com/us/en/technology/publications/us-china-cleantech-connection.jhtml.

CONCLUSION

Unlike earlier programs and policies, which predominantly consisted of purchase subsidies for electric vehicles, the new policies introduced since the passage of the 12th Five Year Plan reflect a multi-faceted approach to developing China's electric vehicle market. The policies address the industry as a whole: starting with raw materials and research and development; continuing through the component supply chain, required infrastructure, and integration with the electric power grid; and finally with the institution of a variety of monetary and non-monetary incentives to attempt to create a critical mass of consumer demand. Ultimately, consumers will sustain the industry and allow the government to gradually withdraw monetary support. The Chinese government recognizes (as do many other countries) that the next ten years will provide key opportunities to grow the electric vehicle industry or be left behind.

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CHINA FINANCE: SECURITIZATION OF SOLAR ASSETS IN CHINA: A MODEST PROPOSAL

Louis Schwartz
China Strategies, LLC

A fortuitous convergence of initiatives in solar deployment and asset securitization offers an opportunity for China to expand financing for an unprecedented ramp-up of solar power investment, while systematizing asset securitization to ensure that this new source of capital is reliable, transparent, and effective. By carving out a portion of the recently restarted asset securitization pilot program[22] for solar assets approved for inclusion in the Golden Sun Program, China can develop a sophisticated and creditable policy structure governing asset securitization, while simultaneously helping its distressed solar manufacturing industry. A highly professional and transparent system for the securitization of solar assets in China has the potential to be an important new vehicle for the future participation of foreign capital in China's clean energy development, and perhaps a means of creating a more disciplined Chinese banking system. It is imperative that Beijing ensures the Chinese banking system not be given the opportunity to exploit the asset securitization pilot program to package low quality loans and dump them on buyers. Given the sour experience of foreign investors in China's solar industry during its IPO bubble of the mid-2000s, this is particularly important for the future of foreign investment in China's clean energy development. And despite, or perhaps because of, our own abysmal recent experience with asset securitization in the U.S., foreign participation in the structuring and marketing of clean energy asset-backed securities (ABS) can serve the goal of constructing a world class system whose imprimatur represents the highest levels of transparency, quality, and stability. While the legal, financial, technical, and administrative challenges are formidable, China stands to reap substantial rewards in terms of the enhancement of the rule of law and the acceleration of clean energy deployment. If done well, this "pilot within a pilot" will serve as a template for the scale financing of other sources of renewable energy in China.

While China's solar manufacturing industry has grown from a negligible base to more than 16 gigawatts (GW) per annum in less than a decade, and now dominates worldwide trade in solar products, the Chinese government initially displayed little interest in deploying solar power domestically. When the *Medium and Long Term Development Plan for Renewable Energy in China*[23] was released in the fall of 2007, its goal for solar power installations in China totaled a paltry 1.8 GW by 2020.

Over the last four or five years, the Chinese photovoltaic (PV) industry has met a plethora of challenges, which have caused Beijing to take steps to support its indigenous solar industry. These challenges have ranged from unbridled growth in solar cell, wafer, and panel capacity in China; a precipitous decline in demand for Chinese PV products in the wake of the 2008 financial crisis and the ongoing EU financial crisis; the initiation of trade cases in the United States and the EU, which are having a chilling, if as yet indeterminate effect on Chinese PV exports; the steady growth in energy demand in China; a remarkable decline in the cost of solar power, largely due to the success of the Chinese solar industry; and the

22 Notice on Further Strengthening the Credit Asset Securitization Pilot Program, May 17, 2012.
23 National Development and Reform Commission ("NDRC") of the People's Republic of China, September 2007, http://www.chinaenvironmentallaw.com/wp-content/uploads/2008/04/medium-and-long-term-development-plan-for-renewable-energy.pdf.

dire state of China's environment, which makes renewable energy deployment an imperative.

Responding to the dramatic changes of the solar landscape worldwide and the state of its own solar manufacturing industry, the Chinese government is now planning to facilitate the building of an impressive 22 GW of solar power by 2020. One of the more successful and well-developed programs to increase domestic solar installations has been the "Golden Sun Demonstration Project" (金太阳示范工程). Under the auspices of the Ministry of Finance, the Ministry of Science and Technology, and the National Energy Administration of the National Development and Reform Commission (NDRC), this national solar 'pilot' program has grown in sophistication and scale since its inception in July 2009. Approximately one-fifth of near-term planned solar power installations in China will be accomplished through the Golden Sun Demonstration Project.[24] The 2012 Golden Sun Program,[25] which is comprised of 162 solar projects totaling approximately 1709 megawatts (MW) of solar power, builds on the accumulated experience of prior years and represents a pool of high quality solar assets that is well suited for credit asset securitization.

The securitization of Golden Sun Program assets has the potential to become the nucleus of a constellation of clean energy asset-backed securitizations, which, if executed well, will facilitate large-scale deployment of renewable energy financed in part by foreign capital. In addition to being administered jointly by the Ministry of Finance, the Ministry of Science and Technology, and the National Energy Administration of the NDRC, which have the professionalism and expertise to vet and oversee project participants and pull together a pool of high quality assets that then may be securitized and sold, the Golden Sun Demonstration Project also provides generous subsidies[26] that should enhance the viability and value of these solar installations and consequently the underlying securities. The cluster of Golden Sun projects also is diverse geographically (the approved 2012 Golden Sun list has projects throughout China) and technically (e.g., there are both grid connected and non-grid connected projects), and boasts projects ranging in size (at a minimum each project must be able to generate 300 kilowatt peak (kWp), though average size is in excess of 5 MWp). The Golden Sun Program also claims a number of significant companies that are developers, owners or purchasers of solar power.[27]

The Notice on Further Expanding the Credit Asset Securitization Pilot Program, issued on May 17, 2012 by the People's Bank of China (PBOC) and the China Banking Regulatory Commission (CBRC), re-launched the pilot credit asset securitization program (the "Credit Asset Securitization Program"), which first was introduced in the April 20, 2005 (Measures for the Trial Administration of Credit Asset Securitization).[28] The Credit Asset Securitization Program provides a framework for qualified and approved financial institutions to begin again issuing asset-backed securities.

By providing a mechanism for banks and other financial institutions to sell some of their assets and free up capital for other loans, a well-executed ABS program promises to be an important source of new capital for China's next stage of development. The various classes of eligible loans are in line with the priorities of

24 In 2009, designed capacity of the 329 Golden Sun projects approved that year totaled 642MW; in 2010, there were a total of 272MW of approved solar power through the Golden Sun program; and in 2011, the Golden Sun program yielded 600MW of solar power projects.
25 http://guangfu.bjx.com.cn/news/20120504/358247-5.shtml.
26 In its present iteration, the Golden Sun program now provides 5.5 Yuan/watt in subsidies. The subsidy has declined steadily over the past two years first from 9 Yuan/watt in early 2011 to 8 Yuan/watt later in 2011 and then from 7 Yuan/watt in early 2012 to 5.5 Yuan/watt at present.
27 These include the China Energy Conservation and Environmental Protection Group (中国节能环保集团公司), China's largest industrial group in energy conservation, environmental protection and renewable energy, Wal-mart and the China Guangdong Nuclear Group, which has a significant presence in China's renewable energy industry.
28 信贷资产证券化试点管理办法, http://vip.chinalawinfo.com/NewLaw2002/Slc/slc.asp?db=chl&gid=57934.

the 12th Five Year Plan, including loans for new energy development. The danger, of course, is that Chinese banks will be tempted to view this nearly $8 billion pilot program as an opportunity to dump those parts of their portfolios that are underperforming (or non-performing). If the PBOC and the CBRC do not provide the rigorous oversight that is necessary, the Credit Asset Securitization Program is unlikely to mature into a secure vehicle for additional capital formation. Given the subsidies that the Chinese government provides to support the Golden Sun Program, the credit asset securitization of solar assets is well suited for high standards, transparency, and strict compliance. It is clear that the Chinese government, through the PBOC, the CBRC, the Ministry of Finance, the Ministry of Science and Technology, and the National Energy Administration of the NDRC, has the institutional capacity, legal authority, and financial enticements to incentivize, structure, and oversee a highly transparent and effective Solar Assets Securitization Program.[29]

A well-executed ABS program also promises to help impose more rigorous lending standards on Chinese banks, which would help to strengthen of one of the weakest links in China's development superstructure. To the extent that Chinese banking regulators are able to establish and sustain rigorously high credit asset standards for pools of ABS, Chinese banks that produce high quality loans will garner the larger share of funds available through the Credit Asset Securitization Program, allowing them to grow more quickly than counterparts whose lending standards are weak. This, in turn, may be a vehicle for an industry-wide strengthening of lending practices among Chinese banks.

As China pursues economic growth, sustainability, financial reform, foreign engagement, and progress in building a society governed by rule of law, a well-formulated Golden Sun Credit Asset Securitization program can serve as a an important pathway. The benefits of successful implementation of such a program would reverberate throughout the Chinese economy and help lay the groundwork for sustainable growth in China in the decades ahead.

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29 In subsequent years, the criteria for participation in the Golden Sun Demonstration Project ideally would include stipulations providing for an option to include any approved projects in future rounds of solar credit asset securitizations.

CHINA MARKET FOCUS: NORTH CHINA GRID CO. (NCGC) $1.6B ZHANGBEI RENEWABLES DEMONSTRATION PROJECT

700 MW planned capacity in a single project with integrated wind, solar, storage, and transmission. Projects' viability ensured by advanced forecasting.

Dr. Haifeng Wang, Rolf Gibbels, Wen Jun, and Jin Dong
IBM

INTRODUCTION

The energy industry has made great strides in deploying new resources for renewable power generation. In some countries renewable energy comprises 10 to 20% of the total energy capacity. With renewable generation now making up such a significant portion of the total, integration and management of renewable resources needs to shift from "boutique" to industrial scale. Information systems that enable analytics and optimization are critical for developing efficient and flexible operations, and for helping to mitigate risk.

A 2012 Pike Research report on Smart Grid Renewables Integration highlights the importance of forecasting: "A study released in 2010 by General Electric for the National Renewable Energy Laboratory (NREL), entitled 'Western Wind and Solar Integration Study,' maintains that even at a penetration level of 30% wind and 5% solar capacity, storage technologies do not make economic sense and that better forecasting is a better investment."

Advanced analytics can help increase availability, reduce capital and operational expenditure, and improve dispatch of renewables, acting as a "pivot point" for the industrialization of renewable energy. Advanced weather and power forecasting are important analytics capabilities needed to increase the viability and sustainability of renewable integration projects.

CHINA HAS REQUIRED POWER FORECASTING SINCE MID-2011

Due to the predicted impact of climate change and as part of its state policies, China has in recent years been vigorously promoting the development of renewable energy resources. Despite being "cleaner" and having lower carbon emissions than energy from more conventional generation, renewable generated energy is not currently seen as a viable replacement for much of the supply that today is generated using nuclear energy, coal, gas, and oil. There are various reasons for this (and many variables), but two key limiting factors are the inadequate forecasting of intermittency and high integration costs, which make renewables a less reliable source of energy. For example, because of the challenge of accurately predicting wind power, on average around 20 to 50% of the wind power generated cannot be integrated into the electrical grid.

Over the past few years, China has started wind and solar power prediction programs by combining state weather forecast data with technologies introduced from abroad. However, the accuracy of prediction has so far been far from ideal for maintaining stable and reliable grid conditions. Due to this, the Chinese government launched a policy in mid-2011 requiring that wind power forecasting become an essential part for all wind power dispatched into the electrical grid.

The North China Grid Co. (NCGC), a leader in renewable energy projects, partnered with IBM to leverage its tools and experience developed over years of research into precise weather forecasting and its expertise in managing challenging IT projects. NCGC and IBM are working closely together to develop more accurate wind and solar forecasting solutions to help increase the viability of future renewable integration projects.

THE ZHANGBEI 700 MEGAWATT (MW) DEMONSTRATION PROJECT

Advanced forecasting increases power dispatch by 10% and revenue by $3 million a year

FIGURE 4: RENDERING OF NCGC ZHANGBEI RENEWABLE DEMO PROJECT

The Zhangbei demonstration project of wind power, solar power, energy storage, and transmission is currently the world's largest renewable energy project, and was set up jointly by the State Grid Corporation of China (SGCC), China's Ministry of Finance, and the Ministry of Science and Technology. It is also a major project of China's National Key Technology R&D Program.

The planned capacity is 700 MW in total. As of the end of December 2011, as much as 160 MW of capacity was in operation, including 100 MW of wind generation, 40 MW of solar power, and 20 MW of battery storage. The gross investment is RMB 10 billion ($1.6 billion U.S.).

As part of the project, a sophisticated and scalable power forecasting environment was required. Weather forecasting methodology and tools developed by IBM in a number of projects over the years have now been deployed for renewable power generation forecasting. The two companies have collaborated to develop the specific high-accuracy and high-resolution weather forecasting models needed. These models were extended via advanced data assimilation methodologies, using observational information from real-time data provided by wind turbines. The result is a highly accurate power-forecasting system that can predict the output of individual turbines.

The weather forecasting service employs the numerical weather prediction (NWP) method, which models complex physical processes that impact weather and produces highly accurate local weather forecasts for the wind farm turbines. Calculating factors such as wind speed and wind direction, the system forecasts the power output of a wind farm. This method has been found to be highly accurate, and should be widely applicable.

In addition, the solution uses advanced cloud imaging technology to track clouds in near real time, to revise the solar power forecast results, which improves forecast accuracy. Wind information, such as the scale of wind strength, wind speed, temperature, and wind direction, is gathered by sensors, while a sky-facing camera or nephograph (an instrument for photographing clouds) captures the movements and velocity of clouds.

FIGURE 5: THE WIND-SOLAR POWER FORECASTING SYSTEM USER INTERFACE

IBM's Research Lab in China supplied an innovative **H**ybrid data-assimilation solution based on **R**enewable **E**nergy **F**orecasting, known as "HyREF." HyREF helps NCGC obtain accurate weather and power forecasts. With continuous development in large-scale computing

resources and computational efficiency, as well as advancements in models for high-resolution numerical weather prediction and techniques for advanced data assimilation, NCGC has been able to deploy a cutting-edge wind and solar power forecasting system that can forecast accurately down to a single wind turbine or to a spatial resolution of several hundreds of meters. This precision enables NCGC to collect much more accurate forecasts of wind variation within wind farms.

HYBRID RENEWABLE ENERGY FORECASTING HIGHLIGHTS:

1. Deploys high-resolution weather forecasting models to predict wind and solar energy generation
2. Applies advanced data assimilation, turbulence analysis, and wake models, using real-time data from sensors dynamically to adjust forecasts in a 200m x 200m scale region
3. Uses advanced physical and statistical combined power forecasting models for better generation forecasts
4. Applies advanced cloud imaging technology to track clouds in near-real-time, to adjust forecasts for solar power output and improve accuracy

The system has been running online since the end of December 2011, and has shown excellent levels of accuracy. NCGC believes it to be the world's leading day-ahead power forecasting system for wind and solar generation. It has achieved less than 8% in terms of root mean square error (RMSE),[30] which enables NCGC to significantly increase their wind-solar energy integration by around 10%—meaning that more energy can be sold and dispatched. The wind power forecasting accuracy for RMSE required by the Chinese government is 25% or less.

MAIN BENEFITS OF NCGC ADVANCED FORECASTING SYSTEM:

- Better accuracy: The advanced weather prediction models and data assimilation techniques have made it possible to predict the power output of a single wind turbine. For that reason, forecast errors could be reduced to less than 10%. The solution provides extra short-term power forecasting (zero to four hours per 15 minutes), short-term power forecasting (four to 72 hours), near-term power forecasting (one month), and extreme condition alerts.
- Improves capability for renewable power integration: With better forecasting of wind and solar power output, NCGC is able to significantly enhance the grid's integration capability. As the world's largest such program, NCGC's demonstration project serves to accelerate the development of renewable energy integration and strengthen China's leading role in the large-scale renewable energy industry. The increased availability of renewable power is estimated to be around 10%, equivalent to $3 million per year in revenues (for phase one of the project), or $80 million over the full life of a wind farm (a typical wind farm is online for roughly 25 years).

30 Note that the root mean square error is a statistical measure of the magnitude of a varying error quantity.

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US-CHINA COLLABORATION UPDATE

GOVERNMENT COLLABORATION

U.S. and Chinese government officials attend the EcoPartnership Signing Ceremony, which took place at the Diaoyutai State Guest House in Beijing, China, on May 3, 2012.

Despite the ongoing trade disputes between the U.S. and China, there have been meaningful strategic dialogues and cooperation recently between the two countries to promote the development of renewable energy.

STRATEGIC DIALOGUES

The 8th Joint Working Group Meeting of the U.S.-China Ten-Year Framework (TYF) on Energy and Environmental Cooperation

U.S. Department of Energy officials Dr. Kerri-Ann Jones, Assistant Secretary of State for Oceans and International Environmental and Scientific Affairs, and David Sandalow, Assistant Secretary of Energy for Policy and International Affairs, co-chaired the 8th Joint Working Group Meeting of the U.S.-China TYF on Energy and Environmental Cooperation April 9–10 in Washington, D.C. Vice Chairman Zhang Xiaoqiang from the Chinese National Development and Reform Commission (NDRC) and a Chinese delegation attended the meeting and discussed ongoing collaboration and emerging issues. The countries identified a range of targets for deepened collaboration, including the development of aviation biofuels.[31]

U.S. - China Strategic and Economic Dialogue

U.S. Secretary of State Hillary Rodham Clinton and China State Councilor Dai Bingguo co-chaired the fourth round of the U.S.-China Strategic and Economic Dialogue (S&ED) in Beijing, China on May 3–4, 2012.[32] The event featured in-depth discussion on major bilateral, regional, and global issues, and reviewed progress in fostering mutual understanding and cooperation between the U.S. and China.

31 "U.S.-China Ten Year Framework for Energy and Environment Cooperation," U.S. Department of State, April 11, 2012, http://www.state.gov/r/pa/prs/ps/2012/04/187736.htm.

32 Information about this forum comes from "Joint Statement on the U.S.-China Strategic and Economic Dialogue Outcomes of the Strategic Track May 3–4, 2012," U.S. Department of State, May 4, 2012, http://www.state.gov/r/pa/prs/ps/2012/05/189287.htm; Angel Hsu and Deborah Seligsohn, "The Strategic and Economic Dialogue and Energy and Climate," ChinaFAQs, May 2, 2012, http://www.chinafaqs.org/blog-posts/strategic-and-economic-dialogue-and-energy-and-climate.

During the dialogue, officials from the two countries signed five new EcoPartnerships, increasing the total number of EcoPartnerships between the U.S. and China to 18. These agreements establish a framework for public-private partnerships at the sub-national level for energy and climate goals.[33] Of the notable EcoPartnerships announced, the University of California Los Angeles and Peking University have joined together to spearhead a consortium of clean energy and climate change leaders, through which participants from American and Chinese universities, think thanks, and the private sector will conduct joint research on smart grids, intelligent vehicles, and electric vehicles. The consortium will also build a research laboratory on smart grid technology at Peking University.[34]

The countries also reaffirmed commitments made in the U.S.-China Joint Statement on Energy Security Cooperation, and agreed to strengthen dialogue and planning in the stabilization of energy markets, emergency responses, diversified energy supply, and the rational and efficient use of energy.

RESEARCH AND COOPERATION

The U.S.-China Clean Energy Research Center (CERC) released its first annual report on clean energy research in June 2012. The report reviews the work progress and key achievements of CERC, including its establishment of formal leadership and oversight, development of joint work plans that enhance coordination and commit private sector and government funding, creation of a groundbreaking framework for protecting intellectual property, promotion of long-term research partnerships, and development of significant technological advancement.[35] CERC was established in 2009 by U.S. President Barack Obama and China President Hu Jintao with the aim to accelerate clean energy innovation, help both countries improve quality of life, and meet energy and environmental goals.[36]

33 "Secretary Clinton Supports Expansion of U.S.-China EcoPartnerships Program," U.S. Department of State, May 3, 2012, http://www.state.gov/r/pa/prs/ps/2012/05/189253.htm.

34 "CERC-LA awarded EcoPartnership by U.S. Department of State," University of California, Los Angeles, International Institute, May 29, 2012, http://www.international.ucla.edu/news/article.asp?parentid=126137.

35 "U.S.-China Clean Energy Research Center Annual Report 2011," U.S.-China Clean Energy Research Center, accessed August 8, 2012, http://www.us-china-cerc.org/pdfs/US-China_CERC_Annual_Report_2011.pdf.

36 U.S.-China Clean Energy Research Center official website, accessed August 8, 2012, http://www.us-china-cerc.org.

PRIVATE SECTOR COLLABORATION

GE opened its Chengdu Innovation Center in southwest China on May 31, 2012 to develop new products in clean energy and other sectors (Source: Xinhua).

Collaboration in clean energy continued between U.S. and Chinese companies in the second and third quarters of 2012, with agreements announced in technology innovation, project development, and other activities.

INNOVATION

Expecting a prolonged period of expansion in China, General Electric Co. (GE) opened two new innovation centers: one in the Shaanxi province capital city Xi'an, northwest China and the other in the Sichuan province capital city Chengdu, southwest China. The centers will serve as regional innovation hubs, and are designed to provide a platform for GE to create products and solutions in the lighting, aviation, clean energy, and other sectors specifically tailored to local customers' needs. "The customer innovation centers we have built in China's hinterland are in line with the country's ongoing shift in growth pattern" said Mark Hutchinson, president and CEO of GE Greater China. The innovation centers are part of GE's commitment to invest $2 billion in innovation activities and technology partnerships in China over three years.[37]

INVESTMENT

In May 2012, Shenyang-based turbine manufacturer China Creative Wind Energy (CCWE) acquired a 61.5 megawatt (MW) wind project in Texas from local developer Wind Tex Energy for an undisclosed amount. The project will demonstrate CCWE's prototype 3.6 MW wind turbines, which will be some of the largest operating wind turbines in the U.S.[38] CCWE ranked ninth in terms of installation volume in China in 2011, and this project marks its entry into the U.S. market.[39] The developer expects to complete the project by the end of 2012 in order to qualify for the federal production tax credit (PTC).

SUPPLY AGREEMENT

Chinese solar manufacturer JinkoSolar Holding Co., Ltd. announced in late June that it will partner with Boston-based project developer Southern Sky Renewable Energy LLC (SSRE) to build a solar facility at a former landfill in Canton, Massachusetts. The companies aim to turn the brownfield site into a $16.3 million revenue-generating source of clean energy for the local community. Canton town board members selected SSRE's proposal and signed off on the $25 million project that incorporates 5.75 MW of JinkoSolar panels, making it one of the largest solar electric developments in New England.[40]

37 "GE opens innovation center in NW China," China Daily, July 19, 2012, http://www.chinadaily.com.cn/business/2012-07/19/content_15599011.htm, "GE Opens China Innovation Center in Chengdu," PR Newswire, May 30, 2012, http://www.prnewswire.com/news-releases/ge-opens-china-innovation-center-in-chengdu-155858485.html.

38 "Chinese-backed Texas wind project to boast largest US turbines," Platts, May 8, 2012, http://www.platts.com/RSSFeedDetailedNews/RSSFeed/ElectricPower/6276887.

39 Dominique Patton, "China Creative Wind Energy to install 3.6 MW turbines in Texas," Recharge, May 8, 2012, http://www.rechargenews.com/energy/wind/article312715.ece.

40 "JinkoSolar, Southern Sky Renewable Energy LLC Revitalize Former Canton Landfill with Solar Power," JinkoSolar, June 26, 2012, http://www.jinkosolar.com/press_detail_263.html.

OTHER RECENT U.S.-CHINA PRIVATE SECTOR COLLABORATION

U.S. Firm	Chinese Firm	Collaboration
Borrego Solar	Suntech Power Holdings Co. Ltd	In April 2012, Suntech provided 3.4 MW of solar panels for a solar installation at Edwards Air Force Base in Southern California. The solar installation was designed, financed, and installed by Borrego Solar.[41]
Broadwind Energy	Goldwind	Broadwind Energy announced in June that it has been contracted by Goldwind to supply 14 wind turbine towers for a project in Montana.[42]
AllEarth Renewables	Goldwind	Goldwind signed an agreement in June with AllEarth Renewables to supply four 2.5 MW wind turbines to the Georgia Mountain wind farm in Vermont.[43]
Boeing Co.	PetroChina and Air China	In June, Boeing, Air China, and PetroChina announced that they will launch their second biofuel test flight in the third quarter of 2012, which will partly be powered by jatropha-based fuel. The companies plan to fly the plane across the Pacific Ocean.[44]
EMCORE Corporation	San'an Optoelectronics Co.	In August, EMCORE Corporation announced that it will consolidate its terrestrial concentrating photovoltaics (CPV) system engineering and development efforts into its joint venture with Chinese company San'an Optoelectronics Co, Ltd., called Suncore Photovoltaics.[45]
A123 Systems	Wanxiang Group Corp.	In August, Wanxiang Group Corp. announced that it would invest up to $450 million to acquire an 80% stake in A123 Systems, a struggling battery maker in Michigan, to keep the company in business.[46]

Note: Information in the table above is derived exclusively from generally available public information and does not purport to be a comprehensive listing of partnerships between U.S. and Chinese firms in 2012.

41 "Suntech Provides 3.4 MW of Solar Panels for Edwards Air Force Base," Suntech, April 12, 2012, http://ir.suntech-power.com/phoenix.zhtml?c=192654&p=irol-newsArticle&ID=1682419&hilight=.

42 "Broadwind wins tower order from Goldwind," New Net, June 21, 2012, http://www.newenergyworldnetwork.com/investor-news/renewable-energy-news/by-technology/wind/broadwind-wins-tower-order-from-goldwind.html.

43 "Goldwind Inks Supply Deal for Vermont Wind Farm," North American Wind Power, June 5, 2012, http://www.nawindpower.com/e107_plugins/content/content.php?content.9944.

44 "Boeing, PetroChina aim for second biofuel flight test," U.S. China Energy Cooperation Program, June 12, 2012, http://www.uschinaecp.org/boeing-petrochina.

45 "EMCORE Consolidates Terrestrial Concentrating Photovoltaics (CPV) Business Into Its Joint Venture, Suncore Photovoltaics," EMCORE, August 6, 2012, http://files.shareholder.com/downloads/AMDA-J7DK9/2012465539x0x589144/12847aee-e99c-495e-a1ff-8cf78e333345/EMKR_News_2012_8_6_General_Releases.pdf.

46 David Shepardson, "Chinese auto parts firm to invest up to $450M in A123," Detroit News, August 8, 2012, http://www.detroitnews.com/article/20120808/AUTO01/208080387/1361/Chinese-auto-parts-firm-to-invest-up-to-$450M-in-A123.