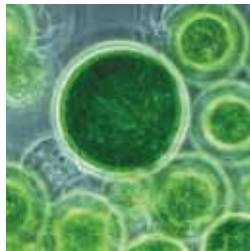


KAUFFMAN FELLOWS REPORT



volume 2



2011



China's National Energy Plan and Investment Considerations

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China's exploding energy needs—both in terms of scope and pace of change—have incredible potential for venture capitalists. The country is rich with natural resources, usable land, and money; however, it is also increasingly reliant on fossil fuels. Renewable energy sources are underdeveloped and often disconnected from demand centers, while the exploding population of urban middle-class consumers is driving an insatiable demand for low cost energy. From 1960 to present, China's population has increased from 667 million to over 1.3 billion and the nation's urban population has grown from 16 percent of the total to over 41 percent.¹ All of this fuels a rapidly growing market for energy generation, distribution, and energy efficiency—and creates the potential for large investment opportunities.

Yet this opportunity comes hand in hand with challenges that, for businesspeople outside China, can seem opaque at first glance and difficult to understand, much less navigate with success. Our investigation of opportunities and challenges in China, however, yielded key considerations and best practices for investment in China's energy market. This article presents key themes from our research meetings, an assessment of the role of the Chinese government, and a discussion of venture capital and investment trends. We conclude the discussion by considering short- and long-term

implications for non-Chinese cleantech companies and investors.

Overview of China's Energy Market

It is hard to miss the level of excitement around the growth of China's energy markets. In 2004, 0.8 gigawatts (GW) of new wind capacity were installed;² 2010 saw the installation of 16.5 GW, representing a 66 percent compound annual growth rate (CAGR).³ The explosion in solar cell production (for export) was even more dramatic: from 0.15 GW of cell production in 2005⁴ to 14.1 GW in 2010, which represents a CAGR of 150 percent.⁵ In the early days, most of these Chinese companies were exporting their technologies to the rest of the world, but since 2009 China has made a strong push to build its domestic market for installed renewable energy.

China has committed to invest significantly in its energy infrastructure over the next decade and this contribution will likely have a profound impact on the global energy venture capital industry. By 2020, China intends to obtain

² China Greentech Initiative, *The China Greentech Report 2009*, September 2009, 36 fig. 20, <http://www.china-greentech.com/2009report>.

³ Asian Power, "China Leads the Global Renewable Energy Market," 1 March 2011, para. 5, <http://asian-power.com/node/7345>.

⁴ Zhao Yuwen, Wu Dacheng, and Li Xudong, *The Status of Photovoltaic Industry and Market Development in China*, 2006, 3 para. 1, http://www.martinot.info/Zhao_et_al_GWREF2006.pdf.

⁵ Shyam Mehta, "PV News Annual Data Collection Results: 2010 Cell, Module Production Explodes Past 20 GW," para. 5, 9 May 2011, <http://www.greentechmedia.com/articles/read/pv-news-annual-data-collection-results-cell-and-module-production-explode-p/>.

¹ Gapminder, "Indicator Gapminder Population," retrieved from Gapminder.org: https://spreadsheets.google.com/pub?key=phAwcNAVuyj0XOoBL_n5tAQ&gid=0.

20 percent of its energy from renewable sources, up from 10 percent in 2010, as well as reducing its carbon dioxide emissions by 40-45 percent relative to 2005 levels.⁶ To meet these goals, the central government has outlined massive investments in traditional and clean energy generation, electricity-grid infrastructure, demand-side energy management, improvements in transportation infrastructure, and oil and gas exploration and processing improvements.

While China is rich in solar and wind energy, these generation centers are often thousands of miles from the core energy-consuming megacities and industrial regions (figure 1). In order to transmit solar and wind energy from the western and northern areas of the country to the major cities in the east and south, the central government has prioritized and invested significantly in developing its transmission infrastructure to power more constituents and with greater capacity. To this end, the country has implemented high voltage direct current (HVDC) technology collaboratively developed

between Western corporations and local Chinese partners to reduce energy losses experienced in more traditional alternating current (AC) transmission systems. At the same time, the government has instituted policies promoting demand-side management platforms, to allow the major utility operators to monitor and manage load levels over time.

China has only five major energy generators (Guodian Corp, Huadian Corp, Huaneng Group, Datang Corp, and China Power Invest Corp) and two major transmission/distribution/retail entities: State Grid Corporation of China (SGCC) and China Southern Power Grid Company Limited. Given this concentrated base, the government can drive initiatives more effectively and monitor progress more easily. Suppliers to these organizations, however, have much more difficulty navigating because the level of vertical integration varies, the sales process can be long, the influencing elements many, and the ability to develop long-standing customer relationships elusive.

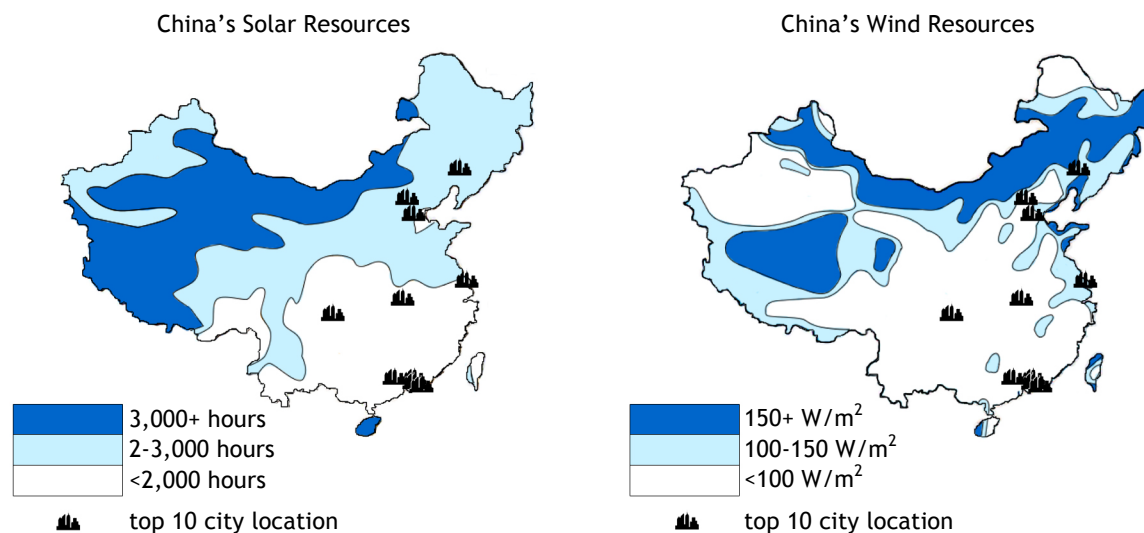


Figure 1. China's Solar and Wind Energy Resources, with Top 10 Most Populated Cities in China.⁷ Darker blue indicates higher resource density.

⁶ China Greentech Initiative, *China Greentech Report 2009*, 48.

⁷ Author's map; solar and wind data from the Center for Wind and Solar Energy Resources Assessment (CWERA), <http://cwera.cma.gov.cn/cn/>, and city data from PBS NewsHour, "Photo Essay: China's 10 Largest Cities," 19 January 2011, <http://www.pbs.org/newshour/multimedia/chinacities/index.html>.

Investigating China's Energy Market Opportunities on the Ground

We set forth to investigate the major trends in the Chinese energy market, with the ultimate goal of developing our individual networks within the Chinese energy segment as well as developing opportunities for our current and future portfolio companies. To this end, we held a number of preliminary meetings over the course of a year, with U.S. players that have interests in the Chinese energy market. We then focused our efforts on the ground in China to build a foundational network of energy experts in Beijing and Shanghai. While these cities do not completely represent China, a critical mass of key players operate out of these city centers and were instrumental in crafting an understanding of strategies that have a reasonable chance of success within China.

During a research trip in Spring 2010, we arranged over 35 meetings in Beijing and Shanghai, focusing our efforts on meeting with major players in each of the primary energy segments and using this base to promote dialog across the broader ecosystem. We were fortunate to meet face-to-face with key executives at both local and international corporations who were candid on what strategies have worked and where they have experienced challenges. Our trip brought us in front of executives from 4 state-owned enterprises, 2 municipalities, 4 large multinational corporations, 4 private Chinese energy companies, 10 venture capital firms, 2 academic institutions, and 10 industry service providers such as accountants, lawyers, and management consultants.

After synthesizing and digesting the contents of the meetings, two key themes emerged and generated interesting discussions during our project: (1) the question of whether a Western company should look to China as the land of opportunity, and (2) key strategies for doing business in China.

Considerations on Entering the Chinese Market

The first question, whether or not to enter China, was the most discussed topic with those we interviewed. Even the large multinational

companies who had already committed substantial investment in China seemed to still struggle with this question. The dialog had a constant ebb and flow. On one side, everyone mentioned the rapid growth of the energy markets and the tangible need for capacity expansion and capability-expanding investments, while on the other side, there was a sense of fear and lack of control over one's destiny. Across individual participants and constituent groups, three reasons for concern were surprisingly consistent.

First, protecting one's intellectual property was always a top priority. No matter how detailed and well considered a company's intellectual property strategy, none of the meetings gave us a sense that anyone had figured out how to truly protect company secrets. Patent enforcement was believed to have improved, especially when responding to concerns raised by local Chinese companies; however, no one was banking on that protection. There were numerous stories of the widespread practice of leveraging a foreign company's product or intellectual property to develop a Chinese version: **One multinational company believed it had only a year to extract economic value from a product before competitive local "knock-offs" emerged.**

Second, excessive levels of competition were a prime concern in our conversations. Local officials are evaluated by the central government based on the growth of their cities, and this growth is largely tied to jobs; therefore, there is little incentive or check-and-balance on whether a market is being flooded with oversupply of a given product or service. As a result, local governments dole out significant grants, land rights, and manufacturing buildings to local businesses, creating multiple local competitors and the feeling that companies are racing to zero-margin production.

Last, concern over the strong power and influence of the concentrated customer base (i.e., the People's Republic of China) received significant attention in our meetings. We asked all of the participating companies "who is buying

new clean energy technologies in China?" The answer was always the same: "state-owned enterprises [SOEs] represent over 90 percent of our sales." With this concentrated base, the ability of the supplier to drive pricing and negotiations is limited. Additionally, the remaining sales were driven by industry mandates from the central government to adopt certain technologies. This top-down influence is demonstrated by China's Top 1,000 Enterprises Energy Efficiency Program, which in 2006 mandated that the top 1,000 polluting companies reduce carbon emissions by 100 million tons of carbon equivalent by 2010. Based on evaluations conducted by the National Development Reform Commission (NDRC) and China's National Statistic's Bureau (NBS), the Top 1,000 enterprises achieved savings beyond their targets through the use of energy audits and the purchase of more efficient production equipment.⁸

Despite these concerns, the companies we met with had ultimately decided that the opportunity in China was too large to ignore and had therefore put their intellectual property and contribution margin at risk. When pushed to defend this decision, **some Western companies argued that even if they "lost" in China, learning to compete in China made them more agile in other global markets.** We found this to be a consistent and interesting statement that often led into the second theme of the conversation: appropriate strategies for competing in China's energy markets.

Best Practices for Competing in China's Energy Markets

In our conversations, startups and large companies alike mentioned that the culture of doing business and developing products and technologies in China was inherently different than in the United States or Europe. These companies spanned the gamut of business models and included, for example, small Western companies forming joint ventures with small or

large Chinese companies, small and large Western companies opening their own Chinese offices, and Western companies licensing or assigning technologies to Eastern companies.

Regardless of the structure pursued, four business practices should be understood and incorporated for a given venture to have a chance of success in China. We have named them (1) In China for China, (2) Good Enough for China, (3) High Touch Points in China, and (4) Fragment Your Intellectual Property.

In China for China

The first best practice, In China for China, is a consequence of the national government being the largest customer of energy technologies; when a customer has that much power, they can and will heavily influence the selection of vendors and products to benefit their primary constituents. The People's Republic of China wants to generate as much revenue and as many jobs for domestic companies as possible, which led us to believe that going into China alone needs to be a carefully deliberated decision for a Western energy-technology company. An anecdote we often heard was that "open bids do not always mean open bids"—Western and Chinese companies alike stated that state-owned enterprises (SOEs) would let domestic companies know about a specific project months before releasing the open Request for Proposal (RFP) process, while Western companies were often given only a week or two to respond to large, complex contract opportunities. Also, participants described SOEs segmenting previously large RFPs into component tenders during successive projects, generally aiding local Chinese companies in capturing piecemeal work as they migrated up the technology learning curve.

Good Enough for China

One of the more interesting themes of our meetings was the best practice Good Enough for China. Many Western companies we spoke with felt as though they were losing contracts and sales because they conducted product development in China the same way they did in the United States and Europe, describing their product-development cycle as calculated, cautious, and thorough to ensure high quality

⁸ S. Ohshita and L. Price, "Lessons For Industrial Energy Efficiency Cooperation With China," *China Environment Series* 11 (2010-2011), 56.

and reliability, thereby protecting their valuable brand. Chinese companies could therefore bring a new product to the market twice as quickly and have a second version of the product out before the Western companies released their first.

Whether good or bad, the Chinese energy market is less concerned at this moment about top quality; rather, they are looking for any competitive advantage and are not afraid to introduce new technologies, especially if doing so gives a significant cost advantage prior to full development and testing. This trend is likely a consequence of the significant competition that exists in China, as well as a common mindset resulting from Chinese post-sale support services. Many of the Western companies recognized this reality, but their corporate culture and organizational structures were too ingrained to effectively make the switch in mindset from the traditional imperative of protecting their strong brand and product reputations to one where unusually high responsiveness to the market is necessary.

High Touch in China

The third best practice, High Touch in China, is a corollary to Good Enough for China and refers to the high level of service that Chinese customers demand from their vendors. **Leading Chinese companies we spoke to had large teams for post-sale service whose primary job was to visit a customer's facility the same day of a malfunction or failure, to troubleshoot the issue and drive a resolution at a very rapid pace, through a new version introduction.** This practice was critical to maintaining good relationships with customers and encouraging them to try new products and technologies. Western companies again seemed to recognize the importance of this business practice, but had yet to effectively make the organizational changes required to implement it.

Fragment Your Intellectual Property

This best practice emerges from the fact that when firms were able to successfully close initial

sales, it was common to find over time that customers had developed their own solution using their in-house engineers, concluding the sales relationship with the multinational firm for that particular product. This interesting dynamic requires solutions-providers to develop a multilayered strategy for product development and sales that goes beyond merely conceiving of a product: Firms must also determine how much capability to provide and when to provide it, knowing that their customer may begin to reverse-engineer their own solution shortly after receiving the first unit. The incentive both to sell into the large Chinese energy segment and to also protect the firm's intellectual property constantly requires these teams to evaluate their strategies.

Fragment Your Intellectual Property refers to strategies for protecting intellectual property—interestingly, this was an equal concern for both Western and Chinese companies. The lawyers we spoke with confirmed that laws are in place in China to protect intellectual property and that the problem is lack of enforcement. Management teams and lawyers do, however, believe that enforcement practices are improving. Companies often felt they were in danger of losing control of their intellectual property in China, but they believed that customs control and international trade agreements did a good job of preventing Chinese companies from exporting stolen intellectual property. Nonetheless, companies often employed the strategy of fragmenting their intellectual property by using several different contract manufactures to make different pieces of equipment, so that no one company was capable of producing a complete, working system.

Financing Clean Energy Ventures

Once a Western company decides to invest in the Chinese energy market, they face the task of determining how best to finance and structure their venture. We found four areas to consider: the role of government, venture financing and investment considerations, structural considerations, and trends regarding exits.

The Role of Government

The Chinese government, both central and local, is the most significant driving force in financing

energy innovations, substantially dwarfing all other funding sources. It is important to recognize that **the People's Republic of China has more than \$3 trillion in currency reserves⁹ and intends to use those funds to accelerate its position with regard to energy.**

First, the central government outlines its initiatives in a series of “five year” plans dictating policy in a number of industry sectors including energy; these plans are essentially top-down roadmaps to achieve certain goals, with deployment of capital to achieve these goals. The most recent plan was enacted into law by the Chinese government in March 2011. The 12th Five Year Plan (2011-2015) calls for many infrastructure investment initiatives including achieving 90 GW of total installed wind and 5 GW of total installed solar by 2015, up from 44.7 GW of total installed wind capacity and less than 1 GW of total installed solar capacity in 2010,¹⁰ with a target of increasing non-fossil-fuel energy to 11.4 percent of total energy use (from the current 8.3 percent).¹¹ The 12th Five Year Plan also sets a target of \$1.5 trillion dollars of public and private investment over the next five years in strategic emerging industries including new energy, new materials, and clean energy vehicles.¹²

Second, China has proposed two large stimulus packages (totaling almost \$1 billion) to be deployed immediately, focused on energy-related projects, and has outlined long term plans to invest hundreds of billions of dollars over the next decade.¹³ Of the capital allocated via the “five year” plan and stimulus packages, a substantial portion flows to state-owned enterprises such as the State Grid Corporation of China (SGCC).

⁹ Daily News and Economic Review, “China’s Currency Reserves Exceed \$3 Trillion,” 14 April 2011, <http://www.hurriyetdailynews.com/n.php?n=china8217s-currency-reserves-exceed-3-trillion-2011-04-14>.

¹⁰ China Greentech Initiative, *China Greentech Report 2011*, 15 para. 1, <http://www.china-greentech.com/report>.

¹¹ Joanna Lewis, “Energy and Climate Goals of China’s 12th Five-Year Plan”, 2, March 2011, <http://www.pewclimate.org/international/factsheet/energy-climate-goals-china-twelfth-five-year-plan>.

¹² David Abraham and Meredith Ludlow, “China’s Bold New Plan for Economic Domination,” *The Atlantic* 18 May 2011, para. 4, <http://www.theatlantic.com/international/archive/2011/05/chinas-bold-new-plan-for-economic-domination/239041/>.

¹³ Global Times, “Stimulus Package Effects on Energy Saving May Last for Years: Report,” 12 February 2011, <http://business.globaltimes.cn/industries/2011-02/622277.html>.

Third and certainly not least, local municipalities have quickly emerged as a critical force in the financing ecosystem. Motivated by generating local commerce and jobs, local governments (at the city and sub-city level) have issued incentives to promote local businesses. Perhaps more impactful, these local governments have opened up cash reserves as a substantial source of capital for regionally focused venture funds; as a result, the number of new local venture funds has recently exploded, deploying an extraordinary amount of capital into concentrated regions.

Venture Financing and Investment Considerations

Rather than venture-backed, most clean energy financing activity in China is project-financed or financed from public markets, which is not surprising because the majority of energy projects are in capital-intensive businesses such as wind and solar. While the venture industry in China is still emerging and is relatively small compared to the United States, the industry has grown 10x in the past decade. Approximately \$5.3 billion was deployed in 2010 across all sectors, with \$500 million deployed in cleantech (figure 2), and if we include all energy technologies (green or not), this number approaches \$1 billion.¹⁴ In contrast, U.S. venture firms deployed approximately \$5 billion into cleantech companies alone.

The venture capitalists in China we spoke with offered a common theme: **Very few investors are openly “early stage” and instead tend to look for companies with fully developed solutions and well understood financial metrics that look more like growth and expansion investments.** The data supports this observation: More than 90 percent of venture investments in 2010 are considered expansion or later stage by both number and dollar (figure 3).¹⁵ In fact, the dominant strategy voiced was to invest as the first institutional capital

¹⁴ Zero2IPO Research Center, *China VC/PE Market Review 2010* (15 January 2011), 8, available from <http://www.zero2ipogroup.com/en/research/>.

¹⁵ Ibid., 10.

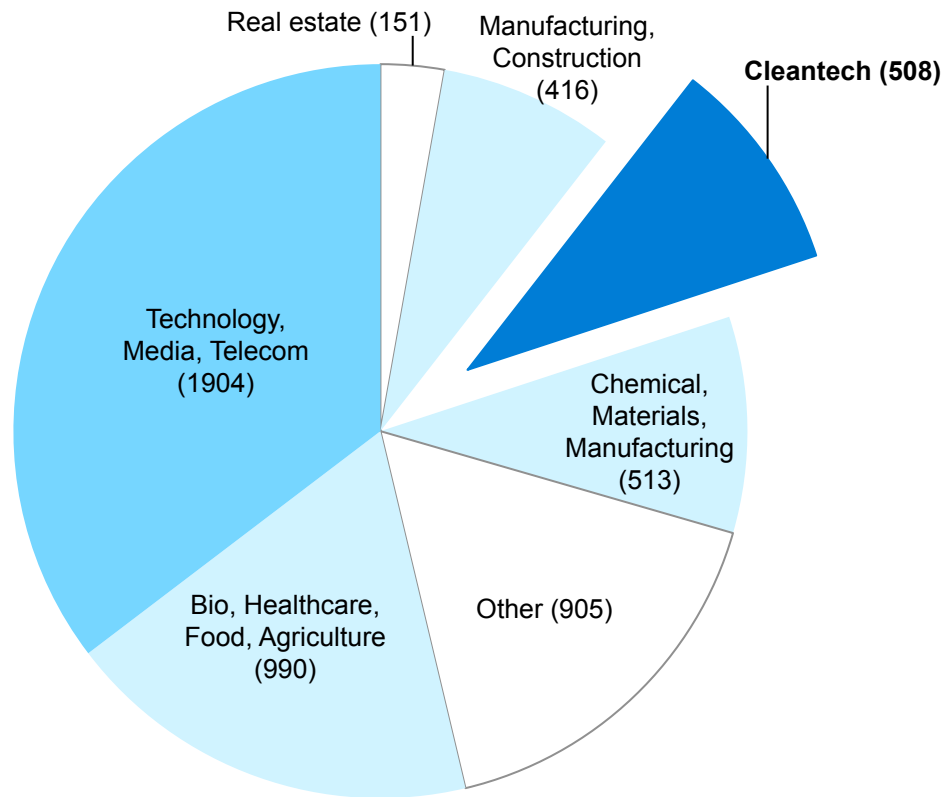


Figure 2. Chinese Venture Capital Investments (US\$m) by Sector in 2010.¹⁶

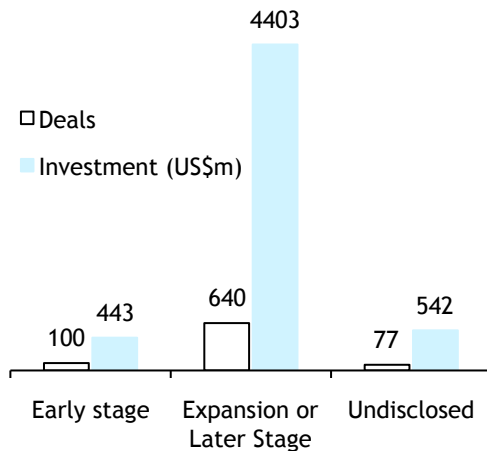


Figure 3. Chinese Venture Capital Investments by Stage in 2010.¹⁷

(i.e., Series-A deals) in profitable companies. Most investors also candidly expressed their investment strategy as momentum plays and used the government’s “five year” plan as a roadmap for investment.

Structural Considerations for Investing in China: Choice of Currency

Venture firms wishing to invest in China must decide whether to raise a fund in U.S. dollars or local currency (RMB); regardless of whether the fund is foreign (e.g., a U.S.-based firm) or domestic, this choice is critical as both options come with unique benefits and challenges. Because the structural limitations for both types of funds are rapidly changing with evolving regulations, the following discussion does not focus on details, but rather on high-level observations.

U.S.-dollar funds generally require complex investment structures through offshore

¹⁶ Authors’ chart; data from Zero2IPO Research Center, *China VC/PE Market Review 2010*, 8.

¹⁷ Authors’ graph; data from Zero2IPO Research Center, *China VC/PE Market Review 2010*, 10.

investment entities. However, the venture firms, law firms, and financial institutions we interviewed all affirmed that these complex structures made it mechanically easier to list such companies on U.S. and Hong Kong exchanges for liquidity.

Local currency (RMB) funds can be used to directly invest in opportunities without complex investment structures, but for most cases the RMB is a nonconvertible currency, thus dramatically limiting exit options. Depending on the source of capital, there can also be many restrictions associated with these funds, including regional and sector limitations.

Fundraising for RMB funds has outpaced U.S.-dollar funds by more than 10:1,¹⁷ driven by significant investment by municipalities in locally managed funds. In addition to these local funds, there are a number of well recognized Western and Chinese firms, including Draper Fisher Jurvetson and Tsing Capital, that have chosen to raise independent RMB funds alongside U.S.-dollar funds. Excluding these and similar experienced funds, the majority of local currency funds are brand new firms with first-time investment managers who have less (or sometimes no) venture-investing experience. Time will tell whether these funds can profitably invest capital or are simply flooding the market with low-cost capital. In 2010, 146 local currency (RMB) funds were raised for a total of \$6.8 billion, while only 12 U.S.-dollar funds were raised for \$4.3 billion. In terms of investment dollars, RMB funds represented 1/2 of the value and 2/3 of the deals in 2010.¹⁸

Trends Regarding Exits

Contrary to our expectations, acquisitions are rare as an exit path for Chinese venture-backed startups, and even rarer in cleantech sectors (only 3 out of 91 M&As in 2010).¹⁹ While this number increased through the beginning of 2011, it is still very small relative to the number of investments.²⁰ Regardless of sector, taking the company public is the most likely option for liquidity. Listing a company internationally (whether on a U.S., Hong Kong, or other

exchange) comes with a very high bar including a long history of revenue and profitability; moreover, companies funded by RMB-based funds may face additional limitations.

The most likely exit option is to list domestically in one of China's three local exchanges: Shanghai Stock Exchange (trading both in RMB and dollars), Shenzhen Stock Exchange (predominantly trading companies with majority government ownership), and ChiNext (intended to be similar to NASDAQ for fast-growth companies). ChiNext is the preferred exchange for startups, but it is worth noting that all these exchanges are extremely volatile. The majority of traders are retail investors essentially day trading, rather than the traditional institutional investors who invest based upon fundamentals; as a result, the market fluctuates based on irrational news releases and there is little reliable research coverage. Additionally, long lockup periods (up to three years) have been historically common, though this is now changing.

Under this framework, it is not surprising that venture capital strategies and time horizons are much shorter than in the United States. A typical investment plan for a China-focused venture capitalist includes four years from investment to IPO, targeting 2-3 years proven profitability in government-driven markets.

Conclusion

China's commitment to investing in and adopting new energy technologies is real. The sheer magnitude of financial resources and the ensuing rate of growth will continue to create significant opportunities and threats for energy companies large and small. The opportunities are brightest for companies that are well aligned with the strategic initiatives laid out by the central government in their five year plans and that create a product-development and business strategy catering to the uniqueness and the culture of the Chinese market. Some Western companies are successfully leveraging China's commitment through investment, manufacturing partners, and commercial relationships. Our experience in China leads us to believe that **while there is no hard-and-fast**

¹⁷ Zero2IPO Research Center, *China VC/PE Market Review 2010*, 5.

¹⁸ *Ibid.*, 7.

¹⁹ *Ibid.*, 28.

²⁰ *Ibid.*

rule for being successful in China, one key ingredient is having a dedicated and experienced local team who understands how to navigate China's state-influenced energy markets.

Our recommendation to investors and entrepreneurs interested in China's energy markets is to start now by identifying opportunities and building relationships with local organizations and leaders. Focus on (1) evaluating how open the market really is for your company's innovation, (2) how to structure your organization to respond to the product development and post-sales service requirements, and (3) how to use different manufacturing partners to separate core aspects of your IP. **Finally, do not underestimate the amount of time and resources needed to effectively develop and execute a China strategy.** The potential is there for those who are well positioned and well prepared to take advantage of it.

The authors would like to acknowledge and thank Kauffman Fellows Joshua Raffaelli, Principal at Draper Fisher Jurvetson, and Barry Zhang, CEO and Chairman of NSI Technologies LLC. Messrs Raffaelli and Zhang are core team members who worked with the authors to complete the research and participated in the trip discussions and interviews, which allowed our team to draw our conclusions. The team also acknowledges the significant support from PricewaterhouseCoopers LLP, Silicon Valley Bank, and Courtney McColgan.



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