Capitalizing on China’s renewable energy opportunities

Innovative financing models for China’s solar and wind markets
Based on EY global experience and findings from this study, new ways to finance renewable energy in China can help to build a better working world. This study relied on a range of information and expertise from various sources in China and globally. EY China would like to thank the experts in China and globally who contributed to this study.
China has bold ambitions to increase adoption of renewable energy - especially wind and solar - to reduce its dependence on fossil fuels, battle severe air pollution and create global industry leaders. China has set ambitious targets for solar and wind energy production: 35 GW of installed solar capacity and 100 GW of wind, representing 9% of China’s total electric power capacity target by 2015.\(^1\)

Further, the National Development Reform Commission (NDRC) recently announced that China would reach 70 GW of installed solar capacity and 160 GW of wind by 2017. Of this, 50% of China’s solar capacity by 2017 is targeted to come from smaller scale distributed projects (such as commercial and industrial rooftops), while offshore wind is forecast to reach 3.6 GW.

China and United States commitments made in November 2014 to reduce greenhouse gas emissions (GHG) also provide support for adoption of renewables in China. China has committed to peak its carbon emissions around 2030 and increase its non-fossil share of energy to 20% by 2030.\(^2\)

Based on EY global experience, financing quality renewables projects requires innovative financing models, rather than simply relying on the limited range of conventional financing solutions prevalent in China today.

EY’s study on renewable energy financing offers five main insights for manufacturers, project developers, financial institutions, investors and policymakers:

- China will require at least RMB1.58 trillion (US$258 billion)\(^3\) of investment between 2014 and 2017 to meet its aggressive targets. Distributed solar projects alone will require at least RMB 522 billion (US$85 billion).

- Reliance on corporate debt is insufficient for smaller scale, costlier distributed solar projects, which are important to achieve China’s solar targets and catalyze new technology and business model innovations.

- Yield cos, leasing, and crowd- and community-funding are promising financing models used with success globally that are also being experimented with by a growing number of companies in China. These innovative financing models have the potential to lower the cost of capital for projects and in turn make investment returns more attractive.

- Institutional funding such as insurance and pension funds provide lower cost of capital through inflation-linked yields and are insulated from equity market volatility. Insurance companies in particular are a significant untapped source of capital for solar and wind projects in China.

- Industry and government can collaborate to create common standards and criteria that will increase access to capital, price risk accurately and encourage high quality projects. Stakeholders in China can learn from the efforts and early successes of consortiums such as truSolar in the United States.

While China’s government has many of the requirements in place for widespread adoption of wind and solar power, new financing models are critical to broaden access to capital for high quality wind and solar projects which can contribute meaningfully to a cleaner, brighter future for China and the world.

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2. Chinadaily.com.cn, November 7, 2014
3. Exchange rate used: US$1 = RMB6.14
China's ambitious targets and supportive policies

China's 12th five-year plan includes ambitious goals to lower air pollution, reduce reliance on fossil fuels and significantly expand the use of renewable energy, especially solar and wind. China aims to increase solar and wind energy generation capacity to 35 GW and 100 GW respectively, accounting for over 9% of total electricity power generation by 2015. 4

Wind capacity is expected to double from 44.7 GW in 2010 to 100 GW by 2015, and China plans to expand wind capacity to 160 GW by 2017. 5 Solar plans are even more ambitious: from less than 1 GW in 2010, solar capacity is targeted to reach 35 GW in 2015 and 70 GW in 2017, with up to one half expected from distributed solar. 6

How ambitious are China's renewable energy targets? If achieved, China will likely have the largest solar and wind capacities in the world by 2017, with more than the combined wind capacity of Germany and the U.S., and for solar nearly 75% of the combined capacity of those two countries. In just three years, China's total solar capacity has grown from less than 1 GW in 2010 to a remarkable 19.4 GW in 2013, more than the 13.2 GW of the U.S. in 2013. 7

China's national government has established various regulations, tariffs and subsidies to encourage provinces and state-owned enterprises to achieve top-down wind and solar targets set by the national government. Further, locations such as Shanghai offer additional feed-in-tariffs (FiT) to individuals and companies to encourage distributed solar projects. China's aim is to bring renewables closer to grid parity so that by 2020 solar and wind power will be competitive with coal, even excluding the many negative externalities from coal burning. 8

By 2017, China may have twice the wind capacity of the U.S.
China will likely have nearly 75% of the combined solar capacity of the U.S. and Germany by 2017.

4 “The China Greentech Report 2013”
5 “The China Greentech Report 2013”
7 Bloomberg New Energy Finance (BNEF)
8 IBM, 2020: Transforming China’s Electric Power Future
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**Figure 1**: China’s total installed solar capacity compared with selected countries (2010-2017E)

<table>
<thead>
<tr>
<th>Year</th>
<th>China</th>
<th>Germany</th>
<th>U.S.</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>0.8</td>
<td>17.1</td>
<td>2.7</td>
<td>0.8</td>
</tr>
<tr>
<td>2013</td>
<td>19.9</td>
<td>35.5</td>
<td>13.2</td>
<td>2.4</td>
</tr>
<tr>
<td>2017</td>
<td>70.0</td>
<td>44.2</td>
<td>50.0</td>
<td>10.0</td>
</tr>
</tbody>
</table>

Source: BNEF; 2020: Transforming China's Electric Power Future (IBM); EY analysis

**Figure 2**: China’s total installed wind capacity compared with selected countries (2010-2017E)

<table>
<thead>
<tr>
<th>Year</th>
<th>China</th>
<th>Germany</th>
<th>U.S.</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>42.3</td>
<td>26.5</td>
<td>38.3</td>
<td>11.1</td>
</tr>
<tr>
<td>2013</td>
<td>89.5</td>
<td>34.2</td>
<td>59.4</td>
<td>18.1</td>
</tr>
<tr>
<td>2017</td>
<td>160.4</td>
<td>47.0</td>
<td>78.1</td>
<td>33.1</td>
</tr>
</tbody>
</table>

Source: BNEF; 2020: Transforming China's Electric Power Future (IBM); EY analysis
China’s aggressive renewable energy targets translate into significant capital required to fund projects over the next three years. EY estimates at least RMB1.58 trillion (US$258 billion) will be needed to fund China’s solar and wind ambitions from 2014 to 2017. Further, distributed solar will make up an increasingly large portion of the total required investment, from only an estimated RMB80 billion (US$13 billion) in 2014 to RMB178 billion (US$29 billion) in 2017.

Currently, corporate collateralized loans are a common form of financing used in China for solar and wind projects. However, reliance on loans (and corporate bonds) limits market participants and does not necessarily encourage high quality projects. Loans and bond issuances are more accessible to large state-owned and publicly listed companies, often leaving private companies unable to obtain sufficient capital for projects. In addition, loans typically use corporate assets as collateral, not project assets – reducing the incentive for high quality projects that require optimized designs and long-term operating efficiencies.

Access to capital for distributed solar projects is even more constrained. Economic returns on these projects vary significantly and are often less favorable than utility-scale solar, due in great part to their small size and scale. Without new forms of financing, many industry experts we interviewed felt it would be difficult for China to achieve its aggressive distributed solar targets. To date, much of the financing for distributed solar projects are in the form of lines of credit and collateralized loans provided to solar manufacturers eager to use manufacturing capacity and develop new markets.

Figure 3: Estimated capital required for solar and wind in China (2013-2017E)

China’s Solar Investment Requirements
- RMB737 billion (US$120 billion) capital investment required from 2014 to 2017
- Distributed solar requires total of RMB528 billion (US$86 billion) in capital from 2014 to 2017

China’s Wind Investment Requirements
- RMB847 billion (US$138 billion) capital investment required from 2014 to 2017
- Offshore wind costs may increase sharply by 2017

Source: EY analysis
To create healthy solar and wind markets with high quality projects, China requires new, innovative types of financing to complement the conventional financing mechanisms used for most projects today.

EY has identified four main innovative financing models used globally that can potentially be adopted in China to help achieve renewable energy targets, improve access to low cost capital and encourage high quality projects.

- **Yield companies**
  Yield companies (yield cos) are publically listed and tradable companies set up by pre-established renewable energy developers. The developers place a portfolio of energy generating assets under the governance of the yield co. In turn, the yield co raises capital and manages the energy generating assets which provide stable, long-term cash flow back to shareholders. In most cases, the original developer is one of the main shareholders of the yield co. Popular in North America and increasingly in Europe, yield cos have become a common form of financing for projects that are, on the one hand, low risk for investors (since the yield co owns a portfolio of assets, not a single project) and, on the other, help project developers access low cost capital, usually at rates less than 5%.

- **Institutional funds**
  Institutional funds are vehicles that invest capital from large institutions such as pension funds or insurance companies. They are an attractive source of financing because they provide developers with low cost of capital and in return provide investors with long-term, stable and inflation-linked yields. Globally, institutional funding is growing in popularity because it is insulated from equity market volatility.

In 2013, institutions in Europe invested more than US$3.3 billion in renewable energy and are expected to play a greater role in renewable energy financing in the future.

NRG yield
NRG yield became the first yield co to list on a U.S. stock exchange, raising US$431 million in 2013 for solar and wind projects. Shares were more than ten times over-subscribed for its IPO. Chinese companies are in the early stages of exploring the use of yield cos.

Source: Chadbourne & Parke LLP: Yield Cos Compared; EY analysis

Bluefield solar income fund limited
Bluefield solar income fund limited was the first listed fund on the London Stock Exchange in July 2013. Gross proceeds of £130 million were raised from a broad group of large institutional investors.

EY interviews indicated that some insurance companies in China are considering investments in renewable energy projects. However, overall understanding of the sector appears limited.

Source:Solar Power Portal; EY analysis
Leasing

Leasing is potentially an attractive form of financing because it allows developers to bypass significant up-front capital and installation costs by leasing the assets from a third party.

For rooftop projects, building owners can lease their rooftops to developers who in turn install solar systems on the rooftop and sell the electricity generated to the building owner and/or utility companies. Developers benefit from any subsidies offered by governments and receive revenues from electricity generated by their systems. At the same time, building owners benefit by receiving leasing payments for their rooftop and pay the same or less cost for their electricity.

In the U.S., Solar City has developed a successful model for leasing. It surpassed 100,000 customers in March 2013, and expects to reach 1 million by 2018. Similarly, in India the Gujarat India Solar Program holds promise as a model that delivers benefits to developers, building owners and policymakers.

Crowd and community funding

Crowd-funding companies are platforms that enable distributed PV project owners to obtain funding from a large pool of individual investors, each contributing a small amount of capital – as little as US$25. Investors receive a constant annual rate of return (in the U.S. about 5%) for a fixed number of years before their principal is eventually returned. Meanwhile, project owners pay a slightly higher interest rate for access to the capital aggregated by the crowd-funding company. The difference between the amount paid to investors and provided to project owners is collected by the crowd-funding company, similar to how a commercial bank earns money from the spread between interest paid on deposits and interest from loans.

Crowd-funding is becoming more popular in both Europe and the U.S: In 2013, UK-based Abundance Generation raised US$2.7 million for four solar projects and U.S. based Mosaic raised US$5.6 million.

Community funding is similar to crowd funding, but is confined to individual investors living in a particular community (such as a village or small town) that pool their capital together to invest in renewable energy projects in their community. Communities in Germany and emerging markets, for example, are adopting this model.

Gujarat India Solar Program

In 2011, the Gujarat provincial government in India launched a 5 MW rent-a-rooftop scheme in Gujarat city. The purpose was to experiment with contractual models and demonstrate the economic feasibility of rooftop solar. Over 3.2 MW of rooftop solar systems have been installed by two developers and 760 KW of residential leases have been signed.

Under the model, developers rent rooftops from building owners and sell electricity generated to power utility companies using virtually no subsidies.

In 2014, the model was rolled-out to five more large cities in Gujarat Province and the Delhi government is preparing to replicate the scheme.

Source: IFC: Gandhinagar Solar Rooftop Program; EY analysis

Mosaic

Mosaic is a leading crowd-funding platform for distributed solar projects in the U.S. It allows developers to tap into consumer capital to fund projects at attractive rates. In 2013, Mosaic raised US$5.6 million for smaller scale commercial and industrial projects.

Industry experts in China we interviewed view crowd-funding using the internet as a powerful channel for distributed solar projects – despite current regulatory constraints.

Source: EY RECAI, September 2014
Which financing models used globally have the potential for broad adoption in China in the next three years? EY sought to answer this question through a combination of financial analysis, discussions with experts and our own assessment of prospects for different types of projects.

Clearly, uncertainties surrounding the scope and timing of regulatory and financial reforms impact our ability to draw definitive conclusions; however, we hope EY's assessment can stimulate further discussion and debate of how innovative financing models can drive healthy development of China's wind and solar markets.

EY developed a three-step approach to assess the attractiveness of different financing models for China. First, we developed financial and operating assumptions based on our global experience and expert interviews in China. Next, we conducted sensitivity analyses to evaluate under which scenarios wind and solar projects would be attractive to financiers. Based on this, we assessed the relative attractiveness of different financing models for utility-scale and distributed projects. We did not focus our analysis on conventional financing methods such as those for debt (such as corporate loans, bonds and lines of credit) and equity (such as private equity and IPOs).

Overall, we considered an IRR level of 12% as attractive for financiers in China who are often accustomed to relatively high investment returns; however, we recognize lower IRR rates will still be considered attractive for many classes of investors, such as those with institutional funds.

- **Yield cos can be an attractive financing model for both utility-scale wind and solar projects.** At a time when many of China’s solar and wind companies face high debt-to-equity ratios and credit constraints, financing through yield cos is an attractive option to fund projects without raising debt levels. For example, if utility scale projects are financed 80% by yield cos (equity) and cost of capital is less than 5%, projects are attractive (IRR greater than 12%) assuming the FiT rate is greater than 1.4 RMB/kWh, installation costs are 7.0 RMB per watt or lower, and capacity factors are 26% or greater.

- **Institutional funding** can be an attractive financing source for utility-scale projects, especially for insurance companies in China with significant capital reserves requiring low risk, stable returns. Funds can invest directly in individual projects or financial instruments backed by pooled assets. For example, institutional investors can pool their capital into a private yield co offering long-term yield but not exposed to the vagaries of equity markets. This is particularly useful for investors who do not want the liquidity and exposure of public equity investments.

- **Leasing** is most suitable for distributed solar projects using business models already proven globally, but adapted for China. While investment returns are typically lower than if the systems are owned outright, the low upfront costs to developers can make leasing sufficiently attractive in some cases. While EY assesses leasing as only moderately attractive, it has the potential to become a popular financing model in China if tax or other incentives are introduced as they have been in the U.S., India and other countries.
Crowd-funding and community-funding are attractive for smaller scale distributed solar projects in China. Investors can invest small amounts of capital for specific projects. Since financing is provided to individual projects, it provides developers a strong incentive to design and implement quality projects which in turn ensures an efficient use of capital. Based on EY analysis, crowd-funding or community-funding can be attractive when conditions such as the following are met: FiT rate is increased from 0.42 RMB per kWh mandated by central government to 1.22 /kWh and cost of capital is less than 8%, the capacity factor is greater than 23% and cost of capital is 4% or less, the installed cost is less than RMB 10/kWh and cost of capital is 8% or less, or electricity prices are RMB 1.2/kWh and cost of capital is 4% or less.

Figure 4: Attractiveness of financing models for wind and solar in China

<table>
<thead>
<tr>
<th>Financial Models</th>
<th>Utility-Scale</th>
<th>Distributed Solar</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Wind</td>
<td>Solar</td>
</tr>
<tr>
<td>Debt (corporate loans, bonds, credit lines)</td>
<td></td>
<td></td>
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<tr>
<td>Equity (private equity and public listings)</td>
<td></td>
<td></td>
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<tr>
<td>Yield cos</td>
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<tr>
<td>Institutional funding</td>
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<tr>
<td>Leasing</td>
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<td></td>
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<tr>
<td>Crowd- and community-funding</td>
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Source: EY analysis
EY research and expert interviews uncovered the pressing need for industry standards and criteria as a catalyst for financing distributed solar commercial and industrial projects. Similar to industry-recognized ratings for financial instruments such as corporate bonds, “scoring” projects using industry standards and criteria will create more efficient markets for capital. Financiers can evaluate projects with greater confidence by being able to price the risks and quality of potential projects more accurately.

Companies, government and associations appear to be in the early stages of considering industry standards and criteria specifically for China. The consortium truSolar based in the United States is an interesting example of how projects can be “scored” using a transparent methodology and metrics based on standards and criteria defined by organizations across the solar value chain.

The objectives of truSolar are to:

- **Increase access to capital** – Expand the market for commercial and industrial solar with standardized finance for a wider range and higher volume of projects
- **Accurately price risk** – Projects scored through truSolar allow finance providers to improve their understanding of solar projects, have more control in specifying their target projects and understand the cost of capital they should offer
- **Reduce deal fallout rates** – Provides upfront screening using standard criteria to allow companies to quickly filter out projects that are unattractive and build projects that are commercially viable.

Launched in January 2013, the truSolar initiative represents a consortium of over 15 companies and organizations across the solar value chain (including insurance and rating agencies) and anticipates adding another 25 or more members in the future.9

While the market and financial environment for the solar industry in the United States differs from China, we believe a similar initiative in China can be an important enabler for financing of distributed solar projects.

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9 Trusolarscore.com; EY analysis
China’s aggressive wind and solar targets, combined with top-down policy support, provide a solid foundation for significant adoption of wind and solar power over the next three years. However, the volume and quality of projects will be largely dependent on appropriate financing that aligns the need for significant capital with the requirements of different types of financiers. Introducing innovative financing models, supported by industry standards and criteria, can help companies across the value chain to capitalize on China’s renewable energy opportunities, and in the process create a cleaner, brighter future.

Roles of stakeholders

Capitalizing on China’s renewable energy opportunities will require actions and collaboration from stakeholders across the wind and solar value chains.

- **Solar and wind manufacturers**: Partner with investors, financial institutions and developers to build and operate commercially viable wind and solar projects
- **Project developers and operators**: Structure financing of high quality projects in a manner that considers the entire asset lifecycle, in order to attract investors seeking stable, low-risk returns
- **Financial institutions**: Develop customized solutions which can meet the needs and requirements for various types of projects
- **Investors**: Develop a deeper understanding of renewable energy projects and evaluate investment opportunities which can offer acceptable returns commensurate with risk levels
- **Policymakers**: Evolve policies to encourage wider adoption of financing models that hold promise in China, especially for distributed solar
- **All stakeholders**: Collaborate together to develop standards and criteria that can increase access to capital and price risk more accurately for quality projects