Consultancy on China-Ghana Renewable Energy Technology Transfer Financing

(Reference No.CG322-1)

Part III

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Contents

1.Overview of global renewable energy Investment

1.1 Global renewable energy investment

Global investment in renewable energy (excluding large hydro-electric projects) was $270.2 billion in 2014, nearly 17% higher than the previous year. This was the first increase for three years, and reflected several influences, including a boom in solar installations in China and Japan, totaling $74.9 billion between those two countries, and a record $18.6 billion of final investment decisions on offshore wind projects in Europe.

Taking into account the capital costs in wind, and particularly in solar PV, falling sharply in recent years. the capacity looks more impressive than it would seem from the investment numbers. A record number capacity of wind and solar photovoltaic power was installed, at about 95GW. This compared to 74GW in 2013, 79GW in 2012 and 70GW in 2011, the only year in which dollar investment was higher than 2014, at $278.8 billion.

Table 1-1. Global New Investment in Renewable energy by Category, 2004-2014, $BN

Categary	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Wind	17.9	29.1	39.6	61.6	75.2	81.2	98.9	84.2	84.1	89.3	99.5
solr	12	16.3	22.1	38	60.8	63.7	103.3	155.7	144.3	119.8	149.6
biofuels	3.9	9.6	28.4	28.7	19.2	10.2	10.1	10.4	7	5.5	5.1
biomass & w-t-e	7.4	9.6	12.1	15.8	16.9	13.9	16	17.4	12.4	9.3	8.4
Small hydro	2.6	7.2	7.6	7.1	7.8	6.3	5.7	7.2	6.4	5.5	4.5
geothermal	1.2	1	1.5	2	1.7	2.9	3	3.7	1.8	2.2	2.7
Marine	0	0.1	0.9	0.8	0.2	0.3	0.3	0.3	0.3	0.2	0.4
Total	45	72.9	112	154	181.8	178.4	237.3	278.8	256.3	231.8	270.2

Source: UNEP, Bloomberg New Energy Finance

The biggest locations for renewable energy investment in 2014 were the established markets in major economies – with China far out in front at $83.3 billion, a record number and 33% ahead of 2013. In second place came the US, at $38.3 billion, up 7% on the year but still well below its all-time high, reached in 2011. Third came Japan, at $35.7 billion, a tenth higher than in 2013 and its biggest total ever. India was up 14% at $7.4 billion, and Brazil 93% higher, at $7.6 billion.

Renewable energy also faced challenges now. Firstly , the 50%-plus collapse in the oil price have direct and indirect effect on the renewable energy investment, which is likely to dampen investor confidence in parts of the sector. secondly, policy uncertainty will also impact the renewable energy investment, for example retroactive policy changes in countries such as Italy and Romania, and concerns about grid access for small-scale solar in Japan and some US states.

1.2 Financing source of global renewable energy investment

Bloomberg New Energy Finance tracks deals across the financing continuum, from R&D funding and venture capital for technology and early-stage companies, through to public market financing for projects and mature companies. Investment categories are defined as follows:

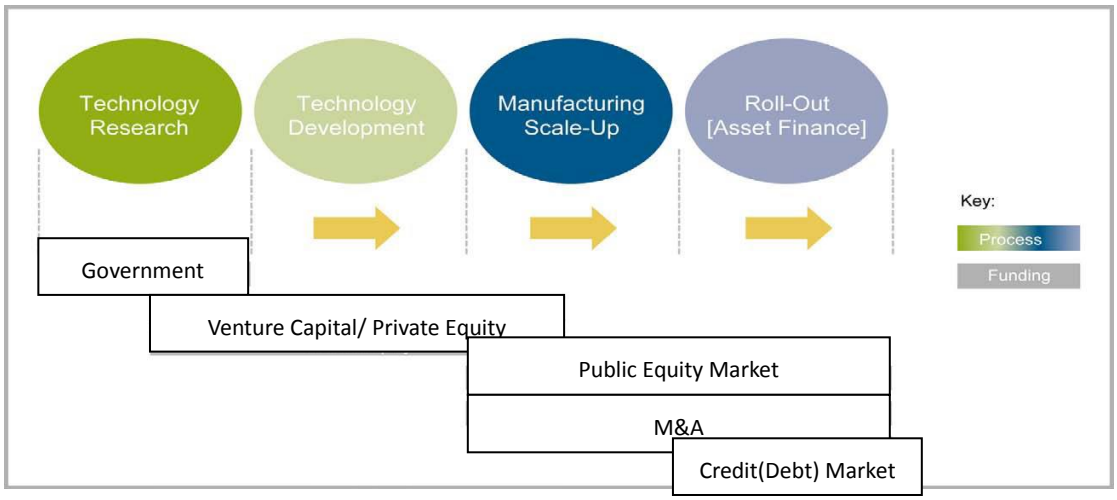
Venture capital and private equity (VC/PE): all money invested by venture capital and private equity funds in the equity of companies developing renewable energy technology. Similar investment in companies setting up generating capacity through special purpose vehicles is counted in the asset financing figure.

Public markets: all money invested in the equity of publicly quoted companies developing renewable energy technology and clean power generation.

Asset finance: all money invested in renewable energy generation projects (excluding large hydro), whether from internal company balance sheets, from loans, or from equity capital. This excludes refinancing.

Mergers and acquisitions (M&A): the value of existing equity and debt purchased by new corporate buyers, in companies developing renewable energy technology or operating renewable power and fuel projects.

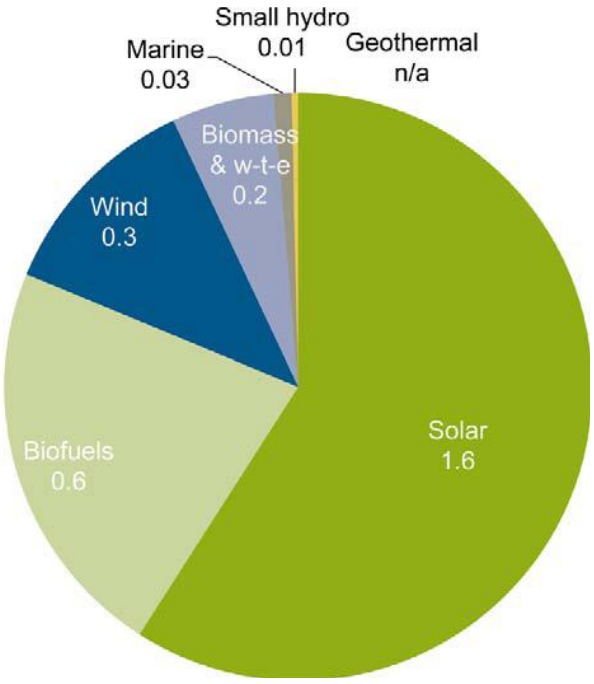
Figure 1-1 financing continuum of renewable energy project



Financing source of global renewable energy investment in 2014

Figure 1-2 shows that the balance was slightly different as far as the venture capital and private equity category of investment was concerned, with solar the largest recipient at $1.6 billion and biofuels second at $610 million.

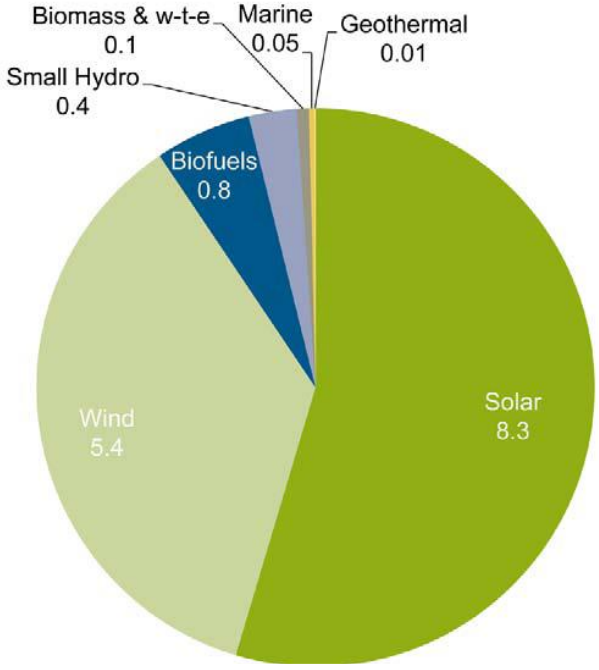
Figure 1-2 VC/PE Investment in Renewable Energy by Sector, 2014, $bn



Source: UNEP, Bloomberg New Energy Finance

In Figure 1-3, a relatively strong year for public markets investment in clean energy featured some impressive increases for the individual sectors, with solar companies receiving 73% more equity capital from stock markets than in 2013, at $8.3 billion, and wind companies 120% more, at $5.4 billion. Wind was the largest sector in terms of utility-scale asset finance in 2014, as previously, but the gap between it and solar narrowed somewhat.

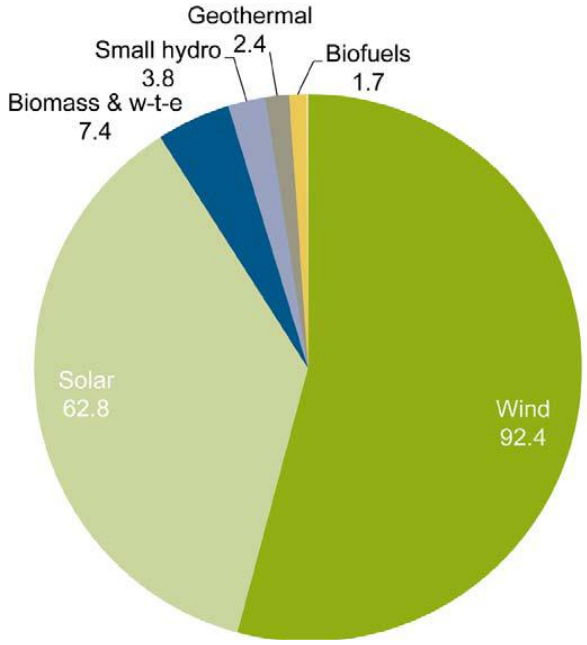
Figure 1-3 Public Market in Renewable Energy by Sector, 2014, $bn



Source: UNEP, Bloomberg New Energy Finance

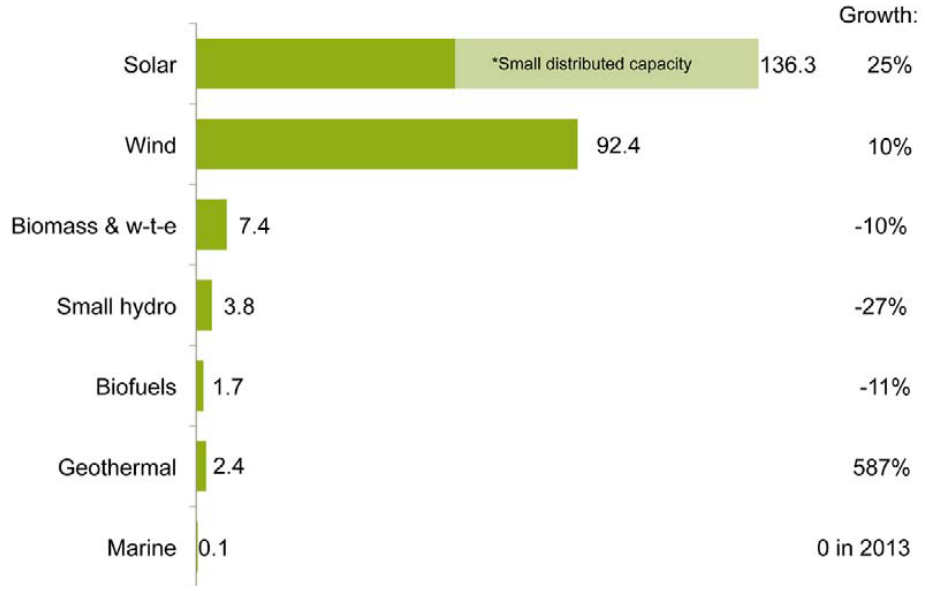
Figure 1-4 shows that asset finance of wind farms increased 10% to $92.4 billion while that for solar parks advanced 15% to $62.8 billion. The next largest sector was biomass and waste-to-power, with $7.4 billion, down 10% on the previous year. If you add together all capacity investment (both utility-scale and small projects), solar came out on top in 2014, with $136.3 billion, up 25% (see Figure 1-5).

Figure 1-4 Asset finance in Renewable Energy by Sector, 2014, $bn



Source: UNEP, Bloomberg New Energy Finance

Figure 1-5 Asset Finance Of Renewable Energy Assets And Small Distributed Capacity By Sector, 2014, And Growth On 2013, $Bn



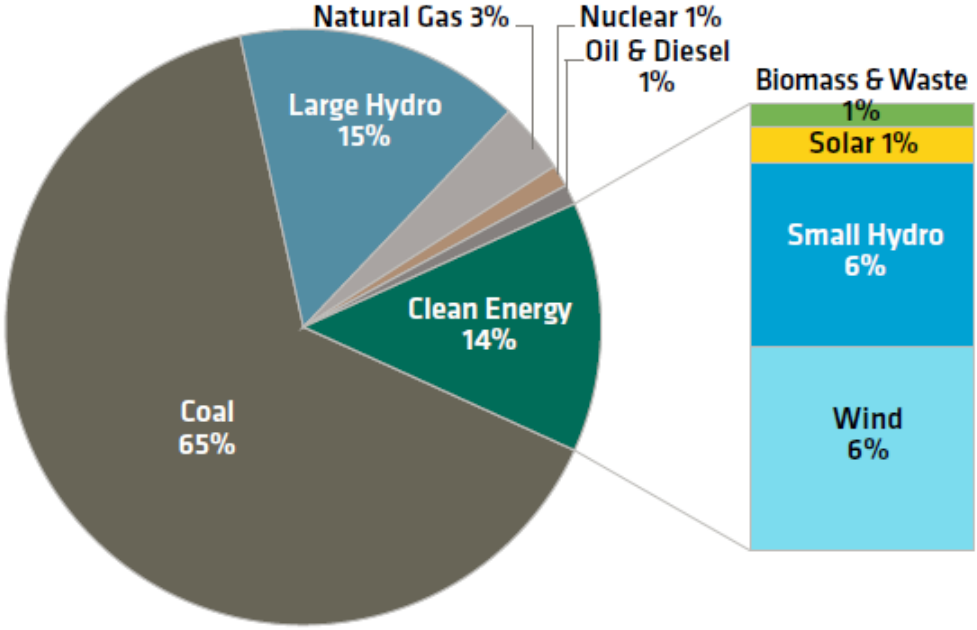
Source: UNEP, Bloomberg New Energy Finance

2. Overview of renewable energy investment in China

2.1 The overall renewable energy investment in China

China's power sector is highly regulated, and state-owned companies dominate, controlling 50% of generation and 100% of transmission, distribution, and retail. The government directly controls wholesale and retail prices. Electricity consumption has long increased at or above the rate overall real GDP growth, though these are now decoupling, with electricity demand growth forecast at 7.1% and GDP growth of 7.5%. China commissioned 103GW of power generation capacity in 2013, bringing its overall capacity to 1,247GW. Coal is the backbone of China's power fleet, but it is decreasing as a percentage of new capacity getting added, to 42% last year from 61% in the past four years. Hydro and nuclear continue to grow and wind and solar added 16.1GW and 12.9GW respectively in 2013 (in Figure 2-1).

Figure 2-1. Installed Power Capacity by Source in China, 2013(%)



Source: Bloomberg New Energy Finance , Lawrence Berkeley National Lab, National Energy Administration

China sees renewables as a source of energy security, not just of carbon emission reductions. Issued by China's State Council in September 2013, China's Action Plan for the Prevention and Control of Air Pollution illustrates government desire to increase the share of renewables in China's energy mix.[8] Unlike oil, coal and gas, the supplies of which are finite and subject to geopolitical tensions, renewable energy systems can be built and used wherever there is sufficient water, wind and sun.[7]

China became the world's largest wind energy market and then the world's largest solar PV market. In 2013, China led the world in renewable energy production, with a total capacity of 378 GW, mainly from hydroelectric and wind power. As of 2014, China leads the world in the production and use of wind power, solar photovoltaic power and smart grid technologies,

generating almost as much water, wind and solar energy as all of France and Germany's power plants combined. China's renewable energy sector is growing faster than its fossil fuels and nuclear power capacity. Since 2005, production of solar cells in China has expanded 100-fold. As Chinese renewable manufacturing has grown, the costs of renewable energy technologies have dropped dramatically. Innovation has helped, but the main driver of reduced costs has been market expansion[7].

Renewable investment in China raced up from just $3 billion in 2004 to $83.3 billion in 2014 (see Table X), helped by supportive government policies aimed at boosting power generation in the country, at providing demand for domestic wind and solar manufacturing industries, and – especially recently – at offering an alternative to pollution-inducing fossil fuel generation.

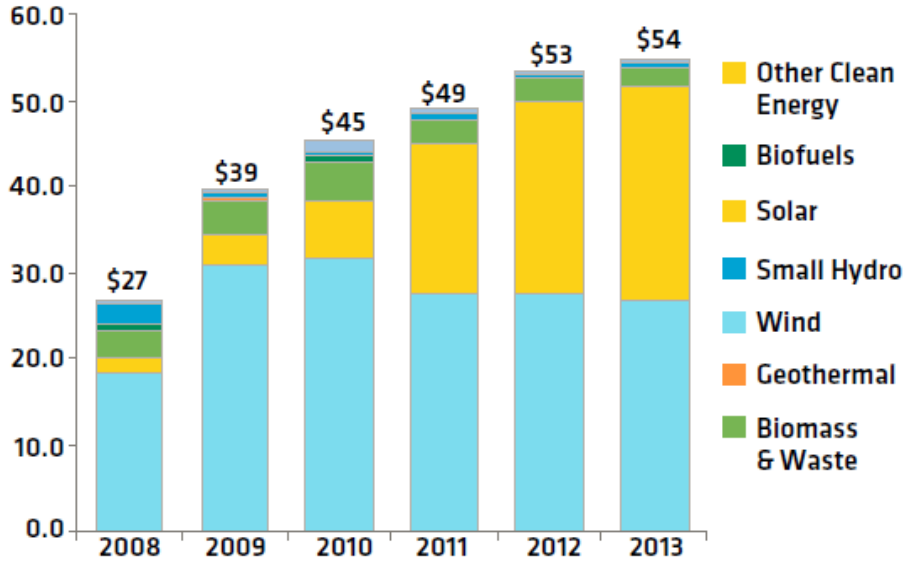
Among the renewable energy investment, Wind and Solar have the biggest share in recent years.

Table 2-1. Renewable Energy investment in China :2004-2014

year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Unit	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn
RE investment	3	8.2	11.1	16.6	25.7	39.5	38.7	49.1	62.8	62.6	83.3

Source: Source: UNEP, Bloomberg New Energy Finance

Figure 2-2. Annual Investment in Renewable Energy in China 2008-2013 ($bn)



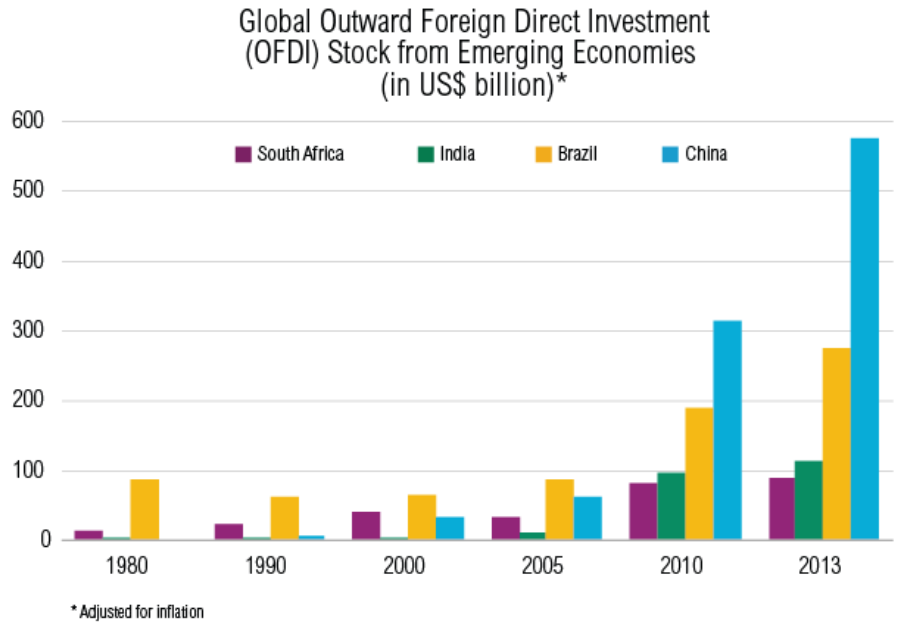
Source: Bloomberg New Energy Finance
Notes: Total investments includes: Asset Finance, Corporate Finance and Venture Capital/ Private Equity Commitments.

2.2 China's oversea renewable energy investment

2.2.1 China's oversea investment

Between 2004 and 2013, China's overseas investments increased 13.7 times, from $45 billion to $613 billion. Formerly the recipients of overseas investments, emerging economies like China, India and Brazil are now playing an increasingly important role as investors. In 2014, China's overseas investments, known as outward foreign direct investments (OFDI), rose 14.1 percent to $102.9 billion, while China's inward OFDI only rose 1.7 percent to $119.6 billion (Figure 2-3). At this rate, China's outbound investments will overtake inward OFDI within the next two years.

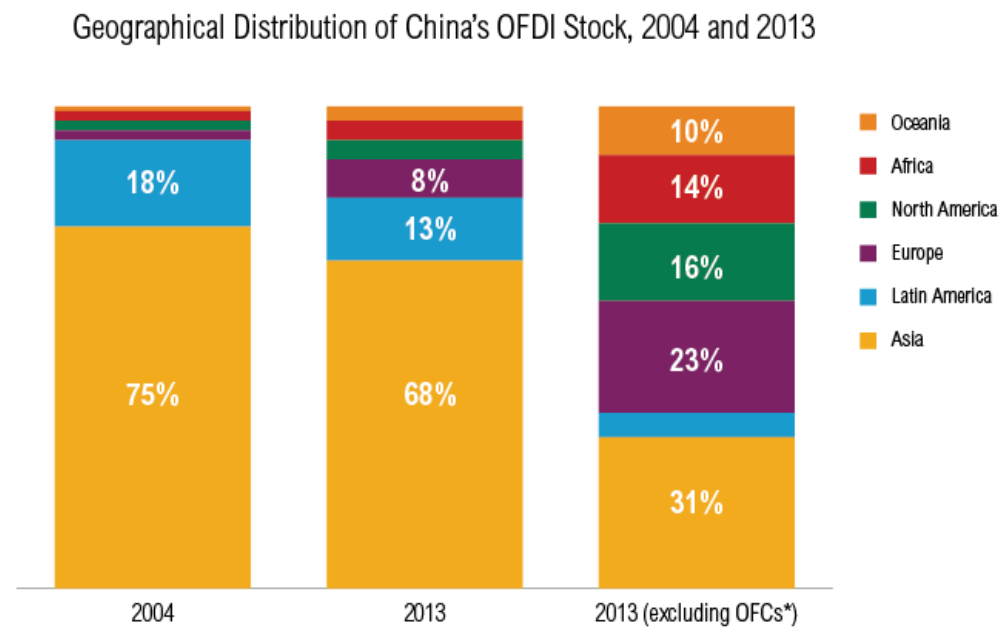
Figure 2-3. Global Outward Foreign Direct Investment from Emerging Economies



Source: http://bit.ly/1Jvef5J

Despite the reported concentration of Chinese investments within Asia, official Chinese OFDI statistics may not fully reflect the final destinations of China's OFDI. Like companies from many countries, some Chinese companies initially invest in tax havens or offshore financial centers (OFC) where there is minimal or no tax, such as Hong Kong or the Cayman Islands. Then, these companies reinvest this same money in other destinations, such as Africa and Latin America, through their subsidiaries in these offshore financial centers. Official Chinese OFDI only indicates the initial destination of investments. The graphic below illustrates China's OFDI stock in each region, and also extracts potential flows to OFCs(Figure 2-4).

Figure 2-4. Geographical Distribution of China's ODFI Stock, 2004 and 2013



Source: http://bit.ly/1Jvef5J

2.2.2 China's OFDI in Africa

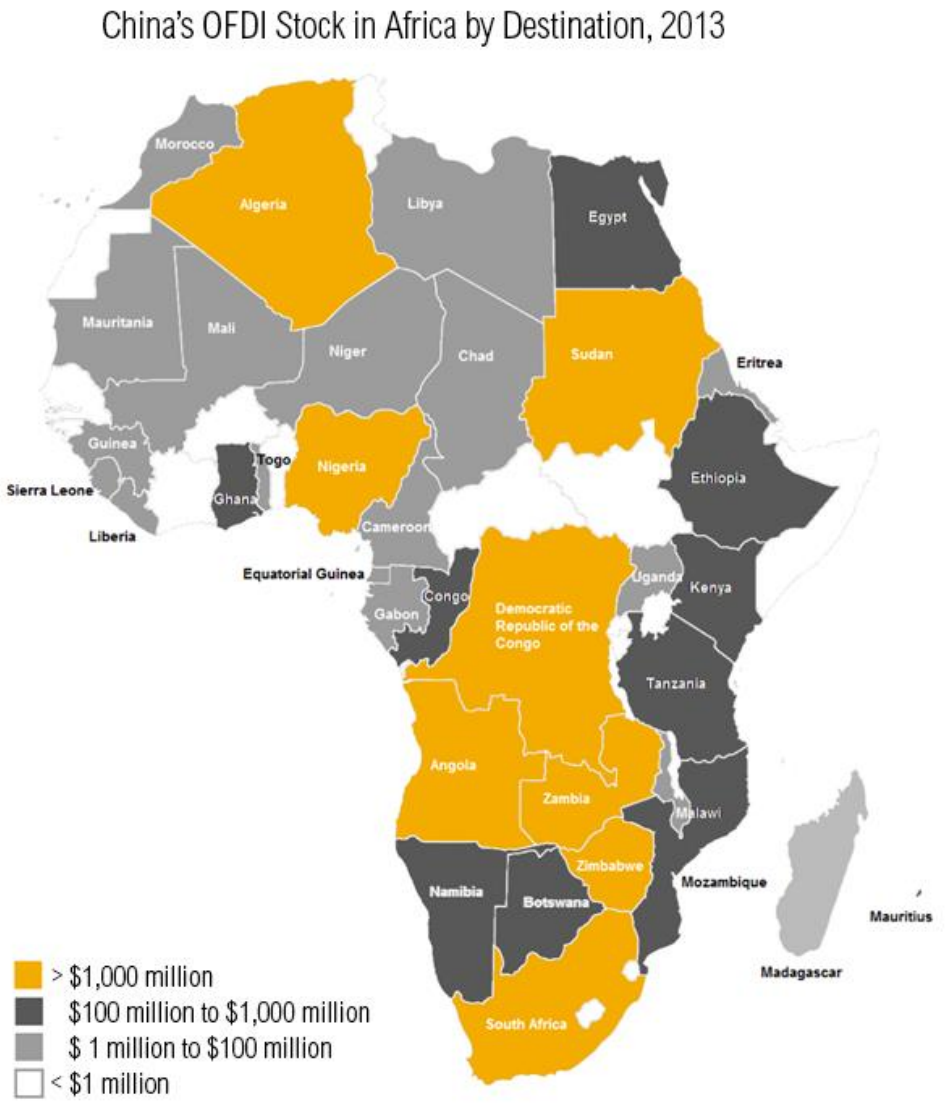
China's OFDI in Africa is accelerating rapidly, increasing from $1 billion in 2004 to $24.5 billion in 2013 (in Figure 2-5).

Figure 2-5. China's OFDI in Africa

Source: http://bit.ly/1Jvef5J

By the end of 2013, 4 percent of China's OFDI stock, or $26.2 billion, was in Africa. By 2013, the top eight recipients accounted for 61 percent of China's OFDI stock in Africa, with South Africa alone receiving 22 percent of China's OFDI in Africa (Figure 2-6).

Figure 2-6. China's OFDI in Africa by Destination in 2013



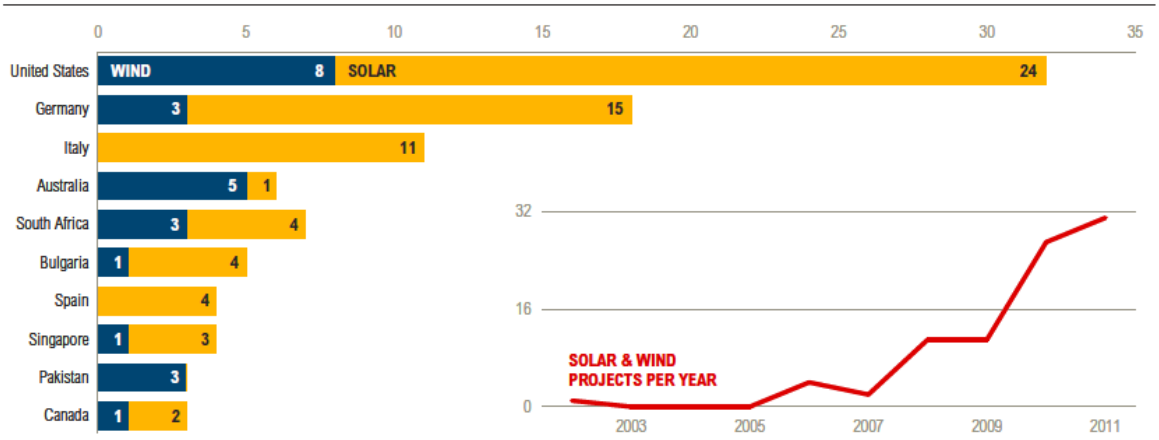
Source: http://bit.ly/1Jvef5J

2.2.3 China's OFDI in renewable energy

Over the past several years, China has become a leading investor in global renewable energy infrastructure. China was one of the few countries to increase its overseas investments through the global financial crisis in 2008 (UNCTAD 2012). China has become a major source of investment for the renewable energy sector globally and is increasingly a major renewable energy investor overseas, including in other developing countries.

Take Wind and Solar industries as examples. The number of investments rose steadily since 2005 (see inset in Figure X). Based on available data, roughly US$10 billion was invested in 16 wind projects and US$27.5 billion in 38 solar investments. The total capacity installed (for which data were available) was larger for wind (6,000 MW- 4,700 MW in 26 investments) than for solar (1,336MW in 27 investments)(Figure 2-7).

Figure 2-7. Number of China's Overseas Investments in Solar and Wind Industries in the Top 10 Destination Countries, 2002-12



Source: China's Oversea Investments in the wind and Solar Industries: Trend and Drives, (2012). WRI.

Of the 43 investments in the wind industry, 90 percent were undertaken to perform three functions: electricity generation; manufacturing; and sales, marketing, and support (see Figure2-8). As in the wind industry, 86 percent of China's investments in the solar industry were made in companies performing three functions: electricity generation; sales, marketing, and support; and manufacturing (see Figure 2-9).

Figure 2-8. Percentage of China's oversea Wind Investments by Function

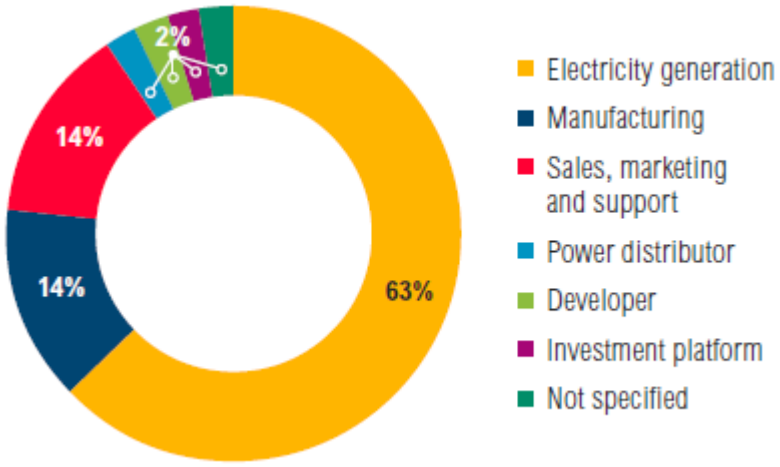
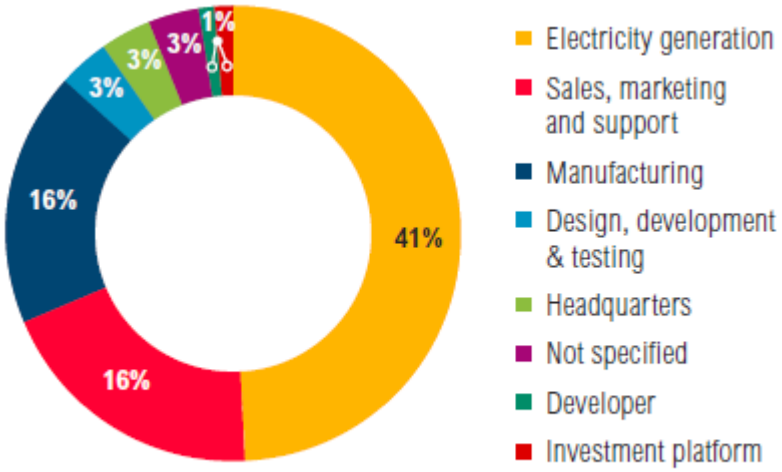


Figure 2-9. Percentage of China's oversea Solar Investments by Function



Drivers of China's OFDI in renewable energy industries

Several factors have contributed to China's increased overseas investments in renewable energy industries. "Broad drivers" include that favorable macroeconomic conditions and government policies encouraging greater foreign direct investment are broad drivers of increased overseas investments. Drivers specific to the wind and solar industries include industry conditions and policy incentives that "push" Chinese companies to invest overseas, enabling financial support from Chinese banks, and attractive host country policy and market conditions that "pull" Chinese companies to these destinations. The specific drivers are not relevant in every investment, and each of them influences investments in varying degrees.

2.3 Financing Source of China's Renewable Energy Investment

China's Renewable energy investment grew fast, owe a lot to China's well-evolved financial sector, so projects are funded by project equity, domestic debt, corporate balance sheets and credit extended to its state-owned enterprises. China's largest projects financed in 2013 were wind and solar projects financed by the corporate balance sheets of their builders. In addition, China Development Bank extended more than $150m in credit to two solar manufacturers, after extending many billions of dollars in credit in earlier years.

According to financing source of China's renewable energy investment in 2012 and 2013 (Table 2-2), financing from bank and internal financing is important in China.

Table 2-2. Financing Source of China's Renewable Energy

	2012		2013	
Source	￥bn	%	￥bn	%
Government	31.05	5.2%	11.5	1.9%
Internal Financing	122.68	20.5%	115.8	19.2%
Bank	339.7	56.6%	343.1	56.8%
Public market(equity and Debt)	12.69	2.1%	0	0.0%
VC/PE	0.06	0.0%	0	0.0%

Stake holders financing	86.71	14.5%	126.3	20.9%
CDM	68.2	1.1%	75	1.2%
Other	31.04	5.2%	11.5	1.9%
Total	599.7	100.0%	604.3	100.0%

Source: Annual Review of Low-Carbon Development in China 2015

Direct government support

During the past five years, Chinese governments – at both central and provincial level – have undertaken significant efforts to support and incentivize renewable energy development and energy efficiency improvement. A significant amount of public funding has been utilized to support a series of implementation and demonstration programs such as the *Ten Key Projects* for the use of more energy efficient technologies, the *Top-1000 Program* targeting the largest industrial energy users, the phase-out of outdated industrial capacity, various environmental protection measures, the *Golden Sun Photovoltaic Demonstration Project*, the *Green Energy County Demonstration Project*, as well as low-carbon city and small town demonstration programs.

Financing through public equity markets

The total amount of clean energy financing through China's public equity markets between 2006 and 2010 was around 62 billion yuan (US$9.9 billion). China set a record in 2010 in raising funds to finance clean energy development through its stock markets with the number of Initial Public Offerings (IPOs) reaching 32. Investment through the country's stock markets in 2010 was 1.67 times the amount raised in the four years combined from 2006 to 2009. China's public equity market investments accounted for 35% of world's combined clean energy stocks in 2010.50,51 This share, however, does not included the funds that Chinese clean technology companies raised from public offerings outside of China.

Even though funding through the stock market has been relatively small in China's total share of green investments, the public equity market has played an important role in helping curb the country's growing environmental problems. The most notable example is the China's "Green Security" policy that has made it harder for *liang gao* industries to raise capital from the public equity market. Since the implementation of the policy in February 2008, 20 out of 38 companies who did not pass the government's review of energy and environmental compliances had their IPOs rejected or delayed subject to further review by China's environmental regulators.

Venture capital and private equity investments

Venture capital and private equity have played a smaller role in financing clean energy development in China. The total amount of investments under this category was merely 33 billion yuan (US$5.3 billion) during the 11th FYP period.50 Investment through venture capital and private equity accounted only for 2.2% of China's total clean energy investment of $51.1 billion in 2010. Despite the small share of 14 venture capital and private equity investments in the total green energy investments in China, investments through this private source made up about 13 percent of the world's total venture capital and private equity investments in clean energy in 2010.

Carbon financing

Carbon financing such as the Clean Development Mechanism (CDM) has played a positive role in directing China's investment to green development. The interaction between the CDM and

renewable energy development is an indication of this. Despite questions about the additionality of a number of renewable energy projects, CDM has in fact become a tool for fulfilling the country's policy, particularly in the wind sector, where the capacity of all CDM projects in the pipeline was twice the 5GW target.

3. The status of renewable energy investment in Ghana

3.1 Overview of renewable energy investment in Ghana

Ghana's power sector is unbundled but remains predominantly state-owned. There is a growing number of independent power producers, yet over 75% of generation assets belong to the government-owned Volta River Authority. The transmission and distribution companies, while legally separate entities, are also owned by the government.

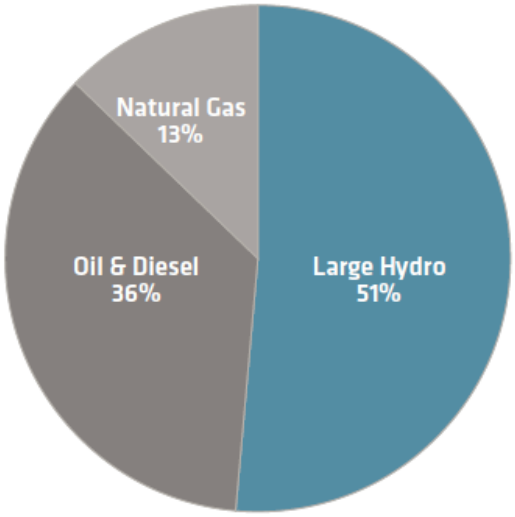
Table 3-1: National Overview Statistics of Ghana

Index	**Unit**	
Population(July 2014 est.)	thousand people	25,758
Population Density(July 2014 est.)	people/km2	113.2
Population Growth Rate (2014 est.)	%	2.19
Urban Population (2011)	%	51.9
Annual Rate of Urbanisation (2010–15 est.)	%	3.5
GDP (2013 est.)	USD billlion PPP	90.41
GDP per Capita (2013 est.)	USD/PPP	3,500
Human Development Index 2014	ranking	138

Source: REN 21, ECOWAS RENEWABLE ENERGY AND ENERGY EFFICIENCY STATUS REPORT, 2014

The country has almost no on-grid clean power generating capacity other than large hydro, which comprises more than half of national installed capacity. The rest is made up of fossil fuel plants, apart from one small utility-scale PV project.

Figure 3-1. Installed Power Capacity by Source in Ghana, 2013(%)



Source: Bloomberg New Energy Finance, Ghana Energy Commission

This Accra mix may change as a feed-in tariff (FiT) took effect in Q3 2013, though the several renewable energy projects under development face high local currency risk. The FiT was one of four policies of the Renewable Energy Act of 2011. The four key policies is listed in the following table.

Table 3-2: The key policies in Ghana

Feed-in Tariff	A 10-year fixed tariff for wind, solar, hydro,biogas projects took effect in 2013.
Energy Target	The energy ministry set a notional target of 500MW ofinstalled renewable energy – roughly 10% of the energy mix – by 2020.
Tax Incentives	Investors are eligible for accelerated depreciation and import duty exemptions.
Utility Regulation	The Renewable Energy Act of 2011 includes a purchase obligation, alongside a new renewable energy fund and a biofuel blending mandate, which as of Q4 2014 had yet to be implemented.

Renewable energy projects are gaining the attention of government planners and project developers in Ghana in recent years. The Africa-EU Energy Partnership estimates that, Ghana has projected cumulative project development (including large hydro) exceeding 1 gigawatt (1.1 GW).

Table 3-3. Renewable Energy Projects in the Pipeline in Ghana

Category	Installed Capacity (MW)
Small Hydro(< 30 MW)	30.3
Wind	57
Solar	162.9
Hydro	837
Biomass	22
Total	1109.2

Source: Africa-EU Energy Partnership Status Report

The international renewable energy market is becoming an increasingly attractive sector for a host of public and private investors. Overall, consolidated, reliable data on investments in the renewable energy sector is not available for Ghana. However, analysis by Bloomberg New Energy Finance of Ghana indicates a variable flow of investment into the nation (See Table X.). Within Ghana, investments in new renewable energy totalled USD 29.7 million in 2013.

Table 3-4. Renewable Energy Investment in Ghana (million USD)

	2008	2009	2010	2011	2012	2013
Renewable Energy Investment	0	0	0	0	0	29.7

Source: Bloomberg New Energy Finance

3.2 Barriers to RE Investment in Developing Countries like Ghana

3.2.1 Economic Barriers

Local deal flow and value chain

Another preclusion to private sector engagement is the lack of sufficient deal flow. There is not always an unwillingness to provide capital for RE projects in the developing world like Ghana. Instead, there is often a shortage of sufficiently commercially attractive, easily executable deals in which to deploy capital. Moreover, there is often too little focus on developing a national supply chain that supports local employment and manufacturing (e.g. through local R&D, business and project development assistance).

Reticence of the commercial banking sector

Developing countries are characterised by greater real or perceived market risk due to less stable macroeconomic conditions. The perception of higher risk by financial institutions leads to higher borrowing costs in these countries. The general reluctance of investors in developing countries is compounded by a lack of understanding of RE investments and public finance mechanisms to assume risk and permit commercial banks to invest in RE projects that have unique risks and high up-front liquidity needs compared to traditional investments.

Lack of equity

Lending to project developers in developing and emerging markets typically requires a higher proportion of equity relative to debt than would be the case for similar projects in mature markets. Requirements for equity co-finance in developing countries are typically around 40%. At the same time, developing countries are also characterised by less availability of angel and venture capital (business finance) for start-up of small and medium enterprises.

Currency risk

Developing countries face higher foreign exchange risks when sourcing international funds. Currency risk results from exchange rate fluctuations, which restrict private sector engagement because assets with stable and predictable returns in their local currency are much more volatile when converted to the currency of the investor, and this significantly increases the investment risk. Although financial instruments to hedge this risk are already available for commonly traded currencies, the private sector appears unwilling to provide the same instruments for currencies

traded less frequently.

Currency risk is therefore a greater problem for developing countries that do not use the major currencies. Even for those that do, however, hedging becomes prohibitively expensive as the tenor increases. Given that RE requires 12-15 year funding, hedging in any currency combination is difficult to do.

Lack of access to loans with tenor longer than 5-6 years

Long-term loans are required to finance RE infrastructure projects that often have a payback period of longer than seven years, but debt financing in emerging and developing countries is in many cases not available for more than 5-6 years. This is because debt providers are hesitant or unable to provide long-term loans when country conditions are unstable or financial conditions are constrained. Raising longer-term debt to cover the duration of RE projects in these countries can therefore be extremely difficult.

3.2.2 Technical and Non-financial Barriers

Infrastructure challenges

Infrastructure challenges present a major concern for energy project development. They are particularly acute for RE deployment, often increasing the risk associated with renewable investments and, in extreme cases, preventing a prospective project from being taken forward. Key examples of infrastructure challenges include system constraints, lack of grid access, high grid connection costs, limited grid capacity and coverage, lack of technical standards and certification, and lack of operation and maintenance facilities.

Limitations in knowledge and capacity

In developing countries, limitations in knowledge and capacity among relevant actors are a significant constraint on RE investment. This applies to project developers, financing authorities, and public administrators. Bankers often do not understand RE technologies and are unwilling to approve financing due to an inability to assess the risk of the project. Project developers require support in business and financial planning, technical expertise, or basic information to be able to apply for project funding. Public administrators often lack the capacity to streamline approval processes effectively. Where supportive RE sector laws have been passed, public administrators often lack the capacity to implement them, rendering them ineffective at facilitating investment.

4. Financial model/ Instruments for China-Ghana RETT

4.1 General Financial Instruments

A wide range of financing instruments can be applied in support of the scaling up of renewable energy technologies (RETs). These various instruments can in turn be distinguished by both the level of risk assumed by the public sector entity funding the instrument concerned, and by the level of leverage (the extent to which public funding mobilizes private finance) involved.

4.1.1 Grants

Capital grants fund part of the investment costs of an RET project, generally in an effort to reduce its ultimate financial cost to increase its competitiveness, or where off-takers are obliged to purchase its output to reduce ultimate customer prices (the use of grants as part of a results-based financing mechanism is discussed separately). Simple grants provide no control over the project itself and create no incentives on the project developer to deliver a viable project (unlike a loan, where the project needs to generate sufficient revenues for repayment), but they may be necessary as a means of reducing the costs of a project sufficiently to make it affordable. They also have the advantage of being relatively simple to implement and manage- the need for due diligence on the ability of the project to repay as well as for ongoing administration of loans is unnecessary.

This does not, of course, eliminate the need to ensure the project itself is well designed to meet the objectives that the provision of the grant is intended to further.

4.1.2 Venture Capital/ Private Equity

Equity funding from public sources to support RET scaling up can comprise long-term investments, as discussed above under capital grants, or venture capital financing, which represents equity investments intended to develop high risk projects followed by exit.

Venture capital financing is generally targeted at new technologies and companies with a high growth potential. Financiers look to make their returns by exiting the investment, typically through an initial public offering (IPO) on the stock market or sale to a larger company interested in acquiring the business's technology.

Funding of this type is high risk, and the returns required reflect this. It also requires sufficiently developed financial markets for the initial financiers to be able to readily exit their investment through a sale of their shareholding in what may still be a relatively small and risky business. Given these requirements, such funding is unlikely to be well suited to RET investments in low-income countries (LICs), unless these use particularly innovative technologies that may make them attractive to an international investor.

4.1.3 Debt

Debt, refers to loans advanced to RET projects. Asset-backed securities are discussed separately.

Senior Debt

Senior debt provided from public sources, whether in the form of a project loan or credit line, will take its place among the first creditors to be repaid from a project. It is primarily used to reduce the costs of the project, by providing concessionary funds that may be blended with more expensive commercial funding, and to offer longer-term debt than may be available in local financial markets. Long-term loans from public sources can also help establish credibility among private financiers for longer-term lending to RET projects. A wide variety of debt amortization and repayment schedules can be used, allowing tailoring of debt service costs to project cash flows.

Subordinated Debt (Mezzanine Finance)

Subordinated debt is considered to encompass all forms of mezzanine or quasi-equity finance,

of which there are many variants. The key features these share in common are that repayment is subordinate to providers of senior debt (hence the name), and that the financier does not obtain a shareholding and thus control of the project (although some forms of subordinated debt may be capable of conversion to shares or, as in the case of preferred shares, take the form of can also be used to extend the effective term of loans, thus helping project cash flows and viability.

4.1.4 Asset-Backed Securities

Asset-backed securities are bonds or similar instruments, which are backed by the cash flows generated by a RET project or projects (rather than being corporate bonds backed by the assets of a company as a whole). These cash flows form the security for repayment. The process of raising finance in this way, secured against future cash flows, is frequently termed securitization.

Asset-backed securities are generally used for refinancing projects that are generating positive cash flows, although they can also be issued in the form of project bonds ahead of construction. Such refinancing offers a potential way to free up public funds that have been committed for development and investment, thereby allowing these funds to be redeployed to support new projects.

As well as freeing up development funds, asset-backed securities allow the potential bundling of a number of RET projects by issuing bonds secured against the cash flows of multiple projects. By doing so, they can increase the financing capabilities of CFIs.

4.1.5 Guarantees And Insurance

Guarantees and insurance do not comprise direct financing as such. Instead, by offering protection to financiers against risks, they make it possible to mobilize commercial financing for the necessary terms and at acceptable costs.

Both guarantees and insurance represent an agreement by the guarantor or insurer to pay part of the costs or losses incurred by a RET project in the event of a specified event happening in return for the payment of a fee or premium. The difference lies in the commercial arrangements. A guarantee is a three-way relationship with the guarantor offering the guarantee to one entity (the financier) against the performance of another entity (that receiving the finance). Insurance is a two-way relationship between the insurer and the insured (typically the entity providing finance) without a need for the entity receiving the financing to be involved. The financier would expect to receive the proceeds of any insurance payout to provide them with the necessary protection against the performance of the financed entity.

By their nature, guarantees tend to be more one-off or bespoke in nature involving the guarantor in extensive due diligence and in the design of the project, while insurance tends to be better suited to more developed markets where insurers can offer standard products and can assess the risks involved based on extensive data.

4.2 Innovative Financial Instruments

4.2.1 Results-Based Financing

Payment against Outputs Results-based financing (RBF) links the payment of funds to the delivery of specific outputs. There are many variations of such funding and many names used by different members of the development community to reference these variations.

RBF is based on the concept of shifting from funding of inputs (such as a contribution to the capital costs of a project) to payment for outputs or results (such as the successful commissioning of the project) and, from this, the transfer of investment and operating risks from funders to implementing agencies. This concept of risk transfer is a critical element that needs to be captured in the design and is instrumental in a number of benefits derived from RBF.

A typical RBF approach involves a public entity providing a financial incentive, reward, subsidy, or grant conditional on the recipient undertaking a set of predetermined actions or achieving a predetermined performance or set of results. Funds are disbursed not against individual input expenditures or contracts on the input side, but against demonstrated and verified results that are largely within the control of the recipient. The recipient prefinances the activity based on the certainty that, as long as it delivers the pre-agreed service, it will receive payment. The credit worthiness of the funding entity and the track record of the recipient should allow the recipient to raise this prefinancing either internationally or locally. But where financial markets are significantly underdeveloped or project developers are small scale and have limited track records, this may not always be possible and RBF mechanisms may need to be combined with or supplemented by other financial instruments. There are several ways of structuring RBF mechanisms. These include the following:

Output-based aid (OBA). OBA specifically refers to delivering outputs for low-income consumers. For the energy sector, OBA is typically used to increase access to energy services by the poor, by helping cover the difference between the full cost of supply and the affordable price to poor households. OBA subsidies can either buy down the capital cost of investments or can cover the difference between an affordable user fee and a cost-recovery user fee, for example, a consumption subsidy. OBA can also be used to support more efficient delivery of services that exhibit positive externalities, by tying payments for contracted-out services to the achievement of specified service performance levels or outputs.

Output-based disbursement (OBD). OBD involves payment of a subsidy to a service provider or a contractor against delivery of improvements in the efficiency of service related assets, systems, or recurrent government activities. Unlike OBA, OBD is not targeted at low-income consumers per se.

RBF also includes a range of mechanisms that aim to create sustainable markets by guaranteeing service providers—for a limited period of time—a price on their delivery of a predefined output and/or a minimum number of units that they will be able to sell. This concept was known as Advanced Market Commitments, or AMCs, when it began in the health sector, but is now being applied more widely to the energy and other sectors. Feed-in tariffs, which guarantee the price for RET projects, can be considered a form of AMC.

Payment for Environment Service (PES). PESs are market like payment mechanisms where the

downstream beneficiaries of environment services (including reductions in carbon emissions) pay for the continued supply of these services by upstream providers. For instance, an entity such as a bottling company pays another party, such as a rural community, a fee to ensure the delivery of reliable and high-quality water supplies. The community would commit to sustainable land and water use activities to meet this requirement. PESs usually involve legal contracts and an administrator who helps design, negotiate, and monitor the agreement.

Contingent Project Development Grants

One specific form of RBF of particular application to larger RET projects is that of contingent project development grants. RET projects, particularly when the technologies are new and unfamiliar, face significant risks of delays and increased costs of project development due to technological problems and extended permitting and approvals procedures.

Public agencies can provide funding to help defray these costs. If the funding is provided as a loan, which then converts to a grant if the project is successfully implemented, then incentives are created for the developer to pursue rapid implementation of the project. But there are obvious concerns as to how the developer would repay a loan if the project didn't succeed, as well as doubts whether further incentives to reach implementation would be required. An alternative mechanism is actually the reverse, a contingent grant that transforms to a loan if the project is successful. This allows development activities to proceed without the developer taking on loans that they may default on if the project cannot be implemented for reasons outside their control, as well as providing a source of funds through loan repayments that can then be used for future project development grants.

4.2.2 Carbon Financing

Advance sales of CERs offer a way for project developers to manage the risks associated with the sales of CERs and, thereby, help mobilize funding. Such sales may be either made on the basis that the purchaser will be responsible for obtaining registration under the CDM (which will reduce the price offered) or that the developer will do so. Various commercial entities are already engaged in such purchases, and the World Bank also administers a number of trust funds for the purposes of purchasing CERs. The Carbon Partnership Facility under the World Bank will further enhance this capability as well be a mechanism for post-2012 funding by providing guaranteed commitments to purchase certified reductions in emissions on a standard basis rather than negotiating individually on a project-by-project basis, as is common at present.

A risk for any advance purchase of CERs, of course, is that the expected volumes of emissions reductions will not be forthcoming. To manage this, carbon delivery guarantees might be used, covering the losses resulting from actual emissions reductions being less than expected.

4.2.3 Small-Scale Project Financing

This category of financial instruments relates specifically to small-scale RET projects, in particular household and community-level systems for off-grid electrification. Such projects are generally developed by small suppliers and serve low-income communities with limited ability to

pay up front. Consequently, they face even greater problems than other RET projects in raising the necessary capital to make initial investments.

The instruments below are more specific to small-scale RET projects, but other instruments can obviously be used to support these as well. In particular, the use of RBF can be effectively combined with appropriate business models to create appropriate incentives for developers. One example of this is the linkage of payment of subsidies for SHS installations to the continued operation of those installations, under an OBA model. This creates incentives for suppliers to provide continued maintenance for these installations to be able to collect the full subsidy.

Micro financing

One mechanism that has been pursued is that of channeling funds through micro financing institutions (MFIs) to provide loans to households, either directly or via the equipment supplier, who can then use this to pay for at least part of the capital costs of RET systems. The need to collect repayments also provides an incentive for the supplier to maintain and ensure the continuing operation of the systems post installation. MFIs are characterized by their focus on lending to households and small businesses- generally for productive investments (such as cottage industries) or to support agricultural activities (such as the purchase of fertilizers ahead of harvests). Most MFIs have a relatively narrow focus in geographical, product, and sector terms (the well-known Grameen Bank in Bangladesh is somewhat of an exception). Loans are typically made at relatively high interest rates and for short periods, to be repaid from the additional revenues generated by the investment or from the future sale of crops. Longer-term lending for appliances where repayment depends on household incomes, as is the case for the purchase of SHSs, is therefore a change in business model for many MFIs. In Bangladesh RBF has been used in combination with microfinance activity to refinance MFIs after they have been verified to have carried out appropriate installations, thus freeing MFI funds for further lending.

Portfolio Guarantees and Loss Reserves

Obviously there are high risks of default in lending to poor rural households for the purchase of electrical systems that do not (directly) increase household incomes. One mechanism for managing this risk is the use of guarantees. As projects of this kind typically involve large numbers of similar individual loans, portfolio guarantees or loss reserves are appropriate instruments rather than individual guarantees that might characterize larger RET projects. Portfolio guarantees cover a proportion of the losses on the package of loans (or projects) as a whole. A “first loss” guarantee would cover part of the first tranche of losses—for example, 80 percent of losses up to a value of 10 percent of the portfolio as a whole. A “second loss” guarantee would cover a second tranche of losses—for example, 80 percent of losses between 10 and 30 percent of the portfolio. First loss guarantees provide greater protection to the financier. Second loss guarantees protect against extreme events while also providing strong incentives for the supplier to minimize losses as it bears the first tranche of these.

A risk in any such arrangement is that the guarantor has limited control over the loansor projects added to the portfolio. Although standard criteria might be defined, it is very difficult to ensure these are followed in all cases.

Again, the recent experience with collateralized debt obligations written against household mortgages in the United States shows the high levels of risk inherent in relying on entities with incentives to maximize the volume of loans covered by such guarantees to determine which loans to include in their coverage.

Loss reserves operate in a similar manner, except in this case the actual sums required to cover the guarantee are set aside rather than simply being a promise to pay if the guarantee is called. Consequently, they provide greater certainty that funds will be available to meet the guarantor's obligations. They also allow for the use of a guarantee without an actual guarantor— the necessary loss reserves can simply be paid into a special account for this purposeat the project's start.

Aggregation

A major barrier to lending to small-scale projects is that of associated transaction costs. These will rule out many RET projects from the commercial financing market, even if they are otherwise attractive. Aggregation of projects is one way to overcome this barrier. Various forms of aggregation can be used. One approach is to adopt standard project specifications and agreements so that each individual project can be rapidly appraised at low cost. For example, Sri Lanka and Vietnam have both adopted standard power purchase agreements and tariffs for small hydro projects, avoiding the need for these to be reviewed for each new project.

Another is to establish a dedicated financing intermediary that, because of the large volumes of similar transactions it deals with, can realize economies of scale in their appraisal. Such an intermediary could be a public entity or could be a CFI through which loans for RET projects are channeled. The role of intermediaries is discussed below.

4.2.4 PPP

Public-private partnerships (PPPs) are a mechanism for government to procure and implement public infrastructrure and/ or services using the resources and expertise of the private sector. Where governments are facing ageing or lack of infrastructure and require more efficient services, a partnership with the private sector can help foster new solutions and bring finance.

PPPs combine the skills and resources of both the public and private sectors through sharing of risks and responsibilities. This enables governments to benefit from the expertise of the private sector, and allows them to focus instead on policy, planning and regulation by delegating day-to-day operations. In order to achieve a successful PPP, a careful analysis of the long-term development objectives and risk allocation is essential. The legal and institutional framework in the country also needs to support this new model of service delivery and provide effective governance and monitoring mechanisms for PPPs. A well-drafted PPP agreement for the project should clearly allocate risks and responsibilities.

There are many cases for RE project financed by PPP model.

5. Key potential investors for China-Ghana RETT

The international renewable energy market is becoming an increasingly attractive sector for a host of public and private investors. The public sector has also played an important role in funding renewable energy development, with national governments, international development partners, and multilateral development banks having all allocated funds to energy sector development in Africa. As demonstrated, Ghana governments are already supporting the renewable energy sector by providing financial incentives and/or public financing to project development. Globally, private finance plays an important role in renewable energy development. Within ECOWAS, incentivizing private participation in the sector has been one of the key priorities for policymakers.
For China-Ghana RETT, we listed key potential investors in the following part.

5.1 Financial institution with government policy background

Starting in 2010, two Chinese state-owned banks (China Development Bank (CDB) and the Export-Import Bank of China (China Exim)) lent more money annually to other developing countries than the World Bank. In 2014, China spearheaded the BRICS Development Bank, the Asia Infrastructure Investment Bank (AIIB) and the Silk Road Fund, symbolizing China's growing influence in development finance. Among them, China Development Bank is likely to play an important role in China-Ghana RETT Financing.

5.1.1 China Development Bank

China Development Bank is a major development financial institution of China. It is at the center of Chinese infrastructural development and has financed high-speed railways, roads, power grids and large-scale projects such as the three Gorges Dam. CDB is also the largest development bank in the world and, by financing Chinese investment overseas, a key player in China's 'going out' policy.
The going out strategy has brought the CDB and its combined commercial and policy operational strategy to the international stage. CDB has significantly expanded its overseas portfolio in the last few years and entered into partnerships with governments and companies from over 140 countries; it has become China's biggest lender, financing cross-border transactions with a total foreign currency loan balance of USD 200 billion outstanding. The following section outlines and discusses the financing mechanisms used by the Bank in this context.

Loans to Chinese companies

CDB provides lines of credit to Chinese state-owned enterprises and private companies as they expand abroad, raising concerns among western governments. CDB has directed its support not only to solar panel manufacturers but also to project developers. In autumn 2012, CDB extended USD 1.6 billion in credit lines to Sky Solar Holdings, a PhotoVoltaic power developer based in Shanghai. This decision indirectly helped the

manufacturers, who witnessed the dropping price of solar panels in the last few years, by creating demand for their product.

Loans to foreign energy companies and government entities

In recent years CDB has extended lines of credit to foreign energy companies and government entities of countries such as Brazil, Ecuador, Russia, Turkmenistan and Venezuela. The loans are secured by revenue from the oil sold to Chinese national oil companies. They are characterized by their large size - up to USD 20.6 billion - and long term - up to twenty years.

Equity funds

Another way CDB finances overseas expansion is via equity funds. In the last few years, CDB has invested in strategic Sino-foreign funds, such as the China-Africa Development Fund, the Sino-Belgian Fund, the China-Italy Mandarin Fund, the ASEAN China Investment Fund L.P and Infinity Group (in partnership with Israel's biggest conglomerate IDB Group). In line with its commercial transformation plan, CDB established a subsidiary - CDB Capital - to operate its private equity investment activities. CDB Capital's total assets under management in 2010 exceeded RMB 50 billion (USD 5.1 billion). It is the only Chinese bank-subsidiary licensed to invest in renminbi and played a pioneering role in developing China's equity market.25 Its investment areas include urban development, fund investment, direct equity investment and overseas investment.

5.1.2 The China-Africa Development Fund

The China-Africa Development Fund (CAD fund) is China's largest private equity fund focusing on African investments and stimulating and facilitating Chinese investments in Africa. In 2007, CDB made an initial investment of USD 1 billion into the fund and it aims to raise USD 5 billion. The CAD fund provides financial advice and invests in infrastructure, manufacturing, energy and agriculture projects. Furthermore, in 2010, CDB, together with the Suzhou Ventures Group, set up Guochuang, China's biggest Fund of Funds, in order to invest in industrial and venture capital projects. In 2011, it launched an overseas investment platform in Hong Kong and signed strategic agreements with global private equity funds KKR, Permira and TPG.

The fund's primary purpose is foster Sino-African investment through bridging finance, financial advice, Africa specific managerial advice, and identification of potential investment opportunities as well as connecting African projects to Chinese investors.

As of 2010 the fund had invested in 30 projects in Africa worth around US$800 million. In 2009 alone, the fund invested US$140 million of China's total US$1.3 billion invested in Africa that year. The fund is focused on industrial development and the acquisition of stakes in mining interests such as its joint purchase with China Guangdong Nuclear Power Group for Rio Tinto's 11.1% share in Kalahari Minerals valued at US$996 million in February 2012.The fund in 2010 teamed up with several partners by contributing 382.5 million ZAR into a 1.65 billion ZAR investment by Jidong Cement to build a cement plant in Limpopo, South Africa.

CAD has office in Ghana, and has shown the interests in participating the China-Ghana RETT Financing.

5.2 International (Regional) Development financial institution

In addition to government support, renewable energy has become a key component of the lending activity of international and regional development banks.

5.2.1 African development bank (AfDB)

The African Development Bank Group (AfDB) is a multilateral development finance institution established to contribute to the economic development and social progress of African countries. The AfDB was founded in 1964 and comprises three entities: The African Development Bank, the African Development Fund and the Nigeria Trust Fund. The AfDB's mission is to fight poverty and improve living conditions on the continent through promoting the investment of public and private capital in projects and programs that are likely to contribute to the economic and social development of the region. The AfDB is a financial provider to African governments and private companies investing in the regional member countries (RMC). While it was originally headquartered in Abidjan, Côte d'Ivoire, the bank's headquarters moved to Tunis, Tunisia in 2003, due to the Ivorian civil war; before returning in September 2014.

The African development bank (AfDB), has a large energy sector portfolio and is increasingly active in West Africa. Regionally, West Africa received USD 1.54 billion (Unit of Account (UA) 991 million), or 27.8 % of total loans and grants approved by the AfDB in 2013, of which infrastructure investments—including energy, water and sanitation, and transportation—accounted for nearly USD 500 million, or 31.9 percent.13 Overall, energy accounted for 16% of the bank's loan and grant activity over the same period. Ghana is also eligible for the AfDB's African Development Fund (ADF) concessionary window.

Other multinational lending institutions, such as **the World Bank** and the **European Investment Bank**, have made the development of Africa's sustainable energy sector an important priority.

5.2.2 Specialized funds for the development of renewable energy

Specialized funds for the development of renewable energy are playing an increasingly important role in supporting project development and catalysing financing in the region.

The Sustainable Energy Fund for Africa (SEFA), a multi-donor facility hosted by AfDB, provides preparation grants and equity to bring small and medium-scale renewable energy generation and energy efficiency projects to bankability.

SEFA was instrumental in the incubation and co-sponsorship of the **African Renewable Energy Fund (AREF)**, a private equity fund with USD 100 million secured in March 2014 to support the development and construction of 5–50 MW grid-connected solar, small hydro, wind, geothermal, biomass, and waste gas projects across sub-Saharan Africa. The fund is managed by Berkeley Energy Africa with capital contributions from numerous actors, including the AfDB and SEFA, the GEF, the ECOWAS Bank for Investment and Development (IBID), The Bank for West African Development (BOAD), the Netherland Development Bank (FMO) and the African Biofuel and Renewable Energy Company (ABREC). The fund is expected to reach a second close

at USD 200 million in 2014 with additional contributions coming from commercial and institutional investors. The U.S. led Power Africa Initiative has pledged USD 7 billion to energy sector development in six African nations, including Ghana, Liberia, and Nigeria. The programme aims to add 10,000 MW of clean energy capacity across the region.

ECREEE (ECOWAS Centre for Renewable Energy and Energy Efficiency) has also taken a leading role in supporting project development by creating the Renewable Energy Investment Initiative (EREI) and the EREF. The EREF, created in 2011, offers grant funding for small- to medium-sized renewable energy and energy efficiency projects in rural and peri-urban areas of the region. The programme's first funding window provided approximately EUR 1 million to 41 projects distributed across all 15 Member States. The second funding window under the EREF was opened for the submission of new proposals in summer 2014. The EREI has been established to attract investments to medium- and large-scale renewable energy projects in the region.

5.2.3 Climate finance agency

Global Environment Facility

The west Africa region already has significant experience in attracting financing from climate finance sources. Among the most successful to date has been the Global Environment Facility (GEF).

The Global Environment Facility (GEF) unites 183 countries in partnership with international institutions, civil society organizations (CSOs), and the private sector to address global environmental issues while supporting national sustainable development initiatives. Today the GEF is the largest public funder of projects to improve the global environment. An independently operating financial organization, the GEF provides grants for projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants.

Since 1991, the GEF has achieved a strong track record with developing countries and countries with economies in transition, providing $12.5 billion in grants and leveraging $58 billion in co-financing for over 3,690 projects in over 165 countries. Through its Small Grants Programme (SGP), the GEF has also made more than 20,000 small grants directly to civil society and community-based organizations, totaling $653.2 million.

The GEF also serves as financial mechanism for the following conventions:

- ✓ Convention on Biological Diversity (CBD)
- ✓ United Nations Framework Convention on Climate Change (UNFCCC)
- ✓ UN Convention to Combat Desertification (UNCCD)
- ✓ Stockholm Convention on Persistent Organic Pollutants (POPs)
- ✓ Minamata Convention on Mercury

Operating under the GEF-Strategic Programme for West Africa (GEF-SPWA), the GEF has financed country-specific sustainable energy projects in 12 ECOWAS Member States(including Ghana) along with regional projects. Financing has gone to support renewable energy and energy efficiency projects as well as to develop an enabling environment for scaling up the sustainable energy sector. As of April 2014, nearly USD 100 million had been approved or disbursed through the GEF to support projects in the region. The GEF Small Grants Programme has also been very active in supporting small-scale project development throughout the region. This can be a key

funding mechanism for rural renewable energy projects. The programme provides grants of up to USD 50,000 directly to local communities for financing smalls cale projects under its target areas.

5.3 Project developer

China's leading renewable energy manufacturers and developer globally are also their leading overseas investors and project developers. These company are also the key potential investors for China-Ghana RETT. Taking Wind and Solar industries as examples.

Previously strong government support to Chinese wind turbine manufacturers enabled companies to grow rapidly, resulting in several turbine-producing giants, four of which are ranked among top 10 suppliers globally in 2010 (Sinovel, Goldwind, Dongfang Turbine, United Power). There also four company are ranked among top 10 developer globally. China was also the largest wind turbine consumer in the world in 2010, larger than the next nine largest consumers combined. However, as supply has outstripped demand, there has been a glut in the domestic market, resulting in lower domestic prices caused by fierce competition.Coupled with curtailed installed wind power, a stricter government policy on approving and building new wind farms, and diminishing funding due to the global financial crisis, these companies have been pressured to seek markets and revenues overseas.

In contrast to the wind sector, the Chinese solar industry has always been internationally oriented and suppliers compete globally. The industry relies mainly on exports to the German, Italian, Spanish, U.S., Czech and other emerging markets. Chinese companies have developed manufacturing, sales, and service capacity in these countries to support their exports. Along the solar value chain, competitive Chinese solar companies have started providing engineering, procurement and construction (EPC) services and developing solar PV plants. Antidumping measures have resulted in the United States imposing 35 to 200 percent tariffs on solar-cell imports from China, and Europe plans similar measures to protect its domestic manufacturers (Chaffin 2012). These tariffs have prompted China to stimulate its domestic demand to offset these impacts (see Table 4). As the domestic market grows, shifting manufacturing overseas might be a short term measure to continue to service its existing markets and retain its market share, but this trend is not yet evident.

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