

Financing the global low-carbon energy transition: China's dual role domestically and overseas

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Context

Climate change mitigation and adaptation have become key priorities of governments around the globe. Yet, there is growing criticism that current climate pledges are not sufficient to curb carbon emissions and stop severe global warming. According to a recent report by leading climate scientists, 75% of climate pledges are “partially or totally insufficient to contribute to reducing GHG emissions by 50% by 2030” (Watson et al. 2019, p. 4). It has been acknowledged that accelerating the transition to a green economy will not only require a significant increase in public and private investments but also new instruments to mobilize a wide range of funding sources (Semieniuk and Mazzucato 2018; Buchner et al. 2019). As the energy sector¹ accounts for two-thirds of global greenhouse gas emissions, decarbonizing it is critical to efforts to combat climate change (IEA 2019; IRENA 2017).

Since 2006, China has developed into the world's largest energy investor (IEEFA 2017; Semieniuk and Mazzucato 2019).² Taking into account all investments in renewable capacity, China committed \$758 billion between 2010 and 2019³, followed by the United States (\$356 billion) and Japan (\$202 billion) (FS-UNEP 2019).⁴ Indeed, in 2017, China accounted for almost half of the world's renewable energy investments (Murdock et al. 2019) and the country has dominated solar and wind investments for more than a decade (Kong and Gallagher 2020). However, China's domestic versus overseas energy investments speak different languages: while renewables account for almost half of energy investments domestically (IEA 2020), the share of renewables in financing overseas is only 10% (Cabr e et al. 2018)⁵ In fact, 80% of China's

policy banks' energy investments outside the country are in fossil fuels (Gallagher and Qi 2018). Despite global financial institutions increasingly moving away from coal, China has recently committed \$36 billion funding to 102 gigawatts⁶ (GW) of coal-fired power plants outside the country and continues to be the largest international funder of coal plants overseas. This scenario jeopardizes the country's position as the world's clean energy leader (IEEFA 2019a; Climate Transparency 2019).

This is a cause for major concern since China is rapidly expanding its influence in global infrastructure investments as part of the Belt and Road Initiative (BRI), but to date has displayed little ambition to align its overseas investments with the demands of the Paris Agreement (Voituriez 2019; Zhou et al. 2018). In fact, countries have to surpass their current nationally determined contributions (NDC) to limit global warming to well below 2°C. (UNDP et al. 2020; Levin and Fransen 2015). Moreover, as the largest emitter of greenhouse gases in the world, accounting for 26.8% of the global total (Watson et al. 2019), the action China takes on the climate can serve as a model for other emerging economies. This chapter provides an overview of China's dual role in financing the energy transition. We show that China's financial system is geared towards state-owned enterprises (SOE), a tendency which favours fossil fuel to the detriment of renewable energy projects overseas.

The chapter is organised as follows. Section 2 provides a general overview of China's energy investments. Section 3 focuses on the financing barriers Chinese energy companies face when moving overseas, exposing a bias in the Chinese financial system towards SOE fossil fuel companies. Section 4 discusses policy options for the five main actors that can facilitate financing to renewable energy projects overseas. Section 5 concludes the chapter with a summary of key findings and their relevance to policy making.

1 Encompassing energy production and use.

2 When low-carbon energy became a priority in China's 11th Five-Year plan and the renewable energy law came into effect.

3 First half of 2019; excluding large hydro (FS-UNEP, 2019).

4 The sum of all European investments is \$698 billion (FS-UNEP 2019).

5 40% of China's overseas investment was reportedly spent on coal projects (Watts 2019).

6 This represents 26% of all coal plants under development outside China (399 GW), according to IEEFA (2019b).

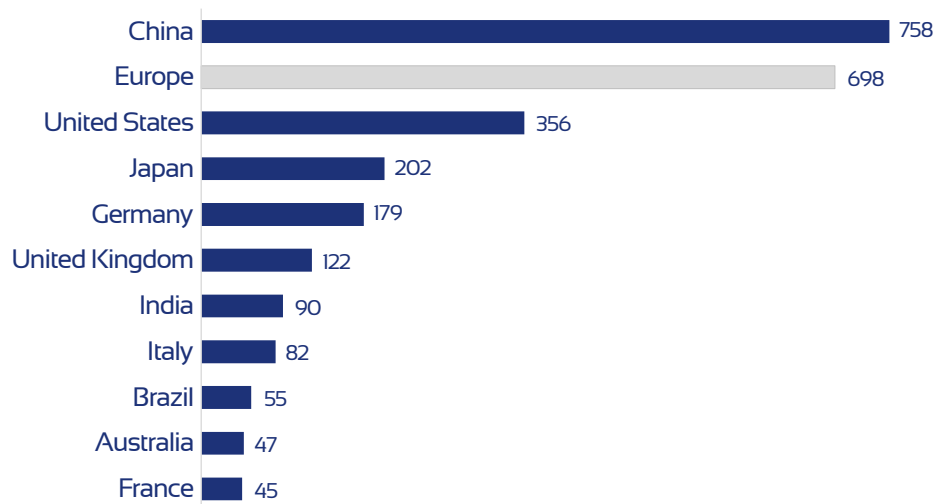


Figure 1 Renewable energy investment capacity between 2010 and 2019 (in USD bn)
 (Source: FS-UNEP 2019). Note: Data for 2019 covers the first half of the year.

Overview of China's energy investments

We start by providing a brief overview of China's domestic and overseas energy investments and pointing out the most important trends over the last years. The term 'energy investments' refers to all available financing instruments including both public and private debt, and equity and concessional loans. In terms of the split between these sources, total financing in China is made up of approximately 85% loans, 10% bonds and 5% listed equity⁷. As the largest financial institutions in China, about 90% of the loan proportion comes from China's 21 main banks, namely three policy banks, six large state-owned commercial banks and 12 nationwide incorporated banks. Their total outstanding loans to renewable energy amounts to RMB 1,610 tn, which represents 20% (RMB 8.296 tn) of all loans for green investments (CBRC 2017). Overall, green loans make up only 10% of all loans by the 21 banks. This data is available in China due to a green credit statistics system established in 2014 by the China Banking Regulatory Commission (CBRC), which requires mandatory disclosure from China's 21 largest banks. As banks in western markets do not share a similar disclosure requirement and green definitions differ across geographies, there are no comparable international statistics.

China leading renewable energy investments

A central milestone for China's explosive growth in green investments was the country's Renewable Energy Law that came into force in 2006. Until today, it can be considered China's most influential policy instrument, introduced to stimulate unprecedented growth in what was a marginal renewable energy sector. Besides

setting mid and long-term targets and prioritizing renewables over other power sources in the grid system, the law created a Renewable Energy Development Fund, financed through a surcharge on end-consumers electricity bills (Wang et al. 2016).

Figure 1 shows China's dominance in renewable energy investment capacity between 2010 and 2019, amounting to \$758 billion, exceeding the combined sum of European countries. Cumulatively since 2010, China is the largest renewable energy investor despite showing a downward trend from \$145.9 billion in 2017 to \$91.2 billion in 2018, when the phase-out of solar subsidies deterred investment (Murdock et al. 2019). Indeed, Table 1 shows that China accounted for the largest proportion of renewable energy investments on a global scale. Chinese investments in the power sector as a whole easily outstrip its investments in fossil fuels.

When taking a closer look at how these renewable energy investments translate into deployment of renewables, we can see that China's domestic market accounts for almost one-third of total renewable power capacity in the world, with wind (36%), solar PV (35%) and hydro (28%) at the forefront of China's renewable energy leadership (Table 1). This shows that China's renewable energy investments have been mainly channeled towards the domestic market in the aftermath of the 2006 Renewable Energy Law, while international deployment remains comparatively low. This is especially true for the wind power industry, where Chinese lead firms in 2017 installed less than 3% of their manufactured turbines outside China (FTI 2018).

In order to evaluate recent trends, we looked at newly added capacity in 2019. While no comprehensive investment statistics are available, Figure 2 shows that renewables made up 58.7% of newly added capacity in 2019, and 52% when excluding hydro power (CEC 2020). As renewables have higher upfront investment costs, they

⁷ Concessional loans are part of the 85% figure as it is not possible to calculate them separately. This subdivision is not disclosed by policy and commercial banks and Chinese definitions are flexible; determining concessional loans is difficult with limited information on loan portfolios.

Table 1 Cumulative renewable energy capacity in GW per source as of 2018, world and China. Source: Author's compilation based on Murdock et al. 2019.

Technology	World (GW)	China (GW)	Share (%)
Wind	591	210	36
Solar PV	505	176	35
Hydro	1,132	322	28
Bioenergy	130	17,8	14
Concentrated solar power (CSP)	5.5	0.2	4
Geothermal	13.3	0.02	0.1
Total	2,378	727	30.5



Figure 2 2019 added power generation capacity by energy source. (Source: China Electricity Council 2020)

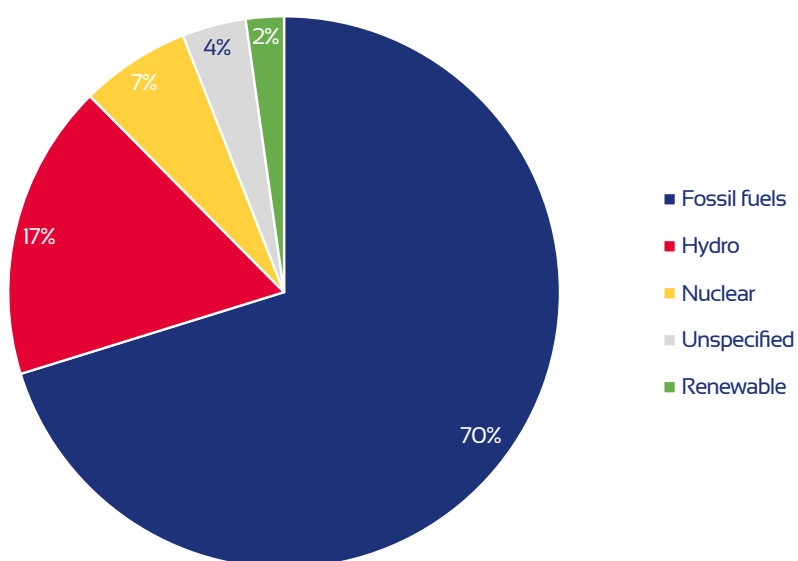


Figure 3 China's global energy finance per source (Source: Gallagher and Kevin 2019). Note: Data covers CBD and CHEXIM.

Table 2 2019 investment proportions in fossil and renewable energy across sectors and geographies. Approximations based on various sources such as Zhou et al. 2018; IEA 2020; CEC 2020; Dong and Ye 2018. (Source: Authors' summary). Note: "Hydro" refers to mid- and large hydropower generation.

Geography	Energy sector as a whole Power generation plus energy supply and electricity networks			Power generation		
	USD	Fossil / renewable split	Fossil / renewable split (w/o hydro)	USD	Fossil / renewable split	Fossil / renewable split (w/o hydro)
Global	1,480 bn	72 / 28 %	75 / 25 %	480 bn	25 / 75 %	36 / 64 %
Chinese domestic	370 bn	56 / 44 %	64 / 36 %	122 bn	15 / 85 %	23 / 77 %
Chinese overseas (BRI countries)	60.3 bn	87 / 13 %	91.4 / 8.6 %	21.3 bn	66 / 34 %	78 / 22 %

represented about 80% of Chinese domestic power investment in 2019, even when disregarding mid- and large hydro (Dong and Ye 2018; IEA 2020). Though this is impressive, it is notable that according to IEA's (2020) calculation of energy investment required to meet the Sustainable Development Goals (SDGs), China cannot add any fossil fuel capacity at all unless it is equipped with carbon capture and storage technologies.

China's global energy finance dominated by fossil fuels

Compared with the scale of domestic investments, Chinese investment in renewable energies overseas is still at a very early stage. As shown in Figure 3, China's global energy finance from policy banks is dominated by fossil fuels (70%) whereas renewables (excluding hydro) only represent 2% (Gallagher and Kevin, 2019).

Figure 4 shows Chinese energy investments from commercial banks, the Silk Road Fund, SOEs and private companies, for which the trend of mainly financing fossil fuels persists. Indeed, it can clearly be seen that renewables only make up the largest proportion of financing from the private sector. Further, when excluding hydro power, renewable investments from syndicated loans and exclusive policy bank loans are reduced by two-thirds. Though private owned enterprises only make up 8% of Chinese overseas energy investments, they account for

65% of renewable power generation minus hydro.⁸

Table 2 compares domestic and overseas energy investment data to the global context. While China performs better than the global average domestically, it performs significantly worse than the global average overseas. It is notable that Chinese domestic power generation investment is 85% in renewables, while the overseas percentage is only 34%. If we further exclude medium- and large hydro power, which are neither considered green nor renewable by most current definitions, these figures are 77% and 22%, widening the gap even further.

Barriers to China's renewable energy investments overseas

General barriers to renewable energy project finance

There are general and country-specific financing barriers to renewable energy projects. On a generic level, renewable energy projects are capital intensive and require higher upfront investments. However, they benefit from considerably lower and stable operating costs compared to conventional energy. Oil, gas and coal are subject to substantial and unpredictable price fluctuations as

8 Based on figures provided by Zhou et al. 2018.

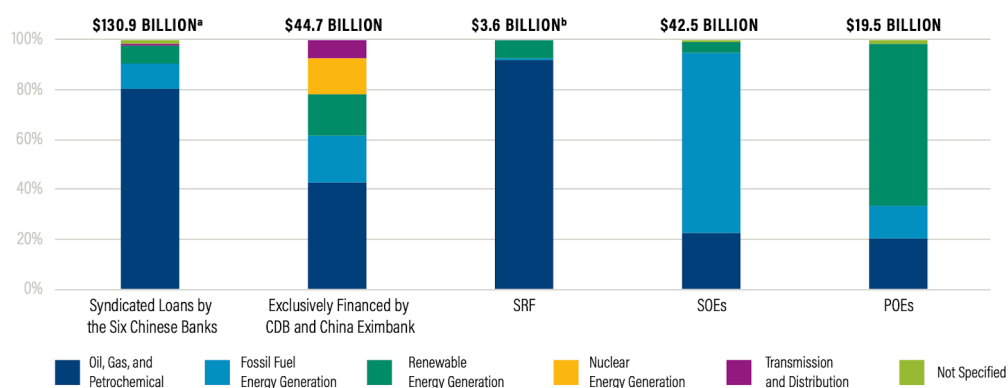


Figure 4 China's energy sector financial flows to BRI countries from 2014-2017 (Source: Zhou et al. 2018).

Table 3 Ownership structure of leading wind turbine, solar PV and fossil fuel companies in China

Sector	Firm	Global market	Type	Government ownership
Wind turbine	Goldwind	13.8%	Public	43.33% (Three Gorges New Energy)
	Envision Energy	8.4%	Private	
	Mingyang	5.2%	Public	7.3% (ICBC Int. Investment)
Solar PV	Jinko Solar	12.8%	Public	
	JA Solar	9.7%	Private	
	Trina Solar	8.9%	Public	
Consolidated revenue 2018				
Fossil fuels	China National Petroleum	\$340 bn	SOE	81% (China National Petroleum Corporation (SASAC))
	Sinopec Group	\$314 bn	SOE	70% (Sinopec Group (SASAC))
	China Energy Investment*	\$76 bn	SOE	100% (SASAC)
	China National Offshore Oil	\$22 bn	SOE	64.44% (China National Offshore Oil Corporation (SASAC))

Source: Author's compilation based on Wang (2019), GWEC (2018), corporate annual reports. Note: An 'SOE' is defined as the government holding more than 50% of equity under its ultimate control. Government ownership includes both directly and indirectly controlled equity. *Formerly Shenhua and Guodian.

recently demonstrated by the US benchmark price for crude oil temporarily dropping below zero. The paradigm shift⁹ in financing renewables marks a clean break from traditional energy business models. Hence, accelerating progress towards a green economy requires transforming the current financing paradigm based on short-term lending. The International Renewable Energy Agency (IRENA) emphasizes the urgent need to “develop finance innovations to transform the cash flow from fossil fuel consumption expenditure over time into upfront capital for renewable energy projects” (IRENA 2019, p. 50).

Barriers specific to financing Chinese renewable energy projects overseas

China's country-specific barriers to investing in renewable energy projects can be divided into the regulatory, financial and administrative spheres. A recent report published by Greenovation Hub and Tsinghua University (Ma 2020) identifies key reasons why Chinese renewable energy investments overseas¹⁰ remain largely unexplored. According to the report, the following factors explain China's comparatively low level of renewable energy financing overseas: (i) delayed payment of subsidies, (ii) higher price competition overseas, (iii) insufficient support from credit insurance agencies, (iv) high financing costs, (v) limited access to project financing, and (vi) lack of cooperation with foreign financial institutions. While these obstacles are similar for renewable energy companies from other countries, the report by Ma (2020) analyses the specific context of Chinese companies.

First, delayed subsidy payments have been the result of lengthy administrative processes and the constantly growing deficit of China's Renewable Energy Development Fund, which now amounts to \$28 bn (Energy Iceberg 2020). In Europe, subsidies are paid by host countries, however most Chinese overseas renewable energy projects are located in developing countries that have limited subsidy schemes. A delay in the payment of subsidies leads to insufficient funding capacity for overseas investments, an obstacle that particularly impacts private companies. Second, in recent years many overseas markets have shifted from a fixed feed-in-tariff to a competitive auction-based system (Dai et al., 2020; The Economist 2018). As China is still in the process of shifting towards these competitive mechanisms, the ability of Chinese companies to bid for overseas projects is limited, putting them at a disadvantage when faced with fierce competition from international and local enterprises. Third, insufficient support from China's export credit insurance companies often leads to non-viability of project financing, as China's financial institutions often lack the experience to evaluate host country risks. This may be due to the high exposure of the Chinese Export and Credit Insurance Corporation (Sinosure) to the energy sector (Li 2019). Fourth, as China has a closed capital account that translates into higher financing costs, borrowing foreign currencies from Chinese banks tends to be more expensive than borrowing from international banks (Ma 2020). In addition, companies have to secure export credit insurance from Sinosure, rather than using international export credit agencies, further exacerbating their financing costs. Fifth, Chinese renewable energy companies have limited access to project financing from Chinese financial institutions, a particularly important

⁹ From financing short to long-term and from financing operating costs to financing upfront costs.

¹⁰ Based on interviews with Chinese companies and financial institutions investing in BRI countries.

source of finance for large-scale on-grid projects with an installed capacity of 10 MW and above (FS-UNEP 2010). Therefore, they have to deploy corporate finance based on their balance sheets, leading to heavy debt burdens and limited financing capabilities going forward, especially for private firms (Ma 2020). The impact on renewables is particularly adverse because their dependence on project finance is far greater than projects based on fossil fuel technologies (Steffen 2018). Finally, to date there has been little cooperation between Chinese and foreign finance institutions that have more experience in financing renewable energy projects overseas. This may be particularly detrimental in providing long-term project finance to Chinese companies (Ma 2020).

It is worth noting that some of these barriers apply to Chinese overseas investments in general, across different sectors. However, as mentioned above, renewable energies are capital intensive and necessitate high upfront costs (in contrast to conventional energy sources such as gas or coal-fired power plants) that are associated with higher (perceived) risk. Hence, the combination of technology- and China-specific barriers results in a significantly higher hurdle to overcome in opting for renewable vis-à-vis conventional energy investments.

Chinese financial system favouritism of state-owned over private companies

Adding another layer to this problem, Chinese renewable energy companies are traditionally private while fossil fuel companies are largely state-owned, as shown in Table 3. Despite multiple state-owned companies increasingly diversifying into renewables,¹¹ Chinese lead firms in the renewable energy sector are still not majority-owned by the state. The essential reason for this is historical, as China used to be purely reliant on fossil fuels at a time when all companies were state-owned. As the economy liberalized to some extent, these fossil fuel companies were kept as strategic companies, leaving renewables to develop largely inside the private sector. The incentive for conventional state-owned energy firms to diversify into renewables is the result of government policies that require a certain percentage of investments to be in renewables.¹² For example, the world's largest power producer,¹³ the China Energy Investment Group (formerly Guodian and Shenua Group), owns both China's largest project developer in wind power, Longyuan, and China's eighth largest wind turbine manufacturer, United Power. As the Chinese financial system is skewed in favor of SOEs, fossil fuel companies receive the financial sup-

port they need to overcome barriers in the energy sector in general, and the fossil fuel industry in particular, when moving abroad. An exception is the state-owned China Three Gorges company (historically associated with hydropower) that has made major renewable energy investments overseas in the past decade (IEEFA 2018). However, on a general level and because they are mainly private, financial support is not equally provided to renewable energy companies. This ultimately means that the Chinese financial system provides a clear advantage to fossil fuel companies over renewable energy companies when they are looking to move abroad. This lack of support for Chinese renewable energy companies moving abroad is evidenced by obstacles (iii), (iv), and (v), mentioned above.

It is reasonable to conclude that the stark contrast between Chinese domestic and overseas renewable energy investments can be explained by (i) general financing barriers for renewables based on the existing financing paradigm, (ii) multiple systemic factors that entail extremely high financial burdens and low viability of renewable energy projects overseas, and (iii) a general favouritism of the financial system towards state-owned energy enterprises, which are to a large extent fossil-fuel based. At the same time, a lack of overseas experience and an operational track record leads to insufficient bankability, which prevents many Chinese firms from accessing finance from foreign institutions. In order to disrupt this vicious circle, Chinese renewable companies have been experimenting with different forms of market entry. For example, Goldwind, China's leading wind turbine manufacturer in terms of market share, entered the Australian market by simultaneously becoming project owner (acquiring land), project developer, turbine supplier and renewable energy assets retailer, a highly unconventional scenario in the wind energy sector.

Discussion: Five central actors that can facilitate Chinese financing for Chinese renewable energy projects overseas

All the barriers identified above can be overcome through adequate support from financial institutions. Through exerting a higher degree of state governance of relevant financial institutions and the operation of the financial system as a whole, the Chinese government has a number of policy options available. These collectively need to change the status quo by easing access to finance for Chinese renewable companies relative to fossil fuel companies. The five most important types of actors to be targeted by such policies are (i) policy banks, (ii) state-owned commercial banks currently financing the majority of Chinese overseas energy projects, (iii) smaller financial institutions which are currently not involved in this type of financing overseas, (iv) Sinosure, which today primarily insures fossil fuel projects, and (v) Chinese energy, utility and construction companies that can expand further into renewables. While a wide range of available tools, both in and outside financial institution governance, can shape

11 For example, Shanghai Electric diversified into offshore wind through a joint venture with Siemens in 2014 (Dai et al. 2020).

12 In 2017, China started to reorganize its largest state-owned power generators, which has been perceived as an effort to move away from their domestic reliance on coal (IEEFA 2018).

13 In terms of installed capacity.

the issue, we highlight some of the policies with the greatest potential for the five types of organisations.

Chinese policy banks

As the single largest source of Chinese overseas energy financing, changing the behavior of CDB and EXIM banks would have a significant direct and perceived effect in the eyes of commercial banks. The Chinese government has complete authority to green their lending as they are managed directly by the Chinese State Council and regulated by the China Insurance and Banking Regulatory Commission. Key policy options include negative screening of the most polluting projects, such as coal, alongside proportional commitments to green or climate financing in a similar way to most countries' development banks and multilateral development banks. Another policy approach is to minimize harm by implementing environmental and social safeguards, as well as public disclosure of standards and project assessments. Initiatives such as a shift from using the lowest standards between China and the host country to using the highest, is an easy-to-implement change, as suggested by Voituriez et al. (2019). A third key policy option is to increase disclosure by following the praxis of the International Development Finance Club, of which CDB is already a member, and to categorize and publish data based on the OECD DAC format, which is open to non-DAC members, such as China, as well as the deployment of the broader concept of Total Official Support for Sustainable Development (TOSSD).

Chinese national level state-owned large commercial banks

The second largest source of financing derives from four large state-owned commercial banks, ICBC, BOC, BOC, and CCB. While these banks are publicly listed, the Chinese state is their largest shareholder and has a comprehensive mandate to govern their behavior through a number of channels, including CCP party committees established within the banks. Key policy options to increase their financing for renewable projects include 'window guidance', where State Council, China Banking and Insurance Regulatory Commission (CBIRC) and Green Finance Committee policies provide an official mandate to the banks to move away from business-as-usual and fossil fuel projects. Direct financial incentives can also be strengthened, such as the recently implemented, innovative and green macroprudential measures, giving banks a higher interest rate on their central bank deposits depending on how green their overall performance is. Furthermore, CBIRC can directly require the banks to publish the Financial Stability Board's Task Force on Climate Related Financial Disclosure, an increasingly common format that includes both current climate risk as well as strategies to minimize such risk.

Chinese smaller commercial banks

As shown above, Chinese domestic renewable energy projects are financed by the four large banks, but

smaller banks also play a role. However, the smaller banks provide very limited overseas financing. Conversely, as fossil fuel SOEs are mainly financed by the large commercial banks domestically, they can rely on this relationship to expand their overseas operations. Consequently, if relying on existing relations were possible for smaller banks investing in renewable energy, international expansion would be substantially smoother. However, CBIRC policies that require smaller banks to meet stringent governance and management standards inhibit their operational ambitions. These standards include securing the approval of the Central Bank's State Administration of Foreign Exchange (SAFE) to transfer money across borders and use foreign currencies. These impediments are exacerbated by smaller banks being subject to a higher cost of capital than the big four, particularly internationally, in addition to the costs of establishing overseas branches (the big five's branches have been in place for many years). Regulators could reduce barriers and actively encourage overseas lending, while obliging Sinosure to cover this lending in order to reduce smaller banks' risk exposure. While local banks are small in comparison to the largest Chinese commercial banks, they are large by international standards and certainly mature enough to manage international loan portfolios.

Sinosure Export and Credit Insurance

While insuring the majority of Chinese overseas fossil fuel energy investments and often working as the actor who gives a project the green light (Wei and Baxter 2018), the state-owned Sinosure has to this point only insured a limited number of renewable energy projects. Chinese commercial banks would be more willing to lend to renewable energy projects if Sinosure was able to match their endeavor. As Sinosure is already significantly exposed from Chinese loans to coal projects, this is a limiting factor for expanding into renewables (Li 2019). Consequently, it may require the Chinese State Council to insist Sinosure extends its coverage to prompt a more decisive shift from their business-as-usual model of insuring fossil fuels. Options include placing stringent quotas on maximum coal exposure as well as on minimum proportions allocated to green energy. An additional option often discussed is for Sinosure to require projects to use an independent third party to carry out an environmental and social impact assessment to a high standard. This would inevitably reduce financing to polluting projects that are insured under current practice, thus freeing up insuring capacity for green projects. Furthermore, Sinosure could improve the insurance terms for renewable energy projects by offering, for example, longer terms, lower acceptance thresholds and broader cover (Ma 2020).

Chinese state owned energy, utility and construction companies

The final actor that can facilitate financing towards Chinese renewable energy projects overseas lies

outside the financial system itself, namely Chinese SOE energy, utility and construction companies. While financing in the form of loans comes from policy and commercial banks, actual investments in energy assets derive from SOE companies in the form of equity stakes through greenfield investments, and mergers and acquisitions, amounting to USD 115bn in 2019 (Li et al, 2020). While these assets are mainly in fossil fuels, a gradual increase in renewable assets is evident. As SOEs have access to Chinese financing for overseas projects, shifting companies into renewables circumvents the obstacle of renewable companies being disadvantaged as private companies. SASAC, as the state representative owner of many companies in this category, could alter companies' strategies to gradually increase renewables in their asset mix. This evolution could follow the practice of international fossil fuel companies becoming low carbon companies, such as Engie, Ørsted and Iberdrola.

Conclusion

This article has highlighted that while China is the world's largest investor in renewable energy, its overseas energy investments are primarily in fossil fuels. This is problematic as countries across the globe need to transition towards low-carbon development trajectories to meet the 1.5 degree warming target of the Paris Agreement. As China is a leader in renewable energy technology, not adequately deploying this expertise outside the country is a lost opportunity, both for China and the world. The scale of the problem is highlighted

by the fact that power generation investment in renewables domestically is 77%, when excluding medium- and large hydro, while overseas it is only 22%.

The critical barrier to Chinese renewable energy companies moving overseas is their lack of access to financing. The generic barriers to renewable energy include higher upfront costs and other expenditure, and income cycles that differ from traditional energy finance models. A country-specific barrier is the lack of support from financial institutions, in the form of loans and insurance. The key reason for this problem is that the largest Chinese financial institutions, the four large Chinese state-owned commercial banks, as well as China Development Bank and China Exim Bank, favour state-owned enterprises (SOEs) over private companies. Given that the energy sector is characterized by fossil fuel technologies and assets being primarily held by SOEs, with renewable energy in the hands of private companies, favouritism towards fossil fuels is to be expected.

This favouritism can be overcome through a range of policy options addressing five types of actors, namely 1) policy banks, 2) state-owned commercial banks that currently finance the majority of Chinese overseas energy projects, 3) smaller financial institutions currently not involved in this type of financing overseas, 4) Sinosure, which today primarily insures fossil fuel projects, and 5) Chinese energy, utility and construction companies that could expand into renewables.

References

- Buchner, B., Clark, A., Falconer, A., Macquarie, R., Meattle, C., Wetherbee, C. 2019. 'Global landscape of climate finance 2019'. *Climate Policy Initiative*. Retrieved from <https://climatepolicyinitiative.org>
- Cabré, M. M., Gallagher, K. P. and Li, Z. 2018. 'Renewable energy: The trillion dollar opportunity for Chinese overseas investment'. *China and World Economy*, 26(6): pp. 27-49.
- China Banking Regulatory Commission. 2017. *The green credit data of 21 major banks from 2013 to Jun 2017*. Retrieved from www.cbrc.gov.cn
- China Electricity Council. 2020. *Power Industry Statistics 2019*. Retrieved from [www.http://english.cec.org.cn](http://english.cec.org.cn)
- Climate Transparency. 2019. *Managing the phase-out of coal A comparison of actions in G20 countries*. Retrieved from <https://www.climate-transparency.org>
- Dai, Y., Haakonsson, S. and Oehler, L. 2020. 'Catching up through techno-economic paradigm shifts in an era of green transformation. Empirical evidence from the Chinese wind energy sector'. *Industrial and Corporate Change*, forthcoming.
- Dong, W. and Ye, Q. 2018. *Utility of renewable energy in China's low-carbon transition*. Brookings. Retrieved from www.brookings.edu
- Energy Iceberg. 2020. *How to Harvest From China's Renewable Asset Sales: Subsidy-Not-Receiveable the Biggest Threat*. Retrieved from <https://energyiceberg.com/>
- FS-UNEP. 2019. *Global Trends in Renewable Energy Investment 2019*. Retrieved from <https://wedocs.unep.org>
- FS-UNEP. 2018. *Certified Expert in Climate and Renewable Energy Finance. Unit 7: Renewable energy Finance and*

- their Role of Project Finance. Unpublished course manuscript, Frankfurt am Main.
- FTI. 2018. *Global Wind Market update - Demand and Supply 2017*. FTI Intelligence.
- Gallagher, K. P. 2019. *China's Global Energy Finance*. Global Development Policy Center, Boston University
- Gallagher, K. S., and Qi, Q. 2018. 'Policies Governing China's Overseas Development Finance Implications for Climate Change'. *Center for International Environment and Resource Policy, The Fletcher School, Tufts University, March*, (016).
- GWEC. 2018. *Global Wind Report: Annual Market Update 2018*. Global Wind Energy Council: Brussels.
- IEA. 2020. *World Energy Investment 2020*. Retrieved from <https://www.iea.org>
- IEA. 2019. *Climate change. The energy sector is central to efforts to combat climate change*. Retrieved from <https://www.iea.org>
- IEEFA. 2019a. *IEEFA China: Lender of last resort for coal plants*. Retrieved from <https://ieefa.org>
- IEEFA. 2019b. *China at a crossroads: continued support for coal power erodes country's clean energy leadership*. Retrieved from <https://ieefa.org>
- IEEFA. 2018. *China 2017 Review. World's Second-biggest Economy Continues to Drive Global Trends in Energy Investment*. Retrieved from <https://ieefa.org>
- IEEFA. 2017. *China's global renewable energy expansion. How the world's second-biggest national economy is positioned to lead the world in clean-power investment*. Retrieved from <https://ieefa.org>
- IRENA. 2019. *Global Energy Transformation. The Remap Transition Pathway. A Roadmap to 2050* (2019 Edition, background report). Retrieved from <https://www.irena.org>
- IRENA. 2017. *Renewable energy: a key climate solution*. Retrieved from <https://www.apren.pt>
- Kong, B. and Gallagher, K. 2020. *Chinese development finance for solar and wind power abroad*. Global Development Policy Center. Boston University. Retrieved from <http://www.bu.edu>
- Levin, K. and Fransen, T. 2015. *With Latest Climate Commitments, How Will the World Warm? It's Complicated*. World Resources Institute. Retrieved from <https://www.wri.org>
- Li, Z., Gallagher, K. P. and Mauzerall, D. L. 2020. 'China's global power: Estimating Chinese foreign direct investment in the electric power sector'. *Energy Policy*, 136: p. 111056.
- Ma, J. 2020. *Investment and Financing Models, Challenges and Recommendations of Renewable Energy Projects by Chinese Companies in the Belt and Road Countries*. Tsinghua PBCSF and Greenovation:Hub. Retrieved from www.ghub.org
- Murdock, H. E., Gibb, D., André, T., Appavou, F., Brown, A., Epp, B. and Sawin, J. L. 2019. *Renewables 2019 Global Status Report*. Retrieved from <https://www.ren21.net>
- Li, D. 2019. *China's export insurance giant is taking a risk on coal* Medium. Retrieved from www.medium.com/resource-china
- Semieniuk, G., and Mazzucato, M. 2018. *Financing Green Growth*. SOAS Department of Economics Working Paper No. 210, London: SOAS University of London. Retrieved from <https://www.soas.ac.uk>
- Steffen, B. 2018. 'The importance of project finance for renewable energy projects'. *Energy Economics*, 69: pp. 280-294.
- The Economist. 2018. (16 June). 'Solar energy. On the solarcoaster'.
- UNDP, UNEP, UNEP DTU and WRI. 2020. *Implementing Nationally Determined Contributions (NDCs)*. UNEP DTU Partnership Copenhagen, Denmark.
- Voituriez, T., Yao, W. and Larsen, M. L. 2019. 'Revising the 'host country standard' principle: a step for China to align its overseas investment with the Paris Agreement'. *Climate Policy*, 19(10): pp. 1205-1210.
- Wang, T. 2019. *Global solar companies based on market share of PV cell and module shipments 2018*. Retrieved from <https://www.statista.com>
- Wei, H. and Baxter, T. 2018. 'Belt and Road insiders: What we think about "greening" the initiative'. Panda Paw Dragon Claw. Retrieved from pandapawdragonclaw.blog
- Wang, H., Kitson, L., Gass, P. and Attwood, C. 2016. 'Wind Power in China: A cautionary tale'. *GSI Report*. Retrieved from <https://www.iisd.org>
- Watson, R., McCarthy, H., Canziani, P., Nakicenovic, N. and Hisas, L. 2019. 'The Truth Behind the Climate Pledges'. Retrieved from <http://pure.iiasa.ac.at>
- Watts, J. 2019. (April 25). 'Belt and Road summit puts spotlight on Chinese coal funding'. *The Guardian*, p. 1.
- Zhou, L., Gilbert, S., Wang, Y., Cabré, M. M. and Gallagher, K. P. 2018. *Moving the green belt and road initiative: from words to actions*. World Resources Institute and Global Development Policy Center.