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Reaching India's Renewable Energy Targets: The Role of Institutional Investors

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December 2016

THE **NEW** CLIMATE **ECONOMY**

The Global Commission on the Economy and Climate

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A CPI Report

Acknowledgements

The authors would like to acknowledge the valuable contributions made by Udit Mathur, Christoph Wolff, David Nelson, Stefan Muench, Matthew Huxham and all the participants in our primary research for their contribution. The authors also thank Maggie Young, Amira Hankin, Tim Varga, Elysha Davila and Dharini Parthasarathy for internal reviews and suggestions.

This report has been funded by UK aid from the UK government; however the views expressed do not necessarily reflect the UK government's official policies. We extend special thanks to the David and Lucile Packard Foundation, the UK government and the New Climate Economy for their support. This paper contributed to the 2016 work programme of the New Climate Economy project which was set up to help governments, businesses and society make better-informed decisions on how to achieve economic prosperity and development while also addressing climate change.

Descriptors

Sector	Renewable energy finance
Region	India
Keywords	Renewable energy targets, institutional investment, domestic institutional investors, foreign institutional investors, off-taker risk, currency risk, pooled investment vehicles
Related CPI Reports	Reaching India's Renewable Energy Targets Cost-Effectively, A Foreign Exchange Hedging Facility, Driving Foreign Investment to India's Renewable Energy Targets: A Payment Security Mechanism to Address Off-Taker Risk
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About CPI

Climate Policy Initiative works to improve the most important energy and land use policies around the world, with a particular focus on finance. An independent organization supported in part by a grant from the Open Society Foundations, CPI works in places that provide the most potential for policy impact including Brazil, China, Europe, India, Indonesia, and the United States.

Our work helps nations grow while addressing increasingly scarce resources and climate risk. This is a complex challenge in which policy plays a crucial role.

Executive Summary

India has ambitious renewable energy targets of 175GW by 2022.

In 2014, the Government of India embarked on an ambitious plan to increase the share of renewable energy in the country's energy mix, setting targets to achieve 175 GW of installed renewable energy capacity by 2022. This includes 100 GW of solar power, 60 GW of wind power, 10 GW of waste-to-energy power and 5 GW of small hydropower by 2022. This is a significant increase from existing capacities of 3.5 GW, 23 GW, 4.4 GW and 4.2 GW, respectively (MNRE, November 2015).

In order to meet this target of 175 GW by 2022, the renewable energy sector in India will require $189 billion in additional investment.

The USD $189 billion requirement includes $57 billion in equity, and $132 billion in debt. We estimated this using capital expenditure forecasting for renewable energy projects (including solar power, onshore wind power, small hydropower, and waste-to-energy power) between 2016 and 2022.

The potential amount of investment in the renewable energy sector in India is more than double the investment required. However, the amount of investment expected falls short of the investment required, by 29% for equity and 27% for debt.

The potential for investment up to 2022 is $411 billion. The investment potential for equity is $220 billion – four times the equity investment required – and the investment potential for debt is $191 billion – 45% more than required. This indicates that more than sufficient investment potential is available for financing the renewable energy targets by 2022.

In a best case scenario, the amount of expected investment in debt financing is $126 billion, which falls short of the debt investment requirement by 5% (about $6 billion). On the equity side, the expected investment is $40 billion, which falls short of the equity investment requirement by 29% ($17 billion).

However, because banks are burdened with stressed loans (The Economic Times, 2016) and are overexposed to the infrastructure sector, their ability to finance renewable energy project debt may reduce to 64% in a realistic scenario. This will cause a shortfall of 27% ($36 billion) of the debt financing amount required.

Foreign and domestic institutional investors have the highest potential to bridge this financing gap between expected and required investments, for equity and debt financing, respectively.

Though the equity capital from foreign institutional investors comes at a slightly higher cost compared to the cost of capital from other sources, these investors have the highest unutilised potential for equity financing. In fact, these investors have the ability to meet 100% of the equity financing gap.

On the other hand, the cost of capital for domestic institutional investors is the most cost-effective amongst the investors providing the project debt for renewable energy projects in India. Domestic institutional investors have the ability to meet a large fraction – 54% – of the debt financing gap.

However, institutional investors have little exposure to the renewable energy sector in India, and because they are risk-averse, they have been reluctant to invest. There is a need to increase institutional investors' understanding of and familiarity with the renewable energy sector in India as a viable investment option.

One potentially significant solution for this is to develop a business case which would demonstrate the benefits of institutional investment in renewable energy in India and would provide institutional investors with the information required to help them make informed investment decisions in renewable energy in India. The business case would include designing appropriate asset allocation models for institutional investors that indicate that investments in renewable energy in India are a good match with their preferred risk-return profiles. This is an area of future work for CPI.

Institutional investment in the renewable energy sector in India also remains seriously constrained by several specific policy and financial barriers.

Both foreign and domestic institutional investors are facing significant barriers to investment in renewable energy. The key risks facing foreign institutional investors are (in priority order): off-taker risk, lack of transmission evacuation infrastructure, currency risk, regulatory risks, and a mismatch in return expectations. The key risks for domestic institutional investors are (in priority order): a lack of intermediaries, lack of liquid instruments to invest in renewable energy, and

low credit rating of operational assets; however, once these issues are resolved, land acquisition issues and regulatory risks are likely to become significant.

There are financial instruments and policy solutions which can address the barriers to institutional investment and drive more investment to fill the financing gap for meeting the targets.

The financial instrument solutions which have the highest potential to mitigate the above risks cost-effectively include a payment security mechanism to address off-taker risk, a foreign exchange hedging mechanism to address currency risk, and infrastructure debt funds and partial credit guarantees to enhance the credit rating of projects. Policy solutions include building adequate transmission capacity, creating consistent policy and regulatory provisions between central and state levels, and facilitating easier land acquisition, and helping create intermediaries to increase access to finance.

Contents

1. Introduction

India is facing a growing electricity demand and overdependence on fossil fuels.

The Indian electricity grid is heavily dependent on fossil fuels to meet its electricity needs. Fossil fuel-based electricity generation has a 70% share of the total installed capacity as shown in Figure 1. In addition, currently 360 million people in India lack access to grid electricity, another 20 million households receive less than four hours of electricity a day, and on top of that, electricity demand is expected to double by 2030 (The Climate Group, 2016). The potential of renewable energy in India has been largely underutilized – currently it only makes up 13% of total installed electricity generation capacity (CEA, 2016).

To increase energy security, India has set an ambitious target of 175 GW of renewable energy by 2022, but raising enough finance to meet this target will be a significant challenge.

To put this 175 GW target into perspective, India's cumulative renewable energy capacity grew by only 37 GW over eight years, from 2007 to 2015. Achieving an additional renewable energy capacity of around 138 GW in the next six years will require huge investments with relatively low-cost capital financing.

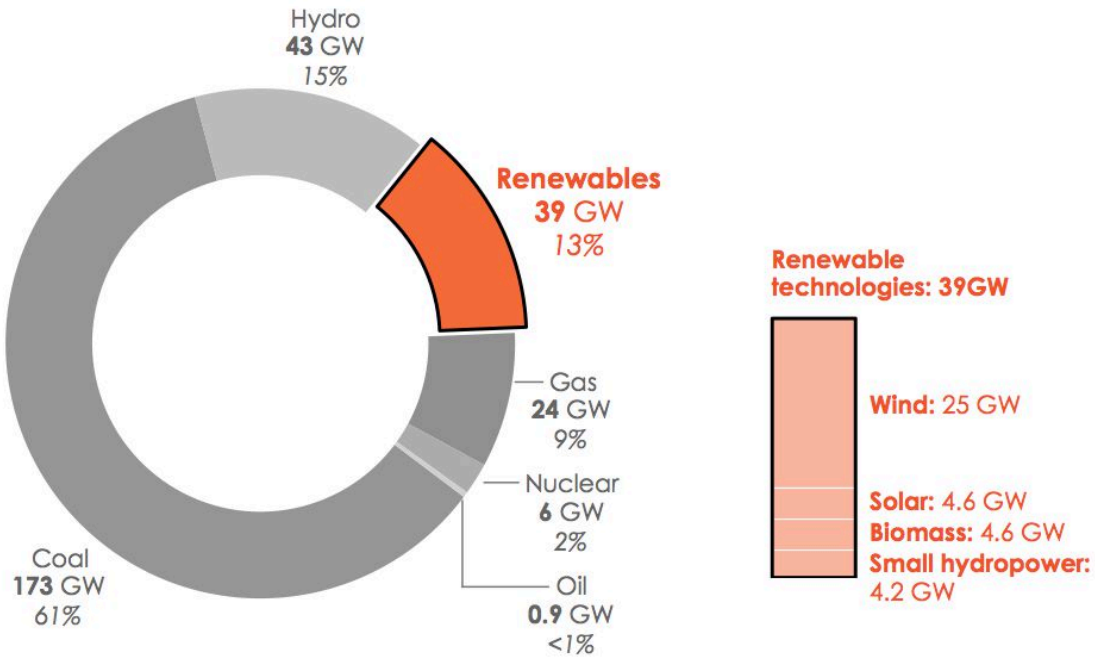
Institutional investors, both foreign and domestic, are a potentially significant source of investment for financing India's renewable energy targets.

Institutional investors are well-suited to invest in renewable energy because they prefer to invest in assets that deliver a steady and reliable stream of income, providing an ideal match with the low-risk, low-return profiles of renewable energy projects.

In order to help drive investment from institutional investors, it's important to understand their investment potential, motivations, and challenges. **This study examines institutional investors and their investment potential, expected investments, barriers to investment, and financial instruments and policy solutions which can address these barriers to scale up the investment needed to meet the renewable energy targets.** We also briefly examine other investor classes to provide a complete picture of India's renewable energy investment landscape.

Section 2 examines the investment requirement for meeting India's renewable energy targets by 2022. Section 3 examines the investment potential of institutional investors and other investor classes for renewable energy from 2016 to 2022, and their expected investments. Section 4 examines various barriers and risks facing institutional investment in renewable energy. Section 5 proposes solutions for addressing the barriers. Finally, Section 6 offers conclusions and suggests areas for future work.

Figure 1: India's energy mix as of December 2015

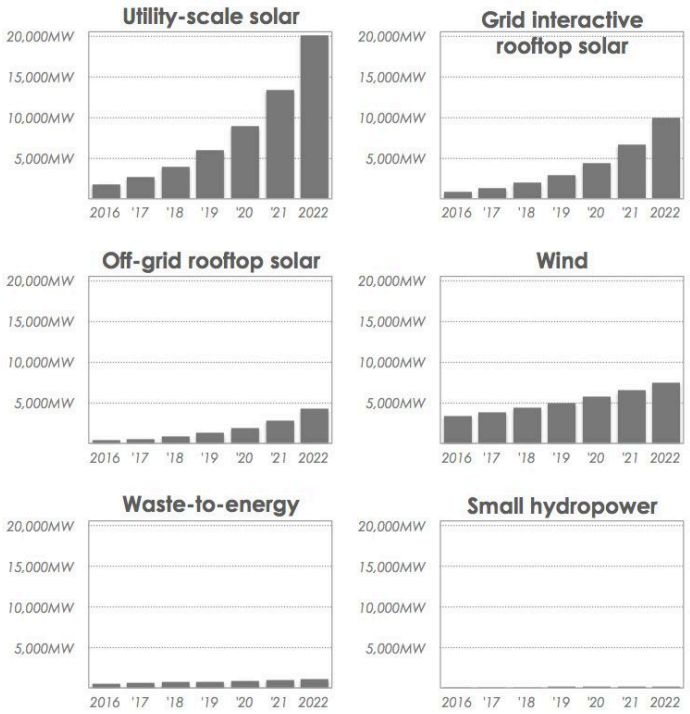


2. Investment Needed to Meet India's Renewable Energy Targets

Meeting India's renewable energy targets by 2022 will require financing of $189 billion. While the potential for financing is $411 billion, the expected investment is $166 billion, which falls short of the required amount by 12% (about $23 billion).

In order to estimate the amount of investment required to meet India's renewable energy targets of 175 GW by 2022, we began by forecasting the capital expenditure required from 2016 to 2022 for all types of renewable energy technologies approved by the Ministry of New and Renewable Energy (MNRE): utility-scale wind and solar power (the dominant renewable energy technologies), grid interactive rooftop solar power, off-grid rooftop solar power with storage facilities, small hydropower, and waste-to-energy power projects.[1] We used liner interpolation[2] to break down the 175 GW target into the targeted capacity for each year for each renewable energy technology.[3] The numbers used in our analysis are mostly based on data obtained during late 2015/early 2016 from various sources, including the Central Electric Authority (CEA) of India. The projected yearly capacity addition targets are shown in Figure 2.

Figure 2: Projected capacity addition to meet the targets, by year and technology type

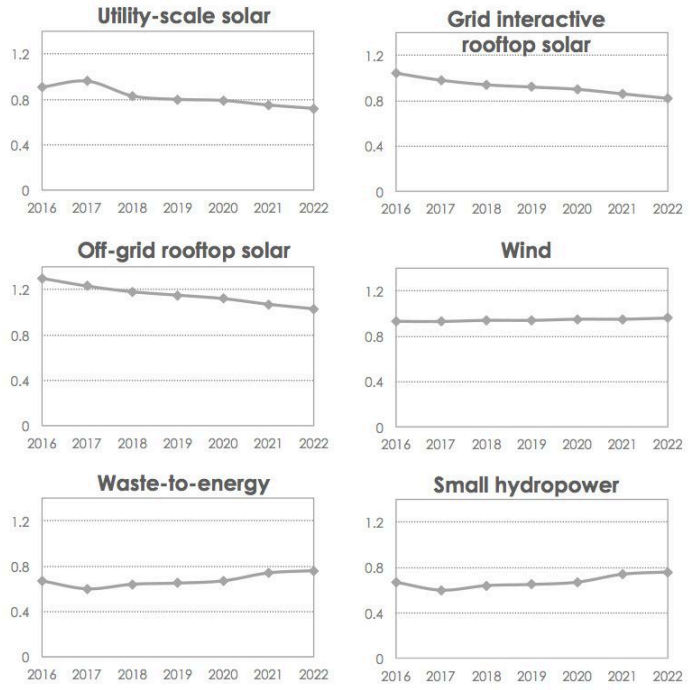


2.1 Forecasting the capital expenditure to estimate the investment requirement

We used the following methods to forecast the capital expenditure for each type of renewable energy technology:

- *Utility scale wind and solar projects:* We developed models for forecasting the capital expenditure per MW for each year from 2016 to 2022. These models are multivariate regression models developed by CPI (2016a).[4]
- *Rooftop solar projects*: Rooftop solar projects are kilowatt-scale projects that fall under two categories: grid connected and off-grid systems. Both these types do not enjoy economies of scale and therefore are more expensive than utility scale solar projects. Further, in off-grid

Figure 3: Projected capital expenditure forecast, in USD $ million/MW



1 We excluded solar thermal technology as it does not fall under the suggested technologies to reach the 175 GW by 2022.

2 We used linear interpolation to arrive at yearly capacity addition (new data points) within the range of installed capacity in 2016 and target capacity addition by 2022 (discrete set of known data points).

3 Targets have been broken into yearly projected capacity addition to accommodate for the change in capital expenditure requirements over 2016 to 2022.

4 To forecast the capital expenditure for utility scale solar and wind power, we used the same methodology as used in (CPI, 2016a).

systems, there is a need for a storage facility (like a battery bank) that can store excess energy generated during the daytime which can be utilized when sunlight is not available. We forecasted the capital expenditure for rooftop solar projects by using Ministry of New and Renewable Energy data on rooftop solar power projects commissioned in 2014 and further for off-grid rooftop solar by adding the cost of storage facilities for grid-connected rooftop systems.

- *Small hydropower projects:* We took the capital expenditure based on capital expenditure approved by the Central Electricity Regulatory Commission during 2009 to 2015 via its various tariff orders and regulations, projecting it until 2022 using a compound annual growth rate.
- *Waste-to-energy:* Similar to small hydropower projects, we took the capital expenditure using various orders and regulations of Central Electricity Regulatory Commission between 2009 and 2015 and projected it to 2022 using a compound annual growth rate.[5]

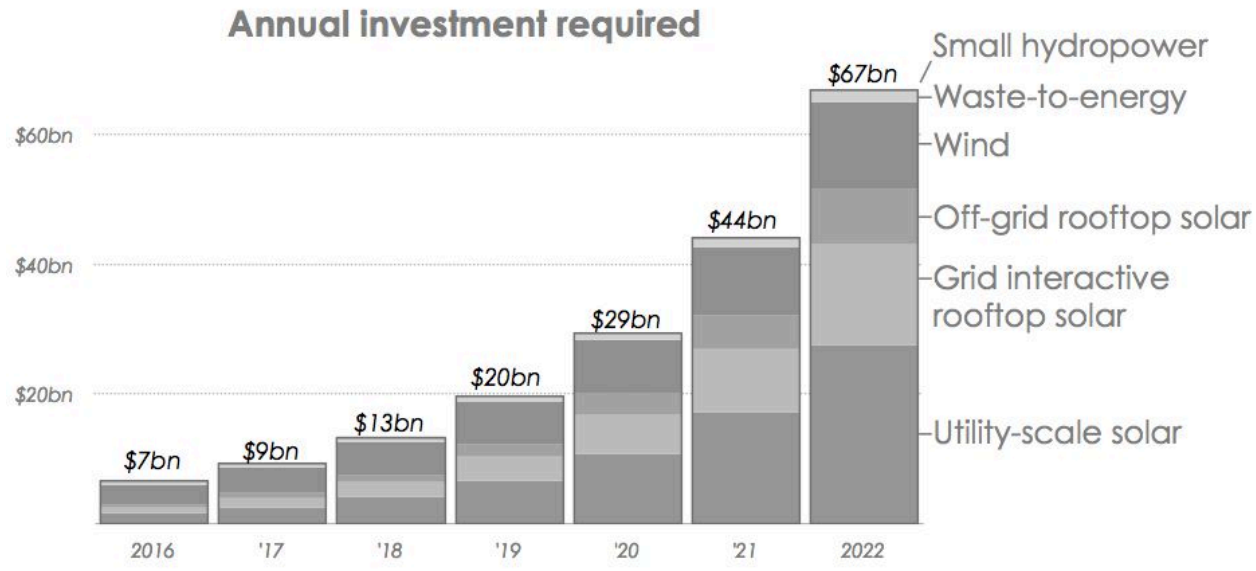
Based on the yearly capacity addition targets for each of the renewable energy technologies (shown in Figure 2) and the corresponding forecasted capital expenditure (shown in Figure 3), we estimated the total amount of investment required to meet the renewable energy targets by 2022. We used a discount factor to arrive at the yearly investment requirement on a present value basis.

The total amount of investment required to meet the renewable energy targets by 2022 is $189.15 billion.

Out of this requirement, 27% ($51.19 billion) is required for financing wind power projects, 37% ($70.27 billion) for financing utility scale solar projects, 32% ($60.94 billion) for financing grid-connected and off-grid rooftop solar projects, and 4% ($6.74 billion) is required for financing waste-to-energy and small hydropower projects, all shown in Figure 4.

This demonstrates that while wind power continues to remain an important energy resource and require significant investment, solar power (both utility scale and rooftop) will require significantly more investment, a reflection of its increasing importance in India's renewable energy mix.

Figure 4: Annual investment required by technology type, from 2016-2022



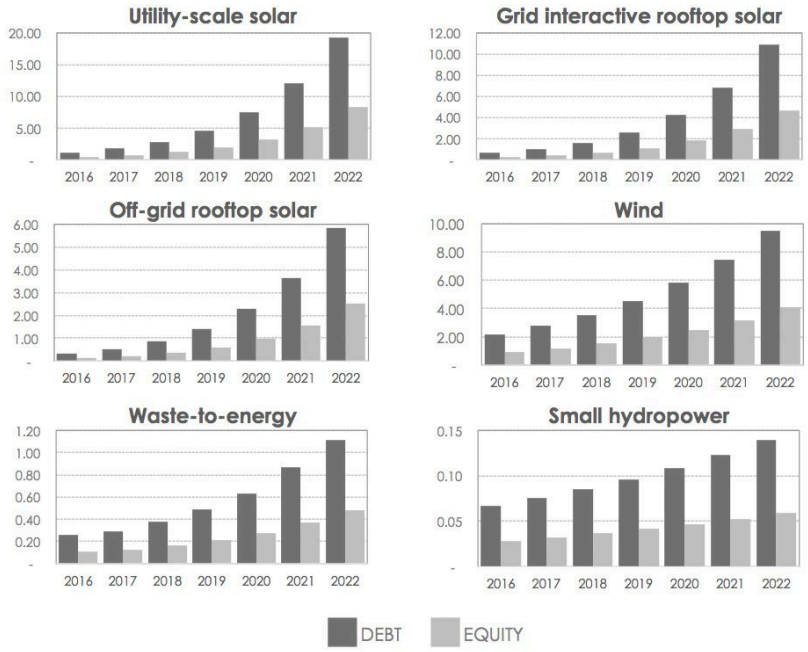
5 Compounded annual growth rate is generally used to forecast values based on growth rate seen in the last few years. In the case of hydro and waste to energy technologies, it was taken from Central Electricity Regulatory Commission and used to arrive at year-over-year growth in the capital cost.

2.2 Debt and equity financing requirement

In order to meet the renewable energy targets by 2022, the amount of debt financing required $132 billion, and the amount of equity financing required is $57 billion.

In order to estimate the debt and equity financing requirement, we used a debt to equity ratio of 70:30. We also estimated the yearly debt and equity investment requirement for each technology type, shown in Figure 5.

Figure 5: Annual debt and equity investment requirement by technology type



Box 1: How we estimated the discount factor

Cost of equity: The threshold required rate of return that represents the compensation and investor demands in exchange of owning the assets and risks associated with the ownership. We used the regulated return on equity offered in India as the cost of equity for our analysis.

Cost of debt: Currently the cost of debt for renewable energy projects in India is in the range of 12% to 13%, depending on the credit rating of the borrower. We arrived at the landed cost of debt by adding the SBI base rate + risk coverage, which is the formula used by state regulators. The SBI base rate is 9.30% (SBI, 2015) and the risk coverage allowed to lenders is 3% (CERC, 2015).

Weighted average cost of capital (WACC): We have used the weighted average cost of capital as the discount factor. The weighted average cost of capital, which represents the investor's opportunity cost of taking on the risk of investing into an asset, is the minimum rate of return at which a company produces value for its investors. It therefore takes into account effect of the capital structure of any project and therefore gives a true measure of the returns. For renewable eneargy projects the weighted average cost of capital works out to be 11.38% based on the equation below.

$$WACC = Discount\ Factor = ((Cost\ of\ Debt\ x\ 0.70\ x\ (1 - Tax\ rate)) + (Cost\ of\ Equity\ x\ 0.30))$$

3. Potential Investment and Expected Investment

The total amount of investment that is potentially available for renewable energy is $411 billion – more than double the amount of investment required to meet the renewable energy targets by 2022 in the best case scenario. However, the total amount of expected investment is $166 billion in the realistic scenario, falling short of the $189 billion required to meet the targets.

In order to determine if the investment requirement of $189 billion can be met, in this section we've examined the various investor categories to determine the amount they are able to invest, or their potential investment, and the amount they are expected to invest based on their past investment trends.[6] We've also identified the overall financing gaps between the amount of investment expected and the amount required to meet the renewable energy targets, as well as the financing gaps in debt and equity investment.

We analyzed the total amount of potential investment and expected investment for all investor categories, in order to briefly provide the landscape of renewable energy investment in India. Following that, because it is evident that institutional investors have the greatest potential to scale up investment, we have focused the majority of our analysis on them.

3.1 Investor categories

The need for investment in renewable energy continues to accelerate in India. Given the relatively stable cash flows offered by renewable energy projects, several new investor categories have been increasing their exposure to renewable energy, while making strides in alternative investment assets. Such investments involve different forms of financing like debt and equity, direct and indirect investments, and private and public investments (CPI, 2013).

In order to estimate the investment potential in renewable energy for various investor classes, we have categorized investors into four broad categories – government, private sector, financiers and retail investors.[7] Institutional investors fall within the financiers category. Table 1 shows the composition of the four investor categories, as well as their preferred investment form, debt or equity.

Table 1: Investor categories and their investment pathways

INVESTOR BASE		INVESTMENT PATHWAY
GOVERNMENT	• Central government, public sector unit • State government, public sector unit	EQUITY
PRIVATE SECTOR	• Group companies • Domestic and foreign pure play, independent power producers	EQUITY
FINANCIERS	• Private equity/venture capital	EQUITY
	• Domestic institutional investors • Domestic banks • Non-banking financial companies	DEBT
	• Foreign institutional investors • Multilateral / bilateral agencies	EQUITY / DEBT
RETAIL	• Domestic consumers • Public waterworks • Industrial low tension • Commercial load • Agricultural-base – Irrigation load	EQUITY

6 For the purpose of our analysis we have defined the investment potential as the maximum investment if external conditions were favourable and the expected investment as investment taking into consideration the effect of all events/barriers that reduce the investment potential, and with the assumption that past investment trends continue among the identified investor categories.

7 Investment potential and financing instruments for retail investors are discussed in Appendix 7.6.

3.2 Estimating potential investment and expected investment

To arrive at the investment potential for a particular investor category, we considered their commitments to renewable energy projects, assets under management, and credit exposure and then applied relevant filters like country allocation limit for foreign investors, infrastructure sector investment limit, and a filter for investments into the power sector and renewable energy sector for domestic investors.

Similarly, we applied various filters to calculate the expected investments for each investor category.[8] This section discusses the investment potential for various investor classes and the expected investments from these investor classes from 2016 to 2022. We've also assessed the financing gap and provided cost-effective solutions to address this financing gap in meeting the renewable energy targets.

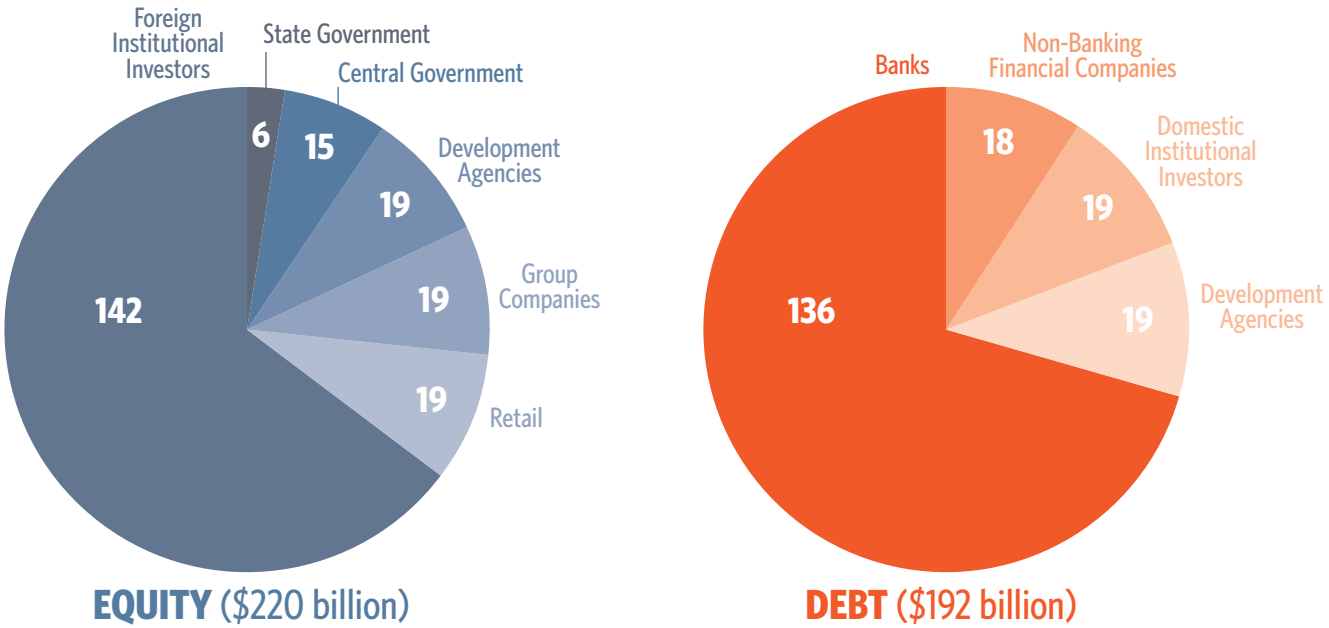
The total amount of potential investment available for renewable energy from 2016 to 2022 from all four investor categories is $411 billion, including $220 billion for equity financing and $191 billion for debt financing.

In other words, the amount of investment available is more than double the amount required to meet the targets. The amount of equity financing available is four times the amount required, and the amount of debt financing available is 44% higher than the amount required, as shown in Figure 6.

Foreign institutional investors are the most significant source of potential equity investment, with $142 billion available, or a share of 35%. Public and private sector banks are the most significant source of potential debt investment, with $135.63 billion available, or a share of 33%.

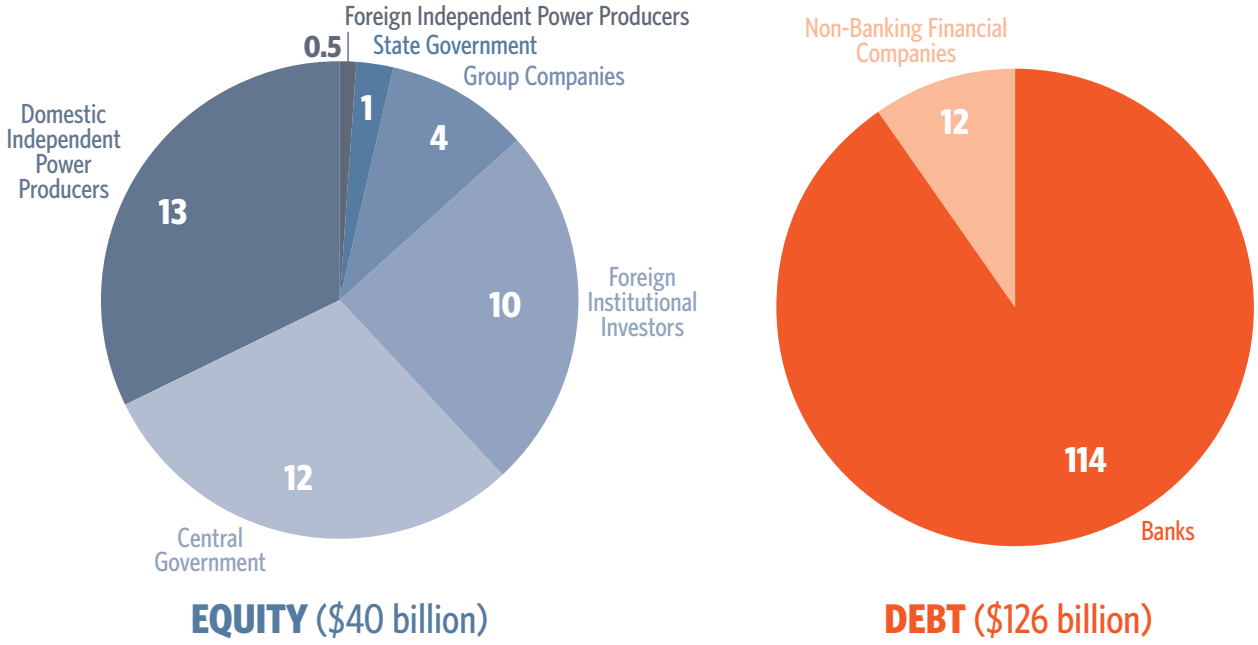
Foreign institutional investors are the most significant source of potential equity investment, with a share of 35%.

Figure 6: Potential equity and debt investments



8 Appendix 7.1 discusses the methodologies adopted for arriving at the investment potential and expected investments for each investor category in greater detail.

Figure 7: Expected equity and debt investments



However, despite the huge amount of potential investment, the amount of investment expected to 2022 is $166 billion, which will fall short of the amount of investment required to meet the targets by $23 billion, or 12%.

The expected amount of equity investment is $40 billion, and the expected amount of debt investment is $126 billion.

The shortfall of 12% in overall expected investment is under an optimistic scenario, in which market conditions are expected to remain favorable for investors, alongside continued government support for renewable energy. Foreign institutional investors, domestic independent power producers, and government-owned enterprises) are the most significant sources of expected equity financing, with a 25%, 32%, and 30% share, respectively. On the debt side, public and private sector banks are the most significant source, with an 88% share.

3.3 The investment gap to meeting the renewable energy targets

While an overall shortfall of 12% appears to be manageable, when the equity and debt shortfalls are considered separately, the equity gap is so significant that it may present a formidable barrier to achieving the 2022 targets.

The potential for equity investment is $220 billion; however, the expected equity investment amount is $40 billion, which is a shortfall of 29%, or $17 billion, of the $57 billion required to meet the 2022 targets (Figure 7). This is under an optimistic scenario, which assumes that the market conditions will remain favorable for investors, alongside continued government support for renewable energy. This is a significant shortfall, which could impede meeting the targets, especially when compared with the debt side. Given the limited budget of the Indian government, their capacity is limited to fill in this gap and provide the equity financing required to meet the 2022 renewable energy targets.

On the debt side, the potential for investment is $191 billion. The expected debt investment amount is $126 billion, which is a shortfall of approximately 5%, or $6 billion, of the $132 billion required to meet the 2022 targets (Figure 7). This is under an optimistic scenario, which assumes that market conditions will remain favorable for investors, alongside continued government support for renewable energy.

On the surface level, this means that there should be little difficulty in providing the amount of debt investment required to meet the targets. However, if we look more closely at the investors, public and private sector banks are the most significant source of expected debt investment, with approximately $114 billion, or 88% of total expected debt. Banks' large share could become problematic, because banks have exposure limits to

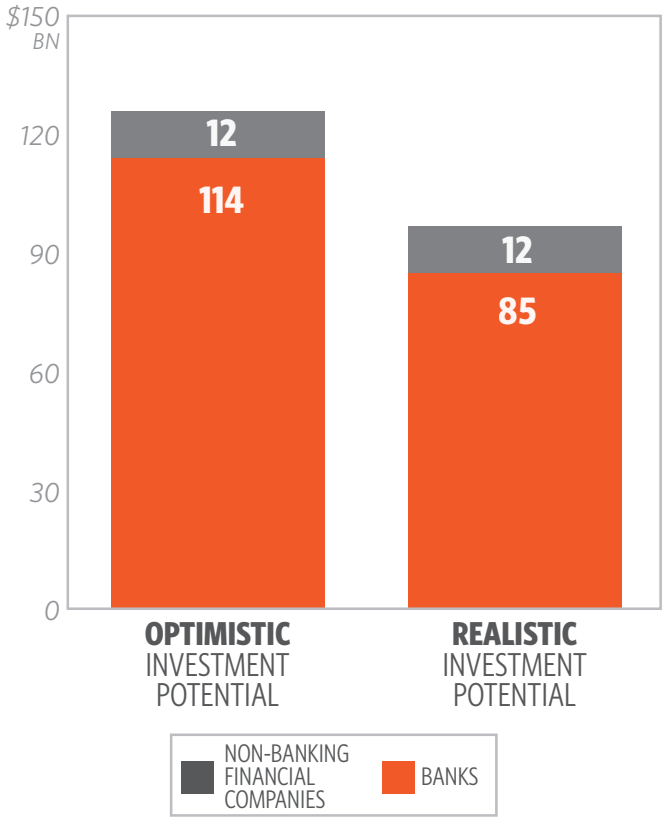
lending to the infrastructure sector, and as they become overexposed, their expected ability to provide debt may decrease. This is a more realistic scenario.

As banks draw closer to reaching their exposure limit to the infrastructure sector, their expected ability to provide debt may reduce to $84.6 billion, or 64% of total expected debt, decreasing from $114 billion, or 88% of the total. This would increase the gap between the amount of debt expected and the amount required to 27%, or $36 billion, a significant increase from 5% (Figure 8).

The financing gap of 5% between the amount of debt expected and the amount of debt required seems surmountable. However, any decline in banks' ability to provide debt, due to overexposure to the infrastructure sector, could potentially increase the gap to 27% and create problems for meeting the renewable energy targets by 2022.

However, because of the significant amount of unutilized potential financing available, the financing gap of 29% in equity and up to 27% in debt could be filled by scaling up finance from the right investors.

Figure 8: Amount of expected debt investment by banks, under optimistic and realistic scenarios



Investors with the lowest cost capital should be prioritized for filling the debt and equity financing gaps.

India has a high cost of capital, which increases the cost of renewable energy by 24-32% compared with similar projects in developed countries (CPI, 2014). This has become a significant barrier to raising the amount of financing needed for India's renewable energy targets. The government should prioritize enabling investment from investors with the lowest cost of capital, in order to fill the financing gaps the most cost-effectively.

In order to assess investors' potential to fill the equity and debt financing gaps, we prioritized investors based on their cost of capital. We defined their potential to fill the gap as the difference between their investment potential and their expected investments.

Based on our estimates, we found that because domestic institutional investors have the lowest cost of capital, they have the most potential to help fill the debt financing gap, by refinancing renewable energy project debt. Foreign institutional investors have the most potential to fill the equity financing gap, due to the difference between their expected and potential investment.

Domestic institutional investors have the most potential to help fill the debt financing gap, and foreign institutional investors have the most potential to help fill the equity financing gap.

3.4 The investment potential of institutional investors

Institutional investors, such as insurance companies and pension funds, offer a promising avenue for more investment in renewable energy in India. Compared to commercial banks, institutional investors not only invest over longer terms, but also accept lower returns in exchange for lower risks, providing a better match with the low-risk, low-return profiles of renewable energy projects.

3.4.1 DOMESTIC INSTITUTIONAL INVESTORS

Domestic institutional investors, who have the lowest cost of capital among the investors we examined, have the ability to meet 54% of the debt financing gap.

Of the types of investors that we looked at, domestic institutional investors have the lowest cost of capital and are therefore the most cost-effective option for helping to fill the debt financing gap. They have the ability to provide $19.42 billion in debt, which would fill 54% the debt financing gap of $36 billion, as shown in Figure 9.

Domestic institutional investors are well-positioned to increase the availability of debt as well as provide debt at more attractive terms to renewable energy projects that have achieved successful commercial operations. By refinancing project debt at a low cost, they could also help free tied-up bank debt, thereby enhancing banks' ability to finance new renewable energy projects.

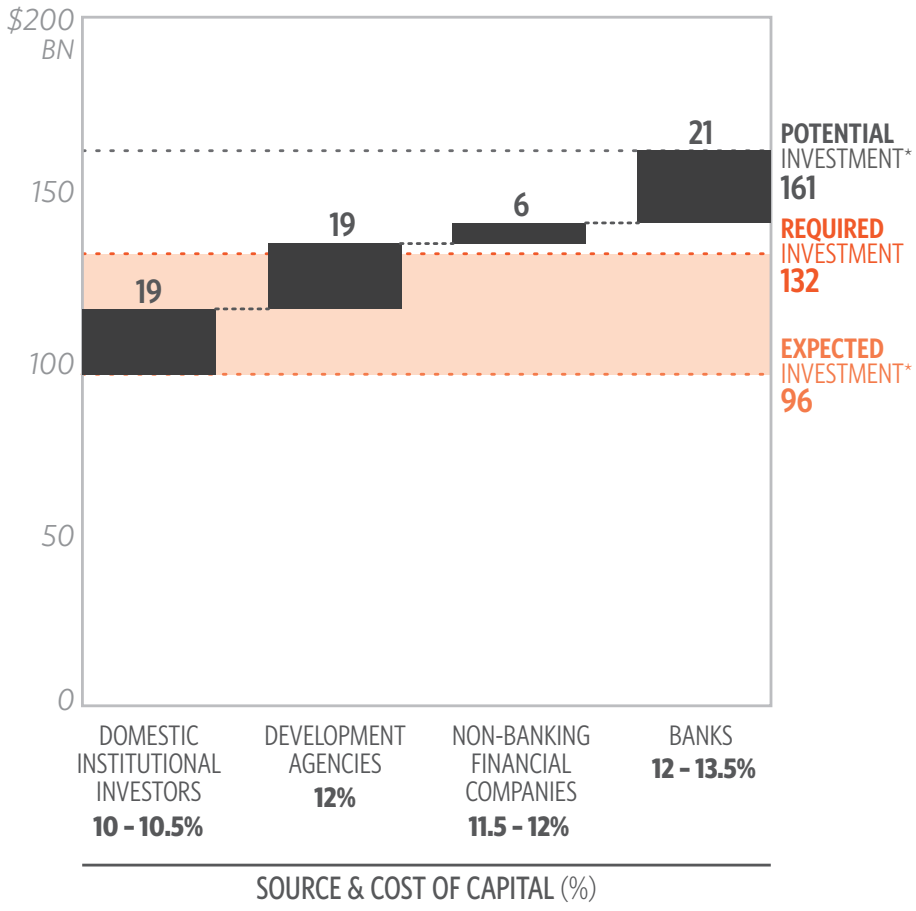
However, domestic institutional investors are facing certain barriers that are impeding investment, particularly the low credit rating of renewable energy projects. These barriers are discussed more in Section 4.1.

3.4.2 FOREIGN INSTITUTIONAL INVESTORS

Foreign institutional investors have the ability to fill 100% of the equity financing gap of $17 billion.

Similarly to the debt financing gap, filling the equity financing gap with the most cost-effective option – investment with the lowest cost of capital – is important. However, while equity from the government may be the most cost-effective option, the government's overall ability to provide equity is limited due to other competing development priorities. Similarly, private investors, with a slightly higher cost of equity, also have a limited ability to fill the equity financing gap, as most of their investment potential is already in use.

Figure 9: Investors' abilities to fill the debt financing gap, based on their cost of capital and potential investment amount

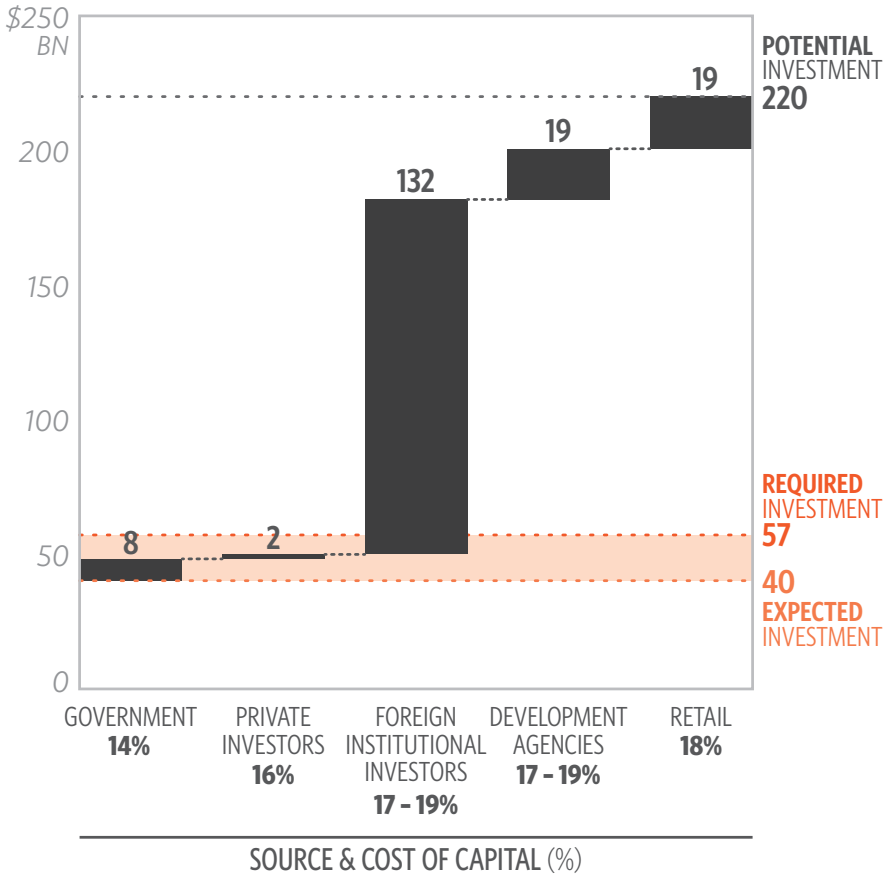


*Adjusted to relfect decreased expected investment from Banks after exposure limit is reached

Even though the cost of equity is higher from foreign institutional investors, they have the ability to completely fill the equity financing gap, given that their investment potential of $132 billion is mostly unutilized. Further, their high cost of equity can be reduced through certain financial instruments, such as a currency hedging mechanism (explained further in Section 5).

However, similarly to domestic institutional investors, foreign institutional investors are facing certain barriers that have impeded investment, especially currency risk and policy uncertainty. There is a need to address these barriers to enable foreign institutional investors to provide the equity required to meet the 2022 renewable energy targets. We've examined these barriers, as well as the barriers facing domestic institutional investors, in the next section.

Figure 10: Investors' abilities to fill the equity financing gap, based on their cost of capital and potential investment amount



4. Barriers to Institutional Investment in Renewable Energy

Investment in renewable energy from institutional investors remains seriously constrained by certain barriers.

In order to utilize the full potential of institutional investors to finance India's renewable energy targets, it's important to first understand their barriers to investment. In this section, we've examined and prioritized the barriers facing foreign institutional investors, who have the most potential to fill the debt financing gap and domestic institutional investors, who have the most potential to fill the equity financing gap.

In order to indicate the significance of the various barriers, we have prioritized the barriers according to their severity level, using a ranking system of 1 to 5, with 1 being the most severe. We ranked the top five most severe barriers for each investor category, shown in Table 2.

We have also categorized the investment barriers as binary or non-binary. Binary barriers directly affect the investor's decision on whether or not to invest, whereas non-binary barriers, while still significant, are typically matters of a risk/return trade-off.

Our methodology is based on interviews with domestic and foreign investors, in which we requested the participants to rank the barriers in order of their severity level.[9] We used a modified Borda count method to prioritize the barriers – a preferred voting procedure in which a barrier is identified by the highest average preference score.

Table 2: Ranking of investment barriers by investor class

BARRIER	FOREIGN INSTITUTIONAL INVESTORS	DOMESTIC INSTITUTIONAL INVESTORS
OFF-TAKER RISK	**1**	
LACK OF TRANSMISSION EVACUATION INFRASTRUCTURE	**2**	
CURRENCY RISK	**3**	
REGULATORY/POLICY RISK	**4**	**5**
UNFAVORABLE RETURN EXPECTATIONS	**5**	
LIMITED UNDERSTANDING OF THE RENEWABLE ENERGY SECTOR		**1**
LACK OF INTERMEDIARIES		**2**
LACK OF LIQUID INSTRUMENTS TO INVEST IN RENEWABLE ENERGY		**3**
LOW CREDIT RATING OF OPERATIONAL ASSETS		**4**

9 The sample size for the domestic investors and the foreign investors we interviewed is 42 and 9 respectively. The investor categories comprised domestic institutional investors, foreign institutional investors, domestic (public and private) sector banks, foreign banks, domestic and foreign independent power producers, retail investors et. al.

4.1 Barriers facing foreign institutional investors

Foreign institutional investors – OECD investment funds, insurance companies, and pension funds – have the ability to completely fill the debt financing gap for India's renewable energy targets, but first certain barriers need to be addressed. Table 3 shows the most significant barriers facing foreign institutional investors, in order of priority:

Off-taker risk and lack of transmission evacuation infrastructure are the two most significant barriers impeding foreign institutional investment.

Both of these barriers are binary, meaning they directly affect foreign institutional investors' decisions on whether or not to invest.

Off-taker risk

An off-take agreement is a power purchase agreement between a producer and buyer (or off-taker) of power, typically negotiated prior to construction of a project, that guarantees that the buyer will purchase a certain amount of electricity. This makes it easier for the producer to secure financing. Off-taker risk is the risk that the buyer/off-taker will not fulfill its contractual obligations and will make delayed or incomplete payments.

Table 3: Barriers facing foreign institutional investors, in order of significance

BARRIER	RANKING	BINARY OR NON-BINARY
OFF-TAKER RISK	**1**	BINARY
LACK OF TRANSMISSION EVACUATION INFRASTRUCTURE	**2**	BINARY
CURRENCY RISK	**3**	NON-BINARY
REGULATORY / POLICY RISK	**4**	NON-BINARY
UNFAVORABLE RETURN EXPECTATIONS	**5**	NON-BINARY

*Ranked on a scale of 1 to 5, with 1 being the most severe

Off-taker risk is a major issue in India, where the primary off-takers are the state-level public sector distribution companies, DISCOMs. Because DISCOMs are in a poor financial state, there is a high risk of them being unable to make timely payments for power procured. As of 2014, state-level DISCOMs held debt in excess of INR 3.04 trillion and had accumulated losses of INR 2.52 trillion. Off-taker risk increases the overall risk of a renewable energy project. Because foreign institutional investors look for investments with steady returns and low risk, addressing off-taker risk will be key to enabling more foreign institutional investment.

There are several short-term solutions to manage off-taker risk, which we discuss in Section 5. However, ultimately, addressing off-taker risk will require long-term financial structural fixes for DISCOMs, some of which are currently under consideration (CPI, 2016b).

Lack of transmission evacuation infrastructure

The lack of proper transmission evacuation infrastructure – which is the infrastructure required to transmit power from generation to distribution, and the time taken to get clearances and permits to build and operate transmission evacuation infrastructure – is another serious barrier to investment for foreign institutional investors. Delays in getting clearances and permits can add onto project construction time, which results in delayed commissioning of the project and delayed revenues. This directly increases the risks for foreign institutional investors and compromises the steady returns that they require.

The pace of development of evacuation infrastructure has not kept up with renewable energy capacity addition in the past few years, resulting in delayed commissioning of renewable energy projects, congestion, and stranded generation assets. This is corroborated by the fact that power generation capacity grew around 50% in the last five years, whereas transmission capacity increased by just about 30% (FICCI, 2013).

Currency risk, regulatory and policy risks, and unfavorable return expectations are the non-binary barriers to foreign institutional investment. This means these barriers don't directly affect decisions to invest, but do affect investors' returns.

Currency risk

Currency risk is the risk of loss from unexpected and volatile fluctuations in foreign exchange rates, when a foreign investor has exposure to foreign currency or in foreign-currency-traded investments. Currency risk is the most significant non-binary risk facing foreign institutional investors. When a renewable energy project is financed by a foreign loan, it requires a currency hedge to protect against currency risk. Market-based currency hedging in India is expensive, adding approximately 7 percentage points (CPI, 2015) to the cost of debt. This makes fully-hedged foreign debt nearly as expensive as domestic debt, and renders investments from foreign investors, including institutional investors, less competitive when compared to domestic investment.

Regulatory and policy risks

A stable policy regime is critical for sustained investment in the renewable energy sector. Frequent changes in policies have resulted in sharp fluctuations in renewable energy capacity addition in India in the past. Uncertainty around the continuity and amount of certain government incentives, including an accelerated depreciation benefit, a generation-based incentive, and waving off the transmission charges for solar energy, are some examples of the regulatory risks. The poor implementation of net metering[10] and variability in net metering policies across states adds to regulatory and policy risk. Regulatory and policy risk increases foreign institutional investors' perception of the risk involved in investing in renewable energy in India, resulting in decreased investment and/or increased cost of finance.

Unfavourable return expectations

Our primary research suggests that renewable energy projects are not able to meet the risk-return expectations of investors, and especially so for foreign institutional investors. Because the risks for renewable energy projects in India are relatively high, the returns need to be equally high. The returns offered by renewable energy projects are do not compensate for the risks involved, and the returns have further reduced predominantly for solar power projects because of very aggressive competitive bidding during recent times. The solar bids involving tariffs of as low as INR 4.34 ($0.06) per kWh have further worsened the case for foreign institutional investors interested in renewable energy projects (Business Line, 2016). Investors are sceptical about the level of returns they would be able to generate from such low solar tariffs. The lowered returns resulting from lower solar tariffs are not able to meet the return expectations of foreign institutional investors, which is 19% or higher as shown in Figure 10.

Currency hedging protects foreign institutional investors against currency volatility but pushes up the cost of foreign institutional capital resulting in higher cost of financing. Since the cost for foreign institutional capital is high, so are their return expectations. One way to overcome this barrier is through instruments that can reduce currency hedging costs, thereby reducing the cost of foreign institutional capital.

4.2 Barriers facing domestic institutional investors

Domestic institutional investors – domestic insurance companies and pension funds – have the ability to fill more than half of the equity financing gap for India's renewable energy targets, but first certain barriers to investment need to be addressed. Table 4 shows the most significant barriers facing domestic institutional investors, in order of priority:

Table 4: Barriers facing domestic institutional investors, in order of significance

BARRIER	RANKING	BINARY OR NON-BINARY
LIMITED UNDERSTANDING OF THE RENEWABLE ENERGY SECTOR	1	BINARY
LACK OF INTERMEDIARIES	2	BINARY
LACK OF LIQUID INSTRUMENTS TO INVEST IN RENEWABLE ENERGY	3	NON-BINARY
LOW CREDIT RATING OF OPERATIONAL ASSETS	4	NON-BINARY
REGULATORY/POLICY RISKS	5	NON-BINARY

*Ranked on a scale of 1 to 5, with 1 being the most severe

10 Net metering is a billing mechanism that credits solar energy system owners for the electricity they add to the grid. Net metering allows residential and commercial customers who generate their own electricity from solar power to feed electricity they do not use back into the grid (SEIA).

The most significant barriers facing domestic institutional investors are a limited understanding of the renewable energy sector and a lack of intermediaries.

These are both binary barriers, meaning they directly affect domestic institutional investors' decisions on whether or not to invest.

These barriers are binary, meaning they directly affect domestic institutional investors' decisions on whether or not to invest in renewable energy.

Limited understanding of the renewable energy sector

Domestic institutional investors essentially make liability-driven investments, meaning they avoid riskier investments. Their line of investments is traditionally in securities and other financial assets that are more liquid and less risky. The renewable energy sector falls is outside of their typical investments, and domestic institutional investors do not fully understand the Indian renewable energy market, causing them to be reluctant to invest. Additionally, a lack of sufficient liquid investment instruments for renewable energy and the low credit rating of operational assets (both explained further below) add to their limited exposure to the renewable energy sector. They look for liquid investments that have a credit rating of AA or higher which is a rarity for Indian renewable energy projects.

Lack of intermediaries

There is a lack of financial intermediaries for investments in the renewable energy sector. The role of intermediaries is to provide first-hand information about risk mitigation measures and investment opportunities in the renewable energy market to the investors. Domestic institutional investors find it difficult to invest in the sector because they don't have adequate information, resulting from a lack of financial intermediaries to inform their investment.

A lack of liquid instruments to invest in renewable energy, the low credit rating of operational assets, and regulatory and policy risks are the non-binary barriers to domestic institutional investment.

This means these barriers don't directly affect decisions to invest, but do affect investors' returns.

Lack of liquid instruments to invest in renewable energy

Domestic institutional investors prefer to invest in liquid assets with stable returns as their investments are liability-driven. There is a lack of liquid instruments for investing in renewable energy projects, as indicated by our primary research. There is a need for pooled investment vehicles to enable domestic institutional investment in the renewable energy sector.

Low credit rating of operational renewable energy assets

Domestic institutional investors require operational assets with stable cash flows and that have a credit rating of AA or higher, as per their investment criteria. Our research indicates that operational renewable energy assets are typically rated BBB or below, falling below their investment standards. While they generate stable cash flows, the operational renewable energy assets do not meet the credit rating criteria needed to attract investments from domestic institutional investors. There is therefore a need for pooled investment vehicles that can enhance the debt credit rating for operational renewable energy projects.

Regulatory and policy risks

Inconsistent policies between the central and state levels of government have created uncertainty around India's policy regime. A stable policy regime is critical for sustained investment in the renewable energy sector. Similarly to foreign institutional investors (Section 4.1), regulatory and policy risk increases domestic institutional investors' perception of the risk involved in investing in renewable energy, resulting in decreased investment and/or increased cost of finance.

4.3 Additional barriers facing all domestic investors

In addition to the barriers discussed above, there are several other significant barriers facing domestic institutional investors, which are shared with all domestic investors in India. These are land acquisition issues, which is a binary barrier, and curtailment issues, which is non-binary. While the barriers described in Section 4.2 are more significant for domestic institutional investors, they are also likely to be affected by land acquisition issues and curtailment risk, given that they affect all domestic investors in India.

Land acquisition and securitization issues

Issues that delay the securitization of land for renewable energy projects are a significant barrier to investment. The crux of this matter lies with the way land is owned in India. Most of land that is used for renewable energy projects is in rural areas and owned by undivided families that have multiple stake-owners. While project developers want to deal with as few land owners as possible, multiple stake-owners make the acquisition and transfer of land complex, which makes securitization a lengthy and costly process.

Many investors become wary of such challenges and hesitate on investment decisions. Those who do decide to invest have to accommodate the cost of delays into their project cash flows, thereby raising the overall cost of capital. Even traditional lenders like banks and financial institutions realize the effect of delays on project cash flows and therefore the profitability. This makes them consider investments in renewable energy projects to be riskier propositions and therefore lend at higher rates.

Curtailment risk

Curtailment risk is the risk of reducing power generation at a facility below what it is capable of producing, and is a significant risk facing operational wind and solar projects. Wind developers especially have been facing curtailment risk due to backing down instructions[11] passed by state load dispatch centers during high wind seasons, which has resulted in generated power that's been stranded and not consumed. This has also happened with solar installations when they have received backing down instructions. Stranded power decreases the profitability of solar and wind facilities, making them a riskier investment. This is exacerbated by the fact that state DISCOMs have been unwilling to sign power purchase agreements (PPAs) or have delayed the execution of PPAs, rendering renewable energy investments even riskier.

11 In the high wind season the wind produces energy which at times is more than the requirement of the grid, and therefore the wind energy generators are asked by the state load dispatch centres to back down generation, which goes against the must run status accorded to renewable energy by regulations in India.

5. Solutions to Enable Institutional Investment in the Renewable Energy Sector

In order to mobilize more institutional investment towards meeting India's renewable energy targets, there is a need to address the barriers explained in Section 4 through appropriate solutions. There are three areas of work for developing solutions to enable institutional investment:

1. Develop a business case to present to institutional investors, which increases their understanding of and interest in investing in renewable energy
2. Financial instruments which are a better match with the needs of institutional investors, and which are supported by the Indian government
3. Additional policy solutions to remove barriers to investment.

In this section, we've begun by explaining the need to develop a business case for institutional investment in renewable energy. We've then examined potential finance and policy solutions and have prioritized them based on the barriers they address, their impact on the cost of capital, and their feasibility of implementation.

Table 5 maps the various solutions for addressing the barriers facing institutional investors.

Table 5: Solutions to address the barriers

BARRIERS	SOLUTION 1	SOLUTION 2 : FINANCIAL INSTRUMENTS				SOLUTION 3 : POLICY SOLUTIONS			
	BUILD A BUSINESS CASE FOR RENEWABLE ENERGY	PAYMENT SECURITY MECHANISM	FOREIGN EXCHANGE HEDGING FACILITY	INFRASTRUCTURE DEBT FUND – NON-BANKING FINANCIAL COMPANY	PARTIAL CREDIT GUARANTEES	BUILD ADEQUATE TRANSMISSION CAPACITY	CREATE CONSISTENT POLICIES BETWEEN THE CENTRAL AND STATE LEVELS	FACILITY EASIER LAND ACQUISITION	PROVIDE INTERMEDIARIES TO INCREASE ACCESS TO INFORMATION
LIMITED UNDERSTANDING OF THE RENEWABLE ENERGY SECTOR	✔								
OFF-TAKER RISK		✔							
CURRENCY RISK			✔						
LACK OF INTERMEDIARIES				✔					✔
LACK OF LIQUID INSTRUMENTS TO INVEST IN RENEWABLE ENERGY				✔	✔				
LOW RATING OF OPERATIONAL ASSETS				✔	✔				
LACK OF TRANSMISSION EVACUATION INFRASTRUCTURE						✔			
REGULATORY/ POLICY RISK							✔		
LAND ACQUISITION								✔	
CURTAILMENT ISSUES						✔			

5.1 Developing a business case to attract institutional investment in renewable energy

Institutional investors have little exposure to the renewable energy sector, since their investment decisions are driven by their liability-driven investment philosophy – meaning they traditionally invest in financial assets that are liquid and low risk. Renewable energy falls outside of their typical investments, and does not have many liquid investment options. Because their exposure to and understanding of the renewable energy sector is limited, they are reluctant to invest.

There is a need to increase institutional investors' understanding of and familiarity with the renewable energy sector as a viable investment option. **One potentially significant solution for this is to develop a business case which would demonstrate the benefits of institutional investment in renewable energy and would provide institutional investors with the information required to help them make informed investment decisions in renewable energy.**

The business case could include designing appropriate asset allocation models for institutional investors that are a good match with their preferred risk-return profiles, as well as designing pooled investment vehicles that could address the investment barriers facing institutional investors, like infrastructure investment trust (INvITs), infrastructure debt funds and partial credit guarantees.

Developing a business case for investment in renewable energy in India would demonstrate that renewable energy is a viable option for institutional investors.

Developing a business case for institutional investment in renewable energy is an overarching solution to enabling more investment, and CPI plans to do this for future work. There are also specific financial instruments and policy changes to address the most significant barriers to investment, discussed in the next two sections.

5.2 Financial instruments

There are several promising financial instruments that offer solutions to overcoming some of the most significant barriers that restrict institutional investment in renewable energy. Table 6 lists the financial instruments that demonstrate the most potential to enable institutional investment, based on the significance of the barrier they address and their impact on the cost of financing.

Table 6: Financial instruments that demonstrate the most potential to enable institutional investment

FINANCIAL SOLUTION	BARRIER	IMPACT ON COST OF FINANCING
PAYMENT SECURITY MECHANISM	OFF-TAKER RISK	100 BASIS POINTS
FOREIGN EXCHANGE HEDGING MECHANISM	CURRENCY RISK	350 BASIS POINTS
INFRASTRUCTURE DEBT FUND – NON-BANKING FINANCIAL COMPANY (IDF-NBFC)	LACK OF LIQUID INSTRUMENTS TO INVEST IN RENEWABLE ENERGY; LOW CREDIT RATING OF OPERATIONAL ASSETS	300 BASIS POINTS
PARTIAL CREDIT GUARANTEES	LACK OF LIQUID INSTRUMENTS TO INVEST IN RENEWABLE ENERGY; LOW CREDIT RATING OF OPERATIONAL ASSETS	190 BASIS POINTS

Source: CPI (2015, 2014)

5.2.1 A PAYMENT SECURITY MECHANISM TO ADDRESS OFF-TAKER RISK

A payment security mechanism could mitigate the most significant risk facing foreign institutional investors, off-taker risk, in the near term of the next two to five years.

Ultimately, the long-term solution for addressing off-taker risk lies in better management of the financial problems of DISCOMs, including reducing the commercial and technical losses, improving the billing

and collection efficiency, and restructuring the existing losses of DISCOMs. But a more transparent payment security mechanism offers a short-term solution.

In the short-term, a payment security mechanism may be needed to address investor concerns around off-taker risk. It is a government-sponsored standalone fund which provides assurance to the investors that payments under power purchase agreements are made on time. It would essentially provide a guarantee against the delays in payments by DISCOMs, thus mitigating off-taker risk and building investors' confidence. Our primary research has shown that a payment security mechanism has the potential of reducing the cost of finance by 100 basis points (CPI, 2016b).

A payment security mechanism was offered for grid-connected solar power projects under Jawaharlal Nehru National Solar Mission (JNNSM) Phase I, launched in 2011-12, and Phase II, launched in 2012-13. In Phase I, the fund size under the payment security mechanism was estimated to be $71 million, where as in phase II this size was $25 million. Recently, a new payment security fund of INR 15 billion has been set up by the Indian government to provide comfort for solar projects.[12]

While setting up a payment security mechanism was a good move to attract investors, specifically foreign investors, the impact of a payment security mechanism is less clear, due to a lack of transparency around the frameworks of Payment security mechanisms, resulting in an inability to assess adequate risk coverage (CPI, 2016b). This may have led to the apparent lack of interest by foreign investors.

In order for a payment security mechanism to be taken up by foreign investors, it would need to demonstrate that it can adequately cover the risk of delayed payments.

An examination of the adequacy of existing payment security mechanisms is not easily possible because the frameworks for these mechanisms are not publicly available (CPI, 2016b). Thus, there is a need for the Indian government to develop a more transparent framework for a payment security mechanism, which can not only use government funds more effectively but also demonstrate adequate risk coverage.

As a starting point, CPI developed a potential framework and applied it to an existing payment security mechanism in order to assess its adequacy in risk coverage (CPI, 2016). This framework used elements of credit and financial guarantees, and using DISCOM financial data corresponding to JNNSM Phase 2, Batch 1, showed that the required size of the payment security mechanism would be INR 4.16 billion; this would be almost three times of the size of the fund actually used by the government, indicating that the existing payment security mechanism may not have been adequate in covering the risk of delayed payment from DISCOMs.

5.2.2 A FOREIGN EXCHANGE HEDGING FACILITY TO ADDRESS CURRENCY RISK

A government-sponsored foreign exchange hedging facility could mitigate currency risk and lower hedging costs.

The cost of capital for foreign investors is relatively high due to high associated currency risk, including the expensive cost of currency hedging. The cost of hedging currency is very high (7 percentage points or higher) in India, adding to the cost of foreign debt and making foreign capital less attractive when compared with domestic capital (CPI, 2015).

The Indian government could bear currency risk and provide currency hedging to lower the financing cost. The Indian government has shown interest in setting up a government-sponsored foreign exchange hedging facility. However, the design of the facility can be a large undertaking that has to be well-thought-out, given that currency movements can be uncertain and volatile.

A government-sponsored foreign exchange hedging facility can enable greater control over risk exposure and reduce the hedging cost by nearly 50%.

The government can provide project developers or state DISCOMs protection from currency risks through a standalone fund. The fund would provide hedging for expected currency depreciation and unexpected and extreme currency depreciation. Our research has shown that a government-sponsored foreign exchange hedging facility has the potential of reducing the cost of finance by 350 basis points (CPI, 2015).

However, the government should also be aware of the risk exposure of the foreign exchange hedging facility, which may require large capital buffers.

12 See http://indianexpress.com/article/india/india-news-india/govt-to-set-up-rs-1-5k-crore-payment-security-fund-for-solar-projects-3000234/

The hedging facility would enable a greater control over risk exposure and risk assessment than hedging in the market (CPI, 2015). One way to protect the foreign exchange facility from defaulting is to use a capital buffer, or a reserve. However, the size of this buffer could be large; for example, to achieve India's sovereign rating (a target of foreign investors), the required capital buffer could be approximately 30% of the underlying loan amount.

5.2.3 AN INFRASTRUCTURE DEBT FUND TO PROVIDE MORE LIQUIDITY

Infrastructure debt funds can enable institutional investment in the renewable energy sector by providing a more liquid investment option.

Infrastructure debt funds (IDFs) are a promising instrument to enable institutional investment in renewable energy projects. IDFs are pooled investment vehicles designed to facilitate investment across infrastructure sectors such as roads, ports, and energy. IDFs have the potential to reduce the cost of financing by 300 basis points (CPI, 2014).

In this paper, we focus on infrastructure debt funds sponsored by non-banking financial companies (NBFCs), also known as IDF-NBFCs, given their focus on refinancing debt of infrastructure companies, which matches the risk-return profile of institutional investors. Investors can invest in infrastructure projects by subscribing to units and bonds issued by IDFs.

As of 2016, infrastructure debt funds have been offered by IDFC, L&T, and India ICICI Bank, with total consolidated assets under management of around $880 million (Economic Times, 2016). These funds typically own all infrastructure assets, including renewable energy projects.

Regulatory/policy support is necessary for development of IDFs and, in particular, pure play renewable energy IDFs.[13]

The Reserve Bank of India initially allowed IDF-NBFCs to invest in only public-private partnership projects in presence of a three-way agreement among the IDF, the project developer and a government authority. These agreements are typically automatically present in road and port projects but not in power projects;[14] thus discouraging IDF-NBFCs to invest in power projects. The Reserve Bank of India later removed the requirement for the three-way agreement, making it simpler for these funds to invest even in power projects.

While this is a good development, the high risks (especially off-taker risk) associated with renewable energy projects can still hamper development of pure play infrastructure debt funds in renewable energy. These pure play renewable energy debt funds may be necessary to achieve the fullest potential for institutional investment in renewable energy.

We propose that a requirement for financing under a pure play renewable energy IDF-NBFC would be an explicit three-way agreement which specifies the sharing of risks among the project developer, the IDF-NBFC, and a government-backed project authority, such as the Solar Energy Corporation of India. This would allow the IDF-NBFC to refinance the project's debt subject to a specified limit; more importantly, in the event of a default, this agreement will provide a buy-out guarantee from the project authority to the IDF-NBFC.

5.2.4 PARTIAL CREDIT GAURANTEES TO INCREASE CREDIT RATINGS

Partial credit guarantees can improve the credit rating of the debt of operational renewable energy projects, and make them attractive to institutional investors (CPI, 2014).

A partial credit guarantee is a form of credit enhancement wherein the borrower's debt obligations are guaranteed by a guarantor with a strong credit rating. In CPI (2014), we found that, depending on the structure of the guarantee, the potential reduction in the cost of debt is up to 190 basis points and the estimated increase in tenor is by up to five years.

Partial credit guarantees may be able to raise the credit rating of refinanced renewable energy project debt to the required (AA or higher) level required by domestic institutional investors, thereby creating an investable asset class for domestic institutional investors. Partial credit guarantees can thus be effective in mobilizing debt.

There is already an institutional framework for implementing partial credit guarantees in India.[15] Further, there is precedence of provision of such guarantees by IIFCL. It is estimated that a total credit

13 We provide a brief description here. We refer the reader to Appendix 7.3 for further reading.

14 The project authority is generally an AAA rated government owned entity such as the National Highways Authority of India for road projects or a port authority for port projects.

15 See https://www.rbi.org.in/scripts/FS_Speeches.aspx?Id=980&fn=6

enhancement of $290 million in the form of partial credit guarantees has been raised for renewable energy projects in India (Business Standard, 2016).

Partial credit guarantees face many barriers that can be resolved with appropriate regulatory/policy intervention.

First, the market does not differentiate between construction loans and capital expenditure loans; however there is no construction finance facility available. This reduces the incentives of banks for allow potentially cheaper refinancing. A potential solution is the creation of a construction finance market by public sector banks.

Second, regulations require that domestic institutional investors' exposure be limited to 25% of the project company's net worth. This results in an implicit requirement of participation by a large number of institutional investors, which is hard given the small number of domestic institutional investors. A potential solution is to change the regulation to 25% of the project company's total worth.

In addition to the major barriers above, partial credit guarantees face multiple minor barriers, each of which may require regulatory/policy fixes:[16]

- The market does not price the cost of bank debt efficiently compared to bond markets.
- The Indian bond market lacks liquidity, which limits exit options for investors.
- Investors are not confident about partial credit enhancements' ability to address the risks surrounding the Indian power sector.
- The Reserve Bank of India limits credit enhancement to a maximum of two notches or 20% of the refinanced project debt, whichever is lower. However, in many cases, more than 20% of credit enhancement may be required.

5.3 Policy solutions

In addition to the financial solutions listed above, there are also several policy solutions which could help mitigate the barriers facing institutional investors.

16 Refer to Appendix 7.4 for further reading

5.3.1 BUILD ADEQUATE TRANSMISSION CAPACITY

As explained in Section 4, the lack of proper transmission evacuation infrastructure, which is the infrastructure required to transmit power from generation to distribution, and the time taken to get clearances and permits to build and operate transmission evacuation infrastructure is another serious barrier to investment for foreign institutional investors. Delays in getting clearances and permits can add onto project construction time, which results in delayed commissioning of the project and delayed revenues. This directly increases the risks for foreign institutional investors and compromises the steady returns that they require.

There is a need for the government to plan and build adequate transmission capacity to ensure that there is no shortage of transmission capacity to accommodate renewable energy generation. Adequate transmission capacity would enable better integration of renewable energy into the transmission grid on a large scale, and would enable all renewable energy generation to be utilized, so that the must run status of renewable energy projects is not compromised, thereby eliminating the effects of curtailment on project profitability.[17]

5.3.2 CREATE CONSISTENT POLICY AND REGULATORY PROVISIONS BETWEEN THE CENTRAL AND STATE LEVELS

A stable policy regime is critical for sustained investment in the renewable energy sector. Inconsistent policies and regulations at the central and state level can impede investment from both foreign and domestic institutional investors. The central government is responsible for creating policies and promulgating regulations that can be adopted at the state level. However, as electricity generation is governed by both central and state government, the states are also empowered to make policies and pass regulations for renewable energy.

State-level governments do not always follow the intent of the central government, and this can often lead to an incoherent and confusing policy and regulatory environment for investors.

17 MNRE has requested that all regulators enable clear regulations to support the must run status of solar power projects. Must run status allows all the energy produced from renewable energy projects, including solar power, to be consumed by the grid - which means that adequate transmission and inter-connection facilities have to be made available to renewable energy projects at all times.

Such instances exemplify the poor state of affairs for renewable energy developers' especially foreign institutional investors who examine very closely the policy and regulatory environment while making their investment decisions. A roadmap that can bridge the gap between the center and states will bring in more transparency and encourage foreign investors, and other investors, to enter the renewable energy sector. This will increase in inflow of capital for renewable energy development in India.

5.3.3 FACILITATE EASIER LAND ACQUISITION

As explained earlier, issues in acquiring land for renewable energy projects has led to delays in project cash flows and an increased cost of capital, making investment in renewable energy riskier.

This problem cannot be solved just by the Land Acquisition Act[18] or by having a single agency through which to obtain all the necessary permits and clearances for land acquisition. The government should consider a series of secondary reforms that are specific to the needs of the renewable energy sector, which aim at reducing projects delays and thereby increase investors' confidence. As one suggestion, the government can take the lead on developing a model framework for acquisition of land specifically for renewable energy projects.

5.3.4 PROVIDE INTERMEDIARIES TO INCREASE ACCESS TO INFORMATION

Increasing institutional investors' understanding of the renewable energy sector and their access to information will motivate foreign as well as domestic institutional investors to invest in the renewable energy sector. Intermediaries can increase transparency by providing first-hand information about the renewable energy market and its prospects in India. Domestic institutional investors can have the option of investing either directly into projects or through an intermediary (CPI, 2013). Intermediaries can be investment managers, private equity funds, infrastructure funds, and other pooled investment vehicles.

Intermediaries can play a critical role in educating these institutional investors and help them make informed decisions in order to drive more investment, including by informing investors of relevant policy changes that may affect their investments.

18 The Land Acquisition Act of 2013 regulates how the union or a state government in India acquires private land for the purpose of industrialization, development of infrastructural facilities or urbanization of the private land, and provides compensation to the affected land owners and their rehabilitation and resettlement.

6. Conclusion

Meeting India's ambitious renewable energy targets of 175 GW by 2022 will require $189 billion in financing. The total amount of investment that is potentially available for renewable energy is $411 billion – more than double the amount of investment required to meet the renewable energy targets by 2022. However, the total amount of expected investment is $166 billion, falling short of the $189 billion required to meet the targets.

Both foreign and domestic institutional investors have significant potential to provide more investment to meet India's 2022 renewable energy targets. Foreign institutional investors have the potential to completely close the gap between the amount of investment expected and the amount required for equity financing, and domestic institutional investors have the potential to fill more than half the gap for debt financing. However, both foreign and domestic institutional investors are facing significant barriers to investment, which have impeded their contribution so far.

The most significant barriers facing foreign institutional investors are off-taker risk, a lack of transmission evacuation infrastructure, and currency risk. The most significant barriers facing domestic institutional investors are a limited understanding of the renewable energy sector, a lack of intermediaries, and a lack of liquid investment instruments for renewable energy.

The financial instrument solutions that have the highest potential to mitigate these risks cost-effectively include a payment security mechanism to address off-taker risk, a foreign exchange hedging facility to address currency risk, and infrastructure debt funds and partial credit guarantees to enhance the credit rating of renewable energy projects.

Policy solutions include facilitating easier land acquisition, building adequate transmission capacity, developing better grid management systems for ensuring the smooth integration of renewable energy, and creating consistent regulations of renewable energy between the central and state levels of government.

Most importantly though, overall we found that because institutional investors have limited exposure to and understanding of the renewable energy sector, they are reluctant to invest. To address this, there is a need to increase institutional investors' understanding of and familiarity with the renewable energy sector as a viable investment option, by developing a business case which would demonstrate the benefits of institutional investment in renewable energy and would provide institutional investors with the information required to help them make informed investment decisions in renewable energy.

We plan to develop this business case as an area of future work. Our future research will build on our initial assessment of the investment potential and expected investment of institutional investors, and look into designing appropriate asset allocation models for them, keeping in mind their preferred risk-return profiles.

We will also examine the possible structure and characteristics of financing instruments proposed in this report, focusing on the optimal design to overcome the investment barriers facing institutional investors. We also plan to examine in greater detail the policy solutions proposed in this report, and the best implementation pathway for them to attract more investment.

7. Appendix

7.1 Potential investment

We have estimated the investment potential using different methodologies, based on publically available data and primary research interviews. We have used the following methodologies for estimating the investment potential for the various investor classes considered for our analysis:

Government:

The maximum investment potential of central and state government-owned enterprises works out to be $21.02 billion.

We have assessed the equity investment potential of the central and state government-owned enterprises. Using data on the capacity addition targets for government owned-enterprises from the 12th Five Year Plan (Planning Commission, 2012a), across all technologies from 2003 to 2015, we have computed the compounded annual growth rate (CAGR) and then used it to project the capacity addition targets till 2022. We have relied on the Five Year Plan documents as the most realistic commitment level from the government on its potential of adding generation capacity, as these numbers are a result of surveys that are conducted by the government while deciding and presenting the numbers in the Five Year Plan documents. The investment potential during 2016 to 2022 was computed using a capital expenditure cost of INR 50 million/ MW (CERC, 2012) considering on the benchmark hard cost for as provided by Central Electricity Regulatory Commission. This is justified considering that during 2016 to 2022 most of the capacity addition would be on a competitive basis, as we have seen for last few years. We have further assumed the capital structure of power generation projects using a 70:30 debt to equity ratio based on Central Electricity Regulatory Commission norms (CERC, 2014). To arrive at the present value of the equity investment potential derived, we have used the weighted average cost of capital (WACC) as the discounting factor.

Private sector:

The latest few Five Year Plans show that the share of the private sector in capacity expansion was substantially high in the Eleventh Plan, at 33% of the total incremental capacity will come from the private sector. In the Twelfth Plan, this share is expected to increase further to about 50%. This means that the private sector will have to play an increasing role in adding generation capacity. For estimating potential and expected investment from the private sector, we have subcategorized it into 3 categories.

Group companies are entities that have multiple, unrelated businesses that al cover the power generation business. This includes groups like Tata Group, Reliance Group, GVK Group, Adani Group, GMR Group, Torrent Group etc. that are active in the power generation business.

Domestic IPPs (pure-play companies) are independent power producers (IPP) that are not public utility owned by domestic investors, but that own facilities to generate electricity for sale to distribution utilities and end users. IPPs may be privately held facilities, corporations, and cooperatives such as Hero Future Energy, Mytrah Energy, ACME Solar, Azure Power, CLP India.

Foreign IPPs (pure-play companies) are independent power producers (IPP) which are not public utility owned by foreign investors, but that own facilities to generate electricity for sale to distribution utilities and end users. Foreign IPP examples include Enel Energy, SunEdison, Fortum Energy etc.

Similar to the government, we estimated the investment potential for the private sector based on the commitments provided in the Five Year Plan documents and renewable generation obligation respectively. The investment potential for the private sector is $18.91 billion.

Domestic institutional investors:

In order to estimate the maximum amount that domestic institutional investors would be able to invest in renewable energy projects, or what we refer to as domestic institutional investor technical potential, we looked at their past investment patterns to forecast expected growth in their investments. We estimated the domestic institutional investor technical potential over 2014 to 2016 by analyzing four classes of domestic institutional investors and their cumulative investments, also known as assets under management:

Life insurance companies: Currently, there are 24 life insurance companies in India. As of March 2013, life insurance companies had assets under management of $234 billion.[19] General insurance companies: There are 28 general (non-life) insurance companies. As of March 2013, general insurance companies had assets under management of $21 billion. National Pension System: The Government of India started the National Pension System as a contribution scheme for all citizens from January 2009. As of March 2014, the National Pension System has assets under management of $8 billion. Employees' Provident Fund: The Employees' Provident Fund Organization manages a provident fund, pension, and insurance scheme for employees. As of March 2013, the Fund has assets under management of $79 billion.

The data for total assets under management (AUM) for domestic institutional investor is taken from IRDA annual report (IRDAI annual reports) for financial year 2014. Non-life insurance companies are excluded from this assets under management data as they need their investments to be highly liquid and they can't make illiquid investments and hence these companies have been excluded from further analysis. Smaller companies under the life insurance category that have assets under management below INR 50,000 crore are excluded because they may have the internal capabilities to handle the transactions while investing in the renewable energy sector. Further, IRDA Regulations (IRDAI, 2013) suggest that domestic institutional investor s need to invest 15% of their assets under management into the infrastructure sector. We assume that this is the maximum limit domestic institutional investor s will invest into the infrastructure sector. Now, Life Insurance Corporation of India which captures 89% share in bigger companies and 80% share of the total life insurance segment invests 50% of their infrastructure funds (LIC annual report, 2011) into the power sector, i.e. which is equivalent to the 40% of the total funds available for the infrastructure sector. So, the maximum realizable potential is 40% of the infrastructure funds available for the power sector, or in other words, $21.2 Billion.

19 Latest data available for most sources is 2013. More recent data is provided wherever available.

Banks:

As per the norms set by RBI, banks' credit exposure to a single borrower and group cannot exceed 15% and 40% respectively of the bank's capital funds (Tier I & Tier II capital). Credit exposure to a single borrower may exceed the exposure norm of 15% of the bank's capital funds by an additional 5% (i.e. up to 20%) provided the additional credit exposure is on account of infrastructure. Credit exposure to borrowers belonging to a group may exceed the exposure norm of 40% of the bank's capital funds by an additional 10% (i.e. up to 50%), provided the additional credit exposure is on account of extension of credit to infrastructure projects. But this is exposure to all infrastructure projects, of which power is just one sector. Since the exposure of banks in the power sector is huge, these banks are under duress to finance any more infrastructure/ power projects. Bank investment in the power sector is primarily through lending to project developers for tenures as long as 12 years. Banks at crucial moments have also been supporting the power sector in India through reforming and have at multiple times bailed DISCOMs out of financially weak situations.

In order to estimate the investment potential for banks, we have relied on the gross bank credit data available from RBI from 2003 to 2015. We estimated the compounded annual growth rate and forecasted the gross bank credit till 2022. We then found the present value of gross bank credit for each year during 2016 -2022 using the weighted average cost of capital rate as the discount factor. We then applied the RBI infrastructure sector exposure limit for banks (15%) on the gross bank credit during 2016-2022 to get the exposure in infrastructure. We understand that out of the total gross bank credit during 2007-2012, 64% on an average has been invested in the power generation sector. Assuming that same trend will continue because of the huge impetus on generation capacity addition, we got the overall realizable potential in power generation, applying renewable energy investment limit as per the 12th Five Year Plan that specifies at least 10% of the generation investment to be in renewable energy gives the investment potential for banks as $135.63 billion.

Non-banking financing companies (NBFCs):

Financial intermediaries like non-banking financing companies constitute a significant element of the financial system and have penetrated into those areas uninhabited by banks by taking on both operational and regulatory risks. Non-banking financing companies generally lend debt to renewable energy projects

which is a part of their fixed income strategy. The debt portfolio is largely run as a fixed income product which is passively managed. The investment philosophy for fixed income investments follows from the objective to deliver optimal risk-adjusted returns. Generally the fixed income portfolio[20] comprises of AA and AAA & equivalent rated debt securities. This is hard to find in the renewable energy space as there are very few projects that can achieve that sort of credit rating. However non-banking financing companies are interested in refinancing renewable energy assets that meet their requirements of optimizing returns over a long duration and providing adequate risk adjusted returns.

For estimating the potential from non-banking financing companies we have taken data on the commitment of top non-banking financing companies for renewable energy from HDFC non-banking financial company Arm, LIC Housing Finance, Indian Renewable Energy Development Agency, PTC Financial Services, Power Finance Corporation, India Infrastructure Finance Company Limited, Rural Electrification Corporation, L&T Infrastructure Finance, Infrastructure Development Finance Company & Muthoot Finance are the non-banking financial company that have shown commitment towards renewable energy development in India. Out of these non-banking financial company we have then considered Indian Renewable Energy Development Agency, Power Finance Corporation, PTC Financial Services, India Infrastructure Finance Company Limited, L&T Infrastructure Finance, Infrastructure Development Finance Company that are actively lending to projects in the power sector. These non-banking financial companies represent approximately 80% of the total non-banking financial company potential for renewable energy projects in India. This gives the maximum realizable potential as $17.62 billion.

Foreign institutional investors:

Foreign institutional investors with assets under management (AuM) of more than $90 trillion are a key source of potential foreign investments in renewable energy in India. Institutional investors, with their distinctive risk/return requirements and longer-term objectives, are better placed than other investors to invest in renewable energy projects.

We clarify the scope of who these "foreign institutional investors" are and whether differences within this group matter with respect to renewable energy. The range of answers for this along different dimensions are discussed in Appendix Table 1. We identified eleven different kinds of foreign institutional investors from the infrastructure investor universe[21]. Institutional investors include insurance companies, pension funds, foundations, endowments, sovereign wealth funds, family offices, public pension reserve funds and investment managers. Together these total approximately $90 trillion in assets under management. Institutional investors are not homogenous. They have a wide range of investment objectives and approaches, structural factors that influence how they invest, and regulatory pressures. Each class of investor has different objectives and faces different constraints, many of which affect their ability to invest in renewable energy. This discussion has been summarized in following table:

TYPE	COVERED IN FOREIGN INSTITUTIONAL INVESTORS	TYPE	COVERED IN FOREIGN INSTITUTIONAL INVESTORS
PUBLIC PENSION FUNDS	Y	INVESTMENT COMPANIES	Y
PRIVATE SECTOR PENSION FUNDS	Y	FUND OF FUNDS MANAGERS	Y
INSURANCE COMPANIES	Y	SUPERANNUATION SCHEMES	Y
ASSET MANAGERS	Y	BANKS	N
FAMILY OFFICES	Y	INVESTMENT BANKS	N
WEALTH MANAGERS	Y	GOVERNMENT AGENCIES	N
SOVEREIGN WEALTH FUNDS	Y	CORPORATE INVESTORS	N
FOUNDATIONS	Y	OTHER	N
ENDOWMENT PLANS	Y		

20 A combination of top down and bottom up approaches are used to construct portfolios. Global and local macro-economic variables such as growth indicators, inflation outlook, currency changes, liquidity, etc. are analyzed to determine the long-term and short-term trends. The investment universe includes government securities, corporate bonds, mortgages backed securities, and asset backed securities and money market instruments.

21 Infrastructure investor universe as outlined in the Preqin database

For each of these investor types, we constructed a hypothesis and verified it using a range of methods, including primary research. We analyzed their investment portfolios along with global data on institutional investors. Some institutional investors have short-term investment horizons that preclude them from entering into assets that may include a lockup period or otherwise require long-term investment horizons. This constraint eliminates many classes of institutional investors, including most defined contribution pension funds, property and casualty insurance companies, and the money invested through external managers in mutual funds. Even the largest funds with direct investment teams will only be able to dedicate a portion of their portfolio to direct investment in renewable energy or infrastructure, which is among the least liquid investment opportunities for these funds. Even within their illiquid investments, investors need to diversify across a range of sectors and geographies.

The table above demonstrates how each of these constraints impact potential investment in renewable energy projects, beginning with the double counting filter that excludes the fraction of assets under management of investment managers sourced from institutional investors such as pension funds and insurance companies. Next, the potential to make long term investments based on liability profile, risk appetite and investment philosophies was estimated. Then, the allocation of illiquid investment to a particular geography-- emerging markets and then to India were estimated. Finally, even within their illiquid investments in India, investors need to diversify across a range of sectors, and hence a factor of 0.15 and 0.5 was used to estimate the range of investment allocation to renewable energy. The renewable energy investment potential of these investors is $42 billion up to $142 billion.

Development agencies:

Development finance is aimed at bringing in accelerated finance to renewable energy and creating successful financing models in emerging markets like India. The objective is to give financial support to specific projects and schemes for generating electricity through new and renewable sources of energy. Most of the development finance in India comes from agencies like the World Bank, Asian Development Bank, Department for International Development, Kreditanstalt für Wiederaufbau, International Finance Corporation, etc. These entities have been committing capital for various development priorities in India. As all sectors have challenges these entities are concerned about the risk profile of projects and past experiences of the progress of power sector reforms in India. Other concerning factors are inadequate returns due to poor financial health of the off-takers and lack of a comprehensive payment security mechanism that act as deterrents to advancement of financing by multilateral agencies to the renewable energy in a big way.

The investment potential from development banks and multilateral agencies for financing the 2022 renewable energy targets[22] has been estimated based on their commitments. While there is no way to estimate the upper and lower limits for investment potential from development agencies, the potential reflects the proportion of funds that would be available for deployment in renewable energy and, therefore, provides an upper bound on the investment that the development banks are likely to invest. The development banks invest in both debt and equity and the investment potential for development banks is $37.70 billion over the period 2016-22. For the purpose of our analysis of we have taken an assumption that these investors will be investing 50% each in debt and equity.

Retail:

In the retail category we have considered the investment potential from residential consumers, commercial consumers, industrial consumers – low tension, public water works/municipal corporations and agricultural consumers. The retail investors are not big ticket players and will be investing in smaller projects, mainly in rooftop solar. The potential demand for these categories reflects the portion of finance that would be available for deployment in the renewable energy especially into the rooftop solar sector.

To estimate the investment potential we start by taking the electricity demand/load requirement of the above five categories in the financial year 2015. This is because this is the maximum demand/load requirement which can be replaced by putting up the solar rooftop systems. The electricity demand for the retail categories considered for our analysis comes out to be 598.42 billion units of electricity. We understand that all of this demand can't be met by renewable energy sources due to technical reasons/grid integration issues. We have taken an assumption that 20% of this demand, or 56 GW, can be met by the solar rooftop systems. This estimate is also very high considering that solar generation is intermittent and the grid can't handle this

22 This represents the period beginning from April 1, 2016 and ending on March 31, 2022

huge amount of solar penetration. The retail investors under the agricultural category have no motivation to invest in solar rooftop systems as they are already getting the supply of electricity at subsidized rates (cross subsidy being charged to industrial consumers for subsidizing the supply of power to the agricultural consumers); hence, we have removed the load requirement pertaining to the agricultural category. The investment potential from this estimate considering our capital expenditure forecast for solar rooftop systems comes out to $19.40 billion.

7.2 Expected Investments

The investment behavior of each of the investor categories for at least 10 years has been taken into account to arrive at the expected investment numbers. We have also assumed that the investment behavior of each investor category doesn't change till 2022 while computing the expected investment.

Government:

For estimating the expected investment from the government, the actual total investment made by central government and state government enterprises in renewable energy technologies has been only obtained from CMIE Capex Database for the duration 2003 to 2015. Based on this data a compounded annual growth rate has been calculated to establish the expected investment. Using this compounded annual growth rate the investment made by has been extrapolated till 2022. For the purpose of analysis we have taken only the equity portion of the total investment using a debt equity ratio of 70:30. We further estimate the present value of the expected investment by using weighted average cost of capital as the discounting factor. Based on this method the expected investment from the central government and state government enterprises in renewable energy technologies is $12.92 billion.

Private sector:

The expected investment from the private sector during 2016 to 2022 has been estimated based on similar methodology used for the government category. The expected investment from private sector is $17.24 billion

Domestic institutional investors:

The expected investments from domestic institutional investor s cannot be estimated as the historical investment data is not available for domestic institutional investors. We have assumed this to be nil for the purpose of analysis.

Banks:

The investment potential of the banks has been derived based on the gross bank credit exposure in the power sector taken from RBI from 2003 to 2015. Based on this historical data it is established that the gross bank credit in power sector is growing at a compounded annual growth rate of 24%. Using this compounded annual growth rate the gross bank credit exposure in power sector has been established till 2022. Historically out of gross bank credit in power sector, 64% on an average has been in generation sector during 2007-2012. [23] We have assumed that the same trend would continue considering the high priority given to adding adequate generation capacity in the country. Based on the 12th Five Year Plan it is envisaged that out of the total investment in capacity addition, at least 10% would happen in renewable energy technologies. We then find the present value of gross bank credit in renewable energy during 2016 -2022 using a weighted average cost of capital as the discounting factor. The expected investment comes out to be $114.38 billion.

Non-banking financial companies:

Non-banking financial companies have increased their lending sharply as the credit demand for power, telecoms and roads expanded. The major infrastructure finance companies considered are Power Finance Corporation, Rural Electrification Corporation, Infrastructure Development Finance Company, India Infrastructure Finance Company Limited, L&T Infrastructure Finance and Industrial Finance Corporation of India. The Power Finance Corporation and Rural Electrification Corporation which together constitute around 80% of the lending by Infrastructure Finance Companies have had their outstanding credit grown at ~27% per annum (Planning Commission, 2012b). Going forward, the high historical growth rates observed in the past may not be feasible as non-banking finance companies would need to take up further capital raising to be able to lend significant amounts. Hence, for the purpose of estimation the growth rate for the financial year 2016- 22 has been assumed at ~20 % p.a. which is at the same levels as commercial banks as per IBEF. We extrapolated this number till 2022 using aforesaid compounded annual growth rate of 20% and converted to net present value using SBI base rate as the discounting factor. Since non-banking finance companies follow the RBI guidelines (RBI Regulations, 2015) for priority sector lending as provided for banks, 40% of adjusted net bank credit or credit equivalent

23 11th Five Year Plan data

amount of off-balance sheet exposure, whichever is higher would be lent to priority sector. Renewable energy is one of the nine categories that fall under the priority sector. Assuming that at least 1/9th of the investment would come into renewable energy the expected investment is $11.68 billion.

Foreign institutional investors:

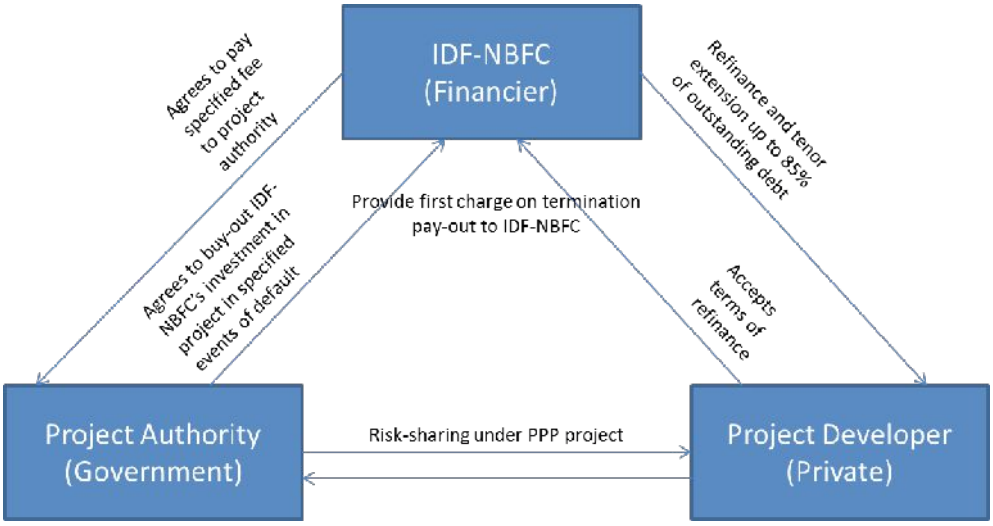
Based on the past investment trends we have worked out the expected investments from foreign institutional investors as $10 billion. Using the compounded annual growth rate of foreign direct investment flows in renewable energy in India, the investments for the period 2016-2022 were projected. This is not the most correct method to estimate the expected investment because of the limited size of the data sample for calculating the compounded annual growth rate. However in lack of any data or information from publically available sources, we have used this method. As an alternative method, the ARIMA model can be used.

Retail investors:

As the historical investment data is not available for retail investors the expected investments cannot be worked out. We have assumed this to be nil for the purpose of analysis.

7.3 Infrastructure debt fund - non banking financial company model

Though not required by regulations, a three-way model agreement for renewable energy projects is best suited enable refinancing through infrastructure debt fund - non banking financial company (IDF-NBFCs).



Source: CPI Analysis

The major sources of risk for renewable energy projects are off-taker risk and renegotiation risk. Off-taker risk refers to the risk of renewable energy projects not receiving payments on a timely basis from an entity that is purchasing power (in particular, DISCOMs).[24] Renegotiation risk refers to a perception among investors that state-owned DISCOMs may want to renegotiate existing solar tariffs in power purchase agreements to lower rates due to a sharp fall in capital costs for solar photovoltaic cells over the last three to four years.[25]

In order to enable IDF-NBFCs to refinance outstanding debt of operational renewable energy projects, a model three-way agreement between the project developer, a project authority for renewable energy, and the IDF-NBFC can be used.[26] The project authority may either be a state-owned DISCOM or a government-owned enterprise. The agreement can cover the IDF-NBFC's outstanding debt in the event of termination of the power purchase agreements and buy-back of the IDF-NBFC's investment in the event of default.

24 As of March 31, 2012, DISCOMs in many states had accumulated losses of $41 billion and investors are apprehensive about the ability of DISCOMs to make timely payments to project developers. These losses have accumulated over decades due to escalating costs and insufficient tariff hikes at the retail level since passing on costs to consumers has always been a politically sensitive issue in India. Reducing the accumulated losses of DISCOMs would require periodic tariff hikes at the consumer level. Although many states have started hiking tariffs, any perceptible change in the financial position of DISCOMs may only happen over the long run.

25 This perception was created out of a DISCOM in the state of Gujarat, Gujarat Urja Vikas Nigam Limited, (GUVNL) – a profit making, highly rated DISCOM) filing a petition with the Appellate Tribunal of Electricity (APTEL) recently for a downward revision of solar tariffs in power purchase agreements with project developers. GUVNL's demand was however struck down by the APTEL, although GUVNL has the option of filing a petition in the Supreme Court against the APTEL order.

26 Based on the RBI Governor's proposal in the recent bi-monthly statement, neither would a tri-partite agreement be required nor would the renewable energy project need to be a public-private partnership asset. However, since the proposal is subject to detailed guidelines being issued in the future, we have considered public-private partnership status and a tri-partite agreement as pre-requisites for provision of take-out financing by Infrastructure debt fund - non banking financial company.

Our research suggests that if a DISCOM is party to the three-way agreement, IDF-NBFCs may be hesitant to provide debt financing to renewable energy projects. This is due to the poor financial position of most Indian DISCOMs which raises apprehension about their ability to provide effective cover over the IDF-NBFC's outstanding debt if the underlying PPA is terminated. This can be addressed through policy measures such as a state or central government guarantee for DISCOM payments.

A government guarantee may be essential to keep the renewable energy project operational and to ensure that the IDF-NBFC's outstanding exposure to the project is completely protected if the DISCOM is unable to make payments in the event of termination of the PPA due to default by either the project developer or the DISCOM. The guarantee may be in the form of an AAA-rated government backed entity (such as NTPC) taking over the project and agreeing to purchase power from the project to keep it operational, or an explicit guarantee by the state or central government to cover outstanding debt if the PPA is terminated.

7.4 Partial credit guarantees

Partial credit guarantees can improve the credit rating of operational renewable projects and make them attractive to institutional investors.

Institutional investors like pension and insurance funds have longer investment cycles of 10-15 years, compared to 7-10 year loans offered by commercial banks, and therefore the risk associated with renewable energy has to be borne for a long duration. However the Indian regulations permit long-term investors such as pension and insurance funds to invest in corporate bonds only if they have a minimum credit rating of AA from at least two rating agencies.

The size of renewable energy projects and the associated investment make renewable energy an inherently complex asset class that is perceived as risky by investors, financiers, governments and other stakeholders. Renewable energy projects therefore have a lower credit rating – typically even the best operational renewable energy projects are rated A -and are considered a risky investment.

Partial credit guarantees are an attractive form of partial credit enhancement for refinanced debt of renewable energy projects. Partial credit guarantee facilities undertake the lenders' default risk on a part amount of the debt provided to the project, in exchange for a predetermined fee charged by the guarantor. Under a partial credit guarantee mechanism, the project developer borrows funds from a financial institution to develop the project and the organization providing the partial credit guarantee gives a guarantee to the financial institution for repayment of the debt.

The guarantor can be government bodies, development banks, and government backed financial institutions. In India, risk guarantee programs for renewable energy projects have not scaled up and have been limited to a few cases. The guarantor charges a fee on the amount guaranteed. In case the project developer is unable to service the debt obligation, the guarantee is invoked and the obligation to the financial institution is fulfilled by the guaranteeing organization.

By enhancing the credit rating of renewable project bonds to AA, partial credit guarantees make it possible to tap additional funds from insurance and pension funds. Also, raising debt from the bond market allows extending the tenor by 5 years compared with the typical loan tenors available through commercial banks (CPI, 2014).

Partial credit guarantee therefore provide a cover against risk of default, thereby improving a renewable energy project's credit rating and reducing the perceived investment risk. Partial credit guarantees are used to encourage lending to projects that otherwise would not have been funded by financial institutions due to various reasons, such as the use of new technologies, counterparty risk, or a lack of understanding among lenders regarding renewable energy sector.

Our primary research indicates that partial credit guarantees have not been successful in India over the last two to three years due to some structural and regulatory issues, which would need to be addressed.

The market does not differentiate between construction loans and capex loans; however there is no construction finance facility available.

Commercial banks in India are the most popular option to finance the construction stage of renewable energy projects which carries higher risks, while institutional investors are well suited to refinance outstanding debt of operational renewable energy projects.

When commercial banks begin financing a project, they determine the initial lending rate assuming a long-term loan which incorporates high construction risk in the first few years and lower project risks after construction. Due to the effects of averaging, relative to risk undertaken, this may lead to a lower interest rate

in the initial years of the project when construction risk is high, and a higher interest rate after construction when project risks are relatively lower. Therefore, in order to be compensated for the higher risk (but not adequate returns) during construction, banks have a strong incentive to remain invested in the project after construction is completed. Project developers also avoid risking established relationships with their bankers and often choose to refinance outstanding debt after construction through the same banks.

Regulations require that domestic institutional investors' exposure be limited to 25% of the project company's net worth.

The Reserve Bank of India's regulations specify that the maximum exposure to a specific project company for any domestic institutional investor must be limited to 25% of the company's net worth. This creates several difficulties for project developers in sourcing domestic institutional investment.

First, renewable projects that are set up as special purpose vehicles (SPVs) by independent power producers[27] may have a low or negative net worth, making it impossible for domestic institutional investors to invest in them.

Second, an investment limit of 25% of net worth (that is, equity) is very low. Assuming a project's capital structure comprises 30% equity and 70% debt (which is the typical situation), a single institutional investor can provide debt financing up to 7.5% of a project's total worth, or up to 10% of the outstanding debt from refinancing. In such a scenario, refinancing a single project's outstanding debt would require the mobilization of funds from up to ten domestic institutional investors. This poses a problem for insurance companies, which are required to invest 5% to 15% in infrastructure. The 25% net worth limit makes it difficult for them to meet the requirement of 5-15% in infrastructure through investments in individual project companies since they can only invest a very small amount in each project.[28]

Our primary research indicates that a potential solution to this is to modify the regulation to allow exposure to 25% of the project company's total worth instead of its net worth. This would make it possible to raise the required debt from just three or four domestic institutional investors, a more reasonable number given India's limited number of institutional investors.

In addition to these two barriers to using PCGs, we've identified several additional potential barriers which require further analysis:

- **The market does not price the cost of bank debt efficiently.** Compared to commercial bank loans, project developers may opt to use refinanced project debt with PCGs only if the net benefit were positive and significant, which primarily depends on the spread between the debt costs of the commercial loan and the refinanced project debt, such as a bond, with PCG.[29] This is possible only if the spread between the commercial rate of interest and bond yields is sufficiently large. This is made difficult due to relationship banking wherein commercial banks may provide debt at attractive rates to their preferred customers reducing the attractiveness of efficiently priced refinanced project debt with PCGs.
- **The Indian bond market lacks liquidity**. Given the dominance of direct investment (or private placement) in India, a PCG raises the credit rating at the time of issuance of project debt. However, investors are wary of investing in PCG-backed refinanced project debt because the project rating may vary over time, along with return expectations. This limits exit options for institutional investors.
- **Investors are less confident about partial credit enhancements.** Many investors in India do not understand the concept of partial guarantees and feel that they may not be sufficient to mitigate the high risks of the power sector. Investors are more confident in full credit enhancement (for example, monoline

27 In India, SPVs are separate subsidiary legal entities that are created for developing and operating infrastructure projects. They are used to isolate the parent company from financial risk.

28 This is 5% in the case of general insurers and 15% in the case of life insurers. Working Sub-Group on Infrastructure, Planning Commission (2012-17)

29 Our primary research indicates that the cost of debt for a refinanced project debt with partial credit guarantee, including guarantee fee, origination expenses, and placement cost, should be at least 100 basis points lower than the interest on a commercial loan. In 2013, the spread fell to 50 basis points, discouraging most project developers from executing a partial credit guarantee-backed refinanced project debt. However, with spreads increasing to about 150 basis points by the end of 2014, there may be renewed interest in partial credit guarantees.

insurance) to mitigate risks.[30] However, high insurance premiums on riskier infrastructure assets may offset benefits from the lower cost of financing.

- **The Reserve Bank of India limits credit enhancement to a maximum of two notches or 20% of the refinanced project debt, whichever is lower**. The recent set of guidelines issued by the RBI allows credit enhancement for renewable energy projects, but only by a maximum of two notches. While this shows that RBI recognizes the importance of credit enhancement, arrangement limit of two notches would likely be suitable only for projects that are rated A (or higher). A majority of operational renewable projects are rated A- or below. Raising this limit can support institutional investors' interest in PCGs for renewable energy projects.
- **RBI limits the guarantee fee to 2% for foreign banks.** The current maximum 2% guarantee fee charged for a PCG by foreign guarantors is sufficient to cover a refinanced project debt with a rating of A and raise it to the required AA rating; however, it is not sufficient to cover refinanced project debt with ratings below A. Allowing market pricing of guarantee fees can induce competitive pricing and increase the supply of PCGs. This could be a barrier for foreign banks and multilateral agencies that could act as market makers.

7.5 Investment potential of retail investors

Retail investors will play a crucial role in addressing the issue of energy security and providing access to energy in rural areas. The target of 175 GW of renewable energy by 2022 includes 40 GW of rooftop solar power. Retail investors such as residential consumers, commercial consumers, and industrial consumers will have to play a key role in achieving the target of 40 GW of rooftop solar power by 2022.

As per our analysis, the investment potential of retail investors is $19 billion.[31] Our analysis is based on the assumption that the retail investors will be doing equity investments. Debt for rooftop solar will be sourced from conventional sources of finance such as public and private sector banks. The retail investors have not invested in rooftop solar as the installed rooftop capacity stands at 0.75 GW.[32] The investments from retail investors are seriously constrained because of barriers prevailing in the rooftop solar industry.

7.5.1 BARRIERS FOR RETAIL INVESTORS

The top five barriers faced by the retail investors are as follows (CPI, 2016c):

1. High upfront cost of capital
2. Limited access to debt finance
3. Consumer perceptions of performance risk
4. Challenges in implementation of net-metering
5. Lack of consumer awareness

These barriers are needed to be addressed for enabling the retail investors to invest in rooftop solar projects.

7.5.2 FINANCING OPTIONS AVAILABLE FOR RETAIL INVESTORS

Third party financing model for rooftop solar power

A third party financing model has the potential to solve the barriers faced by retail investors. Under the third party financing model, a developer would install a rooftop solar plant on the roof of the consumer and the power generated from this plant is sold to the consumer. The developer and the consumer enter into a legal long-term contract of 15 to 25 years. The key element of the third party financing model is that the developer will be able to manage the financing challenges and also the operations of the plant. This model eliminates certain barriers like high upfront cost, limited availability of debt finance and performance risk of the solar rooftop plant (CPI, 2016c).

Rooftop Solar Private Sector Financing Facility

The India Innovation Lab for Green Finance is in the process of designing a rooftop financing facility that seeks to address certain financing challenges for rooftop solar power. The Rooftop Solar Private Sector Financing Facility addresses these barriers by structuring a large number of small projects together so that the aggregate deal size is large enough and of sufficient credit quality to attract more attention from investors, particularly from institutional investors, who can provide capital at a lower cost. The Facility has two phases: the aggregation

30 A monoline insurance is a 100% credit guarantee. While this may not be a tenable as a long-term solution, it could be explored to help create a more liquid market.

31 Appendix 7.5 discusses the methodology used for assessing the investment potential for retail investors.

32 Ministry of New and Renewable Energy Reports

(or loan book building) phase and the mobilization (securitization) phase, which involves securitizing the deals through issuing asset-backed securities. The aggregation phase involves building a warehouse line of credit that provides loans to creditworthy rooftop solar projects. The second phase – mobilization – includes refinancing the warehouse line of credit by issuing asset-backed bonds to domestic institutional investors, domestic lenders, or international investors (if currency risk can be managed by the implementing agency). The asset-backed bond will be securitized against the loan pool. The refinancing should reduce the loan costs and free up lending from the warehouse line of credit to finance additional projects (CPI, 2016d).

Loans4SMEs, a peer to peer lending platform

The India Innovation Lab for Green Finance is also designing a peer to peer lending platform that seeks to provide financing for small and medium enterprises (SMEs) in solar rooftop and energy efficiency activities, called Loans4SME. Loans4SME would solve barriers like limited access to debt finance and high upfront cost involved with rooftop solar projects.

Peer to peer lending (also known as P2P lending) is the large-scale lending of money using an online platform. The practice involves lending money to individuals or businesses through online services that match lenders directly with borrowers. On P2P lending platforms, potential borrowers apply for credit, receive a credit rating, and post to a listing that investors view. Investors can then choose to fund part of the loan, and are repaid periodically until the loan matures Peer to peer lending practices in India is in a very nascent stage having around close to 40 platforms operating in India. These platforms are targeting micro finance activities with a focus on improving access to capital for entrepreneurs involved with small business activities (CPI, 2016e).

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