Stanford | Precourt Institute for Energy

OCTOBER 2017

Instruments to Mitigate Financial Risk in Indian Renewable Energy Investments

Gireesh Shrimali,[1] Research-Fellow, Steyer-Taylor Center for Energy Policy and Finance, Stanford University
Dan Reicher, Executive Director, Steyer-Taylor Center for Energy Policy and Finance, Stanford University

Introduction[2]

AS A KEY component of its Nationally Determined Contributions (NDC) under the Paris climate agreement, India has committed to ambitious renewable energy targets, of 175 GW by 2022. This includes 100 GW of solar, 60GW of wind, and 15 GW of other sources such as biomass. The 100 GW of solar target is further divided among 60 GW of utility scale solar and 40 GW of rooftop solar.

Based on these targets, and assuming that these targets will be met in a linear fashion (i.e., equal capacity installation per year), using forecasted costs of renewable technologies, this would require approximately $189 billion of additional investment, including $132 billion of debt and $57 billion of equity. Among technologies, solar energy would require approximately $131 billion, wind energy would require approximately $51 billion and other technologies the rest.

Although there are some rosy "best case" scenarios for access to capital, in the expected scenario, the debt shortfall would be 27% and the equity shortfall would be 41%. This requires investigation of alternative sources that may help fulfill this gap.

We find that institutional investors will be key to reaching India's ambitious renewable energy targets. Institutional investors – insurance companies, sovereign wealth and pension funds, and university and foundation endowments – are a potential source of capital that can help fulfill approximately 50% and 100% of the expected debt and equity gaps respectively. Preliminary investigation reveals that the basic requirements of these investors – long-term steady returns – match those provided by renewable projects.

However, given the current policy and institutional environment in India, these institutional investors – both domestic and foreign – are currently unlikely to meet the requirement due to multiple risks, including: foreign exchange, off-taker credit, regulatory/policy, etc. Further, these investors face an uncertain business environment and lack of trusted intermediaries. Addressing these risks and barriers would go a long way towards ensuring India's renewable energy goals receive the required level of investments.

In Section 1 of this paper, we examine these investment barriers to get a sense of relative priorities and help inform appropriate targeting of risk. In sections 2 and 3 we then dig a little deeper into potential solutions for the top two risks – currency (Section 2) and off-taker (Section 3). We recognize that both of these risks will need longer-term solutions, however given that India's renewable energy targets extend only over the next five years; our focus in this paper is on short-to-mid-term solutions. Section 4 concludes with policy implications and suggestions for future research.

1. BARRIERS TO RENEWABLE ENERGY INVESTMENT[3]

There are many barriers to clean energy investment in India. We classify the barriers under the following categories: financing, completion, operational, and others (Sen et al., 2016). These can be further sub-classified as below in Table 1.

We find that currency and off-take risks are the biggest risks based on discussions with 9 foreign investors in late-2015/early-2016,[5] where we asked the investors to assign scores out of 10 regarding risk. Table 2 indicates that currency and off-take risks are at least twice as highly rated as other risks. A similar discussion with domestic investors reveals that off-taker risk is the top-rated risk. Therefore, we focus mainly on these two risks in this paper.

TABLE 1: Risks faced by investors in renewable energy projects in India

BARRIER	BRIEF DESCRIPTION
Financing	
Foreign exchange risk	Currency risk due to uncertain currency movements and high cost involved with market based currency hedging solutions.
Offtaker credit risk	The risk that the buyer/off-taker will not fulfill its contractual obligations. It is a key contributor to the overall credit risk of a power project.
Quality of renewable energy Projects	The credit rating of the operational renewable energy assets may be low overall, leading to operational assets not meeting investment criteria.
Lack of instruments for investment	Lack of financial instruments (or pathways) – illiquid or liquid – to invest in renewable energy.
Low returns compared to expectations	Renewable energy projects not being able to meet the risk-return expectations of investors.
Limited availability of debt capital	Limited availability of debt capital due to capital market conditions, either domestically or internationally.
Completion	
Construction risk	Risks related to increase in overall financing cost due to construction related issues – esp. due to delays in construction due to permitting.
Land acquisition issues	Issues faced in land acquisition, esp. if there is no single window clearance in place, or if the time taken to obtain clearances is high.
Transmission evacuation[2]	The lack of availability of transmission evacuation infrastructure, and time taken to get the clearances and permitting.
Operational	
Curtailment issues	Wind developers may face this issue during high wind seasons when higher than expected generation creates oversupply situations as well as congestion.
Contract enforceability risk	Drastic reduction in cost of solar power generation may result in poor contract enforceability in the long-term.
Others	
Lack of trusted intermediaries	Lack of trusted financial intermediaries may result in new and/or smaller investors staying away from the sector.
Limited understanding of sector	Many investors are not aware of renewable energy sector and, therefore, prefer to make investments in mainstream asset classes.
Regulatory/policy risk	The risks related to uncertainty in availability of incentive schemes, poor implementation of policies and non-uniform policies across states.
Net metering policies	The net metering policies across states may lack coherency as well as poor implementation.

TABLE 2: Scoring of risks faced by investors in renewable energy projects in India

RISK/BARRIER	SCORE (OUT OF 10)
Currency	8.33
Off-taker	7.11
Regulatory/policy	3.89
Unfavorable returns	3.0
Transmission and evacuation	2.78
Land acquisition	1.78
Cost of capital	0.89
Availability of debt	0.78

We had follow-up discussions with 5 foreign investors in mid-2017 to verify these findings.[6] These follow-up discussions confirmed the earlier findings related to the high importance of currency and off-take risks.

2. THE CURRENCY (OR FOREIGN EXCHANGE) RISK[7]

We find that, to achieve India's renewable energy targets cost-effectively, more debt is required at attractive terms – i.e., with reduced costs and extended tenors (Shrimali et al., 2013). High costs (more than 12%), short tenors (less than 10 years), and variable rates (as opposed to fixed), end up increasing the cost of renewable energy in India by 24-32% compared to renewable energy projects elsewhere (Shrimali et al., 2013).

Foreign loans (e.g., in USD) appear attractive for Indian policymakers, given that seemingly cheaper (e.g., 5-7% USD), longer-term (15 years or more), fixed-rate foreign loans have the potential to not only reduce the cost of renewable energy significantly but also reduce the cost of government support by making renewable energy more competitive with fossil based-electricity (Shrimali et al., 2013; Shrimali et al., 2017). This raises the question as to why developers just don't borrow in USD, and the answer is foreign exchange rate risk, as described below.

The reason that foreign exchange risk is an issue is that renewable projects earn revenues in local currency (e.g., in INR), when financing a renewable energy project by a foreign loan (e.g., in USD), the mismatch in the currency of debt obligations (i.e., USD) and currency of revenue (i.e., INR) exposes the project to the risk of devaluation in INR over time. This can result in reduced investments in the country due to currency risk,[8] necessitating the use of a currency "hedge" (or currency "swap")[9] with a third-party provider to protect against these devaluations.

Market-based currency hedging solutions are not only limited in availability (e.g., beyond 5-years) but also are expensive in India, increasing the final cost of debt, and almost entirely eliminating the benefit of seemingly cheaper foreign loans. For example, the typical cost of currency hedging in India is around 7% per year (Bloomberg Terminal, 2017), making completely hedged foreign loans as expensive as domestic loans – i.e., at 12-13% (Shrimali et al., 2013).

Further, depending on the credit risk of the borrower, additional credit-risk premium may increase the cost of currency hedging by another 100bps.[10] Credit risk is the risk that a party to the swap agreement will default on its obligations. Currency swaps have high exposure to credit risk as they involve the exchange of money (e.g., USD and INR) over an extended period of time. Since a premium is charged for default risk, currency swaps lead to a double counting of credit risk as the borrower already pays a credit risk premium for the underlying debt to the creditor.[11]

Governments need to recognize the role that cheaper currency hedging mechanisms could play in expanding renewable energy capacity. Further, there is an argument that governments should bear currency risk in some strategic situations. One main reason is that macroeconomic conditions are key drivers of currency movements and related foreign exchange rates, and government policy, in turn, influences macroeconomic conditions.

In case of India, another strong argument for government-sponsored currency hedging solutions is that bearing the currency risk for renewable energy today offsets the currency risk the economy would have borne in future on purchasing imported fossil fuels that the renewable energy would displace. This is particularly relevant for imported coal, which is the marginal fossil fuel that additional renewable energy is likely to replace (Shrimali et al., 2016).

Given that currency depreciation is a direct consequence of macroeconomic conditions, such as inflation, the long-term solution to control currency risk is to reduce inflation via sound macroeconomic policy that, for example, targets disciplined government spending and borrowing. However, controlling inflation may not always be possible in a fast growing economy such as India and, therefore, short-term fixes may be required.

Multiple solutions may be possible in the near term. One potential solution is to use a structure where public money is used to provide a buffer against the risk of unexpected currency movements (Section 2.1).

2.1 Foreign exchange hedging facility: Using a risk buffer

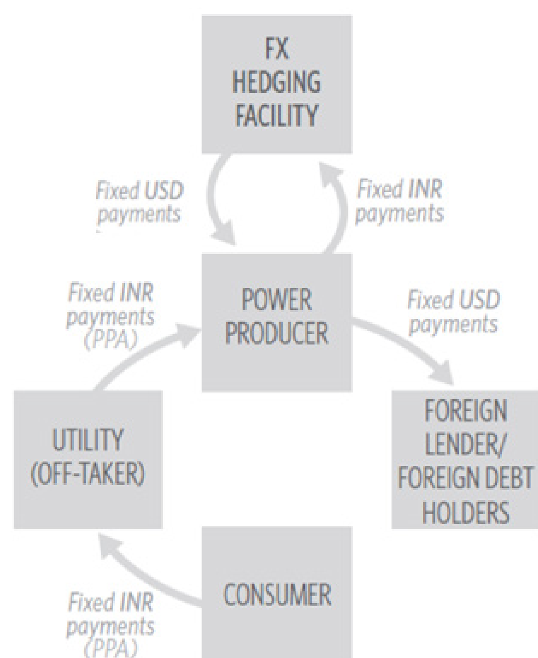
In providing currency hedging solutions for renewable projects, we need to consider the following questions: first, what are the expected costs of providing such hedging solutions? Second, how can the risks related to unexpected and extreme movements in foreign exchange rates be managed? Third, what is the market risk premium for taking these risks? We provide insights into these questions by examining a government-sponsored foreign exchange rate hedging facility ("FXHF").

Under an FXHF, the government would provide project developers or off-takers a currency hedging solution through a standalone fund that covers debt payments for underlying USD loans. In this case the government is not providing a sovereign guarantee,[12] but rather is pre-committing public money for creating a standalone fund that can be used to provide cheaper currency hedging solutions. As we will see below, the FXHF provides an indirect way to subsidize currency hedging without providing an explicit (or direct) subsidy.

We explain the working of the FXHF for a local currency power purchase agreement (PPA). Under a local currency power purchase agreement, the project developer borrows in foreign currency (i.e., USD) and therefore, the foreign exchange risk exposure is borne by the project developer. In this case, the FXHF can enter into a swap – via a "contract for differences (CFD)" – with the project developer.

Under a contract for differences, the two counterparties – FXHF and developers – would sign a contract at a fixed/initial foreign exchange rate and, over time, exchange payments for the differences between the actual and the contracted foreign exchange rates (see Figure 1). The frequency of this payment would be similar to debt payment obligations of the project developer.

FIGURE 1: Cash flows in a local currency PPA
[Source: Farooquee and Shrimali (2016)]



For example, when the fixed/initial rate is 1 USD = 63 INR, then, at fixed periods when debt payments are due, if the foreign exchange rate is higher than 1 USD = 63 INR, the FXHF would make a net payment to the project developer. This net payment is equal to the difference of a variable payment (USD debt payments at the actual/current foreign exchange rate on the day) from the FXHF to the developer and the fixed payment from the developer to the FXHF (USD debt payments at the contracted foreign exchange rate of 1 USD = 63 INR). In the reverse situation, if the foreign exchange rate is lower than 1 USD = 63 INR, the project developer would make a net payment to the FXHF.

The final design of the FXHF would depend on the underlying mix of loans. Here we provide an indicative analysis based on assumptions from primary and secondary research. We assume that the underlying USD loan is at 5.5% and for 10-years. We also assume that the market cost of providing a 10-year USD to INR currency swap would be 7 percentage points.

We start with the first question: what are the expected costs of providing such hedging solutions? Our analysis reveals that the expected cost[13] – or the average cost across all potential outcomes represented by our probabilistic model – to provide a 10 year currency hedge via the FXHF is approximately 3.5 percentage points per year, 50% below market rates. This is what the FXHF would charge the developer.

However, governments should be aware of the risk exposure of the FXHF. That is, they should be aware of what would happen to the FXHF if the Indian currency depreciates more than the expected value and that also in extreme ways. The FXHF would need to manage this risk; a risk that is typically managed by market.

We therefore examine the second question: how can the risks related to unexpected and extreme movements in foreign exchange rates be managed? One way to protect against this risk, and to ensure that the FXHF does not default, is to use a capital buffer. Based on our analysis, for the FXHF to achieve India's current sovereign rating of BBB-,[14] the cumulative capital buffer requirement for 10 years would be almost 30% of the underlying loan amount; that is, with a leverage of approximately 3.

A potential solution to avoid such large public commitments is to use a structure where public money is used to provide protection against currency devaluation in particular range, via a market based instruments such as currency options (Farooquee et al., 2016a). This approach shows that much higher leverages (up to 10) for public money can be achieved.

The government should also be aware that the expected cost of the FXHF of 3.5 percentage points doesn't take into account the market cost of a capital buffer – i.e., the risk-premium that the market would place on taking the risk of unexpected and extreme movements in foreign exchange rates, and maintaining this capital buffer.

We therefore examine the third question: what is the market risk premium for taking currency risks? Using foreign exchange option pricing theory, we explicitly calculate the risk-premium as 2.76 percentage points, which largely accounts for the difference between the cost of currency hedging in the market and the expected cost of the FXHF. That is, the government is indirectly subsidizing the FXHF by keeping the capital buffer but not charging for the risk it mitigates.

3. THE COUNTERPARTY RISK[15]

The counterparty risk is related to the risk of non (or delayed) payment by the power purchaser (also known as the off-taker) to the power producer. From a lender's perspective, this results in the power producer missing the debt payments. The typical power purchasers in India are the public-sector, state-level distribution companies, also known as DISCOMs.

Figure 2 shows the main components, with arrows depicting the flow of energy and money flowing in the reverse direction. In this structure the main problem lies with the DISCOMs who, due to their poor financial health, regularly delay payments.

FIGURE 2: Flow of electricity

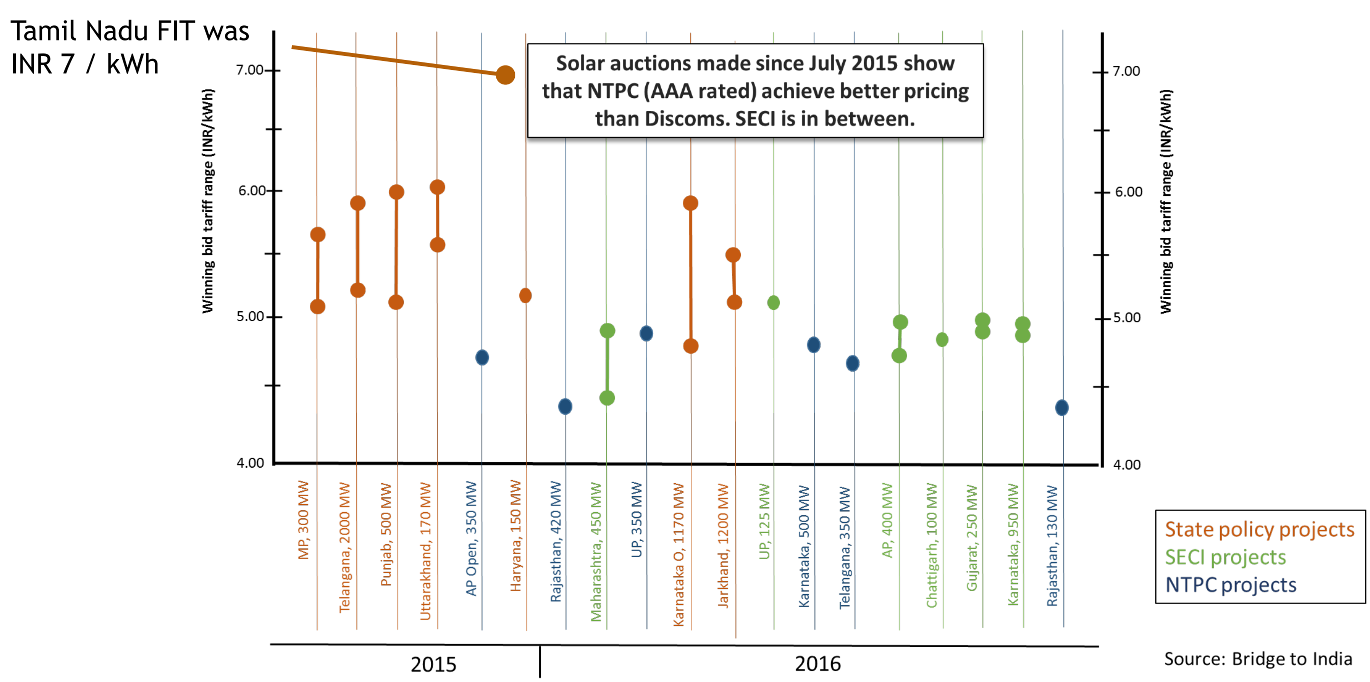
For example, during 2014-15, the DISCOMs had booked cumulative losses on the order of INR[16] 633 billion (Power Finance Corporation, 2016), for two reasons. The first is economic – the DISCOMs do not even recover costs due to power tariffs being kept artificially low because of political pressures: in the same year, the average cost of purchase of power for the DISCOMs was INR 5.20/KWh whereas the average consumer tariff was INR 4.62/KWh. The second is operational – in the same year, the aggregate transmission and commercial (AT&C) losses stood at 24.62% (Power Finance Corporation, 2016).

This poor performance results in a combined negative net worth of DISCOMs at INR 1,164 billion as on March 31, 2015, with loans outstanding at INR 6,730 billion, receivables outstanding against banks at 92 days, and receivables outstanding against Independent Power Producers at 121 days. The receivables outstanding gap clearly indicates that power producers are exposed to the risk of the poor financial health of the DISCOMs and the consequent risk of delays and/or defaults in payment.

In fact, state DISCOMs have a history of delaying payments to independent power producers (IPPs) by up to as much as 24 months. This poses a direct risk to the ability of IPPs to meet their credit obligations and exposes debt investors to default scenarios. This causes banks and other debt providers to limit their investment to the renewable energy sector or otherwise raise the cost of debt provided.

The higher cost of capital available to the IPPs may ultimately result in higher power tariffs (Figure 3). This has been evidenced in recent solar auctions, wherein the PPA prices are always lower when the well-rated National Thermal Power Corporation (NTPC) is the off-taker. For example, a state auction held in Karnataka resulted in an average price of INR 5.07 per kWh while a NTPC auction - also held in Karnataka - achieved a price of INR 4.78 per kWh, equivalent to a saving of INR 0.29 per kWh (Bridge to India, 2017).

FIGURE 3: Auction prices in recent auctions



Source: Bridge to India

The long-term solution to off-taker risk lies in proper management of the DISCOMs, where states assume full responsibility of running the utilities on sound commercial principles (Ministry of Power, 2012). A comprehensive set of measures is required to do so, including financial restructuring, tariff setting, revenue realization, subsidies management, metering, and audit and monitoring. In the past, the central government has introduced many schemes for financial restructuring of DISCOMs, but none of them have produced the intended outcomes.

The most recent example is a financial restructuring scheme called UDAY (Indian Express, 2015). The scheme involves four initiatives: improving operational efficiencies of DISCOMs; reducing the cost of power; reducing the interest cost of DISCOMs; and enforcing financial discipline on DISCOMs through alignment with state finances. UDAY allows state governments, which own the DISCOMs, to take over 75 percent of their debt and pay back lenders by selling bonds. DISCOMs are expected to issue bonds for the remaining 25 percent of their debt. The scheme aims to achieve a reduction of average transmission and commercial (AT&C) loss to 15% by 2018-19 as well as a reduction in gap between average cost of supply (ACS) and average revenue realized (ARR) to zero by 2018-19.[17]

While a financial overhaul of DISCOMs is the necessary long-term solution to mitigate off-taker risk, there are also short-term solutions that can help drive renewable energy investments. Depending on the creditworthiness of the off-taker, a liquidity facility and/or a sovereign guarantee could support the off-takers' obligations (OPIC, 2015). In this paper, we examine such a short-term solution, called a payment security mechanism (PSM). A PSM is a standalone fund that is a form of guarantee that covers the risk of payment default in a power purchase agreement.

Multiple approaches to a PSM] may be possible in the near term. One potential approach is to use a structure where public money is used to provide a buffer against the risk of DISCOM default (Section 3.1).[18]

3.1 Payment security mechanism: Contingent facility

Payment risk is similar to credit risk: both are legal obligations, where credit risk is related to the default risk in debt payments, payment risk is related to the default risk in accounts payable. For the purpose of this discussion, we make a simplifying assumption that defaulting on any legal obligation is equivalent, and hence the defaulting on debt payments is the same as defaulting on accounts payable. This allows us to use well-known techniques for creating contingent facilities for credit risk management.

The framework for calculating the size of this contingent facility (i.e., PSM) uses elements of credit guarantees, specifically the probability of default (i.e. the likelihood that default would occur), exposure at default (i.e. the amount not paid due to default), and recovery after default (the percentage of exposure at default that is eventually recovered) (Hsiao, 2001; Marrison, 2001).

We estimated the probability of default using a modified version of the popular Z-score methodology (Altman, 2000; Crosbie and Bohn, 2003), which uses key financial characteristics of the firm. Based on typical delays and power purchase agreement legalities, we estimated the exposure at default as the payment for one-year worth of electricity produced at the contracted per unit price. Finally, given that payments are always made eventually,[19] the recovery after default as 100% of the guaranteed payment after delay.

We retrospectively estimated the expected size of an existing payment security mechanism – equal to the probability of default and the exposure at default – for a central solar power aggregator that buys power from multiple generators and sells power to multiple off-takers under the Jawaharalal Nehru Solar Mission.[20] We selected a sample of DISCOMs representing the credit spread of all the DISCOMs (Ministry of Power, 2013).

For the supported capacity (750MW) of the existing payment security mechanism, and based on the realistic assumption that the exposure at default is

12-months, we estimated the size of the payment security mechanism as less than 10% of capital costs of the solar power deployed, but almost three times the size of the existing payment security mechanism deployed by the government. That is, our results indicated that the existing provision for a payment security mechanism may not have been adequate in covering the risk of delayed payment from DISCOMs.

However, this solution does not assess the impact such a security mechanism would have on the credit ratings of the covered projects, or alternatively, the size of the PSM needed to achieve the desired credit enhancement (e.g., from BBB to AA). Additionally, the existing work also misses a crucial piece of analysis comparing the expected benefits of such a facility with the cost of maintaining such a pool of capital. A sizing that takes into account the differential credit quality of DISCOMs would ensure a fair and efficient allocation of capital. Further, the cost of maintaining such a facility also needs to be determined, and the pros and cons of such an approach contrasted with other structures. All this is part of future work.

4. CONCLUSIONS

In this paper we investigated key risks to investing in clean energy in India. We found currency and off-take risks to be the top risks – in fact, riskier compared to other risks by a margin of two. We also discussed some potential financial instruments to address these issues: an FXHF to address currency risks and a PSM to address off-take risk. These instruments have the potential to reduce the cost of capital and eventually the levelized cost by up to 20%. These instruments may take different forms, depending on policy priorities.

The policy implications of our work so far are three-fold: first, Indian policymakers should recognize the relative importance of currency and off-take risks to renewable energy investment in India. By focusing on key risks and developing solutions to alleviate these risks they can more effectively achieve their ambitious renewable target of 175GW by 2022.

Second, Indian policymakers should also recognize that these risks – currency and off-take – are connected to higher level issues that potentially affect the economy as a whole. For example, the currency risk is related to macroeconomic conditions and the government may need to think about longer term solutions focusing on issues such as: stabilizing inflation, reducing government borrowing, improving balance of payment, etc. (Farooquee and Shrimali, 2016b). Similarly, off-take risk is related to the troublesome financial conditions of the DISCOMS, requiring longer-term fixes to fiscal prudence and operational efficiencies.

Third, while recognizing the long-term aspects, Indian policymakers should think about the short-to-mid-term solutions to still attract foreign investment in renewable energy in India. These solutions include not only policy/regulatory solutions but also financial instruments, such as ones discussed in this paper. By allocating public money to these instruments, which are designing to maximized leverage of public money, they can ensure that India stays on target to achieving its ambitious renewable energy targets.

We recognize that our work is just the beginning. We still need to develop the design details of many of these mechanisms. One of these efforts is currently underway at the Stanford Steyer-Taylor Center for Energy Policy and Finance, where we are exploring the design of a contingent facility for the PSM, based on the credit enhancement approach. Finally, stemming from our analytical insights, we still need to design robust financial mechanisms that would work in the market.

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(ENDNOTES)

1 Gireesh would like to thank the following for providing research support: Noam Rosenthal, Vivek Sen, Vinit Atal, and Vaibhav Pratap Singh. The authors would also like to thank Jeff Brown for this insightful review.

2 This sections relies on Sen et al. (2016)

3 This sections relies on Sen et al. (2016)

4 Transmission evacuation essentially means the infrastructure to connect to the transmission grid.

5 The investors included: Bank of America, Blackrock, Generation Investment Management, EIG Partners, Goldman Sachs, Morgan Stanley, Silverlake Kraftwerk, TIAA CREF, UC Regents, etc. Some of this information was used to support the analysis in Sen et al. (2016).

6 These investors included: Bank of America, Barclays Finance, Blackrock, Citibank, Goldman Sachs, GE Capital, etc. The conversations with Barclays and GE Capital were more in depth on India.

7 This section relies on Farooquee and Shrimali (2016a)

8 Currency risk is a major barrier to foreign investments in developing countries. Currency crises, defined as a quick decline of a local currency, have triggered regional economic crises (Laeven and Valencia, 2013). While all projects with foreign investments face currency risk, infrastructure projects are often exposed to greater risk because of longer terms and difficulty in re-deployment of assets, making exit difficult for investors.

9 A currency swap is an agreement to make a currency exchange between two parties. The agreement consists of swapping principal and interest payments on a loan made in one currency for principal and interest payments of a loan of equal value in another currency. Borrowers can lock in currency swaps with a third-party provider that takes currency risk and charges a currency swap fee.

10 100bps is equal to 1% point.

11 The price of a market-based currency hedge reflects three components: cost of managing currency risk itself, cost of managing the credit risk of the counterparty, and margin for the currency hedge provider. Given that the debt provider and currency hedge provider can be different parties, credit risk gets priced into not only the debt rate but also the price of currency hedge.

12 Typically governments are averse to providing sovereign guarantees against their own currencies, since that amounts to taking positions against their own macroeconomic policies.

13 In the context of a probabilistic model, the expected (or average) cost means a statistic that is higher than 50% of the potential cost outcomes and lower than the other 50%.

14 The basic idea is to enable investors to view this investment as good as investing in the government of India securities. Since government of India is rated at BBB-, which is also investment grade.

15 This section relies on Farooque and Shrimali (2016b).

16 INR is the Indian currency i.e., Indian Rupee. Currently, the currency exchange rate stands at 1 USD = (approximately) 60 INR.

17 Average transmission and commercial (AT&C) losses refer to not only electrical losses due to transmission and distribution but also commercial losses due to theft and non-payment.

18 Another potential approach is to use public money to provide protection against DISCOM default via using risk management instruments already provided by multilateral agencies such as MIGA.

19 Since the DISCOMs are public sector entities, though they delay payments, they do not default due to regular bailouts by the central government.

20 The Jawaharlal Nehru National Solar Mission initially set a target of 20GW of solar power by 2022. This target was later revised to 100GW of solar power by 2022 under the National Solar Mission. Recognizing that attracting investment for this target would necessitate a PSM, the government of India did allocate some funds; however, we show that this amount was not enough.