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# Financing India's Energy Transition Through International Bond Markets

Shreyas Garg, Rishabh Jain, Gagan Sidhu

Report | August 2021





International bonds markets have strongly supported India's energy transition, with developers raising over USD 11 billion through the route from 2014 to H1 2021.

Image: iStock



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Suggested citation:

Garg, Shreyas, Rishabh Jain and Gagan Sidhu. 2021. *Financing India's Energy Transition Through International Bond Markets*. New Delhi: Council on Energy, Environment and Water.

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Cover image:

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Peer reviewers:

Abhishek Goel, Principal, Global Infrastructure Partners; Deepak Gupta, Senior Vice President, ReNew Power; Lakshmi Narayanan B, DGM, Ayana Renewable Power; Raghav Anand, Senior Program Manager, Shakti Sustainable Energy Foundation; Sandeep Arora, Senior Vice President, Azure Power; Sandeep Bhattacharya, India Projects Manager, Climate Bonds Initiative; Arjun Dutt, Programme Lead, and Vaibhav Pratap Singh, Programme Lead, Council on Energy, Environment and Water.

Publication team:

Alina Sen (CEEW), The Clean Copy, Twig Designs, and Friends Digital.

Acknowledgments:

The authors of this issue brief would like to thank the reviewers – Abhishek Goel, Principal, Global Infrastructure Partners; Deepak Gupta, Senior Vice President, ReNew Power; Lakshmi Narayanan B, DGM, Ayana Renewable Power; Raghav Anand, Senior Program Manager, Shakti Sustainable Energy Foundation; Sandeep Arora, Senior Vice President, Azure Power; Sandeep Bhattacharya, India Projects Manager, Climate Bonds Initiative; Arjun Dutt, Programme Lead, CEEW-CEF; and Vaibhav Pratap Singh, Programme Lead, CEEW-CEF – for their valuable comments and suggestions on the brief and on the characteristics of international and domestic bond markets.

From CEEW, we would like to thank Harsha V. Rao, Research Analyst, for her research inputs. We would like to thank Bloomberg Philanthropies for supporting our work at CEEW-CEF. We would also like to thank the Outreach team at CEEW for helping us with the design, publishing, and release of the report.

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# CEEW Centre for Energy Finance

The CEEW Centre for Energy Finance (CEEW-CEF) is an initiative of the Council on Energy, Environment and Water (CEEW), one of Asia's leading think tanks.

CEEW-CEF acts as a non-partisan market observer and driver that monitors, develops, tests, and deploys financial solutions to advance the energy transition. It aims to help deepen markets, increase transparency, and attract capital in clean energy sectors in emerging economies. It achieves this by comprehensively tracking, interpreting, and responding to developments in the energy markets while also bridging gaps between governments, industry, and financiers.

The need for enabling an efficient and timely energy transition is growing in emerging economies. In response, CEEW-CEF focuses on developing fit-for-purpose market-responsive financial products. A robust energy transition requires deep markets, which need continuous monitoring, support, and course correction. By designing financial solutions and providing near-real-time analysis of current and emerging clean energy markets, CEEW-CEF builds confidence and coherence among key actors, reduces information asymmetry, and bridges the financial gap.

## **Financing the energy transition in emerging economies**

The clean energy transition is gaining momentum across the world with cumulative renewable energy installation crossing 1000 GW in 2018. Several emerging markets see renewable energy markets of significant scale. However, these markets are young and prone to challenges that could inhibit or reverse recent advances. Emerging economies lack well-functioning markets. That makes investment in clean technologies risky and prevents capital from flowing from where it is in surplus to regions where it is most needed. CEEW-CEF addresses the urgent need for increasing the flow and affordability of private capital into clean energy markets in emerging economies.

## **CEEW-CEF's focus: analysis and solutions**

CEEW-CEF has a twin focus on markets and solutions. CEEW-CEF's market analysis covers energy transition-related sectors on both the supply side (solar, wind, energy storage) and demand-side (electric vehicles, distributed renewable energy applications). It creates open-source data sets, salient and timely analysis, and market trend studies.

CEEW-CEF's solution-focused work will enable the flow of new and more affordable capital into clean energy sectors. These solutions will be designed to address specific market risks that block capital flows. These will include designing, implementation support, and evaluation of policy instruments, insurance products, and incubation funds.

CEEW-CEF was launched in July 2019 in the presence of HE Mr Dharmendra Pradhan and H.E. Dr Fatih Birol at Energy Horizons.

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Shreyas is a consultant at the CEEW Centre for Energy Finance. He previously worked as a management consultant with a specific focus on infrastructure and renewable energy.

*“Calls for increasing supply of climate finance to developing nations have grown sharply in the past year. At the same time, international markets have shown consistently strong interest in green bonds issued by Indian developers. Indian entities must leverage these advantages and ramp up green bond activity to turbo-charge India’s energy transition.”*



**Rishabh Jain**  
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Rishabh, a public policy practitioner, leads Market Intelligence at the CEEW Centre for Energy Finance and works closely with key decision-makers in the Indian RE sector. Previously, he worked in India’s solar manufacturing sector.

*“India requires billions of dollars to meet the 2030 renewable energy target. Domestic institutional debt has its limitations. International green bonds can improve the accessibility of finance at better interest rates. Renewable energy developers, lenders, investors, and other potential market participants will benefit from this analysis as they look for new avenues for raising either investments or money.”*



**Gagan Sidhu**  
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Gagan is Director–CEEW Centre for Energy Finance. He was previously CFO of a renewable energy business, and, before that, an investment banker.

*“India’s renewable energy ambitions require capital to flow at an unprecedented scale. In this context, the remarkable international bond market appetite for issuances by Indian renewable energy developers is a strong vote of confidence for the sector. All the more reason for domestic bond market participants to take note and catch up in funding renewables.”*



2021 has seen a ramp-up in green bond issuances, with developers raising USD 3.6 billion in the first 6 months, higher than any previous 12-month period.

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# Acronyms

ECB	External Commercial Borrowing
EMEA	Europe, Middle East, and Africa
ESG	environmental, social, and governance
GBP	British Pound
GW	gigawatts
ICMA	International Capital Market Association
INR	Indian Rupees
INX	India International Exchange
KPI	key performance indicator
LSEG	London Stock Exchange
MIFOR	Mumbai Interbank Forward Offer Rate
MNRE	Ministry of New and Renewable Energy
MW	megawatts
NBFC	non-banking financial corporation
PFC	Power Finance Corporation
PPA	power purchase agreement
RBI	Reserve Bank of India
RE	renewable energy
SEBI	Securities and Exchange Board of India
SECI	Solar Energy Corporation of India
SGX	Singapore Stock Exchange
SPV	special purpose vehicle
US	United States
USD	United States Dollar
VRR	voluntary retention route



Indian developers have refinanced at least 10 GW of renewable energy capacity through international green bonds issued from 2014 to H1 2021.

Image: REGEN

## Executive summary

To realise India's ambitious target of installing 450 GW of renewable energy (RE) capacity by 2030, developers and financing institutions in India must mobilise funds at an unprecedented rate. Although domestic institutional debt is the primary source for RE project debt in India, international debt capital (bond) markets have grown sharply since 2019. Bonds issued for financing or refinancing RE assets typically carry third-party certification as 'green' bonds. Bond markets provide developers with an additional avenue for fundraising beyond the traditional lender route. With funds availability with domestic lenders proving a bottleneck for RE projects, developers must fully utilise all available routes to accelerate fundraising and project deployment. We believe that green bonds can play a vital role in this process.

### RE developers have raised over USD 11 billion through international bond markets since 2014

Indian entities have raised USD 15.6 billion through international green bonds since 2014. Developers account for most of this share, with a total of USD 11.2 billion raised through 21 green bonds issued by 8 developers. In comparison, the State Bank of India's entire lending to the RE sector amounted to USD 4.3 billion as of March 2021, further illustrating the growing prominence of international bond markets in financing Indian RE (Nair 2021). By May 2021, green bond issuances by Indian RE developers had already surpassed the previous calendar year record, with USD 3.6 billion raised in the first five months

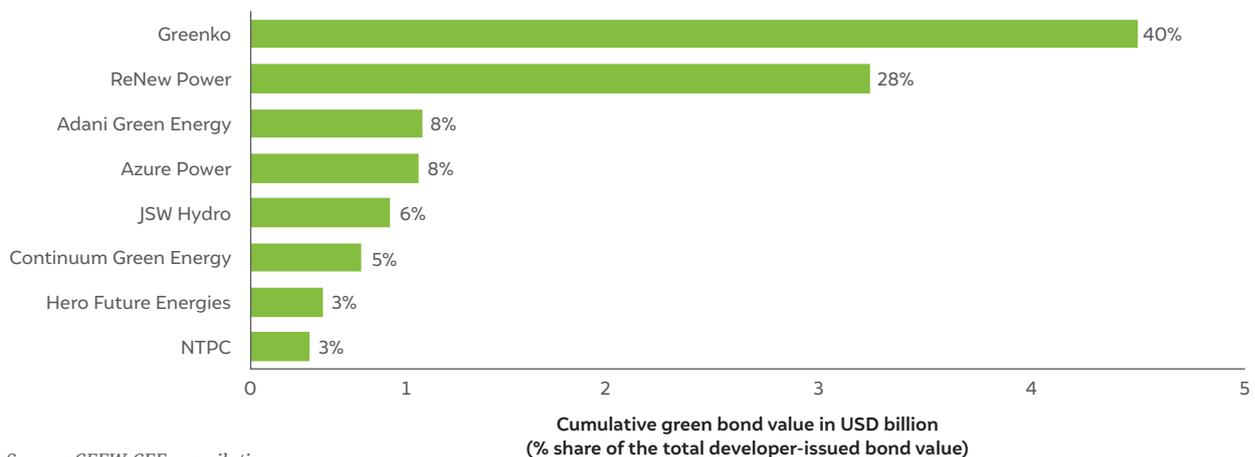
**Developers have already raised USD 3.6B through international green bonds in 2021, higher than any previous calendar year.**

of the year. The two largest RE developers,<sup>1</sup> Greenko and ReNew Power, dominate the market, as shown in Figure ES1. However, 2021 saw three new entrants (Continuum Green Energy, Hero Future Energies, and JSW Hydro), indicating increasing interest in the route.

It is crucial to understand this critical source of debt, particularly in light of its immense potential to support India's energy transition. We have built a database of international green bonds issuances by Indian RE developers and analysed their listing documents available on trading exchanges. In this report, we have detailed the characteristics of such bonds, including their coupon rates, spreads, maturity periods, and buyers. We have also taken a deep dive into the underlying RE portfolio that has been refinanced through these bonds to understand its technology split, offtaker profile, operational history, and tariff profile.

Our report covers green bonds issued by Indian RE developers. We have not included green bonds issued by other entities, such as lenders and non-power, non-financial corporates. While a portion of funds raised through bonds by these entities may also finance RE projects, proceeds from such bonds cannot be directly mapped to projects due to widely varying reporting standards.

**Figure ES1** Greenko and ReNew Power dominate Indian RE green bond issuances



Source: CEEW-CEF compilation

1. By installed capacity as of June 2021.

## Asian investors have led the market charge for high-yield Indian RE green bonds

Markets have shown a keen interest in green bonds issued by Indian RE developers, with offerings being oversubscribed by 3.6 times on average. Asian fund managers have led this market rally, picking up 48 per cent of bond proceeds. Green bonds issued by Indian developers since 2019 carry an average spread of four per cent over the United States (US) treasury benchmark, making them a relatively safe high-yield instrument for investors.

Developers are entering international bond markets to access new sources of capital, particularly as domestic institutional lenders are reaching their lending limits to the power sector. Through green bonds, developers can raise vast amounts in a single instance and refinance existing INR loans with easily recyclable capital.

We found that of the total USD 11.2 billion raised since 2014, developers deployed 16 bonds worth USD 9.2 billion to directly refinance project loans that are overwhelmingly INR-denominated. More recently, developers have also been able to obtain cost advantages due to favourable hedging costs. We found an average pre-hedging differential of six per cent between the bond coupon rate and INR loan interest rate. Once the cost of hedging is accounted for, green bonds are likely to be at par or a slight advantage compared to INR loan interest rates; however, hedging costs are market-dependent, and a cost advantage may not always exist.

## International green bonds have refinanced 10 GW of Indian RE capacity

Our analysis reveals that international green bonds raised by Indian developers have refinanced a unique

**10% of India's solar and wind capacity has been refinanced through international bond markets.**

portfolio of 10 GW of RE capacity in India. Of this, 8.4 GW was evenly split between solar and wind, while the balance was made up by hydro.

Further, state-owned utilities are the offtakers for almost two-thirds of this 10 GW of RE capacity, while central and open-access buyers make up the rest. State offtakers are dominated by utilities with a poor track record in paying developers, although this risk is typically diversified by including multiple state utilities in the portfolio.

## Investors have stayed largely agnostic towards the RE portfolio's profile

We found that despite the higher offtaker risk, bonds dominated by state utilities as offtakers have performed at par with bonds dominated by central buyers as offtakers. This suggests that the developer's financial health determines the bond's pricing and that investors are comfortable with a portfolio dominated by state utilities if the risk is diversified. However, given the low volume of capacity contracted by central buyers, this trend may evolve as more projects auctioned by central buyers are refinanced through international bonds in the future.

Further, we found that international bond markets have also shown a healthy appetite for project portfolios with a short to moderate operational history. Most bond portfolios have operational histories below four years, with no material trend against bond pricing. Similarly, we found no significant trend between portfolio tariffs and bond pricing. While projects with tariffs over a wide range have been refinanced, developers typically diversify portfolios and balance out high-tariff and low-tariff projects, thereby reducing the dependence on individual projects.

Our deep dive into bond parameters and the underlying RE portfolio showcases the advantages of raising debt through international bond markets; developers will be able to access a wider pool of funds, raise large sums through single offerings, and potentially obtain pricing advantages depending

on hedging agreements. With only eight developers having accessed international bond markets so far, we believe that both gigawatt-scale and smaller-scale developers in India must seriously evaluate this option.

**With increased focus on ESG investing, developers can unlock new funding avenues through international green bonds.**

Beyond developers, industry players that are inherently 'green', such as upstream RE manufacturing, and energy-intensive industries looking to go green, can raise climate-aligned bonds to obtain wider access to capital for new projects. Finally, we suggest that policymakers can use key learnings from international bond markets to revive the domestic market. Although Vector Green Energy recently raised an AAA-rated domestic green bond, developer activity has been low since 2016.

Delivering on India's ambitious RE targets will require tapping the full potential of all debt funding sources. Our analysis reveals the key role that international bond markets have played so far and calls for developers, consumers, and policymakers to ramp up green bonds and accelerate India's energy transition.

## 1. Introduction

As of May 2021, a total of 96 GW of renewable energy (RE) capacity had been installed<sup>2</sup>, with a further 50 GW in various stages of construction (MNRE 2021). The Government of India has set an ambitious target of installing 450 GW of RE capacity by 2030. Achieving the 2030 target will require significant investments in power generation, transmission, and distribution infrastructure. An analysis by CEEW-CEF in 2020 suggests that approximately USD 199 billion would need to be mobilised for India to meet its 2030 RE power generation targets alone (Singh, Dutt, and Sidhu 2020). To put this in context, outstanding exposure to the power sector by Indian banks and non-banking financial corporations (NBFCs) totalled to approximately USD 168 billion as of March 2020.<sup>3</sup> Banks have limited headroom to further ramp up

further lending for RE at such levels of exposure to the power sector.

Therefore, to successfully achieve the 2030 target of 450 GW of installed RE capacity, developers must mobilise an unprecedented amount of funds over the next decade. Project finance comprises two components – equity, which is invested by the developers themselves, and debt, which is a mix of externally raised debt and parent loans. Developers' equity contribution for RE power projects in India has typically been 25 per cent, with debt making up the rest (Dutt, Arboleña, and Gonzalez 2020).

When raising debt, RE project developers can raise money from international USD-denominated markets or domestic INR-denominated markets. Additionally, capital can be raised in either denomination from institutions or debt capital (bond) markets. As depicted in Figure 1, four sources of debt emerge from these considerations.

Institutional domestic debt is the predominant source of funds for the Indian RE sector (Sinha, et al. 2020). Institutional debt from international entities is dominated by lending from multilateral and sovereign development banks. However, in recent years, alternate sources of funds are emerging, as seen in the case of Adani Green Energy's 2021 debt raise of USD 1.35 billion from a consortium of private international lenders (Adani Green Energy 2021).



Image: iStock

2. 96 GW includes 81 GW of wind and solar and 15 GW of bio-power and small hydro.

3. Credit from banks = USD 77 billion (RBI 2020); credit from NBFCs includes only Power Finance Corporation at USD 47 billion (PFC 2020) and REC at USD 44 billion (REC 2020), as these are the dominant NBFC lenders to the power sector.

**Figure 1** Indian RE developers can leverage four routes to raise debt

Source: CEEW-CEF research

Raising debt through bond markets, particularly through the issue of 'green bonds', has been a fast-growing source of funds. Domestic bond markets have remained untapped by private RE developers since issuances by ReNew Power and Hero Future Energies in 2016 (Singh, Dutt, and Sidhu 2020). Incidentally, sovereign-backed NTPC has raised significant funds from domestic bond markets for financing its thermal-dominated portfolio. As of June 2021, over USD 7 billion worth of domestic INR bonds is outstanding (NTPC 2021). However, domestic bond markets have recently seen encouraging activity from RE developers, with Vector Green Energy successfully raising INR 1,237 crores (USD 166 million)<sup>4</sup> in July 2021. Interestingly, the issue received a AAA credit rating from Indian rating agencies, which is a first for Indian green bonds (Roy 2021). Whether this issue is an early indicator of a potential increase in developer activity in domestic bond markets remains to be seen.

The major challenges faced by developers in raising efficient INR funding include limitations placed on power-sector lending for banks and NBFCs, maturity and size constraints, and covenants that do not allow efficient recycling of capital refinancing loans. International bond markets allow developers to raise large and recyclable amounts of capital.

International bond markets have shown significant interest in Indian green bond offerings. Our analysis suggests that Indian RE developers have raised a total

of USD 11.2 billion through green bonds since 2014. In addition, other institutions, including Indian lending institutions and non-financial, non-power corporates, have raised a further USD 4.4 billion, bringing the total green bond issuance in international bond markets to USD 15.6 billion.

**Issuances by RE developers make up 70% of all Indian green bonds in international markets.**



Image: iStock

4. Conversion rate taken as INR 74.33 per USD 1.00 as per RBI July rates.

## BOX 1 What are 'green' bonds?

Bond issuers have typically relied on frameworks developed by international bodies to label their bonds as 'green'. Popular frameworks leveraged include those by the Climate Bonds Initiative, Sustainalytics, CICERO, and International Capital Market Association (ICMA), which specify pre-issuance and post-issuance requirements for the bond to be classified as 'green'. These organisations also provide certifications, typically through third-party auditors. In 2017, the Securities and Exchange Board of India (SEBI) issued guidelines specifying mandatory disclosures, use of proceeds, and reporting standards for green bonds (SEBI 2017). These guidelines specify that debt raised through a green bond offering must be used for financing or refinancing projects across eight end-use themes, including RE projects.

Green bonds come under the broader ambit of environmental, social, and governance (ESG) financing. ESG-related bonds are predominantly of two types – use of proceeds and key performance indicator (KPI)-linked. For use of proceeds bonds, the funds raised are invested in projects that achieve ESG goals. For KPI-linked bonds, bond parameters, such as the coupon rate applicable, are based on the achievement of ESG-related KPIs. Figure 2 depicts the characteristics and relationships of these four different bond types.

**Figure 2** ESG-related bonds typically consist of two types



Source: CEEW-CEF analysis

India has seen multiple issuances of social bonds, such as those by the Pimpri Chinchwad Municipal Corporation (Bhosale 2020) and Shriram Transport Finance (STFC 2021). UltraTech Cement issued India's first sustainability-linked bond with a USD 400 million bond in 2021. The bond linked the coupon rate to the achievement of emissions intensity reduction targets (Das 2021).

Figure 3 shows the geographic split of cumulative green bond issuances in domestic and international markets as of December 2020. The share of Indian green bonds is significantly smaller compared to that of other countries. Four countries, namely, the US, China, France, and Germany, have a cumulative market share of over 50 per cent. Governments in Europe are aggressively targeting green bond markets. The German government recently issued a green bond with an unprecedented maturity of 30 years given that green bonds have maturities typically in the 5 – 10 year range (Ainger 2021). The British government too has strongly indicated its interest in green bonds, stating that it will raise GBP 15 billion (USD 21 billion<sup>5</sup>) in green bonds in 2021 (Oliver 2021).

This report focuses on the role of international bonds in financing India's RE projects. There are three key sections – approach and methodology, the state of the sector, and a deep dive into the RE portfolio that the bonds have refinanced. Our analysis dissects the key bond and RE portfolio parameters of developer-issued green bonds. We intend to help newer developers and other key stakeholders make informed decisions as they tap into the rich fund sources available in international bond markets.

## 2. Study approach and methodology

In this study, we analyse green bonds<sup>6</sup> issued by Indian entities, specifically RE developers, in international bond markets. These bonds are either denominated in a foreign currency (typically USD) or in INR through a masala bond offering. We followed a three-step process for primary research:

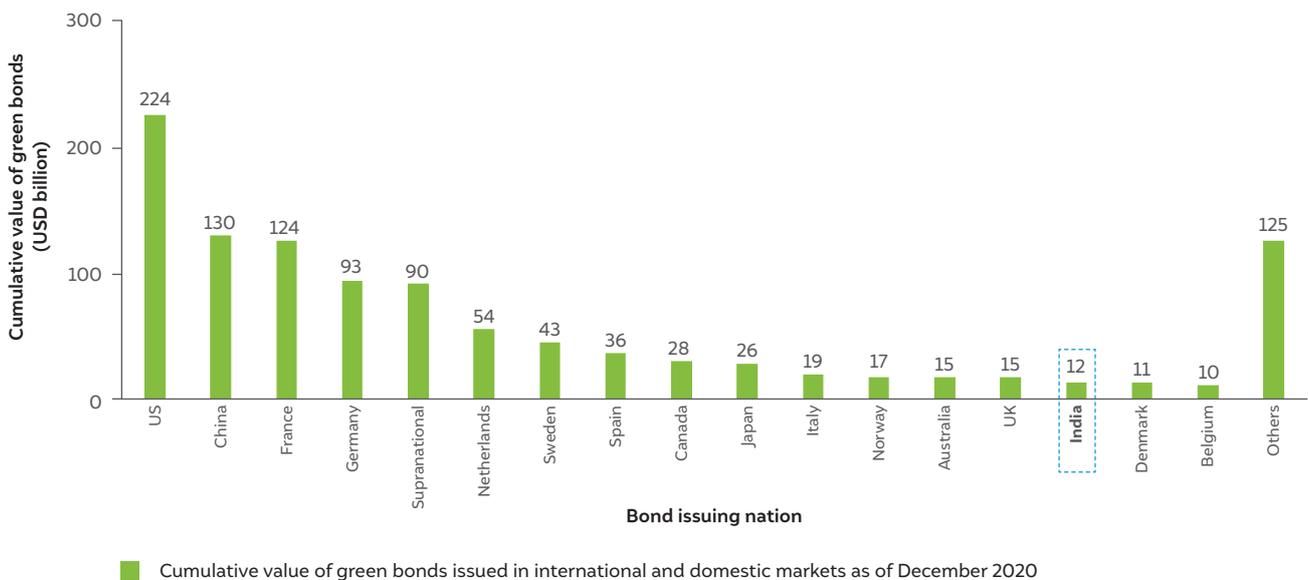
### 1. Green bond identification and database

**creation:** We built up a database of green bonds issued by Indian entities in international bond markets through a comprehensive review of exchange listing information, corporate press releases, and media reports. The information gathered was cross-verified with public documents released by institutions such as the Climate Bonds Initiative, Climate Policy Initiative, and the Reserve Bank of India.

### 2. Baselining of bond parameters and portfolio

**details:** We obtained details on bond parameters (maturity, the coupon rate, use of proceeds, rating, and restricted group details) through

**Figure 3** India significantly lags behind developed markets in issuing green bonds; US, China and European nations lead



Source: Climate Bonds Initiative. 2020. "Green Bond Data Platform." Accessed June 5, 2021. <https://www.climatebonds.net/market/data/>.

5. Conversion rate taken at USD 1.38 per GBP 1.00 as per Bank of England's July 2021 rate.

6. For the purpose of this study, we have considered bonds issued by pureplay RE developers without a 'green' certification (Greenko USD 550 million bond in 2014) as green bonds.

publicly available listing documents. We obtained geographic placement data for listed bonds by reviewing news reports, corporate press releases, and primary interviews.

- Analysis methodology:** We focused on green bonds issued by Indian RE developers, which constitute 72 per cent of such issuances<sup>7</sup> in international markets. Lenders and non-power, non-financial corporates issued the remaining bonds. Upon analysing the bonds, we found that reporting standards for the deployment of offering proceeds differ widely across issuers and could therefore not be mapped to a specific megawatt (MW) capacity of RE financed. Therefore, we limited the focus of this report to developer-issued green bonds.

We present our findings in two parts. First, we detail the characteristics and trends in developer-issued bonds – their issuers, maturity, coupon rates, spreads, use of proceeds, bond placement, and bond ratings. Second, we delve into the RE portfolio thus refinanced and detail trends in technologies, offtaker profiles, and project characteristics.

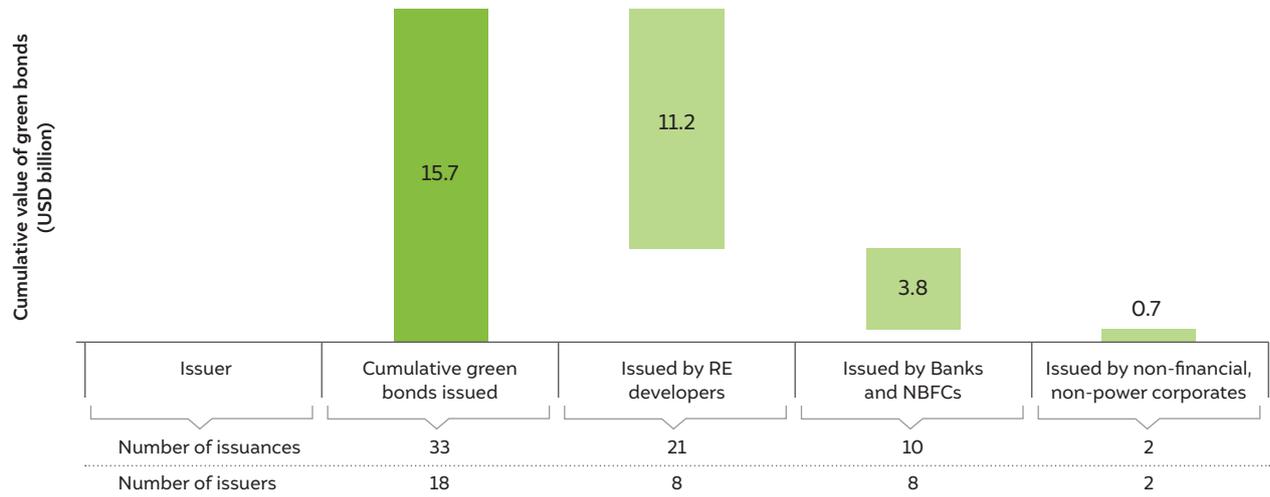
### 3. State of the green bond market

#### 3.1 How large is the green bond market?

RE developers, financiers, and other non-financial, non-power corporates from India have raised green bonds worth USD 15.6 billion between 2014 and the first half of 2021. Figure 4 depicts the capacity split of USD 15.6 billion between developers, banks and NBFCs, and non-power corporates.

Incidentally, the Greenko group, which raised the first bond (USD 550 million), did not specifically label it as a green bond in their documents. It was, however, considered green due to the nature of the projects financed by the proceeds (Kidney 2014). The Export-Import Bank of India issued India's first labelled green bond in international markets in 2015 (Hindu 2015). NTPC was the first among project developers to issue a labelled green bond on the London Stock Exchange (LSEG) in 2016. The bond was also the world's maiden green masala bond (LSEG 2016).

Figure 4 RE developers have issued over 70% of Indian green bonds in international markets



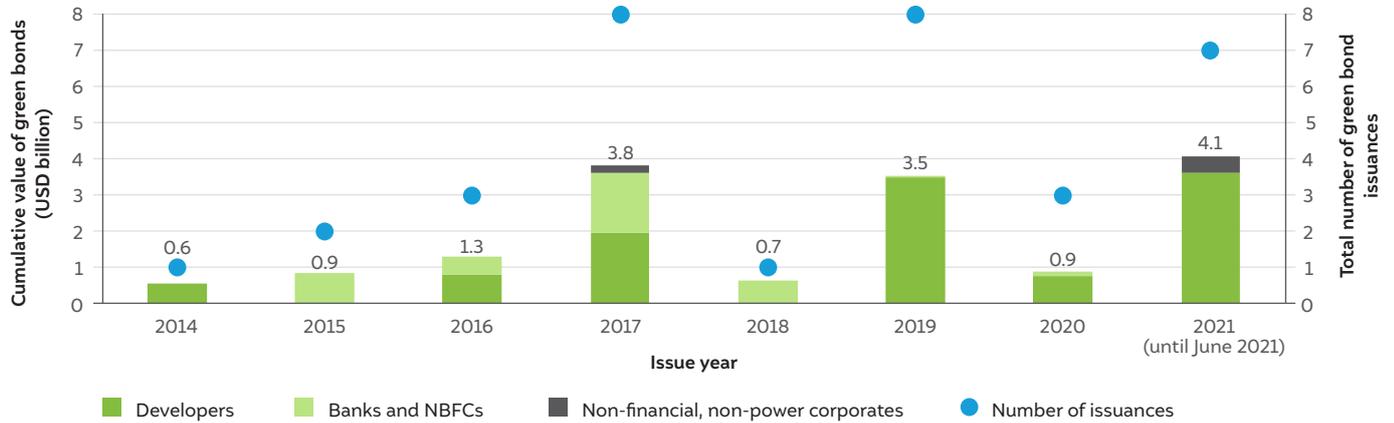
Source: CEEW-CEF compilation

7. Based on a CEEW-CEF compilation of green bonds issued by Indian entities.

Since 2019, project developers have been at the forefront of Indian green bond issuances. Figure 5 shows that listings in the first half of 2021 have already crossed the previous one-year record set in 2017. With over USD 4.1 billion issued till June 2021,

Indian green bond activity in international markets has rebounded sharply since a slowdown in issuances in 2020 due to the COVID-19 pandemic. In subsequent sections, we focus exclusively on bonds issued by RE developers.

**Figure 5** Cumulative green bond value in the first 6 months of 2021 has surpassed the previous one-year record



Source: CEEW-CEF compilation

## BOX 2 How are bonds raised in international markets regulated by the Reserve Bank of India?

Indian RE developers can use multiple channels to raise funds from international markets. Our analysis found that 13 of the 21 international green bonds raised by developers were issued by foreign-based entities. In this channel, a foreign-incorporated company, which may or may not be a subsidiary of the developer's Indian group company, issues green bonds in international markets. This foreign investor then on-lends the bond proceeds to Indian entities through securities issued to Indian project special purpose vehicles (SPVs). The remaining eight issuances were made directly by India-based entities in international bond markets.

The Reserve Bank of India (RBI) has provided several channels for foreign investments in Indian bonds and securities. The 'voluntary retention route' (VRR) is a popular channel leveraged by RE developers for their green bonds. RBI notified the VRR in 2019 to remove previous restrictions imposed on foreign borrowing (RBI 2019a). Through the VRR, foreign investors, such as the developer-linked companies raising green bonds, can invest in Indian securities, such as those issued by Indian project SPVs, to facilitate on-lending, subject to basic limitations on durations and amounts. The same applies to green bonds issued directly by India-incorporated entities.

If the VRR route is not leveraged, foreign borrowings may be subject to the RBI's External Commercial Borrowing (ECB) directions. These were updated in 2019 to detail the minimum maturity periods for corporate bonds in international markets and introduce certain relaxations (RBI 2019b). The ECB route typically involves more restrictions than the VRR route, making VRR the preferred option among developers.



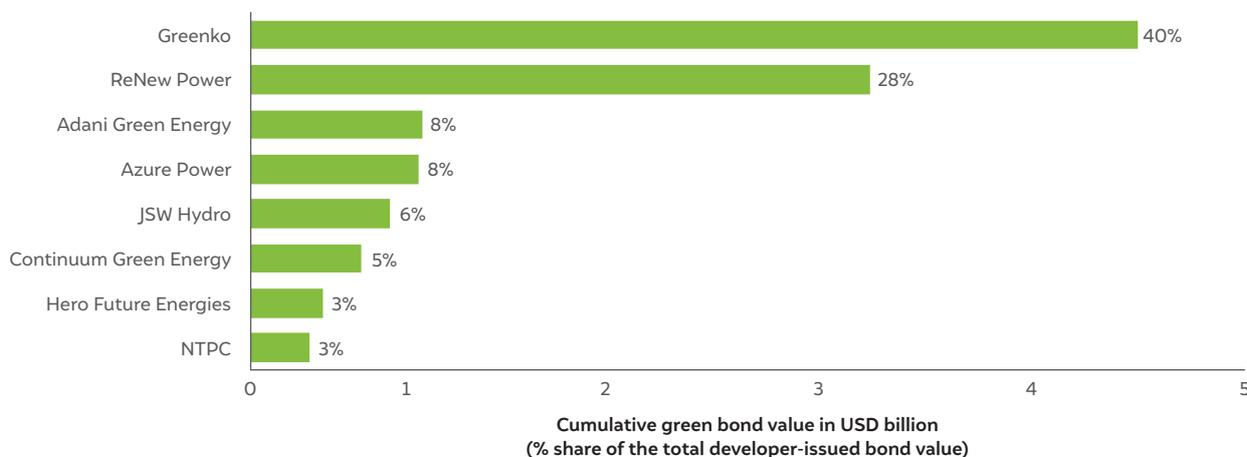
Source: CEEW-CEF compilation

### 3.2 Which developers have issued green bonds?

A total of eight Indian developers have issued green bonds worth USD 11.2 billion since 2014. While annual value of issuances has grown significantly, Indian offerings are dominated by two of the largest RE developers, Greenko and ReNew Power, as depicted in Figure 6. The two developers have issued almost 70 per cent of all developer green bonds by value.

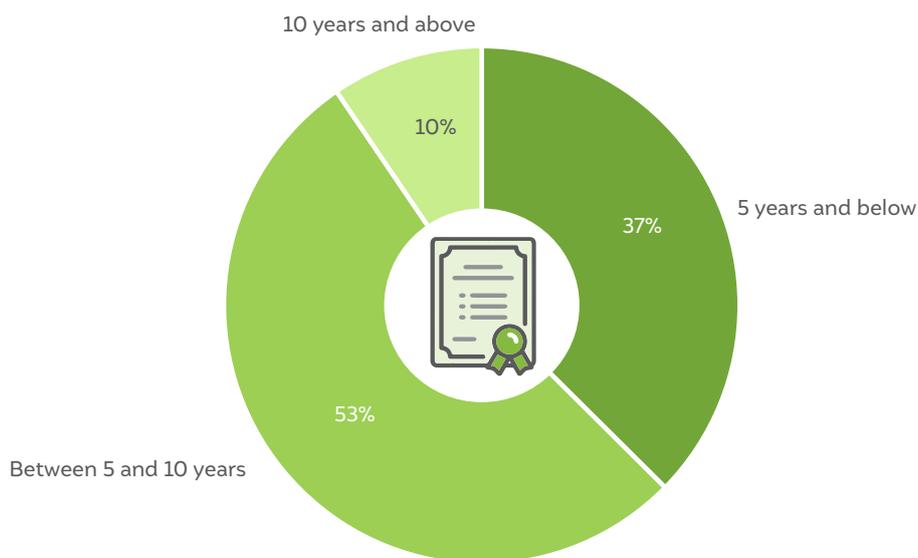
Between 2014 and 2020, green bonds were issued by leading project developers like Adani Green Energy, Azure Power, Greenko, NTPC, and ReNew Power. However, more recently, in 2021, we see new entrants making their debut in international bond markets (Continuum Green Energy, Hero Future Energies, and JSW Hydro). Figure 8 lists the size and maturity period for all bonds issued by developers.

**Figure 6** Greenko and ReNew Power dominate Indian developer-issued green bonds



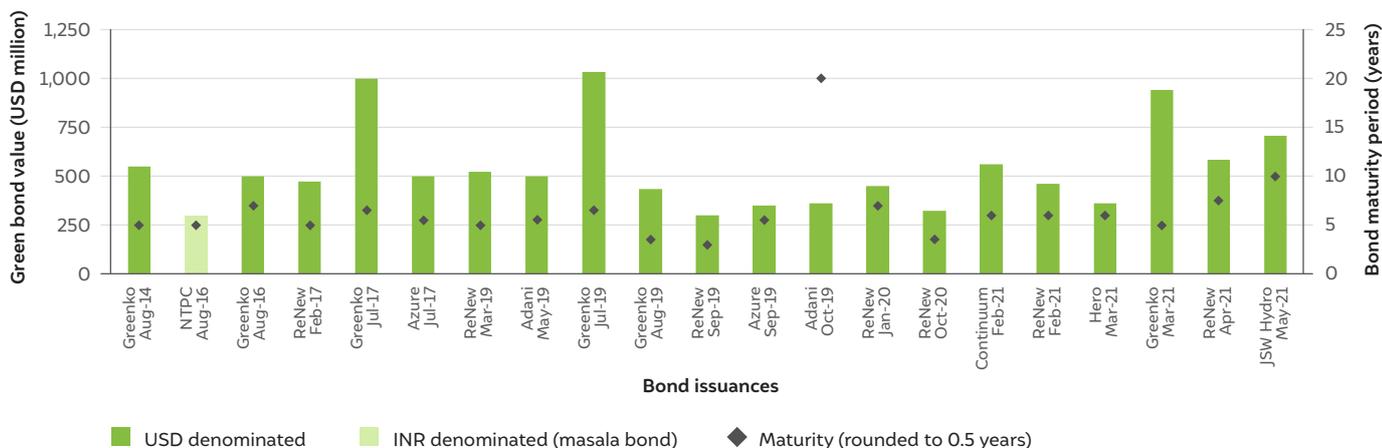
Source: CEEW-CEF compilation

**Figure 7** Most bonds have a maturity period between 5 and 10 years



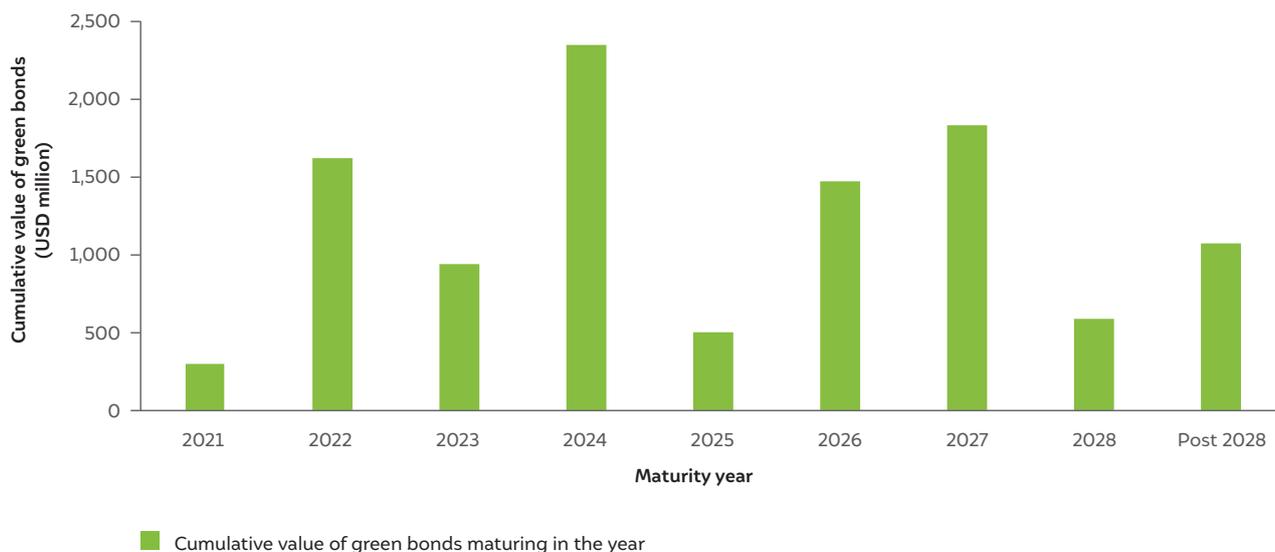
Source: CEEW-CEF compilation

**Figure 8** Two green bonds, both by Greenko, have crossed the USD 1 billion mark; the average green bond size is just over USD 500 million



Source: CEEW-CEF compilation

**Figure 9** Green bonds worth over USD 5 billion will mature by 2024



Source: CEEW-CEF compilation

Figure 9 shows that USD 5 billion worth of developer-issued green bonds will mature by 2024. Given the longer terms of institutional loans that were initially used to finance construction and project power purchase agreements (PPAs), developers are likely to refinance these bonds as they mature or even earlier, likely through new green bond issuances.

Developers mostly chose to list their bonds on the Singapore Exchange. The one exception was ReNew Power’s 2021 USD 585 million issuance, which

was exclusively listed on the recently set up India International Exchange (Gupta 2021). Additionally, Adani Green Energy’s USD 500 million bond, issued in 2019, was listed on the India International Exchange as well as the Singapore Exchange.

### 3.3 How has green bond pricing evolved?

Figure 10 reveals that while coupon rates for initial green bond issuances were as high as 8 per cent, they have recently been fluctuating between 4 to 6 per

cent. Figure 10 represents the coupon rate as the sum of the US treasury benchmark for a similar maturity period and the spread over this benchmark. These coupon rates are fixed interest rates determined after a book-building exercise in the market. Therefore, they represent the actual cost of borrowing for the developer. Interest payments are typically made to investors twice a year, while the principal amount is typically repaid through a bullet repayment at the end of the maturity period. Some bonds provide a partial amortising schedule for the principal repayment, while only Adani Green Energy's USD 363 million bond, issued in 2019, provides a primarily amortising schedule.

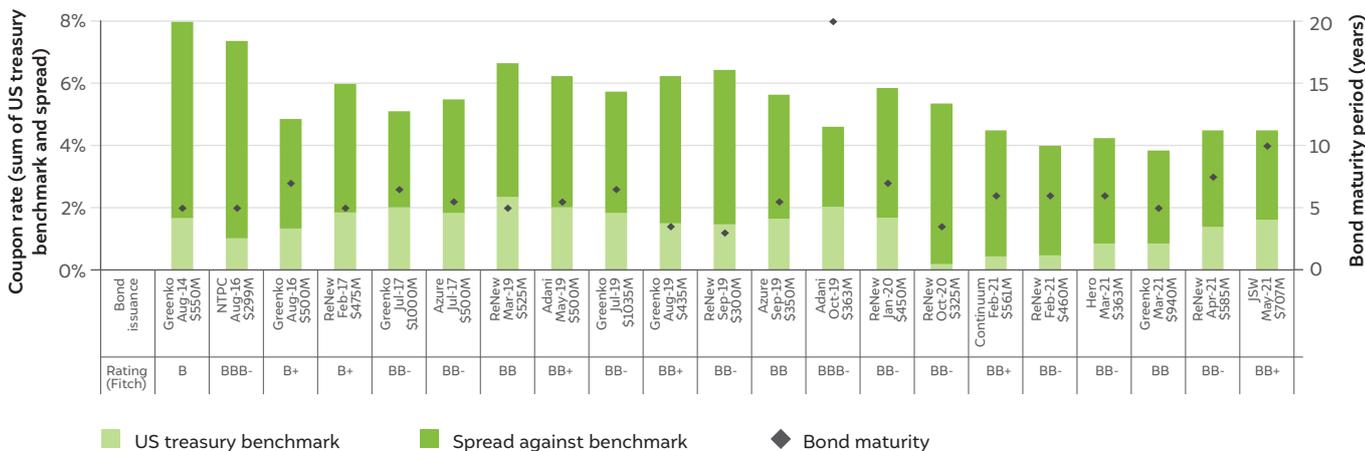
Coupon rates for Indian developer-issued green bonds have been slightly higher than those for corporate non-green bonds, that average around 4 per cent (RBI 2021). While ReNew Power and Greenko have successfully raised funds at 4 per cent and below

through one issuance each in 2021, the broader trend still indicates that developers are paying a premium for green bonds. Our analysis reveals that credit ratings for 19 of the 21 green bonds issued are below investment grade, resulting in the high interest rates for Indian RE green bonds.

**The average spread over benchmark for 2021 is 60 basis points lower than the overall average.**

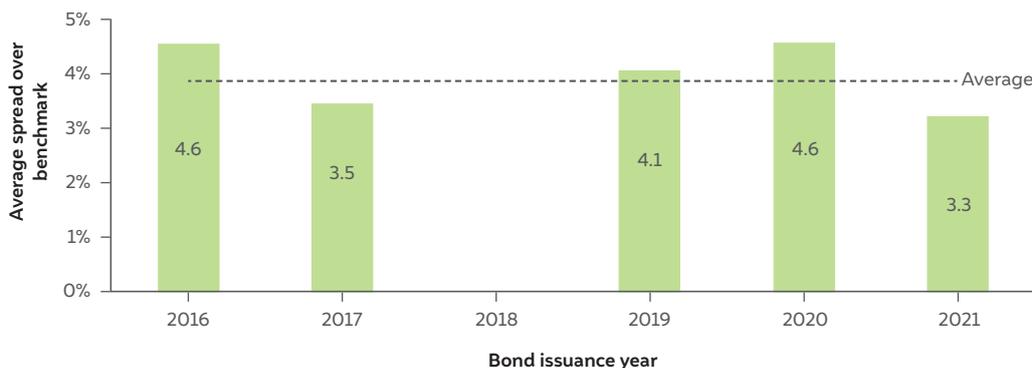
The spread of coupon rates against the US treasury benchmark averages near 4 per cent, as depicted in Figure 11. Interestingly, the average spread for 2021 is over 60 basis points lower than the average spread across all issuances, suggesting that developers have been able to refinance their portfolios at lower costs in 2021. However, this trend has fluctuated over the past years and remains indicative.

Figure 10 Bond coupon rates have typically ranged between 4-6%



Source: CEEW-CEF analysis

Figure 11 The spread against the US treasury benchmark has sharply decreased in 2021



Source: CEEW-CEF analysis

### BOX 3 Adani Green Energy's 20-year green bond

In 2019, Adani Green Energy issued India's first-ever amortising green bond in international markets, at USD 363 million with a 4.625 per cent coupon rate and repayments scheduled over a 20-year maturity period (ET Energyworld 2019). The bond carried an investment-grade rating of BBB- and offers the lowest spread against the US treasury benchmark of all RE developer green bonds. The only other developer-issued green bond to carry an investment-grade rating was NTPC's 2016 masala bond. Interestingly, this bond was issued to primarily refinance foreign currency loans, unlike most other bond offerings that primarily refinance INR loans.



Source: CEEW-CEF research

### 3.4 Who buys green bonds at issuance?

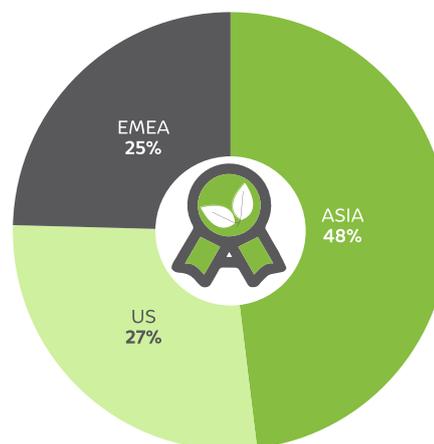
Our analysis suggests that Asian investors are the leading source of the influx of international debt capital for Indian RE developers. Figure 12 shows that 48 per cent of the bond value was picked up by Asian accounts, followed by investors in the US at 27 per cent and those in Europe, Middle East, and Africa (EMEA) at 25 per cent.

It is important to note that the geographical placement represents the location of buyer accounts that bid for the bond offering and not the location of the global headquarters of the buyer. Therefore, bids from Asia may include buyers from the US or EMEA who bid through their Asian subsidiaries and vice versa. Further, regional placement data are only available at the time of bond issuing and do not represent the current geographical breakup of bond allocation.

Overall, the split between Asia, the US, and EMEA at the time of issuance has remained consistent across developer bond issuances, cementing the view that Asian markets are a reliable source of capital for developers.

International markets have shown a strong appetite for Indian green bonds, with bonds typically oversubscribed from 1.5 to over 8 times. On average, bonds have been oversubscribed by 3.6 times.<sup>9</sup>

Figure 12 Asian investors have purchased almost half of all proceeds from developer-issued green bonds



Source: CEEW-CEF compilation<sup>8</sup>

Debut issuances have also received significant interest, with Continuum Wind Energy and Hero Future Energies' 2021 bonds oversubscribed by 6 and 8.3 times, respectively. Undersubscription is rare, with the only significant instance being that of a planned 2020 bond by SB Energy, which was pulled due to low market interest despite a high coupon rate of 6.75 per cent (Barman 2020).

8. Based on a CEEW-CEF compilation of publicly available data and developer responses to data requests for 67 per cent of developer-issued green bonds by value in USD billion.

9. Based on a CEEW-CEF compilation of available subscription data of 79 per cent of developer-issued green bonds by value in USD billion.

## 4. Portfolios financed by green bonds

This section discusses characteristics of the RE portfolio refinanced through green bonds and assesses their impact on bond pricing, i.e., the spread over the benchmark. We specifically delve into the renewable technology (solar, wind, or hydro), offtaker identity, operational history, and tariff profile.

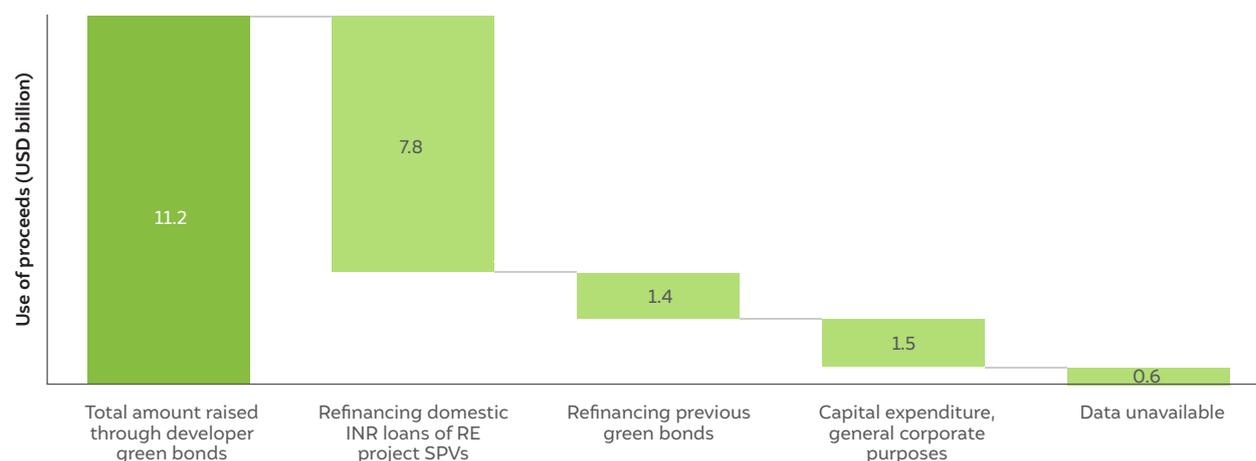
Figure 13 shows that of the USD 11.2 billion worth of green bonds issued by Indian developers, green bonds worth USD 9.2 billion refinanced RE project loans.<sup>10</sup> Of the balance, proceeds worth USD 1.5 billion were allocated towards capital expenditure, general corporate purposes, and fees related to bond issuance and account management.<sup>11</sup>

RE projects with loans refinanced by a bond are referred to as the bond's 'restricted group'. These projects are housed in various SPVs that typically act as issuers for the bond offering. The existing indebtedness of the restricted group, which overwhelmingly comprises domestic INR loans, is refinanced through the bond proceeds. Restricted

group assets are typically secured as collateral with conditionalities. Thus, the restricted group is a critical evaluation parameter for bond investors. It also represents the exact projects financed through international bond markets in the country.

Figure 14 depicts the difference between the interest rates of existing loans and green bond coupon rates. On average, developers have obtained a differential of 5.7 per cent on their domestic INR loans.<sup>12</sup> This advantage does not include the market-dependent cost of hedging or prepayment penalties,<sup>13</sup> which significantly lower the differential. Developers typically do not hedge bond proceeds for the whole of the maturity period at once and prefer to recycle short duration hedging agreements. The 12-month Mumbai Interbank Forward Offer Rate (MIFOR) index, an indicator of hedging costs, averaged 4.8 per cent over the financial year 2020–21. The actual hedging cost is likely to include a spread over this benchmark. As the cost is market-dependent, developers might not always obtain an advantage over domestic INR loans. In such situations, they enter the market primarily to obtain access to a wider pool of capital due to low liquidity with domestic lenders.

**Figure 13** Over 80% of bond proceeds were allocated for refinancing



Source: CEEW-CEF analysis

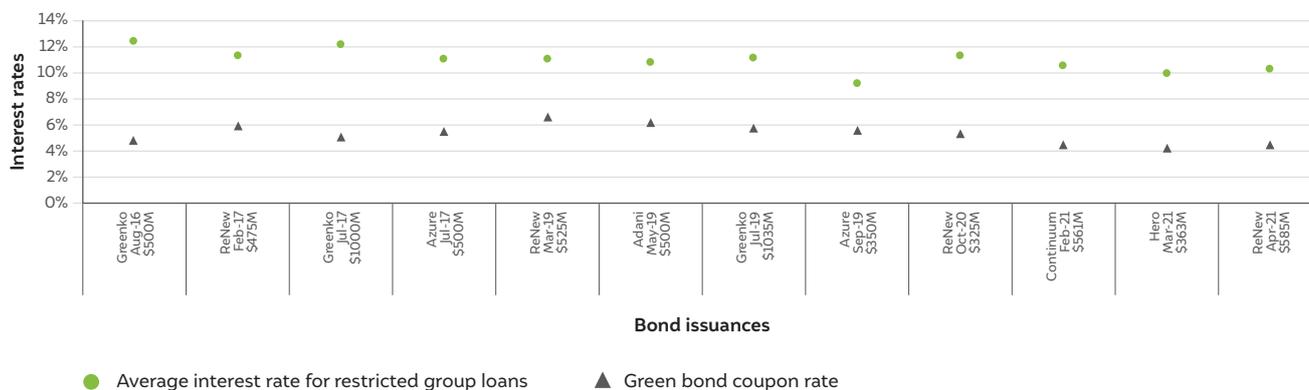
10. Based on CEEW-CEF analysis of bond use of proceeds available in bond listing documents.

11. Use of proceeds data is unavailable for Greenko's 2014 USD 550 million bond and has not been included.

12. Based on CEEW-CEF analysis of restricted group loans available in bond listing documents.

13. Typically levied as a one-time payment of 1–2 per cent on the outstanding amounts being repaid before maturity, although developers may include covenants stating that the penalty will not apply if prepayment is through bonds or Infrastructure Investment Trusts (InvIT).

**Figure 14** While developers have achieved lower interest rates than domestic INR loans through green bonds, the differential is reduced due to hedging costs<sup>14</sup>



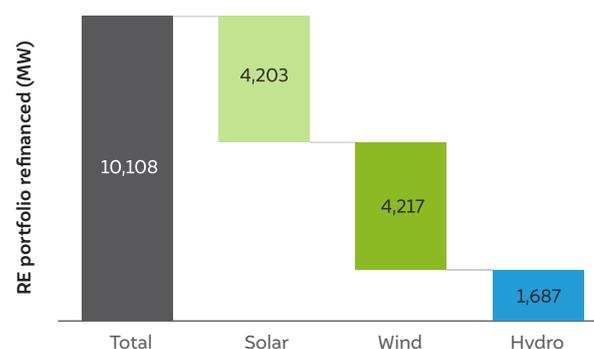
Source: CEEW-CEF analysis

The capacity underlying the USD 9.2 billion of bond capital raised for refinancing amounts to 10 GW of unique RE projects. Of this, USD 1.4 billion consisted of bonds that refinanced previous green bonds with the same restricted group. This translates to 1.6 GW of the 10 GW portfolio. Apart from in figures depicting bond-wise information, these projects have only been counted once to avoid data repetition and have been discussed separately in Box 4.

### 4.1 Which renewable energy sources have powered green bond growth?

As seen in Figure 15, solar and wind each makes up just over 40 per cent of the overall portfolio, with hydro accounting for the rest. Therefore, solar and wind total 8.4 GW. This means that 10 per cent of India's 81 GW of solar and wind capacity (MNRE 2021) has been debt-financed through bonds. The split across developers follows the trends of their early portfolio development, with Greenko and ReNew Power accounting for the bulk of wind assets, Adani Green Energy and Azure Power accounting for most of the solar capacity, and JSW Hydro accounting for the bulk of hydro capacity.

**Figure 15** Wind and solar each make up 40% of the refinanced RE portfolio

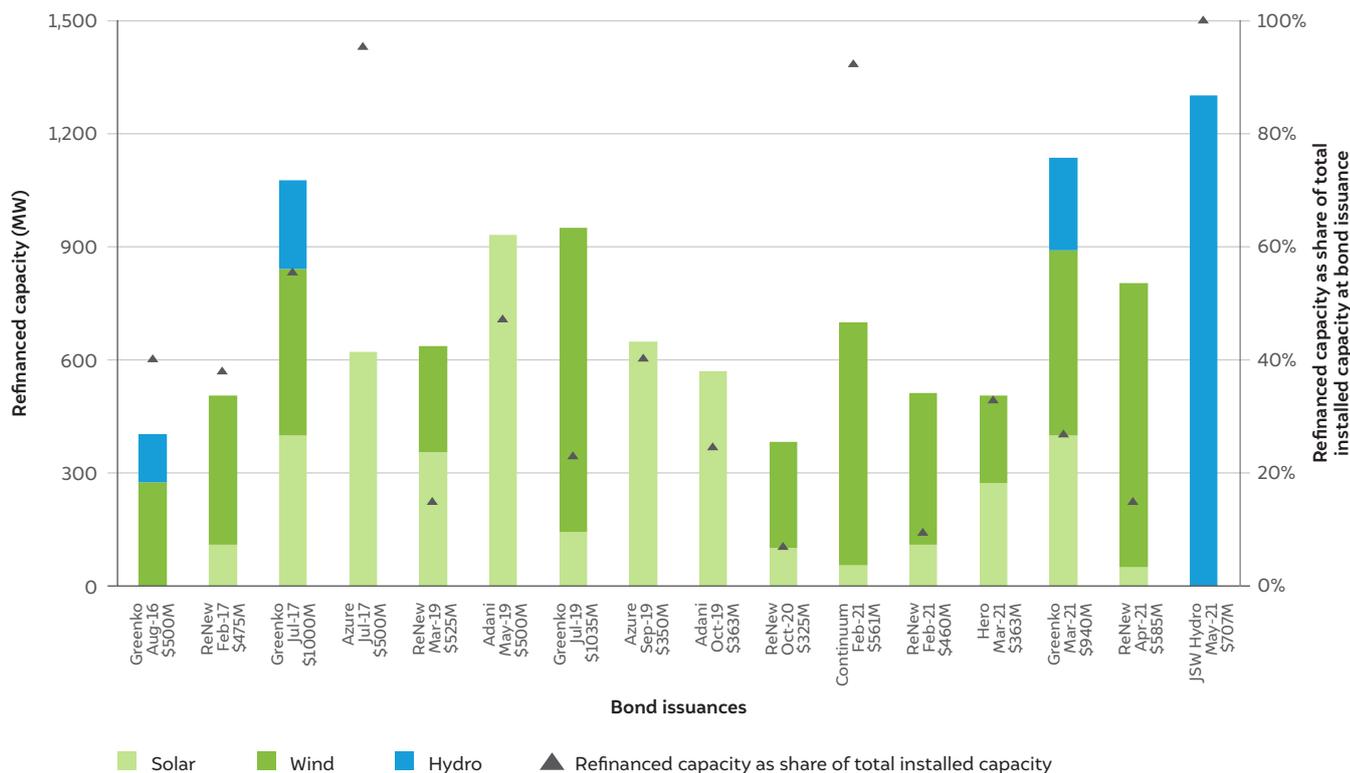


Source: CEEW-CEF compilation

Figure 16 depicts the size and technology split of each bond's restricted group portfolio, as well as the share of the developer's total operational capacity that the restricted group represented at the time of issuance. Except for Azure Power, Continuum, and JSW Hydro's first issuances, refinanced RE portfolios have never exceeded 60 per cent of the group's operational capacity. Three issuances – two from Greenko and one from JSW Hydro – have breached the 1 GW mark for their restricted groups. These issuances also represent three of the four largest bond offerings in terms of USD value.

14. Bonds refinancing foreign currency loans (Adani, 2019, USD 363 million), refinancing previous green bonds (Greenko, 2021, USD 940 million, and ReNew, 2021, USD 460 million), or without interest information (JSW Hydro, 2021, USD 707 million) are not included.

**Figure 16** Bond portfolio technologies follow the early capacity development trend for the issuer



Source: CEEW-CEF compilation

### 4.2 Which utilities offtake restricted group capacity?

Figure 17 shows that state utilities are the offtakers for 6.4 GW out of the total 10 GW of refinanced capacity. This may seem counter-intuitive, given the current difficulties in ensuring timely payment of dues from state utilities. Central buyers, such as NTPC and Solar Energy Corporation of India (SECI), account for 2.8 GW. Interestingly, developers have even refinanced projects installed for third-party electricity sale under the open-access mechanism. However, these projects

typically contribute a small share of the overall portfolio mix in a restricted group.

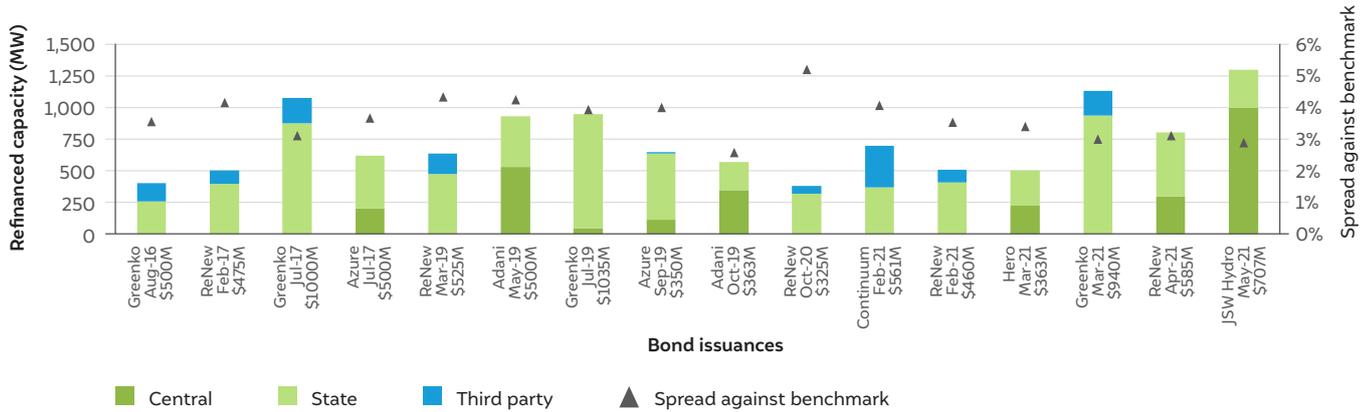
Figure 19 shows the offtaker mix for each green bond issuance. Most bonds, particularly those of Greenko and ReNew Power, are dominated by projects contracted by state utilities. A significant share of the capacity contracted by central buyers comes from a single 1 GW project, Karcham Wangtoo, in the JSW Hydro bond. Figure 19 also shows that bond pricing, i.e., the spread against the benchmark, has not significantly changed with a changing portfolio mix.

**Figure 17** State utilities dominate the offtake of refinanced RE portfolios



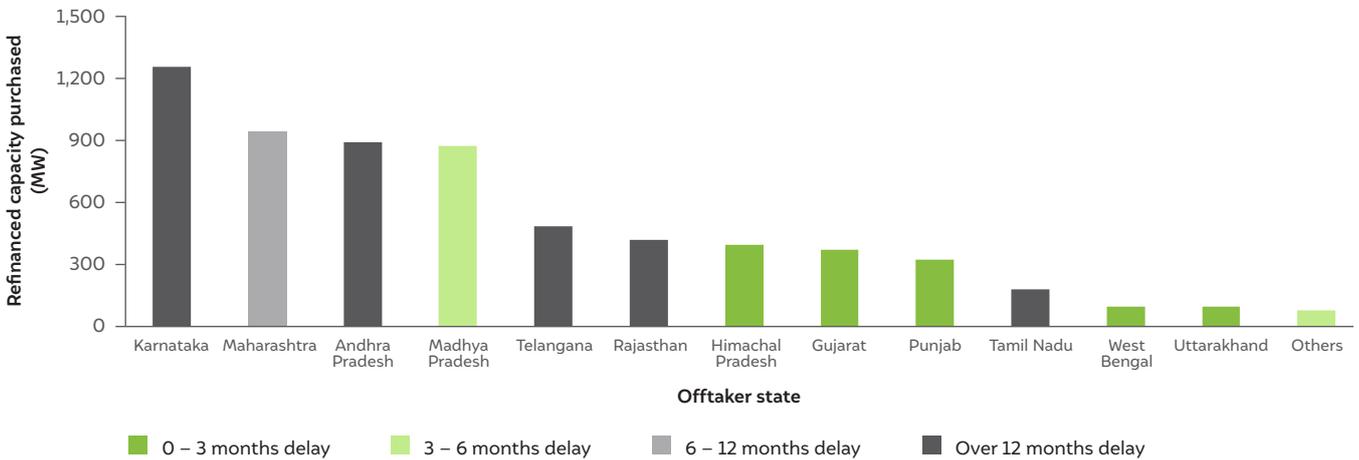
Source: CEEW-CEF analysis

**Figure 19** Bond portfolios are largely contracted by state utilities; the share of central offtake has no noticeable impact on spread



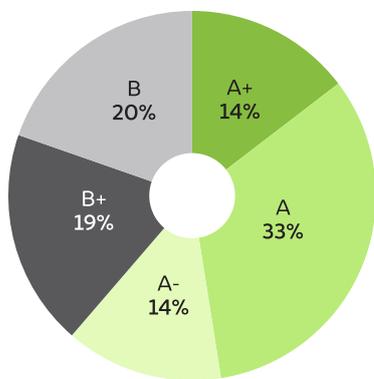
Source: CEEW-CEF analysis

**Figure 18** Five states make up 70% of the 6.4 GW capacity with state utilities as offtakers



Source: CEEW-CEF analysis

**Figure 20** Offtakers for 39% of the 6.4 GW capacity with state utilities are rated below A



Source: CEEW-CEF analysis

Delving further into the 6.4 GW of project capacity that has state utilities as offtakers, we find that the top five states account for 70 per cent of this capacity. As shown in Figure 18, Karnataka leads with 1.2 GW, followed by Maharashtra, Andhra Pradesh, Madhya Pradesh, and Telangana, respectively. The colour coding depicts the average payment delay in months over the financial year 2020–21 as per the Ministry of Power’s Praapti portal.<sup>15</sup> Leading states all show significant delays in payments to power developers.

**Discoms with payment delays over one year make up 50% of state-bought capacity.**

15. As of 31st March 2021.

Further, Figure 20 shows the split of capacity with state utilities as offtakers across their ratings as per the annual integrated ratings for state distribution utilities put out by the Ministry of Power and the Power Finance Corporation (PFC 2019).<sup>16</sup> Our analysis shows that offtakers for 39% of the 6.4 GW capacity with state utilities are rated below A.

International bond markets have responded positively despite these apparent risks as developers typically balance the share of lower-rated utilities with better-rated utilities to create a more diversified mix and reduce risk. Further, markets typically secure repayment through financial covenants that strictly monitor the developer's debt service coverage at a group level.

### 4.3 Is project operational history a key concern for investors?

Figure 21 depicts the average years of operational history available to green bond buyers and the consequent spread across issuances. We have defined operational history as the number of years between the projects commissioning date and the date of bond

issuance on the market. The short timelines between project commissioning and bond issuance and the corresponding spreads show that bond markets have been favourable towards projects with short operational histories.

### 4.4 What is the tariff mix of refinanced capacity?

Figure 22 depicts the tariff range and weighted average portfolio tariffs for government-bid projects refinanced by developer-issued green bonds. The tariff range does not show a clear correlation with the bond pricing. Greenko's 2021 USD 940 million bond achieved the lowest coupon rate despite a high tariff range across its refinancing portfolio, with tariffs as high as INR 7/kWh being refinanced even in 2021. Recent years have seen a focus on renegotiating tariffs, particularly in the much-publicised case of Andhra Pradesh, and further in Uttar Pradesh, Punjab, and Gujarat (Chatterjee 2019; Prateek 2018; Bhaskar 2021; Chandrasekaran 2021). While some of these cases are only for tendered capacity, state attempts to renegotiate signed PPAs may add risks to a developer's bond offering in the future.

**Figure 21** The bond spread has not materially increased or decreased with higher years of operational history<sup>17</sup>

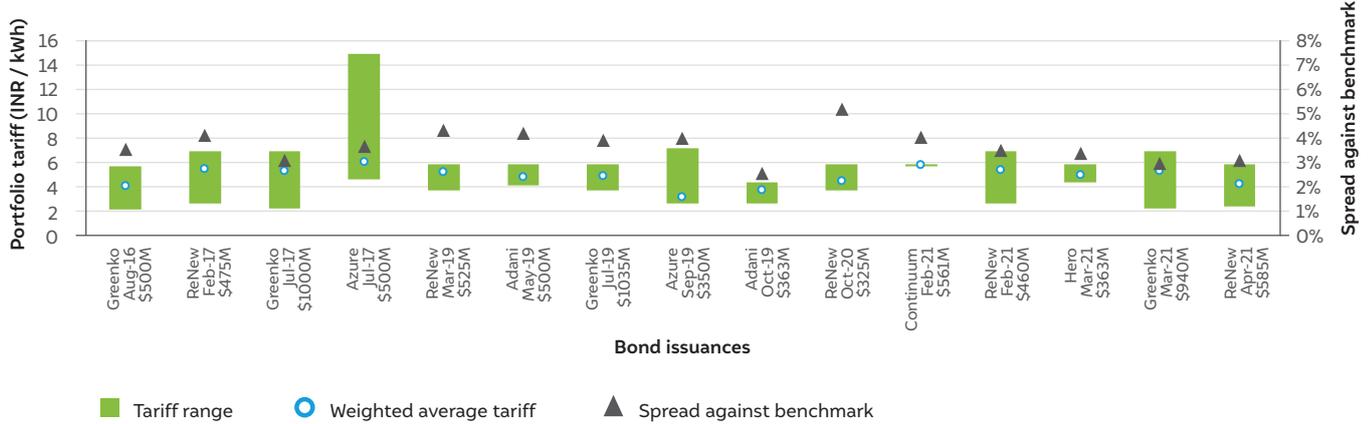


Source: CEEW-CEF analysis

16. PFC's utility ratings cover a mixture of financial parameters (33 per cent), operational and reform parameters (52 per cent), and regulatory parameters (15 per cent) and do not represent credit ratings.

17. Excludes JSW Hydro's 2021 issuance due to its outlier nature with over 13 years of operational history available.

**Figure 22** The average portfolio tariff has remained around INR 5/kWh with no noticeable trend against bond spread<sup>18</sup>

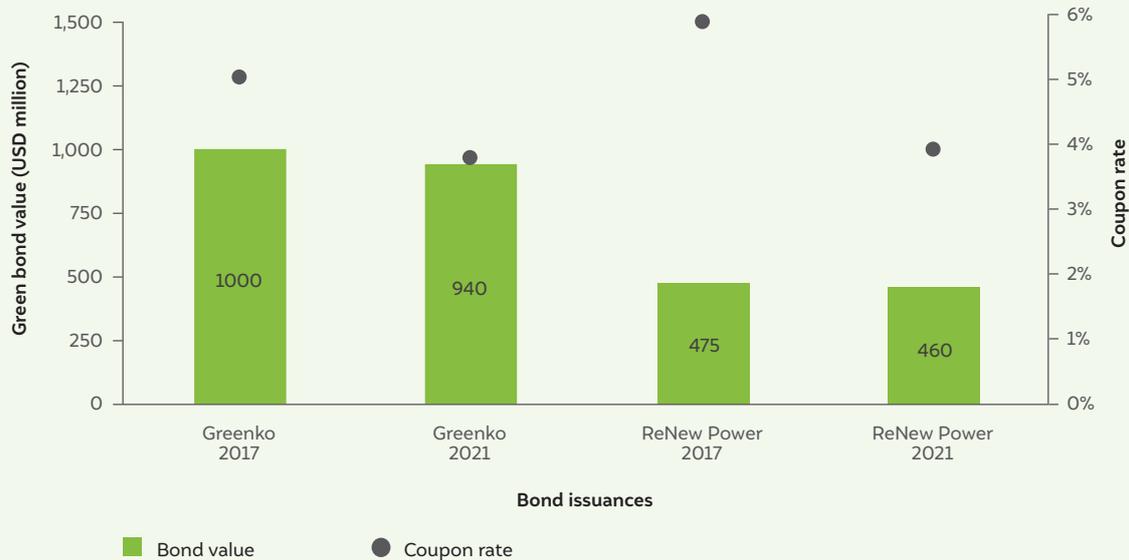


Source: CEEW-CEF analysis

**BOX 4 Refinancing green bonds – Greenko and ReNew Power's repeat issuances**

In 2021, Greenko and ReNew Power tapped international bond markets to refinance previous green bonds issued in 2017. The initial bonds were due for maturity in 2022 for ReNew Power and 2022 and 2024 for Greenko; however, the developers still chose to redeem the green bonds with new bonds at lower coupon rates. A part of Greenko's 2017 bond was allocated for refinancing its 2014 green bond, which was the first such issuance by Indian players.<sup>19</sup> Figure 23 details the pricing advantage achieved through the 2021 bonds, representing the lowest coupon rates achieved by a developer.

**Figure 23** Both developers obtained a cost advantage on their previous green bonds through the 2021 issue



Source: CEEW-CEF compilation

18. JSW Hydro was left out as the tariffs for its restricted group projects are determined periodically by state and central regulators.

19. Due to the unavailability of restricted group data for the Greenko USD 550 million bond in 2014, we cannot comment on whether the entire restricted group from 2014 was refinanced again in 2017.

## 5. Conclusion

As India scales up its RE capacity to its 2030 target of installing 450 GW of RE, Indian institutional lenders are nearing their sectoral lending limits for the power sector. Developers must seek out new funding sources to maintain the required pace of capacity addition. Green bonds in international markets present an opportunity to enhance developers' access to capital. Indian developers have issued international green bonds valued at USD 11.2 billion to refinance their RE portfolios. We found that these bonds have been significantly oversubscribed, particularly by Asian buyers.

**International markets have been largely agnostic to the nature of the portfolio refinanced through green bonds.**

Bond spreads have not shown material trends against the key characteristics of the refinanced portfolios, which are listed below –

- Projects with state utilities as offtakers dominate RE portfolios, while the renewable technologies covered are evenly split between solar and wind with a small share of hydro
- Most bond portfolios have short to moderate operational histories, typically under four years
- Average tariffs for refinanced portfolios have hovered around INR 5/kWh with developers balancing out high-tariff and low-tariff projects

While the poor financial health of state utilities has been highlighted as a risk by rating agencies, it has not dampened interest in Indian green bonds. This is because markets typically secure repayment through financial covenants that strictly monitor debt service coverage and Capex reserves.

The route has only been leveraged by eight Indian RE developers to date. However, growing calls for increased climate finance from developed nations suggest that the pool of funds will expand in the coming years. We believe that green bonds have the

potential to play a significant role in India's energy transition. Therefore, all stakeholders, including developers, consumers, and policymakers, must view the international market green bond route as complementary to domestic institutional debt. We have outlined the potential for various stakeholders below.

- **RE developers:** Several utility-scale RE developers in India are yet to raise funds through international bonds. They can access a large pool of funds with lenient covenants through this route while favourable hedging agreements can deliver pricing advantages. Additionally, of the total 21 green bonds raised by RE developers, 5 refinanced restricted groups of sizes near or below 500 MW. This indicates that international markets are open to smaller developers without GW scale capacities so long as they exhibit a stable credit profile.
- **Industries and manufacturers:** Upstream industries in the RE sector such as module manufacturers can leverage their inherently 'green' businesses to raise green bonds and diversify capital. Further, many players in energy-intensive industries such as oil and gas, metals and mining, and cement have set net-zero or RE targets. These companies may also obtain favourable pricing due to their strong credit profiles. Such industries can accelerate their energy transition plans by accessing dedicated international finance through climate-aligned bonds that are either 'green' or 'sustainability linked'.<sup>20</sup>
- **Policymakers:** While developer activity in international bond markets has ramped up, the domestic bond market has seen little participation from RE developers since 2016. Vector Green Energy's 2021 green bond<sup>21</sup> in the domestic market is a welcome development; however, it remains to be seen whether this indicates a change in the trend. Policymakers must focus on revitalising the domestic bond market by learning from international green bonds, not just those issued by Indian RE developers but also by sovereign institutions such as those in Europe. To achieve India's RE targets, we must fully tap into the potential of all sources of debt funding.

20. UltraTech Cement issued India's first sustainability-linked bond in 2021, raising USD 400 million at a 2.8 per cent coupon rate.

21. Vector Green Energy announced India's first AAA-rated domestic green bond by an RE developer, raising INR 1,237 crore (USD 166 million at conversion rate of INR 74.33 per USD 1.00) at 6.49 per cent interest in July 2021.

- **South and South-East Asian developers:** RE developers in nations with similar sovereign credit profiles and ambitious RE targets as India, such as Malaysia, Indonesia, and the Philippines, can also ramp up their activity in international bond markets to fund their energy transitions. State and private entities from these nations have issued green bonds in international markets in the past and are well placed to benefit from the market's advantages.

International bond markets have been strong supporters of the Indian energy transition. The path forward must continue this year's trend with not just developers, but industries and policymakers also seriously evaluating the market to unlock a much-needed alternate source of debt.

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# Annexures

## Annexure I

**Table 1** List of green bonds issued by Indian developers in international bond markets

S No.	Developer	Bond details (issue month)	Listing source
1	Greenko	USD 550 million at 8.00% due 2019 (Aug-14)	SGX
2	NTPC	INR 20,000 million at 7.38% due 2021 (Aug-16)	LSEG, SGX
3	Greenko	USD 500 million at 4.88% due 2023 (Aug-16)	SGX
4	ReNew Power	USD 475 million at 6.00% due 2022 (Feb-17)	SGX
5	Greenko	USD 1,000 million USD 350 million at 4.88% due 2022 (Jul-17) USD 650 million at 5.25% due 2024 (Jul-17)	SGX
6	Azure Power	USD 500 million at 5.50% due 2022 (Jul-17)	SGX
7	ReNew Power	USD 525 million USD 375 million at 6.67% due 2024 (Mar-19) USD 60 million at 6.67% due 2024 (Mar-19) USD 90 million at 6.67% due 2024 (Sep-19)	SGX
8	Adani Green Energy	USD 500 million at 6.25% due 2024 (May-19)	INX, SGX
9	Greenko	USD 1,035 million USD 500 million at 5.55% due 2025 (Jul-19) USD 450 million at 5.95% due 2026 (Jul-19) USD 85 million at 5.95% due 2026 (Sep-19)	SGX
10	Greenko	USD 435 million USD 350 million at 6.25% due 2023 (Aug-19) USD 85 million at 6.25% due 2023 (Aug-19)	SGX
11	ReNew Power	USD 300 million at 6.45% due 2022 (Sep-19)	SGX
12	Azure Power	USD 350.101 million at 5.65% due 2024 (Sep-19)	SGX
13	Adani Green Energy	USD 362.5 million at 4.63% due 2039 (Oct-19)	SGX
14	ReNew Power	USD 450 million at 5.88% due 2027 (Jan-20)	SGX
15	ReNew Power	USD 325 million at 5.38% due 2024 (Oct-20)	SGX
16	Continuum Green Energy	USD 561 million at 4.50% due 2027 (Feb-21)	SGX
17	ReNew Power	USD 460 million at 4.00% due 2027 (Feb-21)	SGX
18	Hero Future Energies	USD 363 million at 4.25% due 2027 (Mar-21)	SGX
19	Greenko	USD 940 million at 3.85% due 2026 (Mar-21)	SGX
20	ReNew Power	USD 585 million at 4.50% due 2028 (Apr-21)	INX
21	JSW Hydro	USD 707 million at 4.50% due 2031 (May-21)	SGX

Source: CEEW-CEF compilation

**Table 2** List of green bonds issued by Indian lenders and non-financial, non-power corporates in international bond markets

S No.	Developer	Bond details (issue month)	Listing source
1	Exim Bank	USD 500 million at 2.75% due 2020	Bank website
2	IDBI Bank	USD 350 million at 4.25% due 2020	Bank website
3	Axis Bank	USD 500 million at 2.88% due 2021	SGX
4	Jain Irrigation	USD 200 million at 7.125% due 2022	SGX
5	REC	USD 450 million at 3.97% due 2027	LSEG
6	Indian Renewable Energy Development Agency	INR 19,500 million at 7.13% due 2022	SGX
7	Power Finance Corporation	USD 400 million at 3.75% due 2027	LSEG
8	Indian Railway Finance Corporation	USD 500 million at 3.84% due 2027	INX
9	State Bank of India	USD 650 million at 4.50% due 2023	INX
10	Axis Bank	USD 40 million at 3.82% due 2024	SGX
11	State Bank of India	USD 100 million due 2022	SGX
12	Delhi International Airport	USD 450 million at 6.25% due 2025	SGX

Source: CEEW-CEF compilation

## Annexure II

We obtained the geographic allocation of Indian RE developer-issued green bonds through a compilation of – (i) media reports from Business Standard, Bloomberg Quint, The Hindu Business Line, The

Economic Times, The Times of India, and The Asset; (ii) an official press release by NTPC; and (iii) direct inputs from ReNew Power and Azure Power.



International bond markets have been a critical source of debt capital; developers and other stakeholders must ramp up bond activity to unlock new sources of funds.





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