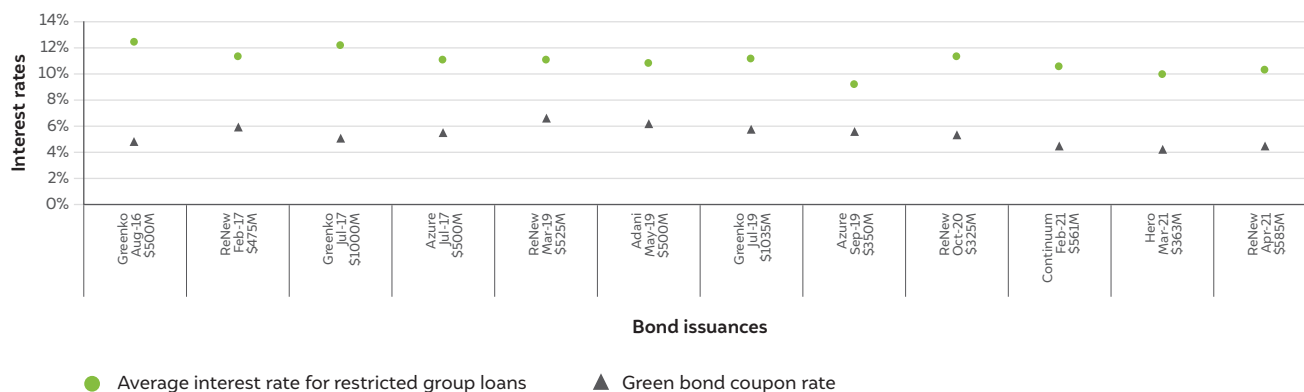


Figure 14 While developers have achieved lower interest rates than domestic INR loans through green bonds, the differential is reduced due to hedging costs¹⁴



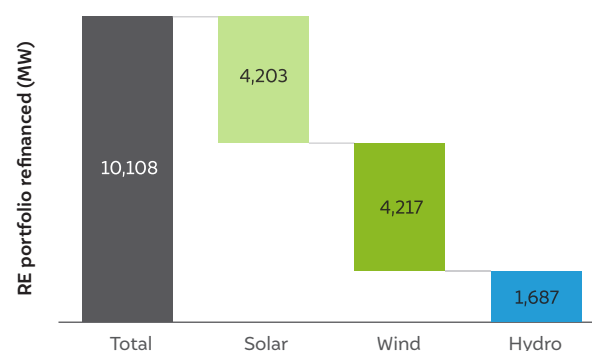
Source: CEEW-CEF analysis

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

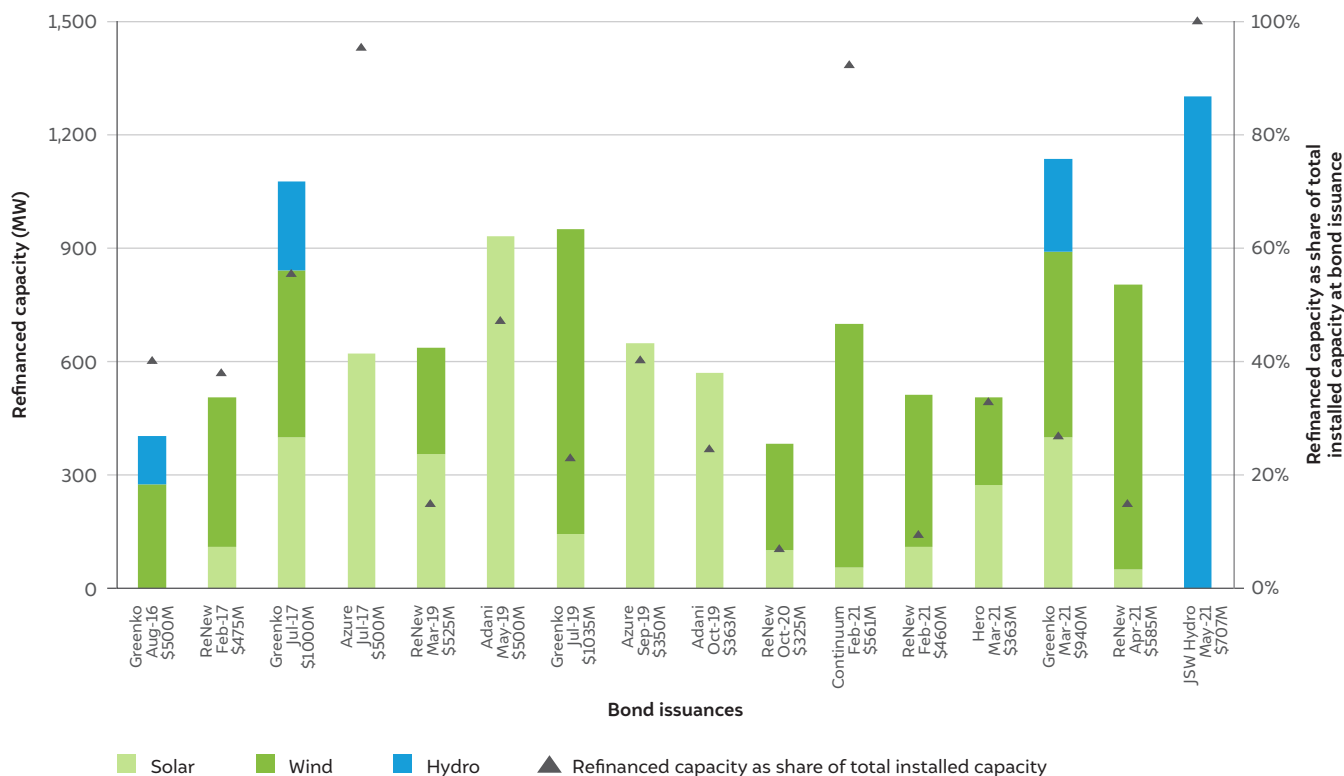


Source: CEEW-CEF compilation

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

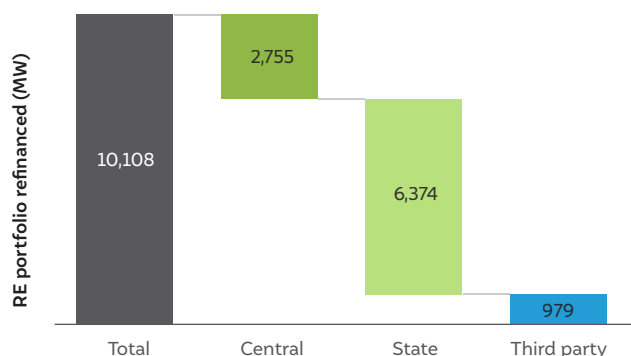
4.2 Which utilities offtake restricted group capacity?

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.

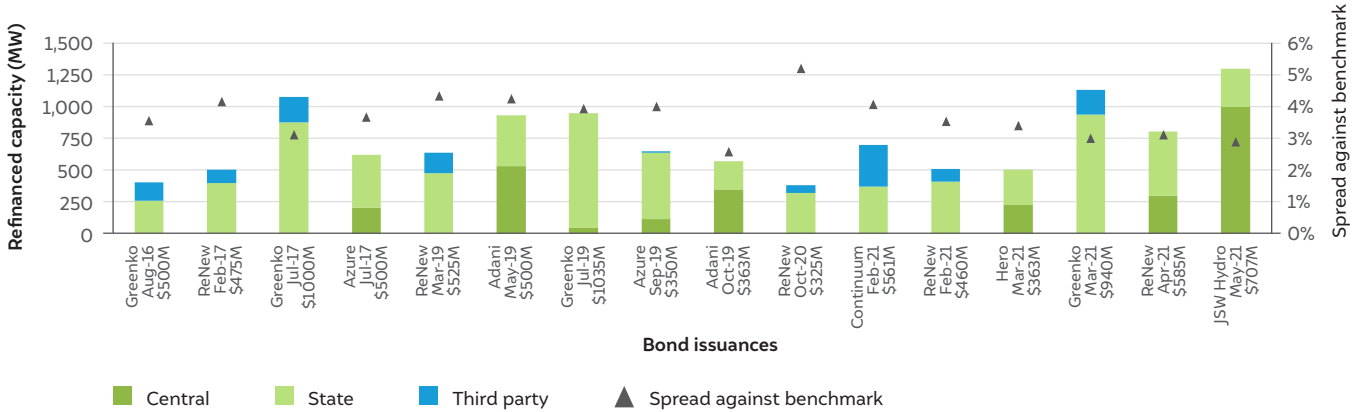
Figure 19 shows the offtaker mix for each green bond issuance. Most bonds, particularly those of Greenko and ReNew Power, are dominated by projects contracted by state utilities. A significant share of the capacity contracted by central buyers comes from a single 1 GW project, Karcham Wangtoo, in the 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



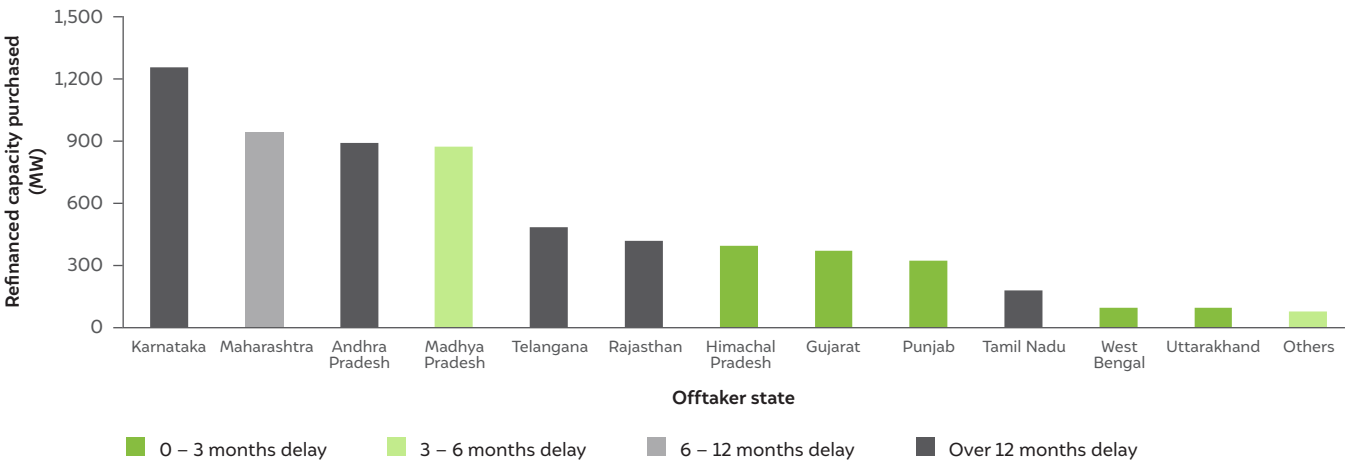
Source: CEEW-CEF analysis

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



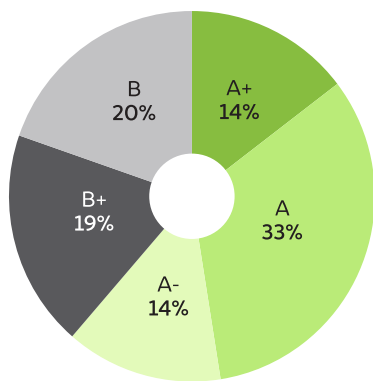
Source: CEEW-CEF analysis

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.¹⁵ 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).¹⁶ 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?

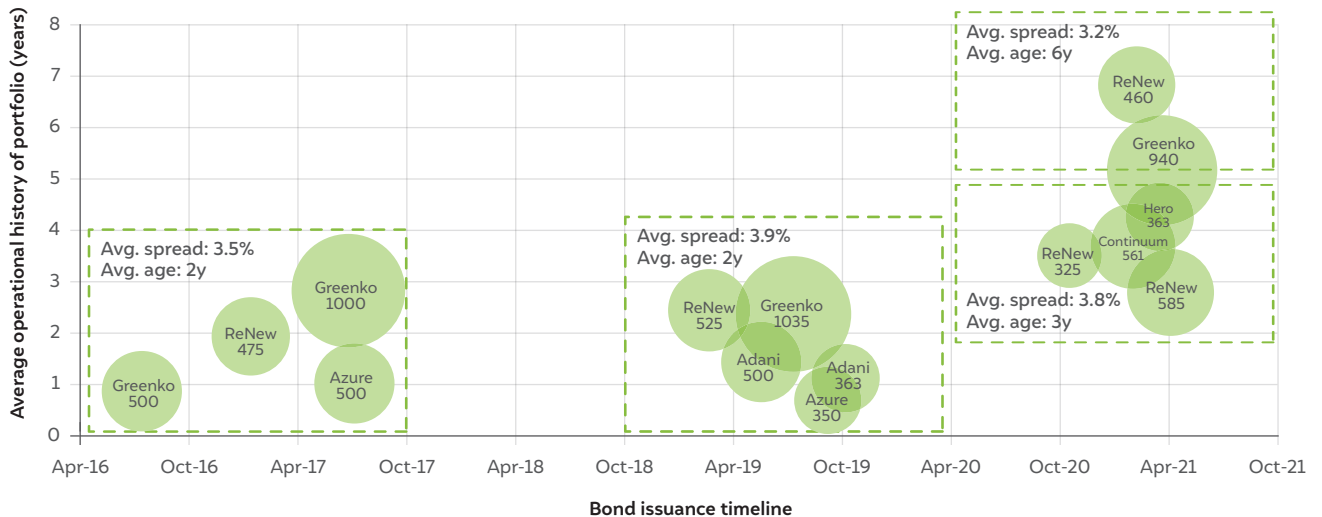
Figure 21 depicts the average years of operational history available to green bond buyers and the consequent spread across issuances. We have defined operational history as the number of years between the projects commissioning date and the date of bond

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 history¹⁷

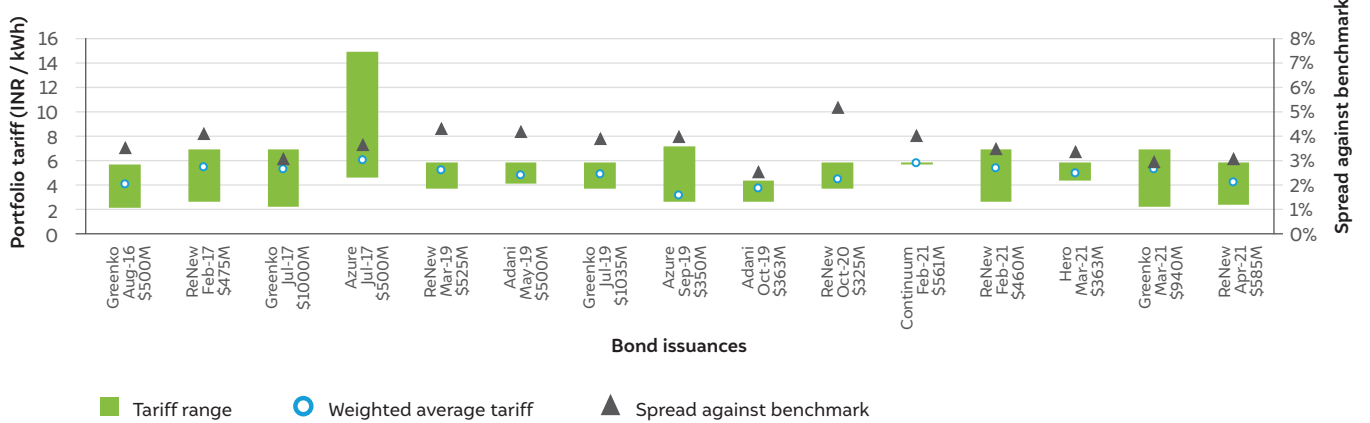


Source: CEEW-CEF analysis

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 spread¹⁸

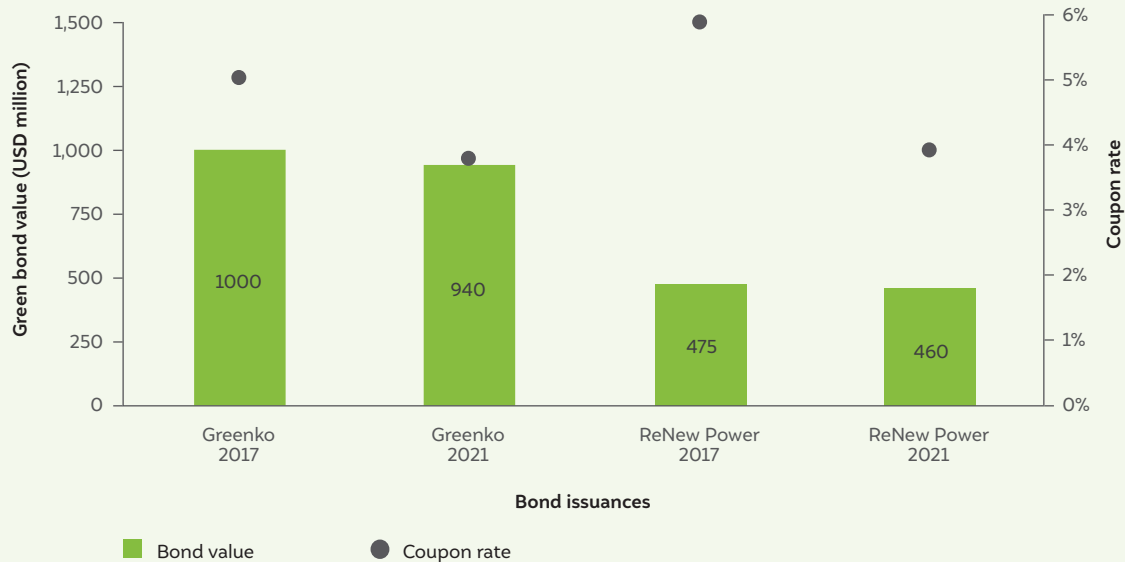


Source: CEEW-CEF analysis

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.¹⁹ 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.