

Multiplying the Transition

**Market-based solutions
for catalyzing clean
energy investment in
emerging economies**

October 2021



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About this report

This report was commissioned by the Climate Investment Funds, a multilateral climate fund housed within the World Bank, and produced by BloombergNEF. It aims to identify lessons, opportunities and recommendations of how fund-deployment and fund-raising activities of financial intermediaries can help mobilize clean-energy investment in emerging markets. It looks at the historical context of using financial intermediation, explores current opportunities and challenges and gives an outlook of the potential of financial intermediation as a tool to meet current climate goals.

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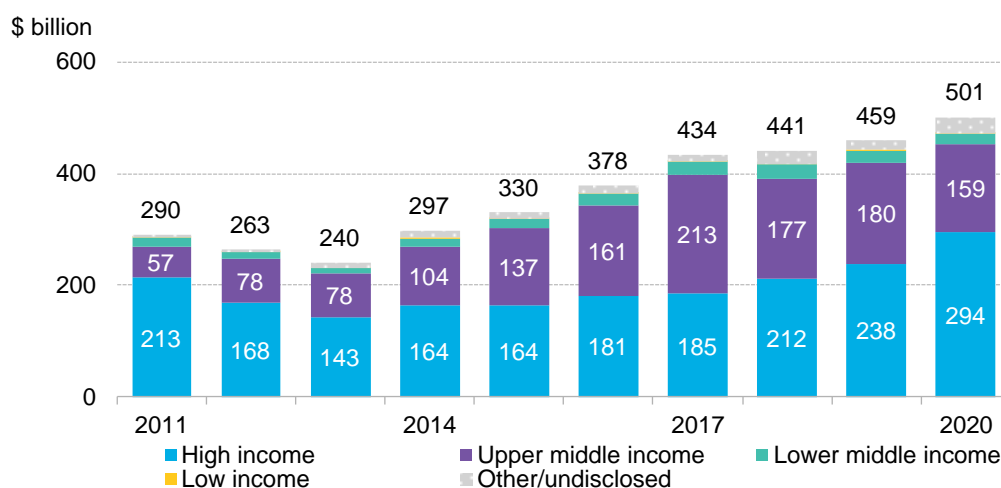
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Section 1. Executive summary

As countries seek to recover from the pandemic and meet climate commitments, new solutions to scale investment are needed more than ever. Global investment into technologies to decarbonize the world's energy systems hit a record high of \$501 billion in 2020, but also became more concentrated among wealthier countries as Covid-19 slowed flows to emerging markets. Many nations today lack the conditions to attract the volumes required, particularly as they grapple with finances strained by the health crisis.

Figure 1: Global energy transition investment, country income breakdown



Source: BloombergNEF.

This joint report between the Climate Investment Funds (CIF) and BloombergNEF identifies the role that financial intermediaries can play in mobilizing clean energy investment in emerging markets, with a focus on clean power and transport. It examines the evolution of fund-deployment and fund-raising activities in emerging markets and explores four cases where intermediation has achieved key goals. The report then explores opportunities to involve largely untapped intermediaries such as institutional investors in mobilizing clean power investment. Finally, it applies these findings to five country-specific “clean energy finance roadmaps” that trace routes for achieving far greater scale by 2030.

How can financial intermediation make a difference today?

- **Efforts to improve access to capital are most fruitful where financial ecosystems are least developed.** In many emerging markets, clean power and transport companies struggle

to access capital or benefit from financial instruments. Recognizing where this is the case and learning from past experiences allows intermediaries to efficiently deploy their resources.

- **Development finance is adopting an increasingly active role in backing climate technologies.** Development finance institutions (DFIs) are aware of their ability to de-risk and crowd in energy-transition investment to sectors that have been passed over by investors. Tapping into capital markets and institutional investors can be achieved through a variety of approaches, such as supporting the issuance of green bonds.
- **Intermediation can make the unorthodox become the norm in early-stage markets.** Nascent markets can require DFI-supported intermediation to “prove” a technology, new type of financing instrument or business model. The next step is to activate more domestic intermediaries and new types of financing instruments to access further liquidity.
- **Emerging markets are poised to benefit from the breakneck growth in global sustainable debt issuance.** Even the emerging markets attracting the most energy-transition investment have struggled to access debt via international markets. Yet the burgeoning sustainable debt market represents a vast opportunity to draw new capital.
- **Institutional investors have the deepest capital pools and could make the biggest impact.** Pension funds and similar institutions have long investment horizons, face ESG pressure from investors, and are increasingly eager to support the transition to a lower-carbon economy. Supported appropriately, they could redirect vast capital flows toward the energy transition.
- **Knowledge networks can foster a more holistic approach to supporting the energy transition.** Innovative ideas with potential include instruments to finance the infrastructure that is critical to cleaning up both power and transport, such as transmission and distribution electricity assets. Proliferating information on concepts such as ‘sector coupling’ between electricity, heating and cooling, transport or industry is particularly useful.

What changes would catalyze more financial intermediation?

- **DFIs should marry intermediation with a strong backing for market reforms.** Too often, a profusion of international capital is driven away by unsuitable enabling environments in countries’ financial, power and transport sectors. Investors tend to avoid deploying capital into developing countries due to concerns about regulatory, sovereign or currency risk.
- **For power, long-term offtake agreements are particularly attractive to institutional investors.** Many funds’ conservative approach to risk leads them to prize markets that offer power purchase agreements with longer tenors. Other draws include a pipeline of investment-grade assets and the investment volumes to justify due diligence procedures.
- **Indian renewables need to access local and international finance to accelerate the transition away from coal.** Reducing barriers to international capital, capacity building of local lenders and innovative financing schemes supported by DFIs could scale up financing. Other challenges concern grid integration, project development hurdles, and electricity distribution companies’ poor finances. All must be addressed to bring the ambitious 2030 renewables target within reach.
- **South Africa should decommission its dated coal plants, replace them with renewables capacity and address a restrictive enabling environment.** Even under current constraints, financial intermediaries can back new utility-scale capacity tendered via forthcoming auctions. Small-scale projects procured by municipalities and businesses can also be supported.

- **Indonesia must address fossil-fuel overcapacity while breaking down barriers to renewables deployment.** Reforming tariff caps, operating a national auction program, and a moratorium on coal plants followed by the technology's phase-out would all favor clean power. Meanwhile, DFI-backed intermediation can play a role in unlocking funding for commercial projects and decentralized energy.
- **Morocco would do well to end a temporary lull in renewables procurement, and establish a framework to procure small-scale solar.** Still, the country's mature financial sector is poised to play a large role in funding clean power, and local institutional investors have already funded renewables. DFI support could help deepen the country's bond market, and support to local banks could reduce financing costs by unlocking financing in dirhams.
- **Brazil must improve efforts to address rising emissions from transport.** The current focus on biofuels largely excludes electrification. Ultimately, the country will be able to transfer its success in clean energy into electrifying transport, but this is likely to require the participation of domestic development banks. DFIs could play a role, particularly at this early stage.

Section 2. Introduction

As the world attempts a green, equitable recovery from the Covid-19 catastrophe, the demand for energy transition capital to decarbonize power and transport systems has never been greater. Developing countries, historically under-funded in this area, are particularly ill equipped today to provide the needed support after the pandemic has drained public finances.

Meanwhile, in the world's financial capitals, investor demand for socially minded assets has been growing swiftly, particularly for clean power assets. This raises the alluring prospect of private capital meeting emerging markets' capital needs through billions, or even trillions of dollars in new deployment.

Against that backdrop, this report aims to identify lessons learned from a decade of financial intermediaries' involvement in supporting clean power growth in developing countries. It highlights opportunities for further expansion, then offers recommendations on how to achieve ambitious new goals. It comprises three chapters.

The first contextualizes how financial intermediation has supported clean power growth in emerging markets over the past two decades. This includes case studies that highlight well-established fund-deployment mechanisms and more novel techniques.

The second chapter examines opportunities and barriers for tapping the resources of largely untouched major financial intermediaries, such as institutional funds.

Finally, the third chapter looks ahead to consider how financial intermediaries could participate at greater scale to mobilize clean power investment in emerging markets. It applies lessons learned to three real-world examples to produce 2030 clean power financing "roadmaps".

BloombergNEF regards broader use of electricity across the energy sphere coupled with renewables' deployment as critical to true decarbonization of the world's economy. Power sector transformation and electrification of new sectors can only be achieved through mass deployment of clean utility-scale and distributed projects. And this can be accomplished only with new, innovative policies and financing solutions. While the main focus of this report is financial intermediation, it will touch on policy, regulation and further contextual factors where relevant.

Section 3. Evolution of financial intermediation in clean power

If the world is to have any chance of meeting the Paris Agreement goals, investment supporting lower-carbon energy sources must scale dramatically, particularly in emerging markets. Current global capital flows remain far below levels required to address climate change adequately and have become more concentrated in higher-income economies during the pandemic. With these rapidly growing markets poised to produce the bulk of global CO₂ emission additions through 2050, the need for change is more urgent than ever.

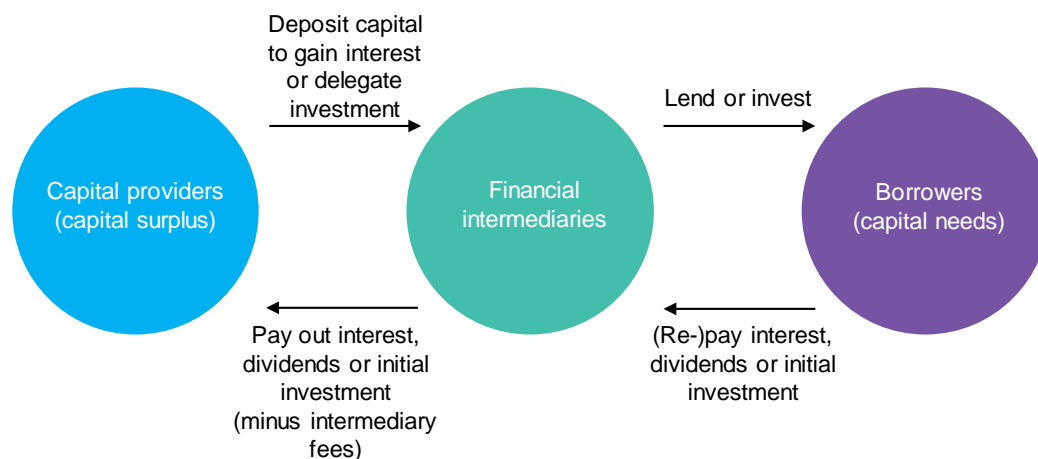
The power sector remains the top source of emissions in the world's economy and, within it, coal remains the single largest source of generation. As a result, mobilizing clean power investment can create immediate and meaningful cuts to emissions. Today, renewable energy technologies are available, scalable and can serve as the foundation for comprehensive decarbonization, particularly if coupled with expanded electrification of other sectors of the economy, including transportation. Given the fiscal constraints many governments face today due to the pandemic, the need for other sources of capital is particularly acute.

Well before the pandemic took hold, development finance institutions (DFIs) were seeking to make greater use of financial intermediation to mobilize clean power investment from private sources. This chapter outlines various techniques used to date. It starts by defining what financial intermediaries are and how they are used in fund-deployment and fund-raising. We then offer an overview of typical debt, equity and grants instruments used.

3.1. Historical context of financial intermediation

Financial intermediaries act as a bridge between capital providers and borrowers through fund-raising and fund-deployment activities. While intermediation can take many forms, its common purpose is to facilitate financial transactions and make them more efficient (Figure 2). Matching capital providers' and borrowers' capital centrally can lower transaction costs and diversify risks, thereby allowing investment to scale.

Figure 2: Function of financial intermediaries



Source: BloombergNEF

Financial intermediaries can include private, public and public-private entities. They can be broadly categorized into two groups: banks and nonbank financial companies (NBFCs). The former includes commercial, investment, national, regional, multinational development, and “green” banks. The latter comprises institutional investors (insurance companies, sovereign wealth funds or pension funds), private equity and venture capital funds, credit unions, microfinance institutions, or leasing companies.¹ Depending on the maturity of the financial sector of a country, the available intermediaries may be limited to DFIs but can also range to institutional investors and capital markets.

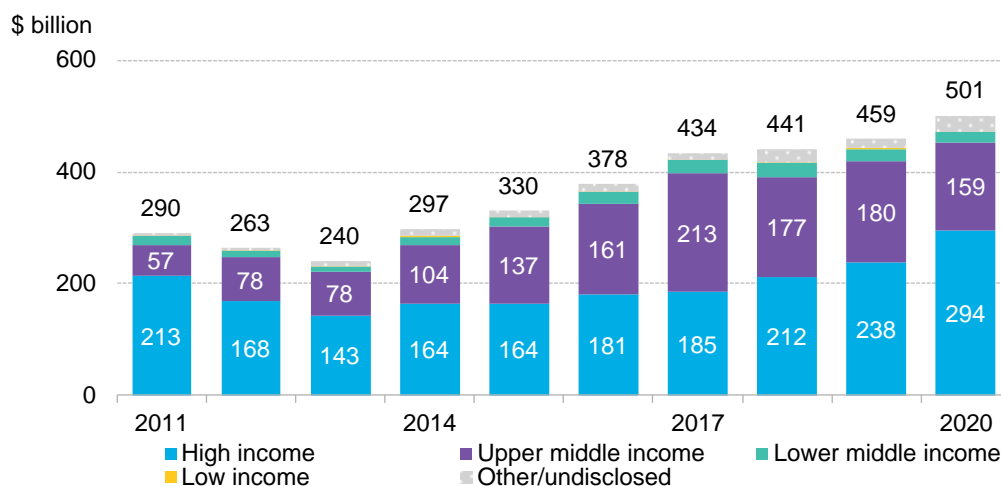
In addition to their direct lending activities, DFIs make use of intermediaries to support domestic banks and NBFCs in deploying clean power finance in emerging markets. DFIs also have the potential to assist emerging markets in leveraging capital markets and institutional investors, for instance through supporting the issuance of green bonds. DFI-enhanced intermediation can therefore prove key to using public money optimally to mobilize and scale clean power investment to help meet the goals set under the Paris Agreement.

Intermediation in support of clean power investment

Current investment globally remains far below what is needed to accelerate the energy transition to address climate change, particularly in emerging markets. Despite achieving a record annual high of \$501 billion in 2020, global energy transition investment has become more concentrated in high income countries, likely due to the Covid-19 pandemic (Figure 3).

¹ For the purpose of this report, the main financial intermediaries included in the analysis are commercial banks, national and regional development banks, capital markets, and institutional investors, such as sovereign and pension funds.

Figure 3: Global energy transition investment



Source: BloombergNEF. Note: Numbers include renewable energy, electrified transport, electrified heat, energy storage, carbon capture and storage and hydrogen.

Emerging markets are, however, key to achieving the global energy transition. With rapid economic expansion and improving access to electricity, BloombergNEF's New Energy Outlook 2020 expects that emerging markets will account for 68% of global power demand by 2050. This has obvious implications for the trajectory of global power sector emissions, with 44% of all power in emerging markets currently generated by coal. This creates an urgent need to not only ensure that new power-generating capacity is clean, but also that existing fossil assets are successfully replaced by renewables.

It is therefore crucial to activate domestic and international public and private sources of capital to provide much-needed finance to support emerging markets' energy transitions. A particular emphasis should, however, be placed on mobilizing private capital as, especially in low and lower middle income emerging markets, public finances are limited and therefore unable to provide the necessary volumes of capital. This is particularly true in the era of Covid-19. Governments are seeing slower economic activity and incurring major costs related to stimulating their economies. The result has been widening deficits and record high levels of public debt.

Intermediation can help to activate private sector investment

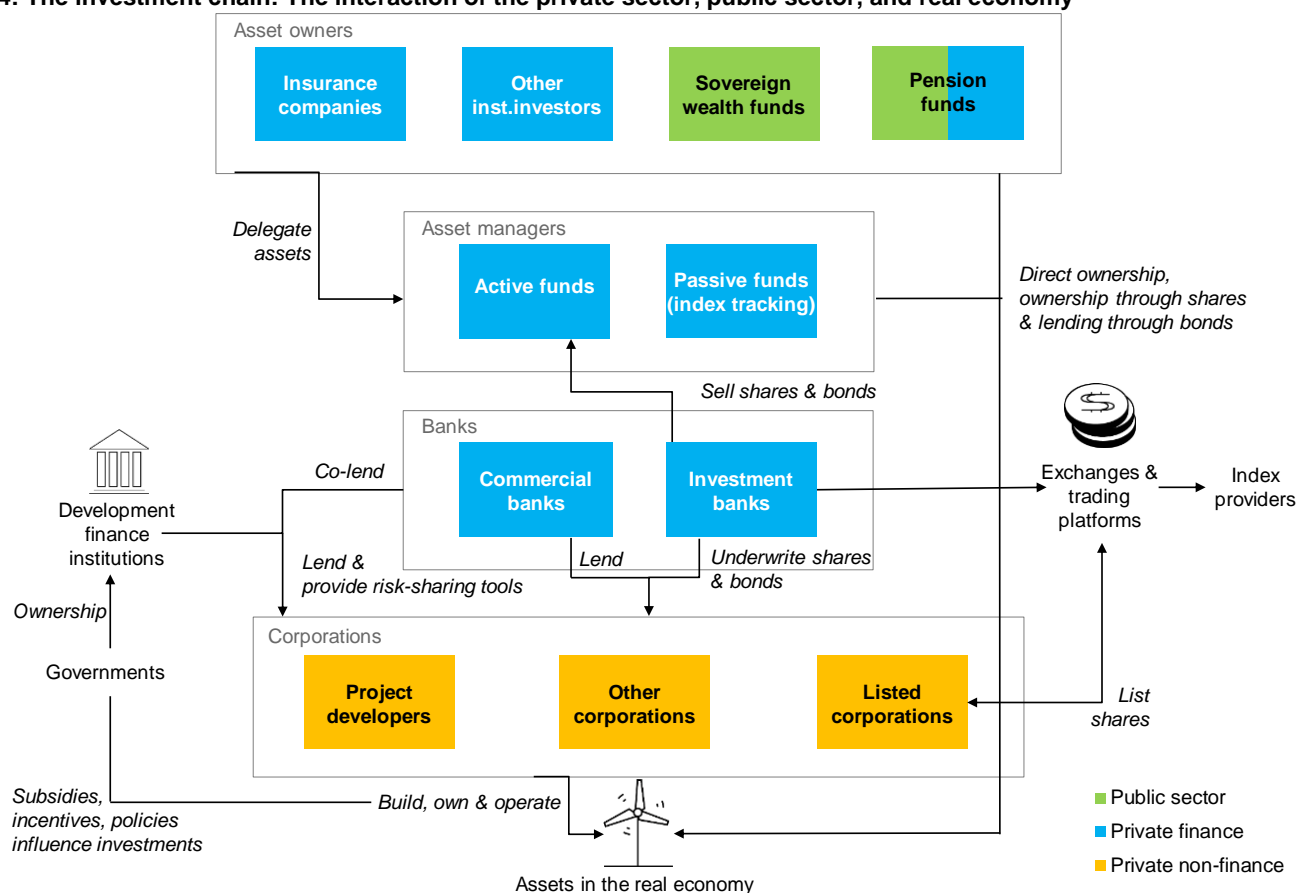
Private sector support for renewables in developing countries often faces a variety of barriers. Many emerging markets lack adequate financial ecosystems or regulatory environments, with shallow domestic financial sectors offering only a modest amount of financial market entities and products. Particularly in nascent markets for clean power, local financial actors have limited experience with the risk/return profiles of renewables projects. This can result in debt providers demanding unreasonably high interest rates or offering loans with unsuitable tenors or collateral requirements. For their part, investors can demand unreasonably high equity returns.

Other factors have historically limited large-scale private sector investor participation as well. Most clean power infrastructure investment opportunities have thus far tended to be illiquid and non-tradeable. As a result, they do not allow easy entrances or exits for investors. Clean power projects or companies in developing countries generally lack credit ratings, hindering the involvement of institutional investors with mandates to invest in only highly rated projects. Lack of available or reliable data on local markets adds further headaches.

To address these constraints, DFIs have sought to leverage financial intermediation in support of local, national or regional entities to mobilize investment. The aim has been to scale impact of capital deployed while de-risking technologies or sectors financial institutions have typically avoided. DFI involvement through financial intermediation seeks to crowd *in* investment.

Figure 4 shows how different financial sector stakeholders interact, and illustrates how intermediaries like banks or institutional investors can be involved in financing clean power assets. It also helps us visualize how DFIs can support intermediaries such as banks or leverage other DFIs such as national and regional development banks in financing new renewable energy projects. DFI involvement through concessional or market-rate capital and/or technical assistance can help to activate the available actors of the domestic and international financial eco-systems in the investment chain and foster market familiarity.

Figure 4: The investment chain: The interaction of the private sector, public sector, and real economy



Source: CFLI

In countries with well-established domestic financial sectors, additional more mature financial intermediation options exist – especially if a country has a domestic capital market and/or access to international capital markets. A variety of institutional investors such as pension funds or sovereign wealth funds can also act as intermediaries in financing clean power projects on market terms or supported through DFIs. Entities such as insurance companies can for instance invest in the clean power sector as part of their portfolio diversification. This could translate into an equity stake in a clean power project or developer or the purchase of publicly or privately traded fixed-income securities.

Intermediation instruments

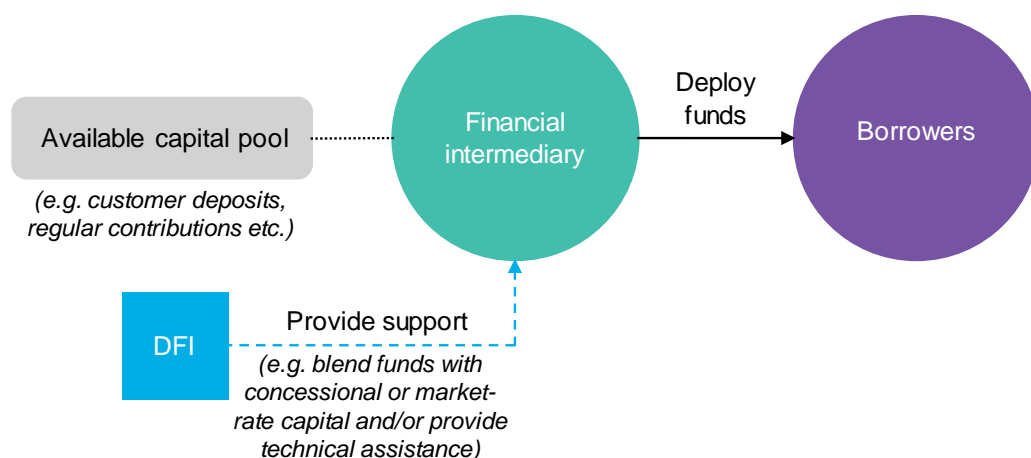
Deploying or raising funds?

Financial intermediary activities can roughly be divided into two categories: fund-deployment and fund-raising. Both can occur on private or public markets and can be supported by DFIs. In deployment, the intermediary acts as the delivery vehicle of (blended) DFI funds to foster development of an early-stage sector. In fund-raising, DFIs can help attract additional capital. In many emerging markets, much of the financing of renewables projects so far has taken place in private markets, with public markets largely only tapped following a company's initial public offering (IPO) or the public floating of a bond.

Fund-deployment

Financial intermediaries can be used to tap existing pools of capital, then deploy those funds in support of clean power projects. Funds can be deployed to public or private entities depending on the mandate of the intermediary. A simple example of this is a national development bank, serving as an intermediary, that taps funds from donor countries to lend to a municipality's rooftop solar program. In markets where capital is theoretically available, yet not accessible to all sectors, DFIs can act as an intermediary themselves or provide both capital and technical assistance to support domestic intermediaries in enhancing their financial offer to early-stage or high risk technologies (Figure 5).

Figure 5: Function of fund deployment



Source: BloombergNEF.

A typical example of DFI-enhanced fund-deployment would be such an institution providing both capital and guidance to a commercial bank, which, in turn, lends to a developer building new renewable energy projects. DFI involvement, by making capital available or providing technical assistance, can allow a commercial bank become familiar with a technology or sector it previously may have declined to support. This, in turn, can improve domestic financing conditions for that technology, making it easier to mobilize domestic or international private sector capital. This ideally allows the DFI to dial back its support, freeing up capital to use for other activities.

National development banks as financial intermediaries

National development banks (NDBs) can play unique roles as fund-deploying financial intermediaries. Unlike other intermediaries, NDBs have in-depth knowledge of local

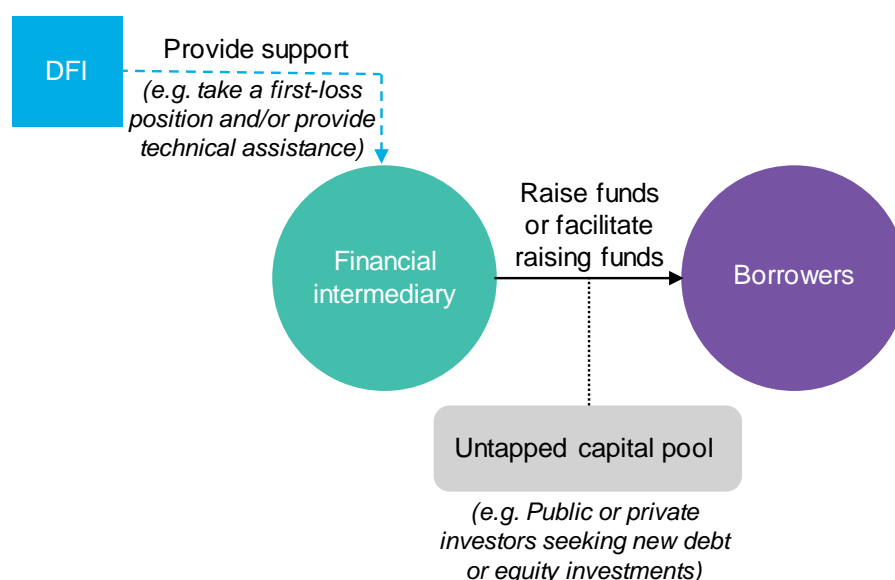
renewables sectors and access to domestic financial markets – and a public mandate to advance the socio-economic well-being of the country. They are also often well connected internationally to other DFIs such as bilateral, regional or multinational development banks or climate funds. They have the potential to be major financial intermediation vehicles and some already are.

NDBs can provide **debt** through direct loans at a senior or subordinated position in the capital stack, or by lending to domestic intermediaries. They can make **equity** investments and help draw in further investors by accepting first-loss positions in venture capital or seed funds. NDBs can also offer financing in even more concessional ways, such as issuing **grants**, offering full or partial guarantees or providing insurance.

Fund-raising

Fund-raising in the context of financial intermediaries involves mobilizing pools of investment for a project or entity. A simple example would be an independent power producer seeking capital either by selling equity or raising debt. This could mean issuing a green bond to refinance an outstanding loan on a solar project, or a straight equity raise. To access larger volumes of capital, DFIs can support intermediaries in fund-raising activities through concessional, near-market or market-rate capital and technical assistance (Figure 6). A typical fund-raising example would be using DFI assistance to help entities draw up a green bond to access capital markets or taking a first-loss equity position to crowd in further equity investors.

Figure 6: Function of fund-raising



Source: BloombergNEF.

Expanding fund-raising activities can greatly accelerate the volume of finance available for clean power, especially if securities are tradeable on public markets. As the volume of global financial activity in secondary markets runs into the billions each day and global demand for green products tends to exceed supply, making use of fund-raising intermediation in particular can prove a promising avenue to rapidly scaling clean power investment in emerging markets.

Stand-out instruments

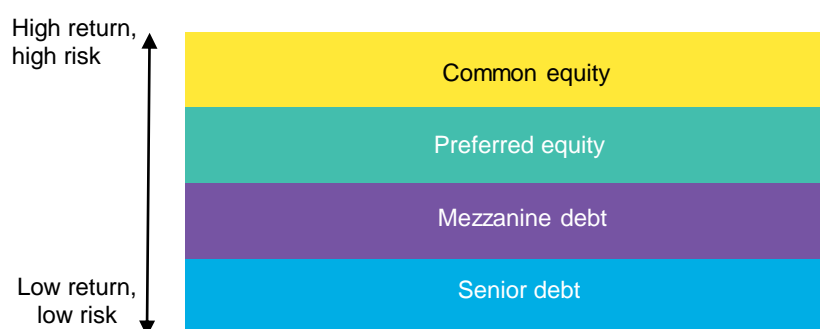
The range of instruments intermediaries can put to use spans the public debt, private debt, equity and grant universes. Within each of these categories, typical instruments vary in availability and attractiveness depending on the market and intended use. Depending on the maturity of the financial sector and market familiarity with clean power, intermediaries may already be involved in clean power financing on commercial terms. Where this is not the case, DFIs can support intermediary activities through risk mitigation to crowd in finance. DFIs can help through credit enhancement by using concessional, near-market or market-rate equity, debt and grants in the form of guarantees, insurances or first-loss positions. They can also offer technical assistance to facilitate transactions. The main instruments intermediaries currently use in clean power are explained below.

Equity

For early-stage companies or projects, equity injections from intermediaries such as venture capital funds or private equity firms can be crucial. This is particularly true when a business founder lacks sufficient equity of his/her own and when debt financing is largely unavailable. Equity investments expand a company's capital base to allow it to make the investments needed to establish itself. The goal is to nurture the base for growth, which can then enable access to other forms of financing.

Equity investments can also be of interest to further developed companies, either through the issuance of additional shares to private investors or through a listing on a public exchange for an initial public offering. The risk/return profiles of equity investments depend on where they sit in a business's capital stack and the business context (Figure 7).

Figure 7: Typical capital stack



Source: BloombergNEF.

By supporting intermediaries' activities, DFIs can provide equity investments at concessional, near-market or market-rate terms to help crowd in other investors. The involvement of DFIs in junior or subordinated positions in the capital stack of a project or entity can help to activate a host of financial intermediaries, ranging from venture capital funds to investment banks or institutional investors. This de-risking measure can result in securing co-investment from further entities at a similar or higher position in the capital stack, as they feel more comfortable with the associated risk.

Table 1: Types of equity

Type of equity	Description
Common equity	Common stock or junior equity sits at the top of the capital stack with the lowest priority of repayment in case of bankruptcy, and therefore has the highest risk and return profile. In early-stage projects, new technologies or generally entities with an unknown or potentially high risk, common equity is the riskiest form of investment, but is needed to provide capital for growth. For this reason, in countries where financial markets cannot offer suitable equity products, DFIs can (co-)invest in common equity positions in order to attract further investors to other segments of the capital stack.
Preferred equity	Preferred stock sits below common stock, allowing for slightly lower risk and return than a junior equity position. In financial intermediation, this can be an attractive position for private equity investors, such as venture capital funds. Similar to common equity, in underserved markets, DFIs can (co-)invest in preferred equity positions in order to attract further investors to other segments of the capital stack.

Source: BloombergNEF.

Debt

Debt financing is the most widely used by financial intermediaries. As discussed above, debt is generally difficult to access for early-stage companies or projects with new technologies to access. Early-stage companies typically cannot access debt capital markets because they do not have the stable cash flows required to service loans. Lenders are often unfamiliar with the associated risks or the collateral against which debt is taken on and may not be able to provide unsecured debt.

Where the market does not allow for suitable debt instruments, for instance in terms of unattractive interest rates or tenors, DFIs can support debt-providing intermediaries on concessional, near-market or market-rate terms at various positions in the capital stack (Figure 7). This is all the more critical as early-stage companies often have trouble accessing debt financing even where it is available.

Table 2: Types of debt

Types of debt	Sub-type	Description
Senior debt		<i>Senior debt sits at the bottom of the capital stack, giving lenders highest priority in repayment in case of bankruptcy. Correspondingly, this is the position with the lowest risk and return profile.</i>
	Loans	Senior loans can greatly vary in nature of their interest rates, repayment periods and other conditions such as collateral requirements. In many emerging markets, loans are typically "secured", meaning they have high collateral requirements. Many banks are unwilling to provide so-called non-recourse loans, which do not hold borrowers financially liable outside of their pledged collateral. As loans are some of the most typically required financing instruments for renewable energy projects, bottlenecks in loan offers can greatly hamper the development of the market. Blending DFI capital at concessional, near-market or market rates with intermediaries' loans can help to improve borrowing conditions, such as through interest rates, longer loan tenors or longer grace periods.
	Credit lines	Credit lines or revolving loans function similar to loans with the difference that they are more flexible. Within a fixed period of time, the borrower can draw and repay segments of the loan dependent on their needs at the time, paying interest only on the amounts drawn. Similar to loans, DFIs can support intermediaries in their offering of credit lines through blending finance at concessional, near-market or market-rate terms to improve the borrowing conditions.
	Bonds	Senior bonds are becoming increasingly popular to (re-)finance clean power projects, with a growing variety of types and themes. Themes can include i.a. green or sustainability bonds, with issuers ranging from (securitized) projects, municipalities, corporates, to sovereigns or

Types of debt	Sub-type	Description
		supranational entities. Depending on the circumstances, bonds can be preferable to loans in that the issuer can better tailor the debt tenor to their financing needs. Publicly floated bonds in emerging markets have been limited so far, as rating requirements and access to public markets may be too costly for issuers. Instead, private placement bonds to known investors are popular. DFIs can assist entities in raising bonds through credit enhancement to improve ratings or other forms of guarantees.
Mezzanine debt		<i>Mezzanine debt (or quasi-equity) sits in the middle of the capital stack, ranking higher than senior debt, but lower than equity in terms of repayment seniority and risk and return profile.</i>
	Loans	Subordinated loans differ from senior loans through their lower repayment priority, higher interest rates and generally riskier terms. Through providing a subordinated loan at concessional, near-market or market rates, DFIs can help to crowd in investors at the senior debt level.
	Bonds	Subordinated bonds differ from senior bonds through their lower repayment priority, higher interest rates or generally riskier terms.
	Convertible notes	Convertible notes are similar to loans and bonds, yet offer repayment through equity stakes instead of the payback of the principal and interest rates.

Source: BloombergNEF

Grants

DFIs can also use grants to support intermediation activities. This typically takes the form of technical assistance through capacity building and knowledge sharing. Grants can also include other one-off financial contributions, for instance to support the financial set-up of an entity.

Table 3: Types of grants

Types of grants	Description
Technical assistance grants	Guidance to intermediaries through technical assistance to support their activities. This could include training to build market awareness about a renewables technology unfamiliar to a commercial lender.
Financial contribution	DFIs can also use grants to provide a one-off financial contribution to a project or an entity.

Source: BloombergNEF.

Section 4. Fund-deployment and fund-raising case studies

This section examines how financial intermediation has been applied in the clean power space by highlighting four case studies. These showcase successful examples of intermediation at different stages of a country's transition to lower-carbon power sources (Table 4).

Table 4: Examples of intermediaries included in the case studies of this report

Capital providers	Intermediaries	Borrowers	Instruments
General and limited Partners; other private shareholders	Venture capital fund	Project developers	Equity stakes
Public shareholders	Investment bank	Independent power producer	Equity stakes and support in bond raising
Employer and employee contributions	Pension fund	Development finance institutions	Bonds
Private and corporate customers; retail and institutional investors	Banks and capital markets	Coal plant owners	Securitized bonds

Source: BloombergNEF.

Each case study provides an overview of the country context and goal of the intermediation, the set-up and choice of intermediary as well as the outcome and lessons learned of the intermediation. Sub-section 4.5 then summarizes the key findings, pointing out lessons learned from past examples of intermediation and exploring the replicability for other emerging markets. In addition, this sub-section also touches on the follow-on activities for financial intermediaries in this space, which are then further explored in Section 5.

4.1. Early-stage intermediation: the Honduras Renewable Energy Finance Facility

Table 5: Project summary

Overview of key indicators

Country	Honduras
Intermediary	VC fund
Activity	Fund-deployment
Sector	Private
Focus	Small-scale on-/off-grid power

Source: BloombergNEF

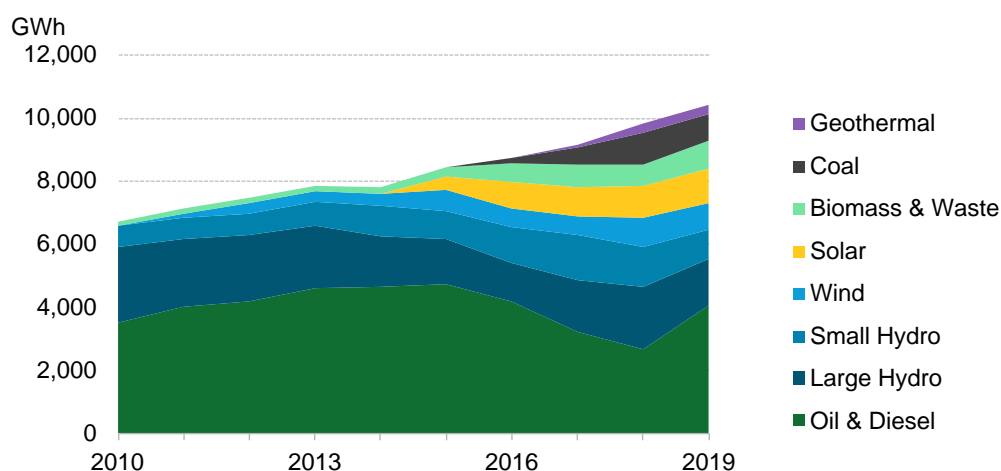
As part of its Strategic Climate Fund (SCF), the Climate Investment Funds (CIF) runs the Scaling-up Renewable Energy in Low Income Countries Program (SREP) to support electrification and economic opportunities through renewables in low and lower middle income countries. Funds are disbursed via one of five multilateral development banks (MDBs), with the aim of drawing co-financing from the respective MDB to leverage further public and private sources of capital.

The Honduras Renewable Energy Finance Facility (H-REFF) is a successful example of a project supported by the SREP in cooperation with the Inter-American Development Bank Group (IDB). The off-balance sheet arm of the IDB, IDB Lab, tests innovative approaches to development finance, dispensing microfinance for intermediaries or funds.

Country context and goal of intermediation

Fossil fuels account for around half of power generation in Honduras, with 39% in 2019 provided by oil and diesel and 8% by coal (Figure 8). As a result, the country's power consumers are highly exposed to commodity price fluctuations, which translates into costly power tariffs (Figure 9).

Figure 8: Honduras power generation mix

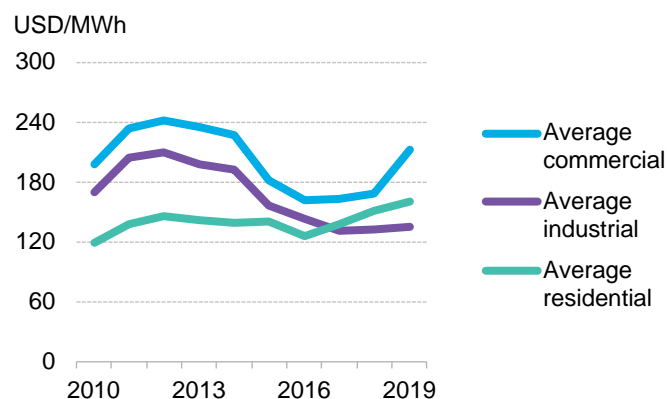


Source: BloombergNEF

Honduras is one of the poorest countries in Latin America with a GDP of \$2,574.9 per capita in 2019 compared to the regional average of \$8,870.² Currently, 80% of the population has access to power but the figure is rising, suggesting power demand will continue to grow for the foreseeable future (Figure 10). Electricity demand is rising, and peak demand has been growing 3% per year in the last five years on average. As the country is already a net importer of power from the Central American Electrical Interconnected System (SIEPAC), new domestic projects are needed to meet growing needs.

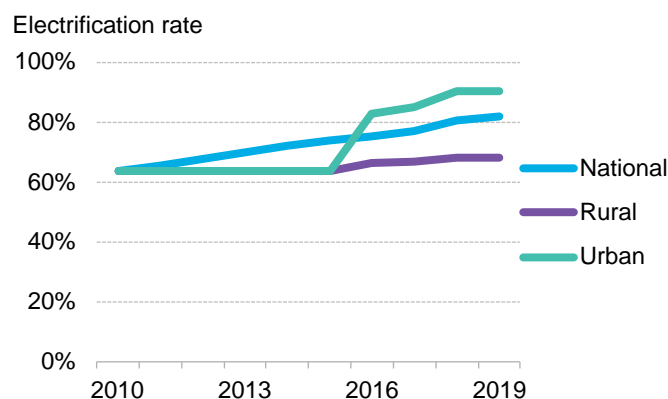
² World Bank (2019) [Database](#)

Figure 9: Honduras power tariffs



Source: ENEE

Figure 10: Honduras electrification rates

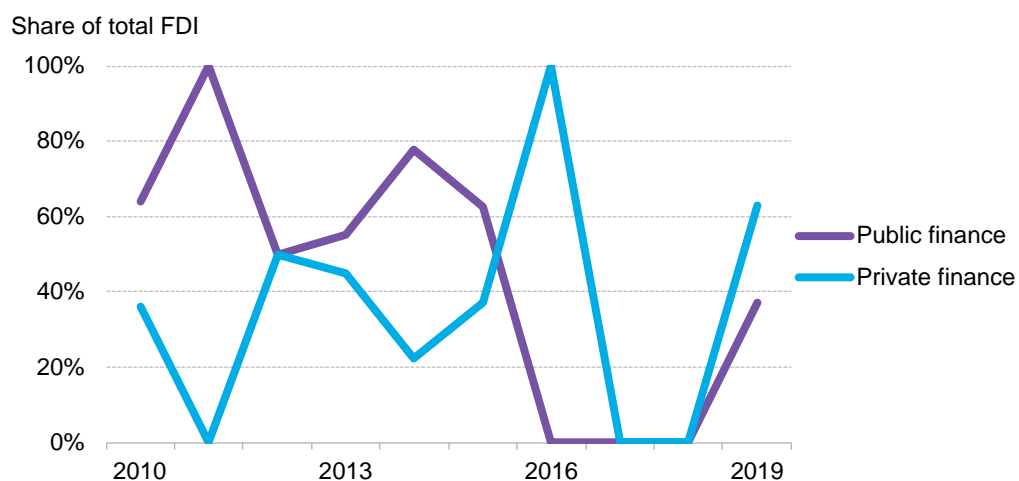


Source: ENEE

Honduras lacks financiers to meet the needs of small-scale renewable energy producers, especially those seeking equity. Commercial banks may offer loans under certain conditions, but do not take equity positions or offer mezzanine³ products. Yet many small-scale local developers lack sufficient capital or collateral to qualify for loans.

While Honduras offers a variety of clean power policies such as an ambitious clean power target, priority grid access for renewables and tax incentives for renewable energy project development, the market has yet to attract a steady stream of private finance via foreign direct investment (Figure 11). This is largely due to a perception of high political, financial and country risk of an early-stage renewables market. This lack of both local and international private finance hinders the development of on- and off-grid small-scale renewables.

Figure 11: Clean power direct foreign investment in Honduras by type of investor



Source: BloombergNEF.

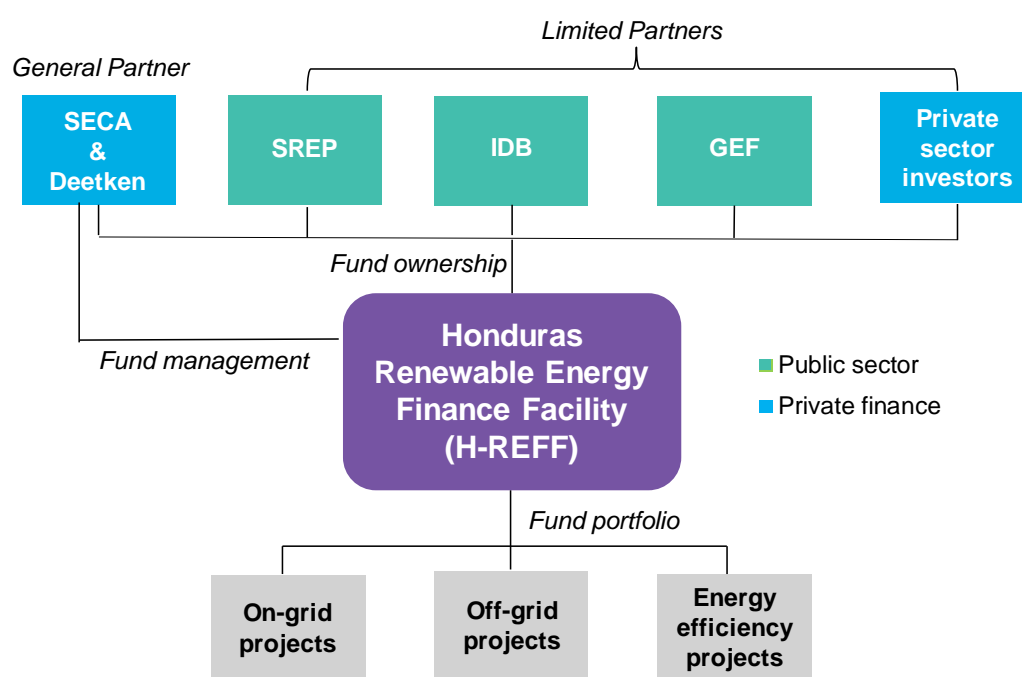
³ Mezzanine refers to subordinated debt or preferred equity.

The motivation behind H-REFF was therefore to bridge this private finance gap by increasing expertise within the local financial market with renewable energy, equity, quasi-equity, and subordinated debt financing, as well as leveraging the available debt market.

Project set-up and choice of intermediary

As the first clean energy investment fund in the country, H-REFF was established in 2016 with a targeted lifetime of 13 years, with the project end set for late 2029. The project is structured like a venture capital fund managed by a general partner, with shareholders acting as limited partners (Figure 12). The general partner manages the fund for a fee from the limited partners and receives 20% of any excess return. In the case of H-REFF, the management company is a consortium between Sustainable Energy Central America (SECA), from Costa Rica, and the Canadian impact investing firm Deetken Impact Sustainable Energy. The targeted preferred annual return is of 11% over the lifetime of the fund.

Figure 12: Structure of H-REFF



Source: BloombergNEF

In the case of H-REFF, IDB Lab and SREP acted as initial limited partners to capitalize the fund at \$4 million and \$20 million in non-grant resources, respectively. To kick-start capital commitments from further entities, a quarter of the SREP resources (\$5 million) were structured as first-loss capital. Employing SREP funds in this manner had the aim of improving risk perceptions of other entities regarding country and technology risk as well as allowing H-REFF to provide funding to smaller, higher-risk deals.

Table 6: H-REFF's intermediation

Capital provider	Intermediary	Borrower	Instrument
General and limited partners; other private shareholders	Venture capital fund	Project developers	Equity stakes

Source: BloombergNEF.

Funds from SREP were key to drawing in capital commitments from other entities. The initial \$24 million from SREP and IDB Lab secured a further \$34 million in co-financing, including resources from the private sector, the GEF, and further resources from IDB Lab (Table 7). In addition, SREP provided a grant component of \$0.95 million to draw up a technical assistance facility. The key objective of the grant was to support capacity building and knowledge sharing for both H-REFF and the local community. Among other things, this facility provides social and environmental training for investee companies, supports community development and practices due diligence on H-REFF.

These activities are led by the Honduran consulting firm Pedra Clau, which practices environmental, social, governance (ESG) due diligence and monitoring of investee companies on behalf of SECA. This emphasis on sustainability and social considerations was a further factor to draw in large-scale investors like GEF. Together, this funding initially aimed at a 18:1 leverage effect for local commercial debt, with the initial capitalization target of \$44 million seeking to allow small-scale project developers to access \$346 million of local commercial debt. Overall, the fund aimed to add 153MW of renewables capacity by project close.

Table 7: H-REFF financing structure

Capital commitments	Entity	Grant	Non-Grant	Totals
Lead DFI	CIF via SREP (IP resources)	\$0.95m	\$5m	\$27.95m
	CIF SREP FLC equity - (Set-aside resources)		\$15m	
Lead MDB and Limited Partner	IDB Lab (equity)	-	\$4m	
Other Limited Partner (public)	Global Environment Facility	-	\$3m	\$31m
Other Limited Partner (private)	Pedra Clau S.A.	-	\$0.15m	
General Partners	SECA & Deetken	-	\$0.85m	
Other private sector investors	Calvert Foundation	-	\$5m	
Further co-investment	Caribbean Basin Sustainable Energy Fund	-	\$25m	
Total		\$0.95m	\$58m	\$58.95m

Source: IDB Lab. Note: Green indicates public and blue indicates private sources of finance. H-REFF has a co-investment strategy with the Caribbean Basin Sustainable Energy Fund, which includes \$15m from GEF, \$5m from IDB Lab, and \$6.7m from the General Partners and other private sector investors.

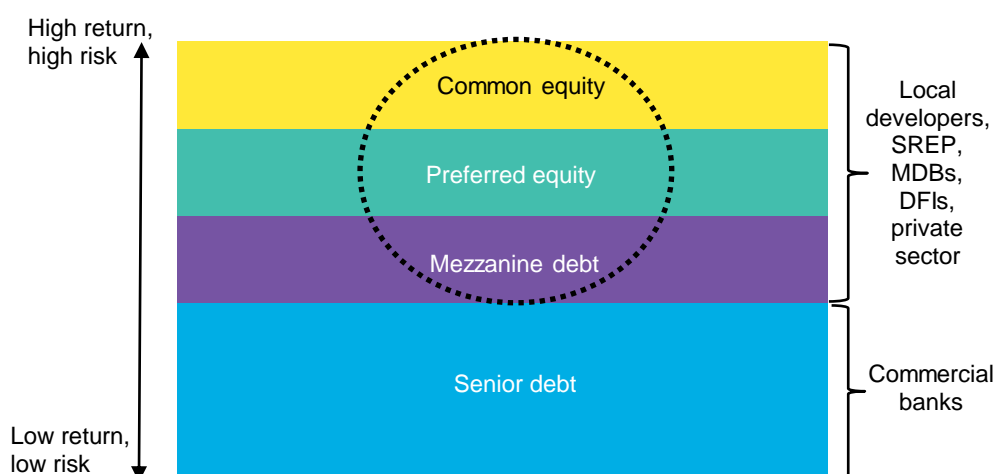
As part of its investment strategy to diversify risks, the structure of H-REFF allows it to co-invest with the Caribbean Basin Sustainable Energy Fund (CABEF), which is also managed by Deetken. Both funds have mirror limited partnership agreements (also known as the bylaws of each fund) and can operate as a single fund.

After its capitalization, H-REFF began operations. The fund provides financing at near market rates to on- and off-grid small-scale clean power and energy efficiency projects. This includes equity, but mostly mezzanine financing, with ticket sizes ranging from \$250,000 to \$5 million.

A variety of prerequisites exist for local developers to access funding. Applicants must prove they have strong sponsors (i.e. investors with track records), have already secured a long-term power purchase agreement for their project and have satisfactorily completed an environmental impact assessment.

The typical capital structure of a new renewables project applying for funding from H-REFF would therefore comprise equity from the developer and their sponsor in order to obtain further equity or mezzanine finance from the fund. This, in turn, would enable sufficient funds to access local and/or international commercial debt (Figure 13).

Figure 13: Envisaged typical capital stack for local renewables developers



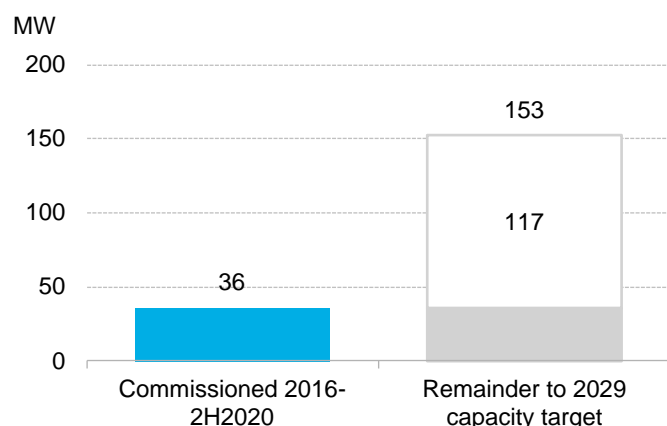
Source: BloombergNEF. Note: Circle indicates the products that commercial banks in Honduras do not commonly offer to small-scale renewables developers.

Eligible technologies include biomass, biogas, small hydro below 15MW, small-scale solar PV, waste-to-energy, and wind projects. In addition, smaller scale applications such as projects focusing on rooftop PV or solar water heaters can also apply, as well as energy efficiency projects, yet these should not make up more than a tenth of H-REFF funding. While at least 90% of SREP resources of H-REFF can only target projects in Honduras, the general partner can also disburse funding to projects in other countries of Central America.

Outcome

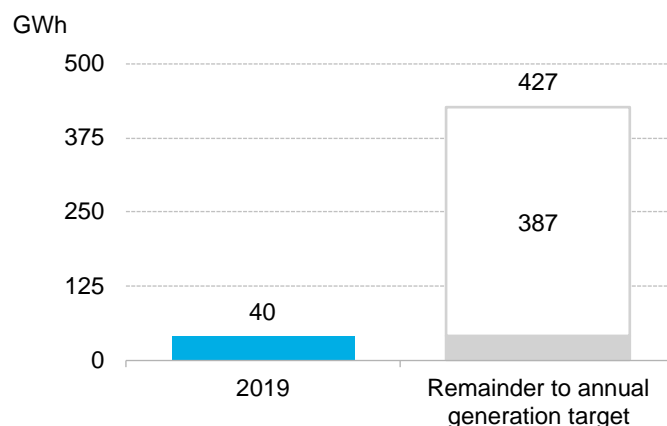
In 2020, H-REFF was in its fourth year. Nearly 25% of the targeted installed capacity of 153MW, and nearly 10% of the targeted annual generation of 427GWh had been achieved as of December 2020 (Figure 14). The commissioned projects to date have benefited 22 businesses directly and 3,000 indirectly from improved power access.

Figure 14: Actual vs. targeted new capacity through H-REFF



Source: IDB Lab. Note: Only includes projects commissioned in Honduras (excludes projects commissioned under CABEF).

Figure 15: Actual vs. targeted generation through H-REFF



Source: IDB Lab. Note: Only includes projects commissioned in Honduras (excludes projects commissioned under CABEF).

While a complete financial analysis can only be conducted when the fund winds down in 2029, early indicators suggest some success. So far, H-REFF has provided returns of 8% per year compared to the targeted preferred annual return of 11% over the lifetime of the fund. Projects funded through the facility have leveraged about \$5 million of local commercial debt so far.

For example, the 3MW “Los Pinos 1” biomass project managed to leverage 3:1 of third-party financing after securing \$1.9 million via H-REFF and CABEF.⁴ Similarly, the energy-as-a-service provider KW Financial achieved a leverage of 2:1 for PV projects after securing \$5 million via H-REFF and CABEF.

As in other regions of the world, the Covid-19 pandemic has rendered operations more difficult and placed a strain on the offtaker ENEE. While H-REFF has remained successful so far, this underscores the need for risk diversification in terms of geographical involvement and flexibility of the use of concessional resources.

Lessons learned

In terms of replicability, H-REFF can offer multiple lessons for other projects. While it is always important to keep the country context in mind, these lessons can be applied to varying degrees across regions.

Flexible use of instruments

Given the lack of available equity in Honduras, the flexible use of concessional resources was key to the success of the project. The first-loss capitalization of the fund enabled by CIF’s SREP funding in addition to its equity stake allowed it to attract co-investment, particularly from private sources of capital. As highly rated institutions, DFI involvement in first-loss positions can allow private investors to feel more comfortable with risk and thus help draw private funding.

Strategic use of grant resources

The technical assistance was crucial to providing training and knowledge sharing to safeguard environmental and social considerations, promote clean energy finance best practices and ensure

⁴ Deetken Impact (2021) [Sustainable energy](#)

the quality of H-REFF's portfolio. This played a role in drawing in other anchor investors, such as the IDB and GEF.

Best practice design

The process of accessing H-REFF funds is crucial to creating potential returns for the investors and growth for the investees/developers. Any developer wishing to access funding must provide proof of a signed power purchase agreement and go through a detailed due diligence made by the fund manager that includes integrity checks and ESG risk analysis. This ensures that only sound business models receive H-REFF funding and that returns are structured adequately. This prerequisite can be a useful design that can be adapted to work for similar projects.

Replicability

The ability of IDB Lab to finance riskier projects via equity due to its own off-balance sheet nature offers the opportunity to experiment with novel forms of risk financing within climate finance without jeopardizing the credit rating of the parent organization. Setting up a structure akin to a venture capital fund was unusual for a DFI and opened up a further intermediary channel. While not all DFIs are able to do this, it is a useful model for those that wish to pursue riskier projects with higher returns. H-REFF provides a small-scale example of employing a risk capital approach to scaling private climate finance. Yet this project could also potentially be scaled to a larger structure with larger ticket sizes, potentially with backing from private equity capital.

Finally, greater environmental social and financial returns could be achieved if H-REFF were able to finance projects in neighboring or similar countries. Increased country diversification would dilute the overall risk of the fund and potentially attract more private capital.

4.2. Early-stage intermediation: ReNew Power

Table 8: Project summary

Overview of key indicators

Country	India
Initial intermediary	Investment bank
Activity	Fund-raising
Sector	Private
Focus	Scaling an early-stage local IPP

Source: BloombergNEF

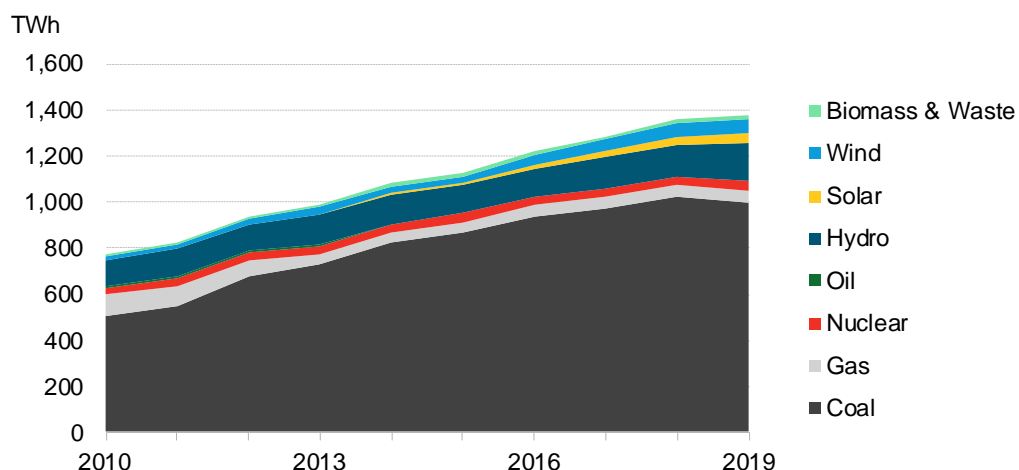
The success of Indian independent power producer (IPP) ReNew Power shows how powerful and wide-reaching financial intermediation through early-stage fund-raising can be. Evolving from a start-up seeking venture capital, to a firm large enough to issue a green bond and list on a U.S. stock exchange, the early-stage intermediation of investment bank Goldman Sachs proved important to ReNew Power's success. ReNew was, moreover, the first Indian IPP to commission 5GW and the largest such company by renewables capacity commissioned.

Country context and goal of intermediation

India power generation has grown rapidly in recent years with coal supplying the vast majority of new electrons (Figure 16). According to government data, the country has been fully electrified since 2018. The challenge now is providing affordable power to all consumers round the clock.

Meanwhile, peak demand has been continuously rising due to economic and population growth. Despite the current Covid-19 crisis, India's economy should return to strong growth and require significant additional power-generating capacity. Given the government's ambitious renewable energy target of 450GW renewables installed in 2030 and the need for emissions management under its NDC, most if not all new capacity must be clean. This context offers growth opportunities for companies in the renewables space.

Figure 16: India power generation mix

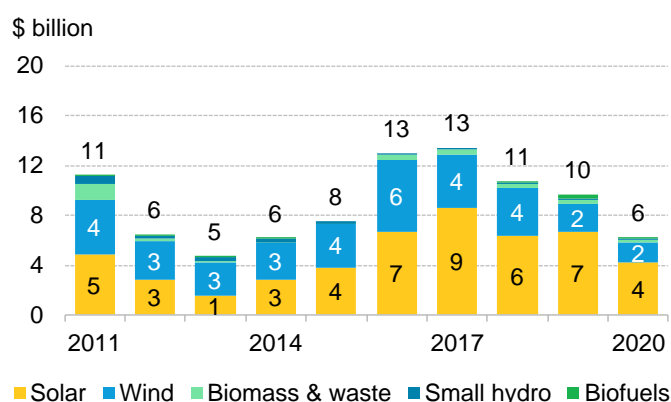


Source: BloombergNEF

The Indian power sector has drawn the second-highest levels of clean power investment across emerging markets in the past decade (Figure 17). A strong enabling environment and ambitious clean power policy have been key drivers. This has included federal- and state-level auctions, which kick-started domestic and foreign investment as of 2016 through the second phase of the National Solar Mission (Figure 18).

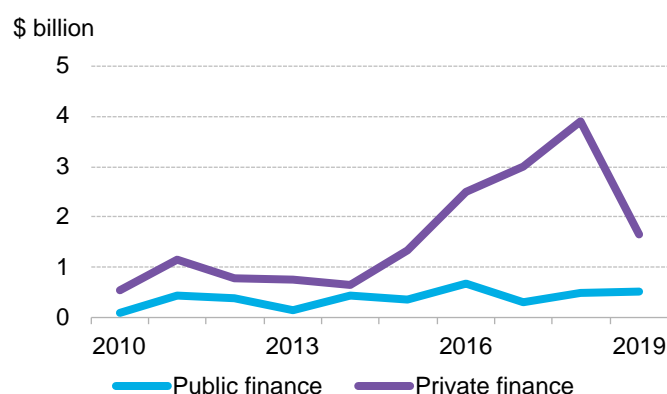
These auctions have been crucial in allowing the local renewables sector to grow and mature, with competition helping to drive down costs. Federal auctions notably protect IPPs from payment delays by having federal agencies such as SECI act as an intermediate producer – in effect providing a quasi-sovereign guarantee. Other enabling factors favoring renewable power projects include priority dispatch for wind and solar, standardized bidding guidelines, a waiver from transmission charges for projects connecting to the national grid, reduced corporate tax, accelerated depreciation, and an openness to foreign direct investment without reviews.

Figure 17: India asset finance for new renewables build



Source: BloombergNEF.

Figure 18: India clean power foreign direct investment



Source: BloombergNEF.

In the early 2010s, however, the market for renewable energy capital lacked a diverse array of equity investors. It also featured high debt costs, short loan tenors, and a high perception of

technology and sector risk. This made it difficult for new IPPs to enter the renewables market if they could not bring along ample funding of their own.

Founded in 2011, ReNew Power faced similar constraints regarding the lack of suitable renewable energy infrastructure financing. The IPP was established with an initial equity investment provided by the CEO to hire staff and secure a power purchase agreement for its first project. However, ReNew needed large-scale equity investments to kick-start its business to then, in turn, access to domestic and international equity and debt to expand its operations.

Project set-up and choice of intermediary

In order to equip the company with sufficient capital to build up operations, ReNew's founders approached a wide range of equity investors with a capital ask of \$60 million. However, due to the company's early stage and corresponding lack of track record, domestic equity investors were not willing to fund the asking sum.

At the time, investment bank Goldman Sachs had already proven successes with early-stage intermediation in renewables companies through its experience in investing in U.S. IPP Horizon Energy in 2005, which it successfully exited in 2007. The ReNew team pitched Goldman and received approval for \$60 million.

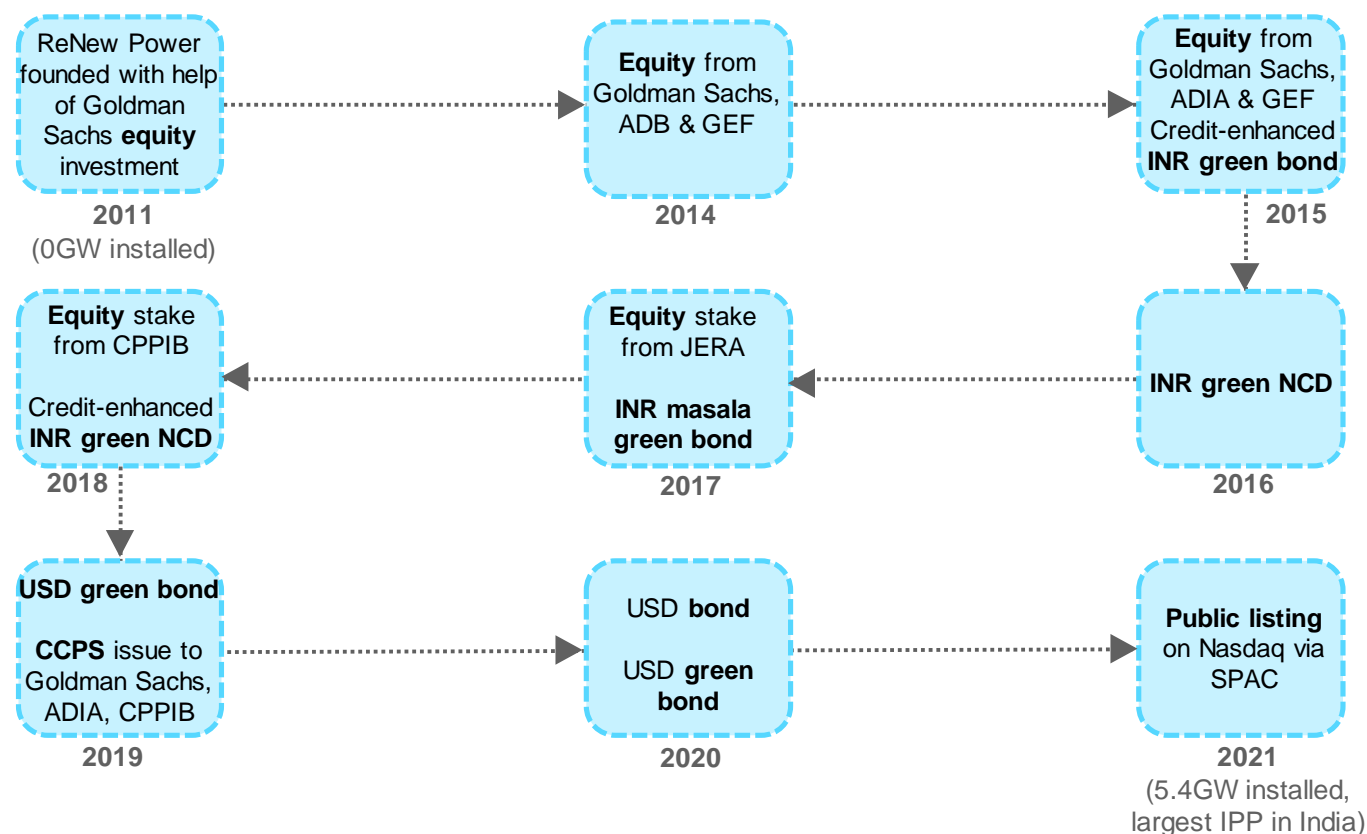
Table 9: ReNew Power's intermediation

Capital provider	Intermediary	Borrower	Instrument
Public shareholders	Investment bank	Independent power producer	Equity stakes and support in bond raising

Source: BloombergNEF.

This early-stage equity stake was important to drawing in further co-investment. The Asian Development Bank (ADB) and alternative asset manager Global Environment Fund (GEF) each invested alongside a new round of funding from Goldman in 2014 (Figure 19).

Figure 19: ReNew Power funding timeline by major instrument and intermediary, 2011-2021



Source: ReNew Power, BloombergNEF. Note: Table is a simplification of major intermediation instruments and only includes disclosed major investments. ADB = Asian Development Bank, GEF = Global Environment Fund, ADIA = Abu Dhabi Investment Authority, INR = Indian Rupees, NCD = non-convertible debenture, CPPIB = Canada Pension Plan Investment Board, USD = U.S. Dollars, CCPS = compulsorily convertible preference shares, SPAC = special purpose acquisition company.

These initial equity investments enabled the company not only to access bank loans from domestic and international lenders over the following years but also provided enough market confidence to draw in equity investment from institutional investors such as the Abu Dhabi Investment Authority (ADIA) or the Canada Pension Plan Investment Board (CPPIB).⁵

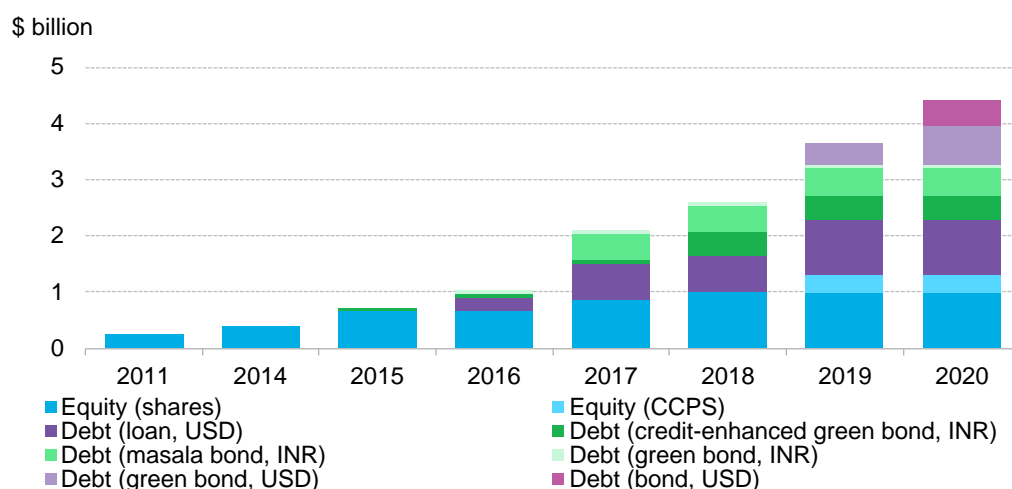
Continuous efforts to lower the borrowing rates ReNew started tapping the bond markets in India, including one issuance in 2015. To support the issuance, the India Infrastructure Finance Company (IIFCL) provided a first-loss partial guarantee of 30% to the bond, with the ADB putting in place a 50% backstop guarantee to IIFCL. This raised the bond's credit rating from A to AA+, allowing for debt with a longer tenor and at lower cost, while also enabling access to domestic institutional investors.

Following on from this first experience, ReNew was able to further explore the fixed-income spectrum to broaden its capital base (Figure 20). Rupee-denominated green bonds raised on the domestic market, many of which were issued on a bilateral basis to familiar investors, were used

⁵ Section 5 delves into greater detail on the involvement of institutional investors in clean power investment.

to supply financing. These private placements eliminated the need to officially label the bonds as green, as investors were already familiar with the company.

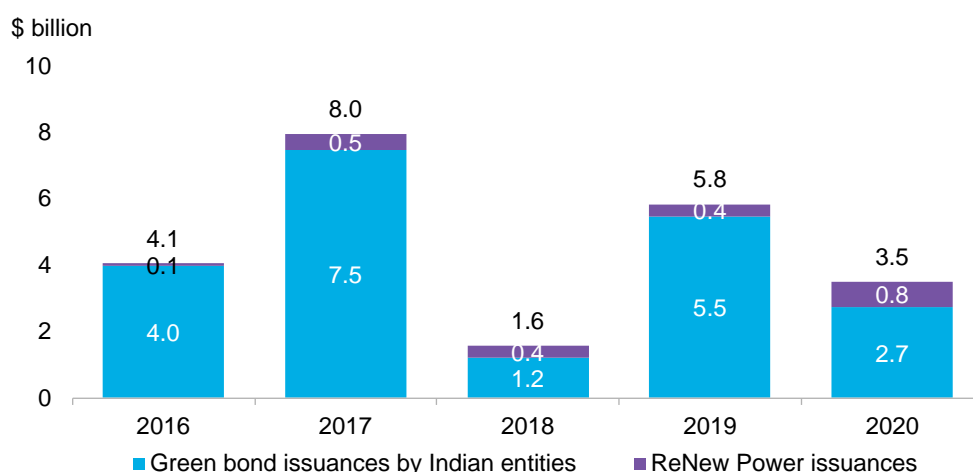
Figure 20: ReNew Power fund-raising, 2011-2020



Source: ReNew Power, BloombergNEF. Note: Chart is a simplification of major intermediation instruments and only includes disclosed major investments. CCPS = compulsorily convertible preference shares, INR = Indian Rupees, USD = U.S. Dollars.

To free up further capital, the IPP also sought to refinance existing debt on international markets. ReNew first accessed the international bond market through a masala bond in 2017, which was a Rupee-denominated bond issued using a special purpose vehicle overseas. In recent years, the IPP has also become increasingly able to access debt denominated in U.S. dollars, which was previously too costly due to hedging risks. Dollar-denominated debt at lower interest rates has helped it refinance existing domestic debt at higher rates. In contrast to fixed-income instruments issued on the Indian market, ReNew Power's Dollar-denominated bonds were certified in order to draw in institutional investors seeking to green their portfolios. Combined, these issuances have allowed the IPP to become a key fixture among Indian entities issuing green debt (Figure 21).

Figure 21: Green bond issuances by Indian companies



Source: BloombergNEF. Note: Includes labeled and unlabeled green bonds.

In February 2021, ReNew took a major step to broaden its capital base by announcing plans to list its shares on U.S. Nasdaq stock exchange through a merger. The IPP merged with a special purpose acquisition company (SPAC), RMG Acquisition Corporation II, to form ReNew Energy Global PLC. The listing was completed in August 2021.

Outcome

Early-stage intermediation from prominent investor Goldman Sachs helped ReNew to become the largest IPP in India within a decade. The company expanded from owning no installed capacity in 2011 to 5.4GW in solar and wind assets by 2021. ReNew was the first renewable IPP to make use of masala bonds in 2017. This has not only helped to significantly increase market familiarity with renewables in India, but has also led ReNew to become a significant IPP on the global stage as well.

Early-stage intermediation was important to attract further equity co-investors, who in turn, facilitated the IPP's access to a wide range of available instruments to obtain further working and investment capital. Continued equity injections from existing and new investors broadened ReNew's capital base and allowed it to pursue various models of domestic and international debt financing. In addition, the initial and continued involvement of a prominent investment bank allowed for increased public interest and, in light of global demand for ESG-denominated securities, caught the attention of large-scale institutional investors such as pension fund CPPIB or sovereign wealth fund ADIA. These various steps were necessary to ultimately lead to the IPP's initial public offering.

Lessons learned

The ReNew story highlights the multiple financing stages an IPP can go through to achieve real scale, showcasing the importance of early-stage intermediation to create investor confidence both domestically and internationally.

Choice of partners and role of renewables growth markets

Matching the early-stage investment financing needs of an IPP with a deep-pocketed and supportive global investment bank with a track record in renewables was important to kick-starting the working relationship and drawing in further investors. At the time of Goldman Sachs' initial investment, India's clean power sector was poised for growth with a very large future investment potential.

Role of development finance

Initial equity investments, loans, and credit enhancement for debt-raising activities from international DFIs boosted further confidence in both ReNew and the Indian renewables market from domestic and international investors, eventually drawing interest from typically risk-averse institutional investors. This demonstrates that DFI support can be crucial to initially "prove" a new technology, instrument or entity, after which sufficient market familiarity and investor confidence can evolve so that concessional support can be reduced or completely eliminated.

In this context, the collaboration between international DFIs with local entities, such as the India Infrastructure Facility, was necessary to not only navigate the local market, but also familiarize local players with instruments such as credit enhancement for green bonds. Establishing familiarity in the local market in turn helped to open the path to experimenting in international capital markets.

Other important roles that can be played by DFIs include providing a working example of what can be done in the financing universe. IPPs then take these examples to domestic lenders and that helps in developing financial products for the local market.

Replicability

The working relationship between ReNew and Goldman may be unique, but it can serve as a template to other marquee investors seeking to support first-movers in countries with the necessary market fundamentals in place. For entities with strong business models located in markets with growth potential, early-stage co-investment from a large private bank in combination with DFIs can support not only the growth of the individual company, but also the renewables sector as a whole.

For its part, Goldman leveraged its connections with the investing world and willingness to experiment with ways of raising capital. As the first pure-play renewables IPP in India to achieve various milestones, ReNew has blazed a trail other entities can potentially follow. In order to create a replicable example, a balanced cooperation and capital supply between international and local entities should be kept in mind to sufficiently account for domestic market realities.

4.3. Advanced-stage intermediation: Japan's Government Pension Investment Fund

Table 10: Project summary

Overview of key indicators

Country	Japan (global portfolio)
Intermediary	Pension fund
Activity	Fund-raising
Sector	Public
Focus	Scaling institutional sustainable investment

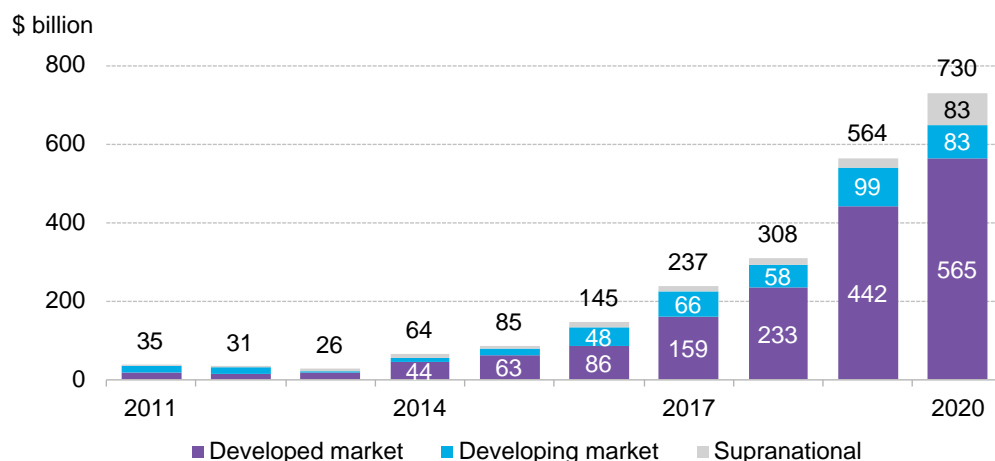
Source: BloombergNEF

The involvement of Japan's Government Pension Investment Fund (GPIF) in clean power highlights how financial intermediation can mobilize particularly large volumes of capital from an institutional investor. It demonstrates what can be achieved when an institutional investor's ESG mandate matches well with a DFI's fund-raising activities.

Context and goal of intermediation

Investor appetite for securities that meet certain ESG criteria has grown dramatically in recent years (Figure 22). Still, demand for sustainable debt instruments tends to exceed supply, with green bond issuances regularly oversubscribed. Buy-side entities, including institutional investors, face pressure to meet ESG mandates and are ramping up purchases of sustainable fixed-income products. Due to limited supply and the search for increased yield, investors are increasingly looking to new markets to satisfy demand. By comparison, issuances of sustainable debt focused on emerging markets has been more limited.

Figure 22: Global sustainable debt issuance



Source: BloombergNEF. Note: Includes both debt and loans.

Greening the world's largest pension fund

As the world's largest pension fund with \$1.5 trillion worth of assets under management, GPIF was seeking to green its portfolio in the mid-2010s and signed the UN's Principles for Responsible Investment in 2015. As a first step, GPIF pursued ESG equity investments, for which the market was already more established. It also sought to green its fixed-income portfolio, but was struggling to find suitable products with reliable information and standards in order to meet its fiduciary duty⁶. Its large-scale investment in sustainable fixed-income faced further barriers in the form of a lack of sustainable debt issuers and a lack of liquidity.

As is common for large institutional investors, GPIF's global equity and foreign fixed-income investment activities are outsourced to external asset managers under clear investment guidance. This investment criteria needed to be updated to adjust for a greater orientation towards ESG. The combination of these factors drove GPIF to look for other solutions to green its fixed-income portfolio and allow for large-scale sustainable investment.

Project set-up and choice of intermediary

To comply with its fiduciary duty, GPIF needed to ensure it worked together with highly rated institutions with a long-term sustainable investment approach. The idea to partner with DFIs therefore made sense, as these tend to have a high credit-worthiness, yet also have a continued need for capital to fund their country-level activities. Given the large volumes of investment needed to finance the energy transition in emerging markets, this also proved an avenue with a large-scale growth outlook.

Table 11: GPIF's intermediation

Capital provider	Intermediary	Borrower	Instruments
Employer and employee contributions	Pension fund	Development finance institutions	Bonds

⁶ Fiduciary duty means the legal and ethical obligation to act in others' best interests.

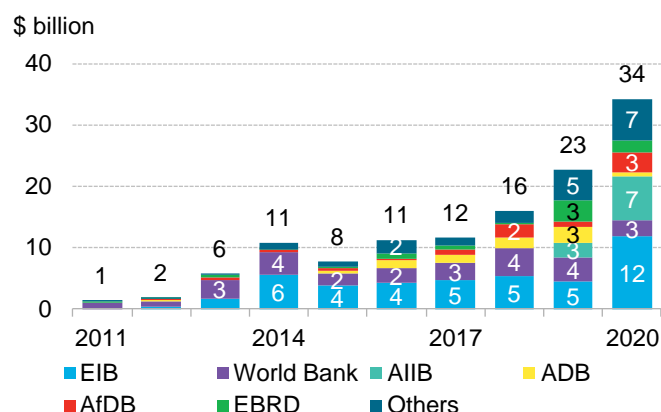
Source: BloombergNEF.

First step: Partner up with DFIs

DFIs are issuing an increasing amount of sustainable debt to finance their country-level activities (Figure 23). Compared to global sustainable debt issuance, the absolute and relative volumes of issuances remain small to date, yet the number of DFIs active in this space has diversified in recent years, with volumes growing rapidly. Much of the sustainable debt issued by DFIs has taken the form of green bonds, but social and sustainability bonds⁷ are also on the rise (Figure 24).

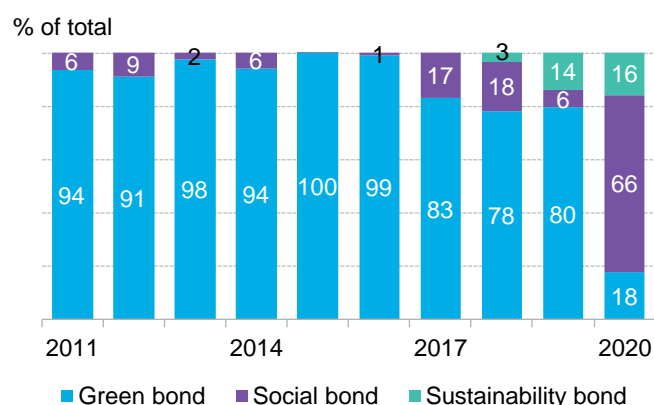
The trend was particularly marked during the pandemic, when DFIs employed thematic bond issuance in response to various governments' additional financing requirements resulting from economic downturns. For instance, the IDB registered a jump in social and sustainability bond issuance in Latin America and the Caribbean in 2020, with total volumes rising to a cumulative \$24.4 billion. Green bonds, however, make up some 80% of thematic-bond volumes in the region. IDB has also supported the design and provision of guarantees to credit enhance bond issuances.

Figure 23: Sustainable debt issuance by DFIs



Source: BloombergNEF. Note: Does not include issuances from the European Union and the Council of Europe. EIB = European Investment Bank, AIIB = Asia Infrastructure Investment Bank, ADB = Asian Development Bank, AfDB = African Development Bank, EBRD = European Bank for Reconstruction and Development.

Figure 24: DFI sustainable debt issuance by theme



Source: BloombergNEF.

GPIF sought to learn more about how its demand for ESG-denominated securities could potentially match up with DFIs' capital needs. It collaborated with The World Bank Group⁸ in 2017 to research solutions to making fixed-income portfolios more sustainable while engaging with investors to learn more about integrating ESG into its investment strategy. A year later, this

⁷ Green bonds support climate- and environment-related activities, while social bonds are focussed on creating positive social impact. Sustainability bonds cover both social and green aspects.

⁸ More specifically, the International Bank for Reconstruction and Development (IBRD) and the International Finance Corporation (IFC).

resulted in the publication of the report “Incorporating ESG factors into fixed income investment”⁹. This report provided a comprehensive overview of the state of the fixed-income ESG market in terms of analysis, performance, implementation and challenges. Some of the key recommendations included factoring in ESG integration from the board to the analyst level, setting clear ESG investment objectives at the organizational level and improving the measurement of ESG outcomes.

Second step: Modify investment guidelines

Based on the report’s findings, GPIF amended its investment guidelines to include ESG considerations across all asset classes as part of its fiduciary duty. To provide a common understanding within the institution, the guidelines defined what ESG integration should mean in practice, namely the “explicit and systematic inclusion of ESG factors into investment analysis and decisions”.¹⁰ Translated into investment practice, GPIF stated that investment into green, social and sustainability bonds were a direct channel to comply with ESG integration.

Third step: Provide clear guidance to asset managers

The majority of GPIF’s fixed-income portfolio is managed passively, aligned with the FTSE World Government Bond Index. As only a limited number of the sovereigns in the index have issued green bonds, however, this created a challenge in significantly increasing the volume of fixed-income securities in GPIF’s portfolio. To address this, GPIF had to adjust guidelines for passive managers to explicitly allow for off-index investment, thereby opening up the possibility to invest in AAA-rated bonds issued by DFIs. While the implementation of the adjusted guidelines proved challenging initially due to concerns over fiduciary duty, investor perception changed favorably due to the fact that DFI fixed-income instruments tended to offer higher yields than those of sovereigns in the index, yet still maintained a similarly high rating.

Fourth step: Solidify collaboration through preferential access

Following on from their initial collaboration, GPIF and the World Bank Group teamed up to allow GPIF’s asset managers preferential access to their green bond issuances. This directly paired up the DFIs’ capital needs and GPIF’s ESG investment requirements, resulting in a beneficial outcome to all parties.

Figure 25: GPIF’s intermediation journey



Source: BloombergNEF.

Outcome

GPIF’s preferential access for the World Bank Group’s green bonds mobilized more than \$500 million of initial investment in green bonds. Based on this blueprint, GPIF went on to form similar

⁹ World Bank (2018) Incorporating Environmental, Social and Governance (ESG) Factors into Fixed Income Investment

¹⁰ GPIF (2020) ESG Report 2019

partnerships with the European Investment Bank, the Asian Development Bank and the Islamic Development Bank, increasing the pension fund's sustainable fixed-income assets to over \$1 billion in 2019 alone (Table 12).

Table 12: Examples of GPIF's collaboration with DFIs

Start date	Entity	Instrument	Certification
2019	World Bank Group ¹¹	Green bonds	Undisclosed
		Social bonds	
		Sustainable development bonds	
	European Investment Bank	Climate Awareness Bonds Sustainability Awareness Bonds	Green Bond Principles; ICMA's Sustainability Bond Guidelines
	Asian Development Bank	Green bonds	ICMA's Sustainability Bond Guidelines
	Islamic Development Bank	Green and Sustainable Sukuk	ICMA's Green Bond Principles, Social Bond Principles and Sustainability Bond Guidelines
2020	Inter-American Development Bank	Social bonds	ICMA's Social Bond Principles

Source: GPIF, BloombergNEF. Note: Includes disclosed major collaborations only. ICMA = The International Capital Market Association.

In the meantime, GPIF has also partnered with other DFIs such as the Nordic Investment Bank, the European Bank for Reconstruction and Development, the Council of Europe Development Bank, Germany's KfW, Swedish Kommuninvest or Dutch BNG bank. The various DFI collaborations also allow GPIF to diversify its portfolio, with bond holdings across different geographies and in various currencies, such as U.S. Dollar, Australian Dollar or British Pound Sterling. As of March 2020, this has resulted in GPIF's total investment into green, social and sustainability bonds of DFIs to rise to \$4.2 billion or 0.3% of total assets under management.¹²

Lessons learned

Providing a blueprint for other institutional investors

Aside from mobilizing large sums of capital through a fruitful collaboration between a large institutional investor and a multitude of DFIs, GPIF's activities provide a template to other buy-side investors seeking to green their portfolio. While, so far, this type of cooperation including preferential access is probably only possible for large-scale institutional investors, it can serve to open the field to smaller entities, for instance acting as a precursor to corporate pension funds in practical (and symbolic) terms. Entities can learn from which changes GPIF needed to make to investment guidelines and which instructions were most valuable in changing their portfolio. This has for instance been the case for Japan's Pension Fund Association for Local Government

¹¹ More specifically, the International Bank for Reconstruction and Development (IBRD) and the International Finance Corporation (IFC).

¹² GPIF (2020) [ESG Report 2019](#)

Officials, which has modeled its investment strategy on that of GPIF, vastly increasing its ESG holdings.¹³ The collaborative blueprint and investment guidelines of GPIF therefore may serve as a template to other institutional investors both in developed and developing markets.

In addition, due to the sheer size of institutional investors like GPIF, such collaborations are significant in terms of the volume of finance mobilized and, correspondingly, the impact achieved.

Merit of collaboration between DFIs and institutional investors

While pension funds appear to be most active in pursuing ESG mandates, similar collaborations between DFIs and other institutional investors such as insurance companies and sovereign wealth funds could be forged. To more directly channel capital to emerging markets, it could also be useful to consider bond-issuing partnerships between national development banks or green banks with international or domestic institutional investors. Regulatory authorities can play an important role in strengthening such partnerships, as pension funds face relatively high levels of scrutiny when investing in illiquid asset classes. Supervisory and regulatory bodies could harmonize their position around sustainable finance, thereby facilitating decarbonization-related investments.

Replicability

To replicate the GPIF success story, proactive engagement between national and multinational DFIs, green banks or similar organizations and buy-side entities will be required to better understand the investment realities of each. Knowledge sharing platforms (such as those outlined in Section 5) will be key. These are particularly valuable in regions where ESG implementation is in its infancy, such as Latin America and sub-Saharan Africa.

As major investors continue to gain further understanding of the regulatory and implementation process of incorporating ESG securities in their portfolios at scale, adjustments to investment practices should become streamlined. With improved understanding of the investment criteria and obligations under fiduciary duty of institutional investors, issuing entities can incorporate this knowledge when structuring new instruments.

4.4. Advanced-stage intermediation: coal plant securitization in the U.S.

Table 13: Project summary

Overview of key indicators	
Country	U.S.
Intermediary	Banks; capital markets
Activity	Fund-raising
Focus	Refinance coal plants to allow early retirement

Source: BloombergNEF.

While intermediation is key to mobilizing investment in support of new clean power assets, it can also play a role in the decommissioning of fossil assets in the context of decarbonization. This case study explores the securitization of coal plants in the U.S., which could provide a template for retiring similar assets in emerging markets. That, in turn, could generate fresh capital for clean power assets in these countries.

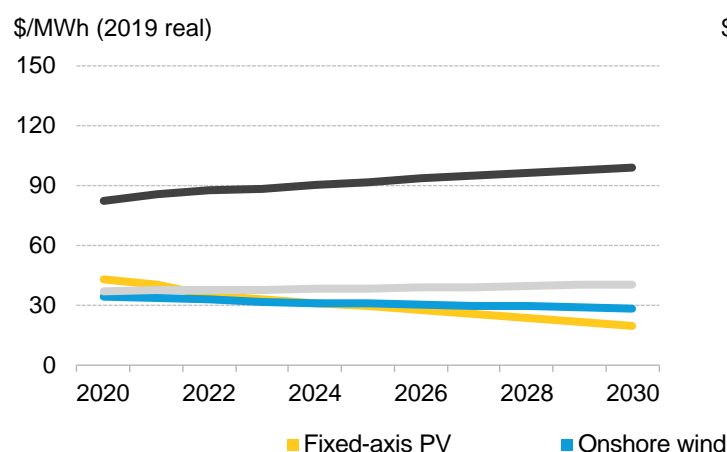
Context and goal of intermediation

In the context of decarbonization, pollution and health discussions, the decommissioning of fossil assets has become increasingly important when thinking of accelerating the energy transition. However, while there is a need to address the retirement of coal assets in light of the commitments made under the Paris Agreement, challenges such as socioeconomic impacts of shuttering the coal industry prove difficult to navigate. This opens the opportunity to speak of coal retirement in terms of cost considerations: Through the rapid cost decline of renewable energy

¹³ Bloomberg (2021) Pension Fund That Mimicks World's Largest Boosts ESG Stocks

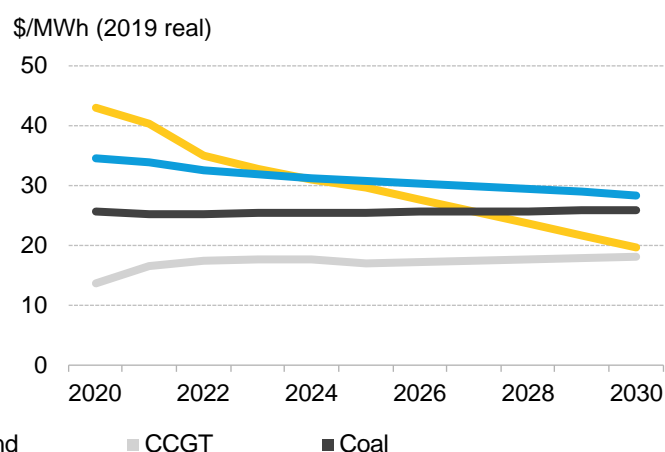
technologies in recent years, fossil assets are becoming increasingly unattractive in economic terms. In many markets of the world, including the U.S., it is much cheaper nowadays to install a new PV or onshore wind plant than to build a new coal asset (Figure 26). However, new-build renewables cannot yet always underprice existing coal assets; in the U.S., it is only towards the late 2020s that it becomes cheaper to replace an existing coal asset with a new-build PV plant (Figure 27).

Figure 26: Mid-range LCOE forecast of new-build renewables vs. new-build coal and gas in the U.S.



Source: BloombergNEF. Note: CCGT = Combined Cycle Gas Turbine.

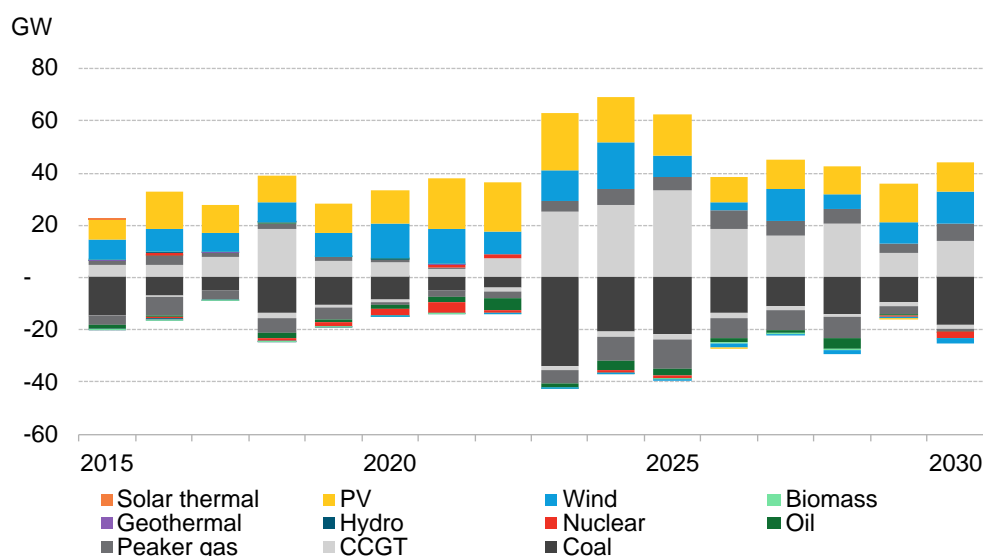
Figure 27: Mid-range LCOE forecast of new-build renewables vs. existing coal and gas in the U.S.



Source: BloombergNEF. Note: CCGT = Combined Cycle Gas Turbine.

Based on BloombergNEF's New Energy Outlook, much of U.S. coal capacity is set to retire in the second half of the 2020s (Figure 28). Yet to meet decarbonization goals that help address climate change, most of these assets must retire earlier. This creates problems for owners of coal assets who subsequently may not be able to make a full cost recovery of their initial investment.

Figure 28: Historic and forecast gross capacity additions and retirements of select technologies in the U.S.



Source: BloombergNEF. Note: CCGT = Combined Cycle Gas Turbine.

The issue of how to best handle undepreciated and/or uneconomic coal plants and manage losses to coal plant owners is a conundrum many countries face as they seek to meet climate commitments. This applies equally to coal assets owned by public bodies, private investors or IPPs with long-term PPAs signed with utilities. However, in regulated power markets, there is less pressure to ensure that an asset runs economically, as costs are typically footed by end customers.

Prematurely retiring a coal plant or failing to recover its full initial investment at the end of its lifetime can put a hole in the plant owner's balance sheet, jeopardize the owner's credit rating and potentially result in losses for shareholders. This can also negatively impact power customers, who may face higher bills as a result. Writing off such "stranded assets" is also not in the plant owner's interest because the owner is typically contractually bound to long-term fuel supply or offtake agreements, which cannot easily be exited.

Project set-up and choice of intermediary

To address this issue, several U.S. states have established laws that allow for the refinancing of such plants while freeing up capital for new renewables assets. The rationale behind using refinancing is to raise debt at lower interest rates than existing costs of debt and equity in order to finance one or several assets off plant owners' balance sheets and retire the assets ("debt for equity"). The freed up liquidity is then used to re-invest in new, replacement clean power projects.

Table 14: U.S. coal plant securitization intermediation

Capital provider	Intermediary	Borrower	Instrument
Private and corporate customers; retail and institutional investors	Banks and capital markets	Coal plant owners	Securitized bonds

Source: BloombergNEF.

This form of refinancing and "capital recycling" has the additional attraction of tailoring loan or bond tenors to the plant owner's needs. One particular challenge, however, lies in the valuation of the coal plant(s) in question and therefore of the amount to borrow. Aside from depreciation of the initial investment in the plant, its value is further decreased through the unattractiveness of coal assets in the current context of mitigating climate change. This section describes four approaches to refinance coal assets on- and off-balance sheet, while freeing up liquidity to invest in new renewables plants (Table 15).

Table 15: Options to refinance one or multiple coal assets

Instrument	Borrower	Lender	Backing	Balance sheet
Single asset refinancing (loan)	Plant owner	Public or private banks, DFIs	Plant owner's creditworthiness	On
Green bond	Plant owner	Public and private capital market participants, DFIs	Plant owner's creditworthiness	On
Ratepayer-backed securitization (bond)	Electricity consumers via SPV	Public and private capital market participants, DFIs	Future bill surcharges	Off

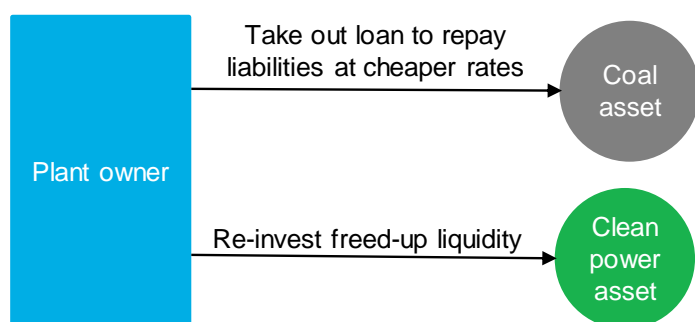
Instrument	Borrower	Lender	Backing	Balance sheet
Asset-backed securitization (bond)	Plant owner via SPV	Public and private capital market participants, DFIs	Future PPA payments	Off

Source: *Rocky Mountain Institute, BloombergNEF*. Note: SPV = Special purpose vehicle.

Refinancing on-balance sheet

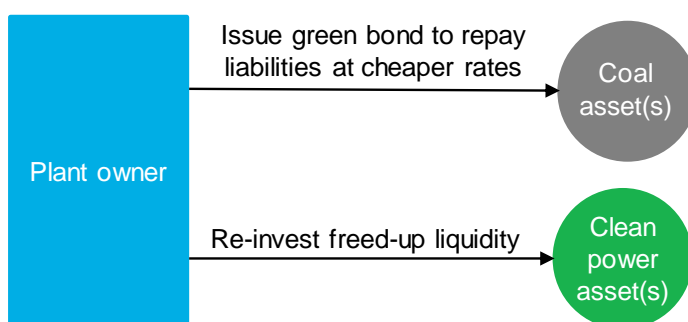
At the most simple level, a plant owner can borrow capital to pay off the liabilities of a particular asset, including fuel supply contracts, and invest into a new clean power plant through **single asset refinancing** (Figure 29). As taking out a loan takes place on-balance sheet, this, however, requires the borrower to have a good enough credit rating to borrow capital at favorable terms. Similarly, a plant owner can simply issue a **green bond**, the proceeds of which can be used to support various activities surrounding retiring fossil plants and developing or acquiring new renewables assets (Figure 30). Likewise, this approach depends on the issuer's creditworthiness.

Figure 29: Single asset refinancing



Source: BloombergNEF.

Figure 30: Green bond refinancing



Source: BloombergNEF.

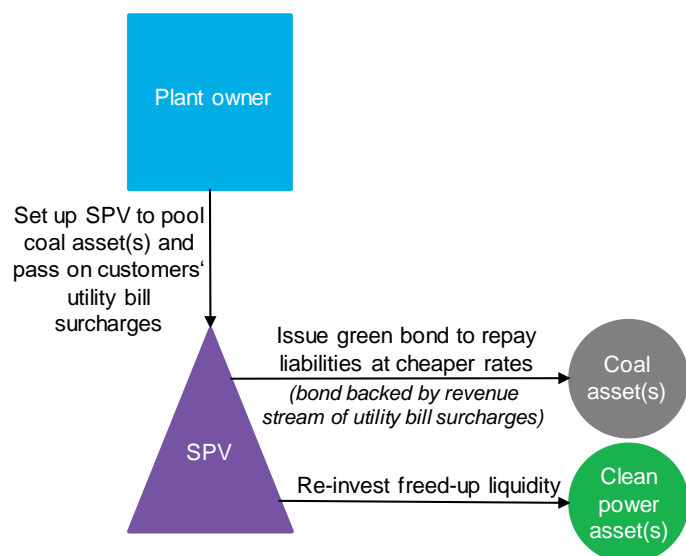
To pursue refinancing activities off-balance sheet may, however, be a prerequisite for certain plant owners due to issues surrounding credit ratings. This can be particularly relevant for public entities, such as municipalities. This is where securitization can play an important role.

Refinancing off-balance sheet

One avenue of using securitization involves electricity customers in the refinancing activity: Plant owners can pool their coal asset(s) into a special purpose vehicle (SPV) via which they raise a bond, backed by the future revenue of a surcharge placed on consumer bills (Figure 31). Through the large number of customers and low probability of non-payment of bills, this **ratepayer-backed securitization** entails low risk, allowing the bond to achieve a good credit rating and, consequently, low rates. This has the advantage of circumventing the plant owner in the financing activity, creating the ability to access lower-cost debt and leaving them with more liquidity to invest in renewables projects.

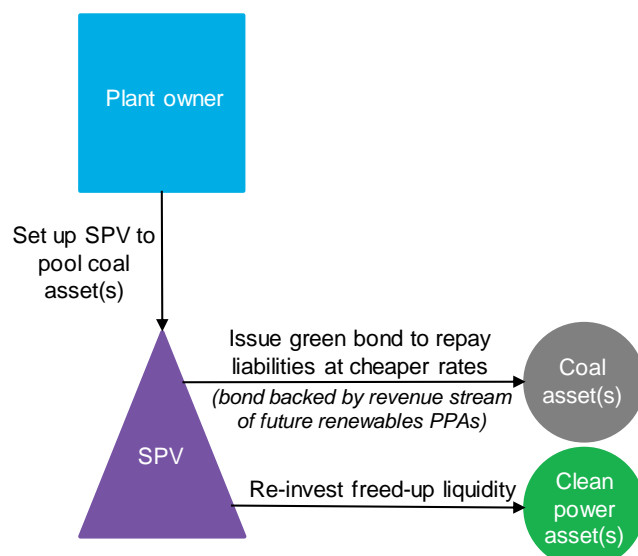
A further option is **asset-backed securitization**: Similar to the model described above, one or several coal assets are pooled into an SPV through which a bond is raised, backed by the future revenue stream of PPAs of clean power projects (Figure 32). Through the steady returns of renewables assets, the value of the underlying assets and technology familiarity, the security is considered relatively low risk and can therefore achieve a good rating and lower financing rates.

Figure 31: Ratepayer-backed securitization



Source: BloombergNEF.

Figure 32: Asset-backed securitization



Source: BloombergNEF.

U.S. examples of coal asset refinancing

The most prominent progressive securitization legislation to date has come in Colorado. In 2019, the state approved a new law that allows utilities to issue bonds to refinance coal asset liabilities to retire a plant prematurely, subject to approval by the regulator.¹⁴ To do so, it allows utilities to levy “energy impact assistance” surcharges on customers’ bills. Utilities can collect these surcharges, which are adjusted for payments of both interest and principal to bondholders, and transmit them to an SPV. The SPV is legally independent of the utility and is authorized to issue and repay bonds.

Revenue collected through surcharges is not only used to refinance coal assets to free up liquidity for new clean power plants, but 15% of net present value savings resulting from avoided costs related to running the coal plants are accrued in a transition assistance fund to support impacted communities. This can provide funding for job retraining, compensation or other costs resulting from the premature plant closure. In addition, the legislation includes several provisions relating to “maximizing public interest”, such as focusing on least-cost solutions of coal asset retirement to power consumers. This for example means achieving the lowest possible interest rate for bonds to lower overall costs footed by customer bills.

Montana¹⁵ and New Mexico¹⁶ have enacted similar measures but with less emphasis consumer protection.

¹⁴ State of Colorado (2019) [Colorado Energy Impact Assistance Act HB19-1037](#)

¹⁵ State of Montana (2019) [Montana Energy Impact Assistance Act HB467](#)

¹⁶ State of New Mexico (2019) [Energy Transition Act](#)

Outcome

A number of laws supporting securitization are relatively new and there are limited examples of coal-fired power plants that have been retired under them. In New Mexico, utility PNM was approved to retire two coal-fired units totaling 497MW at the San Juan Generating Station using securitization in early 2020. The aim is to retire the plant in 2022 following the expiration of fuel supply agreements with the help of a \$360 million ratepayer-backed bond. The proceeds will be used to fund cleaner replacement resources and support transition assistance. This would save customers around \$80 million already in the following year, according to the Rocky Mountain Institute.¹⁷

Colorado saw its first application to use securitization in early 2021 from Xcel Energy. The utility is seeking to retire five coal-generating units later this decade. The funding proposal has yet to be approved by the regulator.

Minnesota and Kansas have similar laws underway with an eye toward retiring coal as well. Pressure to achieve decarbonization targets, which could become more stringent under the Biden administration, is pushing utilities across the country to investigate financially viable ways to retire coal plants.

Lessons learned and relevance to emerging markets

While the securitization model has been put to use in U.S. states with regulated power markets, it has yet to be tested in emerging markets. Rolling such efforts out in less developed countries will pose new and different challenges.

Need for collaboration with the government

In many emerging markets, the economics of an individual coal plant are often less at issue than the general financial health of the plant's owner. In addition, coal regularly plays an integral role in the economies of developing countries, providing jobs and other local benefits. As coal phase-outs involve renegotiating and exiting contractual obligations such as fuel supply contracts, technical assistance can be vitally important to bringing relevant stakeholders to the table to negotiate feasible solutions. Refinancing can be one of several complementary activities in supporting a market's transition away from coal.

Need for a suitable enabling environment

Subsidized power tariffs are frequently available to consumers in emerging markets. State-owned utilities that foot the cost of these often suffer accordingly as poor cost recovery and technical and efficiency losses can drain balance sheets. This can make it impossible for utilities to secure debt at reasonable rates. Table 16 provides an overview of the feasibility of the four refinancing approaches in emerging markets based on respective market conditions.

Role of financial sector mobilization and replicability

Utilities with sound credit ratings in emerging markets have the widest selection of options, including potentially single asset refinancing or the issuance of green bonds that can fund replacement of coal with lower-carbon assets. DFIs can potentially support these activities through providing concessional, near-market or market-rate loans or credit enhancement, for

¹⁷ Rocky Mountain Institute (2021) [Securitization in Action: How us States are Shaping an Equitable Coal Transition](#)

instance through blended loans from commercial banks for single asset refinancing, or through guarantees for green bonds.

Table 16: Possible coal asset refinancing instruments in emerging markets

Instrument	Borrower	Lender	Backing	Balance sheet	Prerequisite
Single asset refinancing (loan)	Plant owner	Public or private banks, DFIs	Plant owner's creditworthiness	On	Feasible if borrower's credit rating allows
Green bond	Plant owner	Public and private capital market participants, DFIs	Plant owner's creditworthiness	On	Feasible if borrower's credit rating allows
Ratepayer-backed securitization (bond)	Electricity consumers via SPV	Public and private capital market participants, DFIs	Future bill surcharges	Off	Feasible if power tariffs are cost-reflective and bill recoup is stable
Asset-backed securitization (bond)	Plant owner via SPV	Public and private capital market participants, DFIs	Future PPA payments	Off	Feasible if PPAs are standardized and enforceable

Source: BloombergNEF.

For utilities unable to borrow at favorable rates, securitization to generate off-balance sheet liquidity could be the only realistic option. A requisite precursor would inevitably be technical assistance provided to the local government to construct an enabling framework that allows securitization. When designing the regulation, earmarking a certain percentage of the revenue for energy transition assistance, such as in the example of Colorado, will be especially attractive to regions facing larger socioeconomic transition risks.

The most feasible avenue for utilities in emerging markets seeking to raise capital off-balance sheet could be asset-backed securitization. By replacing coal assets with new renewables projects with long-term offtake agreements, bonds backed by future revenue streams from renewables PPAs are potentially feasible. DFIs can, however, play a vital role in introducing and proving the instrument by providing credit enhancement for bonds in the form of a partial or full guarantee or insurance. This would help to improve the bond's credit rating and subsequently allow for lower borrowing costs. Depending on whether the bond is set to be raised domestically or internationally, DFI support could also prove valuable in terms of addressing risks such as the convertibility of currency.

Ratepayer-backed securitization is likely to be more difficult as customers in emerging markets simply pose higher risk – particularly when they are conditioned to paying discounted rates for power. Yet, it could be on the table in markets with cost-reflective power tariffs and more solvent customers. Similar to the example above, DFIs could back revenue streams from bill surcharges through a partial or full guarantee or insurance to buffer potential revenue fall-out. Again, this would improve the instrument's rating and subsequent borrowing rates.

4.5. Lessons learned

The case studies above display how financial intermediation can increase liquidity for clean power investment activities, from markets at their earliest stage of development to those that are more mature. Power sector players have varying financing needs and access to capital at each step of

a country's energy transition. Financial intermediation plays differing roles dependent on the market context (Table 17).

Table 17: Summary of case studies

Case study	Country	Income group	Issue	Use of financial intermediation	Intermediary instruments	Role of DFIs and instruments
Honduras Renewable Energy Finance Facility (H-REFF)	Honduras	Lower-middle income	Lack of risk equity	Supplying equity to access local debt market (fund-deployment)	Equity, quasi-equity and subordinated debt	De-risking and crowding in private investment through concessional finance, grants and technical assistance
ReNew Power	India	Lower-middle income	Lack of early-stage equity	Increasing liquidity to access more investors and instruments (fund-raising)	Equity, support for further fund-raising	Co-investing alongside a marquee investor and proving new bond instrument through DFI funds and guarantees
Government Pension Investment Fund (GPIF)	Japan (global portfolio)	High income	Lack of institutional investment in emerging markets' sustainable finance instruments	Accessing large international investors and instruments (fund-raising)	Green, social, sustainability and sukuk bonds	Collaborating with an institutional investor to match bond investment criteria through technical assistance
Coal plant securitization	U.S.	High income	Lack of financial mechanisms to retire coal plants	Monetizing coal assets to allow for retirement (fund-raising)	Securitized green bonds	-

Source: BloombergNEF.

Impact of financial intermediation and role of DFIs

Intermediation intervention and the role of DFIs differed in each case study and the impact varied accordingly. In the case of the **H-REFF**, DFI-supported financial intermediation addressed the lack of risk equity available to small-scale project developers. By supplying equity and/or mezzanine finance, H-REFF enabled developers to access the local debt market, thereby cultivating the local investment chain. The strategic use of CIF's SREP funding was crucial to de-risk and "prove" a new facility like H-REFF in order to crowd in further co-investment. In addition, the grant component of SREP funding allowed to set up a technical assistance facility to support best practices regarding ESG considerations, taking into account the impact of H-REFF-funded projects on the local community. Technical assistance included support with the standards and informing required for accessing financing.

This DFI-supported financial intermediation highlights how a domestic financial ecosystem for renewables financing can be developed by drawing in and familiarizing local intermediaries. Extrapolating to other markets, similar early-stage DFI-supported intermediation has the potential to "prove" a new technology, type of financing instrument or business model. This could be useful in other lower-middle income markets with a minimum, yet not very wide range, of intermediaries and instruments available for renewables financing.

The case of **ReNew Power** demonstrates how a marquee investor can activate more domestic intermediaries and new types of financing instruments to access further liquidity. The intermediation of Goldman Sachs, which had a successful track record in early-stage renewables

investment, provided confidence to further early-stage co-investors, also DFIs. In combination, this quickly rolled out the possibility to access an increasing range of different domestic and, later, international intermediaries and instruments.

The ReNew example shows that creating investor confidence through select intermediation, backed up by a sound business model and market potential, is key to incrementally accessing more avenues of liquidity. This may require initial support from DFIs, but should then ideally enable financing on own terms, such as moving from ReNew's first domestic green bond supported by IIFCL and ADB to issuing green bonds internationally.

In terms of replicability in other markets, this case shows that, if a strong business model is in place and the market conditions allow, a 'trailblazer' can help to grow and mature an entire market, allowing other entities to follow in the footsteps of the first entrant. This has positive knock-on effects in developing the renewables sector as a whole. This example could be interesting to certain lower-middle income markets with a strong financial sector in place and growth potential, yet where renewables financing is still getting off the ground.

The case of **GPIF** shows that it is possible to involve more novel, large-scale intermediaries and their substantial capital pools in renewables financing when properly designed. To date, it is often still difficult to directly connect renewables capital needs in emerging markets with international institutional investors' desire to include more sustainable finance products in their portfolio. Renewables companies or projects in emerging markets often lack sufficient access to domestic or international capital markets due to cost, regulatory or other barriers. This intermediation shows how impactful collaborations with large buy-side players seeking to incorporate more ESG securities can be. As such "match-making" is still not very common, DFI facilitation is ideal to not only better understand investment criteria of such big players, but also the issuing and financing needs of emerging market players. In terms of replicability, the GPIF case can prove useful to upper middle-income markets with fairly mature renewables and financial sectors that are moving into wide-spread use of e.g. green bonds to support refinancing activities.

Finally, the **U.S. coal plant securitization** case study suggests the role intermediation can play in monetizing the retirement of coal assets and supporting renewables development. In markets with regulated environments where coal decommissioning is not occurring based on economics alone, which have a large low-efficiency fleet or where coal simply needs replacing in order to meet NDCs, refinancing through securitization can prove an attractive option to get coal plant owners on board. While this model was only recently piloted in the U.S., it could interest upper-middle or high-income emerging markets with mature renewables and financial sectors in place. Most likely, this will be applicable to countries with a stable power demand trajectory that are looking to successively replace their fossil fleet with clean power assets. As this type of interest remains to be widely proven, DFI support will likely be needed to initially garner investor interest by supporting the creation of a clear, national coal-exit plan, designing a reliable funding structure and providing risk mitigation instruments.

Next steps for intermediation

The follow-on potential for financial intermediation depends on the market context.

For renewables growth markets, such as in the examples of **H-REFF** and **ReNew Power**, (DFI-supported) intermediation is important to activate the domestic investment chain. Once the local market is sufficiently established and familiar with renewables financing, the next step involves growing the range of available domestic instruments and intermediaries as well as spreading the reach to draw in larger volumes of capital through international markets. This will likely initially

necessitate DFI support to prove first moves into the international institutional investor space (see Section 5 for details).

For established renewables markets seeking large-scale liquidity, the example of **GPIF** shows how to connect capital needs in emerging markets with international institutional investors interested in ESG securities. As a next step, this type of collaborative intermediation could be further scaled to target NDBs or national green banks to channel funds as a first point of call. DFI efforts can focus on continuing to open new avenues of such high-level collaboration as well as leverage knowledge sharing and best practice networks, such as outlined in Section 5. Once established as a collaborative template, this would offer up great opportunities to many more markets given the high demand for ESG securities in developed markets and the large capital needs in many emerging markets.

Similarly, the example of the **U.S. coal plant securitization** is a foray into the future of intermediation to retire fossil fleets. The next step for intermediation here is to prove and spread this model in other market contexts outside the U.S. This will certainly require DFI involvement in terms of knowledge sharing, capacity building and de-risking mechanisms to prove this model in a wider range of settings.

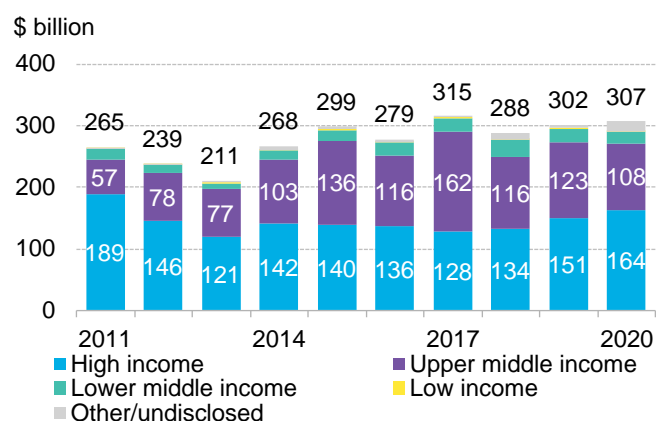
Given that many of the next steps of financial intermediation involve tapping large-scale domestic and international intermediaries, such as institutional investors, the next section of this report will look at current and future opportunities of fully activating the renewables investment chain.

Section 5. Current opportunities and constraints of financial intermediation in clean power

Energy transition investment¹⁸ in emerging markets has faltered in recent years. While high-income countries have seen capital flows steadily increase, defying the Covid-19 pandemic in 2020, others have seen volumes stagnate or decline since 2017. For power and energy storage assets alone, global volumes have remained more or less flat since 2015 and accounted for 76% of overall global energy transition investment between 2011 and 2020 (Figure 33). Yet this masks the fact that new investment in renewables and storage assets in developing nations is concentrated in relatively few markets and peaked in 2017, with a further sharp contraction in 2020 (Figure 34).

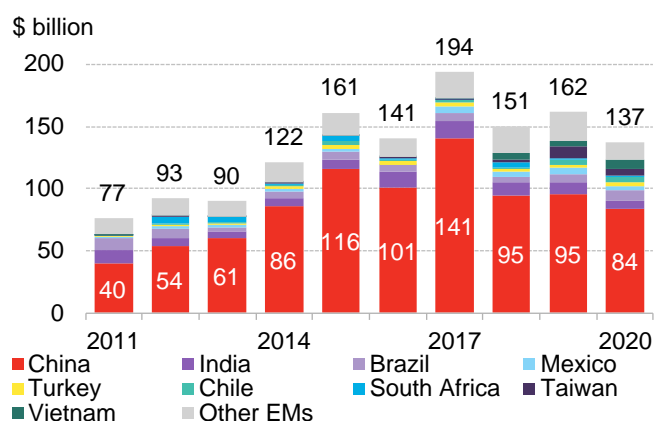
Falling technology costs partially account for this trend in recent years, since the required investment for installing the same level of capacity is now lower for solar or wind power. However, current investment levels are still far from those needed to meet the commitments under the Paris Agreement. BloombergNEF estimates that expanding and decarbonizing the power system to stay on track for warming of as much as 1.75 degrees Celsius would require more than \$2 trillion globally in power generation assets and batteries per year until 2050.

Figure 33: Global new investment in renewables and storage by income group



Source: BloombergNEF.

Figure 34: Emerging markets' new investment in renewables and storage



Source: BloombergNEF. Note: Emerging markets include all non-OECD markets, plus Chile, Colombia, Mexico and Turkey.

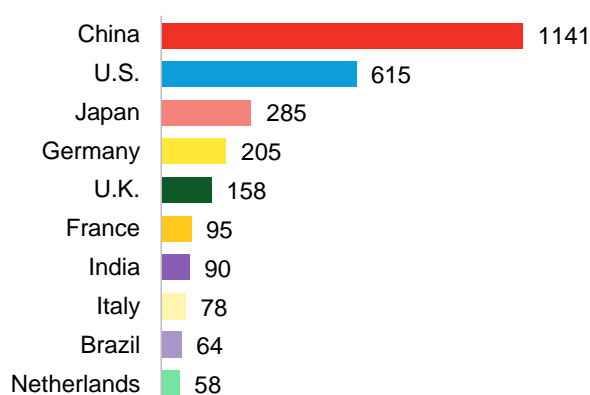
Covid-19 has made it all the more difficult for emerging market governments to fund the energy transition as their coffers have been strained by the pandemic. Activating domestic and international fund-deployment and fund-raising activities can help to meet some of the capital needed to deliver on current climate goals. There is a need to crowd in investments through the creation of vehicles that open sustainable infrastructure assets to a wider investor group. Yet

¹⁸ This includes investment into renewable energy, electrified transport, electrified heat, energy storage, carbon capture and storage and hydrogen.

experiences gleaned in one part of the world are insufficiently applied elsewhere with many investment chain actors remaining underutilized – especially those active in capital markets. As recent years have seen a sharp increase in investor appetite for ESG securities, however, this remains a field to further leverage financial intermediation.

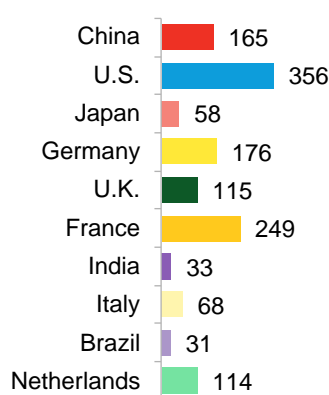
Regarding sustainable debt investors, there are significant potential opportunities for emerging markets to benefit from the large pools of capital they have to offer. Even the top emerging markets for renewables asset finance have attracted relatively little sustainable debt to date (Figure 35 and Figure 36).

Figure 35: Top markets for energy transition investment, 2011-2020



Source: BloombergNEF.

Figure 36: Sustainable debt issuances in support of energy transition, 2011-2020



Source: BloombergNEF.

With borrowing rates low, investors seeking to deploy capital in socially conscious ways, and limited opportunities in wealthy nations, opportunities for clean power fund-raising in developing countries could be substantial.

5.1. Current limitations to the activation of capital market players

Some of the factors that have slowed investment in support of clean power in emerging markets are novel to the sector. Others, however, are more common and quite similar to those that can slow infrastructure investment more generally. Like other infrastructure, renewables are generally financing through private transactions, which by definition are not tradeable on secondary markets where most institutional investors are active.

While institutional investors can invest directly in renewables projects, they rarely do. Rather, they tend to purchase debt or take equity stakes in companies or funds. Direct investments into projects tend to be illiquid, long-term and less competitive in pricing, with greater due diligence effort required; they do however offer the opportunity to pursue higher yields.¹⁹ Other barriers to direct investment involve the lack of transparency as well as comparable data and standards of many renewables projects. Particularly in cases where assets are financed individually, small ticket sizes can also make it difficult to justify the due diligence procedure required for investors.

¹⁹ IRENA (2020) [Mobilising Institutional Capital for Renewable Energy](#)

Clean power projects in emerging markets pose a unique set of risks to investors (Table 18). In some cases, the risks may be too high or the potential returns too low.

Table 18: Typical risks for investing in renewable energy projects in emerging markets

Typical risks	Description
Country/political risk	Macro-level country and political risks
Currency risk	Currency fluctuation and/or convertibility risks
Policy/regulatory risk	Policy/regulatory instability or intransparency; lack of clear project procurement plan and pipeline; lack of contractual enforcement; lack of cost-reflective power tariffs
Execution/operation risk	Risks surrounding land rights, project construction, grid connection, operation, offtake and curtailment
Technology risk	Risks surrounding new, unfamiliar technologies

Source: *Asian Development Bank, BloombergNEF.*

To forgo some of these, capital market actors such as institutional investors prefer to invest in already operational assets and refinancing “proven” projects – especially when in a large and diversified portfolio.

Local factors must also be taken into account (Table 19). The depth of a domestic financial market and its access to international capital sources have a large impact on the availability and diversity of renewables financing. A poorly developed local bond market greatly stymies renewables financing options such as green bonds. Lack of taxonomy of green instruments in emerging markets can prove a further deterrent.

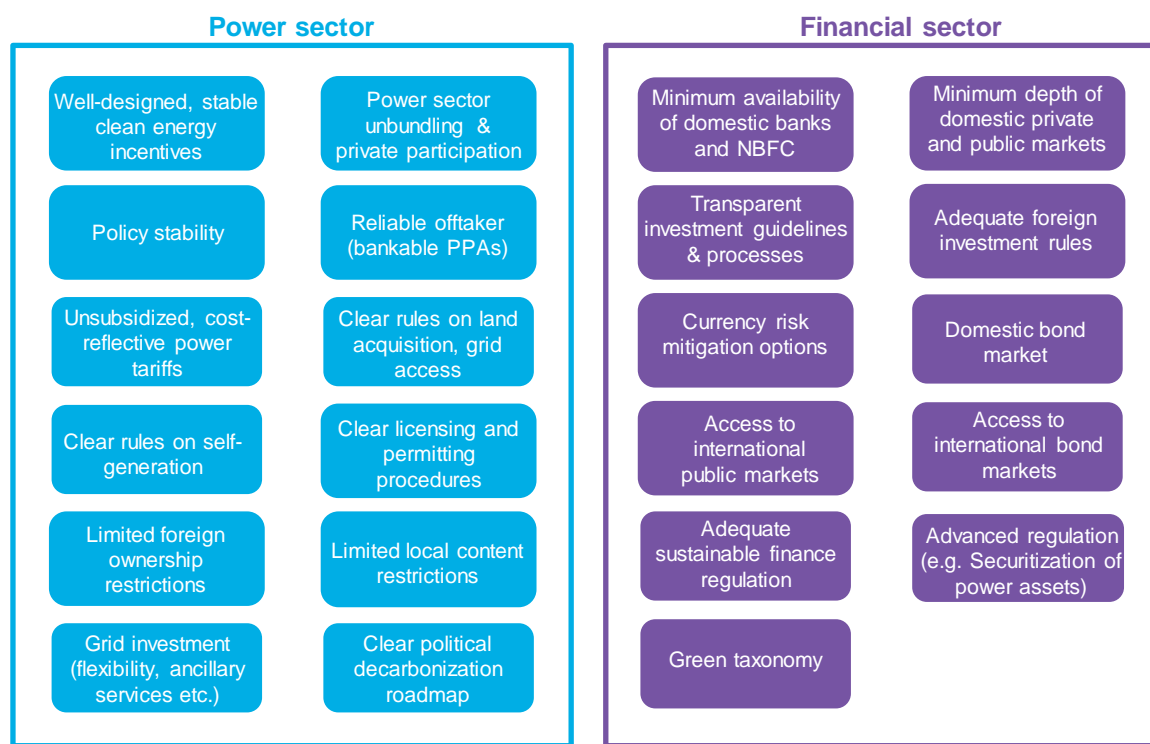
Table 19: Typical risks associated with emerging markets investment

Risk	Description
Country/political risk	Macro-level country and political risks
Currency risk	Currency fluctuation and/or convertibility risk
Regulatory risk	Unclear, poorly enforced investment guidelines and processes; limits on foreign investment
Lack of liquidity	Limited availability/lack of domestic banks and NBFCs and instruments; limited availability/lack of other private and public investment chain actors and instruments; lack of secondary market
High cost of capital	Expensive debt and equity costs

Source: *BloombergNEF.*

These risks can limit the availability of intermediation instruments in emerging markets. Creating suitable enabling environments for both the power and financial sectors is therefore a crucial step for emerging markets to tap all players of the investment chain. The overview below summarizes key investment prerequisites that determine market attractiveness to investors (Figure 37). While a market may not need to fully or partially fulfil all the criteria, having in place as many as possible facilitates access to a larger range of intermediaries and instruments.

Figure 37: Enabling environment prerequisites for maximum clean power investment



Source: BloombergNEF.

5.2. Opportunities for accessing institutional capital

Despite the limitations outlined above, renewables can be well-suited for institutional investors looking to hold assets that offer reliable returns over the long term. Under increasing pressure from investors, institutional investors are also seeking to incorporate climate concerns and ESG goals into their investment approach.

By potentially offering steady, reliable returns, renewable energy projects can potentially meet institutional investors' needs while also checking the box on sustainability (Table 20). Projects in developing countries can be even more attractive than those in wealthier nations by achieving exceptional capacity factors due to largely untapped and exceptional local natural resources.

Table 20: Attributes and advantages of renewables projects in emerging markets

Potential attribute	Potential advantage vs. wealthier nations
Steady, predictable returns secured through long-term PPAs (can include inflation and/or currency hedging)	Often exceptional or above-average solar and wind resources
High quality of underlying power-generating infrastructure	Economic and subsequent power demand growth
Long-term investment horizon	Higher yields
Low correlation with other assets classes (portfolio diversification)	

Backing from reliable, investment-grade or credit-enhanced offtakers

High demand for clean power in light of global climate commitments and economics

Source: BloombergNEF.

Connecting renewables assets with institutional investors

Today, there are relatively limited avenues for institutional investors to invest in clean power projects. However, options are expanding. Recent years have seen a rise in more novel ways to connect renewables assets with capital market players. Key examples are listed below.²⁰

Equity instruments

Opportunities to support clean energy in emerging markets through the world's stock exchanges are limited. Investors can back international utilities, but such companies are rarely offer pure-play opportunities in emerging markets as they have projects in wealthier nations as well. **Private equity and venture capital** can thus be a more attractive option, along with direct investment in projects.

Often, direct backing of specific projects is incompatible with institutional investors' investment criteria. This could be changing, however. As the world's largest sovereign wealth fund at over \$1 trillion in assets under management, Norway's GPFG changed its rules in 2019 to invest in unlisted renewable energy infrastructure.²¹ In a drive to greater align with SDGs, the changes implemented by the fund's asset manager NBIM may prove an important template for other institutional investors going forward.

Mutual funds and more recently exchange-traded funds are popular with retail and other investors, but because they encompass baskets of stocks they rarely offer opportunities to make explicit investments in clean power in emerging markets. **Infrastructure Investment Trusts (InvITs)**, which have become popular in India, seek to address this. These listed investment vehicles are registered with the Securities and Exchange Board of India (SEBI). They can hold both debt and equity of existing renewables assets or those under construction. The diversification of projects and asset classes helps to spread risk, while still generating revenue.

In terms of indirect investment, a further way to involve institutional investors are **renewable energy project funds**. First known as "yieldcos" (yield companies) in the U.S., they pool operating renewable energy assets and generate returns based on PPA payments. Through the aggregation of several projects, risks are diversified, with PPA revenue streams providing a similar return profile to fixed-income instruments such as bonds. These can also be held within mutual funds.

Debt instruments

While debt for renewable energy projects is often provided in the form of direct loans from banks, **bonds or bond funds** trading on capital markets can encompass clean power assets. While institutional investors would typically not hold a bond tied to a single renewables asset, investment in green corporate bonds or green bond funds have grown in popularity. Private

²⁰ This list does not aim to be exhaustive, but rather provides an overview of the most common renewable energy capital market instruments to date.

²¹ Government of Norway (2019) [Allowing for unlisted renewable energy infrastructure](#)

placements of bonds with known can also be an option for project owners when listing is tricky or not possible. **Debt funds** can include other forms of renewable energy debt, such as securitized project or corporate debt. Again, InvITs are a popular example of debt funds.

As outlined in the U.S. coal securitization case study, securitization can prove a further approach to generating revenue off renewables assets. Successful examples to date have included solar **asset-backed securities** (ABS) in which loans, leases or PPAs of a number of rooftop solar assets are bundled into an SPV. Regular customer payments generate the ABS's revenue stream, with the solar projects serving as collateral and the diversity of the project portfolio reducing risk. There is also the option of pooling SPVs into an ABS fund. ABS and ABS funds can also include distinctions between securitized debt on the project level and debt at the corporate level.

The role for DFIs

The instruments outlined above are so far only accessible to emerging markets with mature renewable energy sectors and well-developed financial markets. Even in those markets, however, tapping institutional investor capital pools remains rare. For markets unable to employ these instruments, DFI support can prompt others in the investment chain through concessional, near-market or market-rate finance and advisory services.

For markets where investors have regulatory or sovereign risk concerns, technical assistance can prove critical. This can involve efforts to coordinate between various investment players. As discussed in the GPIF case study, DFI support helped establish a dialogue between interested institutional investors and bond-issuing entities.

In terms of funding, DFI support can kickstart a market and crowd in investors. Providing co-investment through blended finance or taking on riskier positions in the capital stack (as discussed in the H-REFF case study) can provide the impetus for other investors to follow suit. In addition, risk mitigation instruments, such as full or partial insurance policies or guarantees against risks surrounding currency, political or offtake issues, are often needed to garner capital market players' interest.

An example of this is the collaboration between the International Finance Corporation (IFC) and investment bank HSBC in creating a green bond fund, the Real Economy Green Investment Opportunity GEM Bond Fund (REGIO). Starting with anchor investments of \$75 million apiece in 2019, the fund has since attracted eight further investors. By 2021, it had raised a total of \$538 million.²²

Similarly, a collaboration between asset manager Amundi, IFC, the European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD) created the world's largest green bond fund in 2018, the "Amundi Planet – Emerging Green One". With a commitment of \$424.5 million, the fund managed to achieve a total investor commitment of \$1.4 billion.²³

Even on a smaller scale, supporting key market actors is crucial to prove new instruments and grow a market. Examples of this in recent years are the collaboration between IFC and South Africa's

²² IFC (2021) [HSBC, IFC "Real Economy" Green Bond Fund Raises \\$538M at Final Close for Climate Action](#)

²³ EBRD (2018) [EBRD, IFC and EIB commit US\\$ 425 million to fund for green bonds in emerging markets](#)

Standard Bank²⁴ or the arrangement between IFC and Colombia's Davivienda²⁵ to issue the respective continents' largest green bonds at the time. In subsequent years, both countries have begun issuing more green bonds.

5.3. Market leaders

Under increasing pressure to take into account risks of climate change and stranded assets, institutional investors are greening their long-term investment strategies. Along the way, they have recognized the need for common standards and greater knowledge exchange. Some of the largest institutional investors globally have proven most progressive in this regard so far. Often, they face greatest public and shareholder scrutiny and have the in-house capabilities to conduct extensive research. Their actions can send important signals to smaller, less well-resourced organizations.

To share knowledge, a variety of platforms have sprung up to facilitate dialogues and establish common standards. Based on guidelines such as the Task Force on Climate-related Financial Disclosures (TCFD) or the United Nation's Principles of Responsible Investment (PRI), networks have helped investors on their pathways toward investment sustainability. Some of the most prominent networks include the Institutional Investors Group on Climate Change (IIGCC), the Network for Greening the Financial System (NGFS), the One Planet Sovereign Wealth Fund Working Group or the Net-Zero Asset Owner Alliance.

This has spurred momentum for large capital markets players to take interest in buying or creating their own emerging markets' green investment instruments, such as Canada's pension fund Canada Pension Plan Investment Board (CPPIB), France's Caisse de Dépôts, Dutch pension funds ABP or PGGM or Denmark's pension fund AkademikerPension. This can range from private placement bond-buying to collaborating with asset managers to set up equity or debt funds aligned with SDGs. This provides an important templates for other, or smaller entities seeking to similarly adjust their investment strategies.

²⁴ IFC (2020) [IFC Invests \\$200 Million in Standard Bank of South Africa's Green Bond Issuance](#)

²⁵ IFC (2017) [Davivienda Issues COP\\$433 Billion in Green Bonds in Support of Projects Mitigating Climate Change, with IFC as Sole Investors](#)

Section 6. Further opportunities of intermediation in the clean power space

How, specifically, can financial intermediation be better applied in emerging markets to drive clean power investment and help countries meet their decarbonization goals? This section seeks to answer that question for five markets with very different current circumstances and ambitions for the next ten years. It lays out clean power financing roadmaps for three key emerging markets.

Table 21: Overview of 2030 clean power financing roadmap countries

Market	Power market fundamentals	Financial sector fundamentals	Primary 2030 challenge
India	●	●	Scaling clean capacity to 450GW to meet growing demand and a national goal
South Africa	●	●	Replacing an aging coal fleet with clean capacity in a constrained regulatory environment
Indonesia	●	●	Kickstarting a renewables market and addressing fossil overcapacity in a constrained regulatory environment
Morocco	●	●	Regaining momentum in order to achieve 52% of renewable installed capacity in a context of growing power demand
Brazil	●	●	Building on Brazil's success in clean energy in electrifying transport and finding the optimal role for biofuels in the country's energy transition.

Source: BloombergNEF. Note: green circle = fundamentals fully in place, yellow circle = fundamentals partially in place.

The roadmaps focus on energy transition priorities to 2030, highlighting where financial intermediation can help scale investment. In these countries as in many markets, intermediation activities are inextricably linked with and dependent on enabling environments. Priority areas include power market and financial sector fundamentals, which need to be addressed to unleash the full potential of intermediation.

Each roadmap offers a condensed overview of challenges and opportunities in the country's power and financial sectors.

6.1. India 2030 clean power financing roadmap

Table 22: India projected 2030 key indicators

Indicator	2030
GDP	\$5.5 trillion (4 th largest)
Population	1.5 billion (Largest)
Power consumption	2.2PWh (2 nd largest)

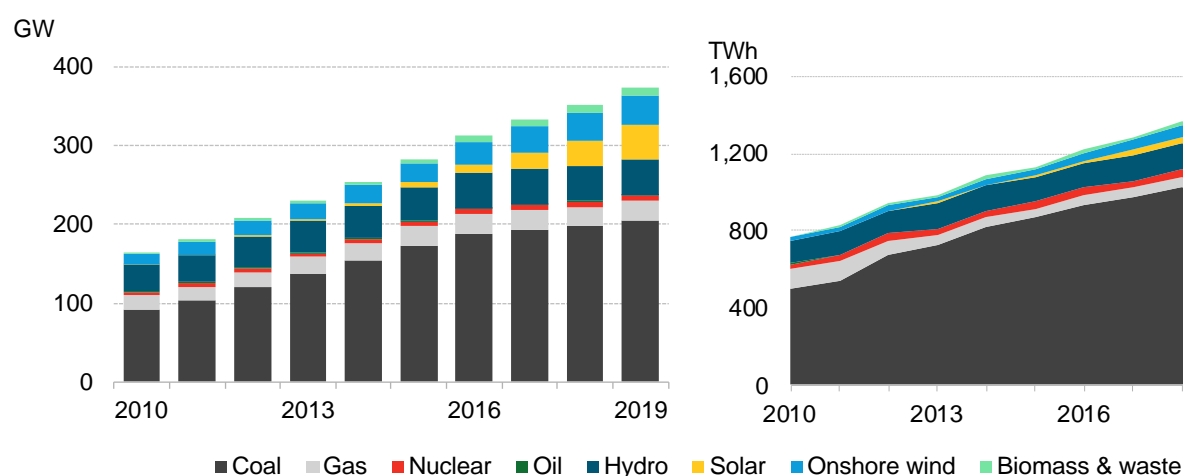
Source: BloombergNEF New Energy Outlook, IMF, OECD, World Bank. Note: Ranking is global.

Country context

India's 2030 renewables target of 450GW is second only to China's in ambition. The country's interim 175GW target by 2022 emphasizes the role of solar at 100GW(AC) and wind at 60GW with the balance to come from biomass and small hydro. In its NDC, India aims for 40% non-fossil fuel based installed capacity by 2030. Based on a least-cost outlook, BloombergNEF modelling indicates 373GW or 57% of non-fossil capacity could be installed by 2030, of which 159GW is solar and 126GW wind.²⁶

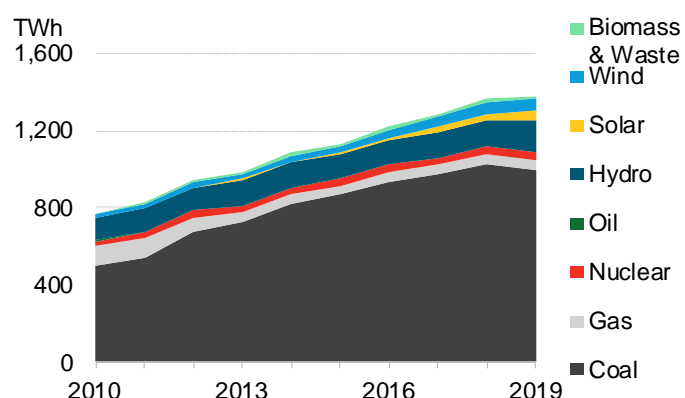
India had 100GW of renewables online in August 2021 and needs to add another 75GW by next year to meet its 2022 target. While currently not on track to achieve that objective, India has nonetheless made quick progress in advancing its energy transition. In 2019, 25% of capacity and 10% of generation were from renewable energy sources at 95GW and 134TWh, respectively (Figure 38, Figure 39).²⁷ This includes 44GW(DC) of solar and 28GW of wind. However, the largest source of power-generating capacity by far remains coal at 205GW, providing about 70% of total generation.

Figure 38: India installed capacity



Source: BloombergNEF, Central Electricity Authority.

Figure 39: India power generation



Source: BloombergNEF, Central Electricity Authority.

While India already hosts an advanced renewables market, further scale-up this decade will be needed to meet its ambitious targets.

²⁶ Based on BloombergNEF's Economic Transition Scenario (ETS) of the New Energy Outlook (NEO) 2020. The ETS is NEO's core economics-led scenario that employs a combination of near-term market analysis, least-cost modeling, consumer uptake and trend-based analysis to describe the deployment and diffusion of commercially available technologies. Over the long-term it removes policy drivers to uncover the underlying economic fundamentals of the energy transition. As such, this scenario does not bake in climate targets, nor does it mandate aspirational national energy policies.

²⁷ This excludes large hydro.

Energy sector overview

India has many of the market fundamentals in place to help it meet its 2030 target. It has a largely unbundled power market open to private participation, although the retail segment is yet to be fully opened. The market boasts a variety of sound clean power supports, including its auctions program, the world's largest in 2020. Bids submitted under the auctions have continuously declined, making it one of the most competitive schemes worldwide. This has been key to attracting investment: After China, India secured the highest clean power investment across emerging markets 2011-2020, at \$89 billion. Much of this investment came from domestic investors at 77% between 2010 and 2019.

There are however bottlenecks to the development of utility and small-scale renewables capacity. One of the biggest concerns is the poor financial health of India's power distribution companies. Most state-owned discoms are financially stressed as they do not have cost reflective retail tariffs. As a result of under-recoveries, the discoms defer payments to IPPs, creating a series of delays throughout the value chain. A few discoms have also attempted to renegotiate signed PPAs or curtail power offtake to lower their costs. This dents investor confidence because of the threat to their project returns.

In addition, issues related to integrating large volumes of intermittent renewables into the grid are proving challenging, as the grid currently lacks strength, flexibility, digitalization, and demand-side response measures. Project development bottlenecks include lengthy, bureaucratic land acquisition processes. For small-scale assets, subsidized retail tariffs and state-level regulatory issues have hindered residential solar market take off.

Table 23: India power sector opportunities and challenges

Opportunities

Highly ambitious clean power policies

India has very ambitious 2022 and 2030 renewables targets, with plenty of sound clean power policies and incentives to leverage, in particular its auctions scheme.

Ample experience in clean power investment and procurement

Due to the government's push for renewables via a variety of strong clean power incentives, domestic and international investors are generally comfortable with the risks utility-scale solar and wind projects pose.

Strong economic trajectory

The expected growth of the economy and population will create additional demand for power for years to come.

Open to foreign investment

The Indian market is fully open to foreign investment in renewables. In turn, larger IPPs seeking more favorable financing rates can access international markets to refinance capital borrowed on the Indian market at higher rates.

Challenges

Current and forecast installed fossil capacity

India is one of world's largest coal markets, with a large and relatively young coal fleet and more additions to come. The current make-up of coal PPAs supports their economic viability through a fixed price component independent of actual output.

Financial woes of distribution companies

The frail financial health of state-owned distribution companies impacts offtake risk and adds liabilities to state government balance sheets. Tariffs of agricultural and residential users are cross-subsidized with higher tariffs for commercial and industrial users. While the government subsidizes the distribution companies, delays in payments cause significant financial distress, further exacerbated during Covid-19.

Grid strength

While some programs are underway, there is a large investment need for transmission build-out, storage and system flexibility to accommodate large volumes of renewables.

Federal and state-level differences in power sector regulation

Challenges exist on the streamlining of rules across the federal and state governments, with different treatment of residential solar among states.

Source: BloombergNEF.

Brief financial sector overview

India has seen participation from players along all segments of investment value chain and from domestic investors as well as those abroad. The domestic market is generally able to provide most of the capital required. Major renewables project lenders have emerged over the past decade, including domestic commercial and public banks and NBFCs. The Indian market is generally open to foreign investment, with the largest foreign clean power investors to date being investment banks, private equity entities, developers and utilities.

Debt instruments are generally offered by domestic commercial and public banks, yet the availability of non-recourse loans is still often dependent on a letter of credit. As the Indian corporate bond market is fairly shallow, it is not used as primary means of capital, but rather to refinance existing debt. Due to the lack of depth of the bond market, green rupee-denominated bonds are therefore more commonly offered via private placements, i.e. to investors with which the issuer has already established a rapport. Equity funding comes from a diverse range of domestic and international investors, such as family conglomerates, developers, institutional investors or private equity and venture capital funds.

For larger, more established IPPs, it can be attractive to tap U.S. dollar markets to access lower interest rates. This can prove valuable in recycling capital on a company's balance sheet, but entails hedging risks and is therefore not yet a widely available option to many players on the market. In addition, India's low investment-grade sovereign rating is a further hindrance to issuing dollar-denominated green bonds.

Table 24: India's renewables financing opportunities and challenges

Opportunities	Challenges
Large investment needs for new clean power capacity Given India's growing economy and population, future power demand will need to be met. Together with the government's extremely ambitious push for clean power, this offers large investment opportunities.	Shallow bond market India's bond market is not (yet) deep enough to make large-scale use of (green) bonds as means of primary financing for IPPs.
Cut-price renewables financing costs India's renewables, PV in particular, offer extremely favorable financing rates, which render investment in new capacity attractive.	Decommissioning only financially feasible for old assets India's coal fleet is relatively young, so there is little financial incentive to finance their premature retirement.
Financial sector maturity The market has significant experience in financing renewables, yet non-recourse loans are still missing. Moreover, the general bond market is shallow.	Hedging risk hinders widespread access to international capital While the Indian market is liquid for renewables financing, limited access to international markets equals a missed opportunity in accessing larger capital volumes.
Expanded use of sustainable debt There is potential to explore further sustainable finance instruments, such as green bonds or InvITs or green hedging models in order to better access international capital.	Lack of wide-spread financing options for small-scale solar As regulations differ by state, the offer for small-scale financing can be limited for residential and small corporate customers in particular due to small ticket sizes, high administrative costs and lack of familiarity with the technology.

Source: BloombergNEF.

2030 priority areas and options for intermediation

The roaring success of Indian renewables is testament to what can be achieved when all the necessary market fundamentals are in place to attract investment. To achieve 2030 goals, however, greater financial intermediation should be a priority to increase liquidity, allow well-

established technologies to scale and to promote expanded use of other technologies. Intermediation can be also considered as a possible means for retiring the oldest, least profitable fossil assets.

Five priority areas for intermediation in India are discussed below. Some include considerations on enabling environment activities where relevant, including action areas for DFIs in terms of investment and advisory services.

Priority area: Meeting growing power demand through clean capacity

Challenge: India must scale utility-scale clean power capacity to meet its ambitious 2030 renewables goal and keep pace with rapidly growing overall electricity demand.

Potential for financial intermediation

Key power sector players poised to leverage more capital flows from intermediaries are state-owned utilities, IPPs and, to some extent, larger industrials. These will likely deploy mature and proven renewables technologies, in particular solar PV. Technologies such as storage will also be important to accommodate the increasing share of intermittent renewables.

Equity injections and loans from domestic intermediaries will continue to prove the basis for expanding utilities', IPPs' and industrials' capital base. However, to access fresh liquidity via further intermediaries, the role of capital recycling and other forms of accessing further investors must be considered. To reduce cost and access more working capital, existing debt can be refinanced on the domestic market via public or private placement (green) bonds. Due to the limited depth of the Indian bond market, however, debt funds such as InvITs can also be considered as a means for debt refinancing. If hedging risks can be addressed sufficiently going forward, these capital markets instruments could also open up channels to international institutional investors.

Role of DFIs

- As the domestic and international intermediaries are familiar with renewables, there is likely no DFI support needed to access traditional means of capital for most players in the utility-scale clean power market. That said, DFIs can assist smaller to mid-size utilities and IPPs in their first bond issuance or in structuring an InvIT.
- Given the fairly shallow Indian bond market, DFI support could be useful in facilitating private placements or bond-issuing/-purchasing programs with institutional investors. In terms of accessing international capital markets, further options could include supporting the issuance of masala bonds or looking into green hedging instruments.
- To further support the energy transition, DFI funds would be very valuable in helping to bring down the cost of utility-scale storage. Thinking beyond the period to 2030, it would also be useful to explore de-risking of unproven and costly technologies in the Indian market such as offshore wind and green hydrogen.
- In terms of the country's enabling environment, technical assistance can be valuable in designing sound policy incentives to incentivize the build-out of storage, such as energy storage mandates or subsidies. A further idea could be to mandate the inclusion of storage in federal and state-level auctions.
- Technical assistance regarding the streamlining of state-level auction frameworks and discom business models can help clarify regulatory uncertainty and reduce offtake risk.

Priority area: Strengthening discoms' financial health

Challenge: The unsustainable business model of discoms needs to be addressed to improve their financial health and safeguard reliable offtake payments for the utility- and small-scale markets to grow.

Potential for financial intermediation

Poorly enforced metering and bill collection as well as the current cross-subsidization model are impeding discoms' revenue streams and increasing offtake risk. While C&I users have an incentive to install self-generation due to compensating for subsidized retail tariffs, their revenue defection exacerbates the discoms' financial situation. In addition, the split into fixed and variable components of thermal PPAs forces discoms to pay fixed costs to coal plants, even if their output is not used.

While addressing this challenge has more to do with adjusting enabling environment aspects, financial intermediation through domestic banks and NBFCs can be a useful next step in deploying funding to discoms, for instance through providing loans to roll out smart meters to improve cost recovery. Once proven, loan aggregation instruments could also be considered to tap a wider range of investors.

Role of DFIs

- In terms of enabling environment, technical assistance can help to create a sustainable business model for discoms without relying on cross-subsidization.
- Once the underlying discom business model has been addressed, DFI support could be useful to draw investment into novel sectors such as digitalization measures through a suitable financial mechanism.

Priority area: Enhancing the grid to better accommodate variable resources

Challenge: To accommodate the large volumes of renewable capacity under the government's 450GW by 2030 target, grid integration must improve. This should include investment into regional intra- and inter-state transmission capacity ("green corridors") and interconnectors in particular, but also into distribution networks.

Potential for financial intermediation

Domestic intermediaries in particular will be key to deploying and raising funds for transmission and distribution investment. Transmission and distribution companies will need to invest into power lines and substations, utility- and small-scale storage, flexibility, digitalization such as sensors or automation and demand-side response measures. Aside traditional methods of funding such as loans, a diversified pool of operational projects, such as of IndiGrid's transmission InvIT, should be considered to tap further intermediaries that desire stable long-term returns.

Role of DFIs

- DFIs can help domestic intermediaries gain familiarity with more novel forms of network upgrades, such as digitalization, flexibility and demand-side response measures through blended DFI funding. In addition, help to aggregate such loans into packages like InvITs could help to access a wider range of investors.
- To further support the energy transition, capital from DFIs would be very valuable in helping to bring down the cost of utility-scale storage.

- In terms of enabling environment, capacity building and knowledge sharing can be key in supporting discoms in the implementation of flexibility and storage measures. In addition, support for policy development can be useful in terms of designing regulations on flexibility and balancing requirements.

Priority area: Scaling up the self-generation and small-scale market

Challenge: The market for smaller commercial and residential customers is currently underserved due to lack of sufficient collateral, low ticket sizes, differing state regulations and high administrative costs for small systems. There is also little incentive for residential users benefiting from subsidized tariffs to switch to self-generation.

Potential for financial intermediation

As the subsidized business model of the residential sector hampers profitability, the sector is currently not of interest to many intermediaries. While domestic banks or NBFCs can deploy loans, credit lines or leases to install rooftop solar, even in combination with small-scale storage, this entails risks. Community-ownership models could help diversify risk and abate the challenge of scale and relative costs, yet would not address the underlying problem of non-cost reflective tariffs. Once enabling environment issues are addressed, opportunities could open for aggregation of small-scale projects, such as rooftop ABS, assuming the lack of credit ratings for households can be accounted for.

Role of DFIs

- While DFI funding could be blended with loans, credit lines or leases of domestic banks or NBFCs, this does not address the underlying fundamentals hampering the small-scale market.
- DFI support should therefore mainly focus on enabling environment activities, such as supporting an overhaul of the current tariff structure and discom business model. In addition, clear and stable regulations need to be streamlined in federal and state legislation for net metering and grid charges. Once these market fundamentals are addressed, investor appetite should grow.

Priority area: Enabling a 'just transition' away from coal

Challenge: In the context of decarbonizing India's power sector, a clear government commitment to phase out coal is needed to support its path to 2030. In combination with concerns surrounding local pollution, it is likely most feasible to retire the oldest and most emissions-intensive plants first. In October 2020, the power minister R.K. Singh restated the government's plan to retire coal plants in order to achieve renewable power targets.

Potential for financial intermediation

Intermediaries with ESG mandates have the potential to raise funds to accelerate coal's phase-out. Utilities and IPPs require suitable financing mechanisms to retire coal assets and, ideally, provide funding for new renewables projects and impacted communities. This could include green bonds at the project or corporate level or bonds raised off a securitized project portfolio. Given the novelty and relative shallowness of the Indian bond market, these types of bonds are most likely to be successful through DFI capital resources and specifically designed bond-issuing/-purchasing collaborations.

Role of DFIs

- DFI support will be crucial to proving the model of coal retirement finance and support in its design, implementation and financing. This can involve help to suitably structure a securitized instrument or bond and step in at a first-loss position with DFI funding. In addition, assistance in pairing such bond issuance with a suitable investor could help accelerate market familiarity. Further innovative financing mechanisms provided purely by DFIs such as decarbonization loans can prove valuable in growing the market.
- Due to socioeconomic and political challenges, DFI support in a just transition from coal should include both technical assistance as well as investments that create alternative economic opportunities for those directly impacted by the transition. The coal transition is a challenge that requires a clear decarbonization commitment at the highest political level and collaboration between a variety of stakeholders, from mine operators holding long-term coal offtake contracts with power plants to discoms and state governments.
- In terms of enabling environment, revisiting the structure of PPAs associated with thermal plants can also benefit from technical assistance. The current split into fixed and variable charges disproportionately benefits coal plant operators, hurts discoms and poses curtailment risk to renewables in times of low power demand and high renewables output.

6.2. South Africa 2030 clean power financing roadmap

Country context

Table 25: South Africa projected 2030 key indicators

Indicator	2030
GDP	\$456 billion (41 st largest)
Population	66 million (25 th largest)
Power consumption	252TWh (22 nd largest)

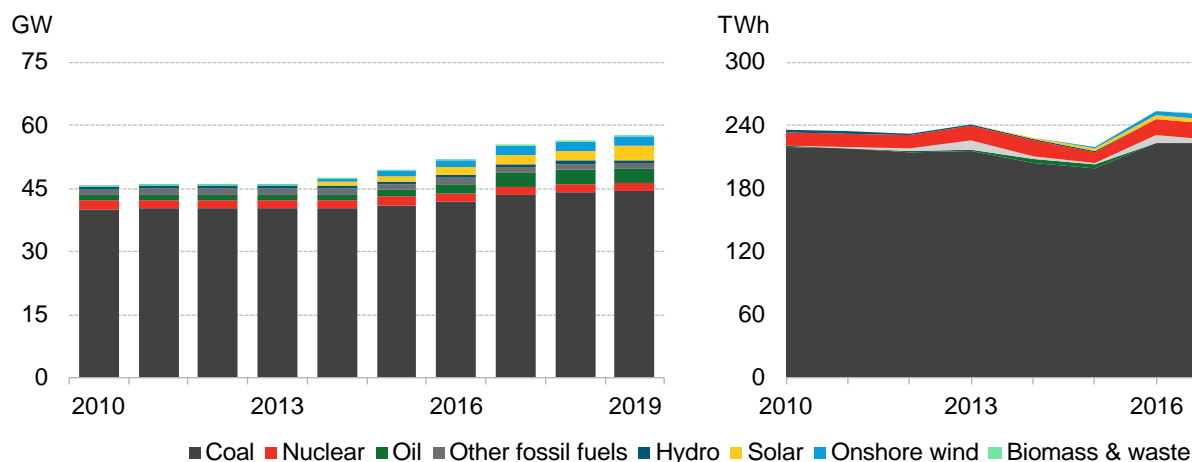
Source: BloombergNEF New Energy Outlook, IMF, OECD, World Bank. Note: Ranking is global.

Under the Integrated Resource Plan 2019 (IRP), South Africa's Department of Mineral Resources and Energy will allow for the procurement of 14.4GW of wind and 6GW of PV cumulative new capacity installed by 2030, generating an estimated annual 61TWh. At the time of its approval (in October 2019), the IRP was the first electricity masterplan in Southern Africa to promote onshore wind and PV as the least-cost technologies.

These thresholds are far from current levels: In 2019, 3GW of PV and 2.2GW of wind were installed, generating 11.5TWh (Figure 40, Figure 41). Cumulatively, renewable technologies represented 10% of installed capacity in 2019.²⁸ The power mix is dominated by coal generated by an aging fleet, accounting for 44.4GW and 193TWh.

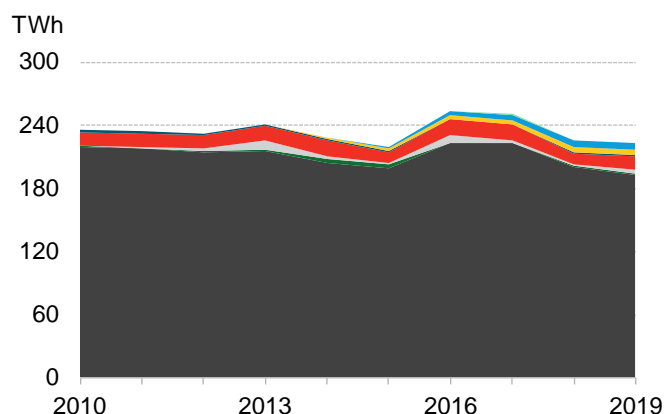
²⁸ Excludes large hydro.

Figure 40: South Africa installed capacity



Source: BloombergNEF.

Figure 41: South Africa power generation



Source: BloombergNEF.

South Africa therefore needs to accelerate its renewable energy capacity development to meet its 2030 targets. This will represent a considerable challenge as the country also plans to decommission 10GW of old coal plants during the same period according to the IRP.

Brief energy sector overview

The South African power sector is characterized by vertically integrated state utility Eskom's single-buyer model, with plans to unbundle it into three entities by the end of 2022. Power generation is open to private participation and distribution is managed by Eskom (40% of distribution grids) and municipal distribution companies. The country has a 83% energy access rate, with an urban poor fringe of the population without legal access to the grid.

The Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) initially delivered steady growth of the installed renewables capacity. Four auctions rounds held between 2011 and 2015 led to more than 5GW of new renewables build with 20-year PPAs, and were responsible for much of the \$21 billion invested into clean power in the country between 2011 and 2020. This attracted many domestic investors, with national entities responsible for 68% of total clean power investment between 2010 and 2019. However, the three-year delay to signing PPAs from REIPPPP rounds 3.5 and 4, alongside a lack of new auction rounds between 2015 and 2021, has severely limited the options for developers to build new projects.

Due to severe load shedding issues and a structural power supply gap, the DMRE announced at the end of 2020 an emergency auction to procure 2GW of dispatchable capacity, called the Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP). Bidders awarded from this program offered solutions comprising thermal, hybrid and renewables- plus-storage technologies.

As part of implementing the IRP, a fifth round of REIPPPP – for 1,000MW wind and 1,600MW PV – was launched in March 2021, and 102 bids were received in August 16, 2021. REIPPPP round 6 (also for 2,600 MW) and the first round of battery storage public auction in South Africa (513 MW of energy storage capacity) are scheduled for the end of 2021, according to DMRE's latest update on 24 August 24, 2021.

Much of the success of South Africa's energy transition depends on Eskom's ability to manage its Just Transition program, despite ongoing operational and financial difficulties. A combination of factors have caused Eskom's financial woes, ranging from poor plant maintenance, uneconomical coal supply cost and investment cost overruns on its balance sheet²⁹, to emergency buying of power from thermal peaker plants. Following the introduction of more stringent Minimum Emission Standards in April 2020, Eskom additionally faces a further risk of emissions penalties, and compliance cost estimates could exceed 300 billion rand (\$20 billion)³⁰. That compares to Eskom's 400 billion rand of total debt in 2021. A contraction of power demand and electricity sales caused by the Covid-19 pandemic has further exacerbated the utility's financial situation.

Table 26: South Africa's power sector opportunities and challenges

Opportunities	Challenges
Experience in clean power procurement The country has good experience in procuring new capacity through auctions and can leverage this during future rounds.	Policy instability South Africa has a history of policy instability, such as delays to signing PPAs and retroactive renegotiation of tariffs, which deters and increases the cost of investment.
Emergency power needs South Africa's electricity supply shortfall and frequent, severe load shedding create an urgent need for new-build generation assets.	Eskom financial health/subsidized power tariffs Retail tariffs are set by the regulator and do not allow cost-reflective retail. Aside from being a deterrent to IPPs, this also lowers the incentive for self-generation/net metering by detracting revenue. On-site generation projects <1MW generally fare well, but the negotiation of wheeling agreements with Eskom can be problematic. This should improve under the newly loosened self-generation rules.
Aging fleet needs replacement Many coal assets are over 40 years old and face high costs to meet power plant emissions standards. These will need to be substituted.	Untransparent regulatory environment Licensing and permitting processes lack transparency, thereby stalling progress for generation license approvals for IPPs.
Loosened rules for C&I To abate the electricity shortfall issue, rules for C&I self-generation have been eased. This offers great potential for large industrials (such as mining houses), corporates or bankable municipalities.	Grid issues Investment is needed to improve the grid and prepare it for variable resources. In addition, most renewables are currently located in Northern Cape, far from transmission lines.

Source: BloombergNEF.

Brief financial sector overview

The South African financial sector is fairly deep and mature, with all major actors of the investment chain involved and vested to varying degrees in energy transition investment. While the most active domestic financial participants in clean power financing are banks and corporations, asset owners such as pension funds or insurance companies are also active. Ample investment opportunities exist in rand, so there is little need to borrow hard currency and incur exchange rate risk. The largest foreign investors to date in South Africa are project developers and utilities such as Enel due to participation in the REIPPP.

The South African market offers a variety of debt products, with loans easily available. There is easy access to domestic and international bond markets, with green bonds already a feature of the market. The South African market also has good liquidity in terms of equity investors, ranging

²⁹ This includes cost overruns of building the new coal power plants Medupi and Kusile.

³⁰ Bloomberg (2021) [Eskom, Sasol Face Government Demand to Meet Emission Limits](#)

from private sector entities to DFIs. Many domestic institutional investors have impact investment funds in clean power.

Despite this vibrant local market for renewables investors, the main setback hindering investment is the regulatory context.

Table 27: South Africa renewables financing opportunities and challenges

Opportunities	Challenges
Strength of local and international financial sector <p>The South African financial ecosystem is well placed to (re-)finance greenfield and brownfield renewables projects through a variety of entities and instruments. In addition, access to international markets opens up further avenues to finance.</p>	Eskom's financial health <p>Eskom's financial woes negatively impact the power sector and government finances. In addition to incurring losses, aging coal assets which urgently need upgrades or decommissioning are liabilities on the government's balance sheet, yet Eskom is virtually unbankable.</p>
Advanced sustainable finance regulation <p>Dependent on a clear project pipeline and regulatory outlook, the South African market can leverage its bond markets and advanced sustainable debt regulation to (re-)finance renewables projects. This offers investors the possibility to invest in suitable assets that fulfil their ESG mandates.</p>	Deteriorating credit rating <p>The financial ills of Eskom, in addition to weak GDP growth and the impact of the Covid-19 pandemic, are increasing the liabilities of the South African government. This is hurting the government's credit rating, which makes accessing capital more challenging.</p>
Leverage C&I/municipalities' financial health <p>The relaxation of rules for C&I self-generation under the emergency power situation creates investment opportunities for public and private sector entities wishing to stabilize their power supply. This will interest bankable municipalities, well-capitalized mines and large industrials.</p>	Risk perception <p>Despite having good access to capital, country, political and currency risks can all deter some investors looking at South Africa.</p>

Source: BloombergNEF.

2030 priority areas and options for intermediation

Despite being a mature renewables market in terms of procurement experience and financing capacity, the major stumbling block to South Africa's energy transition lies in its policy instability, regulatory tightness and political risk. When enforced properly, its clean power incentives such as auctions have allowed the market to flourish in the past decade, yet retroactive changes and cancelations have damaged investor confidence. All necessary entities are in place to provide the funds needed to 2030, yet are very much dependent on a sound enabling environment governing the power sector and a foreseeable project pipeline.

Priority areas for financial intermediation in South Africa therefore depend on the success of changes to the enabling environment, which is currently the main obstacle to bringing investment to the market. Within these constraints, however, financial intermediaries can partake in the financing of new utility-scale assets under the new REIPPP window and in small-scale projects for C&I clients and bankable municipalities under the newly loosened rules in the context of the emergency power situation.

The following five 2030 priority areas combine intermediation and enabling environment activities, including action areas for DFIs in terms of investment and advisory services.

Priority area: Improving Eskom's financial health and supporting its green transition

Challenge: Improving the financial health of Eskom to not only ensure reliable offtake, but also reduce the burden on the government budget is key to the success of South Africa's energy

transition and overall economic situation, particularly in the context of the Covid-19 pandemic. This is inextricably linked with phasing out aging coal assets.

Potential for financial intermediation

Domestic and international financial intermediaries will have a limited role and interest to play in this priority area until there is a clear commitment to resolving Eskom's unbankability. Once Eskom's underlying financial situation has been resolved, intermediation could prove interesting to raise funds to pay down coal debt and re-invest in renewables, fund upgrades to the transmission and distribution networks and grid strengthening measures to reduce technical and financial losses and inefficiencies. Once bankability has been improved, instruments like a securitized coal portfolio or transition bonds can therefore be considered. Investors will, however, likely require assurance through risk mitigation instruments from DFIs.

Role of DFIs

- Technical assistance will be necessary across a range of issues to help Eskom improve its financial situation. Support in restructuring its significant outstanding debt is vital to stabilize the utility's overall financial health. This will also include revisiting rules surrounding power procurement and electricity tariffs to ensure a more cost-reflective and sustainable business model.
- Capacity building and knowledge sharing will also be required in supporting Eskom on its mission to unbundle by 2022.
- Once the underlying debt issue has been addressed and a clear political commitment to decarbonization has been made, suitable financial instruments such as (securitized) green bonds can be investigated, as Eskom will otherwise be unable to borrow.

Priority area: Addressing emergency power needs

Challenge: To end South Africa's power sector emergency, its supply shortfall, load shedding issues and grid strength must be addressed. While the emergency bidding program RMIPPPP will supply additional generation capacity in the short-term, regulatory changes are required to allow for mid- to long-term investment opportunities for new capacity including via the successful delivery of the REIPPP program.

Potential for financial intermediation

While the winners of the RMIPPPP have likely already secured financing due to the tight program timeframe, domestic financial intermediaries can be involved in deploying funds to C&I or municipal projects, for which rules have now been eased under the emergency power situation. The market can likely supply all financial instruments needed to proven renewables technologies and storage.

Role of DFIs

- While IPPs taking part in the RMIPPPP will likely be able to access the necessary financing, DFI support is more needed to address enabling environment issues in the context of building new utility- and small-scale capacity.
- Technical assistance will be key to allow for a long-term solution of South Africa's power supply challenges through opening a clear and reliable procurement pipeline and enforcing policy stability. The successful implementation of the recently announced RMIPPPP and the fifth bid window of the REIPPP will be vital to restore investor confidence in the market.

- In addition, technical assistance will be necessary to support the South African power sector transition as a whole. This will include revisiting regulations surrounding Eskom's unbundling, procurement pipelines and licensing procedures to open up the market.
- Thinking beyond the period of 2030, DFI funding could explore helping to decrease the cost of green hydrogen, which could have ample use in the context of South Africa's power, industrial and electrified mobility sectors.

Priority area: Strengthening the grid

Challenge: In light of the emergency power situation and the need to prepare the grid for a greater share of intermittent renewables by 2030, investment in flexibility and grid integration is needed.

Potential for financial intermediation

South Africa currently lacks the investment incentives required to deliver a resilient and flexible grid. Upgrades to both the transmission and distribution network are necessary, and investment in digitalization (e.g. sensors, automation), demand-side response measures and storage should be prioritized. Intermediaries will require a more bankable Eskom to deploy or raise funds for large-scale transmission and distribution investments, likely even after the utility's legal unbundling in late 2022. On a smaller scale, however, domestic intermediaries can support new small-scale projects including storage of C&I or municipalities by deploying funds in the forms of loans.

Role of DFIs

- DFI support will be needed to address Eskom's financial situation before investment in transmission, distribution and grid strengthening measures can be undertaken on a large scale. However, support for policy development can also be useful in terms of revisiting flexibility and balancing requirements as well as placing a greater focus on utility-scale storage requirements in tenders.
- On a smaller scale, DFI capital resources can help to further lower the cost and "prove" storage on the market for new C&I and municipal projects.

Priority area: Scaling up decentralized energy and self-generation

Challenge: Power outages are greatly affecting C&I users and municipalities. The loosened rules under the current emergency power situation allow municipalities to develop or procure their own power and have increased the threshold for C&I self-generation projects. This should help to activate the market by spurring self-generation uptake.

Potential for financial intermediation

Domestic intermediaries are well placed to deploy funds to solvent entities to finance self-generation projects, with all traditional forms of financing available for proven renewable energy technologies. For projects with similar profiles, securitization of assets could be of particular interest for bankable municipalities with multiple community-owned assets.

Role of DFIs

- While bankable C&I and municipal users will already be able to access the necessary financing, DFI funding can be helpful for smaller customers, such as SMEs or residential users. Blending DFI capital with that of domestic commercial banks or leasing companies

has the potential to grow the small-scale market and build expertise. DFI funds can also help to further lower the cost of small-scale storage.

- While temporarily loosened under the emergency power situation, technical assistance can help ensure long-term regulatory changes that allow for consistent and enforceable rules for self-generation projects of C&I and municipalities. This includes reviewing capacity thresholds, licensing procedures and wheeling agreements.

Priority area: enabling a just transition away from coal

Challenge: One of the key challenges to decarbonizing South Africa's power sector is to replace its coal fleet with new, clean resources, also due to the age of large segments of the coal fleet and pending emissions fines.

Potential for financial intermediation

As decommissioning coal assets is inextricably linked with Eskom's financial health, financial intermediaries will have a limited role to play prior to the resolution of issues pertaining to enabling environment. If provided with satisfactory investment conditions, intermediaries could help to provide the necessary financing mechanisms to support the retirement of coal assets and substitute these with least-cost renewables and storage. However, the prerequisite for any type of financial involvement would necessitate a credible government program to tackle Eskom's debt, as investors will otherwise be unwilling to purchase instruments such as transition bonds.

Role of DFIs

- DFIs will need to be the primary actors involved in South Africa's coal transition before further financial intermediaries can be drawn in. Given the dual challenge of improving Eskom's financial health and decommissioning coal assets, technical assistance will be necessary to restructure Eskom's debt and design a more sustainable business model before further steps can be considered.
- The coal transition is a challenge that requires a clear decarbonization commitment from the highest political level and collaboration across the value chain, from mine operators holding long-term coal offtake contracts with Eskom to mining sector employees. Technical assistance needs to support these dialogues and processes, such as the renegotiation of fuel supply contracts.
- Once Eskom's underlying bankability issues have been sufficiently addressed, DFI support will be necessary in drawing up the suitable financial mechanisms to decommission coal assets such as transition bonds, securitization of coal assets or decarbonization loans. Securitization models in particular could prove a valuable mechanism to simultaneously raise finance for new clean power projects and use savings to support impacted communities, such as for job training programs. Any debt issuances would likely also require guidance through pre-identifying suitable investors.

6.3. Indonesia 2030 clean power financing roadmap

Country context

Under Indonesia's 2019 National Electricity Supply Plan (RUPTL), the country aims to achieve 23% of new and renewable capacity by 2025.³¹ The plan emphasizes the role of large hydro, geothermal and biomass, planning for merely 990MW of PV and 1GW of wind of cumulative capacity by 2025. It does not include targets for 2030. Based on a least-cost outlook ,

BloombergNEF assumes 29GW of renewables could be installed by 2025, and 52GW by 2030. This includes 7.9GW of PV and 681MW of wind by 2025, and 27.3GW of PV and 1.2GW of wind by 2030.

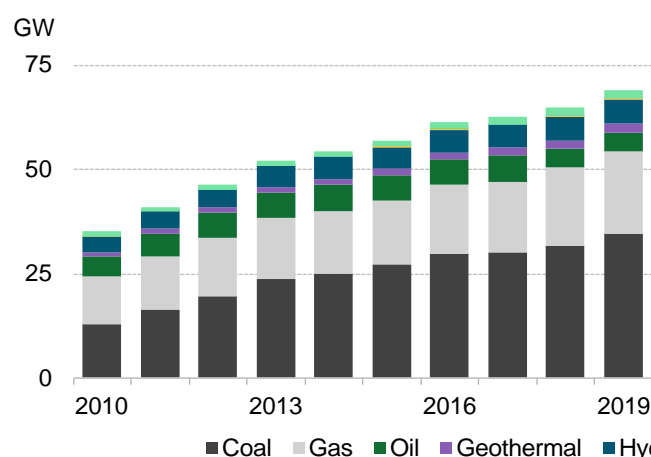
Indonesia still has a way to go to approach these targets: In 2019, only 7% of capacity and 10% of generation were from renewable energy at 4.7GW and 27.6GWh respectively (Figure 42, Figure 43).³² The largest sources of power-generating capacity by far are coal and gas at 34.6GW and 19.8GW. Given the country's current thermal capacity oversupply, the main challenge to meeting its 2030 least-cost potential involves scaling up utility- and small-scale renewables to successively green and replace its fleet.

Table 28: Indonesia 2030 projected key indicators outlook

Indicator	2030
GDP	\$2.1 trillion (11 th largest)
Population	299 million (4 th largest)
Power consumption	367TWh (12 th largest)

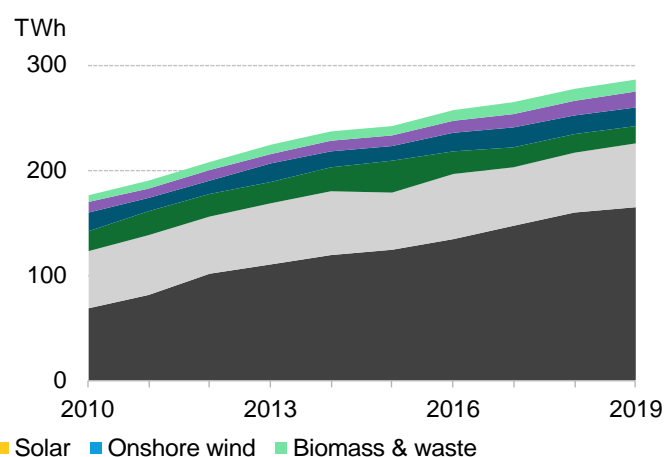
Source: BloombergNEF New Energy Outlook, IMF, OECD, World Bank. Note: Ranking is global.

Figure 42: Indonesia installed capacity



Source: BloombergNEF.

Figure 43: Indonesia power generation



Source: BloombergNEF.

Brief power sector overview

The Indonesian power market is built around state-owned monopoly Perusahaan Listrik Negara (PLN), with only generation open to private participation. There are few clean power incentives in

³¹ This target, however, counts technologies such as oil, coal, nuclear and gas as renewable.

³² Excludes large hydro.

place, the most notable being a capped renewable energy purchase price, which is pegged to the average regional and national generation cost (BPP), and net metering for rooftop solar, receiving 65% of the retail tariff.

Indonesia has been unable to secure a steady pipeline of renewables investment, experiencing large annual fluctuations related to individual deals. The vast majority of renewables investment in the past decade has targeted geothermal, at \$4.9 billion between 2011 and 2020, amounting to 70% of the decade's total. Much of this was supplied by international investors, with foreign investment into clean power accounting for 47% of total investment between 2010 and 2019.

Indonesia's energy transition has largely stalled recently, both for utility- and small-scale assets. With irregular tenders, the market lacks a foreseeable project pipeline, with invitations for IPPs to pre-qualify only issued periodically. When held, tenders can also lack transparency, with the results often unpublished. Much of renewables investment and project development is currently on hold, awaiting a key regulation expected in late 2021. In terms of small-scale projects, subsidized retail tariffs have done little to spur uptake, with regulatory processes posing further barriers to project development.

Table 29: Indonesia power sector opportunities and challenges

Opportunities	Challenges
Rural electrification and archipelago supply <p>Around 1% of the Indonesian population lacks access to power, and reliability of supply is often lacking. Given the geographical make-up of the country, diesel generating sets are still a widespread means of power generation. Both the hybridization of diesel plants and the archipelago nature of Indonesia offer potential for decentralized power.</p>	Single-buyer market lacking project pipeline <p>The market is at overcapacity while the pipeline of clean energy projects potentially to signs PPAs with PLN is weak. Non-transparent processes for the limited tenders which are floated incentivize few new market entrants.</p>
Positive economic trajectory and ensuing power demand <p>Indonesia is a fast-growing economy, with the growth in population and urbanization increasing power demand. Yet there is oversupply of installed capacity, particularly in load areas, so growth alone will do little to incentivize renewables new-build.</p>	No clear policy support for major renewables technologies <p>Until recently, there has been little policy support for established renewables technologies such as PV and onshore wind, with policy instability regarding the introduction and subsequent removal of a feed-in tariff. The government considers fossil fuels within its energy transition targets and prioritizes cheap, domestic coal. Despite low utilization rates, PPAs with thermal plants also include a fixed capacity payment, which supports their economic viability.</p>
First examples of utility-scale renewables <p>The market is seeing its first examples of utility-scale renewables from IPPs such as Vena or AC Energy. While these were supported by a now-cancelled feed-in tariff, further opportunities such as floating solar are also being explored by international developers such as Masdar, which announced a 145MW plant in late 2020. It seems likely the Energy Ministry will provide support for the establishment of solar parks, facilitating current issues such as land acquisition or grid access.</p>	Non-cost-reflective power tariffs <p>Indonesian power prices are highly subsidized and set by the Energy Ministry. Tariffs well below cost recovery do not incentivize the build-out of self-generation facilities.</p>
First examples of C&I onsite generation <p>Large international corporations have been key drivers in the Indonesian C&I market. Companies such as Nike, Danone or Coca-Cola are piloting renewables-based self-generation projects, which can serve as templates for further such projects.</p>	Intransparent regulatory environment for new projects <p>Much of the Indonesian power market is highly regulated, yet regulations can also be non-transparent and poorly enforced. Permitting and licensing procedures for new projects can be slow. Moreover, the lack of a sufficient local supply chain makes complying with stringent local content rules arduous.</p>

Source: BloombergNEF.

Brief financial sector overview

Indonesia's financial sector is not extensive and has made limited investments in the energy transition to date. There is currently a lack of a deep local market for renewables investors, with the major active entities so far being banks such as Bank Negara Indonesia or corporations such as Medco Daya or Pertamina. While liquidity is theoretically available, investors lack appetite for renewables projects, hampered by the current regulatory framework and lack of meaningful policy incentives. The reach of the only available DFI, Sarana Multi Infrastruktur (PT SMI), is not strong enough to crowd-in investment.

The main debt instrument available in the Indonesian market is loans. However, these are not tailored to renewable project needs and are characterized by high interest rates and short tenors. Long-term debt or non-recourse loans are rare, and only available for projects with credible regional or international sponsors. While in its early stages, there is activity in bond markets for larger IPPs, such as Star Energy. There is a relative lack of different domestic entities offering equity, with low appetite for renewables projects.

Table 30: Indonesia's renewables financing opportunities and challenges

Opportunities	Challenges
Replacement of fossil assets with renewables capacity <p>Given Indonesia's large installed coal capacity, energy transition investment can focus on greening the fleet. This can, for example, leverage the government's priority area of scaling geothermal for baseload.</p>	Shallow financial sector <p>The Indonesian financial sector is relatively shallow, in particular regarding familiarity of financing renewables. Few domestic financing entities and instruments exist, which are further hampered by regulatory bottlenecks. There is a lack of Indonesian Rupiah liquidity for renewables projects, with PPAs with IPPs signed in U.S. Dollars, incurring PLN significant hedging risk.</p>
Leverage advanced sustainable finance regulation <p>Indonesia's regulation on sustainable finance is advanced, with growing familiarity of the market with bonds. Amongst others, state utility PLN can make use of this, as its rating is comparable to that of the Indonesian government.</p>	Financial viability of coal <p>Financing conditions for new power plants currently favor coal and gas, with coal remaining cost-competitive in the next ten years. In combination with the government's prioritization of coal, this will make it harder for renewables.</p>
Relaxed foreign ownership rules <p>While likely small in impact, changes to foreign investment restrictions in early 2021 will help to facilitate the possibility of international investors entering the market. Formerly limited to a maximum of 49%, power plants above 1MW can now be up to 100% foreign-owned.</p>	High risk perception <p>Both domestically and abroad, there is high perceived investor risk for Indonesia. Issues such as regulatory changes, offtaker and currency risk as well as issues surrounding land acquisition, project execution and grid availability impact investors' willingness to enter the market. Moreover, many are first awaiting the Presidential Act on Renewable Energy, due to be released later in 2021.</p>
Use lessons from geothermal investment <p>Lessons from previous geothermal investment regarding co-investment structures and policy incentives can prove a template for de-risking other renewables technologies. The (non-)fiscal incentives from early 2021 will help.</p>	Lack of financing options for small-scale assets in particular <p>While accessing finance for utility-scale assets is not without challenges, the financing options small-scale projects can access are even scarcer.</p>

Source: BloombergNEF.

2030 priority areas and options for intermediation

Through its highly regulated, but at times poorly enforced processes, Indonesia lacks many market fundamentals to scale clean power investment. Overall, there is a need for the Indonesian government and PLN to provide a clear direction and sound incentives to accelerate utility-scale renewables build and address the coal capacity oversupply. In the financial sector, the lack of

domestic and, to a certain extent, international involvement can largely be attributed to high-risk perception, regulatory bottlenecks and uncertainty. While there is appetite among investors for clean power investment, it is contingent on improving regulations, transparency and rule enforcement, along with the development of a clear project pipeline.

Priority areas for financial intermediation in Indonesia therefore depend on the success of changes to the enabling environment. Within these constraints, however, financial intermediation can be useful in the build-out of more C&I projects and decentralized energy. The following five 2030 priority areas therefore combine intermediation and enabling environment activities, including action areas for DFIs in terms of investment and advisory services.

Priority area: Addressing the lack of project pipeline and overcapacity

Challenge: Decarbonization will depend on supporting PLN in its energy transition and addressing current oversupply by successively greening or replacing uneconomic and/or low efficiency coal plants.

Potential for financial intermediation

Domestic and international financial intermediaries could help PLN, its subsidiaries and IPPs to deploy and raise funds for new utility-scale renewables capacity. While PLN plans to rely on large hydro and geothermal to meet its targets, PV in particular can prove an economical route to replacing thermal (excess) capacity.

To accommodate the increasing share of intermittent renewables on the grid, investment into transmission and distribution will also be needed. For PLN, potential financial instruments could include green or transition bonds for new clean capacity and loans or pooled debt funds for investment into transmission and distribution. If provided with a project pipeline, IPPs can consider raising bonds.

Role of DFIs

- Due to the low cost of coal, DFI support to further lower the cost of renewables and storage can prove an incentive for PLN to replace thermal with renewables capacity. However, due to the inextricable socioeconomic links to the mining sector, lowering the cost alone will not move the market.
- Technical assistance in various formats will be necessary to support PLN in its energy transition. In addition to financing the greening of its own fleet, capacity building can help to draw up a clear procurement pipeline to allow IPPs to enter the market. PLN could, for instance, open tenders that allocate capacity based on power systems needs and prioritize least-cost renewables and storage.
- In addition, supporting regulatory changes to put in place stable and attractive clean power incentives and simplifying project development procedures would help alleviate investor uncertainty. This could include revisiting provisions on self-generation and decentralized energy as well as power prices. Cost-reflective tariffs would help PLN to better cover costs.

Priority area: Scaling and greening decentralized energy in rural areas

Challenge: Given Indonesia's geographical make-up, there is a need to increase power access and reliability in remote areas and cut dependence on diesel gensets.

Potential for financial intermediation

There is a role for domestic intermediaries to deploy funds to PLN, its subsidiaries and, in areas where PLN's reach is limited, entities such as municipally-owned enterprises (BUMD) for new decentralized and diesel-PV hybridization projects. Loans, credit lines, leasing or other forms of financing can help to grow the small-scale PV and storage and genset hybridization market. Especially for entities other than PLN, this will likely require DFI capital support.

Role of DFIs

- Supporting the capacity building of the small-scale market and offering suitable blended financing mechanisms will help to familiarize lenders with renewables and storage and grow the market. DFI funds could be particularly helpful to bring down the cost of small-scale storage.
- Technical assistance is needed to implement the regulatory changes to allow for derogation from PLN in remote areas and more actively involve entities such as BUMD in power generation. Clear regulations surrounding offtake and greater enforcement of net metering will provide investors with more clarity.

Priority area: Scaling up the self-generation market

Challenge: In addition to greening the utility-scale fleet, efforts need to be made to spread the renewables market in breadth too. Installing self-generation facilities can improve power reliability for large industrials and commercials.

Potential for financial intermediation

Financial intermediation has a role to play in offering suitable financing mechanisms such as loans, credit lines or facilities to C&I entities where the regulatory environment allows. While international C&I will likely continue to rely on international capital, domestic banks and NBFCs can, with guidance, deploy funds to small-scale PV and storage projects of SMEs. Once these more traditional instruments have been proven on the market, securitization of projects with a similar profile can be considered as a next step to increase access to capital market finance.

Role of DFIs

- While large international corporations have piloted this model, financial access for local C&I might require DFI support, particularly for SMEs. DFI support can help to cultivate market familiarity and the development of self-generation projects coupled with storage through loans, credit lines or other forms of financing facilities. At a later stage, it can be useful to explore and support the securitization of assets for projects with a similar profile.
- DFI funds could be particularly helpful to bring down the cost of small-scale storage.

Priority area: Activating the domestic financial sector

Challenge: Many local financial players are insufficiently familiar with renewables financing, with many IPP projects to date financed in overseas currency.

Potential for financial intermediation

To better activate domestic intermediaries and familiarize them with fund-deployment to renewables, DFIs could support Indonesia's national development bank PT SMI (or a similar state-owned enterprise) in providing de-risking mechanisms like first-loss positions or guarantees.

Role of DFIs

- This is largely an enabling environment activity, yet technical assistance combined with DFI funds could help PT SMI develop and offer various risk mitigation instruments such as full or partial guarantees. Alternatively, a project preparation facility using blended finance could offer risk mitigation instruments.
- Once enabling environment issues have been addressed, it will be useful to support the development of the local financial market for more Rupiah-based liquidity. Current PPAs in U.S. Dollars incur significant costs to PLN through forex and hedging risk, which was exacerbated during Covid-19.

Priority area: Enabling a just transition away from coal

Challenge: A major challenge in greening Indonesia's power sector is dealing with the large size of its coal fleet.

Potential for financial intermediation

Once a clear government commitment has been set, domestic and international intermediaries have a role to play in helping PLN, its subsidiaries and IPPs that have PPAs with PLN to raise finance to decommission coal assets and replace these with least-cost renewables and storage. Avenues to consider include raising green or transition bonds to make use of PLN's good access to the bond market. In addition, using securitization to pool and refinance uneconomic or underused coal plants off-balance sheet can provide funding for clean replacement capacity. Depending on the design, part of the revenue could also be used to support communities impacted by the coal transition.

Role of DFIs

- DFIs are largely needed in terms of enabling environment activities. The coal transition is a challenge that requires a clear decarbonization commitment from the highest political level and collaboration between a variety of stakeholders, from mine operators holding long-term coal offtake contracts with PLN to mining sector employees. Technical assistance needs to support these dialogues and processes, such as the renegotiation of fuel supply contracts or exiting coal PPAs with IPPs.
- PLN will require support in structuring the adequate financial instruments to decommission coal assets. Technical assistance in adjusting regulation to allow for securitization of assets can not only be useful in terms of raising debt to pay down coal assets, but can also be a valuable mechanism to raise finance for impacted communities, such as for job training programs. Further innovative financing mechanisms provided purely by DFIs such as decarbonization loans can prove valuable in establishing the market.
- DFI support to collaboration with institutional investors could additionally facilitate pre-identifying lenders and designing bonds to match their investment criteria.

6.4. Morocco 2030 clean power financing roadmap

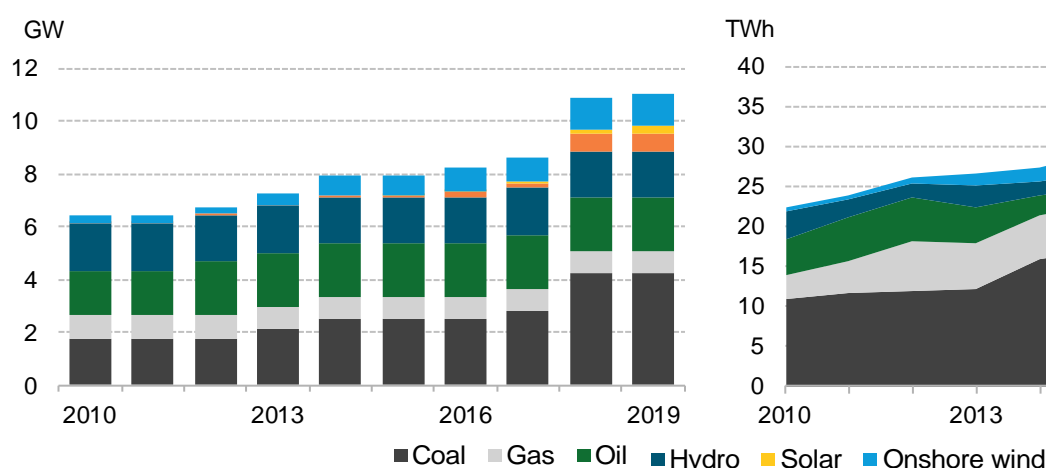
Country context

Morocco's Ministry of Energy, Mining and the Environment aims to achieve 52% installed renewable capacity by 2030; against 36% in 2019 (both figures include hydropower). The country has so far emphasized the role of solar thermal, solar PV and onshore wind. The government has not provided a breakdown of how it plans to achieve this goal, but it is likely to continue to rely on

centrally conducted auctions to procure renewable power. The capacity target is less ambitious than the one expressed as the share of renewables in generation, but would be easier to achieve if the government puts an end to fossil fuel additions.

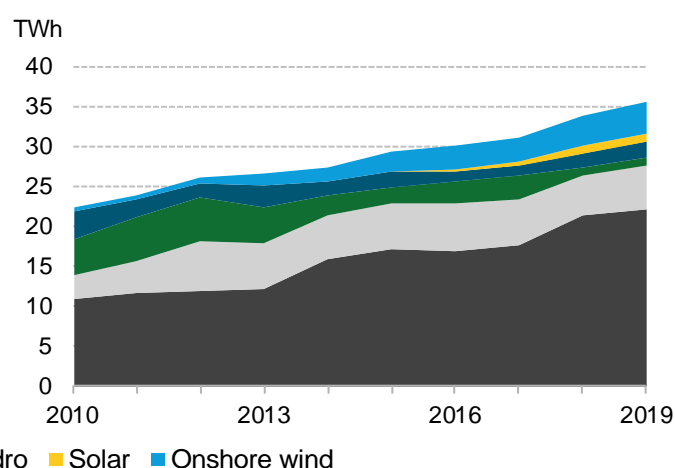
Morocco is on track to meeting the 2030 target, although the country's power mix remains heavily reliant on coal and gas. That said, renewable energy capacity has successfully reduced the share of oil required to meet evening consumption peaks.

Figure 44: Morocco installed capacity



Source: BloombergNEF.

Figure 45: Morocco power generation



Source: BloombergNEF.

Brief power sector overview

Morocco's power sector remains largely vertically integrated. State utility ONEE has a monopoly on transmission, and controls a large proportion of the generation and distribution markets. There are few clean power incentives in place, but a strong commitment to expanding renewables capacity has driven additions through a national auction program. As of 2019, the government had successfully procured more than 1.8GW of clean power capacity, not including hydro.

Annual renewables investment has varied considerably. This is typical of a nascent renewables market reliant on de-risked, large-scale auctions for procurement. Yet investment has dropped considerably in recent years after hitting a \$3.1 billion peak in 2018, and financial flows will have to pick up again if the country is to achieve its renewables targets. Past investment has been largely concessional in nature, and foreign investment has accounted for the majority of funding. That said, local financiers such as Attijariwafa Bank, Banque Populaire and Bank of Africa rank among the top eight lenders to renewables undertakings.

Morocco has consistently made the headlines for its large-scale solar thermal projects, three of which have been commissioned to date. Yet concerns around the technology's cost and delays to a hybrid thermal solar-PV project appear to have led to a policy about-turn. Henceforth, it appears likely that the government will strengthen PV and onshore wind procurement to meet its renewables objectives. Small-scale solar has yet to take off in the absence of a net metering scheme and the presence of a ban on the direct sale of power to end-users over lower-voltage power lines.

Table 31: Morocco power sector opportunities and challenges

Opportunities	Challenges
Experience in clean power procurement across technologies <p>Plans to scale renewables deployment will build on Morocco's substantial experience in procuring clean power. Confidence in the country's track record should help to attract foreign investment in the country's renewable power sector.</p>	Single-buyer model reduces opportunities for small-scale PV <p>ONEE's dominance of the power sector is set to persist. In the absence of promised reforms, the direct sale of power over lower voltage grids limits opportunities for commercial and industrial solar.</p>
Strong political buy-in backs renewables deployment <p>The number one factor driving Moroccan clean power deployment has been the government's strong commitment to building out renewables. This was stepped up in 2015 and is likely to persist as the government seeks to achieve the 52% renewables capacity target set for 2030.</p>	New fossil fuel additions weaken case for building new renewables <p>Recent years have involved the signing of new 30-year power purchase agreements for planned coal-fired power plants. The coal sector has added more than 2.4GW of capacity since 2011, with 1.3GW added in 2018. That extra capacity could slow renewables growth.</p>
Renewables procurement frameworks are thoroughly derisked <p>A combination of experience and political commitment have helped lift barriers to bidding in renewables auctions. Developers are offered pre-developed sites, connections and provisions that negate currency risk. Furthermore, government guarantees back contracts signed with private generators.</p>	Recent tendering delays point to a slowdown in progress <p>Tenders have been conducted fairly regularly over recent years. That is impressive given the challenges of procuring nascent technologies (solar thermal) and the market's immaturity when it comes to renewables. However, delays affecting a PV-solar thermal tender leave little visibility on future additions.</p>
Ambition to develop energy exports could boost renewables build <p>The government seeks to become a major energy exporter to Europe and West Africa. In the short term, it will continue to build out power interconnectors. Long-term ambitions are to export green hydrogen to Europe. A growing supply of renewable power is critical to both.</p>	Non-cost reflective power tariffs deepen deficit of key public players <p>Retail electricity tariffs are high for North Africa, but remain too low to allow the state utility to recoup its operating expenses. Renewable agency MASEN, to which ONEE is gradually transferring its renewables assets, faces similar issues. Deficits could hinder future capacity additions and power sector reform.</p>

Source: BloombergNEF.

Brief financial sector overview

Morocco's financial sector is relatively mature and the country's sophisticated banking institutions have been able to expand their activities across Africa. Morocco was the continent's first to approve a green bond framework. Five further green bonds have been issued to date by actors including national renewables agency MASEN and Casablanca city council. Several green loans have also backed clean power projects. These have served to finance new capacity additions as well as refinance brownfield assets.

Domestic banks have been active in financing clean power plants. However, the sector remains cautious when considering whether to back renewables projects. For now, its focus is squarely on low-risk activities such as credit allocation and increasing deposits. So for larger, grid-scale projects, access to international sponsors lending at concessional rates will remain key.

Table 32: Morocco's renewables financing opportunities and challenges

Opportunities	Challenges
Strength of local and international financial sector <p>The Moroccan financial ecosystem is relatively developed. Making it well positioned to finance (or indeed refinance) greenfield and brownfield renewables projects by deploying a variety of entities and instruments. The ability to tap into international markets opens up further financing opportunities.</p>	Power sector's financial health <p>Financial reforms have been instrumental in improving ONEE's economic outlook. Yet the utility remains vulnerable to financial headwinds. Efforts should be made to tackle network losses and raise heavily subsidized tariffs where consumers are able to pay.</p>

Failure to address such issues could thwart plans to reform the power sector.

Advanced sustainable finance regulation

Buoyed by a strong commitment to expanding clean power, Morocco can build on its initial foray into green bonds and advanced sustainable debt regulation to refinance existing clean power projects. A deeper bond market could offer more opportunities to invest in suitable assets that meet corporate ESG mandates.

Deteriorating credit rating

Despite macroeconomic stability and low inflation, Morocco's credit rating is deteriorating as the country's finances bore the brunt of the Covid-19 crisis. This is likely to make it more challenging to access the capital required for future renewables projects.

Financial sector maturity

The market is developing experience in funding renewables, although many larger projects are still reliant on international finance.

Lack of financing options for small-scale solar

Options for financing rooftop PV will remain restricted until developers are able to sell power to end-users over lower voltage cables.

Source: BloombergNEF.

2030 priority areas and options for intermediation

A slowdown in investment and sustainable debt issuance suggests that more efforts are required to scale clean power investment. The government has provided a clear commitment to building out renewables, but a long-term auction pipeline and clarity about delayed projects would help. Building more coal is another possibility, although this appears unlikely given the several gigawatts of coal (backed by 30-year PPAs) commissioned in recent years.

The financial sector is mature and vested in renewables undertakings, but appetite for risk remains low. That increases the potential impact of enhanced policy visibility. In addition, power sector reform could lead to an uptick in rooftop solar investment. The current regulatory environment limits private power sales directly to end-users, and the sector would benefit if these restrictions were stripped down. This will require addressing the fragile financials of state utility and MASEN as ONEE's revenues could decline if rooftop PV takes off.

Priority areas for financial intermediation depend on several factors, from a commitment to reducing the country's reliance on fossil fuels to setting up the conditions required for small-scale PV to grow. The following five 2030 priority areas therefore combine intermediation and enabling environment activities, including action areas for DFIs in terms of investment and advisory services.

Priority area: Meeting growing power needs through clean capacity

Challenge: Utility-scale renewables additions will have to come fast for Morocco to meet its growing power demand and achieve its 2030 renewable energy target. In the longer term, clean power will be critical to considering the renewables capacity required to develop nascent industries such as green hydrogen production.

Potential for financial intermediation

Despite growing participation from domestic financiers, international financial intermediaries will continue to drive deployment by channeling capital into undertakings coordinated by MASEN. This will accelerate the deployment of mature renewables such as PV, and facilitate the adoption of early-stage technologies like grid-scale battery storage and hydrogen electrolyzers. Morocco's financial market is mature but there is scope for the use of instruments to unlock new funding sources. Capital recycling could help tap into fresh liquidity. Obligations could also be refinanced

via public or private placement green bonds. Debt funds could also draw in a wider pool of institutional investors.

Role of DFIs

- DFI support in providing blended finance remains critical despite the familiarity of domestic and international intermediaries with renewables. It will become clearer as to where their efforts should be directed once ambiguity around the country's procurement priorities are clarified – for example concerning the fate of the delayed Noor-Midelt project.
- Given the fairly shallow Moroccan bond market, DFI support could also be useful in facilitating private placements, and bond-issuing or purchasing programs with institutional investors. Moroccan institutional investors have already deployed funds for renewables projects, and this should be built upon.
- Foreign exchange risk has been taken on by MASEN for past procurement rounds, allowing developers to bid in hard currency. Accessing international capital markets could be facilitated by options such as green hedging instruments.

Priority area: Preparing the grid for intermittent generation

Challenge: Making good on the government target of 52% renewables generation capacity by 2030 will involve integrating large volumes of variable renewables. Improved system flexibility, either by investing in the grid, better managing demand or procuring batteries will be key.

Potential for financial intermediation

Solar thermal has historically contributed to reducing oil burn while meeting the country's late evening peak. Concessional finance will be required to procure future flexibility solutions, such as utility-scale storage. ONEE's smart meter deployment program and the enforcement of time-of-use tariffs opens the door to scaling demand-side response measures and small-scale storage.

For its part, Morocco's grid is becoming inadequate as ONEE struggles to make the investments required to reduce network losses. Domestic intermediaries will be key to deploying and raising funds for transmission and distribution investment. In addition, investment opportunities for transmission include the financing of regional (and intercontinental) interconnectors. Morocco's interconnection with Spain is a case in point. The government is also considering using corporate PPAs to serve European demand.

Role of DFIs

- Implementing energy storage mandates or subsidies for storage will require significant technical assistance from DFIs and other international intermediaries. The inclusion of storage in national auctions is not new in Morocco, which has shown appetite for exploring innovative technologies for managing domestic consumption. Policy makers could also benefit from advice on creating frameworks through which to remunerate flexibility or mandate balancing requirements.
- Concessional financiers can assist by increasing the domestic financial sector's familiarity with lending opportunities related to network upgrades, such as digitalization, flexibility and demand-side response measures. These could all be use cases for blended DFI funding. More than other sectors, distributed and flexible technologies benefit from efforts to pool such loans into a package. This element could attract a wider range of investors.

Priority area: Enabling a transition away from fossil fuels

Challenge: The decarbonization of Morocco's power sector hinges around supporting the government as it reconfigures its power mix. In time, this will involve aligning security of supply and economic objectives with the country's strong climate agenda. This could involve replacing uneconomic or undepreciated coal assets with clean capacity. Intermediaries could help by providing technical support to the government and assistance with finding suitable financing instruments.

Potential for financial intermediation

Once a clear government commitment has been set, domestic and international intermediaries can raise finance to decommission coal assets and replace these with least-cost renewables and storage. At the outset, this will likely require DFI support. ONEE, its subsidiaries and IPPs that have power purchase agreements with ONEE, can for instance raise green or transition bonds. MASEN has accessed the bond market in the past, offering it valuable experience that can be built upon. However, the novelty of these instruments means that the DFI support is likely to remain crucial if they are to be employed to their full potential. Another option is to employ securitization to pool and refinance uneconomic or underused coal plants off-balance sheet in order to provide funding for clean replacement capacity.

Role of DFIs

- The government should refer to existing decarbonization commitments when enforcing measures to reduce its reliance on fossil fuel plants. Morocco's coal is imported, which reduces the social and economic cost of a coal phase-out.
- Technical assistance is required to support these dialogues and processes. Much of the country's coal capacity is relatively new, which enhances the case for renegotiating fuel supply contracts or exiting coal PPAs with IPPs.
- The government will likely require support in structuring the adequate financial instruments to take coal assets offline. Technical assistance could help establish the required regulations to securitize assets, a step that has benefits in terms of raising capital and paying down coal assets.

Priority area: Scaling up the self-generation market

Challenge: Greening the grid-scale generation fleet provides the most direct route to decarbonizing Morocco's power sector. However, this should not replace efforts to address other segments. Installing self-generation facilities could enable industrial and commercial players to reduce their carbon intensity. However, financing mechanisms and project opportunities for private renewables procurement are lacking.

Potential for financial intermediation

Direct electricity sales from private generators to end-users are generally restricted to entities that are positioned to do so across transmission grids. There is a legislation reportedly underway that would solve this issue, but it has yet to be implemented. Meanwhile, efforts should be concentrated on supporting the ability of domestic banks to channel funds to small-scale PV and storage projects. This would reduce procurement costs for commercial and industries enterprises, and build familiarity with decentralized power solutions. Once local financial actors have

increased their familiarity with self-generation, pooling similar projects via securitization could unlock access to a wider range of investors.

Role of DFIs

- Allowing private generators to sell electricity over distribution and lower-voltage transmission lines would help to stimulate the rooftop PV market.
- Considerable technical assistance will be required to enable the integration of small-scale variable renewables. This will help implement the necessary regulatory changes, including setting capacity thresholds, licensing procedures and wheeling agreements.
- Various financing facilities could be provided by DFIs willing to support self-generation projects. These could include loans, credit lines or other instruments. Such assistance will be vital to developing awareness of procurement options among potential customers.

Priority area: Reinforcing the domestic financial sector

Challenge: A broad range of domestic financial actors have backed renewables projects, yet many local players still remain unfamiliar with the opportunities available. Many independent power projects have for instance been financed in foreign currency.

Potential for financial intermediation

DFIs would do well to support local financial institutions that have already shown a willingness to support renewables projects. These include Attijariwafa Bank and Banque Populaire's regional branches. DFIs could provide technical assistance as well as de-risking mechanisms, such as first-loss positions or guarantees.

Role of DFIs

- DFI funds have already proven effective when blended with local finance through projects overseen by MASEN. Full and partial guarantees could increase government appetite for procuring a greater volumes of renewables. Past projects have seen public entities issue guarantees backing power purchase agreements with independent power producers.
- MASEN's procurement program takes on foreign exchange risks when signing contracts with private generators. That significantly increases procurement costs. As Morocco's renewables market becomes increasingly mature, efforts should be made to enhance the ability of local financial institutions to extend credit denominated in Moroccan dirhams.

6.5. Brazil 2030 transport transition financing roadmap

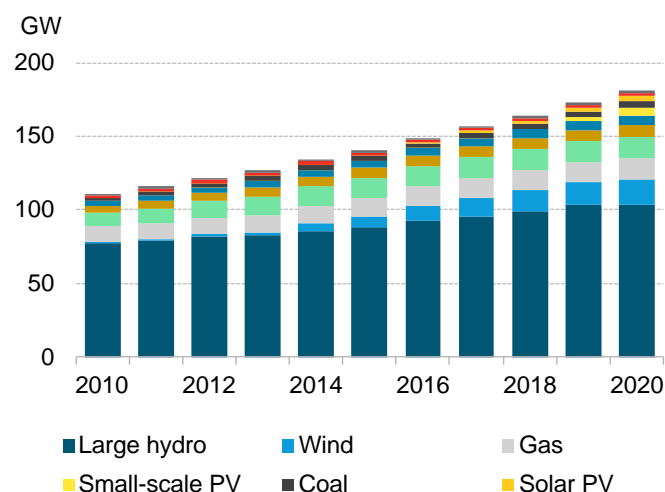
Country context

Brazil's power sector today is relatively low in carbon. Heavy reliance on hydropower, which accounts for nearly two-thirds of capacity, means that overall renewable energy stands at 82% of generation, including large hydro. Excluding large hydro, renewables account for 23% of capacity. The country's clean power matrix has positive implications for transition within transport. Brazil has yet to move to a net zero approach, although it has ambitious NDC targets. Due to the significant role played by hydropower, the power sector accounts for around 7% of emissions, which is about half that of transport at 14%.

Clean energy is likely to continue to flourish, keeping power sector emissions low. Emissions from transport, however, have risen steadily and are the third-largest source after LULUCF (24%) and

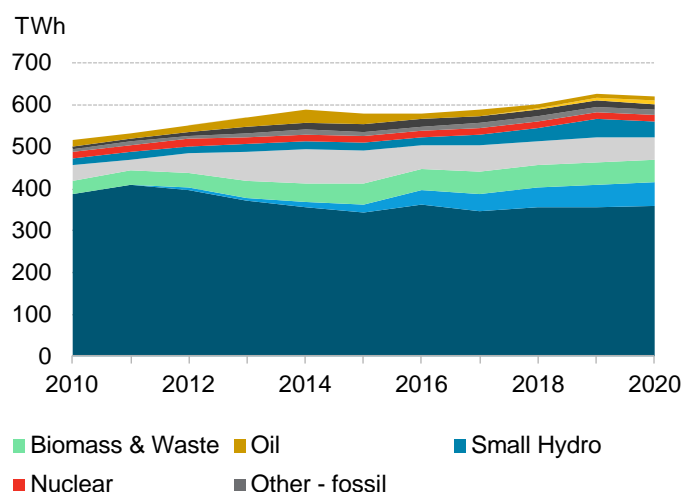
agriculture (36%). Widespread use of biofuels in passenger vehicles reduces transport emissions to an extent, but the use of diesel in heavier segments is widespread. Growing vehicle ownership is likely to contribute to rising transport emissions.

Figure 46: Brazil installed capacity



Source: BloombergNEF.

Figure 47: Brazil power generation



Brazil's NDC reflects the current state of its transport sector. It includes increasing the share of sustainable biofuels in the energy mix to 18% by 2030, expanding biofuel consumption, increasing ethanol supply, including by boosting the share of advanced biofuels and biodiesel in the mix. As major markets embrace net-zero goals, a focus on cutting emissions via biofuels will be insufficient. While biofuels are an important option for reducing CO₂ emissions in the transport sector, direct and indirect land-use change (LUC) emissions associated with large-scale expansion of bioenergy crops raise concerns. Some studies suggest that the wholesale conversion of car and urban bus fleets to 100% biofuels results in similar or higher transport emissions than a business-as-usual (BAU) scenario due to land-use change emissions.³³

Brief transport sector overview

Within transport, Brazil's emphasis on biofuels is a relatively unique one globally. Brazil is the second-largest producer of biofuels in the world after the U.S. Around 85% of all new light vehicles sold in Brazil run on any combination of ethanol and petrol (known as flex-fuel engines). Two-thirds of its light passenger fleet is flex-fuel, standard gasoline is 27% blended (compared to 10% in the U.S.). Ethanol's share of light vehicle total energy demand approaches 50%. Diesel has a mandated 10% biodiesel blend, which was previously 13%.

On the one hand, biofuels displace fossil fuels and offer a viable path to lower emissions in Brazil's transport sector. Yet they also act as a barrier to electrification. EVs have faced opposition from the biofuel industry's large agricultural and industrial base and Brazil's strong domestic auto manufacturing industry, which is dedicated to flex-fuel vehicle production. From an

³³ "Life-Cycle Assessment of Brazilian Transport Biofuel and Electrification Pathways" Glensior, Muñoz 2019.

emissions point of view, Brazil's flex-fuel vehicles compare favorably with ICEs in other markets, but fare much worse in comparison with EVs in their home market.

Electrification has been hampered to date by a lack of government commitment, high import taxes, the high cost of EVs relative to popular passenger vehicle options and opposition from a large and powerful biofuels lobby. Flex-fuel vehicles still benefit from more incentives than EVs. To preserve a role for biofuels, automakers may choose to pursue development of 'flex-fuel engine EVs'.

EV sales in Latin America are a fraction of the global total, but a clear growth trend has emerged. Sales growth of around 70% per year since 2016 is outstripping that of ICEs, pushing up adoption rates toward 1% of new passenger vehicle sales, as well as the region's share of the global EV market. Brazil leads the region in EV sales with 5,894 sold in 2020, a position it only assumed in 2019. Growth has been driven by rising PHEV sales, concentrated in luxury brands such as Volvo, BMW and Porsche. Luxury vehicles accounted for 89% of Brazil EV sales in 2020. The public charging network is limited as most EV owners are likely to have installed home charging.

Due to the lack of meaningful policy support, growth of the EV market to date is almost entirely driven by fundamentals. This includes improvements in cost and technology, compelling new models and growing commitment from automakers and consumers alike. Brazil is likely to continue to lead in the next five years due to the size of its market and continued growth in luxury PHEV sales, even as adoption remains low as a share of new passenger vehicle sales (0.36% in 2020).

In Brazil's passenger vehicle market, BNEF sees price parity as a long way off. The most-sold passenger vehicle in the country today, the Chevrolet Onix, a locally made FFV, retails for R\$63,430 (\$12,396), while the imported, entry-level all-electric Chevrolet Bolt has a price tag of R\$275,100 (\$53,757), approximately 4.3 times more expensive. In emerging markets in Asia (India, Southeast Asia), we expect EVs to achieve upfront price parity with ICE vehicles in the mass-market segments only by around 2030.

Brazil could follow a similar trajectory. Availability of low-cost ICEs, high import taxes, fuel subsidies and the presence of alternatives like ethanol all ensure parity will not be achieved in the next few years. With limited national-level support for EVs in Brazil, automakers are unlikely to direct new electric models there in the next few years. Domestic manufacturing of EVs is a likely route for automakers to eventually take in Brazil in order to avoid high import taxes but is still some years away. Limited model availability will therefore effectively keep EV adoption subdued in the short term.

Table 30: Brazil transport sector opportunities and challenges

Opportunities	Challenges
<p>Clean power sector expected to get cleaner</p> <p>Brazil's power sector is clean, which is favorable for electrifying transport. EVs will charge (and eventually be manufactured) with clean power, reducing lifecycle CO2 emissions and leading to a growing emissions gap with conventional vehicles (ICEs and FFVs). EV emissions fall further as renewables generation rises.</p>	<p>Domestic auto manufacturing industry</p> <p>Among the top 10 auto producers globally, Brazil has a large auto manufacturing industry and FFVs enjoy more incentives than EVs. Limited support will discourage automakers from focusing on Brazil and high import taxes discourage consumers from purchasing EVs. With no large-scale plans to manufacture EVs or batteries domestically, the market will remain dependent on imports, preserving the price gap with ICEs.</p>
<p>Established clean power investment and policy environment</p>	<p>Limited policy support for electrification</p>

A pioneer of renewables auctions, Brazil offers an open investment environment with which domestic and international renewables investors are comfortable and a diverse financial landscape. It has deep experience in supporting new industries.

Large potential for impact in transport as costs fall

Emissions from transport are double those of the power sector and are growing. In countries with clean grids, every ICE replaced has a disproportionate impact on emissions. Growing scale will push down battery and infrastructure costs for emerging markets, reducing investment needs and bringing forward price parity with ICEs. Displaced biofuels offer a complementary path for hard-to-abate sectors.

Large, polluting public transport and urban fleets are ripe for disruption

Brazil's large, diesel bus fleet represents an opportunity for impact, as do urban commercial and passenger fleets. E-buses are a segment further advanced in terms of global adoption, which is often led at the city level. Brazil hosts e-bus chassis and battery manufacturing, but lags neighbors Chile and Colombia in adoption.

Source: BloombergNEF.

Electrification is hampered by a lack of government commitment. Direct subsidies that lower the upfront costs of EVs are unlikely to be adopted. Policies that target the supply side, such as fuel economy standards, EV mandates, or bans on sales of ICEs may eventually be the preferred route, but are not under discussion. Policy may continue to support ethanol as an alternative.

Biofuels are deeply entrenched

Biofuels reduce emissions but act as a barrier to electrification. While FFVs beat ICEs on emissions, they compare much worse with EVs. Biofuels are likely to remain in the transport mix for some time. To preserve a role for them, automakers may pursue development of 'flex-fuel engine EVs'. Optimizing the route to net zero could mean electrifying all passenger cars and redirecting biofuels to sectors with no other easy decarbonization pathway.

EV market is concentrated in luxury vehicles, price parity is years away

Brazil leads the region in EV sales but growth has been concentrated in luxury vehicles. Price parity in the passenger vehicle market is likely a long way off. Public charging network will remain limited as most EV owners are likely to have installed home charging.

Brief financial sector overview

The Brazilian financial sector is mature, with all major actors in the investment chain active in energy transition investment. Brazil's domestic development banks have historically played a dominant role in supplying long-term finance to industry and infrastructure. The most active players in financing clean power in Brazil are domestic development banks, with the lead arrangers being Brazilian national development bank BNDES, Banco do Nordeste, regional development agency Superintendencia do Desenvolvimento do Nordeste (Sudene) and others. BNDES ranks as the top lender to clean energy globally, having disbursed almost \$20 billion in the industry (excluding large hydro) between 2011 and 2020, mainly through term loans.

Brazil's sustainable debt market is maturing and issuance has grown recently, but there is plenty of room for expansion. Brazil issued less than half the volume issued by Chile, a much smaller market, in 2020. Examples within the transport sector are few. In 2021, BNDES launched a Sustainability Bond Framework (SBF) with support from IDB, designed to expand funding options established under its Green Bond Framework (2017). Funds will be used to finance and refinance new or existing projects in the BNDES portfolio across six green and three social categories (including clean transport). Financial products available to transport are almost universally designed for "low-carbon" transportation (i.e. to include biofuels) and the promotion of local industry, rather than to specifically promote electrifying transport.

Table 31: Brazil's transport financing opportunities and challenges

Opportunities

Strength of local and international financial sector

Brazil's financial ecosystem is developed and generally well positioned to finance new transportation initiatives via a variety of entities and instruments. Moreover, the ability to tap into international markets opens up further financing opportunities. The Brazilian EV

Challenges

Lack of dedicated financing options for electrified transport

The current suite of financial products are almost universally designed for "low-carbon" transportation (i.e., to include biofuels) and the promotion of local industry, rather than to specifically promote electrifying transport. As a well-established segment of the

market is still in its infancy and will require substantial and varied resources.

economy, the biofuels industry is better placed to access finance compared to earlier stage EV activity.

Domestic development banks role in spurring new technologies

Brazil's development banks are committed to green funding and played a crucial role in kickstarting the country's renewables market and associated supply chains. Their activity is increasing in the transport sector, which will support electrification.

Room for growth in sustainable credit

Brazil has substantial room for growth in development of its sustainable credit market compared to other markets in Latin America. Chile, for instance, issued more than double the volume of green bonds issued by Brazil in 2020. There is a lack of sustainable debt linked to EVs. Advanced sustainable debt regulation and a deeper market could increase opportunities to invest in assets that meet corporate ESG mandates.

Financial sector maturity

Brazil's significant experience in terms of financing renewables, should in time benefit energy transition investment in other areas as well, including the electrification of transport.

Forex risk hinders access to international goods and capital

The rising costs of goods and capital associated with imported equipment and heavy depreciation of the Brazilian real represents a barrier to planned investments in EVs at the commercial level. At the consumer level, the market is price insensitive and concentrated in luxury vehicles.

Source: BloombergNEF.

2030 priority areas and options for intermediation

The success of Brazil's renewables market underscores the extent to which it has the necessary market fundamentals to attract energy transition investment. Brazil has the largest power market in Latin America and its size, resources and conducive policies have made it the region's main renewable energy market and one of the top 10 in the world. In the past decade, Brazil has attracted more than \$65 billion of new clean energy investment, nearly half of the regional total and one of the highest volumes among emerging markets, supported by policies such as auctions and net metering.

The key drivers of clean power investment in Brazil are relevant to transport. Brazil has clear investment rules, a diverse financial ecosystem of public and private banks and non-bank financial companies, as well as a variety of debt and equity instruments that have provided ample financing for renewables. As transport rises among Brazil's emission reduction priorities and the current narrow focus on biofuels expands in the coming years, investment in electrified transport may benefit from similar market fundamentals.

However, strong regulatory drivers for electrified transport are currently lacking in Brazil, activity in electrified transport is early and commercial, while technology and foreign exchange risk remain impediments to securing goods and capital. Sustainable debt issuance remains below the expected levels. This means that increased, flexible use of financing instruments like bonds could open up opportunities to larger volumes of investment.

Priority areas for financial intermediation depend on several factors. This ranges from a strong political commitment to re-evaluating Brazil's emissions policy and biofuels-dependent approach, to examining public transport business models and raising funds to crowd-in investment in the electrification of municipal bus and commercial fleets. The following three 2030 priority areas therefore combine intermediation and enabling environment activities, including action areas for DFIs in terms of investment and advisory services.

Priority area: Supporting municipal bus fleet emissions reduction targets

Challenge: Brazil must begin scaling up e-buses in the near term. It has e-bus pilot initiatives in several cities and concrete 10 and 20-year targets for fleet-wide emissions reductions in Sao Paulo, the region's largest metropolis and bus fleet, but its existing municipal bus fleet is diesel-powered. Brazil hosts e-bus chassis and battery manufacturing capacity, yet it lags behind neighbors Chile and Colombia, which have deployed hundreds of e-buses in recent years. Urban air quality concerns and city decarbonization goals will accelerate bus electrification in the coming years.

Potential for financial intermediation

Latin America's e-bus fleet in 2020 was almost 2,000 units, but e-bus orders in Brazil remain negligible to date. This may be poised to change. A 2018 Sao Paulo municipal law established a schedule for the conversion of diesel buses into low-emission buses, setting 10- and 20-year targets for fleet-wide emission reductions of 50% and 100%, respectively. The city's fleet consists of more than 14,000 diesel buses. The law was temporarily suspended in 2020. Brazil's financial market is mature but there is scope for using instruments to unlock new funding sources. Domestic and international financial intermediaries can play a role in supporting the rollout of e-buses, a technology that is proven in the region but is in the early stages of ramping up.

Role of DFIs

- Given the higher upfront cost of e-buses relative to diesel, DFI funds could be a valuable support to, or as an alternative to, domestic sources of funding. For example, Brazil hosts e-bus chassis and lithium iron phosphate battery manufacturing capacity, established by Chinese manufacturer, BYD Brasil, and accredited by BNDES' FINAME facility in 2020. FINAME resources are earmarked for financing purchase of Brazilian equipment and enables finance up to 80% of the value of the bus, for up to 10 years, with a two-year grace period. Non-accredited equipment would not be eligible for this.
- DFI support can help to strengthen the financial health of public transportation operators via technical assistance. Covid-19 has imposed severe financial difficulties on fleet operators. Reduced ridership, fare losses, higher costs associated with cleaning and sanitization and slashed public budgets have contributed to losses and prompted operational restructurings and cost reductions. This has impacted revenue and increased offtake risk. Rising costs of e-buses associated with imported equipment and the heavy depreciation of the Brazilian real have further deterred planned investments in e-buses and new market entrants.
- DFI support around development of new business models for public transportation operators could be valuable, including for example, separation of asset ownership, operation and maintenance (these currently lie with the transport operator). The entrance of other players, including from the power market for example, could be encouraged to hold ownership of assets and/or support vehicle finance. This approach has been used elsewhere in the region.
- DFI support could be useful to draw investment to, or help domestic intermediaries gain familiarity with, lending to supportive areas such as optimizing charging infrastructure, digitalization, fleet management and operations.

Priority area: Scaling up commercial EV fleets

Challenge: High circulation, urban commercial fleets offer an opportunity for near-term impact in Brazil, across delivery, transport and shared mobility vehicles. Demand for taxis, ride-hailing and

car-sharing was hit hard by the impact of Covid-19, but delivery businesses benefited from lockdowns. A recovery in urban passenger services will coincide with rising levels of e-commerce which will support demand for delivery vehicles, including vans and smaller trucks in the light-commercial segment.

Potential for financial intermediation

Financial intermediaries can play an important role in raising and deploying funds for investment to electrify commercial fleets, with a focus on urban duty cycles. Ride-hailing companies and large commercial fleet owners are pursuing electrification and will be initial adopters in Brazil. According to our total cost of ownership (TCO) analysis, in urban duty cycles, battery-electric trucks of any size become the cheapest option for several use cases in the 2020s while for some use cases, like delivery vans, the TCO of all-electric vehicles is already the lowest.

Role of DFIs

- DFI funds could be valuable in supporting smaller and mid-size companies to make larger required investments. Larger companies are more likely to have the financial capacity to accommodate the higher upfront cost of electric trucks, vans and cars relative to diesel options. They can also better optimize the deployment of charging infrastructure. Some large corporations have made strong commitments to decarbonize their operations.
- BNDES may become a primary provider of capital to companies buying vehicles in some segments. However, international intermediaries with a focus on ESG can be valuable players in raising funds to support new electrification projects where domestic funding is unavailable or inadequate.
- DFI support may be needed for some players in the market to access traditional means of capital where domestic and international intermediaries are not familiar with transport electrification technologies. DFIs could particularly assist smaller to mid-size owners and operators of commercial fleets in their first bond issuance.
- Foreign exchange risk can be substantial for international procurement, exposing purchasers of imported equipment to volatile costs in local currency. Exploring options such as green hedging instruments could support access to international capital markets.
- Technical assistance could be valuable in designing sound policy incentives to incentivize the electrification of urban commercial fleets across delivery, transport and shared mobility. For example, incentives could be introduced at the municipal level around parking, use of bus lanes and exemption from other restrictions. Recently introduced requirements in Sao Paulo for the mandatory provision of EV charging in new residential and commercial buildings could be expanded to other designated points.

Priority area: Biofuels for hard-to-abate sectors

Challenge: Biofuels reduce emissions in Brazil's transport sector, but they also act as a barrier to electrification in the near term. Brazil's FFVs compare unfavorably with EVs on lifecycle emissions, while wholesale fleet conversion to biofuels likely implies unacceptable land-use change emissions. Electrification will eventually displace a large share of biofuels from Brazil's light passenger fleet and its large biofuel resource may need to be redirected to other areas of transport or the economy, where they may offer a decarbonization solution for hard-to-abate sectors. It is vital to explore optimal applications for biofuels in the context of electrification.

Potential for financial intermediation

BNEF analysis suggests that EVs will ultimately tend to be dominant everywhere due to powerful global policy and technology trends. However, given current market dominance, biofuels are likely to remain in Brazil's transport mix for some time. Policy makers and auto manufacturers may seek to preserve a role for biofuels by, for example, pursuing development of 'flex-fuel engine EVs'. However, optimizing the route to net zero would likely mean electrifying all passenger cars and directing biofuels to sectors with no other easy decarbonization pathway. While this mainly involves enabling environment activities, DFI funds and technical assistance around alternative applications for biofuels could help clarify the optimal role for them in Brazil's energy transition.

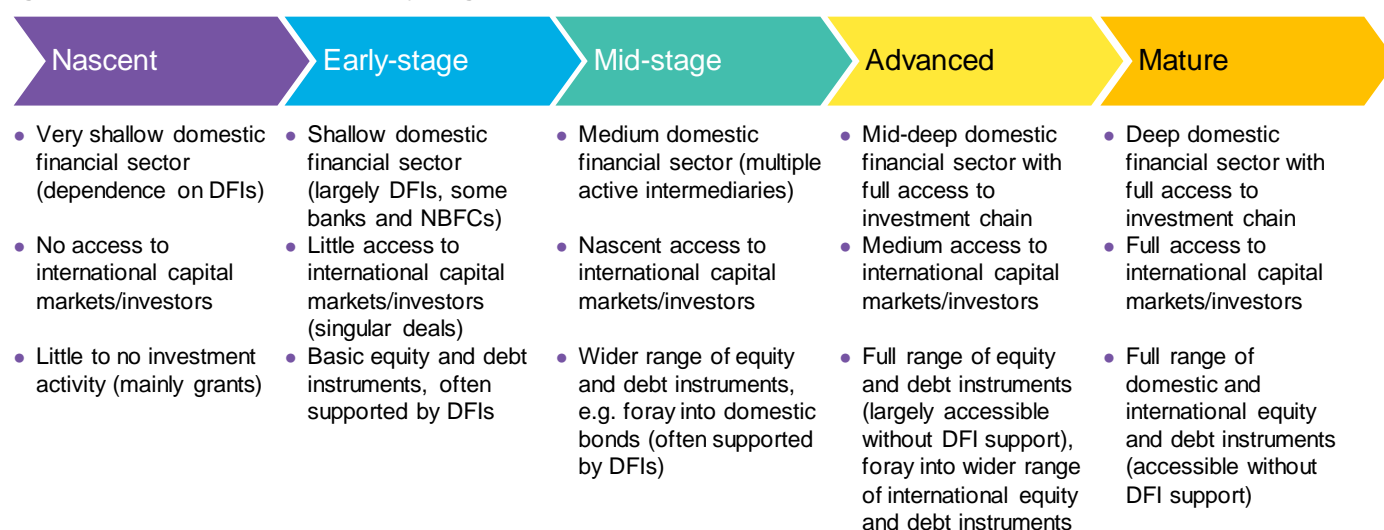
Role of DFIs

- DFI support would be valuable in terms of policy development. Optimizing the use of biofuels in Brazil's transport sector in the medium and long terms means fully understanding their potential applications and tradeoffs associated with their use in other segments of transport and the economy from the perspective of emissions, cost and technology.
- Changes to the role of biofuels in Brazil's transport sector will require commitment from the highest political level, and stakeholder collaboration across Brazil's large biofuels and auto manufacturing industries. Technical assistance can provide valuable support to this process.
- It could be important to obtain DFI support for the multi-stakeholder evaluation of Brazil's emissions policy, NDCs and the long-term role of biofuels. Brazil's NDC includes increasing the share of sustainable biofuels in the energy mix, expanding biofuel consumption, and increasing ethanol supply. Electrification of transport is notably absent, while significantly increasing biofuels production and usage could potentially have an adverse effect on Brazil's emission profile due to land-use change emissions.

6.6. Lessons learned and recommendations

Financial intermediation can be a valuable tool for mobilizing investment, from expanding liquidity in virtually non-existent domestic markets, to tapping international institutional investors for support. To continue and expand their use, strategically timed DFI interventions can be critical to develop the renewables investment chain (Figure 47).

Figure 47: Development and liquidity stages of the renewables investment chain



Source: BloombergNEF.

DFIs can support and leverage domestic and international intermediaries to maximize the impact of their own investment activities (Table 33). As a starting point, DFIs can make use of intermediaries to kick-start or broaden a renewables market by entering a new segment or technology and assisting in developing the familiarity of domestic intermediaries. As a next step, DFIs can leverage domestic and international intermediaries to scale up a market by drawing more actors of the investment chain and more instruments into established technologies. This can help guide a country in the various stages of establishing and growing a renewables market and, ultimately in retiring its fossil fleet.

Table 33: Power transition stages and involvement of financial intermediaries

Goal	Power sector fundamentals	Financial market fundamentals	Use of financial intermediation	Typical instruments	Role of DFIs
Kick-starting a technology or market segment	●	●	Gaining domestic market familiarity (fund-deployment)	Basic equity and debt instruments, such as risk equity or loans	De-risking and crowding in intermediaries through guarantees, first-loss positions, blended finance and technical assistance
Scaling an established technology or segment	●	●	Increasing liquidity by accessing more domestic investors and instruments (fund-raising)	Domestic capital market instruments such as public or private bonds, listing or funds	Proving new instruments through guarantees, co-investment or blended finance and technical assistance
Tapping large international volumes of liquidity for established technologies and segments	●	●	Accessing large international investors and instruments (fund-raising)	International capital market instruments suited to institutional investors, such as bonds, funds or securitized products	Supporting drawing up suitable instruments and pre-identifying buy-side entities through technical assistance
Decommissioning coal fleet and/or addressing fossil overcapacity in regulated settings	●	●	Entering the market upon DFI support (fund-raising)	Transition-specific instruments like green or transition bonds or securitization coal portfolios	Designing and proving suitable financial mechanisms to retire assets through capital resources and technical assistance

Source: BloombergNEF. Note: green circle = fundamentals fully in place, yellow circle = fundamentals partially in place.

Recommendations to make best use of financial intermediation to scale clean power investment to 2030

- Across emerging markets, DFI involvement in the form of concessional, near-market or market-rate finance and technical assistance will continue to be key to bridge early-stage risk in new technologies, market segments or instruments. Once proven, it will be easier to draw in a more diversified group of investors and instruments and for the DFI to exit.
- Across different countries' power markets and financial sector segments, there are efforts to address the standardization, enforcement and predictability of regulations, contracts and procedures in order to provide investors with certainty and transparency. Such adjustments to the enabling environment will greatly improve the potential for domestic, but particularly international investors, to become involved in a market.

- In markets with a nascent financial sector, DFI involvement can be crucial to help foster and enable the market. For instance, the lack of local currency financing creates costly forex and hedging risk, thereby limiting local liquidity and subsequent investment. Similarly, the lack of a well-established bond market can severely impact the growth options of a renewables market, as it limits refinancing activities. Measures to build local financial capacity can therefore have a large impact on domestic investment activity as a whole.
- In established renewables markets, the focus should be on increasing liquidity through tapping into a larger range of instruments and intermediaries. Support to create structures to aggregate and capitalize illiquid assets in order to make them more “tradeable” is important to access capital market actors in particular. Through pooling in funds, securitized instruments or similar, institutional investors on domestic or international capital markets can channel large capital streams not only to generation, but also to transmission and distribution assets.
- It will be increasingly useful to create more channels for collaborating with networks and knowledge platforms of institutional investors, as discussed in Section 5. Given the large capital needs for clean power investment in emerging markets and the relatively short timeframe available, finding and developing new avenues for collaboration can prove an important tool to mobilizing investment to 2030.
- Aside from kick-starting and scaling a local renewables market or segment, consideration should go to pathways that deliver on net zero by 2050. For the power sector, this can involve exploring novel technologies such as green hydrogen, but also in creating a wider range of financial mechanisms to decommission coal assets in regulated markets. Ideally, such considerations and investment decisions should also already factor in market developments of the mid- to long-term, such as electrification and sector coupling of segments such as heating and cooling, transport or industry.

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