

# 2030 India Roadmap

**Multiplying the Transition:  
Market-based solutions for catalyzing clean  
energy investment in emerging economies**

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# About

BloombergNEF is working with the Climate Investment Funds to identify how financial intermediaries can mobilize clean energy investment in emerging markets. In the context of post-pandemic sustainable recoveries and the need to meet international climate commitments such as the Nationally Determined Contributions (NDCs), accelerating the global energy transition is now more pressing than ever. BNEF sees electrification through clean power and transport as the basis of decarbonization, and therefore, as the backbone of the energy transition. With investors' appetite for ESG products at an all-time high and capital needs for clean energy investment in many emerging markets often unmet, this project looks at how to better match this supply and demand. This slide deck serves to support the dialog with stakeholders on this topic.

## About Climate Investment Funds (CIF)

The Climate Investment Funds (CIF) is one of the world's largest and most ambitious climate finance mechanisms. Founded in 2008, it represents one of the first global efforts to invest in a dedicated climate finance vehicle. The CIF emerged from recognition by world leaders that climate change and development are inextricably intertwined. The CIF's creation also recognized a need to fill a gap in the international climate finance architecture—to deliver climate-smart investment at scale. The CIF supports developing and emerging economies in shifting to low carbon and climate resilient development.



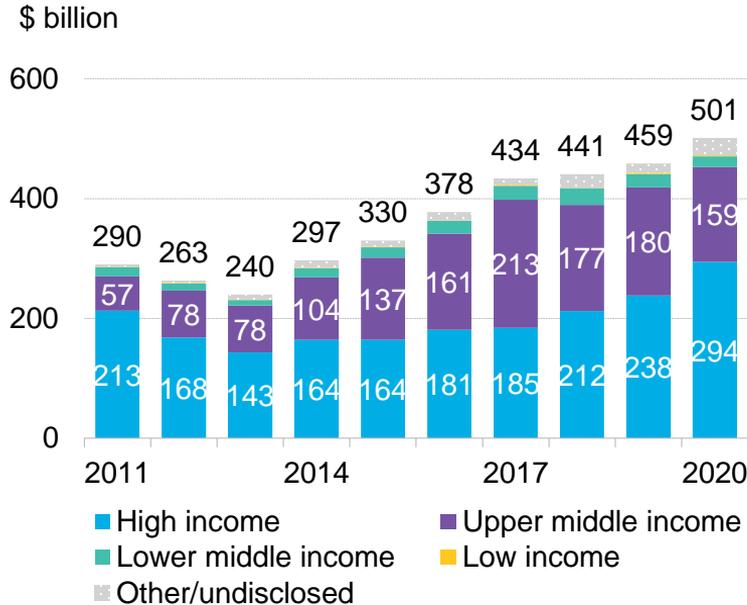
## About BloombergNEF (BNEF)

BloombergNEF (BNEF) is a strategic research provider covering global commodity markets and the disruptive technologies driving the transition to a low-carbon economy. Our expert coverage assesses pathways for the power, transport, industry, buildings and agriculture sectors to adapt to the energy transition. We help commodity trading, corporate strategy, finance and policy professionals navigate change and generate opportunities.

# BloombergNEF

# BNEF Take: Emerging markets and the energy transition

## Global energy transition investment



- Despite reaching a record-high in 2020, at \$501 billion, global energy transition investment has become even more concentrated in high income countries as a result of the Covid-19 pandemic. Emerging markets are, however, key to achieving the global energy transition, as they will produce the bulk of global emissions until 2050. In the context of delivering sustainable post-pandemic recoveries, accelerating economy-wide decarbonization is therefore more important than ever to keep global temperatures well below 2°C to deliver on the goals set under the Paris Agreement.
- BNEF sees electrification through clean power as the basis of decarbonization, and therefore, as the backbone of the energy transition. The power sector is a major contributor to overall emissions, with coal still the largest source of generation. Clean power generation technologies are the most readily available, scalable decarbonization solutions. To enable zero-carbon electrification of further sectors, renewable energy capacity needs to be expanded through utility-scale projects and distributed assets.
- At \$307 billion in 2020, investment volumes in renewable energy and storage are, however, far from the necessary levels to achieve this: BNEF estimates that expanding and decarbonizing the power system to stay on track for warming of as much as 1.75 degrees Celsius would require over \$2 trillion globally in power generation assets and batteries per year until 2050. There is therefore an urgent need to mobilize and accelerate clean power investment, particularly in emerging markets.

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

# Project overview

- **Focus: Scaling up clean energy investment through financial intermediaries in emerging markets**
  - Global energy transition investment and sustainable debt issuance reached a record high in 2020, but flows continue to be concentrated in the world’s wealthiest countries and a select group of trail-blazing emerging markets.
  - The 2020s are the decade where lessons learned need to be replicated and scaled across emerging markets to ensure that their economies can grow sustainably, and help meet the objectives of the Paris Agreement.
  - Through fund-deployment and fund-raising activities, financial intermediation has an important role to play in activating more players in the investment chain, mobilizing more capital and ensuring more liquidity for the energy transition.
- **The “Roadmaps”: Exploring country-level clean energy finance to 2030**
  - Focus: The short- to mid-term opportunities for intermediation in mobilizing clean energy investment in emerging markets in order to fulfil the commitments of the Paris Agreement.
  - Countries: India, Indonesia, South Africa, Morocco and Brazil.
- **Final report - structure:**
  - Part 1: “Looking back”: The evolution of financial intermediation in delivering clean energy investment.
  - Part 2: “Present situation”: Current opportunities and constraints to mobilizing investment through intermediaries.
  - Part 3: “Looking forward”: The further potential of leveraging intermediaries to accelerate clean energy investment.

# India: Key references and background reading

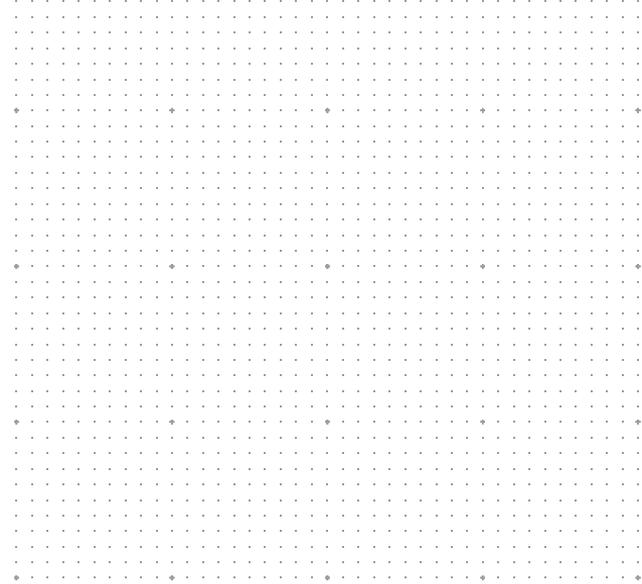
- Ministry of New and Renewable Energy (2021) [Annual Report](#)
- Ministry of New and Renewable Energy (2017) [PV Rooftop Programme](#)
- Ministry of New and Renewable Energy (2016) [Tentative State-wise break-up of Renewable Power by 2022](#)
- Ministry of New and Renewable Energy (2015) [National Renewable Energy Act](#)
- Ministry of New and Renewable Energy (2009) [Jawaharlal Nehru National Solar Mission](#)
- Ministry of Law and Justice (2003) [The Electricity Act](#)

# India contents

State of the energy transition	6
Financial ecosystem, capacity and financing needs	22
Leveraging intermediaries to accelerate clean power investment	31

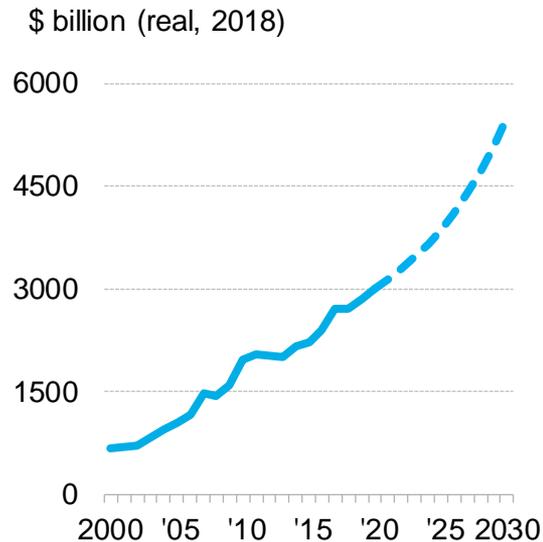
# State of the energy transition

India

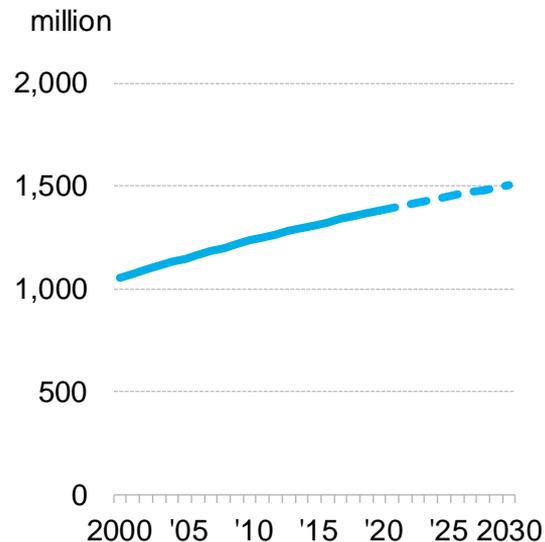


# India is poised for growth in 2020s

## GDP



## Population



## Comments

- World's fifth-largest GDP in 2020, fourth-largest by 2030.
- Second-largest population in 2020, largest by 2030.
- Second-largest power consumer in 2020, expected to remain so by 2030 according to BNEF's New Energy Outlook 2020.

Source: BloombergNEF, IMF, OECD.

Source: World Bank.

Source: BNEF New Energy Outlook 2020.

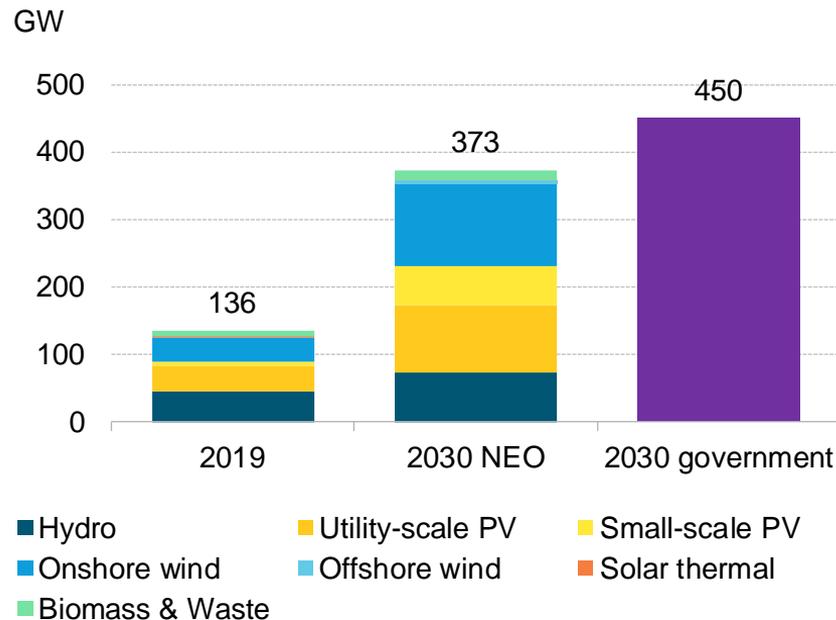
# After China, India has the most ambitious renewables target globally

## Renewable energy targets

Entity	Target	Comments
Ministry of New and Renewable Energy	450GW renewables by 2030 (60% of total capacity)	No official breakup of technologies available so far
Nationally Determined Contribution	40% non-fossil fuel based installed capacity by 2030	-
BNEF New Energy Outlook 2020	373GW renewables by 2030 (57% of total capacity)	Of which 159GW solar, 107GW wind, 5GW biomass, 73GW hydro

Source: India Ministry of New and Renewable Energy, BloombergNEF.

## Installed clean power capacity outlook

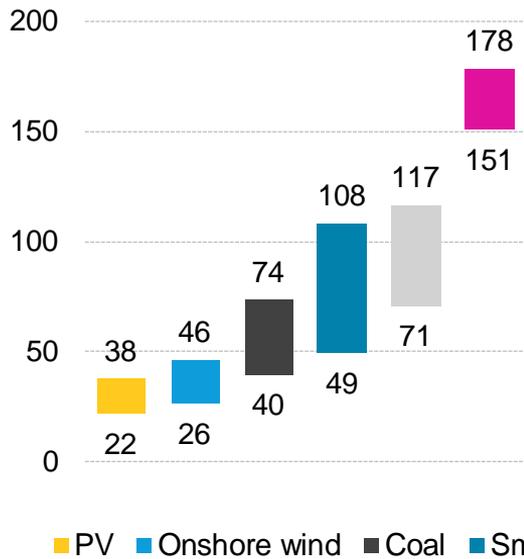


Source: India Ministry of New and Renewable Energy, BloombergNEF. Note: Capacity in DC. Hydro refers to small hydro, classed as under 25MW.

# India boasts best-in-class renewables costs to meet energy transition investment needs

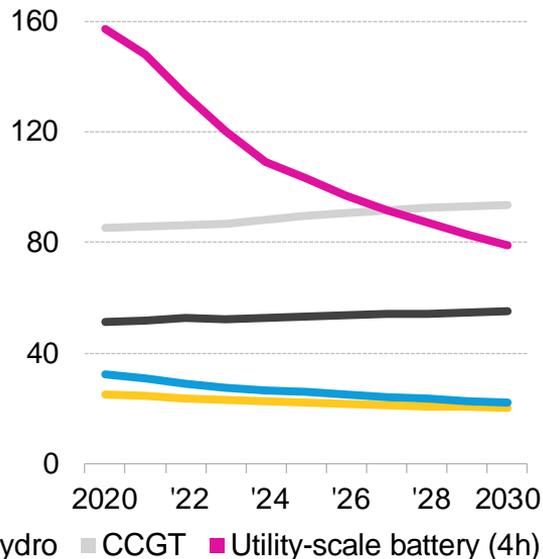
## 2H2020 LCOE

\$/MWh (nominal)



## Forecast LCOE (mid)

\$/MWh (2019, real)



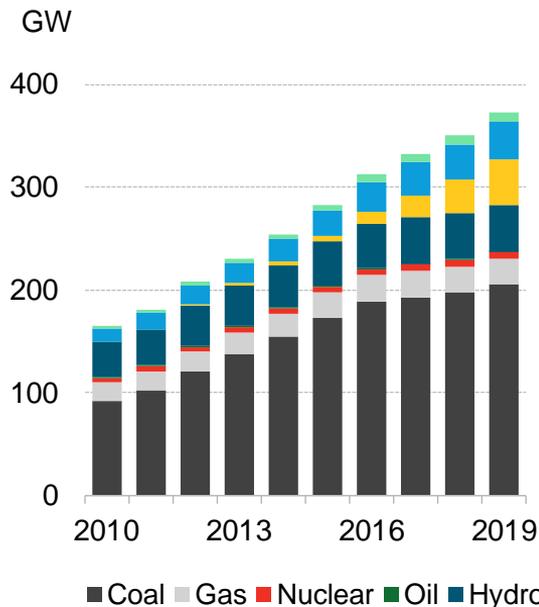
## Comments

- India's renewables are among the cheapest in the world, with fixed-axis PV and onshore wind below the global mid-range LCOE benchmarks at \$22-38/MWh and \$26-46/MWh respectively.
- PV and onshore wind are already the most competitive technologies on an LCOE basis and become even more so towards 2030.
- The current mid-range LCOE of utility-scale batteries lies above the global benchmark at \$151-178/MWh. While they will experience a steep cost decline until 2030, they will only become cheaper than combined cycle gas turbines in 2028.

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

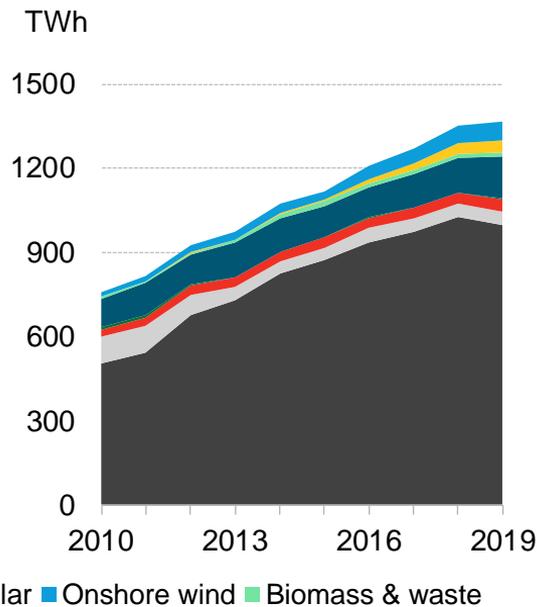
# Despite ample renewables, power generation is dominated by coal

## Installed capacity



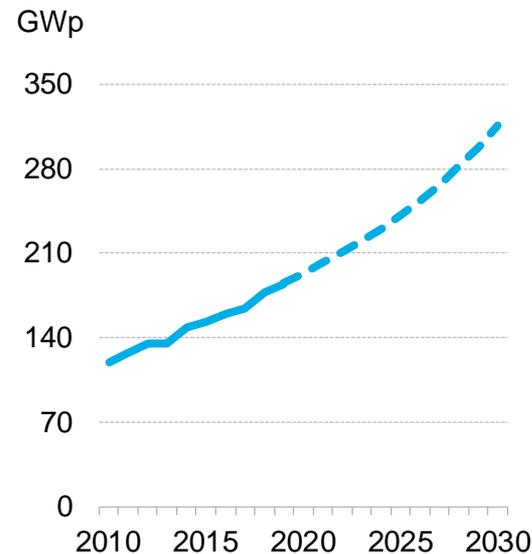
Source: BloombergNEF.

## Power generation mix



Source: BloombergNEF.

## Power demand trajectory

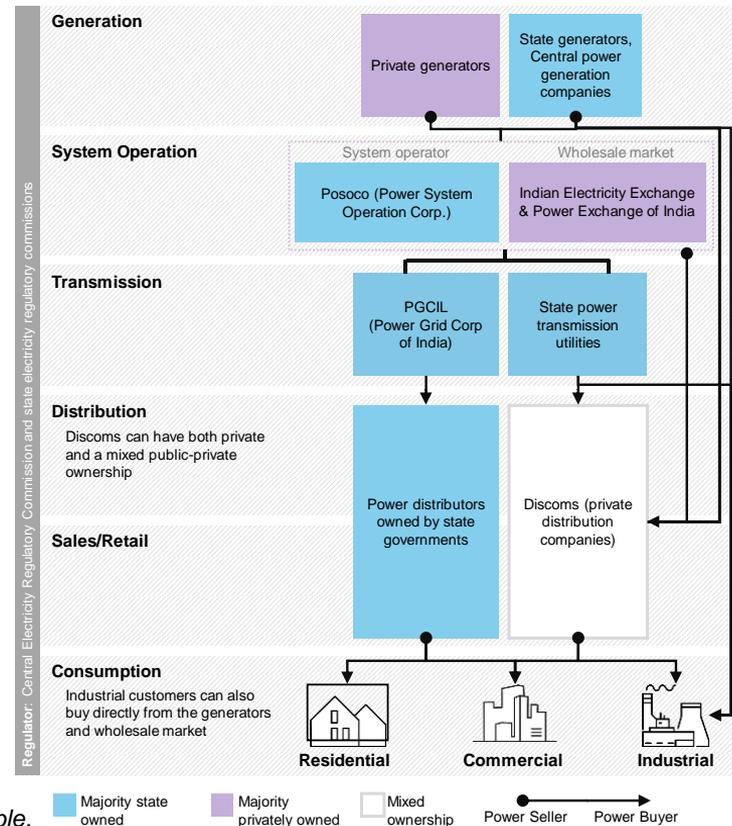


Source: BloombergNEF.

# India's power sector regulation facilitates the transition

Power sector fundamentals	Status	Comments
Utility unbundling	●	Fully unbundled
Private participation	●	Generation, transmission, distribution
Bilateral contracts	●	On- and off-site
Off-grid generation	●	C&I, residential and mini-grids allowed
Purchase obligation	●	Take-or-pay
Cost-reflective tariffs	●	Thermal power plants sign PPAs with a fixed and variable price component.
Wholesale market	●	Power exchange; economic dispatch
Standardized PPAs	●	PPAs signed in Indian rupees (wind, solar PPAs have single fixed tariff)

Source: BloombergNEF. Note: Green = available, yellow = somewhat available, red = not available.

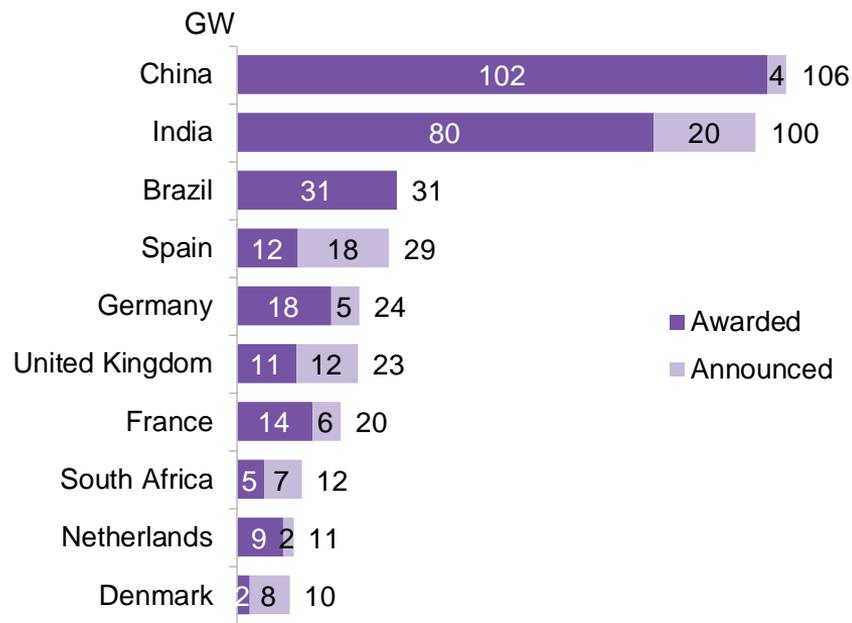


# Strong clean power policies are the backbone of India's energy transition

Clean power policy	Status	Start date	Technologies	Impact to date	Details
Clean power target	● In force	2015	All renewables (excl. large hydro)	Driver of further policies	175GW by 2022 450GW by 2030
Auctions	● In force	2010	Solar, wind	56GW auctioned	25-year PPAs in local currency
Feed-in tariff	● In force	1993	Biomass, small hydro, small-scale PV	50GW supported	25-year PPAs in local currency
Net metering	● In force	2013	Rooftop solar	5GW supported	Regulation differs by state
Accelerated depreciation	● In force	1962	All renewables (excl. large hydro)	Encourages companies to set up renewable projects	-
Priority grid access	● In force	2010	All renewables (excl. large hydro)	-	"Must run" priority dispatch
Renewables mandate	● In force	2010	All renewables (excl. large hydro)	-	17.5% by 2020, 19% by 2021, 21% by 2022

# Auctions have been the main investment driver to date

## World's largest auctions markets



Source: BloombergNEF. Note: Figures are cumulative over 2003-2020.

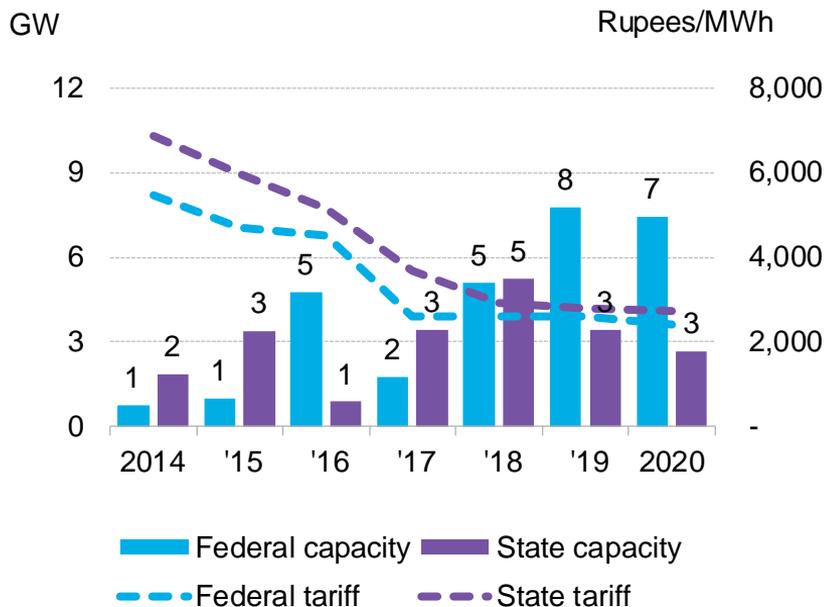
## Looking back: Largest auction market

- India's ambitious renewables targets for 2022 and 2030 are the bedrock for subsequent strong policy incentives.
- The Indian central government is strongly backing the build-out of renewables through its auction scheme. It was the world's largest auction market in 2020.
- Both federal and state-level auctions exist, which are characterized by transparent and standardized guidelines in addition to multiple rounds of stakeholder consultations. These include the option for amendments to encourage participation.
- Policies such as feed-in tariffs, net metering or renewables mandates further support the energy transition.

# ...yet there are differences between federal and state-level auctions

## Federal- and state-level solar auctions

## Outcome and looking forward



- Federal auctions have proved stronger than state-level auctions so far, with the latter being undersubscribed regularly.
- State-level auctions suffer from the effects of poor financial health of local public distribution companies, increasing offtake risk. In contrast, federal auctions act under a quasi-guarantee, as they sell to SECI (Solar Energy Corp of India). SECI's payment security funds provide a buffer to protect from payment delays.
- Bid levels have continuously decreased in the past years, making it one of the most competitive schemes worldwide.
- This, however, also creates (overly) high expectations regarding pricing, which has raised the risks of some auctions being cancelled.

Source: BloombergNEF.

# Aside from auctions, further drivers, but also bottlenecks exist

## Drivers

- Alongside India's strong renewables policies such as auctions, a number of other favorable policy incentives exist to support the market.
- Fiscal incentives include lower corporate tax for power generation, investment subsidies for small-scale solar installations as well as exemptions from Interstate Transmission System charges for solar and wind projects commissioned before June 2023.
- The federal government is also pushing to strengthen the grid through the Green Energy Corridor program or the build-out of grid connection infrastructure in the context of its solar parks program.

## Bottlenecks

- A major bottleneck of the Indian renewables market is a persistent tariff deficit, leading distribution companies into severe financial stress. Subsidized retail power prices, in addition to collection inefficiencies, make it difficult for public distribution companies to recoup costs. Privatization has been suggested, but opposed so far.
- While currently still limited, issues surrounding grid integration of large volumes of intermittent renewables will increasingly prove to be a stumbling block to India's energy transition. The grid currently lacks strength, flexibility, digitalization and demand-side response measures, all of which will be key to scaling up clean power in the future.
- In terms of project development bottlenecks, lengthy, bureaucratic land acquisition processes can prove a hindrance to rapid commissioning of assets.

# Spotlight: Distribution is the weak point of India's power sector

## Key issues to date

- The subsidization of power prices for residential and agricultural users negatively impacts the cost recovery of local distribution companies (discoms).
- To compensate part of the shortfall, C&I consumers are charged higher tariffs (cross-subsidization). In addition, the government provides financial support, yet payments are often delayed and lower than needed. This model is unsustainable both for the discoms and the state government budget.
- Aside from tariffs for residential and agricultural users being below the cost recovery threshold, poorly enforced metering and bill collection further exacerbate discoms' losses.
- The financial stress on discoms can lead to payment delays to IPPs and attempts at retroactive contract renegotiations or curtailment.
- Self-generation projects, particularly of C&I consumers, are not attractive prospects for discoms, as losing highly paying customers will increase their revenue shortfall.

## Impact of Covid-19

- The pandemic has further exacerbated the liquidity of discoms, with many in severe financial distress.
- As a result of lockdowns, overall power demand dropped. The resulting revenue shortfall, particularly of lucrative C&I consumers, has negatively impacted discoms' financial health.
- Through lower power demand, the share of renewables in the overall power mix increased due to their 'must-run' status, leading discoms to purchase all generated renewable power. Yet, due to the nature of thermal PPAs, which include a fixed and variable cost component, discoms simultaneously had to continue paying fixed costs of coal plants, even if their output was not being used.
- The dual impact of revenue shortfall and increased expenditures has led many discoms to shore up large payment delays to IPPs.

# Spotlight: The grid is not (yet) ready for large volumes of renewables

## Grid integration issues

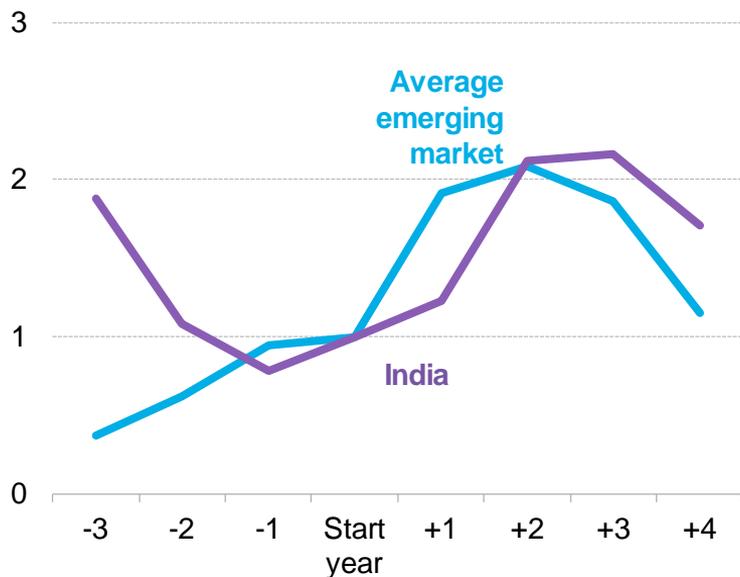
- While not (yet) a wide-spread issue, India's very ambitious push to install 450GW of renewables by 2030 will pose a challenge to network operators and discoms in terms of grid integration and stability. Intermittency of renewables resources can create issues of adequately balancing power supply and demand if stabilizing measures are not taken.
- The Indian grid lacks flexibility and is currently not equipped to deal with large volumes of intermittent resources. So far, there are no major policy incentives to support grid strengthening, nor have renewables auctions tended to include requirements regarding storage or limited dispatch during hours of low power demand.
- A further issue relates to the potential future curtailment of renewables due to the payment structure of PPAs with thermal plants. Split into fixed and variable tariffs, discoms need to compensate operators at least for fixed costs, even if their output is not used. In addition, technical requirements keep coal plants running at a certain threshold, meaning that for both technical and financial reasons, it makes sense for discoms to offtake at least a minimum amount of coal power. There is the danger that in a scenario of higher renewables share, curtailment risk increases.

## Solutions

- Power sector actors are aware of issues pertaining to grid strength and flexibility, with moves to improve transmission and distribution.
- Measures to strengthen the grid and allow it to become flexible enough to accommodate a high share of renewables include installing storage, increasing digitalization and automation and introducing demand-side response measures.
- Additionally, increasing and upgrading transmission lines, notably through regional interconnector capacity, allows for grid interconnectivity and can help even out power supply and demand.
- In the future, it could be useful for auctions to include energy storage mandates and/or requirements regarding hours of dispatch or peak hour availability. Policy incentives specific to grid strengthening and the installation of storage would also be useful. Finally, there should be a regulatory revisit of coal plant contracts to allow discoms to better manage balancing, particularly in times of low power demand and high renewables output.

# Auctions have attracted investment and decreased costs

## Auctions and investment growth



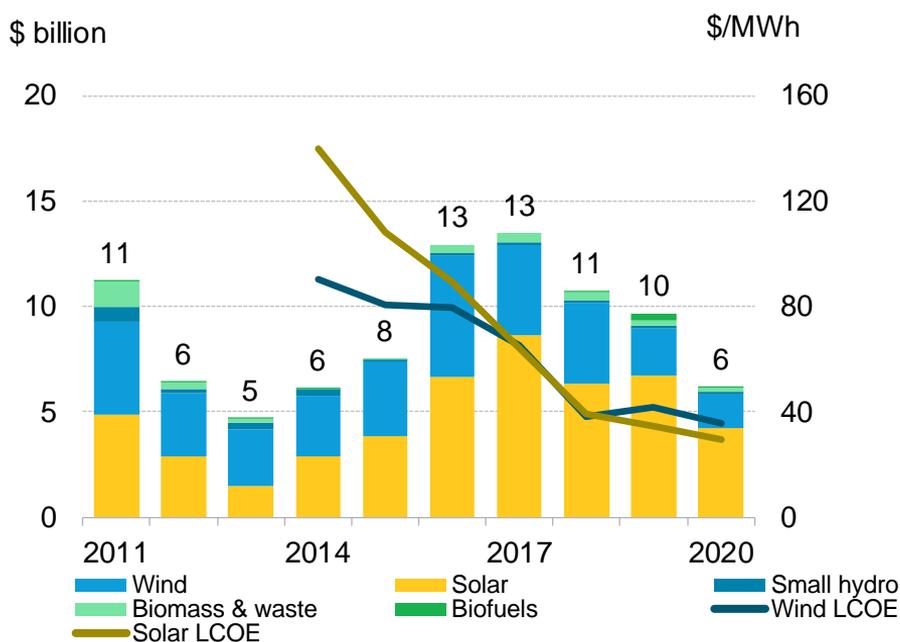
## Comments

- Across emerging markets, well-designed auctions are a key policy tool to attract clean power investment. Following the introduction of auctions, the volume of renewables investment in an average emerging market tends to increase, and competition helps to lower costs.
- India has seen a replication of this trend: While it introduced its first auctions under the National Solar Mission in 2010, the large-scale phase (Phase II) began in 2014. Between 2014 and 2017, India saw annual investments increase by 31.5% on average, jumping from \$5.8 billion to \$12.5 billion. Following strong competition, overall investment volumes dropped by 21% in 2018.

Source: BloombergNEF, CFLI. Note: Baselined growth to 100. "Average" includes 31 emerging markets that introduced auctions between 2012 and 2018.

# Investment volumes are decreasing on the back of falling technology costs

## Renewable energy investment



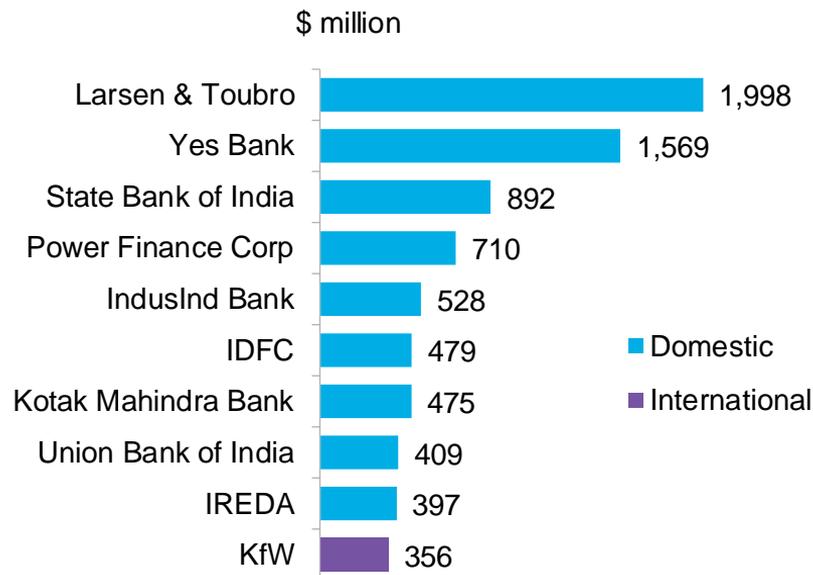
Source: BloombergNEF. Note: LCOE = Levelized cost of electricity.

## Renewables investment characteristics

- After China, India secured the highest clean power investment across emerging markets between 2011 and 2020, at \$89 billion.
- The majority of this investment targeted PV and wind, which absorbed \$49 billion and \$34 billion respectively.
- Falling investment levels in recent years are mainly attributable to a fall in technology costs (particularly of PV) in the wake of India's highly competitive auction. Between 2014 and 2020, the levelized cost of electricity for PV fell 22% annually, whilst for wind it dropped 13%.

# Domestic players are key to renewables lending

## Key renewables lenders, 2011-2020



## Renewables investor characteristics

- The major renewables project lenders of the past decade are domestic commercial and public banks and non-bank financial corporations (NBFCs).
- While international entities also lend to renewables projects, overall volumes tend to be lower.
- The Indian market is fully open to foreign investment, with the largest foreign clean energy investors to date being investment banks, private equity entities, developers and utilities.

Source: BloombergNEF. Note: IREDA = Indian Renewable Energy Development Agency, KfW = Kreditanstalt für Wiederaufbau. Numbers only include disclosed activity from lead arrangers and syndicated lenders.

# Summary: India's energy transition is largely on a good track

## 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, both domestic and international investors are already comfortable with the risks of utility-scale solar and wind projects.

### Strong economic trajectory

The expected growth of the economy and population will create additional demand for power in the 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, in addition to adding up to liabilities of state governments' 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.

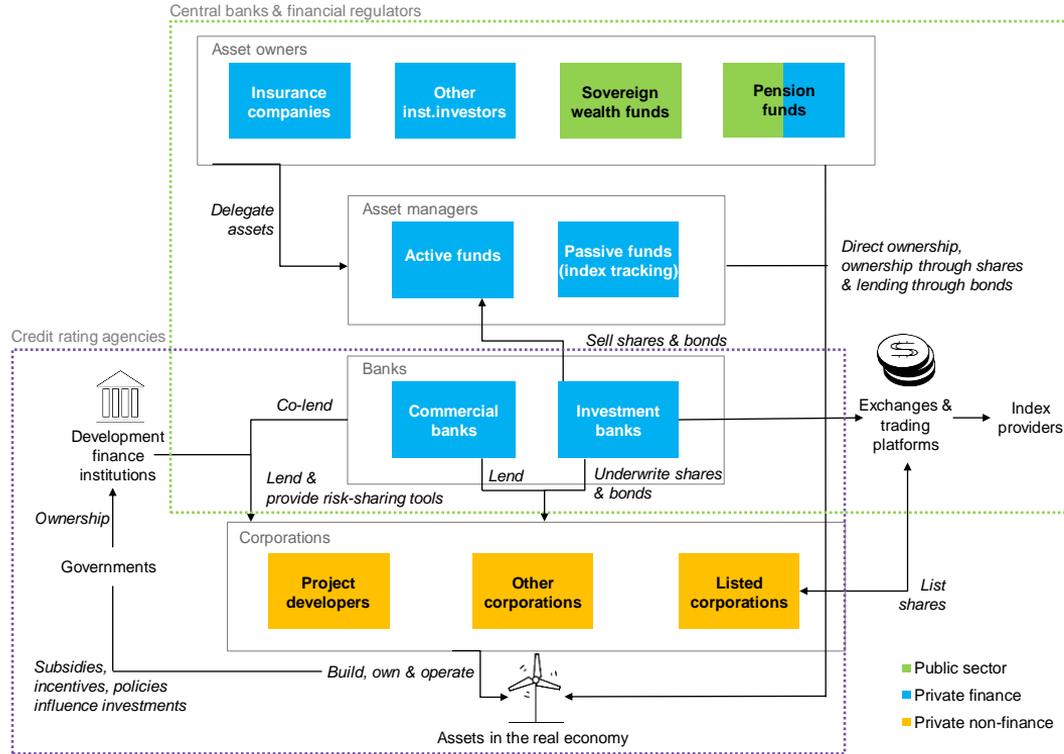
### Federal and state-level differences in power sector regulation

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

# Financial ecosystem, capacity and financing needs

India

# All segments of the investment chain are activated in India



Source: CFLI, BloombergNEF.

# Domestic investors are largely banks and corporations

## Investment chain representation

Entities	National	International
Asset owners	● Active	● Active
Asset managers	● Active	● Active
Banks	● Active	● Active
Corporations	● Active	● Active

### BNEF Take: Intermediation in focus

The domestic and international market are generally able to provide most of the renewables investment required. For larger and 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.

Source: BloombergNEF.

- The Indian financial sector is quite mature, with all major actors of the investment chain activated, though some may be more numerous and vested in energy transition investment than others.
- While the most active domestic financial participants in clean power investment are banks and corporations, asset managers and owners are becoming increasingly involved, with products such as Infrastructure Investment Trusts (InvITs) providing an access to renewables investment.
- Ample investment opportunities exist in Indian Rupees. Hedging is required when investment denomination is in U.S. Dollars, which is only viable for larger borrowers.
- In terms of projects, investors are generally comfortable with established technologies such as PV and wind. For less established technologies, the private sector tends to be more active in early-stage projects. Financing is mainly available for utility-scale projects, with financing for small-scale heavily dependent on state regulation and local partners.

# The Indian renewables space offers various intermediation examples

## Examples of financial intermediation in clean power projects in India

Entity	Investment banks	Pension and sovereign funds	DFIs with commercial banks
Example	Goldman Sachs, JP Morgan, Morgan Stanley and others.	Canada Pension Plan Investment Board, Caisse de dépôt et placement du Québec, APG, Mubadala, Abu Dhabi Investment Authority, India's National Investment and Infrastructure Fund and others.	Partnership between the Climate Investment Funds, the World Bank and the State Bank of India.
Aim	Early-stage risk financing of IPPs, such as ReNew Power.	Long-term financing of IPPs, such as Azure Power.	Expand rooftop PV market through strategic long-term, concessional finance, and support policy development, capacity building and knowledge sharing through grants.
Intermediation	Fund-raising	Fund-raising	Fund-deployment
Instruments	Equity stakes, in addition to financial advisory services.	Equity stakes and fixed-income holdings.	Concessional loans, grants.
Outcome	To pursue yield in new markets and fulfil sustainability targets, investment banks are taking equity stakes.	Institutional investors such as pension funds are seeking to green their assets in a long-term, low-risk manner, with credit-worthy, PPA-backed renewables projects providing steady and predictable returns.	DFI support lowers lending costs, making early-stage technologies commercially viable, and grows the market using technical assistance..

# The local financial sector offers most of the necessary instruments for renewables projects

## Financial sector maturity

Indicator	Value
Domestic banks' credit to private non-financial sector	53.4% of GDP
Domestic credit to private sector	50.2% of GDP
Lending interest rate	9.5%
Stocks traded, total value	43.8% of GDP
Turnover ratio of domestic shares	54%
Depth of credit information index (0=low, 8=high)	7
Strength of legal rights index (0=weak, 12=strong)	9

Source: Bloomberg Terminal, World Bank. Note: 2019 data.

## Key characteristics

### Debt:

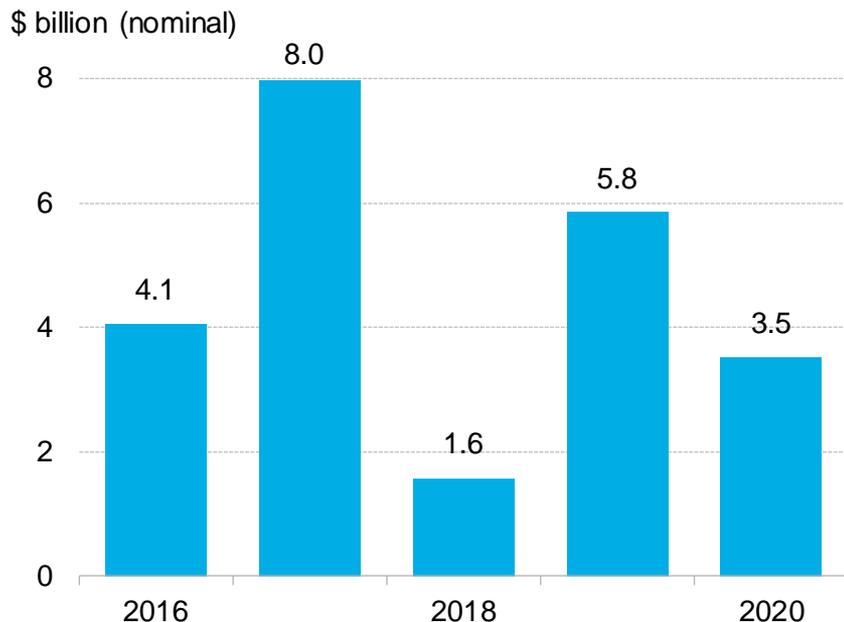
- Debt instruments such as loans are generally accessible from domestic commercial and public banks. Foreign commercial banks also lend, but in lower volumes. Supply has remained largely stable despite the Covid-19 pandemic.
  - Lending conditions have improved and become more suited to renewables project development in recent years, for instance through longer tenors. Pure non-recourse loans are however still not widespread, with a partial guarantee or letter of credit required.
  - The Indian bond market is fairly shallow, so it is not used as primary means of debt financing.

### Equity:

- Equity funding has been largely unaffected by Covid-19 and comes from a diverse range of domestic and international investors, such as family conglomerates, developers, institutional investors or private equity and venture capital.

# Green bonds are a popular financing instrument among India's largest IPPs

## Green bond issuance



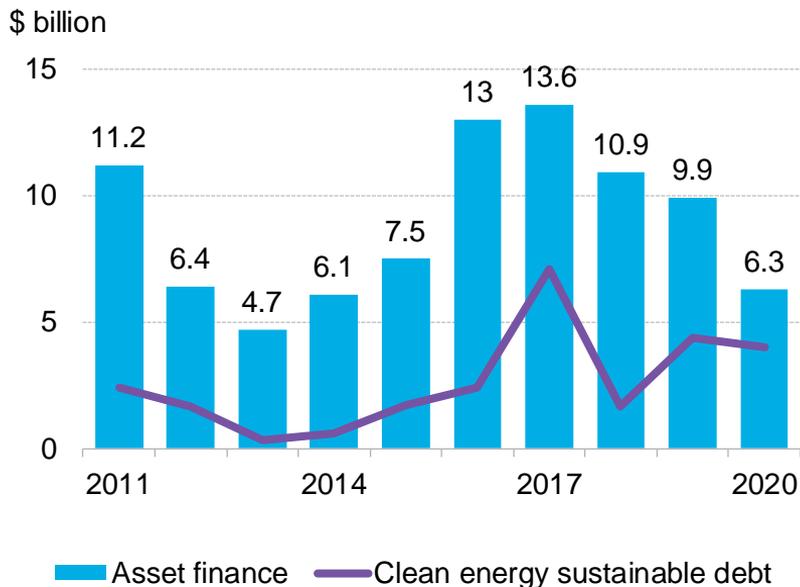
Source: BloombergNEF. Note: Includes labeled and unlabeled green bonds.

## Characteristics

- The majority of bonds for renewables projects in India are not labeled green due to high administrative costs and little added value for domestic investors. The premium for green bonds is more appealing to foreign institutional investors seeking to fulfil ESG mandates.
- Green bonds are more commonly offered via private placements in India, i.e. to pre-selected investors where the issuer has already established a rapport.
- Typical tenors range from five to 10 years, with the majority of bonds having fixed coupons and maturities.
- To date, only the largest Indian IPPs are pursuing green bonds as a means of refinancing existing assets on their balance sheet.

# Potential for further use of sustainable finance

## India clean energy sustainable debt volume compared to asset finance



## Comments

- Overall clean energy asset finance has decreased in recent years due to falling technology costs, with sustainable debt issuance in the power industry only increasing in recent years.
- Issuance of clean energy related sustainable debt has yet to exceed asset finance levels.
- Between 2011 and 2020, sustainable debt in the power sector was mainly issued by corporates at \$26 billion, with project-level issuances at \$0.2 billion.
- The majority of issuances were denominated in rupees (\$15.8 billion). Yet, denominations in U.S. dollars (\$9.3 billion) were also common, unlike euro (\$0.6 billion) and yen (\$0.5 billion).
- Sustainable debt issuance has so far mainly been used to refinance assets of an IPP's balance sheet.

Source: BloombergNEF. Note: Sustainable debt here only includes labeled issuances from utilities, renewable energy and power generation.

# Current favorable renewables financing conditions set to further improve

## LCOE assumptions

	2020				2030			
	PV	Wind	Coal	Gas	PV	Wind	Coal	Gas
Capex (\$/MW)	0.39	0.86	0.98	0.67	0.38	0.81	1.01	0.67
Debt ratio	80%	75%	70%	70%	80%	75%	54%	66%
Cost of debt (bps)	950	950	1265	1265	763	763	1255	1255
Cost of equity	12%	12%	14%	14%	9.8%	9.8%	15.5%	13.9%

## Comment

- Financing conditions are already very favorable for PV and will only continue improving.
- Onshore wind will see a decline in capex in addition to more favorable costs of debt and equity within the next decade.
- Financing conditions for coal deteriorate towards 2030.
- On an LCOE basis, PV and wind are the best suited technologies to add or replace power-generating capacity in the next 10 years.

Source: BloombergNEF. Note: Green shading = improvement, yellow = stable, red = deterioration. PV = fixed-axis PV, wind = onshore wind, gas = CCGT.

# Summary: Despite high investment levels, further growth is still required

## Opportunities

### Large investment needs for new clean power capacity

In the context of 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.

### Cut-price renewables financing costs

India's renewables, PV in particular, offer extremely favorable financing rates, which render investment in new capacity attractive.

### Financial sector maturity

The market has significant experience in terms of financing renewables, yet easily available non-recourse loans are still missing. Moreover, the general bond market is shallow.

### Explore further use of sustainable debt sector

There is potential to explore further sustainable finance instruments, such as green bonds or InvTs or green hedging models in order to better access international capital.

## Challenges

### Shallow bond market

India's bond market is not (yet) deep enough to make large-scale use of (green) bonds as a widespread means of financing for IPPs.

### 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.

### Hedging risk hinders wide-spread access to international capital

While the Indian market is liquid regarding renewables financing, limited access to international markets equals a missed opportunity in accessing larger capital volumes.

### Lack of wide-spread financing options for small-scale solar

As regulation differs by state, the offer for small-scale financing can be limited for residential and small corporate customers in particular due to subsidized tariffs, small ticket sizes, high administrative costs and lack of familiarity with the technology.

# Leveraging intermediaries to accelerate clean power investment

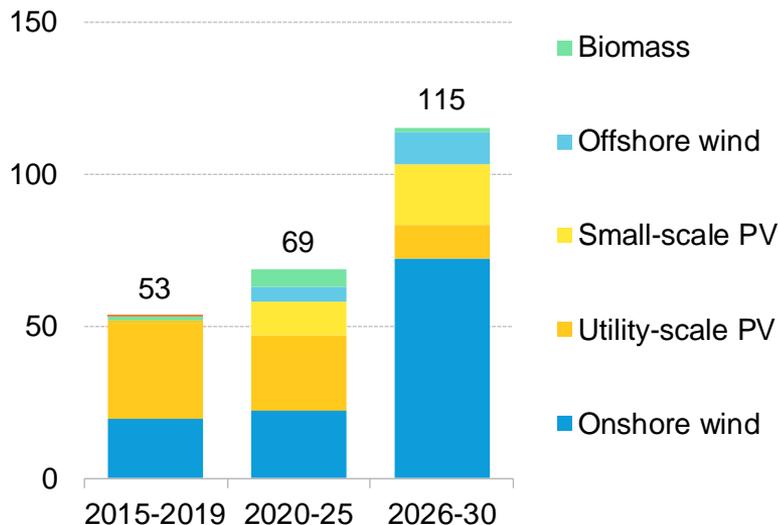
India

# Despite high levels already, investment volumes are set to more than double by 2030

## Least-cost investment pipeline, 2020-2030

## Investment outlook to 2030

\$ billion (real 2019)

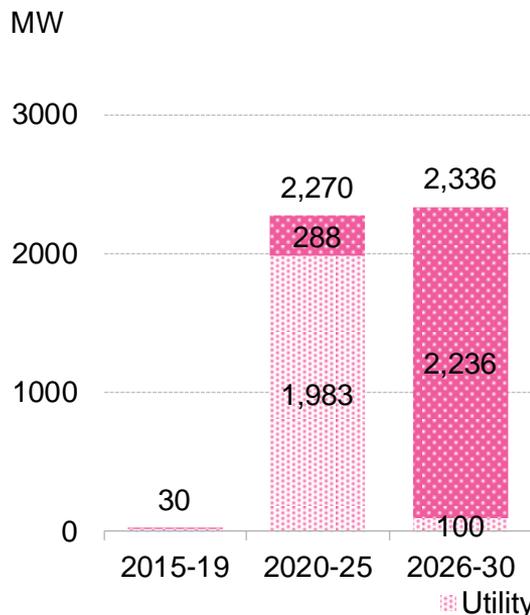


- BNEF's New Energy Outlook sees a large role for utility-scale PV and onshore wind in the next 10 years.
- The technology with the maximum least-cost-potential in terms of investment volume and capacity added is PV. The outlook for utility-scale PV amounts to \$36 billion in the next decade, with \$31 billion for small-scale PV.
- The majority of investment, particularly in the latter half of the 2020s, targets onshore wind at \$94 billion.
- There is only a limited role for offshore wind, at \$15 billion, due to the technology not being established yet in India.
- Given the market context of meeting growing power needs with clean capacity, financial intermediation is most useful to increase liquidity in order to scale well-established technologies. These include utility-scale PV and onshore wind, but also less widespread technologies such as small-scale PV and storage. It can be also considered as a means of helping to retire the oldest, least profitable fossil assets.

Source: NEO 2020. Note: Includes select renewable technologies only.

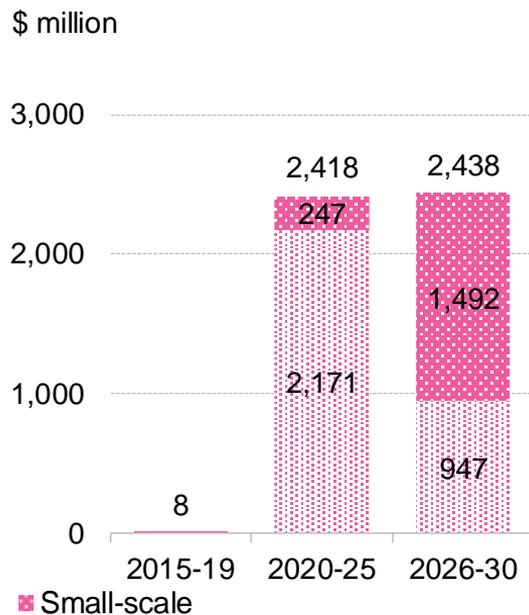
# Battery storage investment will pick up to help accommodate renewables

## Battery capacity outlook



Source: BloombergNEF.

## Battery investment outlook



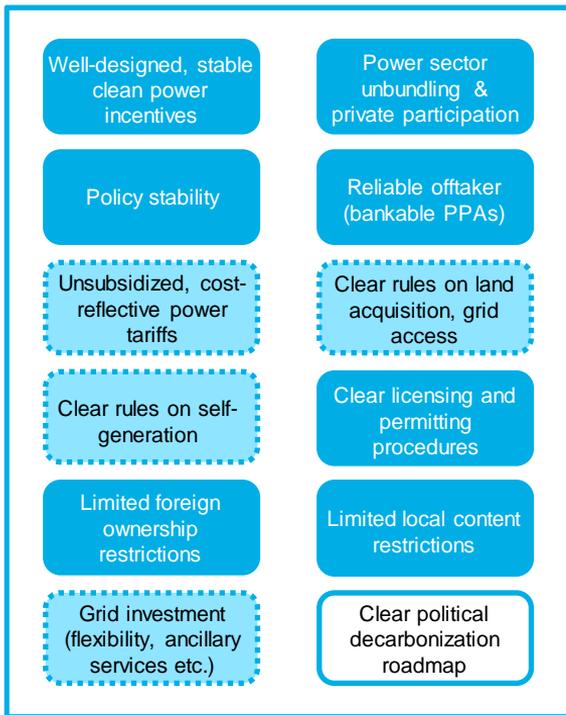
Source: BloombergNEF.

## Comments

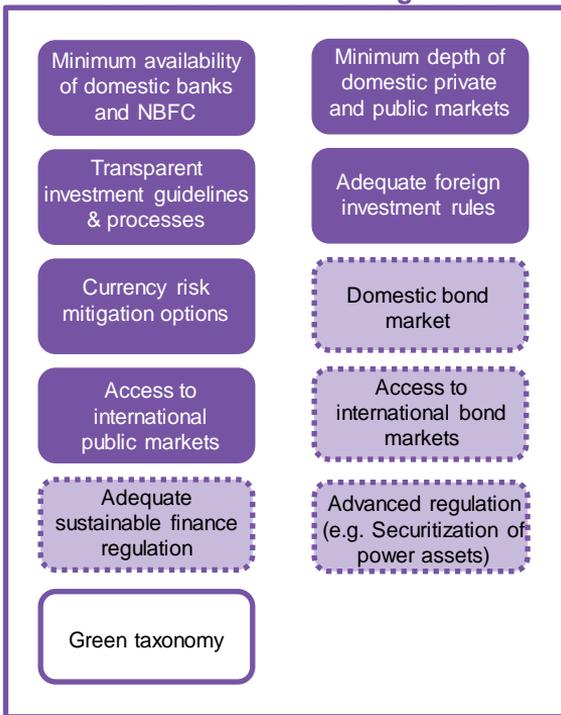
- Limited battery storage has been deployed to date, with 22MW of utility-scale and 8MW of small-scale batteries installed by the end of 2019, amounting to \$8 million invested.
- BNEF's New Energy Outlook sees 2GW of utility-scale storage built in 2020-2025, as the technology will be key to integrate large volumes of renewables in the first half of the 2020s. Small-scale storage is set to increase in the second half of the decade, with 2.2GW added.
- The cumulative investment opportunity for utility-scale storage in India amounts to \$3.1 billion between 2020 and 2030, and \$1.7 billion for small-scale storage.

# India has major fundamentals in place to leverage intermediation for the energy transition

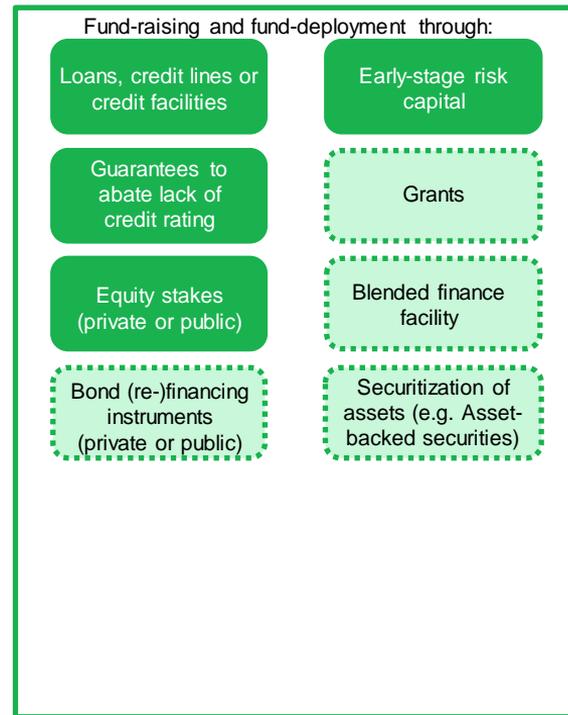
## Power sector



## Financial sector and regulation



## Financial intermediation



Source: CFLI, BloombergNEF.

Note: Full color = availability; dotted lines = partial availability; blank = remaining opportunity.

# India has most necessary prerequisites in place to scale the use of intermediation

- The roaring success of the Indian renewables market is testament to having all the necessary market fundamentals in order to attract investment. In the past decade, India has established itself as the world's largest renewables market following China and has attracted the second-highest volume of renewable energy investment across emerging markets.
- In the power sector, characteristics such as a strong enabling framework, power sector unbundling and policy stability have been some of the key drivers in clean power investment in the past decade.
  - **Acceleration opportunity:** meeting growing power demand through clean capacity and enhancing the grid to make it ready for variable resources offer ample investment opportunities going forward. Exploring further capital market options to finance utility-scale PV and wind assets, in addition to spreading the use of small-scale and self-generation projects through better-suited financing models offer some of the avenues to unleash new investment.
- In the financial sector, clear investment rules, a diverse set up of banks and non-bank financial companies as well as the variety of debt and equity instruments have helped provide financing for renewables in the past.
  - **Acceleration opportunity:** making greater and flexible use of (re-)financing instruments such as bonds offers opportunities to access larger volumes of investment. Tapping international institutional investors is currently limited to only the largest IPPs in the market, as issuing U.S.-dollar denominated green bonds incurs significant hedging risks in addition to the cost of certification. Further models such as securitization could also be increasingly explored, for instance to pool small-scale assets.

# Action area 1: Meeting growing power needs through clean capacity

Given the country's growing power demand and in line with its 2030 renewable energy target, India needs to scale up clean utility-scale capacity going forward. This is also of importance when thinking of renewables capacity needed to supply the electrification of mobility, for instance, which is becoming a greater focus area for India.

## Investment opportunities

- Especially domestic, but also international financial intermediaries will play a significant role in providing capital to state-owned utilities, IPPs and, to some extent, larger industrials. These will likely deploy mature and proven renewables technologies, in particular solar PV, but technologies such as storage will also be important to accommodate the increasing share of intermittent renewables.
- To access fresh liquidity, the role of capital recycling and other forms of accessing further investors must be considered. 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, funds such as InvITs can also be considered. If hedging risks can be addressed sufficiently going forward, this could also open up channels to international institutional investors.
- DFI funds would be very valuable in helping to bring down the cost of utility-scale storage. Thinking beyond the period of 2030, it could also be useful to explore the de-risking of unproven and costly technologies in the Indian market such as offshore wind and green hydrogen.

## Enabling environment opportunities

- 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 could, however, assist especially 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 also 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 looking into green hedging instruments.
- Technical assistance regarding the streamlining of state-level auction frameworks and discom business models can help clarify regulatory uncertainty and decrease offtake risk to support the build-out of utility-scale capacity (see Slide 37).

## Action area 2: Strengthening discoms' financial health

Poorly enforced metering and bill collection as well as the current cross-subsidization model is negatively impacting the revenue streams of discoms and increasing offtake risk. The unsustainable business model of discoms need to be addressed in the near future in order to improve their financial health and safeguard reliable offtake payments for the utility- and small-scale markets to grow.

### Investment opportunities

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

### Enabling environment opportunities

- 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.

# Action area 3: Preparing the grid for a large share of renewables

In order to accommodate large volumes of renewable capacity as foreseen under the government's 450GW by 2030 target, measures to facilitate grid integration will be necessary. Ample investment opportunities exist to strengthen the grid and make it more flexible.

## Investment opportunities

- Domestic intermediaries especially will be key to deploying and raising funds for transmission and distribution investment.
- Investment opportunities for transmission include the financing of regional intra- and inter-state transmission capacity ('green corridors') and interconnectors, such as through loans or InvITs.
- Investment opportunities for distribution include:
  - Supporting discoms in financing flexibility measures of the distribution network, e.g. through loans.
  - Using concessional finance to lower the cost for IPPs or discoms to install utility-scale storage, e.g. through supporting them in raising capital for projects.
  - "Proving" and scaling up demand-side response measures and small-scale storage.

## Enabling environment opportunities

- DFIs can help domestic intermediaries to gain familiarity with lending to more novel forms of network upgrades, such as digitalization, flexibility and demand-side response measures through blending DFI funding. In addition, help to aggregate such loans into a package like InvITs could help to access a wider range of investors.
- Technical assistance can be valuable in designing sound policy incentives to spur 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. Support for policy development can also be useful in terms of designing regulations on flexibility and balancing requirements.
- Capacity building and knowledge sharing can be key in supporting discoms in the implementation of flexibility and storage measures.

# Action area 4: Scaling up the self-generation and small-scale market

Growing the C&I and residential market will support India's energy transition. The market for smaller commercial and residential customers is currently underserved due to a lack of sufficient collateral, low ticket size, 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.

## Investment opportunities

- While larger C&I are already largely able to obtain the necessary financing, the market for smaller entities like SMEs still needs to mature. While this mainly involves enabling environment activities, supporting the development of self-generation projects coupled with storage through technical assistance and DFI funds could help to “prove” and grow the market.
- As the subsidized business model of the residential sector hampers profitability, the sector is currently not of interest to many domestic intermediaries. If at all, domestic banks or NBFC can deploy loans, credit lines or leases to install rooftop solar, also in combination with small-scale storage, yet this entails risks for the lenders. Community-ownership models could help to diversify risk and abate the challenge of scale and relative costs, yet would not address the underlying problem of non-cost reflective tariffs. Once the enabling environment issues are addressed, this would open opportunities for aggregation of small-scale projects, such as rooftop ABS, if aspects such as lacking credit ratings of households are properly accounted for.

## Enabling environment opportunities

- While DFI funding could be blended with loans, credit lines or leases of domestic banks or NBFC, this does not address the underlying fundamentals hampering the smaller commercial and residential 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.
- DFI support can also be valuable in terms of policy development: In order to expand the small-scale market, 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, this would create greater appetite among domestic intermediaries and allow to consider further options, such as the securitization of rooftop projects.

# Action area 5: Enabling a just transition away from coal

One of the key challenges to decarbonizing India's power sector is to ensure that newly added capacity is clean and that existing coal assets are retired where possible. In combination with concerns surrounding local pollution, it is likely most feasible to retire the oldest and most emissions-intensive plants first.

## Investment opportunities

- While this will mainly require technical assistance at the outset, domestic, but also international intermediaries with a focus on ESG can be valuable players in raising funds to phase out coal. Utilities and IPPs require suitable financing mechanisms to retire coal assets and, ideally, provide funding for new renewables projects and impacted communities.
- Investment opportunities include:
  - Green or transition 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 with initial support from DFIs, e.g. through funding and/or specifically designed bond-issuing/-purchasing collaborations.
  - Using decarbonization loans to monetize the reduction of emissions and provide funding for new clean capacity.

## Enabling environment opportunities

- Due to socioeconomic and political challenges, DFI support in a just transition from coal will mainly comprise technical assistance. The coal transition 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 power plants to discoms and state governments. Technical assistance can provide valuable support in this process.
- In addition, support for regulatory changes can include revisiting the structure of thermal PPAs, as the current split into fixed and variable charges disproportionately benefits coal plant operators, negatively impacts discoms' expenditures and poses curtailment risk to renewables in times of low power demand and high renewables output.
- DFI support will be crucial to prove the model of coal retirement finance and support in its design, implementation and financing. This can involve putting in place a framework to allow for the retirement of assets which are uneconomic and/or undepreciated, helping to structure a securitized instrument or bond and stepping in at a first-loss position.

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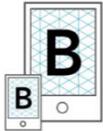
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