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# Renewable Energy Financing in India

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## Abstract

India's installed renewable energy capacity, as of 2022, is 111 GW. It aims to achieve a 500 GW installation by 2030, and has even pledged at the COP 26 summit, carbon neutrality by 2070. In this article, we go through a brief overview on renewable energy financing and the scenario in India. We touch up on the advantages and disadvantages of currently available modes of financing in the literature and discuss the way forward.

## Introduction

Transition to renewable energy is one of the primary goals of all the countries in the world to reach the targets pertaining to climate change stipulated in COP 27. Access to clean energy is required not only for environmental purposes but also for sustainable development. Better availability of clean energy gives rise to positive externalities such as job creation, competitiveness in terms of development, etc. It improves sanitation and agricultural productivity as well. In some countries, lack of equitable and affordable access to energy is a barrier which is preventing them from development.

In COP 26 summit, India, the fourth largest country by CO<sub>2</sub> emissions, has pledged to reach carbon neutrality by 2070. China and USA, countries in the first two positions with respect to CO<sub>2</sub> emissions, are attempting to be net zero in terms of emissions by 2060 and 2050 respectively. For this purpose, it has been estimated that India needs climate finance of \$1 trillion.

However, Climate Action Tracker rated the long term strategy for low carbon development which India put forward in COP 27 summit as "poor", for there have not been clear outlines on how it will be financed beyond current schemes and policies. The emissions sectors are not fully covered under the targets, and it excludes both international aviation and shipping. Moreover, there is reliance on international reserves to reach net zero emissions.

In this article, we will review important aspects of renewable energy financing and what contemporary literature and practitioners opine about how to finance the transition<sup>14</sup>.

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<sup>14</sup> Transition involves invention, innovation and diffusion [Polzin and Sanders(2020)]  
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## **Problems in Renewable Energy Financing**

Demand for electricity depends on highly uncertain factors. It is really difficult to forecast power demand in any region ahead of time. The practice has been to bifurcate demand into base load and peak load, while supplying base load with reliable power generation systems like thermal and hydro, and catering to the peak load with the help of renewable energy systems. Another major difficulty arises here, as two primary sources of renewable energy, i.e., solar and wind in turn depend on highly uncertain sources. In case of solar power generation, it is impossible to generate power during night time. Cost efficient storage technology is still under development.

Moreover, as per an Asian Development Bank report on India in 2018, owing to the federal structure of Indian government, it is necessary to coordinate between different players to accumulate financing, which is time and resource intensive. As can be observed, there is an urgent need for research to take place in order to facilitate innovation. However, uncertainty in the end result disincentivizes VC/PE investors from taking up renewable energy investments.

## **Modes of Financing**

Project financing usually involves non-recourse financing of one or more projects. In general corporate finance applications, there is a claim against the assets of the corporation; whereas in project financing, there is no scope to make similar claims, thus rendering it more risky. Other differences between corporate and project finance include the duration - corporate finance is essentially a going concern whereas a project has a particular predetermined duration; there are no reinvestments involved in project finance and it is a relatively complex transaction. Project finance operates through Special Purpose Entities. It even aids in reducing agency issues due to clearer outlining of dividend payouts. It also alleviates the problem of underinvestment by providing a special financing channel for projects for which funds are unavailable. It is worth noting that debt in project financing is usually raised from banks instead of bond issues owing to banks' superior experience. Banks generally have the expertise to lend to projects.

In general, renewable energy projects are characterized by high risk (uncertainty with respect to demand), necessity for long term investments, and can be financed with debt, equity or mezzanine financing. For patient capital, pension funds, private equity and venture capital funds seem to be a good source. Equity would be a good source to finance inventions and innovations while long term debt for financing diffusion.

## Indian Scenario

According to data from Central Electricity Authority website, share of renewable energy installations in Indian power increased from 26% to 29% from the year 2021-22 to 2022-23. As highlighted by Climate Action Tracker, we have to solidify our policies. There are several policy instruments in India to promote Renewable Energy, such as Renewable Purchase Obligation, Feed in Tariff, Renewable Energy Certificates, etc[Chatterjee(2017)].

**Renewable Purchase Obligations (RPO):** This mandates all electricity distribution licensees to purchase or produce a certain amount of their requirements in terms of renewable energy.

**Renewable Energy Certificates (REC):** An incentive to producers of renewable energy where producers who do not enjoy any concessions can register themselves and get an REC for each Mega Watt-hour of power generation.

RECs are tradeable in markets and aid companies in reaching their RPOs. A stream in contemporary literature has focused on how Venture Capital funding has impacted renewable energy project financing. Although on paper, RECs are very convenient to implement and cost of renewable energy generation has come down, they have not been quite the success they are expected to be, owing to distribution companies being locked in thermal power purchase agreements [Sawhney(2022)]. There are incentive schemes in India - accelerated depreciation, generation based incentives and viability gap funding. Accelerated Depreciation is a tax based incentive; Generation Based Incentives an incentive system per kWh of solar and wind generation and Viability Gap Funding is to encourage economically viable projects which fall short of financing. Indian power demand is dominated by residential users. By 2030, India expects renewable energy sources to power 50% of the demand and 500GW of installed capacity. To achieve this and other decarbonization targets set for our country, solar and wind power generation has to be increased. Recently, REC, a state owned infrastructure finance company has expanded its loan book to accommodate a huge chunk of the financing. To improve the collection of dues, it has also implemented a late payment surcharge system.

Coming to the current financing structure in India, non-recourse loans are rare to non-existent. There is at least a limited amount of claim in the loans. Loans, in general, are not long term as well due to asset-liability mismatch problems. In this case, project refinancing is the way out, for which the green bond market is the preferred route. The Framework for Green Bonds in India outlines the principles as (i) Use of proceeds, (ii) Project Evaluation and Selection, (iii) Management of Proceeds, and (iv) Reporting. Projects which encourage reduction in emissions and contribute towards realization of Sustainable Development Goals (SDGs) are classified as green projects. India recently launched its first green bond to raise \$2 billion. The first issue was a hit and was oversubscribed more than four

times and obtained a greenium of about 5-6 basis points, thus reducing the cost of financing. Having issued the bonds in local currency also proves to be advantageous, as the problems of currency exchange and asset liability mismatch can be avoided. Bonds group diverse asset portfolios and hence provide the advantage of tradability, fixed coupon rate and diversification. Equity financing in India is dominated by private equity and pension fund investors.

However, excess interest on de-risked projects leads to less investments in greenfield projects. There is a lot of scope for improvement in this field. Saboo and Srivastava(2022) suggest setting up a dedicated infrastructure bank for this purpose.

Although the tariffs and required rate of return on equity have reduced leading to a boom, the current troubles renewable energy projects face in India are caused by supply chain disruptions brought forth by the pandemic and Ukraine war.

In order to improve the efficiency and returns, Saboo and Srivastava(2022b) suggest hybrid projects of more than one technology, while also using financial engineering innovations for improving returns. This would aid in reaching the sustainability goals set up for India. There has been what van den Heuvel and Popp(2022) call a 'CleanTech bubble'. Gaddy, Sivaram, Jones and Wayman(2017) use publicly available data on cleantech firms and find that cleantech software is an attractive investment while hardware is not. As van den Heuvel and Popp(2022) elaborate on the causes, Venture Capital funds initially invested a huge amount of money in clean energy technologies, but the demand for clean energy was unfortunately not sufficiently high, which led to lot of these companies to perform poorly. The authors highlight the need for a positive demand shock for VC investments in the field to be profitable. Gaddy et al(2017) state the need for public policy intervention, federal policy initiatives to encourage research and innovation. Polzin and Sanders(2020) suggest scaling up of investments based on ESG themes, encouraging investments in terms of human capital, sharing risks with public or semi-public investors, developing innovative financial products by pooling into larger funds to take advantage of economies of scale.

For Venture Capital funds to show more interest in renewable energy investments, the government has to support them by implementing encouraging policies. There must be creation of demand through policies such as carbon pricing. However, in the US setting, it has been shown to be difficult to implement it [van den Heuvel et al(2022)]. The CleanTech boom has also failed because of failure in creation of demand for clean energy. Even from a strategic business perspective, clean energy startups are quite different from Information & Communication Technology startups and do not comprise of the benefits provided by network effects, patents and product differentiation. It is hard to protect incumbents from the threat of competition owing to this, making renewable energy ventures further

more unattractive for private capital. Hence, the onus falls on governments to try and implement demand enhancing policies.

### **Public Policy Initiatives**

As described earlier, renewable energy projects are capital intensive. Arrangements such as offtake arrangements and power purchase agreements fix the price of energy in terms of long term concession agreements. There are tax partners who invest in the project in view of the tax benefits. Apart from this, public policy initiatives are also required in order to incentivize participation of investors in renewable energy projects, especially in developing countries like India.

Rather than renewable energy production being costly, the enticing feature about mainstream energy production is that it is cheaper economically, albeit with externalities like pollution. Hence, one way out can be to tax conventional energy more. Carbon taxes are one such mechanism. However, it is hard to control the amount of emissions with a particular amount of tax, as it is hard to forecast how much amount of tax would restrain how much emissions. According to OECD data, India has a carbon tax base of 34,72,686.80 kilotonnes, compared to a global weighted average of 3,99,54,156 kilotonnes. In India, there is no explicit carbon tax. However, there is a fuel excise tax, covering nearly 55% of the emissions as of 2021. A coal tax has also been introduced which increased the price of coal from INR 50 to 400 per tonne.

A tradable permit system can be used in this context. However, volatility of the prices is a disadvantage. Surat in Gujarat has implemented a cap mechanism on permits. Another point to be noted is that if a particular state or country imposes strict cap on the amount of permits to be used, industries would move to neighbouring countries/states, thus potentially worsening global pollution [Ben-David et al(2018)].

Harstad(2012) suggests a supply side mechanism instead of demand side mechanisms (discussed above). He explains that demand side policies cause countries which do not participate in emission limiting agreements to increase their consumption owing to reduction in demand for and hence the price of the permits. Instead, by purchasing the deposits (of say coal), the countries in the coalition can limit the supply and do not need to fear negative externalities.

Moving to subsidies to renewable energy, production tax credits and investment tax credits are usually implemented for wind and solar energy respectively. In India, although renewable energy investments have increased, the subsidies have dropped considerably from 2017 to 2022, which is a matter of concern, considering its objectives [CEEW, 2022].

Year	Subsidy(in INR Crore)
2017	16312
2018	15111
2019	8352
2020	7550
2021	5774
2022	11529

CEEW suggests introduction of more subsidies for renewable energy along with subsidies on LPG, mandatory diversification of PSUs, increased clean energy lending targets and strategic taxation.

## Conclusions

Renewable energy financing is inherently very complex due to the uncertainties involved. However this does not reduce the necessity of transitioning from conventional energy sources. It is very much necessary to encourage lending as well as equity financing in this sector. Policy initiatives such as tax subsidies, carbon taxes, etc. would also prove beneficial. Government should step in and implement demand enhancing strategies which makes it lucrative for VC funds to pour in private money, which is patient capital and best suitable for renewable energy startups. As highlighted in Climate Action Tracker report, it is important to make the aims of our renewable energy policy less hazy so that it would be easier to understand the capital requirements and take calculated strides to reach the goals. A diversified financial system is the path ahead.

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