

## Financing India's Renewable Energy Revolution

India is on a pivotal journey to significantly expand its renewable energy capacity, with ambitious targets set for 2030 and a vision for net-zero emissions by 2070. Achieving these goals requires not only a massive scale-up in renewable energy capacity but also a corresponding surge in financial investments. IRENA and other global bodies have highlighted the urgent need for increased investments in renewable energy to meet climate goals, making financing a central challenge for India and other nations.

Global investment in renewable energy has seen significant growth, reaching a record \$0.6 trillion in 2022. While this figure marks a substantial increase, it still falls short of what is required to align with the 1.5°C climate target set by IRENA. In fact, the current investment levels represent less than one-third of the annual investment necessary to keep global warming within safe limits. In 2023, the total investment in energy transition technologies, which encompasses renewable energy and energy efficiency, approached \$2 trillion. This surge underscores the growing recognition of the need for urgent action to combat climate change. However, to truly make a difference, annual investments need to quadruple. This means that the world needs to mobilize approximately \$4-5 trillion annually to effectively transition to a low-carbon economy and meet the climate targets set by international agreements.

Debt financing plays a critical role in the global energy sector, constituting 46% of global energy investments. This is particularly true for projects with predictable revenue streams, such as solar and wind energy, which have become increasingly attractive to investors due to their stable returns. Public finance remains a cornerstone of energy investments, accounting for 37% of the total. This is primarily driven by state-owned enterprises in emerging economies, where public funds are often used to de-risk investments and attract private capital.

India's renewable energy goals are among the most ambitious in the world. By 2030, the country aims to add 500 GW of renewable energy capacity, a target that requires an estimated \$500 billion in investments. This financial requirement is spread across various sectors within renewable energy, including large-scale solar and wind projects, grid infrastructure, storage solutions, and decentralized energy systems. To achieve its 2030 goals, India needs to mobilize approximately \$30-40 billion annually. However, the challenge does not end there. Maintaining progress towards net-zero emissions by 2070 will require continuous investments, estimated at around \$10-15 billion per year after 2030.

Historically, India's renewable energy sector has been primarily financed through public sector banks and financial institutions. Entities like the Power Finance Corporation (PFC) and Rural Electrification Corporation (REC) have provided long-term, low-interest loans that have been instrumental in financing large-scale projects. However, as the sector expands and the demand for capital grows, there is an urgent need to diversify the financing mix. Multilateral development banks, such as the World Bank and the Asian Development Bank (ADB), have played a significant role in providing loans, grants, and technical support for renewable energy projects in India. These institutions can further contribute an

estimated \$5-10 billion per year to support the country's energy transition. Additionally, large Indian corporations such as Tata, Adani, and Reliance have been at the forefront of investing in renewable energy, driven by both regulatory requirements and strategic considerations. These companies are expected to contribute around \$10-20 billion annually to expand their renewable energy portfolios.

To attract the necessary investments, India must adopt innovative financing models that have been successful globally. Issuing green bonds is one of the most effective ways to raise funds from investors who are interested in sustainable investments. Countries like Poland and France have successfully issued sovereign green bonds to support their environmental initiatives. India can follow suit and aim to source around \$5-10 billion per year through green bond issuances. These bonds can be used to finance a wide range of projects, including renewable energy, energy efficiency, and climate adaptation. Public-private partnerships (PPPs) also offer a viable solution by combining the strengths of the public and private sectors to finance large-scale renewable energy projects. Public-private partnerships have proven effective in delivering large infrastructure projects by offering government guarantees and risk mitigation strategies that attract private investors. The United Kingdom's Private Finance Initiative (PFI) and Australia's PPP framework are prime examples of how these partnerships can work in practice. In India, PPPs can play a crucial role in financing the development of grid infrastructure, storage solutions, and large-scale solar and wind farms.

Another innovative financing model is Renewable Energy Investment Trusts (REITs), which provide a steady income stream and are traded on stock exchanges, making them accessible to a broad range of investors. In the United States, Real Estate Investment Trusts (REITs) have shown significant promise for infrastructure projects. By creating a similar structure for renewable energy, India can attract substantial private capital and democratize investment in this critical sector. These can be particularly useful for financing smaller, decentralized renewable energy projects, which often struggle to attract traditional sources of funding. Additionally, blended finance, which combines concessional funding from international development banks with commercial finance, can lower the overall cost of renewable energy projects and attract private investments. The Global Infrastructure Facility (GIF) and the GCF have successfully used blended finance to bridge the funding gap for large-scale projects in developing countries. In India, blended finance can be used to support high-risk projects, such as those involving new technologies or those located in less developed regions.

Decentralized financing is also crucial for expanding energy access in rural and remote areas. Financing for decentralized renewable energy systems, such as rooftop solar panels and mini grids, is vital for achieving energy access goals. Innovative methods like microfinance and pay-as-you-go models have been successfully implemented in countries like Kenya and Bangladesh. These models allow households and small businesses to invest in renewable energy solutions without upfront costs, making clean energy accessible to a broader population. In India, decentralized financing can play a key role in electrifying regions with low access to traditional energy sources.

Institutional investors, including sovereign wealth funds and pension funds, represent substantial sources of long-term capital that can be tapped into for renewable energy investments. These funds are typically



looking for stable, long-term returns, which makes renewable energy projects an attractive investment opportunity. By offering stable and attractive returns, India can encourage these funds to invest in its renewable energy projects. Norway's Government Pension Fund Global (GPFG) and the Canada Pension Plan Investment Board (CPPIB) have made significant investments in renewable energy globally. Attracting these investors will require India to create a stable and predictable regulatory environment, as well as to develop financial instruments that meet the needs of institutional investors.

Public finance remains a crucial element in the global energy transition, particularly in emerging economies like India. State-owned enterprises (SOEs) and public financial institutions have historically played a key role in financing infrastructure projects, including those in the energy sector. In India, public finance is expected to continue playing a significant role, especially in de-risking investments and attracting private capital. Institutions like the Power Finance Corporation (PFC), Rural Electrification Corporation (REC), and the Indian Renewable Energy Development Agency (IREDA) are expected to continue providing significant funding for renewable energy projects. These institutions can help anchor financing for large-scale projects, providing the necessary liquidity and risk mitigation to attract private investors.

International support is also crucial for India's low-carbon transition, the World Bank has approved \$1.5 billion to bolster India's efforts. This funding is aimed at scaling up renewable energy and developing green hydrogen, which is seen as a key technology for decarbonizing sectors that are difficult to electrify. Moreover, the Indian government has acknowledged the need for substantial adaptation finance, estimating that around \$10.1 trillion will be required for climate action by 2070. This includes investments in renewable energy, climate resilience, and infrastructure that can withstand the impacts of climate change.

To meet its renewable energy targets by 2030 and achieve net-zero emissions by 2070, India needs about \$500 billion in investments. The annual investment requirement is estimated to be \$30-40 billion from 2024 to 2030 to add 500 GW of renewable energy capacity.

After 2030, continuous investments of \$10-15 billion per year will be necessary to maintain progress towards net-zero emissions. The financing of these projects can be anchored by Indian banks and non-banking financial companies (NBFCs), contributing around \$10-15 billion per year. Additionally, large corporations and foreign investments, supplemented by green bonds, can raise an additional \$5-10 billion annually. The funds raised through these various sources will be channeled into different areas of the renewable energy sector, including large-scale solar and wind projects, mini-grids, rooftop solar, off-grid solutions, grid infrastructure, storage solutions, and research and development.

India's renewable energy goals are ambitious but achievable through diversified financing, including green bonds, public-private partnerships, and renewable energy investment trusts. Attracting institutional investors and leveraging public finance are key. International support, like the \$1.5 billion from the World Bank, is crucial. By adopting innovative approaches, such as renewable energy auctions, India can meet its targets and drive sustainable growth.



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