

# GREENING INDIA'S FINANCIAL MARKET: OPPORTUNITIES FOR A GREEN BANK IN INDIA



## ABOUT THIS REPORT

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# EXECUTIVE SUMMARY

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**India is at a critical juncture in scaling renewable energy to provide energy access to growing cities and vast rural communities. Financing is one of the principal barriers to the rapid expansion of India's clean energy market needed to meet the ambitious national target of 175 gigawatts (GW) of solar, wind, and other renewable energy by 2022, as well as the broader targets of the Paris Climate Agreement. Financing must be not only abundant, but also cheap, so that clean energy can compete with fossil fuels. Therefore plentiful, low-cost capital will allow India to transition to a clean energy platform while enabling continued economic growth.**

Although investment in renewable energy and energy efficiency is growing both internationally and in India, the scale of investment does not yet match the scale of financing needed for India to reach its internal clean energy targets.<sup>1</sup> Over \$160 billion of investment is required in the next six years to reach India's solar, wind and efficiency targets to increase clean energy access. Significant collaborative efforts are required from various stakeholders, including government, financial institutions, investors, industry, and research organizations, in order to develop innovative financing solutions to achieve these targets. The key barriers to clean energy finance in India include lack of enough domestic debt capital to finance infrastructure, high cost of domestic debt capital, high perceived risk due to lack of knowledge within the domestic banking sector about innovative clean energy technologies, and off-take and currency risks for foreign investors.<sup>2</sup>

Strong policy settings and incentive structures must be adopted to enable renewable energy investment to scale up to needed levels in India. Dedicated "green" financial institutions known as green banks are proving to be successful models internationally at leveraging public funds to bring in private capital. Green banks could propel India's solar and wind energy markets and support critical energy-efficiency and climate resilience projects.

To achieve India's clean energy and climate goals, an innovative financial institution like a green bank can leverage limited public funds to reduce capital costs and

risk – unlocking broader private investment in clean energy projects to scale up the market. In this way, green banks tailor their offerings to match domestic needs and can help mainstream green investment locally. Green banks have many tools at their disposal to grow clean energy markets in three primary forms:

- Offering flexible, affordable lending that matches the terms and payback period of a clean energy project, thereby lowering the cost of energy.
- Using financial products and techniques to mitigate specific risks that currently limit investment in the Indian clean energy market.
- Engaging in market development and demand generation.

Green banks can attract and channel international capital and accelerate domestic investment by leveraging limited public funds to reduce risks, resulting in abundant and affordable capital to scale clean energy. For example, major providers of international public finance, such as the World Bank are stepping up their commitment to invest in the transition to low-carbon economies. The World Bank recently committed to spending 28 percent of its investments (worth \$16 billion) directly on climate change projects.<sup>3</sup> While this money is not traditionally directed towards climate change or low-carbon projects, green banks have the potential to both attract and deploy this money in India.

## FIVE KEY TAKEAWAYS: BENEFITS OF A GREEN BANK IN INDIA

- **A green bank is an institution that is more than the sum of its parts.** Green banks are a new kind of specialized intermediary designed to accelerate the growth of clean energy markets.<sup>4</sup> Their role is not to replace or “crowd out” commercial banks and private investors but to “crowd in” private capital. What this means in practice is different in each country. Green banks are tailored to the country’s goals, resource endowment, market opportunities and market risks. Green banks use private-sector experience and discipline in the service of the public good. They play a transformative role because neither traditional government programs, with their limited engagement with markets, nor the private sector, with its competitive pressures and fiduciary constraints, can reliably achieve this outcome.
- **Better financing terms means more projects, lower cost energy and lower subsidy costs.** Domestic Indian banks typically offer higher interest rates and shorter financing terms than would be economical for clean energy projects. High-cost, short-term and variable-rate debt raises the cost of renewable energy in India by 24 to 32 percent compared with similar projects in the United States.<sup>5</sup> Green banks introduce lower lending rates and flexible terms that match the terms and payback period of clean energy projects because of their green investment mandate, specialized green underwriting expertise, and public sources of capital. This enables a broader pool of clean energy projects to be viable, making projects more likely to be developed and also attract diverse investors, including directing international sources of capital to local projects. Ultimately, this will drive down costs to a rate competitive with coal. Low cost debt can also reduce the overall subsidy cost by 28 to 78 percent relative to existing support of renewable energy.<sup>6</sup>
- **Green banks keep lending costs low.** Green banks help bridge the gap between the perceived risk associated with clean energy investments and the expectations of the private lenders by offering products such as subordinated debt, partial credit guarantees, insurance, or loan-loss reserves. Green banks play a leadership role that can guide commercial lenders. Since some commercial lenders are unfamiliar with clean energy technologies, higher perceived risk exists for financing clean energy projects. The risk mitigation products offered by green banks can help private banks execute

the initial transactions for clean energy projects. Additionally, green banks can provide aggregate market information and facilitate best practices to increase transparency, boost investor confidence and reduce perceived risks in clean energy investment. Following “open source banking” techniques like tracking, publishing and sharing information about the performance of projects and investments in other markets can further reduce real and perceived risks and boost investor confidence.

- **Investment partnerships bring new players on board.** Green banks lend their name, capital, and credibility to clean energy projects thus making them more attractive for private investors. Co-investment, in which the green bank lends in consortium with other commercial banks, helps bring new lenders to the clean energy markets. Green banks can also identify and analyze technologies that are new to the local market, but have a track record elsewhere. This can expand financing for commercially mature, but unfamiliar technologies to India. Green banks can potentially attract higher international capital in India and facilitate rapid scaling up of the domestic market.
- **Green banks facilitate the scaling up of distributed clean energy resources.** Small projects like rooftop solar and off-grid solar applications in rural villages have the potential to be transformative in India. The main barrier is that financing small, nonstandard projects, individually and on a one-off basis, incurs high transaction costs and is often perceived as high risk. Green banks can establish standard terms as a requirement of receiving financing. This reduces costs and has the added benefit of allowing projects to be more easily aggregated into a portfolio. To stimulate markets, green banks can finance, aggregate or “warehouse” deals to reach a scale where they become attractive for on-sale to large investors or for securitization through green bond issuances. Once this has been demonstrated, commercial lenders and other investors understand it is possible and can replicate.

*This report on green banks is the latest in the NRDC-CEEW India Clean Energy Finance Series.<sup>7</sup> IREDA along with NRDC and CEEW released an interim version of this report in May 2016 during an extensive stakeholder consultation with Minister Piyush Goyal. This final report is based on the May 2016 discussions as well as additional discussions with the Ministry of New and Renewable Energy and key stakeholders.*

# SECTION 1

## GREEN BANKS AND HOW THEY SCALE UP CLEAN ENERGY FINANCE

Green banks are new institutions that are publicly funded and finance renewable energy, energy efficiency, and other clean infrastructure projects in partnership with private lenders.<sup>8</sup> Green banks catalyze private financing for low-carbon technologies by using financial tools such as long-term and low-interest loans, revolving loan funds, insurance products (loan guarantees or loan-loss reserves), green bonds, and low-cost public investments. When a green bank uses public funds for financing, rather than grants or subsidies, the public funds are preserved through loan repayment.<sup>9</sup>

Green banks also develop underserved clean energy markets by disseminating information, convening training workshops and launching renewable energy aggregation programs. Green banks can spur market development for distributed and off-grid renewables, clean transportation vehicles and infrastructure, as well as water and energy efficiency measures in small businesses and homes. Many of these opportunities are new to investors; a green bank's pioneering investments and support provide the experience and data that investors need to enter this market.

### COMPARING GREEN BANKS TO COMMERCIAL BANKS

**Green banks differ in several important ways from commercial banks: mandate, objectives, and legal structures.**

|                             | Commercial Bank                        | Green Bank   |
|-----------------------------|--|--|
| <b>Mission and Mandate</b>  | Maximize returns for shareholders      | Create and support clean energy and low-carbon markets   |
| <b>Source of capital</b>    | Shareholder capital, depositors funds  | Central and state government grants, climate finance, green bonds, utility ratepayer funds, renewable portfolio standards, India's National Clean Energy Fund (NCEF) |
| <b>Institutional Origin</b> | Either public or privately established | Established as a public policy instrument to promote clean energy  |

Green banks differ in several important ways from commercial banks, namely, in their mandate, objectives, and legal structures.

- **Mission:** Unlike commercial banks, whose mission is to maximize returns for shareholders and to make profitable investments, the mission of a green bank is to maximize the deployment of clean energy while lowering the cost of energy for all businesses and residents. This mission is primarily achieved through green investments aimed at creating and supporting clean energy and low-carbon markets.
- **Source of Capital:** Commercial banks draw capital from shareholders and depositors' funds, limiting traditional banks from offering lending terms that are not profitable or risk losing the investment. Green banks utilize capital from public sources such as central and state government grants, climate finance, green bonds, utility ratepayer funds, renewable portfolio standards and fossil fuel cess (tax proceeds such as India's National Clean Environment Fund). Because green banks receive the public revenue collected from the government without a requirement to pay neither the money back nor a required lending rate, they can provide more attractive financing with flexible terms that support clean energy and other carbon-cutting investments. For this reason, green banks can also accelerate investor risk-taking through guarantees, co-investment, demonstration and pilot projects of new commercial technologies and other means of reducing risk. As recipients of public funds, however, green banks still remain accountable to taxpayers and must invest responsibly.
- **Ownership:** Commercial banks can be public or privately owned. Green banks are generally publicly owned and leverage public funding to attract private finance. However, green banks can still carve out independence from the government to avoid political interference and attract long-term capital from institutional investors, as demonstrated by the UK Green Investment Bank's (UKGIB) separate bank structure.<sup>10</sup>

## RELATIONSHIP BETWEEN GREEN BANKS AND GREEN BONDS

Green bonds are a capital-raising tool that can be used by green banks. Green banks are financing institutions that are typically capitalized by government capital. Green bonds are bonds just like any other that raise capital, but for green projects. Green banks, as financial institutions, typically issue bonds in order to raise additional capital beyond government grants, and to sell loans and recapitalize its balance sheet. The bonds issued by a green bank would, by definition, be green bonds, because all green bank capital goes toward green projects. Therefore, green banks and green bonds should be used in tandem to raise, recycle, and deploy capital. A green bond is a tool that can be used by a green bank institution.

To meet India's renewable energy targets, a variety of mechanisms and instruments are needed to mobilize adequate finance in a timely manner.

A green bank is a pioneering institution that finances the deployment of renewable energy, energy efficiency, and other clean infrastructure projects in partnership with private lenders. They are commonly government-funded and run, and catalyze private financing for low-carbon technologies by using many financial tools, including issuing green bonds.

Green bonds are a growing financing tool that function like any other type of bond with the added characteristic that the proceeds must be used to support "green" projects such as renewable energy deployment, water, clean transportation, and climate adaptation efforts. As described in detail in "Greening India's Financial Market: How Green Bonds Can Drive Clean Energy Deployment" (another report in the NRDC-CEEW India Clean Energy Finance Series), green bonds can provide low cost financing in multiple ways: a) by providing lower interest rates than typical domestic clean energy project financing, b) by being cost-competitive as compared to other corporate bonds, and c) by potentially bringing down transactional costs even more through strategies such as standards and certifications.

In India, both a green bank and green bonds could support renewable energy projects by providing broader access to domestic and foreign capital as well as better financing terms, including lower interest rates with longer lending terms. In this way, both innovative green financing tools can act as an effective vehicle to raise capital for renewable energy projects while meeting the environmental targets of the investors and climate targets of the Government of India.

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### Green Banks Considerations: National vs. State Level

*There are many considerations when creating a green bank or "greening" an existing public institution to become a green bank at either the national, state, or regional level. State-level green banks may be easier to capitalize on a sustainable basis. State green banks can be more responsive and tailored to local financing needs, in addition to expanding beyond state boundaries when needed through consortium lending. However, national green banks may have a cost advantage, due to higher volumes and risk diversification*

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### VALUE PROPOSITION: HOW GREEN BANKS INCREASE CLEAN ENERGY FINANCE

Green banks are capitalized with public funds that do not have to be repaid. Due to their green investment mandate and public source of capital, green banks can deploy funds in a more flexible manner that both leverages private capital and lowers the borrowing cost to the ultimate customer. This enables a broader pool of clean energy projects to achieve economical financing, which makes the projects more likely to be developed and also attracts more investors, directing international sources of capital to local projects. Green bank financing methods leverage private capital to fill financing gaps by reducing real and perceived risk and asymmetrical information. This allows private investors the chance to learn about a new market opportunity with the security of government partnership. As private lenders gain experience and information about the processes, risks and addressable market size in clean energy, they can become increasingly comfortable and confident lending into these markets.

Green banks have shown that with experience and data, private investors are more eager to enter clean energy markets at scale, ultimately without any green bank support.<sup>11</sup> In this way, green banks engage in market development and create demand for clean energy projects, in addition to offering flexible, low-cost financing that help meet clean energy targets.

### KEY TAKEAWAYS: BENEFITS OF A GREEN BANK

- **Attractive, Low-Cost Financing Terms:** Green banks can offer reduced lending rates and flexible terms below market standards (i.e., lower rates than available in private sector transactions) that match the terms and payback period of clean energy projects because of their green investment mandate and public source of capital. This enables a broader pool of clean energy projects to achieve economical financing that makes projects more likely to be developed and also attracts more investors, including directing international sources of capital to local projects. Additionally, green banks can issue green bonds, which provide lower cost, stable funding opportunities for renewable energy projects from the international market.
- **Credit Support:** A green bank helps bridge the gap between the perceived risk associated with clean energy investments, and the expectations of the private lenders by offering products such as partial credit guarantees, insurance, or loan-loss reserves. These risk mitigation products like guarantees and credit enhancements help private banks execute the initial transactions for clean energy projects. For example, the Connecticut Green Bank (CTGB) in the U.S. provides credit enhancements for working capital loans for Connecticut-based solar companies as a way of bridging the working capital needs of contractors with the needs of local lenders.<sup>12</sup>
- **Co-Investment:** Green banks lend their name, capital, and credibility to clean energy projects thus making it more attractive for private players. Co-investment with local banks and contractors helps bring these investments to the secondary markets through bond issuances and private placement. Green banks can also identify and analyze technologies that are new to the local market, but have a track record elsewhere. For example, UKGB was an early investor in UK off shore wind while other investors were still reluctant. Now the UK off shore wind market is the largest in world.<sup>13</sup>
- **Warehousing:** Green banks can bundle small projects together to reach a scale where they become attractive for on-sale to large investors or for securitization through bond issuances. This aggregation technique reduces transaction costs and drives investment. Additionally, green banks can standardize contracts to facilitate aggregation and reduce costs of individual projects. In Connecticut, CTGB compiled market friendly data of residential solar potential and aggregated rooftop space to attract large installers, such as Solar City, leading to significant expansion in residential solar in the state.
- **Increased Supply of Capital:** Green banks can also provide immediate market information and facilitate best practices to increase transparency, boost investor confidence and reduce perceived risks in clean energy investment. Following “open source banking” techniques like tracking, publishing and sharing information about the performance of projects and investments in other markets can further reduce real and perceived risks and boost investor confidence.

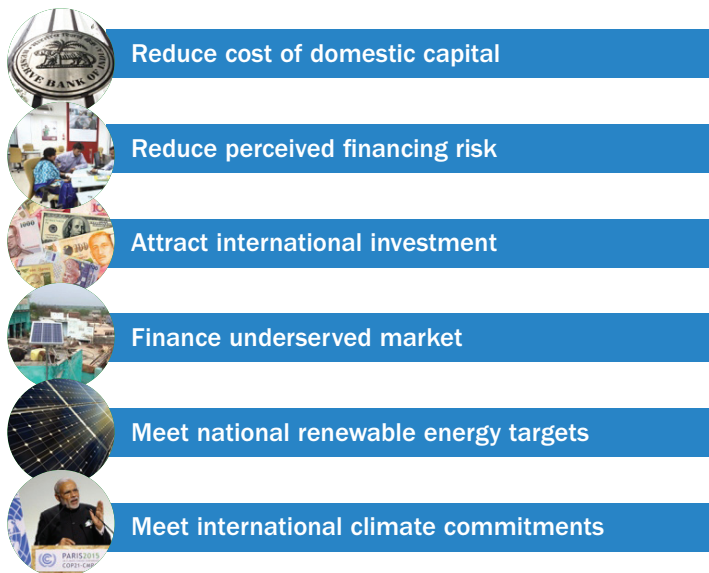


## SECTION 2

# GREEN BANKS IN THE INDIAN CONTEXT

### VALUE PROPOSITION FOR GREEN BANKS IN INDIA

Green banks can spur the growth of the domestic clean energy market by maximizing the impact of limited public funds. Green banks offer solutions to overcome local financing barriers for clean energy and can play a significant role in accelerating low carbon development projects by doing the following:



- **Reduce cost of domestic capital:** Domestic Indian banks typically offer higher interest rates and shorter terms than clean energy projects' payback periods allow. This creates an uneconomical mismatch that makes such projects more difficult to finance and build if the developer is not already well-resourced. Green banks can provide lower interest rates and longer terms of financing to match the payback period and enable more projects to be built – a critical role as India scales its clean energy market.
- **Reduce perceived financing risk:** Traditional Indian bankers perceive clean energy investments as high risk due to their unfamiliarity with clean energy technologies. These high risks result in higher cost financing. Green banks can offer products such as partial credit guarantees, insurance, or loan-loss reserves that reduce the risk and therefore the cost of capital.
- **Attract, coordinate, and deploy capital:** Research on the Indian clean energy markets shows that instruments like

government bonds, infrastructure debt funds, partial credit guarantees, partial risk guarantees and currency hedging facilities could address core limitations of Indian debt markets. Staffed with finance professionals and capitalized with low cost funds, an Indian green bank would be a nexus for the development and deployment of such products. Green banks would serve as a bridge between government ministries and private markets to ensure market responsiveness in the service of the public interest. The green bank would be endowed with sufficient flexibility to evolve products in real time as information on their performance comes in.<sup>14</sup>

- **Attract international investment:** International investment and new private financial investors to Indian clean energy projects are critical untapped sources of capital to spur India's renewable energy deployment. Currently, domestic investment (both public and private) is more than twice the amount of international investment in low-carbon or climate-resilient projects.<sup>15</sup> Green banks lend their name, capital, and credibility to clean energy projects, which is attractive for private players to invest in them. Additionally, a green bank can issue green bonds, which enable access to scalable, long-term and low cost debt capital from institutional investors. Following on the example of rupee denominated "masala" bonds, green banks can help attract and funnel international private investors to local clean energy projects, which is currently lacking
- **Finance under served markets:** Smaller projects like rooftop solar installations on buildings and off-grid solar panels or microgrids in rural villages have the potential to be transformative in India. It is currently estimated that microgrids provide electricity to at least 125,000 households across India.<sup>16</sup> These projects have the ability to supply electricity to a previously underserved population or reduce strain on an already strained grid. In addition to this, the projects could increase work and school productivity during night hours as well as displace the use of kerosene or other harmful fuels. The ability of green banks to aggregate these smaller projects through "warehousing" enables them to be financed through green banks by large investors.
- **Meet national renewable energy targets:** India has set ambitious energy targets for itself, including 175 GW of renewable energy by 2022. Local developers cannot rely solely on domestic finance or international

development banks to fund and build the solar and wind energy projects needed to achieve these clean energy targets. Green banks' ability to attract international investment and finance smaller projects at a lower cost for developers makes it a key tool to quickly scale the domestic market.

- **Meet international climate goals:** India's emissions intensity reduction target of 33-35 percent from 2005 levels by 2030 – made as part of the UN climate commitments in December 2015 in Paris – require serious investment in renewable energy and energy efficiency. As one of the countries most vulnerable to the impacts of climate change, positioning itself as a leading clean energy market not only reduces carbon emissions and meets these climate commitments, but also allows India to develop its low carbon economy.

## THE ROLE OF GREEN BANKS IN ACCELERATING LOW CARBON DEVELOPMENT IN INDIA

In order to generate 175 GW of renewable energy by 2022 and to reduce greenhouse gas emissions intensity by 33 to 35 percent from 2005 levels by 2030 as part of India's climate commitment, India has set ambitious goals for five key sectors: 1) ground-mounted, large-scale solar, 2) rooftop solar, 3) off-grid solar, 4) wind energy, and 5) energy efficiency. Green banks are designed to address local market and policy failures.

Based on international models, green banks can provide financing solutions to grow India's clean energy market. Not all will be appropriate to the Indian context and actual opportunities will be determined through detailed market research.

## THE MANY BENEFITS OF A CLEAN ENERGY MARKET IN INDIA

Developing markets in renewable energy (particularly solar and wind) and energy efficiency tailored to India can help achieve the national carbon emissions reduction targets, meet the ambitious goals in power generation from renewables, and provide many other benefits as energy demand rises. Growing India's renewable energy market and expanding the energy efficiency market provides the following additional benefits:

- **Generate economic benefits through enormous job creation** across all renewable energy and energy efficiency sectors. For example, meeting the 100 GW solar energy goal by 2022 could create as many as 1 million jobs.
- **Increases national energy security** by creating a reliable, domestic source of energy and thereby reducing reliance on foreign imports of fossil fuels to power economic growth.
- **Addresses power shortages** as energy demand currently exceeds energy supply in most Indian cities, making power cuts a regular – and sometimes daily – occurrence. Incorporating energy efficiency measures into the construction and retrofit of buildings and appliances reduces the energy demand of one of the largest energy users, particularly as air conditioner use expands.
- **Increases energy access** through clean energy technologies like off-grid solar applications, which can help electrify rural villages that the traditional grid cannot reach. Improving access to light at night may also lead to increases in productivity. Moreover, in some rural areas where extreme heat increases will be most severe, farmers may adapt by farming at night, making electrification critical.
- **Reduce air pollution and improve health conditions** by providing increasingly affordable and available clean energy options such as solar, which can reduce the overall reliance on fossil fuel use in individual households for cooking, heat, and light, and reduce harmful health impacts of air pollution exposure on a city and regional scale.
- **Reduce overall greenhouse emissions** by taking advantage of plentiful solar and wind capabilities and locking in energy savings in new building construction and appliances. This will be critical to reducing emissions and thereby limiting the impact of climate change, while also meeting the needs of the growing population and economy.

## ROLE OF A GREEN BANK IN GROWING CLEAN ENERGY MARKETS AND ACCELERATING LOW CARBON DEVELOPMENT IN INDIA

| Barriers to Finance   | Potential Green Bank Financing Solutions   | International Examples  |
|---|--|---|
| <p><b>Ground-mounted, large-scale solar energy projects<sup>17</sup></b></p> <p><b>India's Target for Power Generation by 2022:</b> 60 GW</p> <p><b>Definition:</b> Solar farms greater than 1 MW and interconnected to the high-voltage transmission grid</p>  |  |   |
| <ul style="list-style-type: none"> <li>• Expensive financing available from domestic banks makes projects uneconomical (e.g., high domestic interest rates cause high up-front capital costs, limited non-recourse loans, shorter loan repayment terms increase debt burden)</li> <li>• Investments perceived as high-risk due to lack of familiarity with newer technology</li> <li>• Information gaps on project development cause discomfort among lenders</li> <li>• Difficult to attract international investors due to high risks (e.g. lack of access to cheap and long term domestic debt financing, off-take and currency and political risks)</li> <li>• Lenders remain concerned about solar plant commissioning dates and performance, repayment rates, and supportive government policies</li> <li>• Need for financing and regulatory collaboration to reduce completion risks (such as building transmission lines) to increase solar penetration in cost-effective manner</li> <li>• Currency volatility risks inhibit foreign investment, and make Rupee-denominated agreements risky</li> </ul> | <ul style="list-style-type: none"> <li>• Reduce cost of domestic capital by offering lower rates, fixed interest rates, and longer debt tenors to attract international investment; this also reduces overall burden of high cost debt for solar projects</li> <li>• Mobilize attractive debt capital via partial credit guarantees (PCGs) for project bonds and infrastructure debt funds (IDFs) to improve credit ratings of projects, attract domestic investors, reduce cost of debt and increase tenors</li> <li>• Serve as a foreign-exchange hedging facility to reduce currency risks</li> <li>• Provide viability gap funding, refinancing, and securitization</li> <li>• Mitigate risk through credit enhancements tools such as guarantees</li> <li>• Increase transparency and immediate sharing of market information to bridge gaps in information and reduce perceived risk</li> <li>• Fill the gap from declining multilateral investment to meet the goals of the National Solar Mission<sup>18</sup></li> <li>• Increase familiarity, experience, and track record with financing solar technology over time to reduce perceived risk of investment</li> <li>• Share best practices on measuring and quantifying benefits from other markets</li> <li>• Sharing information and data about project technology and performance to help grow the market</li> </ul> | <ul style="list-style-type: none"> <li>• Connecticut Green Bank (CTGB) provides credit enhancements for working capital loans for Connecticut-based solar companies</li> <li>• Australian CEFC<sup>19</sup> is another example where installers are connected to local lenders</li> </ul> |
| <p><b>Rooftop solar energy projects</b></p> <p><b>India's Target for Power Generation by 2022:</b> 40 GW</p> <p><b>Definition:</b> Installations less than 1 MW and connected to the low-voltage distribution grid)<sup>20</sup></p>  |  |   |
| <ul style="list-style-type: none"> <li>• Small loan ticket size makes financing unattractive for lenders</li> <li>• Lack of experience with procurement process creates a gap between solar project commitments and actual deployment of rooftop solar</li> <li>• Less mature market increases risks to foreign investors and commercial banks unwilling to finance projects for residential customers (leading to high cost of debt)</li> </ul>  | <ul style="list-style-type: none"> <li>• Facilitate warehousing to aggregate small rooftop installation projects into larger projects attractive for investors</li> <li>• Facility development of business models based on leasing and third party financing for rooftop solar PV at lower costs to overcome investment barriers</li> <li>• Improve conditions for foreign investment to supplement inadequate domestic capital availability</li> <li>• Serve as depository of data on the value proposition of solar rooftop installations to increase investment</li> </ul>  | <ul style="list-style-type: none"> <li>• Connecticut Green Bank (CTGB) provides credit enhancements for working capital loans for Connecticut-based solar companies</li> </ul>  |

| Barriers to Finance   | Potential Green Bank Financing Solutions   | International Examples   |
|---|--|--|
| <ul style="list-style-type: none"> <li>• Domestic debt capital to finance infrastructure is both expensive (e.g. State Bank of India offers interest rates at 11-13%)<sup>21</sup> and largely unavailable due to less engaged domestic banking sector</li> <li>• High requirement of capital upfront and low domestic availability of capital to finance solar systems prevent uptake by commercial, industrial and residential customers</li> <li>• Lack of third-party financing to reduce upfront capital costs</li> <li>• Low availability of long term financing; short tenor of financing options increase unit costs in the short term</li> <li>• Lack of incentive policies such as net metering to encourage solar rooftop penetration connected to the grid</li> <li>• Lack of available, quality data on benefits of solar rooftop installations over time</li> <li>• Un-sturdy residential and industrial rooftops inhibit rooftop installation</li> </ul> | <ul style="list-style-type: none"> <li>• Increase pool of potential investors and lower cost of capital by issuing asset-backed securities</li> <li>• Share information and increase familiarity with benefits of rooftop solar projects with potential customers like local businesses and real estate developers</li> <li>• Standardization of contracts to facilitate aggregation and reduce individual project costs</li> <li>• Work with utilities, distribution companies, states and municipalities to develop and implement rooftop solar programs based on property taxes, on-bill charges, etc.</li> </ul> | <ul style="list-style-type: none"> <li>• In the U.S., states and municipalities are ramping up Property-Assessed Clean Energy (PACE) financing schemes, under which property owners, especially on the commercial side, can pay for renewable energy and energy efficiency via an assessment on their property tax bills. The additional tax assessment is secured by a senior lien on the property, which confers strong debt collateral. Green banks could potentially run such a program in coordination with local municipalities in India.</li> </ul> |

### Off-grid solar/energy access projects

**India's Target for Power Generation by 2022: 3 GW**

**Definition:** 1 kW-100kW installations that operate in isolation or embedded in an off-grid micro-grid

|  |   |   |
|--|---|---|
| <ul style="list-style-type: none"> <li>• Upfront costs of capital prohibitively high for many potential customers</li> <li>• Difficult to attract large investors to small-scale projects</li> <li>• Difficult to extend the electricity grid to remote areas</li> <li>• Prohibitive cost of energy storage technologies</li> <li>• Lack of investment in building off-grid renewables</li> <li>• Lack of available and affordable domestic capital for off-grid projects</li> <li>• Diverse actors seeking financing</li> <li>• Commercial banks unwilling to lend capital to off-grid projects due to lack of familiarity</li> </ul> | <ul style="list-style-type: none"> <li>• Attract large institutional investors by warehousing smaller project loans and selling them at scale through securitization</li> <li>• Provide financing and credit enhancement</li> <li>• Standardize contracts to facilitate aggregation and reduce transaction costs to achieve project scale that is commercially attractive</li> <li>• Improve investment climate to accelerate technical collaboration and diffusion</li> <li>• Guarantee working capital and low-cost debt finance to off-grid entrepreneurs</li> <li>• Reduce collection risk and increase investor confidence by linking payments through bank accounts to improve revenue collection</li> <li>• Disseminate data and de-risk investments by sharing track record and familiarizing bankers with the technologies and financing arrangements</li> </ul> | <ul style="list-style-type: none"> <li>• UNEP Solar Loan Initiative subsidized interest payments and coordinated market entry of international microfinance investors to expand reach of off-grid solar. Green Banks could play a similar role in India.</li> </ul> |
|--|---|---|



| Barriers to Finance  | Potential Green Bank Financing Solutions   | International Examples  |
|--|--|---|
| <b>Wind energy projects<sup>22</sup></b>   |  |   |
| <b>India's Target for Power Generation by 2022: 60 GW</b>  |  |   |
| <ul style="list-style-type: none"> <li>• High cost and low availability of debt in India increases wind project finance costs</li> <li>• Unfavorable land acquisition policies, which are vital for attracting investments in wind energy market</li> <li>• Unstable and fluctuating fiscal incentives including accelerated depreciation (AD) and generation-based incentives (GBI) impacts investment</li> <li>• Limited non-recourse financing</li> </ul>   | <ul style="list-style-type: none"> <li>• Green banks can work with MNRE to facilitate grid infrastructure for wind power</li> <li>• Pool wind farm assets to facilitate repayment</li> <li>• Co-invest in large utility scale projects</li> <li>• Mitigate risk by offering loan-loss reserves, guarantees, insurance to protect against construction and operational risk, and debt subordination to attract financing</li> <li>• Implement mechanisms to attract investment to achieve goals of National Wind Energy Mission</li> <li>• Green banks can potentially support the reintroduction of policies like accelerated depreciation<sup>23</sup></li> </ul>   | <ul style="list-style-type: none"> <li>• UK Green Investment Bank's offshore wind fund offers co-investment with investment banks and institutional investors in a wholesale approach that has made the UK a leader of the sector.</li> <li>• The National Social Economic Development Bank in Brazil has spurred wind energy investment through low-cost, long-term debt financing at a large scale.</li> <li>• NYGB investment in distributed wind<sup>24</sup></li> </ul>  |
| <b>Energy efficiency (EE) projects<sup>25</sup></b>  |  |   |
| <b>India's Target for Energy Intensity Reduction by 2030: 33-35 percent of 2005 levels</b>   |  |   |
| <ul style="list-style-type: none"> <li>• Single project financing difficult to obtain due to high transaction costs for small-scale EE projects</li> <li>• Lack of structure for retail and commercial EE investments to allow energy savings to offset loan repayments</li> <li>• Local lenders do not account for estimated savings from EE projects during underwriting process and focus only on borrower's credit rating</li> <li>• Lack of familiarity with benefits of EE investments and savings among private investors reduces customer demand<sup>26</sup></li> <li>• Perceived high upfront costs for efficiency technologies by developers</li> <li>• Lack of energy efficiency focused guidelines on bank loans by Reserve Bank of India (RBI)</li> <li>• Small energy service company (ESCO) market</li> <li>• Lack of data on verified savings increase perception of risk</li> <li>• Insufficient collateral for banks because efficiency measures include fixtures which are difficult to repossess in case of non-payment</li> <li>• Limited market experience in energy efficiency financing to evaluate projects based on energy and cost-savings potential</li> <li>• Financial institutions often do not know how to understand, verify and quantify the economic benefits of EE projects or have difficulty monetizing the energy savings</li> </ul> | <ul style="list-style-type: none"> <li>• Aggregate smaller-scale efficiency projects into "deal-size" projects and sell at scale through securitization</li> <li>• Through warehousing and coordination with ESCOs, green banks can aggregate demand and provide capital subsidies</li> <li>• Reduce upfront costs of efficiency measures through low-interest loans and innovative financial products</li> <li>• Co-investing can improve familiarity with EE projects, expertise, and grow market demand</li> <li>• Consult with Reserve Bank of India (RBI) to issue guidelines on EE investment for banks, including potentially portfolio-based efficiency targets and regular audits, and/or making EE investment a priority lending sector</li> <li>• Provide credit-enhancing and direct investment mechanisms to deploy private capital and leverage private investment in EE</li> <li>• Develop EE-focused funds and provide direct lending and leasing offerings to fill gaps in market</li> <li>• Risk mitigation through credit enhancement for commercial banks in initial transactions</li> <li>• Share best practices on quantifying benefits proven in other markets to overcome supply and demand issues</li> <li>• Develop standardized and transparent energy performance contracts (EPCs) that promote finance models that include energy saving monitoring and verification; standardization to reduce costs of individual projects</li> </ul> | <ul style="list-style-type: none"> <li>• C-PACE: Connecticut Green Bank's Energy-Efficiency Program uses a property-assessed clean energy structure to provide long term financing to building owners to perform energy upgrades and repay loan as a new tax lien on the property. This increases lending security and enables a longer payback term. The bank has financed nearly \$54M in energy upgrades for 89 buildings from 2013-2015.</li> <li>• UK Green Bank's Green Loans helps municipalities switch to EE street lighting through an innovative "Green Loan" for municipalities, which is specifically tailored to help cities upgrade their street lighting to more energy efficient light emitting diodes (LEDs), resulting in 80% savings</li> </ul> |

## EXAMINING EXISTING INSTITUTIONS TRANSITIONING TO GREEN BANKS

A green bank can be established as a new institution, or an existing institution could become a green bank. Supporting an existing institution's transition to become a green bank could avoid duplicative government efforts to grow the clean energy market and may generally be less costly and time-intensive than establishing a new green bank. Existing institutions in India play some of the roles of a green bank, but no single institution currently offers the exact type and breadth of financing activities that a green bank can provide.

- A green bank could utilize many tools to address the existing financing gap for clean energy projects in India, filling in particular these three key roles:
  - Offering flexible, low-cost lending that matches the terms and payback period of a typical renewable energy or energy efficiency project;
  - Mitigating specific risks that currently limit investment in the Indian clean energy market; and
  - Engaging in market development and demand generation.
- **Offering flexible, low-cost lending:** Currently, in India, the benchmark lending rate is around 10%, hence there is need for lower cost capital for emerging clean energy markets. A core function of a green bank is providing economically attractive financing. Ensuring low-cost financing (with lower rates) and flexible terms are available to support clean energy projects directly impact whether demand for renewable energy and energy efficiency projects and products exists. The length of the loan is particularly important for deep energy efficiency projects and solar projects that have a long payback period. If the loan term can match the

length of the project, then the cash flows of savings and loan repayments can be matched, and make the project “cash flow positive.” In other words, the amount of money saved exceeds the amount of money that must be repaid in each period. This is highly attractive to borrowers and energy customers and can grow the market.

- **Risk mitigation:** In addition to offering lower rates and longer terms, green banks may cover 100 percent of the project cost but more commonly use co-lending or risk mitigation strategies to bring in private investment. For instance, many green banks use credit enhancements like loan loss reserves to support more private lending on better terms. Currently in India, credit enhancement schemes with entities such as the IDFC, YES Bank, and the IIFCL have been providing first loss partial credit guarantees to many recently-issued renewable energy bonds.<sup>27</sup> However, there are still very few of these credit enhancement tools in place. Green banks can offer attractive financing terms that support clean energy because they act as independent, non-regulated entities that are capitalized with government “grants” or contributions, rather than private investment capital. For example, the CTGB is capitalized with dollars collected from utility revenue paid by their energy customers (utility ratepayers), effectively a tax to support clean energy. The green bank receives all the revenue collected for that purpose from the government without a requirement to pay the money back nor a required lending rate. The green bank should be given wide flexibility (within the confines of its charter, sound business practices and prudent management of public resources) in how it uses this money and could theoretically choose to lend it at 2 percent for 30 years, just enough to cover its operating expenses.

## OVERVIEW OF INDIAN RENEWABLE ENERGY DEVELOPMENT AGENCY (IREDA) AND NATIONAL CLEAN ENERGY FUND (NCEF)

IREDA was established on 11th March, 1987 as a Public Limited Government Company under the Companies Act, 1956 with the goal to “promote, develop and extend financial assistance for Renewable Energy and Energy Efficiency/ Conservation Projects.” IREDA has been notified as a “Public Financial Institution” under section 4 ‘A’ of the Companies Act, 1956 and registered as Non-Banking Financial Company (NFBC) with Reserve Bank of India (RBI).

The main objectives of IREDA include giving financial support to specific projects for generating electricity and energy through new and renewable sources and conserving energy through energy efficiency. Additionally, it aims to maintain its position as a leading organization providing efficient and effective financing in clean energy projects, and to increase IREDA's share in the renewable energy sector through innovative financing. IREDA's mission is to “Be a pioneering, participant friendly and competitive institution for financing and promoting self-sustaining investment in energy generation from Renewable Sources, Energy Efficiency and Environmental Technologies for sustainable development.”

One of IREDA's important functions is providing low interest bearing funds and refinance schemes to viable renewable energy projects based on capital from the National Clean Energy Fund (NCEF). NCEF was established by the Government of India by levying a cess (tax) on coal produced in India as well as from imported coal. The IREDA NCEF Refinance Scheme aims to bring down the cost of funds for renewable energy projects by providing refinance at concessional rates of interest, with funds sourced from the NCEF.<sup>28</sup>

- **Market development, demand generation:** One of the most valuable functions of a green bank is its focus on creating demand for clean energy projects, in addition to providing attractive financing. Green banks often proactively seek to generate demand through certain market development activities. For example, a green bank may hold a focused contractor training to ensure that contractors and installers understand the role financing plays in the clean energy transaction and so they can “sell” financing appropriately. Another role to develop the market is acting as a clearinghouse, making data and information about clean energy technology and financing widely and easily available to all citizens. This includes providing information that is otherwise challenging to come by, such as explaining how clean energy technologies work, why they can be economical, and how to access financing and find clean energy solutions. Green banks also work hand in hand with private banks and local lenders, helping them understand the value proposition and mechanics of clean energy lending. This helps build engagement and interest in lending, beyond the use of financial leveraging instruments like co-lending or credit enhancements.
- **Run demand aggregation programs.** For instance, in an effort headed by the CTGB, several green banks run “solarize” programs, which are community-focused demand aggregation programs. The green bank first selects a city to be a ‘solarize’ city. Then, the green bank runs an RFP to find an installer willing to offer the lowest possible cost for rooftop solar installation in exchange for exclusivity in that market for a period of time. In addition, the more customers that sign up, the lower the installation cost is for everybody. This encourages community engagement and broader adoption, thereby lowering the cost and making clean energy cheaper. Taken together, this market development, when paired with creative financing, enables emerging clean energy markets to grow much more quickly.

## IREDA CONVERTING TO A GREEN BANK

Based on extensive research and stakeholder consultations, IREDA appears to be the institution most like a green bank in India today. Among other benefits functioning as a green bank would enable IREDA to do the following:

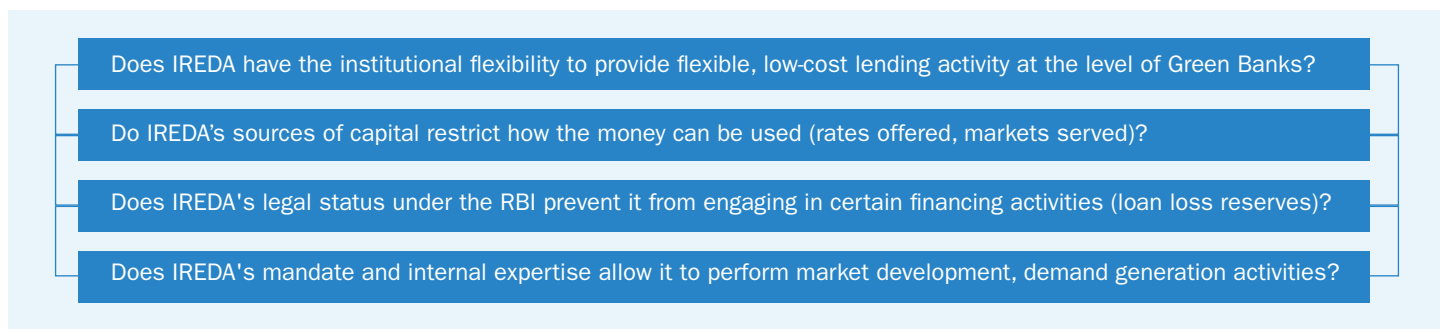
- to attract domestic and international funding by lowering its capital,
- to amplify its impact by financing clean energy, and
- to play a truly transformative role in India’s clean energy markets.

As described in the key questions outlined below, more study is needed to understand whether IREDA has the institutional flexibility to implement the elements needed to achieve the results a green bank can provide. For example, IREDA appears to primarily offer senior debt loans at fixed terms. Those terms tend to be in the low double digits and the loan period is typically around 10 years or less. Green banks typically offer lower rates and longer terms in order to increase the market size of economically viable projects.

## QUESTIONS ADDRESSING THE VIABILITY OF IREDA AS A GREEN BANK:

- Does IREDA have the institutional flexibility to provide flexible, low-cost lending activity at the level a Green Bank can?
- Do IREDA’s sources of capital (including NCEF proceeds from the Government of India and DFIs) restrict how the money can be used, both in terms of the rates that must be offered or the markets that must be served?
- Does IREDA’s legal status under the Reserve Bank of India as a Regulated Non-Banking Financing Institution prevent it from engaging in certain kinds of financing that green banks can otherwise provide? For example, can IREDA use the proceeds from the NCEF to create a reserve to support more lending?
- Does IREDA’s mandate and internal expertise allow it to perform the market development and demand generation activities of a green bank?

**Figure 1: Can IREDA become a Green Bank?**



## SECTION 3

# HIGHLIGHTING INTERNATIONAL GREEN BANK MODELS

Accelerating clean energy deployment – particularly solar energy, wind energy, and energy efficiency projects – is now the primary strategy to transition to lower carbon economies that mitigate the impacts of global warming. A lack of enough affordable traditional financing to fund the magnitude of clean energy projects that need to come online to rapidly support a greener energy system has motivated many countries to explore innovative financing solutions.

Across the globe, green banks have been established at national and sub-national levels to mobilize private

investment to meet both domestic targets for renewable energy deployment and energy efficiency as well as international climate targets for carbon emission reductions. The Paris Climate Agreement, as well as, the falling prices of clean energy technologies and associated cost parity with other forms of energy, has increased the demand for greater and new sources of capital for clean energy projects. The UK Green Investment Bank and the U.S.-based Connecticut Green Bank, among others are leading examples of the impact already made by green banks to finance and scale local clean energy markets.

### EXAMPLES OF GREEN BANKS AROUND THE WORLD

|  |   |  |  |
|--|---|--|--|
|  <p><b>IBank</b><br/>California Infrastructure and Economic Development Bank</p> <p>California Lending for Energy and Environmental Needs (CLEEN) Center (California, U.S.A.)</p> |  <p><b>CEFC</b><br/>CLEAN ENERGY FINANCE CORPORATION</p> <p>Clean Energy Finance Corporation (Australia)</p> |  <p><b>CONNECTICUT GREEN BANK</b></p> <p>Connecticut Green Bank (Connecticut, U.S.A.)</p>              |  <p><b>GEMS</b></p> <p>Hawaii Green Infrastructure Authority (Hawaii, U.S.A.)</p>                   |
|  <p><b>Green Finance Organisation JAPAN</b></p> <p>Green Finance Organisation Japan (Japan)</p>   |  <p><b>Green Tech</b><br/>Malaysia</p> <p>Green Tech Malaysia (Malaysia)</p>                               |  <p><b>مصدر Masdar</b><br/>A MUBADALA COMPANY</p> <p>Masdar (United Arab Emirates)</p>               |  <p><b>MONTGOMERY COUNTY LAND BANK</b></p> <p>Montgomery County Green Bank (Maryland, U.S.A.)</p> |
|  <p><b>NEW JERSEY ENERGY RESILIENCE BANK</b><br/>Building a solid foundation for the future</p> <p>New Jersey Energy Resilience Bank (New Jersey, U.S.A.)</p>                   |  <p><b>NY GREEN BANK</b></p> <p>New York Green Bank (New York, U.S.A.)</p>                                 |  <p><b>RI INFRASTRUCTURE BANK</b></p> <p>Rhode Island Infrastructure Bank (Rhode Island, U.S.A.)</p> |  <p><b>+</b></p> <p>Technology Fund (Switzerland)</p>   |
|  <p><b>UK Green Investments</b></p> <p>UK Green Investment Bank (United Kingdom)</p>  |   |  |  |

Source: Institutions listed in OECD, "Policy Perspectives: Green Investment Banks," p. 6 (2015), <http://www.oecd.org/greengrowth/green-investment-banks.htm>.



## UK Green Investment Bank

|                                 |   |
|---------------------------------|---|
| <b>UK Green Investment Bank</b> | Origin and Formation: Created in 2012 and formally launched on Nov. 28, 2012, the UK Green Investment Bank plc was established as a stand-alone institution to attract private funds to finance the public sector's investment in environmental preservation and low-carbon business and infrastructure investments. The bank is structured as a public limited company and owned by the UK Department for Business, Innovation, and Skills.  |
| <b>Purpose:</b>                 | The UK Green Investment Bank (GIB) is the world's first investment bank dedicated to greening the economy. The mission of the UK GIB is to "mobilise investment in the UK's green economy" through a strategy designed to maximize green impact and "underpinned by robust principles and policies designed to ensure that each investment's green impact is assessed, monitored and reported to the highest standard." <sup>29</sup>   |
| <b>Assets:</b>                  | The Bank had an initial capitalization of approximately £3.8 billion. According to the 2014-2015 Annual Report, the GIB was close to its expected long-term investment run-rate of £800 million to £1 billion per year. <sup>30</sup>   |
| <b>Funding:</b>                 | UK Pension Fund, sovereign wealth fund, private investors, institutional investors. <sup>31</sup>   |
| <b>Target Projects:</b>         | The GIB invests in innovative, environmentally-friendly areas for which there is a lack of support from private markets, namely offshore wind, energy efficiency, waste and bioenergy, and onshore renewables. In 2014-2015, the GIB expanded its investment mandate into community-scale renewables, largely hydro projects of less than 8 MW and onshore wind projects of less than 18 MW. Overseas projects in South Africa, East Africa, and India are also beginning to develop, funded by an initial pilot of £200 million from the Department of Energy & Climate Change (DECC). <sup>32</sup>   |
| <b>Impacts:</b>                 | To date, the GIB has invested in 68 green infrastructure projects and seven funds. It has directly committed £2.6 billion to the UK's green economy into transactions worth £10.6 billion. <sup>33</sup> The GIB has extended its reach into over 200 communities across the UK, created jobs, and mobilized private capital. For every £1 invested, GIB has brought in £3 of additional private capital for UK-based green projects. In March 2015, an FCA authorized subsidiary, GIBFS, reached its first close on a new offshore wind fund, further attracting investors to that sector. GIB also reported becoming profitable in the second half of the 2014-2015 financial year. <sup>34</sup> |

## Connecticut Green Bank

|                              |  |
|------------------------------|--|
| <b>Origin and Formation:</b> | Established in July of 2011, the Connecticut Clean Energy Finance and Investment Authority (CEFIA), also known as the Connecticut Green Bank was the first green bank in the United States. It is a quasi-public organization created by PA 11-80. It succeeds the Connecticut Clean Energy Fund. <sup>32</sup>  |
| <b>Purpose:</b>              | The CT Green Bank was established to develop programs that will leverage private sector capital to create long term, sustainable financing for energy efficiency and clean energy to support residential, commercial, and industrial sector implementation of energy efficiency and clean energy measures. A corollary goal is to transition programs away from government funded grants, rebates, and other subsidies and towards deploying private capital for innovative low-cost financing of clean energy deployment.   |
| <b>Assets:</b>               | Approximately \$110 million in assets as of Jan. 28, 2016  |
| <b>Funding:</b>              | \$.001/kWh surcharge on electric ratepayer bills that provides \$27-30 MM/year. RGGI provides about \$5MM/year. SunShot initiative, ARRA-SEP, private capital. <sup>33</sup>   |
| <b>Target Projects:</b>      | The Green Bank finances the Commercial Property Assessed Clean Energy (C-PACE), an innovative public-public-private partnership program that is helping commercial, industrial and multi-family property owners access affordable, long-term financing for smart energy upgrades to their buildings through a voluntary assessment on their tax bill. C-PACE covers 100% of costs with no money down. Capital provided under C-PACE is secured by a lien on the property and is repaid as a long-term assessment, increasing cash flow and making it easier for low-interest capital to be raised from the private sector. |
| <b>Impacts:</b>              | Since 2013, funded projects have increased every quarter and attracted increasing amounts of private capital. From 2012 to 2015, the CT Green Bank has increased its leverage ratio from 4:1 to 9:1. The bank intends to issue revenue bonds, proceeds of which will be used to scale impact by attracting more private investment in clean energy deployment. The residential solar PV market saw skyrocketing installation capacity from 2013 to 2015 from approximately 10,000 KW installed capacity to 60,000 KW, while reducing overall installation costs and subsidies.   |

### STATE-BASED GREEN BANK SYSTEM:

**Non-Banking Financial Company:** IREDA is a Non-Banking Financial Company (NBFC), which is registered under the Companies Act, 1956 and must conduct financial activity as its principle business. Unlike a bank, a NBFC cannot accept demand deposits. If a Green Bank was to be an NBFC, it would be governed by the Reserve Bank of India (RBI) within the framework of the RBI Act (1934) Chapter III B and the directions issued by it. More research is needed to understand if NBFC status would prevent the Green Bank from engaging in certain forms of financing that otherwise commonly benefit emerging clean energy markets.

**Infrastructure Finance Company:** A Green Bank could potentially also take the form of an Infrastructure Finance company (IFC), deploying more than 75% of its total loans to infrastructure projects. IFCs are mandated to have INR 300 crore as minimum net owned funds and a minimum credit rating of 'A' or equivalent. To meet this requirement, it may be beneficial to create a Green Bank in India at a central government level, so that central and state contributions to the Green Bank can be aggregated to meet the net funds owned requirement. Additionally, autonomous central government agencies can secure high credit ratings, as was demonstrated by IREDA's AAA rated tax-free green bond issued in 2014, which included a sovereign guarantee from the Government of India.

As per RBI regulation, IFCs must maintain a Capital to Risk Weighted Assets Ratio (CRAR) of 15%. A Green Bank in India could potentially offer insurance products for credit enhancement without risk participation by paying a fee and seeking permission from the Insurance Regulatory Development Authority of India (IRDA), complying with the regulations for acting as a 'composite corporate agent' with insurance companies.

## CONCLUSION

Strong policy settings and incentive structures must be adopted to enable renewable energy investment to scale up to needed levels in India. Innovative financial mechanisms and institutions – such as green banks and green bonds – have proved successful on the state level and internationally. These financing tools and institutions can help propel India's solar and wind energy markets and support critical energy-saving efficiency and climate resilience projects.

While in-depth legal analysis and landscape mapping is required to identify the options for capitalizing and establishing a green bank in India, preliminary analysis suggests that a specialized financial institution like a green bank can leverage limited public funds and unlock broader private investment in clean energy projects. Green banks offer solutions to overcome local financing barriers for clean energy and can play a significant role in accelerating low-carbon development projects.

## REFERENCES

1. Yinong Sun, "Global Energy-Efficiency Market Is Growing – But Not Fast Enough," Clean Energy Finance Forum, Nov. 12, 2015, [www.cleanenergyfinanceforum.com/2015/11/12/global-energy-efficiency-market-growing-%E2%80%93-not-fast-enough](http://www.cleanenergyfinanceforum.com/2015/11/12/global-energy-efficiency-market-growing-%E2%80%93-not-fast-enough) (accessed April 8, 2016).
2. Gireesh Shrimali, Charith Konda, Sandhya Srinivasan, Solving India's Renewable Energy Financing Challenge: Instruments to Provide Low-cost, Long-term Debt, Climate Policy Initiative, Bharti Institute of Public Policy, March 2014, [climatepolicyinitiative.org/wp-content/uploads/2014/04/Instruments-to-Provide-Low-cost-Long-term-Debt.pdf](http://climatepolicyinitiative.org/wp-content/uploads/2014/04/Instruments-to-Provide-Low-cost-Long-term-Debt.pdf), Page 2.
3. Arsalan Ali Farooquee, Gireesh Shrimali, Driving Foreign Investment to Renewable Energy in India: A Payment Security Mechanism to Address Off-Taker Risk, Climate Policy Initiative April 2016, [climatepolicyinitiative.org/wp-content/uploads/2016/04/Driving-Foreign-Investment-to-Renewable-Energy-in-India\\_Technical-Report.pdf](http://climatepolicyinitiative.org/wp-content/uploads/2016/04/Driving-Foreign-Investment-to-Renewable-Energy-in-India_Technical-Report.pdf), Page 2.
4. Fiona Harvey, "World Bank to spend 28 percent of investments on climate change projects," The Guardian, April 7, 2016, [www.theguardian.com/environment/2016/apr/07/world-bank-investments-climate-change-environment](http://www.theguardian.com/environment/2016/apr/07/world-bank-investments-climate-change-environment) (accessed April 8, 2016).
5. Unlike U.S. bank rates, Indian banks typically offer interest rates of more than 10 percent.
6. David Nelson et al., Meeting India's Renewable Energy Targets: The Financing Challenge, Climate Policy Initiative, December 2012, [climatepolicyinitiative.org/wp-content/uploads/2012/12/Meeting-Indias-Renewable-Targets-The-Financing-Challenge.pdf](http://climatepolicyinitiative.org/wp-content/uploads/2012/12/Meeting-Indias-Renewable-Targets-The-Financing-Challenge.pdf), Page 1.
7. Gireesh Shrimali, Shobhit Goel, Sandhya Srinivasan and David Nelson, Solving India's Renewable Energy Financing Challenge: Which Federal Policies can be Most Effective, Climate Policy Initiative, March 24, 2014, <http://climatepolicyinitiative.org/wp-content/uploads/2014/03/Which-Federal-Policies-can-be-Most-Effective.pdf>.
8. For more information and to download the reports in the NRDC-CEEW India Clean Energy Finance Series, please visit: [www.nrdc.org/resources/renewable-energy-india-employment-potential-and-financing-solutions-solar-and-wind-energy](http://www.nrdc.org/resources/renewable-energy-india-employment-potential-and-financing-solutions-solar-and-wind-energy).
9. Green Banks are instrumentalities of government and are, by definition, public or quasi-public institutions.
10. OECD, Policy Perspectives: Green Investment Banks, 2015, [www.oecd.org/green-growth/green-investment-banks.htm](http://www.oecd.org/green-growth/green-investment-banks.htm) (accessed April 8, 2016).
11. Ibid.
12. Coalition for Green Capital, Growing Clean Energy Markets with Green Bank Financing, [coalitionforgreencapital.com/wp-content/uploads/2015/08/CGC-Green-Bank-White-Paper.pdf](http://coalitionforgreencapital.com/wp-content/uploads/2015/08/CGC-Green-Bank-White-Paper.pdf) (accessed August 4, 2016).
13. Connecticut Green Bank, Comprehensive Plan: Fiscal Years 2015 and 2016, [www.ctgreenbank.com/wp-content/uploads/2015/11/CGB\\_FY15\\_and\\_FY16\\_Comprehensive\\_Plan.pdf](http://www.ctgreenbank.com/wp-content/uploads/2015/11/CGB_FY15_and_FY16_Comprehensive_Plan.pdf) (accessed August 4, 2016).
14. Jessica Shankleman, "U.K.'s World-Beating Offshore Wind Could Get \$8.4 Billion Bigger," Bloomberg, February 15, 2016, [www.bloomberg.com/news/articles/2016-02-15/u-k-s-world-beating-offshore-wind-could-get-8-4-billion-bigger](http://www.bloomberg.com/news/articles/2016-02-15/u-k-s-world-beating-offshore-wind-could-get-8-4-billion-bigger) (accessed August 4, 2016).
15. Gireesh Shrimali, Charith Konda, Sandhya Srinivasan, Solving India's Renewable Energy Financing Challenge: Instruments to Provide Low-cost, Long-term Debt, Climate Policy Initiative, Bharti Institute of Public Policy, March 2014, [climatepolicyinitiative.org/wp-content/uploads/2014/04/Instruments-to-Provide-Low-cost-Long-term-Debt.pdf](http://climatepolicyinitiative.org/wp-content/uploads/2014/04/Instruments-to-Provide-Low-cost-Long-term-Debt.pdf).
16. OECD, Policy Perspectives: Green Investment Banks, 2015, [www.oecd.org/green-growth/green-investment-banks.htm](http://www.oecd.org/green-growth/green-investment-banks.htm) (accessed April 8, 2016).
17. David Ferris, "Indian Microgrids Aim to Bring Millions Out of Darkness," Environment 360, January 16, 2014, [e360.yale.edu/feature/indian\\_microgrids\\_aim\\_to\\_bring\\_millions\\_out\\_of\\_darkness/2729/](http://e360.yale.edu/feature/indian_microgrids_aim_to_bring_millions_out_of_darkness/2729/) (accessed August 4, 2016).
18. NRDC-CEEW, Re-energizing India's solar energy market through financing, 2014.
19. For more information on the National Solar Mission, please visit [www.mnre.gov.in/solar-mission/jnnsn/introduction-2/](http://www.mnre.gov.in/solar-mission/jnnsn/introduction-2/); See also NRDC-CEEW, Re-energizing India's solar energy market through financing, 2014.
20. For more information on Australia's CEFC, please visit <http://www.cleanenergyfinancecorp.com.au/renewable-energy/solar.aspx>
21. Varun Sivaram, Gireesh Shrimali, Dan Reicher, Reach for the Sun: How India's Audacious Solar Ambitions Could Make or Break its Climate Commitments, Stanford Steyer-Taylor Center for Energy Policy and Finance, December 8, 2015, Page 35.
22. Varun Sivaram, Gireesh Shrimali, Dan Reicher, Reach for the Sun: How India's Audacious Solar Ambitions Could Make or Break its Climate Commitments, Stanford Steyer-Taylor Center for Energy Policy and Finance, December 8, 2015, Page 22.
23. NRDC-CEEW, A Second Wind for India's Energy Market: Financing Mechanisms to Support India's National Wind Energy Mission, 2014.
24. Gireesh Shrimali, Shobhit Goel, Sandhya Srinivasan and David Nelson, Solving India's Renewable Energy Financing Challenge: Which Federal Policies can be Most Effective, Climate Policy Initiative, March 24, 2014, <http://climatepolicyinitiative.org/wp-content/uploads/2014/03/Which-Federal-Policies-can-be-Most-Effective.pdf>.
25. See New York Green Bank Resources. <http://greenbank.ny.gov/-/media/greenbank-new/files/Distributed-Wind-Energy-October-2015.pdf>, <http://greenbank.ny.gov/Investments/Portfolio-and-Pipeline>.
26. NRDC-ASCI, Constructing Change: Accelerating Energy Efficiency in India's Buildings Market, 2012, [www.nrdc.org/resources/constructing-change-accelerating-energy-efficiency-indias-buildings-market](http://www.nrdc.org/resources/constructing-change-accelerating-energy-efficiency-indias-buildings-market).
27. OECD, Policy Perspectives: Green Investment Banks, 2015, [www.oecd.org/green-growth/green-investment-banks.htm](http://www.oecd.org/green-growth/green-investment-banks.htm), Pages 15-16.
28. "IIFCL's Credit Enhancement Debuts with Renewable Energy Issuance; ReNew Wind & Hindustan Power Raise Bonds; IREDA to Come out with Rs 2,000 Cr Bond Issue." India News, Latest News Headlines, BSE Live, NSE Live, Stock Markets Live, Financial News, Business News & Market Analysis on Indian Economy. [www.business-standard.com/article/companies/iifcl-s-credit-enhancement-debuts-with-renewable-energy-issuance-115092301088\\_1.html](http://www.business-standard.com/article/companies/iifcl-s-credit-enhancement-debuts-with-renewable-energy-issuance-115092301088_1.html) (accessed August 5, 2016).
29. IREDA, [www.ireda.gov.in/forms/contentpage.aspx?lid=820](http://www.ireda.gov.in/forms/contentpage.aspx?lid=820); Energy Sector, "IREDA Introduces NCEF Refinance Scheme," March 18, 2014, [www.energysector.in/renewable-news/ireda-introduces-ncef-refinance-scheme](http://www.energysector.in/renewable-news/ireda-introduces-ncef-refinance-scheme); IREDA, [www.ireda.gov.in/forms/contentpage.aspx?lid=820](http://www.ireda.gov.in/forms/contentpage.aspx?lid=820) (accessed April 8, 2016). Reserve Bank of India, Department of Non-Banking Regulation, NOTIFICATION No.DNBR.008-009/ CGM(CDS)-2015 (March 27, 2015), [rbidocs.rbi.org.in/rdocs/Notification/PDFs/RRCCIN270315.PDF](http://rbidocs.rbi.org.in/rdocs/Notification/PDFs/RRCCIN270315.PDF) (accessed April 8, 2016); Reserve Bank of India, Frequently Asked Questions: Infrastructure Finance Companies (March 1, 2016), <https://rbi.org.in/Scripts/FAQView.aspx?Id=89> (accessed April 8, 2016).
30. Green Investment Bank, Green Impact, [www.greeninvestmentbank.com/green-impact/](http://www.greeninvestmentbank.com/green-impact/) (accessed April 8, 2016).
31. UK Green Investment Bank plc, Annual Report and Accounts 2014-15, June 22, 2015, [www.greeninvestmentbank.com/media/44802/gib\\_annual\\_report\\_2015\\_aw\\_web.pdf](http://www.greeninvestmentbank.com/media/44802/gib_annual_report_2015_aw_web.pdf) (accessed April 8, 2016).
32. OECD, Policy Perspectives: Green Investment Banks, 2015, [www.oecd.org/green-growth/green-investment-banks.htm](http://www.oecd.org/green-growth/green-investment-banks.htm), Page 14.
33. Ibid.
34. Green Investment Bank, Summary of Transactions, March 17, 2016, [www.greeninvestmentbank.com/media/45015/gib\\_transaction\\_table\\_170316.pdf](http://www.greeninvestmentbank.com/media/45015/gib_transaction_table_170316.pdf) (accessed April 8, 2016).
35. UK Green Investment Bank plc, Annual Report and Accounts 2014-15, June 22, 2015, [www.greeninvestmentbank.com/media/44802/gib\\_annual\\_report\\_2015\\_aw\\_web.pdf](http://www.greeninvestmentbank.com/media/44802/gib_annual_report_2015_aw_web.pdf) (accessed April 8, 2016).
36. Connecticut Green Bank, <http://www.ctcleanenergy.com/Default.aspx?tabid=62> (accessed April 8, 2016).
37. Inter-American Development Bank: Public-Private Partnerships to Finance Climate Protection, Connecticut Green Bank, January 28, 2016 (accessed August 5, 2016).

## LIST OF STAKEHOLDER ORGANIZATIONS

From 2013 to 2016, we held discussions and roundtables with many stakeholders, including the following organizations, to develop this report:

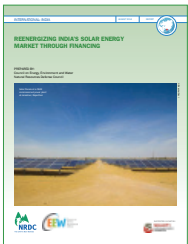
- Asian Development Bank
- Bloomberg India
- Bridge to India
- Central Electricity Regulatory Commission
- Citibank
- Climate Bonds Initiative
- Climate Policy Initiative
- CLP India
- Coalition for Green Capital
- Connecticut Green Bank
- Export Import Bank of India
- Federation of Indian Chambers of Commerce and Industry
- KfW
- Kiran Energy
- Hero Future Energies
- ICICI Bank
- ICICI Prudential Life Insurance
- Indian Renewable Energy Development Agency
- International Finance Corporation
- International Solar Alliance
- InterSolar 2015 participants
- KPMG
- Ministry of New and Renewable Energy
- Ministry of Finance
- Ministry of Power
- MSCI India
- National Bank for Agriculture and Rural Development
- New York Green Bank
- NTPC Vidyut Vyapar Nigam
- Project Finance Corporation of India
- Securities Exchange Board of India
- Shakti Sustainable Energy Foundation
- Solar-Arise
- Solar Energy Society of India
- Suzlon
- Tata BP Solar
- United States Agency for International Development
- United States Department of State
- United States Export Import Bank
- World Bank
- Yes Bank

## INDIA CLEAN ENERGY FINANCE SERIES

The Clean Energy Finance Initiative (CEFI) is a collaborative research effort by the Natural Resources Defense Council (NRDC) and the Council on Energy, Environment and Water (CEEW), aimed towards finding policy and market based solutions to scale up the flow of finance in to the Indian renewable energy market. Based on ongoing research (CEFI) has identified specific themes, analysis on which will underpin the successful development of a domestic finance sector dedicated to clean energy in the years to come. CEFI is partnering with key policy stakeholders including the Ministry of New & Renewable Energy (MNRE), Indian Renewable Energy Development Agency (IREDA) and others to facilitate increased private investments in the clean energy sector in the country. CEFI also engages with multiple other stakeholders ranging such as the Securities and Exchange Board of India (SEBI), to financiers and industry actors such as Export Import Bank of India, Yes Bank, Hero Future Energies, Kiran Energy, and Bloomberg New Energy Finance.

### For more information and to download these reports, please visit:

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[www.nrdc.org/international/india/files/renewable-energy-wind-financing-lp.pdf](http://www.nrdc.org/international/india/files/renewable-energy-wind-financing-lp.pdf)



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[www.nrdc.org/international/india/files/india-renewable-energy-jobs-ib.pdf](http://www.nrdc.org/international/india/files/india-renewable-energy-jobs-ib.pdf)



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