



Scaling Solar India Through Financing

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1. Introduction

India is at a critical crossroads in its effort to become a major solar player. With the creation of the Jawaharlal Nehru National Solar Mission (the Mission) in 2010, India declared its interest in becoming a global leader in solar power development. In the three years since that declaration, India's solar installed capacity has increased from only 17.8 MW as of early 2010¹ to nearly 1.9 GW in June 2013.² India plans to further increase its solar power deployment tenfold to 22 GW of installed capacity by 2022.

If India achieves its target, it likely will be among the world solar leaders including Germany, China, and the United States. For India, like other countries in the solar power race, financing this massive deployment of solar power is a crucial issue. India has taken various steps to create a supportive policy environment for solar power finance, but the market faces several challenges to ensure financing is affordable and available. Additional policy initiatives and financing mechanisms adopted in other countries may benefit India as it scales up solar deployment.

2. Phase II of India's National Solar Mission

a. Phase II Guidelines

The National Solar Mission's Phase II guidelines were recently released in October 2013, prompting the first round of bids for qualifying solar projects in over two years. Given slumping solar sales of late, MNRE's renewed effort to encourage solar growth is important. Despite the Mission's early progress, Phase II is the necessary scaling up phase for the solar market if it is going to meet its ambitious targets. Here are a few of the key guidelines that will shape the Mission's Phase II:

¹ Ministry of New and Renewable Energy, Government of India, 2012. "Jawaharlal Nehru National Solar Mission Phase II Policy Document." <http://mnre.gov.in/file-manager/UserFiles/draft-Missionpd-2.pdf>

² Ministry of New and Renewable Energy, Government of India, 2013. "Achievements." <http://mnre.gov.in/mission-and-vision-2/achievements/>

- **Size:** Projects must be between 10 and 50 MW in size, with a maximum 100 MW allowed per company or bidder.
- **Timing:** Bids are accepted through the end of November 2013, with the power purchase agreements to be signed around February 2014. With thirteen month commissioning timeline, this batch of projects should be online by March 2015.
- **Viability Gap Funding (VGF):** VGF is a subsidy in the form of partial payment from the government to make the project financially viable. The VGF bids are limited to 30% of total project costs or a maximum of Rs 2.5 crores. The funding will be distributed in three tranches: 50% upon successful commissioning of project, and then 10% per year for 5 years following the date of commissioning.
- **Tariff:** The tariff is set at Rs. 5.45 per kWh for 25 years or Rs. 4.95 per kWh (with an accelerated depreciation benefit). Although this tariff is lower than has been offered in the past, developers may still prefer this structure since the VGF is front-loaded to reduce the impact on the project's viability.³
- **Allocation:** Bid allocation is still conducted through reverse bidding, a method that proved popular in Phase 1 due to the transparency it provided and how it drove down prices. This bidding is different however, as the developer will bid for lowest amount of VGF needed rather than the lowest tariff amount, which is set.
- **Domestic Content Requirement (DCR):** A hot-button topic, the requirement that an applicable solar plant must use solar cells and modules manufactured in India, has been bifurcated. Solar developers may choose whether to apply for a project conforming with the DCR, with 50% of projects (375 MW) being awarded to those that are DCR-compliant. While this approach may not resolve World Trade Organization concerns raised by other countries, including the U.S., its technology-neutral wording will at least resolve the "thin film loophole" exposed during Phase 1.

b. Financial Mechanisms Proposed or Adopted for Phase II

The following financial mechanisms have been adopted in the Phase II guidelines, or proposed to coincide with the Mission's second phase:

- **Viability Gap Funding:** The viability gap funding (VGF) scheme described in the previous section is intended to support infrastructure investments through public-private partnerships (PPPs). The VGF target capital grants to facilitate certain infrastructure projects that the government determined were necessary but were not commercially viable without government intervention to "meet the funding gap."⁴ Reverse auctions will be held during Phase II to select the lowest VGF bids needed to fund potential projects.
- **Feed-in Tariffs (FiTs):** Government support of FiTs is critical to the success of solar power in India. Approximately 67 percent of the levelized cost of energy (LCOE) for solar power in India is supported by FiTs.⁵ In Phase II, CERC will issue FiTs for solar power for each fiscal year.

³ "MNRE releases draft guidelines for 750 MW under VGF (JNNSM Phase 2, Batch 1)," Resolve Energy Consultants, available at: <http://www.re-solve.in/perspectives-and-insights/mnre-releases-draft-guidelines-for-750-mw-under-vgf-jnnsm-phase-2-batch-1/>

⁴ Ministry of New and Renewable Energy, Government of India, 2012. "Jawaharlal Nehru National Solar Mission Phase II Policy Document." <http://mnre.gov.in/file-manager/UserFiles/draft-Missionpd-2.pdf>

⁵ Climate Policy Initiative and Indian School of Business, "Meeting India's Renewable Energy Targets: The Financing Challenge," 2012: available at: <http://climatepolicyinitiative.org/publication/meeting-indias-renewable-energy-targets-the-financing-challenge/>

- **Credit Guarantees:** The Ministry of Finance recently approved a program that would provide a guarantee of up to 20 percent of the debt financing of projects in the power sector, including projects in renewable energy.⁶ The guarantees allow projects to attain a higher credit rating, thus broadening the investor pool to include pension funds and insurance companies and lower rates.
- **Priority Sector Lending:** Including renewable energy in priority sector lending has been widely discussed as a means to increase the amount of funding available for solar power projects. The recent prioritization of off-grid solar by the Reserve Bank of India and of solar water heaters by several major banks' loan programs are working example of this mechanism's deployment to spur clean energy expansion.⁷
- **Infrastructure Debt Fund (IDF):** In 2011, the Reserve Bank of India issued guidelines for the operation of new IDFs, structured either as mutual funds or companies, which would provide a conduit for debt financing into infrastructure projects.⁸ Although IDFs may be used for any type of infrastructure asset, they have not yet been used for renewable energy projects.⁹
- **Social Venture Capital Funds:** Non-profit venture capital funds, such as Acumen, that evaluate businesses based on their social or environmental performance in addition to financial performance and invest charitable donations have had some early success in India's energy market.

3. A Look Back: Phase I Financial Mechanisms

a. Mechanisms Employed by the National Solar Mission:

- **Feed-in Tariffs (FiTs):** Both batches of Phase I of the Mission employed a reverse auction bidding process managed by NVVN. Outside of the Mission, the State Electricity Regulatory Commissions (SERCs) declare FiTs for state projects.
- **Long-Term Power Purchase Agreement (PPAs):** Under Phase I of the Mission, solar power developers received long-term (often 25 years) PPAs at preferential tariffs. This provided a strong incentive for developers, but a heavy burden to energy distribution companies (DISCOMs) that were obligated to purchase power at the FiT rate but sell at much lower government-mandated retail rates.¹⁰
- **Power bundling** of renewable with conventional power: During Phase 1, generators sold electricity generated from both solar and conventional resources at a 1:1 ration at a blended rate. This bundling reduced the average LCOE compared to a LCOE based solely on solar generation. Under this program, NVVN purchased 1 GW of solar power, bundled it with electricity

⁶ Remya Nair (Live Mint), 2013. "IIFCL, PFC tie-up likely; will help reduce loan rates for power firms." <http://www.livemint.com/Industry/RjIPOS9eK8AU7Nl6gTxiL/IIFCL-PFC-tieup-likely-will-help-reduce-loan-rates-for-po.html>

⁷ The Hindu Business Line, "Priority lending for off-grid solar products will boost solar industry growth: Ashden founder," available at: <http://www.thehindubusinessline.com/industry-and-economy/priority-lending-for-offgrid-solar-products-will-boost-solar-industry-growth-ashden-founder/article3994622.ece>; Global Solar Thermal Energy Council, "India: Commercial Banks Give Priority to Solar Water Heater Loans," available at: <http://solarthermalworld.org/content/india-commercial-banks-give-priority-solar-water-heater-loans>

⁸ Conduit for debt financing came particularly in the form of long-term debt from pension or insurance funds. Reserve Bank of India, 2011. "Infrastructure Debt Funds (IDFs)." <http://rbi.org.in/scripts/NotificationUser.aspx?Id=6830&Mode=0>

⁹ Partnership to Advance Clean Energy – Deployment (PACE-D) Technical Assistance Program, 2013. "Renewable Energy Finance in India." <http://www.pace-d.com/wp-content/uploads/2013/04/RE-Finance-Presentation-EVI.pdf>

¹⁰ PACE-D Technical Assistance Program, "Financing Renewable Energy in India," October 2013, <http://www.pace-d.com/wp-content/uploads/2013/10/RE-Finance-Report.pdf>

generated from NRVN's own coal-fired plants, and sold the bundled power at a rate below Rs. 5 per kWh.¹¹

- **Multilateral and Bilateral Funding:** Low cost international financing was a major funding source for Phase I projects, particularly from German-based KfW, and American-based Export-Import Bank (Ex-Im) and the Overseas Private Investment Corporation (OPIC). OPIC funding, for example, supports investment from U.S. companies in the Indian market by insuring up to \$250M in total solar project value.¹² Many of these international funding sources' portfolios limit how much financing will be available for Phase II projects, however.
- **Clean Development Mechanism (CDM):** India ranks second in the world in the number of CDM projects hosted (2,252 total) and credits generated.¹³ CDM is a scheme under the Kyoto Protocol to the United Nations Framework Convention on Climate Change under which a country with a commitment to reduce its emissions (an Annex 1 country) may implement a project in a developing or newly-industrialized country that reduces emissions there and receive credit (CER, measured in quantity of abated CO₂ emissions) for the emissions reduction against the Annex 1 country's own reduction commitment. Project developers can register their projects with the Ministry of Environment and Forests to participate in the credits markets.¹⁴
- **Renewable Purchase Obligations (RPOs):** Renewable purchase obligations (RPOs) mandate clean energy targets that utilities must meet. A critical challenge in India's RPO framework is a lack of enforcement.¹⁵ This means not only ensuring that the State Electricity Regulatory Commissions (SERCs) adopt the RPO standards mandated by the NTP, but also ensuring that the SERCs have the power and will to see that the RPO standards are met. Additionally commitments to RPO targets over longer time periods would increase investor confidence that the REC market will exist in the longer term.¹⁶
- **Renewable Energy Credits (RECs):** India created its REC market in 2011 as an attempt to provide an incentive to those areas with higher potential for renewable power generation, such as Gujarat, to generate renewables.¹⁷ Renewable power developers may choose to utilize the FiT or REC for a project, but not both.¹⁸ The market for solar RECs suffers from insufficient demand, with bids to sell priced 3-4 times higher than bids to buy RECs in June 2013.¹⁹ In response to sluggish demand for RECs, CERC doubled the lifetime of RECs from one year to two years,²⁰ but whether this change will have a significant positive effect on the REC market is unclear.

¹¹ Ministry of New and Renewable Energy, Government of India, 2012. "Jawaharlal Nehru National Solar Mission Phase II Policy Document." <http://mnre.gov.in/file-manager/UserFiles/draft-Missionpd-2.pdf>

¹² Capital Markets Climate Initiative, "Scaling Up Solar in India Through Public-Private Action," available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48271/4174-scaling-up-solar-india.pdf

¹³ UNEP RISO Centre, "CDM Pipeline Spreadsheet," <http://www.cdmpipeline.org/cdm-projects-region.htm>

¹⁴ Climate Policy Initiative and Indian School of Business, "Meeting India's Renewable Energy Targets: The Financing Challenge," 2012: available at: <http://climatepolicyinitiative.org/publication/meeting-indias-renewable-energy-targets-the-financing-challenge/>

¹⁵ Partnership to Advance Clean Energy – Deployment (PACE-D) Technical Assistance Program, 2013. "Renewable Energy Finance in India." <http://www.pace-d.com/wp-content/uploads/2013/04/RE-Finance-Presentation-EVI.pdf>

¹⁶ Id.

¹⁷ Id. India's load centers, such as Delhi, are often not in the regions with the highest potential for renewable power generation, such as Gujarat. Climate Policy Initiative and Indian School of Business, "Meeting India's Renewable Energy Targets: The Financing Challenge," 2012: available at: <http://climatepolicyinitiative.org/publication/meeting-indias-renewable-energy-targets-the-financing-challenge/><http://climatepolicyinitiative.org/publication/meeting-indias-renewable-energy-targets-the-financing-challenge/>

¹⁸ Id.

¹⁹ Data from Indian Energy Exchange, 2013. "Renewable Energy Certificate."

<http://www.ixindia.com/Reports/RECData.aspx>, and Power Exchange India, 2013. "REC Market Volume Profile." <http://www.powerexindia.com/PXILReport/pages/RECMVReport.aspx>

²⁰ Ministry of New and Renewable Energy, Government of India, 2013. "Tracking Renewable Power Regulatory Framework (February 2013)." http://mnre.gov.in/file-manager/UserFiles/february_month_2013_ref.pdf

- **Self-financing** by big industry players helped buoy many Phase I projects that could not access affordable financing from other sources. Relying on the company equity will not be enough for Phase II to achieve its scaled up targets, however.

b. Key Financing Mechanisms Employed at the State Level during Phase I:

- **Feed-in Tariffs:** State Electricity Regulatory Commissions (SERCs) of individual Indian states designate their own FiTs for solar power projects outside of the mission. For example, Gujarat's preferential tariffs supported about two-thirds of the total solar photovoltaic systems in India by 2012.²¹
- **Accelerated Depreciation (AD) :** Under an AD scheme, a solar power generator may depreciate its capital asset (the solar project) earlier than would otherwise be permitted, providing a tax benefit of offsetting profits in earlier tax periods. In Gujarat, project developers have the option of depreciating 80 percent in the first year.²² However, a shortcoming of AD schemes for renewable energy is that the company often has low taxable profits in early years of the project anyway, which limits the value of the AD.²³ One solution is to provide generating companies with certificates that carry rights to AD benefits, rather than the benefits themselves, and allow the certificates to be traded.²⁴
 - *Side bar on wind power.* Until April 2012, wind power generators in India could depreciate 80% of their project cost in the first year.²⁵ MNRE reportedly is considering reintroducing AD benefits for wind generators after wind power production fell significantly in FY 2012-13.
- **Bank Guarantees:** Some states require solar project developers to obtain bank guarantees in connection with their project financing. In Gujarat, the developer of a solar project must provide a bank guarantee of Rs. 50 lakh per MW.²⁶ In Madhya Pradesh, the developer must provide a bank guarantee of Rs. 5 lakh per MW.²⁷
- **Net Metering:** Tamil Nadu is developing a net metering scheme whereby commercial and residential customers may earn "power credits" for energy provided to the grid by solar power systems.²⁸ Andhra Pradesh recently announced that it will do the same.²⁹

²¹ Climate Policy Initiative and Indian School of Business, "Meeting India's Renewable Energy Targets: The Financing Challenge," 2012: available at: <http://climatepolicyinitiative.org/publication/meeting-indias-renewable-energy-targets-the-financing-challenge/>

²² National Renewable Energy Laboratory, German Technical Cooperation, Renewable Energy Policy Network for the 21st Century Secretariat in France, and Integrated Research and Action for Development in India, 2010. "Indian Renewable Energy Status Report." <http://www.nrel.gov/docs/fy11osti/48948.pdf>

²³ Partnership to Advance Clean Energy – Deployment (PACE-D) Technical Assistance Program, 2013. "Renewable Energy Finance in India." <http://www.pace-d.com/wp-content/uploads/2013/04/RE-Finance-Presentation-EVI.pdf>

²⁴ Partnership to Advance Clean Energy – Deployment (PACE-D) Technical Assistance Program, 2013. "Renewable Energy Finance in India." <http://www.pace-d.com/wp-content/uploads/2013/04/RE-Finance-Presentation-EVI.pdf>

²⁵ Remya Nair and Utpal Bhaskar (Live Mint), 2013. "India seeks to revive interest in wind sector." <http://www.livemint.com/Industry/HzQ1NGtt9kX7MqsJcJPcmO/India-seeks-to-revive-interest-in-wind-sector.html>

²⁶ Ministry of New and Renewable Energy, Government of India, 2013. "Salient Features – Solar policies." http://mnre.gov.in/file-manager/UserFiles/guidelines_sbd_tariff_gridconnected_res/salient_features_for_State-wise_solar_policies.pdf

²⁷ Id.

²⁸ Ministry of New and Renewable Energy, Government of India, 2013. "Salient Features – Solar policies." http://mnre.gov.in/file-manager/UserFiles/guidelines_sbd_tariff_gridconnected_res/salient_features_for_State-wise_solar_policies.pdf

²⁹ V Kamalakara Rao (The Times of India), 2013. "Discoms get cracking on Solar Net Metering System." http://articles.timesofindia.indiatimes.com/2013-06-30/visakhapatnam/40285582_1_epdcl-discoms-eastern-power-distribution-company

- **Renewable Energy Infrastructure Development Fund (REID):** Rajasthan developed a REID Fund that will provide financing for transmission lines and other infrastructure related to renewable energy deployment.
- **Charge Exemptions:** In Andhra Pradesh, solar power generators are exempt from wheeling and transmission charges on electricity sold within the state.³⁰ Similarly, Tamil Nadu exempts solar power projects from wheeling and banking charges.³¹
- **Subsidies:** Chhattisgarh provides to solar energy developers subsidies on interest and capital investment as well as exemptions from electricity and stamp duties through March 2017.³²

4. International Financial Mechanisms

Brazil. Brazil has demonstrated a vast potential for renewable energy growth, and utilizes a specialized tax regimes, national climate change targets, and public bidding through auctions to foster investment and market growth. With its similar growth and financing environment, including high interest rates, Brazil offers a strong example of an institution that could be implemented in India to address the renewables financing gap. The Brazil National Development Bank (BNDES) is a major financier for clean energy projects, including wind energy, and supports renewable, transport, building and industrial energy efficiency, waste-to-energy, preventing desertification, and reduced deforestation.³³ The BNDES provides low-cost long-term financing at a large scale, cutting renewable energy costs by one-fifth while encouraging investment.³⁴ It acts as the main source of credit for both private and public companies across Brazil.³⁵

United States. As in India, many individual American states promote solar energy through innovative financing mechanisms in addition to national programs.

- **Loan guarantees** for early projects without capital have been very successful at lowering interest rates in the United States. However, the failure of one program invested in by the government doomed the portfolio of programs in U.S. (i.e., collapse of the Solyndra company), offering a cautionary tale.
- **Private sector solar leasing model:** Instead of buying the solar equipment for a house, the homeowner leases it. The leasing company gets a loan from a bank and uses the capital as line of credit for the homeowners who pay leasing fee. However, homeowners seeking the federal tax credits (up to 30%) that come with buying a solar system can now take out direct loans for the purchase.³⁶
- **Renewable portfolio standards** (state-level): In California, for example, utilities procure solar to meet mandated targets. Due to strong enforcement of the RPS, this has proven to be a very effective policy.
- **Net energy metering** on state level has been very popular in the U.S. Many states have adopted net metering policies, spurring solar expansion.s

³⁰ Ministry of New and Renewable Energy, Government of India, 2013. "Salient Features – Solar policies." http://mnre.gov.in/file-manager/UserFiles/guidelines_sbd_tariff_gridconnected_res/salient_features_for_State-wise_solar_policies.pdf

³¹ Id.

³² Id.

³³ PACE-D Technical Assistance Program, "Financing Renewable Energy in India," October 2013, <http://www.pace-d.com/wp-content/uploads/2013/10/RE-Finance-Report.pdf>

³⁴ Climate Policy Initiative and Indian School of Business, "Meeting India's Renewable Energy Targets: The Financing Challenge," 2012: available at: <http://climatepolicyinitiative.org/publication/meeting-indias-renewable-energy-targets-the-financing-challenge/>

³⁵ Id.

³⁶ Groom, Nicola, Reuters, "Loans challenge big money's leasing model for U.S. rooftop solar," Sept. 24, 2013, available at: <http://www.reuters.com/article/2013/09/24/us-solar-loans-idUSBRE98N04C20130924>

- **Master Limited Partnerships (MLPs) and Real Estate Investment Trusts (REITs)** could improve the efficiency of a solar project by converting tax credits into actual capital. MLPS and REITs can raise money on public exchanges but do not pay income tax at the corporate level (pass-through entities), leading to a much lower cost of capital. MLPs are only allowed for certain types of businesses at this time, and an act of Congress is required to include renewable energy. Solar REITs on the other hand would require a ruling from the Internal Revenue Service (IRS) due to the tax ramifications of forming this type of investment trust.
- **Green bonds.** Green bonds function like any other type of bond, with the added requirement that the financing must be used for “green” projects such as renewable energy deployment. Issuers of green bonds may include governments (including state governments and export-import banks), inter-governmental organizations such as the World Bank or regional development banks, financial institutions, and other corporations. In total, they issued more than Rs. 3 lakh crore (approximately \$55 billion) worth of climate-themed bonds in 2012 alone.³⁷ The advantages of green bonds in the Indian context could include access to domestic and foreign capital as well as relatively low cost interest rates because renewable energy projects should be expected to have stable cash flows and low risk.³⁸

Germany. The German renewable energy market is among the most successful, expansive, and innovative in the world. A combination of national-level policies and investment protection has allowed for tremendous growth since the German Renewable Energy Act (Erneuerbare-Energien-Gesetz, EEG in German) was enacted in 2000. Climate protection targets, long-term strategies for future energy supply, and market-oriented innovation and cost reduction have allowed for the expansion of renewable energies in Germany. However, the lowered FiTs that lessened demand and led to a massive over-supply of solar panels in Germany are lessons about the need for careful planning for the emerging solar market in India.

- **Investment protection through FiTs.** In Germany, generated electricity from renewable energy facilities received a fixed FiT rate, which was lowered every year depending on project size. These rates are technology specific and guaranteed for 20 years. The long-term fixed price allowed facilities, particularly small and medium-sized enterprises, equal accessibility to the energy production market and fueled rapid scaling of the renewable energy market.
- **Remuneration rates.** The price of fossil fuel and renewable-generated electricity is passed on and paid for by the consumer, not government-established subsidies so that individuals who use more, pay more. Thus, the market growth of renewable energy is spurred by consumption and generation, not taxes on the German public.
- **Encouraging innovation through lowered FiT rates.** The feed-in tariff prices are periodically lowered for new power plants. This creates an innovation incentive as firms are determined to research and implement technologies that are more efficient and less costly.

China. China continues to lead the world in energy consumption and in investments in renewable energy. Renewable energy investment has risen considerably in the world’s leading emerging market and Chinese fiscal and governmental policies foster the resulting market development.

- **Feed-in tariffs.** FiTs for electricity rates such that renewable electricity generators received a subsidy at market rates.

³⁷ Farah Khalique (Financial News), 2013. “Green bonds win new fans and investors.” <http://www.efinancialnews.com/story/2013-06-18/green-bonds-win-fans-investors>

³⁸ Partnership to Advance Clean Energy – Deployment (PACE-D) Technical Assistance Program, 2013. “Renewable Energy Finance in India.” <http://www.pace-d.com/wp-content/uploads/2013/04/RE-Finance-Presentation-EVI.pdf>

- **Renewable Power Quotas.** The Chinese government agencies set and modify quotas annually for the proportion of power purchased that must be from a renewable energy source. This is directed at and enforced by the grid companies, as opposed to the consumer.
- **Priority Dispatch.** Government agencies develop regulations that require grid companies to give priority electricity dispatch to renewable energy generators over power plants fueled by coal or other high emission plants.
- **Central Development Fund.** Renewable energy surcharges are now allocated to a central renewable energy development fund. The central government manages the fund, instead of provincial grid companies, and may spur further financial investment and development.

Norway. Norway has many national financial incentives to directly and indirectly encourage renewable energy. **Green Certificates** are a primary subsidy for renewable energy, spanning Norwegian and Swedish markets. Companies that supply power to end consumers must purchase green certificates from renewable power plants, creating an additional cash flow to renewable energy sources. New renewable generation sources and existing renewable generation sources that increase their production through construction are eligible to obtain green certificates.

Conclusion:

Financing remains the largest barrier for India's solar energy market. Investments are expected to grow during Phase 2, and yet, the greatest challenge for solar energy is securing project financing. The right subsidy structure must be in place before solar investment will really take off in India. Diverse financial policies, some currently adopted by the central government and many that have proven successful on the state-level or internationally, can fuel India's solar market.