

**UNLOCKING ACCESS TO FINANCE  
FOR DECENTRALISED ENERGY SOLUTIONS**

Study done by:



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# LIST OF ABBREVIATIONS

|           |   |
|-----------|---|
| ADB       | Asian Development Bank  |
| AEDA      | Assam Energy Development Agency   |
| CEA       | Central Electricity Authority   |
| CGTMSE    | Credit Guarantee Scheme for Micro and Small Scale Enterprises                           |
| CLEAN     | Clean Energy Access Network   |
| CSR       | Corporate Social Responsibility   |
| CTI PFAN  | Climate Technology Initiative - Private Financing Advisory Network                      |
| DRE       | Decentralised renewable energy  |
| DRI       | Differential rate of interest   |
| FWWB      | Friends of Women's World Banking  |
| HP        | Horsepower  |
| IFC       | International Finance Corporation   |
| ICS       | Improved Cookstoves   |
| IIMA-CIIE | Indian Institute of Management - Centre for Innovation, Incubation and Entrepreneurship |
| IREDA     | Indian Renewable Energy Development Agency  |
| KCC       | Kisan Credit Card   |
| LaBL      | Lighting a billion lives  |
| MFI       | Microfinance institution  |
| MNRE      | Ministry of New and Renewable Energy  |
| NABARD    | National Bank for Agriculture and Rural Development                                     |
| NEDFi     | North Eastern Development Finance Institution   |
| RE        | Renewable energy  |
| REC       | Rural Electrification Corporation   |
| RGVN      | Rashtriya Gramin Vikas Nidhi  |
| RO        | Reverse Osmosis   |
| SHG       | Self- help group  |
| SHLS      | Solar home lighting solution  |
| S3IDF     | Small-scale Sustainable Infrastructure Development Fund                                 |
| SPEED     | Smart Power for Environmentally Sound Economic Development                              |
| SWP       | Solar Water Pumps   |
| TERI      | The Energy and Resources Institute  |
| WSDS      | Weaker Section Development Society  |





## 2. BACKGROUND

**The challenge:** Implement interventions to alleviate barriers to enterprise and end-user financing to promote wider implementation of decentralised renewable energy access solutions in India.

More than 33% of the Indian population still does not have access to electricity and over 49% of people are dependent on traditional fuels such as firewood, and dung to meet their cooking energy needs. The problem assumes more severe proportions in rural India, where the numbers increase to 45% and 62% with regards to access to electricity and dependence on traditional fuels respectively.<sup>1</sup> The challenge of energy access is most pronounced in the states of Rajasthan (4172 villages), Odisha, Jharkhand (2279 villages), Bihar (1757 villages), Arunachal Pradesh (1564 villages) and Madhya Pradesh (1465 villages). According to the Central Electricity Authority (CEA) estimates, the Eastern and North-Eastern states have around 12,144 unelectrified villages out of an estimated total of 19,909 unelectrified villages in the country (as of 31 January 2015).<sup>2</sup>

Decentralised renewable energy solutions have the potential to ameliorate the bleak energy access situation of the country. Over 250 off-grid renewable energy players (across various technologies and scale) are estimated to exist in the country with diverse mandate, geographic focus and revenue models.<sup>3</sup> However, their ability to scale up business operations is severely hampered by myriad challenges including finance.

The Clean Energy Access Network, a network of decentralised energy stakeholders convened in 2014 with an objective to scale up energy access solutions in the country engaged the Council on Energy, Environment and Water (CEEW) to undertake a scoping study to investigate financing (enterprise and end-user) challenges which currently hinder wider uptake of off-grid renewable energy (RE) and formulate potential interventions which could be implemented by CLEAN to bridge the financing gaps.

**Off-grid finance consists of two components:** the 'downstream' component focuses on end users (consumer finance), while the 'upstream' component focuses on enterprises (start-up/early-stage capital, working capital, growth capital, etc.).

Financing barriers encountered by decentralised renewable energy (RE) enterprises stem from small project and ticket size of transaction, limited track record of the enterprises, lack of working capital, limited understanding of off-grid projects among financiers and investors and uncertain policy (threat from extension of grid in the case of micro grids) and subsidy disbursement regime.

End-user financing also remains a major challenge due to lack of financing options that spreads consumer investment over a time period and is in line with his/her household budget. Finance providers have shown limited appetite to design products for the energy poor and energy product and distribution companies lack the ability to directly finance end-users.

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1. Karthik Ganesan (2014), *Energy Access in India – Today, and Tomorrow*, New Delhi: Council on Energy, Environment and Water, available at: <http://ceew.in/pdf/CEEW-Energy-Access-in-India-Today-and-Tomorrow-1Jul14.pdf>, accessed 4 February 2015

2. CEA estimates (31 October 2014)

3. CEEW-USAID India (2013), "Developing effective networks for energy access", available at [http://ceew.in/pdf/an\\_analysis\\_on\\_developing\\_effective\\_networks\\_for\\_energy\\_access.pdf](http://ceew.in/pdf/an_analysis_on_developing_effective_networks_for_energy_access.pdf), accessed in 17 February 2015

## 3. OBJECTIVE AND METHODOLOGY

### 3.1 Objective of the study

Given that finance constitutes one of the most vital ingredients for promoting uptake of decentralised renewable energy (RE) technologies/solutions across the country, it is important that financing gaps are understood and addressed by the Clean Energy Access Network (CLEAN) to the maximum extent possible to spur a sustainable decentralised RE market in the country. Against this backdrop, the study attempts to:

- Undertake a market analysis to understand the various decentralised RE business models
- Map the financing mechanisms in place for various decentralised RE technologies
- Understand the barriers encountered in accessing enterprise and end-user finance
- Develop a set of interventions which can then be implemented by CLEAN to address the financing gaps in the next three years

In a nutshell, the research intends to lay the foundation for CLEAN’s work on facilitating greater access to finance for off-grid RE enterprises and end-users in the next three years.

### 3.2 Methodology

The study began with literature survey or desk research to collate background information on key financing instruments for the off-grid energy sector, challenges in accessing enterprise and end-user financing and identify key stakeholders for one-on-one engagement. This was followed with primary research, which included interviews, site visits and a stakeholder consultation in the north-east (Guwahati) to garner feedback on the current status of off-grid energy technologies in the region (Table 1).

**Table 1: Overview of research methodology**

| Secondary Research  | Primary research   | Synthesising the Report  |
|---|--|--|
| <ul style="list-style-type: none"> <li>• Conduct literature review of enterprise and end-user financing mechanisms and financing challenges</li> <li>• Compile a stakeholder list for one-on-one interaction</li> </ul> | <ul style="list-style-type: none"> <li>• Design a questionnaire for stakeholder interviews – different for enterprises, financiers, investment enablers grassroots organisations</li> <li>• Telephonic; e-mail, one-on-one interviews (27)</li> <li>• Field visits to East and North-East (8) to meet stakeholders</li> <li>• Conduct stakeholder discussion in North-East (Guwahati)</li> </ul> | <ul style="list-style-type: none"> <li>• Weave in findings from the interviews, field visits and stakeholder workshop into the report</li> </ul> |

## 4. UNDERSTANDING OFF-GRID RE BUSINESS MODELS

This section provides an overview of the various business models of enterprises across different off-grid RE technologies and payment options offered by them to end-users.

**Solar off-grid lighting products:** The solar lighting product category primary includes solar lanterns/task lights and home lighting systems (SHLS) of varying sizes. A basic solar lighting system could be less than 10 W and be able to power one to three LED lights and one mobile charging point. A standard SHLS can be up to 200 W and can power multiple lights, as well as appliances such as DC fans and TVs. Most of the SHLS players are system integrators with a handful of medium scale players (mostly Ministry of New and Renewable energy,(MNRE) empanelled channel partners) having their own manufacturing unit and distribution network. The following table represents the most prevalent business models and payment mechanisms deployed by solar lanterns/HLS players:

**Table 2: Business models and payment mechanisms - solar lighting products**

| <b>Business models for solar lighting products/systems</b>   |
|--|
| <ul style="list-style-type: none"> <li>Design, manufacture and sales via dealer-distribution network: For example: Gautam Polymers</li> </ul>  |
| <p><b>System Integrators (design, procure components, assemble and sales)</b></p> <ul style="list-style-type: none"> <li>Products sold through authorised dealer-distributors: Barefoot Power; Kirti Solar</li> <li>Products sold through regional centres and local agents: SELCO (district/block level energy centres), Onergy (district/block level shakti kendras)</li> <li>Products sold through partnerships with microfinancing institutions (MFIs), para-government institutions: d.light, Greenlight Planet</li> <li>Entrepreneur model: TERI LaBL</li> </ul> |
| <p><b>Consumer payment mechanisms</b></p> <ul style="list-style-type: none"> <li>Individual loans (Consumer makes 10-25% down payment; MFI/Bank provides loan 5-20% interest): For e.g., SELCO, Boond</li> <li>Group loans to SHGs: For e.g., Thrive Energy</li> <li>Subsidies routed through banks: For e.g., Gautam Polymers</li> <li>Pay-as-you-go model: For e.g., SIMPA</li> <li>Monthly instalments: Visionary Lighting and Energy</li> </ul>  |
| Source: CEEW compilation   |

**Improved Biomass Cookstoves (ICS):** Improved cookstoves(ICS) have two variants: natural draft and forced draft models and are available for individual and community use. Thermal efficiency of natural draft models is around 25% while forced draft models report efficiency of the order of 34% to 37%. The cost of natural draft ICS ranges roughly between INR 1,399 – INR 2,000. Forced draft models are slightly higher priced at around INR 3,000 or above as the gasification process is aided by fans which in turn are powered through solar panels and batteries.<sup>4</sup> If the cost of pelletised fuel is factored in, annual operating cost for forced draft stoves could reach INR 5,500. As forced draft models consist of moving parts (as opposed to

4. Based on telephonic interviews with ICS manufacturers; Abhishek Jain, Poulami Choudhury, and Karthik Ganesan (2015) 'Clean, Affordable and Sustainable Cooking Energy for India: Possibilities and Realities beyond LPG', available at: <http://ceew.in/pdf/ceew-clean-affordable-and-sustainable-cooking.pdf>, accessed on 20 March 2015

natural draft counterparts), the annual maintenance cost could range from INR 100 to INR 250. Battery replacement after every two years could be anywhere around INR 500-700.<sup>5</sup>

In contrast, a traditional mud stove can cost as little as INR 50.<sup>6</sup> Given high upfront and operational cost (associated with usage of pelletised fuel) of forced draft stoves, most players deploy these models for institutional use which offer an attractive payback period.<sup>7</sup> The cost economics as well as user acceptability/ease of use of the product when compared with LPG/traditional stoves are the primary factors hindering uptake of ICS. Decentralised RE lighting solutions compete with expenditure on kerosene and transportation cost in charging mobile phones whereas improved cookstoves compete with traditional stoves which are not only less costly but also easy to use. This is why ICS still remains a “push product” in several areas and requires extensive marketing and awareness campaigns to generate demand.

ICS manufacturers are still spending considerable effort in continuous R&D based on customer feedback. Certain companies manufacture stoves which can use different types of fuels depending on the region and can thus gain greater buy-in from consumers, for e.g., charcoal, wood, biomass etc.

Most ICS players manufacture products in-house and distribute it via MFIs and grassroots organisations (Table 3). Interestingly, stakeholder interviews indicated that ICS manufacturers were not availing MNRE subsidies. A few enterprises, when interviewed, indicated that they target higher-income rural households or semi-urban/urban households with a view that it would create awareness amongst low-income households and make them aspire to buy an improved cookstove.

**Table 3: Business models and consumer payment modes: improved cookstoves**

| <b>Business models – Improved Cookstoves</b>  |
|---|
| <ul style="list-style-type: none"> <li>• Manufacture and dissemination via:               <ul style="list-style-type: none"> <li>• Own supply chain: Greenway Grameen Infra (natural draft)</li> <li>• Energy entrepreneurs at block/district level : Phoenix RBS Group (forced draft model)</li> <li>• MFIs and NGOs: First Energy (forced draft), Envirofit (natural draft)</li> <li>• Grants and CSR: Grameen Greenway, Envirofit</li> </ul> </li> </ul> |
| <b>Consumer payment modes</b>   |
| <ul style="list-style-type: none"> <li>• Loans through MFIs: For e.g., Envirofit, Greenway Grameen, First Energy</li> <li>• Upfront payment: For e.g., Samuchit, RAMTARA</li> </ul>   |
| Source: CEEW compilation  |

**Solar water pumps (SWPs):** Most solar water pump players are system integrators (Claro Energy, Suriya Power, Jain Irrigation) and offer products ranging from 1 HP up to 10 HP. Companies do not always have their own dealers and distribute systems via local channel partners, outlets of fertiliser companies, NGOs etc. having last mile reach (for e.g., Claro Energy). There are certain system integrators dedicated to selling only SWPs while there are those which include SWPs as one of the products in their wider portfolio of off-grid RE solutions (for e.g., Boond, Onergy).

The capital cost of SWPs increases by INR 1.5 lakhs/HP.<sup>8</sup> The business model of SWP companies is heavily reliant on subsidies considering the high capital cost of solar water pumps. Aside from government tenders which target individual farmers, these enterprises also install SWPs on captive farms owned by various companies such as sugar mills etc.

In an effort to move away from subsidies, one of the enterprises, Claro Energy, is pilot testing a pay-as-you-go model wherein farmers are charged a nominal fee each month for irrigation services.

5. Abhishek Jain, Poulami Choudhury, and Karthik Ganesan (2015) ‘Clean, Affordable and Sustainable Cooking Energy for India: Possibilities and Realities beyond LPG’, available at: <http://ceew.in/pdf/ceew-clean-affordable-and-sustainable-cooking.pdf>, accessed on 20 March 2015

6. Livemint, December 29, 2010, “Replacing the traditional chulha”, <http://www.livemint.com/Politics/uWfLjlxxtsl9UADucagYiL/Replacing-the-traditional-8216chulha8217.html>, accessed on 25 March 2015

7. LPG cylinders are provided to institutions at unsubsidised cost; hence ICS is an attractive value proposition

8. CEEW-Stakeholder interviews

**Decentralised renewable energy (DRE) (micro/mini grid) solutions:** DRE or micro/mini-grid enterprises install systems that run on solar, biomass, wind, hydro or hybrid (solar-wind or biomass-solar) energy sources. Recently, biogas-powered micro grids are also being explored as one of the options by a few enterprises (such as Gram Oorja). There exist enterprises such as Husk Power, Gram Oorja, DESI Power etc. which are technology agnostic in terms of the source of energy used to power these mini grids. Therefore, they deploy solar, wind, biomass or even biogas<sup>9</sup> depending on the site-specific attributes and costs.

The DRE segment can be segmented in terms of plant sizes: (i) less than 2 kW (ii) 2-10 kW (iii) greater than 10 kW. Installations less than 10 kW are considered micro grids and systems above that are classified as mini grids. DRE enterprises can cater to both household energy use as well as commercial needs (example, markets or telecom towers). Further, few operators provide basic lighting and mobile charging services while there are those that design systems that can cater to households' aspirational energy needs and livelihood generating activities (which in turn can increase demand for power from DRE plants). The majority of DRE enterprises (particularly micro grid operators) use solar technology.<sup>10</sup> Most DRE enterprises are operating plants with capacities less than 10kW and prefer build-only models as it enables them to recover the capital costs relatively quickly (3 years).<sup>11</sup>

The smaller systems of sizes less than 10kW use debt, grants, and corporate social responsibility (CSR) funds to finance the system. Mini grid players operating bigger plants have a longer payback period of 7-8 years and rely on grants as well as loan-equity mix. For instance, DESI Power installs mini grids using 75% loan and 25% equity to finance the systems. Gram Oorja targets tribal remote hamlets and uses grants to cover the capital cost while the operational cost is covered through user charges aggregated in community accounts. Few enterprises have been able to raise funds to sustain ecosystem building activities such as skill building/training local village level people for O&M. Table 4 and 5 highlight business models and end-user payment mechanisms deployed by enterprises respectively.

**Table 4: Business models of DRE or micro and mini grid enterprises**

| Category                         | Sub-category  | Plant size and technology   |
|----------------------------------|---|---|
| <b>Build and maintain models</b> | <b>Franchise/entrepreneur model:</b> The DRE enterprise partners with other local players/village level entrepreneurs. The franchisee partners handles preliminary due-diligence, identifies manpower for plant operations, seeks local regulatory approvals responsible for daily operations and payment of maintenance fees to the company. The DRE enterprise provides technology and equipment; trains the team, provides maintenance support. For example – Husk Power Systems, Onergy | Mostly Plant size less than 10 kW<br>Solar micro grids, biomass micro grids, solar-biomass hybrid plants, small wind installations. pico hydro plants |
|                                  | <b>Community model:</b> The DRE enterprise builds the plant, trains locals for O&M and transfers ownership to a village committee. For example - Gram Oorja, DESI Power. This model is mostly deployed by mini grid operators. In order to mitigate credit risk, enterprises (for e.g., DESI Power) focus on powering livelihood generating activities through mini grids.  | Greater than 10 kW, mostly biomass based systems, biomass-solar systems; small wind   |
|                                  | <b>Catering to commercial loads:</b> The DRE enterprise installs mini grids to fulfil energy needs of anchor loads such as telecom towers, institutions and markets. For example, OMC Power, Mlinda, E-Hands Energy, Unitron (small wind)   | Greater than 10 kW  |

9. Gram Oorja has recently installed biogas powered mini grid in a village in Madhya Pradesh

10. The Climate Group, *The Business Case of Off-grid energy in India*, available at <http://www.dalberg.com/wp-content/uploads/2015/02/The-business-case-for-offgrid-energy-in-India.pdf>; accessed on 23 February 2015

11. Stakeholder interviews

| Category                          | Sub-category  | Plant size and technology |
|-----------------------------------|---|---------------------------|
| <b>Build only</b>                 | <b>CSR model:</b> The DRE enterprise is restricted to working in areas where CSR funding is available. The DRE enterprise sells the system to the entrepreneur who operates them in villages. The DRE enterprise imparts training on O&M and payment collection. For e.g., Minda Next Gen | Less than 10 kW           |
| <b>Build-own-operate-maintain</b> | The company installs the plant and employs its own staff to operate it and collect payment from end-consumers. For e.g., Mera Gao Power   | Less than 10kW            |

Source: CEEW compilation

**Table 5: End-user payment models – DRE or micro and mini grid enterprises**

| End-user payment models  | Examples  |
|--|---|
| <b>Pre-paid mechanism/Pay-as-you go:</b> Use of smart pre-paid meters- customers pay a small fee as connection cost (INR 500), buy credits/small recharges, either daily, or monthly (similar to mobile talk-time) and the meter automatically disconnects supply after the credit is exhausted. | Naturetech Infra based on solar(AC Grids), Husk Power Systems (DC grids) based on biomass/biomass-solar                                       |
| <b>Fixed tariff:</b> Households receive a standard offering and are charged a fixed amount at regular intervals (every month or week).   | Minda (not-for-profit), OMC Power; Minda Next Gen, Mera Gao Power   |
| <b>Post-paid (metering):</b> Customers receive monthly bills as per usage  | Gram Oorja  |
| <b>Power Purchase Agreements (PPAs) with anchor loads:</b> This is applicable to mini grid operators (size > 10 Kw) which supply power to commercial clients/anchor loads such as telecom towers. Households are sold excess power on per unit consumption basis.                                | DESI Power (Biomass), OMC Power (Solar)   |
| <b>Upfront payment:</b> This is applicable for mini grid enterprises installing systems for commercial end-user.   | Biotech India, E-Hands Energy   |
| <b>Feed in tariff</b> from local power distribution company.   | Avani Bio Energy (biomass)  |
| <b>Subsidies</b>   | Solar lighting solutions <sup>12</sup> , solar water pumps, micro/mini grids, pico hydro, small wind installations, biogas installations, ICS |

Source: CEEW compilation

12. Capital subsidy has been discontinued post 31 March 2015

## 5. KEY FINANCING MECHANISMS

### 5.1 Enterprise financing mechanisms:

Grants offered by multilateral/bilateral agencies and philanthropic bodies have been pivotal for the enterprises in terms of early stage financing, R&D for product development, technical assistance, and project financing. Grants have been the backbone of several mini grid enterprises in remote areas.

Various competitions/project call facilities, such as IIMA-CIIE's Infuse Ventures, Sankalp Forum, CTI-PFAN Project Call facility, ADB Investor Forum, etc. have provided early stage/seed funding to enterprises (based on enterprise/project needs) but the sector still grapples with the need for more seed investors. Intelicap Impact Investment Network (I3N) is India's first angel network of high net worth individuals and institutional investors seeking investments in early stage enterprises. I3N was established to build a strong community of experienced "angel" investors who can provide equity capital of up to USD 1 million in these very early stage companies. I3N leverages the Intelicap ecosystem to bring a rich and carefully vetted deal pipeline to its members.

Debt finance has been a crucial need for enterprises and accessing it from traditional sources such as banks (regional rural banks, public sector banks or commercial banks) has been challenging primarily due to lack of collateral and the requirement of three years of audited balance sheet showing profitability. Banks are risk averse and absence of collateral makes it difficult to access long term loans at low interest rates. Often small-scale enterprises with limited collateral, have managed loans of only upto INR 20 lakhs and banks are often reluctant to lend above loan size of INR 50 lakhs.<sup>13</sup> Interviews also indicated that prior networks/connections with bank managers/branch managers served as a silver lining in the context of obtaining loans from banks. Another resonating sentiment amongst enterprises was that the lengthy duration (of more than 2 years) involved in procuring bank loans has been an obstacle.

Very few enterprises have managed to access collateral free loans through government-run schemes such as the Credit Guarantee Scheme for Micro and Small Scale Enterprises (CGTMSE) administered by SIDBI. The maximum amount of loan which can be availed under the scheme is INR 1 crore.

#### Debt financing through NABARD

Interviews indicated that few organisations were also able to tap into NABARD for debt financing of DRE installations in villages. Organisations' experience with NABARD varied with geographies. Organisations have been successful in accessing debt finance from NABARD where it charged a collateral ranging from 25%-30% of the total approved debt amount (for example, in West Bengal). There have been instances where NABARD has charged a collateral of 80%-90% of the total approved debt in other states. The interest rate charged is 10% across all geographies.

**Venture debt funds** such as Intellegrow provide loans (with limited collateral or even collateral free loans) to early or growth-stage enterprises (with at least 12 months of track record) at interest rates of 18%-20% thereby bridging the existing gaps in debt finance for small and medium scale off-grid RE enterprises struggling with limited collateral. Intellegrow has a balance sheet of INR 80 - 85 crores (raised from the Michael and Susan Dell Foundation and Omidyar Network) which it plans to expand to INR 250 crores in FY15. Access to equity is essential to fuel enterprise growth/expansion.

The decentralised RE sector grapples with lack of mainstream investment capital. Various social impact investors/venture capital funds have channelled equity investment by providing venture capital to various off-grid RE enterprises. It is important to note that most of the funds are not always exclusively for clean energy technologies but are sector agnostic and focused on low income markets, like Aavishkar, Bamboo Finance, Acumen Fund, LGT VP, ResponsAbility, etc. Few examples of investments (by sector agnostic funds) are: (i) Bamboo Finance and Husk Power Systems, Greenlight Planet, Orb Energy (ii) Acumen Fund and Husk Power Systems, d.light designs, Orb Energy, Avani Bio-energy (iii) LGT VP and Husk Power Systems,

13. CEEW-Stakeholder interviews

GreenOil (iv) Aavishkaar and Van Vidyut Power Ltd ResponsAbility and Punjab Biomass Project.

Sangam Ventures backed by the Shell Foundation is a venture capital fund tailored for early-stage energy enterprises that improve access to sustainable energy and increase resource productivity. It has invested in Promethean Power Systems, Excellent Renewables and AnthroPower. Rianta Capital and Halloran Foundation are overseas entities which have invested in Onergy and Boond.

**Capital subsidies** provided under MNRE's JNNSM scheme for a gamut of decentralised RE solutions such as solar lighting (lanterns, SHLS) solutions,<sup>14</sup> micro/mini grids (solar, biomass and small wind), wind watermills, biogas installations (National Biogas and Manure Management Programme, NMBPP), solar water pumps, and improved biomass cookstoves (Unnat Chulha Abhiyan) have been instrumental in diffusion of these technologies. Interviews suggested that very few ICS manufacturers and micro/mini grid operators have shown interest in availing subsidies. Despite a full-fledged programme, biogas installations in the country have not been successful owing to lack of focus on O&M post installation. Lately, untimely disbursement of subsidies has proved to be a huge setback for solar lighting enterprises.

**Corporate Social Responsibility (CSR)** funding from corporates or banks has been mobilised for disseminating various off-grid RE technologies such as solar lanterns/home lighting systems, solar water purifiers, solar micro/mini grids, biomass based mini grids, biogas installations, solar water pumps, solar water purifiers and desalination plants, (illustrated by way of examples in Table 6). There are companies which have modelled their business model on CSR funds such as Minda Next Gen. There are a few for-profit enterprises which utilise CSR funds as a secondary source of revenue like Naturetech Infra, Claro Energy and improved cookstove enterprises. Mostly, not-for-profit organisations tap into CSR funds to implement solutions in remote BOP communities like SKG Sangha. CSR has an important role to play for pilot-testing of nascent technologies which create livelihood opportunities and bring in social/economic benefits for a community in terms of improved health and sanitation such as solar powered sewing machines, solar-RO plants, etc.<sup>15</sup>

**Carbon financing** under the Clean Development Mechanism (CDM) was a popular financing mechanism for projects which cut down on GHG emissions by supplying clean energy. However, uncertainty around the Kyoto Protocol and a sharp decline in carbon prices has made this less attractive.

### Crowdfunding/grant-debt financing – The Minda story

Although there are several crowd funding portals available, we could identify only a single stakeholder/organisation utilising crowd funds for financing the systems during the course of interviews. Minda, a not-for-profit organisation, installs micro grids of size 150W-225W for households in Sunderbans and remote tribal areas of West Bengal such as Purulia. Minda uses a grant-debt model to finance micro grid installations in which, 80% is debt and 20% is treated as grant. The grant component is used for capacity building, local repair and maintenance works and to cover Minda's overheads. Sometimes, it is also used as collateral with banks. Finance raised through crowd funding platform, Milaap, at interest rates of 4%-5%, is used for debt financing the systems. Minda has thus far raised INR 50-55 lakhs through crowd funding. To the extent that the debt is paid off on an annual basis by the village-level Joint Liability Group (JLGs), some portion of the collateral amount gets freed and this amount is channelled back into the project for scaling purposes.<sup>16</sup>

### Creating a portfolio of projects to attract investment (project financing)

Considering the high capital costs of mini grids and associated risk, an initiative anchored by the Rockefeller Foundation, entitled Smart Power for Environmentally Sound Economic Development (SPEED) develops a portfolio/bundle of investment ready mini grid projects, which can then disperse the risks associated with single investments. Enterprises that are a part of this program have revealed that the SPEED program offers low interest loans at 5% interest rates with a tenure of 7 years. The Rockefeller Foundation has instituted a new organisation, 'Smart Power India', which will provide access to electricity to more than 1 million Indians in rural areas across 1,000 selected villages in India.

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14. SHLS subsidy has been discontinued post 31 March 2015

15. Poulami Choudhury et al., "RE+: Renewables beyond electricity – Solar Air Conditioning and Desalination", available at <http://ceew.in/pdf/CEEW-WWF-Renewables-beyond-Electricity-Report%203Aug14.pdf>, accessed on 27 March 2015

16. Interview with Minda



**Table 6 : Various enterprises financing mechanisms –Key features and challenges**

| Type of finance  | Key features  | Examples  | Challenges in accessing  |
|--|---|---|--|
| Grants by bilateral/multilateral donor agencies, philanthropic organisations             | <ul style="list-style-type: none"> <li>Signifies one of the most sought after source of financing for enterprises in this sector</li> <li>Financed early-stage enterprises technology development and projects</li> </ul>   | <ul style="list-style-type: none"> <li>Mera Gao Power received early stage financing from USAID</li> <li>Technology development – GIZ supported Switch On to test ICS models</li> <li>ADB extended capacity building support to Mlinda</li> <li>IFC provided technical assistance to Minda NextGen and Gautam Polymers to refine business models</li> </ul> | <ul style="list-style-type: none"> <li>Interviews indicated that enterprises/grassroots organisations cited lack of grant proposal writing skills and networking opportunities as a hindrance to accessing grant funding</li> </ul>  |
| Grants channelled through competitions   | <ul style="list-style-type: none"> <li>Enterprises have benefitted from competitions organised by state government or private entities</li> </ul>   | <ul style="list-style-type: none"> <li>DESI Power received grant reward under Bihar Innovation Forum</li> <li>Greenway Grameen Infra received grants through Sankalp Samridhi Regional Summit and Tata Social Enterprise Challenge</li> </ul>   | <ul style="list-style-type: none"> <li>Only a handful enterprises can access grants through such competitions</li> <li>Often, small scale regional enterprises do not have the bandwidth to gain from such events</li> </ul>   |
| Debt finance through banks (public sector banks, regional rural banks, commercial banks) | <ul style="list-style-type: none"> <li>Debt financing echoed as the primary financing need across enterprises</li> <li>Off-grid RE falls under RBI's priority sector lending norms</li> <li>Banks charge 80%-100% collateral; enterprises comfortable with around 20% collateral</li> <li>Branch manager is the final decision maker when it comes to giving loans</li> </ul> | <ul style="list-style-type: none"> <li>Public sector banks such as SBI, Canara Bank, commercial banks such as HDFC, ICICI, Axis Bank, Regional Rural Banks such as Manipur Rural Bank, Bongyo Grameen Bank</li> <li>NABARD</li> </ul>   | <ul style="list-style-type: none"> <li>Lack of sufficient collateral and 3 years of proven track record is a major challenge regardless of the technology and enterprise age.</li> <li>Administrative delays in loan disbursement (enterprises have reported delays of upto 2 years and more)</li> <li>Lending rates of 12.5% - 14% and above considered unaffordable by enterprises</li> <li>Difficult for small scale enterprises to avail loans above INR 50 lakhs (insufficient collateral)</li> <li>Prior connection with bank/branch manager holds the key which may not always be the case</li> <li>Uncertain revenue inflow and reliance on subsidies (which again is a dicey proposition) deters banks' confidence</li> </ul> |

| Type of finance                      | Key features  | Examples  | Challenges in accessing   |
|--------------------------------------|---|---|---|
|                                      |   |   | <ul style="list-style-type: none"> <li>• Banks' limited knowledge about the technologies and business models makes it difficult to evaluate proposals</li> <li>• Non-banking financing institutions (NBFCs) are more inclined towards large corporate debt and haven't ventured into the sector.</li> </ul> |
| Venture debt                         | <ul style="list-style-type: none"> <li>• Offers customised loans to small and medium scale businesses that lack access to sufficient debt finance for working capital needs</li> <li>• Interest rates at a premium to commercial bank rates</li> <li>• Lending ranges from 18%-20%</li> <li>• Can offer collateral-free loans; lending rates increase with risk.</li> </ul> | <ul style="list-style-type: none"> <li>• Intellegrow provides loans to enterprises at an early or growth stage (most with at least 12 months of track record); loan terms of up to 36 months (typically 18 month); loan size varies from INR 50 lakhs to INR 5 crores. They are invested in companies such as Orb Energy, Boond.</li> </ul> | <ul style="list-style-type: none"> <li>• Few enterprises pointed out high cost of debt (high lending rates) of 18%-20% (+ risk of 5% or so) as the key problem</li> </ul>   |
| Debt finance under the CGTMSE scheme | <ul style="list-style-type: none"> <li>• Not specific for off-grid RE enterprises, meant for MSMEs</li> <li>• Administered by SIDBI</li> <li>• Offers collateral free loans</li> <li>• Loans are availed through PSUs and the banks have to take a 25% risk and the government takes 75% risk</li> <li>• The upper limit of loan size is INR 1 crore</li> </ul>             | <ul style="list-style-type: none"> <li>• Of the interviewed enterprises, Onergy was successful in accessing loan under CGTMSE</li> </ul>  | <ul style="list-style-type: none"> <li>• Accessing loan under the scheme is a lengthy process with administrative hurdles</li> </ul>  |

| Type of finance   | Key features   | Examples   | Challenges in accessing   |
|---|--|--|---|
| Equity finance/<br>venture capital/<br>social impact investment | <ul style="list-style-type: none"> <li>• Various equity investors interested in this space primarily include social impact investors</li> <li>• Focus is on companies that target \$1 million or even \$5 million</li> </ul> | <ul style="list-style-type: none"> <li>• Various sector-agnostic impact funds that have invested in off-grid enterprises.</li> <li>• Examples include:</li> <li>• Insitor investment in Mera Gao Power; CIIE in Greenway Grameen Infra; Aavishkaar in Van Vidyut Power Ltd,</li> <li>• ResponsAbility in Punjab Biomass Project, OPES has invested in Boond, ADB has invested in SIMPA</li> <li>• I3N is a network of experienced "angel" investors who can provide equity capital of up to USD 1 million in these very early stage companies.</li> <li>• Cleantech/ Decentralised energy specific: IIMA-CIIE' Infuse Ventures focuses on companies supplying solar home lighting systems as a service and also solar pico-grids &lt;10kW</li> <li>• Sangam Ventures backed Promethean Power, Excellent Renewables and Anthropower to spur product development, in-house capacity building and business development</li> </ul> | <ul style="list-style-type: none"> <li>• Accessing equity investment through social impact investors requires strong networks which several enterprises lack</li> <li>• Equity investors have high return expectations of the order of 15%-20%</li> </ul> |

| Type of finance   | Key features   | Examples  | Challenges in accessing  |
|---|--|---|--|
| Debt/equity raised through project call facilities organised by various investment enablers | <ul style="list-style-type: none"> <li>Annual project call facilities provide early stage support to shortlisted enterprises</li> <li>Can also cover soft costs</li> <li>The project call facilities may not focus solely on Indian enterprises or on off-grid RE technologies</li> <li>The project call facilities are backed by financiers such as ADB, international governments, etc.</li> </ul> | <ul style="list-style-type: none"> <li>Seed funding: Annual call for proposals by CTI-PFAN focuses on proposals capable of driving down GHG emissions (not sole focus on off-grid RE), provides debt/equity financing to start-ups</li> <li>Soft costs: REEEP Project call facility, funded by Norwegian, Australian and European governments does not offer seed finance but</li> <li>covers project related soft costs</li> </ul> | <ul style="list-style-type: none"> <li>As few of these investment-enabling organisations or events spend on advertising, enterprises/start-ups are often unaware of the existing opportunities that such initiatives have to offer.</li> </ul> |
| Central subsidies   | <ul style="list-style-type: none"> <li>Capital subsidy offered by MNRE on various technologies under different programmes .</li> </ul>   | <ul style="list-style-type: none"> <li>JNNSM off-grid programme for solar PV lighting systems and micro/mini grids, biomass mini grids, solar water pumps, NBMMP, Unnat Chulha Abhiyan, pico hydro installations and small wind programs</li> </ul>   | <ul style="list-style-type: none"> <li>Uncertain disbursement of subsidies, huge backlog with MNRE</li> <li>Subsidies stifle product innovation due to which costs don't come down</li> </ul>  |
| Project finance through grants (project aggregation model)                                  | <ul style="list-style-type: none"> <li>Enterprises find it difficult to source finance for setting up capital intensive micro/mini grids</li> <li>Most micro/mini grids use grants to cover capital costs</li> <li>Aggregating projects can spread risk over multiple projects</li> </ul>  | <ul style="list-style-type: none"> <li>For instance, the SPEED Program anchored by the Rockefeller Foundation provides enterprises access to investors and bundles projects to provide aggregated investment opportunities.</li> </ul>  |  |

| Type of finance        | Key features  | Examples  | Challenges in accessing   |
|------------------------|---|---|---|
| Crowd funding          | <ul style="list-style-type: none"> <li>• Crowd funding is yet to pick up in country's off-grid RE space</li> <li>• Online crowd funding platform/ agencies help raise finance</li> <li>• Regular repayments (with interest) needs to be returned to the crowd funding agency</li> </ul> | <ul style="list-style-type: none"> <li>• Minda, a not-for-profit organisation working on installing micro-grids in rural West Bengal has been successful in using crowd funds (INR 50-55 lakhs) raised through Milaap which is used for debt-financing the systems in West Bengal (Sunderbans and Purulia)</li> </ul>   | <ul style="list-style-type: none"> <li>• Interviews pointed out that enterprises were unaware of crowd funds as a source of finance</li> </ul>  |
| CSR                    | <ul style="list-style-type: none"> <li>• CSR funds used not just for the more established off-grid RE technologies but also nascent applications</li> <li>• CSR funds from corporates;, PSUs, public sector banks have been mobilised thus far.</li> </ul>                              | <ul style="list-style-type: none"> <li>• TERI partners with PSUs and private companies (ICICI, Indus Tower) to obtain funding for distributing solar lanterns under the "Lighting a billion lives" initiative</li> <li>• Claro leveraged ITC's CSR initiative to install 2 HP systems in Odisha</li> <li>• Community solar power plants (5000L/day) installed by Barefoot College in Rajasthan funded by the Coca-Cola Foundation.</li> </ul> | <ul style="list-style-type: none"> <li>• Insufficient awareness amongst enterprises on how CSR funds can be used for energy access initiatives; lack of knowledge about technologies, their applications, sustainability and impact.</li> </ul> |
| Carbon financing (CDM) | <ul style="list-style-type: none"> <li>• Organisations received carbon price for per ton reduction in GHG emissions</li> </ul>  | <ul style="list-style-type: none"> <li>• SKG Sangha (an NGO, working on installing biogas in poor communities) reportedly received approximately 20 USD / ton of GHG reduction which later declined to a mere USD 2/ton</li> </ul>  | <ul style="list-style-type: none"> <li>• Marred by uncertainty around Kyoto Protocol and decline in carbon prices</li> </ul>  |

Source: CEEW compilation

## 5.2 End-user financing mechanism

**Bank loans under MNRE's JNNSM program (for off-grid technologies):** The role of banks (Regional Rural Banks (RRB) or Grameen Vikas Banks, Public Sector banks, Commercial banks) in consumer financing has been primarily driven by the MNRE subsidy scheme for various off-grid RE solutions [such as solar lamps, home lighting systems, solar water pumps which is routed through National Bank for Agriculture and Rural Development (NABARD)]. Loans are provided at interest rates of 12.5% to 14% having tenure of 5 years (RBI norms). MNRE offers capital subsidies for decentralised solar micro grids, small wind mills, solar water pumps, pico and small hydro solutions as well as improved cookstoves.

In a recent announcement by MNRE, 40% capital subsidy for solar home lighting systems is accessible till 31 March 2015. It has advised banks to extend loans to SHLS without subsidy under the banks' own provisions.

Aryavart Grameen Bank (Ashden Award winner) constitutes one of the most successful examples of an RRB investing enormous efforts to make SHLS available to consumers in Uttar Pradesh at affordable prices. There are several enterprises which link end-users to banks for providing end-user financing, for example, SELCO and Gautam Polymers. Gautam Polymers signs MoUs with public sector banks such as the Bank of India and Jammu & Kashmir Bank to provide end-users financing for solar products.

Although the MNRE subsidy scheme has served as a precursor to generating awareness about decentralised renewable energy technologies amongst banks, enterprises have often found it challenging to engage banks due to concerns surrounding quality and after-sales maintenance of the products. Furthermore, a large number of Non-Performing Assets (NPAs) rampant in places in eastern India - West Bengal, Bihar and Jharkhand - has also been cited as a reason for bankers' reluctance to lend.<sup>17</sup> Despite decentralised RE being under the ambit of priority-sector lending, several enterprises have echoed that banks' decision to lend rests not on the shoulders of the bank management but the branch manager. Lack of consumer financing products (as in the case of consumer durable goods such as car loans) tailored for decentralised RE technologies might be a crucial intervention point once the sector evolves and addresses concerns around quality and post-sales maintenance.

**Microfinancing:** Enterprises engage microfinance institutions (MFIs) to not only extend microloans to consumers for buying off-grid RE products such as solar lighting systems and improved cookstoves, but to also act as last-mile delivery agents and after-sales service providers. However, most importantly, this mode of financing depends heavily on the reach and activity of MFIs in a region. For instance, it is far simpler to get systems microfinanced in southern India which has a good MFI network as opposed to northern India.

MFIs provide loans to low-income consumers with short tenures (six months to one year, depending on the capital cost) at an annual interest rate of 24%, which are often not feasible for highly priced decentralised energy products (for e.g., solar water pumps). MFIs provide both individual and group loans (SHGs). However, group loans were found to be more common for decentralised RE products. A lot of MFIs provide top-up loans to consumers to mitigate the risk of non-repayment and relatively higher transaction costs associated with these solutions.

Moreover, as a result of the huge backlog of subsidies with MNRE and uncertainty around the subsidy disbursement regime, the role of RRBs in end-user financing for clean energy solutions has diminished in recent times, which in turn has led to enterprises exploring linkages with microfinancing institutions to provide consumer loans, which has resulted in limited success on occasion.

**End-user financing under schemes other than JNNSM:** Apart from the NABARD scheme, a few enterprises have advocated with banks to finance decentralised RE systems under schemes such as the differential rate of interest (DRI) scheme which was announced by the Government of India in 1972 to provide loans at 4% interest rate (three to four fold lower than normal lending rates) to poor families for productive activities without any requirement of margin money or collateral. Further, the scheme involves less paperwork which expedites the loan disbursement process.<sup>18</sup> SELCO Solar recently (2013) managed to get a breakthrough in facilitating sanctioning of 90 solar loans for its end-users by three different banks, Canara Bank, Indian Overseas Bank and the State Bank of Mysore under the DRI scheme. However, on the flip side, classification of 'productive activity' is not clear which puts the onus on the bank's branch manager to approve loans as per his/her discretion.

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17. CEEW-Stakeholder interviews

18. Families, whose collective income is below Rs 24,000 in urban areas and Rs 18,000 in rural areas, can avail a loan up to INR 15,000. There is no margin money requirement but it has to be implemented through the Scheduled Commercial Banks.

## 6. KEY FINANCING CHALLENGES

### 6.1 Enterprise financing challenges

Raising debt finance, particularly from traditional sources such as banks emerged as the primary challenge for enterprises across various off-grid RE technologies. Enterprises indicated that it was difficult to secure loans above INR 50 lakhs from commercial banks. A handful of enterprises could obtain loans worth INR 10-20 lakhs from banks. Moreover, several enterprises noted that the loan procurement procedures were often too lengthy, spanning at least two years.

Interviews indicated that enterprises, in the event of unavailability of collateral-free debt, were compelled to utilise equity for meeting their working capital requirements. Owing to low rate of return, patient capital was cited as the need of the hour by enterprises involved in the product segment, for instance, solar home lighting system and cookstoves. Enterprises' dearth of awareness of various financing mechanisms besides traditional debt financing was noted during stakeholder interviews.

Further, DRE plant operators often incur overheads because of ecosystem building activities such as community training for plant operations. This could be illustrated in the case of biomass powered mini grid operators which not only involve communities in energy plantations to ensure a steady supply of feedstock but also impart O&M training through their not-for-profit arm. These enterprises, therefore, look for grants to ease overheads or operational costs associated with these activities.

There is a mismatch in expectation of investors (for example, social impact investors/venture debt/venture capital investors) and enterprises' financing needs with investors looking at higher returns than what enterprises are capable of delivering. For instance, a lot of decentralised RE enterprises seek risk capital from investors to refine their approach to the market and build team capacity while most investors seek more installations and sales prior to investment or within a short period after the provision of capital. Most early stage financing in the off-grid RE sector is focused on growth whether it is in the context of number of installations or sales and not on understanding whether there is a product - market fit. Sangam Ventures is a venture capital investor exclusively focused on early-stage cleantech enterprises that improve access to sustainable energy and increase resource productivity. Sangam Ventures has invested in Promethean Power and Excellent Renewables to aid product development, team building and overall business development. Most investors perceive the sector as hard to invest in with poor potential to exit the investments.<sup>19</sup>

DRE plants are not perceived as infrastructure investments and are unable to avail the benefit of low-cost loans (interest rates of 6%-7%) charged for usual infrastructure projects.

**Table 7: Challenges in accessing various sources of enterprise finance**

| Type of finance   | Challenges in accessing finance   |
|---|---|
| Grants by bilateral/multilateral donor agencies, philanthropic organisations                    | Interviews indicated that enterprises/grassroots organisations cited lack of grant proposal writing skills and networking opportunities as a hindrance to accessing grant funding   |
| Debt finance through banks (public sector banks, Regional Rural Banks; Commercial Banks; NBFCs) | <p>Lack of sufficient collateral and 3 years of proven track is a major challenge regardless of the technology and enterprise age.</p> <p>Uncomfortable with bank lending rates of 12.5%-14%; RRBs charge even higher – 13.5%.</p> <p>Uncertain revenue inflow and reliance on subsidies (which again is a dicey proposition) deters banks' confidence. Uncertainty in consumer repayment further builds uncertainty in cash flows/revenue stream, making them a less viable proposition for banks</p> <p>Banks' limited knowledge about the technologies and business models makes it difficult to evaluate proposals</p> <p>Non-banking financial companies institutions (NBFCs) are more inclined toward large corporate debt and haven't ventured into the sector</p> |

19. CEEW-Stakeholder interviews

| Type of finance   | Challenges in accessing finance   |
|---|---|
| Venture debt  | Enterprises pointed out high cost of debt (high lending rates) of 18%-20% as the key problem  |
| Debt finance under the CGTMSE scheme  | Accessing loan under the scheme is a lengthy process with administrative hurdles  |
| Equity finance, venture capital/risk capital  | <p>Accessing equity investment through social impact investors requires strong networks which several enterprises lack</p> <p>Equity investors have high return expectations of the order of 15%-20%</p> <p>Mismatch in expectations – enterprises seek risk capital for product development and team building whereas investors are focussed on enhanced sales/installations and not on understanding if there is a product-market fit</p> <p>Most see the sector as hard to invest in with poor potential to exit investments</p> |
| Debt/equity raised through project call facilities organised by various investment enablers | As a few of the investment-enabling organisations such competitions do not spend on advertising, enterprises/start-ups are often unaware of the existing opportunities that such initiatives have to offer.   |
| Crowd funding   | Stakeholder interviews indicated that enterprises were often unaware of crowd funding opportunities/platforms   |
| CSR   | <p>There is limited knowledge among CSR funders about the potential of nascent innovative technologies such as those involving the nexus of off-grid RE sources with water, health, sanitation and livelihood applications in the context of generating social and economic impact</p> <p>Often, CSR funders are unaware of the social impacts generated by DRE installations</p>   |
| Source: CEEW compilation  |   |

## 6.2 End-user financing challenges

Following are some of the generic end-user financing challenges resonating across the sector:

- **Bankers' reluctance to lend:** Lack of end-user financing has been a deterrent to enterprises involved in the product segment. Poor after-sales records have eroded consumer and bankers' confidence in the off-grid RE solutions. Prior experience with inferior quality off-grid RE products has made bankers' apprehensive around the operability and bankability of off-grid RE technologies. Sensitising bankers on financing technologies such as solar water pumps highlighted the importance of demystifying such technologies.
- **Difficult to engage microfinancing institutions (MFIs):** High interest rates offered by MFIs in the range of 24%-26% is a key disadvantage. In addition, most MFIs offer top-up loans to existing account holders to cut down on transaction costs. The biggest obstacle in engaging MFIs has been the poor after-sales maintenance by several enterprises which has eroded MFI trust in these solutions. Further, poor penetration of MFIs in North Eastern states such as Jharkhand and their reluctance to lend in regions like Assam have been major roadblocks.
- **Lack of consumer awareness:** Lack of consumer awareness on off-grid energy products, their economic advantage over kerosene/diesel usage was a primary dent in enterprises' expansion plans.
- **Regulatory challenges**
  - Uncertainty surrounding subsidies –whether they would be disbursed or reduced or phased



out coupled with inordinate delays in subsidy disbursement fuelled bankers' reluctance to finance off-grid RE products, particularly solar lighting systems. This has led enterprises (for example, Onergy) to reach out to MFIs in eastern states (for example, Jharkhand, West Bengal) but with limited success. Although subsidies under MNRE's JNNSM program have helped ignite awareness around decentralised RE access products, several players (including non-empanelled channel partners) have failed to convince end-users to buy the product sans upfront subsidy.

- Uncertainty around grid extension: Several enterprises have noted that extension of grid to rural areas have often led to end-users abandoning the use of micro/mini grids. The threat of grid extension and competition from virtually free grid power has been a challenge for enterprises.
- **Markets flooded with inferior products makes consumers price sensitive:** For instance, consumers in Bihar are relatively more cost sensitive than other eastern states because of rampant availability of low-cost products (albeit poor quality) in the state.
- Different states have varying financing ecosystems which is highlighted in how enterprises find it difficult to establish financial linkages in a state like Jharkhand to sell their products.
- RRBs are often found to be understaffed leading to inefficient loan collection.

**Table 8 provides a breakdown of enterprise and end-user financing challenges by technology type.**

| Off-grid RE solution                          | Enterprise financing challenges   | End-user financing challenges  |
|---|---|--|
| Solar lighting products/home lighting systems | <ul style="list-style-type: none"> <li>• Difficulty in accessing debt financing in the absence of collateral and three-year financing history of positive cash flows</li> <li>• Lack of patient capital</li> <li>• Interviews revealed that in the absence of debt, enterprises have started using equity to meet working capital requirements</li> </ul> | <ul style="list-style-type: none"> <li>• Uncertainty around continuation/phase-out of subsidies is currently the sector's biggest obstacle. Several interviewed enterprises were not in favour of subsidy and seek clarity from MNRE to be able to tweak business models.</li> <li>• Lack of consumer awareness makes it difficult to distinguish good quality products from inferior ones.</li> <li>• Banks often don't lend if a consumer is not an existing account holder.</li> <li>• Difficult to establish linkages with MFIs, especially in states/regions lacking presence of pan-India MFIs</li> <li>• Consumers in areas such as Bihar are price sensitive due to availability of low-cost, inferior quality products.</li> </ul>  |
| Solar water pumps                             | <ul style="list-style-type: none"> <li>• Difficult to access debt finance from banks</li> <li>• Companies often raise money through unsecured loans at high interest rates which pile up in the absence of timely disbursement of subsidies.</li> </ul>   | <ul style="list-style-type: none"> <li>• High capital cost is the biggest hurdle. Small farmers are unable to access the technology even in areas with huge potential</li> <li>• The banking sector is often reluctant to give loans owing to trust deficit caused by prior experience with solar products. Limited understanding of the technology is also an obstacle.</li> <li>• State subsidies (for e.g., Bihar Surya Sinchai Kranti Yojana) offering huge subsidies (40%-50% state subsidy on top of central subsidy of 40%) are stifling demand and distorting the market. State schemes offer opportunities to a limited set of individuals for buying pumps and farmers often prefer waiting to crack state schemes rather than opt for capital subsidy.</li> <li>• Heavy subsidies discourage innovation in technology for driving down the cost.</li> </ul> |

| <b>Off-grid RE solution</b>  | <b>Enterprise financing challenges</b>   | <b>End-user financing challenges</b>   |
|--|--|--|
| Improved biomass cooktoves   | <ul style="list-style-type: none"> <li>• Sourcing debt finance without collateral is a challenge</li> <li>• Lack of patient capital</li> <li>• ICS not considered an attractive option amongst impact investors. ICS manufacturers find it difficult to tap into social impact funds.</li> </ul>   | <ul style="list-style-type: none"> <li>• Limited consumer awareness is the biggest cause of worry. Companies incur huge expenditure in R&amp;D and educating consumers.</li> <li>• Lack of clarity on subsidy process outlined in the recently announced Unnat Chulha Abhiyan</li> <li>• High capital and operational cost of forced draft cookstoves (used pellets).</li> </ul> |
| Micro grids (<2Kw)   | <ul style="list-style-type: none"> <li>• Accessing debt finance is the major challenge.</li> <li>• Few of the enterprises also cited inability to access grants.</li> </ul>  | <ul style="list-style-type: none"> <li>• Consumer's ability to pay.</li> <li>• Threat from grid extension- consumers have been found to abandon the system once grid reaches the village.</li> </ul>   |
| Micro grids (up to 10Kw)   | <ul style="list-style-type: none"> <li>• Only a handful of enterprises have accessed loans and grants. The lesser known players still find it difficult to raise finance in the absence of grants.</li> <li>• Unable to access low-cost loans. For</li> <li>• e.g.,, kfW funds with IREDA cannot be accessed as it requires collateral.</li> <li>• Enterprises weary of equity investors for fear of dilution of decision making power and operational flexibility.</li> <li>• Most investors perceive the sector as hard to invest in with poor potential to exit investments.</li> </ul> | <ul style="list-style-type: none"> <li>• High capital cost.</li> <li>• Uncertainty in end-user repayment.</li> <li>• Mobile networks cannot be used due to their poor penetration in remote rural locations.</li> <li>• Threat from grid extension; consumers have been found to abandon the system once grid reached the village.</li> </ul>                                    |
| Mini grids (>10Kw); solar; solar-biomass' small wind; pico/micro hydro | <ul style="list-style-type: none"> <li>• Low-cost, long term debt difficult to access</li> <li>• Long pay back periods of around 7-8 years</li> <li>• Equity investors expect returns of the order of about 15-20%- this requires debt to be made available at 10%.</li> <li>• Impact investors reported to be unaware of social benefits of these technologies.</li> </ul>  | <ul style="list-style-type: none"> <li>• Uncertain revenue collection</li> <li>• Threat from grid extension- consumers have been found to abandon the system once grid reached the village.</li> <li>• Grid electricity even if intermittent is given free of cost whereas per unit cost of power from mini grids could be up to INR 18-20 (or even more).</li> </ul>            |

| Off-grid RE solution  | Enterprise financing challenges   | End-user financing challenges  |
|---|---|--|
|   | <ul style="list-style-type: none"> <li>• Decentralised mini grids not perceived as infrastructure investment, therefore unable to access loans at low interest rates of 6%-7% which is usually offered to all infrastructure projects</li> <li>• Uncertain subsidy disbursement regime</li> <li>• Require funds to cover operational expenses such as running a training centre for rural entrepreneurs/technicians, energy plantations (biomass) etc.</li> <li>• Unable to access low-cost loans. For</li> <li>• e.g., kfW funds with IREDA cannot be accessed as it requires collateral.</li> </ul> |  |
| Biogas  | <ul style="list-style-type: none"> <li>• Some not-for-profit enterprises targeting biogas installations in remote rural areas lack grant-writing skills as well as the bandwidth required to engage with donors and various financiers.</li> </ul>  | <ul style="list-style-type: none"> <li>• End-user finance not reported as a constraint; few enterprises install individual biogas plants in semi-urban areas where consumers have the willingness and ability to pay (for example, Pune)</li> </ul>        |
| Other applications (beyond electricity pumping and cooking) | <ul style="list-style-type: none"> <li>• NCEF not being used to fund innovative clean energy applications. Demonstrating successful pilots holds the key.</li> </ul>  | <ul style="list-style-type: none"> <li>• Capital costs of these technologies need to be driven down to attract consumers. For e.g., the cost of a solar powered RO purifier (for individual use) is three times more than a normal RO purifier.</li> </ul> |

Source: CEEW compilation

## 7. A CASE STUDY ON OFF-GRID RE ECOSYSTEM OF THE NORTH-EAST WITH A FOCUS ON FINANCING

The North Eastern region (NER) consists of the seven sisters of North East (Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland and Tripura) with a total of 4,187 unelectrified villages accounting for 21% of the total unelectrified villages in the country (as per CEA estimates). Of the seven states, Arunachal Pradesh, Meghalaya and Assam have the highest number of unelectrified villages. As per 2011 census, Assam accounts for the highest number of households (approximately 4 million) without access to grid power followed by states such as Meghalaya and Manipur.

The North-Eastern states demonstrate considerable variation in terms of the energy access situation, awareness about decentralised energy solutions amongst consumers, demand for various technologies, ability to pay, price sensitivity, bankers' perception about decentralised RE and presence of MFIs and their involvement in energy access (Figure 1). There is potential for solar lighting solutions in the North-Eastern states of Assam, Manipur, Meghalaya and Arunachal Pradesh. Regions of Nagaland and Arunachal Pradesh have significant hydro power installations. However, the state nodal agency in Arunachal Pradesh is keen on exploring solar solutions as well. There are several biogas plants installed in Assam to meet its cooking energy needs. In places at higher altitudes, the potential of biogas declines because of smaller sized animals and lesser quantities of animal dung which can be used as feedstock.

Improved cookstoves are yet to take off in the region because of lack of demand, poor reach of MFIs, etc. but they have a high potential in Assam. The Assam Energy Development Agency (AEDA) is presently looking at funders who can help disseminate ICS in Assam. Table 9 provides an overview of the off-grid energy ecosystem in the North Eastern region. There are very few organised players in the region and they face threat from influx of poor quality products from Myanmar and China.

**Table 9: An overview of key off-grid RE stakeholders in north-east**

| Key stakeholders         | Examples   |
|--------------------------|--|
| Enterprises              | <p><u>Solar products</u> (lamps, lanterns, home lighting systems, task lights, inverters): Free Power Net Pvt Ltd., Mangaal Sustainable Energy Solutions, Eastern Envo, Donton Solar House, Jasmine Solar, Eastern Solar Pvt. Ltd., SS Electronics, Kirti Solar, Agni Power; Onergy, Panasonic</p> <p><u>Improved biomass cookstoves</u>: Envirofit, Ecosystems India</p> <p><u>Pico/micro hydro</u>: Nagaland Empowerment of People through Energy Development (NEPED)</p> <p><u>Biogas</u>: SKG Sangha</p> |
| Financiers               | <p><u>Enterprise financing</u>: RRBs and commercial banks such as the Manipur Rural Bank, Canara Bank</p> <p><u>End-user financing</u>: Mostly MFIs such as SEVA, ORI, WSDS, PSD-SELF, Chanura, NE Microfin, RGVN (NE Microfinance) RRBs, financing institutions such as FWWB-I, and donations by churches</p>   |
| Grassroots organisations | Green Heritage, Chaiduar Rural Development Centre (CRDC), Volunteers for Village Development (VVD), Drishtee, RRTC, RGVN   |
| R&D institutions         | IIT-Guwahati, Tezpur University  |
| Skills building          | IIE-Guwahati (also facilitates financing)  |
| State Nodal Agencies     | Assam Energy Development Agency (AEDA)   |
| Source: CEEW compilation |  |

20. CEA, "Progress report of village electrification as on 31-01-2015 as per 2011", available at [http://www.cea.nic.in/reports/monthly/dpd\\_div\\_rep/village\\_electrification.pdf](http://www.cea.nic.in/reports/monthly/dpd_div_rep/village_electrification.pdf), accessed on 2 March 2015

**Table 10: Enterprises operating in North-East and their business models**

| Off-grid RE solution        | Enterprises   | Business model  | Operations   |
|-----------------------------|---|---|--|
| Solar products              | Free Power Pvt. Ltd. (For profit)                                 | Authorised dealer of Tata Power, Phocos, Barefoot Power; recently obtained trademark for solar inverters (household segment); designed solar systems for Indian Oil petrol pumps. | Operating throughout North-East through its business partners, plans to expand operations to Myanmar and Bangladesh. |
|                             | Mangaal   | System Integrator, authorized dealer of Greenlight Planet, customizes design according to consumer needs (outsources manufacturing).  | Across districts of Manipur  |
|                             | Eastern Envo  | System Integrator (procures components from different suppliers and assembles)  | Assam, Meghalaya and Arunachal Pradesh   |
|                             | SS Electronics  | Manufacturer and distributor  | Manipur  |
|                             | Donton Solar  | System integrator/entrepreneur model  | Meghalaya  |
|                             | Jasmine Solar   | System integrator   | Meghalaya  |
|                             | Kirti Solar   | Manufacturer, distributor   | Assam  |
|                             | Onergy  | System Integrator   | Plans expansion in Assam   |
| Pico/micro hydro            | Nagaland Empowerment of People through Energy Development (NEPED) | Build and operate   | Nagaland   |
| Biogas plants               | SKG Sangha (NGO)  | Build, Operate and Maintain   | Assam  |
| Improved biomass cookstoves | Envirofit   | Manufacturer and sales through partnerships with MFIs and NGOs  | Manipur  |
|                             | Phoenix RBS   | Manufacturer and sales through partnerships with MFIs and NGOs  | Assam  |
|                             | Ecosystems India (NGO)  | Builds community biomass cookstoves (not improved biomass cookstoves though)  | Assam  |

Source: CEEW compilation

## Financing ecosystem

### Organisational financing

- Personal savings:** Many interviews and the North-East stakeholder consultation organized by CLEAN in Guwahati made it evident that clean energy enterprises in the North-East are operating using their own finances or by raising debt finance from banks. Early stage/seed-financiers are non-existent in the region. Sources of early-stage financing for off-grid RE enterprises in the region include informal sources in the form of personal savings or money from friends and families. In the absence of seed-capital or early-stage financiers, incubators step in to facilitate financial linkages for enterprises. For example, SELCO Incubation Centre trained Mangaal to raise finance from banks and facilitated seed-stage financial support through the Small-Scale Sustainable Infrastructure Development Fund (S3IDF).

- **Debt finance from banks:** Most of the enterprises are 2-4 years old and need debt finance to meet their working capital needs. One-on-one interactions and CLEAN's stakeholder consultation in Guwahati revealed that most enterprises are reliant on banks for raising debt finance. Margaal Sustainable Solutions Pvt. Ltd. has recently found success in raising 10 lakhs worth of loans from Manipur Rural Bank after undergoing an onerous process. Enterprise owners are also drawing on revenue streams of other businesses operated by them (for example, FreePower Pvt. Ltd).
- **CSR funds and crowd funds** have also been utilised by grassroots organisations such as Rashtriya Gramin Vikas Nidhi (RGVN) to implement projects in the region. RGVN provides solar lighting solutions to households through CSR funds allocated under IDBI's model village programme. RGVN also raised finance for the projects through crowdfunding (informal network – charitable contributions) in the form of grant and not loan (unlike Minda, as highlighted earlier in the document).
- **State nodal agencies:** Subsidies under various state schemes/tenders have aided installations of pico hydro/micro hydro solutions and biogas plants.

### End-user financing

Not all states in the North-East suffer from poor consumer awareness about off-grid energy technologies. Enterprises pointed out that unlike other North-Eastern states, there are commercial advertisements on solar technologies in Manipur. Consumers in Manipur exhibit relatively higher awareness levels and willingness to pay for decentralised RE solutions earning these technologies the tag of "pull-products". Further, regions of Manipur and Meghalaya are faced with an unfavourable terrain and poor connectivity which makes grid power a distant dream. This further adds to the attractiveness of off-grid RE solutions in these regions.

- **Banks:** Regional Rural Banks (RRBs) have been the traditional source of end-user finance in the North-Eastern region. For example, one of the entrepreneurs pointed out that 90% of his sales were financed through Manipur Rural Bank. However, the role of RRBs in financing off-grid solar solutions has reduced significantly due to inordinate delays in subsidy disbursement and policy uncertainty around subsidies.
- **Leveraging pro-poor schemes – an alternative to capital subsidies:** Stakeholders in the Guwahati consultation organized by CLEAN expressed how various pro-poor schemes such as the differential rate of interest (DRI), Kisan Credit Card (KCC) scheme and women development credit schemes could be tapped to help end-users get access to low-cost loans with minimum paper work. The average loan size under the KCC scheme is INR 15,000-16,000 with a payback period of 1 year at an interest rate of 7%. The interest rates applicable under women development credit schemes are around 3% to 4%. It was illustrated that light is crucial for both farmers and women to carry out livelihood activities (such as tailoring by women). Solar lighting solutions can spur income levels and lead to faster payback of loans.

### A successful example of leveraging DRI scheme for end-user financing in Meghalaya

Eastern Envo, an enterprise based out of Meghalaya has succeeded in availing collateral-free loans for 21 rural households lacking grid electricity from Canara Bank at an interest rate of 4% for a loan size of INR 15,000 (per household) with a tenure of 5 years. It took five months for Eastern Envo to convince the banks to finance the system.

- **Microfinance institutions:** Even among the North-Eastern states, the end-user financing landscape varies greatly. Despite being the largest amongst the North-Eastern states, the end-user financing landscape in Assam is not very encouraging with very few RRBs and microfinancing institutions coming to the fore to provide consumer loans for off-grid energy solutions. Assam Gramin Vikash Bank (RRB) and Rashtriya Gramin Vikash Nidhi (RGVN) are the primary stakeholders involved in end-user financing.

On the contrary, MFIs constitute an important pillar of end-user financing for off-grid RE solutions in places like Manipur where they are involved in financing solar lamps, home lighting systems and improved cookstoves through top-up loans given to SHGs at interest rates of 24% per annum with a tenure of 6 months to one year (depending on the product cost).

- **Cash sales and CSR:** There are enterprises which are selling good quality products (sourcing from companies in southern India) but cannot avail subsidy as they are not empanelled by MNRE. Most of their products are sold via cash sales. Few enterprises are also selling systems by engaging with organisations with CSR money. For example, FreePower has tied up with RGVN in Assam.

### **FWWB-I's solar microloan programme in partnership with MFIs laid the foundation for MFI activity in solar off-grid solutions in Manipur**

In 2009, Friends of Women's World Banking- India (FWWB-I) collaborated with various partner institutions such as WSDS, VVD, ORI, Chanura, PSD-SELF and SEVA to launch a solar lantern credit initiative in Manipur. From the program's inception in 2009, Thrive Energy, a Hyderabad-based solar product company, has served as the sole provider of solar lanterns to MFIs supported by FWWB. FWWB-I acts as a central intermediary in the product ordering, transaction and payment process. The MFIs place orders directly with FWWB-I, which then pays Thrive for the full shipment. FWWB-I has disseminated 35,000 solar lanterns under the program.

The MFIs offer six-month loans at a declining interest rate of 24% per annum. Solar lantern loans are issued solely as "top up" loans which means that they are only approved for members that have other existing loans with the MFI, thereby reducing what would be the high relative transaction costs of servicing a small solar loan by itself. Solar loans are not disbursed as cash. Rather, the consumer receives the product directly from the MFI, and repays the loan over a six-month period. This approach reduces the possibility of the loan being used for other purposes.

- **Flexi-payments:** End-user financing model also involved flexi-payment opportunities offered by a few companies such as Meghalaya based Jasmine Solar. The customer pays upfront payment (covering 40% of the system cost) followed by repayments after every 2-3 months depending upon seasonal income. The payment is recovered over a period of one year.

#### **Enterprise financing challenges**

- **Bankers' reluctance** to provide collateral free loans coupled with stringent criteria for loan eligibility emerged as the biggest bottleneck for enterprises in accessing finance. For instance, one of the entrepreneurs who managed to raise a loan of 10 lakhs from one of the regional rural banks in Manipur pointed out how the RRB required not only collateral but also a security deposit of INR 500,000 and a government employee as the loan guarantor.

#### **End-user financing challenges**

- **Subsidy – "the double edged sword":** Several enterprises have been reliant on MNRE subsidies (under the NABARD scheme) for promoting sale of solar solutions in the region. But uncertain subsidy disbursement has discouraged RRBs from financing off-grid RE products. Often, enterprises which are non MNRE channel partners were unable to sell good quality products because of consumer demand for subsidy. Echoing sentiments of enterprises in other parts of the country, entrepreneurs in the North-East also agreed on excluding subsidy altogether.
- In places like Manipur, banks have been apprehensive to finance solar solutions even in the presence of well-functioning NABARD subsidy scheme owing to prior experience with poor quality products and lack of after-sales maintenance. This is because consumer repayment suffers when products/systems of inferior quality become dysfunctional and users abandon their usage even before the end of the 5-year loan term.
- **MFIs unable to find reliable supplier:** MFIs pointing towards poor aftersales maintenance of products (solar lighting products) have expressed their inability to identify appropriate vendors who can provide proper after sales service.
- **Limited flexibility of MFIs to select appropriate technology provider tailored to meet consumer needs:** MFIs cited the need for support from apex financing bodies for energy access loans that would enable them to disburse energy access solutions without compromising on the quality or after-sales O&M services of the product. One of the drawbacks of the FWWB Solar Microloan initiative was that it didn't offer its partner organisations the opportunity to select

technology providers as FWWB-I disbursed loans in kind and not in cash. The MFIs have struggled in recent times with a decline in the quality of solar lighting products coupled with absence of after-sales service centres.

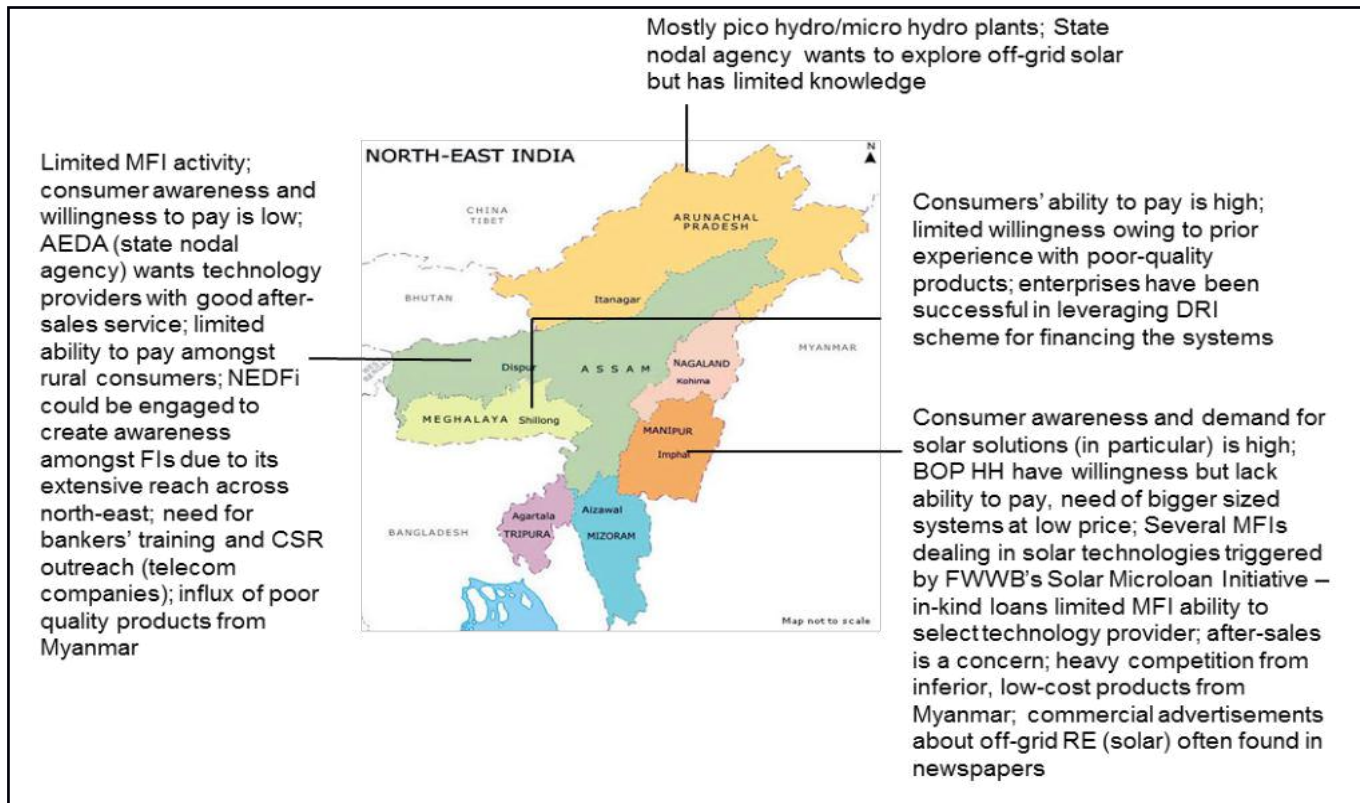
- **Absence of pan-India MFIs in the region:** Some of the ICS enterprises indicated that most of the MFIs are regional and not pan-India operational entities. This at times limits the reach of products and increases the transaction cost of enterprises (in terms of engagement with a wider array of MFIs for expanding product reach).
- **Greater demand and willingness to pay does not coincide with ability to pay:** MFIs looking to provide energy access solution to base of the pyramid (BOP) households in the region (especially in states with greater consumer awareness like Manipur) have to settle for low cost lighting (solar) solutions inadequate in meeting the households energy needs, primarily because of their low income levels.
- **Influx of low-cost products:** Competition from low-cost inferior products from Myanmar and China priced at INR 60-70 per watt-peak (Wp) adds to woes of enterprises as consumers are unable to distinguish between the quality of products.
- **Limited consumer awareness:** In Assam and Meghalaya, limited consumer awareness on off-grid energy solutions, economic benefits over kerosene usage and inability to distinguish between good quality off-grid RE products and inferior quality counterparts are a major impediment hindering penetration of these technologies. Solar inverters are gradually becoming a preferred option for consumers in the region as it is perceived as a consumer durable good.

## Interventions to scale up energy access solutions in the North-East

- Financiers' outreach and training:
  - Training of financiers/bankers: One-on-one interviews and stakeholder discussions emphasised that programmes on financiers' training (e.g., bankers training programs in the North-East must be the cornerstone of CLEAN's work on alleviating financing hurdles. This can include not only RRBs and commercial banks but a wider gamut of financing players such as the North Eastern Development Finance Corporation (NEDFi), various microfinancing institutions, CSR funders, social impact funds etc. It is important to note that NEDFi has extensive network across the North-East and has several verticals related to microfinancing, enterprise financing and skills development which could be leveraged by CLEAN.
  - CLEAN could identify financiers/investors focussed on sectors such as water, health, education, agriculture and encourage them to act as potential funders for decentralised RE. Such investors may find RE an attractive investment proposition if CLEAN showcases how off-grid renewable energy solutions can help in delivering services targeting improved health, clean water, education and agricultural productivity.
- Leverage existing schemes such as the DRI, Kisan Credit Card (KCC) and Women Development Credit Scheme to provide affordable credit to end-users for buying off-grid energy solutions.
- Extend credit support to MFIs to enable them to disburse good quality energy access solutions with a reduced loan size affordable for low-income and BOP households. It is also important to design programs and galvanise financing support for MFIs which provide ample freedom to select off-grid companies with proven technologies and after-sales maintenance service network.
- Cross-cutting solutions
  - Consumer awareness advertising campaigns were highlighted as the need of the hour to spur demand for off-grid energy products in the North-East region. Moving away from purely informative commercials, it is important to focus on designing campaigns geared towards marketing these technologies as "pull products". This is particularly important in the North-East where there is a very high need for alternative solutions to grid power.
  - There should be an increase of information flow and financial linkages through networking events. CLEAN could facilitate linkages of start-ups and established enterprises with early-stage investors, social impact funders etc. Annual networking events and investor fora could be a potential medium for facilitating enterprise-financier linkages.



**Figure 1: Overview of key features of decentralised RE scenario in north-east**



Source: CEEW analysis

## 8. INTERVENTIONS TO MITIGATE FINANCING CHALLENGES

Drawing on stakeholder interviews and site visits, the following interventions aimed at mitigating both enterprise and end-user financing barriers hampering the off-grid RE sector:

- **Lowering transaction costs:** The network will manage to receive large scale buy-in from the stakeholders when it manages to render facilitative services which drive down the transaction cost of firms. The following activities will be initiated as soon as CLEAN starts its operations and would be an on-going process:
  - Leverage CLEAN's online portal to disseminate information about project call facilities/call for proposals/investors' forums/various competitions. A few investment enablers (anchor call for proposals) have pointed out how they would like to leverage platforms like CLEAN to reach out to a wider audience which can benefit from project call facilities.
  - Offer mentorship to small scale social enterprises/not-for-profit organisations on ways to approach various funders/donors. One of the approaches could be by way of assistance with grant-writing skills.
  - Educate enterprises about various financing mechanisms, disseminate information about best practices and stumbling blocks.
  - Facilitate enterprise-financier linkages either through one-on-one engagement or via networking events. As pointed out by enterprises in CLEAN's stakeholder consultation in Guwahati, these events could be held (annually) in places like the North-East or East with enormous potential and demand for alternative sources of energy.
- **Finance outreach:** The network can increase financiers' outreach activities (outlined below) with an aim to increase awareness of opportunities to finance off-grid projects, increase consumer financing as well as bridge expectation gaps between enterprises and financiers:
  - Engage with the finance community either one-on-one or via focussed group meetings to understand investment criteria/preferences
  - Facilitate training programmes for financiers (bankers CSR companies, social impact funds, MFIs, donors etc.) to apprise them of various off-grid RE technologies, existing government policies, how to evaluate viable business models and enterprise needs. Bankers training programmes have the potential to mitigate both enterprise and end-user financing needs. This could draw on various bankers' training efforts undertaken by SELCO, GIZ, and InsPIRE Network.
- **Facilitate end-user financing via microfinance institutions:** Identify and facilitate technical and financial (in-cash loans, grant-debt mix) support to MFIs to enable them to provide energy solutions to BOP households. The network may start in places like Manipur where there is an existing network of MFIs having good reach amongst BOP households coupled with a good track record of distributing off-grid RE solutions. Engagement with MFIs from Manipur indicated that there is an ample demand for high quality off-grid energy solutions from households which MFIs are unable to cater to owing to high capital cost of SHLS and limited repayment ability of households. These MFIs have struggled with in-kind loans(for instance, under the Solar Microloan Initiative by FWWB-I) as it hampered their ability to select the technology supplier. Instead of in-kind loans, trusted MFIs with a good track record should be given technical and financial(in-cash loans, grant-debt mix) support that enables them to select the appropriate vendor. CLEAN can facilitate in-cash loans with a higher grant component that can bring down the overall loan size for BOP households and could also help MFIs to identify reliable vendors.

- **Leverage existing pro-poor schemes to facilitate end-user financing**
  - Spread awareness among enterprises and banks about schemes tailored to serve rural consumers (with low incomes) – for example, Differential Rate of Interest (DRI), Kisan Credit Card (KCC), and Women Development Scheme (in Meghalaya) which offer loans to farmers at low-interest rates (around 4%). SELCO in Karnataka and Eastern Envo in Meghalaya have managed to sell systems using the DRI scheme as illustrated in earlier sections.
- **Facilitate creation of a revolving grant fund with donors:** Grants comprise the funding backbone of quite a few enterprises in the sector. However, not all players are able to access grants, thereby hampering creation of a level-playing field. Further, grant-funding cannot be considered a sustainable or long-term financing panacea. CLEAN could engage DFIs and donors to create a revolving grant fund wherein 70%-80% comprises the grant component and the rest is a long-term loan with zero percent interest. This could be a way by which the loaned amount when returned, could be channeled into other projects.
- **Facilitate disbursement of soft loans with long tenures:**
  - **CLEAN could advocate creation of a separate wing housed in an existing government body for disbursing low cost loans with long tenure:** A common theme resonating across technologies and project implementers was the need for collateral free soft loans (interest rates of 6%-8%) with long tenures of 8 years to 15 years. It is important to note that most infrastructure projects are provided loans with an interest rate of 6%-7% but decentralised RE mini grid installations do not fall under this ambit. CLEAN could advocate creation of a separate wing in REC, NABARD, or IREDA for disbursing low-cost, long-term, collateral free soft loans to enterprises. The separate off-grid RE wing would source funds from development finance institutions (DFIs), bilaterals/multilaterals or even the NCEF. CLEAN could also work with these institutions on developing eligibility criteria for disbursing loans to enterprises at various stages of operation/targeted regions of operation and using various technologies or.
  - **CLEAN could facilitate creation of a partial risk guarantee fund for DRE projects :** CLEAN could work with bilaterals/multilaterals or advocate use of NCEF to constitute a partial risk guarantee fund for DRE projects administered by a government body such as IREDA. The fund could mitigate bankers' risks in the short run while improving their confidence in DRE enterprises in the long run. CLEAN could work with MNRE to formulate guidelines for implementation of the fund. Bankers' training could be a pertinent precursor to understanding the need and feasibility of introducing such a scheme. The guarantee scheme could provide a risk cover up to 50% of debt in a DRE project. This funding organization will enter into guarantee framework agreements with financial institutions.
- **Facilitate creation of a credit risk guarantee fund to address end-user credit risks:** CLEAN could facilitate development of a credit guarantee fund which can provide up to 100% guarantee for end-user loans from local financing institution or extend interest subsidies depending on various factors such as end-user income levels, willingness to pay, decentralised RE solutions on offer (whether it has direct impact on enhancing income levels/livelihood opportunities, previous track record of the enterprise in terms of adequate after-sales maintenance, etc.). The network can pilot this fund with a small district or village in a state where adequate data on the aforementioned factors is available. For example, in order to build bankers' confidence in a state like Manipur where there is adequate consumer awareness and demand for decentralised energy solutions, the partial credit risk guarantee fund could be leveraged to enable MFIs to provide interest subsidies on micro loans to low-income and BOP households. Alternatively, it could be used to provide guarantees against consumer loans taken from banks. Once the end-user has paid off the loan, the amount gets freed and can be used to act as guarantees for other projects.
- **Facilitate design of consumer awareness programmes by leveraging existing initiatives:** Enterprises spend significant resources on consumer awareness. Consumer awareness programs were highlighted as the need of the hour at least in areas/regions where such solutions have the potential to become 'pull products'. The focus of awareness generating initiatives targeting various off-grid RE technologies will vary depending on consumer needs and geographies. It is important to ensure that campaigns are not just informative in nature. CLEAN could work with the

MNRE as well as the Ministry of Information Technology and Broadcasting to provide inputs on ways to designing consumer awareness programmes. One way to approach this could be by leveraging existing initiatives such as Kisan Call Centres to educate end-users about the various aspects of solutions such as solar water pumps, RE powered livelihood/health-related solutions.

- **Engage with government on policy and regulatory issues:** As gaining traction with policy makers is dependent on CLEAN’s performance in the initial year, it could start with drafting a strategy for optimal utilisation of National Clean Energy Fund (NCEF) as outlined in Figure 2, which was originally created to promote R&D in clean energy technologies but has come under the scanner for under-utilisation and almost negligible focus on renewable energy technologies. Engagement with the Ministry of Finance suggested that they are inclined to receiving inputs on NCEF utilisation strategy.
  - Draft a strategy (for MoF) on how NCEF could be best utilised for promoting decentralised RE technologies or R&D or implementation of pilots
  - Work with MNRE to bring more clarity around the Unnat Chulha Abhiyan Programme with respect to subsidies
  - Explore opportunities to introduce ceiling on the total capital subsidy outlay on solar water pumps to address market distortion by heavy subsidies

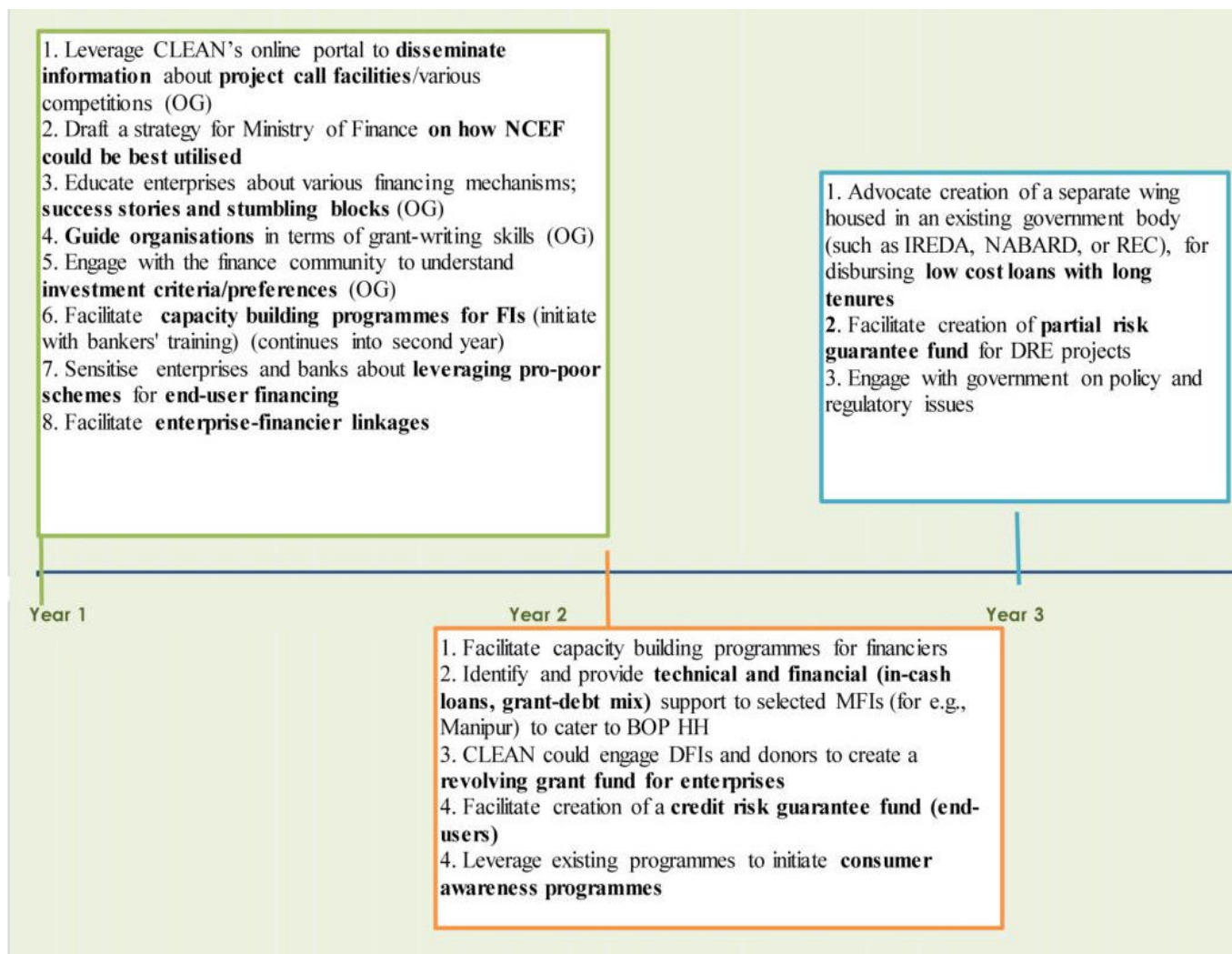
**Table 11: presents a detailed account of suggested interventions for addressing the financing barriers outlined in the previous sections.**

| Type  | Interventions   | Targeted Off-grid RE technology  |
|---|---|--|
| Lowering transaction costs of enterprises                   | • Leverage CLEAN’s online portal to disseminate information about project call facilities/call for proposals/investors’ forums/various competitions   | Any off-grid RE technologies   |
|   | • Guide both small scale for-profit and not-for-profit organisations in terms of grant-writing skills   | Any off-grid RE technology   |
|   | • Educate enterprises about various financing mechanisms, disseminate information about what has worked and what has not.   | Any off-grid RE technology   |
|   | • Facilitate enterprise-financier linkages either through one-on-one engagement or via networking events  | Any off-grid RE technology   |
| Finance Outreach and capacity building of financiers        | • Engage with the finance community either one-on-one or via focussed group meetings to understand investment criteria/preferences  | Any off-grid RE technology   |
|   | • Facilitate capacity building programs for financiers (bankers, CSR companies, social impact funds, MFIs, donors, etc.)  | Could be a range of technologies. Bankers’ training most suitable for solar lighting products, ICS, solar water pumps from the perspective of end-user finance. Beneficial for micro/mini grids operators – enterprise finance. Other financiers’ outreach programs can help in enterprise financing |
| Facilitate end-user financing via microfinance institutions | • Identify and provide technical and financial (in-cash loans, grant-debt mix) support to MFIs for providing off-grid RE technologies to BOP HHs. The network may start in places like Manipur (high consumer demand, MFI awareness). | for solar lighting products and ICS.   |

| Type  | Interventions   | Targeted Off-grid RE technology   |
|---|---|---|
| Leverage existing pro-poor schemes to facilitate end-user financing                 | <ul style="list-style-type: none"> <li>Sensitize enterprises and banks about schemes tailored to serve rural consumers with low incomes—for e.g., DRI, KCC and Women Development Scheme.</li> </ul>   | Solar lighting products/ SHLS, any off-grid RE linked with livelihood generation (e.g., solar powered sewing machine)   |
| Facilitate creation of revolving grant funds with donors                            | <ul style="list-style-type: none"> <li>CLEAN could engage DFIs and donors to create a revolving grant fund wherein 70%-80% comprises the grant component and the rest is a long-term loan with zero percent interest</li> </ul>   | Any technology  |
| Facilitate creation of credit risk guarantee funds for mitigating end-user risks    | <ul style="list-style-type: none"> <li>CLEAN could facilitate development of a credit guarantee fund which can provide up to 100% guarantee for end-user loans from local financing institutions or extend interest subsidies.</li> </ul>   | Mostly for decentralised energy products  |
| Facilitate disbursement of soft loans with long tenures                             | <ul style="list-style-type: none"> <li>Advocate creation of a separate wing housed in an existing government body (such as IREDA, NABARD, or REC) for disbursing low cost loans with long tenures</li> <li>CLEAN could facilitate creation of partial risk guarantee fund to cover up to 50% debt in a DRE projects. funds from donor bodies or the NCEF could be utilized and CLEAN could work with MNRE to formulate implementation guidelines</li> </ul> | Mostly micro/mini grids powered by solar, biomass, wind, hybrid technologies  |
| Facilitate design of consumer awareness programs by leveraging existing initiatives | <ul style="list-style-type: none"> <li>CLEAN could work with the Ministry of Information and Broadcasting and leverage Kisan Call Centre program</li> </ul>   | Could start with lighting and water pumping.  |
| Engage with government on policy and regulatory issues                              | <ul style="list-style-type: none"> <li>Draft a strategy for Ministry of Finance on how NCEF could be best utilized for promoting off-grid RE by R&amp;D. Implement pilots or offer subsidies to cover transmission cost for mini grids</li> </ul>   | <p>Nascent technologies such as solar air conditioning, solar desalination.</p> <p>Micro/mini grids if NCEF could be used to subsidize cost involved in laying transmission infrastructure.</p> |
|   | <ul style="list-style-type: none"> <li>Work with MNRE to bring more clarity around the Unnat Chulha Abhiyan programme with respect to subsidies</li> </ul>  | Improved cookstoves   |
|   | <ul style="list-style-type: none"> <li>Explore opportunities to introduce ceiling on the total capital subsidy outlay on solar water pumps</li> </ul>   | Solar water pumps   |

Source: CEEW compilation

**Figure 2: Timeline of implementing interventions**



Note: OG signifies that the listed intervention must be implemented on an ongoing basis

Source: CEEW analysis

### **About CLEAN:**

Clean Energy Access Network is an all India representative organization launched in 2014 with a clear mandate to support, unify and grow the decentralized clean energy sector in India. It particularly aims to bring together diverse stakeholders across India working to improve energy access for the rural and urban poor and create an inspiring model for countries around the world to follow.

CLEAN is technology agnostic. Technologies include solar, wind, biomass, biogas, pico and micro hydro and so on. It is also scale agnostic. The scale of its members' operations ranges from pico solutions to larger, decentralized solutions.



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