



REPORT

IND

2015

Technical Partner

MicroSave
Market-led solutions for financial services



ROLE OF FINANCE

with a special focus on Microfinance
in Enhancing Clean Energy Access



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ABBREVIATIONS

BIS	Bureau of International Standards
BLE	Block Level Entrepreneur
BLT	Block Level Technician
BoP	Bottom of Pyramid
BPL	Below Poverty Line
Btu	British Thermal Unit
CEP	Clean Energy Products
CFL	Compact Fluorescent Light
CSR	Corporate Social Responsibility
DDG	Decentralised Distributed Generation
DLT	District Level Technician
DRE	Decentralised Renewable Energy Enterprises
FI	Financial Institutions
GDP	Gross Domestic Product
IAP	Indoor Air Pollution
IFC	International Finance Corporation
ISI	Indian Standards Institution
IT	Information Technology
JNNSM	Jawaharlal Nehru National Solar Mission
KCC	Kisan Credit Card
kWh	Kilowatt-hour
LED	Light Emitting Diode
MFI	Microfinance Institution
MNRE	Ministry of New and Renewable Energy
MSME	Micro, Small and Medium Enterprise
MW	Megawatt
NABARD	National Bank for Agriculture and Rural Development
NBFC	Non-Banking Finance Company
NBMMP	National Biogas and Manure Management Programme
NGO	Non-Government Organisation

NPA	Non-Performing Assets
PV	Photo Voltaic
RGVY	Rajiv Gandhi Grameen Vidyutikaran Yojana
RRB	Rural Regional Bank
SHG	Self Help Group
SHS	Solar Home Systems
SIDBI	Small Industries Development Bank of India
SNAs	State Nodal Agencies
TERI	The Energy and Resources Institute
VLE	Village Level Entrepreneur
WRI	World Research Institute
WWF	World Wide Fund for Nature

EXECUTIVE SUMMARY

Access to energy is a looming challenge for many developing nations in the world, especially for fast growing economies like India. Of the 80 countries assessed in the Energy Development Index (EDI),¹ India with an EDI score of 0.30 (out of 1.00) stands at 41st place on access to energy for household and community needs. Considering this as a challenge to economic growth, the Government of India has launched different programmes to attain widespread grid electricity (where infrastructure supports it) and missions to deepen the use of renewable energy sources. As traditional grid electricity is yet to reach 25 per cent of the country, and is erratic and sporadic in rural areas, there is a need for decentralised off-grid energy solutions. However, the factors that limit its widespread adoption are accessibility, awareness and affordability.

Objectives

In this context, WWF-India has commissioned a study to measure/assess affordability of clean energy products in India, with an added impetus on exploring financial institutions (particularly microfinance institutions) as viable last mile channels to encourage adoption of clean energy products. The study covered 51 organizations, including microfinance institutions, banks, funding and donors agencies, knowledge based organizations, government agencies and clean energy product suppliers. The objectives of the study are:

- To assess the current status of energy access in the country, including the role of renewable energy and existing clean energy finance models.
- To understand the role of finance in enhancing access to clean energy.
- Identify challenges and growth opportunities in financing of clean energy products, with special reference to the Indian context and learnings from international experiences.

Approach

The study is based on comprehensive secondary research coupled with primary research with a range of stakeholders. It was ensured that the sample includes a cross-section of stakeholders and financial institutions with geographic diversity and range of products offered.

The report highlights macro-level energy scenario, role of clean energy in addressing energy issues and external environment. The study focuses on the clean energy finance market and its untapped potential. Major off-grid clean energy finance models in India and relevant case studies are used to explain the clean energy sector in India. In addition to the Indian experience, the report includes a chapter on global best practices, through case studies of successful clean energy finance models from across different continents. The study concludes with a list of challenges for the

¹ IEA. 2012. "Chapter 18: Measuring Progress towards Energy for All". *World Energy Outlook 2012*. International Energy Agency, Paris, France. http://www.iea.org/publications/freepublications/publication/WEO2012_free.pdf, accessed on 22 March 2015.

sector and recommendations that provide two scalable finance models in the current policy scenario. The section on recommendations also includes suggestions for improvements/changes in long-term policy formation and implementation in the clean energy sector. These sections are briefly explained below:

Ecosystems and Landscape Analysis

The section on ecosystem and landscape analysis starts with an estimate of the clean energy finance market that is served by microfinance institutions. The market size is estimated based on five factors namely: number of microfinance clients, rural population without electricity, percentage of microfinance clients with low income levels, clean energy solution needs of different segments and rate of adoption of clean energy solutions. The study estimates that microfinance institutions can serve a market worth INR 4 billion. The study also highlights recent developments within the microfinance vertical, including microfinance institutions acting as business correspondents for banks and the Reserve Bank of India's (RBI) regulation regarding small finance banks. These two developments provide greater scope for microfinance institutions to venture into the clean energy sector with minimal portfolio and reputation risks.

The study also underlines efforts of the government in supporting commercial banks to offer loans for solar energy products, much before the financial institutions (particularly microfinance institutions) came into the picture. However, products awareness, post-sales services by the suppliers and delay in receiving subsidy have marred the success of this initiative.

The study also features current clean energy finance models and case studies. These models are:

- Microfinance Institution Intermediation Model
- Direct Bank Linkage Model
- Financing Supplier Model
- Supplier Intermediation Model
- Government Intermediation Model

Challenges

The study identifies challenges on four levels: policy, technology, finance and operation. The apparent challenges at the operational level include coordination between the financial institution and suppliers, product certification, supply chain and line of credit. The challenges at the apex level include issues related to policies that shape the external environment for the clean energy finance sector. These include policies of the government, prospective scope of risk hedging of energy portfolio, need for a dedicated risk fund for energy portfolio and cheaper sources of financing for financial institutions.

Recommendations

The section on recommendations is divided into two parts. The first part details two potential, replicable business models within the current policy, regulatory and external environment. The second part lists long-term recommendations at the policy and implementation levels.

The two models that are conceptualised in the first part of this section are based on strengths and weaknesses of different stakeholders including banks, microfinance institutions, the government, block-level technicians and manufacturers. The first is the business correspondence model that proposes microfinance institutions to act as bank's agents and extend bank's energy loans to its clients. This model is less risky for the microfinance institutions as the loans are held in the bank's books with the microfinance institutions earning a fee or a commission on the loans. The model also presupposes financial institutions to act as technical service providers and advocates for clean energy finance.

The second is a wholesale finance model that rides on existing banks' wholesale finance products. It proposes that banks should further extend this finance to microfinance institutions at a lower rate as compared to traditional microfinance lending, to further the cause of clean energy finance.

In the second part of the recommendations, it is suggested that the government should reconsider the eligibility criteria for subsidies and allow microfinance institutions to receive subsidies against clean energy products' finance portfolio. Further, it is critical that microfinance institutions have access to cheaper sources of finance so as to make clean energy finance a viable business case as compared to traditional microfinance. The recommendations also include a proposal to include clean energy finance in priority sector lending and allow banks to hedge clean energy fund in the derivatives market. It is also important that corporate social responsibility is leveraged to bring a substantial change in the sector. The corporate sector can provide grants or credit for clean energy finance under the social responsibility initiative.

INTRODUCTION

ABOUT THE STUDY

Background

India is a developing nation with ever increasing energy needs. Realising the demand for energy as one of the key challenges to growth, the Government of India has formulated policies that focus on development of large energy infrastructure projects, such as power plants and hydro projects. Albeit even with current and growing capacity, large energy projects are not able to fulfil the energy needs of the growing population, especially the poor and low-income segments that reside in rural and far-flung areas. This has led to a policy shift to explore renewable energy solutions, such as micro-grids and off-grid products, as alternates to conventional energy sources for providing energy service to the last mile. The renewable energy sector has received its due share with formulation of schemes such as the Jawaharlal Nehru National Solar Mission (JNNSM) and Capital Subsidy Scheme through NABARD on subsidy for different off-grid solutions. These steps have made a positive impact on the production and access to renewable energy. However, there are three major practical hurdles in scaling-up adoption and uptake of clean energy products, especially in rural areas. These include affordability, awareness, and accessibility. With increasing outreach of market infrastructure, distribution channels and information, various institutions have to an extent addressed the issues of accessibility and awareness. However, the question of affordability is a less researched and explored aspect of improving access to energy with profound implications on the clean energy sector.

In order to address the challenge of affordability, different funding agencies as well as clean energy product suppliers have leveraged the presence of last mile local financial services providers such as the Regional Rural Banks and similar microfinance institutions. Recently, many innovative models have emerged wherein the microfinance institutions or banks are placed at the core as the financier, with an extension as distributors of small off-grid energy solutions, thereby leveraging their client base and local presence. Despite this, the potential of the market still remains largely untapped. There are several factors behind this limited growth of clean energy finance in the country, especially when business opportunities are large and promising. These factors include affordability and limited availability of finance products for small clean energy solutions, awareness about clean energy solutions and limited accessibility due to lack of adequate number of access points and poor post-sale services.

In this context, WWF-India along with its technical partner *MicroSave* have conducted a *landscape assessment of the role of finance, especially microfinance, in enhancing access to clean energy for the poor in the country*. The study analyses barriers and opportunities to financial institutions to fund last mile clean energy solutions for the

poor. It further discusses the need for clean energy solutions, existing finance and distribution models and case studies connected to these models, challenges related to policy formulation and implementation, and subsequently recommends a path for harnessing the potential that the sector offers. The report is an outcome of secondary and primary research that included interviews with different stakeholders and experts in the sector. Key aspects of regional diversity, socio-economic factors, acceptance and affordability of different models were considered during the sampling. To add to the analysis, cross learning from international experiences in the area of clean energy finance were also taken into consideration in the final report.

The end deliverable of the study is to identify opportunities for wider replication/ scalability of potential models and propose actionable recommendations that would help in overcoming some of the existing barriers. The preliminary findings of the study were shared with a range of stakeholders at a stakeholder consultation workshop in order to seek their inputs and feedback on the findings and recommendations.

Objectives

The key objectives of the landscape analysis are:

Objective 1

To develop an understanding of the sector and the role of finance in enhancing clean energy access:

- **Current status of access to energy and the role of renewables:** Current status of demand and supply of clean energy in the country, demand-supply gap and existing clean energy solutions to bridge this gap.
- **Prevalent models:** Clean energy sector's ecosystem, various stakeholders and their role in the ecosystem, influences and interactions within the stakeholders.

Objective 2

Based on the understanding of the clean energy sector, highlight learnings with potential impact on design of schemes, identify opportunities for replication, and propose recommendations for adoption and scale:

- **Challenges:** Challenges at different levels: policy, finance, operations and implementation
- **Learning:** Building insights which have potential implications on the design and implementation of schemes
- **Opportunities:** Identify opportunities for wider replication of potential models and propose recommendations that will help overcome some of the identified barriers.
- **Share cross learning:** Share cross learning from similar experiences in other countries where access to energy is the policy focus.

Methodology

The study was undertaken through desk research followed by primary research involving individual interviews/discussion with a range of stakeholders. The following tools have been used to capture the responses and learnings:

- Secondary research to understand the macro-level financial scenario of off-grid decentralised energy sector.
- Based on the secondary research, a sampling plan was developed to include: individual interviews involving key stakeholders that are either part of clean energy finance or have an influence on the sector through policymaking and implementation. Keeping into consideration the time constraints, a purposive sample was taken that included diverse sets of institutions based on:
 - their role in the sector
 - region(s) in which they operate
 - types of institutions including services offered, products and size
- The study identified 75 institutions among the microfinance institutions and banks, suppliers, donors/funding agencies and government agencies (please see Annexure 2). The final sample included 65 per cent of the pool, i.e., 51 institutions. The sample composition is as follows:

Type of Institution	Number of Institutions
Microfinance Institutions and Banks	20
Suppliers	18
Government Agencies	3
Knowledge Based Organizations	3
Donors/Funding Agencies	7
Total	51

- Field note for each of the discussion were reviewed, and the findings were consolidated and used for the final analysis.
- Case studies were prepared for successful and unsuccessful models.

SETTING THE CONTEXT

Energy Access Challenge: Global Perspective

In the past few decades, the world has experienced a boom in economies activities, a rise in manufacturing, opening up of new markets and a rapid increase in urbanization. With these developments, hundreds of millions of people have access to modern energy sources over the last two decades. However, there is still a large section of the population, especially in emerging economies, who still do not have access to electricity. Significantly, large population, nearly one-fifth (18 per cent) of the global population, adding up to approximately 1.3 billion¹ people, continue to live without access to electricity. Nearly 97 per cent of those without access to electricity live in sub-Saharan Africa and Asia. In terms of sheer numbers, this refers to 615 million people in developing Asia and nearly 600 million people in sub-Saharan Africa who lack access to electricity. Since 2000, around two-thirds of the people who gained access to electricity live in urban areas, while the population without access to electricity reside in rural areas.

Table 1.1: Top 10 countries where large population have no access to electricity (2014)

Country	Population without access to electricity (in million)	Per cent of world population without access to electricity	Per capita electricity consumption (kWh)
India	304	24	393
Nigeria	93	7	85
Ethiopia	70	5	24
Bangladesh	62	5	102
Democratic Republic of Congo	60	5	47
Indonesia	60	5	390
Pakistan	56	4	374
Tanzania	36	3	55
Myanmar	36	3	74
Kenya	35	3	107
Rest of the World	473	36	692
Total	1,285	100	2,343

Source: IEA. 2014. *World Energy Outlook 2014*. International Energy Agency, Paris, France. <http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase>, accessed on 22 March 2015

1 IEA. 2014. *World Energy Outlook 2014*. International Energy Agency, Paris, France.

Similarly, in terms of the access to cooking fuel, nearly 2.7 billion² people rely on traditional use of biomass, while another 200-300 million people rely on coal that causes air pollution and has serious potential health implications when used in traditional stoves. More than half of the population of developing Asia – over 1.9 billion³ people – and around 80 per cent of population in sub-Saharan Africa – about 700 million people – live without access to clean cooking fuel.

The situation in India too is pretty dismal. Nearly 35 per cent of the global population without electricity lives in India and around two-thirds of the country's population (nearly 800 million)⁴ relies on inefficient, polluting means of cooking such as traditional biomass and coal.

In terms of energy consumption,⁵ India is among the least energy-intensive economies in the world (see Figure 1.1). In terms of per capita energy consumption,⁶ India is ranked 109th in the list of 137 countries.⁷ At a level of 10-40 million British Thermal Units (Btu) per capita per annum, which is almost one-third of the world average, India is substantially lower than many developed countries. For instance, the per capita energy consumption of the USA, which is greater than 400 million Btu, is more than 10 times that of India.

Table 1.2: Top 10 countries where large population is dependent on traditional sources of fuel for cooking (2012)		
Country	Population relying on biomass (in million)	Per cent of world total
India	815	30
China	448	17
Bangladesh	138	5
Nigeria	115	4
Pakistan	112	4
Indonesia	105	4
Ethiopia	87	3
Democratic Republic of Congo	61	2
Myanmar	49	2
Philippines	47	2
Rest of the World	702	27
Total	2,679	100

Source: IEA. 2014. *World Energy Outlook 2014*. International Energy Agency, Paris, France. <http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase>, accessed on 22 March 2015

2 Ibid.

3 Ibid.

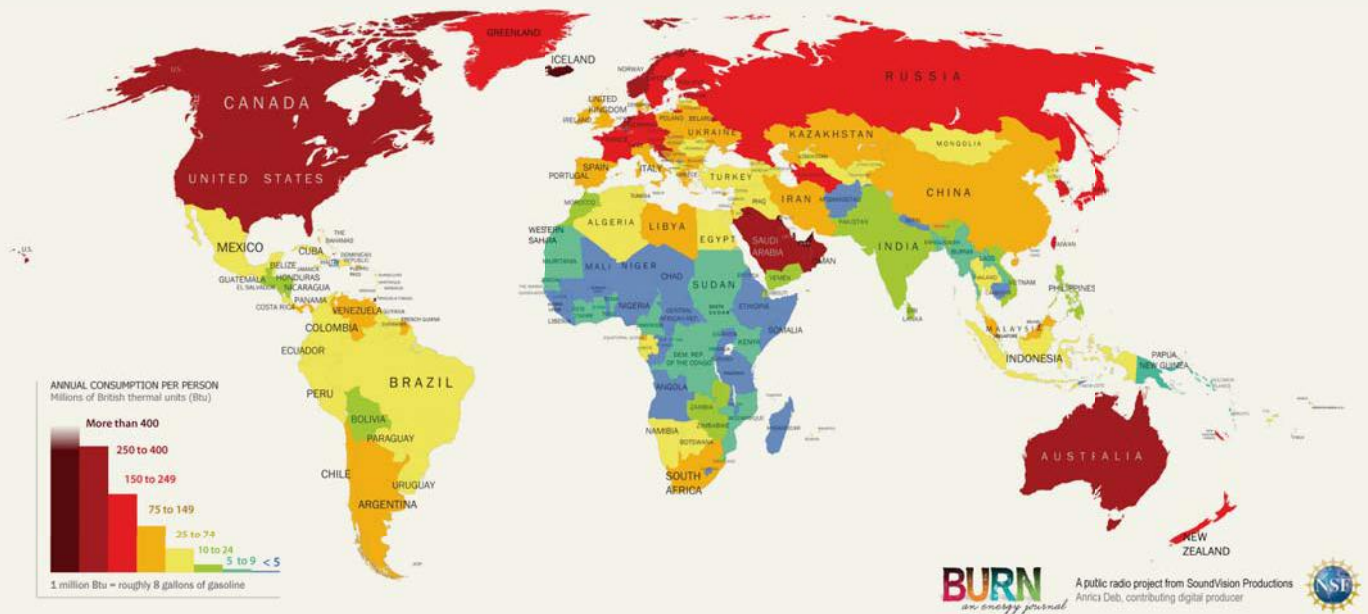
4 Ibid.

5 BURN.n.d. "Map: How Much Energy the World is Using". *BURN: An Energy Journal*. <http://burnanenergyjournal.com/how-much-energy-are-we-using>, accessed on 22 March 2015.

6 Energy use refers to use of primary energy before transformation to other end-use fuels, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport.

7 IEA. 2014. *World Energy Outlook 2014*. International Energy Agency, Paris, France.

Figure 1.1: Per capita energy consumption – by country (2010)



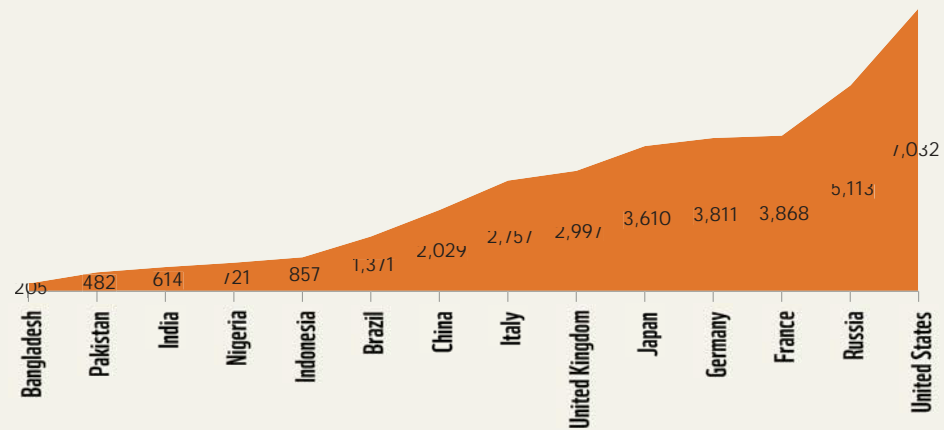
The reasons for low energy consumption are not difficult to surmise given India’s low industrial base; over half of India’s population still depend on agriculture for livelihood, and a little over a quarter are connected with the service sector. However, as India increases its industrial production and joins the group of middle-income countries, the energy consumption of the economy is set to rise. Albeit, if India, China and other rapidly growing economies were to mimic the energy utilisation of the West that will presupposed inexhaustible fossil-fuel resources; the world would be staring at a grave energy crisis. From this perspective, access to secure, reliable and clean energy for the fast-developing nations allows a viable alternative for a greener future.

FACTS ON ENERGY SITUATION IN INDIA⁸

- India has 304 million people without access to electricity – nearly 25 per cent of the world’s 1.3 billion ‘energy poor’.
- An even greater number of people rely on traditional biomass for cooking and heating.
- About 70 per cent of India lives in villages. Of the 650,000 villages in India, 100,000 are not electrified and most of the remaining villages have very poor quality of power supply.
- About 500,000 people, mainly women and children, die each year from Indoor Air Pollution (IAP).

8 Ibid.

Figure 1.2: Energy Consumption (kg of oil equivalent per capita) (2011)



Source: The World Bank. 2014. World Development Indicators. Table 3.6: Energy production and use. <http://wdi.worldbank.org/table/3.6#>, accessed on 22 March 2015.

Clean Energy Access: India

Global energy consumption trends and disparities are also evident in India. Over the last decade, the Indian economy has experienced phenomenal growth.

The average per capita energy consumption masks significant inter-regional and inter-segment disparities within the country. If domestic electricity consumption across regions (as a proxy since electricity is a rather efficient form of energy) is compared, there is a wide variation between urban and rural locations. According to World Bank data, one in four people in India (close to 300 million) still do not have access to electricity.⁹ The situation is even worse in rural areas where just over half the population use electricity as their main source of energy.¹⁰ One of the major reasons for this disparity is the poor availability of electricity in rural India.¹¹ Even in the electrified rural area, electricity supply is poor and erratic with frequent power outages being the norm. The per capita average annual domestic electricity consumption in India in 2009 was 96 kWh in rural areas and 288 kWh in urban areas for those with access to electricity in contrast to the worldwide per capita annual average of 2,600 kWh and 6,200 kWh in the European Union.¹²

This situation leads to an outcome where 43 per cent of the rural population have to depend on kerosene for lighting and 85 per cent have to depend on unclean sources

9 IEA. 2014. *World Energy Outlook 2014*. International Energy Agency, Paris, France

10 Times of India. 2012. "11 lakh households have no electricity; 85% of rural India uses firewood as fuel". *Times of India* (14 March). <http://timesofindia.indiatimes.com/india/11-lakh-households-have-no-electricity-85-of-rural-India-uses-firewood-as-fuel/articleshow/12256306.cms>, accessed on 18 March 2015.

11 Zee News. 2014. "7.5 crore Indian households without electricity: Report". Zee News (27 January). http://zeenews.india.com/news/nation/7-5-crore-indian-households-without-access-to-electricity-report_907188.html, accessed on 18 March 2015

12 IEA. 2011. *World Energy Outlook 2011: Energy for All*. OECD/International Energy Agency, Paris, France.

IMPORTANCE OF CLEAN ENERGY

- Access to clean energy enables the achievement of the Millennium Development Goals including:
 - Significant improvements in infant and maternal health (through reduced Indoor Air Pollution)
 - Combating disease (refrigeration, lighting, sterilization and transport of medicines)
 - Education (lighting, heating, telecommunications, IT)
 - Agriculture and the eradication of hunger (irrigation, transport, storage, processing)
- Clean energy also creates opportunities for income generation for micro-entrepreneurs and improves rural energy supply chains; creates opportunities for agro-processing and small industries to develop.
- Clean energy reduces the contribution of poor communities to greenhouse gas emission.

like firewood, cow dung and agricultural residues as fuel for cooking, which often results in chronic health problems. Combustible renewables and waste constitute about one-fourth of India's energy use. This share includes traditional biomass sources such as firewood and dung, which are used by more than 800 million Indian households for cooking.¹³ Further, kerosene is easily available at government approved fair price shops where it is sold at subsidised rate, which promotes the usage of kerosene. Even though the subsidy on kerosene was intended to incentivise Below-Poverty Line (BPL) families to use it for cooking, people continued using solid fuels like firewood and dung cakes for cooking and diverted the use of kerosene for lighting instead. Thus, a vast majority of India face 'energy poverty'¹⁴ where they continue to use inefficient fuels to meet their energy needs and suffer from concomitant health hazards.

Promoting generation of cleaner energy options like solar, wind and hydropower, and linking it to grid-based electricity, as against coal and oil-fired power plants, is an important policy decision. Even as this option is pursued, and efforts are made to bring grid-based electricity to all the villages, another prong in the strategy for greener future is to promote a range of off-grid/decentralized energy solutions. The two should not be seen as dichotomous; in fact they can complement each other, as has been the case in several countries.¹⁵

There are existing reliable and proven technologies that can substitute polluting fuels like kerosene and biofuels for the "energy poor" who have to depend on them for lack of an alternate or as a matter of sheer habit. These off-grid solutions are not as costly as many would believe (with continuous price reduction as technology gets better) and can be financed by household level investments. Thus, ensuring clean energy access for domestic purposes (lighting, cooking and heating) for the poor household will have a huge impact on ensuring India's energy security.

13 Central Statistical Office. 2013. Energy Statistics 2013. Ministry of Statistics and Programme Implementation, Government of India, New Delhi. http://mospi.nic.in/mospi_new/upload/Energy_Statistics_2013.pdf, accessed on 18 March 2015.

14 IEA.n.d. "Energy Poverty". International Energy Agency. <http://www.iea.org/topics/energypoverty>, accessed on 22 March 2015.

15 Even in metros like Bengaluru, a large number of households prefer solar heating apparatus to meet the need for hot water as against electric geysers.

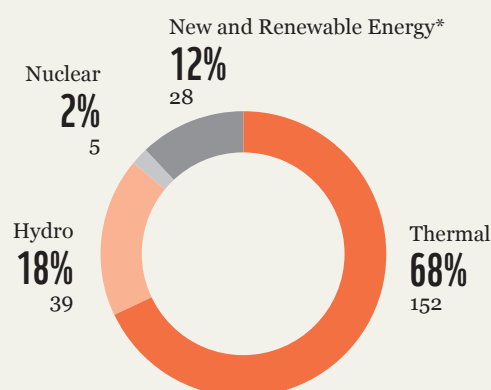
Energy: Demand and Supply Gap in India

India's emergence as a rapidly growing economy (real GDP growth in the past decade was 7.5 per cent¹⁶) is placing enormous demand on its energy resources. Although there have been significant efforts by the Government of India to scale up the supply of energy, the demand and supply imbalance is set to push the country to an impending energy scarcity, which in turn is going to effect the growth of the economy.

Indian citizens' – primarily rural and low-income (~60 per cent) – demand for energy, particularly for electricity, has increased significantly. Owing to their consumption of energy for cooking and lighting, the country is experiencing a widening demand-supply gap.

There are ironies in the access to energy scenario. It is interesting to note that while over 95 per cent¹⁷ of Indian villages are electrified, about 45 per cent of rural and low-income households still do not have reliable access to electricity and rely on kerosene for lighting, and firewood and dung for cooking.

Figure 1.3: Electricity Generation Sources in India as on 31 March 2013 (Giga Watts)



* Renewable Energy Sources include Small Hydro Projects, Wind Power, Biomass Power Biomass Gasifier, Urban & Industrial Waste and Solar Power

Source: Central Statistical Office, 2014. *Energy Statistics 2014*. Ministry of Statistics and Programme Implementation, Government of India, New Delhi. http://mospi.nic.in/mospi_new/upload/Energy_stats_2014.pdf, accessed on 18 March 2015.

As per the *Energy Statistics 2014* of the Ministry of Statistics, Government of India, the rural and low-income households pay the highest price per unit of electricity consumed. The rural and low-income households have emerged as a significant consumer market for energy services and products.

16 Central Statistical Office. 2013. *Energy Statistics 2013*. Ministry of Statistics and Programme Implementation, Government of India, New Delhi. http://mospi.nic.in/mospi_new/upload/Energy_Statistics_2013.pdf, accessed on 18 March 2015.

17 CEA.n.d. "Progress Report of Village Electrification as on 31-01-2015 as per 2011 Census", Central Electricity Authority, Ministry of Power, Government of India. http://www.cea.nic.in/reports/monthly/dpd_div_rep/village_electrification.pdf, accessed on 22 March 2015.

As per the *Energy Statistics 2014*, the total power generation capacity as on 31 March 2013 is 223.34 Giga Watts (GW).¹⁸ It is projected that by 2031-32, with an assumed 8 per cent economic growth, the energy demand of the country would be 800 GW.¹⁹ India's energy basket has a mix of all the resources available including renewables. The dominance of coal in the energy mix is likely to continue in the foreseeable future. At present, India's coal dependence is borne out of the fact that 68 per cent of the total installed electricity generation capacity is coal based. Other renewables such as Small Hydro Projects, Wind Power, Biomass Power Biomass Gasifier, Urban and Industrial Waste, and Solar Power represent a 12 per cent share of the total power generation capacity. Nuclear holds 2 per cent share.

Affordability Challenge

To address the challenge of affordability of clean energy off-grid solutions, funding agencies and clean energy products suppliers partnered with last mile financial services providers such as regional rural banks (RRBs) and microfinance institutions. However, the potential still remains largely untapped.

WHAT LIMITS THE SPREAD IN USAGE OF CLEAN ENERGY?

- Even with government and other agencies' efforts to promote off-grid renewable energy solutions, the demand-supply gaps still looms large.
- Affordability, awareness and accessibility are three major hurdles in scaling up off-grid solution, especially in rural areas.

With advancement in technology, a number of potential solutions like solar lanterns, smokeless stoves and biogas plants have emerged. Although all these solutions are based on tested technologies, there have been practical hurdles in scaling up their deployment in rural areas on account of:

- Affordability:*** Solar home lighting solutions are constrained by high manufacturing cost especially for the solar cells. Even after government subsidies are provided for manufacturing solar cells, the price of the final product becomes prohibitive for low-income consumers, especially if the product has to be purchased from a retail point that adds on the cost of logistics and transportation.
- Awareness:*** Shift from traditional ways of meeting energy needs to more sophisticated and clean energy technologies like solar home systems for lightening or smokeless stoves for cooking requires a fundamental change in behaviour and habits of the target population. Bringing about this change requires dedicated and long-term investments in marketing and awareness generation.

18 Central Statistical Office, 2014. *Energy Statistics 2014*. Ministry of Statistics and Programme Implementation, Government of India, New Delhi. http://mospi.nic.in/mospi_new/upload/Energy_stats_2014.pdf, accessed on 18 March 2015.

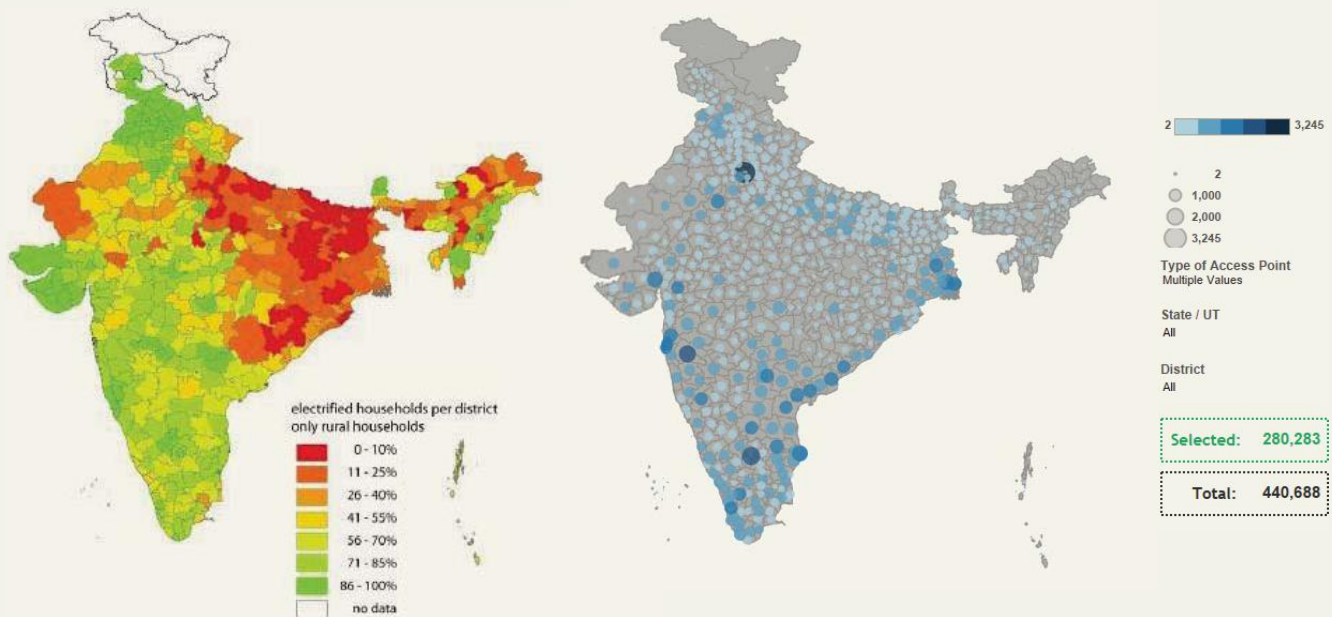
19 Pahariya, N.C. 2008. "Energising' India's development through economic diplomacy". Briefing Paper. CUTS Centre for International Trade, Economics & Environment, Jaipur, India. 5pp. http://www.cuts-citee.org/pdf/Briefing_Paper08-Indias_Development_through_Economic_Diplomacy.pdf, accessed on 18 March 2015.

c. Accessibility: Rural markets are highly dispersed often with poor connectivity. Most of the suppliers of slow moving goods like clean energy products abstain from entering into such markets due to poor economies of scale and higher cost.

Many clean energy products suppliers have leveraged the presence of financial institutions (FIs) such as cooperative banks, RRBs and microfinance institutions (MFIs) in remote pockets to market their services. The areas served by these FIs overlap with the regions that also suffer from energy poverty, making them the natural partners for ensuring a robust channel for supply of clean energy products (see Figures 1.4 and 1.5). From the two figures it is evident that some of the states with majority of districts experiencing low levels of electrification (figure 1.4) have got a reasonable degree of financial services access point (figure 1.5). This makes for a sound basis to explore the collaboration between FIs and suppliers of clean energy products.

Figure 1.4: Electrification Across Different Districts of India

Figure 1.5: Financial Access Points by Districts in India



Source: NSS Data

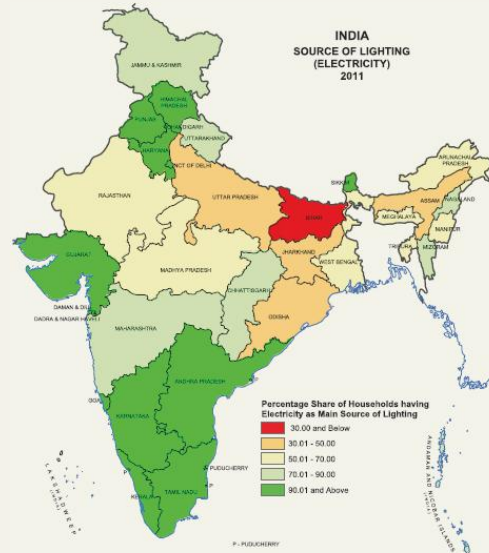
Source: MIX FINclusion Lab

Blueray Solar. 2009. "Rural Electrification in India". Blogspot.in (24 November). <http://blueraysolar.blogspot.in/2009/11/rural-electrification-in-india.html>, accessed on 18 March 2015.

FIs can address the issues related to affordability and accessibility to a large extent, by providing the necessary *channel* and *platform* for provision of clean energy products. Their existing footprints in remote-rural locations provide a viable alternative channel (as is evident from Figures 1.4 and 1.5 above). Plus, financial products offered by them ensure that the energy poor population have the lump-sum cash on hand to acquire clean energy assets, making them affordable. On awareness building too, FIs can play a peripheral role in influencing the energy consumption habit given that the FI staff enjoys considerable trust with their clientele. Thus, FIs can effectively catalyse both the supply and demand sides of the clean energy product market.

Regional Diversity in Access to Clean Energy in India

Figure 1.6: Source of Lighting (Electricity) 2011



As per the Census of India 2011, of the 28 states, 12 states have more than 20 per cent household still dependent on kerosene lamp as a source of light. Among these states, Bihar has 82 per cent, Uttar Pradesh has 61.9 per cent, Assam has 61.8 per cent, Odisha and Jharkhand both have more than 50 per cent and West Bengal has 43.5 per cent such households. The northern states of Punjab, Haryana, Himachal Pradesh and Jammu and Kashmir all have less than 10 per cent such households. Uttarakhand has 11.1 per cent households that rely on kerosene for lighting. In southwest and South India, except Maharashtra with 14.5 per cent such households, rest of the states too have less than 10 per cent such households.²⁰

Interestingly, Uttar Pradesh, Bihar and West Bengal are top 3 states with highest number of households with solar energy as source of light. As per the Census (2011), there were 238,571 households in West Bengal, 156,837 households in Uttar Pradesh and 109,389 households in Bihar with solar as main source of light. This shows the demand trend based on the dire need of clean energy solutions. Also, all these three states were way below the national per capita electricity consumption of 778.63 kWh.²¹ These figures clearly highlight that accessibility is the reason behind low usage of electricity as main source of light for such households.

Similar disparities are noticed in type of cooking fuel used in different states. Firewood is still the widely used cooking fuel in Indian households. As per Census 2011,²² 80.8 per cent of the households in Chhattisgarh are dependent on firewood and 66.4 per cent are using it in Madhya Pradesh. Similarly, more than 60 per cent use firewood as the primary source

20 Indian Census Bureau. 2011. "Census of India 2011: Provisional Population Totals-India Data Sheet." Office of the Registrar General Census Commissioner, India.

21 Press Information Bureau. 2012. "Per Capita Power Consumption". Ministry of Power (18 May). <http://pib.nic.in/newsite/erelease.aspx?relid=84206>, accessed on 18 March 2015.

22 India Census Bureau. 2011. "Cooking Fuel and Lighting". Directorate of Census, Madhya Pradesh State, <http://censusmp.nic.in/censusmp/All-PDF/7.%20Chapter-5%20%20Cooking%20fuel%20and%20lighting.pdf>, accessed on 22 March 2015.

of cooking fuel in Rajasthan and Odisha. Interestingly, in Bihar apart from firewood, crop residue is the prime source of cooking fuel for as large as 32.5 per cent of the households.

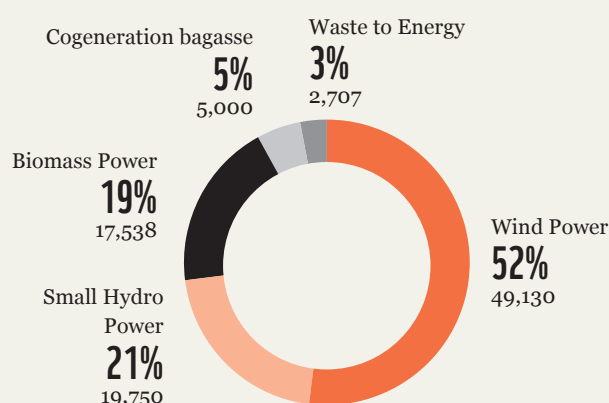
Income along with factors such as accessibility can be the prime reasons behind the trend. Comparison on the income level scale shows that all the stated states have per capita income less than the national figures. As per UNICEF–TERI study²³ on cooking fuel in India, a significant proportion of the rural population even in high expenditure category reported using fuel wood as the primary source of cooking fuel. Similar trends are analysed in a TERI study on rural energy transition in Madhya Pradesh. It concludes that income along with land holding size and women’s engagement in alternate livelihoods play an important role in determining the choice for household fuel.²⁴

The choice of cooking fuel is heavily dependent upon the income level. All these states have low per capita income less than the national average. Bihar is the lowest in the order with per capita income of Rs. 28,317. Similar is the case in Madhya Pradesh, Rajasthan, Chattisgarh and Odisha, whereas it is higher than Bihar but still in the lower bracket as compared to other states in the country.

Clean Energy Sector in India

India’s electricity sector is among the world’s most active players in renewable energy utilization, especially wind energy. The total potential for renewable power generation in the country, as estimated by Ministry of New and Renewable Energy as on March 2013, is estimated at 94,125 MW.²⁵ The electricity generation through the use of different forms of renewable sources is as follows:

Figure 1.7: Potential of Renewable Power in India (Mega Watts)



The graph does not cover estimation of potential of solar power. In November 2014, National Institute of Solar Energy in India has determined the country’s solar power potential at about 750 Giga Watts (GW).* Also, the government has since announced a solar energy capacity target of 100 GW by 2022.**

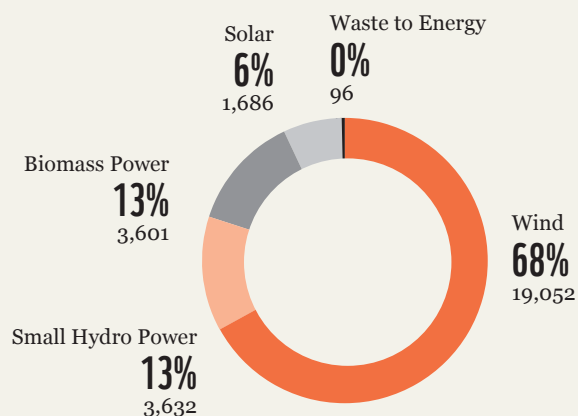
* Ministry of New and Renewable Energy, 2014, State wise Estimated Solar Power Potential in the Country, Government of India, <http://mnre.gov.in/file-manager/UserFiles/Statewise-Solar-Potential-NISE.pdf>, accessed on 22 March 2015
 ** Press Information Bureau Government of India Ministry of New and Renewable Energy, <http://pib.nic.in/newsite/PrintRelease.aspx?relid=117099>, accessed on 22 March 2015

Source: Central Statistical Office. 2014. *Energy Statistics 2014*. Ministry of Statistics and Programme Implementation, Government of India, New Delhi. http://mospi.nic.in/mospi_new/upload/Energy_stats_2014.pdf, accessed on 18 March 2015.

- 23 TERI. 2010. *Cooking with Cleaner Fuels in India: A Strategic Analysis and Assessment*. The Energy and Resources Institute. New Delhi, India. http://www.teriin.org/div/CES/Policy_brief_cooking_fuels.pdf, accessed on 18 March 2015.
- 24 Sehjpal, Ritika, Ramji, Aditya, Soni, Anmol, Das, Saptarshi and Ritu Singh. 2012. *Rural Energy Transitions: Insights from Madhya Pradesh*. TERI-NFA Working Paper No. 5 (December). New Delhi, India. 32pp. http://www.teriin.org/projects/nfa/pdf/Working_paper5.pdf, accessed on 18 March 2015.
- 25 Central Statistical Office. 2014. *Energy Statistics 2014*. Ministry of Statistics and Programme Implementation, Government of India, New Delhi. http://mospi.nic.in/mospi_new/upload/Energy_stats_2014.pdf, accessed on 18 March 2015.

The total installed capacity of grid interactive renewable power, in 2013-14 was 28,067 MW as on March 2013.²⁶ Out of the total installed generation capacity of renewable power, wind power accounted for about 70 per cent of the grid interactive renewable power. The contribution of different renewable sources to grid energy are as follows:

Figure 1.8: Grid-Interactive Energy from Renewable Sources as on 31 March 2013 (Mega Watts)



Source: Central Statistical Office. 2014. *Energy Statistics 2014*. Ministry of Statistics and Programme Implementation, Government of India, New Delhi. http://mospi.nic.in/mospi_new/upload/Energy_stats_2014.pdf, accessed on 18 March 2015.

The potential opportunity for investors in the Indian clean energy market for the rural bottom of pyramid (BoP) is significant. The World Resource Institute has estimated that the aggregated potential market for clean energy will be INR 97.28 billion per year, including INR 94.06 billion for decentralised renewable energy services and INR 3.22 billion for energy products per year.²⁷

A growing number of Indian companies see a market opportunity in providing rural BoP households with access to alternative cooking and electricity solutions, and consequently are developing clean energy products and services for this market. The report estimates that clean energy services and products may require an upfront investment, three to ten times greater than that of conventional energy sources, such as kerosene and firewood, which often are subsidised or provided free to India's rural consumers.

Clean Energy Electricity Systems²⁸

The need for a dependable supply of electricity for multiple uses was the primary driver of the demand for clean energy products and services. Installed in either the household or the community, clean energy products and services can supply enough electricity for several different uses, such as providing lighting, running fans, charging mobile phones, and operating radios and small appliances.

26 Ibid.

27 Bairiganjan, Sreyamsa, et al. 2010. *Power to the people. Investing in Clean Energy for the Base of the Pyramid in India*, World Resources Institute. IFMR research. Center for Development Finance, Washington, USA. See also EBTC. 2011. *Off Grid Distributed Energy in India*. European Business and Technology Centre. New Delhi, India. 7pp. http://ebtc.eu/pdf/111031_SNA_Snapshot_Off-grid-distributed-energy-in-India.pdf, accessed on 18 March 2015.

28 Ibid.

1. **Decentralised Renewable Energy Enterprises (DREs)** are energy companies that supply clean power for a community in a specific geographic region. These systems supply rural BoP consumers with electricity services generated from renewable sources of energy (primarily small hydro and waste biomass) through existing grids or company-owned distribution systems.
2. **Solar Home Systems (SHS)** are solar-based electricity-generating and storage systems designed to provide power to individual households. These systems use photovoltaic panels to generate electricity, combined with a battery and a controller to regulate charging and discharging. These systems are typically purchased on credit by individual households and are customised to meet their specific electricity requirements. WRI estimates that the SHS sector's potential market value for India's rural BoP segment is INR 1.26 billion per year.

Cooking and Lighting Solutions²⁹

Alternative cooking and lighting products such as solar lanterns and energy-efficient cook stoves provide cleaner substitutes for conventional, highly polluting products like traditional cook stoves and kerosene lanterns. But the demand for clean energy lighting and cooking products is not so strong, given their current prices, which put them out of reach of the majority of rural poor households. Many low-income consumers are also not aware of the health benefits of these cleaner alternatives.

- **Solar Lanterns** are portable lamps (either with a CFL or LED light source) that are powered by solar panels and can provide light for four to eight hours, replacing polluting and inefficient kerosene lanterns and supplying basic lighting for BoP households. WRI estimated that the solar lantern market is worth INR 855 million per year.
- **Energy-efficient Cook Stoves** are fixed or portable cook stoves that burn solid-biomass cooking fuels 20 to 65 per cent more efficiently than traditional stoves. Energy-efficient cook stoves can replace traditional polluting stoves that cause indoor air pollution and enhance risk of respiratory problems in women and children. WRI estimates that the energy-efficient cook stove market in India is worth INR 1.11 billion per year.

Access to Clean Energy Services: Policy Perspective

The Government of India realised the need for alternate sources of energy just after the 1970 energy crisis. With the intent to ensure energy security, the Ministry of New and Renewable Energy (MNRE) was instituted in 1992. The Government of India through MNRE propagates clean power, energy availability and access, and improved energy affordability with the intent to maximise investment in this sector. Major clean energy solutions propagated by Government of India are:

29 Ibid.

- **Grid Connected Power** such as wind power, bio-power, small hydro power and solar power
- **Off-Grid Power** such as biomass based heat and power projects, waste-to-energy projects, biomass gasifiers, watermills/micro hydro projects, small wind energy and hybrid systems, and solar PV rooftop systems
- **Decentralised systems** such as family-size biogas plants, solar street lighting systems, solar lanterns and solar home lighting systems, solar water heating systems, solar cookers, stand alone solar/ biomass based power generators and wind pumps

Few major initiatives or schemes propagated in this direction are:

Jawaharlal Nehru National Solar Mission (JNNSM)

This mission was launched in 2010 by the then Prime Minister of India. The objective of this mission is to deploy 20,000 MW of grid connected solar power by 2022. It aims at reducing the cost of solar power generation in the country through:

- Long-term policy initiatives
- Large-scale deployment goals
- Aggressive focus on research and development
- In-house production of critical raw materials, components and products, in order to achieve grid tariff parity by 2022.³⁰

National Biogas and Manure Management Programme (NBMMP)

The programme started in 1981-82 as a nationwide project on biogas development. The main objectives of this programme are:

- To provide fuel and organic manure to rural households through family type biogas plants
- To mitigate drudgery of rural women, reduce pressure on forests and accentuate social benefits
- To improve sanitation in villages by linking sanitary toilets with biogas plants
- To promote indigenously developed models of biogas plants

This project provides various financial incentives in the form of central subsidy to households that setup biogas plants, service charge to state nodal agencies and training support.

³⁰ Ministry of New and Renewable Energy. 2011. "Jawaharlal Nehru National Solar Mission Towards Building Solar India", Government of India http://www.mnre.gov.in/file-manager/UserFiles/mission_document_JNNSM.pdf, accessed on 14 March 2015.

Solar Lantern Programme

This programme is implemented through State Nodal Agencies (SNAs) and Akshaya Urja shops. The intent of this initiative is:

- To reduce kerosene consumption
- To improve the quality of life in rural areas by promoting environment friendly products
- To provide an alternative for small lighting requirements

Remote Village Lighting Programme

This programme was envisioned to provide financial support for electrification of:

- Remote un-electrified census villages
- Un-electrified hamlets of electrified census villages where grid-extension is either not feasible or not cost effective (not covered under the Rajiv Gandhi Grameen Vidyutikaran Yojana)
- The government provides electricity to such villages through renewable sources

Decentralised Distributed Generation (DDG) under Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY)

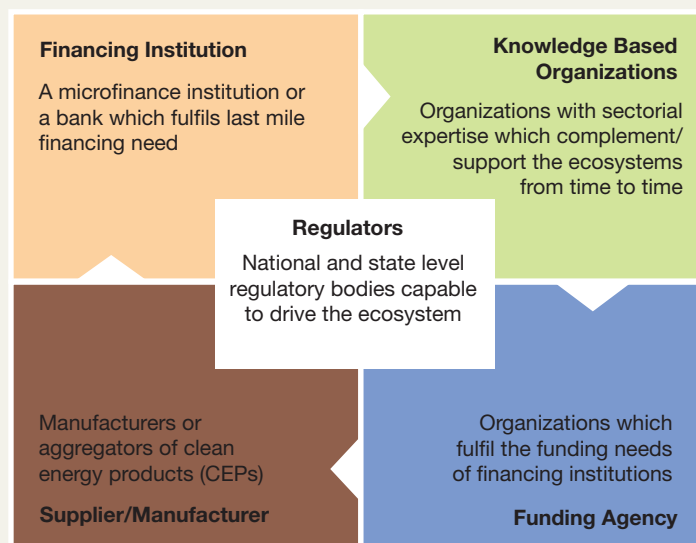
The Ministry of Power approved a capital subsidy of INR 5,400 million during the XI plan period. Decentralised distributed generation can be used for both conventional and renewable sources for villages where grid connectivity is either not feasible or not cost effective. About 90 per cent of the total project cost is provided to the executing agency as subsidy. The remaining 10 per cent has to be in the form of equity investment by the executing agencies to ensure incentive alignment.

Apart from the schemes highlighted above, the central government provides various fiscal incentives to promote renewable energy in India. Income tax holiday on profits from sale of power, concession on excise duty on manufacture of renewable energy systems/devices, concession on tariff for import of capital equipment, materials and components, and capital subsidy are few such incentive schemes. While the sector has significant potential, the role of the government is vital in promoting clean energy in India. To sum up, the policy emphasis and impetus to promote clean energy has been instrumental in advocating, pushing and financing renewable energy in India.

ECOSYSTEM AND LANDSCAPE ANALYSIS

Advancement in the clean energy finance sector involves participation of different stakeholders that include: financial institutions, regulators, clean energy product manufacturers, funding agencies and knowledge based organizations. Although each has their own role to play, a smooth cooperation between the different stakeholders is important to ensure development of the sector and provide a possible answer to the energy crisis.

Figure 2.1: Clean Energy Finance Ecosystems



In the current scenario, the clean energy ecosystem is in the process of stabilizing itself with the help of new and successful models. The greatest influencer in the ecosystem is the government – the concerned ministries and agencies. The current policies, though progressive, are heavily focused on subsidy-driven affordability and commercial bank driven accessibility. Subsidies are a key factor behind the scale-up and act as compensation against unavailability of electricity to the energy poor. However, with changing scenario, there is scope for a second look at the usage of subsidy, in order to shift from the concept of compensating the manufacturer to utilizing the money for research to develop cost effective and affordable solutions for the low income segment.

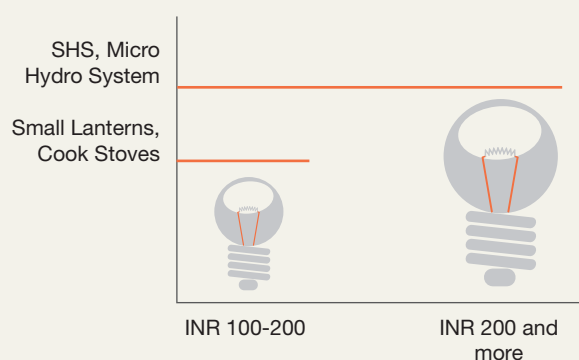
The suppliers and manufacturers are still exploring cost effective solutions and last mile distribution channels. The role of microfinance institutions and regional rural banks (RRBs) in such a scenario increases as they are among the most prominent

channels for the target segment. However, these last mile finance institutions still face challenges of logistics and distribution. Funding agencies are also influencers in terms of government policies as well as for ensuring smooth implementation of different models. They are a key source of finance for the microfinance institutions. Their role is significant for the success of the sector.

Clean Energy Finance Market and Models

Clean Energy Finance Market

Figure 2.2: Segmentation of Clean Energy Products



Clean energy finance is an untapped opportunity for microfinance institutions. It is estimated that there is a clean energy finance market opportunity of INR 4.02 billion that can be served by microfinance institutions.

Microfinance institutions cater largely to two segments of low-income population:

- Poor and those on the borderline with an income of INR 120-200 per day. Considering their income levels, this segment prefers small lanterns or cook stoves as they are affordable and able to meet most of their energy needs.
- Low-income segment having income of more than INR 200 per day. This group afford small housing systems. In the past few years, microfinance institutions have started to serve this segment through individual loan products.

Considering the needs and capacity to pay, the clean energy finance demand in these two segments is estimated at INR 1.33 billion for poor and people on the borderline and INR 2.67 billion for low-income segment.

The emerging microfinance sector's trends and regulatory environment in the country provide a greater scope for interaction between microfinance institutions and banks in bridging this energy gap. The Business Correspondent and small banks are two such promising developments that can bring paradigm shift in clean energy finance through the microfinance sector.

METHODOLOGY

The clean energy finance demand for the microfinance sector is calculated in the following manner:

- To calculate the potential market size in terms of the number of clients, we estimated the number of rural microfinance clients without electricity. As per State of Sector Report 2013, Microfinance India, there were 28 million microfinance customers in India.¹ Based on data available, of these around 70 per cent² live in rural areas. Thus, number of microfinance clients in rural areas is estimated to be 19 million. Then to calculate the number of household without electricity, the census 2011 data was extrapolated taking 45 per cent of the rural households without access to electricity. Extending it to rural microfinance clients, it is estimated that 8.9 million rural microfinance clients lack access to electricity. The potential market size came to 8.9 million.
- The estimated market size was segregated into two income brackets, viz., poor or people on the borderline and the low-income segment. Poor or people on the borderline were defined as population with income of less than or equal to INR 200 per day, whereas the low-income segment were people having income of more than INR 200 per day. As per available data of total microfinance clients,³ 75 per cent belong to the first bracket and the rest belong to people earning more than INR 200. This figure was multiplied with 8.9 million to segment the population without electricity in two income segments. The final numbers that resulted came to 6.7 million people belonging to the poor or borderline clientele and 2.2 million people belonging to the low-income segment.
- After segmentation, we identified the finance needs of the target segments. As poor (also people at the borderline) do not have the capacity to pay for high ticket size loans, they prefer small lanterns costing INR 1,500 to INR 2,000 whereas the low-income segment can pay and prefer small housing systems with a cost range of INR 12,000 to INR 15,000.⁴ Thus to calculate the demand, we used the following formula:
$$(\text{Segment Population}) \times (\text{Individual finance needs of segment}) \times (\text{Adoption rate})$$
- Based on this formula, the final estimated demand for energy finance, utilising 10 per cent as adoption rate is INR 1.33 billion for poor (also the borderline poor) and INR 2.67 billion for low-income segment. Thus, the demand for clean energy stands at INR 4.02 billion

Business Correspondents

Business Correspondents (BCs) are institutions that serve as bank's agents to provide banking services to last-mile customers. They are the key drivers of financial inclusion in India. These institutions offer banking products like savings account, Kisan Credit Card (KCC) and other credit products to rural clientele. In this arrangement, the BC institutions are responsible for customer awareness, acquisition and services, whereas the bank is responsible for credit assessment, hosting accounts on its core banking

- 1 Nair, Tara and Tankha, Ajay. 2014. *Microfinance India: State of the Sector Report 2013*. SAGE Publications, New Delhi, India. http://www.microfinanceindia.org/uploads/publication_link_files/sos-report-2013.pdf, accessed on 22 March 2015.
- 2 Acharya, Namrata. 2014. "MFIs shift focus to urban areas". *Business Standard* (27 August). Kolkata, India. http://www.business-standard.com/article/finance/mfis-shift-focus-to-urban-areas-114082700018_1.html, accessed 18 March 2015.
- 3 IFAD. 2013. Republic of India – National Microfinance Support Programme: Project Performance Assessment. IFAD and Independent Office of Evaluation. http://www.ifad.org/evaluation/public_html/eksyst/doc/prj/region/pi/india/microfinance.pdf, accessed on 18 March 2015.
- 4 IFC. 2012. *Lighting Asia: Solar Off-Grid Lighting*. International Finance Corporation. New Delhi, India. <http://www.ifc.org/wps/wcm/connect/311790804b5ca8d783fbc3bbd578891b/Lighting-Asia-offgrid-lighting-Report072512.pdf?MOD=AJPERES>, accessed on 22 March 2015.

solution and recording the loan or savings in its books. The BC, in turn, gets a fee or commission for these services.

The Reserve Bank of India has recently allowed microfinance institutions to act as BCs; many of them have opted for this model. The arrangement is a win-win solution for banks and microfinance institutions. Banks get institutional clients who require large funds to further on-lend to poor clients. This helps bank achieve its priority sector lending targets. On the other hand, microfinance institutions can offer high ticket size loans as well as savings products to its clients. This model holds potential for offering clean energy loans by banks, especially high-ticket loans for products such as small housing systems or micro-hydro pumps.

Figure 2.3: Clean Energy Finance Stakeholders



Small Finance Banks

In November 2014, the Reserve Bank of India's regulation on small finance and payment banks paved the way for microfinance institutions to register as small banks, offering services to last-mile customers. With the advent of this model, microfinance institutions will be able to offer a range of high-ticket size credit as well savings products. One of these products can be the clean energy loan, especially the high-ticket size loans.

Clean Energy Finance Models

A majority of the models in the ecosystem are driven by financial institutions such as banks and microfinance institutions as also by the suppliers of clean energy products who act as financiers. The list below depicts the different clean energy finance models existing in the ecosystem:

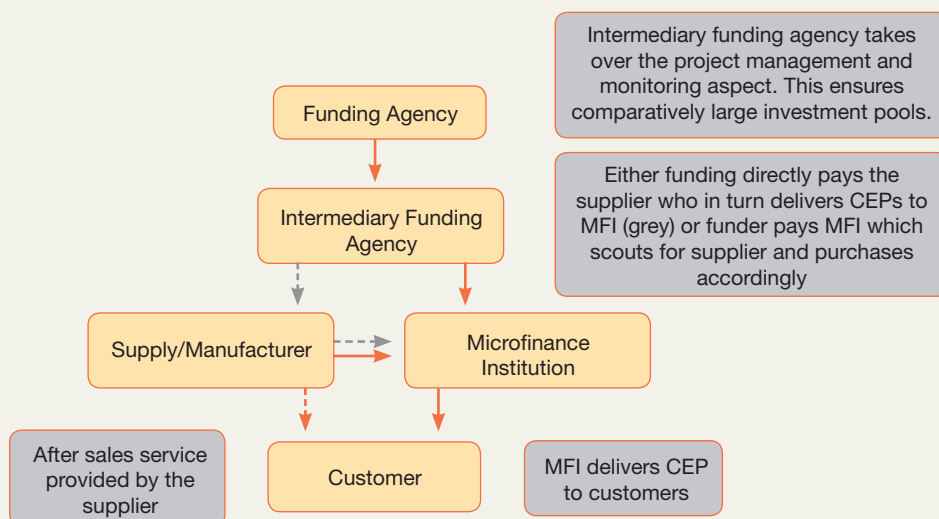
- **Microfinance Institution Intermediation Model** – Applicable when microfinance institution liaises with all stakeholders and is directly involved in either customer or trade finance.
- **Direct Bank Linkage Model** – Bank directly liaises with customers and suppliers with no involvement of any microfinance institution.
- **Financing Supplier Model** – An innovative model where a single entity takes care of finance, technical, distribution and after sales aspects. It provides a ‘single-window’ access to energy products accompanied by finance.
- **Supplier Intermediation Model** – Applicable when suppliers directly liaise with the government and sell their products in the market at post-subsidy price.
- **Government Intermediation Model** – Applicable for clean energy products with higher upfront investment and heavy reliance on subsidy.

Each of these models are dealt subsequently:

Microfinance Institution Intermediation Model – Customer Linked

Figure 2.4 Microfinance Institution Intermediation Model – Customer Linked

This is the most prevalent finance model that involves funding agency, supplier and microfinance institutions. The model is driven by a funding agency and implemented through a microfinance institution.



In the microfinance intermediation model, the funds for on-lending are provided by the funding agencies to an intermediary funding agency. The intermediary funding agency is responsible to identify suppliers and microfinance institutions, conduct due diligence, distribute and manage funds and ensure repayments from microfinance institutions. The microfinance institution is responsible for awareness, client acquisition, collection and post-sales services.

The supplier is identified either by the intermediary funding agency or the microfinance institution in consent with the intermediary funding agency. Supplier provides products to the microfinance institution that further on-lends fund to customers to purchase the product. Microfinance institution then collects the amount from clients and pays it back to the intermediary funding agency as loan repayment. The intermediary funding agency pays the supplier.

Financing	INR 400-25,000
Products	Solar individual lights, heating/cooking solutions, Solar Home Systems (SHS)
Prominent Players	Intermediary Funding Agency: FWWB, Maanaveeya, Arc Finance Suppliers: Thrive, Dlight, Envirofit

This model is generally adopted for individual small ticket size solar loans ranging from INR 400 to INR 25,000 for products including solar lanterns, home lighting systems and improved cook stove. The study found that a major portion of the total portfolio of the microfinance institutions implementing this model constitutes loans for small lanterns charging point.

FRIENDS OF WOMEN'S WORLD BANKING

Friends of Women's World Banking - India (FWWB-I), was promoted in 1982 by the SEWA Bank, as an affiliate of the Women's World Banking, a global network created to focus on the need for women's direct access to financial services. Till March 2010, FWWB-I had made a cumulative disbursement of around INR 11 billion benefitting 2.6 million women. FWWB has a special programme called 'Clean Energy'.

THE STORY

Solar Energy programme was initiated in December 2009 with the aim to provide access to energy efficient devices to poor households, through the partner microfinance institutions. To ensure that the clients receive customised products at cost effective pricing, FWWB assists partner microfinance institutions in product designing and pricing. In 2014, at the time of preparing the case study, clean energy loans accounted to approximately 20-25 per cent of the total portfolio of FWWB and its subsidiaries. As a funding source for these loans, FWWB raised debt funds from banks and grants from international donor organizations.

MODEL

FWWB operates through the following two models:

- **Tri-partite agreement between FWWB, Thrive (supplier) and the implementing microfinance institution:** In this model, the partner microfinance institution collects demand from its clients and forwards it to FWWB or Thrive. Based on the demand, Thrive dispatches the product consignment to the microfinance institution. Thrive raises payment invoice to FWWB that further records the amount in its books as a loan to partner microfinance institution. On the other hand, MFI distributes the products from its branches to the clients and records the sale as loan to the client. Client then repays the amount to the microfinance institution. In this model, the logistics till the microfinance institution's head office or warehouse is managed by Thrive. Further distribution from the head office/warehouse to other branches is the responsibility of the microfinance institution. Thrive generally delivers the product within one month of the date of order.
- **Direct loans to microfinance institutions:** In this model, the microfinance institution receives a direct loan from FWWB and is free to choose its supplier based on its requirements. FWWB conducts a due diligence of the supplier before approving the loan amount. Rest of the model remains the same wherein the supplier manages the logistics till the microfinance institution's head office

or warehouse and the microfinance institution manages further channelizing the product. The sale of the clean energy product is recorded as loan to client in the microfinance institution's book of account.

The risk management practice in this model is on the lines of traditional microfinance. Client credit assessment is based on cash flow and previous repayment history with the institutions. Microfinance institutions also align repayment schedule of clean energy loan with other loan so that client repays both the instalments on same day and the field staff also does not have to travel to the client location twice. This ensures regular follow up and efficient use of existing resources.

LEARNINGS

- **Awareness is the key to greater sales:** Since off-grid clean energy products are push product, it is critical that customer understands the features of the product and its suitability to address the client's energy needs. Thus, it is imperative that a considerable time is spent on awareness building. Below the line marketing methods and word of mouth are two effective marketing methods that microfinance institutions use for demand creation. Microfinance institutions in Manipur such as Chanura and WSDS are evident examples of this learning.
- **Efficient utilisation of existing resources is critical:** Success of the microfinance institution intermediation model depends upon how well the microfinance institution is able to channelize its existing resources for new product. Microfinance institutions have an existing distribution channel and last mile reach through field staff however it is critical that these resources are effectively utilised to push the products. Scientifically designed incentive systems, effective cross-sale from existing channel and logistics management are the key drivers of business.
- **Importance of after sales service:** After sales service is a critical component of the model. Considering the fact that microfinance institutions are not specialists in after sales and suppliers are not able to provide post-sales service channels to the last-mile customer, service agreements between microfinance institutions and suppliers such as replacement warranty and quick turnaround on faulted pieces are very critical for the success of the model. There is huge reputation risk for the microfinance institutions as clients may attribute poor product performance and post-sales services to the microfinance institution rather than the supplier.

ENVIROFIT

The company was established in 2008 as a subsidiary of Envirofit International. It is a social enterprise that aims to develop and distribute clean technology solutions across Asia. It specialises in design, development and production of improved biomass cook stoves. Envirofit India assists all its partners with supply chain management as well as support in marketing and distribution of improved cook stoves.

THE STORY

Envirofit, with its presence in eight Indian states, also caters to markets in Cambodia, Nepal and Sri Lanka. They call themselves a technology company with the intent to avoid 'blow pipes' from traditional cooking households. Envirofit initially distributed its products in India through the traditional distributor-retailer network. Higher operational costs led them to explore alternate channels such as microfinance institutions, NGOs and corporate CSR initiatives. Envirofit is Gold Standard^{*} accredited and all their products receive carbon credit benefits. Their products in India range from INR 1,600 to 2,000.

MODEL

Envirofit started operations in 2008 with primary focus towards creating customer awareness for biomass cook stoves. While the need for such products is apparent, it required considerable efforts by Envirofit to develop a market for its products. Average cost of biomass cook stoves available in India ranges from INR 1,600 to INR 2,000. The company initially used the traditional retail and distribution channels to market and sell cook stoves. There were limited results from this model as the operational costs associated with managing the distribution channel was higher than the margin per product. Over time, Envirofit's business model evolved and they started channelling products through MFIs, NGOs, SHGs as well as CSR initiatives. They currently continue to maintain their distributor-retailer channel and also source their products through other tie-ups highlighted above.

LEARNINGS

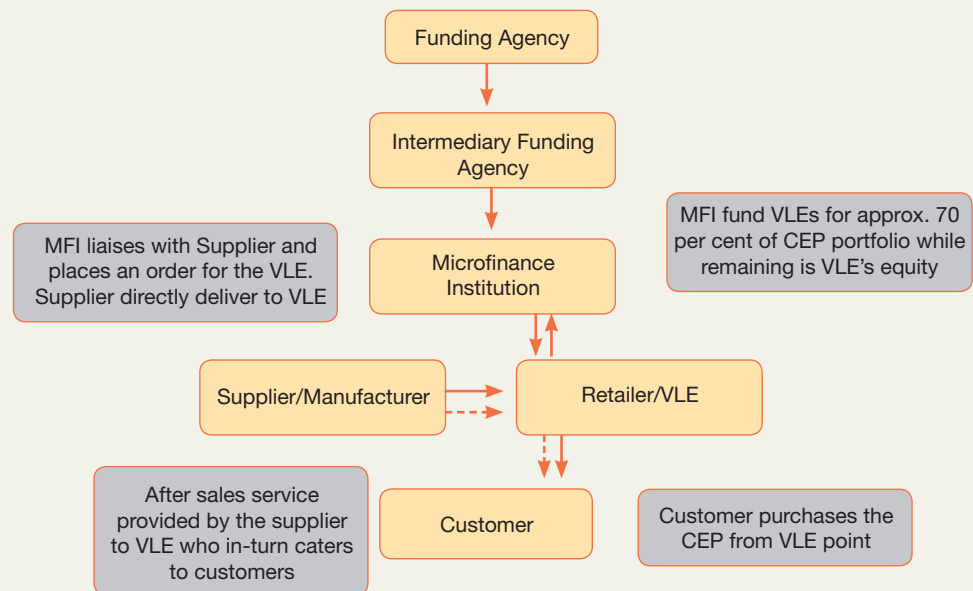
- **Inertia of customer behaviour and habit change in terms of product adoption is a challenge:** A large proportion of the clientele in India still uses old cooking solutions and have still not realised the harmful effects associated with traditional 'chulhas'. Since they do not realise the adverse impact of these chulhas on their health, they remain reluctant to adopt clean solutions. Unfortunately, this process of customer education and behaviour change will take its own time, but continued efforts are essential to ensure adoption and usage.
- **Biomass cook stoves still a 'push-product' in the Indian markets:** Envirofit has been around for more than five years, but it does not witness a pull for clean energy finance product such as improved stove. This is largely due to lack of customer education and awareness regarding biomass cook stoves and their benefits.
- **Biomass cook stoves work efficiently with wood logs of specific dimensions:** Customers are not able to realise the full potential of biomass cook stoves due to non-compliance with product specifications/requirements. Most of the cook stoves have unique and set requirements such as the size and quantity of logs of wood. Such requirements if not adhered to can consequently reduce the efficiency and benefits associated with the cookstove.
- **Innovative carbon credit finance models needed to financially support the sector:** The sector provides scope for carbon credit finance and linking the energy portfolio to carbon credit finance markets. This is an added revenue source for the company.

* Gold Standard is an internationally accepted certification for energy projects that contribute to real reduction of CO₂ emission, the local population is involved and participates in the project and foster know how on clean energy technologies in developing countries. See WWF Global. n.d. The Gold Standard. WWF-Global. http://wwf.panda.org/what_we_do/how_we_work/businesses/climate/offsetting/gold_standard, accessed on 18 March 2015.

Microfinance Institution Intermediation Model - Village-level Entrepreneur Linked

Figure 2.5: MFI Intermediation Model- Village-level Entrepreneur Linked

This model is an add-on to the financial intermediation model. In this model, the microfinance institution develops a distribution channel constituting entrepreneurs who are responsible for sales and services. Thus, microfinance institution provides bulk loan to an entrepreneur for purchase of stocks rather than smaller loans to a number of clients.



This model differs from the funding intermediation model at the customer interface stage. In this model, the intermediary funding agency provides funds to microfinance institution that further lends it to a village level entrepreneur (VLE) to purchase renewable energy products from a specified supplier. The model has dual objectives of serving client segment as well as developing a cadre of VLEs who focus solely on sales and services of clean energy products. The general practice is to provide trade credit to entrepreneurs equivalent to 70 per cent of the fund requirements while the balance is contributed by the VLE as his own equity. The microfinance institution is responsible to liaise with suppliers, place order on behalf of the village level entrepreneur and supply chain management. The village level entrepreneur is responsible for customer acquisition, collections, repayment to microfinance institution and post-sales services.

Financing	INR 25,000+
Products	Solar individual lights, heating/cooking solutions, Solar Home Systems (SHS)
Prominent Players	BASIX (Vayam Renewables), Saija

In this model, generally the loan size is more than INR 25,000. The learning is that the entrepreneurs prefer to deal with smaller products costing INR 400 to INR 1,500. Since, the VLEs place bulk order with the manufacturers, they also receive products at discounted rate. This increases the entrepreneur's margins that have the potential to make his enterprise viable.

VAYAM – BASIX

Basix incorporated Vayam in 2013; however as a MFI it has been active in this space from 2008-09. The key motivation behind setting up Vayam was derived from the need for a specialized service provider that can cater to the energy needs of the low-income segment that BASIX caters to.

THE STORY

The business model has evolved since the starting of operations in 2009. In the first model, Vayam received consulting and implementation fee for funding manufacturer’s products and linking to the market. Later, the model evolved to an arrangement of sharing of cost with the manufacturer, but share of profit based on sales. Subsequently, the model evolved to an arrangement of Vayam purchasing the product from the manufacturers and placing them on their books. The product is sold to the retailers/vendors with available credit facility. In this model, Vayam’s portfolio is expected to grow to INR 50-100 million by end of 2015. Vayam has entered

into an arrangement with Panasonic for solar products in the current model. This provides dual advantages of leveraging the brand name as well as the service centres.

MODEL

In the initial phase, the manufacturer was providing trade credit to the entrepreneurs who were identified and credit assessed by Basix. The model evolved to service agreement and Basix received consulting and implementation fee from manufacturers for market linkage services through Vayam.

Currently, the model is based on a tripartite agreement wherein Vayam purchases the clean energy products from manufacturers, records the purchase in its books and further sells it to identified retailer on trade credit. In this agreement, the retailer pays one-third of the total order cost and Vayam finances the rest. Basix, in this arrangement, provides funds to Vayam for further lending as trade credit. Thus, Basix gets



secured wholesale finance whereas the retail finance is managed by Vayam along with the logistics management and due diligence of the retailers.

In this model, the retailer has a critical role of client selection and sales. Thus, it is imperative to select the retailer with an established customer base, central shop location and expertise in clean energy solution sales. The right retailer can be termed as one who has established business location, vintage, business acumen and high credit worthiness.

LEARNINGS

- **Renewable energy finance is considered a risky business proposition by large financiers such as banks and investors:** As per Basix' experience, clean energy finance is still considered a risky business by investors, large finance houses as well as banks. Thus, organizations of the likes of Basix have had to spend considerable, time, efforts and resources to explore stable and cheap line of credit.
- **After sales service and warranty issues impact Non-Performing Assets:** It is imperative for the suppliers to

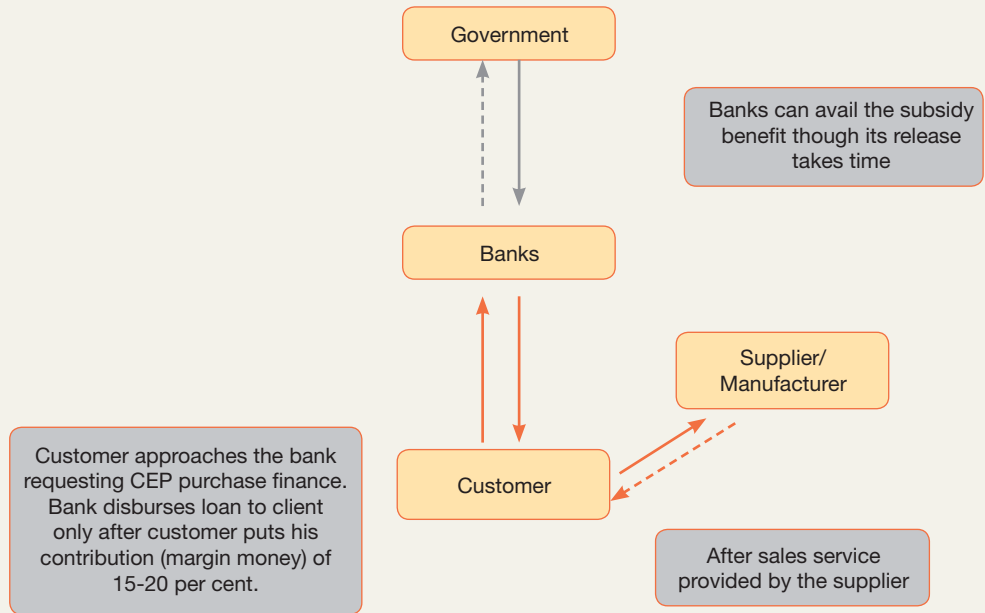
provide warranty on clean energy products especially on small products such as solar lanterns. Equally important is the post-sales services by the retailer. There is high probability of delayed or no repayment by the customer who is facing technical issues with the product and does not get any of the two stated services from the manufacturer.

- **Microfinance institutions need to develop capacities to sell push product:** Microfinance institutions offer income generation loan as their core product. The income-generating loan is in great demand as there is limited availability of these loans from formal financial sources, and the direct impact of this loan is increase in household income. This is, however, not the case in clean energy finance, as customers do not perceive any direct financial impacts from clean energy products. Thus, it is imperative to educate prospective clients about features and cost efficiency of clean energy products against traditional products and develop a demand for it. This is not the forte of microfinance institutions that are used to offering product in existing matured market.

Direct Bank Linkage Model

This is a government and bank driven model and is defined through high levels of subsidies for clean energy products. In this model, the customer approaches the bank for finance to purchase a clean energy product. The bank disburses subsidised loan to the client after due diligence and also links him/her to a specified clean energy product supplier. Banks can further claim this discounted loan from the government through NABARD.

Figure 2.6: Direct Bank Linkage Model



The Government of India, through NABARD, provides subsidy on clean energy product loans. The commercial banks act as per the mandate from NABARD to offer customised loan product. They are also responsible to identify and contract with a clean energy finance product supplier after due diligence. The bank offers loans to clients to purchase the products offered by the identified supplier. The loan is equal to the value of the product. However, the client puts upfront contribution (margin money) of 15-20 per cent of the loan size. Banks avail refinance of the total loan amount from NABARD. It generally takes few weeks to months for NABARD to disburse the subsidy amount to the bank. However, with their stable liquidity, banks can afford this delay. Once the subsidy is received, the bank reimburses the margin money to the client.

Financing	INR 25,000+
Products	Solar Home Systems (SHS), Micro-grid
Prominent Players	Syndicate Bank, Bank of India, Canara Bank, Gramin Bank of Aryavart, Anu Solar, TIDE, SELCO

In this model, the loan size is more than INR 25,000 for products like solar home system or micro-grids. Since the current policy framework only allows banks as eligible entities to raise subsidy component from NABARD, microfinance institutions and NBFCs cannot enter in this segment.

GRAMIN BANK OF ARYAVART - GBA

The regional rural bank was constituted on 1 April 2013 after amalgamation of Aryavart Kshetriya Gramin Bank and Shreyas Gramin Bank. It operates under the sponsorship of the Bank of India in 15 districts of the state of Uttar Pradesh with a network of 651 branches & 11 regional offices. GBA has financed 85,000+ SHSs across 15 districts in Uttar Pradesh.

THE STORY

Gramin Bank of Aryavrat finances clean energy products through its various branches and dealer network. The bank mostly finances small housing systems manufactured by companies approved by the Ministry of New and Renewable Energy. The price of these systems ranges from INR 15,000 to 20,000

The bank finances SHS under NABARD's "Capital subsidy-cum-Refinance Scheme". Under the scheme, the total cost of the product that the bank finances is INR 8,000 to 10,000, NABARD subsidises INR 5,000 and the remaining amount is borne by the customer. The bank provides loans at an interest rate of 5 per cent per annum.

There are three prime challenges in implementation of this model. First, being the selection of right customer as it directly impacts the repayment rate in the long run. Second, as the products are generally for consumption and not productive use, the tracking and recovery of these loans is a challenge for the bank staff. To counter this challenge, Gramin Bank of Aryavrat is leveraging the last-mile reach of its business correspondent agents. They are being entrusted with responsibility of loan recovery and delinquency management. They are accordingly remunerated for this service. Third, due to the smaller loan size and high NPA, the operational cost of clean energy finance in percentage terms is higher than the traditional finance products.

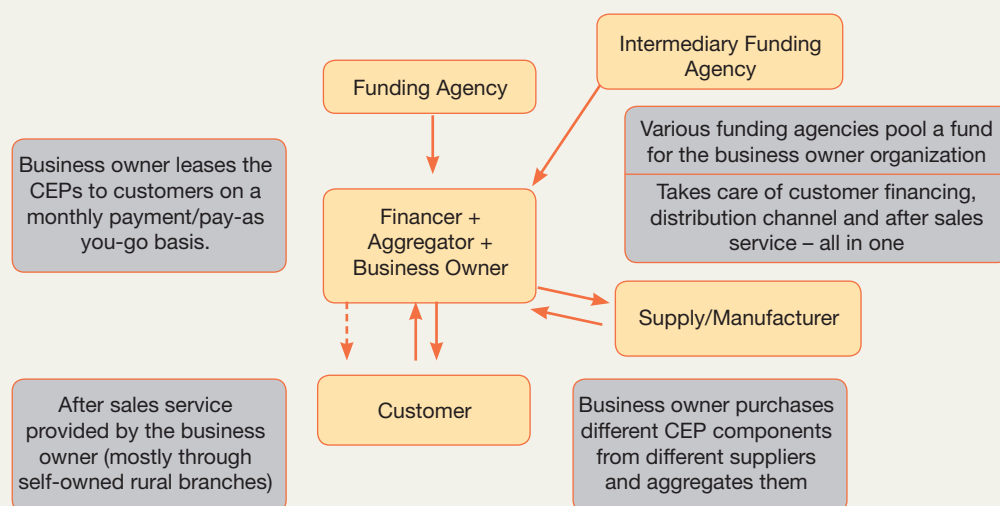
LEARNINGS

- **Operational cost for clean energy portfolio is comparatively higher given the small loan size:** Clean energy loans are of small ticket size (INR 8,000-10,000) as compared to traditional loans such as Kisan Credit Cards, MSME loans or agriculture loans. Thus, when compared on returns to the cost, the operational cost is higher for small ticket size loans. This is not a profitable business proposition for the bank.
- **Repayment collection is a challenge as portfolio management demands on-field monitoring and customer follow-ups (High NPA):** Since energy loans are for consumption with no direct income associated with the purchase, there is always a probability of repayment delays or wilful defaults. Also, the possibility of non-repayment rises if there are technical issues with the product.
- **Liaised with Micro Energy Credit for carbon credit:** The bank has partnered with Micro Energy Credit that is running a clean energy drive in India with the support of International Finance Corporation (IFC). It is supporting the bank to link its clean energy finance loan portfolio to carbon credit trading. This is an additional source of finance to the bank.

The core player under this model is the implementer or business owner. This organization/entrepreneur is the nodal point and takes care of customer acquisition, finance, distribution channel and after sales services. The implementer receives funds from different financing sources like banks, bilateral agencies and funding agencies.

Financing Supplier Model

Figure 2.7: Financing Supplier Model



In this model, the unique factor is amalgamation of different roles within one agency or organization. The implementer receives funds for on-lending, manufactures or aggregates clean energy products under its own brand name, as also establishes its distribution network of VLEs or rural branches for sales and service. The model also incorporates the unique feature of leasing to the customer on monthly rental or on pay-as-you-go basis.

Financing	INR 10,000-25,000
Products	Solar Home Systems (SHS)
Example	Simpa Networks

In this model, the loan size ranges from INR 10,000 to 25,000 and includes solar home systems. The model improves efficiency on account of less number of organization/stakeholders to liaise with.

SIMPA NETWORKS

Incorporated in India in mid-2011, Simpa Networks is a venture based technology company. It sells distributed energy solutions on a “progressive purchase basis” to underserved customers in emerging markets.

THE STORY

Simpa Networks is a financing, distribution and servicing company. It procures different parts of an SHS from various vendors and assembles them to create SHS systems with their own brand. They service 6,000+ clients through a network of nine regional branches followed by village level entrepreneurs (VLE) for last mile approach. Sales are channelled through the regional branches or the VLEs. For complaints, they have a centralised complaints resolution centre accessed through phones. In case they are not able to resolve queries over phone, they liaise with the respective regional branch. The after sales services function is managed in-house.

MODEL

The model has evolved since the inception of the company and is now stabilizing as a branch-based sales and service model. The uniqueness of this model is an integrated ecosystem managed by one organization unlike the prevalent tri-partite agreements between finance providers, last-mile outreach organization such as microfinance institution and manufacturers.

In this model, Simpa generates its funds from equity, debt and grant financing. A large part of this fund is utilized to procure/purchase different elements of a small housing system from 10-12 approved vendors. The internal technical team assembles the small housing system under the brand name of ‘Simpa’. The system is fitted with a prepaid meter that can be centrally locked or unlocked by Simpa technical team. The product price varies from INR 12,000 to 25,000.

These systems are then distributed to clients through VLEs associated mapped to each branch. The systems are leased to clients for a period of two years and this lease is recorded in Simpa’s books as operational lease. The client has to pay an initial upfront amount of INR 2,000. The remaining amount is paid on a progressive purchase model. Under this model, the customer purchases energy credit from well-established retail payment channel. This energy credit can be used to recharge/unlock system for a specific number of days based on the recharge amount. As soon as the customer has paid the entire cost of the product through these recharges, Simpa unlocks the system and any further usage is completely free for the client till the life of the system. The trained and skilled VLEs

provide last mile outreach as well as fast and efficient post-sales service.

Since the model is lease based, it inherently requires high liquidity for product manufacturing while the repayment is received over the period of two years. Thus, Simpa changed the payment mode from post-usage payment to prepaid credit. Now, the payment is received on a per day basis and is deducted from the prepaid credit. Simpa addresses the issues of lack of trust, finance and accessibility through this model.

On a closer look, the organizational model is quite similar to that of a microfinance institution. Like in a microfinance institution’s structure, Simpa branch model too includes head office that manages the branches that have different departments including credit, sales, channel management and technical team all reporting to a branch head or branch manager.

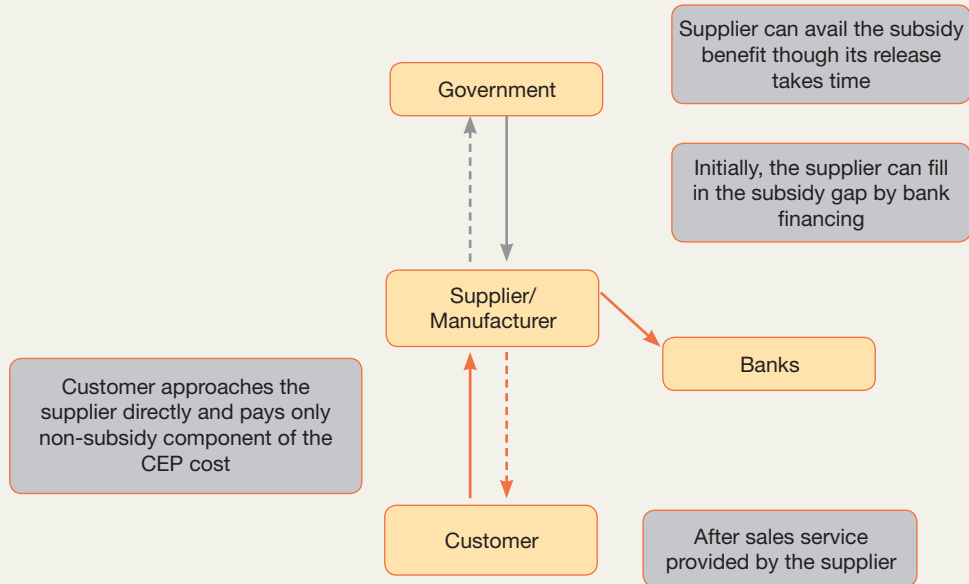
LEARNINGS

- **Microfinance institution’s still perceive energy loans as a risk due to lack of trust and experience:** Microfinance institutions still consider clean energy finance as a risk business because it is a consumption loan and they are traditionally not comfortable in pushing consumption loan due to its high non-repayment.
- **Client payment depends on product’s service and quality:** Clean energy finance is a challenging business due to limited client understanding of the products. If a client faces technical issues with the product, it directly impacts the loan repayment, as the client would not like to pay for a faulty product.
- **High liquidity requirements:** The financing supplier model requires high amount of cash liquidity and a stable as well as cheap credit line to finance the operational lease. Thus, any company venturing into this model needs to focus on this critical aspect for sustainability and growth.
- **Branch and last mile outreach model allows organization to leverage outreach for awareness and sales:** The model allows a last mile outreach for the organization and allows it to focus on awareness and sales. The advantage of an established network of VLEs ensures that prospective clients have easy access to information and product, while, on the other hand, the company has efficient repayment monitoring mechanism at the field level.

Supplier Intermediation Model

Figure 2.8: Supplier Intermediation Model

This model is driven by the supplier and is supported through government subsidies. In this model, the supplier/manufacturer approaches the government to avail direct subsidy, although in most cases the release of the subsidy amount takes time.



In the supplier intermediation model, the supplier offers its products to the end client on a discounted price. The supplier, in turn, applies for government subsidy to cover the discount.

Financing	INR 25,000+
Products	Solar Home Systems (SHS), Micro-Grid
Example	Prakruti Hydro

Since, in many instances, the government may take few days or weeks to disburse the subsidy amount, the supplier approaches the bank for bridge funding to meet the working capital needs. In this case, the bank provides the funds for the intermediate period after due diligence and by treating the government subsidy approval as a guarantee. As the model is supplier driven, it is preferred for larger solutions such as solar home systems, micro-grids and solar agriculture hydro pumps that cost more than INR 25,000.

PRAKRUTI HYDRO LABS

The company was established in 2006 as Prakruti Hydro Labs. It was later restructured and in 2012 bifurcated into two private limited companies called Prakruti Renewable Power Private Limited (PRPPL) and Prakruti Hydro Labs Private Limited (PHLPL). PRPPL operated at the off-grid energy space, while PHLPL concentrates on grid connected hydro (50-500kW).

THE STORY

PRPPL currently deals in 1-2kW pico-hydro systems. It is operating in Karnataka and plans to expand to Uttarakhand and other Himalayan regions. The company offers clients (mainly households) a composite package of design, delivery, implementation and after sales services integrated with financial services for household owned and operated pico-hydro systems. Till date, PRPPL has installed about 650 systems. The company sells its products through dealer network; however technical, engineering innovation, manufacturing and supply chain management are responsibilities of the company.

MODEL

Prakruti Hydro's business model is subsidy driven primarily because the subsidy is critical to open up the market especially for large off-grid hydro solutions. Thus, it offers the products at subsidized price to customers and claims the same from MNRE. Customers are offered bundled services – technology, installation, commissioning and after sales services as well as financing assistance.

The company manages its sales and service through dealer network. The dealers are responsible for the marketing, sales, delivery and after sales functions. The company is responsible for technical, engineering innovation, manufacturing and supply chain management.

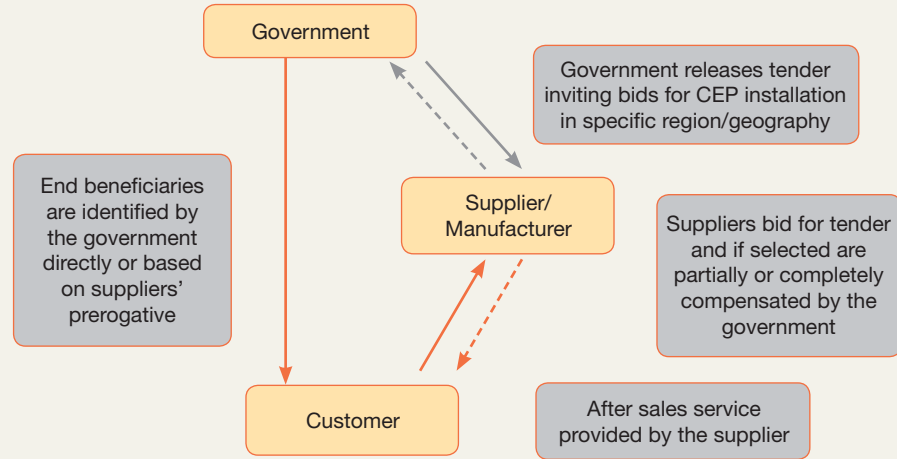
LEARNINGS

- Pico-hydropower systems are too technical and cumbersome to install. Thus, for this product FIs should concentrate their core strength of financing and supplier should focus on supply chain management, sales and marketing, installation and services.
- For pico-hydropower systems, there exists an opportunity for “downscaling” and creating sub-kW (< 1kW) products that are less costly and more mobile to enable energy access to landless labourers who can use it to meet basic energy needs, such as lighting. Product development and financial services integration for such products is an opportunity that needs to be worked on.
- Apart from the pico-hydro range, the 5-100kW range of micro-hydro systems also has significant market potential. The challenges for these systems include both the institutional/financial dimension and the load/use development dimension. This is a grey area that requires more research on market, financing needs, potential channel and product development.

Government Intermediation Model

Figure 2.9: Government Intermediation Model

This model is driven by the government to promote renewable energy products to the target segments. In this model, the government directly provides subsidy to the suppliers to sell their products at discounted price.



Under this model, the government issues tender notice inviting bids for clean energy product installations or distribution in a focus region/geography.

Suppliers bid for the tender and if selected are partially or completely compensated by the government. The supplier directly installs the clean energy products at the beneficiary's location. The end beneficiaries are identified by the government based on eligibility criteria as specified in particular schemes such as capital subsidy schemes.

Financing	INR 100,000+
Products	Micro-grid, Solar Hydro pumps (products with high upfront investment and subsidy)
Example	Claro Energy

This model is generally implemented for large high-cost solutions- such as micro-grids and hydro pumps that require an investment of more than INR 100,000. There is no involvement of financial institutions in this model and the model is questioned for its sustainability in terms of post-sales services and outreach.

CLARO ENERGY

Claro Energy provides off-grid solar power pumping solutions to power-deficit regions in India. Claro Energy established its operations in January 2011 with the motive to harness sun's power to pump ground water. They have engineered solutions to use electricity generated from solar energy to power both AC and DC pumps. The solution is sustainable, pollution free, has no operating costs and has a short payback period when compared to diesel.

THE STORY

In 2011, Claro introduced solar water pumps with an Intelligent Controller to allow smooth functioning of AC water pumps. They introduced Online Remote Monitoring by 2012 and Movable Systems with integrated parallel power output by 2013. Claro Energy currently has more than 600 installations across India. They started out from a pilot project in Nalanda with government support and are now present in 10 states. Claro currently operates on a tender-based model with direct support from the government.

MODEL

The average cost per off-grid solar power pumping solution is more than INR 100,000 and thus, it is hard to acquire independent clients for these products. In this scenario, Claro's revenue model is driven by tender-based business from the government and related agencies. The model is based on the government specified conditions or the end beneficiaries identified by the government.

In this model, Claro bids for government projects or funding to supply the product and if approved, sells its products to identified clients on subsidised prices. Claro later claims this subsidy from the government. Claro's biggest risk is the high cost per product and heavy reliance on government support. However, at the same time the subsidy component is the market opener for the stated product. This fact has reduced the overall market size of solar water pumping with heavy reliance on proportion allocated by the government in the form of subsidy.

LEARNINGS

- **Delays in subsidy claim processing and lack of bridge finance:** Claro Energy, like many other clean energy product suppliers, struggles for bridge finance to cover its working capital needs till the subsidy is reimbursed to the organization. Given the high per unit cost, the financing need is significantly higher than other clean energy solutions. This is a constant challenge for the organization and its sustainability.
- **Customer awareness and lack of trust on the Clean Energy Products:** Farmers are reluctant to adopt solutions like that of Claro due to lack of information and awareness. Thus, it is imperative that a structured awareness drive backed with accessibility is planned for a high-cost high-return clean energy product.
- **Government policies like free electricity adversely impact the water table and also limit the growth of clean energy products:** Few state governments provide free electricity to farmers that also results in propagating non-clean energy products thereby limiting adoption and usage of clean energy products.
- **High reliance on subsidy:** It is a general practice that by provision of subsidy government pushes the adoption of certain products that are beneficial for the customers. At the same time, it also restricts prospective customer's movement toward purchasing less subsidised products especially in case of high-cost clean energy.

INNOVATIVE MODEL: COMMUNITY-OWNED SOLAR SOLUTION MODEL

In the community-owned solar solution model, about 40-50 households from the community come together to form an informal energy collective. In case the households are already working together as a self-help group, then these groups come together to form the informal energy collective. This energy collective pools together the loans that each member/self-help groups is eligible for and uses this amount to buy a community-owned solar mini-grid. This mini-grid is located in the house of one of the collective's members, who is also responsible for its upkeep and maintenance. The system is collectively owned and each member pays a pre-determined amount as a monthly rental/energy charge. This rental charge/energy usage charge is collected and deposited by the responsible member of this collective to the microfinance institution/bank that has provided the finance.

The loan (either individual or to the self-help group) for the purpose is provided by the microfinance institution/bank already working with the community. The microfinance institution/bank also helps the collective identify suitable suppliers. However, the community takes the decision on the supplier. The supplier is responsible for the installation and post-sales services. This model is working in Bihar with Bihar Rural Livelihoods Promotion Society and the Women's Development Corporation sponsored Barabar Federation implementing with their groups. In the case of the Bihar Rural Livelihoods Promotion Society, the energy security credit that each member is eligible for is utilised for this purpose.

3 CHAPTER

INTERNATIONAL EXPERIENCES

Many microfinance institutions in developing countries especially in East Africa and South Asia successfully offer clean energy loans. The products financed include solar lanterns, improved cook-stoves, solar home lighting systems and micro-grid electricity connections.

Figure 3.1 International Models



SEEDS, Sri Lanka

One of the biggest microfinance institutions in Sri Lanka, SEEDS, has a dedicated team for clean energy finance. The organization provides loans for small housing systems, grid connection and village-level micro hydro plants. SEEDS provide loans through the dedicated team and well-laid risk management policies such as buy back option and provision to repossess the solar panels in case the client defaults. From 1998 to 2010, SEEDS has provided loans for more than 80,000 solar panels, 13 micro-hydro systems and micro-grid connection loans to more than 1,800 families.

FINCA, Uganda

FINCA in Uganda initiated a micro energy loan programme in 2008. Till 2010, it has financed 550 small housing systems. FINCA implemented the programme through a separate energy microfinance team that focuses on client awareness, acquisition and

client assessment. Learning from previous similar implementations, FINCA partnered with solar companies that can provide installation, education and post-sales services. After a successful pilot, FINCA has initiated the same loan in Tanzania in 2013.

Grameen Shakti, Bangladesh

Grameen Shakti initiated its operations in 1996 and till 2012, it has established 1,097 branches and distributed more than 1 million solar home systems, more than 16,000 biogas plants¹ and 324,000 improved cook stoves. The company covers 40,000 villages in Bangladesh. The key factors that worked for Grameen Shakti were affordable loans, right product positioning and capacity building of women as change agents. Apart from these key factors, other drivers of success were:

- Innovative financing to make technology cost-effective to traditional energy alternatives
- Post-sales technical services enabled by vast rural network of trained social engineer, in-house R&D specialist and cadre of grassroots local technicians
- Marketing based on awareness creation and education and communications showcasing positive impact of renewable energy technology in terms of economic, social and health benefits
- Robust internal risk management and control systems such as strong internal audit to maintain strict quality control

Banco Los Andes ProCredit, Bolivia

Banco Los Andes ProCredit is a bank in Bolivia that is part of a larger ProCredit group that includes 21 development finance oriented banks across Europe, Latin America and Africa. The Banco Los Andes ProCredit, follows a three-pillared structure of promoting resource efficiency, managing social and environmental risks and granting loans for green investment. This approach is more relevant for a developing economy like Bolivia where most of the equipment, machinery and technology used by small and medium enterprises are obsolete and, on the other hand, the energy efficient and green machines are costly. Banco initiated its green finance initiative from within the bank by enhancing an environment policy and developing an environment management committee. The bank developed a green energy loan, designed related processes and trained its staff accordingly. The bank also developed a list of green investments that can be financed under its policy. By the end of 2013, Banco had distributed 720 loans to small enterprises of which 90 per cent are energy efficient businesses.

1 Hackett, Michelle Therese. 2012. "The 'Everyday' Political Economy of Social Enterprise: Lessons from *Grameen Shakti* in Bangladesh". Unpublished Thesis. The University of Adelaide, South Africa. See chapter 6 of the thesis available at academia.edu, http://www.academia.edu/5782760/Chapter_6_Assessing_Grameen_Shaktis_success_in_delivering_energy_technologies_in_Bangladesh, accessed on 18 March 2015.

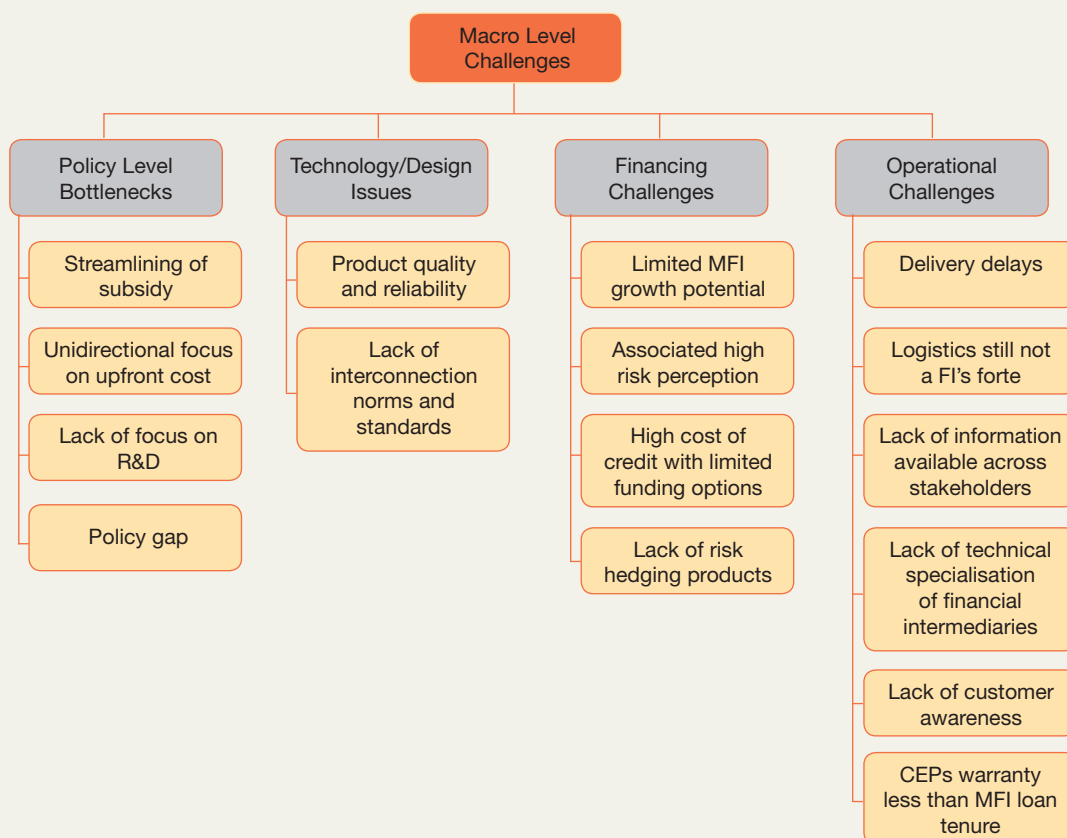
Learnings from the International Models

Following learnings from these models is relevant for any microfinance institution offering clean energy finance:

- **The risk protection mechanism should be in place:** There should be a well-designed credit appraisal process for clean energy finance, especially high-ticket loans. The scope of product insurance can be explored in partnership with suppliers and insurance companies.
- **Specialised functions:** The microfinance institution should focus its energy on core strength of client acquisition, loan distribution and repayment. The logistics, post-sales services and client education on product terms and condition should be the supplier's responsibility.
- **Incentivise the staff:** It is imperative to devise staff incentives for clean energy finance loans. If a microfinance institution is implementing the programme with separate department for clean energy finance, it will ensure better coordination between the non-energy finance and the energy finance teams.

4 CHAPTER CHALLENGES

Figure 4.1: Clean Energy Finance Sector – Challenges



There is tremendous scope and opportunity for clean energy finance in India, as is evidenced by the huge gap in the demand and supply of such products. Several intermediation models have merged, each having their own success factors and limitations. However, none have scaled up to a level that could present the hope of addressing this gigantic need. There are several challenges that affect the growth of the sector. This section details the challenges as emerged from the discussion we had with different stakeholders who participated in the study.

Policy Level Constraints

The sector has been able to attain its current level of success largely due to the policy-level push given by the government over the past decade. Many government schemes and policies have been instrumental in supporting and financing renewable energy products in rural/remote areas. Some of the key challenges that still remain at the policy level include:

- **Streamlining of Subsidy:** Under the government programmes, subsidy payment to banks and manufacturers generally gets delayed, leaving the banks/suppliers in need of bridge finance. A key reason behind this delay is the gap between resource allocated and demand received. In 2013-14, the Government of India allocated INR 3.50 billion¹ for off-grid solar projects, while on the other hand; it received claims to the tune of INR 10 billion from clean energy product manufacturers.

Though there is a surge in demand due to subsidy-based incentives; the delay in granting subsidies to the manufacturers (delay ranges from weeks to 6-7 months on case-to-case basis) has led to government reviewing the subsidy schemes particularly on aspects of payments.

The need of bridge finance arises because banks or suppliers need to pay off their debts on time, while payment would arrive at a later stage depending on the subsidy clearing process. Though banks are able to bridge this gap, it is a challenging scenario for a manufacturer/supplier.

- **Unidirectional Focus on Upfront Cost:** Currently, government subsidies focus on reducing CEP's upfront cost. The customers are liable to pay the remaining CEP cost post subsidy. Despite the subsidy, a number of potential low-income customers are not able to benefit from such schemes due to unidirectional focus on upfront cost. Innovative models for finance can be considered –by engaging private financial institutions –to impact a larger audience and enhance CEPs reach.
- **Lack of Focus on R&D:** Government subsidies are seldom focus on research and development for efficient and cost-effective products and/or delivery mechanisms. The ones that are available are also not adequately publicised resulting in minimal or no usage of such funds.
- **Policy Gap:** There is an evident gap between the two government policies – provision of grid electricity for all and focus on renewable energy solutions. While the former intends to electrify 100 per cent households in India by 2017,² the latter is focused on expanding the reach of renewable energy in India.³ This ends up confusing potential rural customers who shy away from adopting clean energy products with the hope that grid-electricity will reach their village at the earliest.

Technology and Design-level Issues

The renewable energy sector is evolving with cheaper and effective technologies available for wider implementation. The fast changing nature of the sector leaves it with certain uncertainties regarding the current clean energy products with customers struggling to ensure product quality. Few challenges observed in this regard include:

1 Thakkar, Mitul and Jai, Shreya. 2014. "Review of Subsidy Plan for Off-grid Solar Applications". The Economic Times (10 March). http://articles.economictimes.indiatimes.com/2014-03-10/news/48083718_1_subsidy-scheme-ministry-official-solar-lanterns, accessed on 22 March 2015.

2 Ministry of Power. 2013. *Smart Grid Vision and Roadmap for India*. Government of India, New Delhi. <http://indiasmartgrid.org/en/resource-center/Reports/Smart%20Grid%20Vision%20and%20Roadmap%20for%20India.pdf>, accessed on 3 May 2015

3 MNRE.n.d. "Schemes/Documents". Ministry of New and Renewable Energy, Government of India. <http://www.mnre.gov.in/solar-mission/jnsm/introduction-2>, accessed on 3 May 2015.

- **Product Quality and Reliability:** There is an absence of standards for clean energy products, especially the smaller systems targeted at the energy poor. There are three key standard systems in India. These include, (i) MNRE standards that are focused on performance assurance, (ii) IFC standards that are focused on quality and (iii) TERI standards that focus on both quality and performance. This makes the selection of clean energy products difficult for both the clients and the financial institutions. Various financial institutions highlighted how they struggled with product quality even after liaising with certified suppliers. Customers also tend to lose trust on the model if their first experience with clean energy products is not of utmost quality.

IMPORTANCE OF COMMON PRODUCT STANDARDS IN AN INDUSTRY

Product quality standard is one of the key drivers for sales. Consistent quality standards will ensure a positive impact on sales as consumers generally opt for quality certified product even for a premium price.

Consumer electronics is one such market. Consumer electronics products are certified as per norms of the Bureau of Indian Standards (BIS), which randomly tests the products for certification. Subsequently, the products receive ISI mark that signifies that the product is safe and non-hazardous. This is a differentiator, as customers know that the product is safe for use. Further, due to stiff competition and informed customer base, companies are compelled to focus on stringent quality standards to ensure consistent high-quality products, which act as a differentiator for better sales. Also, ISO product standards and BEE's energy labelling standards through its Star Labelling programme are active in India. The learning is that a common standard reduces confusion in the mind of the customer and compels manufacturers to produce quality products in order to sustain in the market.

Source: Bose, Nisha. n.d. "Star Labeling Program in India". Bharat Sanchar Nigam Ltd, Thiruvananthapuram. <http://www.sari-energy.org>, accessed on 3 May 2015.
ISO.n.d. "Energy Efficiency and Renewables". International Organization for Standardization. http://www.iso.org/iso/home/news_index/iso-in-action/energy.htm, accessed on 3 May 2015.

- **Lack of Norms and Standards for Connection of Renewable Energy Systems to Conventional Grid:** The arrival of the conventional grid often spells the end of the renewable energy micro-grid and its operator. Most renewable energy systems do not have the technical capability to merge with conventional grid or feed in the power generated when the area gets grid connectivity. Complementarity has higher probability of success in a long run with long-term return to customer's hard earned money.

Financing Challenges

Lack of customer awareness coupled with significant upfront investment have made clean energy products virtually inaccessible for low-income segments. Financing intermediaries and policy framework has successfully placed clean energy products on the map of energy contributors in India. However, few challenges such as risk

perception of clean energy finance and cost of credit still remain and need to be addressed for greater impact.

- **Limited Potential of Microfinance Institution:** The study clearly indicates the importance of microfinance institutions as last-mile intermediaries in the distribution and finance of renewable energy products. To ensure its continued contribution to the sector, an added impetus is essential. The microfinance institutions are largely offering small solutions/products ranging from INR 400 to INR 3,000 with some microfinance institutions also offering small housing systems worth INR 12,000 and above, as they have limited financial capabilities and they are not eligible for subsidies.

Microfinance institutions are more specialised in pull-products such as credit when compared to push-products such as solar loans. Their staff members are not adequately capacitated to sell push-products and this acts as a potential hindrance for microfinance institutions to play a key role in financing clean energy products.

- **Associated High-risk Perception among Stakeholders:** The large banks and investors still shy away from the sector as it is perceived risky and there is lack of clarity regarding government policies. It is always challenging for microfinance institutions to get investors/credit lines for building a clean energy product finance portfolio.
- **High Cost of Credit with Limited Funding Options:** Cost of credit from financial intermediaries is high and, as an industry norm, ranges between 10-14 per cent per annum. Thus, it makes better business sense for microfinance institutions to invest in traditional income generation credit businesses with higher expected returns than in a new, relatively unknown and low return sector of clean energy finance. Also, due to the high-risk perception, there are limited number of funding sources available. In order to push microfinance institutions to focus on energy finance, a cheaper line of credit can be provided to reduce capital cost and in turn enhance profits.
- **Lack of Risk Hedging Products:** Some of the banks that participated in the study highlighted lack of risk mitigating alternatives as a deterrent to the growth of clean energy finance. Special emphasis on creating risk mitigation funds or risk hedging options is vital to ease the sector's funding crunch.

Operational Challenges

The sector has done a commendable job by identifying and adopting various evolutionary ecosystems in order to propagate clean energy products. However, certain operational difficulties still need to be addressed in order to enhance the overall customer experience.

- **Delivery Delays:** Timely supply of products is a key challenge. Since many manufacturers do not have large dealer networks, logistics become a bottleneck when it comes to delivery of products to far-flung areas such as the north-eastern states. On the other hand, for a supplier it does not make a business

sense to set up distribution channel based on demand generated from one or two intermediaries.

- **Logistics Management is not the Forte of Financial Institutions:** The financial institutions do not specialise in stock management or inventory management skills essential for clean energy product distribution. Delivery of clean energy products from head office to branch is an added cost for the financial institutions and mandates them to develop resources essential for last mile delivery.
- **Lack of Information Available to Stakeholders:** With many stakeholders contributing to clean energy product delivery ecosystem, lack of information is a consistent challenge. The key issues as per the suppliers are insufficient information from financial institutions regarding the sales, repayment and after sales services. One of the key factors that give rise to transparency issues is poor MIS and data reporting systems in small microfinance institutions with whom these suppliers work.
- **Lack of Technical Specialization of Financial Intermediaries:** Distribution of clean energy solutions is inherently different as compared to the core business operations of microfinance institutions. With this precursor, when such financial intermediaries partner with clean energy product suppliers, they lack the basic technical specialization required to service rural clients. Even though FIs are trying to bridge the gap of post-sales services through their branch network, there is a need for greater technical know-how to cater to the customer queries at the earliest.
- **Lack of Customer Awareness:** The target segment is still unaware of the different clean energy solutions available and their associated benefits. This increases the efforts required in marketing and pushing the products on the field. Till date, in a majority of distribution models, the demand is latent especially for solutions like improved cook stoves or micro-hydro projects. However, there are outliers with explicit demand such as in north-eastern states where electricity is a big challenge for daily life or for Kerala and Tamil Nadu where improved cook stoves have been adopted to reduce fuel wood consumption for heating water.
- **Clean Energy Products Warranty less than Microfinance Institution's Loan Tenure:** Many microfinance institutions highlighted the fact that the warranty associated with clean energy products is sometimes lesser than the associated loan maturity. This increases the probability of loan defaults, as customers are willing to pay only as long as the clean energy product works efficiently. This increases the overall reputation and credit risk for the associated financial institution.

RECOMMENDATIONS

The study analyses the challenges and external environment to define a set of actionable and high-impact recommendations. The recommendations are detailed in two sections. The first section suggests an ideal ecosystem configuration considering the existing regulations, external environment, capabilities and skills of different stakeholders in the sector. The second section focuses on recommendations on way forward in terms of changes of long-term nature in the external environment of the sector.

Recommended Ecosystem with Current Capabilities and Skills of Different Stakeholders

Different financial institutions, suppliers and funding agencies are experimenting with their respective models in limited geographies. Though these experiments are successful, their replicability is questionable as they are still marred with several challenges both at the implementation and regulatory levels. Further, these stakeholders have complementary skills and capabilities, which if analysed in the light of existing regulatory environment, can be used to develop replicable clean energy finance ecosystem. The following table details out the strengths and weaknesses of different existing stakeholders of clean energy finance and identifies areas of convergence or complementary skills as opportunity.

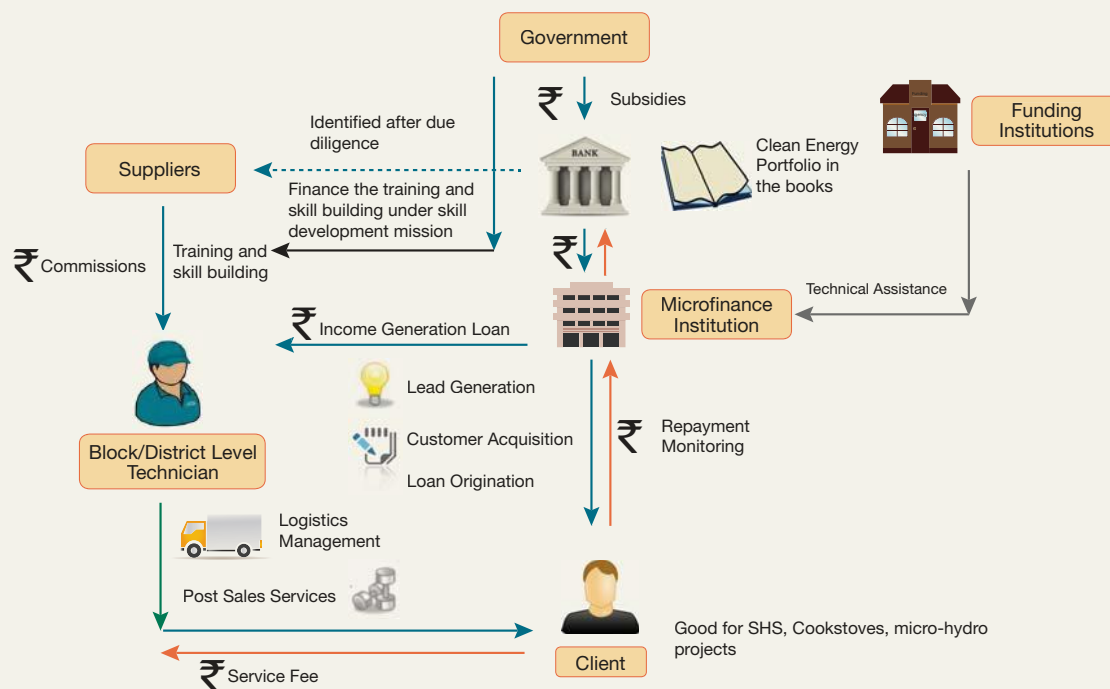
Table 5.1: Capability Analysis of Stakeholders

	Strengths	Weaknesses	Opportunities
Government	<ul style="list-style-type: none"> Policy regulation in place with respect to subsidies Existing mechanisms to implement national level missions, such as the skill building mission or the Prime Minister Jan Dhan Yojana Capacity to enforce labelling standards through ISI 	<ul style="list-style-type: none"> Process delays Lack of convergence between different government programmes Dimension of finance to enhance energy access in India is in operation without specific policy guidelines and goals 	<ul style="list-style-type: none"> Government explores options of convergence of: Jan Dhan Yojana and National Skill Building Mission Establish linkages with finance institutions to expand reach of the system Potential to allocate funds specifically earmarked for clean energy product financing
Banks	<ul style="list-style-type: none"> High liquidity Eligible for government subsidy Outreach and existing Business Correspondent network 	<ul style="list-style-type: none"> NPA due to poor last mile reach and monitoring Perception of subsidy loans provider and scope of loan waivers 	<ul style="list-style-type: none"> Explore MFI as Business Correspondent channel for clean energy loans to leverage MFI's capability to generate client leads and close repayment monitoring
Microfinance Institutions	<ul style="list-style-type: none"> Last mile reach Expertise in repayment, monitoring and collections of micro loans Existing captive market Existing trust and reputation with communities 	<ul style="list-style-type: none"> Cap on maximum amount for loan Non availability of low-cost funds No expertise in post-sales service or logistics management Institutional capacity (i.e., knowledge and employees) to manage an energy programme 	<ul style="list-style-type: none"> Partner with a bank under the Business Correspondent programme to provide high-ticket size clean energy loans Diversify risks as loans are recorded on bank's books Awareness creation Focus on dedicated microenterprise energy loan, home improvement energy loan, energy-linked savings account (in collaboration with banks) and energy retailer (micro-franchise) loan
Suppliers	<ul style="list-style-type: none"> Existing high quality suppliers 	<ul style="list-style-type: none"> No network for post-sales service Supply of reliable and quality products 	<ul style="list-style-type: none"> Support block level technicians as service and sales point to get last-mile reach with low cost channels
Block/ District Level Technician	<ul style="list-style-type: none"> Capability to serve, monitor and strengthen client relationships 	<ul style="list-style-type: none"> Lack of training Lack of sales skills and marketing Lack of institutional accountability with regard to technical service delivery 	<ul style="list-style-type: none"> Last mile service Awareness creation

There are two broad models that emerge based on the analysis of the strengths and weaknesses of the existing stakeholders. These are explained in detail in the next section.

Model 1: Microfinance Institutions as Business Correspondents to Offer Clean Energy Finance

Figure 5.1 Microfinance Institutions as Business Correspondent Model



In this model, four proposed sub-systems will be implemented that will work in coordination to build the ecosystem. These are:

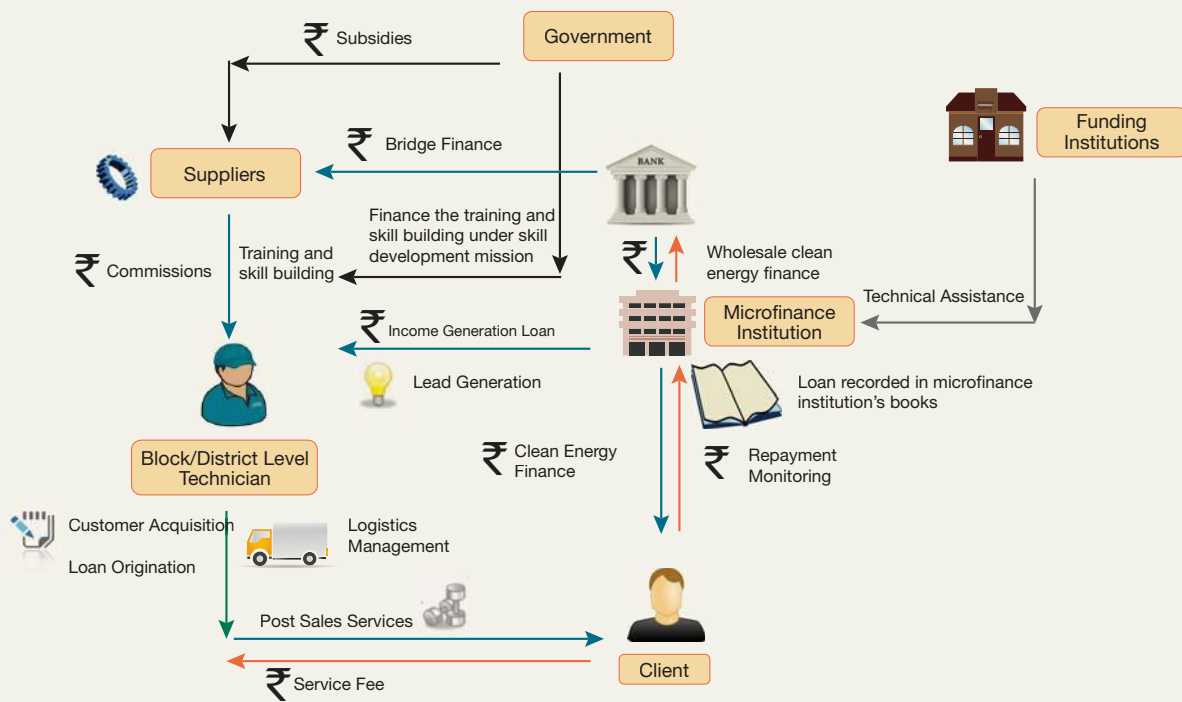
- Government–Banks
- Bank–Microfinance Institutions–Client
- Government–Suppliers–Block Level Technicians–Client
- Funding Agencies–Microfinance Institutions

Table 5.2: Model Analyses of Microfinance Institutions as Business Correspondent Model

Ecosystem–Sub-systems	How it Addresses the Challenges
<p>Government–Banks</p> <p>As per the existing structure, the government will provide capital subsidy to banks to further lend it to end client to purchase clean energy solutions. Banks in line with current system, will identify product needs of the regions in which the bank is serving and accordingly suppliers after due diligence</p>	<p>No proposed change in existing structures and regulatory environment</p>
<p>Banks–Microfinance Institutions</p> <p>Banks on-board microfinance institutions as business correspondents. The microfinance institutions can then offer bank’s clean energy finance products to its clients and the portfolio is recorded on banks’ books. The microfinance institution’s role would be that of awareness generation, lead generation and client acquisition. The banks will be responsible for loan origination and hosting credit on its core banking solution and books. The microfinance institution is then responsible for monitoring repayments. In turn, the microfinance institution will earn fee on each successful acquisition as well get a certain percentage as commission for recovery of bad loans.</p>	<p>Leveraging business correspondent model as solution to:</p> <ul style="list-style-type: none"> • Bank’s limited last mile outreach • Bank’s high NPA in clean energy finance • Microfinance institutions limited capability to service high-ticket size clean energy loans • High cost of funds for microfinance for clean energy finance • Microfinance institution’s non-eligibility to avail subsidised loan from the government
<p>Government–Suppliers–Block Level Technicians</p> <p>The supplier is responsible for providing the solution to the client through efficient logistic management. Thus, the supplier will induct Block Level Technicians (BLT) who are responsible for logistics management, inventory management, supply to end customer and most importantly post-sales services. Each of these BLT will work in coordination with banks and microfinance institutions that provides him/her the sales leads. The BLT will generate income through sales commission from suppliers as well as service fee income from clients for post-sales service. The government can support supplier in training and skill building of the BLT under its skill building programmes or grants.</p>	<ul style="list-style-type: none"> • Supplier able to provide efficient logistics management and post-sales services through low-cost channels • Business case for BLT through sales as well as service fee revenues • Convergence of government programme on skill building with renewable energy mission
<p>Funding Agencies–Banks/Microfinance Institutions</p> <p>Funding agency’s role is critical to providing technical assistance to the microfinance institutions and banks for product development, channel innovation and process improvements.</p>	<p>No change in the existing structure, Role enhancement to technical service providers to ensure skill and capability enhancement</p>

Model 2: Supplier-Bank-Microfinance Institution Model

Figure 5.2: Wholesale Finance Model



In this model, four proposed sub-systems will be implemented that will work in coordination to build the ecosystem. These are:

- Banks–Microfinance Institutions–Clients
- Government–Suppliers–Block Level Technicians–Clients
- Banks–Suppliers
- Funding Agencies–Microfinance Institutions

Table 5.3: Model Analysis of Wholesale Finance Model

Ecosystem	How it addresses challenges
<p>Government–Suppliers</p> <p>As per the existing structure, the government will provide subsidy to the approved suppliers to offer clean energy solutions to the clients on discounted prices.</p>	<ul style="list-style-type: none"> • No proposed change in the existing structures and regulatory environment • Leverage subsidy for market opening and uptake
<p>Banks–Suppliers</p> <p>Banks will provide bridge fund as working capital finance to these suppliers under its MSME finance portfolio.</p>	<ul style="list-style-type: none"> • Scarcity of bridge funds to sustain operations till subsidies are repaid by the government
<p>Suppliers–Microfinance Institutions</p> <p>Supplier partners with microfinance institutions that will offer clean energy finance products to its clients and the portfolio will be recorded on the microfinance institution’s books. The microfinance institution’s role would be that of awareness generation, lead generation, client acquisition, loan origination and repayment monitoring.</p> <p>The banks are responsible for providing wholesale clean energy finance to microfinance institutions for clean energy solution. Microfinance institution is then responsible for ensuring repayments.</p>	<ul style="list-style-type: none"> • Microfinance institution provides available customer base to the supplier • Microfinance institution enables poor to afford high-cost albeit subsidized clean energy solutions • High cost of funds for microfinance for clean energy finance • Microfinance institution’s non-eligibility to avail subsidized loan from the government
<p>Suppliers–Clients</p> <p>The supplier is responsible for providing the solution to the client through efficient logistics management. Thus, the supplier will induct block level technicians who are responsible for logistics management, inventory management, supply to end customer and most importantly post-sales services. Each of these BLT works in coordination with banks and microfinance institutions that provides the technician the lead for sales of clean energy solutions. The BLT generates income through sales commission from suppliers as well service fee income from clients for post-sales services. The government can support supplier in training and skill building of the BLT under its skill building programmes or grants.</p>	<ul style="list-style-type: none"> • Suppliers will be able to provide efficient logistics management and post-sales services through low-cost channel • Business case for BLT through sales as well as service fee revenues • Convergence of government programme on skill building with renewable energy mission
<p>The funding agency role is critical to provide technical assistance to the microfinance institutions and banks for product development, channel innovation and process improvements.</p>	<ul style="list-style-type: none"> • No change in existing structure, gained role of technical service provider to ensure skill and capability enhancement

Recommendations for Long-term Changes in the Sector

Policy-level Recommendations

The clean energy finance sector especially off-grid, decentralised products is largely influenced by two stakeholders, viz., the government, through its policies and programmes, and funding agencies, through their mandate, focus areas and intervention methods. Thus, the three key implementing stakeholders namely microfinance institutions, banks and the manufacturers are dependent on these two influencers to define the macro-level trends of the sector.

Table 5.4: Recommendations

Influencers	Government Policies	Funding Agency	Expected Impact
Key Players			
Microfinance Institution	<ul style="list-style-type: none"> MFI should be eligible to receive government subsidy for clean energy finance 	<ul style="list-style-type: none"> Explore options to provide funds at competitive rates to MFI to enhance the business case for clean energy finance 	<ul style="list-style-type: none"> MFI will have incentives, push factor and risk mitigation in place with subsidies A better business case for MFI to push for clean energy loan due to low cost of funds and high profitability
Banks	<ul style="list-style-type: none"> Explore existing channels such as PMJDY for outreach and push Streamline process for subsidy disbursement Allow portfolio risk hedging 		<ul style="list-style-type: none"> Convergence to clean energy loans as an important part of financial inclusion in the existing scheme High push, efficiency and coverage Incentive for banks and suppliers to opt for subsidy model Banks get risk cover on energy portfolio
Suppliers / Manufacturers	<ul style="list-style-type: none"> There should be consistent quality standards between different agencies 		<ul style="list-style-type: none"> Consistent quality standards will ensure equal pricing, quality products

There is a need for government agencies to recognise microfinance institution's strength to ensure last mile outreach, quality portfolio and post-sales services. It is imperative that they also get equitable treatment as commercial banks and RRBs when it comes to off-grid clean energy finance.

With the emergence of financial inclusion as a high-priority mission for the government, as well as simultaneous growth of the microfinance sector, it is critical to review and update the policies around funds and subsidies for clean energy finance. These two factors are critical incentives for microfinance institutions to enter, sustain and grow energy finance portfolio. Following are the key policy-level recommendations:

For the Government

- Presently, only banks are eligible for government subsidy for energy finance. Microfinance institutions should also be brought within the ambit of government subsidy considering their outreach and role in financial inclusion. It will positively impact government's mission on renewable energy.
- The scope for convergence between renewable energy mission and Prime Minister's Jan Dhan Yojna should be explored. Both these programmes focus on the same segments, i.e., of un-banked and the low-income segments.
- The processes for subsidy disbursement to financial institution should be streamlined to ensure shorter turnaround time. The delay in disbursement of subsidies is one of the main reasons for banks and suppliers staying away from small off-grid solutions.
- Government, in consultation with knowledge based organizations, funding agencies and suppliers, should prescribe uniform standards for quality assurance for small clean energy solutions.
- Government should allow banks to participate in commodity exchanges and derivative markets to hedge their energy portfolio risk. There are not enough products for banks to hedge their portfolio in the commodity exchanges.
- Government should provide greater clarity on differences in the mandate of two complementary missions targeted on traditional and renewable energy. Also, it is imperative that these two missions should lead to convergence rather than contradictions.
- Bringing renewable energy finance within the ambit of CSR activity as per the Companies Act 2013 is a positive step, however, there is a need to create awareness regarding this clause and provide incentives to the corporates to fund such projects. An efficient channel can be government institutions like NABARD and SIDBI who can incentivize the corporates through re-financing, investment and advisory.

For Funding Agencies

Cost of credit for microfinance institutions is comparatively high due to shortage of financial resources in India. MFIs tend to focus on products that provide more returns due to the limited capital at their disposal. In order to push these institutions to focus on energy finance, a cheaper source of fund can be considered to reduce capital cost and in turn enhance microfinance institution's profitability. Development financial

institutions like NABARD and SIDBI can bring energy efficiency finance under their existing schemes and may design a fund that could bridge the funding gap for MFIs.

Implementation-level Recommendations

When it comes to implementation, the models are stable and working efficiently. The major issues in these models are regarding logistics, coordination between suppliers and financial institutions, and research and dissemination. In this context, following are the implementation level recommendations:

For Microfinance Institutions and Banks

Logistics is a challenge for suppliers as well as the microfinance institutions. As the model of microfinance institutions as a distribution channel is still in a nascent phase, the suppliers will wait till the time there are bulk orders from a region that justify setting up of a regional distribution point. Thus, it is for microfinance institutions in a region to focus on collaborating with few suppliers to provide them a consolidated larger market to justify a regional hub rather than tying up with multiple suppliers.

It is imperative for microfinance institutions, suppliers as well funding agencies to conduct a social cost benefit analysis of clean energy investment and share it with a larger audience.

Microfinance institutions and banks should explore different innovative leasing models for high-value renewable energy solutions especially hydro and biomass solutions. This is critical to consolidate and grow these markets.

For Suppliers

Suppliers should explore developing integrated supply chain solutions that includes inventory management and logistics for microfinance institutions. Thus, the microfinance institutions can then just focus only on sales and service aspects.

ANNEXURES

Annexure 1: Questionnaires

Questions for the Financial Institutions (Banks and Microfinance Institutions)

S.No.	Core	Probe-1 st level	Probe-2 nd Level
1	Brief about your organization	Brief history	<ul style="list-style-type: none"> Timelines Nature of the organization and how it has evolved over the years Types of products and services
		When did your organization venture in clean energy solutions? What led to it?	In which year and why did the shift towards clean energy solutions occur?
2	What are your initiatives so far in this space?	List all the major initiatives in financing clean energy solution	Briefly describe each of them; model, process, achievements
3	What were the key motivations behind introducing solutions to finance access to clean energy products (CEP)?	Business potential?	Is access to wholesale finance a motivator? In which case, what were the sources of funds?
		Strategic choice for the FI?	In which case, why did you think of clean energy solution financing critical especially for the target market?
		To ensure greater customer connect/stickiness?	Are you facing client attrition with clean energy product finance?
		Any others?	
4	Arrangements with clean energy product supplier/servicer (model employed)	Who were the clean energy product suppliers/servicers? Who were the other stakeholders associated with the roll-out?	<ul style="list-style-type: none"> What were the responsibilities of each of these stakeholders? Was there any service level agreement between the stakeholders?
		How did you identify a suitable clean energy product supplier/servicer for the partnership?	How did you identify/shortlist the vendor/Energy Service Companies (ESCO)
		What are the arrangements for “after sales service”?	<ul style="list-style-type: none"> Was your staff member trained in attending to maintenance queries? Did the clean energy product supplier/servicer have a dedicated presence in the area to attend to service requests?

S.No.	Core	Probe-1 st level	Probe-2 nd Level
5	Experience with clean energy product supplier/ servicer and other stakeholders	Some of the challenges	Learnings
		Some high-points of the relationship	Learnings
6	What constraints did you face internally in rolling out finance for clean energy products?	Did the challenge pertain to product design, risk, marketing or something else?	What was your response to these challenges and risks?
7	Was the demand for clean energy product obvious or latent?	If it was the latter, what were some of the awareness building measures that you undertook to increase customer awareness?	Besides customer awareness what were some of the other steps you took to increase uptake? Hint: marketing, incentives to staff etc.
		If the demand was obvious, what were the needs?	Probe on the end usages – lighting, cooking and heating
8	What are some of the finance models that you have employed globally and in India?	Who are the stakeholders associated in each of these models?	What role does each one of them play in the overall implementation of the project?
		Is there a significant difference between models in India and abroad?	If yes, what causes these differences?
9	What is your view, where is this sector heading to in next 3-5 years	What will be your strategy to address these challenges? What support would you require for scaling up the initiatives in 3 years horizon?	

Questions for Funding Agencies

S.No.	Core	Probe-1 st level	Probe-2 nd Level
1	Brief about your organization	Brief history	<ul style="list-style-type: none"> • Timelines • Nature of the organization and how it has evolved over the years
		<p>When did your organization venture in clean energy solutions? What led to it?</p>	<ul style="list-style-type: none"> • In which year and why did the shift towards clean energy solutions occur? • What per cent of your portfolio constitutes clean energy finance?
2	What are your initiatives so far in this space?	List all the major initiatives in financing clean energy solution	Briefly describe each of them: model, process, achievements, partners, region/geography
3	<p>What was the key motivation behind adopting energy access as one of your mandate?</p>	<p>What specific dimension of energy access have you chosen to concentrate upon?</p>	<ul style="list-style-type: none"> • Finance, why? • Policy, why? • Technology, why?
		<p>What is the level of intervention you have chosen?</p>	<ul style="list-style-type: none"> • Macro or the policy level – dealing with the Government and other state agencies to influence policy (like reducing fossil-fuel subsidy)? • Meso-level – with institutions that enable access to clean energy product • Micro-level – with institutions involved in ensuring last-mile access to clean energy product (both FIs and suppliers)
5	How do you select partners/ implementing agencies?	Do you focus on geographies?	How do you approach the process of partner selection?
		Do you focus on segments?	
		Do you focus on specific issues/themes?	
6	<p>What are some of the financing models that you have employed globally and in India?</p>	<p>Who are the stakeholders associated in each of these models?</p>	<p>What role does each one of them play in the overall implementation of the project?</p>
		<p>Is there a significant difference between models in India and abroad?</p>	<p>If yes, what causes these differences?</p>
7	How do you ensure that your partners achieve success?	What support do you offer to your partners?	Provide examples of resources deployed for supporting your partners.

S.No.	Core	Probe-1 st level	Probe-2 nd Level
8	What has been your experience so far?	What have been the challenges?	Learnings; probe on any reports or public information regarding these learnings
		What have been the high points?	Learnings; probe on any reports or public information regarding these learnings
9	What are some of the innovative models that can increase the uptake of clean energy products?	Talk us through some of the innovative models that you have come across in your work?	
10	Where do you foresee this sector heading in the next few years?	<ul style="list-style-type: none"> Major policy interventions expected Expected percentage that financing clean energy access solutions will constitute in your portfolio? 	

Questions for Suppliers

S.No.	Core	Probe-1 st level	Probe-2 nd Level
1	Brief about your organization	Brief history	<ul style="list-style-type: none"> Timelines Nature of the organization and how it has evolved over the years Types of products and services; geographies served; target customers
		What is your sales and service model to reach out to the customer segment	Model including process, partners and roles
2	What are the key barriers from customer perspective that prevent adoption of clean energy products over kerosene and other inefficient fuels?	Issues around lack of demand, lack of awareness, lack of technology options, lack of cash-on-hand etc.	<ul style="list-style-type: none"> How critical is the role of finance or in other words do you expect disproportionate rise in uptake of clean energy products if adequate finance was provided to the energy poor? What incentives do you feel can ramp up the uptake of clean energy products among the target segment?

S.No.	Core	Probe-1 st level	Probe-2 nd Level
2	What are some of the internal (institutional) challenges you face in selling clean energy products in the target customer segment?	Cost of outreach, lack of appropriate technology, lack of human resource?	
3	How do you ensure that customers have access to proper after-sales service?	What are the institutional models you have put in place to ensure this?	<ul style="list-style-type: none"> • What have the challenges and learnings been with respect to providers' post-sales support? • Do you feel FIs are capable to extend the after-sales support or clean energy products suppliers/services should take it up? • What are the variables that determine such a choice?
4	What are some of the innovative models across the globe that have achieved rapid scale with respect to adoption of clean energy products among the target segment?	Talk us through some of the innovative models that you have come across in your work?	
5	How has your experience been of tie-up with FIs?	What were some of the challenges?	Learnings
		What were the high-points?	Learnings
6	In your view, where is this sector heading to in next 3-5 years?	What will be your strategy to address these challenges? What support would you require for scaling up the initiatives in 3 years horizon?	

Questions for the Government and Other State Agencies

S.No.	Core	Probe-1 st level	Probe-2 nd Level
1	What has been the intervention strategy with respect to the issue of “Access to clean energy” for the energy poor?	Various schemes on promotion of clean energy product technology, clean energy product finance	<ul style="list-style-type: none"> Why this focus? What were the “policy-levers” used to bring about the intended change?
2	With respect to the stated intervention strategy and schemes, what are the goals of your agency?	Depending on agency’s mandate, probe around the volume of subsidy, no. of beneficiaries etc. Institutional framework in which these interventions/ schemes are introduced	Discuss the areas where the performance has been as planned and those where there has been a shortfall. Focus on agencies involved, partner identification, roles and responsibilities
3	Which of these schemes have worked well?	List the instances and reasons for success	Learnings
4	Which of these schemes have not yielded the desired results?	List the instances and reasons for failure	Learnings
5	What could be some of the policy measures that can increase the uptake of clean energy products among the energy poor?	Probe around incentives for end-customer, manufacturers of clean energy products, FIs, etc.	

Annexure 2: List of Respondents

Table A.1: List of Banks

S.No.	Organization	Location
1	Syndicate Bank	Bangalore
2	Canara Bank	Bangalore
3	Pragati Krishna Grameen Bank	Bellari
4	Karnataka Vikas Grameen Bank	Dharwad
5	Manipal Rural Bank	Imphal
6	Narmada Jhabua Gramin Bank	Indore
7	Ayrvart Grameen Bank	Lucknow
8	Indian Bank	Madurai
9	Kaveri Grameen Bank	Mysore
10	Axis Bank	Mumbai

Table A.2: List of Microfinance Institutions

S.No.	Organization	Location
1	SEWA Bank	Ahmedabad
2	Grameen Koota	Bangalore
3	Ujjivan	Bangalore
4	Sanghamitra Rural Financial Services	Bangalore
5	BASIX	Hyderabad
6	SKS	Hyderabad
7	Spandana	Hyderabad
8	Chanura	Imphal
9	WSDS	Imphal
10	Bandhan	Kolkata
11	ESAF	Mannuthy, Kerala
12	Mimoza Finance	New Delhi
13	Saija Finance	Patna
14	SKDRDP	Ujire/Dharmasthala
15	Utkarsh	Varanasi

Table A.3: List of Suppliers

S.No.	Organization	Location
1	Anu Solar	Bangalore
2	Emvee Solar	Bangalore
3	TIDE/SustainTech	Bangalore
4	Prakruti Hydro	Bangalore
5	Selco	Bangalore
6	Desi Power	Bangalore
7	Chiranjeevi Wind Energy Ltd.	Coimbatore

Table A.3: List of Suppliers		
S.No.	Organization	Location
8	D'light	Gurgaon
9	Thrive	Hyderabad
10	Mangaal Energy	Imphal
11	Gram Power	Jaipur
12	Onergy	Kolkata
13	NatureTech Infra	Lucknow
14	ILFS Energy	Mumbai/Delhi
15	Greenway Grameen Infra Pvt. Ltd.	Navi Mumbai
16	Boond	New Delhi
17	Claro Energy	New Delhi
18	MeraGaon Power	New Delhi
19	Tata Power	New Delhi
20	TERI	New Delhi
21	Duron/RAL	New Delhi
22	Minda Group	New Delhi
23	Simpa Networks	Noida
24	Sakhi Retail (SURE)	Osmanabad
25	Husk Power	Patna
26	Prakti Design	Pondicherry
27	Envirofit	Pune
28	First Energy	Pune
29	Luminous Renewable Energy Solutions	Pune
30	Machinocraft	Pune
31	Enfragy	New Delhi

Table A.4: List of Government Organizations		
S.No.	Organization	Location
1	NABARD	Mumbai
2	MNRE	New Delhi
3	IREDA	New Delhi
4	MNRE-State agencies	Uttar Pradesh

Table A.5: List of Knowledge-based Organizations		
S.No.	Organization	Location
1	IT Power Synergy	Gurgaon
2	Ashden India Collective	New Delhi
3	Clean Network / CEEW	New Delhi

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