

Energy for the Poor: Building an Ecosystem for Decentralized Renewable Energy

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INTRODUCTION AND BACKGROUND

Over 1.2 billion people in the world have no access to electricity. 290 million of these people live in India, with over 90% of them in rural areas. According to the Central Electricity Authority, 31,981 villages in India remain un-electrified as on 31st December, 2013.

The Government of India has various programmes focused on rural electrification – the centrally driven RGGVY¹ scheme (and its DDG² component) of the Ministry of Power and the RVEP³ scheme of the MNRE⁴ for villages not covered under the RGGVY scheme. These programs have fallen short of achieving their targets of electrifying all villages by 2012.

As per the rural electrification policy definition, a village is electrified if at least 10% of its households have been electrified by the central grid or through the DDG program.⁵ Also, the minimum power that must be provided is 6 to 8 hours per day. Both are not very compelling benchmarks in the context of providing quality electricity access to all. Our experience has been that most rural areas with access to grid face issues with reliability, availability and quality of power supplied.

DISCOMs⁶ perceive rural households as non-revenue earners, due to issues of lower consumption, theft and the DISCOMs own inability to meter and collect effectively. Hence they provide power to rural areas on a rationed basis, so as to provide a bulk of the power to urban households and industries.

Market-based small scale renewable energy (electricity) has the potential to be a viable alternative or can complement grid extension programs, if implemented with the right business model and ecosystem setup. It has the potential to:

- 1) Reduce demand on fossil fuels.
- 2) Reduce cost of centralized power generation and distribution.
- 3) Reduce transmission and distribution losses.
- 4) Reduce power theft issues.
- 5) Provide customized system designs, technology selections, business models based on present community needs and the community's domestic/economic growth projections/aspirations.
- 6) Decentralize tariff collections, operations, maintenance and management, thus reducing costs.

¹ RGGVY - Rajiv Gandhi Gramin Vidyutikaran Yojana

² DDG - Decentralized Distributed Generation

³ RVEP - Remote Village Electrification Programme

⁴ MNRE - Ministry of New and Renewable Energy

⁵ Ministry of Power, http://powermin.nic.in/rural_electrification/definition_village_electrification.htm

⁶ DISCOM: Electricity Distribution company

7) Once grid connected, they can potentially:

- Shave peak power demand with intelligent use of storage technology.
- Reduce requirement of short term power purchase.

Over the past decade, socio-economic developmental philosophies have started to be looked at differently. Sustainability has taken center stage and participation of the private sector has become essential for plugging gaps in developmental services delivery. It has witnessed a significant growth in the number of enterprises established to address social problems, while balancing socio-commercial objectives. These enterprises, categorized as social enterprises, operate in areas where critical public services are poor or absent – such as education, energy, agriculture, water, health and so on. Improving the accessibility to solutions using largely market-based approaches, they also add to economic development through local entrepreneurship opportunities.

Social enterprises, largely using market-based approaches, operate in areas where critical public services are poor or absent

Governments have introduced schemes to support dissemination of market based small scale renewable energy solutions. For example, to support the market based small scale solar energy sector, the JNNSM policy of the MNRE included a 2000 MW component to it that looks at promoting its adoption (like solar home lighting systems, solar water pumps and mini-grids) using a combination of credit financing and subsidies made available for end users. While measures like subsidies and tax incentives are a welcome move, what is missed out is that the real impetus to dissemination of improved energy access revolves around other factors- technology, finance and the dissemination model for each specific product, and as important (if not more), similar factors for the sector as a whole- what is today referred to as ‘Ecosystem development’.

The small scale renewable energy sector offers a range of business models, across technologies and scales of operation, be they sales, leasing or rental models of individual home energy systems, portable products, community-based products or mini-grids with productive anchor base loads. There is a variety in the way organizations deliver services and the technologies depending on conditions related to the geography, socio-economic conditions, and supportive infrastructure in a particular region. This sector includes technology solutions that are electricity (such as solar, micro-hydro, biomass, wind) and non-electricity based (thermal technology – biogas, solar thermal) including those that use sustainable energy sources such as improved biomass cooking solutions.

These solutions are vital to the discussion on addressing energy access and enabling households to leapfrog the traditional grid. They are solutions built for the household or the local community where the generation and consumption of energy occur in the same location. Here, making small renewable energy solutions work is spoken of primarily in the context of energy access. An important precondition is to be able to view these solutions not as stop-gap measures for the grid but as ideal complements to the grid depending on resources and context. By making social entrepreneurship the center piece of the discussion on how to make these solutions work, the chapter draws attention to the critical components essential to any business model, defined in the form of holistic solutions. This chapter also throws light on all the supportive infrastructure or ecosystem pieces required for entrepreneurship in this sector to prosper given the variety of stakeholders.

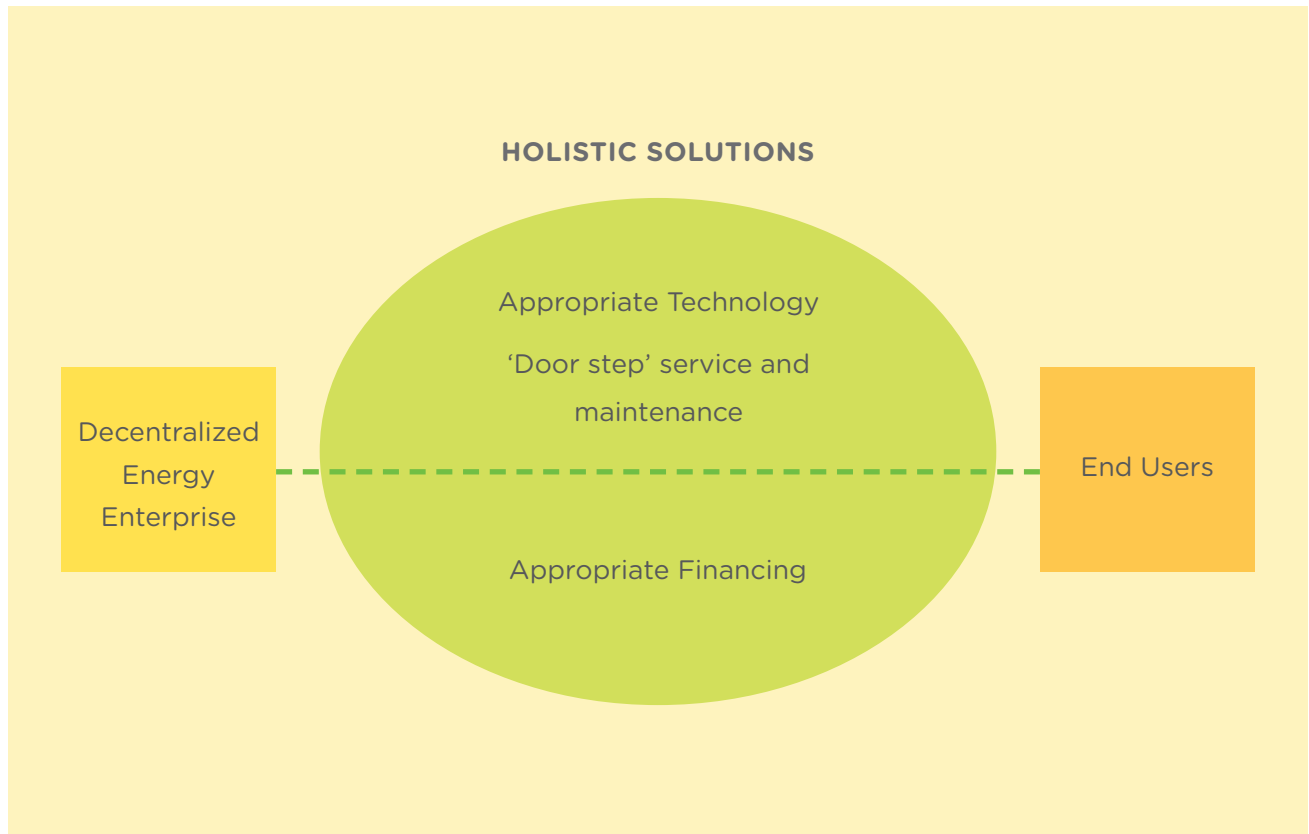
We shall draw inferences from our experience in the electricity based small scale renewable energy sector (specifically solar) to elaborate on the issues to be addressed to make this sector work.

HOLISTIC SOLUTIONS

While there was once a focus on technology alone as the key driver in the provision of decentralized renewable energy solutions, its significance has reduced. The

realization of how important the other aspects are in the provision of last mile access to end user households have made it important to consider a holistic approach, combining customized technology with affordable financing and a sustainable dissemination and maintenance mechanism.

FIGURE 1: Provision of Holistic Sustainable Energy solutions



Customized Technologies

Recognizing early on that needs cannot be standardized helps enterprises work on the philosophy of customizing technology based on the specific needs and affordability of the end- user. This requires rigorous need assessment and last mile innovations in product combinations and installation.

Financial Linkage

“Renewable energy is expensive” is one of the most popular arguments opposing greater dissemination of

renewable energy sources. What is often forgotten is that this statement is only valid in comparison to the grid- which is itself heavily subsidized. The statement ceases to apply when we include households that are still unconnected to the grid.

Kerosene fuel for lighting is a reality in most un-electrified and under electrified households. And this fuel is by no means economical for the poor. Households in most parts of India spend between Rs. 180 to Rs. 300 a month⁷– a significant part of their monthly income-

⁷ While the National Sample Survey Organization in India pegs the expenditure at about Rs. 45 (3 liters), field realities reveal that the 3 liters from the Public Distribution System do not cover the requirements of the average household. They buy an additional 2-3 liters from the market at approximately Rs. 45 - Rs. 60 per liter.

on the most basic energy requirements of lighting and mobile phone charging. On the other hand, providing a product that comes with an instalment based payment in line with the cash flows of the rural household, plays an important role in uptake of small scale renewable energy systems, overcoming the burden of putting down a large one-time payment.

In the case of rental or leased systems, an important question to be answered is on the collection mechanism. A clearly defined collection mechanism for rental models is a significant driver of their long term sustainability.

The financial linkage is not merely important from the point of view of being able to afford decentralized energy solutions. In many cases, it is also an entry point for end users to build institutional financial relationships and credit histories.

Dissemination and Follow-Up (System Maintenance)

Once an enterprise chooses its mode for dissemination of the product or solution, there is a need to ensure that the distribution network is extremely robust with availability of skilled personnel. Good after-sales service and maintenance determine whether the solution is long term or not. They also affect the sustainability of the business model itself. For example, a recent study undertaken by SELCO Foundation on behalf of a nationalized bank in Karnataka, India, reviewed the Non-performing assets (NPAs) within the solar portfo-

lio of one branch in particular and found that in nearly 70% of the cases, despite households registering complaints about non-functional systems, there was no action from the system supplier to attend to maintenance. Such negligence is bound to affect the financing of additional systems, which in-turn affects the business of enterprises in this sector.

ECOSYSTEM DEVELOPMENT FOR THE SECTOR

Absence of a supportive ecosystem is the root cause for the inability to scale or replicate for social enterprises and practitioners

While a number of social enterprises and practitioners have stepped in to fill the energy access gap using decentralized solutions, their inability to replicate or scale these solutions fast enough is a hindrance. The absence of a supportive ecosystem is the root cause of this inability to scale or replicate. Loosely defined, the absence of an ecosystem includes limited availability of skilled human resources, high cost of capital for entrepreneurs and limited access to affordable financing for end users, inadequate support to facilitate technology innovations for field applications, limited access to comprehensive, reliable information on end-users and unsupportive existing policy environments that follow top-down approaches.

FIGURE 2: Ecosystem for the Decentralized Renewable Energy Sector

SOURCE: Selco Foundation (2014)⁸

Human Resource Development

The need for skilled human resources in the sector is large and so far has not been fully addressed. While the sector is still nascent, it is critical to address the development of human resources at all organizational levels for renewable energy enterprises - operations, sales and marketing, finance, servicing, research and development and community involvement. With more than 1.2 billion people without access to electricity worldwide,⁹ there is immense potential for entrepreneurship and job creation in a sector that seeks to address this need. This need becomes more critical in the light of scepticism from bankers to lend for decentralized energy solutions owing to a fear of lack of adequate service network (as articulated earlier in the section on Main-

tenance). One of the main reasons provided by other stakeholders (including banks, financial institutions) for limited engagement with Decentralized energy programmes including JNNSM in India is the lack of rural project implementers with district-level presence and the lack of availability of appropriate, skilled human resources at the local level.

This time and resource intensive need is currently being met directly by the entrepreneurs- who are already stretched for resources. Individual organizations are forced to invest in the most basic skill training even while the initiative would better the sector as a whole.

⁸ SELCO Foundation, "Policy Group: Review 2012-2014" (2014), available at: <http://www.selcofoundation.org/publication/view/policy-review-2012-14/>

⁹ Energy Facts: <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTENERGY2/0,,contentMDK:22855502-pagePK:210058-piPK:210062-theSitePK:4114200,00.html>.

HRD Recommendation:

Institutionalize Energy Courses

The skills required in this sector could be categorized into the following broad categories: Technical; Operations; Micro-entrepreneurship; Research and Development.

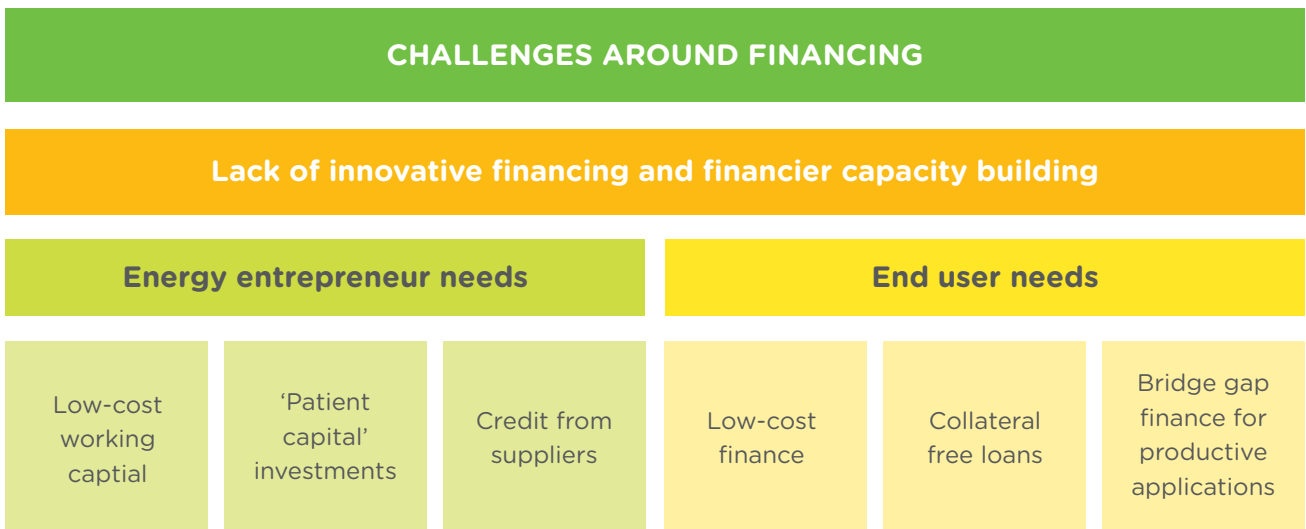
To reduce the cost of training and skill development incurred by individual entrepreneurs, there must be a thrust on creating curriculum and teaching modules for training of Renewable Energy technicians, operators and micro-entrepreneurs. For example, in a country like India, the existing Industrial Training Institutes (ITIs) and Rural Development and Self Employment Training Institutes (RSETIs)¹⁰ in rural areas and semi-urban

areas can then be utilized to disseminate these courses at the local level and build manpower on the ground.

Financing for Entrepreneurs and End-users

The core aspect of building the Financing link in the ecosystem involves an interest from financiers and investors to provide access to credit, which in-turn requires focused capacity building and sensitization initiatives. Drawing from the insights of enterprises in the sector and the experience of end users in accessing credit for renewable energy, certain factors usually identified as concerns are represented in the figure below. This includes concerns of grassroots entrepreneurs with no formal business training, as well as those with better educational qualifications and detailed business plans.

FIGURE 3: Challenges Around Financing for End Users and Entrepreneurs



Low-cost debt financing primarily for working capital is a key need for entrepreneurs which is often hard to access from banks for young and upcoming entrepreneurs with no established credit history. Interest rates with other financial institutions are high and even with bank loans, moratorium periods are short- all of which make it economically infeasible for a newly established energy enterprise. Another critical concern is the difficulty in availing 'patient' investment capital on account of high expectations of growth and Internal Rate of Return

(IRR) from the impact investment community, without considering the challenges of creating an ecosystem on the ground. In the case of end user financing on the other hand, the cost of finance (from Banks, MFIs, local financial institutions) and collateral requirements may become prohibitive factors. Lack of willingness of financial institutions to finance for productive utilizations and applications powered on decentralized renewable energy makes it difficult for households to move to applications beyond basic lighting.

¹⁰ The network of ITIs and RSETIs in India form the backbone of the vocational and entrepreneurial training initiatives to promote employability and entrepreneurship instincts among rural youth across the country.

Financing Recommendations

Capacity building of financiers and investors

Since the core concern revolves around the interest of financiers to lend for decentralized renewable energy, capacity building is inevitable. Experience in parts of India have shown that undertaking workshops and meetings with financiers to debunk myths about the technology and the engagement of former bankers who have actively financed the sector before to discuss the means of reducing or mitigating risks, innovations in financing, promoting financing on newer, productive use technologies, is critical in convincing new financial channels and institutions. For regions where the banking channel is not active, efforts are required towards either revitalizing these or capitalizing on alternate financial institutions. Similar rigour in capacity building and sensitization is critical when it comes to investments in these enterprises. There is a need to convince investors on the importance of patient capital and push back on the nature of due diligence processes and investment conditions when they do not take note of realities on the ground.

Innovations in financing (Loan guarantees, working capital debt)

The use and adoption of innovative financing mechanisms that reduce the risk of bankers, increasing access to loans, improve credit conditions for entrepreneurs etc. are essential in bolstering the financing link. Where the basic financing model is unviable due to high risk—where customers have low ability to pay, where communities are migrant or “illegal” or lack land titles and collateral, increasing the financial institution’s confidence can be achieved by facilitating innovations like Loan Guarantees and interest subsidies using soft funds. Similarly, in the case of entrepreneurs, there is need for more work on structuring working capital debt allowing for lower rates of interest and a reasonable moratorium period. While there are also a number of government and bank schemes in countries to provide this sort of credit, very little is known about their utilization for the energy sector.

Technology Innovation and Energy Efficiency

Today, there are issues with technology innovation in this space on many different fronts – while research continues into improving panel technology and reducing costs significantly, improvements in battery technology which have a clear bearing on decentralized renewable energy systems have not made enough progress to warrant steady local supply in underserved regions at affordable costs. Similarly, improving efficiency and innovating on DC products such as televisions, motors, pumps has been limited ultimately affecting the end-user’s ability to access additional productive use and household appliances. In cases where innovation is occurring, there are hardly standards for comparison of products to determine the working under field conditions. Often quality assurance is lacking on these newer, efficient technologies (where available) and manufacturers make claims based purely on in-housing testing of products. This, however, is insufficient in a sector where end use happens in a completely different set of circumstances that are often difficult to predict—there is no way around field testing.

In cases where innovation is occurring, there are hardly standards for comparison of products to determine the working under field conditions

Such testing is often resource and time intensive for individual enterprises and can easily eat into the revenue streams of an enterprise.

Technology and Innovation Recommendations

Improved quality assurance frameworks

In order to address these issues, a greater thrust is required to field testing of off-grid appliances, in addition to existing lighting solutions, for faster implementation in rural and urban poor communities to facilitate movement of households up the energy ladder. There must

be a greater thrust on bringing these solutions to Tier-2 and Tier-3 cities, with supportive financing for small entrepreneurs. Centralized R&D and quality assurance specifically for this sector would be a move in the right direction.

Field-centric Technology needs

Flexible financial resources and soft funding should be allocated to developing such facilities that can further build sustainable models (through field-based testing and pilot programmes in specific contexts) for decentralized renewable energy as well as energy efficiency. This is possible through initiatives of bilateral and multilateral agencies.

Policies Driven by Practitioner Inputs

Improving energy access for rural and underserved communities is an arduous task requiring supportive Government policies. Capitalizing on the decentralized renewable energy solutions in addressing this energy access on a large scale requires a conducive policy environment. Unfortunately, a number of energy related policies have failed to appreciate ground-level realities and practitioner perspectives. As a result, they have not benefitted end users and have instead become barriers in the way of enterprises providing energy solutions.

Improving energy access for rural and underserved communities is an arduous task requiring supportive Government policies

Practitioner Input Recommendations

Cross-sector approaches

It is vital for governments to look at more integrated energy and electrification policies to take note of where decentralized solutions can complement the grid. De-

centralized solutions can help in addressing the critical energy gaps that exist in the development oriented programmes of ministries such as Health and Family Welfare, Rural Development, Women and Child welfare and Human Resource Development.

For example, interventions can support improvements in agriculture, dairy farming and small businesses. Self Help Groups (SHGs) through Government livelihood programmes can make energy a livelihood in itself, and provide support for other DRE interventions in the village. In the case of maternal health issues, decentralized clean energy can be used to power a number of health-care devices in rural and remote primary health centers and support the Traditional Birth attendants during delivery.

Representative Network

There are also a number of key guidelines and policy changes required to institutionalize the various other links in the ecosystem- financing, technology innovation as well as skill development. To support practitioners tackle common challenges, develop the ecosystem for this sector and build a voice for their inputs to be part of policy dialogues, a representative body or network is useful.

In India, an alliance is being created by a representative group of practitioners, relevant research organizations, think tanks and donors. This alliance – CLEAN, or the ‘Clean Energy Access Network’ – will focus on specific target points such as access to finance, networking and information, training, technology, standards and certification, regulatory framework and policy advocacy. The experience of CLEAN could be useful in determining if this model could be adopted elsewhere as well.

CONCLUSION

Making small scale renewable energy solutions work is no longer an option, it is a necessity in an attempt to meet one of the most basic needs of households in a reliable manner with a quality option. However, the cre-

ation of an ecosystem for these solutions requires that all players and stakeholders take constructive efforts: it is the only way a real breakthrough can be created in decentralised energy access while simultaneously realizing other social objectives including rural entrepreneurship, skilled employment and increased access to credit. Provision of sustainable energy to rural and remote house-

holds is regarded today as a comparatively expensive proposition on account of a failure of the sector to build a strong foundation that can be capitalized upon by energy providers for the benefit of end users. Addressing that most basic challenge of ecosystem building would change the entire tone and need for conversations on the kind of incentives required for dissemination.

