Market Creation for Clean Energy Access

INSIGHTS FROM JEEVIKA-TERI PARTNERSHIP IN BIHAR

SPECIAL THANKS TO

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JEEViKA
Bihar Rural Livelihoods Promotion Society
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SUMMARY

In the recent years, enterprise approach for energy service delivery in the rural and remote areas has gained wider momentum. This has resulted in surge of social enterprise start-ups that provide decentralized clean energy services to households in the bottom of the pyramid (BoP) segments of Bihar. Statistics on rural energy access reveal Bihar has the lowest number of rural households that have access to modern energy. However, rampant poverty in rural Bihar and consequent affordability issues minimize growth prospects for most of these social enterprises that are already grappling with dual challenges of scale-up and sustainability. Hence, newer models for energy access service delivery have to be explored. Based on learning from implementation of an energy access project in Purnia district of Bihar, this report emphasizes on energy entrepreneur model and recommends shift of energy access goals from mere dissemination to wider goal of market creation. Further, it recommends approaches for triggering market creation in BoP through engagement of local institutions in sales and service of frugal technology solutions.

INTRODUCTION

Energy Access and Poverty

Affordable energy is fundamental to human welfare and central to reduction of absolute poverty. Access to reliable and sustainable energy service is an essential element to facilitate reduction in poverty and achievement of the larger goal of sustainable development.

A startling statistic released by the Oxford Poverty and Human Development Initiative in 2015 states that of the 1.6 billion people living under multidimensional poverty across the world, nearly 440 million dwell in eight Indian states alone, which bafflingly is equal to the number of poor in 25 African countries (OPHI 2015; Sonwalkar 2015). A large chunk of this population, nearly 1.3 billion or 80 per cent, also suffers from lack of access to clean energy services to fulfill basic needs, such as lighting and cooking. India alone is home to over 350 million people who lack access to electricity and over 700 million people rely on traditional burning of solid biomass for cooking (IEA 2013).

The co-relation between the lack of access to adequate and affordable energy services and poverty is evident. People who lack access to clean and affordable energy are trapped in a cycle of deprivation and lower incomes (GEA 2012). The poor spend their limited disposable incomes on unhealthy forms of energy, such as kerosene wick lamps for basic lighting. Also, people living on less than USD 2 per day often fail to afford initial electricity costs or the cost for purchasing efficient electrical devices (Practical Action 2015). Lack of modern energy service affects agricultural productivity, income generation opportunities, health, and the overall quality of life which together restrict the poor from moving out of the poverty trap. In addition, use of poor energy sources for basic energy access adds to the environmental degradation. This implies energy poverty has social, economic, and environmental implications. Hence, a pragmatic approach for enabling the poor people's access to clean energy is vital.

Bihar and the Evolving Energy Market

In India, the state of Bihar has earned itself the distinction of being one of the most consistently underdeveloped and poor states. Although the electricity grid has reached a large part of the country, electricity supply in Bihar is still unreliable. Less than 20 per cent of the state's population uses grid electricity as their primary source of lighting forcing more than 80 per cent of Bihar's population to use kerosene as their primary source of lighting (Census of India 2011). The impediments to electricity access in the state include poor paying capacities, inadequate grid infrastructure, high transmission and distribution losses, relatively lower electricity generation capacities, and poor financial health of the utilities (Pargal and Banerjee 2014; World Bank 2015).

Owing to this crippling and alarming situation, Bihar garnered immense focus from the Central government, donor agencies, and other multilateral and bilateral aid to alleviate the condition of its people. Several grant- and subsidy-linked models were introduced as channels to deliver solutions that addressed electricity deficiencies in the region. In recent years, donors shifted focus towards

more market-based solutions[1] that could be developed and sustained within 'Bottom of Pyramid (BoP)'segments[2] . With increasing technological innovations in renewable energy solutions, the market also saw individual- and private business-led models sprout as they joined in to generate and distribute electricity through independent and decentralized systems or to retail stand-alone products.

However, Bihar's under-developed clean energy (specifically solar) markets have been a difficult breaking ground for enterprises that wish to operate purely as per market-based modes, making scalability and sustainability harder than perceived. For example, several business owners and retailers of mobiles, electronics, and allied products/services became value added resellers of pico energy systems[3] to address the gap in electricity access.

[1] Market-based approach refers to delivery of products and services that the poor value and afford. In treating poor as customer, in a market-based approach, the focus is on delivering solutions in ways that can become financially viable so as to avoid donor dependency (Shell Foundation 2010).

[2] BoP segments are difficult for conventional private sector players as the operating and distributions costs are extremely high due to scattered nature of consumers, fragmented retail channels, and low sales volumes (Dutta 2015).

[3] Pico energy systems are 'Plug & Play' systems typically with configurations below 10 Wp and voltages not above 12 V (Source: http://www.energy4humandevelopment.com/2012/02/pico-pv-real-solution-for-rural.html).

Keeping low paying capacities[4] of end users in mind, these 'value added resellers' operated on low profit margins and served only as retail points for the energy products they sold. However, several pitfalls emerged in this scenario. First, absence of any after-sales services due to lack of technical know-how and absence of a spares-bank to replace malfunctioning or damaged products led to distrust in users. This dwindling confidence in non-conventional energy-based solutions meant that users aspired for grid connectivity even more, ultimately reducing demand and shrinking the market.

Second, value added resellers could only sell fixed configurations of products they sourced and were not equipped to customize energy systems to suit specific household energy needs, making their offerings limited in scope and responsiveness. Third, quality standards ran a high risk of being compromised as these 'value added resellers' often sourced and stocked cheaper equipment that allowed them to sell at higher margins.

In due course, it was realized that in order to introduce market-based solutions in BoP segments, innovation[5] would be the key (Figure 1).This led to the emergence of social enterprises that provide decentralized energy services[6] to rural communities (Gurtoo and Lahiti 2012). With a mandate of designing and developing solutions for 'BoP' consumers, these enterprises were funded through grants, innovation contests, crowd sourcing, and debt/equity funding.

Most social enterprises were supported by investors with the intention of generating measurable social and environmental impacts along with financial returns. While the initial setting up of this enterprise was assisted through adequate financial support, scalability and sustainability remained crucial challenges. This is because, while the enterprise had the relevant technological and operational capabilities, due to the low rate of repayments, the gestation period of the returns on investment was so long that it did not allow the enterprise to expand geographically or increase its consumer base and product and service portfolios. High attrition rates also curbed social enterprises from growing out of their immediate regions.

Therefore, in order to effectively introduce a market-based approach that supports the provision of renewable energy products and services for 'BoP' communities, creating the market in itself is a vital step (Simanis 2010). This paper presents a case to highlight how TERI's energy enterprise (EE) based delivery model was synergized with a unique partnerships to accelerate energy access by leveraging strength of last mile institutions to trigger market creation. The paper establishes a comprehensive outlook into the practitioner's approach for market creation and endorses it as an inevitable step for the sustainability of clean energy access.

[4] Rural communities generally have limited disposable incomes and do not have access to small ticket consumer finance to pay for first electricity connection or for purchasing electrical equipment.

[5] This innovation can be introduced across the energy access market value chain and can be in the forms of technology solution, delivery and financial model, partnerships, or a mix of two or more forms.

[6] The Electricity Act, 2003 of the Government of India triggered emergence of private sector led decentralized energy service delivery companies in rural areas.

Creating a Market in BoP

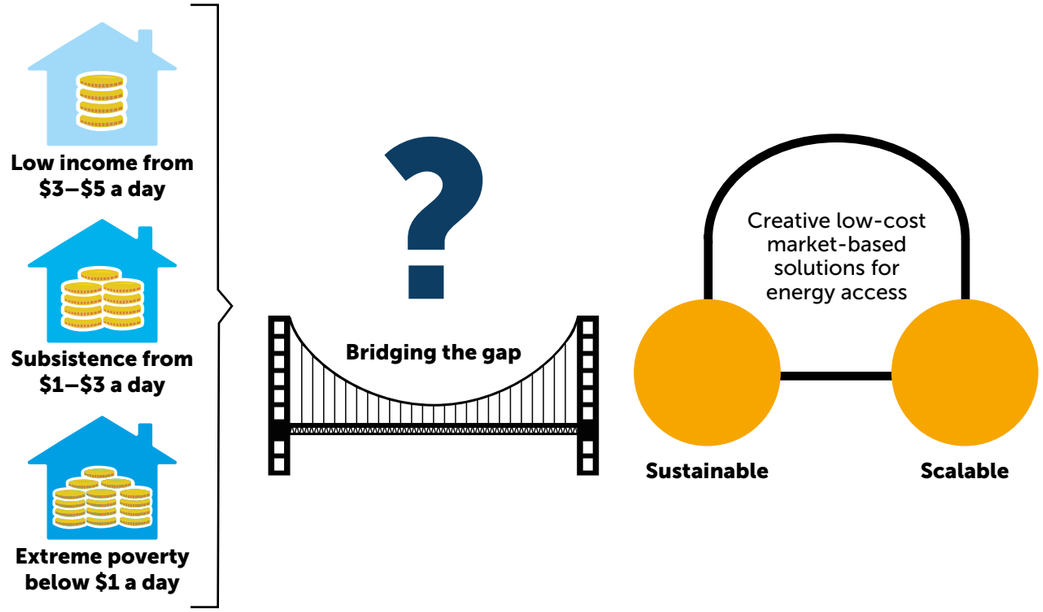
BoP is often misinterpreted as an underserved market when no 'ready to go' market actually exists there. To operate successfully in the BoP, enterprises need to focus on unique products and services. In addition, creation of a local channel using unconventional partnerships with grassroots institutions, government, and community-based institutions for service delivery or product sales is essential. Further, enabling access to products and services through innovative financing mechanisms or through customized channels to ensure physical availability of product/service for end user are vital elements (Hammond *et al.* 2007). Hart and Prahlad (2013) describe the transition of BoP into an active market as a development activity and clarify that it is not about serving an existing market more efficiently.

Creating a market in the BoP segment requires interest to be generated on both the demand and supply side. On the demand side, the creation of a market entails value creation and embedding specific products/services/technology solutions into the lives of end users. On the supply side, it involves the generation of enough interest in individuals within the community, to consider it as a lucrative business opportunity.

The overall market creation process can be divided into three stages, namely, seeding, base building, and growth and consolidation (Simanis 2010). The paper adopts these stages as a broad framework for market creation and contextualizes them to the TERI's intervention in partnership with JEEViKA and Department for International Development (DFID) that has triggered market creation and subsequently introduced enterprise-based delivery model for energy access in Purnia, Bihar.

Purnia is one of the most underdeveloped and flood-prone districts of Bihar. Of the 89 per cent of its households, only 8 per cent have access to electricity. Owing to its massive poverty, the district is among JEEViKA's primary areas of focus and has a network of over 40,000 women SHGs or self-help groups (BRLPS 2015a). With each group having an average membership of 10–20 women, JEEViKA engages over 0.5 million women in various micro-loaning, group saving, and micro-entrepreneurship activities (BRLPS 2015b). TERI identified the Dhamdaha block as a suitable area for intervention.

Figure 1: Innovation is the key in BoP segments



Segmenting the BoP Market (Based on Rangan *et al.* 2011)

Based on a survey conducted in Dhamdaha block in 2011, it was revealed that SHG members paid as high as USD 8 per month to access lighting from a local generator and up to USD 3 per month to charge their mobile handsets (BRLPS and Government of Bihar 2011).

Seeding—Creating a Buzz

At this stage, the objective is to create an interest within the community for a particular product or service. Activities are directed towards gaining the trust of the community and helping them to relate to the value that the product/service delivers. A parallel effort is also made to create initial interest in the entrepreneurship/business opportunities that the product/service offers.

In Purnia, based on indicators developed by TERI, JEEViKA identified a list of villages for implementation. Field surveys revealed that the community aspired for energy solutions that met basic needs of lighting and mobile handset charging. However, an integrated product that met both these needs was not readily available in the local market. While there was an evident need, the community still had limited disposable incomes to fulfil this need. To address the specific energy and technology needs of the SHG members in Damdaha block, TERI designed and tested a customized specification of a solar home light system (SHLS) at its laboratory in New Delhi. This innovative system included two LED luminaries and a socket for mobile charging that were powered by a battery charged through a solar panel. Once a satisfactory specification had been developed, TERI introduced the system to the community through live demonstrations and model installations and actively engaged the community to induce confidence and familiarity in the people.

In the seeding stage, the most crucial element is to create that connect with the last mile user that will eventually convert into acceptance and adoption. With JEEViKA, TERI was able to reach a large number of prospective users in a very short time and in a collective manner through their monthly group meetings. This not only saved time but also, due to the goodwill established by JEEViKA with its members, TERI was able to build trust and rapport with the community much sooner than it would have in a scenario where no partner agency was involved.

JEEViKA's existing network in the villages of Purnia saved a significant amount of project time that would have otherwise been spent on community mobilization and rapport building.

Base Building—Setting the Stage

If the seeding process has been successful, a clear demand for energy systems and solutions will emerge and, at this point, it is important to mobilize stakeholders on the supply side of the value chain. *Base building therefore entails the process of engaging prospective entrepreneurs and allied supply side stakeholders in 'make-and-model workshops' to visualize and analyse the business opportunity and to generate enough interest and confidence to invest in the opportunity.* Participatory approach allows for realization of win-win proposition for market actors and creation of a shared vision (Bloomfield, Waters and Franz 2015). During this period, TERI engaged prospective entrepreneurs in the installation process to impart hands-on experience and to develop a deeper understanding of the energy provisioning supply chain, further strengthened with technical and business skill trainings. A two-way communication and discussion process was also encouraged and facilitated between the prospective entrepreneur and the end user community. This not only helped end users understand the value that would be delivered, it also helped the entrepreneur understand the end user's requirements to further refine his product offering and deliver more responsive solutions.

In Purnia, TERI realized that seasonal variations in the region made a standard SHLS ineffective. To deliver a product that met the required household energy needs more optimally, TERI developed a custom SHLS 12-V system that required a 10 Ah lead-acid tubular battery. Since batteries of such specification were not readily available in the market, TERI engaged a leading component manufacturer and successfully negotiated the production of samples of these batteries required for this configuration. After extensive laboratory and field testing, the battery was sent and duly approved by the Ministry of New and Renewable Energy, Government of India.

While the system is now commercially available, the upfront cost (approx. USD 180[7]) was prohibitive for the majority of SHG households. Hence, to convert demand to actual purchase, JEEViKA agreed to facilitate up to 60 per cent of the hardware cost as a loan to its SHG members. A viability gap funding of up to 40 per cent of the hardware cost was further provided from TERI's clean energy partnership with DFID. This convergence of VGF and the soft, translated into purchase decisions for SHLS by SHG members.

Growth and Consolidation—Harvesting Opportunities Beyond Lighting

In the final stage, a business model, complete with a business unit, is in fully operational mode and has a consumer base that supports market dynamics to evolve and endure in a continuous cycle of growth and expansion. However, for this continuous cycle of growth and expansion to remain sustainable, two primary challenges of a BoP energy market must be addressed by the delivery model—that is, a robust supply chain to meet evolving end user technology needs and prompt and effective after-sales services to end users.

In Purnia, TERI facilitated the creation of enterprise-based delivery model and institutionalization of last mile EEs or *Uttam Urja Kendras*. The EE was the key business unit that brought together all other elements in the energy value chain and functioned as a one-stop shop for retail sales and the after sales maintenance of clean energy systems. As a vital liaison between the manufacturer and end user, the EE occupies an important position in the value chain providing the manufacturer with the opportunity of reaching the last mile and assuring the supply of quality products to the end user. With relatively low business risks and lower operating costs, the EEs tend to be more responsive to the evolving energy service needs of their customers. A typical EE[8] operates at the block level and serves a cluster of villages. In Purnia, prospective entrepreneurs, who were provided hands on training and classroom business skill development inputs, were now facilitated to set up a proper 'brick

[7] Assuming USD 1 =INR 50

[8] Unlike village-level entrepreneurs, who might also be barefoot entrepreneurs, EE entrepreneurs operate from a brick and mortar structure that may or may not be located in their residential premise. Similar to any other micro-enterprise, an EE is a for-profit entity that is owned, operated, and managed by individuals who live close to targeted consumers and often directly interact with them on a daily basis. The entrepreneur needs a license to undertake trade and commerce as per the rules and policies of the government/local self-government institutions. Further, the enterprise needs license to undertake specific kind of business. Network of EEs is essential to drive after-sales service delivery for clean energy-based products at last mile locations in remote and poorly electrified villages. Institutionalizing and operating EE requires relatively small ticket funding and EEs operate at relatively lower business risks. However, start-up funding can be a substantial big chunk for the poor.

and mortar' structure to carry out commercial activities formally and effectively.

Institutionalized as a for-profit business unit, the EE is equipped to offer a wide range of renewable energy solutions from solar lanterns to independent home lighting systems, solar panels, luminaries, and batteries (Figure 2). In many cases, an EE may also provide power distribution services on a rental model through a solar micro grid installed at their premises, that supplies electricity for light in nearby homes and shops. Through their installation and repair experience as well as through augmented trainings, EEs in Purnia have displayed significant capabilities in assembling and configuring customized systems to suit specific household needs as well. This was a big value add, as the user at the last mile is able to receive a good quality tailored solution at an affordable cost.

While in the base building stage, TERI directly placed orders with vendors and manufacturers of equipment; in the growth and consolidation stage, the EE is established enough to directly place such orders himself, with occasional supervision from TERI.

Also, to incentivize participation of the SHG members, over 30 men from the families of SHG members were given opportunities to work and learn as technicians at the EE during the course of implementation. This turned to be an opportunity for the men to earn hands-on experience in installation and commissioning of SHLS. This intuitively helped the women earn support from the men members in their families for their participation in activities of the SHG.

The EE—Opportunity and Value Proposition

Considering the number of people in rural areas without access to affordable and reliable energy services and the absence of an entity that addresses issues of awareness, technology adoption, affordability, availability, and maintenance, the opportunity for a network of micro-EEs to thrive and grow is immense. The value proposition that an EE offers to the other stakeholders in the energy access market value chain is discussed as follows (see the schematic below):

End User	Civil Societies	Technology Manufacturers/ Wholesalers	Financial Institutions
Accessibility and Serviceability—high quality products and responsive warranty services	Opportunity to add energy access and renewable energy into their service portfolio	Access to previously unavailable sales networks; higher sales volumes	Viable opportunity for priority sector lending through a reliable local enterprise
Range of products to suit affordability, needs, and preferences	Project engagement and partnership with EE—technical/ end user training, awareness campaigns	End user feedback, critical market intelligence; better after sales service delivery through EE at reduced operational costs	Addresses the challenge of non-performing assests triggered from poor after-sales service

With effective EE networks in place, government institutions will be able to cut on aid for dissemination of clean energy products in BoP.

[9] It is important that all necessary documentation, including the rent deed must be completed by the entrepreneur.

Institutionalizing EE

The institutionalization of EE can be classified into two broad stages—pre-institutionalization and post-institutionalization. In the pre-institutionalization stage, the entrepreneur must satisfy one major prerequisite, that is, land or a premise to set up a shop. Entrepreneurs who do not already own a shop or piece of land can rent premises[9]. As per Ministry of Micro, Small and Medium Enterprises (2015), other important considerations include:

- The site or location of the EE shop is in accordance with the laws of the government and the guidelines of its local administrative units.
- The energy entrepreneur must possess a basic understanding of business and electrical appliances/equipment.
- EEs will need to get a clearance from the Bureau of Indian Standards (BIS) to undertake sales and services of electrical appliances.
- Obtaining taxpayer identification number (TIN) is mandatory for undertaking sales and for procurement of material/equipment form manufacturer/distributor/supplier. The TIN is a unique number allotted by the Commercial Tax Department of a state and must be mentioned in all Value Added Tax (VAT) transactions and correspondence.
- Energy entrepreneurs must have a Permanent Account Number, a ten-digit alphanumeric number allotted by the Income Tax Department of India.
- A current account with any bank in India is a must, preferably registered in the name of the EE.
- For all business-to-consumer and business-to-business transactions, the enterprise needs letter heads, bill books, visiting cards, sign boards, and invoice pads that carry the name, address, and TIN number of the enterprise.
- The energy entrepreneur may file Memorandum of Micro-Enterprise with the local District Industries Centre. This is optional, though it may garner a benefit in future.

In the post-institutionalization stage, linking the EE with the market value chain is the most vital activity. For a start-up, in order to attract footfalls at the retail outlet, a significant amount of marketing and branding is required. Operating at a hamlet or village level, EE may not receive a huge number of footfalls. Hence, a strategic location of the enterprise is important. For example in India, such EEs may be located near areas of busy local activity, such as bus stands, railway stations, the main market, or near key government institutions or health centres.

Harnessing EE network

Scale brings economy and the same holds true for an EE that functions at the village level. EEs operating in a cluster earn outright benefits in terms of their joint negotiating power with the manufacturer. It also allows for streamlining the procurement of inventory and spares management. Effective networks attract flexible credit facilities from manufacturers and distributors.

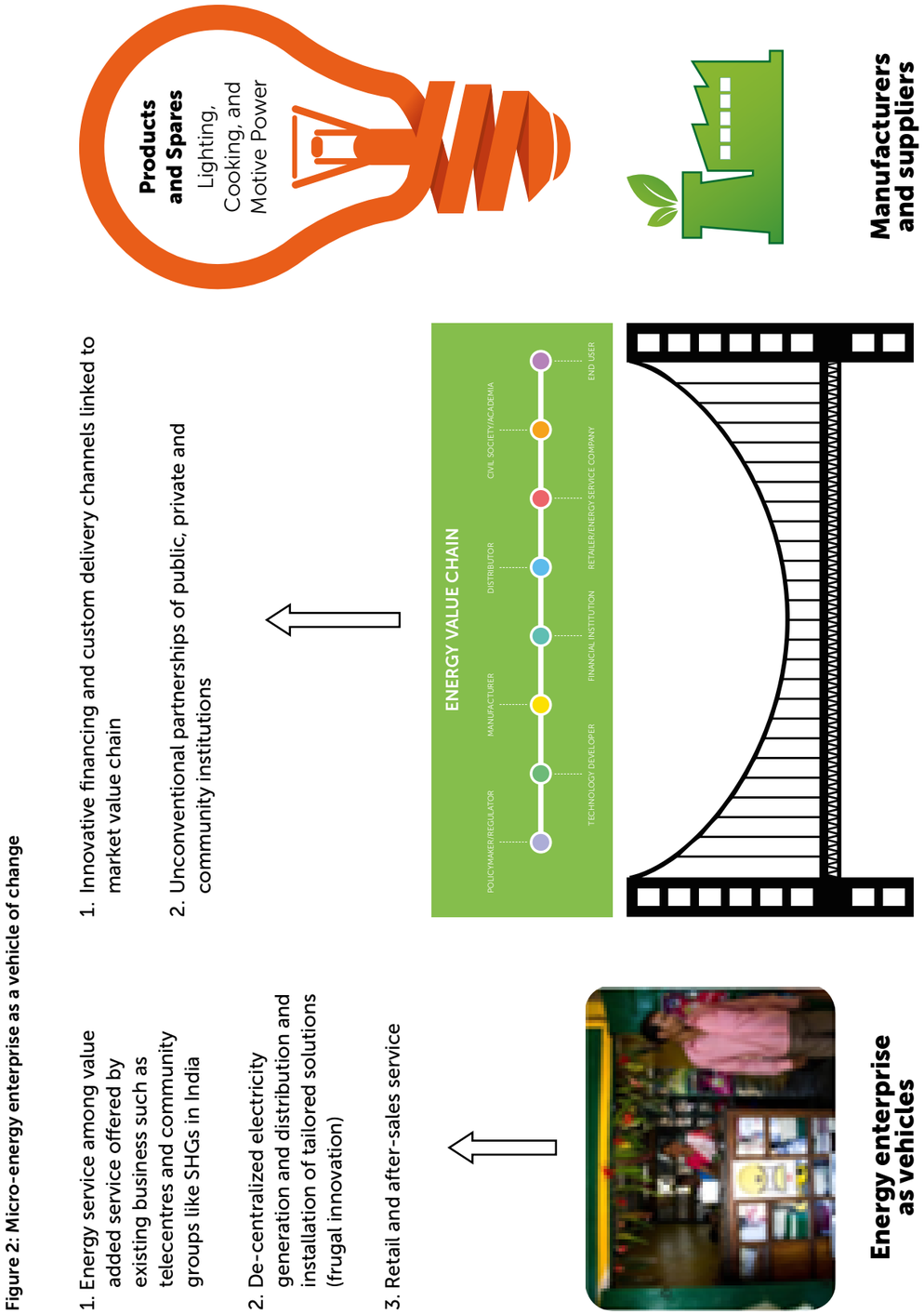


Figure 2: Micro-energy enterprise as a vehicle of change

- **Independent EEs linked to market value chain:** At district and block levels, independent energy entrepreneurs undertake sales of electrical equipment including solar components. Such entrepreneurs can be linked to leading manufacturers and suppliers who supply products and spares that comply with norms of the government. To realize true potential of this approach, necessary training and handholding will have to be provided to the entrepreneurs. Also, the entrepreneurs must be willing to comply with quality norms of the manufacturers and suppliers whom their enterprise is linked to.

- **Build-Own-Maintain model:** In a Build-Own-Maintain model, the private sector builds and owns the infrastructure from where the enterprise is operated. In addition, it also takes up responsibility for maintenance of the EE. The operations will be undertaken by the local institution such as a functionally effective community-based institution.

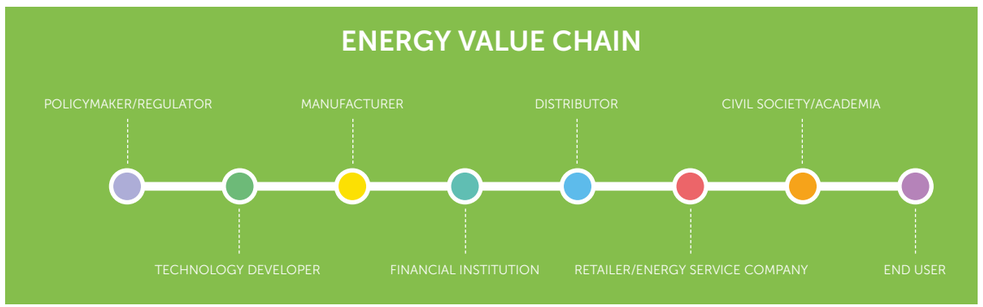
- **Franchising model:** Franchising model is believed to be an effective channel for driving market efficiencies and achieving scale (E+TWG, SE4ALL and Accenture 2014). In franchising model, established manufacturers (franchisor) can mobilize distributors/carry-and-forward agents to become their franchisees. The norms for franchising are established by the franchisor, and the franchisees comply with the terms of partnership as disclosed by the franchisor in the franchise disclosure document. The franchisee can follow either the business format franchising or the product distribution franchising model (Seid and Thomas 2006).

Financing Market Creation

Setting up of an EE requires innovative funding mechanisms. Unfortunately, because of the nature[10] of EEs, patient capital[11] is not available to them. Further, the traditional dependence of communities on grants does not appear to be a favourable business climate for institutions such as EE that operate in a market mode. In a value chain-based system (Figure 3), while patient capital can address funding requirements of manufacturers and technology developers, market creation fund is necessary to harness a network of last mile EEs that operate in a market-based mode.

As per (Simanis 2010), creation of market includes triggering a value for specific product and service into lives of the people, and it also includes creation of interest among local communities for undertaking clean energy-based enterprise activities that are not looked upon as a very lucrative business opportunity otherwise. Hence, market creation fund is required for two specific purposes: (i) to trigger gradual shift of the traditionally aid reliant communities to market-led approaches and (ii) to support creation of the clean energy-based enterprises at last miles. Since risk-taking capability of the people in BoP is

Figure 3: Energy value chain



[10] The traditional micro-enterprises operating in villages do not have legal structure and are often unorganized and informal. This prevents them from getting external investments and also restricts their participation in value chains of larger companies. In case of EEs, while they are institutionalized, their owners and operators might have had no formal education at all. Hence, they might not be able to comply with the complexities of patient capital and the kind of documentation that it requires before investment and after approval of investment.

[11] Patient capital-based approach combines the best of traditional aid- and market-based approaches, and it is facilitated by impact investors to energy service companies that operate rural and remote areas. It is not a grant fund and the investors expect financial returns alongside measurable social and environmental impacts.

Table 1: Project Outputs/Achievements

INDICATOR	ACHIEVEMENT	SOURCE OF VERIFICATION
Technology/ specification developed	1. Solar Home Light System (SHLS)—Two LED luminaries and one mobile phone charging point 2. Integrated Domestic Energy System (IDES)—Two LED luminaries, one mobile phone charging point and one improved biomass cookstove	Quarterly progress report of DFID-TERI clean energy partnership
EEs institutionalized	3 EEs institutionalized	Quarterly progress report of DFID-TERI clean energy partnership
No. of SHG households covered	14,000	Sales Report of EEs, quarterly progress report of DFID-TERI clean energy partnership
No. of districts in Bihar (Footprints)	4 (Purnia, Khagaria, Madhubani, and Gaya)	Quarterly progress report of DFID-TERI clean energy partnership
No. of blocks in Bihar (Footprints)	12 (Dhamdaha, Barharakothi, Baisi, Bhawanipur, Khajauli, Tankuppa, Bodhgaya, Khizarsarai, Dobhi, Allauli, Khagaria, and Chautham)	Lighting a Billion Lives (LaBL)information system, quarterly progress report of DFID-TERI clean energy partnership
No. of technicians trained	200 (Aggregate of trainings conducted between January–March 2013 and May–November 2014)	LaBL information system, quarterly progress report of DFID-TERI clean energy partnership
No. of people employed by EEs	Purnia (10) Madhubani (2) Gaya (4)	Quarterly progress report of DFID-TERI clean energy partnership and Log book of Project Team

poor, incentives and not just sales volume alone will be sufficient to ignite interest among rural inhabitants to uptake energy entrepreneurship.
Start-up finance for EEs will be essential and in this context, grants will play a distinctive role and innovative approaches for delivery of start-up finance will prove to be effective.

TERI, as part of its DFID-TERI clean energy partnership, facilitated enterprise finance to entrepreneurs in form of initial inventory support [12], branding and initial marketing support, training, and support for enterprise institutionalization. Also, handholding for linkage of the enterprise with functionally effective network of JEEViKA's SHGs and the manufacturers/vendors was an essential part of the package of innovative financial instruments offered to EEs. In addition, amalgamation of VGF and soft loans offered by DFID-TERI clean energy partnership and JEEViKA helped in seeding the product in Purnia.

Outputs

With support from JEEViKA and DFID, TERI was successful in facilitating access to clean lighting to over 13,000 self-employed women or SHG members of JEEViKA (Table 1).[13]

Since commencement of JEEViKA-TERI partnership, three EEs[14] have been working closely with SHG members. Independent of TERI, together, these EEs have undertaken sales of over 0.15 million since institutionalization and have scaled up their product/service portfolio that includes sales of standalone solar systems and assembling, installation, and commissioning of higher specification[15] products in rural areas of Bihar. This has also attracted interest of external players[16] in the solar business.

JEEViKA-TERI partnership now has its footprints in Purnia, Gaya, Madhubani, and Khagaria districts of Bihar. Undoubtedly, the strong community coherence coupled with smart financial instruments has led to wider outreach. The outputs are attributable to the unique partnership that JEEViKA, TERI and DFID forged to ensure clean energy access in Purnia. The obvious outcome of the initiative is the triggering of market creation for clean energy access in the region. Also, the institutional arrangement has facilitated roll-out of Integrated Domestic Energy System (IDES) which comprises two LED light points, a forced draft improved biomass cookstove and mobile phone charging point. Both SHLS and IDES are frugal technologies that can be assembled by the EE at last mile. The electrical capacity of these plug and play technology solutions can be enhanced at a later stage when the needs of the household change.

With relatively lower business risks, EEs are able to provide customized renewable energy based solutions to rural consumers and that too on terms that are mutually agreeable upon between the EE and buyer. This insight reflects that the rural entrepreneurs have requisite ability to do business at local levels and that the enterprise model is viable in rural areas. However, when it comes to operating at a scale similar to that of a social enterprise, even the most successful micro-enterprises will not be able to do so. This is because they lack access to necessary financing options such as equity investment. Also, often they do not even have any formal training and expertise which any investor such as an impact investor would demand. To become market ready, EEs would need long term handholding-support which goes beyond establishment of linkages between the EE and clean energy product suppliers.

The Way Forward

Focus on Market Creation

Owing to time-bound targets for clean energy access at national, regional, and international levels, the thrust is largely on making the clean energy product or service available to the BoP household. To meet the targets, traditional subsidy and aid has been the channel that government agencies and non-government institutions settled for. Pure aid-based interventions that do not provision local market linkage for after-sales service and future purchases, only address the needs of the community at that particular time. However, the need itself keeps evolving and hence a grant-based intervention does not ensure long-term access of the BoP household to the clean energy product. This approach restricts the ability of a household to make an informed decision for purchasing technology solutions that meet their needs best. Also, it does not often facilitate access to customized solutions to the households.

[12] As part of initial inventory support, EEs were provided solar products as loan to start-up their business.
[13] As of July 2015
[14] Of the 150 plus EEs that have been institutionalized with support from DFID-TERI partnership in pan India, three EEs are working closely with SHG members of JEEViKA.
[15] Solar systems of 10Wp, 20 Wp, 70 Wp, 75 Wp, 80 Wp, and 100 Wp.
[16] Retailers and value added service providers who have received no support at all from TERI and are undertaking sales/service of solar-based products in and around project areas of TERI.

The existing programmes for energy access mostly focus more on the supply side and monitor availability of clean energy product or service at the household level. It would be useful to change focus of programmes from mere availability of a particular technology solution/energy service to broader goal of market creation. Market creation not only emphasizes on the value that a product brings into lives of people, it also drives institutionalization of local enterprises[17] that have innovative business models that comprises unique partnerships and delivery models for the BoP for addressing evolving needs of the communities. In such an approach where the community pays partial or full price for access to a technology solution—seeding of product/service and institutionalization of a business enterprise that offers the products/services becomes inevitable. To realize this, a balanced approach combining large-scale and long-term public finance with innovative private sector initiatives that trigger market mechanisms are needed (GEA 2012). At the same time, capacity building[18] is inevitable.

Piggybanking on Functionally Effective Institutions at Last Miles

From the perspective of marketing and sales, network of SHGs and home-based enterprises are often preferred by manufacturers and retailers of pico energy products, such as solar lanterns. Being functionally effective, these institutions offer access to a wider consumer base across several geographies. In addition, consumer's ability to pay is a huge attraction because it increases the possibility of higher sales volume. However, network of functionally effective community-based institutions have been traditionally seen as mere product dissemination channels. In the long run, the interest of manufacturers/vendors is limited by the budget available for operations and, hence, they do not focus on after-sales service. Institutionalizing company-owned after-sales service centre in remote areas is not financially viable for small manufacturers and vendors. Poor after-sales service leads to loss of credibility of the buyers on the brand offered by the manufacturers/vendors. Linkage with functionally effective EE network can curb the above stated challenge of after-sales service and help the manufactures reduce their operational costs for after-sales service delivery. At the same time, it will enhance the willingness of banks to finance small ticket solar purchases of the households. With all these elements in place, functionally effective community-based institutions can emerge as a channel for seeding clean energy products and services in BoP segments.

[17] Local enterprise such as an EE.

[18] Technical and business skills training coupled with handholding for institutionalization, initial marketing, and branding and customer acquisition. For end users, it would include community mobilization, awareness generation, and consumer education for after-sales, quality and usage of product/service.

Scale-Up of Micro-Energy Enterprises

At block/district level several small ticket micro-energy enterprises are found to be operating in rural areas. However, they are un-organized and lack the requisite capacities to grow beyond a certain stage of business cycle. Nevertheless, exceptionally performing micro-energy enterprises appear to be promising businesses that can be scaled-up. To do so, micro-energy enterprises would need a range of inputs, such as easy and low cost finance, customized training for business, and technical skills and handholding. One of the most striking parameters for determination of success of such a scale-up initiative would be the readiness of the enterprise to attract finance from the market.

Frugal Innovation to Trigger Replication of Technology Solution at Last Mile

Design and implementation of replicable and scalable energy access solutions are major challenges that the governments and development agencies are facing today. Delivering change through technology solutions in BoP segment requires immense customization to meet specific needs of households. While the need for customization is recognized, pure grants-based programmes often impose technology solutions of their choice on the communities. This constrains adoption of the technology and restricts graduation of the household to cleaner energy access. Also, such solutions fail to earn wider popularity among community members. Simpler technology solutions such as SHLS and Integrated Domestic Energy System (IDES) are easy to assemble and integrate at last mile locations. Their plug-and-play nature provides flexibility to design and assemble those using locally available components. Also, frugality enables design of systems that meet price and specification needs of different income brackets. Above all, with evolving needs and improving income levels, households have the opportunity to enhance the capacity of the solar system deployed at their household without much complexity by using locally available expertise. Hence, as a ripple effect, frugality enhances replicability and scalability of energy access solutions.

Conclusion

Achieving energy access goals is a priority at national, regional and international levels. However, in BoP, to enable shift of communities to sustainable energy access solutions, transition from pure grant based programs to market-based approaches is necessary. Currently, the two most preferred modes for achieving these goals are grant based programs and enterprise approaches. Target based programs focus largely on impact in terms of physical access to clean energy technology solution and miss on addressing evolving needs. At the same time enterprise approaches engage into profit making and aim for scale-up to attain break-even. In BoP for sustainable energy access, market creation is a pre-requisite. Hence, there is a need to re-orient energy access goals which currently focus more on achieving physical targets to broader goals that focus on nurturing a network of service delivery agents at last miles. Physical targets of short term projects are incentives that can be leveraged to only generate initial excitement among local entrepreneurs. The overall market creation in BoP requires convergence of traditional aid and innovative business finance to seed product and encourage participation of individuals and clean energy entrepreneurs who address evolving needs of communities through frugal technology solutions.

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