Tamaso Maa Jyotirgamaya – "Energy-zing" Rural India

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"Tamaso Maa Jyotirgamaya," (Dear God, please take me from darkness to luminance), is a saying that has been used for centuries in various contexts. But, for me, the phrase is the embodiment of what rural India craves for today. I have been working on village electrification for the past few years, and have travelled through villages across our country, lived with the villagers, and tried to understand the dynamics of rural electrification at close proximity. Village electrification is as much an art as it is science! There are several models already in practice in various parts of India, especially the north and the east, where energy shortage is acute. Here is a recount of the learning from these village projects and an attempt to identify potential opportunities in this sector.

Current Scenario of Rural Electricity

The United Nations set eight Millennium Developmental Goals (MDG) that calls out for eradication of poverty & hunger, universal primary education, gender equality, infant mortality, maternal health, and environmental sustainability. What is interesting to note is that energy does not figure in these goals! IEA appropriately called it "Energy poverty: The missing Millennium Development Goal?" A 2010 study by World Energy Council, "*Energy Access through Rural Electrification and Renewable Energy*", confirms that "energy poverty is the main reason for rural poverty which in turn gives rise to health issues" and "restricts the income level and industrial/commercial activity leading to economic stagnation or slow growth." The fact has been realized by the UN, and 2012 has been declared as **"***International Year of Sustainable Energy for All*." (Read full article by Clean Tech SIG here). In my view, the MDG revolves around the nexus of Education, Employment and Energy. If these three can be achieved, all of the goals of MDG are achievable and only then will lead to the empowerment

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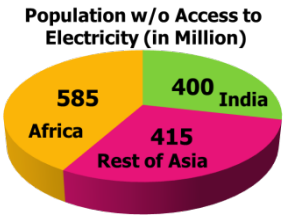
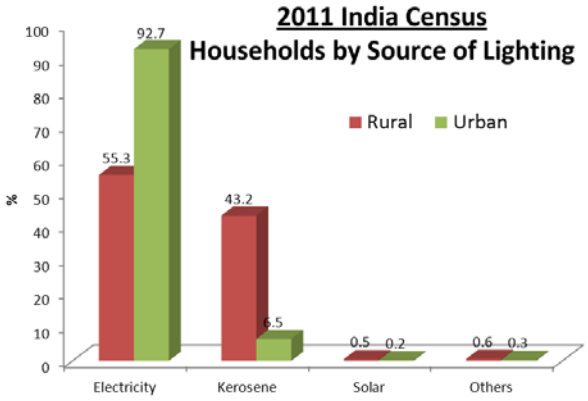
of the poor of the world. Access to energy plays the key role in this – it enables both employment and education.

According to the IEA's report on World Energy Outlook 2011, 1.4 billion people, that is a fifth of the world's population, do not have access to electricity, and of this, 80% are in the rural areas. While 585 million reside in Sub-Saharan Africa, the majority, 815 million live in Asia, with India accounting for 400 million. At the current rate of interventions, 1.1 billion people will still lack access to electricity in 2030 – with 87% in rural areas. So, the interventions have to accelerate globally!





For India, the latest census data show that only 53% of the rural population has access to grid electricity; and 43% still use kerosene for lighting. According to Chandrabhan Sharma, the Pradhan of Vidhuni village in Shrawasti District, UP, people pay anywhere between Rs. 100 to 150 per month on kerosene. However, this does not address other needs they have – power for mobile charging, fans, TV/Satellite, irrigation pumps, agriculture machinery, computers in schools, and so on. Local entrepreneurs have, for a long time, exploited this situation, particularly in abundance in Bihar and UP by providing diesel generator based power just enough to light one CFL bulb for Rs. 100 per month. A shopkeeper in Mansahi village of Katihar District in Bihar, said he pays Rs. 60 per month for one CFL bulb for 3 just hours every night! Like the rest of us, rural India is aspiring and hungry for power! The question is, how do we address this huge latent demand?

The obvious option is to expand the grid-electrification to the villages. The pace of grid-electrification in India has increased multi-fold since the launch of the Rajeev Gandhi Grameen Vidyutikaran Yojana (RGGVY) scheme in 2005 by the Ministry of Power. As of April 2012, about 93.8% villages are electrified leaving some 36,700 villages un-electrified out of a total of 593,700 villages. A trip to these "electrified" villages, on the other hand, show us the reality! These electrified villages receive power for as low as 2 hours a day, to maximum of 8-10 hours a day. The timing of the power supply is also unscheduled, and hence villagers are never able to plan their activities. In Alingo village near Bhuvaneshwar, Odisha, the grid electricity is supplied for just a few hours, but at a voltage as low as 60V! At this low voltage, not only are the lights are dim, neither can any other equipment be operated!

In short, pace of electricity generation has not kept up with the pace of increased grid-access under RGGVY, whereas, demand has been increasing at a rapid pace. The Load Generation Balance Reports by Central Electricity Authority (CEA) of India, shows that the gap in average supply and demand varied from 8 to 11% between 2007 and 2012, while the peak

varied from 9 to 18%. There has been a general decrease in the deficit, but there is still a long way to go. According to a 2009 McKinsey Report, both the peak and base deficits will, in fact, increase to 14% and 20% respectively by 2017 at the current rate of growth in India.

It's clear that there is a huge latent demand for regular power supply in our rural areas. And there has been increasing gap in supply and demand. What have the entrepreneurs been doing to tap into this opportunity?

What entrepreneurs are doing to address this problem?

Over the past decade, several attempts have been made to address the energy deficit and access to it by the poor and rural populace. While grid-electrification has been the primary effort of the government, decentralized renewable energy technologies have played a significant role in this effort. It all began with MNRE (Ministry of New and Renewable Energy) distributing solar lanterns to the villages, later resulting in a massive campaign by TERI (The Energy Research Institute), under its "Lighting a Billion Lives Program" (LaBL). The first phase of LaBL, from January 2010 to July 2010, provided lighting to around 50,000 rural households spread across 300 villages in 9 states of India. The second phase of the project extended the program from July 2011 to June 2012 covering 700 more villages spread across 16 states. The final goal of this program is to cover 1000 villages spread across 17 states in India.

The real breakthrough, however, came from an entrepreneur, Harish Hande, who founded Selco to address rural home lighting in Karnataka. Started in 1995, Selco has provided over 135,000 solar home lighting systems (SHLS) in the past 17 years [Ref]. With their on-the-ground experience, Selco discovered that the solution is actually in financial engineering and not in lighting or energy engineering! They worked on providing access to bank loans for the consumers to purchase a SHLS. Selco partnered with local Grameen Banks to arrange mini loans for its customers, and helped scale the model across Karnataka. However, it has not been able to scale the model to other regions of the country due to limitations of the financial model and service levels requirements. From these limitations and constraints, Selco has now moved to working on a model to develop local entrepreneurs to replicate its model across the country.

In parallel, another pioneering company, DESI Power, developed a micro-grid pay-as-you-go model for renewable electricity produced from biomass and distributed through privately developed micro-grids, serving the villagers in Araria, Bihar. Their goal is not to just provide lighting, but to provide electricity through biomass gasification system. DESI Power now powers rice mills, irrigation pumps and other such microenterprises. In contrast to many Government schemes, DESI Power's customers paid for the electricity they used. They have a target of 100 villages in that district, and according to latest status report of the program, four village grids have been developed. DESI

Power inspired several other micro-grid players and models that have emerged over the decade.

One of these is Husk Power Systems (HPS), which adapted the DESI Power program into their own model. They focused only on providing evening lighting to the villagers in Western districts of Bihar such as Champaran and Muzaffarpur. They are replacing the local DG based electricity supply with electricity generated from a renewable source. HPS also innovated a low-cost husk-based biomass gasification system to address affordability issues. Since 2008, HPS has successfully installed more than 80 plants in Bihar, providing electricity to over 200,000 people across 300 villages and hamlets [Ref]. Husk developed the first 'commercial' social enterprise for rural electrification with micro-grid, balancing between social impact and profitability.

Mera Gao Power, entered this market a in 2010, and chose solar as the power source. They innovated low-cost solutions and packages to serve the remote and extremely poor population of the villages in Uttar Pradesh. They have, so far, set-up micro-grid power plants in 48 villages of Reosa Block of Sitapur District, Uttar Pradesh serving 1,200 households and approximately 6,000 people. Their goal is to touch one million people by 2017 [Ref]. Minda NextGenTech is the latest entrant in the solar micro-grid based power supplier in the villages since 2011. Several new breed of companies, such as Gram Power in Rajasthan and Nature Infratech in Bihar, are emerging to provide power to the villagers.

Challenges and Opportunities

The models above have seen their own share of successes and failures. Individual home lighting solutions demand a large up-front cash outlay from the poor consumers whose day-to-day living depends on a meagre income. MNRE subsidies have come in handy for solar lantern solutions, so has TERI's LaBL program. However, these programs have not been sustainable. Selco's solution of consumer finance to its customers through local banks have worked and been very successful in Karnataka. However, they have not been able to replicate this in other parts of the country. The banks are generally not interested in lending small amounts of money for personal consumption. The Micro-grid approach has solved both of these issues. Consumers don't have a large upfront large cash outflow. Instead, they benefit from the pay-as-you-go model, which is easily affordable on a daily, weekly, or monthly outflow of small amounts, which in any case is spent for lighting (kerosene/DG) and, more importantly, for mobile phone charging.

The pay-as-you-go model has been in existence for a while with local entrepreneurs providing one, two, or three lights, fans, etc. to consumers through DG sets. Husk Power adapted this model with bio-mass-based electricity generation. Both of these models have worked both in non-electrified as well as electrified areas where power is intermittent, unpredictable and limited to just a few hours. The micro-grid solutions, from the early days of DESI Power to the latest addition of Gram Power, all face common issues of distribution,

collection and control. Most operators use a large micro-grid for distribution, and manual process for collection which adds cost. Controlling defaulters is also a manual process, requiring human intervention. Technical interventions are needed to resolve these process issues and improve the affordability of such solutions. Simpa Networks has introduced technologies to address collection and control at the individual home lighting level. Gram Power also claims to have addressed this issue for micro-grids.

A survey of CEOs in this sector revealed a few key pain points. One of the major issues that all of them pointed out was the lack of skilled people. As Gyanesh Pandey of Husk Power put it, "Availability of talent is a major problem in this sector". Praveen Bhasin of Minda NextGenTech echoed similar concerns. This lack of talent is across levels – from executives to engineers to technicians. "The issue is not that we don't have talented people, the bigger issue is finding the right talent willing to work in the villages and at compensation levels commensurate with the business model!" This is an area that has primarily gone unaddressed in this sector.

Another major challenge for all these models has been the unavailability of financing mechanisms. While for SHS, individual small financing has been an issue prohibiting scale-up of Selco's Karnataka model, the micro-grid world has faced the same issue at enterprise level. Micro-grids need an equivalent of micro-project financing that is not available in the market. Plus, the business model for rural micro-grids demand a patient capital, as the return on capital is usually delayed. According to Nikhil Jaisinghani of Mera Gao Power, financiers looking at this sector are also worried about uncertainties from changes in demand as more and more villages get electrified, and changes in policies to make these models viable in the long-run, that is required to recover profits from such ventures. This leads to the challenges of policy reforms that are lacking in this sector. Most government policies are for large scale MW level power generation and feed to the grid, or for completely off-grid solar systems. Policy intervention is needed for the micro-grid sector, extending benefits like that of National Solar Mission to the small micro-grid players.

In summary, there are still numerous challenges to address in rural electrification. However, these challenges create opportunities and it is for the enterprising, innovative entrepreneurs to exploit these opportunities and create solutions to address this market.

For questions or comments, you can contact the author, Ashok Das, at info@sunmoksha.com.

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