

ECOSYSTEM CREATION FOR OFF-GRID SOLAR: ACHIEVING DIFFUSION ACROSS INDIA



EXECUTIVE SUMMARY

Despite the launch of the National Solar Mission and its ambitious targets for the diffusion of solar energy in India by the Government in 2009, diffusion of off-grid solar has yet to take off in a number of states across India. Service providers and Regional Rural Banks have managed to combine their efforts to create successful financing mechanisms for solar home lighting in Karnataka and Uttar Pradesh, but in other states the market for off-grid solar remains nascent. In fact, most of these other states lack key prerequisites for market development that go beyond end-user financing. As outlined below, in this paper the REWG presents some recommendations that attempt to address all aspects of market creation through the establishment of a conducive ecosystem¹.

- Publicize the availability of funds for capacity-building within banks and awareness generation programmes for end-users¹
- Create innovative forms of training for bank personnel, including interactive workshops and show-and-tell demonstrations, based on best practices of previous programmes
- Support solar off-grid entrepreneurs who can cater to local markets through well-developed rural networks for sales and servicing. Reliable post-sale service ensures loan repayment and mitigates the risk of banks.
- Bolster the development of Human Resources for solar enterprises by linking the NSM with initiatives such as the National Skill Development Mission. There is a vital need for skill development at every level of the solar off-grid sector, especially in distribution networks and technical roles. The NSM must take full advantage of the 600 ITIs in the country to increase the capacity of local people to handle the sale and maintenance of solar energy technologies²
- Increase partnerships with civil society and local government and non-government entities by involving them as facilitators between banks, service providers and end-users
- Give greater attention to Research and Development and the innovation aspect of NSM policy, particularly innovation addressing the needs of nascent markets and overlooked communities. Energy for alternate business models such as Small and Micro Enterprises warrants attention.

¹ Since the writing of this paper, the group has taken proactive steps in an attempt to address some of the specific recommendations- particularly those relating to Human Resource Development and capacity building.

INTRODUCTION

Over the last decade, the promotion of off-grid solar energy has seen some success in Indian states such as Karnataka and Uttar Pradesh. Many of these efforts have been recognised internationally for their innovative approach. Access to solar home lighting has been made possible by leveraging the existing extensive banking network to provide bank loans for end-users that circumvent the problem of high up-front cost of solar home lighting systems (SHS). Rural regional banks (RRBs) as well as the UNEP Solar Loan Programme have pioneered this financing mechanism to make available the benefits of decentralised solar energy in rural locations. This has addressed a previously largely overlooked market and proved that rural India is both able and willing to pay for reliable, clean energy.

Acknowledging the potential benefits of solar energy, the Jawaharlal Nehru National Solar Mission (NSM) was launched by the Prime Minister in January 2010 under the Ministry for New and Renewable Energy (MNRE). Under the off-grid component of the mission, a capacity target of 200MW was set for Phase I (2010-13), increasing to 1000MW by the end of Phase II (2017) and 2000MW by 2022, including the deployment of 20 million solar lighting systems for rural areas by 2022.³

Unfortunately, for various reasons, the off-grid component of the NSM has not taken off as expected. Under Phase I, both the initial and

revised subsidy schemes have posed problems for banks in terms of high transaction costs and procedural delays (see REWG paper on Review of Financing). More importantly, the subsidy scheme, which was meant to help kick-start and increase the diffusion of off-grid solar, has not been significantly useful in ensuring this in states with nascent markets. It thus becomes apparent that market development, in addition to end-user financing, requires a holistic approach that addresses the needs of all stakeholders.

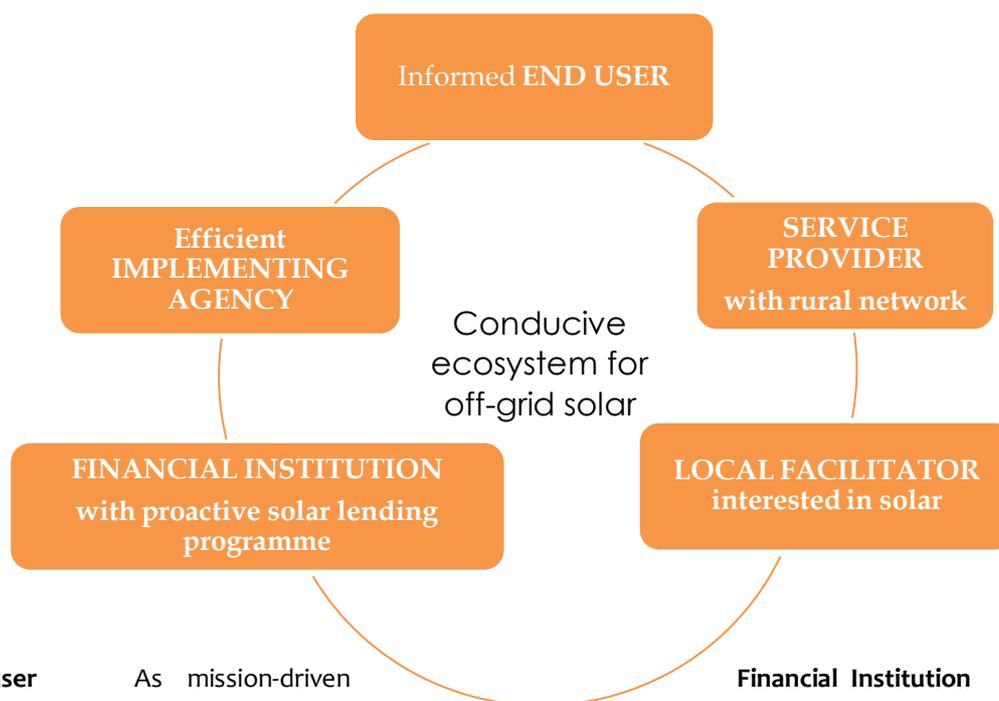
Looking towards Phase II, there is great potential to scale up by replicating the existing successful business models in other states with nascent off-grid markets. To achieve the social mission of rural electrification and development, the use of decentralised solar energy must continue to grow. Our primary objective is to make recommendations regarding the broader effort of creating an ecosystem for off-grid solar in India, while asking the question of how successful models can be replicated to achieve diffusion of off-grid solar across the country.

Based on the experience of the REWG with various solar energy initiatives around the country, this paper also offers some recommendations for facilitating market development in the rest of India.

CREATING A CONDUCTIVE ECOSYSTEM FOR OFF-GRID SOLAR

Creating a market to foster the diffusion of off-grid solar requires a holistic approach that looks at the market as an ecosystem (see diagram below). Developing a conducive ecosystem involves making sure that all

stakeholders are present and able to fulfil their respective roles. Based on our experience as practitioners in the off-grid solar energy space, we have mapped out what this kind of ecosystem would look like for off-grid solar.



End-user As mission-driven enterprises, we see the target market for off-grid solar as under-served rural households. End-users need to be aware of the benefits of the off-grid solar technology, the ability to access credit from banks in the form of solar loans and the availability of government subsidy.

Service Provider A commercial entity that is mission-driven, catering to the needs of the end-user. To reach the target market, the service provider needs to have a strong rural network. To ensure end-user satisfaction and problem-free loan repayment, it is essential to provide high-quality products that include reliable post-sale servicing.

Facilitator A local third-party organisation can bring much added value to the process in facilitating communication and transactions between End-users, Service Providers and Financing Institutions. Local vested interests for off-grid solar help to push end-user awareness and solar lending by financial institutions.

Financial Institution Financial Institutions have included mainly commercial and regional rural banks, but innovative forms of financing can also be provided through Self Help Groups (SHGs) and Cooperative Societies. These institutions play a crucial role in making off-grid solar affordable through the provision of credit in the form of solar loans. For solar lending to take off, there needs to be initiative on part of the bank in making credit accessible, with proactive managers at all levels.

Implementing Agency The entity that sets guidelines for solar lending and is the source of finance for any subsidy. In the case of the NSM off-grid subsidy scheme, NABARD has been the (government) implementing agency. Often, for Micro and Mini-grid systems, MNRE itself is the implementing agency. To ensure a well-functioning ecosystem, the implementing agency needs to have effective internal processes as well as close relationships and communication with stakeholders on the ground.

RECOMMENDATIONS FOR FACILITATING MARKET DEVELOPMENT IN NASCENT MARKETS

In a nascent market, the initial cost of creating a market for off-grid solar can be very high, yet MNRE currently provides little additional support or policy differentiation for states with nascent markets. In many states the prerequisites for diffusion of off-grid solar, such as proactive financing institutions and service providers with a rural network, are absent. Creating an ecosystem conducive to replication in these states will thus require additional support. Below we have provided some suggestions for action that attempt to cover all aspects of the ecosystem. While these are macro-level recommendations, the REWG, is interested in working the government to help develop the action plan to implement these recommendations and achieve impact on the ground.

1. Creating awareness among end-users

For most rural end-users dependent on kerosene or diesel, purchasing solar home lighting would make economic sense. However, in many nascent markets, such as Bihar, awareness among end-users is quite low. To provide the necessary push for adoption, end-users need to be aware of the benefits of off-grid solar, the ability to access credit from banks in the form of solar loans and the availability of government subsidy. To achieve this, awareness generation programmes, similar to the Financial Literacy programmes under the government's Financial Inclusion scheme, need to be conducted. MNRE must use resources allocated for awareness creation optimally and capitalize on the interest of facilitators in this regard. Facilitators interested in promoting solar energy can significantly influence the opinion of local communities, and present a potentially suitable entity for organizing awareness activities.

2. Supporting solar entrepreneurship

It is crucial to support solar off-grid entrepreneurs who can cater to local markets through well-developed rural networks for sales and servicing. The government should support enterprise creation in the off-grid space by plugging in the various missing gaps in the value chain. The current climate is challenging for renewable energy start-ups. For example, enterprises have to be three years old to apply for subsidies from banks. Existing policy assumes that all states have a presence of vendors with adequate know-how and well-developed networks, but as demonstrated by the case studies included on Bihar and the UNEP Solar Loan Programme in Maharashtra, this is not the case for many nascent markets.

As a government flagship policy with the overall aim of creating a solar energy industry in India, the NSM should also provide more support for service providers through encouraging Human Resources development as well (see Case Study 1). In line with the objective of the newly established National Skill Development Mission (NSDM), the NSM should seek to take advantage of the already existing 600 technical training institutes in the country to increase the capacity of local people to handle solar technologies on the ground. For enterprises operating in this sector, the distribution network needs to be extremely robust and a stimulus must be provided in increasing the availability of skilled personnel in this area for the solar sector. In general, attention needs to be paid to developing human resources at all organisational levels of solar enterprises - operations, sales and

marketing, finance, servicing and community involvementⁱⁱ.

The MNRE accreditation and rating process for off-grid solar channel partners is unclear in terms of its criteria. For mission-oriented service providers, obtaining a good rating is very difficult even if they are long-established enterprises. MNRE must make sure that the rating criteria used by CRISIL are customized to evaluate off-grid solar, and if relevant, also more specifically to evaluate social enterprises as a specific business model with criteria distinct from what is currently used for rating other commercial entities. To support service providers with high-quality products, post-sales service should be included as a rating criterion after the first year. For example, CRISIL could evaluate system performance and post-sale support through field visits for a certain sample end-user base and use findings as a basis for the overall rating. The ranking of service providers with regards to this post-sale support criterion could also be publicized separately on the MNRE website, thereby giving enterprises an incentive to provide better service.

With regard to day-to-day operational requirements, it would be extremely useful to reduce the paper work and procedures involved for enterprises to function. In the case of mini and micro-grid operators, the procedures involved in submitting the Detailed Project Report (DPR) are extremely time and resource intensive. For smaller systems (say less than 10kWp), allowance to set up the micro-grid through a local partner without DPR can reduce the hassles for the Enterprise and speed up the provision of energy access. Streamlining the process and making it more enterprise-friendly is essential.

Ideally, the MNRE should support Off-grid practitioners' plea to remove Value Added Tax and other such taxes applicable at the State

level on Renewable Energy products and spare parts. This is bound to impact the end user and their expenditure on energy access.

Lastly, solar enterprises should be able to benefit from the same provisions the government has made for Small and Micro Enterprises (SMEs). This includes being eligible for the Credit Guarantee Scheme, under which SMEs can avail an unsecured loan from any nationalized bank⁴. Onergy, a renewable energy service provider and close REWG partner in West Bengal (see Case Study 2), tried to avail a loan under the scheme but was rejected on the grounds that the loan was for working capital and not capital investment. However, the fact that off-grid solar was probably an unfamiliar sector to the bank could have also contributed to the decision. Clearer communication between Implementing agencies and Enterprises on all aspects of Project implementation is vital.

In general, the NSM is silent on micro-entrepreneurs, who contribute in an important way to enhancing the livelihood generation opportunities of off-grid solar, taking it beyond mere solar home lighting systems. Micro-entrepreneurs running charging stations for street vendors, mobile charging or community energy centres need to be considered as potential beneficiaries when designing subsidies and other incentives. Currently, many alternate business models with great potential are receiving little attention from the government.

ⁱⁱ Subsequent to this paper having been written, appropriate organizations have been approached about creating a constructive solar training programme through entities like RUDSETIs that can be scaled up across the country to simultaneously also meet the requirements of the Skill Development Mission and Rural Livelihoods mission.

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graph TD; End-user --- Service-Provider[Service Provider]; Service-Provider --- Facilitator; Facilitator --- Financing-Institution[Financing Institution]; Financing-Institution --- Implementing-Agency[Implementing Agency]; Implementing-Agency --- End-user;
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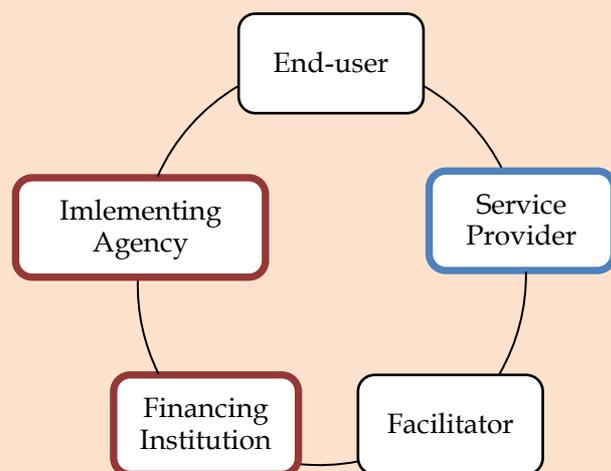
Case study 1: UNEP Solar Loan Programme in Maharashtra⁵

The success of the UNEP Solar Loan Programme in Karnataka and Kerala during the years 2000-2005 is well known. UNEP partnered with service providers and commercial banks (and their partner *grameen* banks) to establish a lending mechanism for SHS, which included a back-ended interest subsidy that was gradually scaled back over the course of the scheme.

A less well-known fact is that that UNEP also attempted to replicate the positive experience of Karnataka in Maharashtra. A partnership was established with the Bank of Maharashtra, with direct involvement of senior management. The bank was enthusiastic about solar lending and had a good network of branches in rural areas. Seven districts were selected for being high potential markets for SHS, and a training programme was conducted for branch managers in the style of the successful format developed by Winrock International.

However, the state lacked a presence of service providers with a comprehensive rural sales and service network. At the time in Maharashtra, off-grid solar was not being done through a direct marketing model, but rather through a dealer-run model, largely focused on solar water heating. The vendor infrastructure found in Karnataka was absent in Maharashtra – a crucial component of the ecosystem was missing. As a consequence the Solar Loan Programme was unsuccessful in Maharashtra. UNEP reviewed solar lending in the state after one year, and found that only 10-20 loans had been sanctioned. This illustrates how market creation is a holistic process that requires more than the simple availability of end-user financing. In order to establish a conducive ecosystem and achieve diffusion in nascent markets it is necessary to support for off-grid solar entrepreneurs who can cater to local markets through well-developed rural networks. As emphasized by Recommendation 2, this can be achieved through supporting the development of Human Resources of all organisational levels of solar enterprises, especially of technical staff.

Case study 2: Onergy in West Bengal⁶



Onergy is a renewable energy enterprise headquartered in Kolkata, West Bengal. The company was founded in 2009 to address the energy needs of bottom-of-pyramid (BoP) households across rural India by providing decentralised energy solutions in the form of a complete package including product, service and customer financing. Currently the product line is focused on off-grid solar solutions.

The market for off-grid solar in West Bengal is still very much underdeveloped, despite large potential created by high solar insolation and below-average rural electrification. Initially,

making SHS affordable proved challenging since it was difficult to convince banks to provide loans for this new unfamiliar product. The banking infrastructure of West Bengal is much weaker than that of Karnataka – most banks in the state are operating at a loss, and the default rate on loan repayment is also higher. These factors make banks in West Bengal a lot more risk-averse: they do not want any more non-performing assets in their loan portfolio.

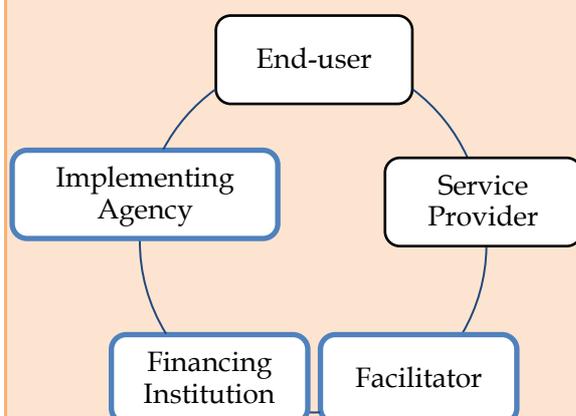
Onergy is currently working with all Regional Rural Banks (RRBs) in the state, as well as three commercial banks. The key to finally managing to convince banks to engage in solar lending was largely to identify the right people – proactive bank managers with a positive attitude. NABARD had a passive role in facilitating some introductions between bankers and service providers by organising networking events. NABARD could take a more active role in publicizing funds available for capacity building of banks, and consult an entity (service provider or third-party facilitator) to organise a training programme for bank managers including show-and-tell demonstrations of SHS and sensitization workshops. As emphasized by Recommendation 1, this kind of additional support is necessary for creating enthusiasm among banks regarding solar lending in nascent markets where familiarity with off-grid solar energy is lacking.

3. Involving third party organisations as facilitators

Interviews with players in the field have revealed the importance of organisations acting as facilitators between the service provider and the bank for the success of solar lending programmes, as reflected in Case Study 3, where SEWA Bharat acted as a facilitator in the state of Bihar. Service providers should seek to identify and partner with community organisations and NGOs to connect end-users with banks. Third parties can advocate for banks to take up solar lending and facilitate handholding between the end-user, service provider and the bank in the initial stages of

market development. These facilitators would probably have to be organisations with a certain focus on social development and community betterment. Third party organisations with a social mission can be incentivised by giving them recognition of their efforts through award schemes. Furthermore, by identifying local organisations with an interest in off-grid solar, additional impetus can be given to awareness generation among end-users and the task of convincing banks to engage in solar lending.

Case study 3: SEWA Bharat in Bihar⁷



SEWA Bharat and SELCO India partnered to undertake a pilot project in 2010 in Munger district of Bihar to electrify 57 off-grid homes with solar home lighting and mobile phone charging systems. Encouraged by the response in the pilot phase, SELCO was confident that a full-fledged project could be undertaken at a larger scale, making optimum utilization of the National Solar Mission policy and its subsidy scheme.

This project, operational since April 2012, has a target of 400 Solar Home energy systems over a period of one financial year (2012-2013) with 100 systems being installed every quarter. The aim was to create a holistic and sustainable model after considering all aspects of financing, technology, community interaction and current policy. Till date, 100 solar home lighting systems have been installed through the SEWA Bharat-SELCO partnership in Khadagpur taluk of Munger, with financing from the Bihar Kshetriya Grameen Bank. The bank proved to be an excellent partner for the project: it is the most profitable *grameen* bank in Bihar with an enthusiastic senior management. This is the first set of off-grid solar loans sanctioned by the bank, with subsidy to be received from NABARD as per the NSM off-grid solar subsidy scheme. Tremendous support has been received both from the Bank and NABARD officials in the district in the sanctioning the loans.

A special feature of the project is that the bank sanctions loans to Self Help Groups (SHGs) through SEWA Bharat, whereas in Karnataka and Uttar Pradesh solar loans are usually given on an individual basis. Lending through SHGs is a win-win scenario for both the bank and the end-user: it makes credit available for end-users that may not have been able to take a loan individually, and also represents a loan of larger volume for the bank, making it a more attractive product for lending compared to small individual loans with high transaction costs. This is a good example of innovation in end-user financing as mentioned in Recommendation 4.

While the project aims at complete financial sustainability with users paying for the cost of the system, facilitating the initial take-off required certain operational costs to be covered through funding support. These costs included: salary of local technical support, cost of training undertaken for the project, transaction costs in organizing loans and so on. For this first phase, on average Rs.600 is being spent per system as 'facilitation expenses' in coordinating efforts to get the project off the ground. It must be emphasized that the majority of these market development costs should be borne by the government instead of the service provider. The presence of SEWA Bharat with its strong community network and ability to process documents, interact with the bank on behalf of the Self Help Groups and oversee collections post loan sanctioning added great value to this project. This case also emphasizes the important role a facilitator can play in ensuring success in diffusing off-grid solar systems, as highlighted by Recommendation 3.

Although this particular project has seen success, the market for off-grid solar in Bihar at large remains nascent. According to records of the NABARD Office in Bihar, a meagre 280 solar off-grid loans were

sanctioned in all of Bihar in 2011-2012. Clearly, this scenario is an indication of the limited impact the NSM has had in the state so far. Bank personnel and NABARD officials have indicated that the reasons for this are: a lack of vendors with strong rural service networks; limited awareness among rural households and dearth of entities capable of proposing projects and ensuring collections and loan repayment. Due to the state's low rate of rural electrification there is great potential for off-grid solar – yet to fulfil this potential a lot of effort still needs to go into making the ecosystem more conducive.

4. Capacity development for financial Institutions

In nascent markets, banks are not always familiar with off-grid solar as a loan product, and would, in most cases, be hesitant to include solar loans in their lending portfolio. Convincing banks to engage in solar lending often takes a lot of effort, as demonstrated in Case Study 2. The entire cost of this cannot be borne by the service provider – additional support would be required.

MNRE has included the availability of funds for capacity building of bank managers in the NSM off-grid guidelines. Although these funds are available, few banks have made use of them. Their availability needs to be better publicized to banks. Training programmes need to be conducted for bank managers in nascent markets to familiarize them with solar lending. These should include interactive sensitization workshops and show-and-tell demonstrations of SHS, and be based on best practices, for example- similar to the format developed by the Bharatiya Vikas Trust (BVT) that has previously seen success. Ideally, a pool of funds would be created with NABARD, to which banks could apply to cover their capacity-building expenses.

A separate report by the REWG on issues specific to financing and the NSM off-grid subsidy scheme contain recommendations on what needs to be done to ensure credit access for the end-user, as well as mainstream solar lending to include targets and monitoring through banks and the RBI Lead Bank Scheme.

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5. Fostering innovation in product development and end-user financing

The NSM off-grid guidelines state as one of its objectives to “encourage innovation in addressing market needs and promoting sustainable business models”.⁹ This aspect of the off-grid policy needs to receive greater attention. The rural poor have been traditionally overlooked as a target group for innovation, hence there is need to put specific emphasis on creating solutions catering to their needs. Specifically, attention needs to be given to the energy needs beyond those of individual households, but also for micro-entrepreneurs as discussed earlier. Innovation in both products and business models is needed to encourage more productive applications of off-grid solar that can contribute to rural livelihood.

The government's **National Clean Energy Fund (NCEF)** is meant for investment in entrepreneurial ventures and research in the field of clean energy technologies, yet it has been suggested that 80% of the money available under fund remains unutilized.¹⁰ This money should be used to support start-ups in the renewable energy space – creating an incubation process for the next generation of renewable energy service providers.

Beyond the model of solar loans for individual households developed in Karnataka and Uttar Pradesh, innovation needs to continue with regard to end-user financing, in a continuous effort to widen the reach to the bottom of the pyramid. Financing through cooperative societies and self-help groups, as discussed in Case Study 3 on Bihar, helps strengthen access to credit for the rural poor. Research and

Development efforts are often focused solely on technology. This is detrimental to the final implementation of solar energy systems. There should be encouragement and provision to support innovative research models on the ground, that use solar lighting systems, mini and micro grids through financing and community linkages, under the NSM.

Lastly, it must be ensured that policy guidelines do not distort financial incentives to innovate. Currently, the technical specifications and benchmark costs of the current subsidy

scheme inhibit innovation of new products. It would be better to make the subsidy more flexible, making it based on the wattage of the system, rather than setting a benchmark price. As under the UNEP Solar Loan Programme, some indicative price ranges for different products can instead be given to protect end-users from over-pricing. Commoditisation and commercialization of off-grid solar requires encouraging innovation and competition in a more free market where end-users face true freedom of choice.

CONCLUSION

The first phase of the NSM has seen some success in developing a financial mechanism for off-grid solar in parts of India. However, much of the cost of market development was borne by service providers. In nascent markets, additional support needs to be offered by the government to create conditions for the emergence of a new generation of solar entrepreneurs. This requires proactive efforts in areas such as: Human Resource Development for technical and non-technical roles, Innovation beyond solar lighting to other technology-financing models, encouraging the

role of facilitators where appropriate, Awareness creation among rural users and strengthening of financial mechanisms through timely capacity building. An ecosystem for solar energy will not be created in India unless all players take constructive efforts: it is the only way we can create a real breakthrough in decentralised solar energy in India and make social objectives realisable.

ENDNOTES

¹ MNRE (2010) Appendix 2, Guidelines on off-grid and decentralised solar applications: http://mnre.gov.in/file-manager/UserFiles/jnnsnm_g170610.pdf

² Similar to the exercise undertaken during the Agricultural Revolution, for machinery in particular

³ MNRE (2009) JNNSM Mission Document. Available at: http://www.mnre.gov.in/file-manager/UserFiles/mission_document_JNNSM.pdf

⁴ Credit Guarantee Fund Trust for Micro and Small Enterprises. <http://www.cgtsi.org.in/>

⁵ Based on interview with H V Kumar, Advisor to the UNEP Solar Loan Programme

⁶ Based on discussions with Vinay Jaju, COO of Onergy

⁷ Based on field interviews and inputs by various stakeholders in Bihar

⁸ Refer to REWG Financing Report

⁹ MNRE (2010) Guidelines on off-grid and decentralised solar applications: http://mnre.gov.in/file-manager/UserFiles/jnnsnm_g170610.pdf

¹⁰ Speech by MP Shri Kalikesh Narayan Singh Deo at the Lok Sabha, 21.08.2012

About REWG (Renewable Energy Working Group)

The REWG is an informal network of social enterprises delivering clean energy solutions in rural areas that has come together to speak in a unified voice and constructively engage with the various stakeholders in the eco-system, especially policy-makers. The initiative is currently being supported by the Khemka Foundation.