Workshop on Off-grid Access System in South Asia

January 06, 2011, TERI University, New Delhi, India

1.0 Background

Off-grid electricity access systems are of great interest, particularly in developing countries like India and other South Asian countries. Apart from the capacity to provide reliable, affordable and sustainable electricity access to remote villages as well as peri-urban areas with no or limited access to centralized grid electricity, they also have the potential ability to support local development, create local employment, and contribute to climate change mitigation. Despite growing popularity, commercial viability, operational issues, social issues, local governance issues plus institutional challenges remain the primary concerns for the sustainability of any decentralized energy system. Developing a techno-economically viable and replicable business model for every region is perhaps the first step in implementation of a successful off-grid access system.

The one day workshop on "Off grid Access System in South Asia" was organized by TERI and TERI University on January 6, 2011 at TERI University as part of the ongoing inter-disciplinary research project, on off grid delivery options titled "Decentralized off-grid electricity generation in developing countries: Business models for off-grid electricity supply". The project started in October 2009 and will continue until September 2014. The project is led by the University of Dundee with TERI, TERI University, Edinburgh Napier University and the University of Manchester as consortium partners. The project aims to find appropriate local solutions, which are techno-economically viable, institutionally feasible, socio- politically acceptable and environmentally sound, for sustainable electricity supply to off-grid areas. This workshop brought together a myriad of stakeholders, from India, Nepal, Sri Lanka and UK, consisting of off-grid energy sector researchers and professionals, bilateral and multilateral organizations, government officials, consultants and development practitioners from NGOs (non governmental organization) and CBOs (community based organization).

2.0 Objective of the workshop

The aim of the workshop was to give an opportunity to off-grid electricity sector researchers and practioners from South Asian countries to come together in a common platform, where they could discuss and share their experiences and brainstorm to arrive at various possible innovative and sustainable financing and delivery mechanisms to scale up off-grid energy access systems in various parts of South Asia.

The broad objectives of this workshop are:

- To provide a platform for sharing of experiences by international experts and practitioners in the energy sector; and

- To derive learnings from various programmes across the South Asian region to finally enhance the possibility of successful implementation of off-grid energy access systems by making the business models and supporting policies custom-made for each location by incorporating the social, environmental and local governance aspects into it.

2.1 Speakers

Senior officials from the Government of India, multilateral organizations, academia, NGOs, think-tanks etc. highlighted some of the key concerns in the off-grid electrification sector and debated about resolving the challenges ahead. The programme schedule including the list of speakers is appended in Annexure I.

2.2 Participants

The workshop was attended by 44 participants (the complete list of participants is provided in Annexure II).

3.0 Summary of Sessions

The workshop comprised of four sessions including the inaugural session, two technical sessions and a panel discussion. The following section highlights the summary of each session.

3.1 Inaugural Session

The workshop started with Dr Rajiv Seth, Registrar of TERI University formally welcoming the audience and sharing the TERI University's programme with all, and also stressing on the need of such research projects. Thereafter, Dr Subhes Bhattacharya, the project leader, presented the genesis, objectives, themes and expected outcomes of the OASYS project. Dr Bhattacharya while sharing his views on the project said this applied, multi-dimensional, collaborative research brings together the expertise of both British and Indian researchers on an important development issue. He shared that the research proposal is based on the premise that the a strategy has to promote innovative solutions as opposed to prescribing standard templates for adoption for which each rural area will have to search for its own solutions. This research will focus on hybrid, multi-functional technological platforms using innovative participatory delivery mechanisms (such as franchisees, licensees, co-operatives or other local enterprise models) and alternative funding options (e.g. micro-finance, capital grants, subsidies, fee-based systems). He further added that the focus on business and participatory approaches to off-grid supply is expected to produce practical local solutions for wider application in South Asia and beyond. It will also include a demonstration component and investigate up-scaling and replication possibilities.

Dr. S N Srinivas from UNDP highlighted the price parity issue between grid connected and off-grid projects and shared that UNDP India has undertaken pilot projects in off-grid access systems. Currently the projects are in closing phase and he suggested that OASYS project team may consider partnering with UNDP for its demonstration project. On a question raised by Mr K Ramanathan, Distinguished Fellow, TERI regarding the scope of the project – Whether the

framework of OASYS project would capture the possibility of grid connectivity of off grid projects in the long term - Dr Bhattacharya shared that the framework will take into account both standalone projects as well as projects that may become grid connected in the future.

3.2 Technical Session- I: *Sharing experiences on off-grid programmes/projects in South Asia*

Chair: Prof (Dr) VVN Kishore of TERI University

Dr Ahmar Raza, Director, Ministry of New and Renewable Energy presented India's experience on off grid projects focusing on solar PV systems. His presentation outlined the potential applications of solar PV systems, incentives and subsidies provided by Government of India and way forward for solar lighting in India. At the same time he also pointed out that one of the key concerns associated with the solar PV technology, is the lack of upkeep and regular maintenance of the installed systems. He then highlighted the Jawaharlal Nehru National Solar Mission, its objectives and targets and the bouquet of incentive instruments available under the mission for off-grid solar applications.

The next speaker, Mr Asoka Abhaygunawardana, Executive Director, Energy Forum and Adviser to the Minister of Power and Energy - Sri Lanka, shared Sri Lanka's experience with off-grid programmes. He highlighted the achievements and issues in two rural electrification programmes, launched by the Government of Sri Lanka and supported by the World Bank viz. (1) Energy Services Delivery Programme (ESDP) and (2) Renewable Energy for Rural Economic Development (RERED). He highlighted that during 1997 a network was developed for establishing a financing mechanism for off-grid power projects and the Energy Forum was created. He pointed out that despite a dismal performance in the initial phase of the ESDP, wherein only 556 systems were installed, the mid-term review helped in identifying the problems and subsequently plugging in the gaps. The programme introduced an innovative financing mechanism which is now considered to be a best practice by the World Bank. The projects have been able to disseminate about 120,000 SHS in Sri Lanka by the end of 2010. He also shared that they have established a Federation of Electricity Consumer Societies and Energy Forum conducts capacity building programs for electricity consumer societies and have so far trained village leaders attached to 200 societies. He concluded his presentation by highlighting that Sri Lanka government has committed to provide electricity for all by 2012 through three programmes - Vidulamu Lanka (extend the grid to all villages); Viduli Athwela (concessionary loan for grid connection and Grama Shakthi (provide renewable energy technologies to all remaining households who cannot be connected to grid).

Thereafter, Mr Dilli Prasad Ghimire, Chairperson, National Association of Community Electricity Users-Nepal (NACEUN) shared the experience of community based rural electrification in Nepal. He explained the underlying service delivery model in Nepal through case studies. The model is primarily a demand driven and offers numerous advantages over the services provided by the national utility of Nepal. He said that the community based model was initiated in the country with the enactment of community electricity by-laws in 2003. Mr Ghimire then discussed the community based rural electrification model and the community based operation and maintenance approach and said that under community based rural electrification model, the metering, billing and revenue collection from electricity consumers,

and operation & maintenance of low voltage distribution system is taken care of by the community user organization, while the Nepal Electricity Authority generates and sell electricity in bulk to the community user organization. He shared that 132 community rural electricity cooperatives are in operation now in Nepal providing access to 135,000 households. An additional 92,000 households will get electricity access after completion of projects in pipeline. He stressed to the fact that US $ 10.2 million have been invested in community rural electrification by the community as their share of contribution. He also shared the role played by NACEUN in ensuring the effective implementation of the community based electrification model. In conclusion, he opined that though community has been showing enthusiasms to participate in rural electrification and willing to contribute resources, an enabling environment is also required for increased community participation which can be achieved through appropriate policy framework, legal provision and institutional arrangements.

The session evinced a lot of interest amongst the participants, who raised several questions. Mr Govind Raj Pokharel, Senior Advisor and Sponsor Manager, Renewable Energy Asia, SNV Netherlands Development Organization, Nepal pointed out that a lot of investment goes into stand-alone systems in rural areas which sooner or later will get connected to the grid. This calls for proper planning and an enabling policy framework which takes into account the sustainability of such systems in the long run. Further, Mr K Ramanathan suggested that a proper strategy for supplementing/complementing off-grid systems with grid connection needs to be developed so that there is no lock-in. He also pointed that most of the off-grid programmes are dependent on subsidy, thus questioning the very sustainability of such systems. Dr Ahmar Raza responded to this by saying that off-grid projects shall continue to be relevant, sustainable at least for another two decades as the electricity from grid is not reliable in the rural and peri-urban areas of most of the developing countries.

Ms Anne Marie Moeller, Senior Adviser from Humana People to People India shared the experiences of promoting off-grid solar lighting in the Indian states of Uttar Pradesh (UP) and Rajasthan. She highlighted that they are covering 100 villages in UP and has earlier covered 34 villages in Rajasthan. In each of the villages, solar charging stations have been set up, under the aegis of TERI's Lighting a Billion Lives Campaign with 50 solar lamps each. A trained operator manages the solar charging stations and rents out the solar lamps to the community at a affordable rent. A technology resource centre has also been set up, covering 20-25 villages in clusters, to provide the necessary after sales service and ensure sustainability.

3.3 Technical Session-II: *Experience in implementing and maintaining off-grid projects in rural areas*

Chair: Dr Subhes Bhattacharya, University of Dundee, UK

The first speaker of the afternoon session was Mr. S. K. Shukla, Director, Chhattisgarh Renewable Energy Development Agency (CREDA), Raipur. His topic was 'Maintenance of Solar Power Plants' wherein he shared the experience of CREDA's GOLD model, a cluster based model for sustainable operation and maintenance of solar power plants. He brought forth the uniqueness of this model in the form of specialized channels for servicing the rural market. The presentation highlighted the challenges faced during implementation of this model in

Chhattisgarh and also mentioned its key features which contributed in the success of this rural electrification model while many other off-grid projects were unable to sustain themselves due to multiple issues faced in a rural market with a limited load requirement and paying capacity. The model has proven to be a success owing to a host of factors such as trained manpower available locally, good customer service and robust monitoring mechanism by CREDA.

The next presentation was on Solar Multi-Utility Centre and Smart Mini-grid; Experience in implementing and maintaining off-grid projects in rural areas made by Dr. Nivedita Thakur, Associate Fellow, TERI and Mr. Lalit Sahoo, Research Associate, TERI. While Dr Thakur shared TERI's experience in developing a solar multi utility (SMU) centre for livelihood generation with a case study, Mr Sahoo elaborated the concept of mini-grid and smart mini grids stating the example of the smart mini grid project being implemented in TERI's facility in collaboration with CSIRO, Australia. Dr Thakur explained the concept of SMU and the institutional model followed detailing out the roles and responsibilities of various entities such as local NGOs and self-help groups. She highlighted the value added application from the SMU such as solar lantern charging and renting, mobile phone charging, honey skimming, bamboo splitting etc and how these applications are benefiting the rural community covering 3-4 villages. Thereafter, Mr Sahoo pointed out how smart mini grids can offer numerous benefits such as electricity access to remote and economically backward areas, forecasting load demand and resource availability, helping in load and resource management for efficient operation, and its possibility of integration with the national grid. They concluded their presentation by emphasizing the relevance of smart mini grids for the OASYS project in the following areas: Optimization of whole system for developing techno-economical business model; and Integration of community needs by employing situation/demand driven approach.

The last presentation on 'Rural Electrification using Biomass' was by Mr Gyanesh Pandey, CEO, Husk Power Systems (HPS). He made an elaborate presentation on the business model of HPS which currently has more than 60 operational biomass gasifier based plants catering to over 300 villages and hamlets in Bihar. HPS has pioneered the concept of using rice husk to generate electricity in rural areas. The speaker stated that HPS has mainly three growth models – Build Own operate Maintain (BOOM), Build Own Maintain (BOM) and Build Maintain (BM).HPS offers competitive tariffs to rural consumers charging for the power and not the energy (per watt and not per kWh). In fact the consumers pay less for higher usage thus encouraging higher consumption and in turn ensuring greater profits for HPS. He emphasized that the payback period for the HPS project is only 3 years and they are getting support from various private equity fund and investors such as International Finance Corporation, Acumen Fund, Oasis Funds, Shell Foundation etc. In addition to providing electricity services, HPS also utilizes the charred husk for making incense sticks thereby contributing to their cash flow and also providing local employment opportunities to rural women. One of the questions posed by the participants was whether HPS was also involved in mobilizing the community and if the project is dependent on government subsidies. Mr Pandey responded by saying that HPS is purely a commercial venture and subsidies are not crucial for its existence, however any subsidy given by MNRE will be an added bonus. Ms Akanksha Chaurey, Director, Decentralized Electricity Solutions, TERI also asked if HPS has any plans of expanding in India, beyond Bihar where it is currently based. Mr Pandey answered by saying that HPS was thinking of exploring other areas as well.

3.4 Panel Discussion: *Off Grid Access System in South Asia - The Way Forward*

Moderator: Dr Akanksha Chaurey, Director, Decentralised Electricity Solutions, TERI

Dr Chaurey initiated the discussion stressing on the fact that the renewable energy technologies - be it biomass, solar, winds etc. have evolved over time and is here to stay. She posed a question to the participants for discussion - "Can we move towards a regime where it is institutionalized as a national policy itself, that if one wants to opt for a 4-5 kW plant or a 100kW plant, standard incentives should be available? Is it possible to have a one stop window or a common framework for all decentralized energy options?" Mr G Ashok Kumar, Director (Rural Electrification), Ministry of Power put forth his views about the status of power sector, in particular the scenario of off-grid electrification in India. He emphasized the importance of local communities in making any off-grid system a success. Further he stressed on the need for developing off-grid and village mini grids in view of the high transmission and distribution losses to the tune of 40 percent in the centralized grid. He also commented on the mounting financial losses of the state owned utilities which are severely impacting the distribution sector. He stated that a number of villages are getting electrified but not energized, due to inadequate power supply by the DISCOMs reiterating the significance of decentralized electricity solutions. He stated that the Ministry is making concerted efforts to remove the entry barriers for the private sector and make the environment more conducive. In this context, he mentioned that DDG (Decentralised Distributed Generation) scheme under the Rajiv Gandhi Grameen Vidyutikaran Yoyana, which presently requires an off-grid project developer to obtain a certificate from the state government to set up the infrastructure, is restricting the entry of private players. To remove this restrictive clause, the ministry is planning to revisit the DDG guidelines.

Mr Chandrashekar, Group CEO, IT Power took the discussion forward and said that instead of thinking of grid extension to villages, it would be better to think of a system of mini grids or regional grids. Ms Chaurey responded by saying that grids are essentially carriers of energy and cannot be done away with. However systemic inefficiencies in the grids would have to be addressed. She also said that sustainable business models could rely on subsidy by the public sector however they need to run on commercial lines by the private sector where each actor in the "value chain" is able to reap profits.

Mr Shantanu Mitra, Team Leader, Climate Change and Development, DFID India, said that funding organizations like DFID are interested in exploring how policy mechanisms can be designed in a way that they create assured markets for the new and innovative decentralized energy access systems. Dr Mitra also opined that DFID sees off-grid renewable energy as having a key role in tackling both poverty reduction and climate change. Scaling up of such technologies will have to be driven by the private sector, based on sustainable business models. We have a lot to learn about how such models can work in remote areas, and how there development can be supported by appropriate policies. He wished that the OASYS project would be contributing to filling up the knowledge gap on the business models by highlighting practical lessons and understanding what worked and what failed and why.

Mr B K Mohanty from Sambandh, an Orissa based NGO working in the energy access sector, underlined the importance of capacity building and training of communities for sustainability of off-grid projects. He further stressed on the need for providing effective after-sale services in these off-grid electrification projects to make them successful in the long-run.

Mr Pokhriyal brought the forum's attention to the issue of availability of sufficient and suitable forms of subsidy and other financing related issues. He was also of the opinion that local entrepreneurial capacity must be enhanced to bring about greater local development, which is sustainable as well. According to him, along with electricity, other forms of energy such as biogas for cooking stoves must also be given equal impetus as they contribute equally in bringing about monumental change in the lifestyles of the villagers.

Dr Srinivas, shared the experience of Hosahalli biomass gasifier based system in Karnataka which was set up by Indian Institute of Science, Bangalore. He said that the system has now stopped its operations as it became commercially unviable and could not meet the changing needs of the consumers. Price of electricity and availability of grid power was also one of the factors responsible for its failure, thus emphasizing the issue of price parity for future off-grid projects as well. He also shared the practical lessons from the BERI (Biomass Energy for Rural India) project. According to Dr. Srinivas amongst the various issues faced in an off-grid energy access project, lack of strong supply chains and absence of structured tariff systems are two major issues that need to be addressed.

Mr Sachin Rele from Autonic Energy Systems P. Ltd the last speaker on the panel, opined that the future projects must look into frontiers like that of poly-generation and hybrid power generation to be able to provide more reliable and power supply and also to make the projects financially feasible. At the end of the session, Dr Chaurey while highlighting the wider business potential for off-grid solutions, also suggested the need for clear regulatory arrangements and targeted financial support for wider social benefits.

4.0 Conclusion and Outcome

Dr Subhes Bhattacharya summarized the panel discussion and thanked all the participants and speakers for sharing their views on off-grid electrification projects. The diversity of presentations and the intense discussions that followed brought out important points, which will help the project in its subsequent activities. He indicated that:

- OASYS project will take into account all the suggestions made during the workshop which includes policy dimensions, alternative technological options, financial options, alternative regulatory and institutional structures to suit various conditions.

- The project will surely look into the policy issue to bridge the knowledge gap in this sphere. Similarly, the alternative participatory models being used in various parts of South Asia will be looked into. It will also consider the possibility of partnering with UNDP for the demonstration project. Other suggestions related to avoiding technological lock-in effects, using of off-grid options in peri-urban areas, as well as facilitating stakeholder interactions in a systematic manner will also be considered.

- A comprehensive database of off-grid projects would be developed taking inputs from organization that are implementing or supporting off grid projects.

- An attempt would be made to consolidate and build upon emerging successful business models, rather than populating a large number of alternative models.

The workshop delved on the fact that institutional issues and development of viable business models for rural electricity and energy supply needs adequate attention. Thus systematic analysis and research to find appropriate local solutions which have scale-up the potential and can be replicated, need to be found instead of universal or global solutions, to bring them to the mainstream. The workshop concluded with Ds Akanksha Chaurey thanking all the participants of the workshop for their active participation and wished to get support and cooperation from all stakeholders for success of the OASYS project.

Annexure – I

Program Schedule

09.30 – 09.40: Welcome by Dr Rajiv Seth, Registrar, TERI University, New Delhi

09.40 – 10:10: **The OASYS Project** – Genesis, Objectives, Themes and Expected Outcomes
by Dr Subhes Bhattacharya**,** Project Leader, OASYS Project, University of Dundee, UK.

10.10 – 10.30: *Tea/coffee Break*

10.30 – 13.00: **Sharing experiences on off grid programmes/projects in South Asia**

1. India - Dr Ahmar Raza, Director, Ministry of New and Renewable Energy, Govt of India
2. Sri Lanka - Mr. Asoka Abeygunawardana, Executive Director, Energy Forum, Sri Lanka
3. Nepal - Mr Dilli Prasad Ghimire, Chairperson, National Association of Community Electricity Users, Nepal

13.00-13.40: *Lunch*

13.40 – 15.00: **Experience in implementing & maintaining off grid projects in rural areas**

- Maintenance of Solar Power Plants - Mr S K Shukla, Director, Chhattisgarh Renewable Energy Development Agency, Raipur
- Solar Multi-Utility Centre and Smart Mini-grid - Dr Nivedita D Thakur, Associate Fellow, TERI and Mr Lalit Sahoo, Research Associate, TERI
- Rural Electrification using Biomass- Mr Gyanesh Pandey, Director, HuskPower Systems, Bihar

The business models, costs of off grid power, revenue collection, the practical implementation processes, and the operation and maintenance responsibility.

15.00 – 15.20 *Tea/Coffee Break*

15.20 – 16.40 Panel Discussion: **Off Grid Access System in South Asia – The Way Forward**

Moderator: Dr Akanksha Chaurey, Director, TERI

Panelists: Mr G Ashok Kumar, Director (RE), Ministry of Power, Government of India; Dr Shantanu Mitra, Team Leader, Climate Change and Development, DFID - India; Dr S N Srinivas, United Nations Development Programme; Mr Govind Raj Pokharel, Senior Advisor and Sponsor Manager Renewable Energy Asia, SNV Netherlands Development Organisation, Nepal; Mr Chandrashekar R, Group Chief Executive Officer, IT Power, India.

16.40 - 17.00: **Concluding Remarks** – Dr Subhes Bhattacharya, University of Dundee, UK

Annexure –II

Workshop on Off-grid Access System in South Asia

LIST OF PARTICIPANTS

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