

SCALING UP RENEWABLE ENERGY BASED MINI GRIDS FOR RURAL ELECTRIFICATION

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The energy situation in rural India



As per the Census of India 2011:

- 55.3% households are connected to the grid.
 - ▣ But, the availability of electricity supply continues to remain poor; 75% get less than 6 hours supply.
 - ▣ Per capita consumption is only 8 kWh per month
- 44.2% use other energy sources for lighting apart from electricity
 - ▣ 72.4 million households which is about 350 million people, use kerosene
 - ▣ About 1.0 million households use solar for lighting (mostly individual household lighting systems)
- 1.2 million households go dark after sunset
- 145 million households with no electricity or less than 6 hours electricity supply



The energy challenge in India

- Although a large section of rural India is connected to the grid, they do not receive electricity consistently
- Most villages receive less than 6 hours of electricity
- Around 9,000 remote villages in India where the grid may never reach due to geographical constraints
- **What role can mini-grids play in meeting this massive energy poverty challenge?**

Agenda of the discussion in Raipur



Objective: To discuss the policy framework required to scale up the development of mini-grids in rural areas

- To discuss the issues pertaining to the development of mini-grids in India, Centre for Science & Environment (CSE) in collaboration with Chattisgarh Renewable Energy Development Agency (CREDA) organised a workshop in Raipur on August 12 – 14, 2013
- Stakeholders included: NGOs, policy makers, financial institutions, and project developers based on solar, biomass, micro hydro, wind hybrid models
- Various existing models on mini grids were analysed including private sector based, CSR funded, external funds captured by NGOs, and government subsidy driven

The Chhattisgarh model

- Among the government subsidy based projects, the Chhattisgarh model has the track record of having scaled up mini grid projects with systems installed in more than 1,400 remote villages
- The operation and maintenance model, which includes the employment of local technicians for village clusters by CREDA has also been a notable approach
- Therefore, we organised a visit to remote villages in the Barnawapara wildlife sanctuary, about 100 km from Raipur, located in Mahasamund district



Stories from the ground

- The villages are completely off-grid and were using kerosene for lighting until the solar power plants were set up in 2003
- Rawan
 - A 4 kW solar power plant was setup in 2003 which was enhanced with another plant of 4 kW capacity in 2007 to suit the lighting needs of 70 households in the village
- Mohda
 - Village with 55 households powered by 4 kW of solar power capacity since 2003 to meet lighting needs only

Stories from the ground

- The power plants were designed only to meet lighting needs for 6 hours each day
- The plants were fully subsidised by the state and centre
- Users had to pay a marginal amount of Rs 5 per month on a flat rate basis
- Low generation and low plant load factor were recorded

Limitations in Chhattisgarh model



- Households were dissatisfied with just 6 hours of electricity and mostly received lesser than 6 hours after having connected more electrical appliances like television. Thus, the aspirations of the villagers were not accounted for in the design of the power plant
- Few households also purchased individual solar home lighting systems and continued to use kerosene for lighting during operational problems of the mini-grid
- When households are provided with electricity, their aspirations tend to increase, and they like to use other electrical appliances including fan, TV etc



Key takeaways from the discussion

The discussion analysed the various existing models that are currently operational in India

- The majority of the models rely on external funds, government subsidies, and CSR support
- In the private sector models, the unit cost of electricity is extremely high ranging from Rs. 35 to Rs. 120 per unit
- When the grid reaches, there is no scope for grid interaction and users prefer the grid as it is cheaper
- The current models cannot be scaled up due to the high cost of energy

Challenges faced by mini-grid developers



- Financing
 - ▣ High capital cost to be met without a viable funding model
 - ▣ Financial institutions are reluctant to provide loans for mini-grid projects due to the amount of risk and uncertainty involved
 - ▣ RBI has included off-grid solar lending to be prioritised by banks. However, this does not include mini-grids for communities
- Project sustainability
 - ▣ Once the grid reaches a village, there is little interest in the solar power plant due to the high tariff being charged by the solar power developer and opt for the

Key learning

The scaling up of mini-grids can happen only if:

- The unit cost of electricity can be minimized
- The growing aspirations met
- There is a viable financial model
- The developer can operate and co-exist when the grid reaches the village

CSE Proposal to scale up mini-grids



For remote-inaccessible villages (where the grid may never reach):

- In these areas, capital subsidies are essential in order to set up mini-grids with a combination of funds from the centre and the state as private sector is not likely to invest in these areas
- Tariffs should be levied on the end user for operation and maintenance. This can be considered towards their replacement of kerosene costs
- In this case also, provision has to be made for meeting the increasing energy need. This can be paid for by the consumers

CSE Proposal to scale up mini-grids



For villages where there is a grid or will reach:

- The model should be grid-interactive mini-grids
- Government programmes need to move from capital subsidy based model to feed-in-tariff model plus providing cheaper loans to meet upfront capital costs of the developer
- Tariff received by project developers could be two parts: end-users should be charged grid electricity rates; the other part of the tariff required to cover the cost should come as feed-in-tariff for renewable energy
- The funds required for the feed-in-tariff can come from many sources including the national clean

CSE Proposal to scale up mini-grids



- Once the grid reaches the village, the developer should have the certainty to export excess power to the grid at an approved feed-in-tariff
- The developer could also import power as and when required to meet the aspiring needs of the rural households
- Thousands of small power producers would import and export power from the grid
- This will help the local economy and create local jobs



Distributed renewable

- Millions without electricity today
- Should not take them through fossil route but provide leapfrog to clean power
- But this is expensive – need to find the financial model to scale up to meet needs and aspirations
- Learn from the current grid-based solar system which is based on generation based incentive and provides framework for action by private players
- Need to scale up; distributed renewable energy not about a few panels and lanterns