



De-centralised Micro Grids in India

Anil Agarwal Dialogue 2014



Scale of the Rural Electrification Challenge

- As per Ministry of Power figures, Village Electrification stands at 93%
- However, Rural Household electrification level is dismal at 54 % (Census 2011)
- About 7.5 crore rural households still not electrified
- Of the un-electrified villages, Bihar and Uttar Pradesh contribute nearly 46%
- West Bengal, Orissa, Madhya Pradesh, Jharkhand and Rajasthan are the other major contributors to the list of no HH electrification
- In many electrified villages power supply remains poor

Categories of Problems

- Grid has reached the village but large number of households (HH) remain un-electrified
- Village has been electrified but limited or no power supply
- Electrical grid has not reached the village because of remoteness



Different Categories, Different Solutions?

- Grid has reached the village but large number of households remain un-electrified
 - Small renewable based solutions targeting kerosene and diesel substitution reaching viability with limited/no capital subsidy
- Village has been electrified but limited or no power supply
 - Poor collections a major disincentive for supplying power, tackling the underlying socio-economic reasons more important than a debate between renewable or conventional energy
- Electrical grid has not reached the village because of remoteness
 - Off Grid Solutions are likely to be cheaper than grid extension
 - Schemes like the DDG program of the RGGVY or REAP of JNNSM are possibly the most appropriate solution for this.
 - The design and implementation of these schemes need to be improved to hasten the implementation process
 - The cost of creating the local grid (PDN) gets clubbed in the cost of the Renewable System.
 - For a like to like comparison with the cost of grid based power, perhaps this needs to be excluded and treated as a one time infrastructure cost like in the case of RGGVY



Outlook & Issues

- Large commitments to the sector from the Government (REAP of MNRE or DDG of Ministry of Power) with a clear intent on electrifying 20000 villages using micro-grids
- Similar interest shown by multilateral funding agencies like the World Bank and ADB. World Bank is in the process of rolling out Micro Grid based electrifications in seven districts in Uttar Pradesh and Bihar
- Despite public commitments actual roll out of these program is taking time
- Decentralized grids with capability to exporting to grids being suggested as an interim measure, but in the absence of coordinated policy making by MNRE, MoP and state discoms, too much ambiguity for private developers to pitch in
- Roll out of DDG program of RGGVY is slow with several tenders by implementing agencies not generating any vendor interest. Given the staggered payment models most developers feel pricing not commensurate with risk



Gram Oorja – the way ahead

- Gram Oorja's current focus is on rolling out RE based micro-grids in remote locations where grid extension is not feasible.
- Estimates for such villages vary from about 20,000 to more than double that figure if remote hamlets are included.
- Focus on providing electricity beyond basic lighting/mobile charging to include ability to service productive loads.
- Gram Oorja has already implemented two such projects in Maharashtra and Karnataka
- Surveyed more than 100 such villages and is planning to roll out n 10 more villages
- Model requires one time external funding support but O&M and battery replacement to be funded by tariffs
- Metered tariffs are crucial to ensure usage discipline



Villagers -Willingness to pay?

- Most village households incurring between Rs 100- 150 for kerosene and mobile charging
- At the bare minimum, Rs 100 per month should be feasible, provided power is supply as promised
- Gram Oorja's survey of 100 villages across Karnataka, Madhya Pradesh, Uttar Pradesh and parts of Maharashtra indicate that the threshold could be higher
- At Gram Oorja's plant there are customers who have run up bills of up to Rs 400/500 and have paid



Villagers -Willingness to pay?

- In some of the larger plants surveyed including Scatec Solar/Bergen, CREDA and Gram Oorja's Darewadi plant about 30% of the villagers have purchased televisions
- Government programs may be underestimating the ability to pay thereby threatening the long term sustainability e.g.
 - CREDA charges Rs 5 per household but the villagers purchase televisions paying upwards of Rs 7000/-
 - As a consequence, systems though fairly large by solar micro-grid standards(8-12 kWp) they are not able to meet the energy demand thereby causing disillusionment



Can Distributed RE achieve Grid Parity?

- Distributed generation of Solar remains very expensive primarily due to storage costs
- Matching the supply curve to the demand curve in an off grid scenario is a huge challenge, leading to unmet demand or conversely “wasted” producton
- Operations & maintenance can be prohibitively high in remote locations
- Community buy-in is vital for success of systems to reduce risk of theft, vandalism, non payment and illegal connections
- As percentage of revenue, collection overheads can be high in systems of small size
- Availability of skilled manpower locally can pose a challenge
- Biomass based systems while relatively less capital intensive can face challenges of regular feedstock availability at reasonable costs



Expectations – Policy environment

- Different ministries playing a role in the sector, often with overlapping programs
 - The Ministry of Power undertaking intensive grid extension through the Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY). This is usually carried out in conjunction with State Electricity Boards.
 - The Ministry of New and Renewable Energy (MNRE) run programs like Remote Village Electrification (RVE) and the proposed Energy Access Program under the National Solar Mission
 - State Nodal Agencies (SNAs) for Renewable Energy are usually the implementing agencies for MNRE programs. The SNAs themselves have varying interest levels, understanding and capability, resulting in very differing performance of these schemes across states
 - Several state governments like Madhya Pradesh, Maharashtra and Karnataka are running rural feeder line separation programs. expected to improve single phase electricity to rural households beyond the 6 hr threshold that both RGGVY and Remote Area Energy Access Program have defined for Renewable Energy based Micro Grids
 - Sporadic improvement of grid power as a consequence of local politics can threaten economic model of decentralised systems
- Expectations – A Coordinated policy framework among different govt stakeholders with a clear vision on the role that Decentralised Systems will play in the Rural Electrification Sector



Summary/Points For Discussion

- Three distinct facets/need different solutions
- State Electricity Board/MoP/MNRE programs have a clear bearing on strategy
- When grid power improves the population has a tendency to migrate towards it
- Decentralized Renewable based power is delivered between Rs 15 to 50 per kWh (possibly even more)
- Customers with no other options are the potential customers
- The remotest villages where grid extension is not possible, need to be electrified as an infrastructure building exercise



THANK YOU