Regional Training Workshop on Widening Access to Energy Services through Pro-Poor Public-Private Partnerships

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Scaling up Rural Initiatives - Financing & Delivery Models

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Points of Discussion

- Would productive-end-use enhance integration of energy in broader development agenda - Synergy with other sectors
- How can involving mainstream infrastructure companies [such as telecom] help to reduce the risk in rural energy initiatives?
- What are some of the on-going rural development programs or initiatives that promote productive use of modern energy services and/or promote partnerships with mainstream infrastructure companies?
Framework for Mini Grid

Lifeline ➔ Productive ➔ Consumptive

Small scale RETs
Ideal for isolated and vulnerable communities

Facilitate

Village-scale mini-grids
Ideal for larger or more developed villages

Facilitate

Could develop into

Mini-grids coupled the main grid
Ideal for cluster of villages

Facilitate

Level 1 - Basic needs
- Lighting
- Communication
- Cooking
- Heating

Level 2 - Productive uses
- Agriculture (water pumping, mechanized tilling etc.)
- Public health centers
- Education (Schools, tuition centres etc.)
- Street lighting
- Sewing, cottage industries
- Grain grinding

Level 3 - Modern society needs
- Modern domestic gadgets and appliances for space cooling, heating etc.
- All productive applications for 24/7 usage
- Transport

Source: TERI
Mini Grids in India: Earlier Model

FUNDING AGENCY
- Grant from Central Government
- Equity by PIA/NGO or Beneficiaries

Funding Agency

Consultant (DPR, system design, TA support)

System Supplier

$ System Supplier

PIA
- System Engineering
- System Owner

Power Plant

VEC
- System custodian
- O&M
- LT line Maintenance

VEC

Electricity

VEC

Consumers

Revenue: Tariff, billing, collection

Source: TERI
Some Lessons from early Mini grids

- Decentralized, low capacity, covering remote areas
- Usually domestic loads served
- Limited by capacity and duration of supply
- Community as stakeholder
- Tariff based on flat rate, locally decided, depending on O&M cost and WTP
- Non commercial in nature
- Clustering of projects more successful

- Inability to meet increased demand, no smartness
- Single energy resource catering to fixed load for fixed time
- Battery - vulnerable, overdrawl by most consumers
- Generation not as per design - quality issues of solar panel
- Difficulty in O&M because of remoteness
- Not linked to any productive enterprise/irrigation pumpset - viability ??
Hybrid System

55 kW Solar and 3.5 kW Wind Electric Generator based hybrid system

Source: TERI
Managing Mini Grids: Addressing low load

Source: TERI
Mini Grid - Private Sector

Husk Power System

Coverage ~ 80 villages, 33 kWe systems, Targets village with ~ 1000 hh, min 250 ready to take connection
Tariff: based on load ($2-3/month/HH for 2-3 lights, 5-6 hrs daily supply)
Synergies created for co-benefits & viability

Source: TERI
HPS Ecosystem

Source: Husk Power Systems
Solar Mini Grids in Chhattisgarh - 5P

- Providing access to population earning less than 1$/day
- Remote, tribal communities w/o cash disposable income
- Subsidy vs. financing - affordability?
- Subsidy for capital infrastructure?
  - ensuing operational sustainability → improved quality of life

CREDA has reportedly electrified around 35,000 households through installation of 1400 solar mini-grids and most of these mini-grids are operational
Financing

- Capital cost ~ 25000 INR (500$) per household
- Capital subsidy
  - 18,400 INR (368$) per HH - by MNRE under RVE program
  - Balance by state government
- Tariff per connection = 30 INR/0.6$ (2x11 W CFL)
- Tariff subsidy (by Chhattisgarh government)
  - 25 INR (0.5 $) per HH connection

In Sunderban region, tariff for mini-grids ranges between 2-3$ depending on light points (3-5) for 4-5 hours supply

Source: CREDA and WBREDA
Solar mini-grid model of CREDA

Source: TERI, 2012
3 tier Maintenance System

- Comprehensive Annual Maintenance Contracts (CAMC)
- Three tier system of maintenance
  - Project level - operator
  - Cluster level - cluster technician
  - For multiple clusters - Cluster supervisor
- Parallel supervision by CREDA staffs

Diagram:
- Partners (Group)
- Skills (Organize)
- Allocate (Load)
- Service (Delivery)
- > Install
- > Operate
- > Maintain
Cluster Based Service Delivery

Village Cluster
- 15 Villages
- 50 Customers / Village

H : Service Hub
( Base station )
- Technician / Helper
- Spares / Consumables

V : Villages in the Cluster

Source: CREDA
Pro-poor Energy Delivery Model - Essentials

- Designed to have **positive human development impact**, creating health, education & income opportunities
- **Economically sustainable** over its entire life cycle
- **Technologically appropriate** - capable of meeting local energy needs & demand
- Environmentally sustainable & socially desirable
- Participatory (may not mean managed by community, but community’s concurrence)
- Adaptable to different contexts - Scalable
Takeaways

- Defining success - not just financial but should also consider operational and outcome - benefits to community.
- Service delivery models to be structured considering the uniqueness of the region within which the plant is to be installed - *Today off-grid, grid-connected tomorrow*.
- Contrary to prescribed models of off-grid electrification, *top-down approach/organized structure* seems to be working better than community model - Scaling up may need differentiated responsibility.
- Anchor load may be useful for meeting the fixed costs - not necessarily energy costs - to reduce overall cost of supply from small capacity systems.
Takeaways

- Cost of supply may be considered as the metric for comparison and not cost of generation, while designing projects.
- Designing variable tariff structures considering both ability to pay as well as operational expenses.
- Strong regulatory & policy regime supports development of projects - Viability gap funding/Results based aid.
- Low cost /Patient capital required for scale up.
- Need to build local capacity and adopt clustering for effective maintenance & viability of operation.
- Most importantly - recognition by country political set up.
Any Questions ?