Remote Village Electrification

Gram Oorja’s Journey…

September 18, 2013
About Gram Oorja

Gram Oorja Solutions Private Limited (www.gramoorja.in) founded in 2008, acts as a catalyst in commercialising on-the-ground viable Renewable Energy solutions with focus on the rural sector. Founded by professionals willing to take a leap of faith in renewable energy solutions with a long term view.

Vision:
To achieve social good under a commercial framework, delivered with highest levels of ethics, integrity and professionalism

Focus Areas for Operations
- Rural mini grids based on renewable energy sources (solar/biogas/biomass/small wind etc) for off grid villages
- Act as an energy provider for commercial entities that use diesel gensets for their business (Rural BPOs, Telecom Companies, Bulk mill chillers, etc)
9.4 Kwp Solar System at Darewadi, a village 140 kms from pune

- Identified the village through social networks
- Convinced villagers about the project and monitored formation of trust for project maintenance
- Negotiated with Bosch Solar AG to have the project installed at the location as part of their Pilot project
- Designed the system jointly with Bosch and managed the end to end project execution
- Ongoing operations and maintenance of the plant including monitoring of system performance.
- Ensuring bill collection and trouble shooting.

Consulting assignment for Shakti Foundation

- Undertaken detailed survey of 85 off-grid villages
- The states covered are Uttar Pradesh, Madhya Pradesh, Karnataka and Maharashtra.
Experience - Others

- Renewable Energy Service Company - RESCO
  - 8.1 Kwp plant set up at a Rural BPO in Sonari. This is located about 70 kms from Lucknow
  - The plant supplies power for a 40 seat BPO
  - Gram Oorja owns the asset and has a long term power supply contract with the BPO
  - Project operational since mid 2011 and discussions for enhancement of capacity is currently going on

- Other Projects
  - Biogas based electricity supply for an ashram in Kumbakonam, Tamil Nadu. Gram Oorja was the EPC contractor for this project
  - Small solar projects executed in Mohali, Chandigarh, Naitwar in Uttarakhand
  - Solar water pumping solutions for villages in Jawhar, Thane district
Remote Village Electrification - Problem Statement
Dimensions to the problem

- Villages located in inaccessible locations
- Cost of taking grid to these locations are prohibitive OR not allowed by law
- Population in these villages have little or no access to modern sources of energy
- India has over 20,000 villages that remain un-electrified
- Latent demand exists
- India has a significant electricity deficit
Project Darewadi

**Why Darewadi**

- Proximity to Gram Oorja operational center – Pune
- No grid at Darewadi - hamlet does not exist on government records
- Initial social interaction showed willingness of villagers to set up a community level project
- Inhospitable terrain and significantly deprived community
Project Darewadi - Key features

- Collaboration between Bosch Solar Energy AG and Gram Oorja
- This is a reference plant to establish a model that works and is sustainable
- Helped in understanding implementation issues
- Project success as follows:
  - Moderate if project stabilizes over the longer term
  - High success if project scales up, based on demand
Darewadi – Key Factors

- Identification
- Sizing
- Implementation
- Maintenance
- Growth
Darewadi – Key factors - Identification

- Population - ~220
- Num. households – 39
- Distance from motorable road – 2 km
Darewadi – Key factors - Sizing

Bosch & Gram Oorja are looking forward to setting up renewable & decentralized power plants in remote villages, so that electricity can be provided for domestic as well as for productive applications.

<table>
<thead>
<tr>
<th>Plan</th>
<th>Vision</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Basic Hygiene</strong></td>
<td>Reduction in Kerosene use, hence smoke &amp; carbon</td>
</tr>
<tr>
<td><strong>2. Entertainment</strong></td>
<td>Reduction in migration</td>
</tr>
<tr>
<td><strong>3. Mechanization</strong></td>
<td>Reduction in human efforts for basic needs</td>
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<td><strong>4. Employment generation</strong></td>
<td>Reduction in migration</td>
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<tr>
<td><strong>5. Skill development</strong></td>
<td>Upward lift</td>
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**Darewadi – Key factors - Implementation**

<table>
<thead>
<tr>
<th>Sr No.</th>
<th>Item</th>
<th>Description</th>
<th>No</th>
<th>Model / Make</th>
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<tbody>
<tr>
<td>1</td>
<td>Solar PV Module</td>
<td>240 Wp</td>
<td>39</td>
<td>Monocrystalline Bosch Modules</td>
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<tr>
<td>2</td>
<td>Battery</td>
<td>600 Ah, 48 V</td>
<td>-</td>
<td>Amaron</td>
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<tr>
<td>3</td>
<td>Inverter</td>
<td>5 kW</td>
<td>2</td>
<td>SMA, Sunny Island Si 5048</td>
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<tr>
<td>4</td>
<td></td>
<td>10 kW</td>
<td>1</td>
<td>SMA, Sunny mini central</td>
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<tr>
<td>5</td>
<td>Mini-grid length</td>
<td>~1.5 km</td>
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<td>-</td>
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</table>

- Entire system has been paid for by Bosch Solar Energy AG
- Transmission and distribution also defined and specified as per Bosch guidelines
Darewadi - Key factors - Implementation
Darewadi - Inauguration!
Darewadi - Inauguration!
## Sample Energy usage - August 2012

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<th>ग्राहक क्रमांक</th>
<th>ग्राहक नाव</th>
<th>जोडणी पत्र</th>
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Darewadi – Key factors - Maintenance

Sample Energy Bill
Darewadi – Key factors - Growth

- In last 13 months, there has been an increase in the energy usage
- 7 households have purchased TVs with satellite connections
- 2 computers and a flour mill are in operation
- Water pump is in the works
- Collection has been very consistent
- Village Trust has taken complete ownership of the project
Rural Micro Grids

Current Government Programs

- Government has in the national solar mission modified its approach and is taking the mini grid approach to solve the problem
  - Is targeting 20,000 villages under its “Energy Access” program. To be achieved till 2017
  - 90% of the capital costs to be provided by central government
  - Collection of tariffs to pay for operations and battery replacement

- DDG program of RGGVY – Allocation of Rs 540 crores under the 11th plan
  - For locations where grid connectivity is either not feasible or not cost effective
  - To be implemented on a Build, Operate, Maintain Transfer Model over 5 years
  - Close to 280 projects covering 680 villages is said to be under implementation but progress is slow
  - First set of villages completed in Andhra Pradesh, in most other states the process is still at the bidding stage

- The World Bank has separately announced a program along with the MNRE (Ministry of New and Renewable Energy) targeted at specific states. In the first phase program to target Uttar Pradesh and Bihar

- ADB, IFC etc also are reportedly mulling similar programs
The Way Forward

Business Ecosystem – Relationships

Driver of Ecosystem

Regulator (Government)

Project Leader

Fund Providers

System Integrator

Component Supplier

System Operator

Village Committee

Village

Micro-Credit Providers

Final Ecosystem has to be verified with Pilot Projects
Darewadi – after electricity came in!
Thank you!

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