



Remote Village Electrification

Gram Oorja's Journey...

August 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)

Experience - Microgrids



- 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.
 - Detailed Project Reports prepared for 10 villages
 - Gram Oorja is in various stages of attempting to execute projects at these 10 villages including
 - Including discussions with villagers for project implementation
 - Approaching potential funders for the project including CSR , Local MLAs/MPs, NABARD, etc.

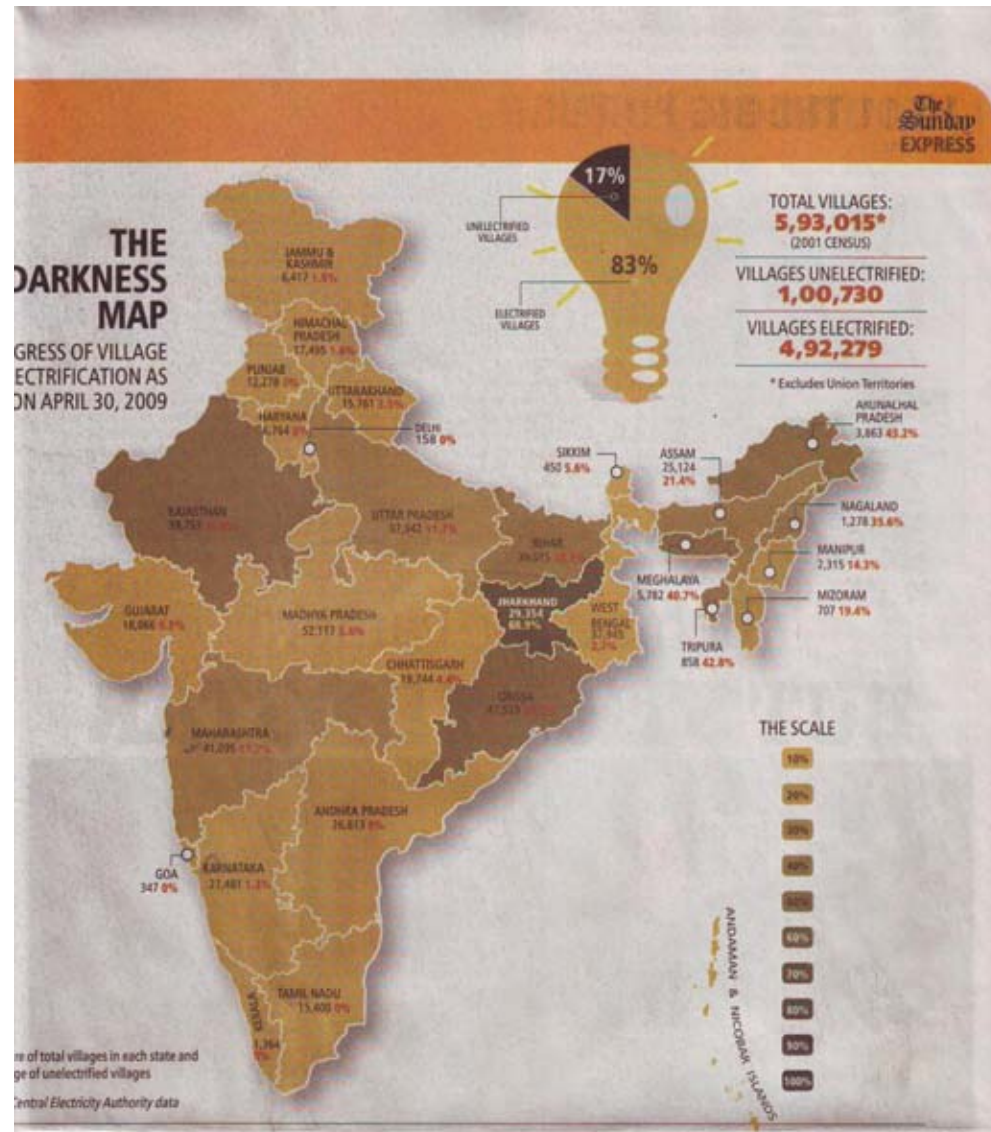
Experience - Others



- 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 100,000 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 govt. 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





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.

Plan	Vision
1. Basic Hygiene	Reduction in Kerosene use, hence smoke & carbon
2. Entertainment	Reduction in migration
3. Mechanization	Reduction in human efforts for basic needs
4. Employment generation	Reduction in migration
5. Skill development	Upward lift

Darewadi – Key factors - Implementation



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

- 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 – Key factors - Implementation



Darewadi - Inauguration!



Darewadi - Inauguration!



Darewadi – Key factors - Maintenance



Data collection

	SI5048EH	SI5048EH	SI5048EH	SI5048EH	SI5048EH	SI5048EH	SI5048EH	SI5048EH	SI5048EH	SI5048EH	SI5048EH	SI5048EH	SI5048EH	SI5048EH	SI5048EH	SI5048EH	SI5048EH	SI5048EH	SI5048EH	SI5048EH
	1.26E+09	1.26E+09	1.26E+09	1.26E+09	1.26E+09	1.26E+09	1.26E+09	1.26E+09	1.26E+09	1.26E+09	1.26E+09	1.26E+09	1.26E+09	1.26E+09	1.26E+09	1.26E+09	1.26E+09	1.26E+09	1.26E+09	1.26E+09
TimeStam	Adr	AptPhs	AptTmRm	BatChrgO	BatChrgVt	BatSoc	BatSocErr	BatTmp	BatVtg	CardStt	ChpPwrAt	ChpRmgTi	ChpStrRm	ChpStt	EgyCntIn	EgyCntOu	EgyCntTm	Error	E-Total	E-Total-In
hh:mm			hhmmss		V	%	%	degC	V		kW	hhmmss	hhmmss		kWh	kWh	h		kWh	kWh
0:15	1: Master	2: On	0 3: Float		53.43	99.17	7.6	25.9	53.4	2: Operati	0	0	0 1: Idle	253.9	169.4	1112 0: -----		169.4	253.9	
0:30	1: Master	2: On	0 3: Float		53.43	99.2	7.6	25.9	53.4	2: Operati	0	0	0 1: Idle	254	169.4	1112.2 0: -----		169.4	254	
0:45	1: Master	2: On	0 3: Float		53.43	99.3	7.6	25.91	53.42	2: Operati	0	0	0 1: Idle	254.1	169.4	1112.5 0: -----		169.4	254.1	
1:00	1: Master	2: On	0 3: Float		53.42	99.4	7.7	26	53.4	2: Operati	0	0	0 1: Idle	254.1	169.4	1112.7 0: -----		169.4	254.1	
1:15	1: Master	2: On	0 3: Float		53.42	99.4	7.7	25.96	53.4	2: Operati	0	0	0 1: Idle	254.2	169.4	1113 0: -----		169.4	254.2	
3:00	1: Master	1: Off	20000 1: Boost		57.03	96.23	3.5	25.9	52.14	2: Operati	0	0	0 1: Idle	254.3	169.5	1113.2 0: -----		169.5	254.3	
3:15	1: Master	1: Off	20000 1: Boost		57.03	96.04	3.5	25.9	52	2: Operati	0	0	0 1: Idle	254.3	169.5	1113.5 0: -----		169.5	254.3	
3:45	1: Master	1: Off	20000 1: Boost		57.04	95.31	3.5	25.76	51.59	2: Operati	0	0	0 1: Idle	254.3	169.7	1114 0: -----		169.7	254.3	
4:00	1: Master	1: Off	20000 1: Boost		57.06	94.9	3.5	25.61	51.49	2: Operati	0	0	0 1: Idle	254.3	169.8	1114.2 0: -----		169.8	254.3	
4:15	1: Master	1: Off	20000 1: Boost		57.06	94.45	3.6	25.58	51.4	2: Operati	0	0	0 1: Idle	254.3	170	1114.5 0: -----		170	254.3	
4:30	1: Master	1: Off	20000 1: Boost		57.07	93.8	3.6	25.5	51.3	2: Operati	0	0	0 1: Idle	254.3	170.1	1114.7 0: -----		170.1	254.3	
4:45	1: Master	1: Off	20000 1: Boost		57.06	93.32	3.6	25.53	51.2	2: Operati	0	0	0 1: Idle	254.3	170.2	1115 0: -----		170.2	254.3	
5:00	1: Master	1: Off	20000 1: Boost		57.07	92.77	3.6	25.5	51.16	2: Operati	0	0	0 1: Idle	254.3	170.4	1115.2 0: -----		170.4	254.3	
5:30	1: Master	1: Off	20000 1: Boost		57.07	91.28	3.7	25.48	51	2: Operati	0	0	0 1: Idle	254.3	170.8	1115.7 0: -----		170.8	254.3	
5:45	1: Master	1: Off	20000 1: Boost		57.07	90.68	3.7	25.42	50.99	2: Operati	0	0	0 1: Idle	254.3	171	1116 0: -----		171	254.3	
6:00	1: Master	1: Off	20000 1: Boost		57.08	90.1	3.7	25.33	50.96	2: Operati	0	0	0 1: Idle	254.3	171.1	1116.2 0: -----		171.1	254.3	
6:15	1: Master	1: Off	20000 1: Boost		57.09	89.4	3.7	25.24	51.02	2: Operati	0	0	0 1: Idle	254.3	171.3	1116.5 0: -----		171.3	254.3	

Darewadi – Key factors - Maintenance



Sample Energy usage – August 2012

वनदेव ग्रामोद्योग न्यास, दरेवाडी, पोस्ट देवळे, ता. जुन्नर						
ग्राहक क्रमांक	ग्राहकाचे नाव	जोडणी प्रकार	Meter reading			Bill amount
			1.8.2012	31.8.2012	Difference	
१	त्काराम खेमा बोऱ्हाडे	घरगृती				
२	सोमा आंबू शिंगाडे	घरगृती				
३	एकनाथ देवराम बोऱ्हाडे	घरगृती	25	26	1	92
४	लक्ष्मण देवराम बोऱ्हाडे	घरगृती	24	33	9	108
५	पूनाजी लक्ष्मण बूळे	घरगृती	27	27	0	90
६	नारायण नामदेव बोऱ्हाडे	घरगृती	22	31	9	108
७	सीताराम लक्ष्मण बूळे	घरगृती	20	21	1	92
८	नारायण बारकू बोऱ्हाडे	घरगृती	28	43	15	120
९	गेनू अंबू घटे	घरगृती			0	90
१०	बाळू भीमा बोऱ्हाडे	घरगृती	23	30	7	104
११	चंद्रकांत गणू शिंदे	घरगृती	26	61	35	160
१२	संदीप लूमा बोऱ्हाडे	घरगृती	22	26	4	98
१३	लहू खेवजी बोऱ्हाडे	घरगृती	30	48	18	126
१४	खेवजी येसू बोऱ्हाडे	घरगृती	26	34	8	106
१५	होना आनाजी बोऱ्हाडे	घरगृती	24	34	10	110
१६	काशिनाथ चिमा बोऱ्हाडे	घरगृती	22	51	29	148
१७	पाराजी पूनाजी बोऱ्हाडे	घरगृती	26	46	20	130

Darewadi – Key factors - Maintenance



Sample Energy Bill

ग्राम गौरव ग्रामीण न्याय सर्वकारी, पो. देवडी, ता. मुंजर, जि. पुणे
वीज जाकार देवडी

देवडीकार महीना: सप्टेंबर वीज दिनांक: 1/10/2012
 वीज जाकार क्रमांक: 12 अंतिम तारीख: 4/10/2012
 साहकाराचे नाव: संदीप लक्ष्मी बाळुडे
 पत्ता: मु. पो देवडी (खेरवडी) ता. मुंजर जि. पुणे

मिटर जाकार	<u>90</u>	वायू मीटर दिवाळी	<u>43</u>
वीज जाकार	<u>2 रु सुमारे</u>	दिवसा व वेळ	<u>1/10/2012</u>
पुरत जाकार	<u>0</u>	भागीदार मीटर दिवाळी	<u>26</u>
दुरुवा		दुरुवा वीज वापर	<u>17 सुमारे</u>
दिवस जाकार	<u>50</u>		
सावभागी	<u>0</u>		
जमा	<u>124</u>		
देवडीची रक्कम	<u>90+34=124</u>		

ग्राम गौरव
 देवडी कार्यालय
 पो. देवडी, ता. मुंजर, जि. पुणे

Darewadi – Key factors - Growth



- In last 10 months, there has been an increase in the energy usage every month
- 7 households have purchased TVs with satellite connections
- 2 computers and a flour mill are in operation
- Water pump is in the works

Rural Micro Grids



Current Government Programs

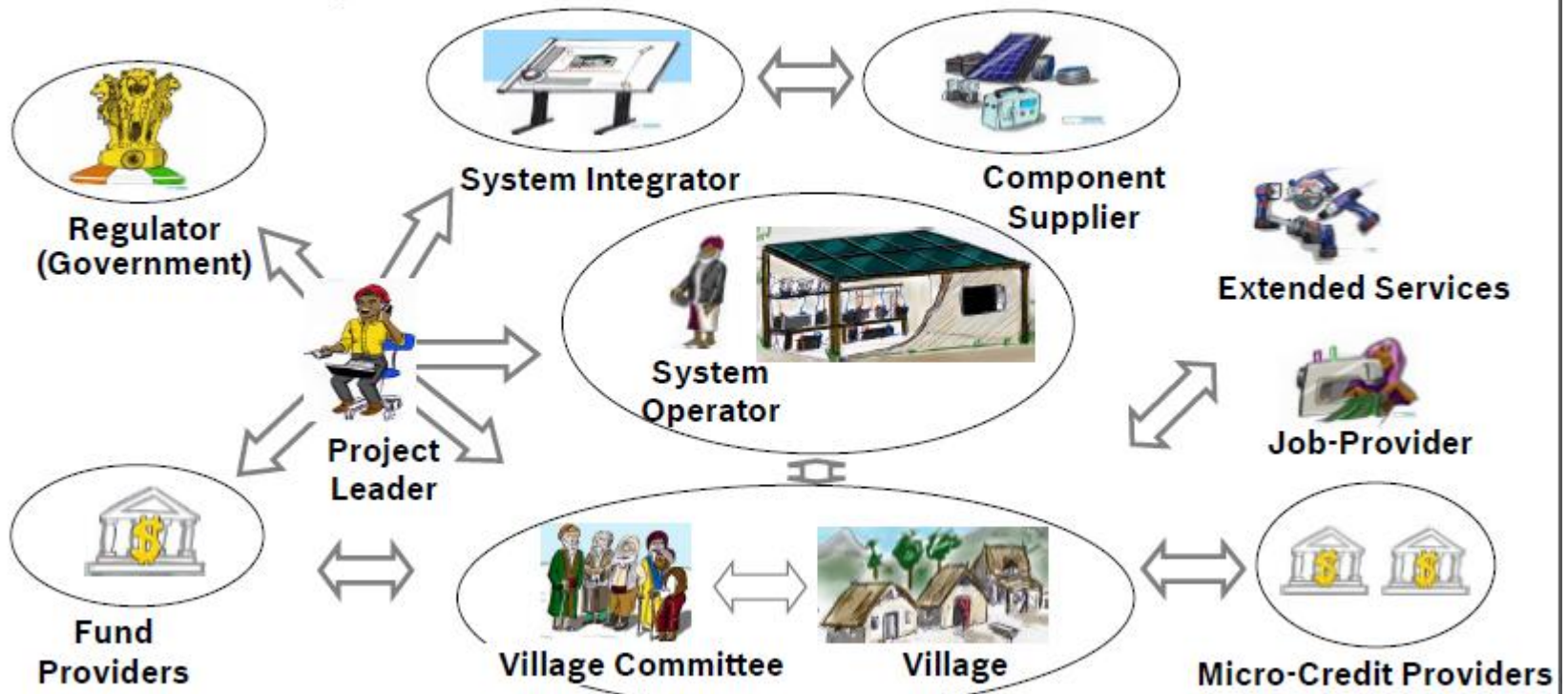
- Government has in the national solar mission modified its approach and is taking the mini grid approach to solve the problem
 - Is targeting 20,000 villages under its "Energy Access " program. To be achieved till 2017
 - 90% of the capital costs to be provided by central government
 - Collection of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



Final Ecosystem has to be verified with Pilot Projects

Darewadi – after electricity came in!





Thank you!
