Livelihood security by meeting electricity need of small scale garment industry, Kumbhya, SPS in Madhya Pradesh, India

TD 612: Technology In Practice

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Brief Description

The unique significance of Kumbhya is that in a predominantly agrarian and tribal dryland region, where there have been no traditional marketable crafts, it makes machine-stitched ready-to-wear garments, home linen and accessories designed to market specifications and international trends. It provides employment to more than 40 local women in the region and thereby provides them a better platform in socio-economic context.

Kumbhya has two major units in Dewas district in Madhya pradesh, one in Bhikupura village and other is in Bagli town. Both units majorly operate on diesel driven generators (5 hp and 10 hp) as the load shedding is very high in this region which ranges from 6-22 hrs per day. The solar irradiation is very good in this area which can be termed as more than 300 sunny days per year with an average of >5KWH/sq-m/day. The Grid-tied solar PV system will provide a clean and sustainable way to produce energy which will also boost up the local income and savings over fossil fuel prices in an indirect manner. Additional DC outlets will facilitate the local people to utilize the installation for charging the solar lantern or mobile.

Major outcomes that will be achieved

The outcomes will be as follows:

- Savings over the ever increasing diesel cost and their by more income at grass root level.
- Savings over higher O&M cost in remote areas.
- Clean energy generation along with sustainability over decades.
- Further boost to “Kumbhya” brand with green energy initiative.
- An additional step towards women empowerment in tribal belts of Dewas, M.P.
- Further replication for local small scale units in diversified fields.

Table of contents

List of Figures

List of Tables

Abbreviations

Sl. no	Abbreviation	Expansion
1	ABF	Axis Bank Foundation
2	Am	Ante Meridian
3	CO_2	Carbon Dioxide
4	EPC	Engineering, Procurement and Construction
5	HP	Horsepower
6	IIT B	Indian Institute of Technology Bombay
7	INR	Indian rupee
8	JNNSM	Jawaharlal Nehru National Solar Mission
9	Kg	Kilogram
10	Km	Kilometre
11	KWh	Kilo Watt hour
12	LED	light-emitting diode
13	Lit	Litre
14	LPA	Lakh Per Annum
15	MNRE	Ministry of New and Renewable Energy
16	MP	Madhya Pradesh
17	NGO	Non-Governmental Organization
18	Pm	Post Meridian
19	PV	Photovoltaic
20	SPS	Samaj Pragati Sahayog

1. Situation analysis

1.1 Context and significance

Kumbhya has empowered women from one of the most deprived areas of the country by creating livelihoods through the dynamic skill of garment fabrication. Most of these tribal women had never stitched a garment before and had no options other than manual labour. Kumbhya provides them a stable platform to generate income for themselves with special attention to differently-abled people, particularly women, whose inability to contribute manual labour in an agricultural area leads to their abandonment. Kumbhya guarantees work and a market to producers for 300 days a year and makes a range of Indian and western casual wear, duvets, patchwork cushion covers, table and bed linen, curtains, wall hangings and different types of bags and rucksacks.

The ever-growing demand from customers, retailers and exporters has ensured a steady rise in sales at 40% per annum over the last 3 years providing 300 days of guaranteed work to the trained women.

Environmental context

At present Kumbhya uses 10 HP and 5 HP, 3 phase generators for energy generation. A 10 HP pump requires 1.9 lit diesel/hour and a 5HP generator requires 1 lit diesel/hour. Both the generators emit around 7.7 Kg of CO_2 per hour (1 lit diesel produces 2.6391 kgs of CO_2). If we see on the annual scale then Kumbhya produces 11.55 ton of CO2 per year with an assumption of 300 working days in a year and 5 hour dependency on diesel generator out of 8 hour of working shift.

Technical context

The population of MP in December 2010 was 69,385,000. While the number of electricity generated in year 2010 was little over 22000 units. In this way the per capita per year electricity generation in MP is 329 KWH/capita/year. The national average of per capita annual electricity consumption is more than 650 KWH/capita/year while the per capita annual electricity consumption of the developing countries is more than 3,000 KWH/capita/year. From these data one can see that the situation of electricity is very poor in MP. From the planned installation of power plants in the state, it is very unlikely that the situation of per capita electricity generation will improve drastically in MP in near future. There is shortfall

of electricity supply in most part of the rural areas of MP. The power cut in the rural areas varies from 6 hours to 22 hours. [1]

Socio-economic context

The findings of our two and half month stay in Dewas district clearly describes that people and small scale level industries/units are very much disturbed by the erratic grid supply. Every class of the society, be it famer or local businessman, everyone is suffering in some corner because of grid supply unavailability for at least more than 10 to 15 hours per day.

Kumbhya operates between 9am to 5 pm standard working time and on an average it hardly receives 3 hours of grid electricity during the entire operational time span. Everyone has to finish the entire day work just before sunset and during the day time also the long lasting load shedding affects the work. Kumbhya is boosting up the image of women in tribal belts of Dewas district by empowering them as self-dependent by becoming an earning member in the family.

On a social context, people are eagerly looking for a lighting option for day to day operation as the entire region seems like a dark blanket just after the sunset in absence of grid electricity.

The uninterrupted Kumbhya operation will facilitate the grass root level employees with better socio-economic conditions. Local people will also be benefited by the availability of uninterrupted charging scheme for their own solar lanterns or mobile.

Policy and institutional context

At the institutional level, there is arrangement for having grid supply to the far most habitation based on some fixed onetime payment which again depends on the sector of utilization and land area in case of the farmers. But even in case of grid electricity connection, the uptime is only 4 to 10 hours a day which cannot support any day to day ongoing activities, be it garments production, agriculture needs or any other business.

There is no scope in central and state policy to provide electricity to remote areas on a regular basis in remote areas of Madhya Pradesh. Some of the villagers consider themselves lucky as their village is electrified though electricity supply is very erratic.

1.2 Stakeholders and baseline analysis

Table1-1 Stakeholder analysis

S.No	Stakeholder	Role and responsibilities	Effect of proposed intervention
1	Kumbhya, SPS	Direct beneficiary	• Better uninterrupted work execution. • Will meet with increasing product demand. • Reduction in carbon foot-print. • Saving over diesel cost and maintenance.
2	Tribal employees	Indirect beneficiary	• More income generation. • Better pollution free work environment. • Awareness about Solar energy.
3	Local tribal people (95-98% of population)	Direct beneficiary	• Solution for charging their solar-lantern, mobile, LED torch etc.
4	IITB team	Consultant cum project proponent	• Experience in project execution having dynamics related to corporate, technology and socio-economic sector.
5	XYZ EPC company	EPC contractor	• Business opportunity.
6	ABF (Axis Bank Foundation) [2]	Funding agency	• Initiation of a new relationship with SPS over providing Sustainable livelihood, alleviation of poverty. And green energy implementation. • Post installation study may lead towards business generation of the bank over green loans and co-related issues.
7	MNRE and Madhya Pradesh Govt	To provide Subsidy	• Govt. initiative to promote subsidized project in tribal belts.

Baseline analysis

At present, Kumbhya employs around 50 women on a contract basis and the payout depends on the amount and type of work done by the worker. As per our survey during May-July 2012, in present situation, the load shedding causes loss to both the tribal women and Kumbhya. Tribal women cannot do uninterrupted work with the load shedding and compromise made by Kumbhya over increasing diesel costs. Kumbhya also suffers the loss and cannot meet up the demands for their products in the market.

Figure1-1: At Kumbhya Centre women stitching and sewing

Figure 1-2: Kumbhya employee doing cutting with electric machine

Figure 1-3: Kumbhya employee doing cutting and ironing the cloth

Figure 1-4: Generator using during load shedding

Apart from the market economics, Kumbhya is emitting around 11.55 ton of CO_2 per annum based on the above mentioned calculations. The diesel based operation causes both economical and environmental loss so it is very much necessary to come up with a sustainable solution. At present the diesel operation costs around INR 10 to 15 for per KWH of generated electricity while Solar PV based energy would cost around INR 7 to 8 at maximum.

1.3 Long term solutions and barrier to solution

Erratic electricity supply and costly diesel cost leaded Kumbhya towards other sustainable options to provide continuous, cost effective and environmentally friendly source of electricity. Hence the aim is to select an energy source that not only fulfils the need of electricity but also makes the business sustainable. Renewable energy sources both Biogas and solar energy was studied and analysed both in technical and social aspect to provide sustainable source of electricity to Kumbhya. Feasibility and sustainability of biogas is an issue.

1) Availability of biomass.
   The biomass for biogas generation in Kumbhya could be obtained from the agro residue or dung. The availability of both for biogas is an issue. Farmers take only one crop in a year. They store the agro residue for animal fodder. Competition for food and energy is concern while generating electricity from biogas using agro residue as raw material.
2) Seasonality of biomass
   Agro residue is available only after harvesting the crop in a particular season.
3) Collection and transportation of biomass
   The households are very scattered. Farmers live along their fields. Farmers are using dung as well as urine of animals for composting to get bio-manure. Therefore collection and then transportation of dung and to the Kumbhya centre is very difficult.

Hence the technical as well as social aspects of biogas are not sustainable to choice electricity generation from biogas.

Indore, which is less than 75 km far from the both Kumbhya centres, is being certified as the area having highest solar horizontal irradiation in the Asia continent by NASA (National Aeronautics and Space Administration) in Sep 2012. Dewas district also receives solar

irradiation of more than 5 KWH/sq-m/day on an annual average. Apart from the abundant solar energy, the ever increasing price of diesel makes it more and more economically unviable to use diesel as fuel for any day to day operation. The electricity supply in the state is very erratic and deficient. Also, the hopes for future to get higher electricity generation (much higher than population growth, and growth of living standards) using hydro or coal or nuclear is bleak. Therefore in this scenario solar PV based grid tied electricity generation will provide the best sustainable energy solution for Kumbhya's day to day operation.

MNRE provides a flat subsidy of 30% in total project cost for any off grid or grid tied solar PV project under JNNSM. Different state govt. also provides different level subsidy depending on the type of the project and it varies from 10 to 30 % of the total project cost.

SPS is working in the Dewas region since last 20 years and ABF promotes the SPS work by funding their different activities in the region. This project can be funded by ABF to provide better uninterrupted operational time to Kumbhya which will help in women empowerment in the region.

High initial cost will act as the barrier in case of the project implementation. But if we see the life time cost analysis then solar PV based energy generation is cheaper, eco-friendly and sustainable in comparison to diesel generated electricity. As local people will get benefit from this installation in terms of employment and income generation so the project will not have any social issues. The O&M issues will also decrease in a large extent in comparison to the diesel generator based electricity generation.

2. Strategy

2.1 Project rationale

Project objective

The objectives of the project are as follows:

- To secure livelihood by meeting electricity need for Kumbhya.
- To stop the diesel based electricity generation and thereby the pollution with costly per unit electricity.
- To empower tribal women and Kumbhya brand all together with implementation of solar PV based electricity generation. Kumbhya brand will enjoy the green energy image while

tribal women will have more income and thereby status in the society following the uninterrupted work.

- To promote and disseminate information related to solar energy in the remote areas where uninterrupted grid electricity supply is still a dream to come true.
- To facilitate local people with uninterrupted facility for solar lantern, mobile charging etc.

Outcomes

The outcomes will be as follows:

- Clean energy generation along with livelihood security for tribal women.
- Savings over the ever increasing diesel cost and their by more income at grass root level.
- Savings over higher O&M cost in remote areas.
- Further boost to "Kumbhya" brand with green and sustainable energy initiative.
- An additional step towards women empowerment in tribal belts of Dewas, M.P.
- Further replication for local small scale units in diversified fields.

Activities

The project related activities will be as follows:

- To understand the current load pattern and electricity requirement for uninterrupted work in Kumbhya.
- To survey the load shedding pattern from both consumer and supplier side.
- To design a technological solution based on the load profile.
- To talk with beneficiary i.e. Kumbhya and project funding agency i.e. ABF for the project proposal and approval.
- To conduct a socio-economic survey of the local place for sustenance of the project.
- To prepare a tender matching up with the requirement with consultation of all stakeholders in the project.
- To bid out the tender to an organization with satisfactory record in EPC projects related to grid-tied solar PV and best possible solution for Kumbhya.
- To analyze the implementation part on a day to day basis from both sides i.e. beneficiary and project funding agency.
- To hand over the tested grid tied solar PV setup to Kumbhya, SPS.

Table 2-1 Current practices, alternatives and expected benefits

Current practice	Alternative to put in place by the project (with grant support)	Expected benefits
Mostly diesel based electricity generation	Grid-tied solar PV based electricity generation	• Saving over diesel cost. • Pollution free green and sustainable energy. • Saving over high O&M cost. • Awareness dissemination about the solar energy. • Kumbhya brand promotion with green energy banner.
Interrupted work span because of erratic grid supply and costly diesel electricity	Uninterrupted work span with continuous supply from solar energy/battery/grid	• Win-win situation for Kumbhya and local women. • Women empowerment in terms of self dependency.

2.2 Sustainability

The project sustainability is always been very essential concern after the implementation of the project. In this case Kumbhya is also looking for a sustainable electricity solution. Grid-tied solar PV based electricity generation will be sustainable because of the following reasons:

- At present Kumbhya spends around INR 2.17 LPA (2.9 lit * 5hrs/day * 300days/annum * INR 50/lit) for diesel cost apart from O&M costs for diesel generator. The O&M cost for grid-tied solar PV will be very less compared to the present expenditure.
- Only the present O&M cost excluding diesel cost will meet with the O&M costing of solar PV installation.
- The project will also be sustainable as it utilizes the solar energy, which is abundant and renewable in nature.
- Further socio-economic improvement will make this project more sustainable.

2.3 Replicability

Madhya Pradesh receives very high solar irradiation with at least 300 sunny days per year. The small scale business units, farmers with bore well or surface water pumps and local people are desperately looking for a sustainable solution which can meet their electricity needs. At present people are aware of the solar energy options but the successful implementation of the project will further strengthen up the people belief over the technology which will boost up the replicability of the project.

During our May-July 2012 field visit one local private school and two flourmill (*chakki*) business men were very curious about the solar PV based electricity generation to cope up with their electricity demand. It shows that people are eagerly looking for any sustainable electricity generation technology and it will not take much effort to replicate the technology as the technology is commercially proven.

3. Project results framework

The project results framework is as follows:

Goal/Objective	Indicators	Baseline	Targets End of project	Source of verification	Risks
To understand the current load pattern and electricity requirement for uninterrupted work in Kumbhya.	• Different loads • No of each type of loads • Load shedding hours • Dependency on diesel genset in hours	Erratic grid supply Raising diesel price	Electricity requirement in KWh based on survey of different loads, their rating and use pattern on weekly basis.	• Site visit or details from an employee • Electricity bill • Loads serial no • Bill copy/Xerox • Local sub-station report and kumbhya employee statement. • Diesel purchase slips/kumbhya vouchers on diesel head. • SPS annual	Loads are not having unique identification details Substation may not provide load shedding data

				review report • Kumbhya balance sheet	
To design a technological solution based on the load profile	Rating of equipments/ machines used at Kumbhya	Unable to take advantage of solar potential	100% mitigation of use and dependence on diesel generator Uninterrupted supply of electricity for Kumbhya during working hours (9:00am to 6:00pm) Use of solar energy to meet minimum 60% of daily electrical need	SPS annual review report Kumbhya balance sheet	Expansion of Kumbhya/ increase in work load is not considered
To talk or Convince beneficiary i.e. Kumbhya	Organising workshop (Audio/Video) for Kumbhya and local	People not fully aware about the technology Lack involvement in	Improved understanding about the technology	Feedback from workshops Personal feedback	Passive participation or no participation of local people

	people NGO acting as mediator for trust building Improvement of knowledge regarding solar energy Involvement of local people and direct beneficiary Providing a sense of responsibility and ownership	technical aspect of project Lack of involvement from local people and direct beneficiary is main reason for failure and adoption of technology	Better communication Adoption of technology by Kumbhya	from local people and Kumbhya employee, NGO officials	People hesitate to provide information
To talk or Convince funding agency i.e. ABF	Proposing plan, its impact and outcomes	ABF has tie ups with SPS	Sanction of grant by ABF		ABF does not provide grant for the specific project. Assuming all fund as per grant though it can be reduced by 30% with MNRE subsidy, which will be availed after

					project implementation. Risk: Because MNRE channel partners may not be available in remote region.
To conduct a socio-economic survey of the local place for sustenance of the project.	To design a sustainable business model and institutional model.	SPS has roots in the villager and villagers have faith and trust in NGO	Institutional and business model for implementation of project Socio-economic pattern and acceptability on a wide basis.	Feedback from workshops Personal feedback from local people and Kumbhya employee, NGO officials	People hesitate to provide information Passive participation or no participation of local people
To prepare a tender matching up with the requirement with consultation of all stakeholders in the project.	Making a format for filling tender specifying all requirements and mandates	Data from Socio-economic survey Feedback after formal talk/interview/workshop with local people/beneficiary	Tender with all specifications and mandates Acceptance by all stakeholders	SPS annual review report Feedback from workshops Personal feedback from local people and Kumbhya employee,	Passive participation or no participation of local people No consolidation among different stakeholders

				NGO officials	
To bid out the tender to an organization with satisfactory record in EPC projects related to grid-tied solar PV and best possible solution for Kumbhya.	Floating tender Selection of best bid	Previous projects and work experience of organisation	Tender bidding based on the customize requirement of kumbhya.	Selection of best bid	Assumption over EPC company to work in the remote area of dewas district
To analyze the implementation part on a day to day basis from both sides i.e. beneficiary and project funding agency.	Working experience of employee with their machines and new source of electricity		Cross verification of project specifications and correction of implementation errors if any and documentation of project	SPS annual review report Feedback from workshops Personal feedback from local people and Kumbhya employee, NGO officials	Lack of understanding between Kumbhya employee and Project implementation team

4. Total budget and work plan

The budget requirement of the projects is given in the table below followed with calculation for the same.

Table 4-1 Project budget

Sl No	Expense Head	Fund required (in INR)	Total cost (in INR)
A	**DPR preparation (both sites)**		
A1	Socio-economic survey	15,000	60,000
A2	Technical survey and feasibility study	25,000	
A3	Tender preparation	20,000	
B	**Project implementation (site 1 and site 2)**		
B1	Installation site survey and selection (site 1 and site 2)	20,000	23,30,000
B2	PV module cost (16 KW and 6KW)	13,20,000	
B3	Grid-tie inverter cost (15 KVA and 5 KVA)	2,40,000	
B4	Battery bank with 12V, 150Ah batteries (25 pieces and 10 pieces)	3,50,000	
B5	Installation and other components with manual tracking system and charging slots (site 1 and site 2)	4,00,000	
C	**Post implementation analysis (both sites)**		
C1	Power generation profile and crosscheck with targets	30,000	50,000
C2	Documentation of the project	20,000	
C3	Handover to Kumbhya, SPS	-	
		Total	24,40,000

The calculation for the above mentioned budget requirement is as follows:

A) DPR preparation

Time span: 1 month

A1) Socio economic survey (20-25 days)

1 student intern from master's course in sociology (INR 10,000 per month) + 1 local SPS worker (INR 5000 per month)

= INR 15,000

A2) Technical survey and feasibility study (5-10 days)

1 solar PV EPC consultant for both site check up (INR 10,000 per site) + 1 Kumbhya, SPS employee (INR 5000 for assistance)

= INR 25,000

A3) Tender preparation (2-5 days)

1 person from IITB team (INR 10,000) + 1 solar PV EPC consultant (INR 10,000)

= INR 20,000

B) Project implementation

Time span: 1 month

B1) Installation site survey and selection (2-5 days)

1 person from IITB team (INR 10,000) + 1 person from xyz company (INR 10,000)

= INR 20,000

B2) PV module cost

The PV module cost has been defined as per depending on the peak load, loss in bi-directional inverter circuit, available peak global horizontal irradiation and a power back up of 5 hours in absence of both sun and grid supply. The rate considered for PV module is INR 60 per Watt.

Table 4-2 Peak load requirement

Number of	Sewing motors (200 W)	Tube lights (40 W)	Fans (80 W)	Cutting motors (250 W)	Others	Total peak load (in KW)
Site 1	25*0.2	20*0.04	12*0.08	2*0.25	0.76	8
Site 2	2*0.2	16*0.04	6*0.08	4*0.25	0.48	3

Table 4-3 Module size estimation

	Peak Load (in KW)	Peak load with 0.85 overall circuit efficiency factor (in KW)	Peak load with 800W/sq-m radiation during 10 am to 3 pm (in KW)	Peak load with 600W/sq-m radiation during 8am to 10 am and 3pm to 5 pm (in KW)
Site 1	8	9.5	11.875	15.83
Site 2	3	3.5	4.375	5.83
			Total (Round off)	22

Cost of 22 KW PV module

= 22,000watt * INR 60/watt

= INR 13, 20,000

B3) Grid-tie inverter cost

(Source: Enertech inverters)

For 15KVA cost is INR 1, 70,000

For 5KVA cost is INR 70,000

Total cost

=INR 2, 40,000

B4) Battery bank with 12V, 150Ah batteries

Each battery energy rating

=12V*150Ah = 1.8 KWH

For 5 hour back up

Energy storage need at site 1= 40 KWH i.e. approx 23 batteries

Considered number of batteries= 25

Energy storage need at site 2= 15 KWH i.e. approx 8 batteries

Considered number of batteries= 10

Total cost= 35 batteries * INR 10,000/ battery

= INR 3, 50,000

B5) Installation and other components

INR 4, 00,000

C) Post implementation analysis

Time span: 1 month

C1) Power generation profile and cross check with targets

1 person from IITB team (INR 10,000) + 1 Technical person from xyz company (IR 20,000)

= INR 30,000

C2) Documentation of the project

1 person from IITB team (INR 10,000) + 1 solar PV EPC consultant (INR 10,000)

= INR 20,000

C3) Hand over to Kumbhya

5. Management arrangements and work plan

Table 5-1: Institutional structure, work breakdown structure and cost required for each task

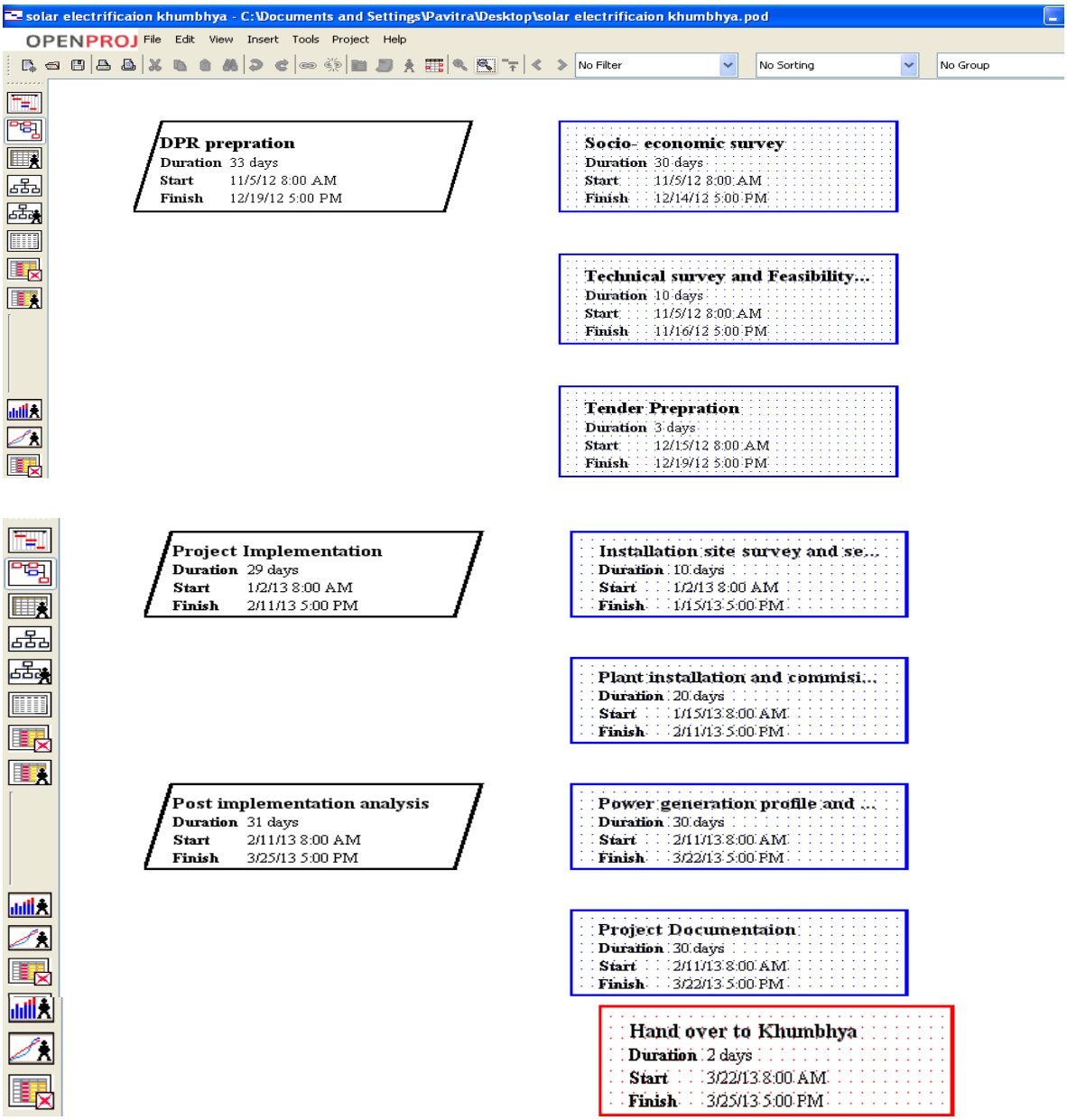
S.No.	Activity	Number of Person required for task	Time Taken
A	**DPR Preparation (both sites)**		**33 days**
A1	Socio-economic survey	1 intern (Master Sociology) 1 local SPS employee	30 days
A2	Technical survey and feasibility study	1 solar PV EPC consultant for both site check up (INR 10,000 per site) + 1 Kumbhya, SPS employee (INR 5000 for assistance)	10 days
A3	Tender preparation	1 person from IITB team (INR 10,000) + 1 solar PV EPC consultant (INR 10,000)	3 days
B	**Project implementation (site 1 and site 2)**		**29 days**
B1	Installation site survey and selection (site 1 and site 2)	1 person from IITB team (INR 10,000) + 1 Technical person from xyz company (INR 10,000)	10 days
B2	Plant installation and commissioning	1 person from IITB team (INR 10,000) + 1 Technical person from xyz company (INR 10,000)	20 days
B3			
B4			
B5			
C	**Post implementation analysis (both sites)**		**31 days**
C1	Power generation profile and crosscheck with targets	1 person from IITB team (INR 10,000) + 1 Technical person from xyz EPC company (INR 10,000)	30 days
C2	Documentation of the project	1 person from IITB team (INR 10,000) + 1 solar PV EPC consultant (INR 10,000)	30 days
C3	Handover to Kumbhya, SPS	-	2 days

6. References

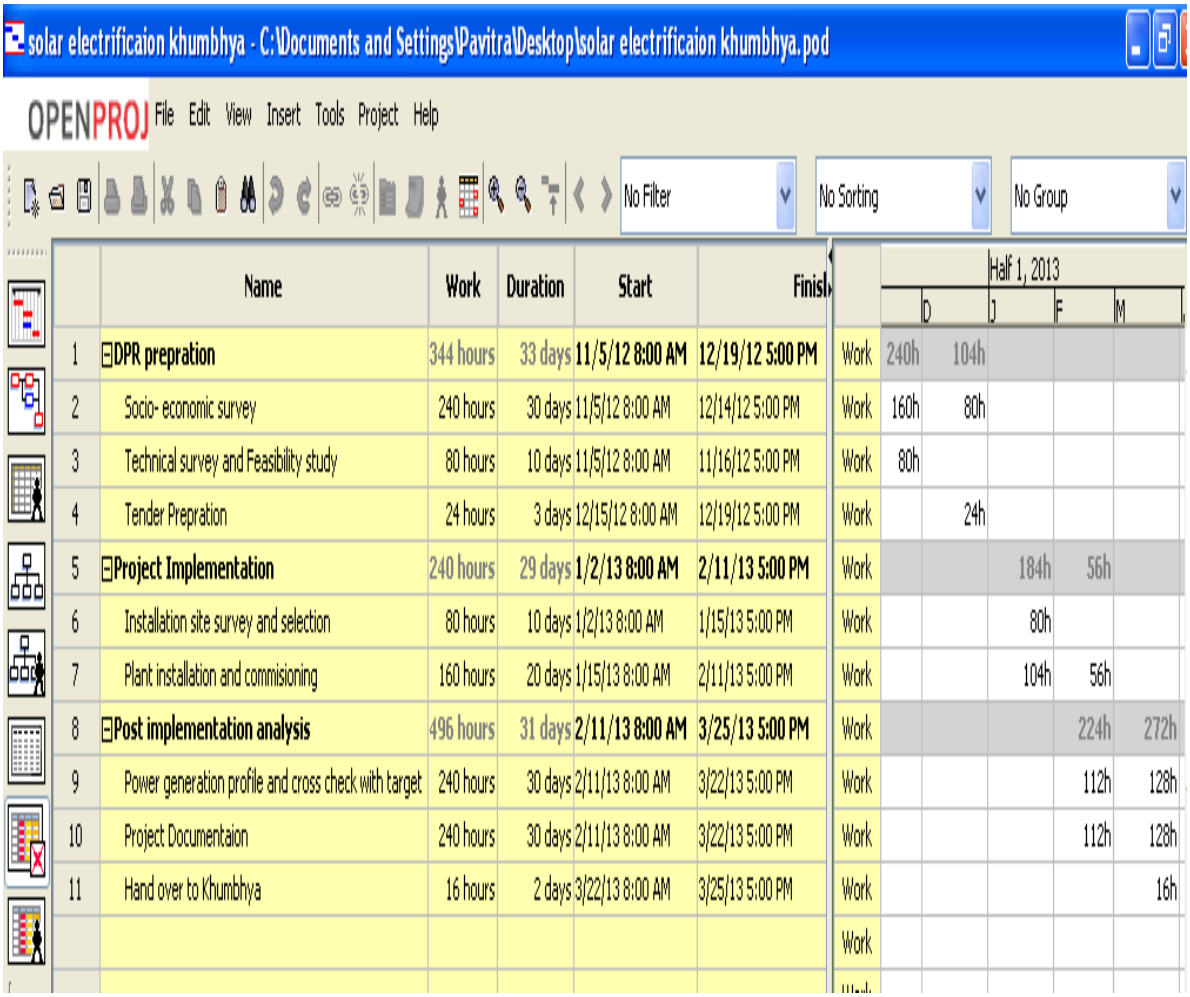
1. A case for Solar Water Pumping in Madhya Pradesh Instead of diesel water pumping" by Prof Chetan S. Solanki, DESE, IIt Bombay on Jan 15th 2012
2. http://www.axisbankfoundation.org/ourprograms/sustainablelivelihoods.asp site accessed on 1 November,2012.

7. Appendix

Appendix I: Time line and work duration in OPEN PROJ.



Appendix II: Task Usage In Open Proj



	Name	Work	Duration	Start	Finish		Half 1, 2013				
							D	J	F	M	
1	DPR prepration	344 hours	33 days	11/5/12 8:00 AM	12/19/12 5:00 PM	Work	240h	104h			
2	Socio- economic survey	240 hours	30 days	11/5/12 8:00 AM	12/14/12 5:00 PM	Work	160h	80h			
3	Technical survey and Feasibility study	80 hours	10 days	11/5/12 8:00 AM	11/16/12 5:00 PM	Work	80h				
4	Tender Prepration	24 hours	3 days	12/15/12 8:00 AM	12/19/12 5:00 PM	Work		24h			
5	Project Implementation	240 hours	29 days	1/2/13 8:00 AM	2/11/13 5:00 PM	Work			184h	56h	
6	Installation site survey and selection	80 hours	10 days	1/2/13 8:00 AM	1/15/13 5:00 PM	Work			80h		
7	Plant installation and commisioning	160 hours	20 days	1/15/13 8:00 AM	2/11/13 5:00 PM	Work			104h	56h	
8	Post implementation analysis	496 hours	31 days	2/11/13 8:00 AM	3/25/13 5:00 PM	Work				224h	272h
9	Power generation profile and cross check with target	240 hours	30 days	2/11/13 8:00 AM	3/22/13 5:00 PM	Work				112h	128h
10	Project Documentaion	240 hours	30 days	2/11/13 8:00 AM	3/22/13 5:00 PM	Work				112h	128h
11	Hand over to Khumbhya	16 hours	2 days	3/22/13 8:00 AM	3/25/13 5:00 PM	Work					16h
						Work					

Appendix III:

Open Proj File: Solar electrification Khumbya.pod