A TOOL KIT

For

Participatory Village Energy Planning

Supported by:

HEINRICH BÖLL STIFTUNG

C-20, (1st Floor), Qutub Institutional Area,
New Delhi -110016 (India)
Tel: + 91- 11 -26854405, E-mail: india@hbfasia.org

Prepared by:

Development Alternatives

B-32, Tara Crescent, Qutub Institutional Area,
New Delhi -110016 (India), Tel: +91-11-26134103
E-mail: akumar3@devalt.org, nrana@devalt.org

ACKNOWLEDGMENT

There was a long felt need for capturing the understanding and lessons generated from initiatives on 'Community Based Decentralized Renewable Energy Models' and converting these into training and capacity building modules. This would not only help in wider replication of the successful renewable energy models but also help in information dissemination necessary for implementing such projects.

With this objective, Development Alternatives (DA) prepared a toolkit on 'Participatory Village Energy Planning' with the support of Heinrich Böll Foundation (HBF). The toolkit is essentially meant for Non-Governmental Organizations (NGOs) with the main objective to provide them with guidelines on different aspects of community based renewable energy initiatives in rural areas.

The project team at Development Alternatives acknowledges contributions of various stakeholders in the toolkit development. These stakeholders include Panchayat Raj Institution (PRI) members, local entrepreneurs, local NGOs, Village Energy Committee members and community members involved in similar kind of initiatives at the micro level.

The project team expresses deep gratitude to Heinrich Böll Foundation (HBF) for providing technical and financial support in the development of this toolkit.

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Project Team
George C. Varughese
Neelam Rana
Shivani Mathur
Anand Kumar
Kavita Syal
Raktim Ray
Chandan Mishra
Vinit Singh

ABOUT THE TOOLKIT

Number of organizations have been involved in community based renewable energy initiatives in India. The basic characteristic of most of these initiatives is establishment of a community managed revenue model. Through these initiatives various institutional, financial mechanisms, models have been put in place along with the communities to ensure sustainability of the project in the long run. The understanding and learning generated from these initiatives needs to be captured, documented and converted into training and capacity building modules for local NGOs. This will help not only in wider replication of the successful community based decentralized renewable energy models but also in information dissemination necessary for implementing such projects.

The present toolkit on 'Participatory Village Energy Planning' & other similar organizations draws lessons from the practical experiences gained by Development Alternatives on community based renewable energy projects. The toolkit is essentially meant for Non-Governmental Organizations (NGOs) with the main objective to provide them with guidelines on different aspects of community based renewable energy initiatives.

The toolkit is applicable to 'community based renewable energy projects' that require involvement of local communities and will help in making the implementing agencies (essentially NGOs) more responsive to the felt needs of the local community. The toolkit has been developed in consultation with key stakeholders such as Panchayati Raj Institutions (PRIs), government officials, farmers, local entrepreneurs and local NGOs.

Applicability of the toolkit

The present toolkit is applicable to 'Decentralized Renewable Energy Projects' in rural areas only.

Modules given in the toolkit cover key aspects of scoping, planning, implementation and monitoring phases of the project. It has been assumed that scope of the renewable energy project is predefined.

It provides detailed step by step processes to be followed for carrying out various project activities. However, extreme details on some of the aspects are not within the scope of this toolkit.

We hope that the present toolkit would, provide local NGOs with the practical knowledge and guidance on 'community based renewable energy ' in rural India.

CONTENTS

SECTION - A

SOCIAL & ENVIRONMENTAL ASSESSMENT

The present section focuses on 'assessment of local environmental conditions, availability of resources and social structure'. The assessment process will help in identifying villages for implementing future decentralized renewable energy intervention.

IDENTIFICATION OF VILLAGES

Decetralized renewable energy generation - electrifying rural India

Introduction: To shortlist the villages for future intervention on community based renewable energy initiative, social assessment processes including household survey and market survey are required to be conducted. Assessments will provide the baseline information on various socio-economic parameters (including energy consumption pattern) crucial for the village selection and will help in the development of Village Energy Plan (including rough tariff plan) for the future intervention, i, e. establishment of Decentralized Renewable Energy Plant.

Objective: To conduct the socio-economic assessment of the villages.

To shortlist villages for future intervention.

Process:

Steps:

1. Before going for a detailed survey a reconnaissance visit to each village/hamlet should be made to basically scan the general environment, social structure and social cohesiveness among different stakeholders in the village. The visits will also help in assessing the willingness of the villagers to access electricity and their capacity to pay for it. The output of this exercise is to prioritize the villages to actually start with the implementation phase.
2. Information required for selection can be collected through secondary sources as well as primary sources such as surveys and focus group discussions with the village communities.
3. Orient the field team in case of household surveys for primary data collection. Orientation is required on how to approach villagers, data collection formats/ tools etc.
4. Information can be collected for following parameters (indicative list only*) (please refer to annex -2).*

    Electrified or un-electrified status of village

    Demographic details

    Number & type of households

    Infrastructure details (schools, drinking water facility, training centres etc.)

    Livelihood profile (agriculture, service sector etc.)

    Land holding

    Land use profile

Number and kinds of assets (livestock population, water pumps etc.)

Village / local institutions - formal and informal (farmers club, SHGs, financial institutions, NGOs etc.)

5. Analyze the collected data to prioritize and identify the villages. Selection can be made on the following basis:

   Pro activeness of the village Panchayat

   Load profile of village

   Electrification status of village

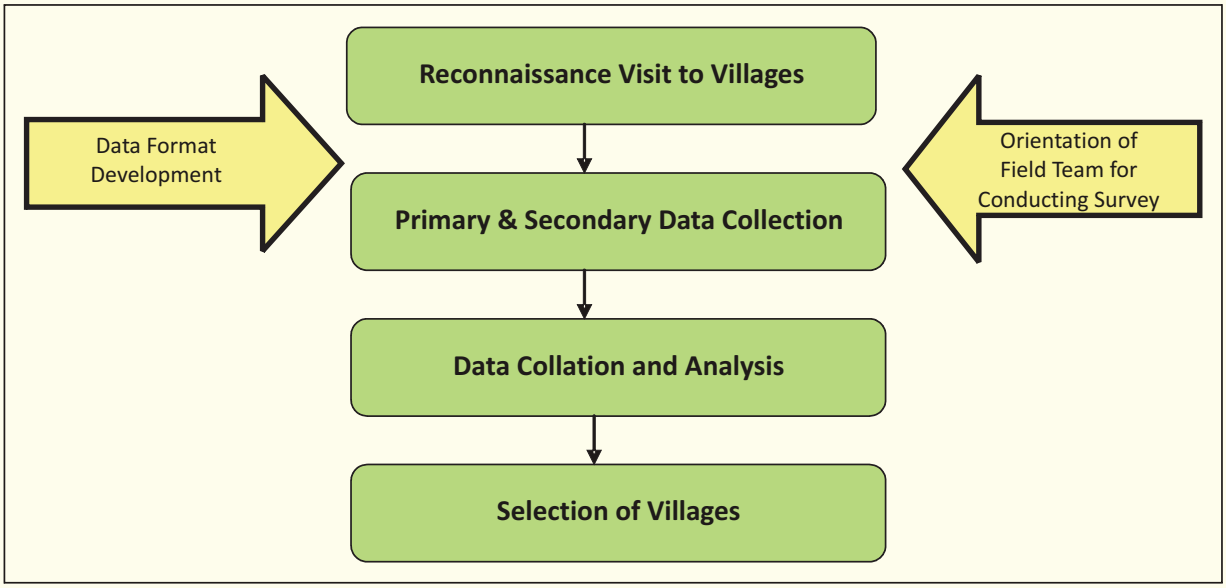
   Availability of local resources in village

   Energy demand

   Social and cultural environment

   Financial viability

Schematic Representation of Module



SHORT NOTES / TIPS

It is very important to take help of locals in conducting the surveys because of their understanding of the local language, customs etc.

One supervisor can be assigned per team to ensure quality of data collected.

Survey team should be polite enough not to hurt anyone's sentiments.

For conducting the survey no less than 10-15 % of the total surveyed households, is to be surveyed for accurate estimation.

The survey team should also make a second round of interviews with key informants (mainly local authorities) in order to validate information collected in the survey.

Semi structured interviews can be conducted with key stakeholders to provide detailed and complete information on resource availability in the village, social and economic scenario of the village and institutional capabilities of the village.

Discussions should also be held with the local authorities after community mobilization regarding availability of land for the required initiative if any.

SECTION - B

COMMUNITY MOBILIZATION

The present section is on 'Community Mobilization' focusing on awareness generation among the communities on importance of renewable energy and how it can ensure access to quality and reliable energy. Section highlights the importance of participatory energy planning and role of local communities in it. Section also focuses on mapping communities' needs and aspirations related to energy in a participatory mode.

WHAT IS RENEWABLE ENERGY AND WHY IS IT IMPORTANT?

Introduction: Government faces difficulty in connecting rural households to the grid and hence they need to be electrified by a decentralized source of energy. This is mainly due to inaccessibility of villages and poor infrastructure related issues. Even in the so called grid linked villages the quality and availability of power is not reliable. In such cases, utilization of local energy resources for example sun light, wind, water and agri-waste, livestock waste in decentralized mode is a suitable option and can be used in a cost-effective manner to meet the local energy needs. The Government of India has been supporting programmes for the deployment of renewable energy systems such as biogas plants, photovoltaic systems, biomass gasifiers, solar cookers and other solar thermal systems, etc. in rural areas of the country. The Government has been implementing Remote Village Electrification, Village Energy Security test projects and decentralized biogas based power generation programmes.

Harnessing solar energy for decentralized energy generation

Objective: To make the participants (village communities)aware about renewable energy and its importance in ensuring energy security in rural areas.

Process:

Steps:

1. Gather people preferably from all strata of the village and make sure there is representation /participation of key stakeholders (Panchayati Raj Institutions, Self Help Groups, informal institutions).
2. The session can be a combination of lectures and short activities, explaining the importance of renewable energy, to make it more interactive. First provide a brief introduction to participants on the following :
   a. Lecture Notes
      i. What is Renewable Energy? What are its sources?

         Energy which comes from natural sources and that can be replenished is renewable energy. Examples of renewable energy sources are sun light, wind, water, tides, geothermal heat etc. It also includes new energy sources from waste material such as dung, municipal solid waste, biomass etc *(please refer to annex-4).*

      ii. What is decentralized renewable energy generation?

         Generation of electricity from many small energy sources. Small scale power generation that is closer to the end user (In simple terms electricity is not distributed through a common grid system).

Also known as distributed generation, on-site generation, dispersed generation, distributed energy generation.

iii. Important of decentralized renewable energy generation (especially for rural communities)

Can reach places where grid electricity can't reach

Is a reliable source of energy for domestic, commercial, agricultural (irrigation), enterprise usage

Can be used to run small scale enterprises such as oil expeller, flour mill, milk chilling unit, spice grinding unit etc.

Provides opportunities for employment generation at local level

Efficient use of local resources

Requires lower capital investment as compared to grid based power

Synchronize demand & supply

Communities have an important role to play

Has comparatively less environmental effects

Better health and sanitation conditions

Solar Cooker
- simplest application of using sun energy

iv. Support from Government (especially for rural areas)

Number of schemes / policies have been put in place by the Government of India such as Power to All by 2012 etc. Some examples specific to rural areas are: Remote Area Village Electrification Programme, Rajiv Gandhi Grameen Vidhyutikaran Yojana, National Biogas and Manure Management programmes etc.

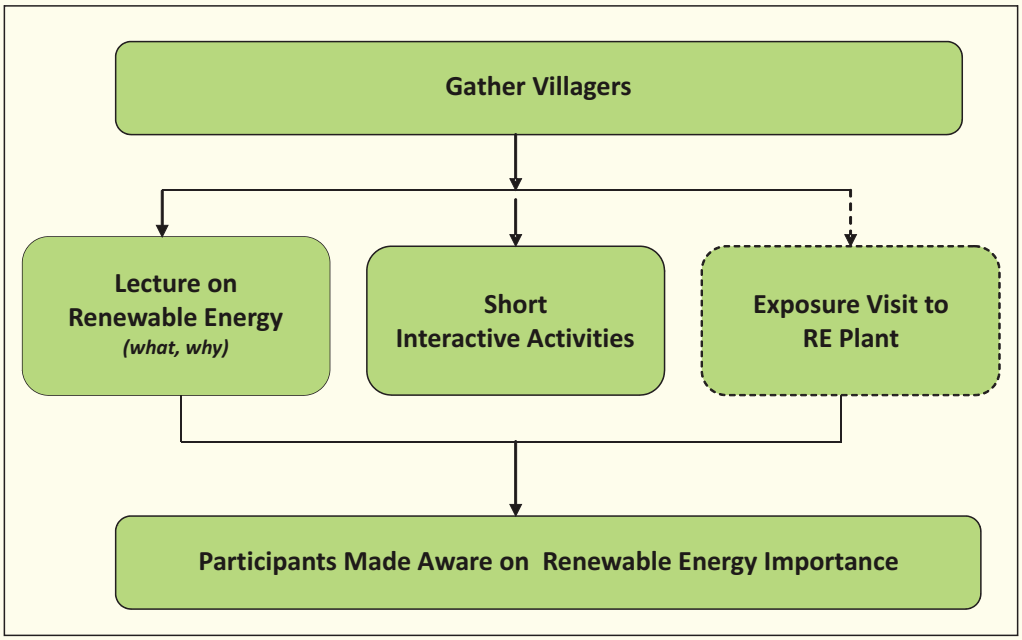
3. The next step could be performing interactive activities for generating awareness among the participants on renewable energy.

a. Awareness generation activities *(optional & selection will depend on time and resource availability)*

i. Trainers can demonstrate how sun light can be used to cook food through 'Solar cooker' *(please refer to annex-5)* and / or give them demo/ training to prepare a solar cooker in the workshop (Please mention that solar energy can be used in various forms, one of them being heat energy & the other electrical energy).

ii. Trainers can also show participants Solar PV, Solar lights, models of energy generation through other renewable sources, their working principle & how they can be used.

Schematic Representation of Module



SHORT NOTES / TIPS

It would be useful to hold a one or two day exposure visit for the villagers to the nearest community based renewable energy plant.

A discussion on existing energy scenario in the village and hazardous health impacts of current energy sources will be useful.

WHAT IS PARTICIPATORY ENERGY PLANNING ?

Introduction: Participatory planning underlines the involvement/ participation of communities in the strategic and management processes of planning. In other words it talks about community-level planning processes at the local level. Participatory planning is often considered as part of the community development process. The concept of participatory planning holds true to any field where community involvement in planning, design, management and implementation is perceived essential. This is especially true in case of rural development where participatory approaches could form the basis of entry for understanding local society, with the view of shaping interventions that have greatest likelihood of acceptance[1]. The key ingredient of successful participatory planning is to build a relationship of mutual confidence with the communities. Participatory Planning process can help in:

Focused Group Discussions for Participatory Planning

Identification of community needs and aspirations

Confidence among the communities regarding the initiative and the implementation team

Say of local disadvantageous groups

Integration of traditional knowledge into the initiative, therefore it is a two-way learning process between the implementation agency and local communities

Commitment and support from local government (PRIs), local institutions, and communities. Accountability (to some extent) in local governance

Objective: To make the participants aware of the concept and importance of participatory energy planning.

Process:

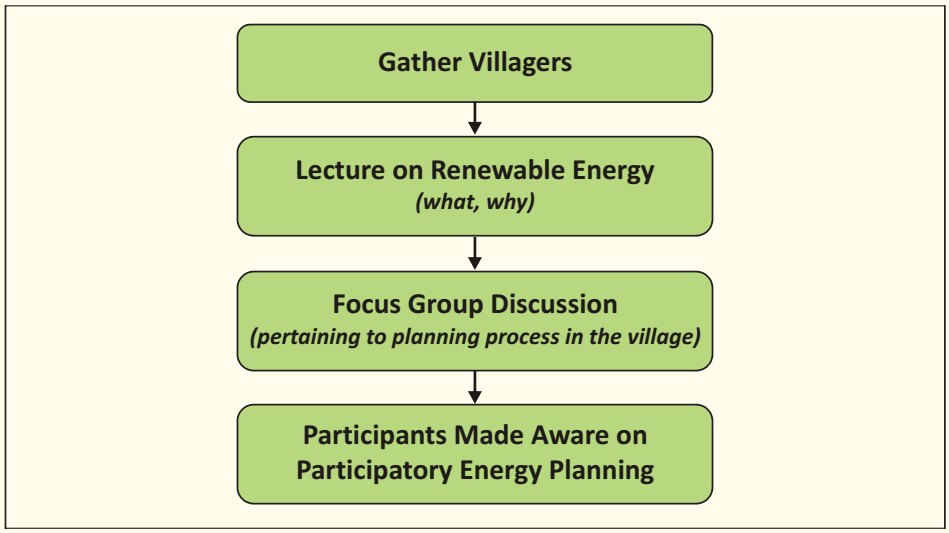
Steps:

1. Gather people preferably from all strata of the village and make sure there is representation /participation of key stakeholders (Panchayati Raj Institutions, Self Help Groups, informal institutions, women).
2. Start the session with a brief introduction on participatory planning and enumerate benefits of the process for communities *(as given in the introduction part of this module).* Try to give as many examples as possible of participatory planning process especially in case of decentralised renewable energy generation. For example: development of Village Energy Plan, formation of Village Energy Committee, tariff structuring, monitoring and evaluation etc. are some of the processes where community participation is essential.

1 http://www.sasanet.org/documents/Tools/Participatory%20Planning.pdf

3. Start the next session with questions directed to participants. The main objective of this session is to map participants understanding on participatory planning process
   a. Have participants ever participated in any kind of planning process? If yes, then at what level (village, Panchayat or any other).
   b. Are they aware of or have they heard about *'Gram Sabha'*?
   c. If yes, then do they participate in *'Gram Sabha'* meetings? If yes how many and how frequently.
   d. What kinds of issues are being discussed in '*Gram Sabha'* meetings? *(make a list of these).*
   e. If participants are not involved in any kind of planning process, ask them to list areas on which they want to participate in if given the chance *(make a list of these).*

Schematic Representation of Module



SHORT NOTES / TIPS

Points to keep in mind by the NGO for effective participatory planning process

What do you mean by community participation?

What kind of participation and by whom? Gender specific?

At what level? In which roles? For what purpose (s)?

Who will benefit and in what way ?

What needs to be done in order to get desired participation in the planning process?

Barriers to participatory planning process

Participants belonging to lower cast or are less influential might feel fear/hesitation of speaking up in common gathering.

Villagers might have some uncertainties in mind regarding the project (reluctance to take risks).

VISIONING EXERCISE

Introduction: The foundation of any successful long-term planning process is a vision that broadly reflects the principles and goals of the community. A vision is, by definition, inclusive of all ideas. Some aspects of the vision may later prove to be impractical, but the initial stages of the visioning process are not the time to discount them. This vision serves as an underpinning for the community energy planning process and should continue to inform decision and policy makers as they progress through the planning and implementation stages. The visioning process encourages communities to engage in a thinking process about their future form, function, resource base, finances and quality of life. For many rural communities, access to reliable and quality energy could be a natural component of a community vision.[2]

Visioning Exercise Involving Local Community

Objective: To map the village community's vision with respect to energy.

Process:

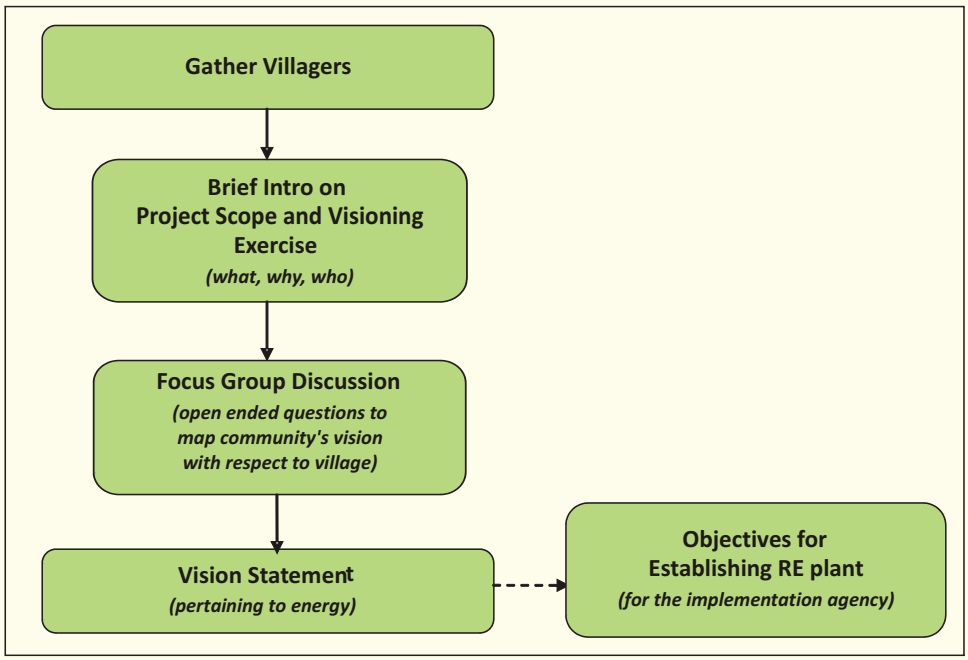
Steps:

1. Gather people preferably from all strata of the village and make sure there is representation /participation of key stakeholders (Panchayati Raj Institutions, Self Help Groups, informal institutions, women). The exercise can be conducted through Focus Group Discussions.
2. Give a brief introduction to the participants on the renewable energy project scope and intent of the project to be implemented.
3. Start the process of mapping the community's vision with a brief introduction on the purpose of conducting the exercise. Explain to participants their expected role in the process.
4. To initiate the discussion, following open ended questions can be put forward:-
   a. Where do you see your community in coming 20 or 30 years?
   b. According to you is electricity/energy/power important in fulfilling the community's needs? (as envisaged by the participants in previous question) If yes then how?
   c. What would be the prioritized list of options for energy/electricity usage if given a chance to decide? (domestic, commercial, enterprises, irrigation, school etc) (a matrix of options with preference rating can be formed).
   d. Are community members willing to pay if electricity is provided to them? If yes then how much?
5. Record the key discussion points on cards and place them on the board so that the participants can visualize and comprehend the discussions results into a common 'Vision Statement' for the community.

2 Adapted from: Community Energy Planning - A Resource Guide for Remote Communities in Canada (2005). Available at http://www.thesolarvillage.com/energyplan/CEP%20Remote.pdf

6. The visioning process should conclude in the establishment of a 'Vision Statement' and set of objectives for the local NGO (implementation agency) for establishment of the community renewable energy plant. The vision and objectives will help in deciding project execution strategy.
7. Share the 'Vision Statement' with the participants (villager communities and other key stakeholders such as local institutions etc.).

Schematic Representation of Module



SHORT NOTES / TIPS

All thoughts/ideas given by the participants should be given due consideration and importance in the visioning exercise (even though some may not be suitable, these may help to stimulate further discussion.)

Special care should be taken in capturing the voices/ideas of marginalised communities / disadvantageous groups and communities belonging to different cast/culture.

SECTION - C

IDENTIFICATION OF RENEWBALE ENERGY OPPORTUNTIES

Third section provides methods of identifying kind/type of renewable energy opportunities most suitable for the particular area, based on the environment and social assessment. The present section also provides guidelines to develop a Village Energy Plan in participatory mode with the help of villagers including Village Energy Committee and other key stakeholders.

RESOURCE MAPPING

Introduction: Resource mapping is a very important tool to understand the village community and identify its resource base. The key and the most important component of conducting resource mapping is participation of local communities. The primary concern is not to develop an accurate map but to get useful information about perceptions of resources. The information thus collected could be in qualitative terms or quantitative terms or both and will help in deciding renewable energy opportunity/options suitable for the particular area.

Objective: To map the natural resources available in the village.

Process:

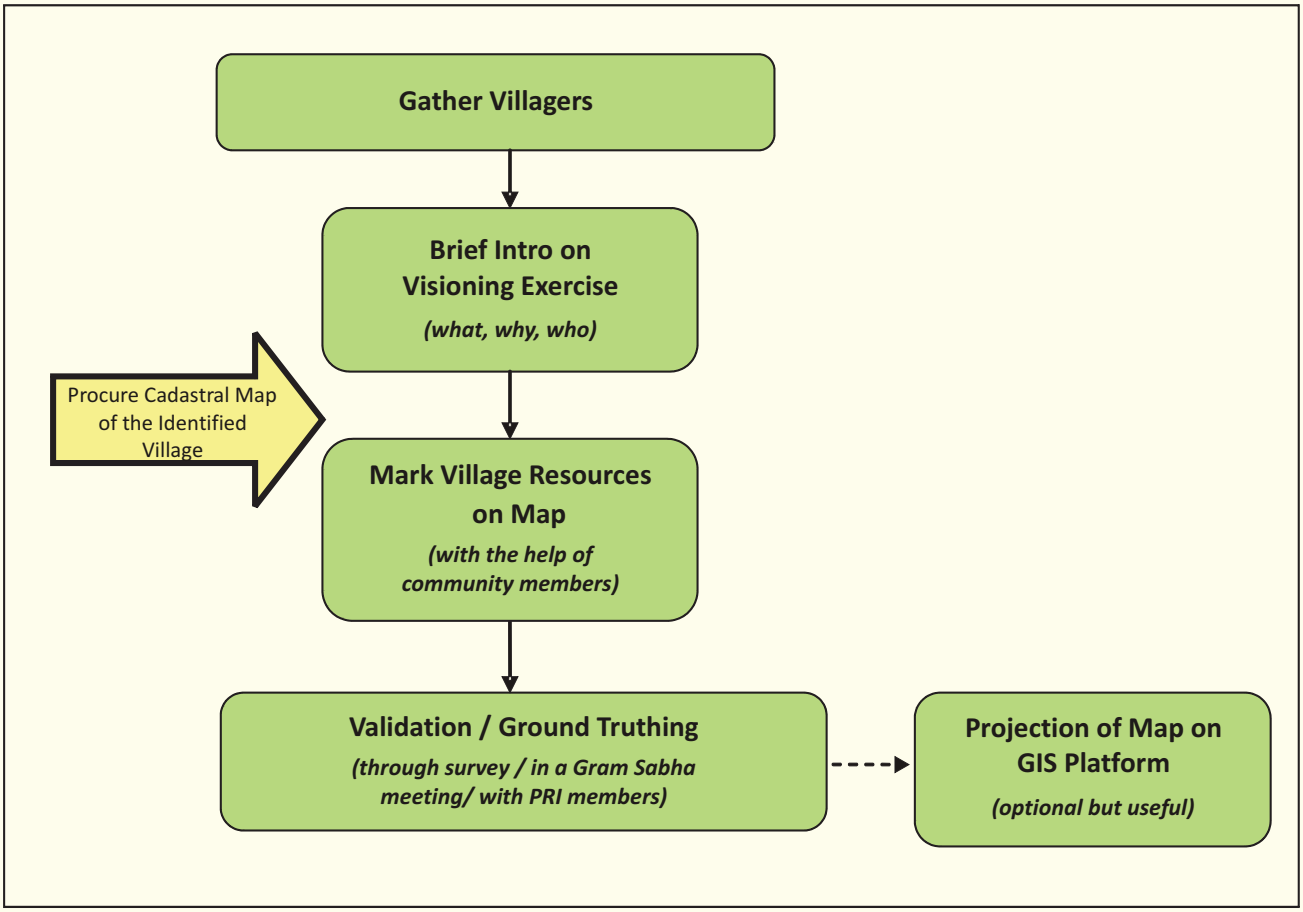
Steps:

1. Procure cadastral map of the identified village from the District Land Revenue Department.[3]
2. Gather people preferably from all strata of the village and make sure there is representation /participation of key stakeholders (Panchayati Raj Institutions, Self Help Groups, informal institutions, women). The exercise can be conducted through Focus Group Discussions.
3. Brief them about the purpose of resource mapping, expectations and their role in conducting the process.
4. Mark / plot the available resources (land, forest, water bodies, settlements or other relevant resources) of the village on the cadastral map. While doing the same it may be useful to first mark the main road of the village and then follow these to mark village resources and landmarks such as wells, hand pumps, water bodies etc along them. This exercise of resource identification and mapping should be carried out with help of the land revenue department officer (also known as *'Patwari'*) and community members. The best and most effective way of carrying out this step is to hold the exercise in a *'Gram Sabha'* meeting in the presence of PRI members.
5. Validation and ground truthing of the village resources can be carried out either through Focus Group Discussions (FGDs) or through reconnaissance survey or both with the help of village communities (representing different community groups like Schedule Caste, Schedule Tribes in the village).
6. Optional step: Cadastral map thus formed can be scanned and projected on the Geographic Information System (GIS) platform to make it interactive.

3 Cost of a cadastral map is approximately 100 INR

Village Cadastral Map | *Plotting resources on cadastral map with communities* | *Validation process with the help of communities* | *Final Map*

Schematic Representation of Module



SHORT NOTES / TIPS

Other information to be collected:

Refer the national solar radiation map and wind velocity map. These can be collected through sources such as Government agencies (Meteorological Department), renewable energy technology provider, local agriculture institutions etc.

For information regarding available Government subsidies/ schemes and technology providers/manufactures refer the Ministry of New and Renewable Energy (MNRE), Government of India website (http://www.mnre.gov.in/) .

Follow the link http://www.ireda.gov.in/Compendium/index.htm for a Compendium Of State Government Policies On Renewable Energy Sector In India.

A transect walk is a systematic walk along a defined path (transect) across the community/project area together with the local people to explore the energy situation in the village by observing, asking, listening, looking and producing a transect diagram. *(Please refer to annex-15).*

Key Government Departments/ Institutions

The Government has established State Nodal Departments and State Nodal Agencies for promotion of renewable energy. Information about these is available on the MNRE website.

Financial institutions such as National Bank for Agriculture and Rural Development (Follow the link for more details http://www.nabard.org/).

A number of Microfinance Institutions (MFIs) also facilitate the purchase of renewable energy systems like solar cookers, solar lanterns, or small biogas plants in off-grid areas of the country. One of the main features of micro financing is provision of small amounts of credit to potential users with very low purchasing power underserved by formal banking / financing institutions.

MNRE has established Indian Renewable Energy Development Agency (IREDA) which promotes and extends financial assistance for renewable energy and energy efficiency/ conservation projects. Follow the link for more details http://www.ireda.gov.in/).

Financial resources can also be leveraged from other government schemes such as Mahatma Gandhi National Rural Employment Guarantee Scheme (resources can be used for biomass plantation).

VILLAGE ENERGY COMMITTEE (VEC) FORMATION

Introduction: Village Energy Committee (VEC) are established and capacitated to own, operate, maintain and manage the energy production and distribution facilities of decentralized renewable energy establishments. VEC formation promotes community participation and decentralized decision making in the project. A process of electricity generation which is owned and maintained by the community ensures long time sustainability of the project. It contains representation of all the identified key stakeholders example women, farmers, entrepreneurs, tribal etc. Village Energy Committee (VEC) should be formed in a participatory manner with equal participation from all groups in the village.

VEC meetings at regular intervals are very important

Objective: To form a Village Energy Committee (VEC) in participatory manner.

Process:

Steps:

1. Identify different stakeholders depending on the village population. The key stakeholders for village energy planning should include farmers, women, entrepreneurs, youth, people from lower caste, NGO partners, tribals, Panchayat members. The identified stakeholders should be part of the VEC being formed.
2. Gather people preferably from all strata of the village and make sure there is representation /participation of key stakeholders (Panchayati Raj Institution, Self Help Groups, informal institutions, women). The exercise can be conducted through Focus Group Discussions and preferably with '*Gram Sabha'* meeting.

   Provide a brief introduction to the overall objective and vision of the project to be implemented in the area.

   Explain to them the concept of a VEC (as mentioned in the introduction section to this module).

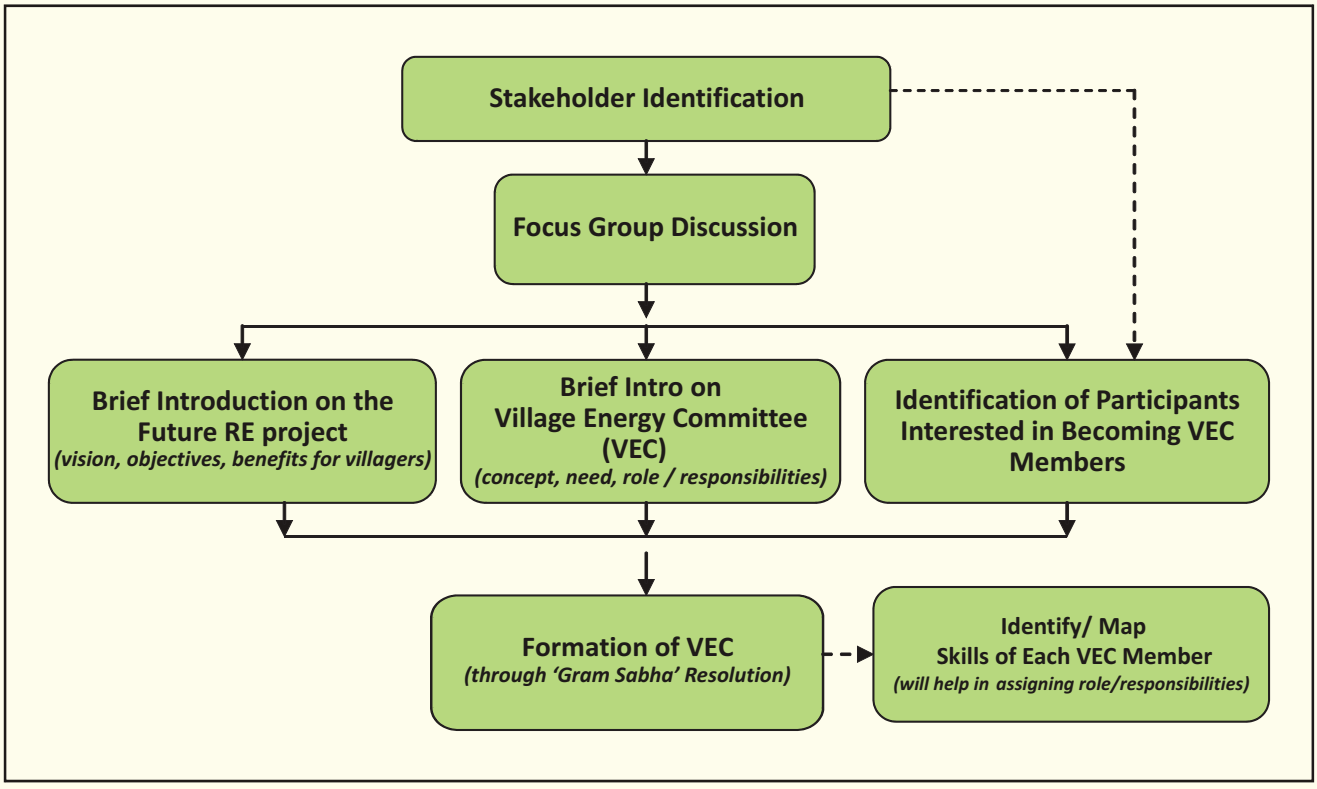
   Explain to them the need of establishing VEC (as mentioned in the introduction section to this module).

   Give brief introduction on the roles and responsibilities that a VEC is supposed to perform (please refer to annex -6).

   Identify participants interested in becoming members of the VECH
3. Form a Village Energy Committee making sure equal participation from all the representative groups in the village. VEC can be formed by passing a '*Gram Sabha'* Resolution to ensure ownership being taken by villagers and overall sustainability of the project *(please refer to annex -7).*Within the same *'Gram Sabha*' meeting, expected role and responsibilities of VEC can be enumerated.
4. The next step is to map each VEC member's skill set individually and assign them with responsibility (as given in table below). Also assess areas where further capacity building of the VEC members is required.

Responsibilities	Activities	Required skill set	Member/s who takes up this activity	Capacity building required	Member/s who takes up this responsibility
Responsibility 1					
Responsibility 2					

Schematic Representation of Module



SHORT NOTES / TIPS

The Committee should comprise of at least 11 members.

The Committee should comprise of at least of 30 % (one third) women besides other villagers from all hamlets and caste, to avoid any future social turbulence.

Efforts should be taken to ensure that all key stakeholders earlier identified are equally represented in the VEC.

It may be beneficial to have one member of the implementing agency (NGO) as part of the committee to ensure smooth operation of the VEC.

A source of income i.e. a regular salary to the VEC members could act as an added incentive to be part of the VEC & would inculcate a feeling of ownership towards the RE plant.

The minimum age & qualification criteria for the VEC members should be decided in participatory mode.

The VEC structure & methods for member's selection should be decided in a participatory manner.

In an ideal situation formation of VEC should be through the *Gram Sabha* and duly notified by the Gram Panchayat as a Sub-Committee or Standing Committee as per the relevant provisions of the State Panchayati Raj Act and rules in this regard. In this case the Gram Panchayat will act as the Apex body and will assume the supervisory role for all project partners at the village level. The *Sarpanch* should assume the post of a chairman of the said committee. In the absence of *Sarpanch* any representative of the Panchayat should assume the post of chairman of the said committee.

The existing governance structure of the Panchayat under consideration should be studied. If the existing Panchayat committee lacks in skill & service delivery as required for the VEC then their capacities should be built.

VILLAGE ENERGY PLAN DEVELOPMENT

Introduction: A 'Village Energy Plan' (VEP) provides guidelines for establishing a decentralized renewable energy plant to meet the energy needs of villagers. Its major components are technology selection, implementation model selection and monitoring and evaluation planning. Beside this, VEP also takes into due consideration the social aspects (structure, status, resources) of the village. Technology selection helps to decide the technology of the RE plant to be implemented. Under implementation model we decide a suitable techno-commercial & social model for the proposed plant establishment. Monitoring & evaluation planning is essential to assess the impact of the RE plant under consideration.

DRE generation should add value to local economy besides meeting domestic energy demand

Objective: To form a Village Energy Plan (VEP) in participatory made with the community, which will form the guidelines for the implementation processes.

Process:

Steps:

The VEP should be developed based on the vision statement and overall objective/scope of the project earlier defined. The key steps for developing VEP are as follows:

1. **Technology Selection:** It is primarily based on demand of energy, supply of resources and available finances. Technology selection should be done in a participatory mode involving key stakeholders such as VEC members, PRI members, local institutions etc.
    a. **Demand Estimation:** In this step we need to find out the load demand and the hours of operation for domestic, commercial and community use. The load demand is basically a combination of current & future energy demand. This also focuses on anticipated yearly percentage increase in energy demand for five years in the village.
        i. Collect baseline information through household surveys. This step involves identifying the various uses of energy in the village, that is, village energy consumption pattern. For this, details like number of households, average load, hours of operation etc needs to be collected*(Please refer Module A1 for further information)*.
        ii. Assessment of the data collected *(Please refer to annex-8)*.
    b. **Power Generation Capacity Estimation (based on resource available) :**
        i. Collect the information on different resources in the village i.e current production & consumption of these resources through baseline surveys & resource mapping *(Please refer Module A1 & C1 for further information)*.

ii. This information should be collated & calculations are done to estimate power generation capacity based on the renewable energy resource available *(Please refer to annex-9*).

c. **Financial Analysis:** In this step, one needs to consider all the finances in the project life *(Please refer to annex-10*).

i. Calculate the costs to be occurred in the project life. For example: capital cost (technology, T&D), production cost, etc.

ii. Calculate the expected revenue.

iii. Consider subsidies & applicable schemes offered by the government as a source of funds.

iv. Fund gap analysis is done considering the parameters like: costs to be occurred in the project life & funds available.

Biomass collection as a raw material for DRE solution provides opportunity for local income generation

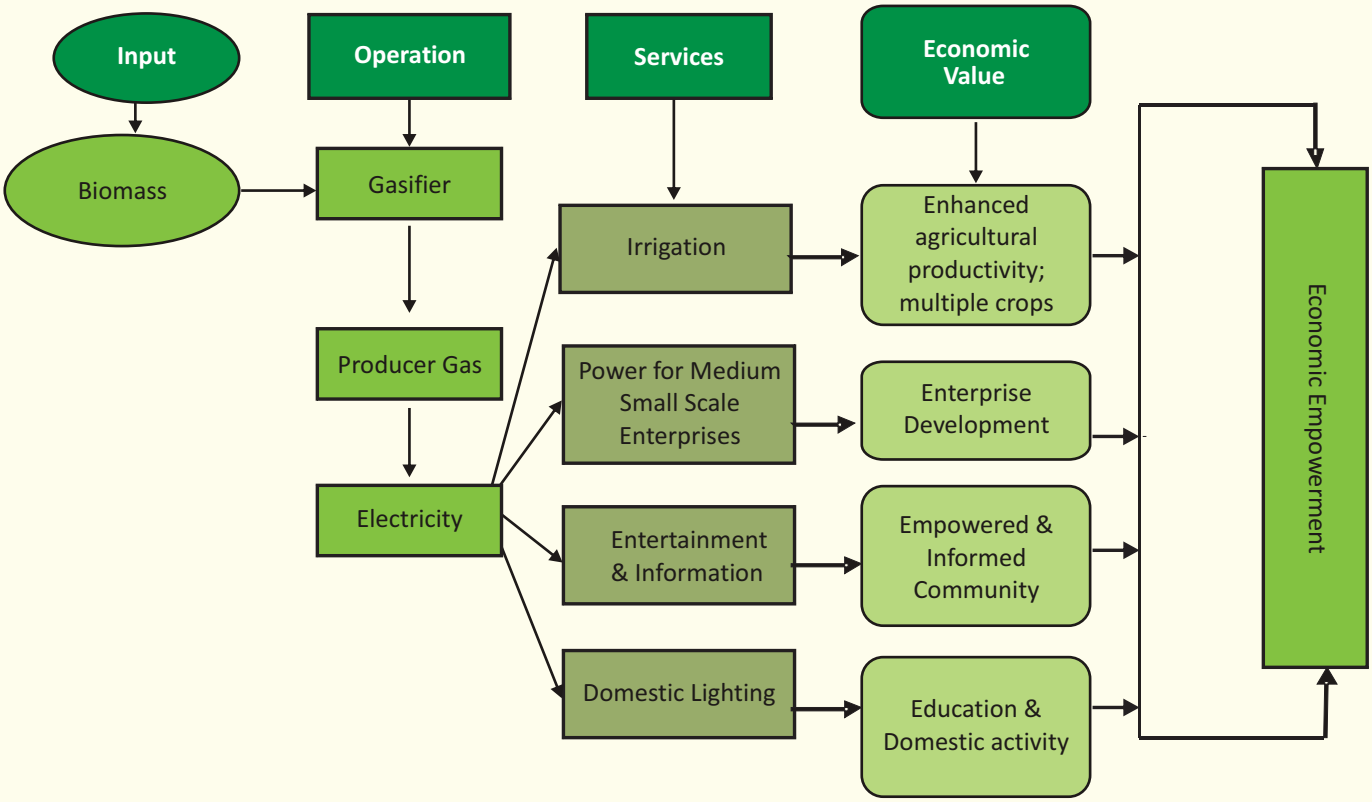
d. **Installed Capacity Estimation**: Based on the demand and generation capacity estimates (supply side) and resources available (finances), implementer needs to decide the installed capacity of the power plant to be established.

e. **Technology Selection:** To decide on renewable energy technology option a comparison of different technologies on basis of their generation capacity, installed capacity, available finances and resources should be done.

2. **Implementation Model:** One of the important components of VEP is selection of implementation model based on technology, commercial and social aspects. The implementer needs to decide based on the overall objective and vision of the decentralized renewable energy project. Some of the examples are listed below:

a. The '**Energy Service Approach' model** shows a strong realization of monetary profit at individual level, as well as at community level and thereby not only encourage every villager to pay for the service but also help them to enhance their paying capacity in due course of time to avail more and more services at their door steps. The line diagram of the model is as shown below

Figure: Biomass Gasifier Based Economic Development Model



b. **CIG Model:** Common Interest Group (CIG) is essentially a group of like minded people having similar investment and management capacity. In this model CIG owns and manages a RE based power plant which provides a quality and reliable source of energy leading to increased or enhanced income. For e.g. if we consider a farmers CIG group, farmers will own and manage a RE plant which will provide reliable energy to meet their irrigation demand (AC pumps, pipes, sprinkler sets etc.) leading to enhanced agricultural productivity and thereby income.

c. **Rural Entrepreneurship Zone (REZ):** REZ is a centre which provides RE infrastructure required for cluster of Small and Medium Enterprises (SMEs), especially for rural entrepreneurs and farmers to create substantial added-value to the local resources. Around these assured power supply zones, economic activities are encouraged based on the traditional skills and available local resources (including waste). REZs create a huge positive environmental and social impact while creating large scale sustainable livelihoods for rural youth/entrepreneurs.

d. **Community Based Service Delivery Model:** Under this approach an RE based plant is set up & the local community takes the charge of the facility i.e. it is owned & managed by the community. The concept of 'Pay for Energy' is introduced to the villagers to ensure financial sustainability of the plant. This ensures a successful and sustainable revenue model. Power generated is primarily used for domestic and developmental activities.

Based on the selected implementation model the exercise of tariff structuring and load management can be performed *(Please refer to annex - 11)*.

3. **Spatial Planning:** Identify two to three options as potential locations for setting up the proposed renewable energy plant. Finalize the land, based on cost, availability, accessibility, legal status and transmission and distribution (T&D) route, with the help of PRI members, VEC and villagers. Earlier planning with respect to T&D route will not only help in reducing cost but also ensure reach to expected beneficiaries. A map can be drawn for spatial representation of plant location, T&D lines and village settlements.

4. **Monitoring and Evaluation Planning:** This forms a very important step in the project planning process. For project to be sustainable in the long run it is very crucial to assess impacts generated by the project on ground. For this the project team should decide / define important indicators for assessing the project performance pre, during and post implementation. One of the key aspects to select M&E indicators is overall project objectives and the business model chosen by the team *(details have been provided in Section E of this toolkit).*

5. The output of above mentioned exercises should lead to formation of a 'Village Energy Plan'. It could be depicted through a matrix and/or map. Example of a matrix is given below:

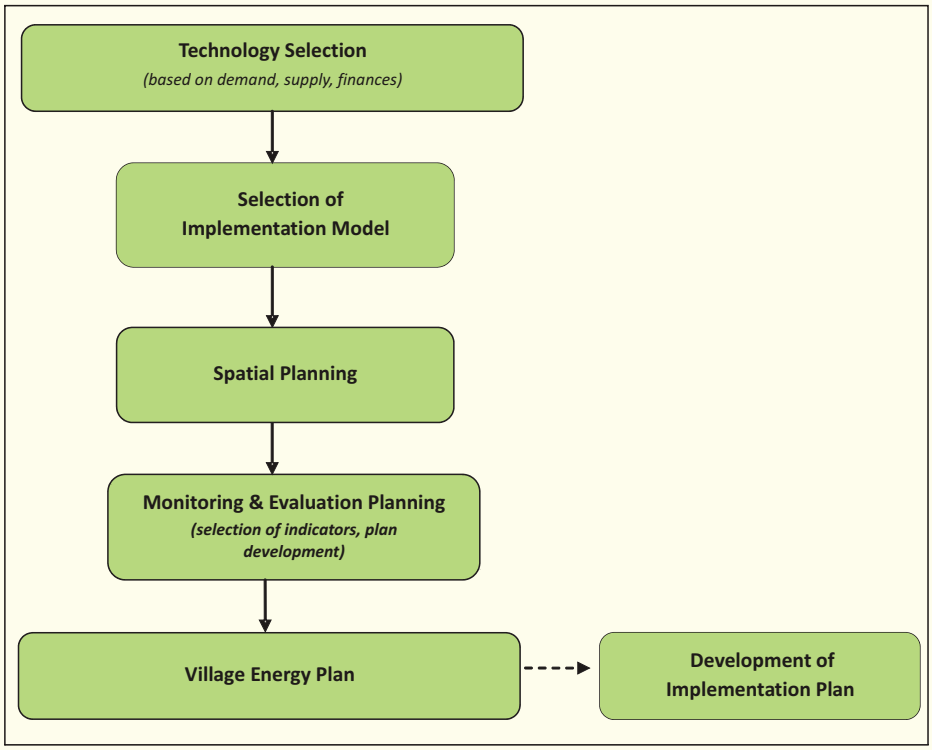
Vision Statement and Project Objectives	Technology Selected	Techno-Commercial and Social Model	Expected Outputs	Activities	M&E Indicators

6. **Implementation Plan Development:** Implementation plan should be made based on the VEP. This will provide guidelines to the activities that need to be conducted on the ground as per the VEP. Implementation plan helps in efficient and effective use of resources (inputs) to give the desired outputs as envisaged during the project planning process. Implementation plan comprises of a list of activities with a designated timeline and stakeholders responsible for carrying out those activities.

   a. **Activity Calendar Development:** Identify the different activities required to be performed according to the VEP. Identify the institutions/people responsible for those particular activities and assign them with their expected responsibilities. After this the team needs to decide on an agreeable timeline for delivering the outputs. The suggested activity calendar is given below:

Expected Outputs	Activities	Stakeholders	Timeline

Schematic Representation of Module



SHORT NOTES / TIPS

Selection of the technology should be based on expert opinion as well as on the views of the community.

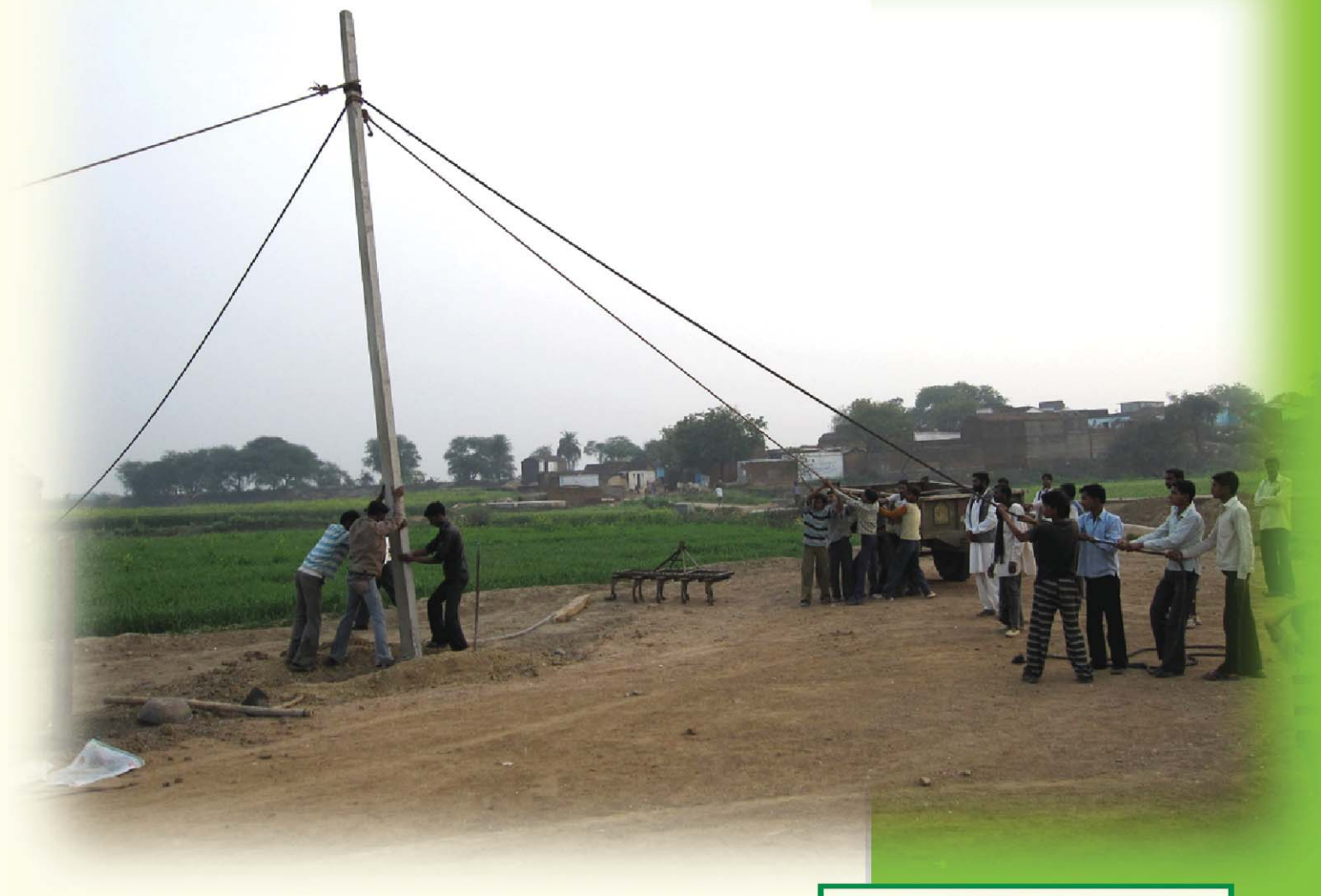
Tariff structuring should be done based on the social dynamics & technology cost. Tariffs can be worked out for different types of load on the basis of operational and maintenance cost of the system, which includes the cost of fuel, lubricating oil, spare parts, and wages of the VEC staff *(differential tariffs further explained with an example in annex-11.)*

Load Management is the factor of peak demand, demand duration, demand fluctuation (seasonal and daily), social dynamics and associated tariff model.

In the villages where community initiatives may be difficult to implement, solar home lighting system or solar lantern with charging station models can be used. Similar initiatives have been taken by SELCO which have been documented as case studies. For further reading go to www.selco-india.com/case-studies.html.

While performing the financial analysis, it would be useful to look at different viable business models for decentralized renewable energy. *(Please refer to annex – 16).* For more case studies on different business models please go to www.grida.no/files/activities/greeneconomy/case-studies-da-india.pdf.

While preparing the plan, make sure that it is aligned with different social & environmental aspects such as creation of livelihood and employment opportunities, use local skills etc.



SECTION - D

IMPLEMENTATION PROCESSES

Fourth section is on 'Implementation Processes'. The section provides insight on the technical and social processes required to be followed for implementing' the Village Energy Plan'. Social processes include formation of core team, capacity building of key stakeholders, assigning role and responsibilities as per the Village Energy Plan. Technology processes include aspects related to plant establishment, operations and maintenance etc.

SOCIAL PROCESSES

Introduction: Social processes are important to engage stakeholders. It is the most critical phase to ensure villagers' participation by clearing their basic understanding on renewable energy power plant development. In this phase the implementation team will also develop an ownership feeling within the villagers.

Capacity building exercise of VEC members

Objective: To form a core team and build its capacity for smooth functioning of renewable energy project.

Process:

Steps:

Part A: Formation of a Core Team

a. Conduct a Focus Group Discussion. Make sure there is representation /participation of the implementation agency, VEC, PRI members and the community.

b. A team should be drawn from the Project Implementation Agency (PIA), VEC, PRI members and the community in participatory mode for executing the different project activities. While forming the team, due attention should be given to the team member's basic knowledge (social, environmental, resources, economic etc.) of the village and experience in implementing community driven projects especially in renewable energy projects.

c. A Project Manager should be assigned in the meeting & she/he shall be responsible for overall coordination of the project activities. She/ he should be supported by the President and Secretary of the VEC for carrying out the activities at a local level.

d. Various core working groups should be formed based on the capacity, ability and interest of the villagers to perform activities listed in the detailed project activity calendar (prepared under VEP). Women and poor families should be given due preference.

Part B: Capacity Building

Capacity building of key stakeholders and core team members is critical for proper and smooth implementation of the RE project. This will not only enhance their knowledge and ability to perform in an effective manner but will also help them to boost their confidence. To conduct the training following steps need to be followed:

a. **Training Needs Assessment:** Training needs among the key stakeholders (identified in VEP) can be identified through following steps:

   i. Hold Focussed Group Discussions (FGD) separately for different stakeholders.

   ii. List out the various activities that they (the particular stakeholders) are required to perform according to the VEP.

   iii. Identify the person responsible for the activities.

iv. Identify the skills required to perform these activities. This can help one decide the training needs of the institutions & people involved.

v. Prioritize these on basis of the needs of the people (in this case the particular stakeholders) & the overall objective of the project *(please refer to table below)*.

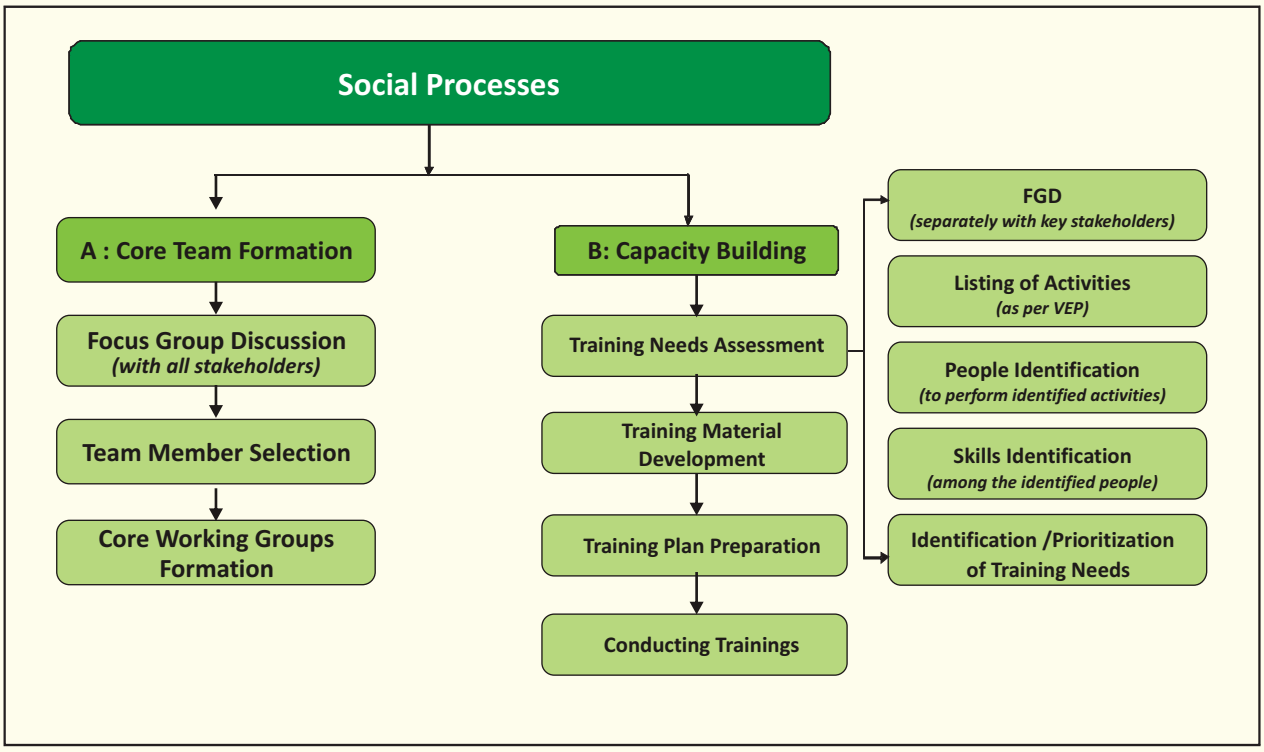
Stakeholder	Activities*	Required Skill Set	Training Required	
			Yes	No
Note: * Role & responsibilities decided as per the Village Energy Plan				

b. **Training Material Development:** Based on the identified capacity gaps among the key stakeholders training material needs to be developed. The training material can be developed by the implementation agency (NGO) itself or they can seek support from other sources (such as, agencies with experience in conducting similar projects). In case of providing training related to plant operations & maintenance experts from technology provider's company can conduct the trainings.

c. **Training Plan Preparation:** Once the training material is ready, the time plan for conducting the training programme should be developed in participatory mode involving key stakeholders. The nature of the training should be interactive and participatory. An example for the same is given below:

S. No.	Type of Training	Target Group	Faculty	Date &Time
1.	Operational Management & book keeping	VEC members		
2.	Power plant operation & maintenance	Operator & Worker		
3.	Organisational Development process	VEC members		
4.	Fire safety	VEC members		
5.	Operational training-Biogas	Individual household		
6.	Load management and conflict resolution	VEC members		

Schematic Representation of Module



SHORT NOTES / TIPS

Government support is a key factor for success of RE based power plants therefore it is suggested to engage them from the starting itself. This will ensure timely and successful implementation fo the plant.

Ensure equal number of men and women participants based on the common needs like awareness and knowledge generation and skill building (introducing new skill and strengthening the existing skills) related to energy activities.

If the need is exclusive to women, organize separate programmes taking in to consideration like convenience, time availability, venue, if possible identify a competent women trainer etc.

Training and capacity building based on the changing needs and requirements is a continuous process and thus periodically observe and identify the needs and organize the programmes accordingly.

TECHNOLOGY PROCESSES

Introduction: The present module provides insights to the overall project implementation processes that needs to be carried out on the ground. The processes described herein are related to technology implementation aspects of the decentralized renewable energy project. The module essentially provides guidelines to help in actual implementation of the decentralized renewable energy technology on the ground.

Local Operator of Biogas Engine - decentralized energy generation provides local employment opportunity

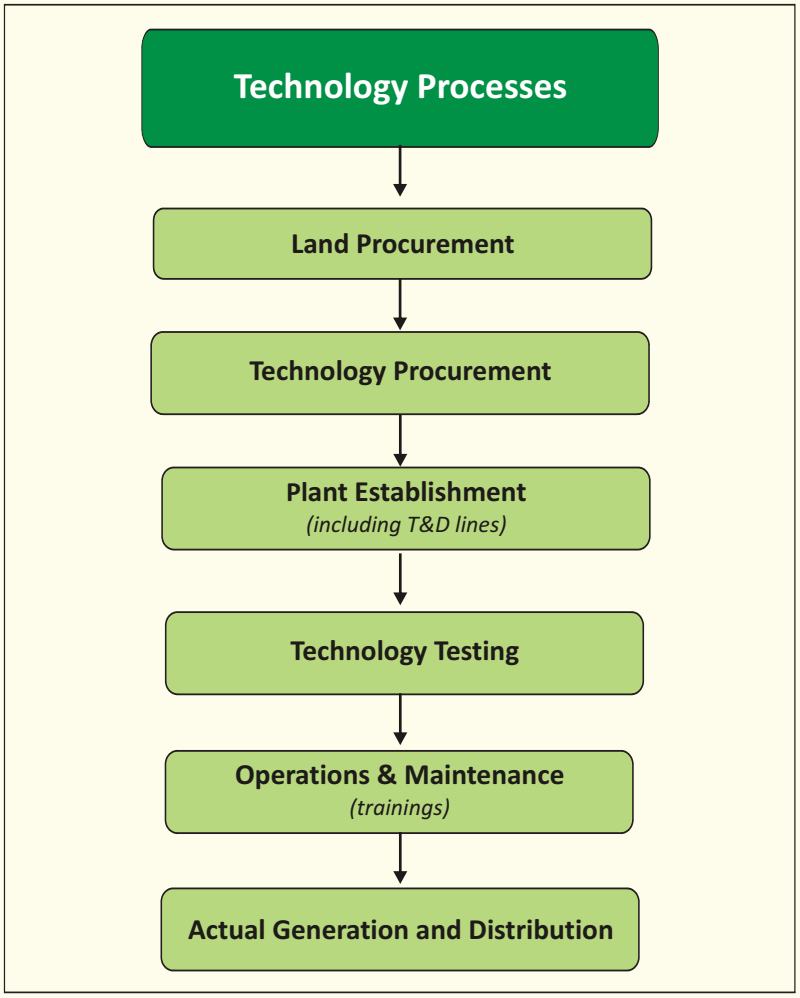
Objective: To set up the RE plant system.

Process:

1. **Land procurement & building clearances** for the plant from various authorities is the first step that should be ensured *(please refer to annex- 12)*.
2. **Technology Procurement**
   a. Identify technology supplier/ manufacturer, civil and electrical contractor and ask for quotations against specific requirements related to the technology identified in the VEP.
   b. Compare the quotations and choose the most appropriate one according to cost, quality and scope of work. Sign an agreement with the respective company/organization/person.
   c. Obtain techno-commercial details of the proposed plant and machinery from the selected technology provider. Obtain civil and electrical specifications (plant layout, materials specification, time plan etc.) required for the plant installation from the respective contractor *(please refer to annex - 13)*.
3. **Plant Establishment**
   a. Based on the agreed technology and civil specifications, set up the renewable energy plant at the procured land area. The project team is required to provide support and facilitate the respective contractors in the plant establishment process.
   b. Laying down transmission and distribution lines.
4. **Technology Testing Phase:** While commissioning the power plant implementer needs to check performance of the technology under various load conditions. The implementer should conduct at least 100 hours test under the supervision of technology suppliers.
5. **Operations and Maintenance:** The implementer should identify an operator from within the village and define role/ responsibility of the operator through a participatory process. The operator should be trained by the technology supplier. Operator should manage the power plant operations and maintain various log-books to record energy generation and distribution. Operator should also follow the periodic and breakdown maintenance as per the guidelines provided by the technology suppliers.

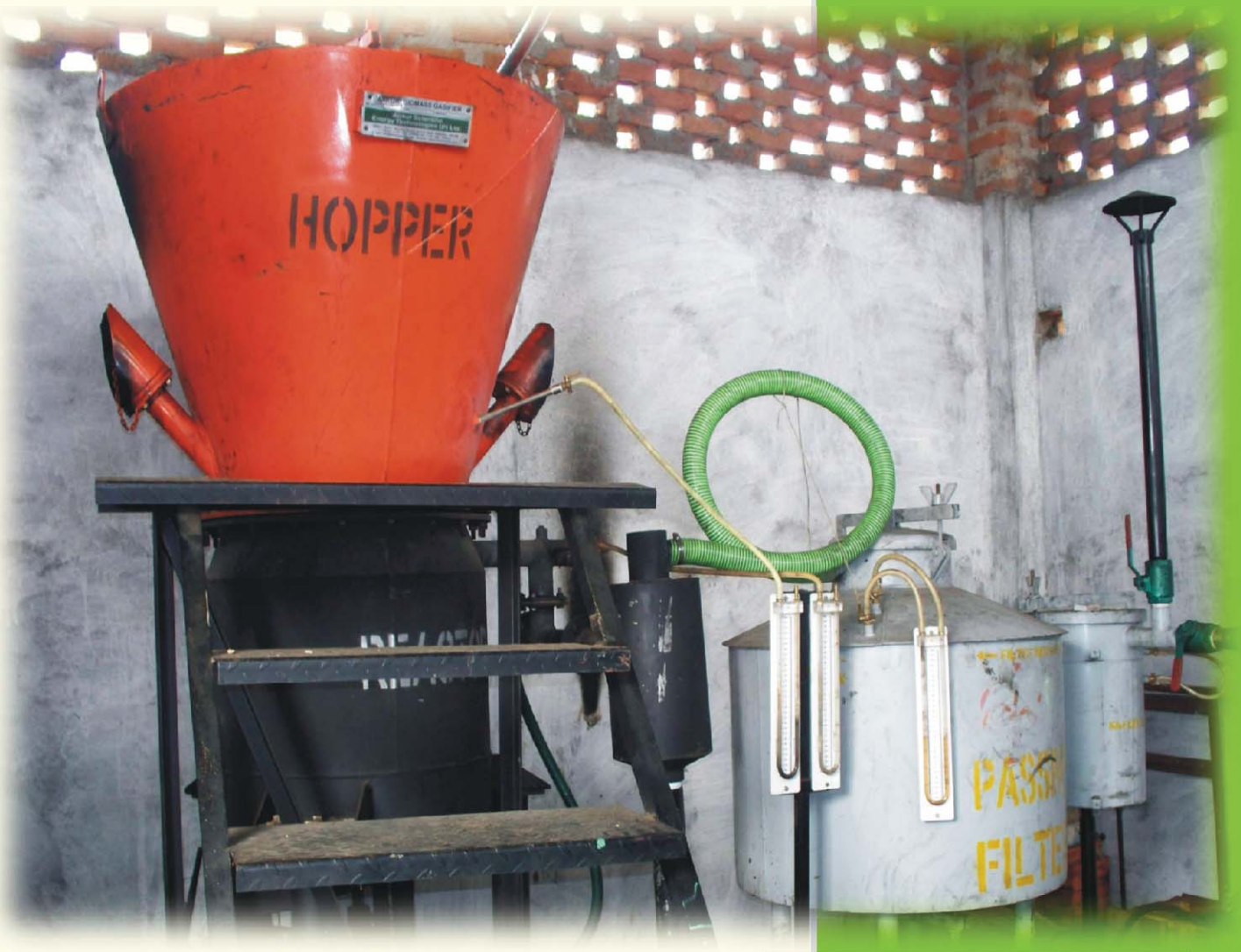
6. **Actual Generation and Distribution to Beneficiaries:** The first few months are very critical in case of both energy generation and distribution. The aspects critical are listed below:
   a. Raw material management: The implementer should design a mechanism to ensure un-interrupted supply of quality raw material at the lowest possible cost. This mainly depends on seasonality of the demand of energy and supply of the resource.
   b. Load management and tariff structuring: Based on the consumption & payment trends, load management and tariff strategy should be revised for the project to be sustainable in long run.

Schematic Representation of Module



SHORT NOTES / TIPS

Safety: The implementer should analyze the risk possibilities and should take necessary safety measures to mitigate them.



SECTION - E

PARTICIPATORY MONITORING AND EVALUATION

Fifth section talks about Monitoring and Evaluation. The section highlights the mechanism of conducting monitoring and evaluation of community renewable energy projects in participatory mode.

MONITORING AND EVALUATION PROCESSES

Introduction: Monitoring and Evaluation (M&E) is a very important component of a project cycle. M&E, is essentially a process that is intended to measures the progress and success of the project as per the agreed indicators. M&E ideally should be done throughout the project cycle i.e. at the project initiation, during the project and at the end of the project. While M&E at the beginning and end helps in evaluating the overall performance of the project, M&E during the project helps in doing any mid- term course corrections. One of the most important advantages of conducting M&E is extraction of lessons in areas like design improvement, process improvement etc. for future replication/multiplication of project. While M&E is necessary for any kind of project, the tools, indicators, approach, timeline, methods etc. may vary from project to project and should be adapted as per the need of the project and stakeholders.

Batteries for storing power produced from DRE system

Objective: To build capacity of local NGOs (implementing agency) on conducting monitoring and evaluation of energy projects in participatory mode involving communities and VEC members.

Process:

Steps:

1. First step is to make the M&E plan at the project planning phase itself. It would be useful to develop the plan in a participatory mode involving key stakeholders including communities, VEC members etc. Points to consider while developing the M&E plan are as follows:
   a. **Selection of M&E indictors:** Based on the business model chosen for implementing the renewable energy project select indictors for evaluating the performance. The broad categories of indictors are as follows:
      i. **Technology:** System performance, load profile, resource profile, etc. *(please refer to annex-14).*[4] *Will also take care of the financial aspects such as financial viability etc.*
      ii. **Social:** Number of beneficiaries (expected to get direct benefit from the power supply), end user satisfaction
      iii. **Development:** indirect or developmental impacts of the project (value addition in existing local economy, gender issues, job creation, training and capacity building, reduced emissions/environmental pollution etc.)[5]

4 Adapted from http://www.unescap.org/esd/energy/cap_building/renewable/documents/sppd/Presentation%20docs/pdf1/day3/SESSION%208/Technical%20Evaluation%20(Anare).pdf

5 It is important to evaluate indirect impacts of the renewable energy project on overall development of the area and communities. These are important to the sustainability and success of the project.

b. Selection of data collection methods and approach. Based on the selection made, tools/ formats to collect data should be developed *(please refer to annex-14)*.

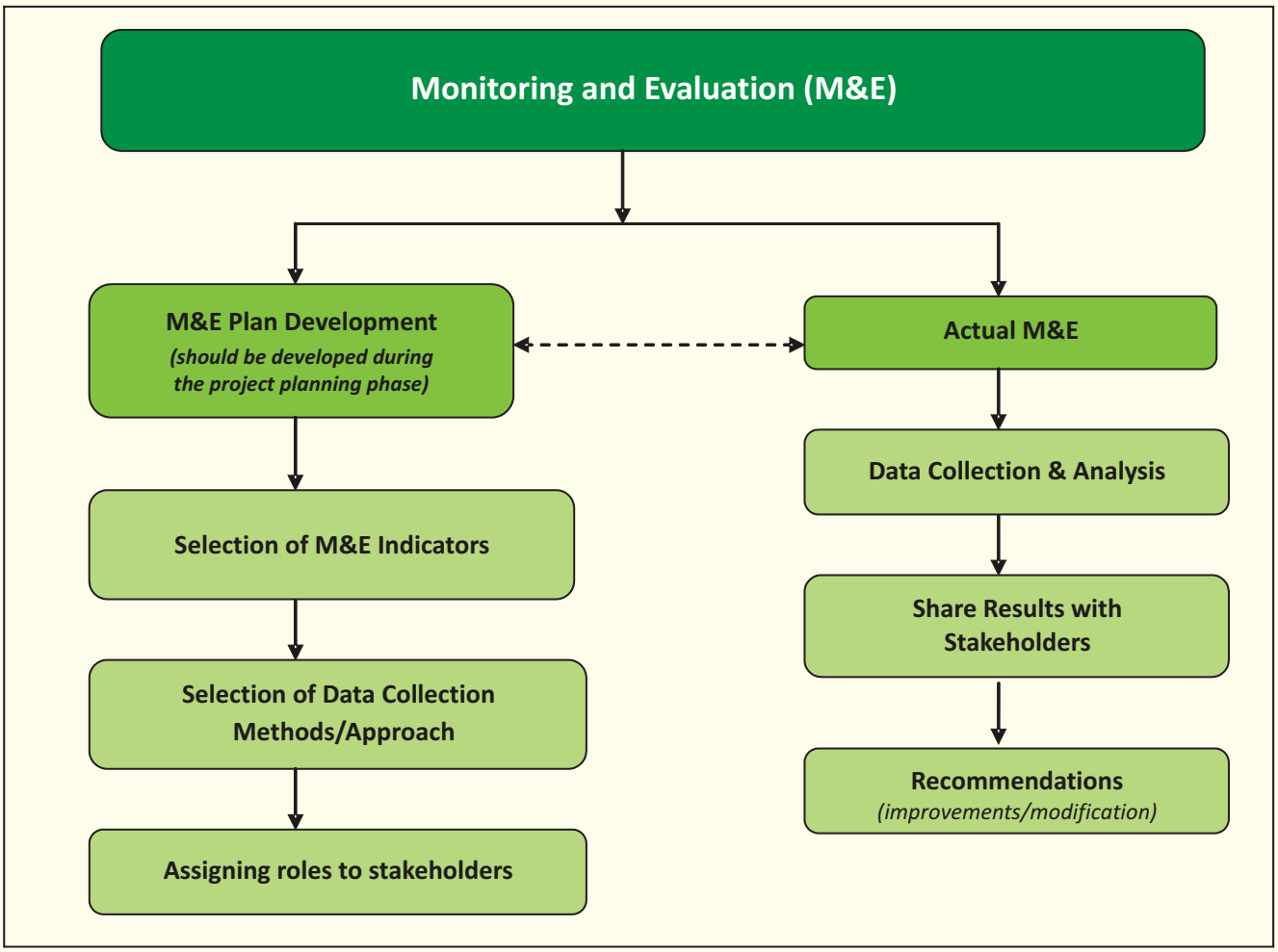
c. Define roles / responsibilities of different stakeholders for carrying out the M&E tasks.

2. Collect data/information against the selected M&E indicators through primary sources such as household survey, focus group discussions and/or from secondary sources (already available information/documents with Government institutions, local institutions etc.).[7]

3. Collected data / information should be collated first and analyzed to come out with the results against the specified M&E indicators.

4. Results should be presented to all stakeholders and discussed for any follow-up on the recommendations (made on modifications/improvement related to social, technical, and developmental aspects).

Schematic Representation of Module



7 Some of information/data collected in village identification, resource mapping process can also be used as baseline information for M&E purpose especially in case of Social and Development parameters.

SHORT NOTES / TIPS

Baseline survey of all social, economic and environmental parameter, which are subjected to change due to direct and indirect influence of the proposed project should be recorded well in advance as a gauge to measure the outcome/ output and thus direct / indirect impact of the project.

Indicators against which M&E is done, are chosen such that they can be easily understand & monitored by the community.

ANNEXURE

Final section tries to capture lessons from the successful Community Renewable Energy initiatives in India case studies. The section also provides the additional information pertaining to community based renewable energy projects that would help target group in gaining understanding of different aspects such as 'operation and maintenance of the plant, available government subsidies/policies, list of technical agencies related to renewable energy.

Annex - 1

CASE STUDIES

Community Biomass Gasifier Plant - A Case Study of Radhapur Village, Madhya Pradesh

Radhapur is a small village under Badrakha Panchayat in Pichhore block of Shivpuri district of Madhya Pradesh. Agriculture and daily labour are the only source of income in the village. The village has around 550 acres of fertile soil for cultivation, and uses 32 pumps for irrigation that consume more than 4000 litres of diesel.

Like many other unelectrified villages, villagers of Radhapur were facing an energy crisis due to ever raising diesel prices. Increased diesel prices have forced the farmers to migrate to the nearby cities to generate a livelihood. Also, continuous consumption of logwoods for cooking and burning is contributing to deforestation and indoor air pollution.

At a Glance	
Location	Village Radhapur, Panchayat Badarkha, Pichore Block, District. Shivpuri, Uttar Pradesh (India)
Number of Beneficiary Households	87
Power Plant Design	Down drift Biomass Gasifier Engine Plant - 10kW

Overview

Development Alternatives, with financial support from Department of Science and Technology, took an initiative to resolve the environmental, social and economical problems faced by the Radhapur village. In 2009, Development Alternatives had installed biomass gasifier of installed capacity of 10 kW. The gasifier provides electricity to 87 households of the village.

Development Alternatives has contributed to this programme through social mobilization of grassroots stakeholders and building institutional, financial and technical capacity. It has also encouraged the small scale entrepreneurs from the different communities of the village to set micro-enterprises like flour mill, oil expeller etc within the village. Along with this, a community based service delivery model has been established through formulation of Village Energy Committee (VEC). VEC not only manages the production and distribution of energy but also initiates other sustainable development processes on its own.

Process and Approach

The approach followed for setting up biomass gasifier in Radhapur village is ''Build-Own-Operate-Transfer" (BOOT), where local community takes the charge of the facility. The innovative components of the project include need-based load balancing mechanism, participatory planning & execution and value-added energy services for livelihood creation. To achieve this, a 16 member Village Energy Committee was formed (with 4 women members) with its own bank account. Under the "BOOT" model, the VEC monitors, manages and collects revenues for the supplied power. The committee has also given a piece of land for installation of biomass gasifier plant and conducts regular meetings in the village. A plant operator from the village (on the payroll of VEC) has been identified to manage the plant.

Business Model

The most crucial part of setting a biomass based gasifier is to have a sustained supply of biomass. The biomass used here is *Ipomea*, a locally available weed. On direct combustion, it gives a very pungent odour and hence is not used by local

communities as fuel for cooking purpose. Biomass harvesting, chopping and transportation are being done by local communities and thus, it is an additional source of income for them.

The distribution of electricity is done through 750 metre long transmission and distribution (T&D) line in 3 phases. Each phase supplies 220 volts as an alternate current power for households and communities; irrigation and enterprises use. In the initial stages 8 street lights were installed for community use along with the charged battery of 12 volts, 60-150 Ampere per hour service model for off grid domestic supply. Now, the village has 12 street lights. Different slabs for load usage have been formed for varied usage. Domestic load is about 3-4 kW peak for 4 to 12 hours per day; Irrigation load: 8- 25 kW peak for 2 to 14 hours per day and enterprise load upto 3.5 to 8.5 kW peak for 4 to 12 hours per day in the village.

Current Tariff Structure					
Slab-1		Slab-2		Slab-3	
Less than 5KW		5KW to 10 KW		More than 10 KW	
Fixed (Rs)	20	Fixed (Rs)	90	Fixed (Rs)	160
Unit Rate (Rs)	4.50	Unit Rate (Rs)	22.50 +5.50 per unit for additional unit above than 5 units	Unit Rate (Rs)	50.00 + 6.50 per unit for additional unit above than 10 units

The tariff rates against various load categories have been formulated to enhance the plant load factor for the sustainability of the model (please refer table).

Impacts Generated

Social-Economic Conditions

Radhapur is a resource rich village but its economy was badly hit by high cost of energy. Non availability of electricity and dependency on fossil fuel had led the villagers to suffer from the financial, agricultural, education and various other losses. With the implementation of biomass gasifier in the village this picture of the village has changed noticeably. Children are now able to study even in the evening hours after the sunset. Villagers are actively taking part in weekly meetings and planning seasonal activities along with discussing and solving their issues.

Gender Concerns: Provision of electricity has brought positive change in the condition of women. Infact, the domestic meter connections have been issued in the name of women in many households. Women self help groups have been formed and trained for making leaf cups (to be sold in open market). As members of Village Energy Committee, village women are actively participating in decision making process related to the power plant.

Skills Development: Training for making leaf cups and oil seed extraction has been undertaken as activities that could lead to a long term sustainability of distributed generation based power systems like a biomass gasifier system.

Renewable Energy Based Enterprises: One flour mill of 5 horsepower capacity and one motor driven Biomass cutter of 3 horsepower have been installed in the village.

Jobs Created: Two operators (for round the year) have been allocated the duty of maintenance of the plant and 1 entrepreneur is trained to manage the flour mill. Over 500 people at farm level and over 400 people at enterprise level have benefited directly or indirectly from the power plant.

Environmental Conditions

Consumption of electricity through biomass gasifier has resulted into reduced indoor air pollution & CO_2 emission has also reduced the dependence on forests.

Lessons Learnt

The creation of consumer-networks is important for the Radhapur gasifier technology market. This network includes development of micro enterprises and the interactions of these enterprises interactions with local and national banks and the local government.

Adoption of innovative systems by the local people and developers will be easier, if:

- VECs strengths are easily formed and revealed.
- There is compatibility between the technology and the existing infrastructure such as the promotion of power for irrigation.
- Procedures for the implementation of technology are simple and are ruled and commissioned.
- Dense and cohesive networks exist between the developer and the society.

Enhancing the capacity of VEC to generate energy is very crucial for the project sustainability and includes the following aspects :

- Collection and accounting the revenue from the villagers.
- Managing the services and load management system.
- Adoption of safety measures in use of electricity.
- Execution of bank transactions (deposition and withdrawal).
- Identification of possible interventions for income generation activities at the village level.
- Additionally, effective sharing of responsibilities among the present VEC members is crucial for the development of social structure.

Community Solar Power Plant - *A case Study of Village Rampura, District Jhansi, Uttar Pradesh*

Rampura is a small village in the Bundelkhand region - a semi-arid region of district Jhansi, in Uttar Pradesh. Till the year 2008, there was no electricity in the village until Development Alternatives took the initiative, along with Scatec Solar, to set up a Community Solar Power Plant (CSPP) at Rampura. Prior to electrification, people of Rampura were using kerosene as the prime source of energy for household lighting, resulting in an annual kerosene consumption of approximately 2,400 litres.

At a Glance	
Location	Village Rampura, Panchyat Pahalguwan, Baragaon Block, District Jhansi, Uttar Pradesh (India)
Number of Beneficiary Households	70
Power Plant Design	Polycrystalline solar plant 8.7 kWp; Mini-grid 0.75 km; Battery backup to secure 3 days of autonomy (days with no sun)

Overview

The process of establishing Community Solar Power Plant was started in 2008 and by January 2009 it started supplying electricity to the people of Rampura. The main objective of the Community Solar Power Plant was to gain a first-hand experience about the design, construction and operation of stand-alone solar power plants and establish a community managed revenue model. The Community Solar Power Plant was commissioned as a pilot project and now, with its success at the community level, it can be replicated in other areas and context.

Development Alternatives acted as a 'door- opener' for introducing the concept of solar power in the village and played a catalytic role in facilitating the implementation of solar power plant through community participation, along with social mobilization & capacity building of grassroot stakeholders (such as local communities, Panchayati Raj Institution members) . A Village Energy Committee (VEC) was formed with the responsibility of load management, revenue recovery and operation-maintenance on its own for sustainability of the plant.

An electronics company, DD Solar 23 India Pvt. Ltd., which works under the banner of the Bergen Group, provided the technical know-how.

Process and Approach

The approach followed for setting up the solar power plant was 'Build-Own-Operate-Transfer' (BOOT), where the ultimate ownership of setting up and operating the solar energy plant rested with the village community. Development Alternatives took the role of the engaging the village community and encouraged the villagers to utilize the electricity generated using solar power for new income generating activities. The concept of 'Pay for Energy" was introduced to the villagers to ensure financial sustainability of the plant. Solar power generated from CSPP is supplied for household lighting, fans and entertainment/educational purposes (TV, radio, computers etc). Along with these facilities various other developmental activities have been established in the village, which include basic computer education, self-help group formation, land development and health & cleanliness work. These developmental activities have helped in establishing a successful revenue model in the Rampura village.

Business Model

Based on a domestic load survey, it was decided to install an 8.7 kW solar power plant, with polycrystalline solar panels. To secure three days of continuous power supply (during days with no sun), 24 (two Volt) batteries of 2500 Amperes are used. The power station has two 5 kW, 42 Volt (DC) to 220 Volt (AC) inverters and one 9 kW inverter charge controller. For the distribution, the mini-grid is supplying single phase 220 Volt (AC) power for the household, community and enterprise use. 8 street lights have also been installed for community use. The plant has been oversized to meet the electricity demand for an enterprise load up to 2 horsepower (hp). The current tariff is structured in three slabs on the basis of monthly consumption of individual household. Consumption below 5 kW lies in Slab-1, between 5-10 kW in Slab-2 and more than 10 kW in Slab-3. *(Please refer table).*

Current Tariff Structure			
	Slab-I	Slab-II	Slab-III
Type	0-5 KWh	5-10 KWh	10 KWh
Domestic			
Fixed Cost (Rs)	20	90	160
Variable Cost (Rs)	4.50 per KWh	5.5 KWh	6.5 0 KWh
Enterprise			
Fixed Cost (Rs)	200		
Variable Cost (Rs)	6.5 per KWh		

Impacts Generated

Socio-Economic Changes

Education & Skill Development: Presence of electricity in the village has enormously changed the lives of women and children. As per the survey, 14 households have consented that electricity has made a positive impact on education. Children are being able to study for 1.5-2.0 extra hours every day. Advent of electricity has improved the quality of life in Rampura and has placed it amongst the few advanced villages in India. The village has been able to hold a successful computer training programme in the village school campus itself.

To educate villagers, especially children, about the importance of renewable energy and its development a "*Saanp Seedi*" (snakes and ladders) game was invented, with energy efficiency component in it. It proved to be an effective method of information dissemination.

Gender Concerns: Presence of electricity in the village has enormously changed the lives of women and has brought a positive change in their lifestyle. Provision of electricity throughout the day has given more time to women for indulging into various income generating activities like sewing, stitching, rope- making and sweater-weaving.

Renewable Energy Based Enterprises: Rural electrification has also opened new avenues for employment generation and enterprise development in the village. One flour mill of 3 horse power is operating on electricity generated from the solar power plant.

Improved Living Standards: Provision of quality services (due to the continuous electricity supply) has raised the living standard of the villagers. This is visible from the quantity of electrical appliances purchased by them. In fact, 15 new TV sets, 9 coolers, 12 fans and a refrigerator has been purchased within nine months of commencement of the plant, summing up to a total of Rs 64,000. Each household is paying an average of Rs 120 per month for electricity services. Prior to the introduction of these electricity services, each household was spending Rs 60 per month on kerosene oil for lighting purposes only. This clearly demonstrates the willingness of rural people to pay extra money, provided they get the quality services.

Improved Health & Sanitation: The women agreed that non-usage of kerosene lamps has made a positive impact on their individual and family health. Survey revealed that 17 households have already constructed new toilets with in one year of, inception of the solar power plant.

Environmental Changes

Resource Conservation: Reduction in the usage of kerosene oil by the villagers has reduced the environmental problems in the village.

Emission Reduction: Prior to the inception of the plant, the average house hold consumption of kerosene was three litres per month. At present, the average monthly consumption of kerosene has fallen to half of the initial consumption. With 44 households subscribing to electricity services, 110 litres of kerosene is saved per month. Hence, Rampura villagers are successful in keeping in check around 3900 kg of carbon dioxide (CO_2) emissions annually.

Key Lessons Learnt

Community Needs & Aspirations: While planning and designing any welfare and development activity, community needs and aspirations have to be considered. During the implementation of the solar energy project, the project team recognized the growing demand for extra energy by the villagers for irrigation purposes. For this, the project team introduced the concept of mobile irrigation in the village.

Community Awareness: Though the villagers felt that there was a need to utilize alternative methods of energy development to cater to their requirement, there were some apprehensions regarding the solar energy at the initial stage. The common perception amongst villagers was that solar power can be used only for the purpose of lighting and cannot meet the demands of other domestic activities. Also, a change in the mindset of villagers was required for investment in energy-efficient appliances like the CFL.

Community Mobilization to Secure Ownership: For the sustainability of any community-based project, it is essential that the community should be able to take the ownership of the project. For this, community participation was sought from day one by involving the local people in activities such as plant construction. After eight months of continuous training in accounting and management, Village Energy Committee has now become the owner of the solar power plant. Other developmental activities in Rampura like basic computer education, self-help group formation, land development, and health & cleanliness work have helped in establishing a successful revenue model.

Dialogue between Local Government and Stakeholders: Development Alternatives not only initiated the dialogue process between local communities and the government but also influenced the local government to support the project. Support from local Panchayat was required for making land available for the power plant.

Deciding Realistic Power Plant Capacity: Although the power plant capacity varies along the different geographical locations, a large part of northern and central India experience similar seasonal cycles. Hence, the results from this pilot solar plant could be taken as the baseline. Another important component for deciding the realistic capacity of a power plant is its load estimation and response to the fluctuating demand and supply. With the experience of running the pilot solar plant for nine months, Village Energy Committee in Rampura is now in a position to take prudent decisions to meet every day challenges of load management.

Importance of Explaining the Tariff Structure Properly: To gain confidence of villagers it is important to explain each component of the project to the local communities. A locally acceptable tariff structure can certainly promote the usage of electricity in more efficient ways.

Annex - 2

SOCIO-ECONOMIC ASSESSMENT
DATA COLLECTION FORMAT (SAMPLE)*

Village Summary	
Village Name	
Village Panchâyat	
Tehsil & Block	
District	
State	

1. **Number of Households:**

2. **Type of house hold** *(in parenthesis give number)*: pucca ( ) kuccha ( ) semi kuccha ( ) semi pucca ( )

3. **Village Infrastructure:**

Infrastructure	Yes / No	Distance from village(km)
Bus stand	No	25 (at Dinara)
Tarred road		
Bank		
Primary school		
Ration shop		
Kerosene depot		
Telephone booth		
Co-operative		
Post Office		
Panchayat-room		
Market		
Railway Station		
Nearest petrol / diesel pump		
Primary Health Centre		
Drinking water facility		

Note: useful to collect information on:
- For what villagers use nearest market?
- Nearest electrified village is how far?
- Drinking water facility – number, type

**(filled with hypothetical values/information)*

4. Demographic details:

Details	As per census - 2001	As per survey – (year)
Total Population		
Male Population		
Female Population		
Sex ratio		
Population (0-6 year)		
Population (SC)		
Population (ST)		
Literate (%)		
House hold size		
Migration Rate		

Note: Useful to collect information on :

- Literacy (%) in SC/ST/OBC
- Male, Female literacy (%)
- Minimum and Max education in the village
- Reason for migration, kind of opportunities for migrants

5. Livelihood Profile: (information to be collected at household level)

Occupation	Number	Earnings per month (Rs.)
Agriculture		
Shop Owners		
Service (Government)		
Private / Business		
Labour		
Others		

Note: Useful to collect information on:

- Kind of occupation SC/ST/OBC are involved in
- Kind of occupation (or any income generation activity) Women are involved in

6. Land Holding: (information to be collected at household level)

Land Size(in acres)	Number	Earnings per month (Rs.)
Large farmers (> 5 acres)		
Medium farmers (2.5 to 5 acres)		
Small farmers (< 2 acres)		

Note: Useful to collect information on:

- Land holding of SC/ST/OBC

7. Labor: (information to be collected at household level)

Type of work	Daily Wage (in Rs.) of				Earnings per month (Rs.)
	Men	Women	Boys	Girls	
Agriculture	40	30	35	-	Max. 4 month in a year
Construction					
Skilled					
Unskilled					

8. Land use type:

Land details	Area (in acre)
Total geographical areas	
Cultivable land	
Irrigated land	
Grazing land	
Reserve forest	

9. Livestock details: (information to be collected at household level)

Land details	Numbers
Buffalo	
Bullock	
Cows	
Calves	
Goats	
Others	

10. Agriculture System: (information to be collected at household level)

Season & name of crop	Irrigation / crop (No)	Land use (Ac)	Total Yield (Qt)	Self- use (Qt)	Sold Quantity (Qt)
Rabi					
Wheat					
Gram					
Mustard					
Kharif / Maize					
Maize					
Urad dal					
Soya					
Ground nut					
Zaid / Vegetable					

Note: Useful to collect information on:

- Source of irrigation (number, type, availability in days/year)
- Type of irrigation systems (flood, drip, sprinklers, others)
- Number and type of water pumps (diesel ,electric, Horse power)
- Hours on an average water pump runs (to calculate diesel consumption)

Qt = Quintal
No = Number
Ac = Acres

11. Crop residue usage details: (information to be collected at household level)

Season	Crop	Total production (Qt)	Present use (Qt)	Unused Biomass (Qt)
Rabi	Wheat			
	Gram			
	Mustard			
Kharif	Maize			
	Urad dal			
	Soya			
	Ground nut			
Zaid	Vegetable			
Others				

12. Fuel use pattern: (information to be collected at household level)

Energy Consumption	Fuel used	Unit Consumption per day	Cost per unit	Hours of operation
1. Domestic				
• Cooking	Dung cake (kg)			
	Agriculture residues (kg)			
	Kerosene (kg)			
	Other			
• Lighting				
	Kerosene (kg)			
	Electricity (KWh)			
	Other			
• Appliances (fan, TV, Refrigerator, radio, mixer)	Electricity (KWh)			
	Other			
2. Commercial				
• Shop	Kerosene (kg) Electricity (KWh)			
	Other			
• Small entreprise (flour mill etc.)	Electricity (KWh)			
	Other			
• Other				
3. Irrigation				
• Water pump	Diesel (liters)			
	Electricity (KWh)			
4. Others				
Note: useful to collect information on: • Number, scale and type of enterprises				

13. Local Institutions:

Institution Type	Institution name	Activities	How and Number of Villager are part of these
SHGs			
Farmers Group/ Club			
Youth Clubs			
Energy/ Water Group			
Religious Group			
NGOs			
Others			

14. Govt. Programmes: (information to be collected at household level)

Government Programme	Activities / Brief about the programme	Villagers are Aware (Yes/No)	If yes (what they know)
Sarva Siksha Abhiyan			
MGNREGS			
Others			

Annex - 3

HOW TO CONDUCT FOCUS GROUP DISCUSSION (FGD)

Duration: 2 Hour

Personnel: 2 persons are needed, one to facilitate discussions and one to record the minutes.

Steps:

1. Make sure that you know the objective of the meeting and how you want to conduct it.
2. Start the meeting by agreeing on the duration. Then agree on the order in which issues should be addressed.
3. Start with most important issue and ask participants to express their views on the issue. The views expressed by the participants can be recorded directly by the minute recorder or can be written down on the cards and then placed on the board or alternatively can be written down directly on the flip chart. Remember visual representation of this exercise will not only give confidence to the participants that their points have been considered but also everyone can visualize the picture emerging out of the exercise. Repeat the step for any other main issues.
4. Try to cluster the points emerging out of the previous step and discuss. This will give you the idea whether the exercise has resulted in some useful results or not.
5. Discuss any other relevant matters with the group that you or participants think, are important.
6. Evaluate the session. See if anything needs to be improved.
7. If required agree on the time and place of the next meeting. Draw the meeting to a close.

Tips in conducting FGD

1. Make sure that the villagers have prior intimation about any discussion to be held to ensure maximum participation.
2. Ensure that the discussion is a dialogue. You should encourage everyone to participate.
3. Do not use leading questions but use open-ended questions. Let the group make their own conclusions of the discussions.
4. Timings of surveys & FGDs should be suck that they are suitable for the stakeholders involved. For eg during the harvesting season farmers will only be available early in the morning and late in the evening.

Annex - 4

DIFFERENT RENEWABLE ENERGY TECHNOLOGIES

1. **Solar Energy**

Energy generation from solar radiation depends upon two parameters i.e.

Availability of solar radiation (in kW/m^2) at particular geographic location

Availability of sunrays in hours/day and days/year at particular geographic location

Sun energy or solar radiation can be harnessed through following solar technologies

Solar Thermal (to convert solar energy in to heat energy)

- Solar Cooker (to cook food)
- Solar Water Heater (to heat water)
- Solar Dryer (to reduce moisture content of food items to dry them or to preserve them)

Passive Architecture (in buildings / houses lighting, heating) : it follows 2 principles i.e. Glass allows sunrays to come in to heat up the space during day time & stops heat loss during night time.

Solar Photo-Voltaic or Solar PV (to convert solar energy in to electrical energy). Depending on energy requirement Solar PV are of following types:

- For household/domestic use - Small Solar PV (examples: solar charged lanterns, torch, home lighting systems, solar water pumps, solar street lights)
- For community / industrial use - Medium to large Solar PV

2. **Biogas Energy**

Any decomposable material such as agro waste, food waste, animal/human excreta, municipal solid waste etc can be used to produce biogas, which is combustible and can be used directly as cooking gas and indirectly to run engine to generate power.

Biogas plant is typically a close digesting tank fitted with a gas holder. Material decomposition occurs in the digester in absence of air and generates (slowly/continuously) 'Gas'. Gas holder stores the gas.

Khadi and Village Industries Commission (KVIC) Model and *Deenbandhu* model are the most commonly used models for domestic and community use.

3. **Biomass Gasifier**

It converts any biomass (crop residue, woody plants) into a gaseous fuel through partial burning process.

The mixed gaseous fuel is known as producer gas and is flammable in nature and can be used to run engine for energy generation or as a fuel to produce heat.

Biomass Gasifier is most suitable for geographical regions with assured and sustainable availability or supply of invasive biomass (particularly weeds), unused agricultural waste such as cotton stalk, corn cobs, mustard stalk etc.

4. **Micro Hydro Energy**

It essentially converts energy of standing water into energy of falling water to rotate the turbine to generate power. Types of Hyrdo power generation plants:

Storage type: It makes use of a dam to stop river water flow, building up a reservoir of water behind the dam. The water is then released through turbines when power is needed. The advantage of this type is that rain water can accumulate during the wet season of the year and can be used to generate power even during the drier periods of the year.

Run-of-the-river type: This type of power plant basically diverts part of the river water flow into a channel /pipe and then throws water on the turbine. This is comparatively smaller in capacity than the previous one. The biggest advantage of this technology type is that it requires comparatively less financial resources and thus can be built locally and its simplicity gives rise to better long term reliability.

5. **Wind Energy**

Generation of power from wind is specific to the geographical location, i.e. where there is assured availability of wind with a minimum velocity (speed) almost throughout the year.

Small scale wind mills (technologies) are not widely available and commercially viable.

Annex - 5

HOW TO MAKE A SOLAR COOKER[1]

Materials: Shoe box with lid, scissors, roll of aluminum foil, glue, black construction paper (black paint), thick clear plastic sheet, tape, thin wire or bamboo sticks

Steps:

1. Take 2 shoeboxes of different size.

2. Close the flaps of the larger box and place the inner box on top and trace an outline. Cut out the outline so that the inner box can fit inside the large box. There should be roughly a two inch gap between the walls and floors of the inner and outer box.

3. Line the bottom of the larger box with crumpled newspaper and then place the smaller one. Fill the space in between with crumpled newspaper as well.

4. Line and glue aluminum foil paper from within the shoe box, shiny side out. Add 2 or 3 layers if required. Foil the rectangular piece from inside the lid as well which acts as a reflector. Make sure to smooth out any wrinkles on the foil.

5. Cut out black paper and glue in within the shoe box.

6. Cut a plastic sheet and tape it to the inside of the lid to cover the rectangular cutout.

7. Support the foil lined lid open and hold it using metal wire or bamboo sticks placed at the corners.

8. Place food in cookware inside and put the lid on the top (Position your solar cooker where it gets maximum exposure to sun).

1 Taken from http://www.buzzle.com/articles/how-to-make-a-solar-oven-for-kids.html

Annex - 6

ROLE & RESPONSIBILITIES OF KEY STAKEHOLDERS

The role and responsibilities mentioned here is the indicative list only.

Village Energy Committee: The VEC is a homogeneous representation of entire village community and it is established & capacitated to own, operate, maintain and manage the energy production and distribution facilities in Decentralized.

1. **Need assessment:** The VEC, Energy Generation System can help in assessing the energy needs of the community. It can mobilize the community to move towards RE based technologies that are more efficient, clean, eco friendly and sustainable.

2. **Demand creation:** VEC helps in creating demand for electricity at household level, based on their capacity to pay for the service and maintain a record of what is agreed upon by the household and share it with the community from time to time.

3. **Supply management*:*** VEC is responsible for supply of electricity from the installed electricity generating equipment and its day-to-day management and repair and maintenance. The system operator working under the VEC should handle the day to day operation and management of the power plant.

4. **Financing:** The VEC shall maintain a bank account and streamline operational and revenue related transactions. Then committee should maintain consumer wise records and accounts for revenue collection and a book of accounts to keep a record of the materials tools, work performance, and money spent on the work establishment. They should also develop the budget for each financial year based on the expenditures, income sources and other grants made available to the VEC.

5. **Governance:** Responsibility for governance involves two components- Collection of payments for electricity used by the consumers and resolving disputes in case of power supply disruption. More specifically, the roles and responsibilities of the VEC shall be as follows:

   a. To engage trained persons for operation, maintenance and upkeep of the power plant, for revenue collection and to supervise and monitor the working of the power plant

   b. To meet at least once in a month to review the status of power plant operation, receipt of revenue, supply of fuel wood and data related to operation of the plant.

   c. To record the monthly operational and maintenance data of the power plant as per monitoring format and sending the same to the implementing agency.

   d. Providing new connection for eligible consumers (if there is sufficient capacity of the power plant) and disconnection for habitual defaulters.

   e. Monthly meeting with the consumers, for establishing communication with the consumers and also setting up a feedback mechanism, on the perception of the consumers with regard to quality of services rendered and present gaps in the services to the consumers.

f. Redressing commercial and technical cyomplaints of consumers in order to maintain customer satisfaction.

g. Regular/surprise checking of load being consumed by the consumers and ensuring consumption of power within the stipulated and declared limit.

h. Regular maintenance/servicing of the streetlights and fault rectification if any.

i. Conduct discussion on quarterly/ half/yearly audit of assets/inventory status/billing databases within the project duration.

j. VEC can initiate value added services (such as mobile charging facility, battery charging facility, Community TV, sale of electrical appliances etc) for both financial viability of the projects as well as to build up social synergy.

k. To put in place adequate measures to safeguard all installed equipments and ensure the safety of the equipments.

Panchayati Raj Institutions (Gram Sabha and Gram Panchayat):

a. Display the names of VEC members on the information board of its office.

b. Regularly obtain records of the monthly meetings of the VEC and present them in the monthly meetings of the Gram Panchayat.

c. Help the VEC to maintain accounts and details of proceedings, if requested to do so.

d. Present any suggestions related to the project only in the *'Gram Sabha'.*

e. Check whether, basic information on the project such as the name of the contractor and what is being constructed is displayed on a board on the site.

f. Organize quarterly *'Gram Sabha'* so that progress of project activities can be presented by the VEC and Implementing Agency.

g. Undertake regular inspection to assess work progress and performance of the energy production systems.

h. Facilitate convergence with developmental activities being undertaken by the Gram Panchayat and or other government agencies in the village.

Project Implementation Agency (PIA): The implementation agency helps in strategic planning of the project, its management and implementation of all activities. Its main responsibilities include providing technical inputs during the implementation and operational phase besides carrying out social engineering and capacity building activities to strengthen grass roots. It also has the responsibility to identify and engage technology supplying agencies.

Technology Provider: The supplier of the energy production system is responsible for finalizing the configuration, component design, fabrication, erection & commissioning of the system and training of operators and regular operation & maintenance of the system.

ANNEX - 7

GRAM SABHA RESOLUTION

ग्रामीण ऊर्जा विकास समिति की नियमावली

ग्राम..... विकास खण्ड..... जिला..... राज्य.....

इन नियमों की व्याख्या हेतु ग्रामीण ऊर्जा विकास समिति का अर्थ–बिजली चाहे वह खेती के लिये हो, घरेलू उपयोग के लिए हो, लघु उद्योग चलाने के लिये हो, उसका उपयुक्त वैज्ञानिक तकनीक के प्रबंधन से है। जिसका प्रबंधन उपर्युक्त ग्राम समस्त ग्रामवासियों द्वारा समिति के लिये चयन किये गये पदाधिकारियों के माध्यम से होगा और यह समिति समग्र ग्रामवासियों के लिये जबाबदेह रहेगी।

सदस्यताः–

1. ग्रामीण ऊर्जा विकास समिति के निम्नलिखित सदस्य होंगे जो ग्राम सभा के अनुमोदन के उपरान्त संस्था के प्रतिनिधि द्वारा नामांकित होंगे। समिति में न्यूनतम 11 (ग्यारह) सदस्य होंगे, जिनमें संस्था का भी एक प्रतिनिधि होगा। समिति में 30 प्रतिशत महिला सदस्य होंगी।

क्र.सं.	नाम	पिता/पति का नाम	उम्र	जाति	व्यवसाय	पद	हस्ताक्षर
1							
2							
3							
4							
5							

2. यह अनिवार्य है कि समिति का सदस्य ग्राम का मूल निवासी हो यह दशा संस्था के प्रतिनिधि के लिये लागू नहीं है।
3. ग्रामीण ऊर्जा विकास समिति का गठन करने वाले सभी हस्ताक्षरकर्ता ग्रामीण ऊर्जा विकास समिति के उस समय तक सदस्य रहेंगे जब तक वे स्वयं इस्तीफा नहीं देते या समिति के बहुमत (3/4) के फैसले के द्वारा हटा नहीं दिये जाते सदस्यों को ग्राम सभा के संकल्प या संस्था के प्रतिनिधि के द्वारा हटाया जा सकता है।
4. ग्राम सभा अथवा ग्रामीण ऊर्जा विकास समिति के स्वतः के संकल्प द्वारा अतिरिक्त सदस्यों को सम्मिलित किया जा सकता है, ग्रामीण ऊर्जा विकास समिति के सदस्यों को बढ़ाया जाना या हटाया जाना संस्था के प्रतिनिधि की सहमति पर ही सम्भव होगा।
5. ग्रामीण ऊर्जा विकास समिति के सदस्य का पागल होना, दिवालिया होने, चारित्रिक दोष अथवा अपराधिक प्रकरण में दोषी पाये जाने पर सदस्यता से स्वतः ही वंचित होगा।
6. ऊर्जा संयंत्र सुचारू रूप से चलाने के लिए ग्रामीण विकास समिति सर्वथा जिम्मेदार रहेगी।

7. ग्रामीण ऊर्जा विकास समिति के सदस्य को सदस्यता के रूप में 100 रु0 (रूपये सौ मात्र) ग्रामीण ऊर्जा विकास समिति के खाते में जमा करने होंगे जो वापसी योग्य नहीं है जिसका उपयोग समिति के कार्यों के रूप में किया जायेगा।

पदाधिकारी :–

1. उपर्युक्त सदस्यों के चुनाव के बाद ग्राम सभा चयनित सदस्यों में से समिति का अध्यक्ष, कोषाध्यक्ष तथा सचिव का चयन करेंगे।
2. संस्था का प्रतिनिधि ग्रामीण ऊर्जा विकास समिति के सचिव के पद पर शोभित होगा।

बैठक :–

1. ग्रामीण ऊर्जा विकास समिति की नियमित बैठक होनी चाहिए, जैसे पाक्षिक, या मासिक जिसमें समिति द्वारा किया गया कार्य का लेखा–जोखा सभी सदस्यों के सामने रखना अनिवार्य होगा।
2. मासिक स्तर पर समिति को पूर्ण लेखा–जोखा ग्राम वासियों की बैठक में रखना अनिवार्य होगा। यह बैठक समिति की बैठक होने के बाद दूसरे दिन अनिवार्य रूप से होनी चाहिए। बैठक की सूचना गांव में डुग्गी पीट कर देनी होगी।
3. बैठक का दिन, समय व स्थान पहले से ही निश्चित होना चाहिए।
4. आकस्मिक बैठक का भी आयोजन आवश्यकतानुसार किया जा सकता है जिसकी सूचना सदस्यों को 2 दिन पहले देना अनिवार्य होगी।
5. बैठक में अनुपस्थित सदस्य पर जुर्माना भी रखा जा सकता है।
6. सदस्य को बैठक में अनुपस्थित रहने की सूचना समिति को 7 दिन पहले देना अनिवार्य है। केवल विषम परिस्थितियों में (जैसा समिति के सदस्य उचित समझें) वह अनिवार्य नहीं होगी।

अध्यक्ष :–

ग्रामीण ऊर्जा विकास समिति के अध्यक्ष के निम्नलिखित कार्य एवं दायित्व होंगे –

1. ग्रामीण ऊर्जा विकास समिति की बैठकों में अध्यक्षता करना।
2. ग्रामीण ऊर्जा विकास समिति की बैठकों को सुचारू रूप से चलाना।
3. अंशदान एकत्र करने में सदस्यों का सहयोग करना तथा पारदर्शिता रखना।
4. निष्पक्ष होना व सभी निर्णयों में ग्रामवासियों की सहमति को शामिल करना
5. कोषाध्यक्ष तथा सचिव की कार्यवाही की निगरानी रखना।

कोषाध्यक्ष :–

ग्रामीण ऊर्जा विकास समिति के कोषाध्यक्ष के निम्नलिखित कार्य एवं दायित्व होंगे –

1. ग्रामीण ऊर्जा विकास समिति के खातों का हिसाब–किताब रखना।
2. ग्रामीण ऊर्जा विकास समिति का लेखा–जोखा ग्रामवासियों के सामने रखना।

3. अंशदान (सामुदायिक कार्य तथा निजी कार्य) को एकत्रकर संबंधित व्यक्तियों का निजी पासबुक में लिखना तथा हस्ताक्षर करना।
4. एकत्रित अंशदान की राशि को समिति की खाता बहियों में लिखना।
5. एकत्रित अंशदान की राशि को समिति के बचत खाते में अगले दिन जमा करना।
6. एकत्रित की गई अंशदान की राशि तथा सूची को अध्यक्ष तथा सचिव की सन्तुति लेना।

सचिव :–

ग्रामीण ऊर्जा विकास समिति के सचिव के निम्नलिखित कार्य एवं दायित्व होंगे –

1. ग्रामीण ऊर्जा विकास समिति की बैठक की कार्यवाही का लेखन करना।
2. समिति के आय व्यय का खाता विवरण सभा के सम्मुख प्रस्तुत करना।
3. समिति के खातों का वार्षिक अंकेक्षण कराना होगा।

बैंक खाता :–

ग्रामीण ऊर्जा विकास समिति का खाता **राष्ट्रीयत बैंक** में खोला जायेगा खाते का संचालन कोषाध्यक्ष तथा सचिव के संयुक्त हस्ताक्षरों से किया जायेगा। समिति के खाते का प्रकार **''बचत खाता''** होगा। बैंक से राशि का आहरण चैक के माध्यम से होगा। आहरण राशि की अधिकतम सीमा प्रति चैक 25000 रु. (रुपये पच्चीस हजार मात्र) होगी।

सामग्री :–

सामुदायिक कार्य तथा निजी कार्य के लिये प्रयुक्त होने वाली सामग्री के लिये एक भंडारण कक्ष होगा जिसमें प्राप्त होने वाली तथा निकासी की जिम्मेदारी समिति में से किसी एक सदस्य की होगी। जिसका ग्रामवासी चुनाव करेंगे। सामग्री की प्राप्ति तथा निकासी का स्टोर रजिस्टर में लेखा–जोखा करना अनिवार्य होगा।

Annex - 8

DEMAND ESTIMATION[2]

1	Estimation of load:	
1.1	a. No. of households	No. : Average Load_____ KW Total load _____ kW
1.2	b. No. of streetlights	No. : Average Load_____ KW Total load _____ kW
1.3	c. Non-domestic / Productive load	No. : Average Load_____ KW Total load _____ kW
1.4	d. Common facilities (Total load for Schools, Public health centres, Panchayat bhawans, Community buildings, etc.)	Total load _____ kW
.1.4.1	Schools load	No. : Average Load_____ KW Total load _____ kW
1.4.2	Public health centres load	No. : Average Load_____ KW Total load _____ kW
1.4.3	Panchayat bhawans load	No. : Average Load_____ KW Total load _____ kW
1.4.4	Community buildings load	No. : Average Load_____ KW Total load _____ kW
1.5	e. Any other load (Specify)	No. : Average Load_____ KW Total load _____ kW
1.6	f. Total load (A+B+C+D+E)	Total load _____ kW
1.2	Nos. of operational hours per day (Min. 6-8 hours/day)	Total hrs _____ per day

2 http://www.recindia.nic.in/ddg.html

1.3	Anticipated Peak Load	_____ kW
1.4	Suggested DDG capacity (1.5 x peak load)	_____ kW
1.5	Estimated Annual Energy demand for 5 years:	
1.5.1	a. Annual Energy Demand for 1st Year (Covered area as per load curve x 365)	_____ kWH
1.5.2	b. Anticipated annual %age increase in energy demand	_____ %age
1.5.3	c. Annual Energy Demand for 2nd Year (a + b%) #	_____ kWH
1.5.4	d. Annual Energy Demand for 3rd Year (c + b%) #	_____ kWH
1.5.5	e. Annual Energy Demand for 4th Year (d + b%) #	_____ kWH
1.5.6	f. Annual Energy Demand for 5th Year (e + b%) #	_____ kWH
1.5.7	Total Energy Demand for 5 years (a+c+d+e+f)	_____ kWH
1.6	Suggested DDG capacity = annual energy demand for 5th year / (365 days x nos. of operational hours per day)	_____ kW
1.7	Proposed DDG capacity (among 4.5 and 4.7 which ever has higher value)	_____ kW
1.8	Generation voltage (Mark ✓)	(a) 440 V, 3 phase (b) 220 V, 1 phase

Next annual Energy Demand would be current annual energy demand plus the anticipated %age increase in energy demand

Annex - 9

POWER GENERATION CAPACITY ESTIMATION[3]

1.1	**Option 1: Small-hydro**	
1.1.1	Availability of water through out the year If "No" mention the Nos. of months per year water availability	Yes / No
1.1.2	GPS coordinates of upstream water head	_____ latitude _____ longitude
1.1.3	Head Maximum Minimum Average	 _____ m _____ m _____ m
1.1.4	Discharge Maximum Minimum Average	 _____ lps _____ lps _____ lps
1.1.5	Estimated power generation capacity available	_____ kW
1.1.6	Whether power generation project capacity available is sufficient to meet the load	Yes / No
1.2	**Option 2: Biofuels based DDG**	
1.2.1	Quantity of biofuel seed available within the village and nearby	_____ Tons
1.2.2	Availability of degraded lands / wastelands where energy plantations like Jatropha / Pongamia etc can be undertaken	Yes / No
1.2.3	Area available under degraded lands / wastelands where energy plantations like Jatropha / Pongamia etc can be undertaken	_____ ha
1.2.4	Estimated power generation capacity available	_____ kW
1 .2.5	Whether power generation project capacity available is sufficient to meet the load	Yes / No

3 http://www.recindia.nic.in/ddg.html

1.3	**Option 3: Biomass based DDG**		
1.3.1	Availability of biomass	Yes / No	
1.3.2	Type and quantity of biomass available	Type (i) (ii) (iii) (…)	Quantity (Tons / yr) Total quantity
1.3.3	Land available for biomass plantation	_____ ha	
1.3.4	Estimated power generation capacity available	_____kW	
1.3.5	Whether power generation capacity available is sufficient to meet the load	Yes / No	
1.4	**Option 4: Biogas based DDG**		
1.4.1	Nos. of cattle available and quantity of dung available	Nos. of cattle Cows _____ Buffaloes _____ Goats _____ Sheep _____ Pigs _____ Other cattle ___	Quantity (tons/yr) Total quantity
1.4.2	Estimated power generation capacity available	_____kW	
1.4.3	Whether power generation project capacity available is sufficient to meet the load	Yes / No	
1.5	**Option 5: SPV based DDG**		
1.5.1	Availability of land for setting of SPV power plant	Yes / No	
1.5.2	Area of land available	_____ ha	
1.5.3	Insolation level (KWH/sq meter/day)		
1.5.4	Nos. of sunny days available per year	_____ days/yr	

1.5.5	Estimated power generation capacity available		_____kW
1.5.6	Whether power generation project capacity available is sufficient to meet the load		Yes / No
1.6	**Option 6: Wind farm**		
1.6.1	Average wind speed		_____ m/s
1.6.2	Nos. of days available for wind power generation per year		_____ days/yr
1.6.2	Availability of land for wind farm		Yes / No
1.6.3	Area of land available		_____ ha
1.6.4	Estimated power generation capacity available		_____kW
1.6.5	Whether power generation project capacity available is sufficient to meet the load		Yes / No
1.7	**Option 7: Standby option**		
1.7.1	Vicinity of closest diesel station		_____ km
1.8	**Option 8: Hybrid option (wind/diesel, wind/solar or any other newer technological option)**		
1.8.1	Hybrid options	Estimated power generation capacity (kW)	Nos. of days / year power available
	(i) (ii) (iii) (..)	(i) (ii) (iii) (..)	
1.8.2	Estimated total power generation capacity available		_____kW
1.8.3	Whether power generation project capacity available is sufficient to meet the load		Yes / No
1.9	**Technology selected**		_____

Annex - 10

FINANCIAL ANALYSIS

1. **Capital cost:** This is one time investments, the implementer should have to arrange to develop required infrastructures and facilities along with all necessary plant and machinery on ground. Various components are as mentioned below.
   a. Cost of land and land development
   b. Cost of building and other necessary civil work
   c. Cost of power plant
   d. Cost of transmission and distribution lines
   e. Cost of auxiliary equipment
   f. Cost of service equipment
   g. Cost of tools and spares

2. **Production cost:** Production cost is the function of all periodic or routine expenditure. Part of this cost is independent of degree of power generation / production called fixed cost. The other set of costs are proportional to degree/ level of power generation and called variable costs.

   Fixed cost

   a. Manpower cost
   b. Cost of civil / mechanical and electrical maintenance
   c. Depreciation
   d. Inward and out ward transportation
   e. Other overheads
      - Office stationary
      - Communication
      - Training and capacity building
      - Visits and general expenditure

   Variable cost

   a. Cost of input
      - Biomass/ green briquettes/ dung
      - Water
   b. Cost of other consumables
      - Mobile oil
      - Filter

c. Cost of spares and periodic maintenance

d. Provision for breakdown maintenance

e. Cost of service delivery

3. **Sale*:*** Sale of electricity and various energy services are function the following parameters and the implementer should have a through understanding interdependency of the following parameters

   a. Tariff structures and local acceptance

   b. Monthly sale forecasting of electricity considering

      Type of clients

      - Domestic
      - Irrigation
      - Community
      - Enterprise

      Client wise unit consumption

   c. Prepaid and post paid unit consumption details

   d. Sale of byproducts / waste /scrap such as

      Wood charcoal

      Dry slurry / compost / vermin compost

      Burnt oil

      Electro/mechanical spares

4. **Inventory*:*** Inventory management is the art of managing an uninterrupted flow of all resources by maintaining optimum stocks in a cost effectively manner. For this the main aspects are control of seasonal cost fluctuation trends of all the below mentioned resources as well as seasonal demand trends to have optimum inventory

   a. Inventory of biomass / diesel / dung / briquettes

   b. Inventory of fast / medium and slow moving consumables

   c. Inventory of waste / by-products / scrap

5. **Working capital*:*** As project gives return at different rate in different phase of the project, one need to invest from out side or ensure sufficient fund rotation from within the project, to ensure un-interrupted delivery of energy and energy service.

   a. Project life wise return and requirement of working capital

   b. Season wise return and requirement of working capital

   c. Sources and criteria of leveraging working capital

   d. Working capital management strategy/ criteria

   e. Optimizing working capital

6. **Subsidies:**

Various Govt. schemes with

a. Detailed eligibility criteria
b. Methodology
c. Processing time
d. Phase wise cash inflow
e. Cost of subsidy includes

Manpower for completing formalities

Travel cost

7. **Borrowings:**

Fund gap analysis considering the following parameters

a. Total present investment gap considering assured fund
b. Borrowing sources and their expectation/criteria
c. Interest of borrowed fund
d. Re-paying strategy
e. Legal aspect

8. **Profit:**

a. Prediction of profit /loss at various stages of project life
b. Seasonal profit /loss prediction
c. Loss mitigation / Profit sharing strategy

9. **Repayment:**

a. Repayment strategy
b. Legal / moral obligations and role of stakeholders in case of failure
c. Plan Vs actual repayment
d. Contingency plan for repayment

Annex - 11

TARIFF STRUCTURING & LOAD MANAGEMENT

Tariff Structuring : An example of differential tariff structuring is explained below.

Monthly consumption for three categories of loads is considered below.

	Min Hours	Max. Hours	Watt	Min Monthly(KW)	Max. monthly (KW)
Light load	4	5	20	2.40	3.00
Fan	8	10	60	14.40	18.00
TV	3	5	80	7.20	12.00

Keeping this in mind there can be three levels of tariff:-

0-5 KWH	Rs 6.00 per KWH
5-10 KWH	Rs 30.00 for first 5 KWH and Rs 7.0 per KWH for additional
10 and above	Rs 65.00 for first 10 KWH and Rs 8.00 per KWH for additional

Fixed charges should be calculated with Rs 1.00 per Watt first slab, Rs 1.50 per Watt for second slab and Rs 2.00 per Watt. Thus fixed charges for first slab should be Rs 20 per month, for second should be Rs 90/ and for third should be Rs 160/ per month. A meter reading should be taken every fortnight. Total units consumed during the fortnight should determine maximum demand for the month and fixed charges for the household.

This example is based on the Community Solar Power Plant at Rampura implemented by Development Alternatives & Scatec Solar.

Load Management: It is the factor of peak demand, demand duration, demand fluctuation (seasonal and daily), social dynamics and associated tariff model. The following steps need to be followed:

Prepare a seasonal load table (Year wise seasonal demand) based on the base line surveys conducted on the ground. (refer example below).

Conduct a Focus Group Discussion. Make sure there is representation /participation of key stakeholders. Following can be the discussion points for the FGD (in reference to the seasonal load table prepared earlier):

- How best the load can be distributed and managed (Scheduling loads as per time of use);
- How the load hours can be distributed to reduce the peak/maximum load; and
- How this scheduling of load can bring down the cost of the technology?

The participants will be supervised to develop a priority chart- the season wise, day wise distribution strategy. While developing this one should consider the following: Social dynamics such as Caste dynamics, Cross subsidy, Collection of bills (pre paid / post paid) , Paying and investment priority, Management ease ,Metering ease (client group and type of use ease).

Load Distribution Across Year

Seasonal Demand Analysis (on per day basis)

Load Type	Qty	Unit Load (W)	Total Load (kW)	Jan		Feb		Mar		Apr		May		June		July		Aug		Sep		Oct		Nov		Dec		Maximum saleable units/ Annum
				hrs	*kWh*	*hrs*	*kWh*	*hrs*	*kWh*	*hrs*	*kWh*	*hrs*	*kWh*	*hrs*	*kWh*	*hrs*	*kWh*	*hrs*	*kWh*	*hrs*	*kWh*	*hrs*	*kWh*	*hrs*	*kWh*	*hrs*	*kWh*	
Domestic and Community																												
Domestic Lighting																												
Domestic Fans																												
TV																												
Street Light																												
Light at School																												
Commercial																												
Irrigation Pumps																												
Dal mill/oil Mill																												
Atta chakki																												
Dona patta making																												
MCR																												
Battary Charging																												
Total																												

Annex - 12

LAND & BUILDING

The project implementer should understand the implication of various specifications of land and building, considering shot and long term objective of the project to re-check the appropriateness of the same.

1. **Plot**
    a. Requirement of total minimum area for
        i. Power plant
        ii. Engine room
        iii. Cooling tower
        iv. Biomass cutting, drying & storing
        v. Spare parts
        vi. Disposal of byproducts or hazardous materials
        vii. Vehicular movement
        viii. Open space for necessary enterprises/energy service as a project component
    b. Comparative analysis of various available plots considering
        i. Direct (land cost) and in-direct cost such as
            Transmission and distribution cost
            Land development cost,
            Cost of earth work during construction
            Cost and ease of management due to its proximity from village/ load points
            Cost of security
        ii. Nearness to water and other daily necessary resources
        iii. Legal complications of the procedure to be followed to transfer ownership
        iv. Time requirement of transferring ownership
        v. Possibility of acquiring adjoining lands for future project extension
        vi. Requirement of auxiliary power
    c. Site plan (map) including
        i. All hamlets of the village including
            Existing and proposed community infrastructures
            Common facilities

Village roads (major and minor/temporary)

Major landmark(s)

ii. Location of propose power plant

iii. Major water sources such as River/canal with direction of flow, Seasonal / perennial drains with build-up /proposed check dams, Ponds, Open wells for drinking / irrigarion, Hand pumps Over head water tank with position of tap stand

iv. Existing and potential sources of other inputs (mainly biomass)

v. T&D route including

all major load points

location for street lights

vi. Farm lands with area and agriculture priority

vii. Uncultivated land with area

viii. Government land with area

ix. Forest land with area

x. Potential land for energy plantation

xi. Various boundary line (such as army firing range/ Government land/ forest land etc)

2. **Building:**

a. Plant layout (whole campus) with the following considerations

i. Detailed site identification as per Government's revenue map (with land transfer testimony)

ii. Approach road to power plant

iii. Details of surrounding land and respective owners

iv. Detailed plant layout with following consideration

Water (rain) logging, natural flow, harvesting

Orientation of building to enjoy natural heating/cooling, lighting

Location of building will be used as power plant

Main gate and internal road/ free space

Location of biomass processing / drying and storage

Dumping/recycling location for water and other by products/waste

Added biomass processing / storage

Room for enterprise

Maintenance / spare service space (tool room)

Office/ monitoring /security room

b. Plan and elevation of building (power plant): Though the technology provider will provide the detailed plant layout considering the proposed technology but the implementer should re-check and re-draw the plant layout to incorporate necessary parameters such as

i. Safety of operator and plant/machinery

ii. Enough movement space for effective operation, monitoring, maintenance and incorporate on site training

iii. Additional floor space for the future capacity enhancement

iv. Natural lighting, ventilation and noise dumping

v. Rain water protection / drainage

vi. Ramp position to load/unload plant machinery

vii. Space for safety tools, notice/instruction board, reporting files etc

Annex - 13

PLANT & MACHINERY

Plant & Machinery (Main features, specifications, drawings): The technology provider will supply all techno-commercial details of plant and machinery. However the implementer should have the basic understanding regarding the following items so that they can execute the project efficiently

1. **Main equipment:** Power generating unit is considered as the main unit. The implementer should know
   a. Detailed technology and its working principle
   b. Technical specifications and all factors having effects on planned operation
   c. Different suppliers and their techno-commercial comparison
   d. List and contact details of other organization using this technology
   e. Specification of all inputs materials and their impact on planned operation
      i. Nature of input materials needed
      ii. Alternatives to prescribed input materials
      iii. Non-negotiable specification of input parameters
      iv. Quantum of input required for full scale operation
      v. Life of inputs materials and parameters affecting them
   f. List of fast, medium and slow moving consumables and spares parts
   g. List of DOs and DONTs to enhance efficiency and efficiency and effectiveness
   h. Operation manual
   i. Preventive and breakdown maintenance schedule and guidebook
   j. Sub component wise cost and life

2. **Auxiliary equipment:** Project implementing agency should know the following parameters regarding all auxiliary equipment(s)
   a. List of all auxiliary equipments in synchronizing with the main equipment and other auxiliary equipments
   b. Line diagram and assembly drawing
   c. Auxiliary equipment wise details of
      i. Working principle and specific need of the auxiliary equipment
      ii. Technical and physical specification of auxiliary equipment
      iii. Various make wise techno-commercial comparison
      iv. Local suppliers and their detailed commercial offer
      v. Operation manual

vi. List of DOs and DONTs

vii. Preventive and breakdown maintenance schedules and their guidebooks

3. **Service equipment:** Service equipment are needed for maintenance of main equipment and other service

For Biogas Plant

a. Dung / slurry collection tools

b. Bullock cart , cycle/hand trolley for short distance bulk transfer

c. Mechanical (hand or motor operated) mixer

d. Tool box for

Routine mechanical maintenance

Routine electrical / electronics maintenance

e. Gas analyzer

f. Tripod with chain pulley of desire capacity

For Biomass Gasifier

a. Necessary number of biomass cutting tools

b. Bullock cart or cycle trolley

c. Manual chopping or motor operated multi cutter saw

d. Biomass grading sheave

e. Ash removal tray

f. Tool box for

Routine mechanical maintenance

Routine electrical and electronics maintenance

g. Moisture meter

h. Weighing machine and volumetric measurement frame

i. Tripod with chain pulley of desire capacity

4. **Source of equipments:** The implementer must have detailed list of the following technology /service provider with their previous work record, client list and volume of business. The list should contain various player so as to have various alternatives for comparison and hence negotiation power. Biomass gasifier manufacturers and marketing / commissioning agents

a. Biogas digester (both dry and wet systems) constructor / fabricators

b. 100% Gas / duel fuel engine suppliers of different capacity

c. Local civil construction materials suppliers

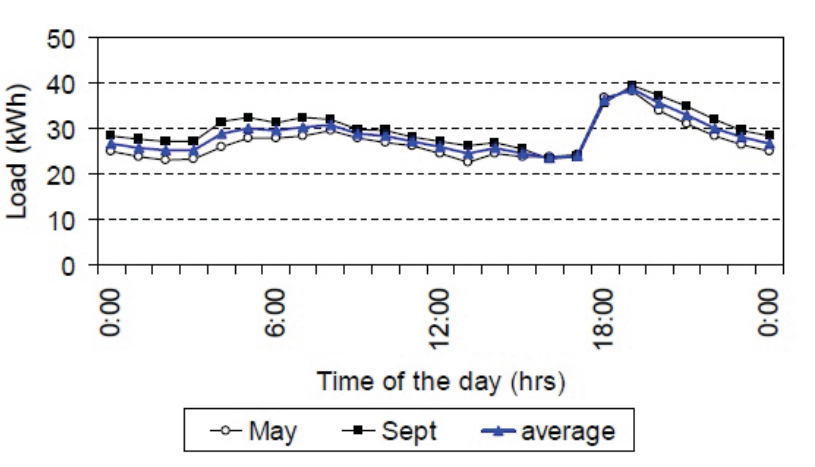
d. Local civil contractors
e. Local fabricators (on site / off site) and hard ware suppliers
f. Local plumber and plumbing materials suppliers
g. Local electrical/electronics equipment/consumables suppliers
h. Authorized dealer/distributor/suppliers of electrical appliances
i. Local wireman of following type (preferably Govt. contractor)
    i. Expertise on high/low tension transmission lines
    ii. Expertise on industrial (3 phase) wiring
    iii. Expertise on domestic and general purpose wiring/fittings
j. Mobile construction machinery service providers
    i. Earth work machineries (big/ small capacity or tractor attached)
    ii. Water tanker
    iii. Tractor attached pneumatic drilling
    iv. Loading / unloading cranes
k. Transporter
    i. Village level (bullock cart / tractor/ motor cycle/ SUV etc)
    ii. Local level (tractor/ loader/ small truck)
    iii. National level (small/big trucks)

Annex - 14

MONITORING AND EVALUATION

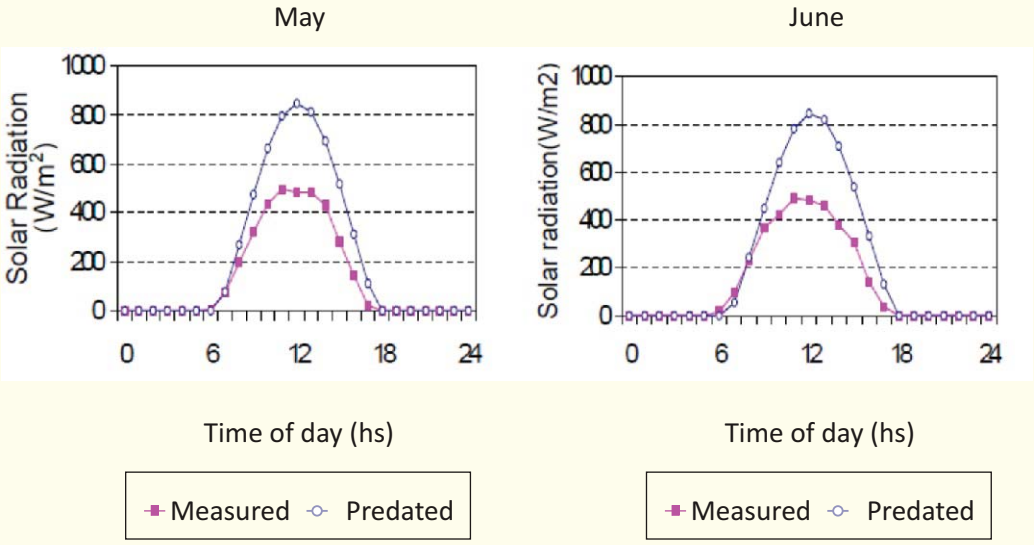
Technology Indicators

Load Profile



Resource Profile

Figure: Representative figure for solar



System Performance

Table: Comparison of Monthly predicted and the measured energy output (Solar power)

Month	Day (number)	For Day (Number)		For Month	
		Predicted Energy (kWh)	Measured Energy (KWh)	Predicted Energy (kWh)	Measured Energy (KWh)
January					
February					
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					
Total (kWh/yr)					

Annex - 15

BUSINESS MODEL OF A RENEWABLE ENERGY POWER PLANT OR PROJECT

1. Introduction

A business model describes how a business creates value. A business model thus describes how to make money out of a renewable energy technology (or an idea) in our respect. It acts as a mediator between a technology and economic value creation.

2. Renewable Energy Business Model

The key elements of renewable energy business models are the revenue streams, cost structure and the way it is financed. With the exception of biomass and biofuels, working capital considerations are not as important (once in operation) due to low fuel and maintenance requirements.

a. Revenue

The most significant revenue streams are the following:

Price from selling electricity to the grid, either at a fixed price (guaranteed feed-in tariff) or a market price.

If the installation is not grid-connected, the savings from not having to purchase electricity from other sources improve net income.

The project may also be able to generate and sell renewable energy certificates or carbon emission reduction certificates .

A second income stream comes from tax benefits.

b. Operating Costs

There are few operational expenses, as maintenance fees tend to be low, although some technologies may require major maintenance half way through the lifetime of the plant - for instance inverters in solar plants may need to be replaced well before the modules.

Tax only needs to be paid after the investment has been fully depreciated.

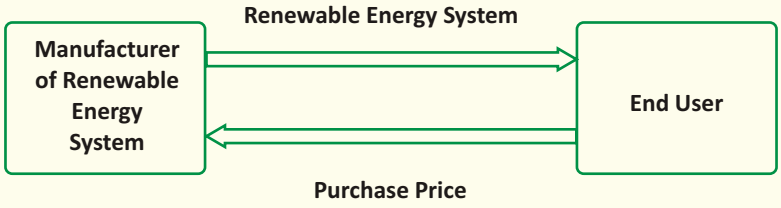
All other flows are dependant on the way the project has been financed.

c. Investment

The up-front investment, which may be spread over the duration of the construction is high.

3. Different Renewable Energy business models

a. Ordinary RE business model



The salient features are

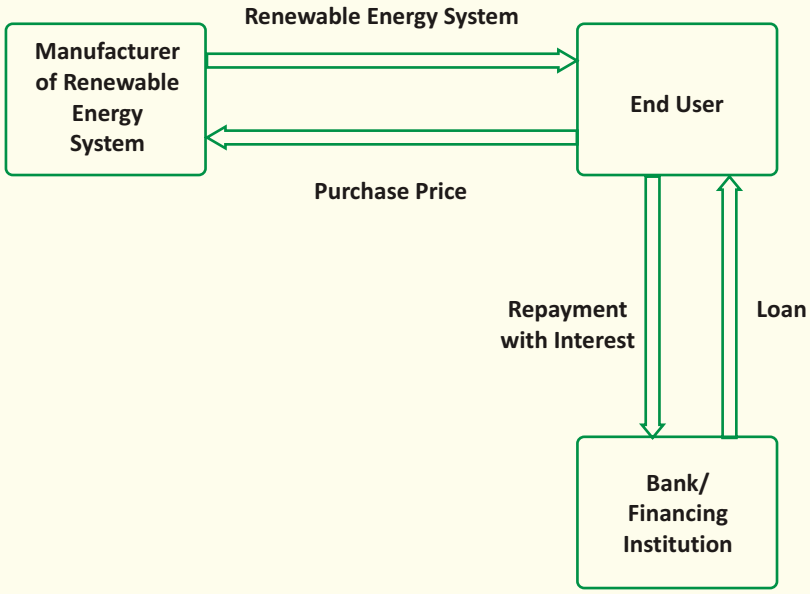
large capital investment

high perceived risks

relatively low rates of return

ownership of the system with the end user

b. Sale with borrowed financing from a bank/ financing institution



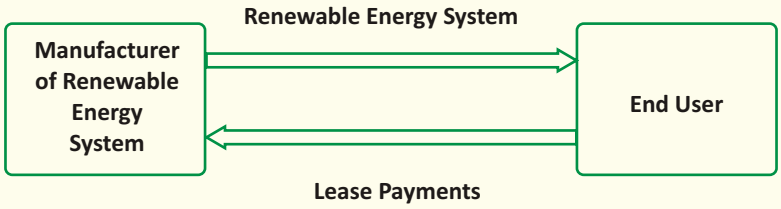
The salient features are

A major fraction of capital (and installation) cost obtained as loan

Loan repaid with interest according to the guarantees and recourse measures stipulated in the loan contract

Ownership of the system with the end user

c. Ordinary Lease



The salient features are:

Ownership with manufacturer

End user would make periodic (regular) lease payments to the manufacturer

There are several more business models which can be implemented and explored. Hence this is not an exhaustive list.

4. Technology specific Business models[4]

a. Biomass: The Biomass DREs employing biomass gasifiers commonly set the price of electricity for low income rural consumers according to their target market segment's current expenditure on energy. By pegging the price to the existing expenditure for directly comparable service, such as kerosene for lighting or diesel generator based electricity, companies can tap consumers' demonstrated ability and willingness to pay.

The fees for electricity services are DRE providers' main source of revenue, although some biomass--based DREs have successfully registered their projects under the global carbon--trading scheme Clean Development Mechanism (CDM) or in the voluntary carbon--trading market.

b. Small Hydro

Some small--scale hydro DREs operate as independent power producers using existing underutilized grid infrastructure and set their prices based on government--determined rates.

Pricing is determined by the preferential tariffs set by India's central and state governments in India, and these tariffs have become increasingly attractive in some states (for example, Himachal Pradesh increased its tariffs by 15% in 2009).

c Solar Home Lighting Systems

More than 90% of the customers buy their SHS on credit with SHS firms forming partnerships with banks to provide financing. Customers pay 10 to 25 percent of the total costs up front and the remaining balance in installments. Banks can charge SHS customers interest rates as high as 17 percent on the outstanding loan, but banks receiving government subsidies charge lower interest rates.

d. Solar lanterns

Solar lighting companies distribute their products through retail sales, either directly to the end user or through local retailers to the end user; or through bulk sales. Most bulk sales are made to government agencies, charities, and corporate social responsibility programs that distribute solar products at below cost or free to rural households. Companies selling directly to the consumers provide micro financing operations.

Some lanterns are sold without solar panels and the companies set up solar lantern charging stations. End users who buy LED lanterns without the solar panels pay Rs 5 per week to pay for charging.

4 Adapted from “Power to the people: investing in clean energy for the base of the pyramid in india” by CDF- IFMR and WRI

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HOW TO CONDUCT A TRANSECT WALK[5]

Introduction: A transect walk is a walk taken by participants and a facilitator through the area of interest, observing, asking, listening, looking, identifying different zones, seeking problems and possible solutions. The findings are documented and they can be mapped on to a transect diagram or map.

Duration: 2 Hour

Methods/Steps:

1. Identify a group of key informants in the selected village. Ideally, the participants should include all important stakeholder groups. They should all be willing to walk some distance, and share their observations.

2. Discuss with the participants the purpose of the walk, and decide on the path that should be taken to cover the full geographical variation in the area. The 'path' may should ideally be a cross section. Maps or aerial photographs (e.g. from Google Earth) may be of use, if available, but are certainly not essential. For monitoring and evaluation purposes, it is important that the route of the transect walk can be easily found again and again, possibly after substantial periods of time.

3. Decide with the key informants what parameters should be used for recording observations. Limit the parameters covered to five or six at maximum.

4. In general, the easiest and most stimulating part of transect walks is the walk itself and the discussions that arise during it, with the local people as experts. Documenting it afterwards can be more difficult. It helps to clearly decide specific observation points along the transect walk at which everyone stops to record all parameters.

Adapt From:

5 http://www.sswm.info/category/planning-process-tools/exploring/exploring-tools/preliminary-assessment-current-status/tran

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DEFINITIONS

1. **Business Model:** A model which includes all components and functions of a project as well as the revenues it generates and the expenses it incurs.

2. **Cadastral Map:** A cadastral map is a map that shows the boundaries and ownership of land. Some cadastral maps show additional details, such as survey district names, unique identifying numbers for land, positions of existing structures, the type of land & land use etc.

3. **Fund gap:** The amount of money needed to fund the ongoing operations or future development of a project that is not currently provided by cash, equity or debt.

4. **Generation capacity:** Generation capacity of a plant is the maximum potential amount of electricity that can be produced by a plant.

5. **GIS:** A Geographic Information System (GIS), is the system that captures, stores, analyzes, manages, and presents data with reference to geographic location data.

6. **Installed capacity:** Installed capacity of a plant is the actual (practically determined) amount of electricity produced by a plant.

7. **Load management:** It is the process of balancing the supply of electricity with the electrical load by adjusting or controlling the load rather than the power plant output.

8. **Subsidies:** Subsidy is a form of financial assistance paid by the government to producers or distributors in an industry (in this case decentralized renewable energy plants) to encourage its growth.

9. **Tariff structuring:** Schedule or system of rates/charges levied on the customer for the service provided (in this case electricity) by the service provider.

10. **Transmission & Distribution:** Transmission & distribution is transfer of electrical energy, from generating power plants to end users.

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ACRONYMS

BOOT	Build Own Operate Transfer
CIG	Common Interest Group
CFL	Compact Flourescent Lamp
CSO	Civil Society Organization
DA	Development Alternatives
DDG	Decentralized Distribution Generation
DRE	Decentralized Renewable Energy
FGD	Focused Group Discussion
GIS	Geographic Information System
GPS	Global Positioning System
ha	Hectares
HBF	Heinrich Böll Foundation
IREDA	Indian Renewable Energy Development Agency
KWH	Kilowatt Hour
m	Meter
M&E	Monitoring & Evaluation
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MNRE	Ministry of New & Renewable Energy
NABARD	National Bank for Agriculture and Rural Development
NGO	Non-Governmental Organizations
OBC	Other Backward Classes
PIA	Project Implementation Agency
PRI	Panchayati Raj Institution
PV	Photovoltaic
Qt.	Quintal
RE	Renewable energy
REZ	Rural Entrepreneurship Zone
SC	Schedule Caste
SHG	Self Help Group
SME	Small and Medium Enterprise
SPV	Solar Photovoltaic
ST	Schedule Tribes
Sq Meter	Squre Meter
T&D	Transmission & Distribution
VEC	Village Energy Committee
VEP	Village Energy Plan
V	Volt
YR	Year

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USEFUL LINKS

http://www.mnre.gov.in

www.ireda.in

http://terienvis.nic.in/windenergy.pdf

http://www.fao.org/docrep/003/x5996e/x5996e06.htm

www.hedon.info/docs/MandEEDGuideFinalVersionEnglish.pdf

http://www.unescap.org/esd/energy/cap_building/renewable/documents/sppd/Pilot%20training%20on%20Solar%20PV%20Project%20Development.html