

# IMPLEMENTATION MANUAL ON DECENTRALIZED GREEN ENERGY DEVELOPMENT PROJECT

An initiative of the Institute of  
Natural Resources, Meghalaya(INR)  
and funded by the National Bank  
for Agriculture and Rural  
Development (NABARD)

Green Energy Mission





## **1. GREEN ENERGY :**

Green energy comes from sources readily available in nature termed as natural resources. It is considered as clean Energy. This means it is produced with little-to-no environmental impact and does not dispense greenhouse gases into the air that contribute to global warming, the way fossil fuels do.

Green energy sources include : Wind, Geo-thermal, Hydro-power, Solar energy and Biomass.

Wind and hydro sources generate energy through the movement of air and water, while geo-thermal biomass and solar sources generate energy through heat. All, however, provide reliable energy and protect the environment.

The interest in commercial green power in the developed world is about 25 years old, starting in the mid-1970s after the first oil shock. Electricity derived from any renewable energy source is considered "green" because of the negligible impact on greenhouse gas emissions. In the 1970s and 1980s, the interest in green power was driven by the goal of replacing fossil fuels to minimize the dependence on oil. Now there is a broader goal: to minimize - the emission of CO<sub>2</sub> (the most common global warming gas) that results from the burning of fossil fuels and deforestation.

## **2. SCENARIO OF GREEN ENERGY IN MEGHALAYA :**

With 70% forestation and very heavy rainfall that the region experiences, such projects will be critical for Meghalaya, a state that requires at least 610MW of power, while currently 354.7MW is being generated by Meghalaya Power Generation Corporation Limited. So, in order to become self-reliant, an increase in decentralized renewable energy source has been identified as one of the sources that would help the state bridge this gap.

## **3. GREEN ENERGY MISSION :**

Energy plays a key role cutting across sectors and impacting various aspects of development. Different aspects of development social, economic, environment, access to water, health, education, gender, agricultural productivity and livelihoods are directly or indirectly impacted by the energy sector. It is important for this energy to be sustainable, renewable and environment friendly so that the primary prerequisites to achieve targets laid out by the Millennium Developmental Goals (MDGs) and Climate Change related emissions scenarios. There is also a shifting paradigm where communities and people are being empowered by allowing them to choose how they wish to develop their resources. The Government here plays the role of a facilitator in comparison to the traditional role of being a provider. The empowerment of people in developing nations is very critical. Such initiatives help communities build greater resilience to negative changes, helps them withstand the onslaught of global market forces and most important of all, allows them to ensure an assured standard of quality life.

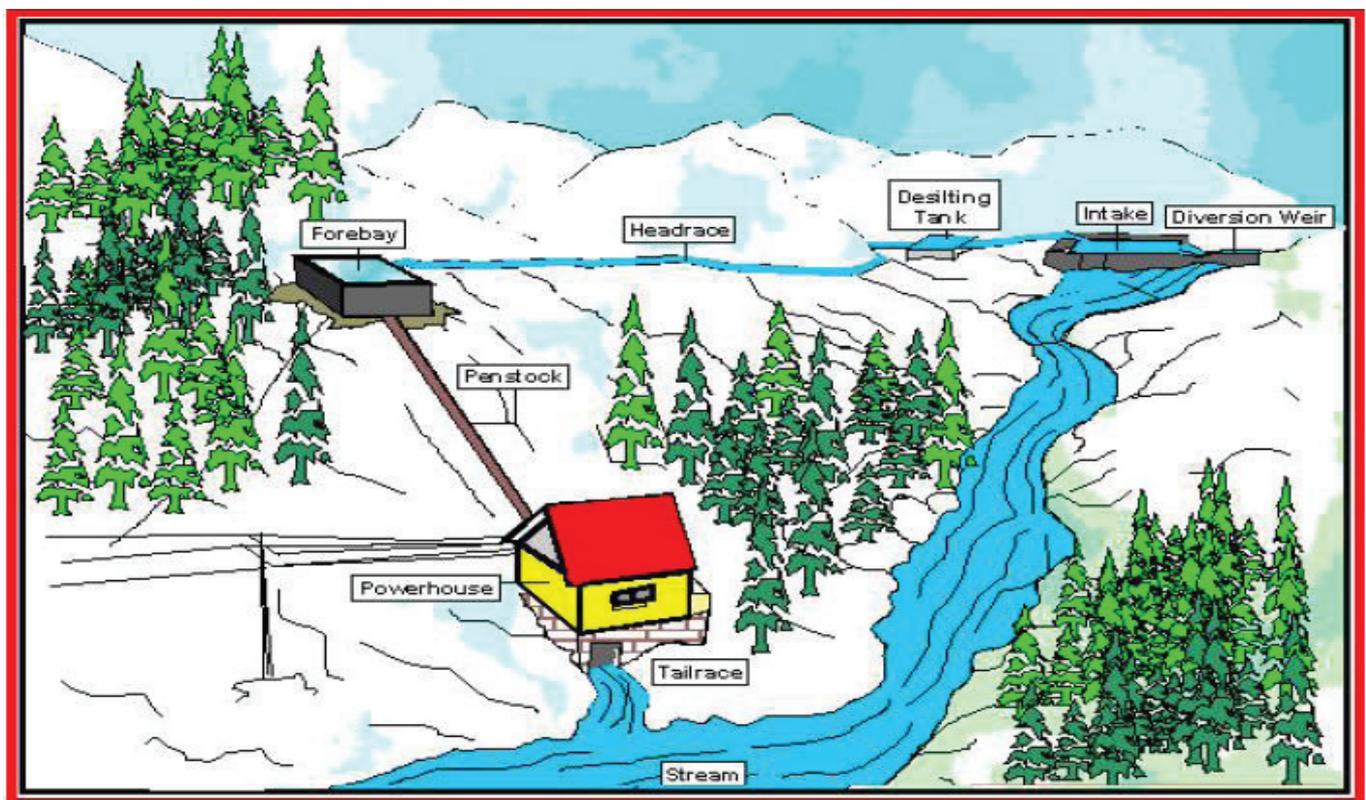
With the rapid changing scenario of fast depleting conventional energy sources, rapidly growing demand of power the future of conventional electric power systems are getting uncertain. This has led to worldwide thrust on development and use of non-conventional energy sources for electric power generation & use. This coupled with almost no chances of extending

the electric power grids to the village located in the isolated placed deep inside the forest zone. Lack of access to clean cooking fuel in such areas adds to the misery by causing respiratory & other ailments, especially to women and children. Meghalaya Government over the past year has initiated a few projects for tapping the renewable energy on the state. The Government is thus setting up projects for catering to the energy needs of small local communities in the state.

There are thousands of villages in Meghalaya which have access to small rivers and streams. These rivers have the hydro power potential to produce sustainable electricity to meet the demand of the entire state. Pico hydro generator's mission it so set up stand-alone micro-hydro power generation systems in these villages, providing them with sufficient energy to enhance quality of life through sustainable livelihoods. MBDA intends to educate and empower people to help maintain bio-diversity and vital ecosystem services and simultaneously ensure equitable access to adequate energy supply. Clean and Green Energy through MBDA's efforts, however small, could contribute to the mitigation of global climate change concerns in the North Eastern Himalayan region as it de-couples the dependence on traditional fossil fuels.

#### 4. GREEN ENERGY WITH PICO HYDRO POWER :

Pico hydro is a hydro power with a maximum electrical output of five kilowatts. Hydro power systems of this size have benefits in the terms of cost and approaches in design, planning and installation than those which are applied to larger hydro power. Pico hydro technology in recent innovation has made it an economic source of power even in some of the world's poorest and most inaccessible places. It is also a versatile power source.



**TYPICAL ARRANGEMENT OF SMALL HYDRO POWER**

## **5. GUIDELINES FOR IMPLEMENTATION OF DECENTRALISED GREEN ENERGY DEVELOPMENT IN MEGHALAYA :**

**PROJECT NAME:** Decentralized Green Energy Development Mission using "Hydro and Generator", or Hydro Generator/Pico Turbine. The objective of the Decentralized Green Energy Project Mission is to promote Environment and Green Energy. Green Energy is generally defined as energy that is collected from resources which are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat. Renewable energy often provides energy in four important areas: electricity generation, air and water heating/cooling, transportation, and rural (off-grid) energy services. Almost all income generating activities requires electricity, if these activities; be it micro, small or medium enterprise are harnessing Green Energy then it would be benefiting to them and to the environment. The other dimension would be to ensure that the ecosystem system services value adds livelihood opportunities.

### **PROJECT OBJECTIVES :**

- i) To empower the community and create awareness about green-energy utilization and its benefits.
- ii) To generate energy that is sustainable, renewable and environment friendly that are pre-requisites to achieve targets laid out by the Millennium Developmental Goals (MDGs) and Climate Change related emissions scenarios.
- iii) To ensure drinking water availability closer to the household to reduce women and children drudgery.
- iv) To enhance quality of life by providing electricity to households, water lifting for drinking and irrigation facilities.
- v) Besides powering Cottage Based Industrial Units like welding shops, rice mills, food processing etc.
- vi) To set up stand-alone micro-hydro power generation systems in these villages, providing them with sufficient energy to enhance quality of life through sustainable livelihoods.
- vii) To ensure catchment area protection for assured base flow of streams and rivers.
- viii) Streams and Rivers Eco System development and assured water for drinking, irrigation and livestock farming besides power generation and aqua-tourism development.

### **CRITERIA AND PRIORITISED VILLAGES :**

The hydro generator Mission primarily aimed at catering power supply to the remote, inaccessible hamlets or non-electrified cluster of households far away from the grid in the eleven districts of the state and which does not fall under any MeECL or central Government scheme of village electrification. The power generated from hydro generator/Pico Turbine are primarily aimed at Eco Tourism Village, locality street lighting, cottage based industrial units, water lifting etc.

**PROJECT LOCATIONS : 11 Districts of the State**

**NUMBER OF VILLAGES COVERED : 220Nos**

**PROJECT PERIOD : 2 YEARS**

**PROJECT IMPLEMENTING AGENCY : INSTITUTE OF NATURAL RESOURCES, MBDA**

**PROJECT ACTIVITIES :**

1. Training and Capacity Building of Barefoot Engineers, Village Energy Committee on Operation & Maintenance
2. Construction of Weir, Forebay and Penstock
3. Installation of Hydroger, Power House and Transmission
4. Street/House Lighting; Cottage based industrial units connections.

**PROJECT IMPLEMENTATION ARRANGEMENTS :**

**STATE PROJECT MANAGEMENT UNIT :**

At the SPMU level the Project will be headed by the Director of the Institute of Natural Resources, MBDA supported by 2 Technical Experts one for Khasi Hills and one for Garo Hills along with Technical Assistant and Field Assistants. SPMU coordinates the project on a day-to-day basis.

**Roles & Responsibilities of PMU :**

- To facilitate and extend logistical and personnel support towards the implementation of the project and for mentoring and suggesting corrective measures.
- To mobilize Training/ Capacity Building and exposure visit.
- To facilitate procurement of Technologies for harnessing Green Energy.

**DISTRICT IMPLEMENTATION UNIT AND BLOCK IMPLEMENTATION UNIT :**

The DC and the BDO are the respective heads supported by DPM's, Nodal Officers and Field Engineers.

**Roles & Responsibilities of BDUs :**

- Coordinating, monitoring and reporting.
- Facilitate VECs for signing of Social Agreement, Resolution of the VEC and convergence with other programs such as MGNREGS and Govt. Schemes under different Govt. line Departments.
- To ensure monitoring on progress of VECs, maintaining VEC profile and obtain Utilization certificates for the operating funds that has been released to them.

**VILLAGE IMPLEMENTATION UNIT :**

In the Village level, The Village Employment Council (alternatively referred to as Village Energy Committees – VECs) is to be formed who will take up responsibility for all efforts of the project. It will comprise of Village volunteers – 2 persons per village.

## **Roles & Responsibilities of Village Community :**

- The village authority shall take charge and ownership of the project.
- The village authority should identify the site for the project implementation measuring as per the project proposal. The site for implementation should be as per the proposal.
- The land should be owned by the community or a group of individuals if community land is not available.
- Community contribution for the project should be facilitated which may be in the form of materials and labour contribution, to be properly documented.
- Facilitate Signing of Partnership Deeds/ Social Agreement. Implement the project activities as per the DPR/PCN.
- The Project will be implemented on a Social Enterprise Mode. Any kind of profits earned from the project would be deposited in the Village Energy Committee. The Village Authority shall decide together with village community regarding maintenance and management of the project from the Social Capital, etc.
- The community shall constitute a Village Energy Committee comprising of 70% male and 30% female to carry out the following functions:
  1. Motivation and creating interest amongst the community for successful implementation of the project.
  2. Maintaining of Corpus fund towards post project operation and maintenance.
  3. Collection of monthly fees from the Energy Consumer as per rates fixed by the VEC.
  4. Appointment of operators etc. for operating and maintenance of the project and fixing of operator's monthly honorarium.
  5. 20% of the Net Benefit collected, shall be invested in the Social Development activities identified by the community.
  6. The Committee should open one Bank Account exclusively for the project.
  7. Promote Agri-Enterprises with energy available.

## **PROJECT SYNERGY :**

Micro Hydel Power Projects have a very high potential synergy of convergence with Water Resources Multipurpose Reservoirs (MR) Projects, Meghalaya Non-Conventional & Rural Energy Development Agency (MNREDA), National Bank for Agriculture and Rural Development (NABARD), Soil and Water Conservation Department(S&WC) and State Council of Science Technology and Environment (SCSTE) and in all these sectors Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) will also play a vital role in Man Power and Infrastructure Development.

Components like Catchment area treatment can be taken up under MLAMP or Forest and Environment Department; releasing of fish fingerlings in existing reservoirs may be mobilized from Fishery Department. Wherever new reservoirs are to be created funding support of Water Resources, Soil and Water Conservation besides MGNREGS may be explored.

**FINANCIAL IMPLICATIONS :**

(a) **PROJECT ESTIMATE:** The number of hydro generators/Pico Turbines indicated below in the table are tentative and are subjected to changes.

<b>TOTAL PROJECT COST</b>	:	Rs. 1045.00 Lakhs
<b>NUMBER OF TARGET VILLAGES</b>	:	220 Villages in 11 Districts
<b>UNIT COST PER HYDRO GENERATORS / PICO TURBINES PER VILLAGE</b>	:	Rs. 4.75 Lakh

**(b) PROJECT PHASING:**

SL. NO	ACTIVITIES	YEAR 1		YEAR 2		TOTAL	
		PHY (Nos)	FIN (Lakh)	PHY (Nos)	FIN (Lakh)	PHY (Nos)	FIN (Lakh)
1	Survey, Feasibility Study, Identification of Potential Green Energy Zones, MOU with Communities, Development of Road Map and DPR, Training and Workshop	220	104.50	-	-	220 nos	104.50
2	Interventions, Procurement of Equipments, Installation and Hand Holding Support	110nos.	470.25	110nos.	470.25	220nos	940.50
	<b>GRAND TOTAL</b>					<b>220nos.</b>	<b>1045.00</b>

**(c) PROJECT UNIT COST :**

<b>Abstract Unit Cost for Hydro Power Project</b>				
Sl.No.	Components	Rate per unit	Unit	Rate as per PWD SOR(B) (2013-14)
1	Construction of C.C Weir	10,718/ Rm	10 meter span	₹ 1,07,180.00
2	Construction Of Power House & Laying Of Pipe / Penstock	9430/ Sqm	11 Sqm	₹ 1,03,730.00
3	Cost of Electrical component	-	-	₹ 50,000.00
4	Cost Of hydro generators/Pico Turbines with Installation Charges (As Per Market Rate 2015)	-	-	₹ 1,90,000.00
<b>TOTAL</b>				<b>₹ 4,50,910.00</b>
5	Training, Capacity Building and Exposure Visit per Village		(lump sum) 5% of the Total Cost	₹ 25,000.00
<b>GRAND TOTAL</b>				<b>₹ 4,75,910.00</b>
<b>SAY</b>				<b>₹ 4,75,000.00</b>

#### **(d) ESTIMATES**

1. The estimates will be as per the Community Rates prepared by the INR and are comply to fall within the amount as given in the DPR so that there will be no excess usage of Funds.
2. The load from the Pico-Turbine will be provided only at the Village Centre and the respective connections from the Village Centre to the Households or for street lights will be taken care by the Community.

#### **PROCUREMENT OF HYDRO GENERATORS/PICO TURBINES :**

Total number of 220 Hydro Generators/Pico Turbines will be installed at different feasible sites of the eleven Districts of the state of which 200 number will be outsourced from a competent authority and 20 numbers will be procured from the local entrepreneurs who will be facilitated to fabricate and manufacture Pico Turbines.

#### **FUND FLOW MECHANISM:**

Funds for Construction of Weir, Power House, Penstocks and laying of pipes as per sites Estimates will be released directly to the VECs respective bank accounts from SPMU. However, the VECs will not be able to withdraw the fund unless the field report submitted by the Field Engineers (both MLAMP and CLLMP) or Nodal Officers of both Non-MLAMP and Non-CLLMP of their respective Block have been forwarded to the SPMU for which work order will be issue and signed by SPMU, MINR copied to the Bank to enable the VEC's to withdraw the fund. The Funds will be made available to the Village Energy Committee through the Village Energy Development Funds based on the demand, progress of work and satisfactory utilization of the resources. SPMU will retain the fund earmarked under Training component to facilitate different training and capacity building programs.

#### **TERMS OF REFERENCE FOR FUND RELEASE:**

- 50% of the Total Project Cost will be released as 1<sup>st</sup> instalment after detailed site Estimation and formation of Village Energy Committee.
- Remaining amount of the Total Project Cost will be released as 2<sup>nd</sup> instalment after submission of utilization certificate and successful completion of 50% of the work with the photographs.
- 10% of the Total Project Cost will also be contributed by the VECs.
- Original copies of Utilization certificate, All Vouchers, All Bills and Expenses with the photographs need to be submitted after successful completion of 100% of the work to the BDU and the scan copies of all of the above may be sent to the SPMU, MINR for records.
- The Original Utilization Certificate must be signed and sealed by the President and Secretary of the particular VEC.

Any accomplished assignments will be submitted along with the photographs, reports etc., as specified in the prescribed format. The Agency / Society will also train Master Trainer in building the capacity of community members and various stakeholders in Green Initiatives.

Any individual associated with the Agency / Society does not qualify to become an employee of MBDA and is not entitled to receive salary, benefits or other compensation. MBDA will be the owner of all the data collected / infrastructure created / machines installed by the Agency / Society, if the same has been collected / created / installed under the projects of MBDA.

## 5. SOCIAL AGREEMENT

This partnership agreement entered into between MINR- MBDA, Shillong which was established in the year 2019 under the Society Act of 1983, having its head office at Bishop Cotton Road, Shillong - 793001 duly represented by the Director.

and

.....Village represented by its Headman, Shri .....  
S/O of..... P.O..... Block.....  
District..... State.....

### Terms of Reference:

#### Roles and Responsibilities of the Project Implementing Agency :-

1. MINR-MBDA has embarked on an initiative to involve the community in the installation of Pico Turbines for electrification at the household level. In case a village is power sufficient then the power generated from hydro generator/Pico Turbine can be utilised for village/ locality street lighting, cottage industrial units, water lifting etc.
2. MINR-MBDA to facilitate procurement of Pico-Turbines.
3. MINR-MBDA to facilitate technical support for construction of Head works or Intake structure, power house, transmission line and installation of Pico Turbines during the period of this agreement.
4. That the project will be implemented within one year from the time the fund is transferred to the bank account of ..... of .....

#### Roles and Responsibilities of the Village Energy Committee(VEC) :-

1. That the amount sanctioned to the VECs for the purpose of installation of the Pico-Turbine shall be strictly utilised for the activity as per the Estimate in the work order.
2. That the community are willing to contribute at least 10% for the project which may be in the form of materials and labour contribution and properly documented.
3. That the VEC shall maintain all books of accounts and submit Utilization Certificates supported by vouchers to BDU in case the fund is released through them and to MINR, MBDA in case the fund is released by MINR-MBDA.
4. That the VEC shall participate in all Training and Capacity Building Programs organized by MINR-MBDA.
5. That the VEC shall identify Village Energy Facilitator to operate and maintain the Project from amongst the local youth preferably with knowledge on basics of Electrical works.

6. That the VEC shall create a Corpus Fund by collecting user charges to meet wear and tear, maintenance of the Project besides paying honorarium to the Village Energy Facilitators.
7. That the guidelines regarding the operation and maintenance of the Pico Turbine Unit has been fully understood and agreed upon.
8. That the VEC shall take charge and ownership of the project.
9. That the VEC have agreed to not exceed the permissible load capacity of the generating unit as it may post as a danger of overload and to be extremely cautious and avoid danger in every possible instance.
10. That the VEC will put in place an Insurance Policy to cover any mishap due to the Project.

**Period of agreement :**

This agreement shall be valid and effective in the first instance for a period of one year commencing from .....to ..... after signing of by both parties, hereafter the very same commitment may be renewed, failing which MINR-MBDA shall withdraw the support. This agreement may be reviewed and revised as and when required as agreed by the partners.

**TERMS OF REFERENCE FOR FUND RELEASE :**

- 50% of the Total Project Cost will be released as 1st instalment after detailed site Estimation and formation of Village Energy Committee.
- Remaining amount of the Total Project Cost will be released as 2nd instalment after submission of utilization certificate and successful completion of 50% of the work with the photographs.
- 10% of the Total Project Cost will also be contributed by the VECs.
- Original copies of Utilization certificate, All Vouchers, All Bills and Expenses with the photographs need to be submitted after successful completion of 100% of the work to the BDU and the scan copies of all of the above may be sent to the SPMU, MINR for records.

IN WITNESS WHEREOF, the Parties to this Deed put their hands and seal on today the .....day of .....2020.

**WITNESSES :**

1. FIRST PARTY
2. SECOND PARTY

**6. UNDERTAKING**

The following resolutions are unanimously made by the members of the Village Energy Committee (VEC) in connection with the Implementation of Decentralized Green Energy Development Project funded by NABARD under RIDF XXIV and facilitated by the INR, Meghalaya, Shillong:-

1. We, the members of the VEC have utilised the amount sanctioned to us for the purpose of installation of the Pico-Turbine as per the Estimated Amount.
2. We, the members of the VEC have contributed 10% for the project which are in the form of materials and labour contribution and it has been properly documented.
3. We, the members of the VEC will maintain all books of accounts and submit Utilization Certificates supported by vouchers to BDU in case the fund are released through them and to MINR, MBDA in case the fund are released by MINR-MBDA.
4. We, the members of the VEC will participate in all Training and Capacity Building Programs organized by MINR-MBDA.
5. We, the members of the VEC will create a Corpus Fund by collecting user charges to meet wear and tear, maintenance of the Project besides paying honorarium to the Village Energy Facilitators.
6. We, the members of the VEC have fully understood and agreed upon the Guidelines regarding the operation and maintenance of the Pico Turbine Unit.
7. We, the members of the VEC will take full ownership and charge of the project.
8. We, the key operators have been trained and are ready to tackle unforeseen incidents which may hinder the proper and normal functioning of the Unit.
9. The Load capacity of the Generating unit has been understood by the members of the VEC and have agreed not to exceed the permissible capacity as it may post as a danger of overload and to be extremely cautious and avoid danger in every possible instance.
10. The conditions for operation of the Unit after the installation and commissioning period has been understood by the VEC whereby they will generate funds within the community for servicing and maintenance of the Hydro unit.
11. We, the members of the VEC will put in place an Insurance Policy to cover any mishap due to the Project.
12. We, the members of the VEC will identify Village Energy Facilitator to operate and maintain the Project from amongst the local youth preferably with knowledge on basics of Electrical works and for necessary mobilisation of resources.
13. The Operators which have been identified are as follows:-
  - a.
  - b.
  - c.
  - d.

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VEC Chairman

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VEC Secretary



