



## REQUEST FOR PROPOSALS

Of the Solar Photovoltaic Salt Water Pumping (SWP) Systems for SEWA

### BACKGROUND

#### ABOUT SEWA :

Self Employed Women's Association ([www.sewa.org](http://www.sewa.org)), started in 1972, is a member based organization of poor, self employed women workers in the informal economy. Most of the informal economy workers are poor, and the poorest of them are women. Despite comprising 90% of women workforce, the informal economy women workers have limited access to market, low social protection and no voice in policy dialogue. They work for long hours, put in immense labor, with low returns.

SEWA's goals are **Full Employment** and **Self Reliance**:

- **Full employment** includes work security, income security, food security and social security (at least healthcare, childcare, nutrition, shelter).
- **Self reliance** means making members autonomous, economically & in decision making.

Currently, SEWA has 1.93 million members across 12 states in India, and also working in neighbouring countries of Afghanistan, Bhutan, Maldives, Nepal, Pakistan and Sri Lanka. Over 4 decades, we in SEWA understood that there are multiple reasons that push the informal economy women workers into poverty, and create a vicious circle of poverty. While some are evident like **Economic** factors, others include **Social** factors, like gender, caste.

#### ABOUT SALT :

Eighty five years ago, MK Gandhi led the salt march in Gujarat, which brought salt and its economics to the forefront of discussions and boosted the independence movement. When India attained Independence in 1947, salt was being imported from the United Kingdom & Adens to meet domestic requirement. Today India has not only achieved self-sufficiency in production of salt to meet its domestic requirement but is also exporting surplus salt. The production of salt during 1947 was 1.9 million tones which has increased ten fold to record 23 million tones during 2013-14 and India is the 3<sup>rd</sup> largest producer of salt in the world (after China and USA, <http://saltcomindia.gov.in> ). Gujarat provides for 77% of the salt produced in India, mainly concentrated in the Little Runn of Kutch (LRK), in Gujarat. The LRK has dual characteristics of wetland in June-September when the entire desert gets submerged with rainwater as well as the sea-water due to ingression. This evaporates by October, when the salt season starts. Approx. 30,000 'Agariyas' (salt workers) produce salt from October to May, and live in the desert for 8 months in temporary shelters.

The process of production involves using diesel pumps to draw brine out of the ground, and spread it in salt pans to enable the sun to evaporate the water and produce salt. A salt farmer uses on an average 1,400 litres of diesel per season to produce approx. 700 tons of salt. After meeting cost of production, the salt farmer earns a net of only Rs 10,000 - Rs 15,000 per season. **Thus, inspite of working 8 months in the desert, she and her family remain in poverty.**



## **ABOUT SEWA's WORK IN SALT :**

SEWA has been working with the salt farmers since 1992, under SEWA's Surendranagar Mahila and Bal Vikas Mandal (SMBVM). SMBVM organises the women Agariyas, imparts training to them, as well as provides technical and financial assistance.

- Training includes introduction of improved production processes, measurements, testing methods, safety, etc.
- Technical assistance is on how to produce industrial salt, which is more onerous to produce but fetches a higher price than edible salt.
- Financial assistance is on how to manage their finances, enabling the Agariya women to save regularly and gradually build financial independence, help Agariya women buy Salt Water Pumps to replace their diesel pumps and save cost of diesel.

***As a result of the good work done, SEWA has a membership of 17,000 Agariyas in the LRK.***

SEWA has piloted with 210 solar pumps over the last 3 years to demonstrate that a direct replacement of diesel by solar leads to saving of approx. 900 litres of diesel per season - ***the farmer is willing to use this saving to pay the installments of the solar pumps, spread over 1 to 3 years.*** However, due to the high interest rates in India and the nature of the trade, commercial financiers are not forthcoming. Hence SEWA has partnered with one bank to enable its salt worker members (Agariyas) to purchase and install up to 600 solar water pumps on installments in November 2015, through its special purpose vehicle 'Grassroot Trading Network for Women', a non-profit section 25 company owned by members of SEWA.

Further, the technical specifications are in process of being considered by MNRE, and if approved, can make the salt pumps eligible for subsidy under the MNRE scheme. This will help lower the cost of the pumps to the poor Agariyas and provide confidence to the lender banks also. SEWA also looks forward to supporting other lender banks in the ground level operations of training, monitoring and collections of installments for solar powered salt water pumps - an activity which can provide much needed comfort to lender banks.

## **REQUEST FOR PROPOSALS :**

SEWA invites Requests for Proposals from interested parties to sell and implement Solar Water Pumps (SWP) for salt production to SEWA members (Agariyas) engaged in the production of salt in the Little Runn of Kutch. Interested parties should send their proposals to the email id [mail@gtnfw.org](mailto:mail@gtnfw.org) and a hard copy on letterhead of company, signed by the authorised signatory, in a sealed envelope to :-

Grassroot Trading Network for Women  
C/o SEWA Mahila Gram Haat  
8 - Navrang Colony, Navrangpura,  
Ahmedabad, Gujarat (India) - 380009

***Please write the following on the envelop : "Proposal for Solar Salt Water Pumps 2015"***

The proposal should comprise of two parts :-

- Part A : L1 : Technical Proposal (conforming to the technical specifications listed below).
- Part B : L2 : Financial Proposal (stating the cost of the solar water pump).



The last date for receipt of the proposals is 31-August-2015. The proposals will be evaluated by a joint committee of SEWA-GTNfW, and the Selected Technology Providers (STP's) finalised by 05-September 2015. GTNfW will issue confirmation letter to STP's.

**Distribution of Solar Water Pumps :**

The list of STP's will be sent to SEWA members who will choose which technology provider they prefer. To facilitate operational implementation, GTNfW and SMBVM will consolidate members at the village level as an aggregator. This is to give a choice to Agariyas, as well as aggregate them for operational ease of STP's. The STP's will be informed of the solar pumps allotted to them for installation by 30-September-2015.

**Operational requirements :**

STP's will engage with GTNfW (and SMBVM) to develop and submit a detailed plan of implementation in the allotted village/s. This will include an implementation manual which will be followed in installation. This plan will need to be submitted by 30-September-2015.

**Warranties and After Sale Service :**

Shortlisted technology providers will need to provide after sale service in the allotted village/s to the salt farmers (Agariyas) as per stated in the Approved Technical Specs.

**Payment :**

Selected Technology Providers will need to furnish a bank guarantee of 10% of the cost of the solar water pumps. This bank guarantee will be provided within 20 days of issue of allotment letter from GTNfW and will be irrevocable for 4 years from the date of issue of the Bank Guarantee. The guarantee will be invoked by GTNfW only if after sale service is not delivered and there are consistent complaints that are not addressed.

On receipt of bank guarantee GTNfW will make payments to the STP's as follows :-

- 5% of cost of SWP as advance by 15-October-2015 (upon receipt of implementation plan)
- 30% of cost of SWP in the week starting 16-Nov-2015 (provided implementation has started)
- 60% of cost of SWP within 30 days of completion of installation of the allotted SWP (*during which time inspection will be carried out and recorded*)
- 5% of cost of SWP will be paid at the end of the season (by July 2016)

This RFP is for the first phase of the project, which involves enabling delivery and installation of upto 600 solar water pumps. For any queries, please write to [mail@gtnfw.org](mailto:mail@gtnfw.org) .



## Technical specifications Solar PV Powered SALT Water Pumping Systems

### I. INTRODUCTION

A solar photovoltaic (SPV) water pumping system consists of:

- PV array : Capacity from 1 KWp to 2 KWp
- Mounting structure with a provision of tracking the sun.
- Motor Pump Set A.C. Induction Motor Pump Set 1 hp to 2 hp motors with suitable Inverter.
- Electronics: Maximum Power Point Tracker (MPPT), with Controls / Protections.
- Interconnect Cables and “On-Off” switch.

### II. PERFORMANCE SPECIFICATIONS AND REQUIREMENTS (DUTY CYCLE)

Solar PV Water Pumps with PV array capacity in the range of 1 KWp to 2 KWp to be installed on a suitable bore-well, open well, water reservoir, water stream, etc.

Under the “Average Daily Solar Radiation” condition of 7.15 KWh/ sq.m. on the surface of PV array (i.e. coplanar with the PV Modules), the minimum water output from a Solar PV Water Pumping System at different “Total Dynamic Heads” should be as specified below :

- (i) 90 liters of water per watt peak of PV array, from a Total Dynamic Head of 10 meters (and a suction head of minimum 7 meters) and with the shut off head being at least 12 metres
- (ii) 75 liters of water per watt peak of PV array, from a Total Dynamic Head of 12 meters (and a suction head of minimum 7 meters) and with the shut off head being at least 14 metres
- (iii) 45 liters of water per watt peak of PV array, from a Total Dynamic Head of 20 meters (and a suction head of minimum 7 meters) and with the shut off head being at least 25metres.
- (iv) 32 liters of water per watt peak of PV array, from a Total Dynamic Head of 30 meters (and a suction head of minimum 7 meters) and with the shut off head being at least 45 metres.

Note: the suction head is maintained by manually lowering the pump into the bore well.

The actual duration of pumping of water on a particular day and the quantity of water pumped could vary depending on the solar intensity, location, season, etc. Indicative performance specifications for the Shallow well SPV Water Pumping Systems are given in the Annexure I.



### **III. PV ARRAY**

The SPV water pumping system should be operated with a PV array capacity in the range of 1 kilo Watts peak to 2 kilo Watts peak, measured under Standard Test Conditions (STC).

Sufficient number of modules in series and parallel could be used to obtain the required PV array power output. The power output of individual PV modules used in the PV array, under STC, should be a minimum of 125 Watts peak, with adequate provision for measurement tolerances.

Use of PV modules with higher power output is preferred. Indigenously produced PV module (s) containing mono/ multi crystalline silicon solar cells could be used in the PV array for the SPV Water Pumping systems.

- Modules supplied with the SPV water pumping systems should have certificate as per IEC 61215 and IEC 61701 specifications or equivalent National or International/ Standards.
- Modules must qualify to IEC 61730 Part I and II for safety qualification testing.
- The efficiency of the PV modules should be minimum 14% and fill factor should be more than 70%.
- Terminal box on module should have a provision for “Opening” for replacing cable, if required.
- There should be a Name Plate fixed inside the module which will give:
  - a. Name of the Manufacturer or Distinctive Logo.
  - b. Model Number
  - c. Serial Number
  - d. Year of manufacture
  - e. contact details of manufacturer (website, e-mail, phone number)

### **IV MOTOR PUMP-SET**

- The SPV water pumping systems may use Surface mounted motor pump-set.
- The 2 Motor Pump Sets should have a capacity of a 1 HP each, and the following features:
  - The mono block AC centrifugal motor pump set has its driving unit and impeller mounted on a common shaft, thereby giving it a perfect alignment. The pump should be provided with specially developed mechanical seals which ensure zero leakage.
  - The suction/ delivery pipe (GI/HDPE), electric cables, floating assembly, civil work and other fittings required to install the system.
  - The following details should be marked indelibly on the motor pump set
    - o Name of the Manufacturer or Distinctive Logo.
    - o Model Number.
    - o Serial Number.
    - o Contact details of manufacturer (website, e-mail, phone number)



## **V. MOUNTING STRUCTURES and TRACKING SYSTEM.**

The PV modules should be mounted on metallic structures of adequate strength and appropriate design with sun tracking system, which can withstand load of modules and high wind velocities up to 100 km per hour. The support structure used in the pumping system should be hot dip galvanized iron with minimum 100 micron thickness.

To enhance the performance of SPV water pumping systems, manual or passive or auto tracking system **must** be used. For manual tracking, arrangement for seasonal tilt angle adjustment and three times manual tracking in a day should be provided.

## **VI. ELECTRONICS AND PROTECTIONS**

- Variable Frequency Drive (VFD) with Maximum Power Point Tracker (MPPT) should be included to optimally use the Solar panel and maximize the water discharge.
- Adequate protections should be incorporated against dry operation of motor pump set, lightning, hails and storms, water, salt and insects.
- Full protection against open circuit, accidental short circuit and reverse polarity should be provided.
- The electronic must have remote sensing capability through on embedded sim card, such that daily operational data and efficiency and performance can be collected remotely to track optimum output and to act as an early warning in case of malfunction.

## **VII. ON/OFF SWITCH**

A good reliable switch suitable for AC use is to be provided with the motor pump set. Sufficient length of cable should be (minimum 12 meters) provided for inter-connection between the PV array and the motor pump set.

## **VIII. WARRANTY**

The PV Modules must be warranted for output wattage, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years.

The whole system including surface pumps shall have replacement warrantee for a minimum of 3 years and should be supported by a maintenance contract for another 2 years. Required spares for trouble free operation during the Warranty period should be provided free of cost.

## **IX. OPERATION AND MAINTENANCE MANUAL**

Initial installation of the pump system will be the responsibility of the Selected Technology Provider (STP). After each installation, a separate check & certification of proper implementation will be done by an independent entity.

An Operation and Maintenance Manual, in English and in local language, should be provided with the solar PV pumping system. The Manual should have information about solar energy, photovoltaic, modules, AC motor pump set, tracking system, mounting structures, electronics and switches. It should also have clear instructions about mounting of PV module, DO's and DONT's and on regular maintenance and Trouble Shooting of the pumping system (*including easy to understand sketches /diagrams for training, memory and reference purposes*). Name and



address of the person or Centre to be contacted in case of failure or complaint should also be provided. Warranty cards for modules, electronics & motor pump set should be provided to the beneficiary.

## X. NOTES

- Wherever the “Water table” or the level of water in the reservoir or the water source (e.g. Diggie) from which the water is to be pumped, is within 10 metres depth, ‘Surface Motor Pump sets’ should be preferred.
- The type of pump set used must match the total dynamic head requirement of the site (i.e. the location at which it is installed). Moreover, it should be appropriately tested and certified by the authorized test centres of the Ministry to meet the performance and water discharge norms specified in section II above.
- There should not be any compulsion to use only one or the other type of Motor-pump set. The beneficiary may select an appropriate Model (i. e. Capacity of PV Array and Type of Motor Pump Set) as per site requirement.

## ANNEXURE - I

Indicative Technical Specifications of Shallow Well (Surface) Solar Pumping Systems With A.C. Induction Motor Pump Set and a suitable Inverter:

Description	Model I	Model II
PV Array	1,000 Wp	1,500 Wp
Motor Capacity	1 HP	1.5 HP
Total Dynamic Head	20 metres	30 metres
Module mounting structure	MS of minimum 5mm, hot dipped galvanised of minimum 100 microns, at least three times manual tracking facilities	MS of minimum 5mm, hot dipped galvanised of minimum 100 microns, at least three times manual tracking facilities
Water Output *	45,000 litres per day from a total dynamic head of 20 metres	48,000 litres per day from a total dynamic head of 30 metres

\* Water output figures are on a clear sunny day with three times tracking of SPV panel, under the “Average Daily Solar Radiation” condition of 7.15 KWh/ sq.m. on the surface of PV array (i.e. coplanar with the PV Modules).

Notes:

1. Suction head, if applicable, minimum 7 metres.
2. For higher or lower head / PV capacity, or in between various models; water output could be decided as per the clause II. (i.e. performance specifications and requirements) specified earlier.
3. If submersible pumps are used in lieu of surface pumps, the water output must match that of the surface pumps as specified in this table.
4. Module mounting structure shall be MS hot dipped galvanised, with a facility of manual tracking at least three times a day.