

No. 32/1/2013-14/PVSE(Part-I)
Government of India
Ministry of New and Renewable Energy

Block No14, CGO Complex,
Lodi Road, New Delhi-110 003
Dated: 05th March 2014

To
The Pay & Accounts Officer
Ministry of New and Renewable Energy
New Delhi-110003

Subject: Installation of 17,500 nos. of SPV water Pumping System in Rajasthan, Tamilnadu, Andhra Pradesh, Uttar Pradesh, Maharashtra, Chhattisgarh, Madhya Pradesh, Bihar and other selected States to meet the irrigation requirements.

Sir,

I am directed to convey sanction of the President for installation of 17,500 nos. of SPV water Pumping System to meet the irrigation requirements with a financial support from NCEF of is **Rs. 299, 50,00,000 (Rupees Two Hundred and Ninety Nine Crores Fifty Lacs only)**, in in Rajasthan, Tamilnadu, Andhra Pradesh, Uttar Pradesh, Maharashtra, Chhattisgarh, Madhya Pradesh, Bihar and other selected States at a project cost of **Rs. 997,50,00,000 (Rs Nine Hundred and Ninety Seven Crores Fifty Lacs only)**.

2. The programme is applicable to only those states who are willing to contribute not less than 15% of the project cost as state shares. The commitment of state share is to be communicate of project stage itself. Ministry will provide up to 2% of CFA as service charges to the implementing SNAs towards implementation and monitoring of SPV Pumping System.

3. The detailed terms and conditions of this Scheme, are indicated in **Annexure-I**. The provisions of this scheme will be applicable only for installation of Installation of 17,500 SPV water Pumping System. The service charges will be paid only to those states who will submit monthly progress report to Ministry(format available on www.mnre.gov.in)

4. The concerned State Renewable Energy Development Agencies will submit annual accounts in the Standard format as required under GFR 209 (xiii), for the funds that would be released for the project. These accounts shall be open for inspection by the sanctioning authority and Audit, both by the Comptroller and Auditor General of India under the provision of C & AG's (DPC) Act 1971 and internal Audit Party by the Principal Accounts Office of the Ministry whenever called upon to do so.

5. Concerned State Renewable Energy Development Agencies will furnish the Utilization Certificate (UC) and audited Statement of Expenditure (SoE) for the released funds, in the prescribed formats given on website.

6. A Internal Review Committee of the Ministry will review this scheme at an interval of **six months** and modification, if any, would be incorporated in the scheme.

7. The State Nodal Agencies will implement the programme through e – Procurement by adopting procedure as prescribed under General Financing Rules.

8. Release of the CFA will be on mile stone basis and settlement of accounts on completion of the project and submission of completion documents.

9. The expenditure involved is debitale to Demand No. 69, Major Head 2810, New and Renewable Energy, Sub Major Head 00, Minor Head 101-Grid Interactive and Distributed Renewable Power, Sub Head 02,-Off Grid/Distributed and Decentralized Renewable Power, Detailed Head 04 Solar Power, Object Head 31-Grants-in-Aid during the year 2013-14 (Plan).

10. This Administrative Approval is based on an approval of an Inter Ministerial Group set up to appraise the proposals for financing under National Clean Energy Fund. The amount of financial assistance provided under this Scheme is specific and will have no bearing on the other Schemes of the Ministry under JNNSM.

11. This issues with the concurrence of IFD dated **26/02/2014** vide their Dy. No. **IFD/2568/13-14 dated 28/02/2014**

12. This sanction has been noted at S. No. **172** on page No. **13** of the Expenditure Control Register of Off-Grid and Decentralized Solar Applications under JNNSM for the year 2013-14.

Yours faithfully,

(S K Sharma)

Scientist D

Ph:24360707/Extn-1901

Copy to:

1. All SNA's
2. The Principal Director of Audit, Scientific Department, DGCACR, New Delhi.
3. PS to Member Secretary, Planning Commission, New Delhi.
4. PS to Minister, NRE / PSO to Secretary, MNRE
5. JS(TK)Dir(GP)/DS(F)/SSO(TS)
6. Dir. (NIC) to upload this on the MNRE website.
7. Sanction file

(S K Sharma)

Scientist D

32/1/2013-14/PVSE(Part-I)
Ministry of New and Renewable Energy
SPV Off Grid Division

Scheme: Installation of 17,500 SPV water Pumping System in Rajasthan, Tamilnadu, Andhra Pradesh, Uttar Pradesh, Maharashtra, Chhattisgarh, Madhya Pradesh, Bihar and other selected States to meet the irrigation requirements.

a. Aim: Installation of 17,500 numbers of solar photovoltaic water pumping systems in Rajasthan, Tamilnadu, Andhra Pradesh, Uttar Pradesh, Maharashtra, Chhattisgarh, Madhya Pradesh, Bihar and other selected States. SPV pumping systems can easily meet the irrigation requirements for land holdings for small and marginal farmers. Due to lack of grid power electricity, a large number of diesel pump sets are being deployed every year in the country. This project help in reduction of diesel consumption. It will obviate farmers from long distance travels to procure and transport diesel. It will increase the cropping intensity of the states through this intervention provided

b. Technical Details: Technical details of SPV Pumping system are as follows:
A solar photovoltaic(**SPV**)water pumping system consists of PV array, a DC/AC surface mounted/submersible/floating motor pump set, electronics if any, interconnect cables and an “On-Off” switch .PV Array is mounted on a suitable structure with a provision of tracking.Electronics could include Maximum Power Point Tracker (MPPT), Inverter and Controls/Protections. Detailed technical specification are given in Annexure 1

c. Budget: Estimated budget for the project is Rs. 299.5 crores (calculated on the basis of tentative project cost of Rs 997.5 crores assuming average size of SPV pumtion system 3 kWp capacity). A 3 kWp pumping system consist of a 3000 W SPV Panels + 3HP Pump + Frames + Wires + Pipes + Insurance + Installation+ Transportation + 5 years AMC Contract to sites.

Ministry will provide 30% of the project cost as subsidy. State Government/Department has to provide minimum subsidy of 15% and remaining cost will be met by the beneficiary

- d. Duration:** Total duration of the project is 2 Years
- e. Implementation:** Overall responsibility for procurement of the systems, installation and providing technical help from time to time will lie with the State Renewable Development Agency
- f. Selection of beneficiaries:** The selection of beneficiaries will be done by the State Renewable Energy Development Agencies by inviting expression of Interest.
- g. Procurement:** State Renewable Energy Development Agencies will place open tender for procurement of equipment. The complete SPV pumping system will have to qualify laid down standards by MNRE. The rate will be inclusive of transportation, installation and maintenance for 5 years from the date of commissioning.
- h. Training:** The beneficiary will be given training on technical aspects and maintenance by selected manufacturer
- i. Monitoring:** SNAs will be responsible to monitor the project and maintain information through web enabled system and also visit periodically to verify the functioning of these Solar pumps. Ministry will get these systems inspected by third party. This information about installed pumps must be updated by SNA website from time to time.
- j. Budget head :** The expenditure involved is debitable to budget head Demand No.69, Major Head 2810, Minor Head: 101-Grid Interactive and Distributed Renewable Power, 02-Off Grid/ Distributed and Decentralised Renewable Power 04- Solar Power, 31-grants-in-aid during the year 2013-14 (plan)

Annexure 1

SOLAR PHOTOVOLTAIC WATER PUMPING SYSTEMS

(2013-14)

I. INTRODUCTION

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

- PV array :
 - Capacity in the range of 200 Watt to 5 KWp .
 - Should be mounted on a suitable structure with a provision of tracking the sun
- Motor Pump Set (Surface or submersible) :
 - D.C. Motor Pump Set (with Brushes or Brush less D.C.)

OR

- A.C. Induction Motor Pump Set with a suitable Inverter
- Electronics :
 - Maximum Power Point Tracker (MPPT)
 - 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 200 Watt to 5 KWp could 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 :

For D.C. Motor Pump Set with Brushes or Brush Less D.C.(B.L.D.C.) :

- (i) 100 liters of water per watt peak of PV array, from a Total Dynamic Head of 10 metres (Suction head, if applicable, minimum of 7 metres) and with the shut off head being at least 12 metres.
- (ii) 55 liters of water per watt peak of PV array, from a Total Dynamic Head of 20 metres (Suction head, if applicable, up to a maximum of 7 metres) and with the shut off head being at least 25 metres.
- (iii) 35 liters of water per watt peak of PV array, from a Total Dynamic Head of 30 metres and the shut off head being at least 45 metres.
- (iv) 21 liters of water per watt peak of PV array, from a Total Dynamic Head of 50 metres and the shut off head being at least 70 metres.
- (v) 14 liters of water per watt peak of PV array, from a Total Dynamic Head of 70 metres and the shut off head being at least 100 metres.

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 and Deep well SPV Water Pumping Systems are given in the Annexure I .

For A.C. Induction Motor Pump Set with a suitable Inverter :

- (i) 90 liters of water per watt peak of PV array, from a Total Dynamic Head of 10 metres (Suction head, if applicable, minimum of 7 metres) and with the shut off head being at least 12 metres.
- (ii) 50 liters of water per watt peak of PV array, from a Total Dynamic Head of 20 metres (Suction head, if applicable, up to a maximum of 7 metres) and with the shut off head being at least 25 metres.
- (iii) 32 liters of water per watt peak of PV array, from a Total Dynamic Head of 30 metres and the shut off head being at least 45 metres.
- (iv) 19 liters of water per watt peak of PV array, from a Total Dynamic Head of 50 metres and the shut off head being at least 70 metres.
- (v) 13 liters of water per watt peak of PV array, from a Total Dynamic Head of 70 metres and the shut off head being at least 100 metres.

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 and Deep well SPV Water Pumping Systems are given in the Annexure II.

III. PV ARRAY

The SPV water pumping system should be operated with a PV array capacity in the range of 200 Watts peak to 5000 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 74 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 should 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 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%.
- The terminal box on the module should have a provision for “Opening” for replacing the 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

IV MOTOR PUMP-SET

The SPV water pumping systems may use any of the following types of motor pump sets:

1. Surface mounted motor pump-set
2. Submersible motor pump set
3. Floating motor pump set
4. Any other type of motor pump set after approval from Test Centers of the Ministry.

The “**Motor Pump Set**” should have a capacity in the range of **0.2 HP to 5 HP** and should have the following features:

- The mono block DC/ 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 motor is of 1-5 HP having spring loaded carbon brushes in case of D.C. Motor Pump Sets. The suction and delivery head will depend on the site specific condition of the field.
- Submersible pumps could also be used according to the technical need of the particular case.
- 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
 - a) Name of the Manufacturer or Distinctive Logo.
 - b) Model Number.
 - c) Serial Number.

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

The PV modules should be mounted on metallic structures of adequate strength and appropriate design, which can withstand load of modules and high wind velocities up to 150 km per hour. The support structure used in the pumping system should be hot dip galvanized iron with minimum 80 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**

- Maximum Power Point Tracker (MPPT) should be included to optimally use the Solar panel and maximize the water discharge.
- Inverter could be used, if required, to operate an A.C. Pump.
- Adequate protections should be incorporated against dry operation of motor pump set, lightning, hails and storms. Full protection against open circuit, accidental short circuit and reverse polarity should be provided.

VII. ON/OFF SWITCH

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

VIII. PERFORMANCE SPECIFICATIONS AND WARRANTY

Solar PV Water Pumps with PV module capacity in the range of 200 Watt to 5 KWp may be installed on a suitable bore-well / open well / Water Reservoir / Water stream etc. Indicative Performance Specifications for the Shallow and Deep well SPV Water Pumping Systems are given in the Annexure.

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 submersible/ surface pumps shall be warranted for 5 years. Required Spares for trouble free operation during the Warrantee period should be provided along with the system.

IX. OPERATION AND MAINTENANCE MANUAL

An Operation and Maintenance Manual, in English and the local language, should be provided with the solar PV pumping system. The Manual should have information about solar energy, photovoltaic, modules, DC/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. Name and address of the person or Centre to be contacted in case of failure or complaint should also be provided. A warranty card for the modules and the motor pump set should also be provided to the beneficiary.

X. NOTES

- i. 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.
- ii. 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.
- iii. 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 D.C. Motor Pump Set with Brushes or Brush Less D.C.(B.L.D.C.)

| Description | Model-I | Model-II | Model-III |
|---------------------------|---|---|---|
| PV array | 900 Wp | 1800 Wp | 2700 Wp |
| Motor capacity | 1 HP | 2 HP | 3 HP |
| Shut Off Dynamic Head | 12 metres | 15 metres | 25metres |
| Module mounting structure | MS hot dipped galvanised, at least three times manual tracking facilities | MS hot dipped galvanised, at least three times manual tracking facilities | MS hot dipped galvanised, at least three times manual tracking facilities |
| Water Output* | 90,000 litres per day from a total head of 10 metres | 180,000 litres per day from a total head of 10 metres | 148,000 litres per day from a total head of 20 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.

Indicative Technical Specifications of Solar Deep well (submersible) Pumping Systems:

With D.C. Motor Pump Set with Brushes or Brush Less D.C.(B.L.D.C.)

| Description | Model I | Model II | Model III | Model IV |
|---------------------------|--|--|--|--|
| PV array | 1200 Wp | 1800 Wp | 3000 Wp | 4800 Wp |
| Motor pump set type | Submersible with electronic controller | Submersible with electronic controller | Submersible with electronic controller | Submersible with electronic controller |
| Max. total dynamic head | 45 Metres | 45 metres | 70 Metres | 70 Metres |
| Module mounting structure | MS hot dipped galvanised, three times manual tracking facilities | MS hot dipped galvanised, three times manual tracking facilities | MS hot dipped galvanised, three times manual tracking facilities | MS hot dipped galvanised, three times manual tracking facilities |
| Water Output* | 42,000 Litres per day from a total head of 30 mtrs | 63,000 litres per day from a total head of 30 mtrs | 63,000 litres per day from a total head of 50 mtrs | 1,00,000 litres per day from a total head of 50 mtrs |

* 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. 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.
2. If surface pumps are used in lieu of submersible pumps, the water output must match that of the submersible pumps as specified in this table.

ANNEXURE – II

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 | Model-III |
|---------------------------|---|---|---|
| PV array | 900 Wp | 1800 Wp | 2700 Wp |
| Motor capacity | 1 HP | 2 HP | 3 HP |
| Shut Off Dynamic Head | 12 metres | 15 metres | 25metres |
| Module mounting structure | MS hot dipped galvanised, at least three times manual tracking facilities | MS hot dipped galvanised, at least three times manual tracking facilities | MS hot dipped galvanised, at least three times manual tracking facilities |
| Water Output* | 81,000 litres per day from a total head of 10 metres | 162,000 litres per day from a total head of 10 metres | 135,000 litres per day from a total head of 20 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, should be 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.

Indicative Technical Specifications of Solar Deep well (submersible) Pumping Systems:

With A.C. Induction Motor Pump Set and a suitable Inverter:

| Description | Model I | Model II | Model III | Model IV |
|---------------------------|--|--|--|--|
| PV array | 1200 Wp | 1800 Wp | 3000 Wp | 4800 Wp |
| Motor pump set type | Submersible with electronic controller | Submersible with electronic controller | Submersible with electronic controller | Submersible with electronic controller |
| Max. total dynamic head | 45 Metres | 45 metres | 70 Metres | 70 Metres |
| Module mounting structure | MS hot dipped galvanised, three times manual tracking facilities | MS hot dipped galvanised, three times manual tracking facilities | MS hot dipped galvanised, three times manual tracking facilities | MS hot dipped galvanised, three times manual tracking facilities |
| Water Output* | 38,000 Litres per day from a total head of 30 mtrs | 57,000 litres per day from a total head of 30 mtrs | 57,000 litres per day from a total head of 50 mtrs | 91,000 litres per day from a total head of 50 mtrs |

* 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. 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.
2. If surface pumps are used in lieu of submersible pumps, the water output must match that of the submersible pumps as specified in this table.