



## Solar Energy Sub Component (SESC)

### Testing and Commissioning Form of RSDWP/PVPS Project (Test on Completion)

**A. Salient Features of the Project**

**B. Technical status of the RSDWP**

**C. Electrical Measurements**

**D. System Performance Test**

**E. Pictures**

**F. Water Quality**

**G. RSDWP Installation completion certification and remarks**

A. Salient Features of the Project	
Name of Project:	Name of Owner:
Location:	
Supplier/Installer:	
Ownership: Private/community	No of households: _____
Total Beneficiaries: _____	Total GESI: _____
Total Design head _____ m; Minimum Source Discharge _____ l/s      Designed Demand _____ l/d System Design: Single-Stage Pumping/Double-stage Pumping Designed PV Array: _____ Wp      Designed Pump Size _____ HP or kW	
Start of Construction of project: _____ day/month/year Commissioning date: _____ day/month/year	

## B. Technical status of the RSDWP

### B.1 Intake

Type of intake:	Permanent/Temporary
If permanent any cracks observed:	Yes/No
Any leakage observed:	Yes/No
Washout(included and Working):	Yes/No
Gate Valves (included and working):	Yes/No
Fencing:	Yes/No
Is Intake according to design	Yes/No

Remarks on Intake – Briefly discuss any major defects observed.

### B.2 Horizontal Roughing Filter

Size: L \_\_\_\_\_ m x B \_\_\_\_\_ m x H \_\_\_\_\_ m  
No. of compartments:  
Separate washout and overflow for each compartment: Yes/ No  
Gate valve in each washout (included and working): Yes/No  
Fencing: Yes/No

Any leakage observed:	Yes/No
Any cracks observed:	Yes/No
Is horizontal roughing filter according to design:	Yes/No

Remarks on Horizontal Roughing filter – Briefly discuss any major defects observed

### B.3 Collection Tank

Type of Collection Tank:	Stone masonry / RCC / Others (specify)
Volume:	.....m <sup>3</sup>
Size:	L _____ m x B _____ m x H _____ m
Barbed wire fencing:	Yes/Not
Fencing type: Wooden Post/metal post/concrete post	

If the reservoir site is on the hill side, for safeguard retaining structure is needed.

Retaining structure: Yes/No

Washout (included and working):	Yes/No
Overflow (included and working):	Yes/No
Pump clearance: .....m from the base of the tank.	
Dry running protection: .....m from the base of the tank.	
Collection tank cover protects run off from slopping ground/flooding: Yes/No	
Any leakage observed:	Yes/No
Any cracks observed:	Yes/No
Is the installation of collection tank according to design:	Yes/No
Remarks on Collection tank – Briefly discuss any minor/ major defects observed:	
<b>B.4 Distribution tank</b>	
Type:	Stone masonry / RCC / Others (specify)
Volume:	.....m <sup>3</sup>
Size:	L _____ m x B _____ m x H _____ m
Days of autonomy:	..... day
Barbed wire fencing:	Yes/No
Fencing Post:	Wooden Post/metal post/concrete post
If the reservoir site is on the hill side, for safeguard retaining structure is needed.	
Retaining structure:	Yes/No
Washout (included and working):	Yes/No
Overflow (included and working):	Yes/No
Any leakage observed:	Yes/No
Any cracks observed:	Yes/No
Flow meter at inlet of Distribution tank:	Yes/No
Flow-meter reading:	.....m <sup>3</sup>
Is the distribution tank installation according to design:	Yes/No
Remarks on Distribution tank – Briefly discuss any minor/major defects observed	

<b>B.5 Tap Stand Post</b>	
Type:	Stone masonry/ Brick Masonry/Others (specify)
Platform:	Yes/No
Number of Taps:	.....
Minimum flow from the tap:	.....lps.
Residual head at the tap stand post:	.....m.
Height of the stand post from the platform:	.....m.
Is tap stand according to design (number, material and construction):	Yes/No
Remarks on Tap Stand Post – Briefly discuss any minor/major defects observed	
<b>B.6 Water Collection Ditch</b>	
Type:	Stone masonry/ Brick Masonry/Others (specify)
Dimension:	.....m x.....m.
Drain Pipe is connected from tap stand and the ditch:	Yes/No.
Any leakage observed:	Yes/No
Any cracks observed:	Yes/No
Remarks on Water Collection Ditch – Briefly discuss any minor/major defects observed	
<b>B.7 Barbed wire Fencing</b>	
Fence post:	Angular Iron/ Wooden Post/Concrete Pillar Others (specify)
Fencing height:	.....m (at least 1.4m high).
Fencing is done at	
Intake:	Yes/No
Horizontal Roughing Filter:	Yes/No
Collection/Ground Reservoir Tank:	Yes/No
Solar Array:	Yes/No
Distribution tank:	Yes/No
Is Fencing installed according to design:	Yes/No
Remarks on Barbed wire Fencing: Briefly discuss any minor/major defects observed	

**B.8 Transmission Pipe****B8.1. Pipe line from Intake to the Horizontal Roughing Filter:**

Length: .....m  
Type: GI/HDPE  
Class/Pressure:.....kg/cm<sup>2</sup>  
Diameter: ..... Mm  
Is pipe dimensions and specification according to design: Yes/No

**B 8.2. Pipe Line Horizontal Roughing Filter to Collection tank:**

Length: .....m  
Type: GI/HDPE  
Class/Pressure: .....kg/cm<sup>2</sup>  
Diameter: ..... Mm  
Is pipe dimensions and specification according to design: Yes/No

**B 8.3. Transmission Pipeline from Collection Tank to Distribution Tank**

Pipe	Length (m)	Diameter (mm)	Head Coverage (m)	Pressure /Class	According to Design (Yes/No)
GI (from collection tank to half section)					
HDPE (from half section to Distribution tank)					

Any leakage observed in Pipe: Yes/No  
Ground clearance maintained: Yes/No (Minimum 45cm should be observed)  
Any leakages in joints: Yes/No  
No of joints: \_\_\_\_\_ Nos  
HDPE conduit buried: Yes/No  
Are the Piping installations according to design: Yes/No

Remarks on Transmission pipes – Briefly discuss any major defects observed

**B.9 Distribution Pipe**

Pipe length from Distribution Tank to Tap stand Post: ..... m

Type: GI/HDPE

Class/Pressure: ..... kg/cm<sup>2</sup>

Diameter ..... Mm

Any leakage observed in Pipe: Yes/No

Any leakages in joints: Yes/No

No of joints: \_\_\_\_\_ Nos

HDPE conduit buried: Yes/No

Is the installation according to design and acceptable: Yes/No

Remarks on Distribution pipes – Briefly discuss any major defects observed

**B.10 Anchor Blocks/Support Pillar**

Any cracks observed in Anchor blocks: Yes/No

Any cracks observed in support piers: Yes/No

Remarks on Anchor blocks/support piers – Briefly discuss any minor/major defects observed

**B.11 Solar Array**

Module Type	Mono/ Poly/Amorphous
Manufacturer's Name:	.....
Peak Power of each module	..... Wp
Total no. of installed solar modules	.....
Total Array Size (i.e. total no. of modules × peak power of each module)	..... Wp
No. of Modules in series	.....
No. of modules in parallel or no. of string	.....
Are above specifications according to design:	Yes/No

Does each module has its serial number and label: Yes/No

**Serial Number of each module:**

Module 1: .....; Module 2: .....; Module 3: .....;  
Module 4: .....; Module 5: .....; Module 6: .....;  
Module 7: .....; Module 8: .....; Module 9: .....;  
Module 10: .....; Module 11: .....; Module 12: .....

Do the above serial number match with the serial number in PIT or RST from RETS: Yes/No

**Information from label (at the back of modules)**

- Open circuit voltage (Voc): ..... V
- Short circuit current (Isc): .....A
- Maximum power point Voltage (Vmpp): ..... V
- Maximum power point Current (Impp): ..... A
- Maximum Power (Pmpp): ..... W

Technical specification above are in line with design/data sheet: Yes/No

All modules are of same brand and model i.e. have same ratings and from same manufacturer: Yes/No

PV module junction box (at the back of module) are closed, weatherproof and no risk of moisture, dust, insects to enter inside: Yes/No

PV Array is free from shadows due to trees, any nearby shading objects: Yes/No

All PV modules are free from visual defects (cracks, broken cell, bubbles or delamination, loss of mechanical integrity): Yes/No

Extension cables at each positive and negative end of the string are done using connectors (type Multi-contact or equivalent) compatible with PV modules: Yes/No

Type of Connectors used: .....	
Cablings in PV array are tied properly: neither hanging or in tension:	Yes/No
Modules installed have Random Sampling Test (RST) Certificates from RETS:	Yes/No
Remarks on Solar Array – – Briefly discuss any major defects observed	
<b>B.12 Mounting Structure and Foundation</b>	
Type	Stainless steel/Aluminum/Galvanized iron/others
Thickness of mounting structure	.....mm
Tilt angle of the support structure	.....°(Degree)
Any corrosion in the mounting structure:	Yes/No
All modules are properly fixed to the mounting structure:	Yes/No
Foundation Type:	Rammed/Concrete/Drilled/others
Foundations of the PV Array: Sizes: .....(m) x .....(m) and Height: .....(m)	
Cracks on the concrete slab: Yes/No	
Mounting structure and Foundation are according to design:	Yes/No
Remarks on Mounting Structure – – Briefly discuss any major defects observed	
<b>B.13 Combiner Box or Switch Box</b>	
Does the Project have Combiner Box: Yes/No	
If Yes,	
Combiner box are collecting strings from PV Array:	Yes/No/NA
If more than 2 strings in combiner box, then each string is protected against reverse current by applying string fuse:	
	Yes/No
String Fuse ratings are according to PV module manufacturer recommendations:	Yes/No
String fuse rating: ..... A	



Combiner box includes pump controller:	Yes/No
Combiner box includes surge Protection, i.e. SPDs:	Yes/No
DC isolation switch is provided either in combiner box or in any switchbox between PV Array and Pump:	Yes/No
Combiner box and/or switch box installation are protected from direct rain, Sun and Dust:	Yes/No
All cables in/out from combiner box are sealed properly so that no dust, insects and mice can enter:	Yes/No
Installation of Combiner Box are according to design:	Yes/No
Remarks on DC Combiner Box or DC Switch Box: Briefly discuss any defects observed	
<b>B.14 Controller</b>	
Model No:	.....
Manufacturer:	.....
Any indication in the Controller:	Yes/No (Explain)
Verification of the parameter settings as per project requirement: Yes/No (Explain the controller setting)	
Controller protected against direct sun exposure:	Yes/No
Controller installed in a DC Combiner or Switch box:	Yes/No
Are the controller Setting according to project design requirement (Dry run protection):	Yes/No
Remarks on Controller: - Briefly discuss any defects observed.	

**B.14 Pump and motor**

Type: Submersible/ surface Pump

Pump Centrifugal/Positive displacement/Progressive cavity/ other (mention)  
.....

Pump Type: DC to DC / DC to AC

MPPT charge Controller is embedded within the Pump Motor unit: Yes/No

MPPT charge Controller is outside the Pump Motor unit: Yes/No

Pump Manufacturer Name .....

Pump Model .....

No of Pumps used .....

Pump Clearance from the base of the Collection tank: .....cm (at least 10 cm or according to manufacturer recommendation)

If more than one pump is installed, the pumps are installed parallel: Yes/No

Dry running protection: Yes /No

Is there any Overflow protection mechanism: Yes/No

Submersible Pumps shall be installed with brackets opposed to permanent embedded with concrete with so that it can be removed easily for any operation and maintenance: Yes/No

Brackets, Bolts and nuts used to fix pump inside collection tank are rust-resistant material: Yes/No

Pump Type according to design: Yes/No

Pump installation are acceptable: Yes/No

Remarks on Pump and motor unit – Briefly discuss any defects observed

**B.15 Cable and Connections**

Type of cable used: Copper/Aluminium

Size of Cable: \_\_\_\_\_mm<sup>2</sup>

Cable jointing and connections properly: Yes/No

Distance between the Solar Array and the Pump .....m

Cable certified IEC 60811/NS342-2052

Cable Voltage drop between the Motor –pump and the solar PV array is: .....% (less than 3 %).

All Cables used are waterproof and UV resistant: Yes/No

For underground cable, armored type cable is used:Yes/No

Cable shoe and Cable logs are used appropriately: Yes/No

Cables shall not be hanging or in tension at any part of installation: Yes/No

Remarks on Cables – Briefly discuss any defects observed

**B.16 Switchgear and Protection**

The Electromechanical system include Circuit breaker:Yes/No

Size of MCCB/MCB: \_\_\_\_\_Amps Rated breaking capacity of the breaker: \_\_\_\_\_ Amp

Location of MCB: \_\_\_\_\_

Mention if other protection devices are installed:

Remarks on Switchgear and Protection: Briefly discuss any defects in Switchgear and Protection.

## B.17 Lightning Protection System and Earthing

Please refer to the section **B.17.5 Practical graphs for the LPS verification** (see below) for a better understanding of the LPS design requirements to be verified in B.17

### B.17.1 Air-Termination System

Is PV Array size within the maximum dimensions shown on Figure 1 ? **Yes/No**

If no, please details:

Is PV Array length (defined in Figure <sup>1</sup>) comprised between 4 and 16 meters? **Yes/No**

If yes (see Figure <sup>3</sup>):

Are there at least two air-termination rods? **Yes/No**

Are air-termination rods located less than one meter from PV array edges? **Yes/No**

Are air-termination rods at least one meter above the highest PV Array part? **Yes/No**

Is PV Array length (L) inferior to 4 meters? **Yes/No**

If yes (see Figure 4):

Is there at least one air-termination rod? **Yes/No**

Is air-termination rod located in the middle of the PV array length? **Yes/No**

Is air-termination rod at least two meters above the highest PV Array part? **Yes/No**

Is air-terminal rod in Aluminum with 10mm thickness for the 1-meter top part? **Yes/No**

Installation type: **Concrete base/fixed on mounting structure with insulating support**

Is separation distance kept (see Figure <sup>2</sup>) ? **Yes/No**

If air-termination rod is installed with a concrete base:

Separation distance (s):.....m (shall be >0.4m)

If air-termination rod is fixed on mounting structure:

Separation distance (s):.....m (shall be >0.6m)

Material of insulator holder: .....(shall be glass-fiber reinforced plastic)

The upper extremity of the air-termination system is pointed? **Yes/No**

Is the fence at a minimum distance of 0,6m (1m recommended) from the air-termination rod? **Yes/No**

Remarks on the air-termination system:

### B.17.2 Earth-Termination System

Is Pipe-in-pipe technology being used with earthing electrode being made of copper or hot-dip galvanized steel with outer diameter >48 mm? **Yes/No**

Are there at least two earthing electrodes, placed at a minimum distance of 2.5 m with for each an inspection pit of minimum 320mm x 320mm x 320mm marked with the word "EARTH"? **Yes/No**

The cable connecting the lower extremity of each air-termination rod with the earthing electrode and the cable connecting all earthing electrodes is bare copper cable of minimum 50 mm<sup>2</sup> and is be buried at a minimum depth of 0.5m? **Yes/No**

Are lugs used to connect air-termination rod and earthing electrodes in copper? **Yes/No**

If two different metal are in contact (e.g. Al and Cu) for an electrical connection, has mitigation measure being considered (such as use of bi-metallic washers) **Yes/No**

Earth resistance measurement: ..... Ohms. Is Earth Resistance below 10 Ohms? **Yes/No**  
(see also electrical measurement C.3)

Remarks on the earth-termination system:

### B.17.3 Surge Protection Devices (SPD)



#### Notes:

Controller protection box includes the pump controller (and inverter if AC pump) and all necessary protection devices. It is located under the PV array  
Pump protection box includes a mini-circuit breaker and is located in the vicinity of the pump  
D is the distance between the two protection boxes

All SPD shall be of type 2

SPD 2 required only if D>10 meters

SPD 1 shall be suitable for DC and specific for PV application and compatible with PV array characteristics

SPD 2 and 3 shall be suitable for AC in case of use of AC pump (and inverter is included in the controller protection box)

Presence of SPD1? **Yes/No**

Manufacturer Name: ..... Rating:..... Model: .....

Presence of SPD3? **Yes/No**

Manufacturer Name: ..... Rating:..... Model: .....

Presence of SPD2? **Yes/No** only if Distance D>10m. Distance D: ..... m

Manufacturer Name: ..... Rating:..... Model: .....

SPD are type 2 with visual status indication and discharge capacity  $I_{total}$  of 40 kA (8/20  $\mu$ s)? **Yes/No**

SPD are rated for DC application (PV) with voltage range compatible with specific PV array? **Yes/No**

DC voltage range of SPD:..... (readable on device)

PV array voltage range :.....

SPD short circuit rating shall be >2.5 kA? **Yes/No**

Remarks on SPD:

#### **B.17.4 Earthing**

All electrical equipment and metallic structure of the PV Array are connected to the earth-termination system? **Yes/No**

Each sub-PV array has its own equipotential bonding connected to earth-termination system with bare copper conductors with minimum cross section of 16 mm<sup>2</sup>? **Yes/No**

Metallic part of the PV mounting structure is connected to the equipotential bonding with bare copper conductors with minimum cross section of 6 mm<sup>2</sup>? **Yes/No**

A bare copper conductor of 50 mm<sup>2</sup> cross section is installed (buried in the cable trench) between the earth-termination system up to the pump protection box located in the vicinity of the pump? **Yes/No**

Remarks on Earthing:

## B.17.5 Practical graphs for the LPS verification

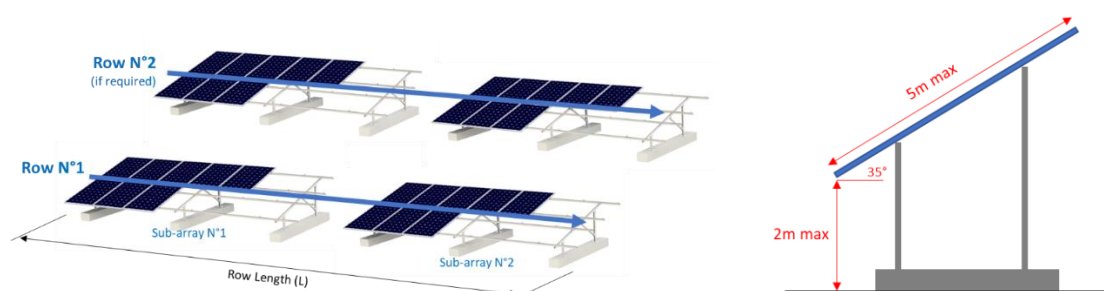


Figure 1: PV Array layout definition (left) and Maximum size of the PV Array (right)

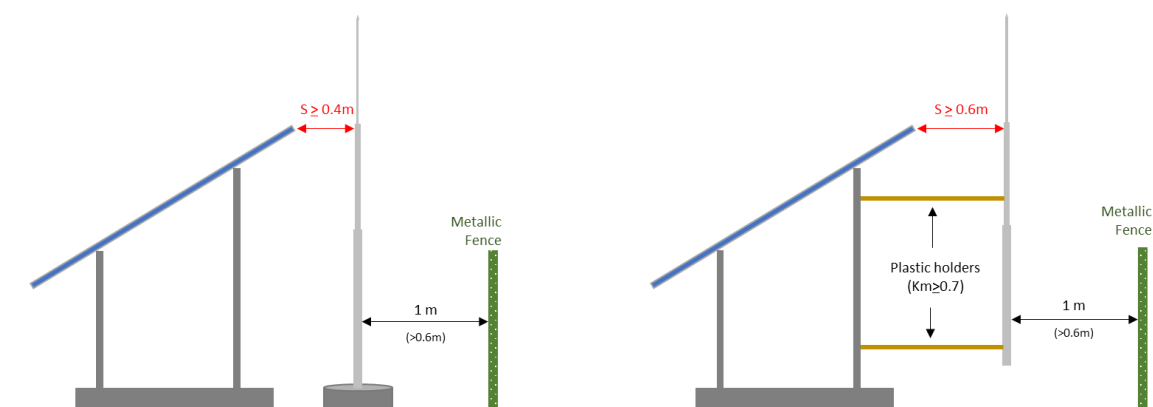


Figure 2: Minimum separation distance according to air terminal rod installation type

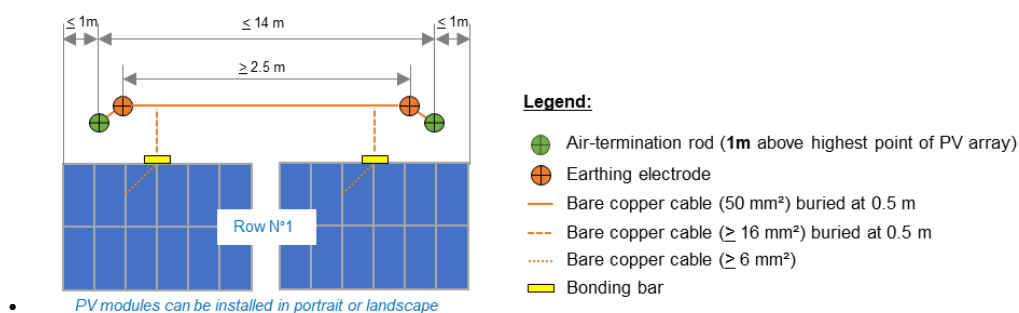


Figure 3: LPS design for PV array length comprised between 4m and 16 m ( $4\text{m} < L \leq 16\text{m}$ )

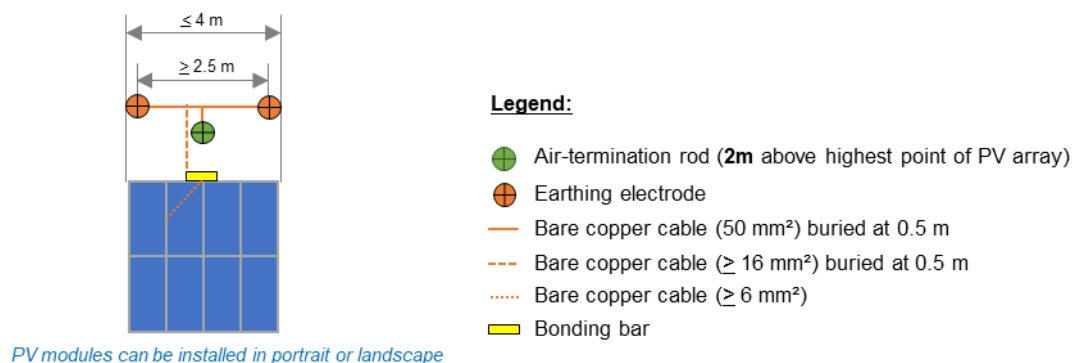


Figure 4: LPS design for PV array row length below 4m ( $L \leq 4\text{m}$ )

## C. Electrical Measurements

### C.1 Continuity of Protecting Earthing

Continuity of earthing cable, wherever used are measured and continuity is verified:

From PV Array/Mounting Structure to Ground: Yes/No

DC Combiner box: Yes/No

Switch Box (just before pump): Yes/No

Pump and Controller (if surface installed): Yes/No

Any other locations where protective earthing been installed (list below):

.....

.....

Remarks on Continuity of Protective Earthing: Briefly discuss any defects.

### C.2 Polarity Check

The polarity checks at following points shall be checked, as minimum to verify the correct polarity of electrical connections:

Between PV Modules in a string: Yes/No

Strings in DC Combiner box: Yes/No

Switch Box (just before pump): Yes/No

Pump and Controller (if surface installed): Yes/No

Uniform cable color shall be used for same polarity throughout the entire system: Yes/No

Remarks on Polarity Check: Briefly discuss any defects.



### C.3 Grounding and Earth Resistance Measurement

Panel to Earth resistance shall be measured and the value shall be less than 10 ohms

Panel to Earth resistance:..... ohm

Is the Earth Resistance value less than 10 ohm: Yes/No  
Measured value: ..... Ohms

Remarks on Measurement of Grounding and Earth Resistance Measurement:

### C.4 PV String Voltage Test

The open circuit voltage (Voc) of each string shall be measured and compared. The measurement shall be done simultaneously on all string under sun shining condition. Measurements during cloud passing shall be avoided:

String 1 open circuit voltage: .....V

String 2 open circuit voltage:.....V

String 3 open circuit voltage: .....V

String 4 open circuit voltage: .....V

Are the string voltages are within +/- 10% range to each-other: Yes/No

If NO, measure the open circuit voltage of each module and compare Voc of each module with the technical data sheet and identify the faulty module, if any: Yes/No

Remarks on Measurement of PV String Voltage Test:

### C.5 PV String Current Test

The Operating current ( $I_{mpp}$ ) of each string shall be measured and compared. The measurement shall be done simultaneously on all string under sun shining condition. Measurements during cloud passing shall be avoided:

In plane instantaneous irradiation: .....W/m<sup>2</sup>(if possible to measure)

String 1 instantaneous current: ..... A

String 2 instantaneous current:..... A

String 3 instantaneous current: ..... A

String 4 instantaneous current: ..... A

Are the string currents are within +/- 10% range to each-other: Yes/No

If NO, measure the short circuit current of each module and compare with the technical data sheet and identify the faulty module, if any: Yes/No

Remarks on Measurement of PV String Current Test:

## **D. System Performance Test**

Once the electrical measurement has been successfully completed, the system performance shall be evaluated to verify whether the complete system is working as per design condition and project requirements. This test shall be performed together with Contractor and witnessed by User Committee and AEPC or Outreach Center or Independent Consultant.

### **D.1 Objective**

The system performance test shall verify the amount of water pumped during the day is according to the design provided by the Contractor. Depending on the testing month, the amount of water volume to be pumped at distribution tank will be corrected by a monthly correction factor (see D.4).

### **D.2 Pre-requisite**

- All electrical measurements mentioned above have been successfully completed;
- AEPC or Outreach Center or Independent Consultant are attending the test.

### **D.3 Test Duration and Test day**

- The test shall be done for one complete day (from sunrise to sunset);
- Test shall be conducted on a clear sunny day, minimum 3 hours of continuous sunshine during the day. In case the test day is not clear, the test shall be postponed to another day.

### **D.4 Monthly Correction Factor**

The monthly correction factor is the ratio of daily average solar irradiation on plane of array to the daily average solar irradiation on plane of array considered as design value. This value is provided by the Employer in section V of bidding form. Such monthly correction factors shall be copied and used here.

**Table 1: Daily Average Irradiation on Plane of Array and Monthly Irradiation Correction Factor**

<b>Month</b>	<b>Expected Irradiation on Plane of Array (kWh/m<sup>2</sup>·day)</b>	<b>Monthly Correction Factor</b>
January	5.73 (exemplary value)	1.4 (exemplary value)
February		
March		
April		
May		
June		
July	4.09 (exemplary value)	1.0 (exemplary value)
August		
September		
October		
November		
December		

#### **D.5 Parameters To be Measured**

The following parameters shall be measured and recorded on every 30 minutes' basis during the entire measurement period:

- Time
- Flow meter reading at distribution tank, i.e. Water Collected at Distribution tank (Litre)

## D.6 Calculation and Methodology

The system performance test shall be evaluated with following procedures;

- STEP 1: The initial reading, at sunshine of flowmeter installed at distribution tank shall be recorded (let's say reading of flowmeter at sunshine during test day is V1);
- STEP 2: record the reading of flowmeter at distribution tank every 30 minutes and fill the value in template provided in Table 2;
- STEP 3: record the value of flowmeter installed at distribution tank as final reading (at sunset) of the day (let's say this reading as V2)
- STEP 4: Calculate the total actual volume of water pumped (V) during the test day by subtracting the initial reading of test day by the final reading of the test day i.e.  $V_{\text{actual}} = V_2 - V_1$
- STEP 5: Calculate the expected volume of water to be pumped during the test day considering the equation below
  - $V_{\text{expected}} = V_{\text{design}} * \text{Monthly Factor} * 0.85$ 
    - Where,  $V_{\text{design}}$  = designed daily discharge/volume
    - Monthly Factor = Monthly factor from Table 1. Depending on the month during which the system performance test is done, the relevant factor shall be considered. For examples, monthly factor is 1.4 if the test is done in January month, monthly factor is 1.0 if the test is done in July etc.
    - 0.85 = Safety Factor which includes the uncertainty during measurement.
- STEP 6: Compare  $V_{\text{actual}}$  Vs  $V_{\text{expected}}$  for the test day.
- STEP 7: To consider the successful execution of System Performance Test: Total actual volume of water pumped (V) during the test day ( $V_{\text{actual}}$ ) shall be  $\geq$  Total Expected volume ( $V_{\text{expected}}$ ) of water to be pumped during the test day ( $V_{\text{expected}}$ ).

**Table 2: Exemplary Template for “System Performance Test”**

<b>S.No.</b>	<b>Time</b>	<b>Flowmeter reading at distribution tank (ltr)</b>
1	6 AM	V1 =
2	6:30 A.M	
3	7:00 A M	
4	7:30 A M	
4	8:00 A.M	
6	8:30 A.M	
7	9:00 A.M	
8	9:30 A.M	
9	10:00 A.M	
10	10:30 A.M	
11	11:00 A.M	
12	11:30 A.M	
13	12:00 Noon	
14	12:30 P.M	
15	1:00 P.M	
16	1:30 P.M	
17	2:00 P.M	
18	2:30 P.M	
19	3:00 P.M	
20	3:30 P.M	
21	4:00 P.M	
22	4:30 P.M	
23	5:00 P.M	
24	5:30 P.M	
25	6:00 P.M (Until Sun set)	V2=

**Table 3: System Performance Test - Evaluation Table**

Parameter	Values
Initial Reading (at sunshine) of Flowmeter at distribution Tank (V1) in liters	
Final reading (at Sunset) of flowmeter at distribution tank (V2) in liters	
Total actual volume of water pumped (Vactual) during the test day in liters	V2-V1 in liters
Designed daily volume of water (Vdesigned) in liters per day	
Monthly Seasonal Factor (from <b>Table 1</b> )	
Safety Factor	0.85
Total Expected volume (Vexpected) of water to be pumped during the test day in liters	

#### **D.7 Requirement**

Total actual volume of water pumped (V) during the test day (Vactual) shall be  $\geq$  Total Expected volume (Vexpected) of water to be pumped during the test day (Vexpected).

If Vactual is lower than Vexpected, the potential reason for not reaching the performance shall be investigated, corrected and test shall be repeated.

## **E. Pictures**

The following pictures (as minimum) shall be included in the Testing and Commissioning Form:

- PV Array;
- PV modules (at least 2 pictures of label);
- Mounting structures;
- Fencing;
- PV junction box;
- Controller;
- Intake and roughing filter;
- Transmission pipelines and thrust blocks;
- Collection tank;
- Distribution tank and tap posts;
- Distribution pipelines;
- Lightning Protection System;
- Pump and Pump mounting.



## F. Water Quality

### F1. Mitigation measures

Are DFS design recommendations regarding water quality being implemented?**Yes/No**

If yes, please details:

*Example: additional sand filtration in collection or distribution tank; chlorination or any other, water handling, hygiene training to the users*

If No, explain reasons:

Has the hygiene and sanitation training taken place?**Yes/No**

Date of training: .....

Remarks:

Are stickers on Do/Don'ts being distributed and signs installed at tap stands?**Yes/No**

Remarks:

### F2. Second Water Quality Test (by accredited laboratory)

Has the second water quality test been carried out after PVPS installation? **Yes/No**  
Date of water sampling:.....

Is the report on the water quality test results issued by the accredited laboratory available and attached to this Testing and Commissioning Report? **Yes/No**

Are there any major differences between results conducted at DFS and results from the second water quality test been carried out after PVPS installation? **Yes/No**

If yes, please details and propose mitigation measures when necessary:

## G. RSDWP Installation completion certification and remarks

### 1. Installation fully accepted, with 2 year warranty

\_\_\_\_\_  
Signature of AEPC  
Representative

Name:-

Date:

\_\_\_\_\_  
Signature of Community  
Representative

Name:

Date:

\_\_\_\_\_  
Signature of Contractor

Name:

Date:

### 2. Installation conditionally accepted provided all defects are of non-critical type and that they would be corrected within defects correction period of one months. (" Non critical")

\_\_\_\_\_  
Signature of AEPC  
Representative

Name:

Date:

\_\_\_\_\_  
Signature of Community  
Representative

Name:

Date:

\_\_\_\_\_  
Signature of Contractor

Name:

Date:

### 3. Installation not accepted as one or more of the defects are of critical type. (“NOT accepted - critical”)

\_\_\_\_\_  
Signature of AEPC  
Representative

Name:

Date:

\_\_\_\_\_  
Signature of Community  
Representative

Name:

Date:

\_\_\_\_\_  
Signature of Contractor

Name:

Date:

Witness 1:

Witness 2:

Witness 3: