

## REQUEST FOR PROPOSALS

### **Provide turnkey services for the design, supply, installation, testing, and commissioning to integrate the solar PV Gangri Lift Irrigation System with the local electricity grid in Paro dzongkhag, Bhutan**

#### **Background**

The International Centre for Integrated Mountain Development (ICIMOD) is a regional intergovernmental learning and knowledge-sharing centre headquartered in Kathmandu, Nepal. It serves eight member countries in the Hindu Kush Himalaya (HKH) – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan.

#### **About the request for proposals**

ICIMOD is soliciting bids from reputable and qualified firms for the supply and installation of a grid-connected solar photovoltaic (PV) pumping system, which would include the expansion of an existing solar array, installing an additional pump, and training local operators in the proper use of the system in Gangri Village, Shabagewog, Paro dzongkhag, Bhutan.

#### **Bidding process**

##### **Submission Guidelines**

1. Interested suppliers may submit their bid proposals via email to [consultancy.int@icimod.org](mailto:consultancy.int@icimod.org) by 5 PM (Nepal Standard Time), 3 October 2024. Two separate files of technical and financial proposals should be submitted.
2. In addition to the proposal documents, the bid should include copies of the following supporting documents:
  - Company registration certificate
  - Tax clearance certificate of the most recent financial year
  - Manufacturer's authorization certificate/letter
  - Schedule and timeline for delivery
  - Guarantee/warranty
  - Bid validity period of at least 3 months from the date of submission
  - Brochures/catalogues of equipment or goods offered
  - Reference of at least one similar project of integrating a solar power system with the grid accomplished by the bidder during the last five years.
3. The bidder shall quote the item rates inclusive of all taxes in a formal quotation with signature and stamp (please refer to the sample in Part VI).
4. The bidder is liable to pay the applicable TDS in accordance with the income tax laws of the Royal Government of Bhutan in the case of local supply.

Bidders are encouraged to visit the site before making the bid. ICIMOD is not liable for the cost of preparation of the bid.

For any queries or clarifications regarding the bidding process, please contact the ICIMOD Programme Finance Unit at [consultancy.int@icimod.org](mailto:consultancy.int@icimod.org) or call +977-5275222 before the submission deadline.

## Terms of Reference

### Objective

The objective of the assignment is to upgrade and modify an existing solar lift irrigation system by (i) integrating a grid-connected inverter; (ii) adding a pump and additional solar array to the system; and (iii) providing training and support to the local community operator to operate and manage the system.

### Scope of Work

The scope of work and main responsibilities of the contractor includes providing turnkey services for the following:

1. **Upgradation and modification of the existing system:** Based on the guiding design provided by ICIMOD, bidders need to submit a design, with supporting documents, for the upgradation and modification of the existing solar water pumping system. The supply and installation shall include the following:
  - a. Grid-connected solar pumping system. The tasks would include:
    - Re-positioning the existing solar array (Figure 5) including the necessary civil works and accessories, to accommodate the new solar array.
    - Re-wiring the solar PV array strings.
    - Installing an additional solar PV array, and a mounting structure.
    - Installing a grid-connected inverter and the required safety equipment.
    - Installing an incoming grid power line from the nearest electricity pole.
    - Installing and commissioning bi-directional meters as required by the Electricity Regulatory Authority/Bhutan Power Corporation Limited.
    - Installing a lighting protection system.
    - Extending the existing fencing to safeguard the PV panels.
  - b. Pumping system
    - Re-configuring the wiring system for existing pumps as per the single line diagram (SLD) provided in Figure 3.
    - Installing a control panel.
    - Installing an additional pump, including the float, as per the design provided in 'Part IV – Pump float design'.

- Installing a GSM-based monitoring system of the grid-connected inverter.
  - Fabricating and installing a pump float.
  - Installing pipes and fittings from the new pump to the pump house.
  - Installing protective equipment.
  - The installation shall include cables, connectors, and other accessories required to make the system functional.
- c. Training the community-based operator
- Providing training to the community-based operator on the proper use and management of the grid-connected system, including safety aspects.
  - Preparing regular maintenance guidelines.
- d. Sustainable operation, maintenance, and management of the system
- The Gangri Water User Community needs to manage a dedicated maintenance account to fund the system's upkeep and repairs. It is estimated that BTN 125,000 is required to maintain essential spare parts and carry out periodic maintenance. This amount should be included in the quotation.
  - Developing and implementing a plan to monitor performance after installation and address any issues promptly
  - Display single-line diagram in the control room, showing the connections and functions of each component, to aid troubleshooting
2. Implementation of safety measures such as surge protection, installing isolation devices, and grid synchronization equipment to ensure the safety of personnel and equipment during integration with the grid.
  3. Coordinating with ICIMOD to review the installation works during the execution of the contract.
  4. Preparing a testing and commissioning form and conducting thorough testing and commissioning of the integrated system to verify its performance, functionality, and compliance with grid standards before full-scale operation. Submit the testing and commissioning form along with 2-day system performance data to ICIMOD for review.
  5. Implementing changes to the system and reporting back based on the feedback provided by ICIMOD after the testing and commissioning form is reviewed.
  6. Once the testing and commissioning form is approved, the contractor is required to develop a detailed operation and maintenance training programme for the local operator nominated by the community. Following ICIMOD's approval of the training content, conduct the training of Gangri community operators.

7. Handover documentation specified in the technical specifications (see ‘Handover documents’ in Part III).
8. Providing a post-installation after-sales service and monitoring plan.

Please refer to Part III for the specifications of the power conditioning unit and other components and accessories.

### **1. Contents of the technical proposal**

Applicants are advised to present their technical proposal in three sections:

#### **1) Technical approach and methodology**

Applicants should submit their proposed design with drawings, design calculations, and supporting technical documents for integrating the existing system with the electricity grid. The proposal should include a single line diagram of the proposed configuration.

#### **2) Work plan.**

The proposal should include a work plan, that includes the project’s duration, interim milestones, and the delivery date, and which aligns with the technical approach and methodology.

#### **3) Relevant experience**

Applicants should provide details of their organization’s relevant experience. The technical proposal will be evaluated based on how well it is in alignment with the terms of reference using the specified evaluation criteria.

### **2. Pre-qualification criteria**

<b>S. No</b>	<b>Criteria</b>	<b>Supporting documents</b>
1	The bidder should be legally registered in their base country	Registration document
2	The bidder should have an average annual turnover of USD 50,000 or more in any three of the last five financial years	Audited financial statement
3	The bidder should have carried out at least one similar project integrating a solar power system with the grid in the last five years	Work order or work completion certificate
4	The bidder should not have been blacklisted or barred or have any such cases of blacklisting/debarment pending in any court of law	Self-declaration

### **3. Evaluation Criteria**

Bids will be evaluated based on the following criteria:

1. Only technically qualified proposals will be deemed eligible for financial opening.

2. The contract will be awarded to the technically qualified lowest bidder.

#### 4. Timelines for deliverables

<b>Deliverable</b>	<b>Due date</b>	<b>Payment schedule</b>
Upon signing the contract	Date of signing	20%
Delivery of materials at the site	21 days after signing the contract	60%
Installation, testing, and commissioning the systems; acceptance of test reports; training the local operator in O&M; submission and acceptance of the operational plan; post-installation performance monitoring plan	35 days after signing the contract	20%

#### **PART I: Description of the existing system**

**The coordinates and location of the project site are given in the table below.**

Site coordinates	27.367851°N, 89.456444° E
Location	Gangri Village, Shaba Gewog, Paro dzongkhag, Bhutan

**Relevant details of the existing solar PV pumping system are provided below.**

Solar PV capacity	16.08 kWp
Discharge	300,000 litres/day
Reservoir tank	150,000 litres
Dynamic head	72.84 metres
Pipe length	739 metres
Pipe diameter	250 mm
Pump capacity	15 HP
Area	30 acres
Number of beneficiaries	38
Annual estimated energy generation	25,920 units

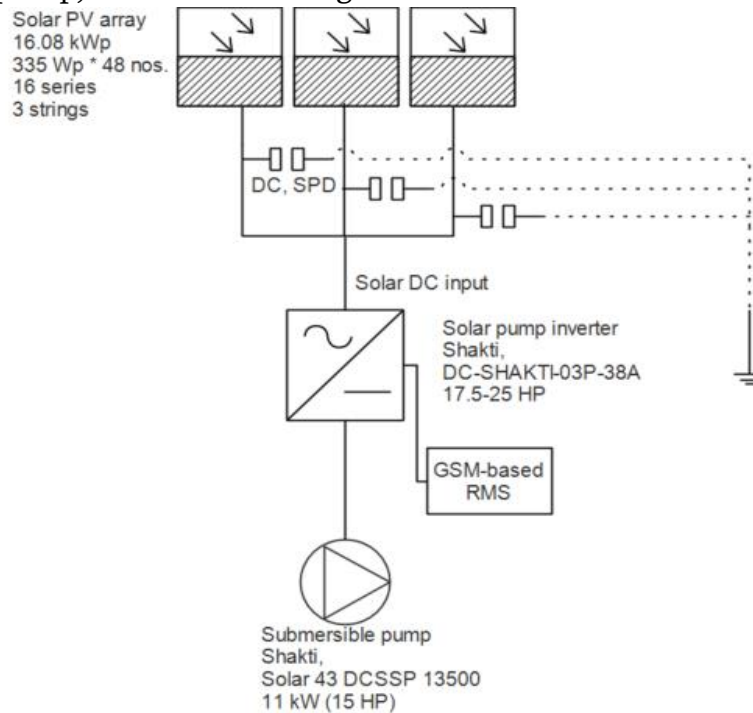
The additional pump should be installed in a protected pond by the riverside (see Figure 4), same as the present pump.

The desired water output of the solar lift irrigation system should be within the ranges respective to the vertical heads given in the table below.

Vertical head (m)	Minimum water output (lpm)	Average daily discharge (m <sup>3</sup> /day)
70	At least 600	155*

\*4.4 peak sun hours

The architecture of the existing system, in which solar power is the only source of energy for the pump, is shown in the figure 1 below.



**Figure 1: Architecture of existing system**

### Existing solar array

The existing solar array is 16.08 kWp. The specifications of the existing solar panel are given below.

Panel manufacturer and model	Shakti Eco 335
Rated Wp	335 Wp
Module type	Polycrystalline
Vmp	38.07 V
Voc	46.22 V
Imp	8.80 A
Isc	9.26 A
Max. system voltage	1,000 V
Efficiency	17.25%

The following is the configuration of the existing solar array:

No. of panels in series	16
No. of strings	3
Array Vmp (STC)	609.12 V
Array Voc (STC)	739.52 V
Array Vmp (after temperature loss)	543.03 V
Array Voc (after temperature loss)	659.28 V

### Existing pump

An 11 kW (15 HP) DC submersible pump has been installed. The specifications of the existing pump are:

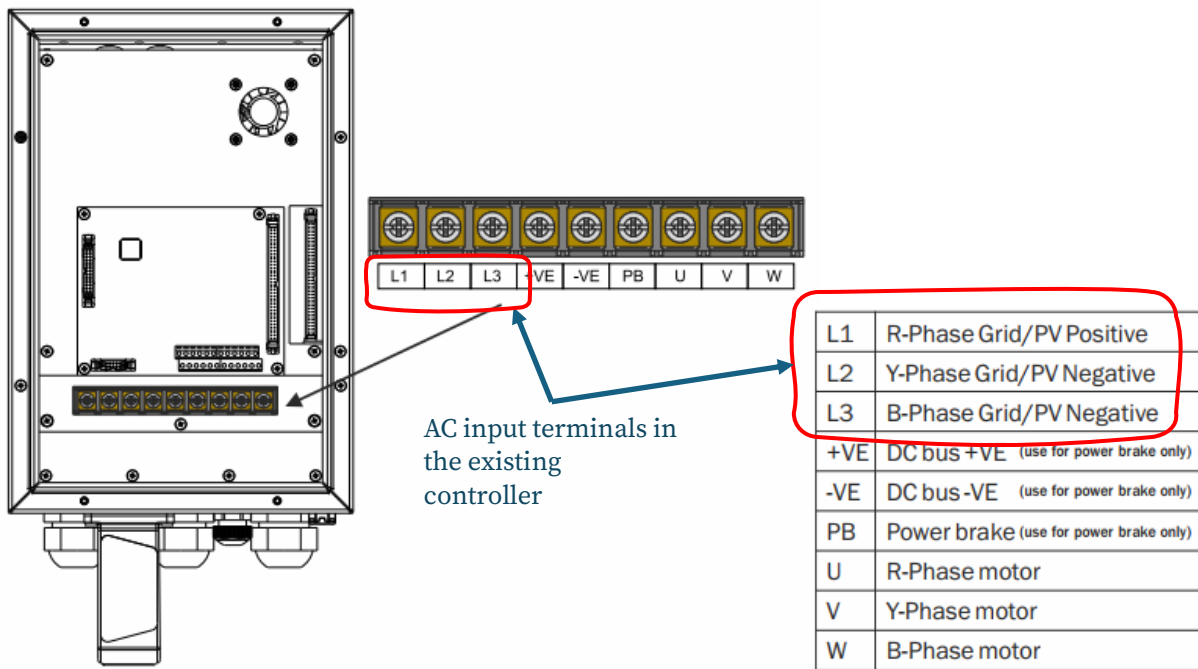
Desired daily discharge	720 LPM
Total dynamic head	70 m
Input power	13,500 W
Pump manufacturer and model	Shakti, Solar 43 DCSSP 13500
Pump rated capacity	11 kW
Pump type	Submersible, DC
Pump outlet diameter	75 mm (2.5 inches)

### Controller

The specifications of the existing solar controller are given below.

Manufacturer and model	Shakti Solar Cont. DC-SHAKTI-03P-38 A
Rated capacity	17.5–25 HP
Input voltage	Max. 780 V
Minimum voltage	250 V
Current	38 A

The controller has both DC and AC inputs (Figure 2). In the current configuration, only the DC input (solar) has been connected.



**Figure 2: Three-phase grid input terminals in the existing controller**

**PART II: Description of the new grid-connected solar lift irrigation system with two pumps, including the piping, float, and safety components**

The existing solar lift irrigation system is to be upgraded with the following additions:

- (i) Grid-connected: When the pump is not in operation, the solar power produced shall be exported to the grid.
- (ii) Additional pump: An additional pump shall be added to double the current water pumping capacity.

The existing solar array, pump, and controller need to be upgraded by adding a pump of identical capacity. The use of the existing DC pump is possible due to the 3-phase AC input option available in the controller.

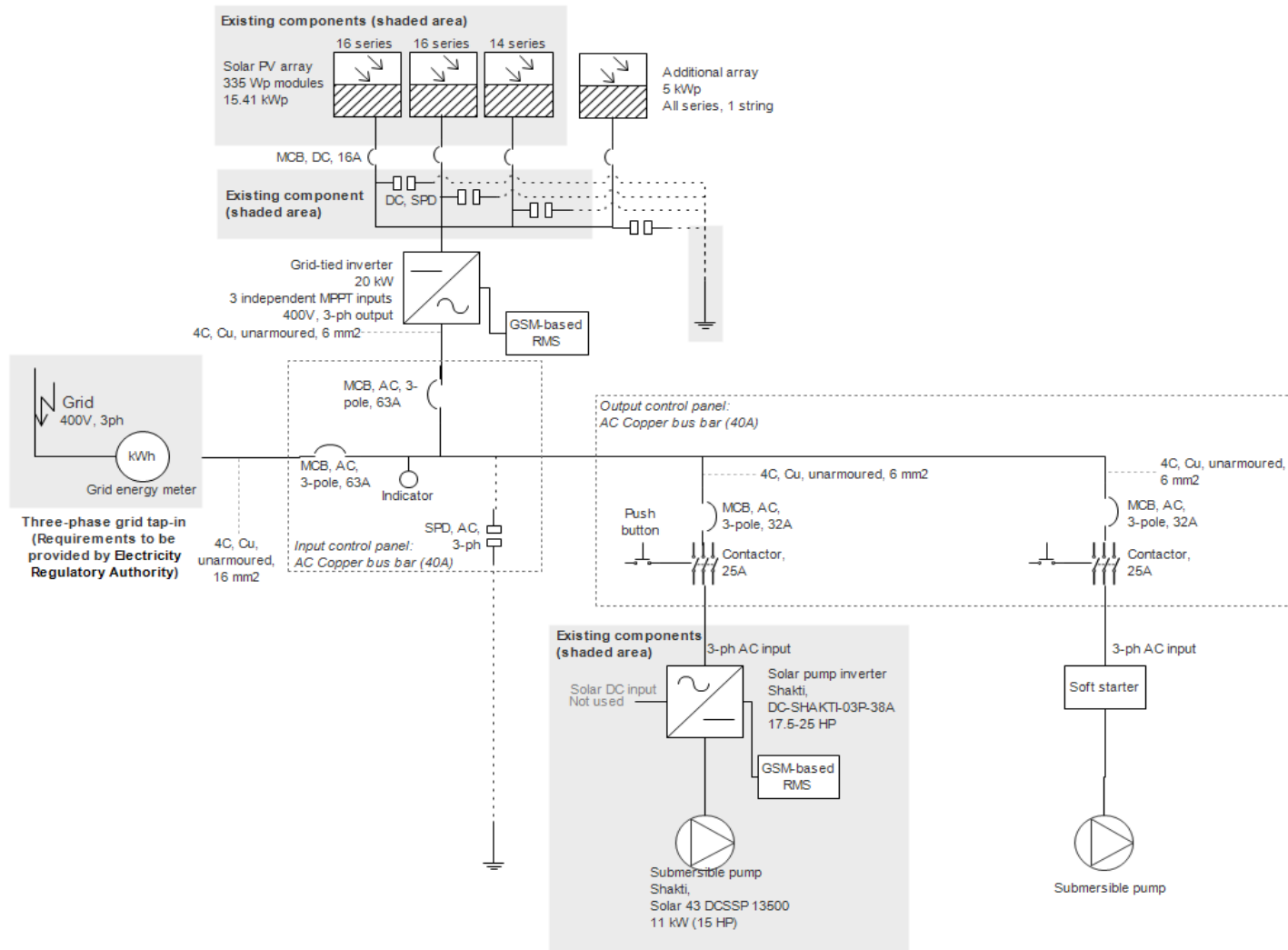
The coordinates of the key locations are given in the table below.

Intake	27.368660°N, 89.456756°E
Solar array installation	27.366944°N, 89.456977°E

**Single line diagram**

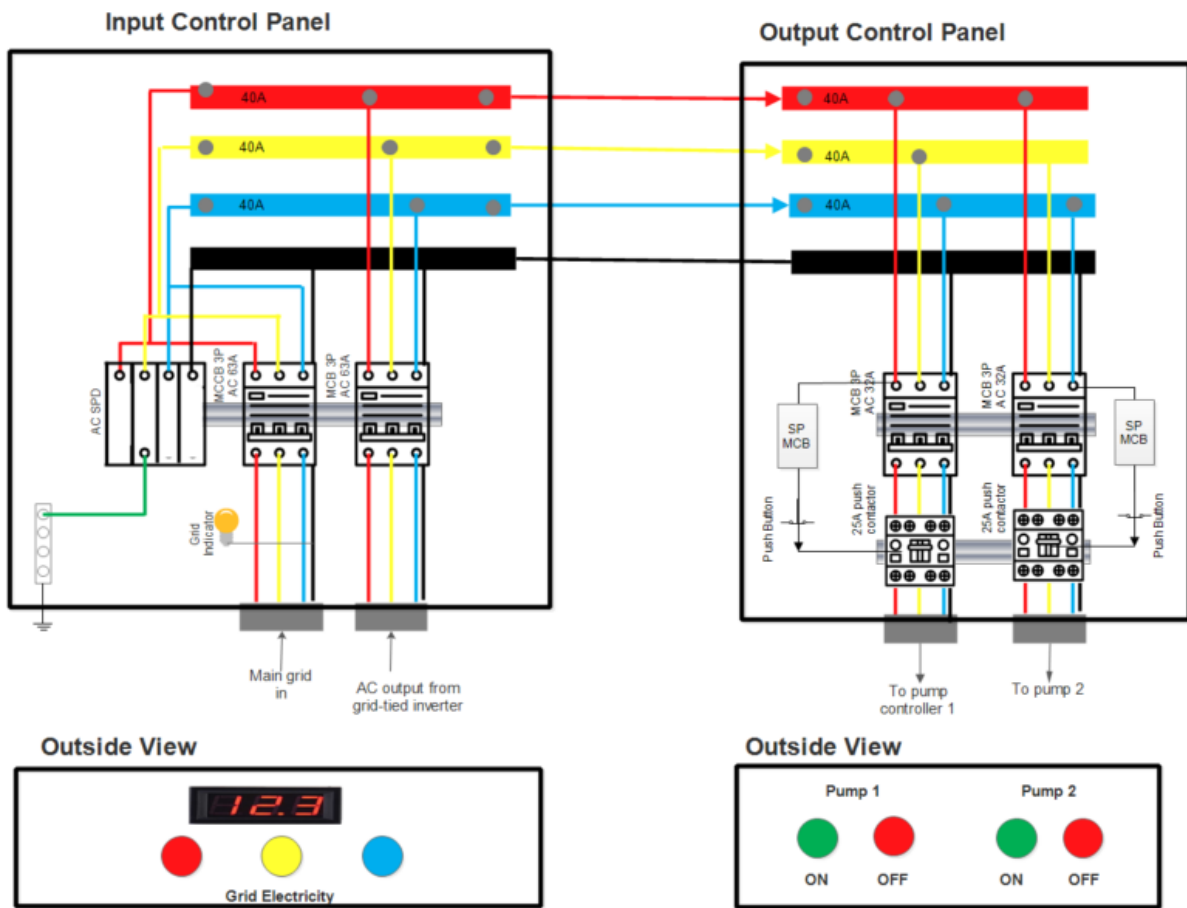
The general single line diagram for the new configuration of the grid-connected solar lift irrigation system is shown in Figure 3.





**Figure 3: Single line diagram for the new configuration of the grid-connected solar lift irrigation system**

Note: The existing system is shaded.



**Figure 4: Input and output control panels**

### Part III: Technical specifications

#### Solar panels

S. No	Specifications required	Details with compliance (fill in the .....)	Reference document provided (Yes/No)
1	Manufacturer	.....	
2	Model	.....	
3	Certifications: ISO9001, ISO 14001  IEC 61215:2005 2nd edition or IEC 61215-1:2016 and IEC 61215-2:2016 for terrestrial PV modules - Design qualification and type approval – Part 1: Test requirements and Part 2: Test procedures. IEC 61730 for PV module safety qualification, IEC 62804 for detection of potential induced degradation (PID) The test certificates must be provided	IEC certifications compliance?  Yes/No: .....	
4	The new cumulative array size should be at least 5 kWp The Vmp of the series connection shall be within the MPPT range of the grid-connected inverter while considering the minimum temperature of Paro dzongkhag at -5°C.	Peak power of individual module: .....Wp  Total new array capacity: .....kWp  Series Vmp at STC: .....  Series Voc at lowest temperature: .....	
5	Product workmanship warranty: ≥10 years  Performance guarantee: 1 <sup>st</sup> year: ≥ 97% of STC power	Number of years of product workmanship warranty: ..... years  Performance guarantee:	

	10 years: $\geq 90\%$ of STC Power 25 years: $\geq 80\%$ of STC Power  Linear warranty $\leq 0.8\%$ per year from year 2 and onwards	1 <sup>st</sup> year: .....% of STC power 10 years: .....% of STC power 25 years: .....% of STC power Linear warranty .....% per year from year 2 and onwards	
6	All the PV modules offered for the project must be of the same type, model, and power rating, and from the same manufacturer	Are all PV modules of the same type, model, rating, and manufacturer? (Yes/No)  .....	
7	The bidder must submit the technical datasheet of the individual solar module	Datasheet provided? (Yes/No)  .....	
8	The bidder must submit a single line diagram (SLD) of the string connection to the inverter	Single line diagram (SLD) of string connection to the inverter provided? (Yes/No)  .....	
10	Warranty certificates		
11	Authorization from the manufacturer (see Part III for the format)		

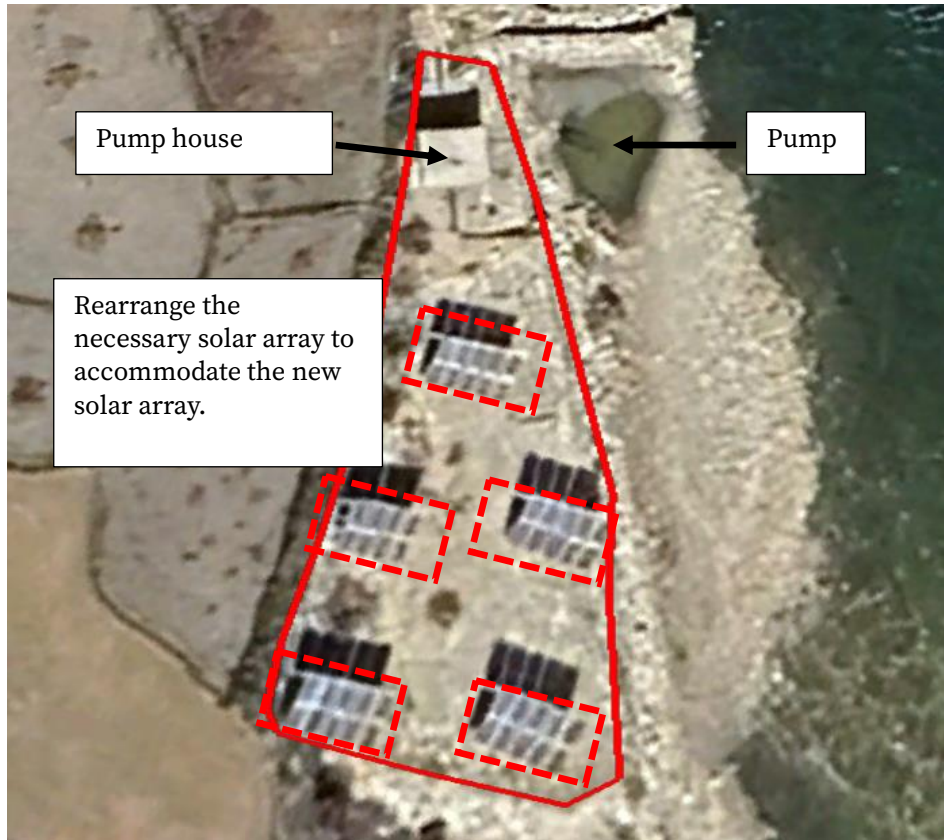
### Support structure for the solar array

S. No	Specifications required	Details with compliance (Fill in the .....)	Reference document provided (Yes/No)
1	Tilt angle and orientation: Optimum angle at the given location, oriented towards the south	Compliance (Yes/No):  .....	
2	Mounting structure design and foundation or fixation mounting arrangements shall consider all static and dynamic loads suitable for the site	Compliance (Yes/No):  .....	
3	The solar PV module structure must be made of MS hot-dip galvanized with suitable sections of rectangular tubes, angles, and channels. A mono-pole structure is preferable	Compliance with MS hot dip galvanized (Yes/No): .....  Type of solar structure: .....	

4	Galvanized bolts, nuts, fasteners, washers, and mounting clamps should be used for fixing the structure, compatible with the materials on which it is being fixed. In the case of welding structures, the galvanization should be done after the fabrication work	Compliance (Yes/No): .....	
5	The bidder must submit the drawing of the solar structure	Drawing of the solar structure submitted? (Yes/No): .....	

**Rearrangement of existing solar arrays to fit the new array**

<b>S. No</b>	<b>Specifications required</b>	<b>Details with compliance (fill in the .....)</b>	<b>Reference document provided (Yes/No)</b>
1	Rearrange the existing solar array (see Figure 5) to optimise its footprint to free up land for additional installation The existing solar array is constructed in an area of approximately 536 m <sup>2</sup> (33 m in length and 16.2 m in width at the longest and widest points)	Compliance (Yes/No): .....	



**Figure 5: Existing solar arrays**

**Pump**

<b>S. No</b>	<b>Specifications required</b>	<b>Details with compliance (Fill in the .....)</b>	<b>Reference document provided (Yes/No)</b>
1	Manufacturer	.....	
2	Model	.....	
3	Submersible pump	Confirm submersible pump (Yes/No): .....	
4	AC, 3-phase, 400V pump	Confirm submersible pump is AC, three phase (Yes/No): ..... Rated voltage of pump: .....	
5	The manufacturer pump curves verifying the water output at desired vertical heads (as given in the 'Description of existing system' section) must be provided	Water output at 70m head: .....m <sup>3</sup> /h Pump rated power: .....kW	

	<b>Vertical head (m)</b>	<b>Minimum water output (lpm)</b>	<b>Input pump power (kW) – for reference only</b>		
	70	At least 600	11		
	50	At least 850	11		
	25	At least 950	11		
	(The existing pump is 11 kW/15HP)				
6	The pump's body and impellers must be made of stainless steel		Confirm stainless steel (Yes/No): .....		
7	The dimensions of the pump must be given in the datasheet. (The pump's outlet size can vary but it is to be connected to the existing 125-mm inlet in the pump house)		Pump outlet size: .....mm Pump body maximum diameter: .....mm Pump length: .....m		
8	Warranty of at least two years		Warranty years: .....years		
9	Certifications: ISO9001, ISO 14001		Compliance (Yes/No): .....		
10	The bidder must submit the technical datasheet of the pump		Datasheet provided? (Yes/No) .....		

### **Pump float and pipe**

<b>S. No</b>	<b>Specifications required</b>	<b>Details with compliance (Fill in the .....</b>	<b>Reference document provided (Yes/No)</b>

1	Fabrication of a pump float for mounting the pump (see Part II – Pump float design)	Compliance (Yes/No): .....	
2	HDPE pipe, PN 8 standard and required fittings to be connected from the pump to the pump house	Compliance (Yes/No): .....	

### Soft starter of the AC pump

S. No	Specifications required	Details with compliance (Fill in the .....)	Reference document provided (Yes/No)
1	Manufacturer	.....	
2	Model	.....	
3	The rated operational power must match the rated power of the pump	Rated operational power: .....kW	
4	The input AC voltage must match the grid voltage (400 V, 3-phase)	Accepted input voltage range: .....V to .....V	
5	The input AC voltage must match the pump's voltage	Accepted output voltage range: ..... V to ..... V	
6	The rated operational current must match the pump's rated current	Operational current: ..... A	
7	The soft starter must be housed in a box	Box for soft starter provided (Yes/No): .....	
8	At least 2-year warranty	Warranty period: ..... years	
9	The bidder must submit the technical datasheet of the pump	Datasheet provided? (Yes/No) .....	

### Grid-tied inverter

S. No	Specifications required	Details with compliance (Fill in the .....)	Reference document provided (Yes/No)
1	Manufacturer	.....	
2	Model	.....	



3	The manufacturer has at least 5 years' experience in manufacturing inverters	Confirm that the manufacturer has at least 5 years' experience in manufacturing inverters (Yes/No): .....	
4	Inverter type: 3-phase, grid-connected	That the inverter is 3-phase, grid-connected (Yes/No): .....	
5	The rated output power of the grid-connected inverter shall be at least 20 kW @25° C	Grid-tied inverter rating: ..... kW	
6	The inverter must have 3 independent MPPT inputs	No. of independent MPPT inputs: .....	
7	The output voltage range and frequency shall accept a 400 V, 50 Hz grid connection	Output voltage range: ..... V to .....V Frequency range: ..... Hz to ..... Hz	
8	Output waveform: Pure sine wave	Confirm that the inverter output waveform is pure sine wave: (Yes/No): .....	
9	Must be MPPT controller  MPPT range must at least accept 300 V-800 V	MPPT controller (Yes/No) ..... MPPT range ..... V to ..... V	
10	The range of the input DC voltage and current of the inverter must accommodate the Vmp, and Imp current from the current configuration of the solar array (Vmp of the solar array: 609.12 V; Imp of the solar array: 26.4 A)	Lowest working voltage: ..... V Maximum DC voltage: ..... V Rated input current: ..... A	
11	At least 97% efficiency	Efficiency: .....%	
12	Power factor: 0.85 lag to 0.95 lead	Power factor: .....lag to .....lead	
13	Protection class: IP65 or above	Protection class: .....	
14	Protections: 1. DC reverse polarity 2. DC side disconnect 3. Grid monitoring 4. AC short circuit	Confirm protection (Yes/No) 1. DC reverse polarity ..... 2. DC side disconnect ..... 3. Grid monitoring .....	

		4. AC short circuit .....	
15	Operating temperature: Minimum range of -20 <sup>0</sup> C to +50 <sup>0</sup> C	Operating temperature: ..... <sup>0</sup> C to ..... <sup>0</sup> C	
16	Communication interface: Modbus, RS232, RS485, or ethernet pack embedded	Communication interface for remote monitoring system available (Yes/No): .....	
17	The kW rating of the inverter must be compatible with the solar array rating of 21 kWp (16.08 kWp existing + 5 kWp new array)	Confirm the inverter is compatible with the solar array rating of 21kWp (Yes/No): .....	
18	International certifications: IEC 61727 for utility interface IEC 62116 for islanding IEC 62109 for safety IEC 61683 for efficiency	Confirm international certifications (Yes/No) IEC 61727 for utility interface ..... IEC 62116 for islanding ..... IEC 62109 for safety ..... IEC 61683 for efficiency .....	
19	At least 5-year warranty	Warranty years: ..... years	
20	The bidder must submit the technical datasheet of the controller	Datasheet provided? (Yes/No) .....	

### Remote monitoring system (RMS) of the grid-connected inverter

S. No	Specifications required	Details with compliance (Fill in the .....	Reference document provided (Yes/No)
1	Manufacturer	.....	
2	Model	.....	
3	Online (remote) real-time monitoring of the grid-connected inverter to be ensured and viewed via the following mediums:	Does the RMS provide real-time data via the following mediums? (Yes/No) 1. Remote computer/mobile via	

	<ol style="list-style-type: none"> <li>1. Remote computer/mobile via online portal or mobile app (Internet connection of the RMS via a GSM modem, CDMA, GPRS, 3G, 4G, etc.)</li> <li>2. Automatic storage of data in the SD card, when remote communication fails, using a GSM-based mechanism</li> </ol> <p>The site does not have ethernet or Wi-Fi</p>	<p>online portal or mobile app: .....</p> <ol style="list-style-type: none"> <li>2. Automatic storage of data in the SD card when remote communication fails: .....</li> </ol>	
4	<p>Minimum parameters of the RMS:</p> <ol style="list-style-type: none"> <li>1. Solar energy (kWh)</li> <li>2. Output energy (kWh)</li> <li>3. Input and output electrical parameters (input voltage and current, output voltage and current, frequency)</li> </ol>	<p>Confirmation of minimum parameters of the RMS:</p> <ol style="list-style-type: none"> <li>1. Solar energy (kWh) .....</li> <li>2. Output energy (kWh) .....</li> <li>3. Input and output electrical parameters (input voltage and current, output voltage and current, frequency) .....</li> </ol>	
5	The RMS must be compatible with the grid-connected inverter	Compatible with the grid-connected inverter (Yes/No): .....	
6	Powering unit for the RMS either grid-connected inverter or powered externally	RMS power ensured? (Yes/No): .....	
7	The bidder must submit the technical datasheet of the RMS	Datasheet provided? (Yes/No) .....	

### Cables and accessories

S. No	Specifications required	Details with compliance (Fill in the .....	Reference document provided (Yes/No)
1	Panel inter-wiring cable: Minimum 4 sq. mm copper within 3% voltage drop,	Cross-section of panel inter-wiring cable: .....sq. mm	

	unarmoured, PVC-insulated, UV-resistant	Compliance with copper, unarmoured, PVC-insulated, UV-resistant: (Yes/No): .....	
2	The allowable voltage drop from the PV array to the grid-connected inverter is 3% and the inverter to the AC bus bar is 1%  Provide voltage drop calculation sheet	One-way length of cable from the PV array to the controller: .....m, voltage drop: .....%  One-way length of cable from controller to pump: .....m, voltage drop: .....%	
3	Cable from the PV array to the inverter: 1. Copper, unarmoured, PVC-insulated 2. Underground cabling (0.3 m depth) with adequate conduit 3. Any underground cable interconnections must be water-tight and corrosion-resistant	From PV array to the controller: Cross-section of cable: .....sq. mm No. of cores: .....	
4	Cable from the inverter to the AC bus bar: 1. Minimum 6 sq. mm, 4C copper, unarmoured, PVC-insulated, UV-resistant 2. Insulation voltage and ampacity of the cable must be higher than the rated voltage and current that the cable will be connected to 3. No interconnection in the length of the cable run	From inverter to AC bus bar: Cross-section of cable: .....sq. mm  No. of cores: .....	
5	Cable from AC bus bar to pumps: 1. Minimum 6 sq. mm, 4C copper, armoured, PVC-insulated, UV-resistant	From AC bus bar to pumps:  Cross-section of cable: .....sq. mm	

	<p>2. Insulation voltage and ampacity of the cable must be higher than the rated voltage and current that the cable will be connected to</p> <p>3. Underground cabling (0.3 m depth)</p> <p>4. No interconnection in the length of the cable run</p> <p>5. The connection to the pump must be water-resistant using water-proof tape</p>	<p>No. of cores: .....</p> <p>Compliance with copper, unarmoured, PVC-insulated, UV-resistant:</p> <p>(Yes/No): .....</p>	
6	All cables must be properly terminated, using cable lugs, pins, etc. (no naked wire termination)	Compliance (Yes/No): .....	NA
7	Adequate cable conduits must be provided for underground cables	Compliance (Yes/No): .....	
8	Adequate stay wires/anchors must be provided for pump support	Compliance (Yes/No): .....	
9	All accessories to complete the installation and commissioning of the solar water pumping system (tapes, screws, nuts, etc.)	Compliance (Yes/No): .....	NA

### **Input control box (national grid and grid-connected inverter inputs)**

1	<p>Material: Painted steel</p> <p>Finish: TGIC powder coat</p> <p>Must have adequate Ventilation:</p> <p>2 in 1 out (national grid and grid-tied inverter in, pump out)</p>	<p>Confirm construction type (Yes/No):</p> <p>Material: Painted steel .....</p> <p>Finish: TGIC powder coat .....</p> <p>Ventilation .....</p>	
2	<p>Should include the following switching and protection equipment:</p> <p>1. AC, 3-phase, SPD, Type II</p> <p>2. MCCB, 3-phase, 63 A for national grid isolation</p>	<p>Confirm switching and protection equipment (Yes/No):</p> <p>1. AC, 3-phase, SPD, Type II .....</p> <p>2. MCCB, 3-phase, 63 A for national grid isolation .....</p>	

	3. MCB, 3-phase, 63 A for grid-connected inverter isolation 4. CT and PT and zero export device or function with required accessories	3. MCB, 3-phase, 63 A for grid-connected inverter isolation ..... 4. CT and PT for grid-connected inverter zero export function .....	
3	The front cover of the control box shall have an indicator of grid availability (R, Y, B phases), see figure 4	Confirm indicator in the front cover (Yes/No): .....	
4	All cables inside the box must be connected properly and the cable's entry/exit into/from the box must be sealed properly (using cable glands, cable shoes, cable ties, etc.) The box must have a locking provision to prevent unwanted access The box must have a stand for ground anchoring	Protection level: .....  The locking mechanism of the controller box: .....  Compliance with sealing and neat cable routing: (Yes/No): .....  Stand included (Yes/No): .....	
5	All cables inside the control box must be properly labelled and the wiring diagram must be pasted inside the box	Compliance (Yes/No): .....	
6	The bidder must submit the technical datasheet of the SPDs, MCCBs, and MCBs	Datasheets provided? (Yes/No) .....	

**Output control box (output to two pumps)**

1	Material: Painted steel Finish: TGIC powder coat Must have adequate ventilation: 1 in 2 out (input control box in, output to two pumps)	Confirm construction type (Yes/No): Material: Painted steel ..... Finish: TGIC power coat ..... Ventilation .....	
2	The front cover of the control box shall have: 1. An indicator of grid availability (R, Y, B phases)	Confirm indicator in the front cover (Yes/No): 1. An indicator of grid availability (R, Y, B phases) .....	

	2. Two sets of manual push buttons one for each pump (correctly labelled), See figure 4	2. Two sets of manual push buttons .....	
3	The control box shall include the following switching and protection equipment: 1. Two MCBs, 3-phase, 32 A for each pump isolation 2. Two contactors for switching 3-phase submersible pumps – 25 A, actuated by push buttons	Confirm switching and protection equipment (Yes/No): 1. Two MCBs, 3-phase, 32 A for each pump isolation .....	
4	All cables inside the box must be connected properly and the cable entering/exiting the box must be sealed properly (using cable glands, cable shoes, cable ties etc.) The box must have a locking provision to prevent unwanted access, and a stand for anchoring it to the ground	Protection level: .....  The locking mechanism of the controller box: ..... Stand included (Yes/No): .....  Compliance with sealing and neat cable routing: (Yes/No): .....	
5	All cables inside the control box must be properly labelled and the wiring diagram pasted inside the box	Compliance (Yes/No): .....	
6	The bidder must submit the technical datasheet of the SPDs, MCCBs, and MCBs	Datasheets provided? (Yes/No) .....	

### Earthing, lightning, and protection systems

The manufacturer should meet the technical specifications of the safety components listed below.

S. No	Specifications	Details with compliance (Fill in the .....	Reference document provided (Yes/No)
1	Equipment earthing: Equipment bonding shall be used to tie the casings of all equipment and	Compliance (Yes/No): .....	

	enclosures, including all electronic equipment casings (such as control box, inverters), combiner boxes with an earth cable of at least 16 sq. mm and connected via an insulated, stranded copper earth wire of at least 16 sq. mm connected to an earth electrode. The maximum allowable earth resistance between the metallic parts of the devices and the consumer earth terminal is 10 Ohms		
2	For rod earthing: Size of copper rod: 1 rod, at least 2.5 metres long and 25 mm in diameter Down conductor size: 25 mm wide and 3 mm thick copper strip Backfill compound: 2 nos. of 25 kg each	Compliance (Yes/No): .....	
3	Type II surge protection devices (SPDs) must be installed in each DC input of the solar array string	DC surge protection device included?  (Yes/No): .....	
4	The bidder must submit the technical datasheet of the DC SPDs	Datasheets provided? (Yes/No) .....	

### Single line diagram

S. No	Specifications required	Details with compliance (fill in the .....	Reference document provided (Yes/No)
1	The bidder must submit a single line diagram (SLD) of the entire new arrangement specified in this RfP. It shall include the existing system, new solar array, grid-connected inverter, and pump, along with balance of systems (cables, protection, control box etc.) showing necessary details for a fully	Single line diagram (SLD) of the entire system provided? (Yes/No) .....	



	functional system. See figure 3.		
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### Workmanship

S. No	Specifications required	Details with compliance (fill in the .....)	Reference document provided (Yes/No)
1	5 years' warranty on workmanship	Compliance (Yes/No): .....	NA
2	Annual operation and maintenance are to be managed by the water user group	Compliance (Yes/No): .....	NA
3	The bidder shall ensure that all worksites shall be free of debris resulting from the construction activity	Compliance (Yes/No): .....	NA

### Civil works

All the necessary civil works required to complete this assignment, as determined by the site conditions and the proposed system configuration, will be the responsibility of the contractor and are considered included in the quoted rate.

### Handover documents

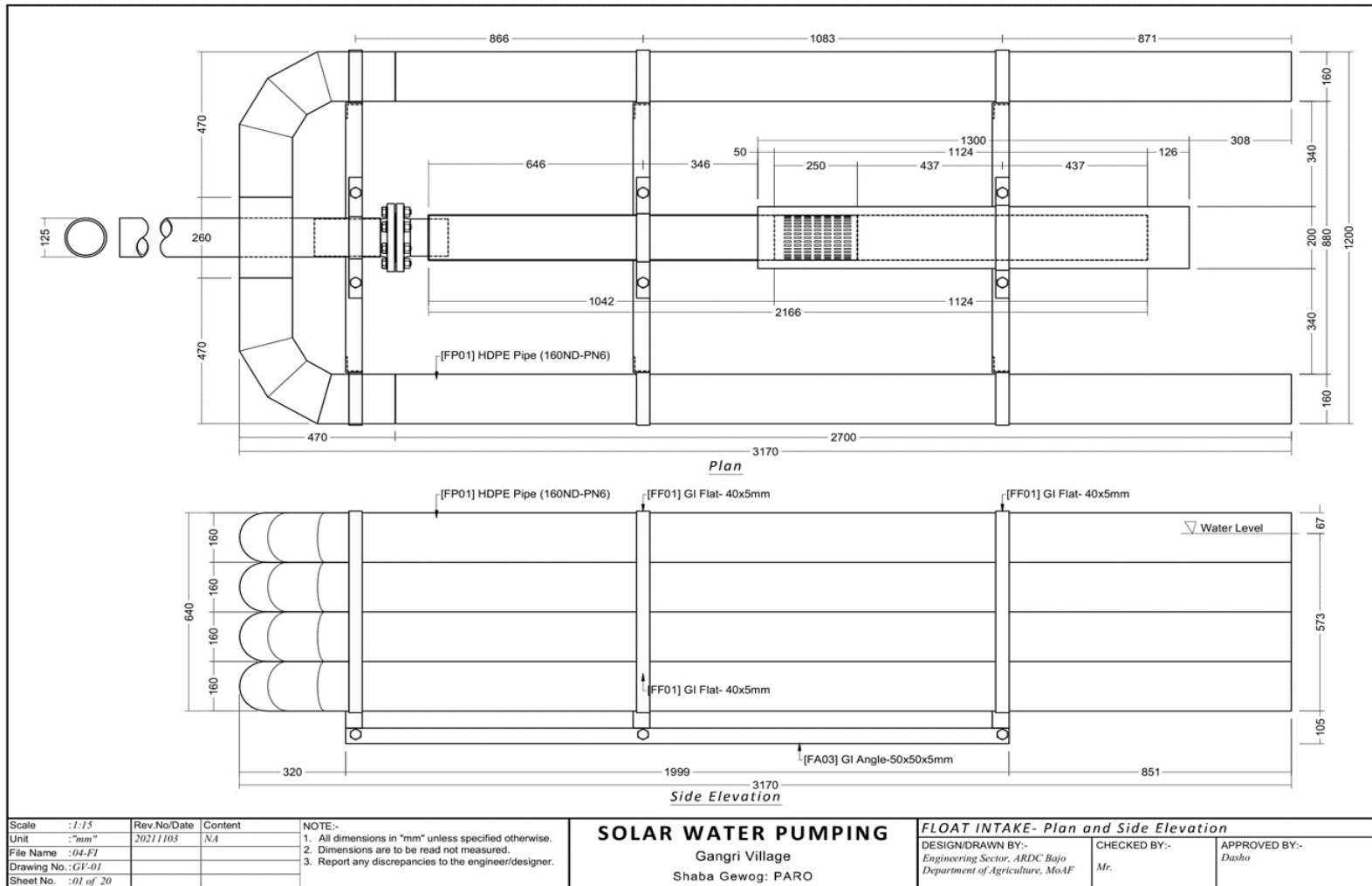
The bidder shall hand over a folder upon completing the assignment that contains at least the following:

Component	Supporting documents
Solar panels	Technical datasheet
Grid-connected inverter	Technical data sheet and manufacturer operation and troubleshooting manual
Pump	Technical data sheet and manufacturer operation and troubleshooting manual
Overall new solar lift irrigation system	Single line diagram
Commitment of the water user group for the safe upkeep of spare parts, and effective operation and management of the plant	The minutes signed by the executive committee of the Water User Group Association, committing to use the allocated funds to sustain the operation of the system by stocking the necessary spare parts and undertaking proactive preventative maintenance

Workmanship warranty	Workmanship warranty letter
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# Request for Bids: Supply, Installation, and integration of existing Gangri 16 KWp solar lift irrigation system to electricity grid at Paro, Bhutan

## Part IV – Pump float design



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# Request for Bids: Supply, Installation, and integration of existing Gangri 16 KWp solar lift irrigation system to electricity grid at Paro, Bhutan

MATERIAL LIST							
Part#	Description	Quantity for		UW (kg/m)	Length (m)	Weight (kg)	Remark
		No	UL(m)				
FP01	HDPE Pipe (160ND-PN6)	6	2.700	3.070	16.200	49.734	Float pipe
FP02	HDPE Pipe (160ND-PN6)-90° bend	6	0.686	3.070	4.116	12.636	Float pipe
FP03	HDPE Pipe (160ND-PN6)	3	0.260	3.070	0.780	2.395	Float pipe
(A)	Total- HDPE Pipe- Float	-	7.0320	-	21.096	64.765	-
FP04	HDPE Pipe (160ND-PN6)	2	2.700	3.070	5.400	16.578	Non-float
FP05	HDPE Pipe (160ND-PN6)	2	0.686	3.070	1.372	4.212	Non-float
FP06	HDPE Pipe (160ND-PN6)	1	0.260	3.070	0.260	0.798	Non-float
(B)	Total- HDPE Pipe- None Float	-	-	-	7.032	21.588	-
FP07	HDPE Pipe (200ND-PN6)	1	1.300	4.740	1.300	6.162	Sleeve
FA01	GI Angle (50x50x5mm-3.8kg/m)	8	0.740	3.800	5.920	22.496	-
FA02	GI Angle (50x50x5mm-3.8kg/m)	9	0.840	3.800	7.560	28.728	-
FA03	GI Angle (50x50x5mm-3.8kg/m)	2	2.000	3.800	4.000	15.200	-
FF01	GI Flat (40x5mm-1.6kg/m)	8	1.4800	1.600	11.840	18.944	-
(C)	Total- Float Frame	-	-	-	-	91.530	-
FT01	Fastener Type-A	1	-	3.442	-	3.442	-
FT02	Fastener Type-B	1	-	2.322	-	2.322	-
FT03	Fastener Type-B	1	-	1.805	-	1.805	-
NB01	Bolt&Nuts (M18x50mm-0.23kg/set)	6	0.050	0.230	-	1.380	-
NB02	Bolt&Nuts (M18x35mm-0.21kg/set)	24	0.035	0.210	-	5.040	-
NB03	Bolt&Nuts (M16x90mm-0.27kg/set)	6	0.035	0.270	-	1.620	-
(D)	Total- Fasteners	-	-	-	-	15.609	-
PM01	Motor	1	-	70.000	-	70.000	-
PM02	Pump	1	-	27.400	-	27.400	-
PM02	Flange	2	-	5.000	-	10.000	-
(E)	Pump/Motor & Fittings	-	-	-	-	107.400	-
(F)	Total weight	-	-	-	-	300.892	-
(H)	Total weight	-	-	-	-	397.074	-

**NOTE:-**

- All float pipes shall be jointed with butt fusion jointing machine.
- All joints shall air tight and with stand pressure of 6kg/sq.cm or 60m of water head.
- Pipe ends shall be closed with end caps with butt fusion joints.
- All float frames shall GI.

Scale : 1:100	Rev.No/Date	Content
Unit : "mm"	20211103	NA
File Name : 04-F1		
Drawing No. : GV-01		
Sheet No. : 03 of 20		

<b>SOLAR WATER PUMPING</b>
Gangri Village
Shaba Gewog: PARO

<b>FLOAT INTAKE- End elevation</b>		
DESIGN/DRAWN BY:- Engineering Sector, ARDC Bajo Department of Agriculture, MoAF	CHECKED BY:- Mr.	APPROVED BY:- Dasho

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**Request for Bids: Supply, Installation, and integration of existing Gangri 16 KWp solar lift irrigation system to electricity grid at Paro, Bhutan**

**Part V: Format of the manufacturer's authorization letter**

*[This letter of authorization should be on the manufacturer's letterhead and be signed by the person with the authority to sign documents that are binding on the manufacturer]*

Date: .....

To: .....

**WHEREAS**

We *[insert the complete name of the manufacturer]*, who are official manufacturers of *[insert the complete name of the product]*, having factories at *[insert full address of the manufacturer's factories]*, do hereby authorize *[insert the complete name of the bidder]* exclusively to submit a bid in relation to the Request for Proposals indicated above, the purpose of which is exclusively to provide the following goods, manufactured by us *[insert the complete name of the manufacturer]* and to subsequently negotiate and sign the contract.

We hereby extend our full guarantee and warranty in accordance with requirements described in the Technical Specifications, with respect to the goods offered by the above firm.

Signed: *[insert complete name of Bidder]*

Name: *[insert complete name(s) of authorized representative(s) of the manufacturer]*

Title: *[insert title]*

Duly authorized to sign the authorization for and on behalf of: *[insert complete name(s) of authorized representative(s) of the manufacturer]*

Date: *[insert date of signing]*

**Request for Bids: Supply, Installation, and integration of existing Gangri 16 KWp solar lift irrigation system to electricity grid at Paro, Bhutan**

**Part VI: Bill of quantity**

The bidder shall use the following format to provide details regarding quantity and costs.

S. No	Items	Description	Qty	Unit	Total (USD)
1	Solar panels	Approximately 5 kWp Panel shall be selected so that the Vmp of the series connection shall be within the MPPT range of the grid-connected inverter	LS	kWp	
2	Mounting structure and accessories	Galvanised iron	LS	Nos.	
3	Grid-connected inverter	Capacity of at least 20 kW - Must have at least 3 independent MPPT inputs	1	Nos.	
4	Remote monitoring unit of grid-connected inverter	GSM-based remote monitoring unit of the grid-connected inverter	1	Nos.	
5	CT/PT	CT and PT for energy export control in grid-connected inverter	1	Nos.	
6	Submersible pump	At least 600 LPM at 70 m head Estimated: 11 kW	1	Nos.	
7	Soft starter	Pump soft starter, rated for pump capacity, 3-phase	1	Nos.	
8	DC MCB	DP, 16 A	4	Nos.	
9	AC MCB	3-phase, 32 A	3	Nos.	
10	AC MCB	3-phase, 63 A	1	Nos.	
11	AC MCCB	3-phase, 63 A	1	Nos.	
12	DC SPD	DC, Type II	1	Nos.	
13	AC SPD	3-phase, Type II	1	Nos.	
14	DC cable	UV-protected, 1-core, copper, 4 sq. mm	50	Metres	

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**Request for Bids: Supply, Installation, and integration of existing Gangri 16 KWp solar lift irrigation system to electricity grid at Paro, Bhutan**

15	AC cable	PVC insulated and sheathed power cable made of copper, unarmoured, 1.1KV, 4C, 16 sq. mm	80	Metres	
16	AC cable	PVC insulated and sheathed power cable made of copper, unarmoured, 1.1KV, 4C, 6 sq. mm	50	Metres	
17	Input control box	Front cover indicator, 40 A busbar with din rails for AC MCBs and SPDs	1	Set	
18	Output control box	Front cover push buttons, 40 A busbar with din rails for AC MCBs and contactors	1	Set	
19	Earthing cable	16 sq. mm, made of copper, yellow-green insulation colour	30	Metres	
20	Earthing set	Cu rod with backfill chemical	1	Set	
21	MC4 connectors	Male and female pairs for solar array to grid-connected inverter connection	12	Pairs	
22	Float	Pump float mechanism (see drawing in Part IV)	1	Set	
23	HDPE pipe	HDPE PN 8, matching the pump outlet	15	Metres	
24	Pipe fittings	Pipe fittings from pump outlet to the pump house connection of 125 mm diameter (GI nipples, GI flanges, etc.) as required.		LS	
25	3-year SIM data charges	Data pack for SIM-enabled router	3	Years	
26	Fencing	Fencing of the solar array area		LS	
				<b>Sub-total (A)</b>	
27	Transportation			LS	
28	Installation	Labour and accessories required for installation such as cable ducts, nuts, bolts,		LS	

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**Request for Bids: Supply, Installation, and integration of existing Gangri 16 KWp solar lift irrigation system to electricity grid at Paro, Bhutan**

		insulation tapes, etc. required to complete the installation			
29	Civil works for the foundation of the solar array	Foundations of existing and new solar array structures		LS	
30	Operation and maintenance	Operation and maintenance to make the existing system fit for grid integration to be managed by the community water user group		LS	
				<b>Sub-total (B)</b>	
				<b>Taxes (C)</b>	
				<b>Total (A+B+C)</b>	

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