REQUEST FOR PROPOSALS

Provide turnkey services for the design, supply, installation, testing, and commissioning of Solar Photovoltaic (PV) Lift Irrigation Systems in Punakha, Bhutan

Background

The agriculture sector in Bhutan employs 60 percent of the total population, with women comprising 53 percent of the overall agriculture workforce. But with escalating climate shocks, among other factors, the sector's contribution to GDP has been declining steadily, and self-sufficiency in staple crops has reached a critical point. Without effective climate adaptation measures, agricultural output is projected to decline by 4–10 percent in the near future.

16% of Bhutan's agriculture is irrigated, and the irrigation systems are predominantly gravity-fed open channels, which are seasonal and highly vulnerable to climate change. Given the country's mountainous topography, lifting water from (river) source is a challenge. This challenge, counterposed against Bhutan's abundance of fast-flowing river water as potential renewable energy resources, presents a unique double-win opportunity of expanding irrigation coverage and strengthening green energy transition in irrigation sector simultaneously.

The Women Empowerment through Renewable Energy Powered Decentralised Lift Irrigation Systems in Bhutan (WERELIS – Bhutan) project, funded by the International Development Research Center (IDRC), Canada, is being jointly implemented by ICIMOD and the Department of Energy, Ministry of Energy and Natural Resources, Royal Government of Bhutan.

This project aims to generate evidence on the economic, environmental, social, and gender (equality) impacts of renewable energy (RE)-powered lift irrigation systems to support their wider adoption. By demonstrating how greener technologies can enhance agricultural productivity, WERELIS seeks to create employment opportunities for women, reduce emissions, and promote environmental sustainability.

About the Proposals

As a key component of the project ICIMOD plans to pilot two solar-powered lift irrigation systems, showcasing their relevance and viability for (i) improving irrigation access; and (ii) in enabling women to leverage new income opportunities

as service providers and business development managers by training them in operation and maintenance/ management of these systems.

For this purpose, ICIMOD invites sealed bid proposals from reputable and qualified firms for the supply and installation of two solar photovoltaic (PV) lift irrigation systems. The scope of work includes turnkey services—design, supply, installation, and/ commissioning (including training of local operators for proper system use). The installations will take place in two locations in Bhutan: (i) Humpatang (Ngyedrupchu), Chhubu Gewog, Punakha, and (ii) Temakha, Chhubu Gewog, Punakha.

Bidding process

Submission Guidelines

1. Interested suppliers may submit their sealed bid proposals to Procurement Unit of ICIMOD. The hardcopies of the sealed bid must be submitted to ICIMOD in the address provided for the international bidders. For Bhutanese bidders, the sealed bids to be submitted to Department of Energy, Ministry of Energy and Natural Resources, Thimphu Bhutan. Proposals must be submitted as per the RFP guidelines by **5 PM BST (Bhutanese firms) / 5 PM NST (international firms), 21 March 20025**. Two separate sealed envelopes containing technical and financial proposals should be submitted in a single sealed envelope. ICIMOD reserves the right to accept or reject any proposals without explanation.
2. ICIMOD Postal Address

   Khumaltar, Lalitpur, Kathmandu, Nepal. G.P.O. Box 3226.
   Phone +977 1 527-5238, 5275239.

3. 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 (FY 23/24)
   - 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
   - documents requested in the bid including -Make/brand, brochure/catalogue, etc of goods offered, drawings, design sheets etc.

- Reference of at least one similar project of installing a solar water pumping system (both electromechanical and civil components) accomplished by the bidder during the last three years.

4. The bidder shall quote the item rates in USD inclusive of all taxes in a formal quotation with signature and stamp (please refer to the sample in Part VI).

5. The bidder is liable to pay the applicable tax 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 Procurement Unit at procurement@icimod.org or call +977-5275222, extn 610, before the submission deadline.

Terms of Reference

Objective

The objective of the assignment is to install two (pilot) solar PV lift irrigation systems in two locations in Punakha. A **complete** installation will involve two tranches of activities: (i) design, supply and construction of civil components and electromechanical components, and (ii) training and support to the local community operator to operate and manage the systems.

1. Scope of Work

The scope of work and main responsibilities of the contractor includes providing turnkey services for **two** solar lift irrigation systems in (i) Humpatang (Ngyedrupchu), Chubbu Gewog, Punakha and (ii) Temakha, Chhubu Gewog, Punakha. The detailed scope of work includes but not limited to the following :

1. **Install solar lift irrigation systems:** Based on the guiding design provided by ICIMOD, bidders need to submit a design, with supporting documents, for the installation of two solar lift irrigation systems. Provide the turnkey supply and installation service shall include but not limited to the following:
    a. Tasks for civil components would include the following which are subject to the guiding design described for each site and its site conditions:
        i. Site clearance and levelling where required
        ii. Construction of pump intake infrastructures, such as gabion walls, sump well, and filtration mechanisms.

iii. Construction of pump house.
iv. Laying of pipe works such as water transmission and distribution lines.
v. Construction of water distribution chambers that house gate valves for water control.
vi. Construction of crossing structure for pipe works over streams.
vii. Installation of the complete set of plumbing works (gate valves in nodal points, pipeline, pump fitting, check valves, to name a few).

b. Tasks for electromechanical components would include the following which are subject to the guiding design described for each site and its site conditions:
   i. Installation of the solar PV arrays including civil works.
   ii. Installation of the controllers and pumps.
   iii. Complete sets of cables, conduits, connectors, and other accessories are required to make the system functional.
   iv. Installation of isolation and protection equipment (such as MCBs, SPDs, earthing and lightning protection).
   v. Installation of GSM-based monitoring systems.

c. Training the community-based operator
   i. Providing training to the community-based operator on the proper use and management of the solar water pumping system, including safety aspects.

2. Coordinate with ICIMOD to review the installation works during the execution of the contract.
3. Prepare a testing and commissioning form and conduct a thorough testing and commissioning of the solar lift irrigation systems to verify their performance, functionality, and compliance with local standards before full-scale operation. Submit the testing and commissioning forms along with 2-day system performance data to ICIMOD for review.
4. Implementing corrections/changes to the system and reporting back based on the feedback provided by ICIMOD after the testing and commissioning forms are reviewed.
5. Once the testing and commissioning forms are 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 for the operators.
6. Handover documentation specified in the technical specifications (see 'Handover documents' at the end of Part III).
7. Providing a post-installation after-sales service and monitoring plan.

Please refer to Part III for the specifications of each component.

2. 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 of the installations of **two** solar lift irrigation systems. 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 aligned with the terms of reference using the specified evaluation criteria.

3. Pre-qualification criteria

S. No	Criteria	Supporting documents
1	The bidder should be legally registered in their base country	Registration document
2	The bidder should have an average annual turnover of USD 100,000 in any three of the last five financial years	Audited financial statement
3	The bidder should have carried out at least one similar project of installing a solar lift irrigation system (both electromechanical and civil components) accomplished by the bidder during 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

4. 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.
3) The International or Regional bidder will require to partner with local firm for providing post installation support services. The bidder should also submit the agreement drawn with the local partner detailing the roles and responsibilities of the partnership agreed between the firm and the local partner.
4) Should have experience of constructing the sump well providing the discharge of at least 200 m^3/day.

5. Timelines for deliverables

Deliverable	Due date	Payment schedule
Upon signing the contract	Date of signing	30%
Delivery of materials at the site and submission of material receipt signed by DoE and winning bidder	21 days after signing the contract	30%
Installation, testing, and commissioning of 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.	45 days after signing the contract	40%

PART I: Site description

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

Site name	Full address	Coordinates
Humpatang	Humpatang (Ngyedrupchu), Chubbu Gewog, Punakha, Bhutan	27.658469°, 89.882319°
Temakha	Temakha, Chhubu Gewog, Punakha, Bhutan	27.627589°, 89.865367°

Humpatang site description

Solar water pumping systems ownership type:	Individual
Command area:	6.3 acres (2.55 hectares)
Irrigation system type:	Standalone solar water pumping system
Designed discharge:	175 m^3/day
Vertical head:	17 m From river water level to the distribution chamber
Water source:	Punatsang Chu
Type of water intake:	Suction pipe of pump protected by gabion structure
Type of water transmission:	Via HDPE pipes
Type of water control:	Gate valves housed in a distribution chamber at the end point of the transmission pipe
Type of water distribution:	2 branches of HDPE pipe
Approx. Solar array coordinates:	27.657519°, 89.881743°
Approx. distribution chamber coordinates:	27.657835°, 89.881343°
Approx. pump intake coordinates:	27.657888°, 89.882433°

Figure 1: Humpatang solar lift irrigation area

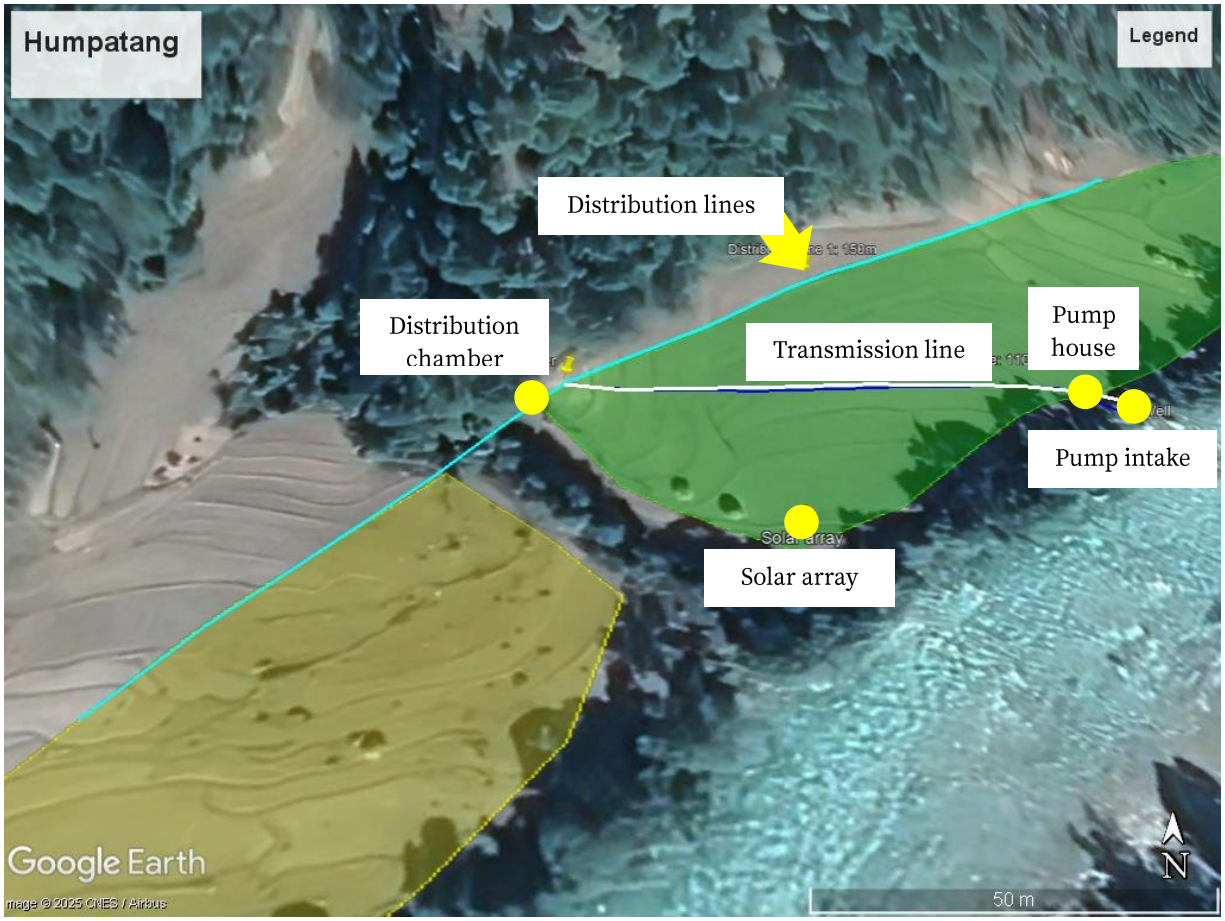


Figure 2: Humpatang solar lift irrigation area – close up

Temakha site description

Solar water pumping systems ownership type:	Community
Number of farmers:	6 farmers
Command area:	4.9 acres (2 hectares)
Irrigation system type:	Standalone solar water pumping system
Designed discharge:	200 m^3/day
Vertical head:	17 m From river water level to the distribution chamber
Water source:	Punatsang Chu
Type of water intake:	Sump well
Type of water transmission:	Via HDPE pipe
Type of water control:	Gate valves housed in a distribution chamber at the end point of the transmission pipe
Type of water distribution:	3 branches of HDPE pipes.

Approx. solar array coordinates:	27.627676°, 89.865631°
Approx. distribution chamber coordinates:	27.628072°, 89.864676°
Approx. pump intake coordinates:	27.627291°, 89.866429°

Figure 3: Temakha solar lift irrigation area

Single line diagram

The general single line diagrams of electromechanical components of the solar lift irrigation system in Humpatang and Temakha are shown in Figure 4 and Figure 5.

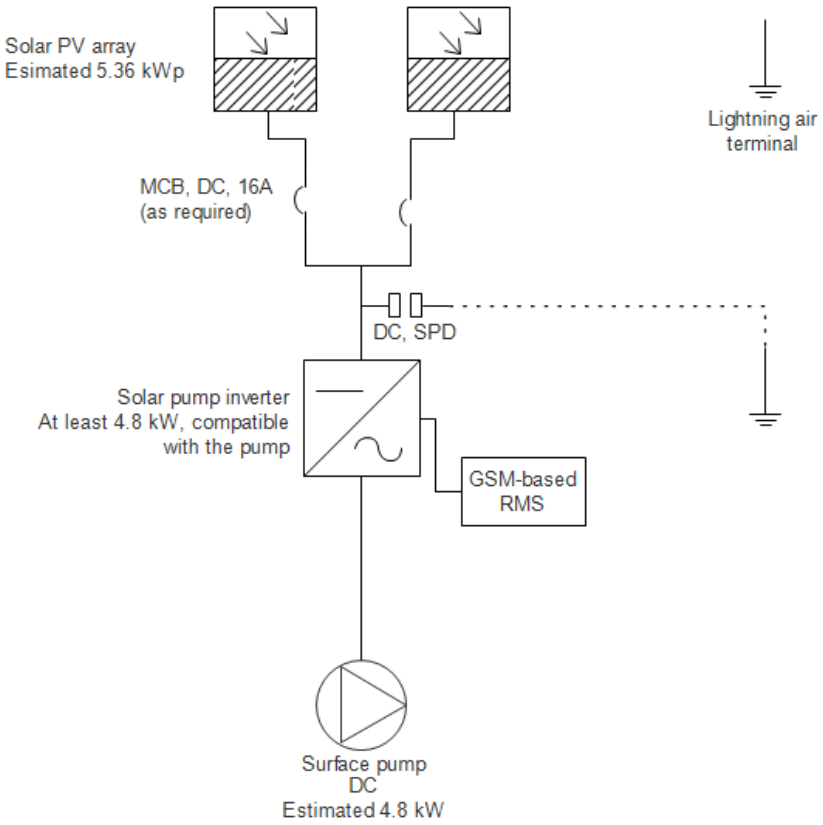


Figure 4: Single line diagram: Humpatang

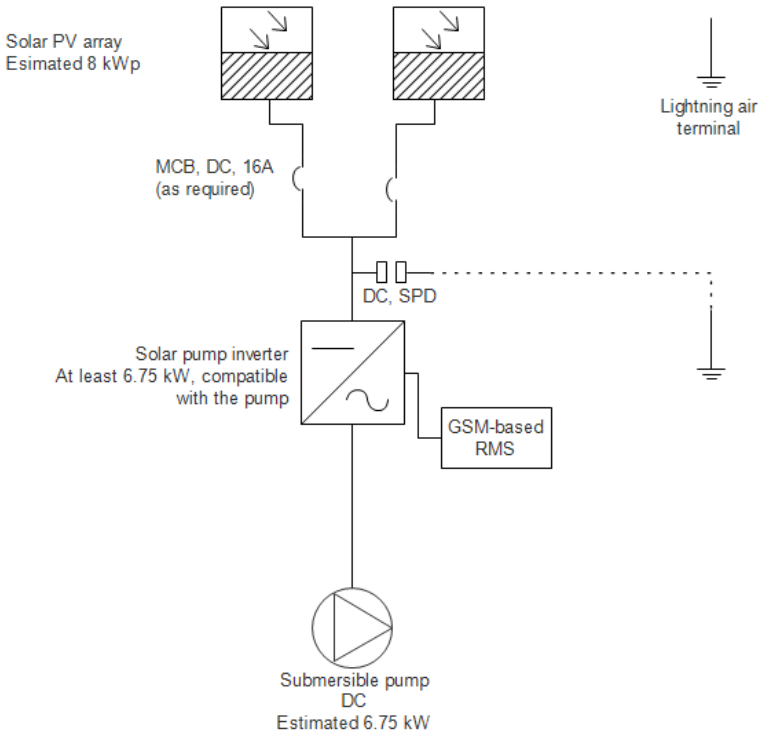


Figure 5: Single line diagram - Temakha

Part III: Technical specifications for Humpatang site

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 cumulative array size should be at least 5 kWp The Vmp of the series connection shall be within the MPPT range of the inverter while considering the minimum temperature of Punakha at -8˚C.	Peak power of individual module: .....Wp Total new array capacity: .....kWp Series Vmp at STC: ..... Series Voc at lowest temperature:	

6	Product workmanship warranty: ≥10 years Performance guarantee: 1st year: ≥ 97% of STC power 10 years: ≥ 90% of STC Power 25 years: ≥ 80% of STC Power Linear warranty ≤ 0.8% per year from year 2 and onwards	Number of years of product workmanship warranty: ..... years Performance guarantee: 1st year: .....% of STC power 10 years: .....% of STC power 25 years: .....% of STC power Linear warranty .....% per year from year 2 and onwards	
7	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)	
8	The bidder must submit the technical datasheet of the individual solar module	Datasheet provided? (Yes/No)	
9	The bidder must submit single line diagrams (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 V for the format)		

Support structure for the solar array

Note: Applicable to both Humpatang and Temakha sites unless specified in the 'Specifications required' column.

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 drawings of the solar structure of both sites	Drawing of the solar structure submitted? (Yes/No): ……	

Pump

S. No	**Specifications required**	**Details with compliance (Fill in the ……)**	**Reference document provided (Yes/No)**
1	Manufacturer	……	
2	Model	……	
3	Surface pump	Confirm surface pump (Yes/No): ……	
4	DC pump	Confirm DC surface pump (Yes/No): ……	
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 25m head: ……m^3/h Pump rated power: ……kW	

	Vertical head (m)	**Minimum water output (lpm)**	**Input pump power (kW) – for reference only**			
	30	At least 600	4.8			
	25	At least 650	4.8			
6	The pump impellers and casing 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 delivery pipe diameter must be at least 50 mm.				Pump delivery pipe diameter: .....mm	
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)	

Controller

S. No	**Specifications required**	**Details with compliance (Fill in the .....)**	**Reference document provided (Yes/No)**
1	Manufacturer	.....	
2	Model	.....	
3	The kW rating of the controller must be compatible with the pump kW ratings	Controller rating: .....kW	
4	Preferable: It is preferable if the controller accepts both AC and solar PV inputs.	Does the controller accept both AC and solar PV inputs? (Yes/No)	

5	The output voltage range and rated output current of the controller must be compatible with the pump operating voltage and current	Output voltage range: …….V to …….V Rated output current: ……..A State whether DC or AC: ……..	
6	The range of input DC voltage and current of the controller must accommodate the Vmp, Voc voltages, and Imp current from the solar array	Lowest working voltage: ……..V Maximum DC voltage: ……..V Rated input current: ……..A	
7	Must be an MPPT controller	MPPT controller (Yes/No) ……..	
8	At least 97% efficiency	 Efficiency: ……..%	
9	Protections: 1. PV and output side overvoltage protection 2. PV and output side Overcurrent protection 3. Dry run protection 4. Overload protection 5. Short circuit protection 6. Overheat protection	Confirm protection (Yes/No), 1. PV and output side overvoltage protection ……. 2. PV and output side Overcurrent protection ……. 3. Dry run protection ……. 4. Overload protection ……. 5. Short circuit protection ……. 6. Overheat protection …….	
10	IP65 for exposed installation	Protection level: ……..	
11	At least 2-year warranty	Warranty years: ……..years	
12	CE certification	Compliance (Yes/No): ……..	
13	The bidder must submit the technical datasheets of the controller	Datasheets provided? (Yes/No) ……..	
14	The controllers and pumps must be from the same manufacturer	 Compliance (Yes/No): ……..	

Remote monitoring system (RMS)

Note: 1. The remote monitoring system (RMS) from the same manufacturer as the controller and pump is preferred.

SN	Specifications required	Details with compliance (fill in the .....)	Reference document provided (Yes/No)
1	Manufacturer	.....	
2	Model	.....	
3	The RMS must be able to record the following parameters: 1. Input power from PV array (can also record PV voltage and current) 2. Output power to the pump (operating voltage and current)	Does the RMS record the following? (Yes/No) 1. Input power from PV array (can also record PV voltage and current): ..... 2. Output power to the pump (operating voltage and current):	
4	The RMS shall allow remote on/off functionality via a mobile app	Does the RMS have remote on/off functionality via a mobile app? (Yes/No)	
5	Optional parameters of RMS (good to have): 1. Fault information	Does the RMS record the following? (Yes/No) 1. Fault information:	
6	The **real-time data** from the RMS must be viewed via the following mediums: 1. Remote computer/mobile via online portal or mobile app (internet connection of RMS via GSM modem, CDMA, GPRS, 3G, 4G, etc.) 2. Automatically store data into SD card when remote communication fails	Does the RMS provide real-time data via the following mediums? (Yes/No) 1. Remote computer/mobile via online portal or mobile app (internet connection of RMS via GSM modem, CDMA, GPRS, 3G, 4G, etc.): ..... 2. Automatic store data into SD card when remote communication fails:	
7	The RMS must be compatible with the controllers provided	State compatibility with controllers	

		(Yes/No)	
8	The RMS can either be powered by the controllers or powered externally. In either case, the powering unit for RMS must be provided	RMS power ensured? (Yes/No)	
9	Data charge for 3 years of monitoring must be provided	Data charge for 3 years provided? (Yes/No)	
10	The bidder must submit the technical datasheet of the RMS	Datasheet provided? (Yes/No)	

Cables and accessories

SN	**Specifications required**	**Details with compliance (fill in the .....)**	**Reference document provided (Yes/No)**
1	Panel inter-wiring cable: Minimum 4 sq.mm copper or within 3% voltage drop, unarmored, PVC insulated, UV resistant	Cross-section of panel inter-wiring cable: .....sq.mm Compliance with copper, unarmoured, PVC insulated, UV resistance: (Yes/No):	
2	The allowable voltage drop from the PV array to the controller is 3% and controller to pump is 1% **Distances:** 1. Controller to be mounted in the solar PV structure 2. Controller to pump: approximately 110 m Provide voltage drop calculation sheet(s)	One-way length of cable from PV array to the controller: .....m, voltage drop: .....% One-way length of cable from controller to pump: .....m, voltage drop: .....%	

3	Cable from the controller to pump: 1. Aluminium or copper, PVC insulated, UV resistant, unarmoured 2. The insulation voltage and ampacity of the cable must be higher than the rated voltage and current that the cable will be connected to 3. There must not be any interconnection in the length of the cable run 4. The connection to the pump must be water-resistant using water-proof tape 5. The cable will be installed overhead across the agricultural land 6. Number of mild steel poles of 2 m height each to support the cable	From the controller to the pump: Cross-section of cable: ……..sq.mm Material (copper or aluminium): …….. No. of cores: …….. Compliance with armoured, PVC insulated: (Yes/No): …….. The number of mild steel mounting poles included each of 2 m height to support the cable: …….. nos.	
4	All cables must be properly terminated using cable lugs, pins etc. (no naked wire termination)	Compliance (Yes/No): ……..	NA
5	A Float Switch must be provided to prevent the pumps from dry-run	Compliance (Yes/No): ……..	
6	If required, output DU/DT must be provided to the controller output to control the leakage current due to the long cable	Compliance (Yes/No): ……..	
7	Adequate cable conduits must be provided for the PV array to the controller cables	Compliance (Yes/No): ……..	
8	Boxes (such as controller box) shall be UV and weather-resistant of IP65 protection	Body material of controller box: ……	

	level and manufacturer-specified ventilation All cables inside the box must be connected properly and cable entering/outings into/from the box must be sealed properly (use of cable glands, cable shoes, cable ties etc.) so that dust, insects, and mice cannot enter the box The PV isolator MCB, DC SPDs, RMS, DU/DT filter and earthing bus bars should be installed inside the controller box along with the controller Boxes must have a locking provision to prevent unwanted access	Protection level: IP..... The locking mechanism of the controller box: ..... Compliance with sealing and neat cable routing: (Yes/No):	
9	Adequate stay wires/anchors must be provided for pump support	Compliance (Yes/No):	
10	All accessories to complete the installation and commissioning of the solar water lifting systems (tapes, screws, nuts, etc.) shall be included	Compliance (Yes/No):	NA

Earthing, lightning, and protection systems

SN	**Specifications required**	**Details with compliance (fill in the .....)**	**Reference document provided (Yes/No)**
1	Type II surge protection devices (SPDs) must be installed on the DC side of the controller	DC side surge protection device included? (Yes/No):	

2	Double pole MCBs must be provided for each string and after combining the strings as a PV disconnector. The rating of the MCBs must be at least 1.56 times the calculated current capacity	Rating of DP MCB for each string: ……..A Rating of DP MCB for combined strings: ……..A	
3	Separate earthing should be given to, 1. Lightning air terminal 2. PV array, DC SPD, structure, controller Rod earthing with copper rod size (for individual earthing): 1 no. of each minimum 2.5 meters length x 25mm diameter Down conductor size: 25 mm wide and 3 mm thick copper strip Equipment bonding shall be used to tie the casings of all equipment and enclosures, including all electronic equipment casings (such as control box and 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. Backfill compound: 2 nos. of each 25Kg	Compliance with separated earthings: (Yes/No): …….. Length of earthing rod: ……..m Diameter of earthing rod: ……..mm	
4	Separation between individual earth pits should be at least 10 meters	Compliance (Yes/No): ……..	

5	The Lightning Protection System (LPS) must be able to minimize the damage to the surrounding environment Copper air terminal at least 2m above the highest height of the solar panels after installation	Length of air terminal: ……..m Diameter of air terminal: ……..mm Compliance with the height of the air terminal above the highest height of the solar panels after installation: (Yes/No): ……..	
6	The maximum allowable earth resistance is 10 ohms	Compliance (Yes/No): ……..	
7	The bidder must submit the technical datasheet of the SPDs and MCBs.	Datasheets provided? (Yes/No) ……..	
8	Safety cards and signages near the controller side and panel area	Safety cards and signages will be provided near the controller? (Yes/No): …….. Safety card will be provided near the solar panel area? (Yes/No): …….. Content of safety cards will cover emergency procedures, warning signs, and safety handling. (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 single line diagram (SLD)s of the entire electromechanical arrangement specified in this	Single line diagrams (SLD) of the entire system provided? (Yes/No) ……..	

	RfP. It shall include solar array, inverter, and pump, along with balance of systems (cables, protection, control box etc.) showing necessary details for a fully functional system.		

Civil: Gabion walls

SN	Specifications required	Details with compliance (fill in the .....)	Reference document provided (Yes/No)
1	Gabion walls shall be constructed to protect the pump intake in both sites **(see Figure 6** Figure 7**and Figure 13).** Construction of gabion wall as per drawings with dry stone masonry (hammer dressed facing) including excavation of foundation in all types of soils, sides and backfilling, delivery of machine woven gabion mesh (Hexagonal mesh of size 100mm x 120mm with a minimum of doubly twisted) with GI wire 2.70mm dia including diaphragm, fixing of selvedged wire 3.4 mm dia, binding/lacing wire 2.40 mm dia complete - Height up to 2 m **No. of gabion walls: 1 nos.**	Agree to complete construction of the gabion wall including all requirements (Yes/No):	

Civil: Pump intake and pump housing

SN	Specifications required	Details with compliance (fill in the .....)	Reference document provided (Yes/No)
1	Erection of 4 metal pipes at the end of the pump suction to support the suction pipe **(see Figure 13)**	Agree to complete erection of suction pipe support including all	

		requirements (Yes/No): ……	
2	The suction pipe of the pump shall be HDPE and match the suction diameter of the surface pump	HDPE (Yes/No): …… Length of pump suction pipe: …… m	
3	A foot valve shall be installed at the end of the suction pipe to prevent the return of water back to the river	Foot valve included (Yes/No): ……	
4	Construction of pump house providing & fixing Corrugated Galvanised Iron (CGI) sheeting, including bolts, hooks and nuts 8mm dia. with bitumen and G.I limpet washers filled with white lead for connection, excluding the cost of purlins, rafter and trusses - 24g **(see Figure 12Figure** 12 Steel work welded, in built up sections, trusses, frameworks including cutting, hoisting, fixing and applying priming coat of red lead paint - In Tubular sections Providing and laying in position plain cement concrete 1:2:4 (1 cement: 2 sand: 4 crushed rock 20 mm nominal size) excluding the cost of centering and shuttering - All work upto plinth level.	Agree to complete the construction of the pump house including all requirements (Yes/No): ……	

Civil: Distribution Chamber

SN	Specifications required	Details with compliance (fill in the .....)	Reference document provided (Yes/No)
1	Construction of a distribution chamber to house gate valves and control/distribute water to the agricultural plots **(see Figure 8)** Earthwork: Earthwork in excavation over areas, depth >300mm, width >1.5m, area >10 Sq.m on plan, including disposal of excavated earth within 50m lead and 1.5m lift & disposed soil to be neatly dressed - All types of Soil Filling of trenches, sides of foundations etc. in layers <200mm using selected excavated earth, ramming etc. within lead 50 m & lift 1.5m Concrete work: Providing and laying in position plain cement concrete 1:2:4 (1 cement: 2 sand : 4 crushed rock 20 mm nominal size) excluding the cost of centering and shuttering - All work upto plinth level. Reinforced concrete work: P&L in position reinforced cement concrete 1:1.5:3 (1 cement: 1.5 sand: 3 graded crushed rock 20 mm nominal size) work in plinth and skirting courses, fillets, columns , pillars, posts and struts upto floor five level excluding the cost of centering, shuttering and reinforcement. Providing & fixing centering and shuttering with timber including	Agree to complete the construction of the distribution chamber including all requirements (Yes/No):	

	strutting, propping etc. and removal of formwork - Foundation and plinth etc. Providing & fixing Thermo-Mechanically Treated reinforcement bar (Yield Strength 500 MPa) for R.C.C work including cutting, bending, binding and placing in position complete Brick work: P&L Second-Class Brick work in Foundation & Plinth - In cement mortar 1:4 Stonework: Providing and laying Hammer dressed dry stone soling Plastering work: P&L 15mm cement plaster on rough side of single or half-brick wall - C.M 1:4 including water-proofing materials in proportion recommended by the manufacturers		

Civil: Water transmission and distribution

SN	Specifications required	Details with compliance (fill in the .....)	State whether reference document has been provided (Yes/No)
1	Water transmission from pump to the distribution chamber: **Refer Figure 6.** HDPE pipe 65 mm diameter PN6: 110 m length Including all pipe fittings required for matching pump connection and water transmission	HDPE pipe 65 mm PN6: 110 m? (Yes/No) ..... Pipe fittings included? (Yes/No)	

2	Water distribution: Distribution line 1, HDPE pipe 65mm diameter PN4: 150 m length Distribution line 2, HDPE pipe 65 mm diameter PN4: 100 m length	HDPE pipe 65 mm PN4: 250 m included? (Yes/No) …….. Pipe fittings included? (Yes/No) ……..	
3	Water distribution: **Refer Figure 6.** Four gate valves in the distribution chamber. One for incoming flow (from pump) and three for distribution. The gate valves shall match the pipe diameters.	No. of gate valves included: …….. nos. Pipe fittings included? (Yes/No) ……..	
4	Two T-joints for water output along the distribution line	2 T-joints with fittings includes? (Yes/No) ……..	
5	Construct crossing structures for pipe crossing over a stream **(see Figure 9)**	Agree to complete the construction of the crossing structure including all requirements (Yes/No): ……..	

Note: 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.

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	The bidder shall ensure that all worksites shall be free of debris resulting from the construction activity	Compliance (Yes/No):	NA

Handover documents

The bidder shall hand over a folder upon commissioning to the client that contains at least the following:

Component	Supporting documents
Solar panels	Technical datasheet
Inverters	Technical data sheet and manufacturer operation and troubleshooting manual
Pumps	Technical data sheet and manufacturer operation and troubleshooting manual
Overall solar lift irrigation systems	Single line diagrams
Workmanship warranty	Workmanship of 5 years warranty letter

This page is intentionally left blank. The technical specifications for Temakha site are given in the following page.

Part IV: Technical specifications for Temakha site

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:	
5	The cumulative array size should be at least 7.5 kWp The Vmp of the series connection shall be within the MPPT range of the inverter while considering the minimum temperature of Punakha at -8˚C.	Peak power of individual module: .....Wp Total new array capacity: .....kWp Series Vmp at STC: ..... Series Voc at lowest temperature:	

6	Product workmanship warranty: ≥10 years Performance guarantee: 1st year: ≥ 97% of STC power 10 years: ≥ 90% of STC Power 25 years: ≥ 80% of STC Power Linear warranty ≤ 0.8% per year from year 2 and onwards	Number of years of product workmanship warranty: ..... years Performance guarantee: 1st year: .....% of STC power 10 years: .....% of STC power 25 years: .....% of STC power Linear warranty .....% per year from year 2 and onwards	
7	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)	
8	The bidder must submit the technical datasheet of the individual solar module	Datasheet provided? (Yes/No)	
9	The bidder must submit single line diagrams (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 V 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	Compliance (Yes/No):	

	consider all static and dynamic loads suitable for the site		
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 drawings of the solar structure of both sites	Drawing of the solar structure submitted? (Yes/No): ……..	

Pump – Temakha site

S. No	**Specifications required**	**Details with compliance (Fill in the ……)**	**Reference document provided (Yes/No)**
1	Manufacturer	……	
2	Model	……	
3	Submersible pump	Confirm submersible pump (Yes/No): …….	
4	DC pump	Confirm DC submersible pump (Yes/No): …….	
5	The manufacturer pump curves verifying the water output at desired vertical heads (as given in the ‘Description of existing	Water output at 25m head: ……m^3/h Pump rated power: …….kW	

<table>
<tr><td></td><td>system' section) must be provided<table><tr><th>Vertical head (m)</th><th>Minimum water output (lpm)</th><th>Input pump power (kW) – for reference only</th></tr><tr><td>30</td><td>At least 700</td><td>6.75</td></tr><tr><td>25</td><td>At least 750</td><td>6.75</td></tr></table></td><td></td><td></td></tr>
<tr><td>6</td><td>The pump's body and impellers must be made of stainless steel</td><td>Confirm stainless steel (Yes/No): .....</td><td></td></tr>
<tr><td>7</td><td>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 a 110 mm water transmission pipe)</td><td>Pump outlet size: .....mm

Pump body maximum diameter:
.....mm
Pump length: .....m</td><td></td></tr>
<tr><td>8</td><td>Warranty of at least two years</td><td>Warranty years:
.....years</td><td></td></tr>
<tr><td>9</td><td>Certifications: ISO9001, ISO 14001</td><td>Compliance (Yes/No):
.....</td><td></td></tr>
<tr><td>10</td><td>The bidder must submit the technical datasheet of the pump</td><td>Datasheet provided? (Yes/No) .....</td><td></td></tr>
</table>

Controller

S. No	Specifications required	Details with compliance (Fill in the .....)	Reference document provided (Yes/No)
1	Manufacturer	.....	
2	Model	.....	
3	The kW rating of the controller must be compatible with the pump kW ratings	Controller ratings: Humpatang site: .....kW	

		Temakha site: .....kW	
4	Preferable: It is preferable if the controller accepts both AC and solar PV inputs.	Does the controller accecpt both AC and solar PV inputs? (Yes/No)	
5	The output voltage range and rated output current of the controller must be compatible with the pump operating voltage and current	Output voltage range: .....V to .....V Rated output current: .....A State whether DC or AC:	
6	The range of input DC voltage and current of the controller must accommodate the Vmp, Voc voltages, and Imp current from the solar array	Lowest working voltage: .....V Maximum DC voltage: .....V Rated input current: .....A	
7	Must be an MPPT controller	MPPT controller (Yes/No)	
8	At least 97% efficiency	Efficiency: .....%	
9	Protections: 7. PV and output side overvoltage protection 8. PV and output side Overcurrent protection 9. Dry run protection 10. Overload protection 11. Short circuit protection 12. Overheat protection	Confirm protection (Yes/No), 7. PV and output side overvoltage protection ..... 8. PV and output side Overcurrent protection ..... 9. Dry run protection ..... 10. Overload protection ..... 11. Short circuit protection ..... 12. Overheat protection	
10	IP65 for exposed installation	Protection level:	
11	At least 2-year warranty	Warranty years: .....years	
12	CE certification	Compliance (Yes/No):	
13	The bidder must submit the technical datasheets of the controllers of both sites	Datasheets provided for both sites? (Yes/No)	

14	The controllers and pumps must be from the same manufacturer	Compliance (Yes/No):	

Remote monitoring system (RMS)

Note: 2. <u>The remote monitoring system (RMS) from the same manufacturer as the controller and pump is preferred.</u>

SN	**Specifications required**	**Details with compliance (fill in the .....)**	**Reference document provided (Yes/No)**
1	Manufacturer	.....	
2	Model	.....	
3	The RMS must be able to record the following parameters: 3. Input power from PV array (can also record PV voltage and current) 4. Output power to the pump (operating voltage and current)	Does the RMS record the following? (Yes/No) 3. Input power from PV array (can also record PV voltage and current): ..... 4. Output power to the pump (operating voltage and current):	
4	The RMS shall allow remote on/off functionality via a mobile app	Does the RMS have remote on/off functionality via a mobile app? (Yes/No)	
5	Optional parameters of RMS (good to have): 2. Fault information	Does the RMS record the following? (Yes/No) 2. Fault information:	
6	The **real-time data** from the RMS must be viewed via the following mediums: 3. Remote computer/mobile via online portal or mobile app (internet connection of RMS via GSM modem, CDMA, GPRS, 3G, 4G, etc.)	Does the RMS provide real-time data via the following mediums? (Yes/No) 3. Remote computer/mobile via online portal or mobile app (internet connection of RMS via GSM modem, CDMA, GPRS, 3G, 4G, etc.): ..... 4. Automatic store data into SD card when remote	

	4. Automatically store data into SD card when remote communication fails	communication fails:	
7	The RMS must be compatible with the controllers provided	State compatibility with controllers (Yes/No)	
8	The RMS can either be powered by the controllers or powered externally. In either case, the powering unit for RMS must be provided	RMS power ensured? (Yes/No)	
9	Data charge for 3 years of monitoring must be provided	Data charge for 3 years provided? (Yes/No)	
10	The bidder must submit the technical datasheet of the RMS	Datasheet provided? (Yes/No)	

Cables and accessories

SN	**Specifications required**	**Details with compliance (fill in the .....)**	**Reference document provided (Yes/No)**
1	Panel inter-wiring cable: Minimum 4 sq.mm copper or within 3% voltage drop, unarmored, PVC insulated, UV resistant	Cross-section of panel inter-wiring cable: .....sq.mm Compliance with copper, unarmoured, PVC insulated, UV resistance: (Yes/No):	
2	The allowable voltage drop from the PV array to the controller is 3% and controller to pump is 1% **Distances:** **1. Controller to be mounted in the solar PV structure** **2. Controller to pump: approximately 140 m**	One-way length of cable from PV array to the controller: .....m, voltage drop: .....% One-way length of cable from controller to pump: .....m, voltage drop: .....%	

	Provide voltage drop calculation sheet(s)		
3	Cable from the controller to pump: 7. Aluminium or copper, PVC insulated, UV resistant, unarmoured 8. The insulation voltage and ampacity of the cable must be higher than the rated voltage and current that the cable will be connected to 9. There must not be any interconnection in the length of the cable run 10. The connection to the pump must be water-resistant using water-proof tape 11. The cable will be installed overhead across the agricultural land 12. Number of mild steel poles of 2 m height each to support the cable	From the controller to the pump: Cross-section of cable: ……..sq.mm Material (copper or aluminium): …….. No. of cores: …….. Compliance with armoured, PVC insulated: (Yes/No): …….. The number of mild steel mounting poles included each of 2 m height to support the cable: …….. nos.	
4	All cables must be properly terminated using cable lugs, pins etc. (no naked wire termination)	Compliance (Yes/No): ……..	NA
5	A Float Switch must be provided to prevent the pumps from dry-run	Compliance (Yes/No): ……..	
6	If required, output DU/DT must be provided to the controller output to control the leakage current due to the long cable	Compliance (Yes/No): ……..	
7	Adequate cable conduits must be provided for the PV array to the controller cables	Compliance (Yes/No): ……..	
8	Boxes (such as controller box) shall be UV and weather-		

	resistant of IP65 protection level and manufacturer-specified ventilation All cables inside the box must be connected properly and cable entering/outings into/from the box must be sealed properly (use of cable glands, cable shoes, cable ties etc.) so that dust, insects, and mice cannot enter the box The PV isolator MCB, DC SPDs, RMS, DU/DT filter and earthing bus bars should be installed inside the controller box along with the controller Boxes must have a locking provision to prevent unwanted access	Body material of controller box: ..... Protection level: IP..... The locking mechanism of the controller box: ..... Compliance with sealing and neat cable routing: (Yes/No):	
9	Adequate stay wires/anchors must be provided for pump support	Compliance (Yes/No):	
10	All accessories to complete the installation and commissioning of the solar water lifting systems (tapes, screws, nuts, etc.) shall be included	Compliance (Yes/No):	NA

Earthing, lightning, and protection systems

SN	**Specifications required**	**Details with compliance (fill in the .....)**	**Reference document provided (Yes/No)**
1	Type II surge protection devices (SPDs) must be installed on the DC side of the controller	DC side surge protection device included? (Yes/No):	

2	Double pole MCBs must be provided for each string and after combining the strings as a PV disconnector. The rating of the MCBs must be at least 1.56 times the calculated current capacity	Rating of DP MCB for each string: ……..A Rating of DP MCB for combined strings: ……..A	
3	Separate earthing should be given to, 3. Lightning air terminal 4. PV array, DC SPD, structure, controller Rod earthing with copper rod size (for individual earthing): 1 no. of each minimum 2.5 meters length x 25mm diameter Down conductor size: 25 mm wide and 3 mm thick copper strip Equipment bonding shall be used to tie the casings of all equipment and enclosures, including all electronic equipment casings (such as control box and 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. Backfill compound: 2 nos. of each 25Kg	Compliance with separated earthings: (Yes/No): …….. Length of earthing rod: ……..m Diameter of earthing rod: ……..mm	
4	Separation between individual earth pits should be at least 10 meters	Compliance (Yes/No): ……..	

5	The Lightning Protection System (LPS) must be able to minimize the damage to the surrounding environment Copper air terminal at least 2m above the highest height of the solar panels after installation	Length of air terminal: ……..m Diameter of air terminal: ……..mm Compliance with the height of the air terminal above the highest height of the solar panels after installation: (Yes/No): ……	
6	The maximum allowable earth resistance is 10 ohms	Compliance (Yes/No): ……	
7	The bidder must submit the technical datasheet of the SPDs and MCBs.	Datasheets provided? (Yes/No) ……	
8	Safety cards and signages near the controller side and panel area	Safety cards and signages will be provided near the controller? (Yes/No): …… Safety card will be provided near the solar panel area? (Yes/No): …… Content of safety cards will cover emergency procedures, warning signs, and safety handling. (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 single line diagram (SLD)s of the entire electromechanical arrangement specified in this RfP. It shall include solar array, inverter, and pump, along with balance of systems (cables, protection, control box etc.) showing necessary details for a fully functional system.	Single line diagrams (SLD) of the entire system provided? (Yes/No) ……	

Civil: Gabion walls

SN	Specifications required	Details with compliance (fill in the .....)	Reference document provided (Yes/No)
1	Gabion walls shall be constructed to protect the pump intake in both sites **(Figure 7).** Construction of gabion wall as per drawings with dry stone masonry (hammer dressed facing) including excavation of foundation in all types of soils, sides and backfilling, delivery of machine woven gabion mesh (Hexagonal mesh of size 100mm x 120mm with a minimum of doubly twisted) with GI wire 2.70mm dia including diaphragm, fixing of selvedged wire 3.4 mm dia, binding/lacing wire 2.40 mm dia complete - Height up to 2 m **No. of gabion walls: 2 nos.**	Agree to complete construction of the gabion wall including all requirements (Yes/No):	

Civil: Sump well

SN	Specifications required	Details with compliance (fill in the .....)	Reference document provided (Yes/No)
1	Construction of a sump well of total 7.9 m depth and 2 m inner diameter **(see Figure 10, Figure 11)** Earthwork in excavation over areas, depth >300mm, width >1.5m, area >10 Sq.m on plan, including disposal of	Agree to complete the construction of the sump well including all requirements (Yes/No):	

	excavated earth within 50m lead and 1.5m lift & disposed soil to be neatly dressed - All types of Soil Filling of trenches, sides of foundations etc. in layers <200mm using selected excavated earth, ramming etc. within lead 50 m & lift 1.5m P&L in position reinforced cement concrete 1:1.5:3 (1 cement: 1.5 sand: 3 graded crushed rock 20 mm nominal size) work in plinth and skirting courses, fillets, columns, pillars, posts and struts upto floor five level excluding the cost of centering, shuttering and reinforcement. Providing & fixing centering and shuttering with timber including strutting, propping etc. and removal of formwork - Foundation and plinth etc. Providing & fixing Thermo-Mechanically Treated reinforcement bar (Yield Strength 500 MPa) for R.C.C work including cutting, bending, binding and placing in position complete Providing and laying dry hand packed rubble masonry with stone boulders >0.04 Cu.m P&L Perforated H.D.P.E pipes, PN 12.5, (excluding trenching, refilling & thrust block) -110mm P&L Non Woven Geotextile Material		

	Well Casing: Placing of well rings in well pit using all necessary equipment, all complete.		

Civil: Distribution Chamber

SN	Specifications required	Details with compliance (fill in the .....)	Reference document provided (Yes/No)
1	Construction of a distribution chamber to house gate valves and control/distribute water to the agricultural plots **(see Figure 8)** Earthwork: Earthwork in excavation over areas, depth >300mm, width >1.5m, area >10 Sq.m on plan, including disposal of excavated earth within 50m lead and 1.5m lift & disposed soil to be neatly dressed - All types of Soil Filling of trenches, sides of foundations etc. in layers <200mm using selected excavated earth, ramming etc. within lead 50 m & lift 1.5m Concrete work: Providing and laying in position plain cement concrete 1:2:4 (1 cement: 2 sand : 4 crushed rock 20 mm nominal size) excluding the cost of centering and shuttering - All work upto plinth level. Reinforced concrete work: P&L in position reinforced cement concrete 1:1.5:3 (1 cement: 1.5 sand: 3 graded crushed rock 20 mm nominal size) work in plinth and skirting courses, fillets, columns, pillars, posts and	Agree to complete the construction of the distribution chamber including all requirements (Yes/No):	

	struts upto floor five level excluding the cost of centering, shuttering and reinforcement. Providing & fixing centering and shuttering with timber including strutting, propping etc. and removal of formwork - Foundation and plinth etc. Providing & fixing Thermo-Mechanically Treated reinforcement bar (Yield Strength 500 MPa) for R.C.C work including cutting, bending, binding and placing in position complete Brick work: P&L Second-Class Brick work in Foundation & Plinth - In cement mortar 1:4 Stonework: Providing and laying Hammer dressed dry stone soling Plastering work: P&L 15mm cement plaster on rough side of single or half-brick wall - C.M 1:4 including water-proofing materials in proportion recommended by the manufacturers		

Civil: Water transmission and distribution

SN	Specifications required	Details with compliance (fill in the .....)	State whether reference document has been provided (Yes/No)
1	Water transmission from pump to the distribution chamber:	HDPE pipe 110 mm PN6: 230 m? (Yes/No)	

	Refer Figure 7. HDPE pipe 110 mm diameter PN6: 230 m length Including all pipe fittings required for matching pump connection and water transmission	Pipe fittings included? (Yes/No)	
2	Water distribution: Distribution line 1, HDPE pipe 110 mm diameter PN2.5: 60 m length Distribution line 2, HDPE pipe 110 mm diameter PN2.5: 100 m length Distribution line 2, HDPE pipe 110 mm diameter PN2.5: 120 m length	HDPE pipe 110 mm PN2.5: 280 m included? (Yes/No) ..... Pipe fittings included? (Yes/No)	
3	Water distribution: **Refer Figure 7.** Five gate valves in the distribution chamber. One for incoming flow (from pump) and four for distribution. The gate valves shall match the pipe diameters.	No. of gate valves included: ..... nos. Pipe fittings included? (Yes/No)	
5	Construct crossing structures for pipe crossing over a stream **(see Figure 9)**	Agree to complete the construction of the crossing structure including all requirements (Yes/No):	

Note: 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.

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	The bidder shall ensure that all worksites shall be free of debris resulting from the construction activity	Compliance (Yes/No):	NA
3	Any existing infrastructure temporarily dismantled for site access purposes (for example, fencing) must be reinstated upon completion of work	Compliance (Yes/No):	NA

Handover documents

The bidder shall hand over a folder upon commissioning to the client that contains at least the following:

Component	Supporting documents
Solar panels	Technical datasheet
Inverters	Technical data sheet and manufacturer operation and troubleshooting manual
Pumps	Technical data sheet and manufacturer operation and troubleshooting manual
Overall solar lift irrigation systems	Single line diagrams
Workmanship warranty	Workmanship of 5 years warranty letter

Part IV – Reference drawings

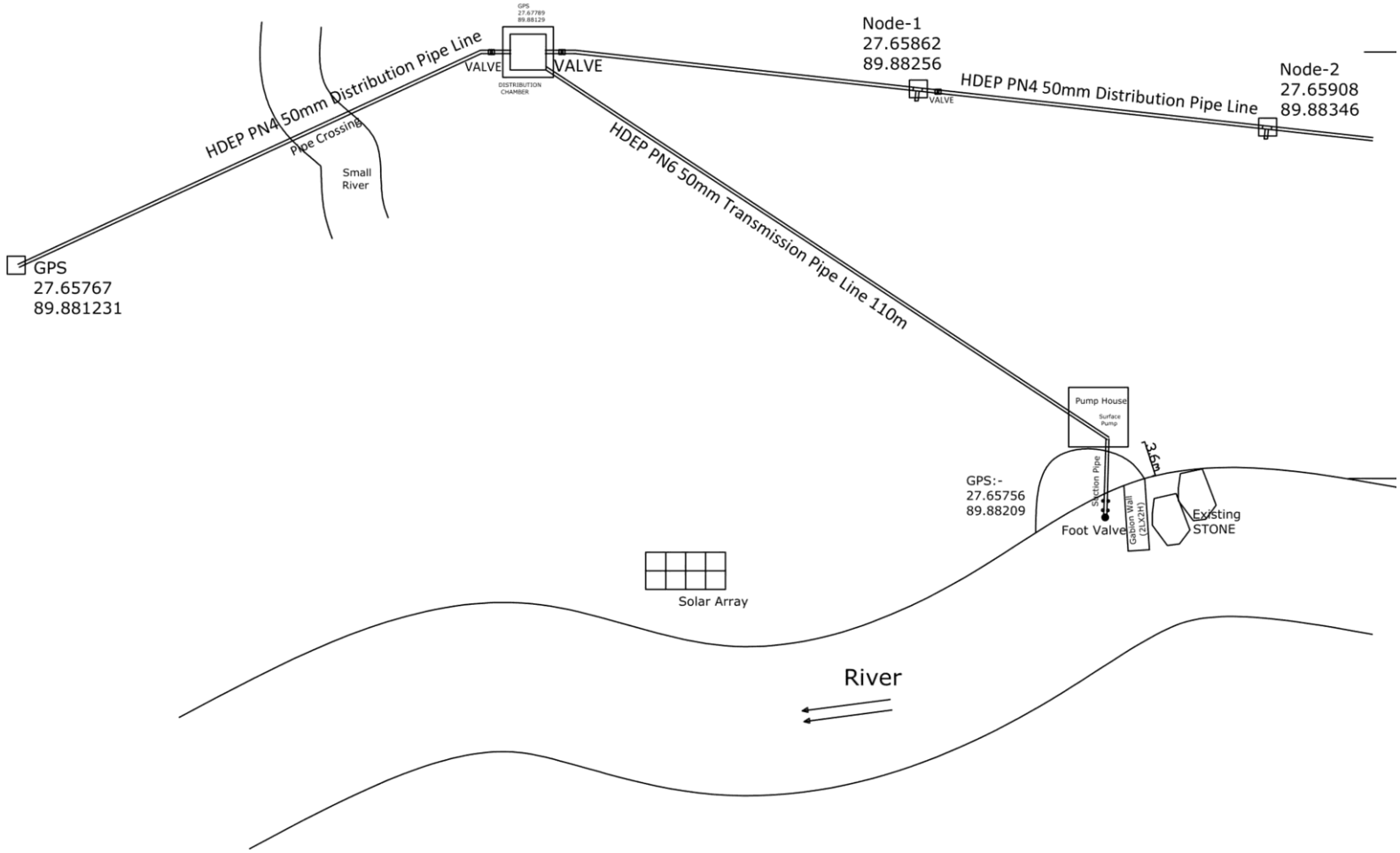


Figure 6: Humpatang water transmission and distribution layout

ICIMOD reserves the right to decline any proposal that does not meet the specified requirements.

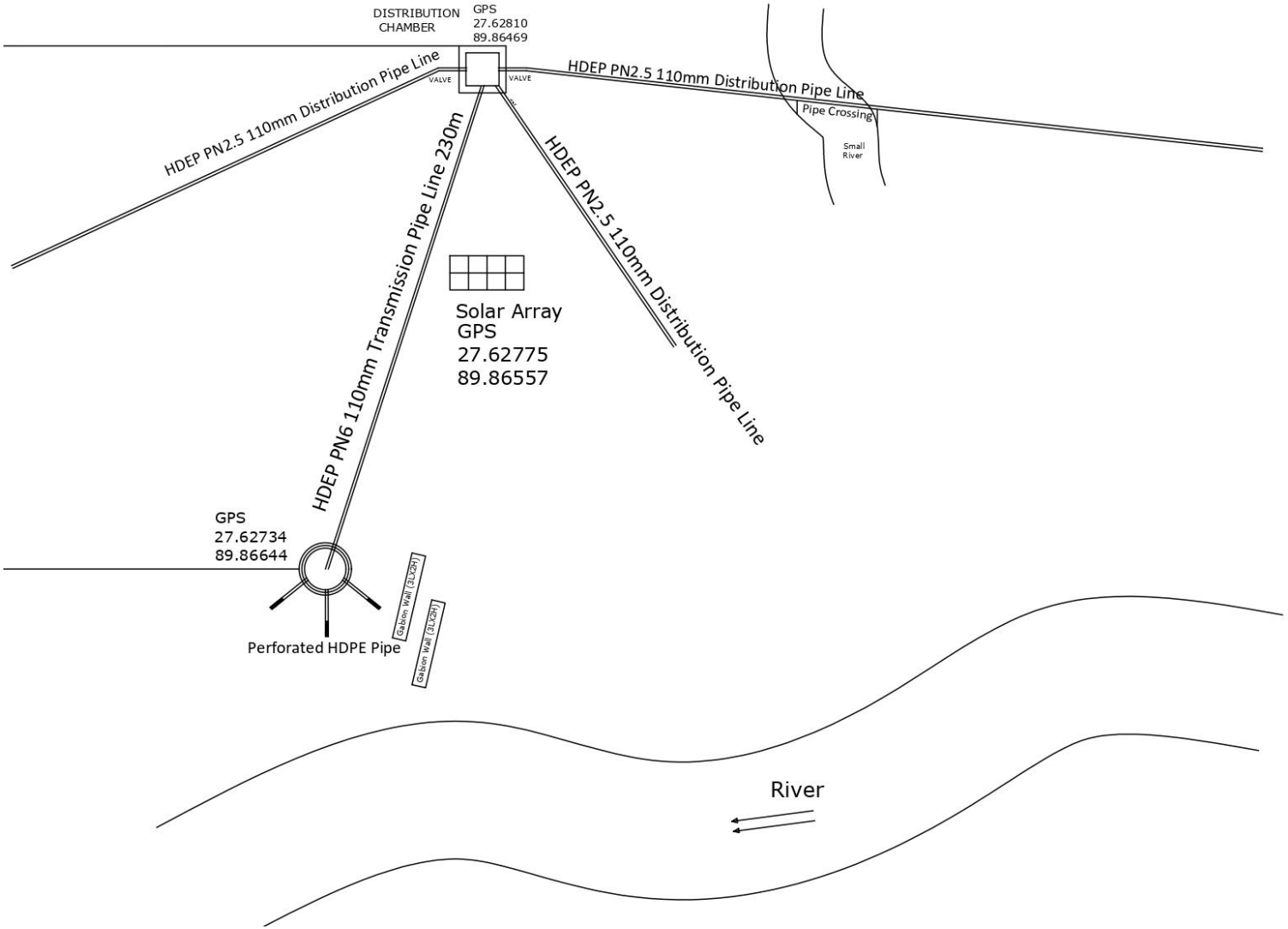


Figure 7: Temakha water transmission and distribution layout

ICIMOD reserves the right to decline any proposal that does not meet the specified requirements.

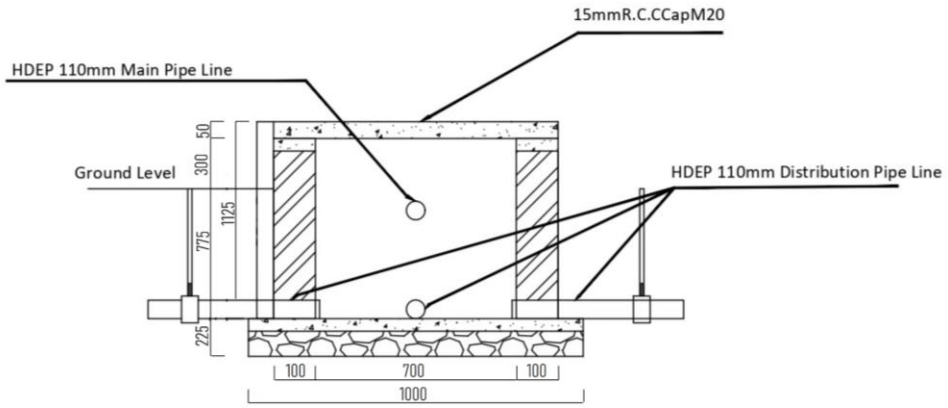


Figure 8: Distribution chamber - applicable to both sites

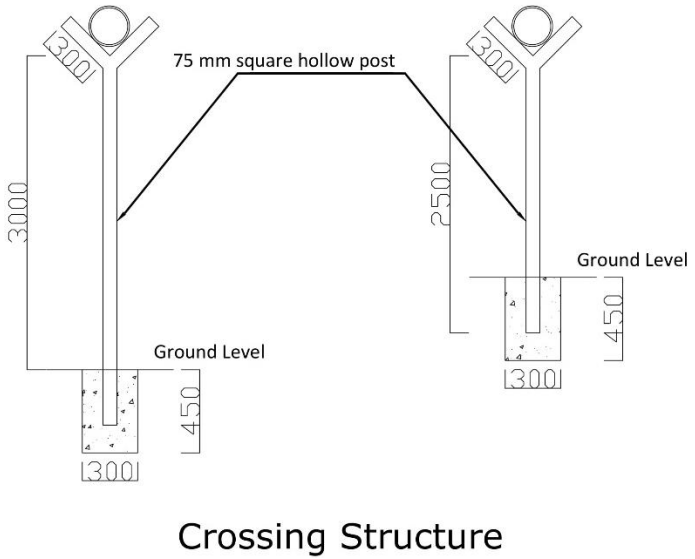


Figure 9: Crossing structure: applicable to both sites

ICIMOD reserves the right to decline any proposal that does not meet the specified requirements.

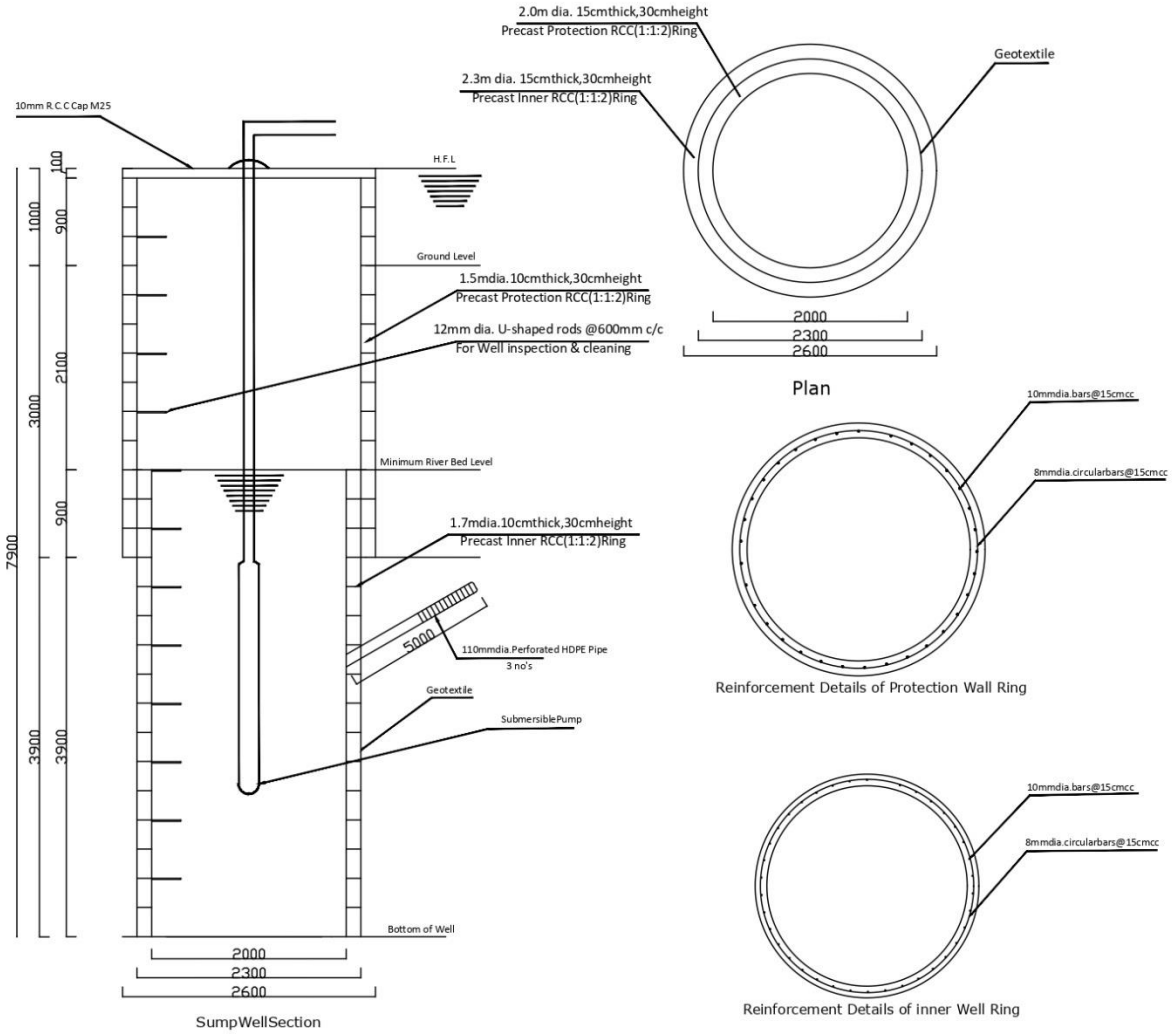


Figure 10: Sump well section in Temakha site

ICIMOD reserves the right to decline any proposal that does not meet the specified requirements.

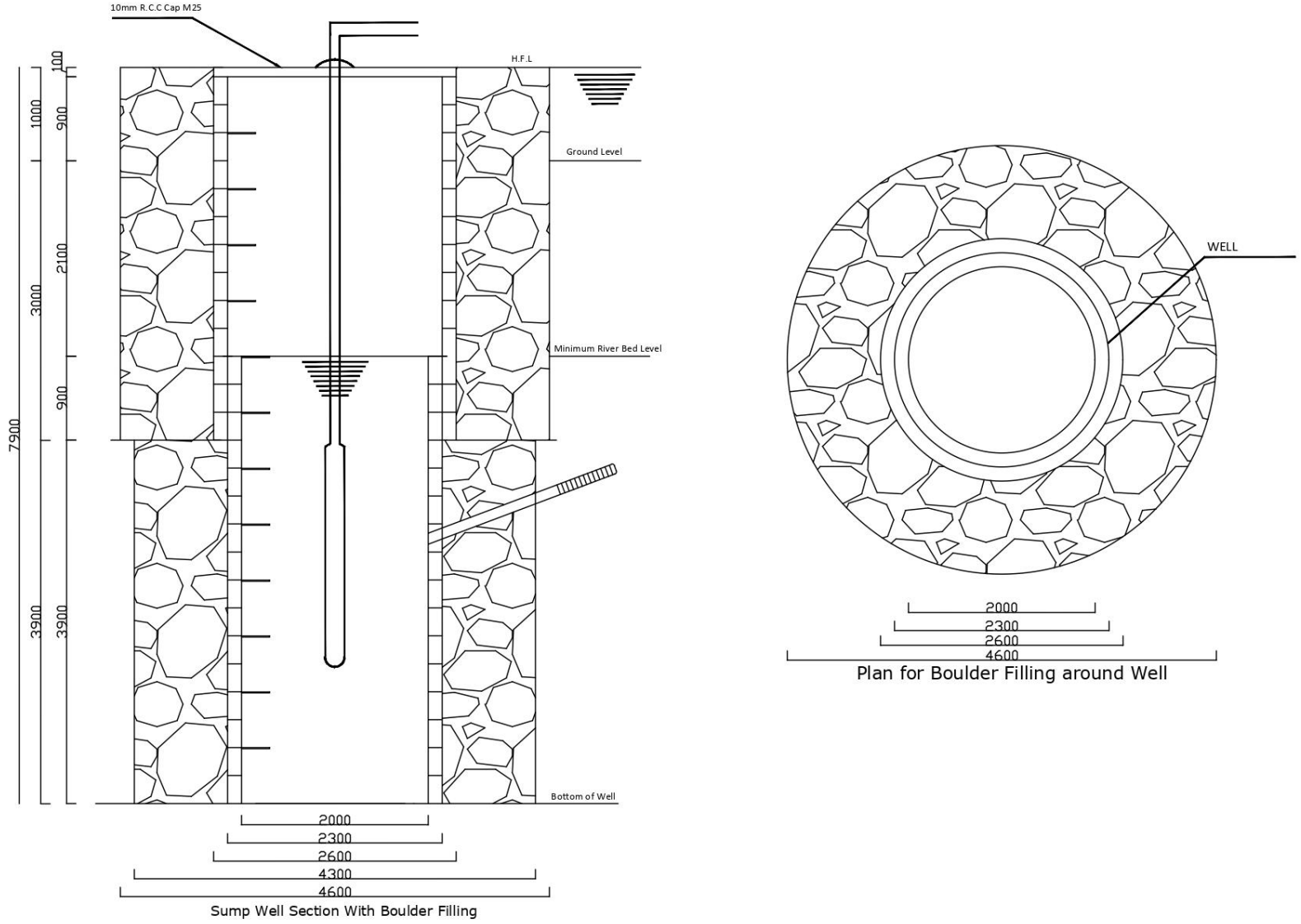


Figure 11: Sump well section with boulder filling in Temakha site

ICIMOD reserves the right to decline any proposal that does not meet the specified requirements.

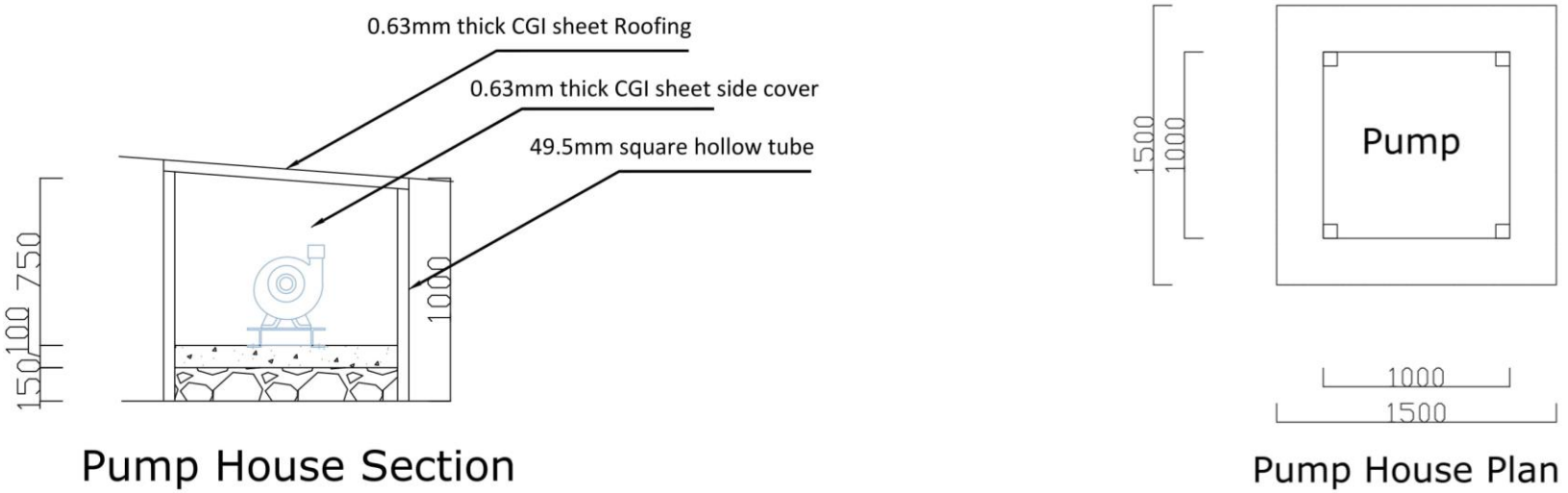
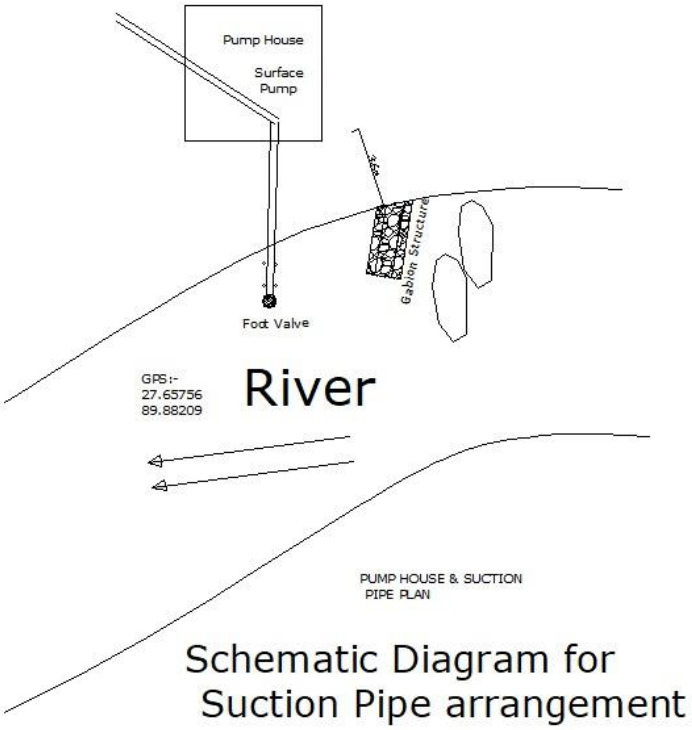


Figure 12: Pump house in Humpatang site



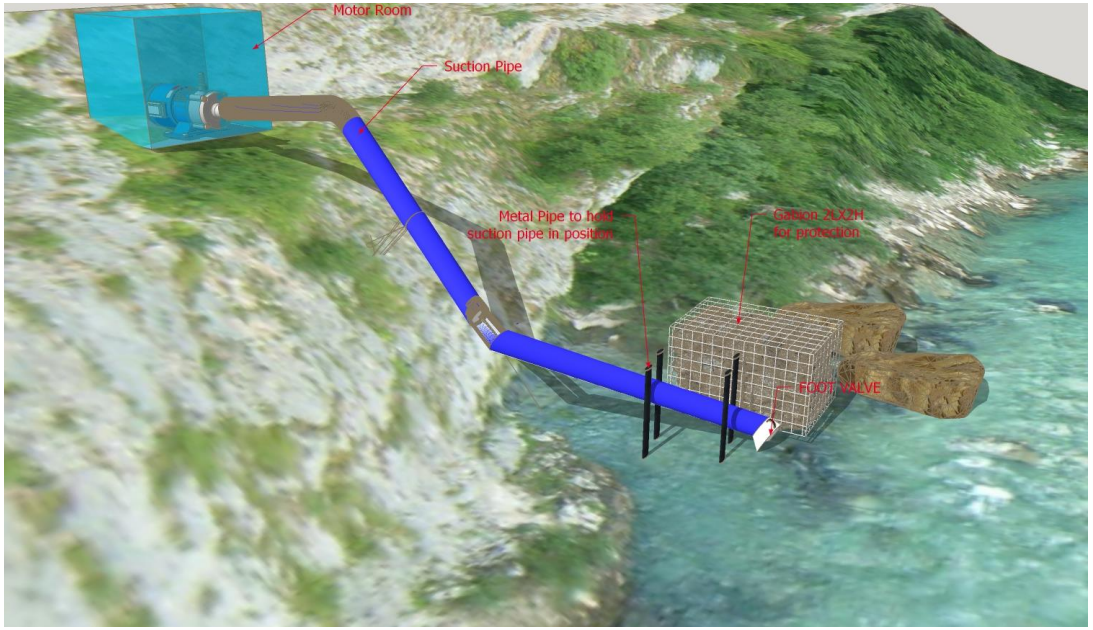


Figure 13: Schema and visualisation of pump intake for Humpatang site

Part V: Manufacturer's authorization letter format

[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: turnkey services for the design, supply, installation, testing, and commissioning of Solar PV Lift Irrigation Systems in Punakha, Bhutan

Part VI: Bill of quantity

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

Humpatang site

SN	Items description	Capacity/description	Qty	Unit	Total (USD)
Electromechanical components					
1	Solar panels	At least 5 kWp	As required	Wp	
2	Mounting structure	GI structure	1	set	
3	Remote monitoring Unit		1	nos.	
4	Controller	MPPT controller, compatible with the solar array arrangement and pump	1	nos.	
5	Pump	At least 5HP (for DC surface pump)	1	nos.	
6	DC MCBs and SPDs	MCB: DP, 16 A Type II SPD		nos.	
7	DC cables	As required	As required	m	
8	AC cables - controller to pump	As required	110	m	
9	Earthing cable	Multi-stranded, 16 sq.mm	As required	m	
10	Cable conduits	As required	As required	m	
11	Mounting pole	Mild steel, 2.5 m height	At least 4	pcs	
12	Earthing sets	As required	2	nos.	
13	Lightning protection with a mounting pole for the rod	As required	1	nos.	

ICIMOD reserves the right to accept or reject any or all bids without giving any reason whatsoever.

14	Data charges for remote monitoring	3 years	LS	LS	
			Sub-total (A)		
Civil components					
1	Gabion structure	As required	LS	LS	
2	Pump intake and pump housing	As required	LS	LS	
3	Distribution chamber	As required	LS	LS	
4	Water transmission pipe	As required	110	m	
5	Water distribution pipe	As required	250	m	
6	Pipe fittings, gate valves, t-joints and all plumbing accessories	As required	As required	LS	
7	Site clearance work	As required			
			Sub-total (B)		
Installation and transportation					
1	Installation	Labour and accessories required for installation such as cable ducts, nut+bolts, insultation tapes, etc. required to complete the installation	LS	LS	
2	Installation	Labour and accessories required for construction of civil components			
3	Transportation		LS	LS	
			Sub-total (C)		
			Taxes (D)		
			Total (A+B+C+D)		

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Request for Bids: turnkey services for the design, supply, installation, testing, and commissioning of Solar PV Lift Irrigation Systems in Punakha, Bhutan

Temakha site

SN	Items description	Capacity/description	Qty	Unit	Total (USD)
Electromechanical components					
1	Solar panels	Estimated 7.5 kWp	As required	Wp	
2	Mounting structure	GI structure	1	set	
3	Remote monitoring Unit		1	nos.	
4	Controller	MPPT controller, compatible with the solar array arrangement and pump	1	nos.	
5	Pump	Estimate 7.5 HP (for DC submersible pump)	1	nos.	
6	DC MCBs and SPDs	MCB: DP, 16 A Type II SPD		nos.	
7	DC cables	As required	As required	m	
8	AC cables - controller to pump	As required	140	m	
9	Earthing cable	Multi-stranded, 16 sq.mm	As required	m	
10	Cable conduits	As required	As required	m	
11	Mounting pole	Mild steel, 2 m height	4	pcs	
12	Earthing sets	As required	2	nos.	
13	Lightning protection with a mounting pole for the rod	As required	1	nos.	
14	Data charges for remote monitoring	3 years	LS	LS	
			Sub-total (A)		
Civil components					

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1	Gabion structure	As required	LS	LS	
2	Sump well	As required	LS	LS	
3	Distribution chamber	As required	LS	LS	
4	Water transmission pipe	As required	230	m	
5	Water distribution pipe	As required	280	m	
6	Pipe fittings, gate valves, t-joints and all plumbing accessories	As required	As required	LS	
7			**Sub-total (B)**		
8	Site clearance				
Installation and transportation					
1	Installation	Labour and accessories required for construction of electromechanical components	LS	LS	
2	Installation	Labour and accessories required for construction of civil components	LS	LS	
3	Transportation		LS	LS	
			Sub-total (C)		
			Taxes (D)		
			Total (A+B+C+D)		

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