

RFQ Reference: 51/05/STAR-C/ISA-2024	Date: 30 May 2024
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**Subject:** Supply, Installation, Testing & Commissioning (SITC) of equipment and instruments for setting up the STAR Centre in **Bhutan** including one-year Comprehensive Maintenance Contract (CMC).

## SECTION 1: REQUEST FOR QUOTATION (RFQ)

ISA kindly requests your quotation for the provision of goods, works and/or services as detailed in Annex 1 of this RFQ.

This Request for Quotation comprises the following documents:

Section 1: This Request Letter

Section 2: RFQ Instructions and Data

Annex 1: Schedule of Requirements

Annex 2: Quotation Submission Form

Annex 3: Technical and Financial Offer

Annex 4: Checklist for Submission of Bid

When preparing your quotation, please be guided by the RFQ Instructions and Data. Please note that quotations must be submitted using Annex 2: Quotation Submission Form and Annex 3 Technical and Financial Offer, by the method and by the date and time indicated in Section 2. It is your responsibility to ensure that your quotation is submitted on or before the deadline. Quotations received after the submission deadline, for whatever reason, will not be considered for evaluation.

The ISA recognizes the importance of valuing diversity and promoting inclusion in all our work programs and partnerships. The ISA highly values engaging with organizations and/or teams that reflect its geographical and diverse nature.

Thank you and we look forward to receiving your quotations.

Issued by: Vishal Pratap

Signature: \_\_\_\_\_

Name: Procurement Unit

Date: May 30, 2024

## SECTION 2: RFQ INSTRUCTIONS AND DATA

<b>Introduction</b>	<p>Bidders shall adhere to all the requirements of this RFQ, including any amendments made in writing by ISA. This RFQ is conducted in accordance with the ISA Financial Regulations and Procedures and ISA Procurement Manual</p> <p>Any Bid submitted will be regarded as an offer by the Bidder and does not constitute or imply the acceptance of the Bid by ISA. ISA is under no obligation to award a contract to any Bidder as a result of this RFQ.</p> <p>ISA reserves the right to cancel the procurement process at any stage without any liability of any kind for ISA, upon notice to the bidders or publication of cancellation notice on ISA website</p>
<b>Deadline for the Submission of Quotation</b>	<p><b>20.06.2024 by 2300 HRS IST</b></p> <p>If any doubt exists as to the time zone in which the quotation should be submitted, refer to <a href="http://www.timeanddate.com/worldclock/">http://www.timeanddate.com/worldclock/</a>.</p> <p>For eTendering submission - as indicated in eTendering system. Note that system time zone is in EST/EDT (New York) time zone.</p>
<b>Method of Submission</b>	<p>Quotations must be submitted as follows:</p> <p><input type="checkbox"/> E-tendering</p> <p><input checked="" type="checkbox"/> Dedicated Email Address</p> <p><input type="checkbox"/> Courier / Hand delivery</p> <p><input type="checkbox"/> Other <a href="#">Click or tap here to enter text.</a></p> <p>Bid submission address: <a href="mailto:procurement@isolaralliance.org">procurement@isolaralliance.org</a></p> <ul style="list-style-type: none"> <li>▪ File Format: PDF files only</li> <li>▪ File names must be maximum 60 characters long and must not contain any letter or special character other than from Latin alphabet/keyboard.</li> <li>▪ All files must be free of viruses and not corrupted.</li> <li>▪ Max. File Size per transmission: 10 MB</li> <li>▪ It is recommended that the entire Quotation be consolidated into as few attachments as possible.</li> <li>▪ The bidder should receive an email acknowledging email receipt.</li> </ul>
<b>Cost of preparation of quotation</b>	<p>ISA shall not be responsible for any costs associated with a Bidder's preparation and submission of a quotation, regardless of the outcome or the manner of conducting the selection process.</p>
<b>Supplier Code of Conduct, Fraud, Corruption,</b>	<p>All prospective suppliers must read the ISA Supplier Code of Conduct and acknowledge that it provides the minimum standards expected of suppliers to the ISA. The Code of Conduct, which includes <b>principles on labour, human rights, environment and ethical conduct</b> may be found at: <a href="https://isolaralliance.org/images/ISA%20Supplier%20Code%20of%20Conduct_14.4.2023.final%20version.pdf">https://isolaralliance.org/images/ISA%20Supplier%20Code%20of%20Conduct_14.4.2023.final%20version.pdf</a></p> <p>Moreover, ISA strictly enforces a policy of zero tolerance on proscribed practices, including fraud, corruption, collusion, unethical or unprofessional practices, and obstruction of ISA vendors and requires all bidders/vendors to observe the highest standard of ethics during the procurement process and contract implementation.</p>
<b>Gifts and Hospitality</b>	<p>Bidders/vendors shall not offer gifts or hospitality of any kind to ISA staff members including recreational trips to sporting or cultural events, theme parks or offers of holidays, transportation, or invitations to extravagant lunches, dinners or similar. In pursuance of this policy, ISA: (a) Shall reject a bid if it determines that the selected bidder has engaged in any corrupt or fraudulent practices in competing for the contract in question; (b) Shall declare a vendor ineligible, either indefinitely or for a stated period, to be awarded a contract if at any time it determines that the</p>

	vendor has engaged in any corrupt or fraudulent practices in competing for, or in executing a ISA contract.
<b>Conflict of Interest</b>	<p>ISA requires every prospective Supplier to avoid and prevent conflicts of interest, by disclosing to ISA if you, or any of your affiliates or personnel, were involved in the preparation of the requirements, design, specifications, cost estimates, and other information used in this RFQ. Bidders shall strictly avoid conflicts with other assignments or their own interests, and act without consideration for future work. Bidders found to have an undisclosed conflict of interest shall be disqualified.</p> <p>The ISA shall have the discretion to disqualify or proceed with a bidder who has disclosed a probable conflict of interest subject to further evaluation and review of various factors such as access to sensitive information which may confer unfair advantage as against other bidders. The decision on a probable conflict of interest shall be made in the best interest of the work of the ISA.</p> <p>Bidders must disclose in their Bid their knowledge of the following: a) If the owners, part-owners, officers, directors, controlling shareholders, of the bidding entity or key personnel who are family members of ISA staff involved in the procurement functions and/or the Government of the country or any Implementing Partner receiving goods and/or services under this RFQ.</p> <p>The eligibility of Bidders that are wholly or partly owned by the Government shall be subject to ISA's further evaluation and review of various factors such as being registered, operated and managed as an independent business entity, the extent of Government ownership/share, receipt of subsidies, mandate and access to information in relation to this RFQ, among others. Conditions that may lead to undue advantage against other Bidders may result in the eventual rejection of the Bid.</p>
<b>General Conditions of Contract</b>	<p>Any Purchase Order or contract that will be issued as a result of this RFQ shall be subject to the General Conditions of Contract</p> <p><input type="checkbox"/> <a href="https://www.isolaralliance.org/images/ISA_GTB.pdf">https://www.isolaralliance.org/images/ISA_GTB.pdf</a></p>
<b>Special Conditions of Contract</b>	<p><input type="checkbox"/> Cancellation of PO/Contract if the delivery/completion is delayed by 10 days</p> <p><input type="checkbox"/> Others [pls. specify]</p>
<b>Pre-bid Conference</b>	Not Applicable
<b>Eligibility</b>	<p>A vendor who will be engaged by ISA may not be suspended, debarred, or otherwise identified as ineligible by any UN Organization or the World Bank Group or any other international Organization. Vendors are therefore required to disclose to ISA whether they are subject to any sanction or temporary suspension imposed by these organizations. Failure to do so may result in termination of any contract or PO subsequently issued to the vendor by ISA.</p> <p>It is the Bidder's responsibility to ensure that its employees, joint venture members, sub-contractors, service providers, suppliers and/or their employees meet the eligibility requirements as established by ISA.</p> <ul style="list-style-type: none"> <li>• Bidders must have the legal capacity to enter a binding contract with ISA and to deliver in the country, or through an authorized representative. <b>Company registration certificate or any other document proving legal entity.</b></li> <li>• The bidder must have the experience of supply of solar equipment's / hardware components. <b>Submit copy of work order or completion certificate</b></li> <li>• The bidder must have annual turnover of more than <b>USD 100,000</b> - Please attach relevant documents.</li> </ul>

<b>Currency of Quotation</b>	Quotations shall be quoted in USD
<b>Joint Venture, Consortium or Association</b>	<p>If the Bidder is a group of legal entities that will form or have formed a Joint Venture (JV), Consortium or Association for the Bid, they shall confirm in their Bid that : (i) they have designated one party to act as a lead entity, duly vested with authority to legally bind the members of the JV, Consortium or Association jointly and severally, which shall be evidenced by a duly notarized Agreement among the legal entities, and submitted with the Bid; and (ii) if they are awarded the contract, the contract shall be entered into, by and between ISA and the designated lead entity, who shall be acting for and on behalf of all the member entities comprising the joint venture, Consortium or Association.</p> <p>Refer to Clauses 22 – 27 under Solicitation Process in the Procurement Manual (will be provided on request) for details on the applicable provisions on Joint Ventures, Consortium or Association.</p>
<b>Only one Bid</b>	<p>The Bidder (including the Lead Entity on behalf of the individual members of any Joint Venture, Consortium or Association) shall submit only one Bid, either in its own name or, if a joint venture, Consortium or Association, as the lead entity of such Joint Venture, Consortium or Association.</p> <p>Bids submitted by two (2) or more Bidders shall all be rejected if they are found to have any of the following:</p> <p>a) they have at least one controlling partner, director or shareholder in common; or b) any one of them receive or have received any direct or indirect subsidy from the other/s; or</p> <p>b) they have the same legal representative for purposes of this RFQ; or</p> <p>c) they have a relationship with each other, directly or through common third parties, that puts them in a position to have access to information about, or influence on the Bid of, another Bidder regarding this RFQ process;</p> <p>d) they are subcontractors to each other's Bid, or a subcontractor to one Bid also submits another Bid under its name as lead Bidder; or</p> <p>e) some key personnel proposed to be in the team of one Bidder participates in more than one Bid received for this RFQ process. This condition relating to the personnel, does not apply to subcontractors being included in more than one Bid.</p>
<b>Duties and taxes</b>	<p>The United Nations (privileges and immunities) Act, 1947 is applicable to ISA pursuant to a notification by the host country. Therefore, ISA is exempt from all direct taxes, except charges for public utility services, and is exempt from customs restrictions, duties, and charges of a similar nature in respect of articles imported or exported for its official use in India. All quotations shall be submitted net of any direct taxes and any other taxes and duties, unless otherwise specified below:</p> <p>All prices must:</p> <p><input checked="" type="checkbox"/> be inclusive of VAT and other applicable indirect taxes</p> <p><input type="checkbox"/> be exclusive of VAT and other applicable indirect taxes</p> <p><b>[according to project and applicable country agreement]</b></p>
<b>Language of quotation</b>	<p>English</p> <p>Including documentation including catalogues, instructions and operating manuals.</p>
<b>Documents to be submitted</b>	<p>Bidders shall include the following documents in their quotation:</p> <p><input checked="" type="checkbox"/> Annex 2: Quotation Submission Form duly completed and signed</p> <p><input checked="" type="checkbox"/> Annex 3: Technical and Financial Offer duly completed and signed and in accordance with the Schedule of Requirements in Annex 1</p> <p><input checked="" type="checkbox"/> Company Profile.</p> <p><input checked="" type="checkbox"/> Registration certificate;</p> <p><input checked="" type="checkbox"/> Company Profile.</p> <p><input checked="" type="checkbox"/> Descriptive Literature: Bidders shall provide full technical details of products being offered, including technical sheets and pictures showing details and general views. Specific details of items offered should be clearly stated as standard catalogues may offer options;</p> <p><input checked="" type="checkbox"/> Documents showing that the bidder has minimum of five (5) years of relevant experience – <b>proof of purchase orders/ contract is to be submitted.</b></p> <p><input checked="" type="checkbox"/> Documents showing that the bidder has an experience of design, supply, installation and commissioning of Grid connected/off grid Solar PV Power Plant and experience of rendering operation and maintenance services for Solar PV units.</p>

	<input checked="" type="checkbox"/> Statement of satisfactory Performance (Certificates) from the top two clients in terms of Contract value in similar field, plus client's contact details who may be contacted for further information on those contracts;
<b>Quotation validity period</b>	Quotations shall remain valid for 90 days from the deadline for the Submission of Quotation.
<b>Price variation</b>	No price variation due to escalation, inflation, fluctuation in exchange rates, or any other market factors shall be accepted at any time during the validity of the quotation after the quotation has been received.
<b>Partial Quotes</b>	<input checked="" type="checkbox"/> Not permitted <input type="checkbox"/> Permitted Insert conditions for partial quotes and ensure that the requirements are properly listed in lots to allow partial quotes
<b>Alternative Quotes</b>	<input checked="" type="checkbox"/> Not permitted
<b>Payment Terms</b>	<input checked="" type="checkbox"/> Within 30 days upon ISA's acceptance and receipt of invoice.
<b>Conditions for Release of Payment</b>	<input checked="" type="checkbox"/> Written Acceptance of Goods & Services, based on full compliance with RFQ requirements. <input checked="" type="checkbox"/> 100% of <u>goods charges</u> after successful delivery and acceptance of goods. <input checked="" type="checkbox"/> 100% of <u>Installation &amp; Commissioning charges</u> after successful installation and commissioning <input checked="" type="checkbox"/> 100% of <u>training charges</u> after completion of Training on Operation and Maintenance. <input checked="" type="checkbox"/> 100% of <u>Comprehensive maintenance charges</u> after successful 1 year of installation and commissioning
<b>Contact Person for correspondence, notifications and clarifications</b>	E-mail address: <b>procurement@isolaralliance.org</b> <b>Attention: Quotations shall not be submitted to this address but to the address for quotation submission above. Otherwise, offer shall be disqualified.</b> <b>Any delay in ISA's response shall be not used as a reason for extending the deadline for submission, unless ISA determines that such an extension is necessary and communicates a new deadline to the Proposers.</b>
<b>Clarifications</b>	Requests for clarification from bidders will not be accepted any later than 2 days before the submission deadline. Responses to request for clarification will be communicated thru email.
<b>Evaluation method</b>	<input checked="" type="checkbox"/> The Contract or Purchase Order will be awarded to the lowest price substantially compliant offer
<b>Evaluation criteria</b>	<input checked="" type="checkbox"/> Full compliance with all requirements as specified in Annex 1 <input checked="" type="checkbox"/> Full acceptance of the General Conditions of Contract <input checked="" type="checkbox"/> Comprehensiveness of after-sales services <input type="checkbox"/> Earliest Delivery /shortest lead time <input type="checkbox"/> Others <a href="#">Click or tap here to enter text.</a>
<b>Right not to accept any quotation</b>	ISA is not bound to accept any quotation, nor award a contract or Purchase Order
<b>Right to vary requirement at time of award</b>	At the time of award of Contract or Purchase Order, ISA reserves the right to vary (increase or decrease) the quantity of services and/or goods, by up to a maximum twenty-five per cent (25%) of the total offer, without any change in the unit price or other terms and conditions.
<b>Type of Contract to be awarded</b>	<input type="checkbox"/> Purchase Order <input checked="" type="checkbox"/> Contract for Works <input type="checkbox"/> Other Type/s of Contract [pls. specify]

<b>Expected date for contract award.</b>	05 July 2024
<b>Publication of Contract Award</b>	ISA will publish the contract awards valued at USD 100,000 and more on the ISA website.
<b>Policies and procedures</b>	This RFQ is conducted in accordance with ISA Financial Regulation and Procedures and ISA procurement manual
<b>Other Provisions</b>	<p>The ISA is striving to achieve gender parity in all its activities. In this regard, female-owned organizations and/or teams with significant gender diversity are strongly encouraged to submit a proposal.</p> <p>The ISA recognizes the importance of valuing diversity and promoting inclusion in all our work programs and partnerships. The ISA strives to engage with organizations and/or teams that reflect its geographical representation and diversity.</p>

## ANNEX 1: SCHEDULE OF REQUIREMENTS

Recognizing the urgent need to support the developing country (ISA members) with high potential for solar technology deployment, the ISA Assembly agreed to establish an international network of STAR C (Solar technology Application Resource Centre). The overarching objective of the STAR C initiative is to provide solar technology and application resourcing services to Member Countries so that these countries can achieve the ISA's vision of scaled up and accelerated large scale deployment of solar energy to meet the respective countries' priority energy access, energy transformation and energy security needs.

ISA aims to have a number of STAR centres across the globe acting as a shared facility that provides capacity for deployment of solar energy applications and research, business modelling, incubation, training, standardization and testing engaging faculty members from different disciplines/institutes of excellence and provide/use shared facilities, labs, testing centres etc.

In order to equip these STAR Centres, ISA aims to procure equipment and instruments that help the centres to offer hands on training, act as a testing facility and setup a knowledge management centre.

Such a centre is being created by ISA in **Bhutan**. The host institution for the STAR Centre in **Bhutan** is the **College of Science and Technology, Royal University of Bhutan**.

This RFQ is for Supply, Installation, Testing & Commissioning (SITC) of equipment and instruments for setting up the STAR Centre in **Bhutan** including one-year Comprehensive Maintenance Contract (CMC).

A needs assessment and situation analysis were undertaken in **Bhutan**, to identify the high growth sectors within solar energy technology, and the attendant training needs. **Rooftop Solar; Solar Mini-Grids; Solar Home System; Off-Grid Solar Applications** and **Solar Thermal Applications** are the high growth sectors in **Bhutan**. These sectors will drive solar training needs in the medium to long term and require trained technicians and engineers to size, install, operate and maintain solar systems for socio-economic development, especially in rural and peri-urban areas. The current solar training and testing facilities as well as the solar curriculum was evaluated for gaps through secondary research and primary stakeholder interviews with the private sector companies, industry bodies, government, and academia.

The major findings were the need for understanding of the various solar components, design, sizing, installation, operations, and maintenance. According to the evaluation of the needs and gaps, a list of solar equipment has been suggested for the STAR C to prioritize in its implementation. A detailed list of the technical specifications is provided:

### Recommended Technical Specifications for Goods

**Subject:** Supply, Installation, Testing & Commissioning (SITC) of equipment and instruments for setting up the STAR Centre in **Bhutan** including one-year Comprehensive Maintenance Contract (CMC).

### Recommended Technical Specifications for Goods

Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
<b>A</b>	<b>Tools and instruments</b>				
<b>A1</b>	<b>Personal Protective Equipment</b>	<b>Specification</b>	<b>Quantity</b>	<b>Unit</b>	<b>Sample item</b>
1	Reflective vests	Reflective vests	20	pcs	
2	Helmets	Helmets	20	pcs	
3	Work gloves	Work gloves	20	pairs	
4	Electricians gloves	EN 60903, insulation class 0, 1000 V, thickness min. 1.5mm, acid resistant, resistance to extreme cold, sizes: 7, 8, 9, 10, 11	5	pairs	
5	Safety glasses	Safety glasses	20	pcs	
<b>A2</b>	<b>Instruments</b>	<b>Specification</b>	<b>Quantity</b>	<b>Unit</b>	<b>Sample item</b>

Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
6	Digital multimeter (medium quality)	TRMS values, capable of measuring AC (750 V) & DC (1000 V) voltages, DC current 10 A, continuity/resistance, fused for current measurements, overvoltage CAT III 1,000 V and CAT IV 600 V. Lower-cost instruments are suitable for work board exercises	6	pcs	<u>Lower-cost option:</u> VOLTCRAFT VC830 Hand-Multimeter digital CAT III 1000 V, CAT IV 600 V Anzeige (Counts): 6000
7	Spare fuses for above multimeter (medium quality)	30 of each type of fuse in multimeter	30	pcs	Feinsicherung (Ø x L) 6.3 mm x 32 mm 0.6 A 1000 V Superflink -FF-
8	Digital multimeter (professional standard)	TRMS values, Capable of measuring 1000 V AC/DC voltages, DC current 10 A, continuity/resistance, fused for current measurements, overvoltage CAT III 1,000 V and CAT IV 600 V, temperature probe, test leads and accessories This needs to be a 'professional standard' instrument such as the the Fluke 179 or similar	2	pcs	<u>Professional standard:</u> Fluke 179 True-RMS Digital Multimeter
9	Spare fuses for above multimeter (professional standard)	5 of each type of fuse in multimeter	5	pcs	FLUKE Sicherung 440mA/1000V , IR 10kA, Abmessung 10,3x34,9mm
10	Clamp meter (medium quality)	Capable of measuring AC & DC (600 V) voltages, DC and AC current ranges 40 A / 400 A, continuity/resistance, overvoltage CAT III 600 V. Lower-cost instruments are suitable for work board exercises	6	pcs	VOLTCRAFT VC-523 Stromzange digital CAT III 600 V Anzeige (Counts): 4000
11	Clamp meter (professional standard)	TRMS values, capable of measuring AC & DC (600 V) voltages, DC and AC current ranges 40 A / 400 A, continuity/resistance, overvoltage CAT III 600 V and CAT IV 300 V. This needs to be a 'professional standard' instrument such as the the Fluke 325 or similar	1	pcs	Fluke 325 True RMS Clamp Meter
12	Insulation resistance tester	Capable of measuring insulation resistance at 250 V, 500 V and 1000 V, isolations-resistance measurement to 20 GΩ, resistance measurement 0,01 Ω - 20 kΩ, AC voltage measurement 0 - 500 V AC , overvoltage CAT IV 600 V	1	pcs	VOLTCRAFT ET-200 Isolationsmes sgerät 50 V, 100 V, 250 V, 500 V, 1000 V 20 GΩ



Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
13	Plug-in wattmeter	To fit AC sockets being used in country (Type C, D or G sockets, the most common one to be selected); capable of measuring appliance power consumption (W), energy (kWh) and cost of electricity consumed	3	pcs	VOLTCRAFT SEM4500 Energiekosten-Messgerät Kostenprognose, Alarmfunktion, Stromtarif einstellbar
14	Hand-held solar irradiance meter	Capable of measuring solar irradiation, hand-held, 0 - 2000 W/m <sup>2</sup> range, resolution 1 W/m <sup>2</sup> , digital display	2	pcs	Handheld Digital Solar Power Meter (Pyranometer) 2000 W/m <sup>2</sup> , 634BTU / (ft <sup>2</sup> xh) Measurement Solar Radiation Energy Insulations Test Device
15	Infrared thermometer	Hand held laser Infrared thermometer, -20 to 100 ° C minimum range, digital display	2	pcs	KETOTEK Infrarot Thermometer Laser Digital IR Thermometer pyrometer Lebensmittel Berührungslos Thermometer Pistole -50-600 °C(-58-1112°F) Thermometer Temperaturprüfgerät (Gelb)
16	Solar Pathfinder	The Solar Pathfinder is the instrument specified. It is relatively low-cost, does not require batteries and is ideal for didactic purposes. To be supplied with tripod.	2	pcs	The Solar Pathfinder, with tripod
17	Sun path diagrams for the Solar Pathfinder (only if Solar Pathfinder can be procured)	For correct latitudes: Available from manufacturer/supplier of Solar Pathfinder	15	pcs	Sunpath Diagram
18	Compass	Basic, low-cost, pocket-size compass, of type used by walkers	4	pcs	CamKpell Professionelle Mini Kompass Kartenmaßstab Lineal Multifunktionsgeräte Outdoor Wandern Camping Survival

Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
					Guiding Tool - Klar
<b>A3</b>	<b>Tools</b>	<b>Specification</b>	<b>Quantity</b>	<b>Unit</b>	<b>Sample item</b>
19	Crimp/termination tools for PV interconnectors	For MC4 PV module connectors, 4-6mm <sup>2</sup> wires (minimum range)	2	pcs	Rennsteing 'Solarkit MC4' Art. Nr. 624 105-55 would be suitable but other kits are available
20	Tool Case for Photovoltaics for solar cable connectors MC4 (Multi-Contact)	A protected and foamed tool case including: - impact-resistant plastic case itself to hold all parts - foam insert with recesses for tools - crimp System Pliers (factory calibrated) with crimping die for solar cable connectors MC4 (Multi-Contact) 4.0 - 10.0 mm <sup>2</sup> - cable shears for copper cables up to Ø 15 mm - assembly tool (Allen key) for changing the crimping dies set of mounting tools to loosen and tighten cable glands of MC4 solar plugs and to open the locking of MC4 housing - Precision Insulation Stripper with adapted blades for larger stripping capacities 4.0 / 6.0 / 10.0 mm <sup>2</sup>	2	pcs	Knipex 97 91 04 V02
21	MC4 mounting tool spanner	mounting tool to loosen and tighten cable glands of MC4 solar plugs and to open the locking of MC4 housing	20	pcs	
22	Torque wrench for MC4	3.0-6.0 Nm, Accuracy ±6 %	1	pcs	Stäubli Torque Tool PV WZ Set
23	Torque wrench for PV	1/4" drive, 2-20Nm, ± 3% accuracy, ISO 6789-1	2	pcs	HASKYY
23	Torque wrench for PV	1/2" drive, 20-50Nm, ± 3% accuracy, ISO 6789-1	2	pcs	STIER Premium+
24	Hydraulic crimp tool	For crimping aluminium and copper tubular cable lugs and connectors on cables with large cross-sections Clean crimping with hexagon Prevents high contact resistance Automatic adjustment of the contact pressure Crimping range (aluminium): 35 - 300 mm <sup>2</sup> Crimping range (copper): 16 - 400 mm <sup>2</sup> Max. crimping pressure: 16 tonnes 12 crimping jaw sets can be used for: 16, 25, 35, 50, 70, 95, 120, 150, 185, 240, 300, 400 mm <sup>2</sup>	1	pcs	BGS Crimpzangen-Satz hydraulisch 16 - 400 mm <sup>2</sup> 9573

Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
25	Crimping tool kit & crimps	Crimping tool kit & supply of 800 min. crimps/lugs. For insulated cable lugs from 0.5 to 6 mm <sup>2</sup> (red-blue-yellow) and non-insulated cable lugs from 1.5 to 10 mm <sup>2</sup> , VDE certified	3	pcs	Crimpzangensatz mit 1000 Kabelschuhen
26	Electrician's tools kit	Set of electricians' insulated hand tools, screwdrivers, pliers, cable cutter, cable stripper, 1000 V insulation, standard IEC EN 60900	20	pcs	BGS 7140   VDE-Zangen- / Schraubendreher-Satz   12-tlg.   inkl. Reißverschluss tasche
27	Adjustable spanners	Maximum opening: 30 mm	3	pcs	LUX Rollgabelschlüssel 250 mm Classic
28	Spanner set	For nuts and bolts widths 6 - 22 mm (recommended range)	2	pcs	BGS 1197   Maul-Ringschlüssel-Satz   12-tlg.   SW 6 - 22 mm   inkl. Tetron-Rolltasche   Gabelringschlüssel
29	Screwdriver set for precision mechanics	For single slot and Philipps screws: 6 different standard sizes	2	pcs	TOOLCRAFT 12-delig Uhrmacher-Schraubendreher-Satz 12teilig Klingebreite: 0.8 mm, 1 mm, 1.2 mm, 1.4 mm, 1.6 mm, 1.8 mm
30	Basic vehicle mechanics tools set	Basic set, socket set, suitable for work on cars and motor cycles, metric	2	pcs	KS Tools 917.0779 1/4 Zoll + 3/8 Zoll + 1/2 Zoll Steckschlüssel-Satz   mit 3 Umschaltknarren, 72-Zahn   matt satiniert   179-tlg.
31	Long tape measures	Also called builder/surveyor's tapes, 20m or more, fibreglass tape (not steel), metric	3	pcs	Deuba Rollbandmaß 50m/100m Beidseitig markiert Fiberglas Öse Maßband Bandmaß Messband Rollmeter Rollmaßband, Variante:50m
32	Hydrometer	For measuring battery electrolyte specific gravity	3	pcs	Batteriesäure-Prüfer

Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
33	Allen key set	Key sizes : 1.5 - 10 mm approx.	2	pcs	Presch Innensechskant Satz 13 tlg mit Kugelkopf HX - Profi Innensechskantschlüssel Set - Schlüssel klein und kompakt mit Halter
34	Clipboards	Suitable for outdoor use, A4, perspex	15	pcs	Office Depot Klemmbrett Blau
<b>A4</b>	<b>Extras and spares</b>	<b>Specification</b>	<b>Quantity</b>	<b>Unit</b>	<b>Sample item</b>
35	Safety harness kit for working at height / on roofs	Complete kit. including harness, fall arrest lanyard, D rings, and packing case/rucksack	10	pcs	Absturzsicherung Rückhalteset Hubarbeitsbühnen im Koffer Basic
36	Replacement batteries for multi- und clamp meters	spare part for multimeters, check requirements of procured meters and provide multiple spare batteries of all required types	20	pcs	
37	multimeter special cables (thermocouples, croco clamps, etc.)	only if not supplied with original multimeter or clampmeter equipment in this tender	10	pcs	
38	Multiple socket strip with personal protection	min. 4 sockets, Robust trunking socket strip with FI/LS function, Connection cable H05VV-F3G1.5mm <sup>2</sup> , 1.4m - 16A; 250V~; max. 3,600 W - IP 20 - with increased touch protection - RCD/LS switch (B 16 A / 30 mA)	2	pcs	EL PS SDL
39	Tool cases for trainees and their tools	Tool box with metal locks Removable tool holder metal locks 2 integrated storage compartments in the lid External dimensions: 320 x 155 x 139 mm Internal dimensions: 298 x 117 x 108 mm Weight: 595 g Material: Plastic	10	pcs	Perel VEL OM13M
40	Hot air gun or blower	Hot air blower Air volume: 150 - 500 l/min Special features: with accessories + incl. bag Temperature setting: 50 - 650 °C Operating voltage: 230 V Power: 2300 W	2	pcs	Bosch Professional GHG 23-66
41	Schottky Diode 15 A 45 V	THT axial bypass diode, 15A, 45V	25	pcs	
42	Multifunction Tool	Battery powered, fully variable speed 5.000 35.000 1/min, at least with 30 accessories, 12VDC, carry case	2	pcs	Dremel Multifunktion swerkzeug 8220-2/45
<b>B</b>	<b>PV EXERCISE BOARDS</b>				

Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
	<b>PV modules</b>	<b>Specification</b>	<b>Quantity</b>	<b>Unit</b>	<b>Sample item</b>
1	PV module	PV module, <b>polycrystalline</b> , 36 cells, 120 Wp approx., 20 Voc approx., 36 cells, aluminium frame, junction box not pre-cabled (openable, not sealed), product certification IEC 61215	3	pcs	Solar Module Phaesun Sun Plus 110
2	PV module	PV module, <b>monocrystalline</b> , 36 cells, 120 Wp approx., 20 Voc approx., 36 cells, aluminium frame, junction box not pre-cabled (openable, not sealed), product certification IEC 61215	3	pcs	Solar Module Phaesun Sun Plus 165 P
3	PV module	Mono or polycrystalline, 150 Wp approx., 40 Voc approx., 72 cells, aluminium frame, junction box not pre-cabled (openable, not sealed), product certification IEC 61215	3	pcs	Solar Module Phaesun Sun Plus 200_5
4	PV module	20 -50 Wp (small), monocrystalline and polycrystalline, 20 Voc approx., 36 cells, aluminium frame, junction box not pre-cabled (openable, not sealed), product certification IEC 61215, a selection of different types	3	pcs	Solar Module Phaesun Sun Plus 20 S
	<b>PV cable connectors</b>	<b>Specification</b>	<b>Quantity</b>	<b>Unit</b>	<b>Sample item</b>
5	PV module inter-connection connectors (male)	MC4 male connectors for 4 mm <sup>2</sup> solar cable. and suitable for above crimp/termination tool, IP65, 30 A, 1000 DC	100	pcs	MC4 connectors: 100 Paar Solarstecker und Buchse für 4-6mm <sup>2</sup> Solarkabel
6	PV module inter-connection connectors (female)	MC4 female connectors for 4 mm <sup>2</sup> solar cable. and suitable for above crimp/termination tool, IP65, 30 A, 1000 DC	100	pcs	MC4 female connectors for 4 mm <sup>2</sup> solar cable. and suitable for above crimp/termination tool, IP65, 30 A, 1000 DC
7	PV module inter-connection connectors (female)	MC-4 compatible PV connectors, male, which do not require specialised tools, for 4 mm <sup>2</sup> solar cable, IP65, 30 A, 1000 DC	100	pcs	Phoenix Contact SUNCLIX oder Weidmüller PV-Stick
8	PV module inter-connection connectors (male)	MC-4 compatible PV connectors, female, which do not require specialised tools, for 4 mm <sup>2</sup> solar cable, IP65, 30 A, 1000 DC	100	pcs	Phoenix Contact SUNCLIX oder Weidmüller PV-Stick
9	MC4 Y-plug	MC4 compatible Y-connector for parallel connection of PV modules	10	pcs	Phaesun 391825 Quick Clip Y-connector
	<b>DC exercise boards</b>	<b>Specification</b>	<b>Quantity</b>	<b>Unit</b>	<b>Sample item</b>

Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
10	Solar charge controller (standard, without MPPT)	10A module current / 10A load current minimum, PWM, 12/24 V, no MPPT, LED (3 indicating battery state of charge) or LC display, cable input/output terminals for 6 mm <sup>2</sup> cable min., for lead-acid batteries, overload protection, low voltage disconnect, reverse polarity protection, temperature compensation, open circuit protection when not connected to battery, IP 20 min., 2-year manufacturers warranty	3	pcs	Steca Solsum 1010
11	Solar charge controller (standard, without MPPT)	20A solar module current / 20A load current minimum, other specs as above	3	pcs	Steca Solarix PRS 1010
12	Solar charge controller (with MPPT)	25 A min. approx. (in/out), 12/24 V, with MPPT range 17 V ... 100+ V (34 V ... 100+ V approx), LC display, cable input/output terminals for 10 mm <sup>2</sup> cable min., for lead-acid batteries, overload protection, low voltage disconnect (deep discharge protection), regular equalisation charge, overcharge protection, reverse polarity protection, temperature compensation, open circuit protection when not connected to battery, IP 20 min.	2	pcs	Steca Solarix MPPT3020
13	Inverter (battery inverter)	12 V DC input, from 220 - 240 V 50 Hz power output, 200 - 500 W (200 - 500 VA continuous power), pure sine wave, IP 20 min, overload and short circuit protection, reverse polarity protection as internal fuse, deep discharge battery protection, to be sourced from a supplier of equipment for PV systems and recommended by that PV supplier for use in off-grid PV systems (not a cheap inverter of the type used in motor vehicles), <u>not</u> to contain integrated solar charge controller  If possible provide inverters from 2 different manufacturers	6	pcs	Inverter Studer AJ 275-12
14	DC lamps, 12 V, florescent	12 V, florescent lamps with replaceable bulb/tube 3 x 7 W 3 x 9 W 3 x 11 W	12	pcs	Lumina DC compact E27 also acceptable
15	DC lamps, 12 V, LED	12 V DC, LED, 2 W, E27, 200 lumens min., warm white various wattage, e.g. 3 x 5 W 3 x 10 W 3 x 15 W	12	pcs	E27 LED Lamps
16	DC lamps, 12 V halogen	12V, halogen, with reflectors, selection between 10W and 40W	12	pcs	OSRAM Eco Halogen EEK: B (A++ - E) GU5.3 45 mm 12 V 14 W Warmweiß Reflekt

Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
17	Lamp holders	E 27 lamp holder, plastic, heavy duty, for surface mounting on work board	14	pcs	
18	DC fans	12 V DC desk fan. 10 W min., 20 W max.	3	pcs	DC Table Fan Fast Breeze
19	DC/DC converter	DC/DC converter, 12 V to 24 V, 1,5 A minium output	6	pcs	Spannungswandler Steca Solsum VC
20	DC sockets	Socket outlet for 12/24 V DC, for surface mounting on work board	12	pcs	DC Double Surface Socket 12 - 48 V
21	DC plugs	DC plugs to fit above DC sockets	12	pcs	DC Plug No Earth 12 - 48 V
22	Junction boxes	100 x 100 x 40 mm (LxWxH) approx., surface mounting (for work board)	30	pcs	Surface Mount Junction Box HJB1010, IP54
23	DC miniature circuit breakers	DC miniature circuit breaker, 1-pole, 80VDC, 6A tripping current, 1 pole, suitable for DIN rail mounting	6	pcs	DC Circuit Breaker CBI QY-1 (13) D,U2,6A
24	DC miniature circuit breakers	DC miniature circuit breaker, 1-pole, 80VDC, 10A or 16A tripping current, 1 pole, suitable for DIN rail mounting	12	pcs	DC Circuit Breaker CBI QY-1 (13) D U2 16A
25	DC miniature circuit breakers	DC miniature circuit breaker, 1-pole, 80VDC, 40A or 50A tripping current, 1 pole, suitable for DIN rail mounting	8	pcs	DC Circuit Breaker CBI QY-1 (13) D U2 40A
<b>AC exercise boards</b>					
	Equipment	Specification	Quantity	Unit	Sample item
26	Consumer unit / fuse board	To fit DP main switch and and 2 - 3 MCBs and E terminal, for 220 - 240 V 50/60 Hz power supply, IP65	3	pcs	Spelsberg AK 05 - Kleinverteiler IP65, 1-reihig, 5 PLE
27	Miniature circuit breaker (MCB) AC	Single-pole, 6A, Type B, 220 - 240 V 50/60 Hz, to fit above consumer unit / fuse board	3	pcs	MCBB 10.6-1 Leitungsschutzschalter, Char. B, 6 A, 1 polig
28	Miniature circuit breaker (MCB) AC	Single-pole, 16A, Type B, 220 - 240 V 50/60 Hz, to fit above consumer unit / fuse board	3	pcs	MCBB 10.16-1 Leitungsschutzschalter, Char. B, 16 A, 1 polig
29	Residual current device (RCD)	Type A 25A 30mA RCD, 220 - 240 V 50/60 Hz, to fit above consumer unit / fuse board	3	pcs	A9Z21225 Fehlerstrom-Schutzschalter iID, 2P, 25A, 30mA, Typ A
30	Socket outlet	Type C 230 V, 2 pole excl. Grounding surface mounted (incl box for surface mounting on board), indoor use, IP22 or IP2X min.	8	pcs	Type C 230 V, 2 pole excl. Grounding surface mounted (incl box for surface

Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
					mounting on board), indoor use, IP22 or IP2X min.
31	Socket outlet	Type D 230 V, 3 pole incl grounding surface mounted (incl box for surface mounting on board), indoor use, IP22 or IP2X min	8	pcs	Type D 230 V, 3 pole incl grounding surface mounted (incl box for surface mounting on board), indoor use, IP22 or IP2X min
32	Socket outlet	Type G 230 V, 3 pole incl grounding surface mounted (incl box for surface mounting on board), indoor use, IP22 or IP2X min.	8	pcs	Type G 230 V, 3 pole incl grounding surface mounted (incl box for surface mounting on board), indoor use, IP22 or IP2X min.
33	Plug	Type C, to fit above sockets	4	pcs	Type C, to fit above sockets
34	Plug	Type D, to fit above sockets	4	pcs	Type D, to fit above sockets
35	Plug	Type G, to fit above sockets	4	pcs	Type G, to fit above sockets
36	Connector blocks / terminal strips	Screw terminal strip, 3A, 400VAC, for 2.5 mm2 cable (10-12 connector blocks per strip, 240 blocks in total )	25	strips	3A 12-Terminal Terminal Strips 10 Pack
37	Connector blocks / terminal strips	Screw terminal strip, 6A, 400VAC, for 4 mm2 cable (10-12 connector blocks per strip, 240 blocks in total )	25	strips	6A 12-Terminal Terminal Strips 10 Pack
38	Connector blocks / terminal strips	Screw terminal strip, 16A, 400VAC, for 6 mm2 cable (10-12 connector blocks per strip, 240 blocks in total )	25	strips	16A 12-Terminal Terminal Strips 10 Pack
39	Earth blocks	4-Way Earth Block Nickel-plated, Suitable for 16-25mm <sup>2</sup> Cables, Brass Construction	6	pcs	4-Way Earth Block
	<b>Cables, etc.</b>	<b>Specification</b>	<b>Quantity</b>	<b>Unit</b>	<b>Sample item</b>
40	Flex	1.5 mm2 flexible cable for connecting appliances to plugs, 3-core incl. PE) , very flexible, copper. PVC sheathed, H05-VVF, 50 m roll	2	pcs	H05VV-F 3G0,75 - PVC-Schlauchleitung, grau,



Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
41	Cable	1.5mm <sup>2</sup> , 2-core (no PE), <u>multi-stranded</u> , very flexible, copper, PVC sheathed, H05-VVF, 50 m roll	2	pcs	H05VV-F 2x1,5 - PVC-Schlauchleitung, schwarz,
42	Cable	2.5mm <sup>2</sup> , 2-core (no PE), <u>multi-stranded</u> , very flexible, copper, PVC sheathed, H05-VVF, 100 m roll	2	pcs	H05VV-F 2x2,5 - PVC-Schlauchleitung, schwarz
43	Cable	2.5 mm <sup>2</sup> flexible cable for connecting appliances to plugs, 3-core incl. PE) , very flexible, copper. PVC sheathed, H05-VVF, 50 m roll	2	pcs	H05VV-F 3G2,5 - PVC-Schlauchleitung, schwarz
44	PV cable / 'solar cable'	4 mm <sup>2</sup> , double insulated, single-core, UV protected ,cable specified for the interconnection of PV modules, <u>fine multi-stranded</u> , copper, temperature rating -40°C - 90°C , 1000 DC, Class II (double insulated), halogen free, flame resitant, 100 m roll	4	pcs	HELUKABEL SOLARFLEX®-X H1Z2Z2-K 4 qmm schwarz 100m
45	Cable	6 mm <sup>2</sup> single-core, <u>fine multi-stranded</u> , PVC, red, very flexible, copper, unsheathed, H07V-K 100 m red roll	2	pcs	H07V-K 6 - PVC-Aderleitung, feindrätig
46	Cable	6 mm <sup>2</sup> single-core, <u>fine multi-stranded</u> , PVC, red, very flexible, copper, unsheathed, H07V-K 100 m black roll	2	pcs	H07V-K 6 - PVC-Aderleitung, feindrätig
47	Cable	6 mm <sup>2</sup> single-core, <u>fine multi-stranded</u> , PVC, red, very flexible, copper, unsheathed, H07V-K 100 m yellow-green roll	2	pcs	H07V-K 6 - PVC-Aderleitung, feindrätig
48	Cable	10 mm <sup>2</sup> single-core, <u>fine multi-stranded</u> , PVC, red, very flexible, copper, unsheathed, H07V-K 100 m red roll	2	pcs	H07V-K 10 - PVC-Aderleitung, feindrätig,
49	Cable	10 mm <sup>2</sup> single-core, <u>fine multi-stranded</u> , PVC, red, very flexible, copper, unsheathed, H07V-K 100 m black roll	2	pcs	H07V-K 10 - PVC-Aderleitung, feindrätig,
50	Cable	10 mm <sup>2</sup> single-core, <u>fine multi-stranded</u> , PVC, red, very flexible, copper, unsheathed, H07V-K 100 m yellow-green roll	2	pcs	H07V-K 10 - PVC-Aderleitung, feindrätig,
51	Electrical insulation tape	25 m length rolls, 20 mm width, approx., max heat resistant temperature 90 °C 5 x red 10 x black 5 x blue 5 x yellow/green	25	rolls	3M Temflex Insulating Tape Green / Yellow 25m x 19mm This is an example for yellow/green only.
	<b>Batteries &amp; accessories</b>	<b>Specification</b>	<b>Quantity</b>	<b>Unit</b>	<b>Sample item</b>

Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
52	Battery	12 V lead gel, 60 - 90Ah, sealed, maintenance-free, 'solar batteries'	8	pcs	Battery Sonnenschein Solar S12/60A
53	Battery terminals (pairs)	To fit above battery	10	pcs	
54	Lead-acid batteries	12 V lead-acid, 60 - 90Ah, flooded, 'solar batteries', dry, to be filled with supplied acid at site	5	pcs	100 Ah, can range from truck SLI batteries to high quality SLI batteries
55	Battery terminals (pairs)	To fit above battery	6	pcs	
56	Battery charger	Suitable for charging sealed 12 V 100 Ah lead-acid battery, from 220 - 240 V 50/60 Hz power supply, charging rate 0.8 A / 3.6 A, robust quality, IP65	2	pcs	Battery Charger 4 Load Multi CB 3.6
57	Funnel	For safely pouring distilled water into batteries, resistant to acids	3	pcs	Pressol 02363 Trichter 0.25 l 100 mm
58	Acid pump (hand-driven)	Device for safely filling a battery with acid, for demonstration purposes mainly	2	pcs	Batteriesäure-Pumpe
59	Work board	1 x 1.5 m approx., thickness 20-25 mm, wood or wood composite, suitable for firmly fixing electrical components to it via wood screws	10	pcs	1 x 1.5 m approx., thickness 20-25 mm, wood or wood composite, suitable for firmly fixing electrical components to it via wood screws
<b>C</b>	<b>HYBRID SYSTEM</b>				
	<b>Solar PV ground mounted installation and additional knock-down installation (made up of the following components)</b>	<b>PV = min. 5 kWdc Inverter = in total min. 5 kWdc nom. true hybrid complete mounting board with pre-installed material as noted below for complete turn-key installation and additional consumables (e.g. wires, fuses, battery fuses, combiner and distribution boxes, load center, earthing system, surge protection devices, etc.) lump sum, turn-key installation at site by a qualified technician Documentation for all technical products shall be available</b>			

Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
1	PV modules	<p>minimum 500+ W each, IEC certified, mono-crystalline</p> <p>(the number of module should be chosen to make the appropriate strings as per the need of the hybrid inverter with cumulative PV capacity more than 5 kW)</p>	10	pieces	Jinko Tiger Neo JKM445N-54HL4R-V - 445Wp (BFR)
2	PV string hybrid inverter	<ul style="list-style-type: none"> <li>- The inverter brand must satisfy all the IEC/IS regulations issued by the national authority in Bhutan</li> <li>-Should have the capacity to export power to grid (with an option to turn off the grid export), charge the battery bank from PV solar and Electricity both with option of priority setting.</li> <li>- Should be compatible with VRLA Battery and LiFeO4 both with option for selection</li> <li>- Three-phase connection (single-phase optional if three-phase system not common)</li> <li>- 5000 W AC output, capable to provide backup power in case of grid-failure</li> <li>- Min. 5000 W PV power to be connected</li> <li>- certified and compliant with the national distribution grid</li> <li>-- Rated AC-output minimum 80% of cumulated rated DC-power of solar modules offered in bid (item 1)</li> <li>- 1 or 2 MPP trackers</li> <li>- 5-year warranty</li> <li>- VDE-AR-N 4105 compliant</li> <li>- altitude certified between 1500 and 3000 m above sea level</li> </ul>	1	pieces	SMA Sunny Boy 5.0
3	Battery system	<p>Cell chemistry: LiFePo4</p> <ul style="list-style-type: none"> <li>- Min. 4000 Wh usable storage capacity at 100% DOD)</li> <li>- Min. 4000 cycles</li> <li>- system voltage and integrated BMS compatible with the installed battery (or hybrid) inverter (certified by manufacturer of inverter)</li> </ul>	1	piece	BYD Battery Box Premium HVS 5.1 (or LVS 4.0 for low voltage systems)
4	Monitoring	If not included as a functionality of the hybrid inverter), provide a separate monitoring system that monitors the main system parameters and sends them to the manufacturer's data portal.	1		
5	BOS-set	set to include all wires, connectors, junction distribution boxes, switchgear, fuses, installation material to integrate a fully operational system	1	set	BOS-set
6	Consumables	4mm <sup>2</sup> DC solar cable: double-insulated, UV-resistant, single core, black	200	m	4mm <sup>2</sup> DC solar cable: double-insulated, UV-resistant, single core, black
7	Consumables	DC-connectors: MC4, Sunclix or similar for 4mm <sup>2</sup> cable, male	50	pieces	DC-connectors: MC4, Sunclix or similar for

Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
					4mm <sup>2</sup> cable, male
8	Consumables	DC-connectors: MC4, Sunclix or similar for 4mm <sup>2</sup> cable, female	50	pieces	DC-connectors: MC4, Sunclix or similar for 4mm <sup>2</sup> cable, female
9	Consumables	Cable ties, 20 cm, UV-resistant	400	pieces	Cable ties, 20 cm, UV-resistant
10	Mounting	Ground-mounted mounting system for solar modules. Also include different types of mounting structures for sloped roof/flat roof and other types of surface for display purpose (structure to install one set of module will be enough to display)	1	set	Ground-mounted mounting system for solar modules. Also include different types of mounting structures for sloped roof/flat roof and other types of surface for display purpose (structure to install one set of module will be enough to display)
11	EPC-service	Concept, engineering, procurement, shipping, installation and commissioning of hybrid system - to include a complete set of system documentation (manuals, datasheets, SLD, wiring diagrams, etc.)	1	lump sum	
<b>D</b>	<b>Residential Rooftop</b>				

Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
	<b>Solar PV rooftop mounted installations (made up of the following components)</b>	<b>PV = min. 1000Wp</b> <b>3 sets for different Bhutanese roof structures and complete mounting kit and switchgear with pre-installed material as noted below for complete turn-key installation and additional consumables (e.g. wires, fuses, battery fuses, combiner and distribution boxes, load center, earthing system, surge protection devices, etc.)</b> <b>lump sum, turn-key installation at site by a qualified technician</b> <b>Documentation for all technical products shall be available</b>			
1	PV Modules Total min 350Wp, Voltage suitable for Charge Controller, Inverter	PV saline protection (IEC 61701) if location is close to the sea Nominal Power per PV Module min 350 W (when using multiple PV Modules they have to be the same manufacturer and model) Bypass diodes min 3 Reverse Current min 15 A Voltage Capability min 1000 VDC IP Class Junction Box min IP65 Temperature Range range -40...85°C Cell Efficiency min 18% Power Tolerance max 5% MC4 Compatible Connectors Monocrystalline or Polycrystalline Technology	6	pcs	
2	PV module mounting bars	PV module mounting according to the 3 rooftop types specified below, complete set with screws, bolts, nuts, washers for best practise installation, stainless material	3	set	
3	Roof Mounting Substructure	corrugated roof as per Bhutanese standard and typical inclination angle, 10m <sup>2</sup> area, concrete foundation, fixation points for safety hookline for rooftop mounting trainings, bolts, screws and all mounting consumables must be included	1	set	
4	Roof Mounting Substructure	Aluminium mount for flat roofs and east-west facing PV module installations, 10m <sup>2</sup> area, concrete floor, screws and mounting anchors, stainless material	1	set	
5	Roof Mounting Substructure	Trapezoidal sheet metal roof as per Bhutanese standard and typical inclination angle, 10m <sup>2</sup> area, concrete foundation, fixation points for safety hookline for rooftop mounting trainings, bolts, screws and all mounting consumables must be included	1	set	
6	wooden or concrete ground mounting for roof fixation	including all consumables needed to hold the roof in place	3	set	
7	Snap hooks		10	pcs	
<b>E</b>	<b>Solar Street Light</b>				
	<b>Solar street light outdoor</b>				

Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
1	Solar Street Light Kit	Park lamp for public areas and paths, 12W high efficiency LEDs, 1620 lumens, incl. lamp bracket, module mounting structure, top of pole mount battery box, solar charge controller with time program function, 80Wp module, 60Ah sealed battery	4	pcs	PV Park Lamp LED Western SPL 12 W-Light 12 Kit
2	Lamp post for Street Light Kit	lamp post 5 metres high with accessories for ground assembly, corrosion safe (anodized)	4	pcs	
3	Scaffold complete assembly	TÜV certified; 5,30 m working height, 200 kg/m <sup>2</sup> load according to DIN EN 1004-1; movable with castors	1	pcs	KRAUSE ProTec Alu-Fahrgerüst AH 5,30 m
4	Scaffolding Elevator Console with Pulley	compatible with scaffolding system, load capacity: minimum 200 kg; rope and attachment to pull up batteries and PV modules to train part exchange	1	pcs	Scaffolding Lift Müba Console
5	Ladder	6 m working height with stair function, aluminium, must withstand up to 150kg	1	pcs	KRAUSE STABILO Vielzweckleiter 3x8 Sprossen
<b>F Solar water pumping indoor</b>					
1	500...700 W Solar Water Pumping System (made up of the following components)	set, complete mounting board with pre-installed material as noted below for complete turn-key installation and additional consumables (e.g. wires, fuses, battery fuses, combiner and distribution boxes, load center, earthing system, surge protection devices, etc.) All components shall be pre-installed on a mounting board covering electrical components and consumables. PV modules and batteries are not part of the mounting board but their cabling and connection has to be designed for plug and play usage. lump sum, turn-key installation at site by a qualified technician Documentation for all technical products shall be available			
2	Submersible pump system (will be inserted into reservoir)	Submersible Pump, range 500...700 W Complete submersible pump kit - DC submersible water pump - DC submersible water pump controller - submersible cable for electrical connection - flexible water pipes of sufficient length (installation set)  Pump has to be attached to the mounting board at the lowest point with no electrical components below. Electronic equipment has to be protected from accidental water pipe bursts by using transparent shielding. Pumping Head max 15 m Flow Rate min 15 m <sup>3</sup> /h Water Pipe Length, 2 pcs, min 30 m, One for each reservoir. Reservoirs will be installed	1	pcs	LORENTZ S1-200 HR07

Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
		outside the building for safety reasons. Connection has to be pluggable without tools for setup and removal. Dry Run Protection Sensor. Has to be attached to mounting board Tank Full Sensors, 2 pcs, One for each reservoir. Cable length must be 30m.			
3	Safety water level sensor for safety water reservoirs		2	pcs	Phaesun Water Level Switch
4	DC bench power supply (to simulate PV modules)	voltage and current specifications according to both pumps; at least 2 channels; adjustable 0 - 30 VDC; 0 - 3A; 195W; Resolution: Voltage: $\leq 0.01\% + 2\text{mV}$ ; Current: $\leq 0.01\% + 250\mu\text{A}$	2	pcs	Rigol DP832
5	Surface Pump (wall mount on mobile work bench)	complete surface pump kit - DC surface water pump - DC surface water pump controller - flexible water pipes of sufficient length (installation set) - 2 water level sensors (high/low) - dry running protection	1	pcs	Shurflo Premium 2088-514-145 with Pump Controller Shurflo LCB-G75
6	Water pressure gauge	according to used water pipes	2	pcs	
7	Water reservoir	200 litres with cover	2	pcs	Plastic lidded barrel 220 litres
8	Safety water reservoir (water reservoir will stand inside)	PE, must be able to take up all the water from both reservoirs plus safety (volume of one reservoir)	2	pcs	
9	Mobile work bench	including RCD with 6 AC outlets, electrically safe and acid resistive coating, dimensions: 1250 x 1970 x 700 mm	1	pcs	Lucas Nuelle ST7200-3A
10	Acrylic safety housing for surface pump	dimensions must match the surface pump	1	pcs	
11	Emergency stop switch for pumps	red emergency stop button on yellow background, surface mounted	1	pcs	EATON 216524
12	Pressure valve	Flux 0.4-10 m <sup>3</sup> /h, regulate flow rate	1	pcs	
13	Flow meter	Min. 0.4 m <sup>3</sup> /h - 10 m <sup>3</sup> /h/ Digital output via USB	1	pcs	
14	Relay box with 4mm laboratory safety connectors	plastic box with DIN rail mount to hold 3 relays - 6 red 4mm terminals (32 A rated) with 2.5mm <sup>2</sup> cable connections to 3 relays - 6 black 4mm terminals (32 A rated) with 2.5mm <sup>2</sup> cable connections to 3 relays	1	pcs	has to be built, not available as off-the-shelf-product
15	Work board (to be attached to the mobile work bench)	dimensions must match and fit to the mobile work bench, e.g. 1250 x 1000 mm; 20 mm thickness	2	pcs	
<b>G</b>	<b>Tools for testing</b>				
1	Isolation measurement equipment/ installation tester	DIN EN 62446, USB, display, IP50, CAT III 300 V/CAT I 1000 V	1	pcs	Benning PV 1-1 Installationster kalibriert (ISO) VDE-Norm 0126
2	Ground earth resistance tester digital	IP67 Dustproof and Waterproof, Two-electrode method/three-electrode method (switchable), $\pm 1.5\%$ rdg $\pm 4$ dgt accuracy, Auxiliary Earthing Rod L9840 (2 piece set) $\times 1$ ,	1	pcs	Hioki EARTH TESTER FT6031-50

Sl.	Equipment	Specification EN	Quantity	Unit	Sample item
		Measurement Cable L9841 (black 4 m) ×1, Measurement Cable L9842-11 (yellow 10 m, equipped with winder) ×1, Measurement Cable L9842-22 (red 20 m, equipped with winder) ×1, Carrying Case C0106 ×1, Protector ×1, LR6 Alkaline battery ×4, Instruction manual ×1			
3	Digital phase detector	Positive phase, negative phase (Three-phase 3-wire, Three-phase 4-wire), open phase, prediction of ground phase (Three-phase 3-wire), 600 V AC (CAT IV), including cables and batteries	1	pcs	Hioki PD3259-50
4	Solar irradiance metre professional	Solar irradiation measurement in W/m <sup>2</sup> for PV systems in accordance with DIN EN 62446 (VDE 0126-23) and solar thermal systems, Wireless connection to BENNING PV 2, BENNING PV 1-1, BENNING PV 3, Data logger for 5000 displays  The scope of delivery shall include the bag, rubber protection frame, module and ambient temperature sensor, batteries, USB cable, download software and calibration certificate.	1	pcs	Benning SUN 2 Photovoltaik-Multimeter kalibriert (ISO)
5	Thermography camera	Image quality with IR resolution of minimum 320 x 240 pixels, 640 x 480 pixels preferred, -20 bis 550 °C, WiFi	1	pcs	FLIR E8xt Wärmebildkamera
6	Clampmeter for PV	IEC 62446, true RMS, 1500 VAC, 2000 VDC,	2	pcs	PV-Stromzange BENNING CM 10-PV
8	IR thermometer	Fluke 62 MAX Infrarot-Thermometer Optik 10:1	4	pcs	Fluke 62 MAX Infrarot-Thermometer Optik 10:1
9	Multimeter x2	Fluke 289 FlukeView® Forms Combo Kit	2	pcs	Fluke 289 FlukeView® Forms Combo Kit
10	IV-Curve tracer - HT I-V500W	Testing Equipment: IV-Curve Tracer, I-U characteristic measurement up to 1500 V/15 A, Power measurement of modules and strings, Open-circuit voltage (VOC) up to 1500 V Short-circuit current (ISC) up to 15 A Irradiation measurement with reference cell included, Ambient & module temperature with sensor included	1	pcs	HT I-V500w or PVPM1540X
11	Pyranometer	ISO 9060 spectrally flat Class A, 5-year full warranty	1	pcs	CMP6, CMP10



**Additional list for solar PV tools, Instruments:**

	<b>Protective equipment &amp; safety gears</b>	<b>Specification</b>	<b>Quantity</b>	<b>Unit</b>	<b>Sample item</b>
1	First aid Kit		2	nos	
2	Electrical safety belt		5	Nos	
3	Fire Extinguisher CO2	2 kg	2	Nos.	
4	Fire buckets	Standard size	2	nos	
	<b>Solar Electrician Tools &amp; accessories</b>	<b>Specification</b>	<b>Quantity</b>	<b>Unit</b>	<b>Sample item</b>
1	Pipe vice Cast Iron with hardened jaw open type	100mm	2	nos	
2	Hand Vice	50 mm jaw	2	nos	
3	Table Vice	100 mm jaw	2	nos	
4	Hacksaw frame (with blade)	Adjustable 300 mm Fixed 150 mm	2, 2	Nos. each	
5	File flat	200 mm 2nd cut with handle	2	nos	
6	File half round	200 mm 2nd cut with handle	2	nos	
7	File round	200 mm 2nd cut with handle	2	nos	
8	Pliers long nose insulated	150 mm	4	nos	
9	Pliers long nose insulated	200mm	4	nos	
10	Pliers flat nose insulated	100 mm	4	nos	
11	Punch centre	9mm x150mm	10	nos	
12	Steel Rule Graduated both in Metric and English Unit	300mm with precision of 1/4 <sup>th</sup> mm	15	nos	
13	Electrician screw driver thin stem insulated handle	4mm X 100 mm	10	Nos	

14	Gauge, wire imperial stainless steel marked in SWG & mm	Wire gauge-metric	2	nos	
15	Portable Electric Drill machine & Set of drilling bits wood, steel, stone	0-12 mm capacity 750W, 240V with chuck and key	1	Set each	
16	Pliers Side Cutting	150 mm	2	nos	
17	Wire stripper adjustable length		4	nos	
18	Electrical Loads	Electrical loads: set of Incandescent lamp, Tube light, CFL, LED light, Heater and Geyser	2	sets	
19	Try Square	150 mm blade	2	nos	
20	Electrical load banks	Up to 1.2 KW ( Lamp / heater Type)	2	sets	
21	Heavy duty Trolley for Transportation	HEAVY DUTY TROLLEY , size 90cm X 60 cm, load bearing 300- 400 KG ( for transport of batteries & equipment for demo)	2	nos	
22	Electrical wiring and switch gear rack	Electrical control elements suitable for practice of control circuits using banana plugs and sockets	1	no	<a href="#">Industrial Electrical Wiring Training Systems Panel Boards Manufacturer (acumenlabware.com)</a>
23	Protective relays and contactors rack	suitable for practice of control circuits using banana plugs and sockets	1	no	<a href="#">Industrial Electrical Wiring Training Systems Panel Boards Manufacturer (acumenlabware.com)</a>
24	Types of Cables:	Twisted Pair Nonmetallic Sheathed Cable Underground Feeder Cable Ribbon Cable Metallic Sheathed Cable Multi-Conductor Cable Coaxial Cable Direct-Buried Cable	1	mtr each	
25	Soldering station	Adjustable temperature range (100° - 450°C), 70W, 5 different solder tips, tip stand and sponge	2	set	
26	Solder	100g roll, lead-free	2	pcs	
27	Universal Power extension Strip/cord	Board Power Strip with Fuse Surge Protector 6+1, 6A 230V 1-5-Meter-Long Wire, Master Switch, Multiple sockets, 4 to 5 ways outlet	10	nos	
28	Hand Pallet heavy Lifter	Load Capacity: 3000 kg Lifting height: 200 mm Pump: 3 ton pump	2	nos	<a href="#">24114_Original document toyota mh.pdf (toyota-forklifts.eu)</a>
	<b>Instruments</b>	<b>Specification</b>	<b>Quantity</b>	<b>unit</b>	
1	Sunshine Recorder	Campbell Stokes Sunshine Recorder for latitudes 0-45 N or S. Supplied with 1-year cards	2	nos	<a href="#">Manual Instruments (Title)   Fairmount</a>

		Adjustment for latitude: 0° to 40° N or S Sphere: 102mm +/- 1.3mm diameter. Focal length for sodium D light, 74.9mm +/- 0.25mm Dimensions: 240 x 187 x 165mm Weight: 3- 4kg			<a href="http://fairmountweather.com">fairmountweather.com</a>
1.1	Sunshine recorder spare parts-	winter cards, summer cards, equinoctial cards	Packs of 100 cards	each	
1.2	Sunshine recorder spare parts-	Glass sphere for above model	1	no	
2	Pyrheliometer	For direct normal incidence solar radiation measurement	1	no	CHP1   SHP1, KIPP& ZONEN
3	Clinometer	For angle measurement	2	nos	
4	A.C energy meter	Single phase 10 A, 230V (digital/analog)	2	nos	
5	A.C energy meter	Three phase 15 A, 400/440V (digital/analog)	2	nos	
6	Frequency meter	45 to 55 Hz	2	nos	
7	Cut model of PV cell assembly		2	Nos	
8	Cut model of lead acid battery		1	no	
9	Battery charger	0 - 6 - 9 - 12 - 24 - 48 V, 30amp	1	no	
10	Earth Ground Resistance Meter	A unique earth ground tester that performs fast, accurate testing with and without stakes Tests 3- and 4-pole fall-of-potential, and 4-pole soil resistivity (with stakes) Performs selective earth ground rod testing (one clamp + stakes) Performs stakeless earth ground rod testing (two clamps) Features IP56 rating for outdoor use	2	sets	<a href="https://www.fluke.com/en/product/electrical-testing/earth-ground/fluke-1623-2">https://www.fluke.com/en/product/electrical-testing/earth-ground/fluke-1623-2</a>
11	Power Quality Monitor and Energy Analyzer	helps you locate, predict, prevent and troubleshoot Power Quality Issues – 50Hz, 60Hz and 400Hz			<a href="https://www.fluke.com/en/product/electrical-testing/power-quality/437-series-ii#">https://www.fluke.com/en/product/electrical-testing/power-quality/437-series-ii#</a>
12	RCD/GFCI/ELCB Tester	Current settings:3mA, 5mA, 7mA, 10mA, 15mA, 20mA, 30mA, 35mA, 50mA, 100mA, 125mA, 150mA, 175mA, 250mA, 275mA, 300mA, 375mA, 500mA. Current selection:Rotary switch selector Phase start selection 0° and 180°: Referenced to Earth Yes Over-temperature protection:Yes (3 sensors) Wiring correctness indication:Yes (LEDs)	2	sets	SEW 1812
13	Insulation Resistance Tester and Megohmmeters	User-selectable voltages of 250 V-2500 V Up to 500 GΩ insulation resistance measurement Short circuit current up to 5mA for fast, stable measurements Automatically calculate PI and DAR Perform 1,300+ insulation tests on a single charge	2	sets	<a href="#">Fluke 1535/1537: Insulation Resistance Tester &amp; Megohmmeter   Fluke</a>
14	Multifunction Installation Tester	Installation Tester verifies the safety of electrical installations in domestic, commercial and industrial applications. It can ensure that fixed wiring is safe and correctly installed to meet the requirements of IEC 60364, HD 384 and all relevant local standards	1	set	<a href="https://www.fluke.com/en/product/electrical-testing/installation-testers/fluke-1653b">https://www.fluke.com/en/product/electrical-testing/installation-testers/fluke-1653b</a>

15	Battery Analyzer	The ideal test tool for maintenance, troubleshooting and performance testing of individual stationary batteries and battery banks used in critical battery back-up applications	1	set	<a href="#">Battery Analyzer   Battery Impedance Tester   BT521   BT520   BT510   Fluke</a>
16	Arc welding machine	Single phase, 220V/230V, 200-300 A	1	set	
17	handheld transformer turns ratiometer	Handheld, battery-operated transformer turns ratiometer A handheld transformer turns ratiometer with optional Go/No Go and short-circuit impedance measurement capabilities	1	no	<a href="#">TTRU1 handheld transformer turns ratiometer   Megger</a>
18	Potable Electric Earth Drill machine (Auger)	1500W Post Hole Digger Earth Auger Hole Digger Electric Auger Digging Tools Auger with 6" Digging Auger Bit Set	1	set	<a href="#">1500W 2HP Earth Auger Drill Electric Post Hole Digger Machine 6" Bit For Garden   eBay</a>
19	Battery Rack with trolley/ base wheel	Load per layer 300 kg (3x100 kg or 2x100 kg) Layers Per Rack 2-3 Layer Size 1200 x 1100 mm Use/Application Battery Storage Material: Mild Steel with insulation cover	10	Nos	
20	<b>Software for PV &amp; Thermal</b>				
1	T*SOL (release 2023/2024) for solar thermal design and simulation	Offline Commercial/ Business version, Latest release (2023/2024) Dynamic simulation program for the design and optimization of solar thermal systems	5-10 user licence (offline user)	set	<a href="https://valentin-software.com/en/products/tsol/#release-notes">https://valentin-software.com/en/products/tsol/#release-notes</a>
2	PVsyst 7.4. Professional	Offline version/ Design and simulation of PV system complete system features and tools (on-grid, offgrid, solar pump, shading, economic analysis)	5-10 user licence (offline user)	set	<a href="#">PVsyst – Photovoltaic software</a>

### Retrofitting list of items for the existing PV and thermal Systems:

Sl. No	Retrofit existing solar PV and Thermal systems	Specifications	Quantity	unit	Sample
1	Battery bank for offgrid 7.5 PV kWp system and with connecting terminals/cables	12V, 200Ah, C10 Maintenance-Free Lead Acid Solar Battery. Dimension: 22*240*242mm Weight: 55 to 70 kg Along with Connecting terminals/cables as required.	20	Nos	QW-BG200Ah
2	Standalone solar CPU, 6.25 kVA, Inverter, with charge controller, single phase, nominal voltage 96 V, Vmin= 90 V Vmax 130 V	INVERTER INPUT PARAMETERS Nominal I/P DC Voltage 96V Low battery Pre-warning 90V±2% Low Battery cut off 88V±2% Inverter Restart time after low battery when mains is not available Battery voltage should be ≥103V±2% High Battery shutdown 130V ±2% No load Power Consumption with No load shutdown enable Less than 1% of rated capacity	1	set	SKU: PH-OGI-6

		<p>No load shutdown ON/OFF (Factory settable as per customer requirement)  Permanent OFF after 5minutes  <b>OUTPUT PARAMETERS</b>  Waveform &amp; Regulation throughout battery voltage range at no load  Pure Sine Wave, 230V + 1%  Frequency Regulation 50Hz + 0.5Hz  Efficiency (typical) ≥85%  Total Load 6.25 kVA @ 0.8PF Load  Overload Up-to 200% for approx. 8seconds  THD V (Linear Load) ≤3%  Crest Factor ≥3:1  Power usage Priority From PV Panel Array  Grid power usage Automatic, if batteries voltage ≤ 96 V, get fully charged. After attaining float charge stage mains power usage will discontinue.  Transfer Time PC should not Reboot (Typical 15 msec.)  <b>GRID CHARGER</b> Grid I/P Voltage Range  NW = 185V to 265V / WW = 155VAC-280VAC, ±10V;  Recovery V = 10V  Charging Current Max. 30Amp + 2Amp (settable)  <b>SOLAR CHARGE CONTROLLER</b>  Type Series Regulator  Maximum I/P PV Voltage  25V Per 36 cell Solar PV modules</p>			
3	<b>15 kW hybrid solar Inverter with the storage and grid tied system, 3-phase output</b>	<p><b>Inclusive of supply, installation, testing and commission.</b>  Max.PV <b>input power</b> (kW): 15 kW  Max. PV voltage (V): 1000 V  MPPT voltage range (V): 180-850 V  Full power MPPT voltage range (V): 430-850 V  Min. input voltage/start-up voltage: 125/180 V  Max. input current per MPPT (A): 13/13  Max. short-circuit current (A): 16/16  No. of MPPT trackers : 2  No. of strings per MPPT track : 1/1  <b>AC output:</b>  Nominal output power to grid (kVA): 10  Max. apparent power to grid (kVA): 11  Max. apparent power from grid (kVA): 22  Max. apparent current from grid (A): 31.8  Nominal output current to grid (A): 14.4  Max.output current to grid (A): 15  Nominal grid voltage (V) : 380/400, 3W+N+PE  Nominal grid frequency (Hz): 50/60  THDi: &lt; 3%  THDu &lt;29 %  Max. efficiency: 98.2 %  MPPT efficiency: 99.9%  Max.battery charge/discharge efficiency: 97.5 %  <b>General data:</b>  Ingress protection: IP65  Operating temperature range (°C) : -25 - 60  Relative humidity: 95%  Operating altitude (m): 4000  Dimensions W*H*D (mm): 530*560*220  Net weight : 30-40 kg  <b>Display and communication</b>  HMI: LCD;APP  BMS: CAN  EMS/Meter : RS485/RS485</p>	1	set	<p>Model R15KH3  <a href="#">2023 Megarevo Brochure-V1.2小内存版本 (enfsolar.com)</a></p>

		Supported communication interface: WFI/GPRS			
4	10 kW grid tied solar inverter single phase	<p><b>Inclusive of supply, installation, testing and commission.</b></p> <p><b>Input data (DC):</b>  Max. recommended PV power (for module STC): 8.1 kW  Input voltage range: 100 – 500 V  Nominal input voltage: 360 V  MPPT work voltage range: 80-550 V  Max. input current per string: 13.5 A  Number of independent MPP trackers/strings per MPP tracker: 2/2</p> <p><b>AC output: single phase</b>  Rated AC output power: 6- 7 kW  Max. output current: 30 A  AC nominal voltage: 220/230 V  AC grid frequency range: 50/60 Hz  Maximum Efficiency: 98 %  MPPT efficiency: 99%</p> <p><b>Protection Features:</b>  DC reverse polarity protection yes  DC switch yes  AC/DC surge protection Type III / Type II  Insulation resistance monitoring yes  Ground fault monitoring yes  Grid monitoring yes  Anti-islanding protection yes  Residual-current monitoring unit AFCI protection yes</p> <p><b>General data:</b>  Dimensions (W / H / D): 375/350/160mm  Weight: 10-20 kg  DC connection : H4/MC4(Optional)  AC connection : Connector  Display: OLED+LED/WIFI+APP  Interfaces: RS485 / USB/Wi-Fi/ GPRS/ RF/LAN : yes  Warranty: 5 years / 10 year</p>	1	set	Model : MIN 6000TL-X Growatt inverter
4.1	Balance of System (DC & AC circuit components & accessories) -set	set to include all wires, connectors, junction box, distribution boxes (DCDB, ACDB) switchgear, fuses, installation material to integrate a fully operational system			
4.1.1	Consumables	cable 2 core 16 sq mm, multistarnd copper flexible	100	m	
4.1.2	Consumables	4mm <sup>2</sup> dc solar cable: double-insulated, uv-resistant, single core, black	300	m	
4.1.3	Consumables	4mm <sup>2</sup> dc solar cable: double-insulated, uv-resistant, single core, red	300	m	
		6 mm <sup>2</sup> , 2 core copper flexible	200	m	
4.1.4	Consumables	dc-connectors: mc4, sunclix or similar for 4mm <sup>2</sup> cable, male	20	nos	
4.1.5	Consumables	dc-connectors: mc4, sunclix or similar for 4mm <sup>2</sup> cable, female	20	nos	
4.1.6	Consumables	earthing pipe with clamp (gi pipe 2inch.dia with hole+clamp 25x5mm)	3	nos	
4.1.7	Consumables	earthing strips	100	m	
4.1.8	Consumables	cable ties, 20 cm, uv-resistant	200	nos	
4.1.9	Consumables	array junction box (ip65) polycarbonate or equivalent with provision of 6 pvc glands suitable for 1cx4 sq.mm 2 in 2 out	3	Nos	

4.1.10	Consumables	dc fuse 12 a, 1000v	10	nos	
4.1.11	consumables	diode 12a/1000v, with heat sink	4	nos	
4.1.12	Consumables	3-way terminal block	3	nos	
4.1.13	Consumables	2-pole mcb, 63 amps	1	no	
4.1.14	Consumables	acdb 10kw with manual switch over switch (2 in 2 out)	1	no	
4.1.15	Consumables	dcdb 10kw with manual switch over switch (2 in 2 out)	1	no	
4.2	USB To RS485 Serial Converter Cable	Maximum RS-485 cable length: 1200m Transmission rate 300bps to 1Mbps. Maximum number of devices in the RS485 network: Half Duplex to 32 devices	3	Nos	
5	RS232 communication cable (ethernet cable)	1to 2 m	2	nos	
6	USB to RS232 Serial Converter Cable	USB Serial Adapter with FTDI Chipsets 2.0 to Male DB9 Serial Cable	2	nos	
7	<b>For the existing solar heating System</b>				
7.1	Flat Plate Collector (for replacement of broken collector TATA solar BP )	<b>Dimensions(LxWxH) 2800mm*1100*80mm (Tata BP make or equivalent</b> <b>Absorber area 2.6 m2</b> Conversion factor $\eta$ 77.3 % Loss coefficient a1 w/m <sup>2</sup> K3.9 Loss coefficient a2 w/m <sup>2</sup> k220.0052 Fluid content L2.22 Maximum operating pressure 1 Mpa Temperature of operation(-)35~150 °C Weight empty33 KG Absorberaluminum, $\delta=0.2$ mm CoatingMagnetron Sputtering Blue Coating <b>Riser pipe Copper T2, <math>\Phi 10*0.6</math>mm, 9 pcs</b> Absorber core welding typeLaser or ultrasonic welding Absorptance $\geq 95\pm 2\%$ Emittance $\leq 4\pm 2\%$ Glass coverLow iron rohbic tempered glass:3.4 mm Dimension of glass sheet 2800*1100mm Transmittance of glass87%~91% Framealuminum, $\delta=1.0$ mm Color of the frameBlack or silver Insulation materialGlass wool + HDPE + EPDM Insulation thickness40mm Back SheetGalvanzied steel :0.3mm Cover Sealing MaterialMetal/EPDM+metal	1	no	<b>TATA Solar BP model or Equivalent (2800mm*1100*80mm)</b> <a href="#">TATA Power Flat Plate Collector (FPC) TATA FPC Solar Power Heater, Capacity: 100 lpd at Rs 25000/unit in Bengaluru (indiamart.com)</a>
7.2	<b>Thermocouple Data Logger 4-Channels Thermocouple Thermometer K,J,E,T Type Data Logger, USB PC Software Windows</b>	Measurement RangeK: -200°C~1372°C (- 328°F ~ 2501°F), J: -200°C~1000°C (- 328°F ~ 1832°F), E: -200°C~750°C (- 328°F ~ 1382°F), T: -200°C~400°C (- 328 °F ~ 752°F)(May require appropriate Thermocouple probes) Temperature Resolution0.1°C < 600°C / 0.1°F < 1000°F, 1°C $\geq$ 600°C / 1°F $\geq$ 1000°F AccuracyAccuracy is specified for ambient temperatures between 18°C (64°F) and 28°C (82°F). The specifications do not include thermocouple sensor error. $\pm(0.1\%$ of reading+0.7°C) $\pm(0.1\%$ of	2	nos	<a href="#">PerfectPrime TC0520, 4-Channels Thermocouple Thermometer K,J,E,T Type Data Logger, USB PC Software Windows: Amazon.com: Industrial &amp; Scientific</a>

		<p>reading+1.4°F), below -100°C (-148°F) , ±(0.4% of reading +0.7°C) ±(0.4% of reading +1.4°F)</p> <p>Temperature Coefficient 0.01% of reading + 0.05°C per °C (&lt;18°C or &gt;28°C)</p> <p>Sample Rate 2 time per second</p> <p>Battery Type UM-4 or AAA 1.5V battery x 4</p> <p>Battery Lifetime Approx. 100 hours (alkaline battery)</p> <p>Operation Temperature 0°C to 50°C (32°F to 122°F)</p> <p>Operation Humidity 10 to 90%RH (no condensing)</p> <p>Storage Temperature -20°C to 60°C (-4°F to 140°F)</p> <p>Storage Humidity 10 to 75%RH</p> <p>Dimensions/ Weight 187mm(L) × 75mm(W) × 29mm(H)/ Approx. 290g</p> <p>Standard Accessories Instruction manual, battery 1.5V AAA x 4 pcs, Windows software, micro-USB cable, K type bead probe x 2 pcs, carrying case.</p> <p>Support Windows 7/ Windows 8/ Windows 10,11</p>			
8	<b>Surge Protective Device for above existing PV systems</b>	for protection of AC surges/Lightning surges (direct & indirect)			
8.1	<b>SPD at Main Distribution Load for Both Type I and Type II (if only 1 SPD is to be provided)</b>	<p>Uc Operating Voltage 440 V RMS Three Phase TPN (4 Pole) if 3 Phase and 240/335 V if single Phase</p> <p>Up Peak Voltage 2500 V or 1500 V (2.5 kV or 1.5 kV)</p> <p>In Normal Peak Current 20 kA</p> <p>Ip Maximum Peak Current 50 kA</p> <p>SPD Class--Type I and Type II</p>	2	set	Legrand model no. 4 122 55/57
8.2	<b>SPD at Sub Main Distribution Load</b>	<p>Uc Operating Voltage 440 V RMS Three Phase TPN (4 Pole) if 3 Phase and 240/335 V if single Phase</p> <p>Up Peak Voltage 1500 V or 1.5 kV</p> <p>In Normal Peak Current 20 kA</p> <p>Ip Maximum Peak Current 50 kA</p> <p>SPD Class- Type II</p>	2	set	Legrand model no. 4 122 25
8.3	<b>SPD at Main Distribution Load</b>	<p>Uc Operating Voltage 440 V RMS Three Phase TPN (4 Pole)</p> <p>Up Peak Voltage 2500 V or 2.5 kV</p> <p>In Normal Peak Current 20 kA</p> <p>Ip Maximum Peak Current 50 kA</p> <p>SPD Class--Type I</p>	2	set	Legrand model no. 4 122 57
9	<b>Single phase Bidirectional Energy Meter (solar net metering)</b>	<p>Measurement: 1-phase AC kWh, Active Power, Current, Voltage and etc</p> <ul style="list-style-type: none"> <li>● Accuracy: 1.0% (kWh)</li> <li>● Frequency: 45~65Hz</li> <li>● Rated Voltage: 220~264Vac (direct connect)</li> <li>● Rated Current: 10(80)A AC (direct connect)</li> <li>● Communication: RS485 (MODBUS-RTU)</li> <li>● Multi-rate/tariff: 4 Tariff Rates and etc</li> <li>● Dimension: 90*36*65mm (L*W*H)</li> <li>● Installation: 35mm DIN Rail</li> <li>● Standard&amp;Certificate: IEC; CE; CE-MID; EAC</li> </ul>			<a href="http://acrel-electric.com.au">ADL200 Single phase energy meter - Acrel (acrel-electric.com.au)</a>
10	<b>Three phase Bidirectional Energy Meter (solar net metering)</b>	<p>Three phase bidirectional energy meter</p> <p>Rated voltage – AC3* 380</p> <p>Input current – 3*10(80)A, 3*1(6)A (By CTs access)</p> <p>Accuracy- kWh Class 0.5</p> <p>LCD display</p> <p>DIN 35mm installation</p> <p>Standard &amp; certification – IEC, CE, CE-MID, EAC</p>			<a href="http://acrel-electric.com.au">ADL400 Three phase energy meter - Acrel (acrel-electric.com.au)</a>
11	<b>Items for New STAR-C Lab establishment</b>				



11.1	<b>LCD Projector for Training Hall</b>	Wireless 685Wi Projectors, LCD, Brightness: 2000-4000 Lumens	1	set	<a href="https://www.indiamart.com/epson-wireless-685wi-projectors-lcd-brightness-2000-4000-lumens-at-rs-102279-in-mumbai">Epson Wireless 685Wi Projectors, LCD, Brightness: 2000-4000 Lumens at Rs 102279 in Mumbai (indiamart.com)</a>
11.2	<b>Slide change pointer (laser Pointer)</b>	Slide Changer Wireless Laser Presenter Presentation Remote Clicker Laser Pointer PowerPoint Clicker PPT, Clicker Controller with Clip for PowerPoint USB Presentation Remote, 2.4GHz for Mac/Laptop/Computer/Keynote/PC/PPT	2	Nos	<a href="https://www.amazon.in/rts-Wireless-Presenter-PowerPoint-Presentation/dp/B07XZJSH63">https://www.amazon.in/rts-Wireless-Presenter-PowerPoint-Presentation/dp/B07XZJSH63</a>
12	<b>Electrical Installation items ( optional)</b>	PI refer separate list attached.			

### List of items for Thermal system (solar water heater) module, kits & accessories

Sl. No	Items	Specification	quantity	Unit	Sample item
1	<b>Different types of Solar collectors</b>	For physical demo/ training purpose			
1.1	Unglazed/naked Flat type solar Collector	For demo purpose	2	nos	
1.2	Evaluated Tube Collector (ETC) , U-tube/ heat pipe	For physical demo/ training purpose	2	nos each	
1.3	PVT-Module	hybrid solar panels combine the technology of PV-modules and solar collectors to generate both heat and electricity at the same time	2	nos	Sunmaxx PX-1 Premium PVT-Module (sunmaxx-pvt.com)
1.4	<b>Flat plate solar air heater solar collector</b>	Black Film, Absorption area(m <sup>2</sup> ) 1.89 Header pipe CopperTP2 Φ22x0.8 Grid pipe CopperTP2 Φ10x0.6 Cover material 3.2Low-iron tempered -glass Transmittance ≥92% Bottom cover 0.50mm Hot galvanized plate Insulation Bottom: glass fiber frame: polyester fiber Frame 1.0mm Aluminum Overall size(mm) 1000x2000x80/95	2	nos	<a href="https://btesolar.en.made-in-china.com/product/VBmnKFdUfSp/China-Flat-Plate-Solar-Air-Heater-Solar-Collector.html">https://btesolar.en.made-in-china.com/product/VBmnKFdUfSp/China-Flat-Plate-Solar-Air-Heater-Solar-Collector.html</a>
2	<b>Balance of System: Solar Plumbing circuit components &amp; accessories</b>	For physical demo/ training purpose			
2.1	<b>Solar Pump Station</b>	GENERAL PARAMETERSPECIFICATION InbuiltCirculation Pump Multi-speed Pump3-speed Pump Power Consumption 93 W maxm DisplayPressure & Temperature Flow MeterIncluded Safety ReleaseHigh Pressure Safety Release ConnectionExpansion Vessel Connection	1	set	Resol Pump


		Insulation CasingEPP Casing Circulation PumpWILO Pressure Bearing1 MPa Safety Release0.8 MPa			
2.2	<b>Solar Pump Controller</b>	GENERAL PARAMETERSPECIFICATION InputsPt1000 Tempr Sensor Switching Capacity2A/240 V Power Supply100 ... 240 V ~ (50 ... 60 Hz) Power Consumption< 1 W (Standby) FunctionsFunctionality control Operating Hours Counter Energy Metering Heat Dissipation Function Pump Speed Control HousingPlastic, PC-ABS & PMMA MountingWall Mounting Indication/DisplaySystem Monitoring Display With memory simcard (32 GB) for data logging.	1	set	Resol pump controller
2.3	<b>Plumbing Accessories stainless steel pipe</b>	SPECIFICATION Interconnection PipeStainless Steel Pipe TypeCorrugated Pipe MaterialSS 304 Working Pressure1.6 MPa Working Temperature0 – 150°C Material Thickness0.3 mm	20	metres	
2.4	<b>Interconnection Fittings</b>	¾" Brass Compression Union To Connect Two Collectors	6	nos	
		¾ " Brass Compression Male Union To Connect Plumbing Accessories to Collector	6	nos	
		¾ " Brass Compression End Cap To Plug Collector End	6	nos	
		¾" Check Valve To prevent back flow	6	nos	
		¾" Brass Socket To connect fittings	6	nos	
		¾ " Brass Male Elbow To connect Fittings	6	nos	
		¾" Brass Tee To connect Fittings	6	nos	
		¾" Brass Male Ball Valve To isolate pipeline	6	nos	
		¾ " Brass Female Tee To connect Fittings	6	nos	
		¾" Brass HEX Nipple For Connection	6	nos	
		¾" Brass Bush For Connection	6	nos	
		¾ " Thermostatic Tempering Valve (mixing valve (for mixing cold & hot water )	3	nos	
		Air Release Valve (brass) Purge Air from the system	6	nos	
		P/T Valve (brass) Safety for Pressure & High Temperature	6	nos	
		GI Split Clamp To Support Pipe lines	4	nos	
		EPDM Insulation Tube (ethylene propylene diene monomer rubber) To Prevent Heat Losses	20	metres	
2.5	<b>Temperature Sensor Probe for Solar Water Heater</b>	Brass, thread size standard, inner diameter 6.8mm Length: 100 -120 mm Function: Sensing heat function.	12	nos	

2.6	<b>HT-1000 High Temp Sensor</b>	PT 1000 sensor elements Wire Length: 78.74 IN, Diameter: 0.21 IN, Sensor Length: 1.1 IN Direct installation inside solar collector wells, designed for 1/4" ID pipe side. – Encased in a UV-protected, durable, and flexible silicone rubber sheathing for added longevity.	12	nos	
2.7	<b>High Temperature UV Rated Tape Black 3in x50ft</b>	Tape Width: 3 inches Tape Length: 50 feet Lifespan: 25+ years Color: Black Inside Layer: Self-sticking butyl Usage: For taping all connections between lineset insulation Cleaning: Proper cleaner required (degreaser recommended) for scissors when cutting	10	nos	
2.8	<b>The Solar Hot Water System Pump Charging station</b>	Charging Pump: Product dimensions 9.75 x 4.5 x 7 IN, Voltage 115 V, Water Consumption 1400G, Material: Aluminum, Color: Red Hoses, Adapters for connecting to 3/4 IN G thread pump station, GHT Connector, G Connector, Boiler Drains Empty 15 G Drum Glycol is not included Connections: G Thread 3/4 IN, GHT Thread 3/4 IN, NPT 3/4 IN Male	1	no	<a href="#">Solar Hot Water System Charging Kit - SunMaxx Solar</a>
2.9	<b>Solar hot water flow meter (ultrasonic flow sensor)</b>	– <b>ultrasonic flow sensor</b> single sensor measuring two variables.  – Rapid, precise measurements through direct fluid contact. – Absence of moving parts eliminates mechanical wear. – No increase in measurement error over time. – Plug & play design for quick setup. – Length: 5.08 inches. – Thread: 1" AG. – Maximum operating temperature: continuous 212 °F, short-term 248 °F. – Type: MEMS sensor, silicon-based. – Material: 1.4408 stainless steel. – Protection type: IP 44.	2	nos	
2.10	PEX-AL-PEX pipe	3/4" dia, For hot water outlet line to consumer point	1	Roll	
2.11	Teflon, or PTFE, sealing tape	1/2-inch PTFE Teflon Tape High-Temp, white	10	pcs	
2.12	Teflon Adhesive Tape	1/2-inch PTFE Teflon Tape High-Temp, brown	10	pcs	
2.13	Plumping tool kits	Tool Kit Contents: – Pipe Wrench 350mm – Waterpump Plier 250mm – Basin Wrench 300mm – Adjustable Wrench 250mm – Combination Plier 180mm – Locking Pliers 250mm – Pipe Cutter 3-15mm & 3-28mm – File – Half Round 200mm – PVC Pipe Cutter 42mm – Hex Keys 9pcs (1.5mm to 10mm) – Screwdrivers PH1, PH2, Slotted 3.2x75mm, 4x100mm, 6x100mm, 8x150mm – Trimming Blade with x5 Spare Blades	1	set	<a href="#">MARATHON 36 Piece Plumbers Toolkit</a>

		<ul style="list-style-type: none"> <li>– Mini Hacksaw</li> <li>– 5m Measuring Tape</li> <li>– Builders Pencil</li> <li>– Toolbox 5 Tray Cantilever Steel</li> </ul>			
2.14	<b>Expansion Vessel</b>	(10 to 15 litter) connection point ¾", pressure 5 bar with connecting SS pipe (2 to 2 m length) To absorb volume expansion during heat	1	nos	
2.15	<b>Cold water storage tank (syntax tank)</b>	500 litters	2	Nos	
2.15	<b>Flexible pipe</b>	For cold water supply	2	Roll	
2.16	<b>Gate valve tap</b>	size ¾ "	5	Nos	
3	<b>Solar thermal Systems trainer Rig or kit</b>	<b>Specification</b>	<b>quantity</b>	<b>unit</b>	<b>Sample</b>
3.1	<b>Solar thermal flat plate Collector with hot tank volume size of 80 to 100 LPD system trainer kit</b>	<p>Build up Module system with the <b>option of assembly/knockdown mounting structure with adjustable tilt angle (nuts &amp; bolts) with based on wheels (trolley type)</b>, with complete sets of components, monitoring controllers and plumbing circuits providing easy for trainers to make &amp; break.</p> <p>Flat plate solar collector mounted on castors: Surface area 2 m2 Steel frame with adjustable inclination Air venting valve Shut-off valves Water storage tank with circulation unit and instrumentation Wheeled tank for domestic hot water storage capacity: 80-100 liters coil heat exchanger dial thermometer, range: 0 ÷ 120°C wells for temperature measurements thermal insulation: polyurethane, thickness 6 cm Circulation unit including: – variable speed pump – safety valve – check valve – gate valve – automatic air venting valve – fill/drain cock – dial pressure gauge, range: 0 ÷ 6 bar – dial flow and return thermometers, range: 0 ÷ 120°C – mechanical water counter Water feeding line including: – shut-off ball valve – check valve – safety valve Expansion vessel Domestic hot water line including mechanical water counter.</p>	1	sets	<a href="#">Solar thermal kit with flat plate collector - Elettronica Veneta S.p.A.</a>

3.2	Solar Hot Water Evacuated Tube ( ETC) Collector with 80 to 100 liter system trainer Kit	<p>Build up Module system with the <b>option of assembly/knockdown mounting structure with tilt angle of 30 degree (nuts &amp; bolts) with based on wheels (Trolley type)</b> , with complete sets of components, monitoring controllers and plumbing circuits providing easy for trainers to make &amp; break.</p> <p>ETC collectors mounted on castors:  20 to 30 tubes with heat pipe Solar Collector  Steel frame with adjustable inclination  Air venting valve  Shut-off valves Water storage tank with circulation unit and instrumentation  Wheeled tank for domestic hot water storage capacity: 80-100 liters  coil heat exchanger  dial thermometer, range: 0 ÷ 120°C  wells for temperature measurements  thermal insulation: polyurethane, thickness 6 cm  Circulation unit including:  – variable speed pump  – safety valve  – check valve  – gate valve  – automatic air venting valve  – fill/drain cock  – dial pressure gauge, range: 0 ÷ 6 bar  – dial flow and return thermometers, range: 0 ÷ 120°C  – mechanical water counter  Water feeding line including:  – shut-off ball valve  – check valve  – safety valve  Expansion vessel  Domestic hot water line including mechanical water counter.</p>	1	sets	<a href="#">HelioMaxx™</a> <a href="#">80G Glycol Solar Hot Water Evacuated Tube Collector Kit - SunMaxx Solar</a>
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**DISPLAY OF THE SYSTEM INSIDE THE TRAINING LAB**

1	Display Stand and Table	<p>For Hybrid system, Solar Home System, Solar Power Generation and Training System and training tables for providing hands on training on using various equipment to participants</p>	<p>Testing tables and display board of adequate size to mount the indoor training equipment and display for giving hands-on training to the trainees. Refer to the indicative picture below:</p> 	<p>The system should be displayed on a display board put on a table with caster wheels ensuring the stability of the display arrangement with an option to easily move as well. The stand and table should be ergonomically designed for ease of operation and use by the trainers and trainees both.</p>
2	Testing Stand		<p>To put solar panels on the stand to test using the testing equipment.</p>	<p>The PV testing stand should be movable to take it out in the sun for testing purpose. The stand should</p>

			To put the battery on stand for testing.	have option to adjust the height and tilt of the panel.
			To put inverter on the stand for testing.	The battery test stand should also be movable and lined with wood/foam to protect from acid spillage etc.

The company selected will be responsible for supply, installation and commissioning and should ensure proper synchronization and integration of the solar system and associated components to enable productive loads and smooth operation. The installation of equipment should be clean, untangled and aesthetically appealing. The cables should be put in conduit using PVC pipes and bends of adequate type and sizes. Cable joints should be properly sealed. The equipment and solar applications should be properly marked with required schematic drawing.

**Notes:**

1. The offered PV Modules should comply with the relevant IEC standards, including but not limited to IEC 61215, IEC 61730, UL 61730, IEC 62716 as well as local country’s standards.
2. All solar components imported to **Bhutan** must comply with the import quality standards for the country.
3. Brands mentioned (if any) are indicative only. ISA may consider equivalent brands meeting the specifications.
4. Bidders are free to procure items locally within the mentioned country as well.

The company needs to submit relevant documents towards compliance of the above standard.

**General Guidance**

- The bidder can source the equipment from anywhere, but the equipment should be of good quality meeting the specifications as listed in the table.
- In case of battery, the bidder can procure it locally where the centre is being established.
- The preferred mode of transportation will be air freight, however economical route needs to be considered. The delivery, commissioning time in the country for all the equipment is maximum 90 days.
- It is bidder’s responsibility to arrange labour or technicians for installation of equipment. The cost can be included in the final costing of the equipment.
- The bidder will provide manufacturer’s warranty for all the equipment with complete documentation.

**B. Objective**

The objective of the assignment is to set up a model solar training and application resource centre (STAR C) lab at the **College of Science and Technology, Royal University of Bhutan, Phuentsholing, Bhutan.**

**C. Scope of Work**

1. **Component A:** Supply, Installation, Testing and Commissioning of the equipment given in the above table.
2. **Component B:** Training of the Country’s staff on Operation and Maintenance practice of the equipment and instruments.
3. **Component C:** Comprehensive Operation and Maintenance for 1 year post commissioning.

**The roles and responsibilities of the bidder and ISA are outlined below:**

**Bidder’s Terms of reference:**

- Design concepts
- Supply of materials and products
- Provide adequate skilled labour for installation and commissioning
- Construction supervision / contract management
- Quality control plan (QCP) and Safety plan
- Commissioning of project
- Mentoring and training, building operating staff for operation and maintenance
- Operation and Maintenance for first year and optional service plan after the first year

**ISA and Country's identified STAR-C responsibilities:**

- Provide location to install solar panels as per the contract.
- Review for approval design submittals
- Witness inspections and test witnesses to verify attainment of performance requirements
- Make progress payments for any service agreed
- Allow consultants access to STAR-C premises for site visit/energy audit exercise.
- Approve any contracts agreed with the consultant.

**Payment Terms:**

**1. For Component-A (Supply, Installation and Commissioning of the equipment's)**

S. No.	Description of Deliverables	Timelines	Release of payment
1	Kick-off meeting with a tentative plan for supply of material, Installation & Commissioning	1 Week	20%
2	Dispatch of material (Document proof of dispatch)	3 Weeks	10%
3	Successful delivery of material on site.	10 Weeks	50%
4	Successful Installation, Commissioning	12 Weeks	15%
5	After successful operation for 3 months		5%

**Notes:**

- Transportation cost will be paid at the time of dispatching of the material.
- Custom duty/excise duty will be paid on actual after submission of invoice and proofs.
- The above payment schedule will be allowed for Component-A pricing.

**2. For Component-B (Training of the Country's staff on Operation and Maintenance practice of the equipment and instruments)**

S. No.	Description of Deliverables	Timelines	Release of payment
1	Training of the Country's staff on Operation and Maintenance practices	Within 2 Weeks after Successful Installation & Commissioning	100%

**Notes:**

- Training of 3-5 people for maximum 4 days on day-to-day O&M of the equipment.

**3. For Component-C (Comprehensive Operation and Maintenance for 1 year post commissioning)**

S. No.	Description of Deliverables	Timelines	Release of payment
1	Maintenance of the equipment	6 months from commissioning	50%

2	Maintenance of the equipment	12 months from commissioning	50%
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Notes:

- i. Payment will be processed in two tranches, 1<sup>st</sup> tranche at the end of six months after commissioning and 2<sup>nd</sup> Tranche at the end of 12 months after commissioning.

#### Delivery Requirements

Delivery Requirements	
<b>Delivery date and time</b>	Bidder shall complete the delivery and installation within 90 days from the issuance of Contract.
<b>Delivery Terms (INCOTERMS 2020)</b>	Delivered at Place
<b>Customs clearance</b>	<input type="checkbox"/> Not applicable Shall be done by: <input type="checkbox"/> Name of organisation (where applicable) <input checked="" type="checkbox"/> Supplier/bidder <input type="checkbox"/> Freight Forwarder
<b>Exact Address(es) of Delivery Location(s)</b>	<b>College of Science and Technology, Royal University of Bhutan, Phuentsholing, Bhutan</b>
<b>Distribution of shipping documents (if using freight forwarder)</b>	Bidder responsibility
<b>Packing Requirements</b>	Safe delivery of supplies, handling will be bidders responsibility
<b>Training on Operations and Maintenance</b>	Within 14 days of delivery and installation
<b>Warranty Period</b>	At least one year
<b>After-sales service and local service support requirements</b>	One year
<b>Preferred Mode of Transport</b>	Air

#### NOTES:

- a. The products/goods/parts of machineries must be recalled by the manufacturer/ bidder/ supplier at the manufacturers/ bidder/ suppliers cost if rejected by ISA/ purchaser or end user because of the problems with quality. The supplier/ bidder/ manufacturer will be obliged to replace the products/goods/parts of machineries in question at its own cost with a new one of acceptable quality.
- b. The supplier will be responsible for protection of materials, property and equipment before successful delivery and handover to ISA.
- c. Prices quoted must be inclusive of all costs necessary to supply these items, including delivery, warranty, transport cost, insurance, materials, installation, training and commissioning etc.
- d. OEM of equipment's' can be from any country. However, meeting the technical specifications is mandatory requirement.
- e. Items can be procured locally, within the country. However, bidder shall provide 1 year CMC as per the contract.



## ANNEX 2: QUOTATION SUBMISSION FORM

Bidders are requested to complete this form, including the Company Profile and Bidder's Declaration, sign it and return it as part of their quotation along with Annex 3: Technical and Financial Offer. The Bidder shall fill in this form in accordance with the instructions indicated. No alterations to its format shall be permitted and no substitutions shall be accepted.

Name of Bidder:	Click or tap here to enter text.	
RFQ reference:	Click or tap here to enter text.	Date: Click or tap to enter a date.

### Company Profile

Item Description	Detail
Legal name of bidder or Lead entity for JVs	Click or tap here to enter text.
Legal Address, City, Country	Click or tap here to enter text.
Website	Click or tap here to enter text.
Year of Registration	Click or tap here to enter text.
Legal structure	Choose an item.
Are you a UNGM registered vendor?	<input type="checkbox"/> Yes <input type="checkbox"/> No      If yes, insert UNGM Vendor Number
Quality Assurance Certification (e.g. ISO 9000 or Equivalent) (If yes, provide a Copy of the valid Certificate):	<input type="checkbox"/> Yes <input type="checkbox"/> No
Does your Company hold any accreditation such as ISO 14001 or ISO 14064 or equivalent related to the environment? (If yes, provide a Copy of the valid Certificate):	<input type="checkbox"/> Yes <input type="checkbox"/> No
Does your Company have a written Statement of its Environmental Policy? (If yes, provide a Copy)	<input type="checkbox"/> Yes <input type="checkbox"/> No
Does your organization demonstrate significant commitment to sustainability through some other means, for example internal company policy documents on women empowerment, renewable energies or membership of trade institutions promoting such issues (If yes, provide a Copy)	<input type="checkbox"/> Yes <input type="checkbox"/> No

Is your company a member of the UN Global Compact	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Bank Information	Bank Name: Click or tap here to enter text. Bank Address: Click or tap here to enter text. IBAN: Click or tap here to enter text. SWIFT/BIC: Click or tap here to enter text. Account Currency: Click or tap here to enter text. Bank Account Number: Click or tap here to enter text.			
<b>Previous relevant experience: 3 contracts</b>				
Name of previous contracts	Client & Reference Contact Details including e-mail	Contract Value	Period of activity	Types of activities undertaken

**Bidder's Declaration**

Yes	No	
<input type="checkbox"/>	<input type="checkbox"/>	<b>Requirements and Terms and Conditions:</b> I/We have read and fully understand the RFQ, including the RFQ Information and Data, Schedule of Requirements, the General Conditions of Contract, and any Special Conditions of Contract. I/we confirm that the Bidder agrees to be bound by them.
<input type="checkbox"/>	<input type="checkbox"/>	I/We confirm that the Bidder has the necessary capacity, capability, and necessary licenses to fully meet or exceed the Requirements and will be available to deliver throughout the relevant Contract period.
<input type="checkbox"/>	<input type="checkbox"/>	<b>Ethics:</b> In submitting this Quote I/we warrant that the bidder: has not entered any improper, illegal, collusive, or anti-competitive arrangements with any Competitor; has not directly or indirectly approached any representative of the Buyer (other than the Point of Contact) to lobby or solicit information in relation to the RFQ; has not attempted to influence, or provide any form of personal inducement, reward, or benefit to any representative of the Buyer.
<input type="checkbox"/>	<input type="checkbox"/>	I/We confirm to undertake not to engage in proscribed practices, , or any other unethical practice, with the UN or any other party, and to conduct business in a manner that averts any financial, operational, reputational or other undue risk to the UN and we have read the United Nations Supplier Code of Conduct : <a href="https://www.un.org/Depts/ptd/about-us/un-supplier-code-conduct">https://www.un.org/Depts/ptd/about-us/un-supplier-code-conduct</a> and acknowledge that it provides the minimum standards expected of suppliers to the UN.
<input type="checkbox"/>	<input type="checkbox"/>	<b>Conflict of interest:</b> I/We warrant that the bidder has no actual, potential, or perceived Conflict of Interest in submitting this Quote or entering a Contract to deliver the Requirements. Where a Conflict of Interest arises during the RFQ process the bidder will report it immediately to the Procuring Organisation's Point of Contact.
<input type="checkbox"/>	<input type="checkbox"/>	<b>Prohibitions, Sanctions:</b> I/We hereby declare that our firm, its affiliates or subsidiaries or employees, including any JV/Consortium members or subcontractors or suppliers for any part of the contract is not under procurement prohibition by the United Nations, including but not limited to prohibitions derived from the Compendium of United Nations Security Council Sanctions Lists and have not been suspended, debarred, sanctioned or otherwise identified as ineligible by any UN Organization or the World Bank Group or any other international Organization.
<input type="checkbox"/>	<input type="checkbox"/>	<b>Bankruptcy:</b> I/We have not declared bankruptcy, are not involved in bankruptcy or receivership proceedings, and there is no judgment or pending legal action against them that could impair their operations in the foreseeable future.

Yes	No	
<input type="checkbox"/>	<input type="checkbox"/>	<b>Offer Validity Period:</b> I/We confirm that this Quote, including the price, remains open for acceptance for the Offer Validity.
<input type="checkbox"/>	<input type="checkbox"/>	I/We understand and recognize that you are not bound to accept any Quotation you receive, and we certify that the goods offered in our Quotation are new and unused.
<input type="checkbox"/>	<input type="checkbox"/>	By signing this declaration, the signatory below represents, warrants and agrees that he/she has been authorised by the Organization/s to make this declaration on its/their behalf.

Signature: \_\_\_\_\_

Name: Click or tap here to enter text.

Title: Click or tap here to enter text.

Date: Click or tap to enter a date.

**ANNEX 3: TECHNICAL AND FINANCIAL OFFER - GOODS**

Bidders are requested to complete this form, sign it and return it as part of their quotation along with Annex 2 Quotation Submission Form. The Bidder shall fill in this form in accordance with the instructions indicated. No alterations to its format shall be permitted and no substitutions shall be accepted.

Name of Bidder:	Click or tap here to enter text.	
RFQ reference:	RFQ/XXXX/IND 2023	Date: Click or tap to enter a date.

**Technical Offer**

**Qualification Criteria**

Please fill this and attach relevant documents. Only quotations of bidders qualifying against the below criteria will be evaluated.

Qualifying Criteria	Yes/No	List of supporting documents
Bidders must have the legal capacity to enter a binding contract with ISA and to deliver in the country, or through an authorized representative.		
Bidders must have the legal capacity to enter a binding contract with ISA and to deliver in the country, or through an authorized representative. <b>Company registration certificate or any other document proving legal entity.</b>		
The bidder must have the experience of supply of solar equipment's / hardware components. <b>Submit copy of work order or completion certificate</b>		
The bidder must have annual turnover of more than <b>USD 100,000</b> - Please attach relevant documents.		

ISA reserves the right to reject the bid if it determines that the selected bidder has not provided the supporting documents against the Qualifying Criteria.

**Technical Proposal**

The bidder shall include the following in the technical proposal document:

- A brief description of your qualification and capacity that is relevant to the Scope of Works;
- A brief method statement and implementation plan;

Technical offer should encompass detailed specifications, including make, complying standards, relevant test certificate as applicable for each of the component proposed to be supplied by the bidder under the RFQ in line with the table below (Please refer to the specification/description given in the schedule of requirement in Annexure 1 for submitting the technical & financial proposal):

**Recommended Technical Specifications for Goods**

#	Description of Supply Items	Quantity	Detailed Specification	Make/Model	Complying Standard	Period of Warranty
A	Tools and instruments					
A1	Personal Protective Equipment					
1	Reflective vests					

#	Description of Supply Items	Quantity	Detailed Specification	Make/Model	Complying Standard	Period of Warranty
2	Helmets					
3	Work gloves					
4	Electricians gloves					
5	Safety glasses					
<b>A2</b>	<b>Instruments</b>					
6	Digital multimeter (medium quality)					
7	Spare fuses for above multimeter (medium quality)					
8	Digital multimeter (professional standard)					
9	Spare fuses for above multimeter (professional standard)					
10	Clamp meter (medium quality)					
11	Clamp meter (professional standard)					
12	Insulation resistance tester					
13	Plug-in wattmeter					
14	Hand-held solar irradiance meter					
15	Infrared thermometer					
16	Solar Pathfinder					
17	Sun path diagrams for the Solar Pathfinder (only if Solar Pathfinder can be procured)					
18	Compass					
<b>A3</b>	<b>Tools</b>					
19	Crimp/termination tools for PV interconnectors					
20	Tool Case for Photovoltaics for solar cable connectors MC4 (Multi-Contact)					
21	MC4 mounting tool spanner					
22	Torque wrench for MC4					
23	Torque wrench for PV					
23	Torque wrench for PV					
24	Hydraulic crimp tool					
25	Crimping tool kit & crimps					
26	Electrician's tools kit					

#	Description of Supply Items	Quantity	Detailed Specification	Make/Model	Complying Standard	Period of Warranty
27	Adjustable spanners					
28	Spanner set					
29	Screwdriver set for precision mechanics					
30	Basic vehicle mechanics tools set					
31	Long tape measures					
32	Hydrometer					
33	Allen key set					
34	Clipboards					
<b>A4</b>	<b>Extras and spares</b>					
35	Safety harness kit for working at height / on roofs					
36	Replacement batteries for multi- und clamp meters					
37	multimeter special cables (thermocouples, croco clamps, etc.)					
38	Multiple socket strip with personal protection					
39	Tool cases for trainees and their tools					
40	Hot air gun or blower					
41	Schottky Diode 15 A 45 V					
42	Multifunction Tool					
<b>B</b>	<b>PV EXERCISE BOARDS</b>					
	<b>PV modules</b>					
1	PV module					
2	PV module					
3	PV module					
4	PV module					
	<b>PV cable connectors</b>					
5	PV module inter-connection connectors (male)					
6	PV module inter-connection connectors (female)					

#	Description of Supply Items	Quantity	Detailed Specification	Make/Model	Complying Standard	Period of Warranty
7	PV module inter-connection connectors (female)					
8	PV module inter-connection connectors (male)					
9	MC4 Y-plug					
	<b>DC exercise boards</b>					
10	Solar charge controller (standard, without MPPT)					
11	Solar charge controller (standard, without MPPT)					
12	Solar charge controller (with MPPT)					
13	Inverter (battery inverter)					
14	DC lamps, 12 V, florescent					
15	DC lamps, 12 V, LED					
16	DC lamps, 12 V halogen					
17	Lamp holders					
18	DC fans					
19	DC/DC converter					
20	DC sockets					
21	DC plugs					
22	Junction boxes					
23	DC miniature circuit breakers					
24	DC miniature circuit breakers					
25	DC miniature circuit breakers					
	<b>AC exercise boards</b>					
26	Consumer unit / fuse board					
27	Miniature circuit breaker (MCB) AC					
28	Miniature circuit breaker (MCB) AC					

#	Description of Supply Items	Quantity	Detailed Specification	Make/Model	Complying Standard	Period of Warranty
29	Residual current device (RCD)					
30	Socket outlet					
31	Socket outlet					
32	Socket outlet					
33	Plug					
34	Plug					
35	Plug					
36	Connector blocks / terminal strips					
37	Connector blocks / terminal strips					
38	Connector blocks / terminal strips					
39	Earth blocks					
	<b>Cables, etc.</b>					
40	Flex					
41	Cable					
42	Cable					
43	Cable					
44	PV cable / 'solar cable'					



#	Description of Supply Items	Quantity	Detailed Specification	Make/Model	Complying Standard	Period of Warranty
45	Cable					
46	Cable					
47	Cable					
48	Cable					
49	Cable					
50	Cable					
51	Electrical insulation tape					
	<b>Batteries &amp; accessories</b>					
52	Battery					
53	Battery terminals (pairs)					
54	Lead-acid batteries					
55	Battery terminals (pairs)					
56	Battery charger					
57	Funnel					
58	Acid pump (hand-driven)					
59	Work board					
<b>C</b>	<b>HYBRID SYSTEM</b>					

#	Description of Supply Items	Quantity	Detailed Specification	Make/Model	Complying Standard	Period of Warranty
	<b>Solar PV ground mounted installation and additional knock-down installation (made up of the following components)</b>					
1	PV modules					
2	PV string hybrid inverter					
3	Battery system					
4	Monitoring					
5	BOS-set					
6	Consumables					
7	Consumables					
8	Consumables					
9	Consumables					
10	Mounting					
11	EPC-service					
<b>D</b>	<b>Residential Rooftop</b>					
	<b>Solar PV rooftop mounted installations (made up of the following components)</b>					
1	PV Modules Total min 350Wp, Voltage suitable for Charge Controller, Inverter					
2	PV module mounting bars					
3	Roof Mounting Substructure					

#	Description of Supply Items	Quantity	Detailed Specification	Make/Model	Complying Standard	Period of Warranty
4	Roof Mounting Substructure					
5	Roof Mounting Substructure					
6	wooden or concrete ground mounting for roof fixation					
7	Snap hooks					
<b>E</b>	<b>Solar Street Light</b>					
	<b>Solar street light outdoor</b>					
1	Solar Street Light Kit					
2	Lamp post for Street Light Kit					
3	Scaffold complete assembly					
4	Scaffolding Elevator Console with Pulley					
5	Ladder					
<b>F</b>	<b>Solar water pumping indoor</b>					
1	500...700 W Solar Water Pumping System (made up of the following components)					
2	Submersible pump system (will be inserted into reservoir)					
3	Safety water level sensor for safety water reservoirs					
4	DC bench power supply (to simulate PV modules)					
5	Surface Pump (wall mount on mobile work bench)					
6	Water pressure gauge					
7	Water reservoir					
8	Safety water reservoir (water reservoir will stand inside)					
9	Mobile work bench					
10	Acrylic safety housing for surface pump					
11	Emergency stops switch for pumps					
12	Pressure valve					
13	Flow meter					
14	Relay box with 4mm laboratory safety connectors					
15	Work board (to be attached to the mobile work bench)					
<b>G</b>	<b>Tools for testing</b>					
1	Isolation measurement equipment/ installation tester					

#	Description of Supply Items	Quantity	Detailed Specification	Make/Model	Complying Standard	Period of Warranty
2	Ground earth resistance tester digital					
3	Digital phase detector					
4	Solar irradiance metre professional					
5	Thermography camera					
6	Clampmeter for PV					
8	IR thermometer					
9	Multimeter x2					
10	IV-Curve tracer - HT I-V500W					
11	Pyranometer					

**Additional list for solar PV tools, Instruments:**

#	Description of Supply Items	Quantity	Detailed Specification	Make/Model	Complying Standard	Period of Warranty
	<b>Protective equipment &amp; safety gears</b>					
1	First aid Kit					
2	Electrical safety belt					
3	Fire Extinguisher CO2					
4	Fire buckets					
	<b>Solar Electrician Tools &amp; accessories</b>					
1	Pipe vice Cast Iron with hardened jaw open type					
2	Hand Vice					
3	Table Vice					
4	Hacksaw frame (with blade)					
5	File flat					
6	File half round					
7	File round					
8	Pliers long nose insulated					
9	Pliers long nose insulated					

#	Description of Supply Items	Quantity	Detailed Specification	Make/Model	Complying Standard	Period of Warranty
10	Pliers flat nose insulated					
11	Punch centre					
12	Steel Rule Graduated both in Metric and English Unit					
13	Electrician screw driver thin stem insulated handle					
14	Gauge, wire imperial stainlees steel marked in SWG & mm					
15	Portable Electric Dril machine & Set of drilling bits wood, steel, stone					
16	Pliers Side Cutting					
17	Wire stripper adjustable length					
18	Electrical Loads					
19	Try Square					
20	Electrical load banks					
21	Trolley for Transportation of Batteries					
22	Electrical wiring and switch gear rack					
23	Protective relays and contactors rack					
24	Types of Cables:					
25	Soldering station					
26	Solder					
27	Universal Power extension Strip/cord					
	<b>Instruments</b>					
1	Sunshine Recorder					
1.1	Sunshine recorder spare parts-					
1.2	Sunshine recorder spare parts-					
2	Pyrheliometer					
3	Clinometer					
4	A.C energy meter					
5	A.C energy meter					
6	Frequency meter					
7	Cut model of PV cell assembly					
8	Cut model of lead acid battery					
9	Battery charger					

#	Description of Supply Items	Quantity	Detailed Specification	Make/Model	Complying Standard	Period of Warranty
10	Power Quality Monitor and Energy Analyzer					
11	RCD/GFCI/ELCB Tester					
12	Multifunction Installation Tester					
13	Battery Analyzer					
14	Arc welding machine					
15	handheld transformer turns ratiometer					
16	Potable Electric Earth Drill machine (Auger) (optional)					

#### Retrofitting list of items for the existing PV and thermal Systems:

#	Description of Supply Items	Quantity	Detailed Specification	Make/Model	Complying Standard	Period of Warranty
Sl. No	<b>Retrofit existing solar PV and Thermal systems</b>					
1	Battery bank for offgrid 7.5 PV kWp system and with connecting terminals/cables					
2	Standalone solar CPU, 6.25 kVA, Inverter, with charge controller, single phase, nominal voltage 96 V, Vmin= 90 V Vmax 130 V					
3	15 kW hybrid solar Inverter with the storage and grid tied system, 3-phase output					
4	10 kW grid tied solar inverter single phase					
4.1	Balance of System (DC & AC circuit components & accessories) -set					
4.1.1	Consumables					
4.1.2	Consumables					
4.1.3	Consumables					
4.1.4	Consumables					
4.1.5	Consumables					
4.1.6	Consumables					

#	Description of Supply Items	Quantity	Detailed Specification	Make/Model	Complying Standard	Period of Warranty
4.1.7	Consumables					
4.1.8	Consumables					
4.1.9	Consumables					
4.1.10	Consumables					
4.1.11	consumables					
4.1.12	Consumables					
4.1.13	Consumables					
4.1.14	Consumables					
4.1.15	Consumables					
4.2	USB To RS485 Serial Converter Cable					
5	RS232 communication cable (ethernet cable)					
6	USB to RS232 Serial Converter Cable					
7	For the existing solar heating System					
7.1	Flat Plate Collector ( for replacement of broken collector TATA solar BP )					
7.2	<b>Thermocouple Data Logger 4-Channels Thermocouple Thermometer K,J,E,T Type Data Logger, USB PC Software Windows</b>					
8	<b>Surge Protective Device for above existing PV systems</b>					
8.1	<b>SPD at Main Distribution Load for Both Type I and Type II (if only 1 SPD is to be provided)</b>					
8.2	<b>SPD at Sub Main Distribution Load</b>					
8.3	<b>SPD at Main Distribution Load</b>					

**List of items for Thermal system (solar water heater) module, kits & accessories**

#	Description of Supply Items	Quantity	Detailed Specification	Make/Model	Complying Standard	Period of Warranty
<b>1</b>	<b>Different types of Solar collectors</b>					
1.1	Unglazed/naked Flat type solar Collector					





3	Solar thermal Systems trainer Rig or kit					
3.1	Solar thermal flat plate Collector size of 80 to 100 Litre tank system trainer kit					
3.2	Solar Hot Water Evacuated Tube (ETC) Collector with 80 to 100 liter system trainer Kit					
<b>DISPLAY OF THE SYSTEM INSIDE THE TRAINING LAB</b>						
1	Display Stand and Table					
2	Testing Stand					

**The submission of proposal should highlight in subject line “SITC for equipment in Bhutan”**

## Financial Offer

Financial offer should encompass the quantity and price as applicable for each of the component proposed to be supplied by the bidder under the RFQ in line with the table below:

Submission for the Country..... *(fill the country name)*

### Recommended Technical Specifications for Goods

#	Description of Supply Items	Quantity	Detailed Specification	Unit Price	Total Price
<b>A</b>	<b>Tools and instruments</b>				
<b>A1</b>	<b>Personal Protective Equipment</b>				
1	Reflective vests				
2	Helmets				
3	Work gloves				
4	Electricians gloves				
5	Safety glasses				
<b>A2</b>	<b>Instruments</b>				
6	Digital multimeter (medium quality)				
7	Spare fuses for above multimeter (medium quality)				
8	Digital multimeter (professional standard)				
9	Spare fuses for above multimeter (professional standard)				
10	Clamp meter (medium quality)				
11	Clamp meter (professional standard)				
12	Insulation resistance tester				
13	Plug-in wattmeter				
14	Hand-held solar irradiance meter				
15	Infrared thermometer				
16	Solar Pathfinder				
17	Sun path diagrams for the Solar Pathfinder (only if Solar Pathfinder can be procured)				
18	Compass				
<b>A3</b>	<b>Tools</b>				
19	Crimp/termination tools for PV interconnectors				
20	Tool Case for Photovoltaics for solar cable connectors MC4 (Multi-Contact)				
21	MC4 mounting tool spanner				
22	Torque wrench for MC4				

#	Description of Supply Items	Quantity	Detailed Specification	Unit Price	Total Price
23	Torque wrench for PV				
23	Torque wrench for PV				
24	Hydraulic crimp tool				
25	Crimping tool kit & crimps				
26	Electrician's tools kit				
27	Adjustable spanners				
28	Spanner set				
29	Screwdriver set for precision mechanics				
30	Basic vehicle mechanics tools set				
31	Long tape measures				
32	Hydrometer				
33	Allen key set				
34	Clipboards				
<b>A4</b>	<b>Extras and spares</b>				
35	Safety harness kit for working at height / on roofs				
36	Replacement batteries for multi- und clamp meters				
37	multimeter special cables (thermocouples, croco clamps, etc.)				
38	Multiple socket strip with personal protection				
39	Tool cases for trainees and their tools				
40	Hot air gun or blower				
41	Schottky Diode 15 A 45 V				
42	Multifunction Tool				
<b>B</b>	<b>PV EXERCISE BOARDS</b>				
	<b>PV modules</b>				
1	PV module				
2	PV module				
3	PV module				
4	PV module				
	<b>PV cable connectors</b>				

#	Description of Supply Items	Quantity	Detailed Specification	Unit Price	Total Price
5	PV module inter-connection connectors (male)				
6	PV module inter-connection connectors (female)				
7	PV module inter-connection connectors (female)				
8	PV module inter-connection connectors (male)				
9	MC4 Y-plug				
<b>DC exercise boards</b>					
10	Solar charge controller (standard, without MPPT)				
11	Solar charge controller (standard, without MPPT)				
12	Solar charge controller (with MPPT)				
13	Inverter (battery inverter)				
14	DC lamps, 12 V, florescent				
15	DC lamps, 12 V, LED				
16	DC lamps, 12 V halogen				
17	Lamp holders				
18	DC fans				
19	DC/DC converter				
20	DC sockets				
21	DC plugs				
22	Junction boxes				
23	DC miniature circuit breakers				
24	DC miniature circuit breakers				
25	DC miniature circuit breakers				
<b>AC exercise boards</b>					
26	Consumer unit / fuse board				
27	Miniature circuit breaker (MCB) AC				

#	Description of Supply Items	Quantity	Detailed Specification	Unit Price	Total Price
28	Miniature circuit breaker (MCB) AC				
29	Residual current device (RCD)				
30	Socket outlet				
31	Socket outlet				
32	Socket outlet				
33	Plug				
34	Plug				
35	Plug				
36	Connector blocks / terminal strips				
37	Connector blocks / terminal strips				
38	Connector blocks / terminal strips				
39	Earth blocks				
	<b>Cables, etc.</b>				
40	Flex				
41	Cable				
42	Cable				
43	Cable				
44	PV cable / 'solar cable'				
45	Cable				
46	Cable				
47	Cable				

#	Description of Supply Items	Quantity	Detailed Specification	Unit Price	Total Price
48	Cable				
49	Cable				
50	Cable				
51	Electrical insulation tape				
	<b>Batteries &amp; accessories</b>				
52	Battery				
53	Battery terminals (pairs)				
54	Lead-acid batteries				
55	Battery terminals (pairs)				
56	Battery charger				
57	Funnel				
58	Acid pump (hand-driven)				
59	Work board				
<b>C</b>	<b>HYBRID SYSTEM</b>				
	<b>Solar PV ground mounted installation and additional knock-down installation (made up of the following components)</b>				
1	PV modules				
2	PV string hybrid inverter				
3	Battery system				
4	Monitoring				

#	Description of Supply Items	Quantity	Detailed Specification	Unit Price	Total Price
5	BOS-set				
6	Consumables				
7	Consumables				
8	Consumables				
9	Consumables				
10	Mounting				
11	EPC-service				
<b>D</b>	<b>Residential Rooftop</b>				
	<b>Solar PV rooftop mounted installations (made up of the following components)</b>				
1	PV Modules Total min 350Wp, Voltage suitable for Charge Controller, Inverter				
2	PV module mounting bars				
3	Roof Mounting Substructure				
4	Roof Mounting Substructure				
5	Roof Mounting Substructure				
6	wooden or concrete ground mounting for roof fixation				
7	Snap hooks				
<b>E</b>	<b>Solar Street Light</b>				
	<b>Solar street light outdoor</b>				
1	Solar Street Light Kit				
2	Lamp post for Street Light Kit				
3	Scaffold complete assembly				
4	Scaffolding Elevator Console with Pulley				
5	Ladder				
<b>F</b>	<b>Solar water pumping indoor</b>				
1	500...700 W Solar Water Pumping System (made up of the following components)				
2	Submersible pump system (will be inserted into reservoir)				

#	Description of Supply Items	Quantity	Detailed Specification	Unit Price	Total Price
3	Safety water level sensor for safety water reservoirs				
4	DC bench power supply (to simulate PV modules)				
5	Surface Pump (wall mount on mobile work bench)				
6	Water pressure gauge				
7	Water reservoir				
8	Safety water reservoir (water reservoir will stand inside)				
9	Mobile work bench				
10	Acrylic safety housing for surface pump				
11	Emergency stops switch for pumps				
12	Pressure valve				
13	Flow meter				
14	Relay box with 4mm laboratory safety connectors				
15	Work board (to be attached to the mobile work bench)				
<b>G</b>	<b>Tools for testing</b>				
1	Isolation measurement equipment/ installation tester				
2	Ground earth resistance tester digital				
3	Digital phase detector				
4	Solar irradiance metre professional				
5	Thermography camera				
6	Clampmeter for PV				
8	IR thermometer				
9	Multimeter x2				
10	IV-Curve tracer - HT I-V500W				
11	Pyranometer				

**Additional list for solar PV tools, Instruments:**

#	Description of Supply Items	Quantity	Detailed Specification	Unit Price	Total Price
	<b>Protective equipment &amp; safety gears</b>				
1	First aid Kit				
2	Electrical safety belt				
3	Fire Extinguisher CO2				
4	Fire buckets				
	<b>Solar Electrician Tools &amp; accessories</b>				
1	Pipe vice Cast Iron with hardened jaw open type				
2	Hand Vice				
3	Table Vice				
4	Hacksaw frame (with blade)				



#	Description of Supply Items	Quantity	Detailed Specification	Unit Price	Total Price
5	File flat				
6	File half round				
7	File round				
8	Pliers long nose insulated				
9	Pliers long nose insulated				
10	Pliers flat nose insulated				
11	Punch centre				
12	Steel Rule Graduated both in Metric and English Unit				
13	Electrician screw driver thin stem insulated handle				
14	Gauge, wire imperial stainless steel marked in SWG & mm				
15	Portable Electric Drill machine & Set of drilling bits wood, steel, stone				
16	Pliers Side Cutting				
17	Wire stripper adjustable length				
18	Electrical Loads				
19	Try Square				
20	Electrical load banks				
21	Trolley for Transportation of Batteries				
22	Electrical wiring and switch gear rack				
23	Protective relays and contactors rack				
24	Types of Cables:				
25	Soldering station				
26	Solder				
27	Universal Power extension Strip/cord				

#	Description of Supply Items	Quantity	Detailed Specification	Unit Price	Total Price
	<b>Instruments</b>				
1	Sunshine Recorder				
1.1	Sunshine recorder spare parts-				
1.2	Sunshine recorder spare parts-				
2	Pyrheliometer				
3	Clinometer				
4	A.C energy meter				
5	A.C energy meter				
6	Frequency meter				
7	Cut model of PV cell assembly				
8	Cut model of lead acid battery				
9	Battery charger				
10	Power Quality Monitor and Energy Analyzer				
11	RCD/GFCI/ELCB Tester				
12	Multifunction Installation Tester				
13	Battery Analyzer				
14	Arc welding machine				
15	handheld transformer turns ratiometer				
16	Potable Electric Earth Drill machine (Auger) (optional)				

**Retrofitting list of items for the existing PV and thermal Systems:**

#	Description of Supply Items	Quantity	Detailed Specification	Unit Price	Total Price
Sl. No	Retrofit existing solar PV and Thermal systems				
1	Battery bank for offgrid 7.5 PV kWp system and with connecting terminals/cables				
2	Standalone solar CPU, 6.25 kVA, Inverter, with charge controller, single phase, nominal voltage 96 V, Vmin= 90 V Vmax 130 V				
3	15 kW hybrid solar Inverter with the storage and grid tied system, 3-phase output				
4	10 kW grid tied solar inverter single phase				
4.1	Balance of System (DC & AC circuit components & accessories) -set				
4.1.1	Consumables				
4.1.1	Consumables				
4.1.1	Consumables				

#	Description of Supply Items	Quantity	Detailed Specification	Unit Price	Total Price
4.1.4	Consumables				
4.1.5	Consumables				
4.1.6	Consumables				
4.1.7	Consumables				
4.1.8	Consumables				
4.1.9	Consumables				
4.1.10	Consumables				
4.1.11	consumables				
4.1.12	Consumables				
4.1.13	Consumables				
4.1.14	Consumables				
4.1.15	Consumables				
4.2	USB To RS485 Serial Converter Cable				
5	RS232 communication cable (ethernet cable)				
6	USB to RS232 Serial Converter Cable				
7	For the existing solar heating System				
7.1	Flat Plate Collector ( for replacement of broken collector TATA solar BP )				
7.2	<b>Thermocouple Data Logger 4-Channels Thermocouple Thermometer K,J,E,T Type Data Logger, USB PC Software Windows</b>				
8	<b>Surge Protective Device for above existing PV systems</b>				
8.1	<b>SPD at Main Distribution Load for Both Type I and Type II (if only 1 SPD is to be provided)</b>				
8.2	<b>SPD at Sub Main Distribution Load</b>				
8.3	<b>SPD at Main Distribution Load</b>				

#### List of items for Thermal system (solar water heater) module, kits & accessories

#	Description of Supply Items	Quantity	Detailed Specification	Unit Price	Total Price
<b>1</b>	<b>Different types of Solar collectors</b>				
1.1	Unglazed/naked Flat type solar Collector				
1.2	Evaluated Tube Collector (ETC) , U-tube/ heat pipe				
1.3	PVT-Module				
1.4	<b>Flat plate solar air heater solar collector</b>				
<b>2</b>	<b>Balance of System: Solar Plumbing circuit components &amp; accessories</b>				

2.1	<b>Solar Pump Station</b>				
2.2	<b>Solar Pump Controller</b>				
2.3	<b>Plumbing Accessories stainless steel pipe</b>				
2.4	<b>Interconnection Fittings</b>				
2.5	<b>Temperature Sensor Probe for Solar Water Heater</b>				
2.6	<b>HT-1000 High Temp Sensor</b>				
2.7	<b>High Temperature UV Rated Tape Black 3in x50ft</b>				
2.8	<b>The Solar Hot Water System Pump Charging station</b>				
2.9	<b>Solar hot water flow meter (unltrasonic flow sensor)</b>				
2.10	PEX-AL-PEX pipe				
2.11	Teflon, or PTFE, sealing tape				
2.12	Teflon Adhesive Tape				
2.13	Plumping tool kits				
2.14	<b>Expansion Vessel</b>				
2.15	<b>Cold water storage tank (syntax tank)</b>				
2.15	<b>Flexible pipe</b>				
2.16	<b>Gate valve tap</b>				
3	<b>Solar thermal Systems trainer Rig or kit</b>				
3.1	<b>Solar thermal flat plate Collector size of 80 to 100 Litre tank system trainer kit</b>				

3.2	Solar Hot Water Evacuated Tube ( ETC) Collector with 80 to 100 liter system trainer Kit				
<b>DISPLAY OF THE SYSTEM INSIDE THE TRAINING LAB</b>					
1	Display Stand and Table				
2	Testing Stand				

Please fill the component wise cost of goods/services in the table below:

SL NO.	BRIEF DESCRIPTION OF GOODS/ SERVICES	Price in USD	Customs duty/excise duty/other taxes#
1	<b>Component A:</b> Supply of required solar PV Training and Testing equipment's* (As detailed out above), Installation, Testing & Commissioning		
2	<b>Component B:</b> Training Charges		
3	<b>Component C:</b> Comprehensive maintenance of the system for the period of one year form the date of commissioning.		
<b>Total Price</b>			
<b>Transportation Price</b> (up to delivery site)			
<b>Insurance Price</b> (up to delivery site)			
<b>Other Charges</b> (specify)			
<b>Total Final and All-inclusive Price</b>			

- ISA will evaluate the financial offers received from the bidders based on total quoted price excluding duties.
- # Please provide details of the nature of the duties/taxes. Duties/Taxes will be paid on actual basis on submission of documents proving the nature and the amount of duties/taxes.
- \* ISA reserves the rights to select/deselect items from list of equipment's.

### Compliance with Requirements

	You Responses		
	Yes, we will comply	No, we cannot comply	If you cannot comply, pls. indicate counter - offer
Minimum Technical Specifications	<input type="checkbox"/>	<input type="checkbox"/>	Click or tap here to enter text.
Delivery Term (INCOTERMS)	<input type="checkbox"/>	<input type="checkbox"/>	Click or tap here to enter text.
Delivery Lead Time	<input type="checkbox"/>	<input type="checkbox"/>	Click or tap here to enter text.
Warranty and After-Sales Requirements	<input type="checkbox"/>	<input type="checkbox"/>	Click or tap here to enter text.
Validity of Quotation	<input type="checkbox"/>	<input type="checkbox"/>	Click or tap here to enter text.

Payment terms	<input type="checkbox"/>	<input type="checkbox"/>	Click or tap here to enter text.
Other requirements <i>[pls. specify]</i>	<input type="checkbox"/>	<input type="checkbox"/>	Click or tap here to enter text.

**Other Information:**

Estimated weight/volume/dimension of the Consignment:	Click or tap here to enter text.
Country/ies of Origin: <i>(if export licence required this must be submitted if awarded the contract)</i>	Click or tap here to enter text.

I, the undersigned, certify that I am duly authorized to sign this quotation and bind the company below in event that the quotation is accepted.	
<i>Exact name and address of company</i> Company Name: Click or tap here to enter text. Address: Click or tap here to enter text. Click or tap here to enter text. Phone No.: Click or tap here to enter text. Email Address: Click or tap here to enter text.	Authorized Signature: Date: Click or tap here to enter text. Name: Click or tap here to enter text. Functional Title of Authorised Signatory: Click or tap here to enter text. Email Address: Click or tap here to enter text.

#### ANNEX 4: CHECKLIST FOR SUBMISSION OF BID

Item	Yes, we have submitted	If you cannot submit, pls. indicate the reason
<b>Technical Proposal</b>	<input type="checkbox"/>	Click or tap here to enter text.
Filled up Annex 2 and Bidder Declaration form	<input type="checkbox"/>	
Registration Certificate	<input type="checkbox"/>	
Annual Turnover Certificate	<input type="checkbox"/>	
Documents against Qualifying criteria as per Annexure-3	<input type="checkbox"/>	
<b>Financial Proposal</b>	<input type="checkbox"/>	Click or tap here to enter text.
Quoted prices for all items in the list	<input type="checkbox"/>	
Quoted price for the three components in the table	<input type="checkbox"/>	
Quoted prices for Transportation (up to the delivery site)	<input type="checkbox"/>	
Quoted prices for Insurance (up to the delivery site)	<input type="checkbox"/>	
Quoted prices for VAT or other taxes and duties	<input type="checkbox"/>	

**The submission of proposal should highlight in subject line “SITC for equipment in Bhutan”**