Province Government

Ministry of Social Development

Province Hospital

Karnali Province Surkhet

PROPOSAL DOCUMENT

For

Procurement of Grid Interactive Solar PV system.

for COVID 19

Proposal Document No. PH/Karnali/COVID-02/077-78

Supplier's Name: …….

Address: …….

Contact No. …….

email Address: ……

Date: ……

अस्पताल निर्देशक

फोन नं.०८३ ५२३२००
फ्याक्स ०८३ ५२०२६६

प्रदेश सरकार
सामाजिक विकास मंत्रालय

प्रदेश अस्पताल

कर्णाली प्रदेश, वीरेन्द्रनगर सुर्खेत

सूचना प्रकासित मिति:२०७८/०१/२९ गते

सोलार सिष्टमखरिद सम्बन्धी सूचना ।

नेपाल तथा यस प्रदेशमा माहामारीको रुपमा फैलिएको COVID-19 Second Wave को संक्रमित बिरामीहरुलाई उपचारका लागि प्रयोग हुने उपकरण संचालन गर्न तथा बैकल्पिक बिद्युतको व्यवस्थापन गर्न तपसिल अनुसारका सामाग्रीहरु बिशेष परिस्थितिमा आकस्मिक रुपमा खरिद गर्नु पर्ने भएकाले इजाजत प्राप्त इच्छुक फर्म वा कम्पनी वा आपूर्तिकर्ताले, आ.व. ०७६/०७७ को कर चुक्ताप्रमाण पत्र, मु.अ.कर दर्ता प्रमाण पत्रको छायाकपि सहित सामाजिक विकास मन्त्रालय कर्णालीप्रदेश सुर्खेतको Website: www.mosd.karnali.gov.np or (karnali.gov.npबाट सामाजिक विकास मन्त्रालय) बाट आर्थिक प्रस्ताव डकुमेण्ट डाउनलोड गरि आपूर्तिकर्ताले आपूर्ति गर्ने सामाग्रीहरुको स्पेसिफिकेसन/टेक्निकल डाटा सिट संलग्न राखि आपूर्ति गर्न लाग्ने समय समेत खुलाई प्रस्ताव अस्पतालको इमेल ठेगाना provincehospitalskt@gmail.com मा मिति २०७८/०२/०५ गते १२:०० बजे सम्म पेश गर्नु हुन जानकारी गराईन्छ । प्राप्त हुन आएका प्रस्तावहरु मिति २०७८/०२/०५ गते १:३० बजे यस अस्पतालमा खोलिने छ । आर्थिक प्रस्तावमा उल्लेखित सामाग्रीको परिमाण अस्पतालको आवश्यकता अनुसार थप घट गर्न सकिनेछ । सूचना तथा प्रस्तावमा माग गरिएको कागजात अनिवार्य रुपमा पेश गर्नु पर्नेछ साथै तोकिएको समय भित्र प्रस्ताव पेश नगरेमा त्यस्ता प्रस्तावहरु मूल्यांकनमा समावेस गरिने छैन । यस सम्बन्धमा बिस्तृत जानकारी चाहिएमा उक्त इमेलमा लेखि पठाउनु हुन वा फोन नं. ९८५८०६३०६४, ९८५८०५००१४ मा सम्पर्क गरि जानकारी लिन सकिनेछ ।

तपसिल,

Item
Package No.1, Procurement of Grid Interactive Solar PV system.

अस्पताल निर्देशक

अस्पताल निर्देशक

1. Price Quotation and Price Schedules

Date:

To: *[name and address of the Purchaser]*

Gentlemen and/or Ladies:

Having examined the Direct Purchase (DP) documents, we the undersigned, offer to supply and deliver ***[description of goods and services]*** in conformity with the said DP documents for the sum of ***[total amount in words and figures]*** or such other sums as may be ascertained in accordance with the Schedule of Prices attached herewith and made part of this Price Quotation.

We undertake, if our Price Quotation is accepted, to deliver the goods in accordance with the delivery schedule specified in the Schedule of Requirements.

We agree to abide by this price Quotation for a Period of 4***5*** days from the last date fixed for submission of the Price Quotation.

Until a formal Contract is prepared and executed, this Price Quotation, together with your written acceptance thereof and your notification of award, shall constitute a binding Contract between us.

We understand that you are not bound to accept the lowest or any Price Quotation you may receive.

Dated this_____day of_____20_____.

_____ _____

[signature] *[in the capacity of]*

Duly authorized to sign Price Quotation for and on behalf of_____

1. Price Schedule

Procurement of Grid Interactive Solar PV system.

S.N.	Component	Description	Quantity	Units	Unit Price in NRs. With VAT		Total Price	Remarks
					In Figure	In Words		
1	Solar Array	Solar Photovoltaic Array of Total Minimum Capacity 30 kWp (Size of individual PV module should be ≥300Wp, Mono, Mono PERC or Poly Crystalline Silicon)	30	kWp				
2	Combiner Box	PV Combiner Box (Protection Class: IP65) with DC Fuse for PV strings as per PV module datasheet , DC MCB, DC SPD, Earthing, DC Breaker)	1	Set				
3	MPPT Charge Controller	MPPT Charge Controller compatible for lead acid battery having output voltage of 240 V DC. The efficiency should be at least 93%	30	kW	0	0	0	
4	Battery	VRLA Gel Tubular Battery of Total Minimum Capacity 96 kWh (Individual battery capacity: Minimum 12V200Ah@C/10) with rack, cables and accessories	96	kWhr				

अस्पताल निर्देशक

5	3 phase grid interactive inverter	Three Phase Pure Sine Wave, Grid Interactive Inverter with charger compatible for lead acid battery having battery bank voltage of 240V. This should take input from grid, diesel generator, battery bank and it should have two outputs for essential and non-essential load seggregation. The efficiency shouldn't be less than 95%. It shall include remote monitoring system inbuilt or offered separately.	30	kW				
6	Mounting Structure	Solar PV Module support structure for minimum of 30 kW of PV array, hot dipped galvanized of minimum of 85 micron metal frame with complete set. The minimum clearance between ground and bottom edge of PV module should be 0.5m. The module laying should be in portrait of 2 modules	30	kW				
7	Earthing for PV Mounting Structures	Earthing System: Maintenance free 2.5 m copper earth Electrode of 25 mm diameter with copper coating thickness of 250 microns, Tested for Dimension, Marking, Tensile Strength, Salt mist, coating thickness, Electrical resistivity test before and after corrosion test. Back-fill chemical compound, wire 16 sq. mm. Earth Resistance value lss than 5 Ohm is desirable	1	no.				

8	ESE Lighting Arrestor for roof mounted systems	Air terminal must be Early Streamer Emission (ESE) type and comply with international standard IEC 62651-2. The mast of minimum 3mhight of 3" dia of minimum 3mmthickness.Thedownconductor should be atleast25x3mm copper strip of at least 30m length and chemical rod earthing of 25mmdia of 2.5m length	1	Set				
9	DC Cable	2 core 35 mm2 Copper aromouredXLPE DC cable for PV Combiner Box to Inveter.	50	m				
10	Protection System at Power House	AC SPD Type 1+2 of 230V Imax 20kA which shall be used at all Inverter Output and Main Distribution Box. The SPD should comply IEC 61643-11	1	Set				
		Equipotential copper bus bar for combining all SPDearthings	1	Set				
		Earthing System for Battery Rack, Inverters, Distribution Boxes: Maintenance free 2.5 m copper earth Electrode of 25 mm diameter with copper coating thickness of 250 microns, Tested for Dimension, Marking, Tensile Strength, Salt mist, coating thickness, Electrical resistivity test before and after corrosion test. Back-fill chemical compound, wire 16 sq. mm. Earth Resistance value lss than 5 Ohm is desirable	1	Set				
11		Installation and Commissioning	1	LS				
12	Transportation	Transportation of goods from warehouse to Site in Surkhet	1	LS				

	Total Amount.		

TotalPrice……..……..……(inwords)

Bidder's Name: ……..…….. Signature ofBidder____

Address: …… Contact No. …… Seal:

2.ScheduleofRequirements

S.N.	Item	Unit	Place of Delivery	Delivery Schedule	Bidders Offer
1	Procurement of Grid Interactive Solar PV system	Set	Province Hospital, Surkhet	Within 4 Weeks from Contract sign.	

अस्पताल निर्देशक

TECHNICAL SPECIFICATIONS

General

The purpose of the Technical Specifications (TS) is to define the technical characteristics of the goods and related services that are required to be procured for the system installation. The TS, as a part of the schedule of supply, constitute a contract document and are, therefore, a part of the contract. The bidder must furnish documentary evidence in the form of data sheets, quality test certificates, drawings and detailed description of goods with essential technical information. All data, drawings, catalogues and other technical documents shall be bound separately from the Bid documents.

The Bidder shall furnish a clause-by-clause commentary on specification. The bidders are required to mention their characteristics of proposed goods with related service stating Complied or Non-Complied or Partially Complied. In the case of Non-Complied or Partially Complied comment provided by Bidder, the bidder has to propose its alternative specification so to satisfy the purchaser's requirements. If the deviation mentioned by the bidder is satisfactory, it will go for further evaluation. Otherwise any one or more non-complied or partially complied or not mentioned anything or otherwise mentioned of particular category of goods and related services are subject to rejection of bid. It is mandatory to submit document from manufacturer showing the proposed technical parameters and highlight the parameters in the technical specification.

The power generation system components shall comply with the standard set forth under Nepal Photovoltaic Quality Assurance (NEPQA) 2015.rev1, wherever applicable.

Site Detail

Province Hospital is situated in Kalagaun, Birendranagar Municipality, Surkhet District, Karnali Province, Nepal. It is located at 28.603836 latitude and 81.600943 longitude. It was established in the year 2005 AD, and in year 2018 it was converted to province hospital from mid-western regional hospital. Currently, it is 115-bed hospital with plans to expand its capacity to additional 185 beds in 2020.The grid supply in Surkhet is neither reliable nor of quality which hinders the operation of necessary medical equipment. Thus, provincial hospital has initiated to install solar PV system in its premises to reduce the dependency of grid supply. Based on the demand, it has been decided to install 30kWp solar PV systems in the Provincial Hospital,Surkhet.

SCOPE OF WORK

1. Supply, delivery, installation, testing and commissioning of grid connected solar PV system in the provincial hospital Surkhet.
2. Bidder has to coordinate with client for clear understanding of the work.
3. The bidder has to provide detail specification of quoted system as proposed in this bid document. The contractor must highlight the description as in the Specification in the Technical Specification and other documents during submission of the bid.
4. The bidder must provide training on operation and maintenance to the bio-medical engineer and electrical technicians working in the hospital
5. The bidder must provide manual for operation, troubleshooting and maintenance.
6. All the wiring end should must have fayrul with proper nomenclature of cable. Complete set of wiring diagram has to be provided to the client.
7. The bidder must provide the necessary warranty and guarantee as mentioned in this bid.
8. The bidder has to provide project completion report to client with declaration of conformity with the specification. Also, bidder has to obtain letter of completion from community/institution.
9. The bidder has to take corrective measure within a week of complain made by monitoring team if incase of deviation found.

SOLAR SYSTEM COMPONENTS

1. SOLAR POWER GENERATION COMPONENTS

The bidder shall clearly response the technical specifications and standards asked for the equipments and grid system components in their technical proposal. The bidder shall provide the data sheet, product catalogue and technical specifications of all the indicated equipments of power generation, transmission and distribution system including IV curve, efficiency curves, test certificates/reports, warranty assurance certificate, international standards that the proposed goods comply with.

1.1 Solar Photovoltaic (PV) Module

General Description

The total required PV array capacity must be at least 30 kWp. The PV modules shall comply with following standards and technical specifications.

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
1	Manufacturer Name/Brand/Model		
2	Manufacturer's experience in manufacturing PV modules: Minimum 10 years		
3	The manufacturer shall have: ISO 9001, ISO14001		
4	Peak Power of Individual Module under STC ≥ 300 Watt-peak		
5	Array Capacity: At least 30 kWp		
6	PV Module Efficiency: ≥ 19%		
7	Cell type: Crystalline Mono PERC.		
8	No. of Cells per Module: Minimum 60		
9	Junction Box Protection: IP67 or better according to IEC 60529		
10	Operating Temperature: Minimum range of -20°C to +50°C		
11	Nominal Module Operating Temperature: 42±3 °C		
12	System Voltage: Minimum 1000 VDC and matches with grid interactive inverter operating voltage.		
13	A letter provided by principal PV module manufacturer in their letter head stating the warranty period for their PV module. Product Workmanship Warranty: ≥ 10 years Performance Guarantee: first year: ≥ 97% of STC power 10 year: ≥ 90% of STC Power 25 years: ≥ 80% of STC Power linear warranty ≤ 0.8% per year from year 2 and onwards		
14	Local Certification required: RETS Certificate. PIT must be submitted before agreement and RST must be submitted before delivery of Solar PV Modules.		
15	International Certification: IEC 61215:2005 2nd Edition or IEC 61215-1:2016 and IEC 61215-2:2016 for Terrestrial photovoltaic (PV) modules - Design qualification and type approval – Part 1: Test requirements and Part 2: Test Procedures. IEC 61730 for PV module safety qualification, IEC 62804 for detection of		

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
	potential induced degradation (PID) The test certificates must be provided.		
16	All PV modules offered for the project must be of same type, same model, same power rating and same manufacturer		
17	The Bidder must submit technical datasheet of PV Module		

1.2 Battery

The total required battery bank size must be at least 96 kWh of VRLA Tubular Gel (OPzV).

The batteries shall comply with following standards and technical specifications.

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
1	Manufacturer Name/Brand/Model		
2	Manufacturer's experience in manufacturing Battery: Minimum 10 years for 12VVRLA Tubular Gel		
3	The manufacturer shall have: ISO 9001, ISO 14001, OHSAS 18001		
4	Warranty of minimum 5 years from battery manufacturer in their letter head signed and stamped.		
5	Battery Type: VRLA Gel Tubular with rack and properly sized cables accessories.		
6	Individual Battery Capacity: VRLA 12 Volts (single cell), minimum size 200 Ah@C10 at 25ºC		
7	Battery bank nominal voltage: 240V. It has to match the inverter and charge controller requirement		
8	Cycle usage: For VRLA Tubular Gel, Minimum 1,500 cycles at 80% Depth of Discharge (DoD)		
9	No. of batteries in parallel: Maximum up to 2 strings		
10	Average Self Discharge: ≤3% per month at 25^{o}C		
11	Operating Temperature: Minimum range of -20^{o}C to +50^{o}C		
12	Battery Rack: the battery rack must be made of hot dip galvanized MS of		

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
	minimum 85 microns		
13	Material for Battery: The installation materials for each battery set must be supplied complete in all including mounting racks, cell connecting copper flexible cables of minimum 70mm^2 or busbars of suitable size, stainless steel screw, bolts, washers, insulated terminal post covers, cable shoes, fixing accessories.		
14	RETS Certification (PIT/RST) must be submitted at the time of bid submission otherwise the bid shall be considered non-responsive.		
15	International Certification: The batteries must be UL1981 certified and EN61000-6-1, EN61000-6-3 Certified.		
16	All batteries offered for the project must be of same type, same model, same Ah rating and same manufacturer		
17	The Bidder must submit the technical datasheet of Battery.		

1.3 Solar Charge Controller (Not needed if in-built in Inverter)

The total required capacity of charge controller shall be at least 30 kW. The charge controllers shall comply with following standards and technical specifications.

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
1	Manufacturer Name/Brand/Model:		
2	Manufacturer's experience in manufacturing charge controllers: Minimum 5 years		
3	The manufacturer shall have: ISO 9001, ISO 14001		
4	Warranty: Manufacturing warranty of minimum 3 years from charge controller manufacturer in their letter head signed and with company stamp		
5	Charge Controller Capacity: At least 30 kW (single or multiple stackable units)		

6	Charger Peak Efficiency: > 95%		
7	Type: Advanced microprocessor control type Maximum Power Point Tracking (MPPT) solar charge controller		
8	Charging stage: Three stage charging to provide quick and safe charging for battery		
9	Protection Function: Over charge, over discharge, PV reverse polarity protection, PV short circuit, over temperature, Lightning		
10	Operating Temperature: Minimum range of -20ºC to +50ºC		
11	RETS Certification or Quality certificate validation		
12	International Certification: IEC 62109 or UL 1741 or AS/NZ 3100 or equivalent.		
13	All charge controllers offered for the project must be of same type, same model, same power rating and same manufacturer		
14	The Bidder must submit the technical datasheet of Solar Charge Controller		

1.4 Grid Interactive Inverter

The total required inverter capacity must be at least 30 kW. The inverter shall comply with following standards and technical specifications.

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
1	Manufacturer Name/Brand/Model		
2	Manufacturer's experience in manufacturing inverters: Minimum 5 years		
3	The manufacturer shall have: ISO 9001, ISO 14001.		
4	Warranty: Manufacturing warranty of minimum 3 years from inverter manufacturer in their letter head signed and stamped		
5	Inverter type: Three Phase Grid Interactive Inverter		
6	Rated Power: Total Cumulative Capacity of at least 30kW @25ºC		
7	AC output Voltage: Three Phase 400±10% Vac (L-L), Single Phase 230 ±10% Vac (L-N)		

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
8	Output Frequency: 50 Hz ± 2.5%		
9	Output Wave form: Pure Sine Wave		
10	Peak efficiency: minimum 95%		
11	Inverter efficiency: The efficiency when operating loads at power levels within 40% to 90% of the rated load must be greater than 90%.		
12	Total Harmonic Distortion (THD) < 5%		
13	Protection class: IP20 or above		
14	Protection: DC reverse polarity, DC side disconnect, grid monitoring, AC short circuit		
15	Operating Temperature: Minimum range of -20ºC to +50ºC		
16	Communication Interface: Modbus or RS232 or RS485 or Ethernet pack embedded, should communicate with other equipment and monitoring system		
17	RETS Certification or Quality certificate validation		
18	International Certifications: IEC or equivalent.		
19	All PV inverters offered for the project must be of same type, and same manufacturer		
20	The Bidder must submit the technical datasheet of inverter		

1.5 Control System

The control system shall comply with following standard and technical specifications.

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
1	Manufacturer Name/Brand/Model:		
2	Manufacturer's experience in manufacturing control system: Minimum 3 years		
3	The manufacturer shall have: ISO 9001, ISO 14001 Certificates		
4	Warranty: Manufacturing warranty of minimum 3 years from manufacturer in their letter head signed and stamped		
5	Box/Center Point: Terminals for		

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
	connection of PV inverters, battery inverters, diesel generator and loads		
6	No. of phase: 3-phase		
7	External grid connected AC combiner box: For connection of PV inverters		
8	Degree of protection: IP54 or above		
9	Certification: CE		
10	The Bidder must submit the technical datasheet of Control System		

1.6 Battery Fuse

The battery fuse shall comply with following technical specifications.

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
1	Manufacturer Name/Brand/Model		
2	Battery fuse box: For battery protection		
3	Compatibility: Battery and Inverter		
4	Type/rating: as per system design and requirement		
5	Warranty: 3 years		
6	The Bidder must submit the technical datasheet of battery fuse		

1.7 Monitoring System

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
1	The bidder must submit the technical datasheet of Monitoring System.		
2	RS485 or Modbus or ethernet for receiving data from inverters, charge controller, PV monitoring unit or power meter etc.		
3	RS232 or LAN port or Modbus for local monitoring or network monitoring		
4	Internet connection via GSM modem, CDMA, GPRS, 3G, 4G, ADSL, VSAT		

1.8 Support Structure for PV Modules

The PV array mounting structure shall comply with following technical specifications.

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
1	Optimum Tilt angle and orientation:		
2	Mounting structure design and foundation or fixation mounting arrangements shall consider all static and dynamic loads suitable for site. Support structure design and foundation or fixation mounting arrangements should withstand wind speed up to 160 km/hr		
3	The solar PV module structure must be made of MS hot dip galvanized suitable sections of rectangular tubes, angles and channels. It should be of portrait laying of maximum 2 rows. The minimum standards to be followed are: Vertical leg (Main leg): Minimum 40mmx80mmx2mm Rectangular tube Rafter: Minimum 40mmx80mmx2mm Rectangular tube Purlins: Minimum 40mmx80mmx2mm Rectangular tube or Minimum 50mmx50mmx5mm angle Column bracing or supporting bracing: Minimum 40mmx40mmx5mm angle Base plate: 200mmx200mmx6mm The horizontal spacing between 2 vertical legs must be between 1.5-2 meters as per load conditions. The PV array must be designed with cross section with maximum 2 numbers for vertical placement and 4 numbers for horizontal placement. There must be minimum of 25mm uniform spacing between the modules. The minimum thickness of galvanization must be at least 85 microns throughout the surface.		
4	The mounting structure and its accessories shall be able to resist at		

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
	least 20 years of outdoor exposure without suffering damage or corrosion.		
5	Mounting structure shall be installed in such a way that PV array shading is minimized as much as possible considering site condition		
6	Clearance: Minimum necessary clearance between ground level and bottom edge of the PV modules/arrays must be at least 80cm for ground based and for inclined roof top system, the clearance must be at least 50cm for easy maintenances. At least 20 cm clearance between module and CGI sheet roof for flush mounted system.		
7	Roofing: The structure must not cause any damage to the roofing, (appropriate procedure must be applied) in case of roof-top system		
8	Stainless Steel (SS 304) nuts & bolts should be used for fixing modules with the structure. Stainless Steel (SS 304) or Galvanized bolts, nuts, fasteners, washers, mounting clamps should be used for fixing structure and compatible with materials which it is being fixed. In case of welding structure, the galvanization should be done after the fabrication work.		
9	The foundation of PV structure shall be minimum 0.8-meter-deep with 0.3(L) x 0.3(B) size with 0.3m thick stone soling with sand filling and 0.3(L) x 0.3(B) x 0.8(H) pillar in 1:2:4 PCC with 0.3m pillar above ground.		

1.9 DC Combiner Box

DC combiner box refers to the box where the PV modules/ strings are collected, and cables are routed towards Solar Charge Controller or PV inverter. The DC combiner box shall comply with following technical specifications.

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
1	The DC combiner box shall be rated for exterior installation suitable for the Site Conditions, shall be UV and weather resistant, and must be rated minimum for IP65 according to IEC 60529		
2	12 sting input combiner box. String fuses shall be selected according to PV module manufacturer's recommendation on reverse current limit. The DC MCB at the output should be in accordance to combined string current with factor of safety of 1.2.		
3	System shall have DC isolation switch which can isolate the connection between PV array and the system. This isolation can be also within DC box.		
4	System must have appropriately sized surge protection device conforming to IEC 61643-11 and grounded adequately.		
5	DC box installation shall be protected from direct rain, Sun and dust		
6	All cables must be connected properly and cable entering/outings into/from the box must be sealed properly (use of cable glands, cables shoes, copper tube, thimble, cable ties) so that dust and insects, mice cannot enter the box		
7	Type 1 + 2 DC SPD suitable for the DC system voltage (1000V or 1500V) which has to earthed with copper earth rod of minimum 2m long 20mmdia surrounded by chemical earthing compound.		

1.10 Cables and Accessories:

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
1	Cables shall be selected with an insulation voltage level applicable to the system voltage for which they are used and ampacities suitable for the		

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
	load being serve		
2	Cables shall be multi-strand, PVC insulated cables and UV resistant, suitable for outdoor installations		
3	All DC and AC cables must be copper.		
4	DC Resistance for 2 core copper armored xlpe cable: 0.386Ω/km for 50mm2 and 0.554Ω/km 35mm2		
5	Protection and safety: PV array to Charge Controller or Inverter cables: Cabling trench with high grade insulation protection		
6	Outdoor cables from PV plant to Powerhouse should be armored. The cable must be underground at depth of 0.3 meter with sand and soil filling. Any underground cable interconnections must be water-tight corrosion resistant types		
7	All external wiring, cabling, insulation material and junction boxes must be UV-resistant and terminals protected against dust and moisture.		
8	String junction boxes/string combiner boxes/main combiner boxes/grid connected AC combiner box must be minimum of IP65 according to IEC 60529		

1.11 Generation System Earthing and Protections:

The earthing and protections must be done separately for following points of the system such as PV module frame & array structure, Equipment Earthing, System Earthing (AC Earthing), Lightning Protection System (LPS) Earthing.

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
1	The PV modules frame and array structure must be properly earthed, connected to an earth electrode via insulated stranded copper earth strip of minimum 25x3 mm and using the shortest practical direct route		

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
	downwards that directs the cable away from sensitive electronic equipment and shall not enter the building. The maximum allowable earth resistance between array frame and earth electrode is 5 Ohms.		
2	Equipment Earthing: Equipment bonding shall be used to tie together casings of all equipment and enclosures, including all electronic equipment casings (MPPT controllers, inverters), battery rack, DC combiner boxes, AC combiner boxes, DC busbars and DC enclosures, with minimum 10 mm^2earth cable, and connected via an insulated stranded copper earth wire of minimum 16 mm^2 connected to an earth electrode. The maximum allowable earth resistance between the metal parts of the devices and metal parts of the consumer earth terminal is 5 Ohms		
3	System Earthing: The AC neutral conductor together with Main AC DB or Multicluster must be properly earthed, connected to an earth electrode via insulated stranded copper earth wire of minimum 16mm^2. The maximum allowable earth resistance is 5 Ohms		
4	For PV frame & array structure earthing, equipment earthing and system earthing, plate earthing or pipe earthing shall be preferred. Copper Strip Size: 25mm x 3.15mm thickness Backfill Compound: 25KgBentonite Copper rod of 2.5m of 25mmdia		
4	The Lightning Protection System (LPS) must be able to minimize the damage to the surrounding environment.		

1.12 Others

S.N.	Specifications Required	Specifications Offered with Compliance	Reference Document (Specify Document)
1	Appropriate labeling to the solar powered sockets, solar PV system components and its wirings.		
2	The Single Line Diagram (SLD) must be provided in Technical Bid.		
3	The SPD must be installed on both DC and AC side conforming to IEC 61643-11.		
4	The Switches/Circuit Breakers/Disconnectors/Fuses used must comply with IEC 60947 Part 1, 2 & 3: All parts		

1.13 Control Room:

Hospital will provide enough space for control room. The control room will include controllers/inverters, battery bank etc. An entrance gate has to be constructed to enter into the control house. The control room must be equipped with fire extinguisher.

1.14 System Electrical Protection

Protection system shall be provided to isolate faulty section as quickly as possible, to limit damage and to maintain healthy systems in stable operating condition. The distributed mini-grid system will feature a high degree of selectivity and discrimination between faulty and healthy circuits. In general, the protection system shall be provided for

- Solar PV modules and solar charge controller
- Battery Bank
- Inverter and power conditioning devices

All the components of solar PV system, both AC and DC must be grounded to a low impedance ground. Grounding conductors and bus bar should be tested and determine the "grounding system" resistance, this should be 5 ohm or less. The solar PV plant structure shall be grounded properly using adequate number of earthing kits indicated under the list of goods and related service. All metal casing/shielding of the solar PV system shall be thoroughly grounded to ensure safety of the power plant. The solar power system shall be provided with lightening and over voltage protection. The main aim in this protection shall be to reduce the over voltage to a tolerable value before it reaches the mini grid power system network.

1.15 Human and Equipment Safety

Following safety affairs are proposed.

- A suitable Fire Protection system shall be incorporated inside the control room where the battery bank, power conditioning devices, cabling and communication systems will be setup.
- Safety Sinage: High visibility warning signs such as electrical shock, acid burn, explosion etc shall be placed at the recommended sections.
- Maintenance and safety equipments shall be used while handling electrical work at the site such as eye glass, electrical safety gloves, acid spill kit etc.

1.16 Operation, Maintenance Manual and Training Program

The bidder shall provide operation and maintenance manual and training to technician provided by the management committee, in English and Nepali language upon completion of the project.

The bidder shall involve technician of the hospital during installation, testing and commissioning. The bidder shall support hospital management committee with the aim to provide clear information on component, safety, installation process, verification on proper functioning of component and system.

The bidder shall prepare and provide operation and maintenance manual to hospital management committee for review and approval not later than 2 weeks before the planned testing and commissioning date. The Operation and Maintenance Manual shall include information as minimum but not limited to followings:

- Basic System design and configuration
- Schedule for maintenance plan
- Schedule of corrective maintenance
- Contact details of Contractor and Component Supplier
- Troubleshooting instructions
- Safety and Safe Operation procedure
- DO’s and Don’ts
- Emergency shutdown procedure

2. Construction Work Standard

2.1 General

1. These specifications together with the construction standards shall govern the performance of the works and shall be the basis for inspection and acceptance of the works by the purchaser.
2. These specifications and the construction standards shall be considered as mutually inclusive, and the conditions stated in each shall supplement the other as appropriate.
3. All these specifications shall be followed at all times by the Contractor unless specifically accepted in writing by the Purchaser, or unless some aspects of the work covered by these specifications are not required by the scope of work.

2.2 Safety

1. The Contractor shall take all measures required to safeguard the public, public and private property from any hazard to life, limb, or property, which may arise during the performance of the construction of the works. Such measures shall include, but not be limited to barricades, signs, newspaper announcements, traffic control by police, or other advisory and control methods deemed appropriate.
2. The Contractor shall provide his work force with all tools and equipment in sufficient numbers and quality to perform all aspects of the works in a safe manner. The Contractor shall provide protective headgear for all members of his workforce and shall provide protective clothing as required for specific tasks. The Contractor shall instruct their work Force in proper and safe construction techniques and shall continuously monitor compliance with safety instructions throughout the period of the Contract.
3. The Contractor shall provide, and require use of, protective grounding equipment when:
    a) Work is being performed on lines adjacent, either in extension of, or parallel to, energized circuits.
    b) Work is being performed on isolated circuits after conductors have been installed.
4. The Contractor shall maintain all tools and equipment in good working order. All mechanized equipment shall have adequate safety mechanisms and guards in place and be fully operational. Operators of such equipment shall be skilled and fully trained in the operation of such equipment.

5. The Contractor shall provide and maintain emergency medical supplies to cover with accidents or snakebites for his work force on a readily available basis. The Contractor shall also instruct all supervisory personnel in the action to be taken in the event of serious injury, and the sources and locations of professional medical assistance, which shall be employed in such cases.
6. The Contractor shall apply all accidental insurance policies to his work force for an accident occurring during the working period of the construction.
7. The Contractor shall furnish the electrical test equipment and personnel to perform electrical tests of equipment and circuits, as specified by, and under the supervision of designated authority of client.
8. All tests specified shall be conducted during suitable atmospheric conditions under the supervision and witness of designated authority of client. All test results shall be documented and signed by both parties.

2.3 Cleanup

1) The Contractor shall ensure that all worksites shall be free of all manner of debris resulting from the construction activity.
2) All crating, conductor reels, packaging materials, conductor scraps, and other miscellaneous items are removed from the workplace. All holes resulting from removal of facilities shall be filled. If trees or brush have been cut or trimmed, all cuttings shall be removed. The worksites shall be left in clean natural conditions.
3) Site cleanup shall be an integral part of the Provisional Acceptance process, and no line section shall be provisionally accepted unless all cleanup work has been accomplished.

2.4 Technical Documentation

All technical documentation as specified herein shall be prepared by the Contractor. The Contractor shall employ skilled drafting personnel to produce all documentation specified. All technical documentation prepared by the Contractor shall be subject to the approval of management committee prior to acceptance of such documentation. All technical documentation shall be prepared in the English language.

3. System Warranty and Guarantee

1) The complete system must be warranted against any manufacturing/design/installation defects for a minimum period of (3) years.
2) Solar PV modules used in power plant must be warranted as indicated in the PV module section of technical specification.
3) The Warrantee/ Guarantee Card to be supplied with the power plant must contain the details of the system supplied. The manufacturers can provide additional information about the system.
4) During the Warrantee/Guarantee period, purchaser will have all the rights to cross check the performance of the solar power plant. Purchaser may carry out the frequent inspections of the system installed and randomly pick up its components to get them tested at any test center. If during such tests any part is not found as per the specified technical parameters, purchaser will take the necessary action. The decision of purchaser in this regard will be final and binding to the Bidder.

4. System Testing and Commissioning Requirement

Site test

As per standard norms, following tests shall be carried out at the field.

- The power and energy output of solar PV array will be measured with the help of Electrical Power Analyzer for a whole day. Alternatively, same test and observation can be made through the 3-phase inverter unit integrated in the same system. The output energy at full sunny day shall be at least 90% of nominal value designed at 5hours average sunshine.
- Each finished component or item installed at site shall be inspected against applicable requirements as indicated in the technical specifications.

5. System Operation and Maintenance

Operation and Maintenance of solar system is essential for the reliable and sustainable power supply to the hospital. For the first three (3) year the Supplier/Contractor shall be fully responsible for any kind of operation and maintenance jobs required to the solar system. The supplier/contractor will depute TWO full time operators (One Senior Technical and One Assistant), tools and consumables, for operation of solar system for three (3) years from the

date of commissioning. A quarterly site visit must be done by the contractor's engineer to make sure the preventative maintenance and assure that all the system components are fully functional. The quarterly site visit report shall be submitted to management committee within a week of each visit.

Other Terms and Conditions of the Proposal:

(i) The supplier should submit document stating the stock evidence of required quantity or the evidence with purchase order of required quantity in given timeframe.

(ii) The Supplier should submit certificate as mention in Specification of required item.

(iii) The supplier should quote the price of all items and Hospital award the lowest amount of package.

(iv) The supplier should supply the item according to hospital purchase order (partially or fully) as per hospital need. The quantity mention in Price Schedule will be increased or decreased as per hospital need.

(v) Hospital has right to fully/partially accept or decline the proposal submitted by the supplier.

अस्पताल निर्देशक

3. Form of Agreement

THIS AGREEMENT made the day of_____20 between ***[name of Purchaser]*** (hereinafter called "the Purchaser") of the one part and ***[name of Supplier]*** of *[city and country of Supplier]* (hereinafter called "the Supplier") of the other part:

WHEREAS the Purchaser invited Priced Quotation for certain goods and ancillary services, viz., ***[brief description of goods and services]*** and has accepted a Price Quotation by the Supplier for the supply of those goods and services in the sum of ***[contract price in words and figures]*** (hereinafter called "the Contract Price").

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

•In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.

•The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.:

•Price Quotation Form and the Price Schedule submitted by the Supplier;

•The Schedule of Requirements;

•The Technical Specifications;

•The Conditions of Contract; and

•The Purchaser's Notification of Award.

•In consideration of the payments to be made by the Purchaser to the Supplier as hereinafter mentioned, the Supplier hereby covenants with the Purchaser to provide the goods and services and to remedy defects there in inconformity in all respects with the provisions of the Contract.

• The Purchaser hereby covenants to pay the Supplier in consideration of the provision of the goods and services and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the contract at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with their respective laws the day and year first above written.

On behalf of the Purchaser	On behalf of the Supplier
Name:	Name:
Designation:	Designation:
Sign:	Sign:
Seal:	Seal: