

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

BDC1617-07501

SPECIFICATIONS FOR SUPPLY OF BoS, ERECTION & COMMISSIONING WITH 05 YEARS WARRANTY AND 05 YEARS OF COMPREHENSIVE MAINTENANCE FOR 8x5 Kwp + 1X10 KWp + 1x25 KWp ROOF TOP HYBRID SPV SYSTEM WITH BATTERIES AT POLICE TRAINING SCHOOL MEERUT - UTTAR PRADESH.

BDC1617-07501

Signature and seal of Bidder

 Rudrapur	PURCHASE SPECIFICATION GROUP : BDC	BDC1617-07501 Rev no 00
---	---	--------------------------------

1 INTRODUCTION:

This specification defines the scope of the Bidder **for supply of balance of system (BoS), erection & commissioning 05 years warranty and 05 years of comprehensive maintenance for 8x5 KWp + 1X10 KWp + 1x25 KWp roof top hybrid SPV system with batteries at police training school(PTS) Meerut - Uttar Pradesh.**

1.1 Site Details:

Site is located at PTS, Meerut at a distance of 7 Km from Meerut railway Station. Incoming supply to all the building is 3 phase 4 wire at 415 V. The SPV systems are to be installed as per following:

- a) **8X5 KWp SPV Hybrid system:** 01 System each of 5 KWp capacities on roof top of 08 Hostels. The roof tops are flat and shadow free facing south. All Hostel buildings are 02 storeys (GF+FF) and approach to roof top is easily accessible by Stairs. PCU, batteries are to be placed on ground floor near Stairs and power evacuation is to be done on DB board on ground floor near stairs.
- b) **1X10 KWp SPV Hybrid systems:** 01 System of 10 KWp capacity on roof top of school building. The roof top is flat and shadow free facing south. School building is single storey (GF) and approach to roof top is easily accessible by Stairs. PCU, batteries are to be placed on ground floor near Stairs and power evacuation is to be done on DB board on ground floor near stairs.
- c) **1X25 KWp SPV Hybrid system:** 01 System of 25 KWp capacity on roof top of admin building. The roof top is flat and shadow free facing south. Admin building is 02 storeys (GF+FF) and approach to roof top is easily accessible by Stairs. PCU, batteries are to be placed on ground floor near Stairs and power evacuation is to be done on DB board on ground floor near stairs.

Bidders are advised that they should visit the site before quoting to fully understand the site conditions.

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

2 BIDDER'S SCOPE:

2.1 System 1: 8x5 KVA System

- Erection and commissioning of **300 Wp, 18 Nos. SPV Modules** each supplied by **BHEL** (Specifications as per SPV Module drawing- 3-679-02-00352 and SPV Module Data Sheet – CD- 4-4001-128):
- Supply, Erection and commissioning of solar module mounting structure along with all accessories.
- Supply, Erection and commissioning of junction box.
- Supply, Erection and commissioning of Hybrid Inverters with Charge Controller (PCU).
- Supply, Erection and commissioning of Batteries with accessories.
- DCDB and ACDB.
- Supply, Erection and commissioning of DC Cu Cables with accessories for connection between Modules, junction box and PCUs.
- Supply, Erection and commissioning of AC Cu Cables with accessories for connections between PCUs and distribution board etc.
- Supply, Erection and commissioning of weather monitoring system (01 No.) with Web Enabled Data Logging system along with 5 year service.
- Supply, Erection and commissioning of desktop computer for monitoring.
- Supply, Erection and commissioning of Earthing & lightning protection of SPV area as per relevant IS.
- Supply, Erection and commissioning of Fire extinguisher.
- Supply, Erection and commissioning of Miscellaneous Equipment (Control cables, insulation tapes, ferrules, Lugs, Cable Glands, cable trays, cable ties, pipe, Clamps, Safety Signs, project Schematic, Project information Signage, MC4 connectors etc.) and Civil Works.
- Freight & Transit insurance
- System Warranty of 05 years
- Comprehensive Maintenance contract of 5 years (Half yearly Visit).

List of Items for Supply & E&C for System 1: 8x5 KVA Systems

Sl. No.	ITEM DESCRIPTION	Qty	SUPPLY	E & C	MAKE/ REMARKS
1.	Solar PV Module 300 Wp	8x18 Nos.	x	✓	SPV Modules shall be provided by BHEL.
2.	Galvanized MS, Aluminium Module Mounting Structures	8x1 lot	✓	✓	As per the indicative Structure drawing (Drg. No: 3-679-05-

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

	with precast PCC pedestals of 350x350x350 (in mm) with galvanized MS foundation bolts and SS Hardware for 8x5 Kwp				00683) attached. Actual configuration may vary based on the array layout. However vendor shall ensure the structure stability and shall submit the structure wind load calculations.
3.	Junction Box	8x1 lot	✓	✓	Make- Hensel, Onexis or equivalent
4.	3 phase input, 3 phase out put 5KVA Hybrid Inverter with charge controller (PCU)	8x1 No.	✓	✓	Statcon Energiaa / Su-Kam / ENERTECH / <u>CONSUL</u> or equivalent MNRE approved
5.	Maintenance Free solar grade Pb-Acid Battery Bank of 28800 VAH	8x1 sets	✓	✓	EXIDE/ Su Kam/ Luminous or equivalent MNRE approved
6	DCDB and ACDB	8x1 lot			Make: MCB/MCCB- L&T, C&S, Legrand, ABB, Schneider.
7	1.1kV grade heavy duty PVC insulated, Double sheathed, UV protected stranded copper DC cables as per IS: 7098 (Part I & II) – 1976 or IS 1554 or IS9537 of suitable size for connection between SPV module to junction box and Hybrid Inverter PCUs	8x1 lot	✓	✓	Reputed makes viz., Polycab / Pagoda/ KEI / LAPP / Advance Cables / Equivalent.
8	1.1kV grade heavy duty PVC insulated galvanized strip/wire XLPE stranded 3.5 core AC Cu conductor cables as per IS: 7098 (Part I & II) – 1976 or IS 1554 or IS9537 of suitable size for connection between Hybrid Inverter PCUs and distribution board.	8x1 lot	✓	✓	Reputed makes viz., Polycab/KEI/LAPP/Advance Cables/equivalent.
9	Weather monitoring system with Web Enabled Data Logging system	1 No.	✓	✓	Make: Reputed make.
10	PC desktop Computer	1 No.	✓	✓	Lenovo, Dell, Hp, Compaq, HCL.
11	Lightning Arrestor (Globe type) with earthing for roof along with mounting arrangement as per relevant IS.	8x1 No.	✓	✓	As per the attached drawing No: 3-679-05-00037.

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

12	Pipe earthing with earth Bus bar for Structures, Hybrid Inverter with charge controller and LA earthing as per IS3043.	8x2 No.	✓	✓	This includes 8 earthing for LA
13	Fire Extinguisher.	8x1 No.	✓	✓	Make: Reputed make
14	Miscellaneous Equipment (Control cables, insulation tapes, , ferrules, Lugs, Cable Glands, cable trays, cable ties, pipe, for synchronization, Clamps, Safety Signs, project Schematic, Project information Signage, MC4 connectors, etc.) and Civil Works required for E&C.	8x1 set	✓	✓	Quantities as required for project completion, Bidder has to organize without any Additional cost.

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

2.2 System 2: 1x10 KVA System

- a. Erection and commissioning of **300 Wp, 36 Nos. SPV Modules supplied by BHEL** (Specifications as per SPV Module drawing- 3-679-02-00352 and SPV Module Data Sheet – CD- 4-4001-128):
- b. Supply, Erection and commissioning of solar module mounting structure along with all accessories.
- c. Supply, Erection and commissioning of junction box.
- d. Supply, Erection and commissioning of Hybrid Inverters with Charge Controller (PCU).
- e. Supply, Erection and commissioning of Batteries with accessories.
- f. DCDB and ACDB.
- g. Supply, Erection and commissioning of DC Cu Cables with accessories for connection between Modules, junction box and PCUs.
- h. Supply, Erection and commissioning of AC Cu Cables with accessories for connections between PCUs and distribution board etc.
- i. Supply, Erection and commissioning of Earthing & lightning protection of SPV area as per relevant IS.
- j. Supply, Erection and commissioning of Fire extinguisher.
- k. Supply, Erection and commissioning of Miscellaneous Equipment (Control cables, insulation tapes, , ferrules, Lugs, Cable Glands, cable trays, cable ties, pipe, Clamps, Safety Signs, project Schematic, Project information Signage, MC4 connectors etc.) and Civil Works.
- l. Freight & Transit insurance
- m. System Warranty of 05 years
- n. Comprehensive Maintenance contract of 5 years (Half yearly Visit).

List of Items for Supply & E&C for System 2: 1x10 KVA Systems

Sl. No.	ITEM DESCRIPTION	Qty	SUP PLY	E & C	MAKE/ REMARKS
1.	Solar PV Module 300 Wp	1x36 Nos.	x	✓	SPV Modules shall be provided by BHEL.
2.	Galvanized MS, Aluminum Module Mounting Structures with precast PCC pedestals of 350x350x350 (in mm) with galvanized MS foundation bolts and SS Hardware for 1X10 KWp SPV Modules.	1 lot	✓	✓	As per the indicative Structure drawing (Drg. No: 3-679-05-00683) attached. Actual configuration may vary based on the array layout. However vendor shall ensure the structure stability and shall submit the structure wind load calculations.

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

3.	Junction Box	1 lot	✓	✓	Make- Hensel, Onexis or equivalent
4.	3 phase input, 3 phase out put 10KVA Hybrid Inverter with charge controller (PCU)	1 No.	✓	✓	Statcon Energiaa / Su-Kam / ENERTECH / <u>CONSUL</u> or equivalent MNRE approved
5.	Maintenance Free solar grade Pb-Acid Battery Bank of 57600VAH	1 sets	✓	✓	EXIDE/ Su Kam/ Luminous or equivalent MNRE approved
6	DCDB and ACDB	1 lot			Make:MCB/MCCB- L&T, C&S, Legrand, ABB, Schnider.
7	1.1kV grade heavy duty PVC insulated, Double sheathed, UV protected stranded copper DC cables as per IS: 7098 (Part I & II) – 1976 or IS 1554 or IS9537 of suitable size for connection between SPV module to junction box and Hybrid Inverter PCUs	1 lot	✓	✓	Reputed makes viz., Polycab / Pagoda/ KEI / LAPP / Advance Cables / Equivalent.
8	1.1kV grade heavy duty PVC insulated galvanized strip/wire XLPE stranded 3.5 core AC Cu conductor cables as per IS: 7098 (Part I & II) – 1976 or IS 1554 or IS9537 of suitable size for connection between Hybrid Inverter PCUs and distribution board.	1 lot	✓	✓	Reputed makes viz., Polycab/KEI/LAPP/Advance Cables/equivalent.
9	Lightning Arrestor (Globe type) with earthing for roof along with mounting arrangement as per relevant IS.	2 No.	✓	✓	As per the attached drawing No: 3-679-05-00037.
10	Pipe earthing with earth Bus bar for Structures, Hybrid Inverter with charge controller and LA earthing as per IS3043.	4 No.	✓	✓	This includes 2 earthing for LA
11	Fire Extinguisher.	1 No.	✓	✓	Make: Reputed make
12	Miscellaneous Equipment (Control cables, insulation tapes, , ferrules, Lugs, Cable Glands, cable trays, cable ties,	1 set	✓	✓	Quantities as required for project completion, Bidder has to organize without any Additional cost.

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

	pipe, for synchronization, Clamps, Safety Signs, project Schematic, Project information Signage, MC4 connectors, etc.) and Civil Works required for E&C.				
--	--	--	--	--	--

BDC1617-07501

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

2.3 System 3: 1x25 KVA System

- Erection and commissioning of **300 Wp, 90 Nos. SPV Modules supplied by BHEL** (Specifications as per SPV Module drawing- 3-679-02-00352 and SPV Module Data Sheet – CD- 4-4001-128):
- Supply, Erection and commissioning of solar module mounting structure along with all accessories.
- Supply, Erection and commissioning of junction box.
- Supply, Erection and commissioning of Hybrid Inverters with Charge Controller (PCU).
- Supply, Erection and commissioning of Batteries with accessories.
- DCDB and ACDB.
- Supply, Erection and commissioning of DC Cu Cables with accessories for connection between Modules, junction box and PCUs.
- Supply, Erection and commissioning of AC Cu Cables with accessories for connections between PCUs and distribution board etc.
- Supply, Erection and commissioning of Earthing & lightning protection of SPV area as per relevant IS.
- Supply, Erection and commissioning of Fire extinguisher.
- Supply, Erection and commissioning of Miscellaneous Equipment (Control cables, insulation tapes, , ferrules, Lugs, Cable Glands, cable trays, cable ties, pipe, Clamps, Safety Signs, project Schematic, Project information Signage, MC4 connectors etc.) and Civil Works.
- Freight & Transit insurance
- System Warranty of 05 years
- Comprehensive Maintenance contract of 5 years (Half yearly Visit).

List of Items for Supply & E&C for System 2: 1x10 KVA System

Sl. No.	ITEM DESCRIPTION	Qty	SUPPLY	E & C	MAKE/ REMARKS
1.	Solar PV Module 300 Wp	1x90 Nos.	x	✓	SPV Modules shall be provided by BHEL.
2.	Galvanized MS, Aluminum Module Mounting Structures with precast PCC pedestals of 350x350x350 (in mm) with galvanized MS foundation bolts and SS Hardware for 1X25 KWp SPV Modules.	1 lot	✓	✓	As per the indicative Structure drawing (Drg. No: 3-679-05-00683) attached. Actual configuration may vary based on the array layout. However vendor shall ensure the structure stability and shall submit the structure wind load calculations.

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501
Rudrapur	GROUP : BDC	Rev no 00

3.	Junction Box	1 lot	✓	✓	Make- Hensel, Onexis or equivalent
4.	3 phase input, 3 phase out put 25KVA Hybrid Inverter with charge controller (PCU)	1 No.	✓	✓	Statcon Energiaa / Su-Kam / ENERTECH / <u>CONSUL</u> or equivalent MNRE approved
5.	Maintenance Free solar grade Pb-Acid Battery Bank of 144000VAH	1 sets	✓	✓	EXIDE/ Su Kam/ Luminous or equivalent MNRE approved
6	DCDB and ACDB	1 lot			Make:MCB/MCCB- L&T, C&S, Legrand, ABB, Schnider.
7	1.1kV grade heavy duty PVC insulated, Double sheathed, UV protected stranded copper DC cables as per IS: 7098 (Part I & II) – 1976 or IS 1554 or IS9537 of suitable size for connection between SPV module to junction box and Hybrid Inverter PCUs	1 lot	✓	✓	Reputed makes viz., Polycab / Pagoda/ KEI / LAPP / Advance Cables / Equivalent.
8	1.1kV grade heavy duty PVC insulated galvanized strip/wire XLPE stranded 3.5 core AC Cu conductor cables as per IS: 7098 (Part I & II) – 1976 or IS 1554 or IS9537 of suitable size for connection between Hybrid Inverter PCUs and distribution board.	1 lot	✓	✓	Reputed makes viz., Polycab/KEI/LAPP/Advance Cables/equivalent.
9	Lightning Arrestor (Globe type) with earthing for roof along with mounting arrangement as per relevant IS.	2 No.	✓	✓	As per the attached drawing No: 3-679-05-00037.
10	Pipe earthing with earth Bus bar for Structures, Hybrid Inverter with charge controller and LA earthing as per IS3043.	4 No.	✓	✓	This includes 2 earthing for LA
11	Fire Extinguisher.	3 No.	✓	✓	Make: Reputed make
12	Miscellaneous Equipment (Control cables, insulation tapes, , ferrules, Lugs, Cable Glands, cable trays, cable ties,	1 set	✓	✓	Quantities as required for project completion, Bidder has to organize without any Additional cost.

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

pipe, for synchronization, Clamps, Safety Signs, project Schematic, Project information Signage, MC4 connectors, etc.) and Civil Works required for E&C.				
--	--	--	--	--

Note:

- 01 No. of Web Enabled weather monitoring system is required on System 1: 8x5 KVA. Web Enabled weather monitoring system is not required on System 2 and System 3.
- 01 No. of PC desktop Computer is required on System 1: 8x5 KVA. PC desktop Computer is not required on System 2 and System 3.
- Such Items, not listed but required for completion of the Project shall deemed to have been included in the scope of this contract.
- SPV Modules shall be supplied by BHEL; However I&C of SPV modules shall be in scope of Bidder.
- The technical particulars, installation procedures and drawings of the bought out items Listed above clause 2.1, 2.2 and 2.3 shall be submitted for approval to BHEL before procuring.
- Bidder has to procure materials as per listed make. Whenever equivalent make has to be procured prior approval has to be taken from BHEL submitting the make and technical particulars of the component.
- Test Certificates of BOS material and dimensional test reports of structures confirming to IS should be submitted to BHEL for PSI.

2.4 Comprehensive Maintenance contract of 5 years (Half Yearly Visit).

All the equipment's to be installed for commissioning of solar PV power plant and the power plant in whole (Except SPV Modules) for each system shall be under Comprehensive Maintenance Contract for 5(five) years from the date of successful commissioning.

The equipments or components, or any part thereof, so found defective/damage during Comprehensive Maintenance Contract period will be forthwith repaired or replaced within the scope of warrantee obligation to the satisfaction of the BHEL.

The maintenance of solar PV power plant includes routine & periodic maintenance, overhauling, breakdown maintenance, and repairing or replacement of defective invertors, and other components, providing of consumables shall be under CMC.

The Down-Time of PV system should not be more than 72 hours (03 days).

The comprehensive CMC will include 2 half yearly visits per year along with emergency/breakdown visits. CMC charges shall be inclusive of all to & from travel, lodging, boarding, etc.

Signature and seal of Bidder

 Rudrapur	PURCHASE SPECIFICATION GROUP : BDC	BDC1617-07501 Rev no 00
---	---	-----------------------------------

3 Technical Specification of BoS

3.1 Solar PV Modules

Around 270 Nos. SPV Modules shall be supplied by BHEL. Specifications of SPV modules is as per SPV Module drawing- 3-679-02-00352 and SPV Module Data Sheet – CD- 4-4001-128. Erection and commissioning of SPV Modules shall lie in Bidder's Scope.

3.2 MODULE MOUNTING STRUCTURE:

Mobile precast PCC pedestals (1:2:4) of 0.35x0.35x0.35 (in meters) should be supplied. The cement used for PCC pedestal casting should be Ordinary Portland Cement of reputed make. The sand used should be free from organic matter and clay content. The aggregate used should be 20 mm nominal size. Vendor has to ensure good finish of the pedestal without any honey combs otherwise BHEL has right get the entire pedestal reworked at no extra cost. Vendor has to ensure proper curing for at least 7 days after casting. All the necessary arrangements for proper casting, if casted at site will be in the scope of vendor. The module mounting structure should be as per indicative drawing (Drg. No: 3-679-05-00683) attached. Actual configuration may vary based on the array layout. However vendor shall ensure the structure stability and shall submit the structure wind load calculations. The structure should be able to withstand 160 KMPH of wind load. Array support structure shall be fabricated using corrosion resistant GI metal sections of min. 70 micron. Array support structure welded joints shall be adequately treated to resist corrosion and fasteners should be SS304.

The support structure shall be free from corrosion when installed. PV modules shall be secured to support structure using screw fasteners. Screw fasteners shall use existing mounting holes provided by module manufacturer. No additional holes shall be drilled on module frame. Module fasteners/clamps shall be adequately treated to resist corrosion. Adequate spacing shall be provided between any two modules secured on PV panel for improved wind resistance. Zinc rich spray paint shall be applied in scratches of the structures for preventing corrosion.

3.3 Junction Box:

Suitable numbers of junction boxes of polycarbonate are to be provided in the PV yard for termination of connecting cables from array to Junction Box & Junction Box to PCU.

IP65 Dust, water and vermin proof junction boxes of adequate rating and adequate terminal facility shall be provided for wiring. All wires/cables must be terminated through cable lugs. The Junction Boxes shall be such that input & output termination can be made

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

through suitable cable glands.

Copper bus bars/terminal blocks housed in the junction box with suitable termination threads. The Junction Box shall have high quality suitable capacity SPD class II surge protection device. Each solar shall be provided with fuses of adequate rating to protect the solar arrays from accidental short circuit. The Junction Boxes shall have suitable arrangement for monitoring and disconnection for each of the groups.

3.4 Hybrid Inverter with charge controller (PCU) :

3Ø input 3Ø output Hybrid Inverter with charge controller (PCU) are required. Bidder should ensure compatibility of PCU with **SPV modules (300 Wp module, Voc-45 V, Vmp-36 V data sheet attached)** and system. The technical particulars of the PCU have to be submitted to BHEL for approval before procurement.

Operational Philosophy

The system shall supply electricity from Grid and Solar Panels. Energy storage in the form of a battery bank provides a buffer and control flexibility to allow optimum use of the renewable energy source without jeopardizing the robustness and quality of power delivered to the customer. The way in which this should be achieved is described below.

a) High load, minimal solar

In this mode the grid primarily supplies the system energy. Operation is optimized to make best use of the battery bank.

Note: The load at Hostels, school and admin building are as follow:

System 1 Hostel- 7.5 KVA (PCU is 5 KVA)

System 2 School-15 KVA (PCU is 10 KVA)

System 3 Admin Building: 50 KVA (PCU is 25 KVA).

The output of PCU shall be designed such that when grid is available the load shall be shared by available solar and rest with Grid. The system should not trip overload upto these load limits.

b) High load, high solar

In this situation the solar behaves in effect as a negative load. The power system will see a reduced demand but the demand will still be large enough to require the operation of the grid.

c) Low load, high solar

When significant amount of solar energy is available and the load is close to that which can be supported by the PV array it shall be possible to internally turn off the grid completely. The inverter and battery bank shall cover for any mismatch between the PV array and the system load. If the battery

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501
Rudrapur	GROUP : BDC	Rev no 00

bank starts to run low, depending on the availability the grid will automatically cut -in. Thus the battery bank shall be able to supply power to the system via the inverter to cover the load in the event of a reduction in PV array output due to a reduction in solar insolation. This allows the system to ride through temporary reductions in the solar output without drawing on the grid.

d) Low load, low solar

In the event that the system load is significantly below the inverter rating it shall be possible to run the system just from the inverter. As the load increases and the battery runs down grid power needs to be drawn.

Hybrid Inverter with charge controller should cater to the following requirements.

(a) System 1: 5 KVA

Sl. No	Technical parameter	Specification
A	Type	3Ø-3Ø Hybrid Inverter with charge controller.
B	Make	Statcon Energiaa / Su-Kam / ENERTECH / CONSUL/Microtek or equivalent MNRE approved.
C	Solar Charge controller (SCC)	
1	Charge control Type	MPPT
2	Charger topology	Buck type
3	PV Nominal Capacity	5 KWp
4	No Of MPPT Channels	Min 1
5	Per Channel PV Capacity (Nominal/ Peak)	5 KWp
6	Max. Open Circuit PV Volts (Voc)	Bidder to specify
7	MPPT Voltage Range	Bidder to specify
8	PV Minimum Voltage	Bidder to specify
9	Max I/P Amps per channel	Bidder to specify
10	Max Battery Amps during PV charging	Bidder to specify
11	Max SCC O/P Amps	Bidder to specify
12	Min. Battery AH Required	Bidder to specify
13	Peak Charging Efficiency	Min 90%
D	Solar Inverter	
1	No of Phases/Connection Type	3-Phase/4 wire, Pure Sine wave
2	Nominal Battery Voltage	48-96Volts
3	Nominal Output Voltage/ Frequency	415 / 50 Volts/ Hz

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501
Rudrapur	GROUP : BDC	Rev no 00

4	Nominal Capacity (Total/ Per phase)	5 KVA
5	Voltage Regulation (in Standalone Mode)	± 2 %
6	Freq. Regulation (in Standalone Mode)	± 0.5 Hz
7	THD	< than 5 %
8	Load Power Factor	0.8 lag to unity
9	Efficiency: Peak/ 100% Load/20% Load	>90/ >89/ >80
10	Over Loads: 60 sec/ 30 sec/ 5 sec	110/ 125/ 150
11	Max Allowed Phase Imbalance	30%
12	Auto Bypass Feature	Provided
13	Parallel Operation with Grid/ DG	Provided
14	Anti-Islanding from Grid	Provided
E	GRID CHARGER	
1	Grid Voltage Range (Voltage Sync Range)	0.10.2
2	Grid Frequency range (Freq. Sync Range)	0.05-0.05
3	Max Grid Import Power	7.5 KVA*
4	Max Battery Amps during Grid charging	Bidder to specify
5	Peak Charging Efficiency	Min. 80%
F	USER INTERFACE	
	LCD display for metering I/P & O/P parameters , fault, mode	
G	protection functions	
	Output peak overload (Please refer 2.1.4 Operational Philosophy (a)), short circuit, phase imbalance, over voltage, under voltage of the grid, Battery: Low voltage, Over voltage, reverse polarity of battery, battery deep discharge protection, Galvanic isolation ,PV array reverses polarity, Surge protections etc.	
H	Communication	
	GPRS based Remote Monitoring	
I	MISCELLANEOUS	
1	Degree of Protection	IP-21
2	Cooling Method	Bidder to specify
3	Operating Temperature ³	0-55 degree (without Derating)
4	Housing	Bidder to specify
5	dimension (H X W X D)	Bidder to specify
6	Weight (kg)	Bidder to specify

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501
Rudrapur	GROUP : BDC	Rev no 00

(b) System 2: 10KVA

Sl. No	Technical parameter	Specification
A	Type	3Ø-3Ø Hybrid Inverter with charge controller.
B	Make	Statcon Energiaa / Su-Kam / ENERTECH / CONSUL/Microtek or equivalent MNRE approved.
C	Solar Charge controller (SCC)	
1	Charge control Type	MPPT
2	Charger topology	Buck type
3	PV Nominal Capacity	10 KWp
4	No Of MPPT Channels	Min 1
5	Per Channel PV Capacity (Nominal/ Peak)	10 KWp
6	Max. Open Circuit PV Volts (Voc)	Bidder to specify
7	MPPT Voltage Range	Bidder to specify
8	PV Minimum Voltage	Bidder to specify
9	Max I/P Amps per channel	Bidder to specify
10	Max Battery Amps during PV charging	Bidder to specify
11	Max SCC O/P Amps	Bidder to specify
12	Min. Battery AH Required	Bidder to specify
13	Peak Charging Efficiency	Min 90%
D	Solar Inviter	
1	No of Phases/Connection Type	3-Phase/4 wire, Pure Sine wave
2	Nominal Battery Voltage	Bidder to specify
3	Nominal Output Voltage/ Frequency	415 / 50 Volts/ Hz
4	Nominal Capacity (Total/ Per phase)	10 KVA
5	Voltage Regulation (in Standalone Mode)	± 2 %
6	Freq. Regulation (in Standalone Mode)	± 0.5 Hz
7	THD	< than 5 %
8	Load Power Factor	0.8 lag to unity
9	Efficiency: Peak/ 100% Load/20% Load	>90/ >89/ >80
10	Over Loads: 60 sec/ 30 sec/ 5 sec	110/ 125/ 150
11	Max Allowed Phase Imbalance	30%

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501
Rudrapur	GROUP : BDC	Rev no 00

12	Auto Bypass Feature	Provided
13	Parallel Operation with Grid/ DG	Provided
14	Anti-Islanding from Grid	Provided
E	GRID CHARGER	
1	Grid Voltage Range (Voltage Sync Range)	0.10.2
2	Grid Frequency range (Freq. Sync Range)	0.05-0.05
3	Max Grid Import Power	15 KVA*
4	Max Battery Amps during Grid charging	Bidder to specify
5	Peak Charging Efficiency	Min. 80%
F	USER INTERFACE	
	LCD display for metering I/P & O/P parameters , fault, mode	
G	protection functions	
	Output peak overload (Please refer 2.1.4 Operational Philosophy (a)), short circuit, phase imbalance, over voltage, under voltage of the grid, Battery: Low voltage, Over voltage, reverse polarity of battery, battery deep discharge protection, Galvanic isolation ,PV array reverses polarity, Surge protections etc.	
H	Communication	
	GPRS based Remote Monitoring	
I	MISCELLANEOUS	
1	Degree of Protection	IP-21
2	Cooling Method	Bidder to specify
3	Operating Temperature ³	0-55 degree (without Derating)
4	Housing	Bidder to specify
5	dimension (H X W X D)	Bidder to specify
6	Weight (kg)	Bidder to specify

(c) System 3: 25KVA

Sl. No	Technical parameter	Specification
A	Type	3Ø-3Ø Hybrid Inverter with charge controller.
B	Make	Statcon Energiaa / Su-Kam / ENERTECH / CONSUL/Microtek or equivalent MNRE approved.
C	Solar Charge controller (SCC)	
1	Charge control Type	MPPT
2	Charger topology	Buck type
3	PV Nominal Capacity	25 KWp

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

4	No Of MPPT Channels	Min 1
5	Per Channel PV Capacity (Nominal/ Peak)	25 KWp
6	Max. Open Circuit PV Volts (Voc)	Bidder to specify
7	MPPT Voltage Range	Bidder to specify
8	PV Minimum Voltage	Bidder to specify
9	Max I/P Amps per channel	Bidder to specify
10	Max Battery Amps during PV charging	Bidder to specify
11	Max SCC O/P Amps	Bidder to specify
12	Min. Battery AH Required	Bidder to specify
13	Peak Charging Efficiency	Min 90%
D Solar Inverter		
1	No of Phases/Connection Type	3-Phase/4 wire, Pure Sine wave
2	Nominal Battery Voltage	Bidder to specify
3	Nominal Output Voltage/ Frequency	415 / 50 Volts/ Hz
4	Nominal Capacity (Total/ Per phase)	25 KVA
5	Voltage Regulation (in Standalone Mode)	± 2 %
6	Freq. Regulation (in Standalone Mode)	± 0.5 Hz
7	THD	< than 5 %
8	Load Power Factor	0.8 lag to unity
9	Efficiency: Peak/ 100% Load/20% Load	>90/ >89/ >80
10	Over Loads: 60 sec/ 30 sec/ 5 sec	110/ 125/ 150
11	Max Allowed Phase Imbalance	30%
12	Auto Bypass Feature	Provided
13	Parallel Operation with Grid/ DG	Provided
14	Anti-Islanding from Grid	Provided
E GRID CHARGER		
1	Grid Voltage Range (Voltage Sync Range)	0.10.2
2	Grid Frequency range (Freq. Sync Range)	0.05-0.05
3	Max Grid Import Power	50 KVA*
4	Max Battery Amps during Grid charging	Bidder to specify
5	Peak Charging Efficiency	Min. 80%
F USER INTERFACE		
	LCD display for metering I/P & O/P parameters , fault, mode	
G protection functions		
	Output peak overload (Please refer 2.1.4 Operational Philosophy (a)), short circuit, phase imbalance, over voltage, under voltage of the grid, Battery: Low voltage, Over voltage,	

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501
Rudrapur	GROUP : BDC	Rev no 00

	reverse polarity of battery, battery deep discharge protection, Galvanic isolation ,PV array reverses polarity, Surge protections etc.	
H	Communication	
	GPRS based Remote Monitoring	
I	MISCELLANEOUS	
1	Degree of Protection	IP-21
2	Cooling Method	Bidder to specify
3	Operating Temperature	0-55 degree (without Derating)
4	Housing	Bidder to specify
5	dimension (H X W X D)	Bidder to specify
6	Weight (kg)	Bidder to specify

Note: *Please refer 3.4 Operational Philosophy (a)

Note: Bidder shall provide for installation & commissioning of the PCUs. Bidder shall depute their service engineer to site during E&C of the PCUs. If Bidder engineers are not competent, Bidder has to arrange engineers from Inverter supplier during commissioning of the plant.

3.5 Maintenance Free solar grade Pb-Acid Battery Bank of following rating:

Maintenance Free solar grade C/10, TUBULAR/ Flooded/VRLA Gel Pb-Acid Battery shall be provided as per following capacity:

- i. 5KVA system: 28800 VAH
- ii. 10Kva System: 57600 VAH
- iii. 25KVA System: 144000VAH

The voltage and ampere hour rating of batteries shall be adjusted to suit the compatibility with PCUs.

The general specifications shall be as under:

- The batteries must be MNRE approved. These batteries should be certified as per IEC 61427 or IEEE1013 or IEC 1361 or IS 1651 or equivalent standard. (Test report shall be submitted).
- The battery bank shall consist of required number of deep-discharge electrochemical storage cells, suitably interconnected as required.
- The cells shall be capable of deep discharge and frequent cycling with long maintenance intervals and high columbic efficiency. Automotive or car batteries shall not be accepted.
- The nominal voltage and capacity of the storage bank shall be selected and specified by the supplier in the bid.
- The self-discharge rate of the battery bank or individual cell shall not exceed four (4) percent per month.

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

- The permitted maximum depth of discharge (DOD) shall not be more than 80%.
- The cells shall include explosion proof safety vents.
- The cells shall include the required number or corrosion resistant inter –cell connectors required chemicals electrolyte packed in separate containers. Full instructions and technical details shall be provided for electrolyte filling and battery recharging at site for the first time.
- **Tools Kit:** Necessary tool kits to be provided along with each system for any immediate maintenance compositions.
- In case of flooded electrolyte Cells, the cells shall preferably be supplied in dry charged condition, complete with all required chemicals electrolyte packed in separate containers. Full instructions and technical details shall be provided for electrolyte filling and battery recharging at site for the first time.
- **Battery rack:** Battery Rack should be of matured treated Sal wood (In case of flooded electrolyte Cells) duly painted single tier or two tier (if required) or epoxy coated MS structure (for VRLA GEL Cells) with rubberized coating on battery runners. Placement of battery should be such that maintenance of the battery could be carried out easily. The non-reactive acid proof mat should be provided to cover the entire floor space covering the battery rack. Battery rack should compulsorily be placed on the appropriate rubbers pads to avoid the contact of racks with the floor, and to protect wooden rack particularly from termite.

3.6 DCDB and ACDB.

DC DISTRIBUTION BOARD (DCDB):

Suitable number of DCDB consisting of suitable powder coated metal casting should be used. In this box a separate arrangement which shall consist of MCCB of suitable specifications & which can withstand respective flow of current, with the purpose of providing the option for isolating the battery bank should be made. There shall be copper bus bars of suitable rating. Each incoming and outgoing feeder must be provided with MCB of proper rating. DCDB shall consist of Ammeter & Voltmeter connected in such a way that they indicate the battery charging parameters through SPV Panels in terms of current & voltage, while charging is on & shall indicate the battery voltage & current when charging is full or no charging duration.

AC DISTRIBUTION BOARD (ACDB):

Suitable number of ACDB consisting of suitable powder coated metal casting for AC power output of PCU to distribution board panel with energy meter through following rating of MCB/MCCB:

- 5KVA system: 4 pole 16A
- 10Kva System: 4 pole 32 A
- 25KVA System: 4 pole 100 A

The ACDB shall have provision to bypass the grid supply to load in case of PCU under failure/ Maintenance. Connection & termination of Cables of main supply line & solar PV Power to DB Panel shall be in scope of bidder. Bidders are encouraged to Visit site before

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

quoting.

3.7 Cables

Supply and E&C of all the cables, wires, control cables for interconnection of the SPV system, batteries connection, PCUs, weather monitoring system etc shall be in bidder scope. The Specification of wiring material of PV Power plant shall include but not limited to the following:

DC Cables

1.1kV grade heavy duty PVC insulated, Double sheathed, UV protected stranded copper DC cables as per IS: 7098 (Part I & II) – 1976 or IS 1554 or IS9537 of suitable size for connection between SPV module to junction box and Hybrid inverter PCUs, Batteries Etc..

AC Cables

1.1kV grade heavy duty PVC insulated galvanized strip/wire XLPE stranded 3.5 core AC Cu conductor cables as per IS: 7098 (Part I & II) – 1976 or IS 1554 or IS9537 of suitable size for connection between grid supply line, Hybrid Inverter PCUs and distribution board.

Procedure of cable laying:

1. Cable terminations shall be made with suitable cable lugs & sockets etc, crimped properly and cables shall be provided with dry type compression glands wherever they enter junction boxes/ panels/ enclosures at the entry & exit point of the cubicles. All cables shall be adequately supported. Outside of the terminals / panels / enclosures, shall be protected by conduits. Cables and wire connections shall be soldered, crimp-on type or thimble or bottle type. All accessories and work including laying of wire in scope bidder.
2. The cable must be laid through PVC conduit /GI pipe/ cable tray on roof and indoor. In case of using metallic pipe as conduit proper grounding of the conduit must be done.
3. Only terminal cable joints shall be accepted. Cable joint to join two cable ends shall not be accepted.
4. All cable/wires/control cable shall be marked with good quality letter and number ferrules of proper sizes so that the cables can be identified easily.
5. All fasteners will be made of Stainless steel or Aluminum or UV Protected PVC.

3.8 Weather monitoring system with Web Enabled Data Logging system

Weather monitoring system with Web Enabled Data Logging system should be provided and shall be compatible with PCUs. The data Logger shall keep record of associated electrical parameters at different stages to study performance of system as well as to study status of the system at a particular instant. The data logger should have required transducer to

Signature and seal of Bidder

 Rudrapur	PURCHASE SPECIFICATION GROUP : BDC	BDC1617-07501 Rev no 00
---	---	-------------------------------------

monitor and record the required relevant parameters of PCUs using remote monitoring over internet using GPRS based monitoring solution

1. Data Acquisition System shall provide data for each of the PCU.
2. Data Logging provision for plant monitoring, time and date stamped system data logs for analysis with the high quality, suitable PC shall be provided. Metering and Instrumentation for display of systems parameters and status indication shall also be provided.
3. **Solar Irradiance:** An integrating **Pyranometer (one no)** (Class II or better, along with calibration certificate) shall be provided, with the sensor mounted in the plane of the array and integrated with data logging system.
4. **Anemometer (One No):** Contractor shall provide at least one no. anemometer of tubular type made up of hot dipped Galvanized iron or anodized aluminum. Velocity range- up to 25 m/ s, accuracy limits of 0.2 m/ s up to 10 m/ sec.
5. **Temperature:** Temperature probes for recording the Solar panel temperature and ambient temperature shall be provided complete with readouts integrated with the data logging system.
6. The following parameters shall be accessible via the operating interface display in real time separately for solar power plant:
 - (a) AC Voltage.
 - (b) AC Output current.
 - (c) Output Power
 - (d) Power factor.
 - (e) DC Input Voltage.
 - (f) DC Input Current.
 - (g) Time Active.
 - (h) Time disabled.
 - (i) Time Idle.
 - (j) Power produced
 - (k) Protective function limits (Viz-AC Over voltage, AC Under voltage, over frequency, under frequency, ground fault, PV starting voltage, PV stopping voltage).
7. The time interval between two sets of data shall not be more than 10 minutes. (A min. of 6 samples of data shall be recorded per hour).
8. Data Acquisition System shall have real time clock, internal reliable battery backup (2 hours) and data storage capacity to record data round the clock for a period of min. 1 year. Computerized AC energy monitoring shall be provided in addition to the digital AC energy meter.

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

9. The data shall be recorded in a common work sheet chronologically date wise. The data file shall be MS Excel compatible. The data shall be represented in both tabular and graphical form.
10. All instantaneous data shall be shown on the computer screen.
11. Software shall be provided for USB download and analysis of DC and AC parametric data for individual plant.
12. Provision for Internet monitoring and download of data shall be incorporated.
13. Software for centralized Internet monitoring system shall be provided for download and analysis of cumulative data of all the plants and the data of the solar radiation and environment monitoring system.

Web based Remote Monitoring system must be compatible with data logger. The system shall be provided with required accessories and **required SIM card** for wireless communication. The server shall be arranged by the bidder. The rental and other costs of the SIM cards, IP address, Server charge (storage, access charge and other charges if any), and Rental charge of data communication for remote monitoring system for a period of five (05) years shall be in bidders scope.

SPD (surge protection device) Type II suitable for communication network, as much number at suitable locations are required must be provided with the system.

Note: The data logger facility of PCU can be used. Overall data of each PCU and weather monitoring system shall be available for analysis on single login ID.

3.9 PC Desktop Computer

A Computer for display of plant performance with the following specifications shall also be supplied for SPV Power Plant: Intel i3 processor with 500GB HDD, 4GB RAM, 4USB ports, DVD RW, 19" TFT Monitor, Optical Mouse, Wi-Fi LAN Card along with a minimum 700VA UPS with 20 minutes battery backup. Also, the PC shall be provided with complete functional software and remote linkage access through service provider for email / data transfer / IP linkage for plant operations monitoring throughout the 5 years CMC period shall be provided.

3.10 LA and EARTHING

LA Shall be provided as per the attached drawing No: 3-679-05-00037.

The earthing for lightning arrestor, plant equipment and LT power system shall be required as per provisions of IS: 3043.

Earth stations and Earthing System:

- I. Earthing Pit with Pipe Electrode: Earthing with 50 mm dia. GI pipe 3.64 mm thick x 3Mts. long to be filled with bitumen partly under the ground level and partly

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

above ground level driven to an average depth of 3.65 Mts. below the ground level & restoring surface duly rammed.

- II. Masonry enclosure with the earth pit of size not less than 600 mm X 600 mm X 500 mm (depth) complete with cemented brick work (1:6) of minimum 150mm width duly plastered with cement mortar (inside) shall be provided. Hinged inspection covers of size not less than 300 mm X 300 mm with locking arrangement shall be provided. Suitable handle shall be provided on the cover by means of welding a rod on top of the cover for future maintenance.
- III. Earthing system must be interconnected through GI Strip 25mmx5mm to arrive equipotential bonding..
- IV. Equipment grounding (Earthing) will connect all non-current carrying metal receptacles, electrical boxes, appliance frames, chassis and PV panel mounting structures in one long run. The grounding wire should not be switched, fused or interrupted.
- V. Connecting the equipments to earth busbar including S & F GI (Hot Dip) wire of size as below on wall/floor with staples buried inside wall/floor as required and making connection to equipments with bolts, nuts, washers, cable lugs etc. as required and mending good damages Solid GI wire of 8 SWG.
- VI. Each Array Structure row must be connected to the earth minimum two separate point with S&F 25 mm x 5 mm galvanized (Hot Dip) MS flat on wall/floor with GI saddles as required and connection to equipments incl. drilling holes, with bolts, nuts, washers etc.
- VII. The complete earthing system will be electrically connected to provide return to earth from all equipment independent of mechanical connection.
- VIII. Test point will be provided for earth pits.

Earth resistance of the earth pits shall be tested in presence of the representative of BHEL as per applicable IS before commissioning and value to be less than 3Ω for structures and to be less than 1Ω for equipment body earthing for acceptance.

3.11 Fire Extinguishers:

ABC type dry power portable fire extinguishers of minimum capacity 5 kg shall be provided. Standard of Fire Extinguisher IS 13849 (with latest amendments)

3.12 Miscellaneous Equipment

Miscellaneous items like Control cables, insulation tapes, , ferrules, Lugs, Cable Glands, cable trays, cable ties, pipe, Clamps, Safety Signs, project Schematic, Project information Signage boards, MC4 connectors etc.) and Civil Works required for E&C shall be provided by the bidder. Such Items, not listed but required for completion of the Project shall deemed to have been included in the scope of the Bidder.

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

4 **Special Terms and conditions:**

4.1 **Freight & Transit insurance:**

Price quoted by the bidder for each system is inclusive of the freight.

The Bidder shall take Insurance for transit of materials to the site and for the installation period.

Insurance of work at site

The Goods supplied under the Contract shall be insured fully against loss or damage incidental to manufacture or acquisition, transportation, storage, and delivery.

Insurance during installation at site:

The Bidder shall so far as reasonably practicable insure against the Bidder's liability in respect of any loss or damage occurring whilst the Bidder is at EMPLOYER'S site for the purpose of making good a defect or carrying out the tests on completion during the installation & commissioning of the equipment at employer's site or for the purpose of completing any outstanding work and against any loss or damage arising during the defects liability period from a cause occurring prior to the taking over of new solar PV plant by the employer. For all practical purpose such insurance, during Defect Liability Period, shall be from an Indian Insurance Company.

4.2 **System Warranty of 05 years**

The bidder must ensure that the goods supplied under the contract are new, unused and of most recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in the contract.

The complete BOS items supplied, workmanship for each system shall be under warranty of 60 **calendar** months from the date of successful commissioning. The equipments or components, or any part thereof of the Power Plant, if so found defective during warrantee period, the bidder will remain liable to repair or replace immediately under warrantee obligation to the satisfaction of the Purchaser in order to ensure trouble free operation of the Power Plant. Within the scope of warranty, the Bidder will repair or replace of any defective part of the Plant & Equipment supplied, Works done and services rendered under the Contract and render periodic maintenance as a preventive measure to up keep performance of the power plant and also to attend breakdown maintenance as and whenever needed.

4.3 **O&M Manual and TEST CERTIFICATES**

- 03 copy of O&M Manual along with as build drawing and project report shall be submitted within 10 days of E&C.
- Test certificates/Test Reports for structures (along with galvanization), PCUs and Batteries to be furnished by the BIDDER. BHEL, if required will inspect the materials at Bidder place.
- Equipment shall not be dispatched until BHEL issues a "Dispatch clearance" to Bidder.
- Warranty certificates shall be submitted for all bought-out items.

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501
Rudrapur	GROUP : BDC	Rev no 00

Note:

1. It is advised that bidder should visit site and ascertain what type of equipment/machines needed at site for execution.
2. Supply shall be made directly to the site.
3. Space for Storage of supplied material shall be arranged by the bidder.
4. Water and electricity during E&C shall be provided by BHEL.
5. The Unloading and shifting of all the materials viz., BHEL supplied material and Bidder supplied materials from stores/storage location to the site (building rooftop) lies in the scope of Bidder.
6. All tools and tackles, like power drilling machine, cutting machine, digging tools, complete set of crimping tools etc, required for installation, wiring, crimping, assembly, digging of cable trenches, if required, earth pits & Megger for checking insulation resistance of cable prior to commissioning etc., have to be organized by the bidder.
7. The storage, watch & ward responsibility of all the materials including BHEL supplies at site will be in Bidder's scope until the commissioning of the plant. Any deficit occurring due to misplacement/mishandling will be borne by the Bidder at no extra cost. The shifting of all the materials to the roof-top from storage location for erection will be in the scope of the Bidder and he has to make necessary arrangements for the same.
8. Before mounting the PV modules on to the structures, each PV module have to be tested during peak sunshine period. Short circuit current (Isc) & Open circuit voltage (Voc) of the module has to be checked & recorded using multimeter and Clamp meter. Ensure the modules are electrically OK. Special crimping tools required for crimping to be arranged by Bidder as per this specification, have to be used to crimp 4 sq.mm cables to quick connects for connecting output of series strings to PCU/junction Box. **This crimping tool has to be kept at site permanently even after completion of project.**
9. Each string Open circuit Voltage & Short Circuit Current (with a testing jig having appropriate load) to be checked and recorded as directed by the BHEL site engineer at site.
10. All the terminations required for SPV plant viz., at the inverter and DB panel etc., will be in the scope of the Bidder. The necessary lugs and hardware required for the termination have to be arranged by the Bidder. Bidder has to ensure that terminations have been made without any tension.

Note: Bidder have to carefully measure twice the exact length of cables required for the connection before cutting the cable from cable drum. Any short fall in length of cable arising out of Bidder works should be borne by the Bidder. Bidder is required to assist BHEL and associate with the other Bidder's technical team during pre-commissioning checks and in commissioning of the power plant.

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

4.4 Delivery Schedule

For Supply of BOQ and E&C (Cl.2): The total time period for Supply and E&C is within 50 days from the date of PO.

5 GENERAL TERMS AND CONDITIONS:

- 1) Bidder's responsibility, right and liabilities under this project will commence from the date of acceptance of the purchase order.
- 2) The installation activity will have to be carried out in such a manner that will not cause any inconvenience to the other agencies working in the site. Any permits from the customer, if required, are to be arranged by the Bidder for his personnel.
- 3) After completion of the E&C, the entire site/area will be cleaned of debris etc. by the Bidder prior to handing over of the site to BHEL.
- 4) All the materials brought to site has to have proper paper work like DC, Invoice etc. duly verified & signed by BHEL/BHEL's customer to be submitted to BHEL for payment.
- 5) Any damage to the buildings/structures/area made by Bidder's work men or by Bidder's agent will be made good by Bidder at Bidder's cost.
- 6) Bidder shall take work permit before commencement of all types of non-routine works as per the statutory procedures followed at the work place.
- 7) Bidder shall explain the job, associated hazards and precautions to his workmen.
- 8) Bidder shall ensure deployment of at least one person who should have the skill, knowledge and experience of performing the allotted task and shall be able to guide his team.
- 9) Bidder shall ensure safe procedure is followed during execution of the job.
- 10) Bidder shall ensure that his workmen wear appropriate safety Personal Protective Equipment.
- 11) Bidder shall ensure adequate supervision of the activity by his supervisor.
- 12) Bidder has to adhere to necessary legal/safety requirements and BHEL shall be kept indemnified against any untoward events taking place during the course of work.
- 13) No child labor should be employed for executing the project.
- 14) In case project is not completed as per BHEL scope due to reasons arising out of materials from BHEL end/Bidder's end, bidder has to complete the job at later stage without any extra charges. No overrun charges shall be paid in case of extension of project schedules.
- 15) Any miscellaneous materials that have not been mentioned specifically in the specification/tender which are required for E&C of the plant shall be deemed to be included in the specification and shall be supplied by the Bidder without any extra charges. Any scope of activities which are not specifically mentioned in this specification but required for the completion of the E&C of the SPV plant for safe, trouble free, normal operation shall be provided at no extra cost by the Bidder, unless explicitly excluded in the specification.
- 16) Bidder must meet statutory/HSE compliance as per Annexure C enclosed along with this tender document.
- 17) The design and operational features of the equipment offered shall also comply with the

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-07501	
Rudrapur	GROUP : BDC	Rev no	00

provisions of latest issue of the Indian Electricity Rules and other statutory regulations.

- 18) **Statutory obligation:** Bidder is required to meet all the statutory obligations/ legal requirement with regard to workmen deployed by Bidder for the project such as ESI, PF, Minimum wage act, Work man compensation act/Accident/medical insurance, Income Tax act, Employees Insurance act etc.
- 19) The installation should strictly conform to this specification. All the works shall be executed strictly as per the direction of BHEL engineer at site.

6 LIST OF ENCLOSURES:

Following enclosure makes the part of BDC1617-07501.

- 5.1 SPV Module drawing- 3-679-02-00352
- 5.2 SPV Module Data Sheet – CD- 4-4001-128
- 5.3 Mounting Structure indicative Drawing: 3-679-05-00683
- 5.4 Schematic of Lightning Arrestor – 3-679-05-00037
- 5.5 Annexure – A includes Qualifying Criteria, Payment terms, bidder's information, and declaration by Bidder etc.
- 5.6 Annexure – B format for certificate by chartered accountant
- 5.1 Annexure – C Statutory compliance by Bidder.

Signature and seal of Bidder