



No. PPDB/R.E/DRE/ 117 /2021  
**PUNJAB POWER DEVELOPMENT BOARD**  
**ENERGY DEPARTMENT**  
1<sup>st</sup> Floor, Irrigation Secretariat,  
Old Anarkali, Lahore  
(Ph: 042-99213877 Fax: 042-99213875)

Dated: 24 / 03 /2021

The Secretary Energy,  
Government of the Punjab,  
Energy Department, 8<sup>th</sup> Floor, EFU Building,  
Jail Road, Lahore.

Subject: TECHNICAL SPECIFICATION FOR PROVISION OF SOLAR PV SYSTEM  
AND ALLIED EQUIPMENT

Please refer to the Technical Committee (the "Committee") constituted vide notification No. SO(PP)15-31/2019 dated December 30, 2020 (Annex-A) by the Energy Department, Government of Punjab (GoPb) regarding, the subject matter. Please also refer to the earlier issued technical specifications of solar PV and allied equipment vide letter No. PPDB/RE/DRE/368/2019 dated August 6, 2019.

In various meetings, the detailed deliberations were made by the Committee on the existing Technical Specifications of solar PV & allied equipment and new advancement in equipment / material (the "Technical Specifications"). The Committee also discussed in detail about the feedback / lesson learnt from the various projects completed / ongoing by different entities of the Energy Department, GoPb.

After detailed deliberations the draft Technical Specifications were referred to CERAD, UET Lahore, for their technical review. The comments /feedback received from CERAD through PEECA were brought before the Technical Committee, wherein, the specifications were reviewed again in the meeting held on March 16, 2021. In the light of comments of CERAD the Technical Committee finalized the minimum specification requirement for Solar PV and allied equipment. The minutes of this Technical Committee meeting and the finalized specifications are attached as Annex-B.

In view of the above please find attached the recommended minimum Technical Specifications by the Technical Committee of solar PV and allied equipment for your information and necessary action please.

Regards,

  
DIRECTOR (RE)  
(Chairman Technical Committee)

Encl: as above

C.C:

✓ All members of the Technical Committee



M (Energy)  
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oM  
March 29<sup>th</sup> '21

please file



GOVERNMENT OF THE PUNJAB  
ENERGY DEPARTMENT  
6<sup>th</sup> Floor, EFJ House, Jail Road, Lahore  
Phone No. 9926019, 99265017 & 9926019 Fax No. 35790721

Dated: 30<sup>th</sup> December, 2020

**NOTIFICATION**

No.SO(PP)15-31/2019. <sup>1394</sup> In supersession of this department's Notification No.SO(EC)ED/4-1/2019-1221, dated 26.07.2019, a Technical Committee is hereby constituted in the Energy Department comprising the following members :-

Sr#	Name & Designation	
1. ✓	Mr. Salman Aizad, Director Renewable, Punjab Power Development Board (PPDB)	Chairman
2.	Mr. Abdur Rehman, Program Manager, Punjab Energy Efficiency & Conservation Agency (PEECA)	Member
3. ✓	Mr. Omar Masood, Manager Policy, Project Management Unit (PMU)	Member
4.	Mr. Jahanzeb Afzal, Deputy Manager (Technical), Quaid-e-Azam Solar Power (Pvt.) Limited (QASPL)	Member

2. Following are the Terms of Reference (ToRs) of the Committee:
- Determination of technical specification of latest available solar systems and related equipment.
  - Coordination with local, / international experts to verify technical specification.
  - Any other role as assigned by the department.

SECRETARY  
GOVERNMENT OF THE PUNJAB  
ENERGY DEPARTMENT

**No. & Date Even**

- PS to Secretary Energy, Government of the Punjab, Energy Department.
- PA to Additional Secretary (Development), Energy Department.
- PA to Deputy Secretary (Solar), Energy Department.
- Section Officer (Solar), Energy Department.
- Section Officer (Conservation), Energy Department.
- All Members of the Committee.

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*Almad Naveez*  
SECTION OFFICER (HYDEL)  
ENERGY DEPARTMENT

Technical Committee (the "Committee") meeting held on 16 March, 2021 through online session via Zoom as per Order- No.SO(PP)15-31/2019-1394, Dated December 30, 2020. Meeting was attended by members as per the attendance sheet attached as Annexure-A.

The Chair welcomed the participants. It was updated that the Specifications were finalized in the meeting held on February 1, 2021 and these were referred through PEECA to CERAD for review/vetting. The comments of CERAD provided through email dated March 02, 2021. To discuss the comments of CERAD, online meeting of the Committee amid corona virus SOPs was arranged on March 16, 2020 at 15.00 hrs.

The Chair opened the forum for discussion. It was emphasized that technology advancement in solar PV and allied equipment with high pace. However there are some recent advancements made in the solar technologies are not widely available; therefore, if followed in excitement of new technology, limited competition is apprehended.

It was observed that this Committee intends to ensure transparency in this process and to make available even playing field for all solar equipment manufacturers to have healthy competition in Punjab. Special care has been taken in drafting minimum solar specification that any provision of this specification may not create extra advantage one specific equipment manufacturer against other competitors.

The clause by clause remarks of CERAD was discussed / reviewed. After detailed deliberations, it was observed that the recommendations of CERAD may limit the open competition therefore may not be beneficial for procuring agencies of the Energy Department GoPb. The Committee also deliberated upon the requirement of inclusion of external surge arrestors for AC and DC sides in addition to inverter's built-in surge protections. It noted that this requirement may vary with the site conditions.

#### Decision

1. It was unanimously decided to retain the specifications as finalized in the 3<sup>rd</sup> meeting held on 1<sup>st</sup> Feb, 2021.
2. In clause special note in "X" of Specs, Inclusion of external surge arrestors/protection AC/DC may be added by the procuring department/agency if required according to the specific site requirement.

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## Minimum Technical Specifications Requirement for Solar Panel and Allied Equipment

*Note- The technical specifications of the solar Panels & allied equipment must fulfil the standard requirements (PSS#IES) as per the import policy S.R.O.604 (I) /2019, Dated 28<sup>th</sup> May,2019. Verifiable Test Certifications for the required standards must be provided with the technical proposal. In case of discrepancy, the mentioned S.R.O shall prevail.*

This document provide minimum technical requirement for solar panels and allied equipment. "All products should be compliant to relevant IEC standards/ specifications; however, other equivalent, international standards may be used where, IEC relevant standard is not available, as per the project requirement, with subject to prior approval of the Project Director".

### I. Solar PV Panels

S.No	Parameters	Min. Specifications required
1.	Module Make	Tier 1 , Brand should be verifiable for the procurement year
2.	PV Module Capacity	400 Watts or above (as per design)
3.	PV Module Type	Poly-crystalline/Monocrystalline
4.	Cell Quality	A Grade (verifiable)
5.	Module Efficiency	18% or higher
6.	Power Tolerance	Must be + 3% or more
7.	Operating Cell Temperature	-40 ° C to +85 ° C
8.	Temperature Coefficient	-0.40% / ° C or less
9.	Bypass Diode	As per design
10.	Bus Bar	4 or higher
11.	Certification	IEC 61215, IEC 61730 , IEC 61439, IEC 60947-3 as amended to date ,PID free
12.	Frame	Must Withstand 5400 PA impulse Load
13.	Junction Box	IP 67 or better
14.	Cable	4 mm <sup>2</sup> (IEC), 1000mm or higher (as per design)
15.	Connectors	MC4 or Comparable weatherproof
16.	Front Cover	3.2 mm thick prism type tempered glass or higher

8.	Operating temperature For Ambient	-5°C to 55°C
9.	Communication	With Remote Monitoring Feature, Mobile App, Web server user interface, Cloud Connected. Real Time System Monitoring. Alerts, Faults and Warning data display. System Statistics – System Parameters, PV predicted values, Forecasted values, Load data, Energy Data, Net Metering Data Control
10.	Humidity	10 ~ 90%RH
11.	THD	≤ 3%, As per IEC 61000-3-2 (as amended to date).
12.	Guarantee	5 years Replacement Guarantee.
13.	Warranty	10 Years or above transferrable warranty from the original inverter manufacturer shall be provided or as defined in the RFP.
14.	Input Voltage Range	150-950 V or above (depending upon the selected design)
15.	Power Factor	0.9 leading to 0.9 lagging (Grid Code Compliant)
16.	Minimum Applicable Standards and Compliances	IEC:62109-1, IEC:62109-2, IEC 61683, IEC 62116, IEC 61727, UL:1741/IEEE:1547, 60068-2. (as amended to date).

### III. Hybrid Solar Inverter

S.No	Parameters	Min. Specifications required
1.	Inverter Make	500MW or above deployment in last five years. Renowned and verifiable brand having successful performance history in similar climatic conditions. Pure Hybrid Inverter
2.	Inverter Type	Grid synchronized Pure Sine wave. Hybrid
3.	Phase	3 Phase IN /3 Phase OUT. Also able to synchronize with generators on site.
PV INPUT		
4.	Max DC Input Voltage	900 VDC
5.	Minimum MPPT Range	250~850 VDC



27.	Communication	With Remote Monitoring Feature, Mobile App, Web server user interface, Cloud Connected
28.	Guarantee	3 years Replacement Guarantee
29.	Warranty	5 Years or above transferrable warranty from the original inverter manufacturer shall be provided or as defined in the RFP.

**IV. Charge Controller**

1. IEC:62509
2. Maximum Power Point Tracking (MPPT) tracing efficiency > 98%
3. External/Built-In charge controller with Hybrid Inverter
4. Minimum 2 independent MPPTs.
5. Warranty- 5 Years transferrable warranty from the original manufacturer.

**V. Smart Energy Storage:**

Minimum Technical Specifications of Energy Storage System:

1. 15 Years life
2. Manufacturing date of batteries must not be more than 6 months old at the time of installation.
3. High Energy, Compact packs.
4. Elegant, Highly compact and energy dense.
5. Battery Management Unit (BMU), BMS (Battery Management System) controls cell temperature, over charging, DOD, Voltage levels & Cell charging current.
6. Fast and Efficient Charging
7. Extended Cycle Life minimum 5000 cycles at 80% DoD.
8. Temperature control unit.
9. IEC 61427 certified.
10. Warranty- 5 years

*The following technical data but not limited to these only shall be provided, wherever applicable for, such as inverter, charge controller, batteries;*

S. No	Characteristic
1	Manufacturer Name & Country of Manufacturing
2	Type/Model number/Date of Manufacturing
3	Datasheet
4	Relevant International Certifications
5	Warranties
6	Installation Guide
7	Operating Manual



- roofing must form a waterproof seal (applicable for wiring only).
2. For conduit and duct flexible PVC material with suitable size must be use, so that ¼ spaces in a conduit should be empty.
  3. Field installed wiring must be joined using terminal strips or screw connectors. Soldering or crimping in the field must be avoided if at all possible. Wire nuts are not allowed. The rated current carrying capacity of the joint must not be less the circuit current rating. All connections must be made in junction boxes. Fittings for lights, switches, and polarity sensitive socket outlets may be used as junction boxes where practical.
  4. All wiring shall be color coded as per IEC standards and labeled at termination point.
  5. No conduit or fitting shall be attached directly to thatch or any other non-supportive surface.
  6. Especially avoid installing the conduit direct over the roof; there must be distance not less than 2 inches between the roof surface and conduit/duct.
  7. Cables must be joined by the use of junction boxes, screw-connectors, and block connectors. MC 4 or equivalent connectors must be used for PV joints.
  8. All wires must be terminated with proper end sleeves and wire thimbles with different colors for positive and negative polarity.
  9. Size, voltage grade and manufacturer name should be printed on every cable
  10. Cable voltage drop specifications are as followed that must be verified through software simulation/ Calculations.
  11. Earthing as per NEPRA net metering rules for all sites.

S. No	Item	Requirement
12.	Solar PV to inverter:	Voltage drop less than 2% tin coated (Stranded and flexible), 99.9 % pure copper fire resistive insulation
13.	Grid / LV Distribution Board to Inverter	Voltage drop less than 2%. 99.9 % pure copper fire resistive insulation

**Solar PV Combiner Box (Junction Box)**

S.No	Parameters	Description
1.	Soar PV Input	As per design
2.	Solar PV Max. Input Voltage	1000VDC (IEC ) or Higher
3.	Number of Solar PV array inputs	As per design
4.	Protections	Lightening Protection
		DC over voltage protection
		Short circuit Protection
		Fuse/Breaker Protection.
		AC & DC disconnecting switch
5.	Protection Class	IP 66 or better
6.	Relative humidity	10-90%



12.	Functional Compliance	IEC 62305-3 (EN62305-3) IEC62305-3 (EN 62305-3) or equivalent
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X. Surge Arrester(with or without counter)

S. No.	Parameters	Min. Specifications required
1.	Applications	Both DC side & AC sides
2.	Discharge current (I max)	min. 20kA (8/20 $\mu$ sec.)
3.	Impulse current (I imp)	min. 25kA (10/350 $\mu$ sec.)
4.	Response time	$\leq$ 50 n sec
5.	Leakage current	$\leq$ 1 mA
6.	Dielectric strength	2000 V AC @ 1 minute
7.	Protection Class	Class 2(Type2) minimum
8.	Discharge voltage	600 V DC (Line to earth) or above (matching the size of inverter)
9.	Ingress Protection	Minimum IP20 (placed in IP 65 Box along with other protections)
10.	Short circuit withstand capacity	min. 30kA

Note: The external surge arrestors/protection AC/DC may be added by the procuring department/agency, if required according to the specific site requirement.

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## **CCTV Security and Monitoring Specifications**

(If to be included where required)

<b>S. No</b>	<b>Night Vision/Day and Night CCTV Surveillance System with Remote Monitoring</b>	<b>Complete System with below items but not limited to.</b>
1	Outdoor Bullet POE Camera	1080, 1/2" CMOS, H.265+ /H.265, IR Range=20-30m, Fixed Lens 2.8 mm, IP67 Rated,
2	Indoor Dome POE Camera	1080, 1/3" CMOS, H.265+/H.265, IR Range=20-30m, Fixed Lens 2.8 mm, IP66, IK10 Rated,
3	NVR along with enough capacity of HDD Surveillance Grade for 24/7, 30 Days storage capacity	16 CH H.265+/H.265/H.264/H.264+ video formats, Connectable to the third-party network cameras, recording at up to 8 MP resolution, supports live view, storage, and playback of the connected camera at up to 8 MP resolution, HDMI/VGA independent output, 2 SATA up to 8 TB, interfaces connectable for recording and backup, 1 self- adaptive 10/100/1000 Mbps network interface, along with 5m HDMI and allied infrastructure.
4	16/24/48 POE Switch	Min 260W POE Budget, 10/100/1000 Mbps.
5	LED 49" Display	3840 x 2160 4K Resolution, along with allied accessories (Power, HDM Cable, Mouse, keyboard), Reputable Original Verifiable Brand, 2 Years OEM warranty
6	Passive Equipment	Cat6 Ethernet Cable including PVC or Dura Duct including clamps, elbows, socket and all allied material.

# SINGLE LINE DRAWING

