PV MODULE Technical Specification and Data Sheet

Rev.	Date Of Issue	Purpose Of Issue	Prepared	Checked	Approved
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1. INTERDUCTION

This document examines the PV MODULE Technical Specification and Data Sheet for the 9 MW Neyriz Solar Power Plant.

2. PURPOSE OF ISSUE

The aim of this document is to specify the minimum requirements for PV panels.
Note that power plants Solar Panels must be N Type, Topcon, Bifacial, Half Cut, Mono crystalline panels with Maximum power (Pmax/W) at STC ≥700 W and Efficiency at STC ≥23 %.

3. QUANTITY AND DESCRIPTION OF EQUIPMENT AND/ OR MATERIALS INQUIRED

Item	Description	Type	Qty.
01	Solar Panels	Monocrystalline Bifacial/ Long Cable/ Anti-Dust Caps for Connectors	3MW + 1% Spare

Note:
All solar panels shall be supplied with Anti-Dust / Dust Proof Caps for MC4 (or equivalent PV) connectors. Caps must include both Male and Female pairs, with minimum IP67/IP68 protection rating, made of UV-resistant silicone material, and suitable for temperature range -40°C to +85°C. Caps shall be provided and installed on unused connectors during delivery, installation, and storage to prevent ingress of dust, moisture, and contaminants, thereby ensuring long-term reliability of the connections.

4. TECHNICAL SPECIFICATION & DATASHEET

Item	Description	Unit	Technical Particulars	Vendor Data
1	**General**			
1.1	Manufacturer		To be filled by vendor	
1.2	Material and process warranty	Years	≥12	
1.3	Power performance warranty	Years	≥ 30	
2	**Electrical Data – STC***			
2.1	Nominal Max. Power (Pmax)	W	≥700	
2.2	Voltage at Maximum Power Point (Vmp)	V	To be filled by vendor	
2.3	Current at Maximum Power Point (Imp)	A	To be filled by vendor	

Item	Description	Unit	Technical Particulars	Vendor Data
2.4	Open Circuit Voltage (Voc)	V	To be filled by vendor	
2.5	Short Circuit Current (Isc)	A	To be filled by vendor	
2.6	Module Efficiency	%	≥23	
2.7	Max. System Voltage	V	DC1500V (IEC/UL)	
2.8	Application Classification		Class A	
2.9	Power Tolerance	W	To be filled by vendor Min. 0-5 W	
2.10	Protection class		Class II	
2.11	First-year power degradation	%	≤1	
2.12	Year 2 - 25 degradation	%	≤0.4	
2.13	Total power degradation in the 25th year	%	≤13	
3	**Electrical Data – NMOT***			
3.1	Nominal Max. Power (Pmax)	W	To be filled by vendor	
3.2	Voltage at Maximum Power Point (Vmp)	V	To be filled by vendor	
3.3	Current at Maximum PowerPoint (Imp)	A	To be filled by vendor	
3.4	Open Circuit Voltage (Voc)	V	To be filled by vendor	
3.5	Short Circuit Current (Isc)	A	To be filled by vendor	
4	**Temperature Characteristics**			
4.1	Temperature Coefficient (Pmax)	%	≥-0.29	
4.2	Temperature Coefficient (Voc)	%	≥-0.24	
4.3	Temperature Coefficient (Isc)	%	≤+0.040	
4.4	Operating Temperature	°C	-40 to +85	
4.5	Nominal Module Operating Temperature	°C	To be filled by vendor	
5	**Mechanical Data**			
5.1	Cell Type		N-Type, Bifacial	
5.2	Cell Arrangement		To be filled by vendor	
5.3	Front Glass		Heat Strengthened Glass	
5.4	Back Glass		To be filled by vendor	
5.5	Dimensions		To be filled by vendor	
5.6	Weight		To be filled by vendor	
5.7	Frame		Anodized aluminum alloy	
5.8	Number of grounding holes		Min. 2	
5.9	J-Box		IP68, 3 bypass diodes	
5.10	Cable		Min. 4 mm2 (IEC)	
5.11	Cable Length (Including Connector)		Will be customized according to string connection	
5.12	Connector		To be filled by vendor	
5.13	Per Pallet		To be filled by vendor	
5.14	Per Container (40' HQ)		To be filled by vendor	
5.15	Front side maximum mechanical loading	Pa	≥5400	
5.16	Rear side maximum mechanical loading	Pa	≥2400	

Item	Description	Unit	Technical Particulars	Vendor Data
5.17	Hailstone test		25 mm hailstone at the speed of 23 m/s	
5.18	Fire rating		UL Type 1 or 2 IEC Class C	
5.19	Power Bifaciality		To be filled by vendor	

5. TESTS:

Before loading for shipment to Iran, all necessary tests must be conducted for verification. Additionally, a packing list must be provided. Upon arrival in Iran, the received items should be compared with the shipping documents to ensure that the same modules that were inspected have been delivered.

The below tests and certifications are required for Solar PV Modules:

1) Inspection and Test shall be carried out at Vendor's shop as per attached "Instruction to Vendor for Inspection", applicable codes and standard.
2) All of offered items shall be inspected and tested according to applicable code and standards. VENDOR shall prepare its inspection and test plan based on the applicable code and standards (but not limited to), and shall submit it with the test procedure to PURCHASER for approval in the time of order placement. Inspection and test shall be done in accordance with the approved plan and procedure including List of parameters to be measured or monitored during the test with their expected range and their acceptance level.
3) VENDOR shall make ready all tools, tackles, materials, equipment, Etc. required for inspection and testing.
4) The VENDOR must carry out all required tests at their own expense, according to the specified standards and technical specifications of the equipment. The conditions for performance tests to be carried out after the trial operation period

and before provisional acceptance must comply with the technical specifications specified in the technical and design requirements and codes and accepted international standards.

5) The VENDOR must randomly select the required number of photovoltaic module samples specified in the contract and send them to an approved reference laboratory at their own expense for conducting a Type Test in the presence of the client's inspector. The laboratory will evaluate them according to the list of tests below, which are related to the technology used in the panels and will be announced by the reference laboratory (Sample Test).

a) Electroluminescence
b) Insolation
c) Wet leakage
d) IV (STC)
e) Mechanical load
f) EVA gel content
g) PIL Test
h) UV
i) Low irradiance
j) Anti-Soiling Coating
k) Hail Impact test

6) It should be noted that based on certain conditions regarding the technology of solar panel cells, the mentioned tests will have the ability to be decreased or increased. The final determination criterion for the tests performed on solar panels will be based on specified conditions by the testing authorities to obtain TUV approval.

a) The approved reference laboratories by the client are as follows:
b) TUV Nord

c) TUV Rheinland
d) PI Berlin
e) TUV SUD

7) Receiving the relevant results and comparing the results of Sample tests and Routine tests performed by the manufacturer of solar panels (specified for each section produced) is a prerequisite for allowing the transportation of equipment from the solar panel manufacturer's factory. It is necessary that the manufacturer of the solar panels provides the overall results of all Flash and EL tests performed on solar panels, which include operational and nominal power, open-circuit voltage and short-circuit current, operating voltage and current, solar panel efficiency, and Fill Factor. This should be done officially and separately for each panel serial number, for all delivered panels and before starting any operations.
8) regardless of the tests performed at the factory and the tests considered in the temporary delivery section, if the manufacturer of the panels proposes additional tests to be performed at the solar site, these tests must also be carried out during the installation at the solar site. It should be noted that performing IV tests and/or megger tests on each string before connecting the solar panels to the inverters is essential.

General Notes:

i. This document is the minimum requirement for the project's PV modules.
ii. The Vendor shall fill and confirm the required gaps.
iii. All electrical and mechanical characteristics of the PV modules shall be specified by the vendor.