Ref: ZSPL/NEPRA-GL/0720-01 Dated: July 13, 2020

The Registrar,
National Electric Power Regulatory Authority,
NEPRA Towers, Sector G-5/1, Islamabad

Subject: **License Proposed Modification Application for 100 MW Zorlu Solar Pakistan (Pvt.) Ltd.**

Dear Sir,

I, Syed Mumtaz Hassan, being the duly authorized representative of Zorlu Solar Pakistan (Pvt.) Ltd. by virtue of Board Resolution hereby apply to the National Electric Power Regulatory Authority for the Modification of Generation License No. NEPRA/R/DL/LAG-391/14274-80 dated 18th August, 2017 pursuant to section 10(2) of the National Electric Power Regulatory Authority (Application and Modification Procedure) Regulations, 1999.

I certify that the documents-in-support attached with this application are prepared and submitted in conformity with the provisions of the National Electric Power Regulatory Authority Licensing (Application and Modification Procedure) Regulations, 1999, and undertake to abide by the terms and provisions of the above-said regulations. 1 further undertake and confirm that the information provided in the attached documents-in-support is true and correct to the best of my knowledge and belief.

A [BANK DRAFT/ PAY ORDER] in the sum of Rupees **400,000/- (Rupees Four Hundred Thousand Only)**, being the non-refundable license application fee calculated in accordance with Schedule II to the National Electric Power Regulatory Authority Licensing (Application and Modification Procedure) Regulations, 1999, is also attached herewith, **PAY ORDER No. 23173767 (HBL) Dated: 13-07-2020**

ZORLU SOLAR PAKISTAN LIMITED

Syed Mumtaz Hassan
Country Manager

Zorlu Solar Pakistan Limited.

ZORLU SOLAR PAKISTAN (PRIVATE) LIMITED

CORPORATE RESOLUTION

It is certified that the following extract resolution has been approved by the Board of Directors of M/s. Zorlu Solar Pakistan (Private) Limited (the "Company") during the Board of Directors meeting on January 06, 2017 held at Levent 199 Büyükdere Caddesi No:199 34394, Istanbul, Turkey.

RESOLVED that this company, Zorlu Solar Pakistan (Private) Limited ("Company") authorizes Mr. Syed Mumtaz Hassan, holding CNIC No: 42301-4366039-3, son of Syed Muhammad Mazhar-ul-Hassan and resident of 701-1, Oyster View Residency, Block-2, Clifton, Karachi Pakistan (the "Authorized Person"), to represent and bind the Company and to enter into negotiations with the Federal and/or any Provincial Government of Pakistan or any relevant governmental authority, to exchange information with governmental authorities, to send and receive formal documentation, to sign necessary documentation requested by governmental authorities stated above, and; to do all such acts, deeds, matters, and things and to execute all such other documents as may be ancillary or incidental or as the Authorized Person shall think expedient for the scope aforesaid.

Name	Specimen Signature
Mr. Syed Mumtaz Hassan	

ZORLU SOLAR PAKISTAN LIMITED

Olgun Zorlu	Mehmet Emre Zorlu	Ömer Yüngül
Director / Chief Executive	Director	Director

ZORLU
www.zoren.com.tr
ZORLU SOLAR PAKISTAN (PRIVATE) LIMITED
Registered Office: C-117, Clifton Block 2, Karachi Tel: 021-35291682, 35875366, Fax: 021-95291681

1. TEXT OF THE PROPOSED MODIFICATION

Zorlu Solar Pakistan (Pvt.) Ltd (the "Company") has been awarded tariff by the NEPRA on 15th January 2020. According to latest tariff the following modification in Generation License are requested:

a) The type of Solar Photovoltaic modules has been changed to Monocrystalline type 470 Wp on fixed tilt having earlier the system was proposed with First Solar Series 4/6 CdTe thin film solar modules. There will be no impact on installed capacity

b) The construction period has been changed to 10 months, earlier it was 6 months.

The above modifications are in line with latest tariff determination for ZSPL. Further, In relations to above modifications, the Schedule I and II has been updated and attached herewith this document as Annex-A.

2. STATEMENTS OF REASONS IN SUPPORT OF MODIFICATIONS

2.1. **PV Module Technology:**

The original design of the Project was based on First Solar Series 4 CdTe thin film solar modules based on a fixed tilt structure. However, in 2018 First Solar has introduced a new product (First Solar Series 6 solar modules) in the market, which is based on the same technology but with different dimensions and specifications. After ramp-up period of Series 6 modules, First Solar have started phasing out the manufacturing of the Series 4 solar modules and only Series 6 modules will be available from 2020.

Due to the difference in the dimensions between the FS Series 4 and FS Series 6 modules, it became imperative to make a change in the design of the Project, since the same design cannot entertain the different sized solar modules. ZSPL therefore, re-evaluated the revised design based on the prevailing market conditions and during this process of re-evaluation also considered alternate technologies.

One of the key aspects of re-evaluation process was market prices of different technologies viz-a-viz correlation between US and Chinese markets. The prevailing conditions and dynamics of the US and Chinese markets are detailed below:

- United States is one of the largest market for Solar PV installations globally having installation of 10.6 GW in 2018 and reached a total installed capacity of 64.2 GW by end of 2018.
- In 2018 the administration of US have put additional custom taxes on import of solar panels from China in order to protect US manufacturer from un-equitable competition coming from China.
- Due to imposition of these additional taxes, First Solar being the major US solar panel manufacturer have started gaining from the resultant price advantage against its Chinese competitors in US market and for this reason, US market has become first priority in First Solar's sales strategy.
- Due to the above extraordinary market conditions in US, the pricing of First Solar panels are off-market and First Solar is actually not following the pricing trend of Chinese market.

Based on above facts, and in order to come up with the best possible solution, ZSPL has considered to change the solar panels technology and decided that Monocrystalline panels from tier 1 manufacturer on fixed tilt structures as the most optimal solution under current circumstances for the given location and land size of the Project.

2.2. Construction Period:

The earlier determination was based on six months of construction period, however, due to change is design and procurement schedule of the project, we therefore request extension in construction period and thereby allow us the construction period of ten (10) months, which is already in line with other projects of similar capacity.

3. STATEMENT OF IMPACT ON TARIFF

3.1. There is no impact on the tariff as the company is not claiming any cost increase under EPC, O&M or any other head for the modification.

3.2. Further, the company anticipates that the quality service, performance and reliability of power plant shall improve as the latest technology will be installed.

3.3. The modifications are already in line with latest determination of NEPRA.

4. Prayers:

It is most humbly prayed to the esteemed Authority that the Company be granted the requested modifications in Generation License to ensure the safe and reliable operation of the Project.

We remain at the disposal of the authority for any further information/clarifications, if required.

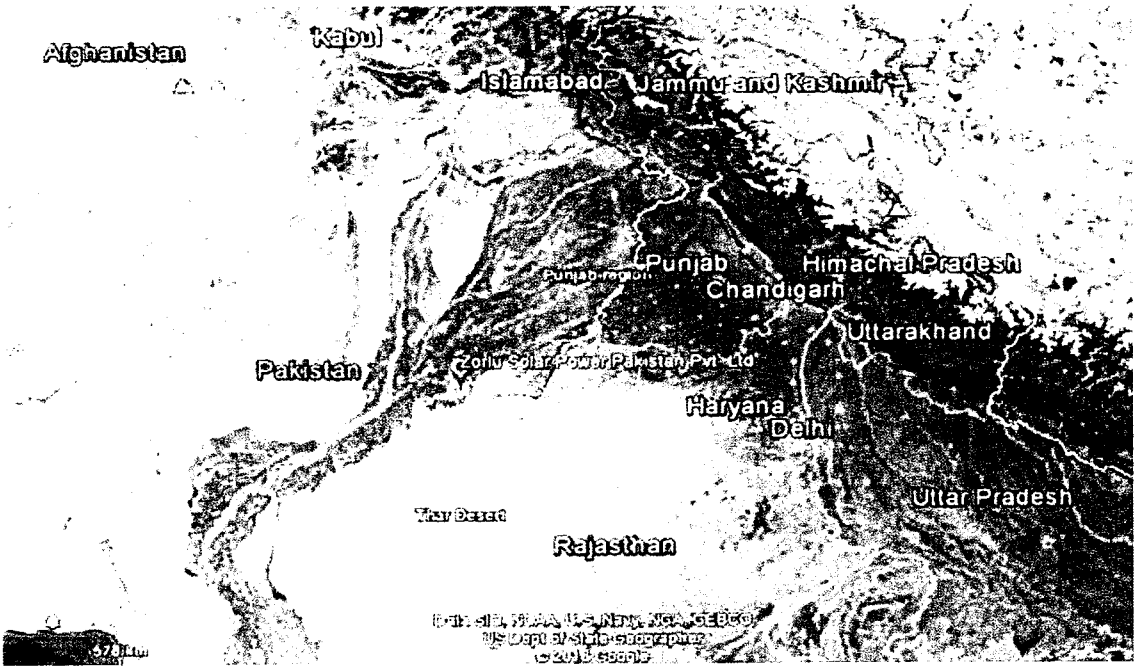
Respectfully submitted for and behalf of the applicant.

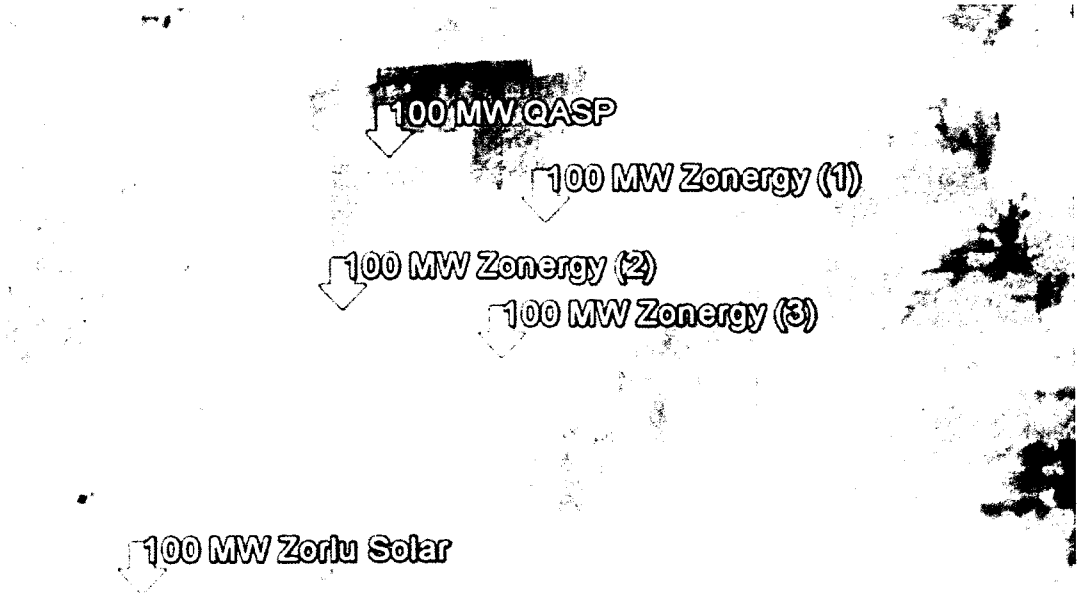
ANNEXURE-A
(Schedule-I)

SCHEDULE-I

The Location, Size (i.e. Capacity in MW), Type of Technology, Interconnection Arrangements, Technical Limits, Technical/Functional Specifications and other details specific to the Generation Facilities of the Licensee are described in this Schedule.

Location of the Solar Power Plant/Solar Farm of Zorlu Solar Pakistan (Pvt.) Limited (ZSPPL)

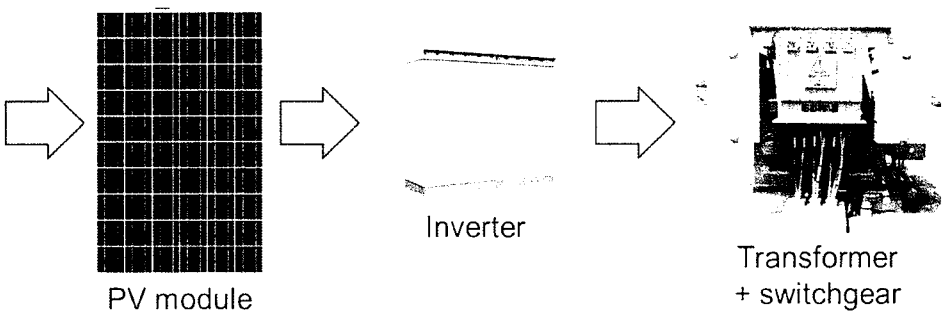


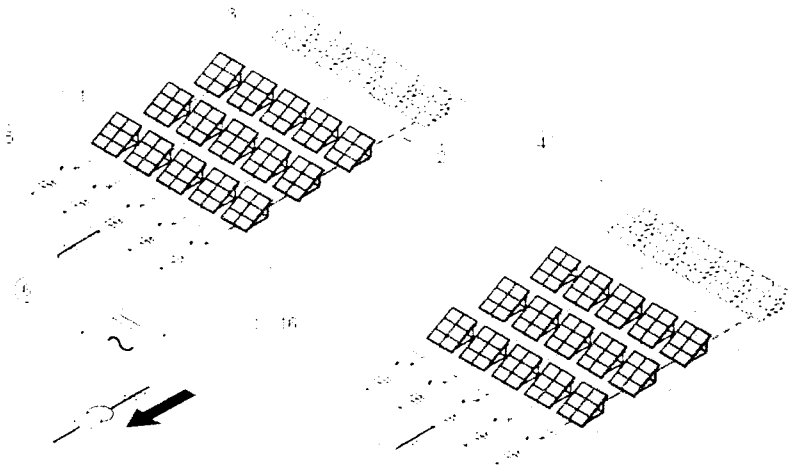


Land Coordinates of the Generation Facility/Solar Farm of ZSPPL

Total Project Land:500 Acres		
S. No.	**Latitude**	**Longitude**
Boundary 1	29°16'50.10"N	71°47'19.98"E
Boundary 2	29°16'50.10"N	71°48'22.08"E
Boundary 3	29°16'30.54"N	71°48'22.08"E
Boundary 4	29°16'30.54"N	71°48'9.66"E
Boundary 5	29°16'20.76"N	71°48'9.66"E
Boundary 6	29°16'20.76"N	71°47'57.24"E
Boundary 7	29°16'1.20"N	71°47'57.24"E
Boundary 8	29°16'1.20"N	71°47'13.98"E

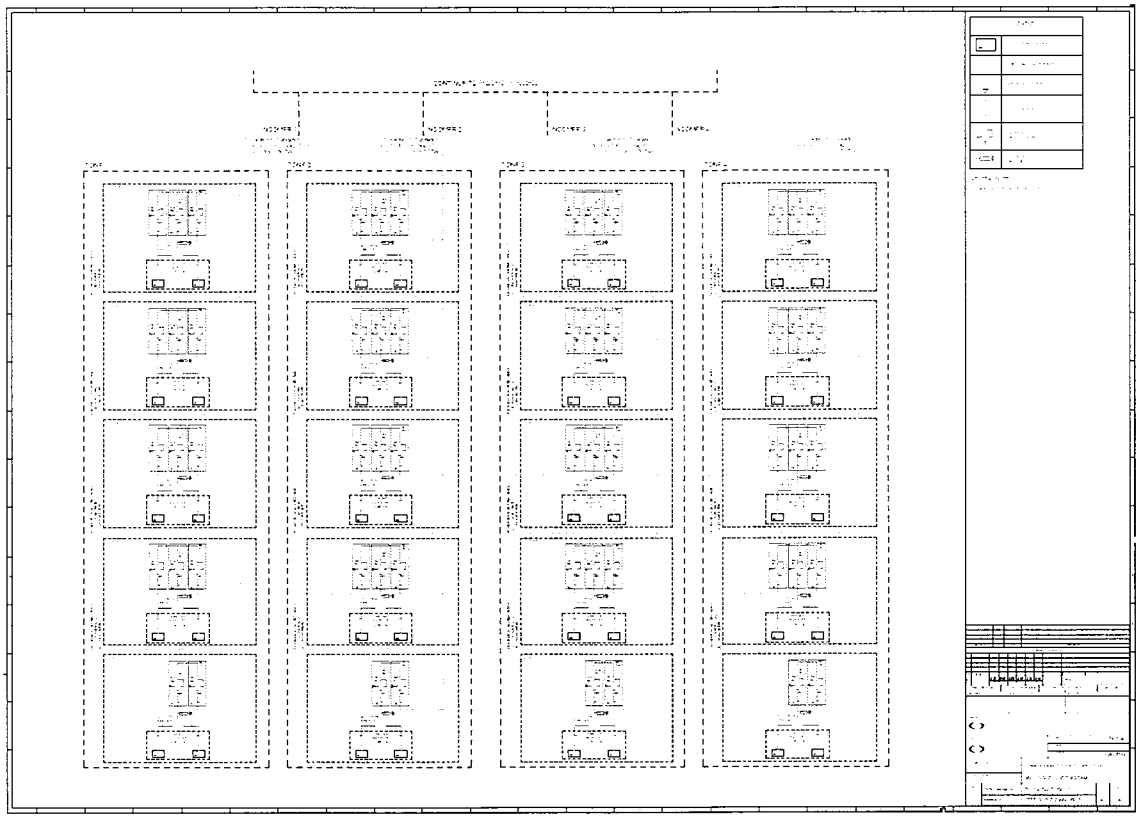
Process Flow Diagram of the Solar Power Plant/Solar Farm of ZSPPL





1 Solar module (photovoltaic module) 3 Solar array 5 Solar array junction box
2 Solar string 4 Solar generator 6 Inverter

Single Line Diagram (Electrical) of the Generation Facility/Solar Farm of ZSPPL



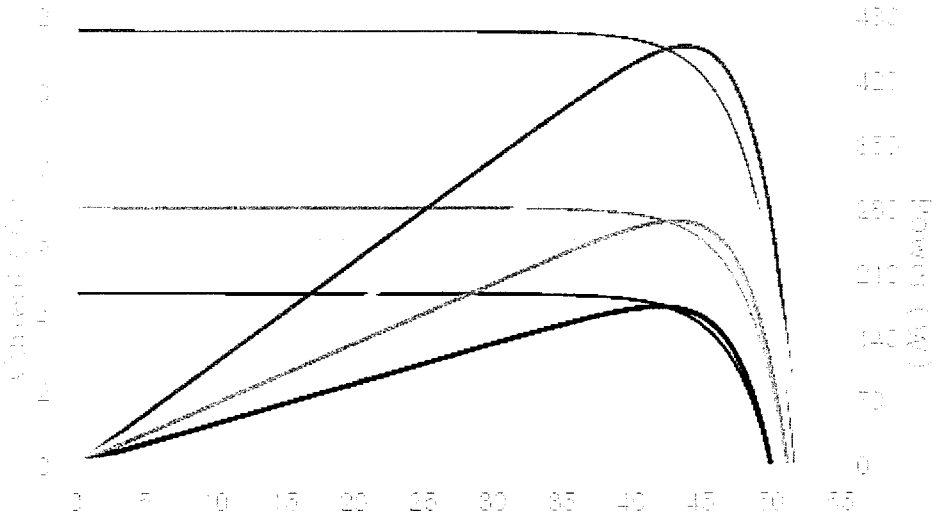
Interconnection Arrangement/Transmission Facilities for Dispersal of Power from the Generation Facility/Solar Farm of ZSPPL

The power generated from the generation facilities/solar farm of Pakistan Zorlu Solar Pakistan (Pvt.) Limited (ZSPPL) shall be dispersed to Lal-Sohanra 220/132 kV Substation

2. The proposed interconnection/dispersal arrangement for the project will be direct 132 kV double circuit from Zorlu Solar-I Power Plant to Lal Sohanra 220/132 kV substation. The distance of the site of solar plant from the grid station, as verified from site visit is approximately 2 km.

3. Any change in the above interconnection arrangement/transmission facility duly agreed by License/ZSPPL, NTDC and MEPCO will be communicated to the Authority in due course of time.

I-V Curve (Normalized) for Tier-1 Monocrystalline Modules



Voltage (V)

Detail of Generation Facility/Solar Farm

(A). General Information

(i).	Name of Licensee	Zorlu Solar Pakistan (Pvt.) Limited
(ii).	Registered/ Business Office	C-117, Clifton Block-2, Karachi Pakistan.
(iii).	Location of the generation facility	Extension of Quaid-e-Azam Solar Park, in the Province of Punjab
(iv).	Type of generation facility	Solar Photovoltaic (PV)

(B). Solar Power Generation Technology & Capacity

(i).	Type of Technology	Photovoltaic (PV) Cell with fixed tilt
(ii).	System Type	Grid Connected
(iii).	Installed Capacity of Solar Farm(MW)	100 MW

(C). Technical Details of Equipment

(a).	**Solar Panels – PV Modules**	
(i).	Type of Module	Tier 1-Monocrystalline PV module type 470 Wp on fixed tilt
(ii).	Type of Cell	Monocrystalline Silicone
(iii).	Dimension of each Module	2182×1029×40mm
(iv).	No. of Panel /Modules	212.750
(v).	Module Area	2.25 m^2
(vi).	Panel's Frame	Anodized Aluminium Alloy
(vii).	Weight of one Module	26.1 kg (57.54 lbs)
(viii).	No of Solar Cells in each module	156 (2×78)
(ix).	Efficiency of module	20.93%

(x).	Maximum Power (P_{max})	470Wp	
(xi).	Voltage @ P_{max}	43.28V	
(xii).	Current @ P_{max}	10.86A	
(xiii).	Open circuit voltage (V_{oc})	52.14V	
(xiv).	Short circuit current (I_{sc})	11.68A	
(xv).	Maximum system open Circuit Voltage	1000/1500VDC (IEC)	
(b).	**Inverters**		
(i).	Capacity of each unit	4000kW	
(ii).	Manufacturer	SIEMENS - WSTECH	
(iii).	Input Operating Voltage Range	836V-1500V	
(iv).	Number of Inverters	20	
(v).	Efficiency of inverter (EU)	98.5 %	
(vi).	Max. Allowable Input voltage	1500 V DC	
(vii).	Max. Current	4 x 1220 A	
(viii).	Max. Power Point Tracking Range	836 ~ 1500V	
(ix).	Output electrical system	3 phase, 3 wire	
(x).	Rated Output Voltage	550V	
(xi).	Power Factor (adjustable)	0 ~ 1 (leading & lagging)	
(xii).	Power control	MPP tracker	
(xiii).	Rated Frequency	50 Hz	
(xiv).	Environmental Enclosures	Relative Humidity	0~95%, non-condensing
		Audible Noise	< 55 dB(A)
		Operating Elevation	4500m (>3000m derating)

(xv).		Operating ambient temperature	-25°C~+60°C
(xvi).	Grid Operating protection	A	DC circuit breaker
		B	AC circuit breaker
		C	DC overload protection (Type 2)
		D	Overheat protection
		E	Grid monitoring
		F	Insulation monitoring
		G	Ground fault monitoring
(c).	**Junction Boxes Installed and fixed on main steel structure in Array yard.**		
(i).	Number of J/Box units	603	
(ii).	Input circuits in each box	10 circuits for 119 of array boxes 15 circuits for 472 of array boxes 20 circuits for 12 of array boxes	
(iii).	Max. input current for each circuit	Impp: 10,82 A ; Isc: 11,68 A	
(iv).	Protection Level	IP65	
(v).	Over current protection	20A input fuses	
(vi).	Surge protection	Type II	
(d).	**Data Collecting System**		
(i).	System Data	Hardwire connection via RS485 and/or Ethernet.	
(e).	**Power Transformer**		
(i).	Rating	2x80/100 MVA	
(ii).	Type of transformer	ONAN/ONAF	
(iii).	Purpose of transformer	Step-up (33 kV/132 kV)	
(iv).	Output Voltage	132 kV	

(f).	**Mounting Structure**	
(i).	Structure	Fixed tilted & ground mounted
(ii).	Tilt of Array frame	22 degree
(iii).	Array specifications	Landscape oriented, 25 modules in series, 5 series in a structure (PV table)

(g).	**Unit Transformer**	
(i).	Rating	20×4000 kVA
(ii).	Type of transformer	33kV Oil Typed Transformer
(iii).	Purpose of transformer	Step-up (2x0.55kV/33kV)
(iv).	Output Voltage	33 KV

(D). Other Details

(i).	Project Commercial Operation date (COD)-Anticipated	15th November, 2021
(ii).	Expected Life of the Project from Commercial Operation date (COD)	25 years

Annex-B
(SCHEDULE-II)

The Total Installed Gross ISO Capacity of the Generation Facility/Power Plant/Solar Plant (MW), Total Annual Full Load (Hours), Average Sun Availability, Total Gross Generation of the Generation Facility/Solar Farm (in kWh), Annual Energy Generation (25 years Equivalent Net Annual Production-AEP) KWh and Net Capacity Factor of the Generation Facility/Solar Farm of Licensee are given in this Schedule.

1. SCHEDULE-II

(1).	Total PV Installed Capacity of the Generation Facility/Solar Farm	100 MW
(2).	Average Sun Hour Availability/Day (Irradiation on Inclined Surface)	8 to 8.5 Hrs
(4).	PV Plant Generating Capacity Annually (As Per Simulation)	173,010 MWh
(5).	Net Capacity Factor	19.75%

Note

All the above figures are indicative as provided by the Licensee. The Net energy available to the Power Purchaser for dispatch will be determined through procedures contained in the Energy Purchase Agreement.