National Electric Power Regulatory Authority
Islamic Republic of Pakistan

Registrar

NEPRA Tower, Ataturk Avenue (East) G-5/1, Islamabad
Ph: +92-51-9206500, Fax: +92-51-2600021
Web: www.nepra.org.pk, E-mail: info@nepra.org.pk

No. NEPRA/R/LAG-235/7167-72

June 26, 2014

Mr. Asim Ahmed Buksh
Director
Buksh Energy (Private) Limited
54, D-1, Sir Syed Road,
Gulberg-III, Lahore
Phone: 042-35716401-406

Subject: **Generation Licence No. SPGL/06/2014**
Licence Application No. LAG-235
Buksh Energy (Private) Limited

Reference: Your letter No. nil, dated February 04, 2013

Enclosed please find herewith Determination of the Authority in the matter of Generation Licence Application of Buksh Energy (Private) Limited (BEPL) along with Generation Licence No. SPGL/06/2014 annexed to this determination granted by the National Electric Power Regulatory Authority to BEPL for its 11.664 MW_P Solar power plant located near Fort Marot at Cholistan, District Bahawalnagar, Punjab, pursuant to Section 15 of the Regulation of Generation, Transmission and Distribution of Electric Power Act (XL of 1997).

2. Please quote above mentioned Generation Licence No. for future correspondence.

Enclosure: **Generation Licence (SPGL/06/2014)**

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY ★ NEPRA ★ REGISTRAR

(Syed Safeer Hussain)

Copy to:

1. Chief Executive Officer, Alternative Energy Development Board (AEDB), 2nd Floor, OPF Building, G-5/2, Islamabad.
2. Chief Executive Officer, NTDC, 414-WAPDA House, Lahore
3. Chief Operating Officer, CPPA, 107-WAPDA House, Lahore
4. Chief Executive Officer, Multan Electric Power Company (MECO), MEPCO Complex, WAPDA Colony, Khanewal Road, Multan
5. Director General, Pakistan Environmental Protection Agency, Plot No. 41, Street No. 6, H-8/2, Islamabad.

National Electric Power Regulatory Authority (NEPRA)

Determination of the Authority in the Matter of Generation Licence Application of Buksh Energy (Private) Limited

June 23, 2014
Application No. LAG-235

(A). Background

(i). Government of Pakistan has set up Alternative Energy Development Board (AEDB) for development of Renewable Energy (RE) resources in the Country. AEDB has issued Letter of Intent (LoI) to various RE developers for setting up projects in the country.

(ii). AEDB issued an LoI to Buksh Energy (Private) Limited (BEPL) for setting up a 10.00 MW Solar Photo Voltaic (PV) Power Generation Project in District Bahawalpur/Lodhran in the Province of Punjab. According to the terms and conditions of the LoI, the sponsors were required to carry out a detailed Feasibility Study (FS) for the project. The Sponsors hired different consulting firms for completing the FS. These included Suggur Energy Limited, U.K., Power Planner International U.K. and Engineers Guild Lahore. BEPL completed the FS and submitted the same to AEDB for the approval of its Panel of Experts (PoEs).

(iii). The Authority through its Determination No. NEPRA/UTS-01/777-779, dated January 21, 2014 announced an Upfront Tariff for setting up PV Solar Power Plants in the Country. BEPL decided to unconditionally accept the above mentioned Up-Front Tariff on the standard terms and conditions as given in the said Determination. Further, BEPL also decided to approach the Authority for the grant of Generation Licence.

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY ★ NEPRA ★ REGISTRAR

(B). Filing of Generation Licence Application

(i). In accordance with Section 15 of Regulation of Generation, Transmission and Distribution of Electric Power Act 1997 (the NEPRA Act), BEPL filed an application on February 11, 2013, requesting for the grant of Generation Licence.

(ii). The Registrar examined the application to confirm its compliance with the NEPRA Licensing (Application and Modification Procedure) Regulations, 1999 (the "Regulations"). The Registrar observed that the application of BEPL was not compliant with the provisions of the Regulations. Accordingly, BEPL was directed for submitting the missing information. BEPL submitted the missing information in piece meal and the latest information was received on July 04, 2013.

(iii). After the completion of the information as stipulated in the Regulations, the Authority admitted the application of BEPL under Regulation 7 of the Regulations on August 23, 2013 for consideration of grant of a Generation Licence. The Authority also approved the Notice of Admission (NoA) to be published in daily newspapers, for seeking comments of the general public as stipulated in Regulation 8 of the Regulations.

(iv). The Authority also approved the list of interested/affected parties for inviting comments or otherwise assisting the Authority in the matter as stipulated in Regulation 9 of the Regulations. Accordingly, NoA was published in one Urdu and one English National Newspaper on August 27, 2013. Further, separate notices were also sent to Individual Experts/Government Ministries/Representative Organizations etc. on August 28, 2013 for submitting their views/comments in the matter.

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

(C). Comments of Stakeholders

(i). In reply to the above, the Authority received comments from one (01) stakeholder. This included Central Power Purchasing Agency (CPPA) of National Transmission and Despatch Company Limited (NTDC).

(ii). The salient points of the comments offered by the above stakeholder are summarized in the following paragraphs: -

(a). CPPA remarked that the proposed project would be based on RE resource and would be beneficial to the customers as well as society at large. Therefore, the grant of Generation Licence to BEPL is supported subject to the fulfilling of the regulatory and Policy requirements. However, BEPL would have to ensure that proposed plant would comply with the latest version of Grid Code to be approved by NEPRA. In view of the very small capacity of the project i.e. 10 MW, the project is to be connected at 11 kV level and the Power Purchaser will be the concerned DISCO i.e. MEPCO.

(iii). The perspective of BEPL on the aforesaid position of CPPA was sought. In its rejoinder. BEPL submitted that its representative attend the last meeting on the invitation of Chairman Grid Code review panel, held on September 20, 2013. BEPL agrees to the proposed addendum to the Grid Code for injecting the solar power to National Grid as decided in the said meeting. Further, BEPL confirmed that its Proposed Plant would comply with latest Grid Code to be approved by the Authority.

(iv). The Authority considered the comments of the stakeholders and the rejoinder of AEPL in its Regulatory Meeting (RM-14-227), held on April 23, 2014 and found the same satisfactory. In view of the said, the Authority considered it

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY ★ NEPRA ★ REGISTRAR

appropriate to process the application of AEPL for the grant of Generation Licence as stipulated in the Regulations and NEPRA Licensing (Generation) Rules 2000.

(D). Grant of Generation Licence

(i). Energy, especially Electricity is considered the lifeblood for the Economy of any Country. The sustainable and affordable energy is a key prerequisite for socio-economic development of any Country. In fact, the Economic Growth of any Country is directly linked with the availability of safe, secure, reliable and cheaper supply of electricity. In view of the said reasons, the Authority is of the considered opinion that for sustainable development, all indigenous power generation resources including RE must be developed on priority basis.

(ii). The existing energy mix of the country is heavily skewed towards the costlier thermal power plants, mainly operating on imported furnace oil. The continuously increasing trend in fuel prices is not only creating pressure on the precious foreign exchange reserves of the country but is also an environmental concern. Therefore, in order to achieve sustainable development it is imperative that indigenous RE resources are given priority for power generation and their development is encouraged. The Energy Security Action Plan 2005 (ESAP) approved by the Government of Pakistan, duly recognizes this very aspect of power generation through RE and envisages that at least 5% of total national power generation capacity (i.e. 9700 MW) is to be met through RE resources by 2030. The Authority considers that the proposed project of BEPL is consistent with the provisions of ESAP. The project will help in diversifying the energy portfolio of the country. Further, it will not only enhance the energy security of the country by reducing the dependence on imported furnace oil but will also help reduction in carbon emission by generating clean electricity, thus improving the environment.

(iii). The term of a Generation Licence under the Rules is to be commensurate with the maximum expected useful life of the units comprised in a generating facility. According to the Determination of the Up-Front Tariff, the Control Period for the Project for Solar Projects has been estimated to twenty five

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY ★ NEPRA ★ REGISTRAR

(25) years from Commercial Operation Date (COD) of the Project. It is envisaged that based on the Up-Front Tariff, BEPL will be negotiating an Energy Purchaser Agreement (EPA) with the Power Purchaser, commensurate with the said Control Period. Therefore, the Authority fixes the term of the Generation Licence of BEPL to twenty five (25) years from COD of the Project.

(iv). In view of the above, the Authority hereby decides to approve the grant of Generation Licence to BEPL on the terms set out in the Generation Licence annexed to this determination. The grant of Generation Licence will be subject to the provisions contained in the NEPRA Act, relevant rules and regulations framed there under.

Authority

Maj. (R) Haroon Rashid
Member

25/6/14

Khawaja Muhammad Naeem
Member

25 GW

Habibullah Khilji
Member/Vice Chairman

24/6/2014

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

26.06.14

National Electric Power Regulatory Authority
(NEPRA)
Islamabad – Pakistan

GENERATION LICENCE

No. SPGL/06/2014

In exercise of the Powers conferred upon the National Electric Power Regulatory Authority (NEPRA) under Section 15 of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997, the Authority hereby grants a Generation Licence to:

BUKSH ENERGY (PRIVATE) LIMITED

Incorporated under the Companies Ordinance, 1984
Corporate Universal Identification No. 0069431, dated May 12, 2009

for its Solar Generation Facility/Solar Power Plant/Solar Farm Located Near Fort Marot at Cholistan, District Bahawalnagar in the Province of Punjab

(Installed Capacity: 11.664 MW_P Gross ISO)

to engage in generation business subject to and in accordance with the Articles of this Licence.

Given under my hand this 26th day of June Two Thousand & Fourteen and expires on 30th day of June Two Thousand & Forty.

Registrar

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Article-1
Definitions

1.1 In this Licence

(a). "Act" means "the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997";

(b). "Authority" means "the National Electric Power Regulatory Authority constituted under section 3 of the Act";

(c). "Bus Bar" means a system of conductors in the generation facility of the Licensee on which the electric power of all the photovoltaic cells is collected for supplying to the Power Purchaser;

(d). "Carbon Credits" mean the amount of carbon dioxide (CO_2) and other greenhouse gases not produced as a result of generation of energy by the generation facility and other environmental air quality credits and related emissions reduction credits or benefits (economic or otherwise) related to the generation of energy by the generation facility, which are available or can be obtained in relation to the generation facility after the COD;

(e). "Commercial Operations Date (COD)" means the Day immediately following the date on which the generation facility of the Licensee is Commissioned;

(f). "CPPA" means "the Central Power Purchasing Agency of NTDC" or any other entity created for the like purpose;

(g). "Energy Purchase Agreement" means the energy purchase agreement, entered or to be entered into by and between the Power Purchaser and the Licensee, for the purchase and sale of electric energy generated by the generation facility, as may be amended by the parties thereto from time to time;

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

(h). "Grid Code" means the grid code prepared by NTDC and approved by the Authority, as it may be revised from time to time by NTDC with any necessary approval by the Authority;

(i). "IEC" means International Electrotechnical Commission or any other entity created for the like purpose and its successors or permitted assigns;

(j). "IEEE" means the Institute of Electrical and Electronics Engineers and its successors or permitted assigns;

(k). "Licensee" means " Buksh Energy (Private) Limited" and its successors or permitted assigns;

(l). "MEPCO" means "Multan Electric Power Company Limited and its successors or permitted assigns;

(m). "NTDC" means National Transmission and Despatch Company Limited and its successors or permitted assigns;

(n). "Policy" means "the Policy for Development of Renewable Energy for Power Generation, 2006 of Government of Pakistan" as amended from time to time;

(o). "Power Purchaser" means the CPPA of NTDC purchasing power on behalf of XW-DISCOs or MEPCO;

(p). "Rules" mean "the National Electric Power Regulatory Authority Licensing (Generation) Rules, 2000";

(q). "Solar Farm" means "a cluster of photovoltaic cells in the same location used for production of electric power";

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

(r). "XW DISCO" means "an Ex-WAPDA distribution company engaged in the distribution of electric power".

1.2 Words and expressions used but not defined herein bear the meaning given thereto in the Act or in the Rules.

Article-2
Application of Rules

This Licence is issued subject to the provisions of the Rules, as amended from time to time.

Article-3
Generation Facilities

3.1 The location, size (capacity in MW), technology, interconnection arrangements, technical limits, technical and functional specifications and other details specific to the generation facility/Solar Farm of the Licensee are set out in Schedule-I to this Licence.

3.2 The net capacity of the generation facility/Solar Farm of the Licensee is set out in Schedule-II hereto.

3.3 The Licensee shall provide the final arrangement, technical and financial specifications and other specific details pertaining to its generation facility/Solar Farm before its commissioning.

Article-4
Term of Licence

4.1 The Licence is granted for a term of twenty five (25) years after the Commercial Operation Date (COD).

4.2 Unless suspended or revoked earlier, the Licensee may within ninety (90) days prior to the expiry of the term of the Licence, apply for renewal of the Licence under the National Electric Power Regulatory Authority Licensing (Application &

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY ★ NEPRA ★ REGISTRAR

Modification Procedure) Regulations, 1999 as amended or replaced from time to time.

Article-5
Licence fee

After the grant of the Generation Licence, the Licensee shall pay to the Authority the Licence fee, in the amount and manner and at the time set out in the National Electric Power Regulatory Authority (Fees) Rules, 2002.

Article-6
Tariff

The Licensee shall charge only such tariff which has been determined, approved or specified by the Authority in terms of Rule-6 of the Rules.

Article-7
Competitive Trading Arrangement

7.1 The Licensee shall participate in such manner as may be directed by the Authority from time to time for development of a Competitive Trading Arrangement. The Licensee shall in good faith work towards implementation and operation of the aforesaid Competitive Trading Arrangement in the manner and time period specified by the Authority. Provided that any such participation shall be subject to any contract entered into between the Licensee and another party with the approval of the Authority.

7.2 Any variation or modification in the above-mentioned contracts for allowing the parties thereto to participate wholly or partially in the Competitive Trading Arrangement shall be subject to mutual agreement of the parties thereto and such terms and conditions as may be approved by the Authority.

Article-8
Maintenance of Records

For the purpose of sub-rule (1) of Rule 19 of the Rules, copies of records and data shall be retained in standard and electronic form and all such records and data shall, subject to just claims of confidentiality, be accessible by authorized officers of the Authority.

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY ★ NEPRA ★ REGISTRAR

Article-9
Compliance with Performance Standards

The Licensee shall comply with the relevant provisions of the National Electric Power Regulatory Authority Performance Standards (Generation) Rules 2009 as amended from time to time.

Article-10
Compliance with Environmental Standards

The Licensee shall comply with the environmental standards as may be prescribed by the relevant competent authority from time to time.

Article-11
Power off take Point and Voltage

The Licensee shall deliver power to the Power Purchaser at the outgoing bus bar of its 11 KV grid station. The up-gradation (step up) of generation voltage up to 11 KV will be the responsibility of the Licensee.

Article-12
Performance Data of Generation Facility/Solar Farm

The Licensee shall install properly calibrated automatic computerized solar radiation recording device(s) and a compatible communication/SCADA system both at its generation facility/Solar Farm and control room of the Power Purchaser for transmission of solar radiation data and power output data to the control room of the Power Purchaser for recording of data.

Article-13
Provision of Information

13.1 The obligation of the Licensee to provide information to the Authority shall be in accordance with Section 44 of the Act.

13.2 The Licensee shall in addition to 13.1 above, supply information to the Power Purchaser regarding solar data specific to the site of the Licensee and other related information on a regular basis and in a manner required by the Power Purchaser.

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

13.3 The Licensee shall be subject to such penalties as may be specified in the relevant rules made by the Authority for failure to furnish such information as may be required from time to time by the Authority and which is or ought to be or has been in the control or possession of the Licensee.

Article-14
Emissions Trading /Carbon Credits

The Licensee shall process and obtain emissions/Carbon Credits expeditiously and credit the proceeds to the Power Purchaser as per the Policy.

Article-15
Design & Manufacturing Standards

Solar photovoltaic cells shall be designed, manufactured and tested according to the latest IEC, IEEE or any other equivalent standards. All plant and equipment shall be unused and brand new.

Article-16
Power Curve

The power curve for the individual solar photovoltaic cell provided by the manufacturer and as mentioned in this Generation Licence shall form the basis in determining the cumulative power curve of generation facility/Solar Farm.

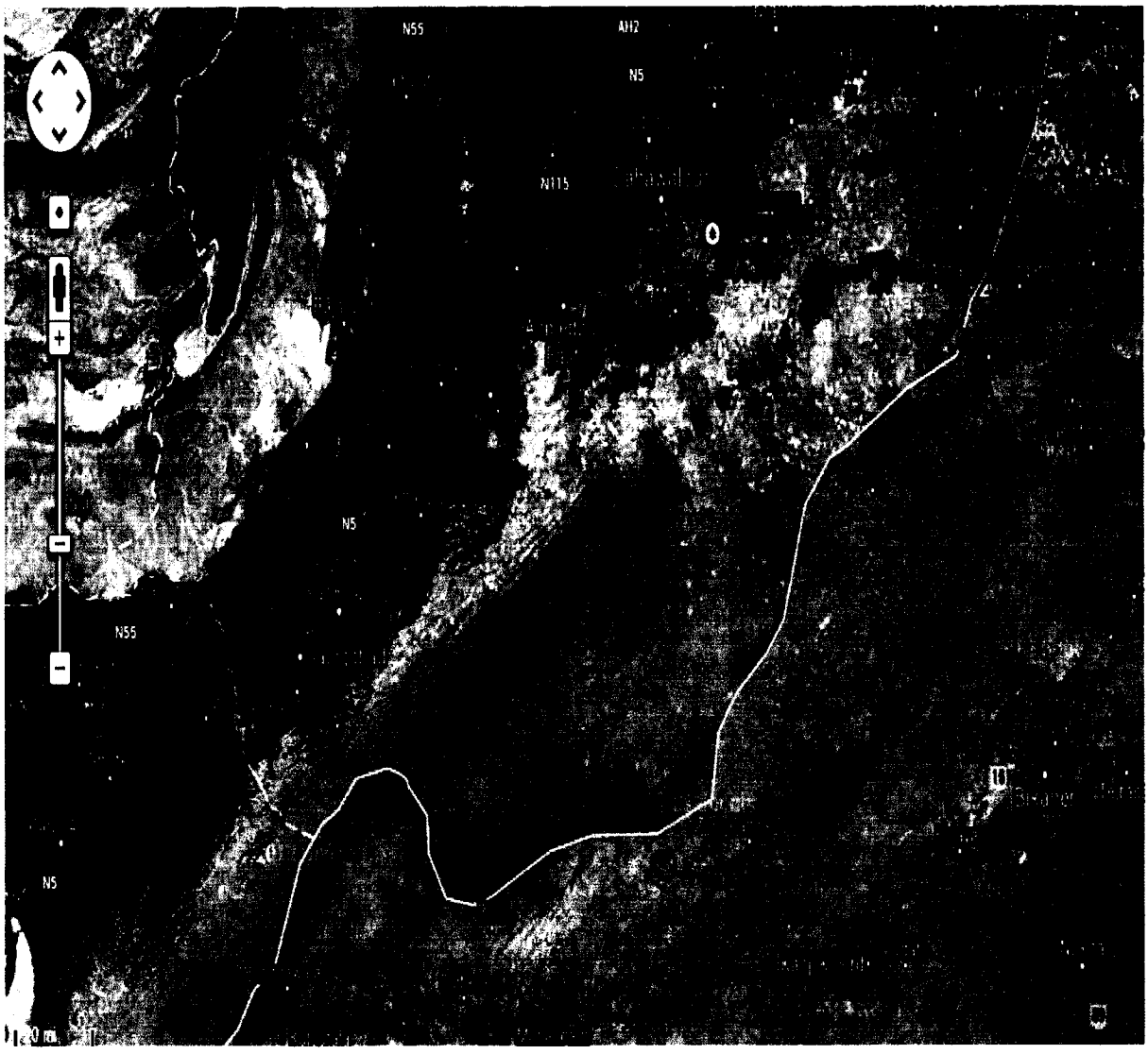
NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

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.

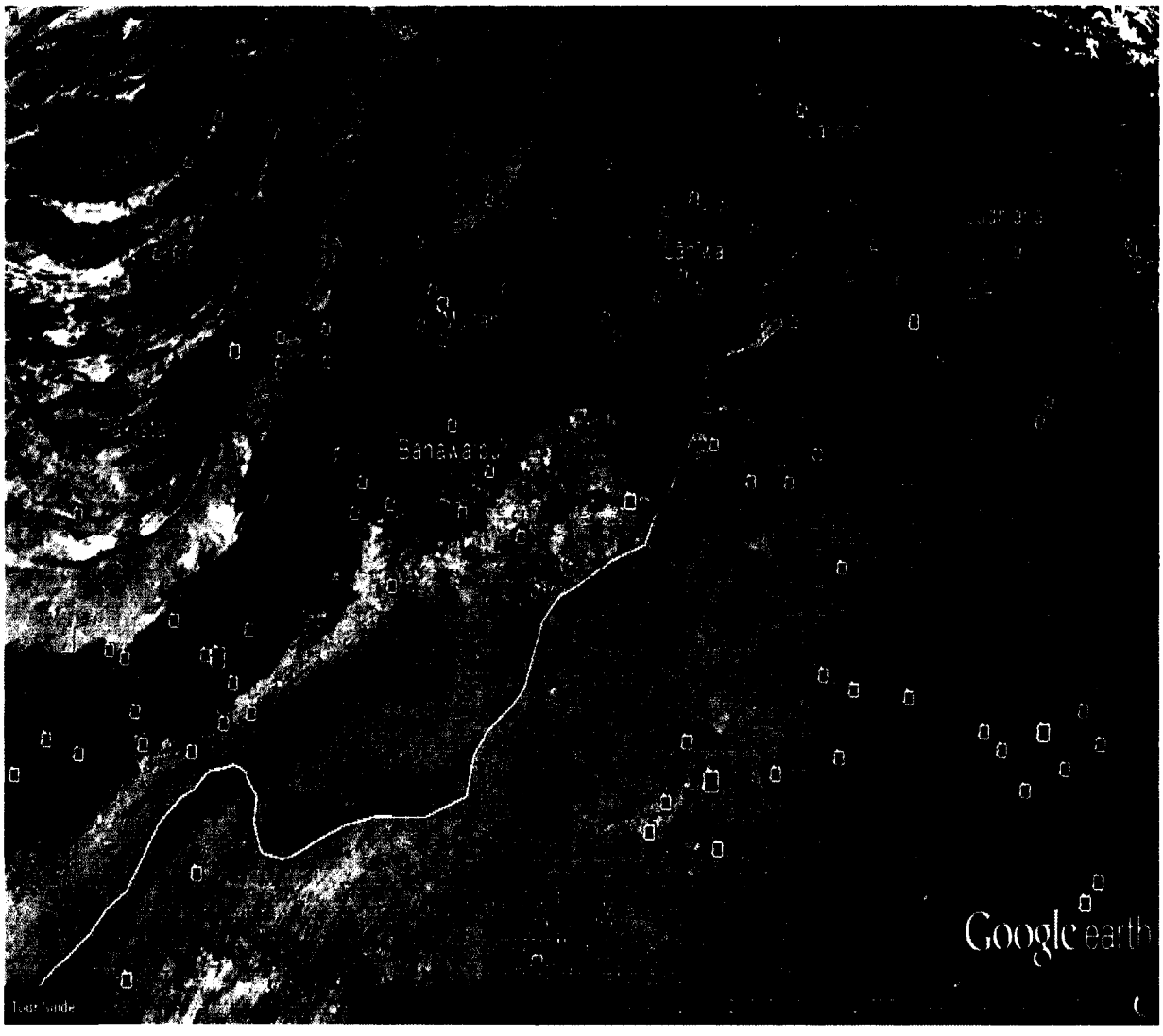
NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Location of the Generation Facility/Solar Power Plant/ Solar Farm



NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Location of the Generation Facility/Solar Power Plant/ Solar Farm



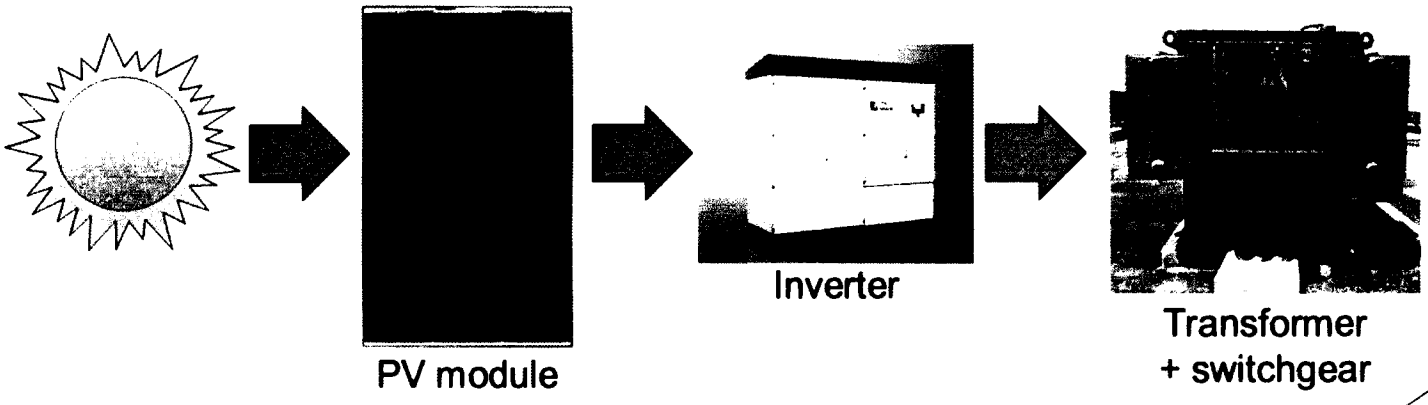
NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Location Coordinates of the Generation Facility/Solar Power Plant/ Solar Farm

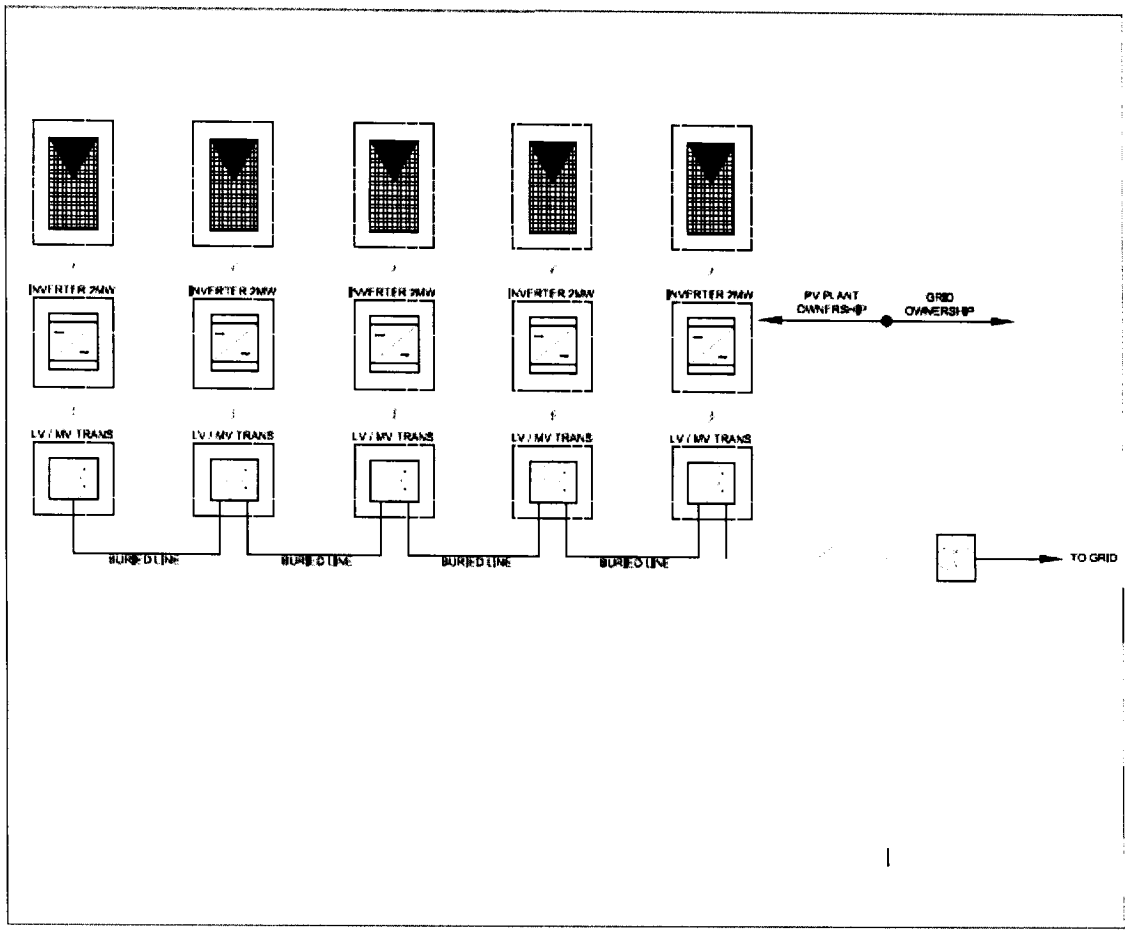
Sr. No.	Easting (m)	Northing (m)	Elevation (m)	Description
1	251575.0000'	3231446.0000'	140.00'	STN+BD+BM15
2	251467.7030'	3231413.9370'	138.89'	BM-1
3	251658.8800'	3231409.0940'	144.22'	BM-14
4	251395.5820'	3231200.9430'	140.18'	BM-2
5	251674.8490'	3231183.6970'	144.73'	BM-13
6	251619.3210'	3231026.4160'	144.16'	BM-4
7	251537.0760'	3230946.7680'	139.69'	BM-3
8	252035.0660'	3231088.0840'	142.94'	BM-6
10	252028.1720'	3230918.5370'	140.69'	BM-5
11	251934.3190'	3231180.5390'	142.48'	BM-7
12	252043.3970'	3231419.1940'	142.31'	BM-9
13	251936.8970'	3231386.6340'	142.41'	BM-10
14	251735.6130'	3231213.3430'	144.99'	BM-12
15	251807.0130'	3231234.2970'	143.16'	BM-11
16	252078.2290'	3231407.4740'	140.56'	BM-8

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Process Flow Diagram of the Generation Facility/Solar Power Plant/ Solar Farm

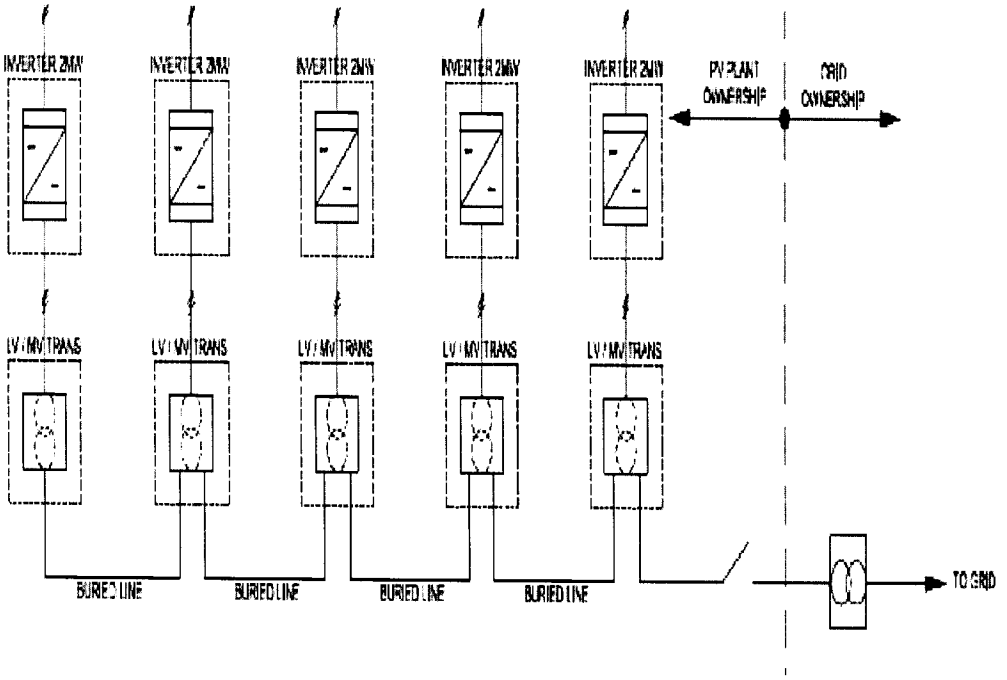


Single Line Diagram of Electrical System of the Generation Facility/Solar Power Plant/ Solar Farm



NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Single Line Diagram of Inverter Station of the Generation Facility/Solar Power Plant/ Solar Farm



NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Interconnection Arrangement/Transmission Facilities for Dispersal of Power from the Generation Facility/ Solar Power Plant /Solar Farm of Buksh Energy (Private) Limited (BEPL)

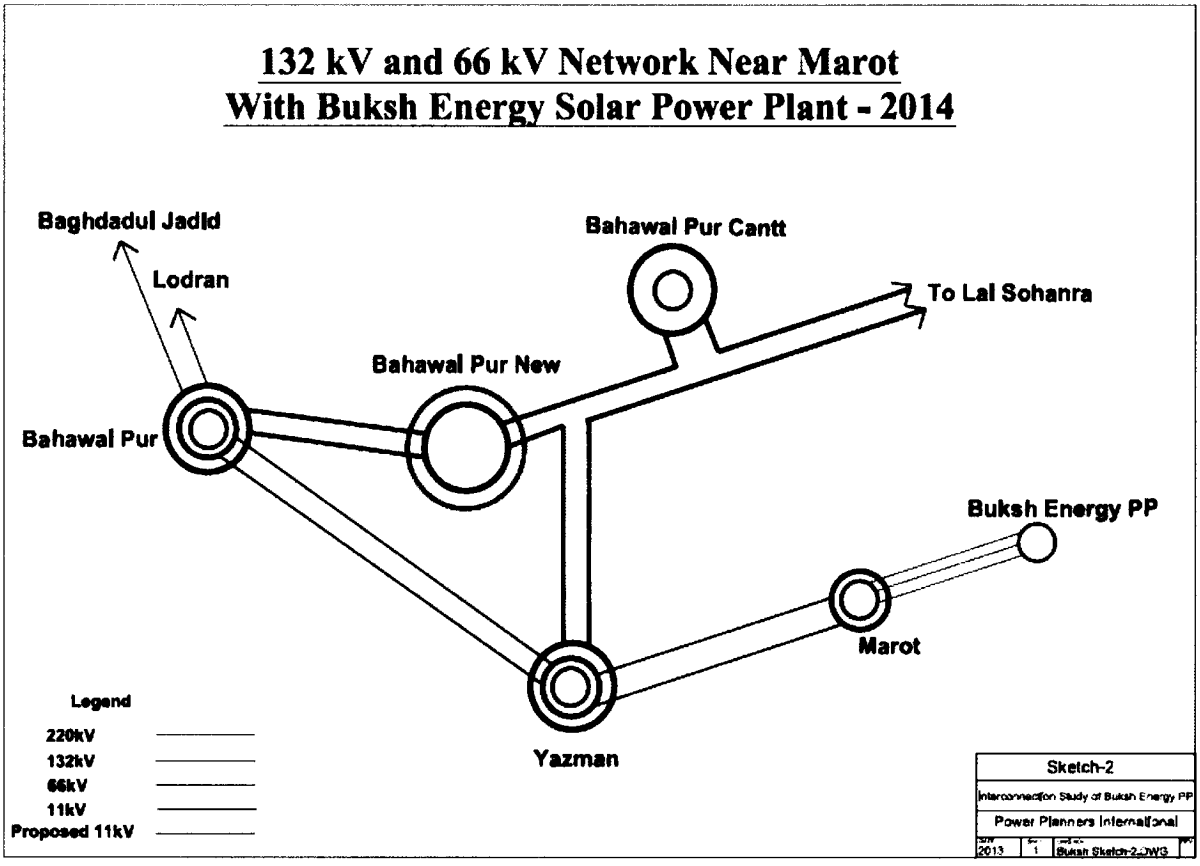
The power generated from the Generation Facility/Power Plant/Solar Farm of BEPL shall be dispersed to the load center of MEPCO.

(2). The proposed Interconnection Arrangement/Transmission Facilities for dispersal of electric power for the project will be consisting of 11 KV Feeders (on ACSR OSPREY Conductor) connecting the Generation Facility/Power Plant/Solar Farm of BEPL with 66 KV Marrot Grid Station of MEPCO.

(3). Any change in the above Interconnection Arrangement/Transmission Facilities duly agreed by BEPL, NTDC and MEPCO, shall be communicated to the Authority in due course of time.

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY ★ NEPRA ★ REGISTRAR

SCHEMATIC DIAGRAM FOR INTERCONNECTION ARRANGEMENT/TRANSMISSION FACILITIES FOR DISPERSAL OF POWER FROM BEPL



NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Detail of Generation Facility/Solar Power Plant/ Solar Plant/Solar Farm

(A). General Information

(i).	Name of Licensee	Buksh Energy (Private) Limited.
(ii).	Registered Office	9 K , Empire Center , Gulberg II, Lahore .
(iii).	Principal Office	9 K , Empire Center , Gulberg II, Lahore .
(iii).	Plants Location	Fort Marot at Cholistan, District Bahawalnagar 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
(ii).	System Type	Grid Connected
(iii).	Installed Capacity of Solar (MW)	11.664 MW_p

(C). Technical Details of Equipment

(a).	**Solar Panels – PV Modules**	
(i).	Type of Module	Polycrystalline PV Module Type Peak Energy 300; REC
(ii).	Type of Cell	Polycrystalline
(iii).	Dimension of each Module	1954 x 982 x 40 mm
(iv).	No. of Panel/ Modules	38,880
(v).	Frame of Panel	Anodised Aluminium
(vi).	Weight of one Module	23 Kg

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

(vii).	Module Output Warranty	For 1st year	For 2nd to 25th year
		97% or above	Not more than 0.7% Output Reduction Each Year
(viii).	Number of Solar Cells in each module	72 Cells	
(ix).	Efficiency of module	15.63 %	
(x).	Environment Protection System	Encapsulation and sealing arrangements for protection from environment.	
(xi).	Maximum Power (P_{max})	300W +5W and -0W	
(xii).	Voltage @ (P_{max})	36.1 V	
(xiii).	Current @ P_{max}	8.30 A	
(xiv).	Open circuit voltage (V_{oc})	44.6 V	
(xv).	Short circuit current (I_{sc})	8.87 A	
(xvi).	Maximum system open Circuit Voltage	1000VDC	
(b).	**PV Array**		
(i).	No. of Sub-arrays	194.4	
(ii).	Modules in a string	20	
(iii).	Total No. of Strings	1944	
(iv).	Modules in Sub-Array	200 modules (10 strings of 20 modules)	
(v).	Total Modules	38,880	
(c).	**PV Capacity**		
(i).	Total	11664 kWp	
(d).	**Inverters**		
(i).	Capacity of each unit	1800kW (@50°C)	
(ii).	Inverter Model	Sunny Central 1800 SC XT	
(iii).	Manufacturer	SMA Solar Technology, Germany	

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

(iv).	Rated Input Voltage	722 V DC	
(v).	Input Operating Voltage Range	DC 722V - 850V	
(vi).	Number of Inverters	27 units	
(vii).	Total Power	10,000kW AC	
(viii).	Efficiency	97.6% (euro: 97.4%; CEC:98.5%)	
(ix).	Max. Allowable Input voltage	DC 1,000V	
(x).	Max. Current	DC 2 x 1,400 A	
(xi).	Max. Power Point Tracking Range	796 - 850V DC (@50°C)	
(xii).	Output electrical system	3-phase, 3-wire	
(xiii).	Rated Output Voltage	AC 360 V	
(xiv).	Rated Frequency	50 Hz	
(xv).	Power Factor	Adjustable 0.9 Induction to 0.9 Capacitance	
(xvi).	Power Control	MPP Tracker	
(xvii).	Environmental Enclosures	Operating Temperature Range	-25° C to 62° C
		Relative Humidity	15% - 95% non-condensing
		Audible Noise	<61 dB(A)
		Operating Elevation	<2000 m
		Warranty Period	5 Years
(xviii).	Grid Operation Protection	(a).	DC circuit breaker
		(b).	AC circuit breaker
		(c).	DC overvoltage protection
		(d).	Lightning protection level III
		(e).	Grid monitoring
		(f).	Insulation monitoring
		(g).	Anti-Islanding
(e).	**Junction Boxes Installed and fixed on main steel structure in Array Yard.**		

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

(i).	Number of Junction Box units	192	
(ii).	Input circuits in each box	10	
(iii).	Max. Input current for each circuit	10 A	
(iv).	Max. Input voltage	1000 V	
(v).	Power at each box	60kW$_p$	
(vi).	Protection Level	IP 54	
(vii).	Over-Current protection	Fuse	
(viii).	Output switch	125A, 1000V disconnector	
(ix).	Surge protection	1000V, Type II	
(x).	Purpose of Junction Box	(a).	Combine groups of modules into sub-arrays that will be wired into the inverter.
		(b).	Provide arrangement for disconnection for each of the groups.
		(c).	To provide group array isolation.
		(d)	The current carrying ratings of the junction boxes shall be suitable with adequate safety factor to inter-connect the Solar PV array.
		(e)	10 protected inputs at 15A to prevent backflow of short circuit current
(f).	**Data Collecting System**		
(i).	Weather Data	(a).	Pyranometer - 2 Sets (incline to record irradiation level)
		(b).	Thermometer - 2 Sets (to record ambient temp)

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

(ii).	System Data	(a).	DC input voltage (V) & current (A) of each Inverter (Phase, Line)
		(b).	Total DC power (kW) generated by PV array.
		(c).	AC output voltage(V) and current (A) of each Inverter (Phase, Total)
		(d).	AC output power (kW) and energy (kWh) of each Inverter
		(e).	Frequency (Hz)
		(f).	Power Factor (PF)
		(g).	Temperature inside inverter station
(g).	**Isolating Transformer**		
(i).	Rating	2,000 KVA x 5 No. (LV/MV)	
(ii).	Type of Transformer	ONAN	
(iii).	Input voltage	360V	
(iv).	Output Voltage	11kV	
(v).	Purpose of Transformer	Step Up Voltage, Galvanic Isolation and Eliminate DC Current Injection	
(vi).	Efficiency	98.8%	
(h).	**Outdoor Cubicle Control Room**		
(i).	Data record	Continuous logging with data logging Software	
(ii).	Control Room System	Computerized Data Acquisition System	
(iii).	Control room System Detail	Interfacing Hardware & Software, Industrial Type PC, which will be robust & rugged suitable to operate in the Control Room Environment	
(i).	**Mounting Structure**		

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

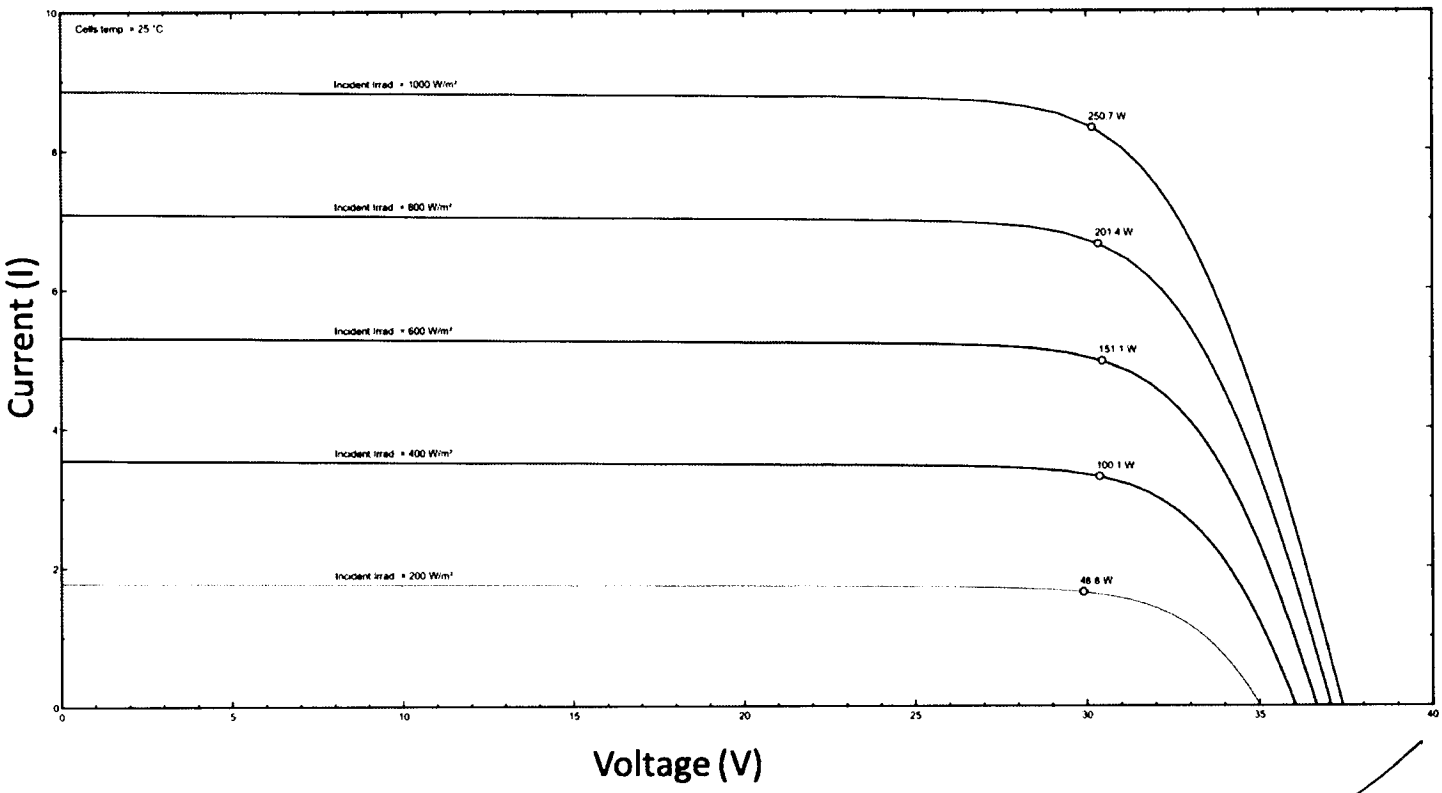
(i).	Structure	HDG steel / aluminium with concrete pile foundations
(ii).	Tilt of Array Frame	30°
(iii).	Array Specification	Certified for wind and seismic requirements
(j).	**Foundation Pillars**	
(i).	No. of Foundations	8,640
(ii).	Foundation Structure	Reinforced concrete

(D). Other Details

(i).	Project Commissioning date (Anticipated)	July 01, 2015
(ii).	Expected Life of the Project from the COD	25 Years

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

V-I Curve of Solar Cell



NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

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/Power Plant/Solar Farm of Licensee is given in this Schedule.

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

SCHEDULE-II

(1).	Total PV Installed Capacity of Generation Facility	11.664 KW_p
(2).	Average Sun Hour Availability/Day (Irradiation on Inclined Surface)	5.06 Hrs
(3).	Days per Year	365
(4).	PV Plant Generating Capacity Annually (As Per Simulation)	17,167 MWh
(5).	Expected Total Generation in 25 years Life Span	429,175 MWh
(6).	Generation per Year from plant keeping 24 Hours Working	11.664 x 24 x 365 = 102,176.64 MWh
(7).	Net Capacity Factor (4/6)	16.80%

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.

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA