National Electric Power Regulatory Authority
Islamic Republic of Pakistan

Registrar

NEPRA Tower, Attaturk Avenue (East), G-5/1, Islamabad
Ph: +92-51-9206500, Fax: +92-51-2600026
Web: www.nepra.org.pk, E-mail: registrar@nepra.org.pk

No. NEPRA/R/LAG-244/14712-18

August 03, 2022

Mr. Amir Altaf
Manager Accounts
Access Electric (Private) Limited
Unit No. 2, 17 Aziz Avenue
Canal Bank, Lahore

Subject: **Modification Generation Licence No. SPGL/05/2014 (Modification-II)**
Licence Application No. LAG-244
Access Electric (Private) Limited, (AEPL)

Reference: *AEPL's LPM submitted vide letter No. nil dated 04.02.2022*

It is intimated that the Authority has approved Modification - II in Generation Licence No. SPGL/05/2014 dated June 26, 2014 in respect of Access Electric (Private) Limited (AEPL) pursuant to Section 26 of the NEPRA Act read with Regulation 10(4) of the NEPRA Licensing Regulations.

2. Enclosed please find herewith determination of the Authority in the matter of Licensee Proposed Modification of AEPL alongwith Modification-II in the Generation Licence No. SPGL/05/2014, approved by the Authority.

Enclosure: **As Above**

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(Syed Safeer Hussain)

Copy to:

1. Secretary, Power Division, Ministry of Energy, 'A' Block, Pak Secretariat, Islamabad
2. C.E.O Alternative Energy Development Board (AEDB), 2nd Floor, OPF Building, G-5/2, Islamabad
3. Managing Director, NTDC, 414 WAPDA House, Lahore
4. Chief Executive Officer, CPPA(G), 73 East, A.K. Fazl-ul-Haq Road, Blue Area, Islamabad
5. Chief Executive Officer, Islamabad Electric Supply Company Limited (IESCO), Head Office Street 40, Sector G-7/4, Islamabad
6. 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 Licensee Proposed Modification in the Generation Licence of Access Electric (Private) Limited

Aug 3
~~July~~ , 2022
Case No. LAG-244

(A). Background

(i). The Authority granted a Generation Licence (No. SPGL/05/2014 dated June 26, 2014 and Modification-I dated September 07, 2020) to Access Electric (Private) Limited (AEPL) for its 10.00 MW_P Photo Voltaic (PV) Module(s) based solar electric power generation facility.

(ii). The above-mentioned Generation Licence was granted to AEPL for its generation facility to be set up at village Hattar, tehsil Pind Dadan Khan, district Jhelum in the province of Punjab, envisaged supplying to the National Grid through the relevant Distribution Company (DISCO).

(B). Communication of Modification

(i). AEPL in accordance with Regulation-9 &10 of the NEPRA Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021 (the "Licensing Regulations") communicated a Licensee Proposed Modification (LPM) in its above-mentioned Generation Licence on February 07, 2022.

(ii). Regarding the "text of the proposed modification", AEPL submitted that it plans to change the technology of its proposed generation facility from Mono-Crystalline to Bifacial Mono-Crystalline PV Module(s). This will cause changes in (a). No. of Panels/Modules to be installed; (b). Maximum Power (P_{max}) of the Module; (c). Efficiency of the Module(s); (d). Net Capacity Factor (NCF) and (e). anticipated Commercial Operation Date (COD) of the generation facility.

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(iii). About the statement of the "reasons in support of the modification", AEPL, *inter alia*, submitted that due to the unavailability of 450 W_P modules and recent improvement in technology, the company has proposed 540 W_P Bifacial Mono-Crystalline PV Modules for the project for which modification in Generation Licence is required.

(iv). As regards the impact (if any), of the proposed modification on Tariff, Quality of Service (QoS) or fulfilment of licence obligations, AEPL submitted that the proposed changes will have a positive impact on the tariff considering the fact that the NCF will be increased to 20.60% from the existing 20.35%. Further, it was also confirmed that the proposed modification will not have any effect on the QoS and fulfilment of obligations of the licence.

(C). Processing of Modification

(i). The Registrar published the LPM in one (01) English and one (01) Urdu newspaper on February 18, 2022. In the said publication, the general public, interested/affected parties and other stakeholders were invited for submitting their views in favour or against the LPM as required under Regulation-10(3) of the Licensing Regulations.

(ii). The Registrar also invited comments (either in favour or against the communicated LPM of the company/AEPL) of the relevant Government Ministries, their attached departments, representative organizations and individual experts etc. for the assistance of the Authority, by sending separate letters to the said stakeholders on February 21, 2022.

(D). Comments of Stakeholders

(i). In response to the above, the Authority received comments from three stakeholders including Alternative Energy Development Board (AEDB), Central Power Purchasing Agency (Guarantee) Limited (CPPAGL) and Punjab Power Development Board Energy Department Govt. of Punjab (PPDB).

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

(a). AEDB submitted that it issued Letter of Support (LoS) to AEPL for development of a 10.00 MW_P solar PV based generation facility to be set up at Pind Dadan Khan, district Jehlum, in the province of Punjab. The project is listed under Category-I of the decision dated April 04, 2019 of the Cabinet Committee on Energy (CCOE). The project is also listed as a committed project under Indicative Generation Capacity Expansion Plan (2021-30)-IGCEP. AEDB supports the LPM in the Generation Licence of AEPL;

(b). CPPAGL stated that the sponsors of the project have proposed Bifacial Mono-Crystalline PV Modules instead of Mono-Crystalline. It is pertinent to mention that the proposed technology is more suitable as the same will result in better efficiency and performance. In view of the said, the modification apparently will not has any adverse impact and therefore, the same may be considered; and

(c). PPDB remarked that the project is at an advance stage and is included in the list of Category-I of the decision of the CCOE dated April 04, 2019. Now, AEPL has proposed Bifacial Mono-Crystalline Modules of 540 W_P. PPDB supports the LPM for the project and the Authority may process the same as per the provision of NEPRA Act, relevant rules, regulations and in line with policy guidelines of the Govt. of Pakistan (GoP).

(iii). The Authority considered the above comments and in view of the encouraging/supporting observations of the stakeholders decided to proceed further

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in the matter as stipulated in the NEPRA Act, NEPRA Licensing (Generation) Rules, 2000 (the "Generation Rules") and Licensing Regulations.

(E). Evaluation/Findings

(i). The Authority has examined the entire case in detail including the already granted Generation Licence, the communicated LPM, comments of the stakeholders and provisions of the NEPRA Act, the relevant rules and regulations framed thereunder.

(ii). The Authority has observed that a Generation Licence (No. SPGL/05/2014 dated June 26, 2014 and Modification-I dated September 07, 2020) was granted to AEPL, for setting up a PV based generation facility. The said licence envisaged setting up a generation facility with a cumulative installed capacity of 10.00 MW_P by installing 22248 Mono-Crystalline PV Modules (each of 450 W_P) with NCF of 20.35% and the expected COD of August 31, 2020. The Authority has observed that according to the communicated LPM, the company/Licensee/AEPL now plans to install 18536 Bi-facial Mono-Crystalline PV Modules (each of 540 W_P) with NCF of 20.60% and expected to achieve COD by December 2022.

(iii). The Authority in terms of Section-26 of the NEPRA Act read with Regulation-9(2) of the Licensing Regulations, is empowered to modify a licence as it may deem fit if, in its opinion such modification (a). will not adversely affect the performance by the licensee of its obligations; (b). is reasonably necessary for the licensee to effectively and efficiently perform its obligations under the licence; (c). is likely to benefit consumers; or (d). is reasonably necessary to ensure the continuous, safe and reliable supply of electric power to consumers, keeping in view the financial and technical viability of the licensee.

(iv). The Authority considers that (a). the proposed LPM will not adversely affect the performance of the licensee of its obligations. In fact the proposed modifications will improve the performance of the Licensee as the NCF of the project will be significantly improved with the deployment of latest PV Modules of 540W_P; (b). the LPM is reasonably necessary for the Licensee to effectively and efficiently

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perform its obligations under the licence; (c). the LPM will be beneficial for the consumers as the LPM will result in lower tariff; and (d).is reasonably necessary to ensure the continuous, safe and reliable supply of electric power to the consumers, keeping in view the financial and technical viability of the Licensee/AEPL.

(F). Approval of LPM

(i). In view of the above, the Authority is satisfied that the Licensee has complied with all the requirements of the Licensing Regulations pertaining to the modification. Therefore, the Authority in terms Section-26 of the NEPRA Act read with Regulation-10(4) of the Licensing Regulations approves the communicated LPM without changes.

(ii). In consideration of the above, the Generation Licence (No. SPGL/05/2014 dated June 26, 2014 and Modification-I dated September 09, 2020) granted to AEPL is hereby modified. The changes made in the Generation Licence are attached as annexure to this determination. The approval of the LPM is subject to the provisions contained in the NEPRA Act, relevant rules framed there under, terms & conditions of the Generation Licence and other applicable documents.

Authority

Engr. Maqsood Anwar Khan
(Member)

Engr. Rafique Ahmed Shaikh
(Member)

Engr. Tauseef H. Farooqi
(Chairman)

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National Electric Power Regulatory Authority
(NEPRA)
Islamabad – Pakistan

GENERATION LICENCE
No. SPGL/05/2014

In exercise of the Powers conferred under Section-26 of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997, the Authority hereby modifies the Generation Licence (No. SPGL/05/2014 dated June 26, 2014 and Modification-I dated September 07, 2020) granted to Access Electric (Private) Limited, to the extent of changes mentioned hereunder:

-

(a). The expiry date of the Licence mentioned on the face sheet may be read as **30th day of December 2047**;

(b). The Changes made in Articles of the Generation Licence are attached as **Revised/Modified Articles of Generation Licence**;

(c). Changes made in Schedule-I of the Generation Licence are attached as **Revised/Modified Schedule-I**.

(d). Changes made in Schedule-II of the Generation Licence are attached as **Revised/Modified Schedule-II**.

This **Modification-II** is given under my hand on this 3rd August day of ~~July~~ **Two Thousand & Twenty-Two.**

Registrar 03.08.22

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Article-1
Definitions

1.1 In this licence

(a). "Act" means the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 as amended or replaced from time to time;

(b). "AEDB" means the Alternative Energy Development Board or any other entity created for the like purpose established by the GoP to facilitate, promote and encourage development of renewable energy in the country;

(c). "Applicable Documents" mean the Act, the rules and regulations framed by the Authority under the Act, any documents or instruments issued or determinations made by the Authority under any of the foregoing or pursuant to the exercise of its powers under the Act, the Grid Code, the applicable Distribution Code, the Commercial Code if any, or the documents or instruments made by the Licensee pursuant to its generation licence, in each case of a binding nature applicable to the Licensee or, where applicable, to its affiliates and to which the Licensee or any of its affiliates may be subject;

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(d). "Applicable Law" means all the Applicable Documents;

(e). "Authority" means the National Electric Power Regulatory Authority constituted under Section-3 of the Act;

(f). "Bus Bar" means a system of conductors in the generation facility/Solar Power Plant/Solar Farm of the Licensee on which the electric power from all the Photo Voltaic Cells is collected for supplying to the Power Purchaser;

(g). "Carbon Credits" mean the amount of Carbon Dioxide (CO2) and other greenhouse gases not produced as a result of generation of electric energy by the generation facility/Solar Power Plant/Solar Farm and other environmental air quality credits and related emissions reduction credits or benefits (economic or otherwise) related to the generation of electric energy by the generation facility/Solar Power Plant/Solar Farm, which are available or can be obtained in relation to the generation facility/Solar Power Plant/Solar Farm after the COD;

(h). "Commercial Code" means the National Electric Power Regulatory Authority (Market Operator, Registration, Standards and Procedure) Rules, 2015 as amended or replaced from time to time;

(i). "Commercial Operations Date (COD)" means the day immediately following the date on which the generation facility/Solar Power Plant/Solar Farm of the Licensee is commissioned;

(j). "Commissioning" means the undertaking of the Commissioning Tests of the generation facility/Solar Power Plant/Solar Farm as stipulated in the EPA;

(k). "CPPA-G" means Central Power Purchasing Agency (Guarantee) Limited or any other entity created for the like purpose;

(l). "Distribution Code" means the distribution code prepared by the concerned XW-DISCO and approved by the Authority, as it may be revised from time to time with necessary approval of the Authority;

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(m). "Energy Purchase Agreement (EPA)" 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/Solar Power Plant/Solar Farm, as may be amended by the parties thereto from time to time;

(n). "Generation Rules" mean the National Electric Power Regulatory Authority Licensing (Generation) Rules, 2000 as amended or replaced from time to time;

(o). "Grid Code" means the grid code prepared and revised from time to time by NTDC with necessary approval of the Authority;

(p). "GoP" means the Government of Pakistan acting through the AEDB which has issued or will be issuing to the Licensee a LoS for the design, engineering, construction, insuring, commissioning, operation and maintenance of the generation facility/Solar Power Plant/Solar Farm;

(q). "IEC" means "the International Electrotechnical Commission or its successors or permitted assigns;

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

(s). "IESCO" means Islamabad Electric Supply Company Limited or its successors or permitted assigns;

(t). "Implementation Agreement (IA)" means the implementation agreement signed or to be signed between the GoP and the Licensee in relation to this particular generation facility/Solar Power Plant/Solar Farm, as may be amended from time to time;

(u). "Letter of Support (LoS)" means the letter of support issued or to be issued by the GoP through the AEDB to the Licensee;

(v). "Licensee" means **Access Electric (Private) Limited** or its successors or permitted assigns;

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(w). "Licensing Regulations" mean the National Electric Power Regulatory Authority Licensing (Application & Modification Procedure) Regulations, 1999 as amended or replaced from time to time;

(x). "Net Delivered Energy" means the net electric energy expressed in kWh generated by the generation facility/Solar Power Plant/Solar Farm of the Licensee at its outgoing Bus Bar and delivered to the Power Purchaser;

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

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

(aa). "Power Purchaser" means CPPA-G which will be purchasing electric energy from the Licensee either on behalf of all XW-DISCOs or any single XW-DISCO, pursuant to an EPA for procurement of electric energy;

(bb). "SCADA System" means the supervisory control and data acquisition system for gathering of data in real time from remote locations to control equipment and conditions;

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

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

1.2 The words and expressions used but not defined herein bear the meaning given thereto in the Act or Generation Rules and Licensing Regulations issued under the Act.

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Article-2
Applicability of Law

This licence is issued subject to the provisions of the Applicable Law, as amended from time to time.

Article-3
Generation Facilities

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

3.2 The net capacity/Net Delivered Energy of the generation facility/Solar Power Plant/Solar Farm of the Licensee is set out in Schedule-II of this licence. The Licensee shall provide the final arrangement, technical and financial specifications and other specific details pertaining to its generation facility/Solar Power Plant/Solar Farm before its COD.

Article-4
Term of Licence

4.1 This licence is effective from the original date of its issuance i.e. June 26, 2014 and will have a term of twenty-five (25) years from the COD of the generation facility/Solar Power Plant/Solar Farm of the Licensee subject to Section 14-B of the Act.

4.2 Unless suspended or revoked earlier or Licence ceases to have effect, the Licensee may apply for renewal of this Licence ninety (90) days prior to the expiry of the above term, as stipulated in the Licensing Regulations.

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Article-5
Licence fee

The Licensee shall pay to the Authority the licence fee as stipulated in the National Electric Power Regulatory Authority (Fees) Rules, 2002 as amended or replaced from time to time.

Article-6
Tariff

The Licensee shall charge only such tariff from the Power Purchaser which has been determined, approved or specified by the Authority.

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.

7.2 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.

7.3 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.

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Article-8
Maintenance of Records

For the purpose of sub-rule(1) of Rule-19 of the Generation 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.

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 or replaced from time to time.

Article-10
Compliance with Environmental & Safety Standards

10.1 The generation facility/Solar Power Plant/Solar Farm of the Licensee shall comply with the environmental and safety standards as may be prescribed by the relevant competent authority from time to time.

10.2 The Licensee shall provide a certificate on a bi-annual basis, confirming that the operation of its generation facility/Solar Power Plant/Solar Farm is in conformity with required environmental standards as prescribed by the relevant competent authority.

Article-11
Power off take Point and Voltage

The Licensee shall deliver the electric energy to the Power Purchaser at the outgoing Bus Bar of its generation facility/Solar Power Plant/Solar Farm. The Licensee shall be responsible for the up-gradation (step up) of generation voltage up to the required dispersal voltage level.

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Article-12
Performance Data

12.1 The Licensee shall install properly calibrated automatic computerized solar radiation recording device(s) at its generation facility/Solar Power Plant/Solar Farm for recording of data.

12.2 The Licensee shall install SCADA System or compatible communication system at its generation facility/Solar Power Plant/Solar Farm as well as at the side of the Power Purchaser.

12.3 The Licensee shall transmit the solar radiation data and power output data of its generation facility/Solar Power Plant/Solar Farm to the control room of the Power Purchaser.

Article-13
Provision of Information

In accordance with provisions of Section-44 of the Act, the Licensee shall be obligated to provide the required information in any form as desired by the Authority without any exception.

Article-14
Emissions Trading /Carbon Credits

The Licensee shall process and obtain expeditiously the Carbon Credits admissible to the generation facility/Solar Power Plant/Solar Farm. The Licensee shall share the said proceeds with the Power Purchaser as per the Policy.

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Article-15
Design & Manufacturing Standards

The photovoltaic cells and other associated equipment of the generation facility/Solar Power Plant/Solar Farm shall be designed, manufactured and tested according to the latest IEC, IEEE standards or any other equivalent standard in the matter. All the plant and equipment of generation facility/Solar Power Plant/Solar Farm shall be unused and brand new.

Article-16
Power Curve

The power curve for the individual photovoltaic cell provided by the manufacturer and as mentioned in Schedule-I of this generation licence, shall form the basis in determining the cumulative power curve of the generation facility/Solar Power Plant/Solar Farm.

Article-17
Compliance with Applicable Law

The Licensee shall comply with the provisions of the Applicable Law, guidelines, directions and prohibitory orders of the Authority as issued from time to time.

Article-18
Corporate Social Responsibility

The Licensee shall provide the descriptive as well as monetary disclosure of its activities pertaining to corporate social responsibility (CSR) on an annual basis.

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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.

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

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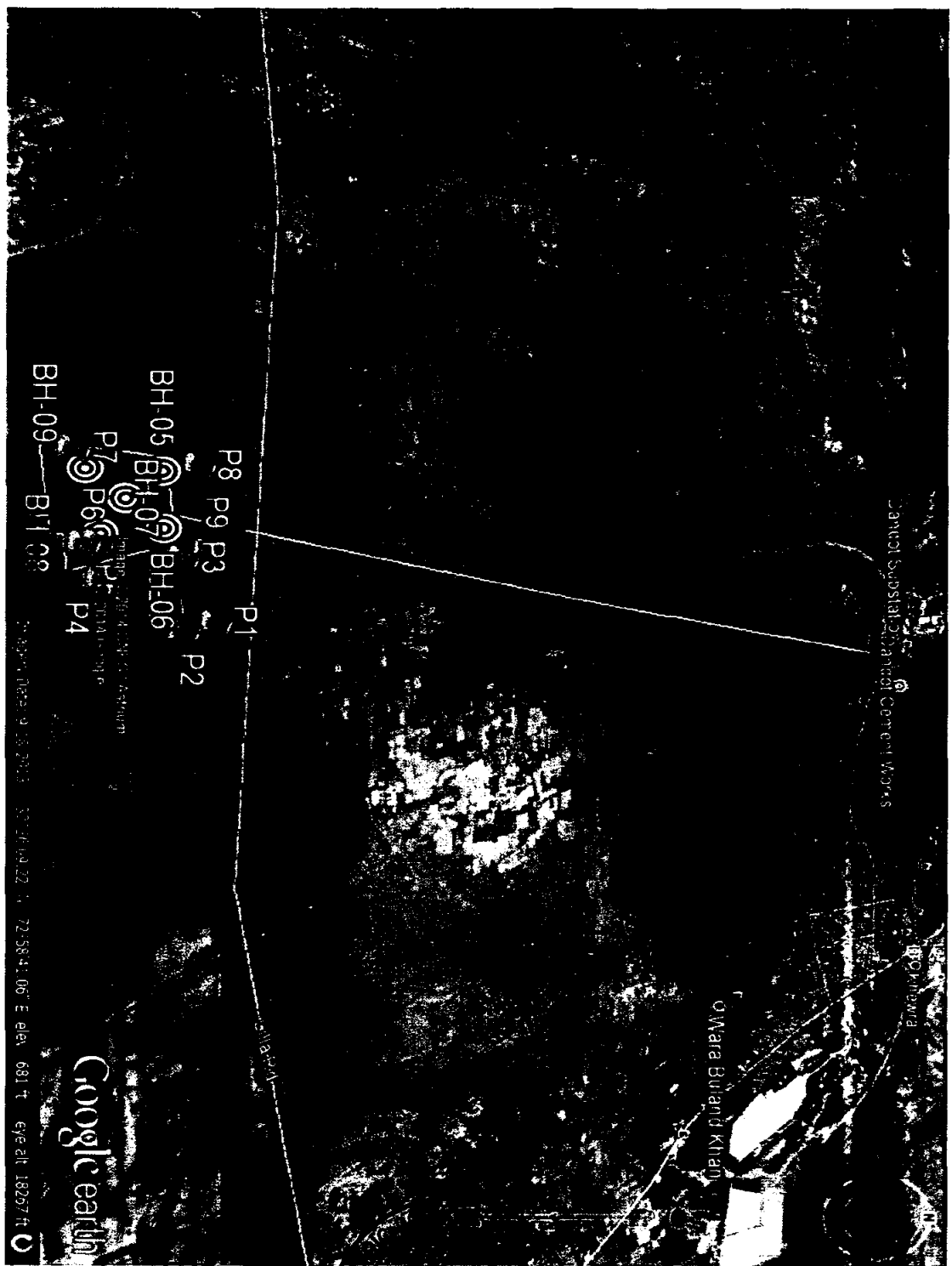
Location of the Generation Facility/Solar Power Plant/Solar Farm of the Licensee



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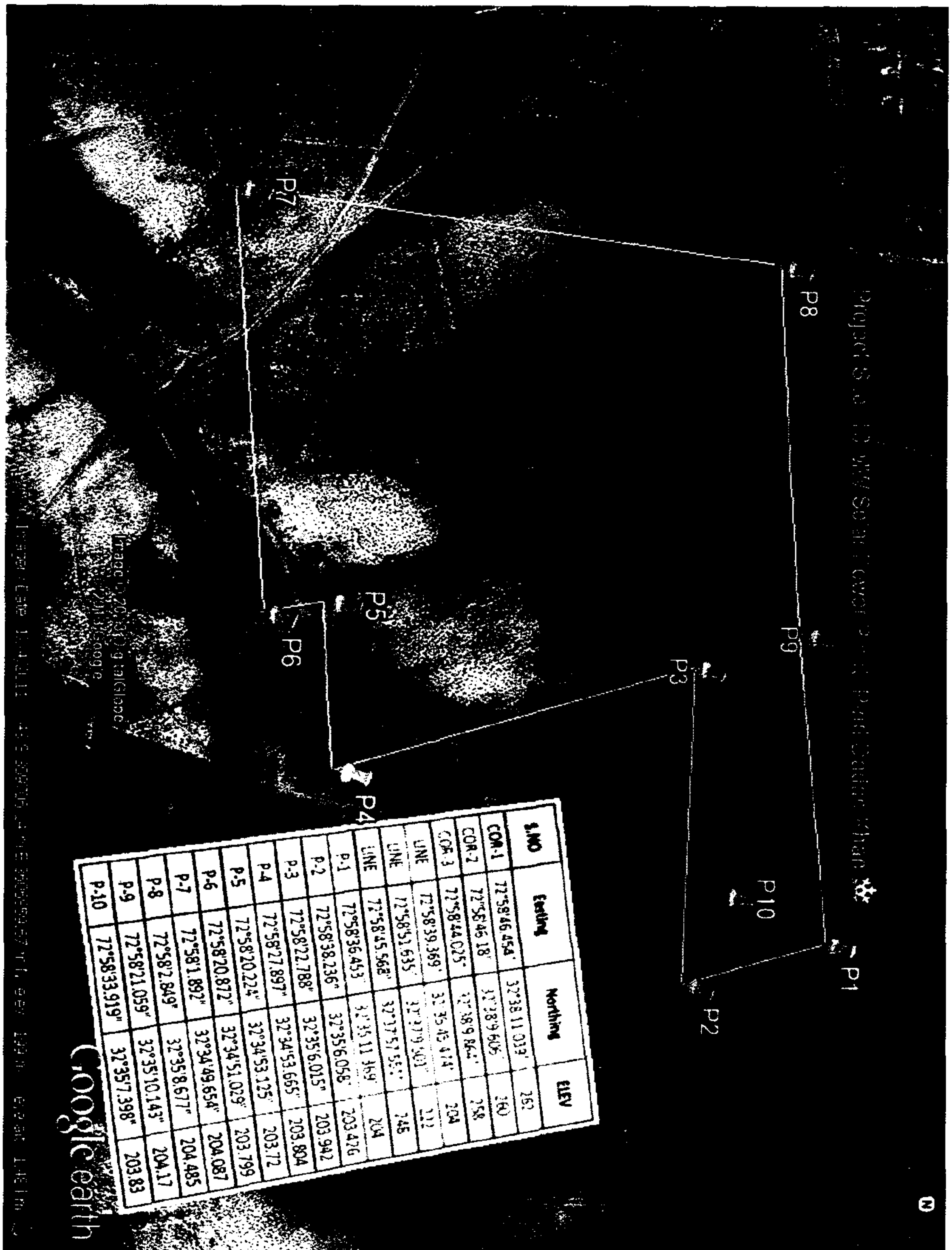
Land Coordinates of the Generation Facility/Solar Power Plant/Solar Farm of the Licensee



S.NO	Easting	Northing	ELEV
COR-1	72°58'46.454'	32°38 11.039'	262
COR-2	72°58'46.18'	32°38'9.606'	260
COR-3	72°58'44.025"	32°38'9.864'	258
LINE	72°58'39.369'	32°35 45.474'	204
LINE	72°58'51.635'	32°37'9.501"	222
LINE	72°58'45.568"	32°37'57.55"	246
P-1	72°58'36.453'	32°35 11.369'	204
P-2	72°58'38.236"	32°35'6.058'	203.426
P-3	72°58'22.788"	32°35'6.015"	203.942
P-4	72°58'27.897"	32°34'53.665"	203.804
P-5	72°58'20.224"	32°34'53.125'	203.72
P-6	72°58'20.872"	32°34'51.029"	203.799
P-7	72°58'1.892"	32°34'49.654"	204.087
P-8	72°58'2.849"	32°35'8.677"	204.485
P-9	72°58'21.059"	32°35'10.143"	204.17
P-10	72°58'33.919"	32°35'7.398"	203.83

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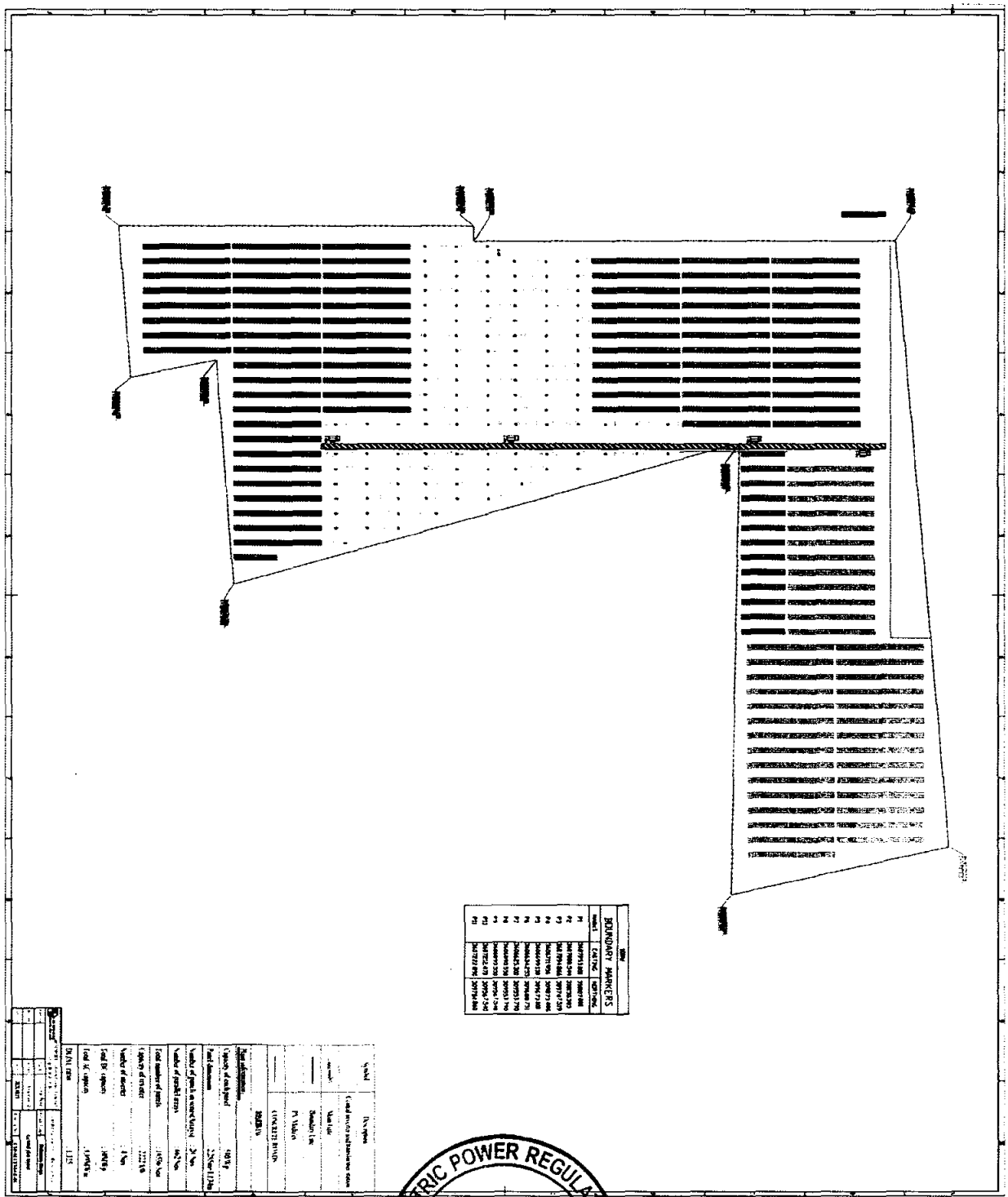
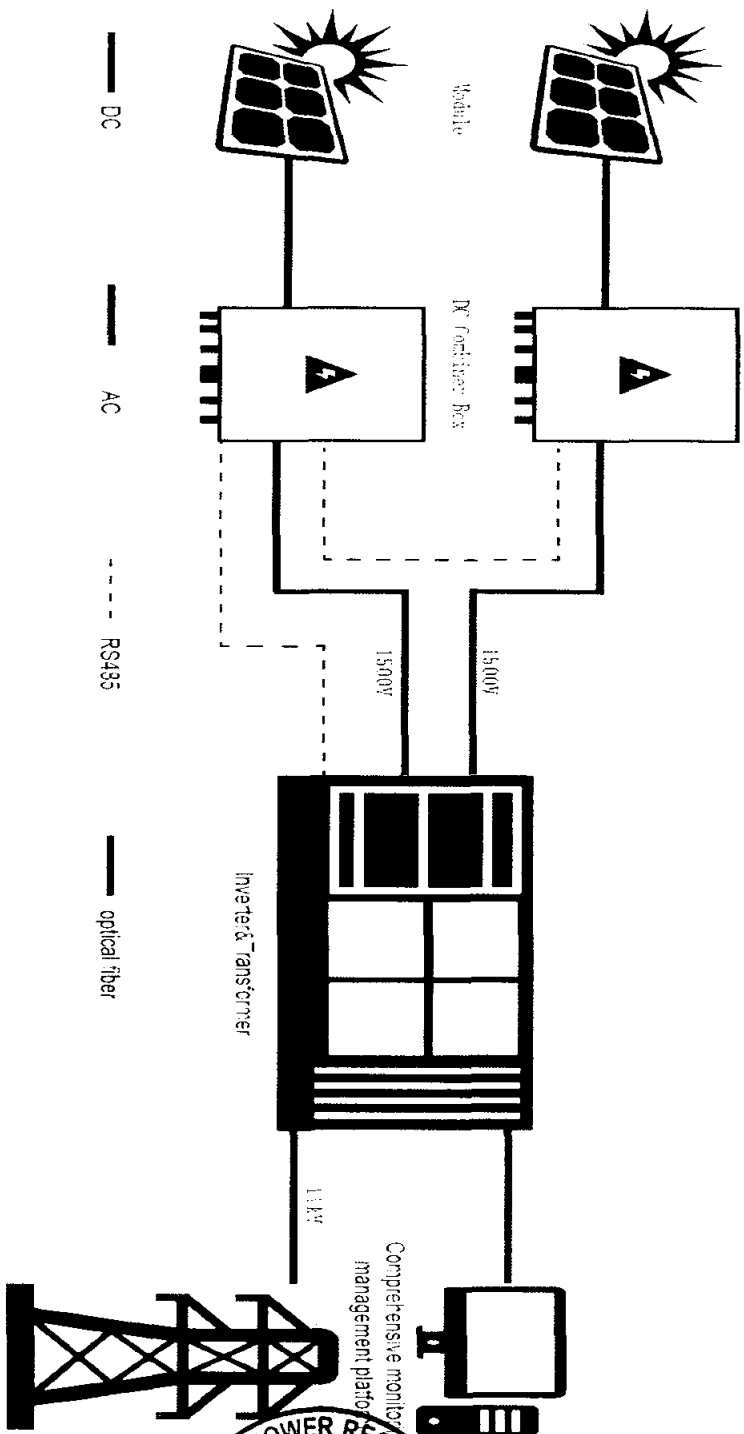
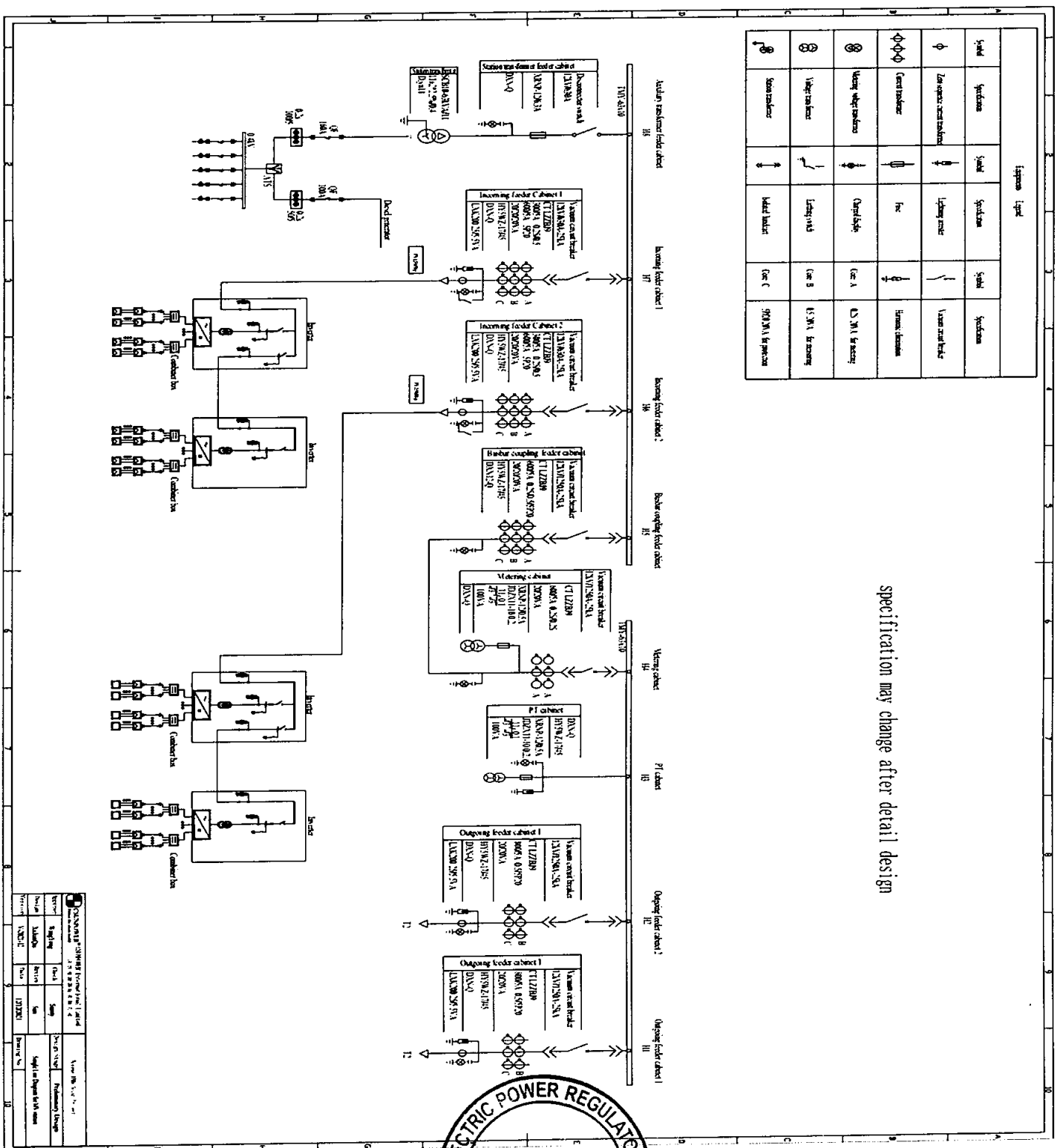
Schematic Diagram of the Layout of the Generation Facility/Solar Power Plant/Solar Farm of the Licensee



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



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



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

The electric power generated from the Generation Facility/Power Plant/Solar Farm of Access Electric (Private) Limited-AEPL shall be dispersed to the load center of IESCO.

(2). The proposed Interconnection Arrangement/Transmission Facility for dispersal of electric power for the Generation Facility/Solar Power Plant/Solar Farm comprises the following: -

(a). 11 kV double circuit feeder consisting of ACSR OSPREY measuring about 5.70 km in length, connecting the generation facility of the Licensee to 132 KV Dandot Grid Station of IESCO.

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

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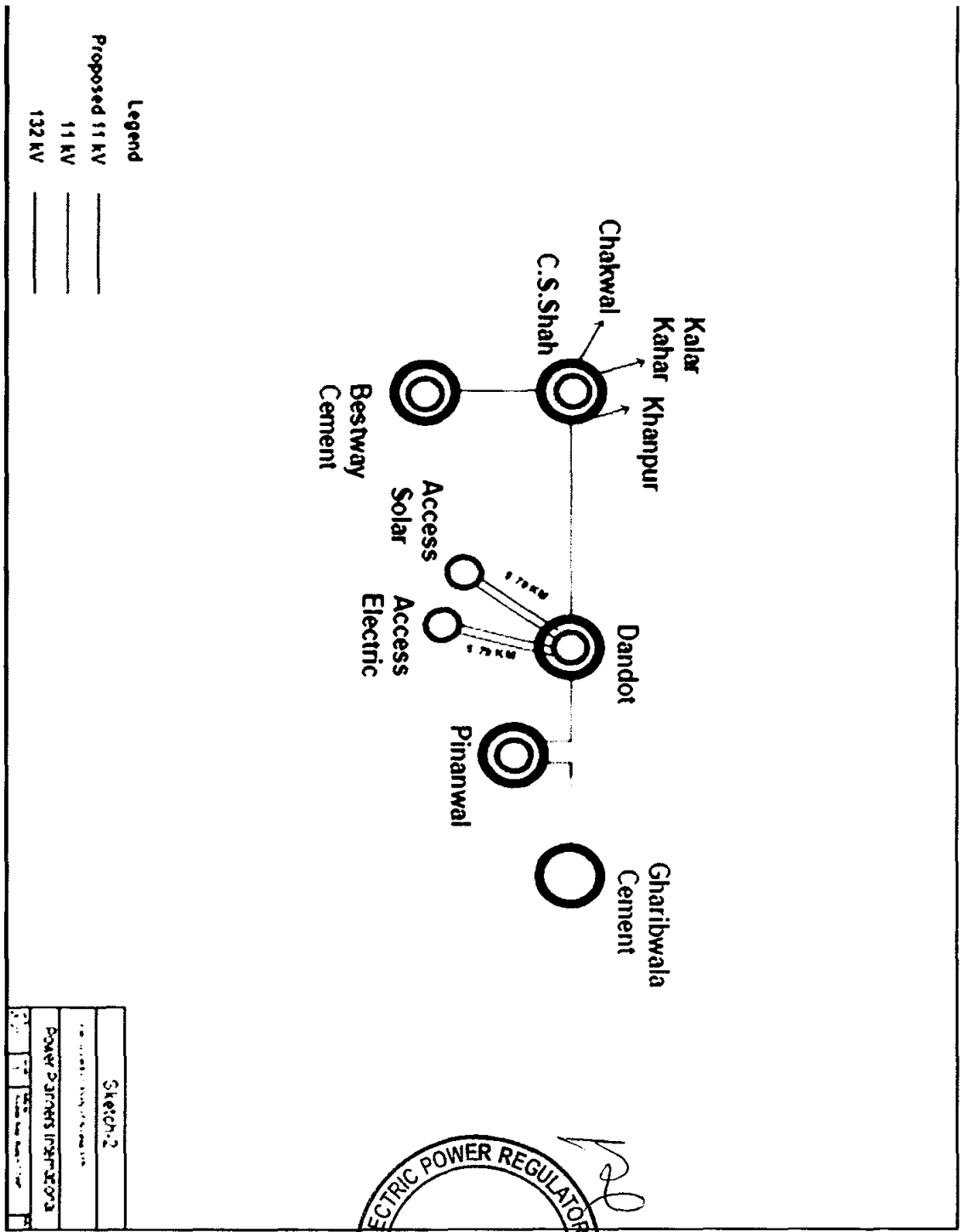
Schematic Diagram of the Interconnection Arrangement/Transmission Facility for Dispersal of Power from the Generation Facility/Solar Power Plant /Solar Farm



Detail of Generation Facility/Solar Power Plant/ Solar Farm

(A). General Information

(i).	Name of the Company/Licensee	Access Electric (Private) Limited.
(ii).	Registered/ Business office of the Company/Licensee	C/o Howath Chaudhary & Co. 25E, Main Market, Gulberg, Lahore.
(iii).	Location of the generation facility Solar Power Plant/ Solar Farm	39-C, Ahmed Block, New Garden Town, Lahore.
(iv).	Type of the generation facility/ Solar Power Plant/Solar Farm	Solar PV Power Plant

(B). Solar Power Generation Technology & Capacity

(i).	Type of Technology	Photovoltaic (PV) with single-axis tracking
(ii).	System Type	Grid Connected
(iii).	Installed Capacity of the generation facility Solar Power Plant/Solar Farm (MW)	≈ 10.00 MW_P

(C). Technical Details of Equipment

(a).	**Solar Panels – PV Modules**	
(i).	Type of Module	Bifacial Monocrystalline PV Module (CSUNPOWER Brand)
(ii).	Type of Cell	Monocrystalline
(iii).	Dimension of each Module	2285 × 1134 × 35 mm
(iv).	Module Surface Area	2.591sq.m.
(v).	No. of Panel/ Modules	18536 pcs

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(vi).	Total Module Area	48030 sq.m.	
(vii).	Total Land Area Used	17.5 Hectors (approximately)	
(viii).	Frame of Panel	Anodized Aluminum	
(ix).	Weight of one Module	31.5kg	
(x).	Module Output Warranty	For 1st year	For 2nd to 25th year
		98%	The loss of power output shall not exceed 0.55% per year
(xi).	Number of Solar Cells in each module	144	
(xii).	Efficiency of module	20.84%	
(xiii).	Environment Protection System	Encapsulation and sealing arrangements for protection from environment.	
(xiv).	Maximum Power (P_{max})	540W, 0 ~ +5W	
(xv).	Voltage @ (P_{max})	41.64V	
(xvi).	Current @ P_{max}	12.97A	
(xvii).	Open circuit voltage (Voc)	49.6V	
(xviii).	Short circuit current (Isc)	13.86A	
(xix).	Maximum system open Circuit Voltage	1500Vdc	
(b).	**PV Array**		
(i).	No. of Sub-arrays	331	
(ii).	Modules in a string	28 pcs	
(iii).	Total No. of Strings	662	
(iv).	Modules in Sub-Array	56 pcs/ sub-array	
(v).	Total Modules	18536 pcs	

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(c).	**PV Capacity**		
(i).	Total	≈ 10.00 MW_P	
(d).	**Inverters**		
(i).	Capacity of each unit	2220 W	
(ii).	Inverter Model	PVH-L2220	
(iii).	Manufacturer	TMEIC/SUNGROW/TBEA or equal	
(iv).	Rated Input Voltage	800~1300Vdc	
(v).	Input Operating Voltage Range	800~1300Vdc	
(vi).	Number of Inverters	4	
(vii).	Total Power	8880kW	
(viii).	Efficiency	Max.:99%; EU: 98.5%	
(ix).	Max. Allowable Input voltage	1500V	
(x).	Max. Current	input: 2844A; output: 2332	
(xi).	Max Power Point Tracking Range	800~1300Vdc	
(xii).	Output electrical system	3 phases	
(xiii).	Rated Output Voltage	550V/600V	
(xiv).	Rated Frequency	50/60Hz	
(xv).	Power Factor	>0.99	
(xvi).	Power Control	Adjustable from 0.85 leading to 0.85 lagging	
(xvii).	Environmental Enclosures	Operating Temperature Range	-20°C ~ +60°C (derating above 50°C)
		Relative Humidity	5% ~ 95% (non-condensing)
		Audible Noise	<70 dB
		Operating Elevation	3000m (derating above 2000m)

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		Warranty Period	5 years
(xviii).	Grid Operation Protection	(a).	Islanding protection
		(b).	short-circuit protection
		(c).	over/under voltage protection
		(d).	over/under current protection
		(e).	over/under frequency protection
		(f).	over temperature protection
		(g).	DC input protection
(e).	**Junction Boxes**		
(i).	Number of Junction Box units	48/34/28	
(ii).	Input circuits in each box	16/20/24	
(iii).	Max. Input current for each circuit	20A	
(iv).	Max. Input voltage	1500V	
(v).	Power at each box	241.92kWp/302.40kWp/362.88kWp	
(vi).	Protection Level	IP65	
(vii).	Over-Current protection	Fuse	
(viii).	Output switch	250A/400A, 1500V circuit breaker	
(ix).	Surge protection	1500V, 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

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			the solar PV array.
		(e).	16 protected inputs at 20A to prevent backflow of short circuit current.
(f).	**Data Collecting System**		
(i).	Weather Data	(a).	Total radiation
		(b).	Ambient temperature
		(c).	Solar panel temperature
		(d).	Wind direction
		(e).	Wind speed
(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)&current(A) of each Inverter (Phase, Total)
		(d).	AC output power (KW) & energy (kWh) of each Inverter
		(e).	Frequency (Hz)
		(f).	Power Factor (PF)
		(g).	Temperature inside inverter station
(g).	**Isolating Transformer**		
(i).	Rating	2220kva, 11±2x2.5%/0.55kV	
(ii).	Type of Transformer	Oil Natural Air Natural	
(iii).	Input voltage	0.63kV	
(iv).	Output Voltage	11kV	
(v).	Purpose of Transformer	Step up voltage, galvanic isolation and eliminate DC current injection	
(vi).	Efficiency	≥99%	

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(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**	
(i).	Structure	HDG steel with concrete pile foundations
(ii).	Tilt of Array System	±60°
(iii).	Array Specification	Certified for wind and seismic requirements
(j).	**Foundation Pillars**	
(i).	No. of foundations	1580 (Preliminary design)
(ii).	Foundation Structure	Reinforced concrete

(D). Other Details

(i).	Expected COD of the generation facility Solar Power Plant/Solar Farm	December 31, 2022
(ii).	Expected useful Life of the generation facility Solar Power Plant/Solar Farm from the COD	25 years

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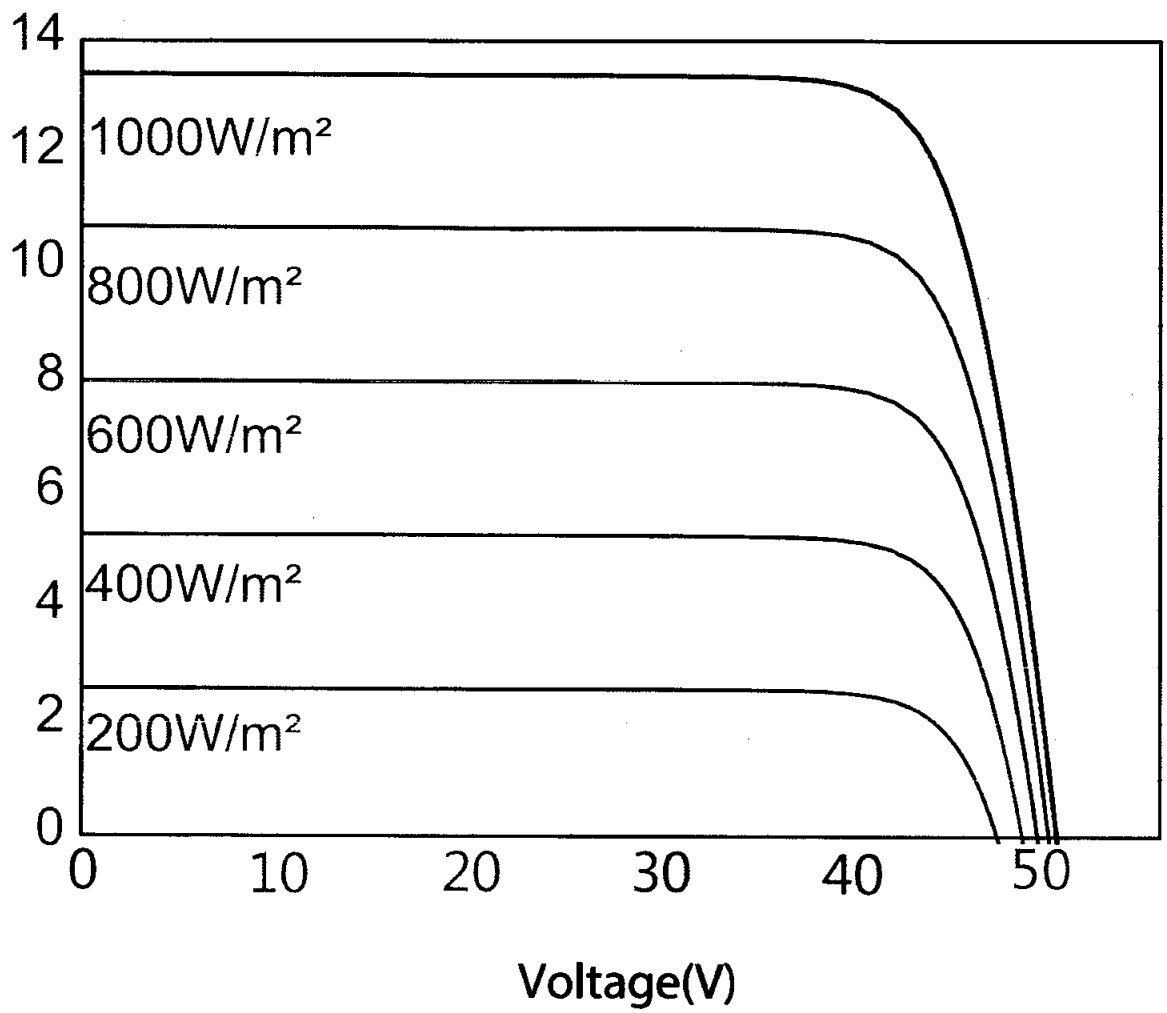
V-I Curve of PV Cell of Generation Facility/Solar Power Plant/ Solar Farm



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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.

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SCHEDULE-II

(1).	Total Installed Capacity of the Generation Facility/Solar Power Plant/Solar Farm	≈10.00 MW_P
(2).	Average Sun Hour Availability/Day (Irradiation on Inclined Surface)	1781 hours
(3).	No. of days per Year	365
(4).	Annual generating capacity of Generation Facility/Solar Power Plant/Solar Farm (As Per Tariff Determination)	18,046 MWh
(5).	Total expected generation of the Generation Facility/Solar Power Plant/Solar Farm during the twenty five (25) years term of this licence	413,142.90 MWh
(6).	Annual generation of Generation Facility/Solar Power Plant/Solar Farm based on 24 hours of working	10.00 X 24 X 365 = 87,600 MWh
(7).	Net Capacity Factor of Generation Facility/Solar Power Plant/Solar Farm (4/6)	≥ 20.60*%

Note

All the above figures are indicative as provided by the Licensee. The Net Delivered Energy available to Power Purchaser for dispatch will be determined through procedures contained in the Energy Purchase Agreement (EPA) or the Applicable Document(s).

* The Company/Licensee has proposed this minimum value which the Authority may change based on the benchmarking while determining the tariff.

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