

The Registrar,
National Electric Power Regulatory Authority (NEPRA),
NEPRA Tower, Attaturk Avenue (East).
Sector G-5/1, Islamabad.

Subject: Application for Grant of Generation License

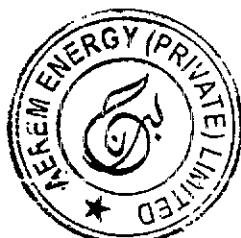
I, Saleem Uz Zaman, Chief Executive Officer, being the duly authorized representative of Aerem Energy Private Limited by virtue of Board Resolution dated April 18, 2025, hereby apply to the National Electric Power Regulatory Authority for the grant of a Generation License to the Aerem Energy Private Limited pursuant to section 14B of the Regulations of Generation, Transmission and Distribution of Electric Power Act, 1997.

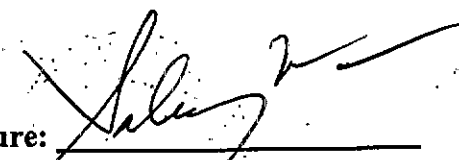
I hereby certify that the documents-in-support attached with this application are prepared and submitted in conformity with the provisions of the National Electric Power Regulatory Authority Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021, and undertake to abide by the terms and provisions of the above-said regulations. I, 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 no material omission has been made.

A Pay Order, PO#03092170 dated 22nd April 2025 in the sum of PKR 2,750,172 (Pakistani Rupees two million seven hundred fifty thousand one hundred seventy-two only), the license fee calculated in accordance with Schedule II to the National Electric Power Regulatory Authority Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021, is also attached herewith.

The Company remains available to the Authority to provide any further information as and when required, including to submit further submissions (oral or written), related to the matters entailed herein as required, from time to time.

April 28th, 2025



Signature: 
Name: Saleem Uz Zaman
Designation: Chief Executive Officer

BEFORE

THE NATIONAL ELECTRIC POWER REGULATORY AUTHORITY (NEPRA)

APPLICATION FOR A GENERATION LICENSE / REGISTRATION FOR

HYBRID POWER GENERATION FACILITY

PURSUANT TO ENABLING PROVISIONS OF REGULATION OF GENERATION, TRANSMISSION
AND DISTRIBUTION OF ELECTRIC POWER ACT, 1997, READ WITH ENABLING
PROVISIONS OF RULES MADE THEREUNDER, LICENSING (GENERATION) RULES 2000,
LICENSING (APPLICATION, MODIFICATION, EXTENSION AND CANCELLATION)
PROCEDURE REGULATIONS, 2021 &

THE FEDERAL GOVERNMENT'S

'POLICY OF RENEWABLE ENERGY FOR POWER GENERATION 2006' AND 'ALTERNATIVE AND
RENEWABLE ENERGY POLICY 2019'

ON BEHALF OF

**AEREM ENERGY PRIVATE LIMITED (THE "APPLICANT" / "SUCCESSFUL BIDDER / PROJECT
COMPANY")**

**"(A SPECIAL PURPOSE VEHICLE INCORPORATED IN ACCORDANCE WITH THE REQUIREMENTS OF
THE APPLICABLE LAWS BY CONSORTIUM AS REQUIRED BY THE NEPRA APPROVED RFP)**

**FOR NEPRA'S GRANT OF GENERATION LICENSE / REGISTRATION FOR AEREM ENERGY
PRIVATE LIMITED**

FOR POWER PROJECT OF TOTAL 240 MW AT

DHABEJI GRID, THATTA DISTRICT, PROVINCE OF SINDH, PAKISTAN

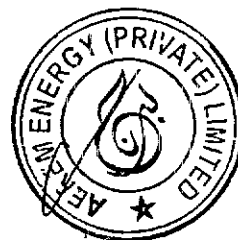
DATED: April 28, 2025

AEREM ENERGY PRIVATE LIMITED

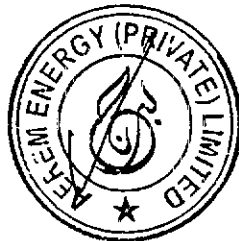
**MAILING ADDRESS: Office # 202, 11-C, Al Murtaza Commercial Lane 2, DHA Phase 8, Karachi
Pakistan**

PHONE #: +92-21-35246400

EMAIL: MASAD@JCMPOWER.CA



APPLICATION FOR GENERATION LICENSE



Triplicate

The Registrar,
National Electric Power Regulatory Authority (NEPRA),
NEPRA Tower, Attaturk Avenue (East).
Sector G-5/1, Islamabad.

Subject: Application for Grant of Generation License

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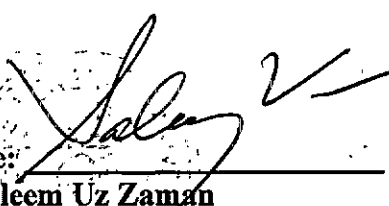
I hereby certify that the documents-in-support attached with this application are prepared and submitted in conformity with the provisions of the National Electric Power Regulatory Authority Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021, and undertake to abide by the terms and provisions of the above-said regulations. I, 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 no material omission has been made.

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The Company remains available to the Authority to provide any further information as and when required, including to submit further submissions (oral or written), related to the matters entailed herein as required, from time to time.

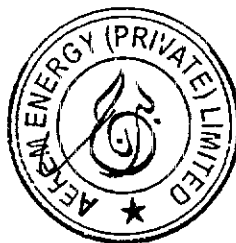
April 28th, 2025



Signature: 
Name: Saleem Uz Zaman
Designation: Chief Executive Officer

CHECKLIST FOR EXAMINATION OF LICENSE

APPLICATION FOR RENEWABLE POWER PROJECT

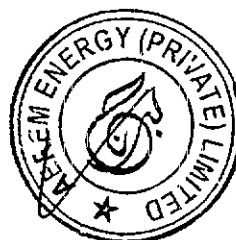


CHECK LIST FOR EXAMINATION OF CONCURRENCE APPLICATION FOR RENEWABLE POWER PROJECT(Regulation 3 read with 3(4)(A) of AMECPR-2021)

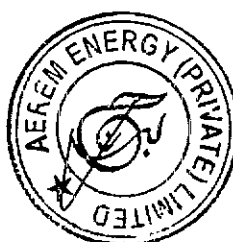
Name of Company: Aerem Energy Private Limited

Installed Capacity: 240MW

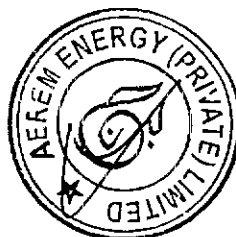
Regulation #	Information/Documents Required	Information/ Documents Submitted
3(1)*	Application fee (including Indexation)	Please refer to "Copy of Bank Draft" below
3(3)	Application submitted in triplicate	✓
3(4)(a)	Applicable documents-in-support and information set out in Schedule III of these regulations;	✓
3(4)(b) *	A prospectus	Annexure A
3(4)(c)(i)(A) *	Certified copies of certificate of incorporation	Annexure B
3(4)(c)(i)(B) *	Certified copies of memorandum and articles of association	Annexure C
3(4)(c)(i)(C) *	Certified copies of annual reports of the company	Annexure D
3(4)(c)(ii) *	The last annual return of the Company submitted in compliance of section 130 of the Companies Act or, in case of an Applicant to whom section 130 of the Companies Act does not apply, a return comprising of all such information and particulars as required by the specified form under section 130 of the Companies Act, as the case may be;	Annexure E
3(4)(c)(iii)	The authorised, issued, subscribed and paid up share capital of the Applicant	Annexure E



Regulation #	Information/Documents Required	Information/ Documents Submitted
3(4)(c)(iv)	The shareholding pattern of the Applicant including list of shareholders holding 5% or more shares, number of shares held by each of them and percentage shares of the total paid-up capital	Annexure E
3(4)(d)(i)	Evidence of cash balances held in reserve by the Applicant, along with bank certificates;	Not applicable
3(4)(d)(ii)	Details of charges or encumbrances attached to the Applicant's assets, if any;	Not applicable
3(4)(d)(iii)	Latest audited financial statements of the Applicant;	Annexure D
3(4)(d)(iv)	Expressions of interest to provide credit or financing along with sources and details thereof;	Bid to KE was submitted by a consortium comprising of JCM Power, Burj Energy International Management Limited (and affiliates) and Rana Nasim Ahmed (the "Consortium"). Indicative term sheets from prospective financiers were submitted by the Consortium as part of its bid submission. BER (as defined below) has been duly approved by NEPRA pursuant to the BER Approval (as defined below).
3(4)(d)(v)	Documents describing the net worth and the equity and debt ratios of the Applicant, as on the date of the audited balance sheet accompanying the application;	Details of net worth of the bidder were submitted by the Consortium as part of the pre-qualification criteria assessment. BER has been duly approved by NEPRA pursuant to the BER Approval.



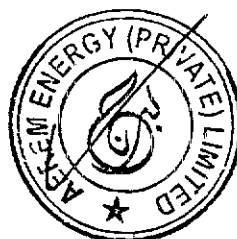
Regulation #	Information/Documents Required	Information/ Documents Submitted
3(4)(d)(vi) *	A reasonably detailed profile of the Applicant and the Applicant's senior management, technical and professional staff;	Annexure G
3(4)(d)(vii)	Employment records of engineering and technical staff of the Applicant proposed to be employed;	Existing in-house team will be utilized for development of the Project. Annexure G
3(4)(d)(viii)	Profile of sub-contractors, if any, along with expressions of interest of such sub-contractors;	Indicative expression of interests from prospective EPC Contractor and sub- contractors were submitted by the Consortium as part of its bid submission. BER has been duly approved by NEPRA pursuant to the BER Approval.
3(4)(d)(ix)	Verifiable references in respect of the experience of the Applicant and its proposed sub-contractors;	Past experience of the bidder in the renewable energy sector was submitted to KE as part of the pre-qualification criteria assessment. A list of proposed vendors was also submitted by the Consortium as part of its bid submission. BER has been duly approved by NEPRA pursuant to the BER Approval.
3(e) *	Technical and financial proposals in reasonable detail for the operation, maintenance, planning and development of the facility or system in respect of which the license is being sought;	Annexure H and L



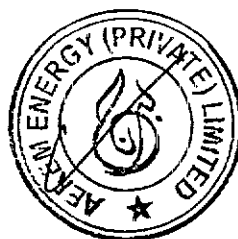
Regulation #	Information/Documents Required	Information/ Documents Submitted
3 (f) *	Feasibility Study	Feasibility Study report submitted to KE as part of the RFP Package duly approved by NEPRA is attached as Annexure I.
3 (g) *	An affidavit stating whether the Applicant has been granted any other license under the Act;	The Company has applied for a generation license for 240MW Site Neutral Hybrid Power Project. No other license under the Act has either been applied or been granted to the Company. Please refer to the "Affidavit" below.
3 (h) *	A duly authorised statement stating whether the Applicant has been refused grant of license under the Act and, if so, the particulars of the refused application, including date of making the application and decision on the application;	Please refer to the "Affidavit" below.
3(6) *	Authorization from Board Resolution / Power of Attorney	Please refer to "Copy of Aerem Energy Private Limited Board Resolution" below.
3(7) *	An affidavit as to the correctness, authenticity and accuracy of the application,	Please refer to the Affidavit below.
Schedule III (A)(e) (Regulation 3(4)(a))		
1.	Interconnection Study	as per section 20.1.10 (a) of the RFP, Bidder is required to make Grid Interconnection Study available within 03 months of its declaration of Successful Bidder.
2.	Environmental Impact Assessment Study	NOC from SEPA for Environmental Impact Assessment Study is attached as Annexure O.

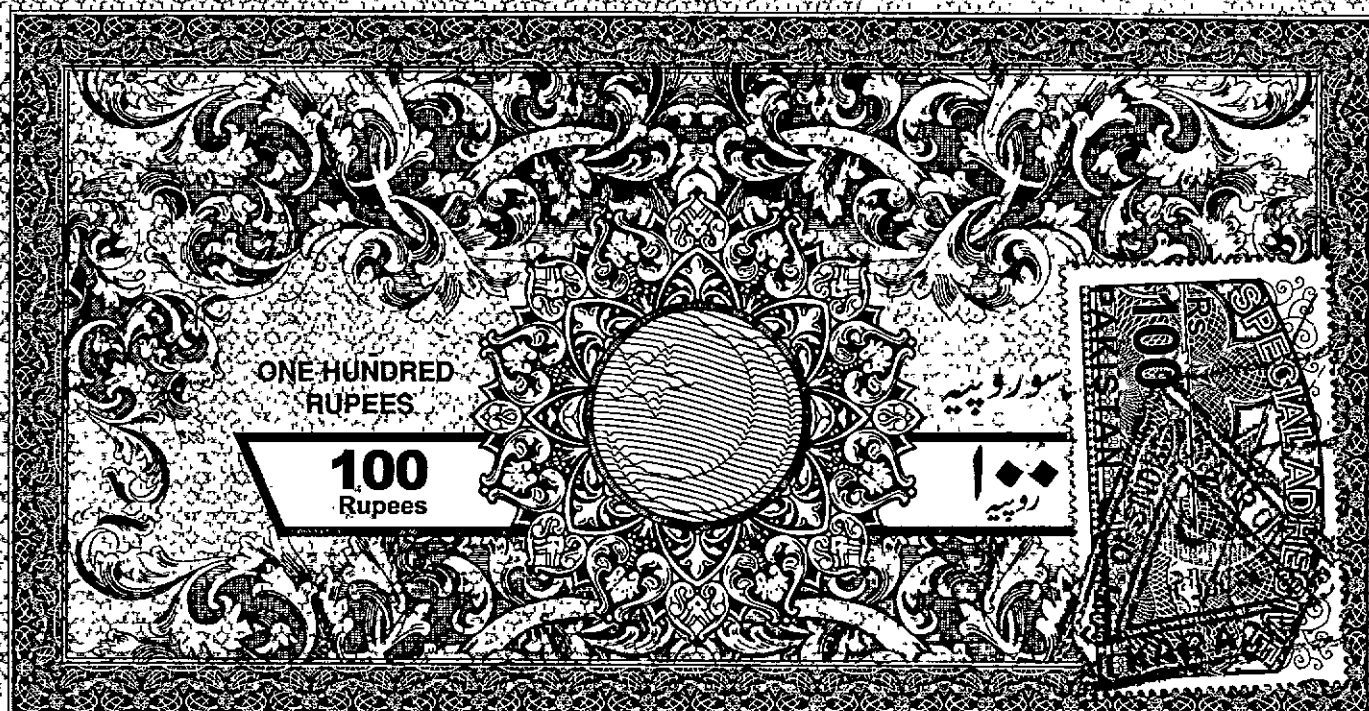


Regulation #	Information/Documents Required	Information/ Documents Submitted
3	Information relating to:	
3(i) *	Location (location maps, site map, land)	Annexure H
3(ii) *	Technology, size of the plant, number of units	Annexure H
3(iii) *	Water source at site for maintenance	Annexure H
3(iv) *	Infrastructure: roads, rail, staff colony, amenities	Annexure H
3(v) *	Project commencement and completion schedule with milestones	Please refer to Section 6 below
3(vi)	Safety plans, emergency plans	Annexure H
3(vii) *	Plant characteristics (generation voltage, frequency etc.)	Annexure H
3(viii)	Control, metering, instrumentation and protection	Annexure H
3(ix) *	Estimated Capacity Factor at site	Annexure H
3(x)	Degradation Factors	Annexure H



STATEMENT OF AUTHORIZED REPRESENTATIVE
OF
AEREM ENERGY PRIVATE LIMITED





ALI FARAZ STAMP VENDOR

Shop No 14, Ruby Centre, Talpur Road, Boulton Market, Karachi

S No: 4282 DATE: 25 JUL 2024

ISSUED TO WITH ADDRESS MR. GHULAM HABIB

THROUGH WITH ADDRESS MR. Advocate High Court

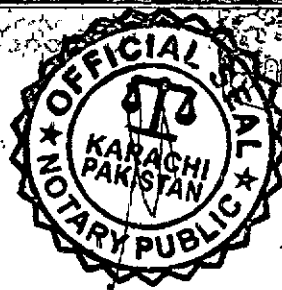
PURPOSE: Affidavit

VALUE RS: (ATTACHED)

STAMP VENDOR'S SIGNATURE: KHALID AVIT

STAMP VENDOR IS NOT RESPONSIBLE FOR ANY FAKE DOCUMENTATION

PLEASE DO NOT USE THIS PAPER FOR DIVORCE DEED WILL PURPOSE



Karachi

2024

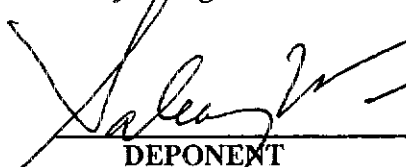
BEFORE

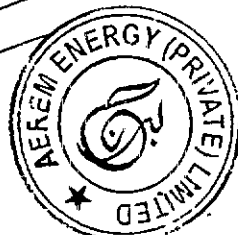
THE NATIONAL ELECTRIC POWER REGULATORY AUTHORITY

I, Saleem Uz Zaman S/o Qamar Uz Zaman, CNIC No. 42301-0948355-5, Chief Executive Officer, Aerem Energy Private Limited ("Applicant") hereby solemnly affirm and declare on oath that the contents of the accompanying application for the Generation License / Registration of Aerem Energy Private Limited, including all attached documents-in-support, are true and correct to the best of my knowledge and belief, and nothing has been concealed or mis-stated therein, and have been prepared and submitted in conformity with the provisions of the National Electric Power Regulatory Authority Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021, read with the enabling provisions of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997.

I, hereby solemnly affirm that the Applicant has not been refused the grant of license under the Act at an earlier date.

I hereby solemnly affirm and declare on oath that Aerem Energy Private Limited was notified as the lowest bidder by KE for 240 MW Site Neutral Hybrid Power Project. No other license under the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997, has currently been granted to Aerem Energy Private Limited.


DEPONENT



Verification

Verified on oath at Karachi, Pakistan on this 25 day of April 2025, that the contents of the above affidavit are true and correct to the best of my knowledge and belief.

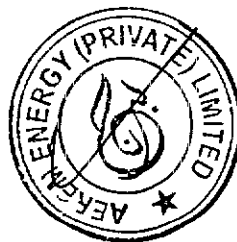
DEPONENT

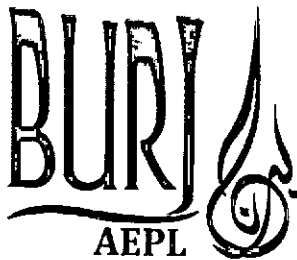


25 APR 2025

COPY OF AEREM ENERGY PRIVATE LIMITED

BOARD RESOLUTION





Aerem Energy (Private) Limited

**CERTIFIED TRUE COPY OF THE MINUTES OF THE MEETING OF THE BOARD OF
DIRECTORS OF AEREM ENERGY PRIVATE LIMITED HELD AT ITS REGISTERED
Office # 202, 11-C, Al Murtaza Commercial Lane 2, DHA Phase 8, Karachi ON April
18, 2025**

We hereby certify that the following resolutions of the Board of Directors of Aerem Energy Private Limited (the "Company") were passed on April 18, 2025:

RESOLUTIONS:

The following resolutions were approved by the Board of the Company:

RESOLVED THAT the Company is hereby authorized in respect of the Company's project comprising of the hybrid project with a total capacity of 240 MW located at Dhabeji Grid, Thatta District, Province of Sindh, Pakistan (the "Project") to file: (i) a tariff application (the "Tariff Application") and other ancillary documents for submission to the National Electric Power Regulatory Authority ("NEPRA") for the approval of the tariff of the Projects and in relation thereto, enter into and execute all required documents, make all filings, attend all hearings, provide all required information and pay all applicable fees, in each case, of any nature whatsoever; (ii) a generation license (the "Generation License") and other ancillary documents for submission to the NEPRA for the approval of the Generation License of the Projects and in relation thereto, enter into and execute all required documents, make all filings, attend all hearings, provide all required information and pay all applicable fees, in each case, of any nature whatsoever; and
(iii) to undertake all action required for the purposes of the Project.

RESOLVED FURTHER THAT Mr. Saleem Uz Zaman S/o Qamar Uz Zaman having CINC # 42301-0948355-5, is hereby authorized and empowered to undertake or delegate all actions on behalf of the Company in relation to the above resolutions, including but not limited to sign, authenticate, execute, review, all necessary applications / forms, verify documents and papers, written statements, affidavits, letters, guarantees, undertakings, approvals, and any other instruments of any nature whatsoever, as may be required, and to submit, file, register any explanation(s), amendments or instrument, with the NEPRA or with any competent authority and to do all such acts, deeds, and things as may be necessary in this regard.

RESOLVED FURTHER THAT all actions, heretofore or hereafter taken by an authorized **OFFICER** in connection within the terms of the foregoing recitals and resolutions be and are hereby ratified and confirmed in their entirety.

RESOLVED FURTHER THAT the aforesaid power entrusted in writing to the said official shall be valid and effective unless revoked earlier by the Board or shall be exercisable by him so long as he is in the concerned to the Company.

RESOLVED FURTHER THAT all acts, deeds, things, matters, etc. as aforesaid shall be deemed to be valid and enforceable only if they are consistent with the instant resolution as may be relevant in this case and that the Board shall not be responsible for any acts done beyond the scope of powers granted in this Resolution.

CERTIFIED TO BE TRUE COPY

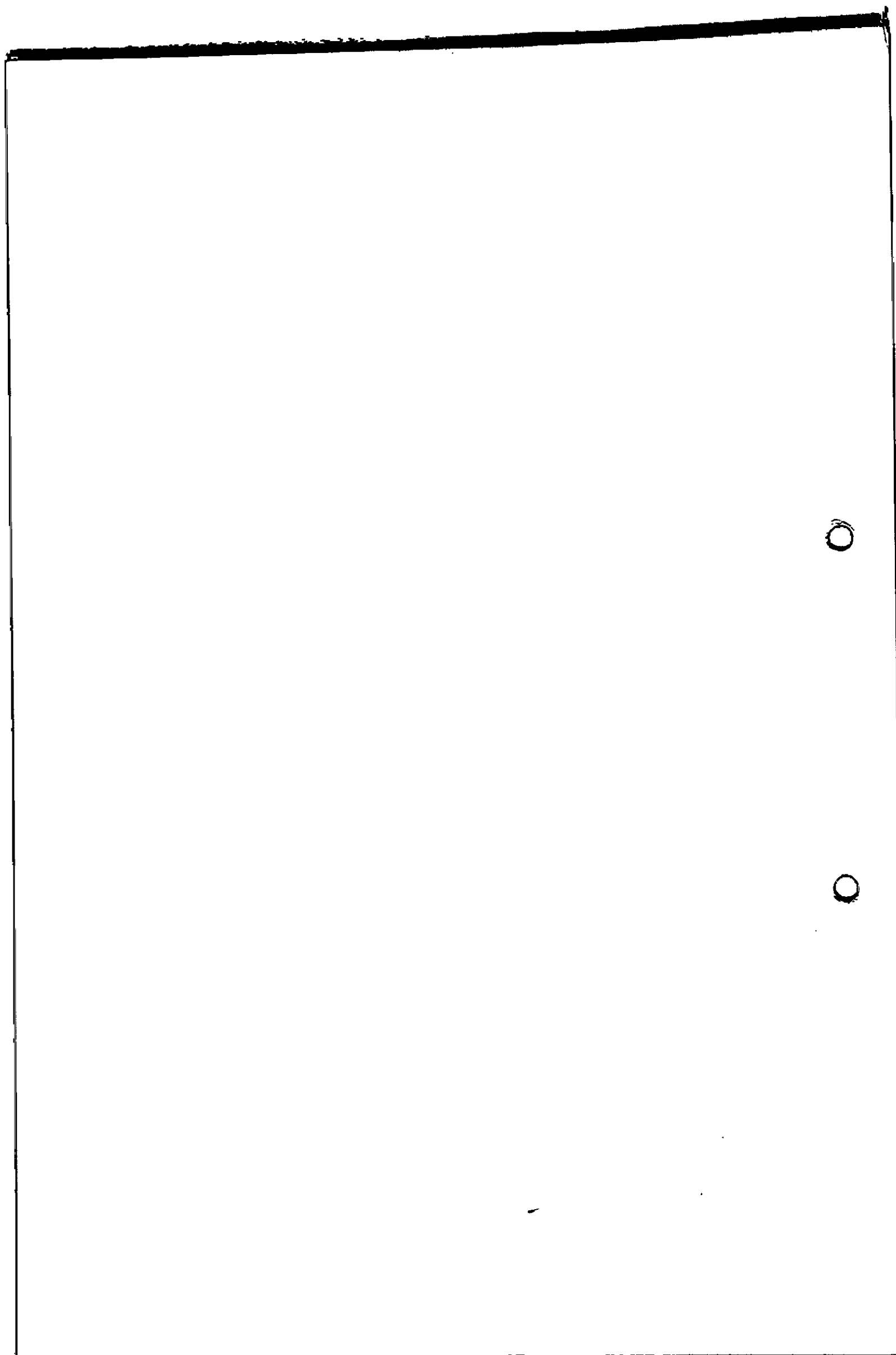
I, the undersigned, do hereby certify that the above resolution (a) was duly passed by the Board of Directors in accordance with the Articles of Association of the Company; and (b) has been duly recorded in the minutes book of the Company.



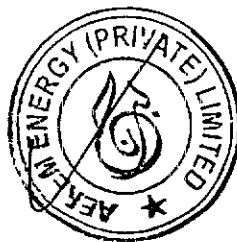
Company Secretary



Affix corporate stamp here



COPY OF BANK DRAFT



A/C PAYEE ONLY

BankIslami

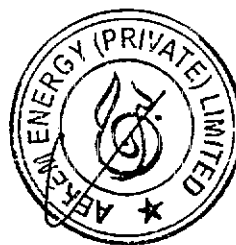


Shahrah e Faisal Branch Karachi (1026)

Pay to _____ of Order _____		PAY ORDER NO. : 03092170	
National Electric Power Regulatory Authority		1026-DRA-03092170-8947883 Y Y	
Rupees _____ Pakistani Rupees Two Million Seven Hundred Eighty Thousand One Hundred Seventy Two Pakistani Rupees only.		22-04-2025	
For content verification please call 111-ISLAM(111-475284).		PKR 2,750,172.00	
2. For instrument verification please visit any BankIslami Branch during Banking hours.		MUHAMMAD FAISAL MENDOZA Customer Service Manager BankIslami Pakistan Ltd. Secretary	
Please do not write or alter the face		Payable BankIslami Pakistan Ltd. 1026/Alhamd No. PAY Alhamd No.	

0309217002100401

020



1. BACKGROUND OF GENERATION LICENSE APPLICATION

1.1 PROCESS LEADING TO GENERATION LICENSE APPLICATION

1.1.1 AEREM ENERGY PRIVATE LIMITED (a company duly organized and existing under the laws of Pakistan, with its registered office located at Office # 202, 11-C, Al Murtaza Commercial Lane 2, DHA Phase 8, Karachi Pakistan, being the SPV of the Consortium being acknowledged as having submitted the lowest bid tariff under the KE Letter (as defined below) for the purpose of this Project (the "Project Company"), submitted its proposal on August 31st, 2024 to K-Electric Limited ("KE") in response to the invitation to bid circulated by KE (the "RFP"), to develop and establish a this project with a total capacity of 240MW (the "Project") located at Dhabeji Grid, Thatta District, Province of Sindh, Pakistan (the "Project Site").

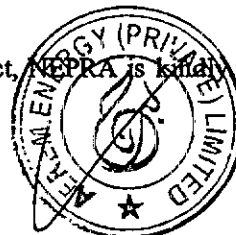
1.1.2 KE submitted the Bid Evaluation Report (the "BER") for the Project to the NEPRA on October 16th, 2024. The BER is attached herein as Annexure J. NEPRA communicated to KE its approval of the BER through an email dated April 16, 2025, which was further communicated to the Project Company through an email dated April 16, 2025 (the "BER Approval"), attached herein as Annexure K. Pursuant to the letter dated October 25, 2024, bearing reference no. BD/SQK/JCM/01/2024-1025, KE informed the Consortium, that the Consortium led by JCM Power has successfully cleared the technical evaluation and submitted the lowest bid tariff for the Project (the "KE Letter") (attached as Annexure M). Furthermore, pursuant to the letter dated April 25, 2025, bearing reference no. BD/MZ/JCM-1559/2025-0425, KE has informed the Consortium that JCM has been declared as the successful bidder for the Project (the "Successful Bidder Notification") (attached as Annexure N).

1.2 SUBMISSION

1.2.1 Under the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (the "NEPRA Act"), the National Electric Power Regulatory Authority Licensing (Generation) Rules, 2000 (the "Licensing Rules 2000"), and the National Electric Power Regulatory Authority Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021 (the "NEPRA Regulations"), NEPRA is responsible for and has the authority to, *inter alia*, grant licenses for the generation of electric power and other terms and conditions for the supply of electricity through generation.

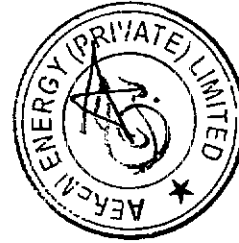
1.2.2 PURSUANT TO Sections 7(2)(a) and 14B of the NEPRA Act, read with the other enabling provisions of the NEPRA Act, the Licensing Rules 2000, and the NEPRA Regulations AND in accordance with the Policy of Renewable Energy for Power Generation 2006 and the Alternative and Renewable Energy Policy 2019: **AEREM ENERGY PRIVATE LIMITED** submits herewith for NEPRA's kind and gracious consideration, the application for the grant of a generation license / registration along with supporting documents (the "Generation License Application") for and on behalf of **AEREM ENERGY PRIVATE LIMITED** for the Project having a total capacity of 240MW, to be located at the Project Site.

1.2.3 Given the advance stage of the Project, NEPRA is kindly requested to process the



Generation License Application at the earliest, thereby enabling the Project Company to proceed further with the development process.

- 1.2.4 This Generation License Application is submitted in triplicate.
- 1.2.5 It is highlighted that the Project Company is submitting with this Generation License Application the required generation license fee through a bank draft in the amount of PKR 2,750,172/- (Pakistani Rupees Two million, seven hundred fifty thousand and one hundred seventy two only) dated [April 22, 2025] in favor of NEPRA.



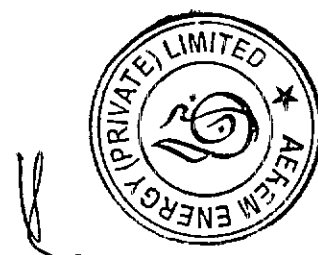
2. APPLICANT – AEREM ENERGY PRIVATE LIMITED

- 2.1 The Project Company, being the Applicant under this Generation License Application, is a private limited company, incorporated under the laws of Pakistan and has been specifically established to setup the Project at the Project Site.
- 2.2 The Project Company (following grant of a generation license and approval of the Project Company's bid tariff by NEPRA) proposes to finance, design, engineer, procure, construct, install, test, complete, commission, insure, operate and maintain the Project constituting of 240 MW Hybrid renewable energy generation facility based on solar and wind (the "Facility") to be located at the Project Site.
- 2.3 For the purposes of establishing the Project, the Project Company is in the process of finalizing a contractual arrangement with globally reputable engineering, procurement and construction contractor and Original Equipment Manufacturers ("OEM"). The profile of the aforementioned suppliers/contractors has been submitted by the Consortium as part of its bid submission. NEPRA has duly approved the BER pursuant to the BER Approval.
- 2.4 The following supporting documents relating to the Project Company are attached herewith as follows:

DOCUMENTS	ANNEXURE
Prospectus	ANNEXURE A
Certificate of Incorporation	ANNEXURE B
Memorandum and Articles of Association	ANNEXURE C
Annual Reports of the Company	ANNEXURE D
Form A	ANNEXURE E
Account Maintenance Certificate	ANNEXURE F
Detailed Profile of the Applicant and Senior Management	ANNEXURE G
Project Technical Proposal	ANNEXURE H
Project Feasibility Study	ANNEXURE I
BER submitted by KE to NEPRA	ANNEXURE J
BER Approval	ANNEXURE K
O&M Plan	ANNEXURE L
KE letter to the Consortium	ANNEXURE M



Successful Bidder Notification	ANNEXURE N
NOC from SEPA	ANNEXURE O



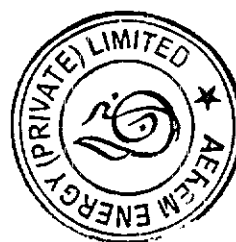
3. FACILITY UTILIZATION

POWER OFF-TAKE

Following commercial operation date of the Project, the electricity generated will be sold to KE, pursuant to an Energy Purchase Agreement (the "EPA"), which in turn will distribute and modulate the electricity generated by the plant.

The EPA will be finalized and executed by and between the Project Company and KE following NEPRA's approval of the Project Company's twenty-five

(25) years bid tariff, and the grant of a Generation License to the Project Company.



A handwritten signature or mark, possibly a stylized 'X' or 'Z'.

4. RESOURCES

4.1 SENIOR MANAGEMENT & PERSONNEL

4.1.1 The Project Company has access to and has engaged the highly qualified personnel (technical, legal and financial in-house teams) for the development of the Project. The Project Company is presently in the process of appointing various personnel/consultants and details of the same will be provided upon finalization of the terms and conditions of their appointment.

4.1.2 In addition, the curriculum vitae of the following individuals currently engaged by the Project Company are attached herewith at ANNEXURE G:

	NAME OF INDIVIDUALS	POSITION	ANNEXURE
1.	Mr. Muhammed Ali	REGIONAL DIRECTOR ASIA - JCM POWER	G
2	Shane Eglinton	REGIONAL DIRECTOR AFRICA- JCM POWER	G
3	Joseph Rodriguez	VP FINANCE – JCM POWER	G
4	Saad Zaman	GROUP CEO – BURJ CAPITAL	G
5	Nabeel Malik	COO & CEO – BURJ CAPITAL	G
6	Rana Uzair Nasim	CEO – GHARO SOLAR	G
7	Muhammad Asad	PROJECT DIRECTOR – JCM POWER	G
8	Umar Saeed	DIRECTOR INVESTMENTS – JCM POWER	G
9	Abdul Basit Tola	VP FINANCE - JCM	G

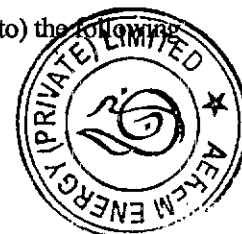
4.2 OPERATIONS AND MAINTENANCE

4.2.1 In addition to recruitment of its own management, staff and personnel for the purposes of the Project, the Project Company will be responsible for the operations and maintenance (the “O&M”) of the Project. However, WTG OEM will be engaged for WTG O&M scope. For details on the O&M plan, please refer to the Annexure L attached herewith.

4.3 TECHNICAL ADVISORS

Various local and international technical consultants including (but not limited to) the following are under consideration for appointment for the purpose of the project

- DNV GL
- Tractebel Engie
- K2 consultant

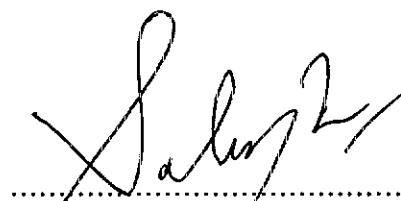


CONCLUSION

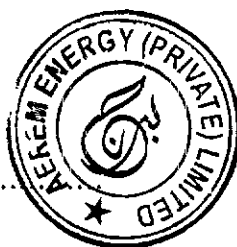
In light of the submissions, the relevant analysis and information contained in this Generation License Application, along with the Annexures attached hereto, this Generation License Application is submitted for NEPRA's approval and for grant of the Generation License to the Project Company.

Respectfully submitted for and on behalf of:

AEREM ENERGY PRIVATE LIMITED



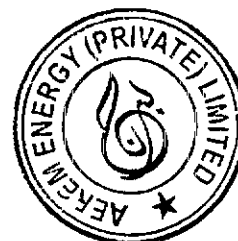
.....
MR. SALEEM UZ ZAMAN
(CHIEF EXECUTIVE OFFICER)



- Renewable Resources
- Renewable Resources

4.4 LEGAL ADVISER

- 4.4.1 HAIDERMOTA & CO., has been selected by the Project Company to provide legal support on all legal aspects of the Project including Project documentation, regulation and financing matters. Haidermota & Co., has been actively involved in the power sector projects and has advised various project companies / sponsors, lenders and the Government of Pakistan on several transactions and matters. It is ranked by Chamber & Partners as a “Band 1” firm in Pakistan for Projects, Banking & Finance and Corporate & Commercial.



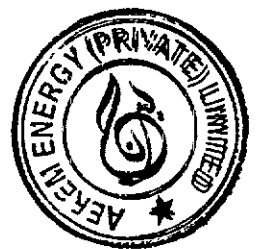
5. THE FACILITY

5.1 TECHNOLOGY

5.1.1 Technology Selection Criteria

The technology for the Project has been selected after detailed analyses of various power generation technologies available internationally for the purposes of power generation through wind and solar (“Hybrid”). This selection is based upon the detailed technical requirements laid out in Section 20 of the RFP provided by KE. Various factors were considered in selection of equipment and technology, which included:

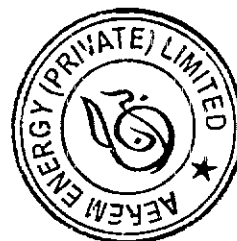
- (a) equipment to be of the latest proven technology, megawatt class and high efficiency;
- (b) safe transportation of equipment to the site;
- (c) maintainability of the equipment and availability of OEM service personnel;
- (d) energy output with warranted power curve and performance warranty;
- (e) grid compatibility with proposed Energy yields and grid code requirements; and
- (f) suitability of operation and maintenance concept for the size and location of projects with suitable availability of spare parts, consumables and main components.



6. IMPLEMENTATION SCHEDULE

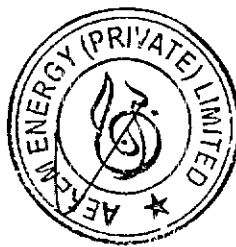
The following provides the key upcoming milestones and dates for the Project's development:

MILESTONES TO BE ACHIEVED¹	
ACTIVITIES	ANTICIPATED COMPLETION DATE
Submission of performance guarantee by Project Company	Prior to the issuance of Letter of Intent ("LOI") by KE and within twenty (20) business days after being declared as the successful bidder
Issuance of LOI	Upon submission of performance guarantee by Project Company
Grant of Generation License	Upon NEPRA's approval
Bid Tariff Approval	Upon NEPRA's approval
Submission of EPA to NEPRA for approval	Five (05) months post issuance of LOI
EPA Signing with KE	Two (02) months prior to financial close
Land Sub-lease agreement with Government of Sindh	Two (02) months prior to financial close
Project financial close & ordering of equipment	In accordance with the timeline stipulated in the LOI
Commercial Operation Date	18 months following Financial Close, in accordance with the RFP
One-time Adjustments by NEPRA	Following Commercial Operations Date



¹ The timelines stipulated above are indicative and subject to change in accordance with the LOI issued to the Project.

ANNEXURE – A
PROSPECTUS



1. Applicant – Aerem Energy (Pvt.) Limited

The Project Company, being the applicant under this Generation License Application, is a private limited company incorporated under the laws of Pakistan and has been specifically established to undertake power generation business and activities in Pakistan.

The Project Company (following grant of a generation license and approval of the Project Company's reference generation tariff by NEPRA) proposes to design, engineer, construct, insure, commission, operate and maintain the Project constituting of a 240 MW power Renewable Energy generation facility (the Facility) to be located at Dhabeji, District Thatta, Province of Sindh, Pakistan (the Site).

For the purposes of designing, engineering, procuring, constructing, installing, testing, completing, commissioning, operation and maintenance of the Project, Indicative expression of interests from prospective sub- contractors were submitted by the Consortium as part of its bid submission. BER has been duly approved by NEPRA pursuant to the BER Approval.

2. Sponsor

JCM Power Corporation

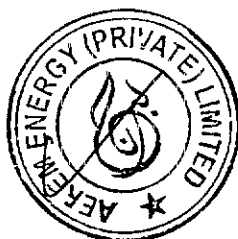
JCM Power is a clean energy Canadian Company backed by five leading Development Finance Institutions (DFIs), including FMO (Netherlands), IFU (Denmark), Swedfund (Sweden) STOA (France), and FinDev Canada. These institutions jointly own and govern JCM with a shared mission of driving measurable climate and development impact what JCM values "impact with intent."

Unlike conventional private equity-backed developers, JCM's model is purpose-built to advance renewable energy in emerging markets by deploying patient capital underpinned by ESG-first mandates. The company specializes in developing, constructing, owning, and operating renewable energy projects across South and Southeast Asia and Sub-Saharan Africa.

JCM currently operates over 200 MW of utility-scale wind and solar projects across Asia and Africa.

Beyond operational assets, JCM is developing a significant pipeline of solar, wind, and hybrid renewable energy projects across its core geographies. JCM continues to expand its presence through the Project in Pakistan.

With its DFI ownership and integrated capabilities, JCM is uniquely positioned to deliver long-term energy access solutions that align with national climate goals while maintaining the highest standards of governance, environmental compliance, and stakeholder engagement.



BEIML (and affiliates)

BEIML is, a Dubai based, investment firm engaged in renewable power development focused on utility scale and distributed generation strategies. BEIML originates, develops, constructs and operates power projects. The firm manages assets end-to-end ensuring project quality and delivering attractive returns for investors and partners. Additionally, BEIML addresses the complete clean energy value chain and has expertise that spans wind, solar, and energy storage solutions.

BEIML focuses on select markets within Asia which offer the potential to scale. The firm works alongside leading institutional investors, development finance institutions and technology providers with the aim to gain significant market share in chosen markets and create market leading platforms to deliver clean power.

BEIML wants to leveraging the experience in Pakistan to replicate offerings in upcoming Asian markets conducive to renewables. The firm is led by investment and industry professionals with experience in developing markets and in financing renewable energy assets. BEIML has also built a strong engineering and project management team with expertise in the design, construction, and operation of power projects. The team has previously created platforms targeting over 2.5GW of clean energy deployment across South Asia, Africa, and Latin America in partnership with the likes of Engie, Total and Africa Finance Corporation, and have worked alongside leading technology providers and construction companies including GE, Vestas, Siemens, Nordex, Wartsila, Power China, and Harbin.

Mr. Rana Nasim Ahmed

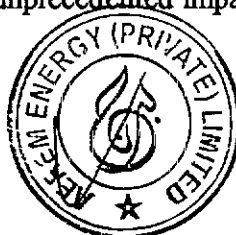
Mr. Rana Nasim Ahmed is a significant shareholder in two pioneering solar PV projects in Pakistan: 50 MW Ghara Solar Limited and 18 MW Harappa Solar (Pvt) Limited. Ghara Solar, commissioned in December 2019, was the first project in the country to deploy bifacial modules and the first renewable energy plant within K-Electric's network to secure financing from a foreign development finance institution. Harappa Solar, established in October 2017, was the first solar project to utilize single-axis tracking technology.

Mr. Ahmed also has extensive experience in biomass technology. He played a leading role in introducing high-pressure cogeneration technology in Pakistan by developing multiple bagasse-based projects of 53 MW total capacity in 2014.

He holds a Master's degree with distinction from the University of Punjab and an MBA from Saint Louis University, USA.

3. Environmental Impact

As per the requirements of Section 12 of Pakistan Environmental Protection Act (PEPA), 1997, Project Company has completed the Initial Environmental Examination ("IEE") report for the Project. Wind Power Project is a green energy Project and, therefore, there is no major long lasting social or environment impact foreseen. The Project is not likely to have any significant adverse environmental impacts, which could be irreversible or could affect sensitive eco-system, requires involuntary resettlement, or has an unprecedented impact. The Project Area does not fall



under any sensitive, protected area. No threatened / Near-Threatened species of wildlife was recorded in the Project Area. There are no settlements in and around the project area. Other settlements are outside from the wind farm site at distance of approximately 10 Kilometers therefore no disturbance to the inhabitants is foreseen. The Project has no gaseous and other emissions. Sewerage will be treated and reused at the Project Site for sprinkling on the unpaved site to reduce fugitive dust. Regarding bird mortality due to collision, it is found that birds landing area is around 10 km away from the wind farm and the migratory birds are not seen in the wind farm area and there are minimal to zero chance of bird collision from these wind turbines. Noise impacts will be less than 70 DB (A) which is within the range as per National Environmental Quality Standards (NEQs) of Pakistan.

After careful review and analysis of the Initial Environmental Examination, the SEPA accorded its approval for the Project through its decision dated 06-03-2025 bearing Reference No. SEPA/ROH/IEE/THATTA/W&S/07/2025 (the IEE Approval Decision). A copy of the IEE Approval Decision is attached for NEPRA's perusal.

4. Social Impact

The Sponsors of Project Company always regard corporate social responsibility as an important force in building a harmonious society. They also believe in paying full attention to human factors, exercising environmental protections and conservation, increasing employment, and helping build the community. Operations of the Plant will provide job opportunities especially to the local people. Poverty alleviation will be another benefit besides meeting power shortage in Pakistan.

5. Proposed Investment

Bid to KE was submitted by the Consortium, Indicative term sheets from prospective financiers were submitted by the Consortium as part of its bid submission. Details of net worth of the bidder were submitted by the Consortium as part of the pre-qualification criteria assessment. BER has been duly approved by NEPRA pursuant to the BER Approval.

6. Salient Features of the Facility

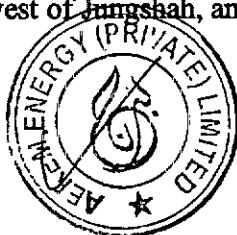
Project Information

The Project Company has conducted various studies to assess the feasibility of the Project. These studies *inter alia* included wind resource assessment, geo technical investigation, digital topographic map and initial environmental examination. The Feasibility Study report submitted to KE as part of the NEPRA Approved RFP Package.

Project Site

The site proposed for the implementation of the Project has been selected by considering the requirement mentioned under RFP Package.

The Facility is located near Goth Dhorj Jokhio, in District Thatta, Sindh, approximately 12 km northwest of Haleji Lake and 10 km west of Jungshah, and is approximately 14 km from the KE



Dhabeji grid station, The Site is located with over 1600 acres of land situated on top of an escarpment and several ridgelines

The GPS location of the Site is at approximately 24.80 N; 67.51 E.

LAND AREA

The Site is located near Goth Dhoi Jokhio, in District Thatta, Sindh, approximately twelve (12) km northwest of Haleji Lake and ten (10) km west of Jungshah, and is approximately fourteen (14) km from the KE Dhabeji grid station, The Site is located with over 1600 acres of land situated on top of an escarpment and several ridgelines.

The GPS location of the Site is approximately 24.80 N; 67.51 E.

The total land comprises WTG strips areas (1063.8 acres), bulk area for the solar plant (468.6 acres), and connecting lines area (141.8 acres) which approximately equals to a total of 1674 acres of land.

The land parcel allocated for the facility is indicated in Figure 1 below, showing the proposed locations of the PV Plant, Wind Plant land strips.

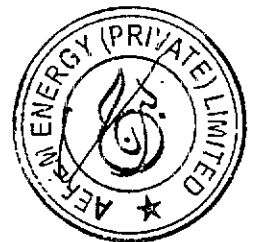


Figure 1: Site Land with Solar and Wind sections

SITE CONDITIONS

The landscape is predominantly flat, with some variations in elevation, particularly towards the southwestern and eastern portions. The terrain features gently sloping areas and a non-perennial

watercourse that flows from the south toward the northeastern corner of the site.

The topography of the area exhibits gradual elevation changes, with the highest point reaching approximately 255 m in the northern section and the lowest point dropping to 84 m in the southeastern zone. The land primarily consists of alluvial deposits, with sand and limestone formations shaping the subsurface. In certain areas, the landscape features rocky outcrops and scattered boulders, particularly near the northern and southern boundaries.

The hydrological characteristics of the site include a major seasonal stream that flows from the northern boundary, exits along the eastern side, and re-enters near the southeastern corner before draining out through the southern boundary. Multiple smaller tributaries are also present, contributing to temporary water accumulation in low-lying areas during the wet season. Due to the clayey nature of the soil, water drains rapidly, forming scattered ponds and wetlands that persist during high-rainfall periods. The annual precipitation is low (~210 mm), with high evaporation rates characteristic of an arid climate.

The soil composition is primarily very dense, fine-grained silty sand, with underlying weak to highly weathered limestone formations. The groundwater table was not encountered up to 30 m in depth, suggesting dry conditions for most of the year. The rocky terrain in some sections consists of fractured limestone, which can impact drainage and structural stability.

The vegetation cover consists of partially dense savannah trees and shrubs, with scattered grassland patches across the site. Larger open fields of grassland are prominent in the southeastern region, influenced by seasonal drainage patterns. The grass-covered areas help reduce erosion, though some erosion occurs along the floodplain of the non-perennial stream.

The Project site is exposed to very strong south westerly winds; wind data analysis of the area suggests that, 80% wind blows from the south west direction. The terrain of the area is flat with small change in altitude. The site is easily accessible through metallic roads. The ground is hard and rocky; the subsurface soil also includes clay and silt.

The proposed wind farms lies on a flat inland area with hard and rocky ground conditions. The site would be categorized as inland wind development as opposed to offshore/coastal wind project development (which is more difficult to develop due to tides and soft subsoil clay). The general terrain at the site can be described as simple and flat terrain. Internal access roads are the roads connecting the single wind turbine locations with each other and the external access roads and grid station would be constructed during the civil works of the wind farm.



Wind Farms Layout at Project Site

The Wind Farm consists of seven rectangular strips. Each strip varies in length, with the longest being approximately 4.0 km and the shortest about 750 m, and each strip is around 200 m wide. The PV Farm is located at the southernmost end of the entire complex. It is approximately 1.5 km long from north to south, and about 600 m to 1200 m wide from east to west, covering an area of approximately 1.3 km².

Topographical and Geological Conditions at Project Site

Topographical conditions:

The overall site area is relatively flat and open in the hilly areas, with local undulations, higher in the northwest and lower in the southeast. The bedrock is exposed on the surface, and the vegetation mainly consists of wild grass and shrubs. No trees are seen within the site.

Geological conditions:

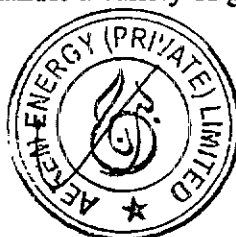
The Project site is located in Sindh, near Gharo in District Thatta, characterized by surficial deposits of alluvium and Pleistocene sedimentary rocks in the central axial belt. The bedrock in the site is generally outcropped. As the WTG is a high-rise structure, it has a high gravity center and should sustain high loads, large horizontal wind force and overturning moments. WTGs are designed to withstand these forces.

Hydrology:

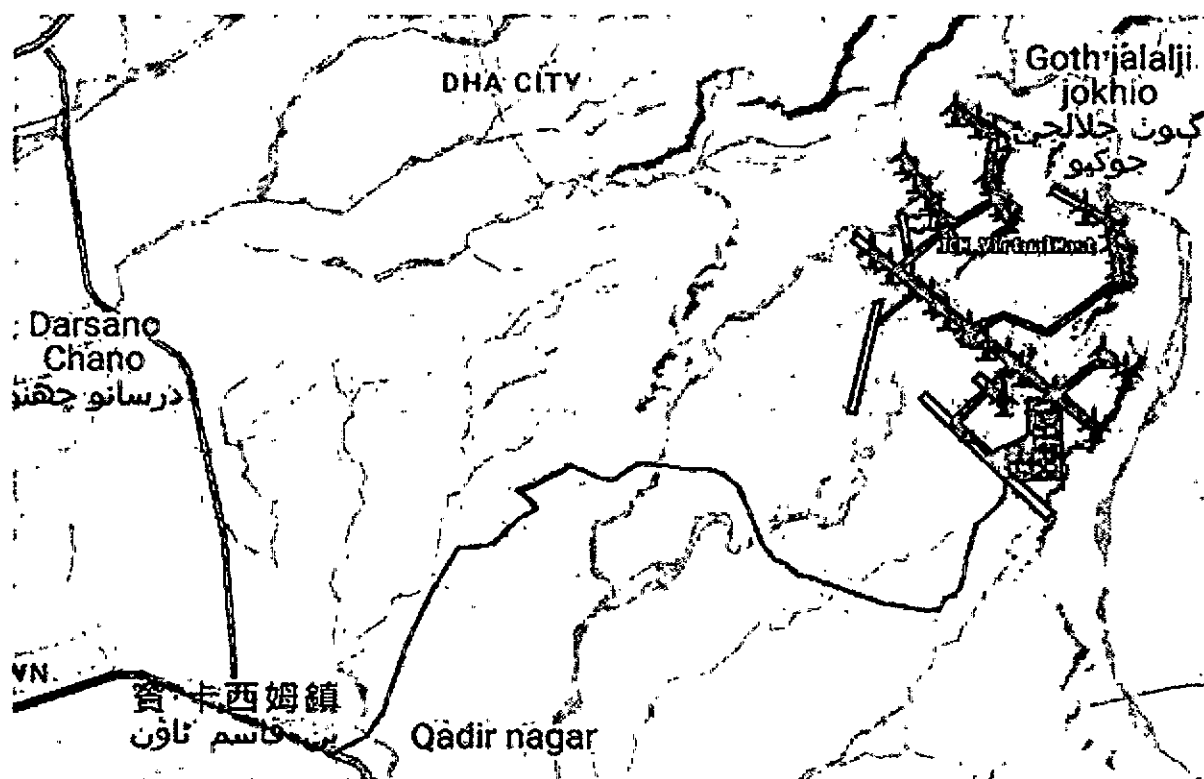
According to the regional hydrological data available, the Project site is in a dry area, where the water table is deeply underground, and the surface water and water in the shallow surface layers is weakly to slightly corrosive to the concrete and is corrosive to the rebars in the concrete which has been immersed in water for a long-time or alternatively in wet and dry conditions. Corrosion prevention measures will be adopted in the design and implementation of the wind farm. It is learned that both the wind turbine and photovoltaic site areas are located at relatively high positions on the hills, so flood control may not need to be considered.

Site Accessibility

The project is located in the east of Karachi, Sindh Province, approximately 50 km away from Karachi in a straight-line distance. For the equipment transportation route of this project, the preliminary plan is to start from Port Qasim, proceed via Qasim Port RD, then follow the N5 Highway, and reach to the transportation road for water pipeline near Dewan Cement Limited. Subsequently, a new access road approximately 4.2 km long needs to be built to reach the photovoltaic area of this project. Overall, the transportation conditions are favorable and can fully meet the transportation needs of wind turbines and electrical equipment. Port Qasim is located in the southeast of Karachi, Sindh Province. It is the second largest port in Pakistan and was established in 1973. It is one of the important industrial and trade hubs in Pakistan. The port facilities include multiple wharves, such as a container terminal, a bulk cargo terminal, a liquid chemical terminal, and a coal terminal, which can handle a variety of goods.



The port has a number of deep - water berths with a maximum permitted draft of 13 meters, making it suitable for large - sized cargo ships to berth. With the progress of the expansion project, it is expected that the maximum draft capacity will be increased to 16 meters, further expanding the range of service ship types. According to communication with logistics companies, wind turbine transportation can only be carried out through Port Qasim.



Telecommunication at project site

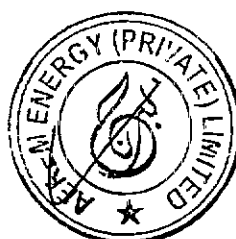
Close to the site, there is wire based telecommunication available in the village Jhimpir. Cellular phone suppliers, Warid Telecom Ltd, and Pakistan Telecommunication Mobile Ltd (Ufone) are offering services at the site. GPRS services are also available in the region.

For the SCADA system of the wind farm, a wire based telecommunication infrastructure has to be installed. Land line network will be arranged from the nearby village Jhimpir once civil work starts at the site.

Availability of Semi-Skilled and Skilled Labor

There is a dearth of wind project specific skilled labor in the area, however unskilled and semi-skilled labor is available in the area and the Project will be a source of employment for these individuals.

General Information



Prospectus

(i).	Name of Applicant/Company	Aerem Energy (Pvt.) Limited
(ii).	Registered/Business Office	Office # 202, 11-C, Al Murtaza Commercial Lane 2, DHA Phase 8, Karachi Pakistan
(iii).	Plant Location	At Dhabeji grid, District Thatta, Sindh
(iv).	Type of Generation Facility	Hybrid (Wind and Solar)

Hybrid Power Plant Capacity & Configuration

i	Installed Capacity of the Hybrid Project (MW)	Upto 240 MWac
ii	Installed Capacity of the Wind Facility	175 MW
iii	Wind Turbine Type, Make & Model	GOLDWIND GWH-182-6.2MW / Envision EN 182/6.25 MW
iv	Number of Wind Turbine Units/Size of each Unit (KW)	28 x 6200 KW / 28 x 6250 KW
v	Installed Capacity of the Solar Facility – PV Capacity	94 MWp(dc) / 61.6 MWac
vi	PV Panels Make & Model	JA Solar JM72D42 620 Wp / Longi Hi-MO 9 630/660 Wp
vii	Number of PV Modules/ Size of each Module	151,613 x 620 Wp / 149,207 x 630 Wp



WTG Technical Details

(i).	Wind Turbine Type, Make & Model	GOLDWIND GWH-182-6.2MW / Envision EN 182/6.25 MW
(ii).	Installed Capacity of the Wind Facility	175 MW
(iii).	Number of Wind Turbine Units/Size of each Unit (KW)	28 x 6200 KW / 28 x 6250 KW
(iv).	Number of blades	3
(v).	Rotor diameter	183.5 m / 181.1 m
(vi).	Hub Height	110 m / 105 m
(vii).	Generator Voltage	1380 V / 1140 V
(viii).	Cut-in wind speed	2.5 m/s / 3 m/s
(ix).	Rated Wind Speed	10.9 m/s / 12.5 m/s
(x).	Cut-out wind speed	24 m/s / 25 m/s

PV Module Technical Details

(i).	Model of Modules	JA Solar JM72D42 620 Wp / Longi Hi-MO 9 630/660 Wp
(ii).	Number of PV Modules/ Size of each Module	151,613 x 620 Wp / 149,207 x 630 Wp
(iii).	Dimensions of Each Module	2465×1134×35mm / 2382×1134×30mm
(iv).	Type of Cell	N-type TOPCon, Monocrystalline, Bifacial / N-type HPBC, Monocrystalline, Bifacial



(v).	Number of Cell in Each Module	144 / 144
(vi).	Module Area	~2.795 m ² / ~2.699 m ²
(vii).	Panel's Frame	Anodized Aluminum Alloy / Anodized Aluminum Alloy
(viii).	Weight of one module	34.6kg / 33.5kg
(ix).	Efficiency of the Module	22.2% / 23.1%
(x).	Maximum Power of each module (Pmax)	620Wp / 630Wp-660Wp
(xi).	Voltage @ (Pmax)	43.51 V / 44.16-44.85 V
(xii).	Current @ (Pmax)	14.25 A / 14.16-14.72 A
(xiii).	Open circuit voltage (Voc)	52.07 V / 53.3-54.0 V
(xiv).	Short circuit current (Isc)	15.11 A / 14.85-15.41 A

(a). Inverters	
Model of inverters	<u>Sungrow SG8800UD-MV-20</u> / <u>Huawei SUN2000-330KTL-H2</u>
Capacity	<u>8800 kVA</u> / <u>330 kVA</u>
Manufacturer	<u>Sungrow</u> / <u>Huawei</u>
Input operating voltage range	<u>938 V – 1500 V</u> / <u>500 V – 1500 V</u>
Total Power	<u>61600 kWac</u>
Efficiency of Inverter	<u>Max. 99.0%</u>



Prospectus

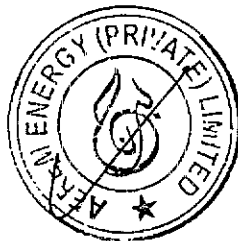
Max. Allowable input voltage	<u>1500 V</u>
Max. Current	<u>$8 \times 1435 \text{ A}$ (input current)</u> / <u>$6 \times 65 \text{ A}$ (per MPPT input)</u>
Max. Power Point Tracking range	<u>938 V – 1500 V</u> / <u>500 V – 1500 V</u>
Output Electrical system	3-phase, 20–35 kV (medium voltage) / 3-phase, 800 V
Rated Output Voltage	<u>20–35 kV (after MV transformer)</u> / <u>800 V</u>
Power Factor	adjustable from 0.8 leading to 0.8 lagging
Power Control	Active and Reactive Power Control
Rated Frequency	50/60 Hz

Expected Date of Financial Close:

In accordance with the timeline stipulated in the LOI to be issued by KE.

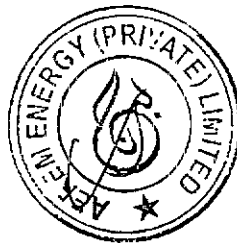
Expected COD:

18 months from the financial close.



ANNEXURE - B

CERTIFICATE OF INCORPORATION





A038121

SECURITIES AND EXCHANGE COMMISSION OF PAKISTAN

COMPANY REGISTRATION OFFICE, KARACHI

CERTIFICATE OF INCORPORATION

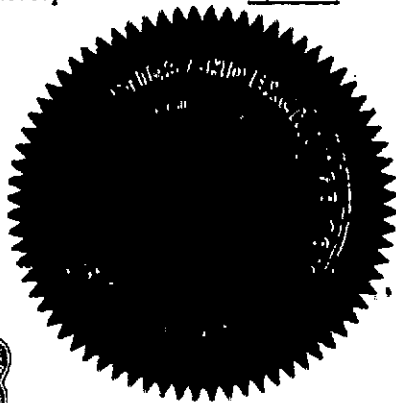
[Under section 16 of the Companies Act, 2017 (XIX of 2017)]

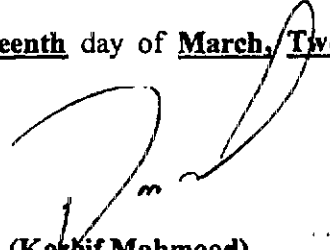
Corporate Universal Identification No. 0117486

I hereby certify that AEREM ENERGY (PRIVATE) LIMITED is this day incorporated under the Companies Act, 2017 (XIX of 2017) and that the company is limited by shares.

Given under my hand at Karachi this Sixteenth day of March, Two Thousand and Eighteen

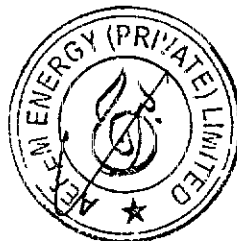
Incorporation fee Rs. 1,000/=




(Kashif Mahmood)
Additional Joint Registrar

ANNEXURE - C

MEMORANDUM AND ARTICLES OF ASSOCIATION

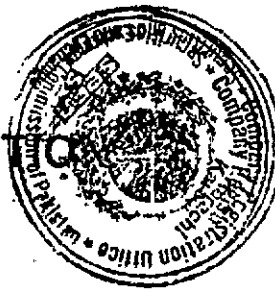


THE COMPANIES ACT, 2017(XIX of 2017)

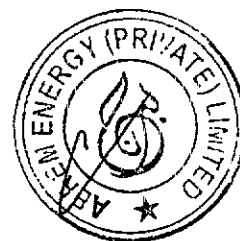
(PRIVATE COMPANY LIMITED BY SHARES)

MEMORANDUM

**OF
ASSOCIATION
OF**



AEREM ENERGY (PRIVATE) LIMITED



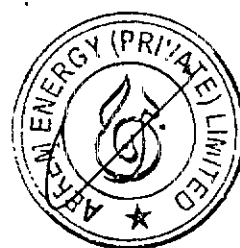
THE COMPANIES ACT, 2017(XIX of 2017)

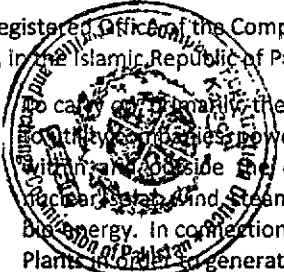
(PRIVATE COMPANY LIMITED BY SHARES)

MEMORANDUM OF ASSOCIATION

OF

"AEREM ENERGY (PRIVATE) LIMITED"



1. The name of the company is **AEREM ENERGY (PRIVATE) LIMITED**
2. The Registered Office of the Company shall be situated in the Province of Sindh, in the Islamic Republic of Pakistan.
3. (i) The company shall carry on primarily the business of power generation, distribution and selling power within and outside the country as independent power producer of thermal, hydel, nuclear, solar and wind, and/or any other alternative / renewable energy sources, and business. In connection with above to set up, operate and manage one or more Power Plants to generate, sell and supply electricity to industrial and other consumers, through distribution networks established, owned and operated by the company itself or by any other person, corporate body, autonomous or semi-autonomous corporation or authority or local body, and for that purpose to acquire land, whether freehold or leasehold, machinery and equipment, and construct, install, operate and maintain thereon power houses, civil and mechanical works and structures, grid stations, transmission towers, power lines, buildings, workshops and other facilities as may from time to time be necessary for the attainment of the objects of the company.

- (ii) Except for the businesses mentioned in sub-clause (iii) hereunder, the company may engage in all the lawful businesses and shall be authorized to take all necessary steps and actions in connection therewith and ancillary thereto.
- (iii) Notwithstanding anything contained in the foregoing sub-clauses of this clause nothing contained herein shall be construed as empowering the Company to undertake or indulge, directly or indirectly in the business of a Banking Company, Non-banking Finance

-

- Page 3 of 4

We, the several persons whose names and addresses are subscribed below, are desirous of being formed into a company, in pursuance of this MEMORANDUM OF ASSOCIATION, and we respectively agree to take the number of shares in the capital of the company as set opposite our respective names:

Name and surname (present & former) in full (in Block Letters)	NIC No. (in case of foreigner, Passport No)	Father's/ Husband's Name in full	Nationality (ies) with any former Nationality	Occupation	Usual residential address in full or the registered/ principal office address for a subscriber other than natural person	Number of shares taken by each subscriber (in figures and words)	Signatures
SALEEM UZ ZAMAN	42301-0948355-5	QAMAR UZ ZAMAN	PAKISTANI	Advocate	House No.F-52/2, Block 7 Clifton, Karachi	1 (One)	
SAAD ZAMAN	42301-0948355-5	QAMAR UZ ZAMAN	PAKISTANI	Business Executive	House No.F-52/2, Block 7 Clifton, Karachi	1 (One)	
Total number of shares taken (in figures and words)						2 (Two)	

Dated the 6th day of March, 2018

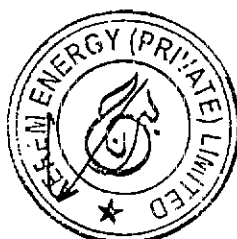
Witness to above signatures: (For the documents submitted in physical form)

Signature	
Full Name (in Block Letters)	
Father's/ Husband's name	
Nationality	
Occupation	
NIC No.	
Usual residential address	

Certified to be true Copy

19/03/2018
Additional Joint Registrar of Companies

Page 4 of 4



FREE OF COST COPY

THE COMPANIES ACT, 2017 (XIX of 2017)

(Private Company Limited by Shares)

ARTICLES OF ASSOCIATION

OF

AEREM ENERGY (PRIVATE) LIMITED

PRELIMINARY

1. (1) In these regulations-

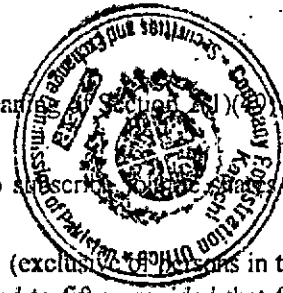
- (a) "section" means section of the Act;
- (b) "the Act" means the Companies Act, 2017; and
- (c) "the seal" means the common seal or official seal of the company as the case may be.

(2) Unless the context otherwise requires, words or expressions contained in these regulations shall have the same meaning as in this Act; and words importing the singular shall include the plural, and *vice versa*, and words importing the masculine gender shall include feminine, and words importing persons shall include bodies corporate.

PRIVATE COMPANY

2. The Company is a "Private Company" within the meaning of section 2(68) of the Act and accordingly:

- (1) No invitation shall be made to the public to subscribe for shares or debentures of the Company.
- (2) The number of the members of the Company (excluding persons in the employment of the Company), shall be limited to fifty, provided that for the purpose of this provision, where two or more persons hold one or more shares in the company jointly, they shall be treated as single member; and
- (3) The right to transfer shares of the Company is restricted in the manner and to the extent herein appearing.

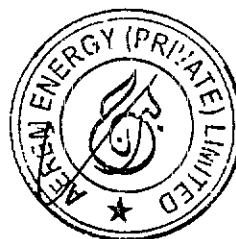


BUSINESS

3. The directors shall have regard to the restrictions on the commencement of business imposed by section 19 if, and so far as, those restrictions are binding upon the company.

SHARES

4. In case of shares in the physical form, every person whose name is entered as a member in the register of members shall, without payment, be entitled to receive, within thirty days after allotment or within fifteen days of the application for registration of transfer, a certificate under the seal specifying the share or shares held by him and the amount paid up thereon:



Provided that if the shares are in book entry form or in case of conversion of physical shares and other transferable securities into book-entry form, the company shall, within ten days after an application is made for the registration of the transfer of any shares or other securities to a central depository, register such transfer in the name of the central depository.

5. The company shall not be bound to issue more than one certificate in respect of a share or shares in the physical form, held jointly by several persons and delivery of a certificate for a share to one of several joint holders shall be sufficient delivery to all.

6. If a share certificate in physical form is defaced, lost or destroyed, it may be renewed on payment of such fee, if any, not exceeding one hundred rupees, and on such terms, if any, as to evidence and indemnity and payment of expenses incurred by the company in investigating title as the directors think fit.

7. Except to the extent and in the manner allowed by section 86, no part of the funds of the company shall be employed in the purchase of, or in loans upon the security of, the company's shares.

TRANSFER AND TRANSMISSION OF SHARES

8. The instrument of transfer of any share in physical form in the company shall be executed both by the transferor and transferee, and the transferor shall be deemed to remain holder of the share until the name of the transferee is entered in the register of members in respect thereof.

9. Shares in physical form in the company shall be transferred in the following form, or in any usual or common form which the directors shall approve: -

Form for Transfer of Shares (First Schedule to the Companies Act, 2017)

I, ... r/o..... (hereinafter called "the transferor") in
consideration of rupees paid to me by..... s/o
..... (hereinafter called "the transferee"), do hereby transfer to the
said the share (or shares) with distinctive numbers from
..... inclusive, in the..... Limited, to hold unto the said
transferee, his executors, administrators and assigns, subject to the several conditions on which I
held the same at the time of the execution hereof, and I, the said transferee, do hereby agree to
take the said share (or shares) subject to the conditions aforesaid.
As witness our hands this..... day of..... 20....

Signature

Transferor

Full Name, Father's / Husband's Name

CNIC Number (in case of foreigner,

Passport Number)

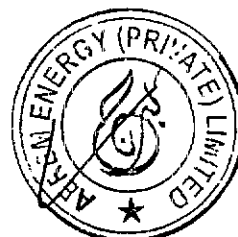
Nationality

Occupation and usual Residential Address

Witness 1:

Signature.....date

Name, CNIC Number and Full Address



Signature

Transferee

Full Name, Father's / Husband's Name

CNIC Number (in case of foreigner,

Passport Number)

Nationality

Occupation and usual Residential Address

Cell number

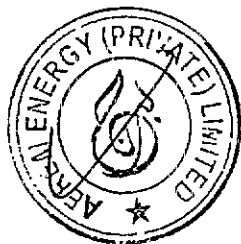
Landline number, if any

Email address

Witness 2:

Signature.....date

Name, CNIC Number and Full Address



Bank Account Details of Transferee for Payment of Cash Dividend
(Mandatory in case of a listed company or optional for any other company)

It is requested that all my cash dividend amounts declared by the company, may be credited into the following bank account:

Title of Bank Account	
Bank Account Number	
Bank's Name	
Branch Name and Address	

It is stated that the above mentioned information is correct and that I will intimate the changes in the above-mentioned information to the company and the concerned Share Registrar as soon as these occur.

.....
Signature of the Transferee(s)

10. (1) Subject to the restrictions contained in regulation 10 and 11, the directors shall not refuse to transfer any share unless the transfer deed is defective or invalid. The directors may also suspend the registration of transfers during the ten days immediately preceding a general meeting or prior to the determination of entitlement or rights of the shareholders by giving seven days' previous notice in the manner provided in the Act. The directors may, in case of shares in physical form, decline to recognise any instrument of transfer unless—

- a) a fee not exceeding fifty rupees as may be determined by the directors is paid to the company in respect thereof; and
- b) the duly stamped instrument of transfer is accompanied by the certificate of the shares to which it relates, and such other evidence as the directors may reasonably require to show the right of the transferor to make the transfer.

(2) If the directors refuse to register a transfer of shares, they shall within fifteen days after the date on which the transfer deed was lodged with the company send to the transferee and the transferor notice of the refusal indicating the defect or invalidity to the transferee, who shall, after removal of such defect or invalidity be entitled to re-lodge the transfer deed with the company.

Provided that the company shall, where the transferee is a central depository the refusal shall be conveyed within five days from the date on which the instrument of transfer was lodged with it notify the defect or invalidity to the transferee who shall, after the removal of such defect or invalidity, be entitled to re-lodge the transfer deed with the company.

TRANSMISSION OF SHARES

11. The executors, administrators, heirs, or nominees, as the case may be, of a deceased sole holder of a share shall be the only persons recognised by the company to deal with the share in accordance with the law. In the case of a share registered in the names of two or more holders, the survivors or survivor, or the executors or administrators of the deceased survivor, shall be the



only persons recognised by the company to deal with the share in accordance with the law.

12. The shares or other securities of a deceased member shall be transferred on application duly supported by succession certificate or by lawful award, as the case may be, in favour of the successors to the extent of their interests and their names shall be entered to the register of members.

13. A person may on acquiring interest in a company as member, represented by shares, at any time after acquisition of such interest deposit with the company a nomination conferring on a person, being the relatives of the member, namely, a spouse, father, mother, brother, sister and son or daughter, the right to protect the interest of the legal heirs in the shares of the deceased in the event of his death, as a trustee and to facilitate the transfer of shares to the legal heirs of the deceased subject to succession to be determined under the Islamic law of inheritance and in case of non-Muslim members, as per their respective law.

14. The person nominated under regulation 12 shall, after the death of the member, be deemed as a member of company till the shares are transferred to the legal heirs and if the deceased was a director of the company, not being a listed company, the nominee shall also act as director of the company to protect the interest of the legal heirs.

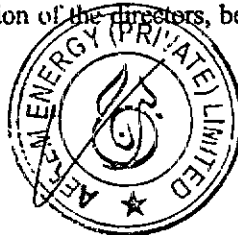
15. A person to be deemed as a member under regulation 12 shall, by reason of the death or insolvency of the holder shall be entitled to the same dividends and other advantages to which he would be entitled if he were the registered holder of the shares and exercise any right conferred by membership in relation to meetings of the company.

ALTERATION OF CAPITAL

16. The company may, by special resolution-

- (a) increase its authorised capital by such amount as it thinks expedient;
- (b) consolidate and divide the whole or any part of its share capital into shares of larger amount than its existing shares;
- (c) sub-divide its shares, or any of them, into shares of smaller amount than is fixed by the memorandum;
- (d) cancel shares which, at the date of the passing of the resolution in that behalf, have not been taken or agreed to be taken by any person, and diminish the amount of its share capital by the amount of the share so cancelled.

17. Subject to the provisions of the Act, all new shares shall at the first instance be offered to such persons as at the date of the offer are entitled to such issue in proportion, as nearly as the circumstances admit, to the amount of the existing shares to which they are entitled. The offer shall be made by letter of offer specifying the number of shares offered, and limiting a time within which the offer, if not accepted, will deem to be declined, and after the expiration of that time, or on the receipt of an intimation from the person to whom the offer is made that he declines to accept the shares offered, the directors may dispose of the same in such manner as they think most beneficial to the company. The directors may likewise so dispose of any new shares which (by reason of the ratio which the new shares bear to shares held by persons entitled to an offer of new shares) cannot, in the opinion of the directors, be conveniently offered under this regulation.



18. The new shares shall be subject to the same provisions with reference to transfer, transmission and otherwise as the shares in the original share capital.

19. The company may, by special resolution-

(a) consolidate and divide its share capital into shares of larger amount than its existing shares;

(b) sub-divide its existing shares or any of them into shares of smaller amount than is fixed by the memorandum of association, subject, nevertheless, to the provisions of section 85;

(c) cancel any shares which, at the date of the passing of the resolution, have not been taken or agreed to be taken by any person.

20. The company may, by special resolution, reduce its share capital in any manner and with, and subject to confirmation by the Court and any incident authorised and consent required, by law.

GENERAL MEETINGS

21. The statutory general meeting of the company shall be held within the period required by section 131.

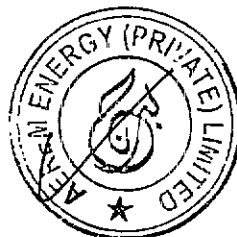
22. A general meeting, to be called annual general meeting, shall be held, in accordance with the provisions of section 132, within sixteen months from the date of incorporation of the company and thereafter once at least in every year within a period of one hundred and twenty days following the close of its financial year.

23. All general meetings of a company other than the statutory meeting or an annual general meeting mentioned in sections 131 and 132 respectively shall be called extraordinary general meetings.

24. The directors or whoever they think fit, call an extraordinary general meeting, and extraordinary general meetings shall also be called on such requisition, or in default, may be called by such requisitionists, as provided by section 133. If at any time there are not within Pakistan sufficient directors capable of acting to form a quorum, any director of the company may call an extraordinary general meeting in the same manner as nearly as possible as that in which meetings may be called by the directors.

25. The company may provide video-link facility to its members for attending general meeting at places other than the town in which general meeting is taking place after considering the geographical dispersal of its members:

Provided that in case of listed companies if the members holding ten percent of the total paid up capital or such other percentage of the paid up capital as may be specified, are resident in any other city, the company shall provide the facility of video-link to such members for attending annual general meeting of the company, if so required by such members in writing to the company at least seven days before the date of the meeting.



NOTICE AND PROCEEDINGS OF GENERAL MEETINGS

26. Twenty-one days' notice at the least (exclusive of the day on which the notice is served or deemed to be served, but inclusive of the day for which notice is given) specifying the place, the day and the hour of meeting and, in case of special business, the general nature of that business, shall be given in manner provided by the Act for the general meeting, to such persons as are, under the Act or the regulations of the company, entitled to receive such notice from the company; but the accidental omission to give notice to, or the non-receipt of notice by, any member shall not invalidate the proceedings at any general meeting.

27. All the business transacted at a general meeting shall be deemed special other than the business stated in sub-section (2) of section 134 namely; the consideration of financial statements and the reports of the board and auditors, the declaration of any dividend, the election and appointment of directors in place of those retiring, and the appointment of the auditors and fixing of their remuneration.

28. No business shall be transacted at any general meeting unless a quorum of members is present at that time when the meeting proceeds to business. The quorum of the general meeting shall be-

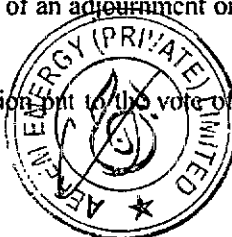
- (a) in the case of a public listed company, not less than ten members present personally, or through video-link who represent not less than twenty-five percent of the total voting power, either of their own account or as proxies;
- (b) in the case of any other company having share capital, two members present personally, or through video-link who represent not less than twenty-five percent of the total voting power, either of their own account or as proxies.

29. If within half an hour from the time appointed for the meeting a quorum is not present, the meeting, if called upon the requisition of members, shall be dissolved; in any other case, it shall stand adjourned to the same day in the next week at the same time and place, and, if at the adjourned meeting a quorum is not present within half an hour from the time appointed for the meeting, the members present, being not less than two, shall be a quorum.

30. The chairman of the board of directors, if any, shall preside as chairman at every general meeting of the company, but if there is no such chairman, or if at any meeting he is not present within fifteen minutes after the time appointed for the meeting, or is unwilling to act as chairman, any one of the directors present may be elected to be chairman, and if none of the directors is present, or willing to act as chairman, the members present shall choose one of their number to be chairman.

31. The chairman may, with the consent of any meeting at which a quorum is present (and shall if so directed by the meeting), adjourn the meeting from time to time but no business shall be transacted at any adjourned meeting other than the business left unfinished at the meeting from which the adjournment took place. When a meeting is adjourned for fifteen days or more, notice of the adjourned meeting shall be given as in the case of an original meeting. Save as aforesaid, it shall not be necessary to give any notice of an adjournment or of the business to be transacted at an adjourned meeting.

32. (1) At any general meeting a resolution put to the vote of the meeting shall be decided on a



show of hands unless a poll is (before or on the declaration of the result of the show of hands) demanded. Unless a poll is so demanded, a declaration by the chairman that a resolution has, on a show of hands, been carried, or carried unanimously, or by a particular majority, or lost, and an entry to that effect in the book of the proceedings of the company shall be conclusive evidence of the fact, without proof of the number or proportion of the votes recorded in favour of, or against, that resolution.

(2) At any general meeting, the company shall transact such businesses as may be notified by the Commission, only through postal ballot.

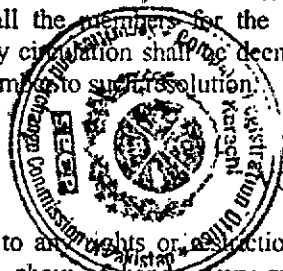
33. A poll may be demanded only in accordance with the provisions of section 143.

34. If a poll is duly demanded, it shall be taken in accordance with the manner laid down in sections 144 and 145 and the result of the poll shall be deemed to be the resolution of the meeting at which the poll was demanded.

35. A poll demanded on the election of chairman or on a question of adjournment shall be taken at once.

36. In the case of an equality of votes, whether on a show of hands or on a poll, the chairman of the meeting at which the show of hands takes place, or at which the poll is demanded, shall have and exercise a second or casting vote.

37. Except for the businesses specified under sub-section (2) of section 134 to be conducted in the annual general meeting, the members of a private company or a public unlisted company (having not more than fifty members), may pass a resolution (ordinary or special) by circulation signed by all the members for the time being entitled to receive notice of a meeting. The resolution by circulation shall be deemed to be passed on the date of signing by the last of the signatory members to such resolution.



NOTES OF MEMBERS

38. Subject to any rights or restrictions for the time being attached to any class or classes of shares, on a show of hands every member present in person shall have one vote except for election of directors in which case the provisions of section 159 shall apply. On a poll every member shall have voting rights as laid down in section 134.

39. In case of joint-holders, the vote of the senior who tenders a vote, whether in person or by proxy or through video-link shall be accepted to the exclusion of the votes of the other joint-holders; and for this purpose seniority shall be determined by the order in which the names stand in the register of members.

40. A member of unsound mind, or in respect of whom an order has been made by any court having jurisdiction in lunacy, may vote, whether on show of hands or on a poll or through video link, by his committee or other legal guardian, and any such committee or guardian may, on a poll, vote by proxy.

41. On a poll votes may be given either personally or through video-link, by proxy or through postal ballot:

Provided that nobody corporate shall vote by proxy as a resolution of its directors



in accordance with the provisions of section 138 is in force.

42. (1) The instrument appointing a proxy shall be in writing under the hand of the appointer or of his attorney duly authorised in writing.

(2) The instrument appointing a proxy and the power-of-attorney or other authority (if any) under which it is signed, or a notarially certified copy of that power or authority, shall be deposited at the registered office of the company not less than forty-eight hours before the time for holding the meeting at which the person named in the instrument proposes to vote and in default the instrument of proxy shall not be treated as valid.

43. An instrument appointing a proxy may be in the following form, or a form as near thereto as may be:

INSTRUMENT OF PROXY

..... Limited

"I s/o r/o being a member of the Limited, hereby appoint s/o r/o as my proxy to attend and vote on my behalf at the (statutory, annual, extraordinary, as the case may be) general meeting of the company to be held on the day of, 20..... and at any adjournment thereof."

44. A vote given in accordance with the terms of an instrument of proxy shall be valid notwithstanding the previous death or insanity of the principal or revocation of the proxy or of the authority under which the proxy was executed, or the transfer of the share in respect of which the proxy is given, provided that no intimation in writing of such death, insanity, revocation or transfer as aforesaid shall have been received by the company at the office before the commencement of the meeting or adjourned meeting at which the proxy is used.

DIRECTORS

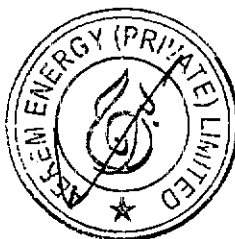
45. The following subscribers of the memorandum of association shall be the first directors of the company, so, however, that the number of directors shall not in any case be less than that specified in section 154 and they shall hold office until the election of directors in the first annual general meeting:

1. SALEEM UZ ZAMAN

2. SAAD UZ ZAMAN

46. The remuneration of the directors shall from time to time be determined by the company in general meeting subject to the provisions of the Act.

47. Save as provided in section 153, no person shall be appointed as a director unless he is a member of the company.



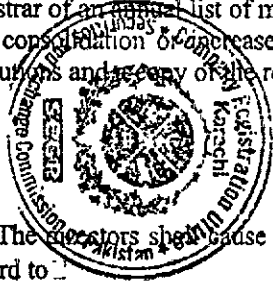
POWERS AND DUTIES OF DIRECTORS

48. The business of the company shall be managed by the directors, who may pay all expenses incurred in promoting and registering the company, and may exercise all such powers of the company as are not by the Act or any statutory modification thereof for the time being in force, or by these regulations, required to be exercised by the company in general meeting, subject nevertheless to the provisions of the Act or to any of these regulations, and such regulations being not inconsistent with the aforesaid provisions, as may be prescribed by the company in general meeting but no regulation made by the company in general meeting shall invalidate any prior act of the directors which would have been valid if that regulation had not been made.

49. The directors shall appoint a chief executive in accordance with the provisions of sections 186 and 187.

50. The amount for the time being remaining undischarged of moneys borrowed or raised by the directors for the purposes of the company (otherwise than by the issue of share capital) shall not at any time, without the sanction of the company in general meeting, exceed the issued share capital of the company.

51. The directors shall duly comply with the provisions of the Act, or any statutory modification thereof for the time being in force, and in particular with the provisions in regard to the registration of the particulars of mortgages, charges and pledge affecting the property of the company or created by it, to the keeping of a register of the directors, and to the sending to the registrar of an annual list of members, and a summary of particulars relating thereto and notice of any consolidation or increase of share capital, or sub-division of shares, and copies of special resolutions and a copy of the register of directors and notifications of any changes therein.

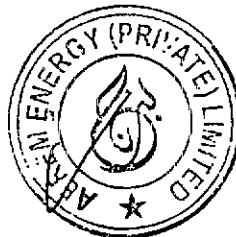


MINUTE BOOKS

52. The directors shall cause records to be kept and minutes to be made in book or books with regard to

- (a) all resolutions and proceedings of general meeting(s) and the meeting(s) of directors and Committee(s) of directors, and every member present at any general meeting and every director present at any meeting of directors or Committee of directors shall put his signature in a book to be kept for that purpose;
- (b) recording the names of the persons present at each meeting of the directors and of any committee of the directors, and the general meeting; and
- (c) all orders made by the directors and Committee(s) of directors;

Provided that all records related to proceedings through video-link shall be maintained in accordance with the relevant regulations specified by the Commission which shall be appropriately rendered into writing as part of the minute books according to the said regulations.



THE SEAL

53. The directors shall provide for the safe custody of the seal and the seal shall not be affixed to any instrument except by the authority of a resolution of the board of directors or by a committee of directors authorized in that behalf by the directors and in the presence of at least two directors and of the secretary or such other person as the directors may appoint for the purpose; and those two directors and secretary or other person as aforesaid shall sign every instrument to which the seal of the company is so affixed in their presence.

DISQUALIFICATION OF DIRECTORS

54. No person shall become the director of a company if he suffers from any of the disabilities or disqualifications mentioned in section 153 or disqualified or debarred from holding such office under any of the provisions of the Act as the case may be and, if already a director, shall cease to hold such office from the date he so becomes disqualified or disabled:

Provided, however, that no director shall vacate his office by reason only of his being a member of any company which has entered into contracts with, or done any work for, the company of which he is director, but such director shall not vote in respect of any such contract or work, and if he does so vote, his vote shall not be counted.

PROCEEDINGS OF DIRECTORS

55. The directors may meet together for the dispatch of business and otherwise regulate their meetings, as they think fit. A director may, and the secretary on the requisition of a director shall, at any time, summon a meeting of directors. Notice sent to a director through email whether such director is in Pakistan or outside Pakistan shall be a valid notice.

56. The directors may elect a chairman of their meetings and determine the period for which he is to hold office; but, if no such chairman is elected, or if at any meeting the chairman is not present within ten minutes after the time appointed for holding the same or is unwilling to act as chairman, the directors present may choose one of their number to be chairman of the meeting.

57. At least one-third ($\frac{1}{3}$ rd) of the total number of directors or two (2) directors whichever is higher, for the time being of the company, present personally or through video-link, shall constitute a quorum.

58. Save as otherwise expressly provided in the Act, every question at meetings of the board shall be determined by a majority of votes of the directors present in person or through video-link, each director having one vote. In case of an equality of votes or tie, the chairman shall have a casting vote in addition to his original vote as a director.

59. The directors may delegate any of their powers not required to be exercised in their meeting to committees consisting of such member or members of their body as they think fit; any committee so formed shall, in the exercise of the powers so delegated, conform to any restrictions that may be imposed on them by the directors.

60. (1) A committee may elect a chairman of its meetings; but, if no such chairman is elected, or if at any meeting the chairman is not present within ten minutes after the time appointed for holding the same or is unwilling to act as chairman, the members present may choose one of



their number to be chairman of the meeting.

(2) A committee may meet and adjourn as it thinks proper. Questions arising at any meeting shall be determined by a majority of votes of the members present. In case of an equality of votes, the chairman shall have and exercise a second or casting vote.

61. All acts done by any meeting of the directors or of a committee of directors, or by any person acting as a director, shall, notwithstanding that it be afterwards discovered that there was some defect in the appointment of any such directors or persons acting as aforesaid, or that they or any of them were disqualified, be as valid as if every such person had been duly appointed and was qualified to be a director.

62. A copy of the draft minutes of meeting of the board of directors shall be furnished to every director within seven working days of the date of meeting.

63. A resolution in writing signed by all the directors for the time being entitled to receive notice of a meeting of the directors shall be as valid and effectual as if it had been passed at a meeting of the directors duly convened and held.

FILLING OF VACANCIES

64. At the first annual general meeting of the company, all the directors shall stand retired from office, and directors shall be elected in their place in accordance with section 159 for a term of three years.

65. A retiring director shall be eligible for re-election.

66. The directors shall comply with the provisions of sections 154 to 159 and sections 161, 162 and 167 relating to the election of directors and matters ancillary thereto.

67. Any casual vacancy occurring on the board of directors may be filled up by the directors, but the person so chosen shall be subject to retirement at the same time as if he had become a director on the day on which the director in whose place he is chosen was last elected as director.

68. The company may remove a director but only in accordance with the provisions of the Act.

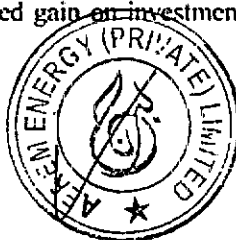
DIVIDENDS AND RESERVE

69. The company in general meeting may declare dividends but no dividend shall exceed the amount recommended by the directors.

70. The directors may from time to time pay to the members such interim dividends as appear to the directors to be justified by the profits of the company.

71. Any dividend may be paid by a company either in cash or in kind only out of its profits. The payment of dividend in kind shall only be in the shape of shares of listed company held by the distributing company.

72. Dividend shall not be paid out of unrealized gain on investment property credited to profit and loss account.



73. Subject to the rights of persons (if any) entitled to shares with special rights as to dividends, all dividends shall be declared and paid according to the amounts paid on the shares.

74. (1) The directors may, before recommending any dividend, set aside out of the profits of the company such sums as they think proper as a reserve or reserves which shall, at the discretion of the directors, be applicable for meeting contingencies, or for equalizing dividends, or for any other purpose to which the profits of the company may be properly applied, and pending such application may, at the like discretion, either be employed in the business of company or be invested in such investments (other than shares of the company) as the directors may, subject to the provisions of the Act, from time to time think fit.

(2) The directors may carry forward any profits which they may think prudent not to distribute, without setting them aside as a reserve.

75. If several persons are registered as joint-holders of any share, any one of them may give effectual receipt for any dividend payable on the share.

76. (1) Notice of any dividend that may have been declared shall be given in manner hereinafter mentioned to the persons entitled to share therein but, in the case of a public company, the company may give such notice by advertisement in a newspaper circulating in the Province in which the registered office of the company is situate.

(2) Any dividend declared by the company shall be paid to its registered shareholders or to their order. The dividend payable in cash may be paid by cheque or warrant or in any electronic mode to the shareholders entitled to the payment of the dividend, as per their direction.

(3) In case of a listed company, any dividend payable in cash shall only be paid through electronic mode directly into the bank account designated by the entitled shareholders.

77. The dividend shall be paid within the period laid down under the Act.

ACCOUNTS

78. The directors shall cause to be kept proper books of account as required under section 220.

79. The books of account shall be kept at the registered office of the company or at such other place as the directors shall think fit and shall be open to inspection by the directors during business hours.

80. The directors shall from time to time determine whether and to what extent and at what time and places and under what conditions or regulations the accounts and books or papers of the company or any of them shall be open to the inspection of members not being directors, and no member (not being a director) shall have any right of inspecting any account and book or papers of the company except as conferred by law or authorised by the directors or by the company in general meeting.

81. The directors shall as required by sections 223 and 226 cause to be prepared and to be laid before the company in general meeting the financial statements duly audited and reports as are referred to in those sections.



82. The financial statements and other reports referred to in regulation 80 shall be made out in every year and laid before the company in the annual general meeting in accordance with sections 132 and 223.

83. A copy of the financial statements and reports of directors and auditors shall, at least twenty-one days preceding the meeting, be sent to the persons entitled to receive notices of general meetings in the manner in which notices are to be given hereunder.

84. The directors shall in all respect comply with the provisions of sections 220 to 227.

85. Auditors shall be appointed and their duties regulated in accordance with sections 246 to 249.

NOTICES

86. (1) A notice may be given by the company to any member to his registered address or if he has no registered address in Pakistan to the address, if any, supplied by him to the company for the giving of notices to him against an acknowledgement or by post or courier service or through electronic means or in any other manner as may be specified by the Commission.

(2) Where a notice is sent by post, service of the notice shall be deemed to be effected by properly addressing, prepaying and posting a letter containing the notice and, unless the contrary is proved, to have been effected at the time at which the letter will be delivered in the ordinary course of post.

87. A notice may be given by the company to the joint-holders of a share by giving the notice to the joint-holder named first in the register in respect of the share.

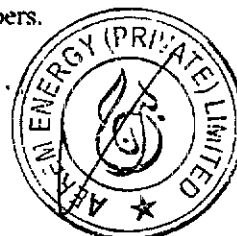
88. A notice may be given by the company to the person entitled to a share in consequence of the death or insolvency of a member in the manner provided under regulation 85 addressed to them by name or by the title of representatives of the deceased, or assignees of the insolvent, or by any like description, at the address, supplied for the purpose by the person claiming to be so entitled.

89. Notice of every general meeting shall be given in the manner hereinbefore authorised to (a) every member of the company and also to (b) every person entitled to a share in consequence of the death or insolvency of a member, who but for his death or insolvency would be entitled to receive notice of the meeting, and (c) to the auditors of the company for the time being and every person who is entitled to receive notice of general meetings.

WINDING UP

90. (1) In the case of members' voluntary winding up, with the sanction of a special resolution of the company, and, in the case of creditors' voluntary winding up, of a meeting of the creditors, the liquidator shall exercise any of the powers given by sub-section (1) of section 337 of the Act to a liquidator in a winding up by the Court including *inter-alia* divide amongst the members, in specie or kind, the whole or any part of the assets of the company, whether they consist of property of the same kind or not.

(2) For the purpose aforesaid, the liquidator may set such value as he deems fair upon any property to be divided as aforesaid and may determine how such division shall be carried out as between the members or different classes of members.



INDEMNITY

91. Every officer or agent for the time being of the company may be indemnified out of the assets of the company against any liability incurred by him in defending any proceedings, whether civil or criminal, arising out of his dealings in relation to the affairs of the company, except those brought by the company against him, in which judgment is given in his favour or in which he is acquitted, or in connection with any application under section 492 in which relief is granted to him by the Court.

We, the several persons whose names and addresses are subscribed below, are desirous of being formed into a company, in pursuance of these ARTICLES OF ASSOCIATION, and we respectively agree to take the number of shares in the capital of the company set opposite our respective names:

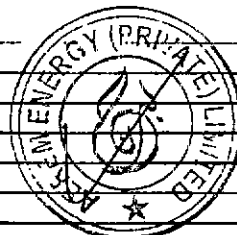
Name and surname (present & former) in full (in Block Letters)	NIC No. (in case of foreigner, Passport No)	Father's Husband's Name in full	Nationality (ies) with any former Nationality	Occupation	Usual residential address in full or the registered/ principal office address for a subscriber other than national person in Block Letters	Number of shares taken by each subscriber (in figures and words)	Signatures
SALEEM UZ ZAMAN	42301-0948355-5	QAMAR UZ ZAMAN	PAKISTANI	Occupation	Karachi	1 (One)	
SAAD UZ ZAMAN	42301-8489997-7	QAMAR UZ ZAMAN	PAKISTANI	Business Executive	House No.F-52/2, Block 7 Clifton, Karachi	1 (One)	
Total number of shares taken (in figures and words)						2 (Two)	

Dated the 6th day of March, 2018

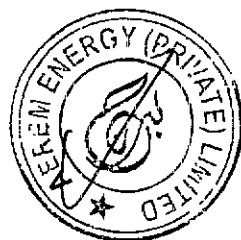
Witness to above signatures: (For the documents submitted in physical form)

Signature	
Full Name (in Block Letters)	
Father's/ Husband's name	
Nationality	
Occupation	
NIC No.	
Usual residential address	

Certified to be true Copy
 19/03/2018
 Assistant Joint Registrar of Companies

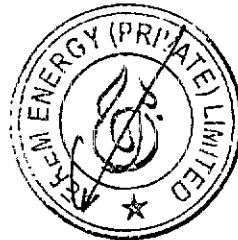


FREE UP



ANNEXURE - D

ANNUAL REPORTS OF THE COMPANY



Ref: No. AEPL/NEPRA/02/2025

Date: April 22, 2025

The Registrar
National Electric Power Regulatory Authority (NEPRA)
NEPRA Tower, Attaturk Avenue (East)
Sector G-5/1, Islamabad.

Subject: Submission of Annual Audited Financial Statements for the year ended June 30, 2019 and update on subsequent years audits

Dear Sir,

Please find enclosed herewith a copy of the annual audited financial statements for the year ended June 30, 2019 for your kind information and record.

We would also like to inform you that the audits for the subsequent years are currently in progress. The latest audited financial statements will be submitted to your esteemed office immediately upon issuance by our external auditors.

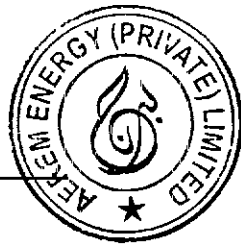
We appreciate your understanding and cooperation in this regard.

Yours sincerely,

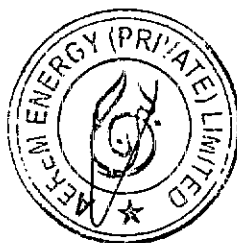
For and on behalf of **Aerem Energy (Private) Limited**



Company Secretary



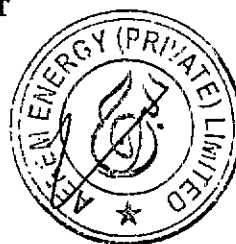
**AEREM ENERGY (PVT) LTD
FINANCIAL STATEMENTS
FOR THE YEAR ENDED
JUNE 30, 2019**



INDEPENDENT AUDITOR'S REPORT

To the members of AEREM ENERGY (PRIVATE) LIMITED

Report on the Audit of the Financial Statements



Opinion

We have audited the annexed financial statement of AEREM ENERGY (PRIVATE) LIMITED, which comprise the statement of financial position as at June 30, 2019 and the statement of profit or loss and other comprehensive income, the statement of changes in equity, the statement of cash flow for the Year then ended, and notes to the financial statements, including a summary of significant accounting policies and other explanatory information, and we state that we have obtained all the information and explanations which, to the best of our knowledge and belief, were necessary for the purposes of the audit.

In our opinion and to the best of our information and according to the explanations given to us, the statement of financial position, statement of profit or loss and other comprehensive income, the statement of changes in equity and statement of cash flow together with the notes forming part thereof conform with the accounting and reporting standards as applicable in Pakistan and give the information required by the Companies Act, 2017, in the manner so required and respectively give a true and fair view of the state of the Company's affairs as at June 30, 2019 and of the loss for the Year then ended; and other comprehensive income, the changes in equity and its cash flows for the Year then ended.

Basis for Opinion

We conducted our audit in accordance with International Standards on Auditing (ISAs) as applicable in Pakistan. Our responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Statements* section of our report. We are independent of the Company in accordance with International Ethics Standards Board for Accountants' Code of Ethics for Professional Accountants as adopted by the Institute of Chartered Accountants of Pakistan / Institute of Cost and management Accountants (the Code) and we have fulfilled our other ethical responsibilities in accordance with the Code. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Responsibilities of Management and Board of Directors for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with the accounting and reporting standards as applicable in Pakistan and the requirement of Companies Act, 2017 and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing the Company's ability to continue as a going concern, disclosing as applicable, matters related to going concern and using the going

concern basis of accounting unless management either intends to liquidate the Company or to cease operation, or has no realistic alternative but to do so.

Board of directors are responsible for overseeing the Company's financial reporting process.

Auditor's Responsibilities for the Audit of the Financial Statements

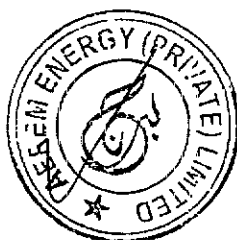
Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with ISAs as applicable in Pakistan will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with ISAs as applicable in Pakistan, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Company's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Company to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

We communicate with the board of directors regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

We also provide the board of directors with a statement that we have complied with relevant ethical requirements regarding independence, and to communicate with them all relationships and other matters that may reasonably be thought to bear on our independence, and where applicable, related safeguards.



Report on Other Legal and Regulatory Requirements

Based on our audit, we further report that in our opinion:

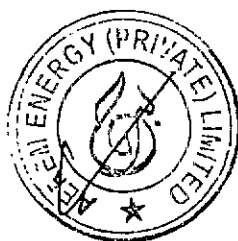
- a) proper books of account have been kept by the Company as required by the Companies Act, 2017;
- b) the statement of financial position, the statement of profit or loss and other comprehensive income or the income and expenditure account, the statement of changes in equity and the statement of cash flows together with the notes thereon have been drawn up in conformity with the Companies Act, 2017 and are in agreement with the books of account and returns;
- c) investments made, expenditure incurred and guarantees extended during the Year were for the purpose of the Company's business; and
- d) No zakat was deductible at source under the Zakat and Ushr Ordinance, 1980.

The engagement partner on the audit resulting in this independent auditor's report is **Imran Iqbal**.

UHY Hassan Naeem & Co.

KARACHI

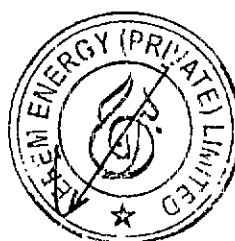
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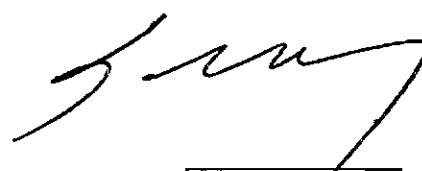
AEREM ENERGY (PRIVATE) LIMITED
STATEMENT OF FINANCIAL POSITION
AS AT JUNE 30, 2019

	Note	June 30, 2019 Rupees	June 30, 2018 Rupees
Assets			
Non-current assets			
Development cost	4	53,732,168	23,216,585
Current assets			
Cash and bank balances	6	3,739	3,378
Total assets		<u>53,735,907</u>	<u>23,219,963</u>
Equity and liabilities			
Authorised capital			
50,000 ordinary shares of Rs. 10 each		<u>500,000</u>	<u>500,000</u>
Issued, subscribed and paid-up capital	7	<u>20</u>	<u>20</u>
Unappropriated (loss)		<u>(132,127)</u>	<u>(70,570)</u>
Total equity		<u>(132,107)</u>	<u>(70,550)</u>
Current liabilities			
Due to related parties	8	<u>53,764,656</u>	<u>23,237,155</u>
Trade and other payables	9	<u>103,358</u>	<u>53,358</u>
		<u>53,868,014</u>	<u>23,290,513</u>
Total equity and liabilities		<u>53,735,907</u>	<u>23,219,963</u>

The annexed notes form an integral part of these financial statements



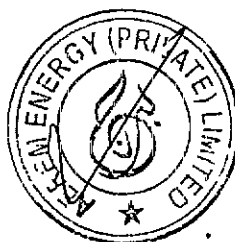

Chief Executive

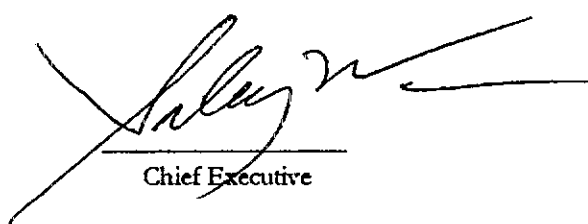

Director

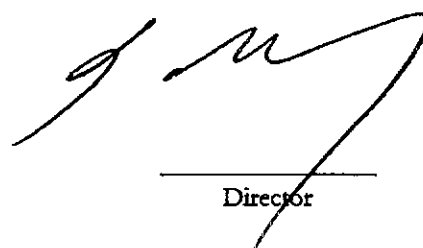
AEREM ENERGY (PRIVATE) LIMITED
STATEMENT OF PROFIT OR LOSS
FOR THE YEAR ENDED JUNE 30, 2019

	Note	June 30, 2019 Rupees	June 30, 2018 Rupees
Revenue		-	-
Administrative expenses	10	(61,557)	(70,570)
(Loss) before taxation		<u>(61,557)</u>	<u>(70,570)</u>
Taxation	11	-	-
Net (loss) for the year		<u>(61,557)</u>	<u>(70,570)</u>
Other comprehensive income		-	-
Total comprehensive (loss) for the year		<u>(61,557)</u>	<u>(70,570)</u>

The annexed notes form an integral part of these financial statements



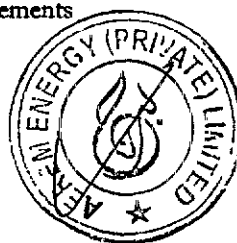

 Chief Executive


 Director

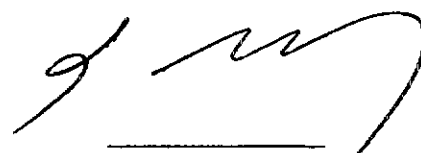
AEREM ENERGY (PRIVATE) LIMITED
STATEMENT OF CASH FLOW
FOR THE YEAR ENDED JUNE 30, 2019

Note	June 30, 2019	June 30, 2018
	Rupees	Rupees
Cash flow from Operating activities		
Net (loss) for the year	(61,557)	(70,570)
Operating (loss) before working capital changes	(61,557)	(70,570)
Changes in working capital		
Increase / (decrease) in due to related parties	30,527,501	23,237,155
Increase / (decrease) in trade and other payables	50,000	53,358
Net working capital changes	30,577,501	23,290,513
Net cash from/(used in) operating activities	30,515,944	23,219,943
Cash flow from investing activities		
Development cost	(30,515,583)	(23,216,585)
Net Cash (used in)/from investing activities	(30,515,583)	(23,216,585)
Cash flow from financing activities		
Share capital Issued	-	20
Net cash from/(used in) financing activities	-	20
Net increase in cash and cash equivalents	361	3,378
Cash and cash equivalents at beginning of the year	3,378	-
Cash and cash equivalents at end of the year	3,739	3,378

The annexed notes form an integral part of these financial statements

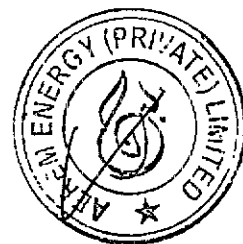


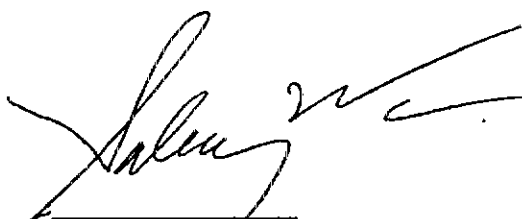

 Chief Executive

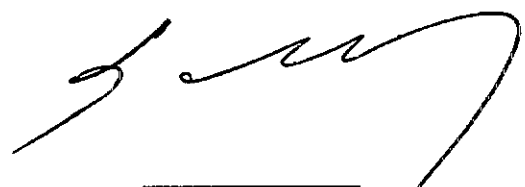

 Director

AEREM ENERGY (PRIVATE) LIMITED
STATEMENT OF CHANGES IN EQUITY
FOR THE YEAR ENDED JUNE 30, 2019

	Issued, subscribed & paid up capital	Unappropriated (loss)	Total
	Rupees		
Share Capital Issued	20		20
Net (loss) for the period	-	(70,570)	(70,570)
Balance at June 30, 2018	20	(70,570)	(70,550)
Net (loss) for the year	-	(61,557)	(61,557)
Balance at June 30, 2019	20	(132,127)	(132,107)




 Chief Executive


 Director

AEREM ENERGY (PRIVATE) LIMITED
NOTES TO THE FINANCIAL STATEMENTS
FOR THE YEAR ENDED JUNE 30, 2019

1. Company and its operations

Aerem Energy (Private) Limited corporate universal identification no. 0117486 (the "Company") was incorporated in Pakistan on March 16, 2018 as a private limited company under the Companies Act, 2017. The principal activity of the Company is to generate and supply electricity to National Transmission and Dispatch Company Limited on Build, Operate and Own (BOO) basis. The Company has signed an agreement with a third party to acquire its Letter of Intent from Energy Department of Government of Sindh. Pursuant to acquisition the Company will conduct feasibility study and negotiate tariff with National Electric Power Regulatory Authority (NEPRA) for the installation of a 250MW wind power project in Jhimpir - Gharo area, Sindh. The Company is in the start-up phase and has not yet commenced its commercial operations. The registered office of the company is located at 16, Abdullah haroon road, 3rd floor, Faysal Bank Building, Karachi, Sindh, Pakistan.

2. Basis of preparation

2.1. Statement of compliance

These financial statements have been prepared in accordance with the approved accounting standards as applicable in Pakistan. Approved accounting standards comprise of Revised Accounting and Financial Reporting Standards for Small Sized Entities (SSEs) issued by the Institute of Chartered Accountants of Pakistan and provisions of and directives issued under the Companies Act 2017. In case requirements differ, the provisions or directives of Companies Act, 2017 shall prevail.

2.2 Accounting convention

These financial statements have been prepared under the 'historical cost convention.'

2.3 Basis of preparation

These financial statements are prepared on accrual basis except for cash flow information.

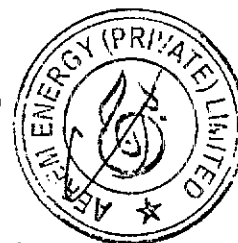
2.4 Presentation and functional currency

These financial statements are presented in Pakistani Rupees, which is also the company's functional currency. All figures have been rounded off to the nearest rupees, unless otherwise stated.

2.5 Use of estimates and judgments

The preparation of financial statements in conformity with approved accounting standards, as applicable in Pakistan, requires management to make judgments, estimates and assumptions that affect the application of accounting policies and the reported amounts of assets, liabilities, income and expenses.

The estimates and associated assumptions are based on historical experience and various other factors that are believed to be reasonable under the circumstances, the results of which form the basis of making judgments about carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates.



The estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates are recognized in the period in which the estimate is revised if the revision affects only that period, or in the period of the revision and future periods if the revision affects both current and future periods.

Judgments made by the management in the application of approved accounting standard, as applicable in Pakistan, that have significant effect on the financial statements and estimates with a significant risk of material adjustment in the next year.

3. Summary of significant accounting policies

3.1 Foreign currency translation

Foreign currency transactions are translated into Pak rupees (functional currency) using the exchange rate prevailing at the dates of the transaction. Monetary assets and liabilities in foreign currencies are translated into Pak rupees using the exchange rate at the balance sheet date. Foreign exchange gains and losses resulting from the settlement of such transaction and from the translation at the year end exchange rates of monetary assets and liabilities denominated in foreign currencies are recognised in the profit and loss account.

3.2 Taxation

Taxation is accounted for by the company after taking into account the relevant laws.

3.3 Trade and other payable

Liabilities for creditors, accrued and other liabilities are carried at cost which is the fair value of the consideration paid in future for goods and services received, whether or not billed to company.

3.4 Financial assets and liabilities

All financial assets and financial liabilities are initially measured at cost, which is the fair value of the consideration given and received respectively. These financial assets and liabilities are subsequently measured at fair value or cost, as the case may be.

3.5 Offsetting of financial assets and liabilities

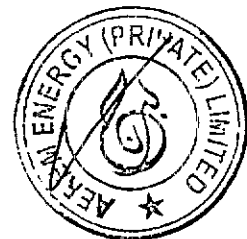
A financial asset and financial liability is offset and the net amount is reported in the balance sheet if the company has a legally enforceable right to set off the recognised amounts and intends either to settle on net basis or to realise the assets and settle the liabilities simultaneously.

3.6 Related parties transaction

All transactions with related parties are priced on an arm's length basis.

3.7 Revenues and expenses

Revenue and expenses are recognized when they are incurred.



Notes		June 30 2019	June 30 2018
		Rupees	Rupees
4 Development cost		53,732,168	23,216,585
	As at June 30, 2018	Additions	As at June 30, 2019
	Rupees	Rupees	Rupees
Travelling, lodging and meeting	-	-	-
Other Directly Attributable Costs	8,029,085	23,150,177	31,179,262
Capitalization adjustment for exchange loss	-	7,365,406	7,365,406
Engineering, Procurement and Construction	15,187,500	-	15,187,500
	23,216,585	30,515,583	53,732,168

5 Embedded Derivatives

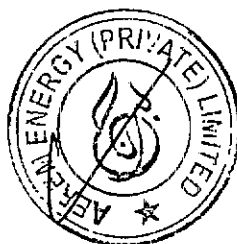
The Company's tariff, like other power companies, comprises of various price components with indexations falling within the ambit of embedded derivatives. Such embedded derivatives, as per International Accounting Standard (IAS) 39, 'Financial Instruments : Recognition and Measurement', need to be separated from the host contract and accounted for as derivatives if economic characteristics and risks of the embedded derivatives are not closely related to the host contract.

However, on January 16, 2012, SECP vide SRO 24 (I) 2012 granted waiver to all the Independent Power Producers (IPPs) from the requirements of IFRIC 4 "Determining whether an arrangement contains a lease" and IFRIC 12 "Service Concession Agreements". Further, SECP through the aforementioned SRO also allowed the IPPs to continue capitalising the exchange differences, and not to recognise embedded derivatives under IAS 39, where these are not closely related to the host contract. However, in case of such derivatives, for periods beginning on or after January 1, 2013, the companies are required to give "Additional Disclosure" as if the accounting for embedded derivatives had been adopted in preparing the financial statements.

In view of the above SRO, the Company has capitalised exchange loss aggregating to Rs. 7,365,406 (2018:Nil)

6 Cash and banks

Cash in hand
Cash at bank - Local Currency
- Foreign Currency



-	-
538	538
3,201	2,840
3,739	3,378

7 Issued, subscribed and paid up capital

Number of shares
Ordinary 2 shares of Rs.10 each fully paid in cash

20	20
20	20

8 Due to related parties

Burj Gharo Energy (Private) Limited
Burj Energy International Management Limited
Burj Wind Energy (Private) Limited

81,105	20,570
53,683,011	23,216,585
540	-
53,764,656	23,237,155

Represents unsecured and interest-free current account balances with the related parties, repayable on demand.

9 Trade and other payables

Auditors remuneration payable
Other payables

June 30 2019	June 30 2018
Rupees	Rupees

100,000	50,000
3,358	3,358
103,358	53,358

10 Administration expenses

Auditors remuneration
Fees and subscription
Miscellaneous
Bank charges

50,000	50,000
1,075	16,570
10,000	4,000
482	-
61,557	70,570

11 Taxation

The income of the Company derived from electric power generation is exempt from tax in terms of clause (132) of Part I of the Second Schedule of the Income Tax Ordinance, 2001.

12 Transaction with related parties

The related parties comprise, associated undertakings, and key management personnel. There have been no transactions with related parties during the year under consideration except remuneration which is disclosed separately.

Details Of Transactions and balances with related parties, other than those which have been specifically disclosed elsewhere in the financial statements are as follows:

Burj Gharo Energy (Private) Limited
Burj Energy International Management Limited
Burj Wind Energy (Private) Limited

81,105	20,570
53,683,011	23,216,585
540	-
53,764,656	23,237,155

13 Number of employees

Number of employees at year end
Avg Number of employees during the year



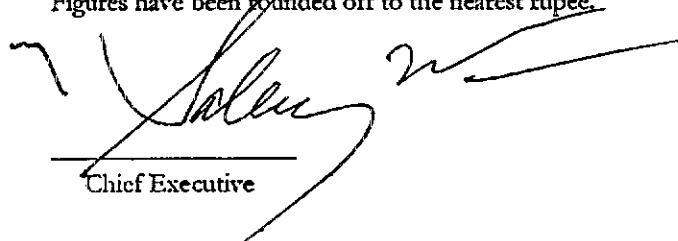
1	1
1	1

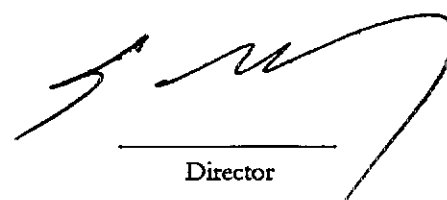
14 Date of authorization

These financial statements have been authorized for issue on 29 MAR 2021 by the Board of Directors of the company.

15 General

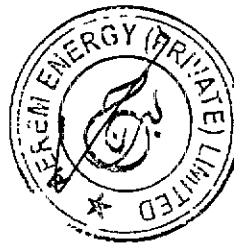
Figures have been rounded off to the nearest rupee.


Chief Executive


Director

ANNEXURE - E

FORM A



FORM-A

Annual Return of a Company

[Pursuant to Section 130(1), 130(2), 424(5) of the Companies Act, 2017 read with Regulation 30 & 62 of the Companies Regulations, 2024]



PART-I

(To be filled by All Companies)



(Please complete in typescript or in bold block capitals)

1.1. CUIIN (Corporate Unique Identification Number)

0 1 7 4 8 6

1.2. Name of the Company

ABREM ENERGY (PRIVATE) LIMITED

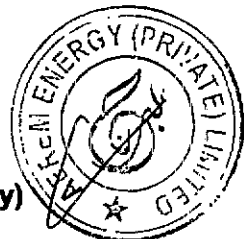
1.3 Fee Payment Details 1.3.1 Challan No 25358731

1.3.2 Challan Amount 2420

1.4 Particulars of—		Please tick the relevant box
Part-II	Annual Return of a company other than inactive company	✓
Part-III	Annual Return of Inactive Company	

PART-II

(To be filled by a company other than inactive company)



2.1. Annual General Meeting held on

DD

MM

YYYY

2 8

1 0

2 0 2 4

2.2. Form-A made up to (Applicable in case no AGM was held/concluded during the year)

DD

MM

YYYY

2.3. Registered office address

Office No. 202,11-C , Al-Murtaza Commercial Lane-2, Phase - VIII, DHA karachi south Sindh, Dha, Karachi South, Sindh, Pakistan

2.4. Email Address

saleem.zaman@burjcap.com

2.5. Office Tel No

+92

2.6. Mobile No. (Preferably WhatsApp enabled number) of authorized officer (Cheif Executive/Director/Company Secretary/Cheif Financial Officer)

+30 30109483555

2.7. **Authorized Share Capital**
(Applicable in case of companies having share capital)

Classes and kinds of Shares	No of Shares	Amount	Face Value
Ordinary Shares	10,000	100,000	10

2.8. **Paid up Share Capital**
(Applicable in case of companies having share capital)

Classes and kinds of Shares	No of Shares	Amount	Face Value
Ordinary/Ordinary	2	20	10

2.9. Annual Turnover

0

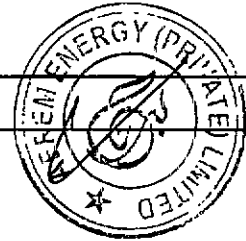
2.10. Number of employees

0

2.11. Particulars of Officer(s) including, legal advisor, auditor & Share Registrar

S#.	Name(s)	Designation	CNIC/NICO P No. / Passport No./ Registratio	Address

			n No.	
1	Saleem uz Zaman	Chief Executive	4230109483555	House No. F-52/2, Block 7, Clifton, Karachi, Pakistan
2	Shabbir Ahmed	Company Secretary	4210117341385	House No. R-325 Sector 11-C/1 North Karachi Karachi Central, Pakistan
3		Chief Financial Officer		
4		Legal Advisor		
5	UHY Hassan Naeem and Co.	Auditor		402 Progressive Centre, Shahrah-e-Faisal Karachi, Karachi, Karachi, Sindh, Pakistan
6		Share Registrar (if applicable)		
7		Any Other Officer		

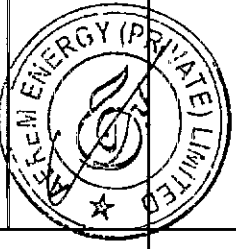


2.12. List of Directors as on the date up to which the Form is made.

Sr. No	Name(s)	Residential Address	Nationality	CNIC No. / NICOP No. / Passport No. (as applicable)	Date of appointment or election	Name of member or creditor nominating or appointing the director
1	Saleem uz Zaman	House No. F-52/2, Block 7, Clifton, Karachi, Pakistan	Pakistan	4230109483555	28-10-2024	
2	Saad uz Zaman	House No. F-52/2, Block 7, Clifton, Karachi, Pakistan	Pakistan	4230184899977	28-10-2024	

2.13. List of members/shareholders & debenture holders on the date up to which this Form is made

Sr. No	Folio # (if any)	Name(s)	Address	Nationality	Kind & Class of share(s) (Applicable in case of	No. of shares / debentures held (Applicable in case	Percentage of shareholding of member having	CNIC No. for Pakistanis, or NICOP No. for

					companies having share capital)	of companies having share capital)	25% or more shareholding (Applicable in case of companies having share capital)	Overseas Pakistanis, or Passport No. for foreigners, or Registration No. for body corporate
								
Shareholders/Member								
1		Saleem uz Zaman	House No. F-52/2, Block 7, Clifton, Karachi, Pakistan	Pakistan	Ordinary and Ordinary		50.0	423010 948355 5
2		Saad uz Zaman	House No. F-52/2, Block 7, Clifton, Karachi, Pakistan	Pakistan	Ordinary and Ordinary	1	50.0	423018 489997 7
Debenture holders								

* In case the member or debenture holder is holding shares or debentures on behalf of other person(s), the name of such other person(s) shall be mentioned in parentheses along with the name of the member or debenture holder.

* In case the member or debenture holder is holding interest or exercising voting or control rights in the company on behalf of other person(s), the name of such other person(s) shall be mentioned in parentheses along with the name of the member or debenture holder.

2.14. Transfer of shares/ debentures since last Form-A was made (Applicable for companies having share capital)

Sr. No.	Name(s) of Transferor	CNIC No./NIC OP No./Passport No./Registration No. of Transfer	Name(s) of Transferee(s)	CNIC No./NIC OP No./Passport No./Registration No. of Transfer	Nationality of Transferee(s)	Correspondence Address of Transferee(s)	Number of shares transferred	Kind & Class of shares	Date of registration of transfer

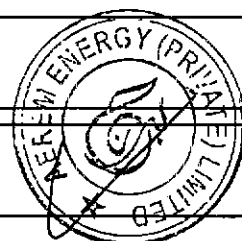
		or		ee					
	Shareholders								
	Debenture holders								

PART-III

(To be filled by an Inactive Company)

3.1. Correspondence Address

3.2. Contact Details



3.3. List of Directors and members as on the date this Form is made.

Sr. No	Name(s)	Designation (Director and / or Shareholder)	Residential Address	Nationality	No of shares held (if any)	CNIC No for Pakistani s, or NICOP No for Overseas Pakistani s, or Passport No for foreigners	Date of becoming member/director	Name of member or creditor nominating or appointing the director

3.4. Confirmation about inactive status of Company

It is hereby stated and confirmed that the Company has :

- not carried out any business or operation since grant of status as an inactive company;
- no substantial assets;
- not made any significant accounting transaction during the last two financial years;

Declaration

3.5. I do hereby solemnly and sincerely declare that the information provided in the form and the enclosures is:

i. true and correct to the best of my knowledge, in consonance with the record as maintained by the company and nothing has been concealed; and

ii. hereby reported after complying with and fulfilling all requirements under the relevant provisions of law, rules, regulations, directives, circulars and notifications whichever is applicable.

3.6. Name of Authorized Officer with designation/Authorized Intermediary (if appointed)

Saleem uz Zaman

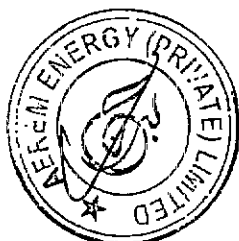
"Director, Chief Executive"

3.7. Signatures

This is an electronically generated document and doesn't require a physical signature

3.8. Registration No of Authorized Intermediary, if applicable

3.9. Date



DD

MM

YYYY

2

0

4

2

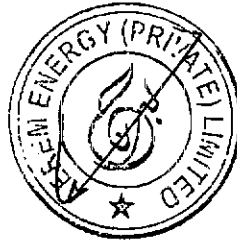
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2

5

INSTRUCTIONS FOR FILLING THIS FORM

1. This Form shall be made up to the date of AGM of the Company or the last date of the calendar year where no AGM is held/concluded during the year.
2. If shares are of different classes the columns should be subdivided, so that the number of each class held, is shown separately against Sr. No. 2.7 and 2.8
3. If space provided is insufficient, the required information should be listed in a separate sheet attached to this return which should also be signed.
4. This form is to be filed within 30 days of the date indicated in Sr. No. 2.1 or 2.2 (as the case may be). If the form is filed after 30 days, additional fee as per section 468 shall be applicable.
5. An inactive company or a company which held its AGM but the same was not concluded shall file Form-A within a period of 30 days from the close of calendar year.
6. This form is not applicable on single member companies & private companies having paid-up capital not exceeding 3.0 million in case there is no change of particulars since last annual return filed with the registrar.
7. A company, other than a single member company or a private company having paid up capital of not more than three million rupees, shall inform the registrar on Form-24 that there is no change of particulars in the last annual return filed with the registrar.
8. In Serial No. 2.11 mention registration number of auditor & legal advisor that is body corporate registered with relevant authority
9. Original challan or other evidence of payment of fee specified in Seventh Schedule of the Act will be submitted with this form (not applicable in case of online filing)



ANNEXURE - F

ACCOUNT MAINTENANCE CERTIFICATE



BankIslami

BankIslami Pakistan Limited

Parso Tower Branch (1026)
Show Room No. 4, Parso Tower,
Shahrah-e-Faisal, Karachi.
www.bankislami.com.pk

24-04-2025 14:29:59

Reference Certificate

TO WHOM IT MAY

KARACHI

Our /2025

Subject:-Reference Certificate

Dear Account AEREM ENERGY PRIVATE

آسلام علیکم ورحمة الله وبرکاته

This is to certify that below mentioned account is being maintained at

Account type:

Account number:

IBAN:

We further certify AEREM ENERGY PRIVATE has a satisfactory

SHAHRA-E-FAISAL

Current Account

102639297360001

PK18BKIP0102639297360001

23-05-2018

This certificate has been issued at the specific request of the customer.

The above information is being communicated to you in strict confidence without any risk and responsibility for error or omission on the part of the bank or its employees, agents and /or informants.

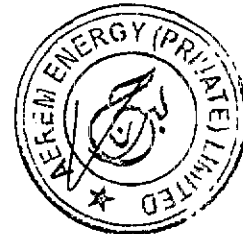
والسلام علیکم ورحمة الله وبرکاته

With Warm Regards

Yours Truly,

1st Signatory

2nd Signatory

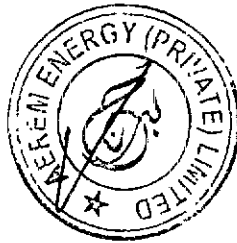


 Serving you, the Right way

ANNEXURE – G

DETAILED PROFILE OF THE APPLICANT &

SENIOR MANAGEMENT



Experience of The Applicant

Aerem Energy (Private) Limited, a private limited company incorporated under the laws of Pakistan, having its registered office at Office # 202, 11-C, Al Murtaza Commercial Lane 2, DHA Phase 8, Karachi Pakistan, being the SPV formed by the Consortium. The consortium comprising of JCM with fifty-one percent (51%) shareholding, Burj Energy International Management Limited ("BEIML") with thirty percent (30%) shareholding, and Rana Nasim Ahmed with nineteen percent (19%) shareholding.

JCM

JCM is a clean energy Canadian Company backed by five leading Development Finance Institutions (DFIs), including FMO (Netherlands), IFU (Denmark), Swedfund (Sweden) STOA (France), and FinDev Canada. These institutions jointly own and govern JCM, united by a shared mission to drive measurable climate and development impact — a reflection of JCM's core value of 'impact with intent'.

Unlike conventional private equity-backed developers, JCM's model is purpose-built to advance renewable energy in emerging markets by deploying long-term, impact-driven capital underpinned by ESG-first mandates. The company specializes in developing, constructing, owning, and operating renewable energy projects across South and Southeast Asia and Sub-Saharan Africa.

JCM currently operates over 200 MW of utility-scale wind and solar projects across Asia and Africa.

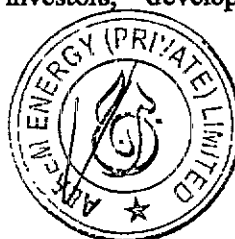
Beyond operational assets, JCM is developing a significant pipeline of solar, wind, and hybrid renewable energy projects across its core geographies. JCM continues to expand its presence through the Project in Pakistan.

With its DFI ownership and integrated capabilities, JCM is uniquely positioned to deliver long-term energy access solutions that align with national climate goals while maintaining the highest standards of governance, environmental compliance, and stakeholder engagement.

BEIML

BEIML is, a Dubai based, investment firm engaged in renewable power development focused on utility scale and distributed generation strategies. BEIML originates, develops, constructs and operates power projects. The firm manages assets end-to-end ensuring project quality and delivering attractive returns for investors and partners. Additionally, BEIML addresses the complete clean energy value chain and has expertise that spans wind, solar, and energy storage solutions.

BEIML focuses on select markets within Asia which offer the potential to scale. The firm works alongside leading institutional investors, development finance



institutions and technology providers with the aim to gain significant market share in chosen markets and create market leading platforms to deliver clean power.

BEIML wants to leverage the experience in Pakistan to replicate offerings in upcoming Asian markets conducive to renewables. The firm is led by investment and industry professionals with experience in developing markets and in financing renewable energy assets. BEIML has also built a strong engineering and project management team with expertise in the design, construction, and operation of power projects. The team has previously created platforms targeting over 2.5GW of clean energy deployment across South Asia, Africa, and Latin America in partnership with the likes of Engie, Total and Africa Finance Corporation, and have worked alongside leading technology providers and construction companies including GE, Vestas, Siemens, Nordex, Wartsila, Power China, and Harbin.

Mr. Rana Nasim Ahmed

Mr. Rana Nasim Ahmed is a significant shareholder in two pioneering solar PV projects in Pakistan: 50 MW Ghara Solar Limited and 18 MW Harappa Solar (Pvt) Limited. Ghara Solar, commissioned in December 2019, was the first project in the country to deploy bifacial modules and the first renewable energy plant within K-Electric's network to secure financing from a foreign development finance institution. Harappa Solar, established in October 2017, was the first solar project to utilize single-axis tracking technology. Mr. Ahmed also has extensive experience in biomass technology. He played a leading role in introducing high-pressure cogeneration technology in Pakistan by developing multiple bagasse-based projects of 53 MW total capacity in 2014.

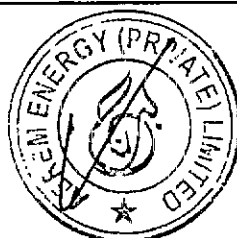
He holds a Master's degree with distinction from the University of Punjab and an MBA from Saint Louis University, USA.

Senior Management & Personnel

The Project Company has access to and has engaged the highly qualified personnel of its Sponsor, in addition to top ranking consultants, for the development of the Project. The Project Company is presently under the process of appointing various personnel and details of the same will be provided upon finalization of the terms and conditions of their appointment.

In addition, the curriculum vitae of the following individuals currently engaged by the Project Company are attached:

	NAME OF INDIVIDUALS	POSITION	ANNEXURE
1.	Mr. Muhammed Ali	REGIONAL DIRECTOR ASIA - JCM POWER	G



2	Shane Eglinton	REGIONAL DIRECTOR AFRICA-JCM POWER	G
3	Joseph Rodriguez	VP FINANCE -- JCM POWER	G
4	Saad Zaman	GROUP CEO -- BURJ CAPITAL	G
5	Nabeel Malik	COO & CEO -- BURJ CAPITAL	G
6	Rana Uzair Nasim	CEO -- GHARO SOLAR	G
7	Muhammad Asad	PROJECT DIRECTOR -- JCM POWER	G
8	Umar Saeed	DIRECTOR INVESTMENTS -- JCM POWER	G
9	Abdul Basit Tola	VP FINANCE - JCM	G

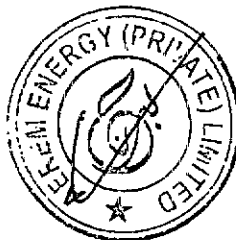
The EPC Contractor

In addition to recruitment of its own management, staff and personnel for the purposes of the Project, the Project Company will engage an EPC contractor in accordance to the criteria mentioned under the RFP. Indicative expression of interests from prospective EPC Contractors and sub- contractors were submitted by the Consortium as part of its bid submission. BER has been duly approved by NEPRA pursuant to the BER Approval.

Technical Advisors and Owner's Engineers

Various local and international technical consultants including (but not limited to) the following are under consideration for appointment for the purpose of the project.

- DNV GL
- Tractebel Engie
- K2 consultant
- Renewable Resources



Legal Adviser

HAIDERMOTABNR & CO. has been selected by the Project Company to provide legal support on all legal aspects of the Project including Project documentation, regulation and financing matters. HaidermotaBNR & Co. has been actively involved in the power sector and other projects and has advised various project companies / sponsors, lenders and the Government of Pakistan on various transactions and matters. It is ranked by Chamber & Partners as a "Band 1" firm in Pakistan for Projects, Banking & Finance and Corporate & Commercial.

Muhammed Ali

House A8-B1, Naval Housing Scheme Zamzama, Clifton, Karachi, Pakistan | Telephone: +92 (324) 4344485 | Email: mali@jcmpower.ca

ACADEMICS

Bachelor of Applied Science Honors

University of Windsor, Windsor, ON

Sept 2003 – Aug 2008

- Electrical Engineering

Publications

Sept 2014

- Co-authored the paper “Mitigation for Connecting Distributed Generators beyond Power Distance Limitation”
- Presented at the CIGRE Canada Conference in September 2014 Toronto Canada

Member of Institute of Electrical and Electronics Engineer (IEEE)

Jan 2013 – Jun 2013

- Participated in the development of IEEE Guide for Conducting Distribution Impact Studies for Distributed Resource Interconnection (1547.7/.8), adding comprehensive knowledge of theory and application of practices related to various renewable generation technologies and Transmission/Distribution system planning.

North American Electric Reliability Corporation (NERC) Standards Development

Mar 2014 – Jan 2015

- Member of the Registered Ballot Body to cast a ballot on NERC Reliability Standards underdevelopment. Actively participated in the Reliability Standards Development, providing comments and concerns.

HIGHLIGHTS AND ACHIEVEMENTS

- Successful construction, commissioning and operations of Hawa, a 50 MW wind farm in Jhimpir, Sindh, Pakistan
- Lead on the ground due diligence and multi-million dollar transactions across various jurisdictions for number of project acquisitions making JCM one of the market leaders in the region
- Awarded President's Award in 2011 for Excellence in Innovation; Involved in the design, testing and implementation of the Online Station & Feeder Capacity Calculator for Generation Connections.
- Prepared and got approved \$100+ Million business case and helped develop the policies and concepts behind it to bundle the generation connection work to maximize efficiencies. This enabled Hydro One to meet customer expectations and regulatory obligations.
- Worked on a 5 year \$1 Billion business plan for generation connections in Ontario. Performed Risk Evaluation and optimized and streamlined the investments with the organization's business values.
- As a Project Manager successfully managed over 1500 megawatts of complex and politically sensitive generation connections, managed over \$100 million budget and directed cross functional team of 75+ engineers, construction, commissioning, operating professionals to complete the projects under tight timelines.
- Successfully managed \$30 million a year program for distribution station refurbishment across the province of Ontario.
- Was recognized corporate wide for building strong customer relations and going above and beyond in providing outstanding customer service.

PROFESSIONAL EXPERIENCE

JCM Power Inc. Canada/Pakistan

Director Pakistan

May 2017 – Present

- Responsible for project origination, business development and operations in Pakistan.
- Actively exploring new opportunities and potential partnerships to build a 400 MW renewable energy platform.
- Oversaw JCM's first investment in Pakistan, a 50MW wind farm. The project was completed on time and on budget.
- Worked on building strong relationships with our partners; JS Group, Daclim Energy, ASMA capital, gaining their respect and confidence.
- Played a key role in building a healthy relationship with the National Transmission and Despatch Company (NTDC) and ensure a timely completion of the power purchaser tests and the 132 kV transmission line for power evacuation.
- Member of the Board appointed Construction Steering Committee and subsequently Operations Committee. Responsible for close monitoring of the project progress and guidance to the management in achieving key milestones.
- Participated in the Board meetings, advising the Board on key issues and associated recommendations.



- Lead on the ground due diligence and multi-million dollar transactions across various jurisdictions for number of project acquisitions making JCM one of the market leaders in the region.
- Liaised with consulting firms for grid, resource, feasibility, Environmental Social Governance (ESG) studies and various legal, tax and financial advice.
- In less than a year, developed effective connections with all relevant government bodies and major industry players in the energy sector of Pakistan.
- Advocating for renewable energy, represented JCM at multiple conferences, panels, associations and round table meetings.
- Established JCM local office which involved hiring and mentoring new staff, negotiating corporate contracts and rates, building process and procedures for day to day operations.

Project Management, Hydro One Inc. Canada

Senior Project Manager

Jan 2015 – May 2017

Jun 2013 – Feb 2014

- Connected all projects on time and within budget through self-motivated behavior and perseverance for solving problems that required analysis of numerous variables and alternative solutions, and exercising judgment.
- Acted as a team leader and multi-discipline task co-coordinator for assigned projects/programs. Ensured health and safety was the number one priority while allocating resources and scheduling the work.

List of Major Projects/Programs

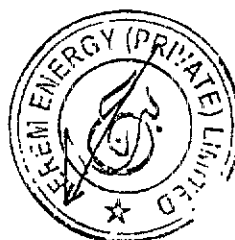
- About 200 MW of multiple renewable (wind, solar and bio-gas) generation connections to the distribution grid (<50kV).
- 500 kV double circuit connection of a 900 MW gas generation facility including protection, telecom and SCADA upgrade.
- Two 50 MW each solar farm facility connection to 230 kV grid, T-tap line expansion and sub-station upgrades.
- \$30 million a year program to refurbish 20 substations each year - transformer, breaker, bus work etc. replacement.
- Implement Special Protection Scheme (SPS). Installing tele-protection at 14 sub-stations with A and B diverse paths. The scheme, in response to single/double contingency, rejects loads, trip reactors and capacitors and cross-trip 115kV circuits.
- A 230 kV line expansion and protection, telecom and SCADA upgrades to connect a large mining load.

Reliability Standards, Hydro One Inc. Canada

Reliability Standards Development and Compliance Officer

Mar 2014 – Jan 2015

- Member of Northeast Power Coordinating Council (NPCC) – Reliability Standard Committee (RSC); Presented Hydro One's concerns regarding the reliability standards at the NPCC – RSC and influenced the development of NERC standards.
- Attended Independent Electricity System Operator (IESO) Technical Panel Meetings to discuss and review amendments to the proposed IESO Market Rules.
- Communicated with various Lines of Businesses and Subject Matter Experts to gather their comments and concerns on emerging NERC standards and submitted them to NERC.
- Assisted in development and documentation of compliance evidence and any associated business processes as applicable to NERC, NPCC and IESO reliability standards.
- Participated in the internal and external reliability audits and management of Hydro One's Reliability Compliance obligations.
- Performed compliance reviews for NERC, NPCC, and IESO reliability standards.
- Provided advice and delivered training to corporate and network management staff to assist in their understanding of reliability standards to facilitate their compliance obligations.
- Attended Hydro One Executives' - Reliability Standards Oversight Committee monthly meetings to discuss Reliability and Compliance issues and concerns.



Generation Connections, Hydro One Inc. Canada*Nov 2008 – May 2013**Network Management Engineer/ Officer*

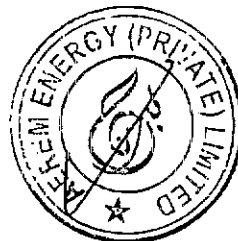
- Effectively held discussions and negotiations regarding complicated and often politically sensitive matters with customers, regulatory authorities, suppliers and other stakeholders.
- Well versed with regulations such as Ontario Energy Board Codes and Market Rules, Ontario Power Authority programs, Hydro One corporate financial and technical policies, industry priorities and concerns.
- As the lead of a team of external consultants, provided them with technical guidance, assisted in resolution of work problems and reviewed their work for quality assurance.
- Completed and reviewed numerous Connection Impact Assessments (CIAs) for new generation connections to the grid and prepared associated scope of work specification to appropriate level of details for service providers.
- Frequently led teams to make decisions to ensure consistent treatment of generators and to smooth out work processes for generator connections at Hydro One.
- Member of the "GCD – Technical Committee"; Conduct and review research studies to develop innovative and economic solutions and define technical standards and requirements for equipment on the transmission and distribution systems.
- Worked towards finding economical alternative options for the connection of constraint generation projects. Prepared functional requirements for Dynamic Var (D-VAR) compensation to mitigate adverse voltage performance issues caused by intermittent renewable generation.
- Mentored junior staff in job responsibilities and coached them on transmission and distribution system theories.

VOLUNTEER EXPERIENCE**Team Lead for Hydro One Charity Campaign***2009 – 2017*

- Led the volunteer staff in planning and organizing events for fund and awareness-raising for Charities.

Movember Participant, Toronto ON*2011 – 2017*

- Dedicated to raise vital awareness and funds for prostate cancer by growing a moustache for a month.
- Led Hydro One Movember initiative raising over \$100,000 in past years to support the battle against cancer.



Qualifications: BEng. Mechanical (Hons)
Specialisation: Wind and Solar Energy
Years in industry: 11

Summary

Mechanical engineer specialising in utility scale renewable energy, with experience primarily across utility scale wind, solar and energy storage technologies. Over a decade as an engineer at Aurecon, a global consulting engineering firm, with experience exceeding over 11GW of projects in development, construction and/or operation across sub-Saharan Africa, Australia and New Zealand. Wide ranging experience in procurement strategy, contracting, business development and project management.

Professional Experience

2010-2012, Aurecon New Zealand (Engineer)

- Wind resource mast inspections, data inspections and
- Energy production assessments for wind farms in New Zealand, Australia and South Africa
- Due diligence assessments for development assets
- Project management for small industrial wind turbine installation for telecoms client

2012-2020, Aurecon South Africa (Engineer, Associate, Wind and Solar Leader)

- Integral in developing Aurecon South Africa's renewable energy capability, growing to a team of 15 with a portfolio of over \$4M USD (fees) per annum
- Technical lead for wind and solar projects, including prospecting, feasibility studies, preliminary design, detailed design, procurement, operational assessments and due diligence. Lead internal technical training.
- Responsible for business development. Compiled numerous proposals, negotiated contracts and managed portfolios of clients during project delivery.
- Wind turbine inspections in South Africa, China and Europe.
- Responsible for intracompany workshare across countries
- Strategic advisor to developers and Independent Power Producers (IPP)
- Conceived and started team focussing on creative technology (gamification, visualisation & virtual reality).

2012-Current, JCM Power (Golomoti JCM Solar Corporation Limited)

- Managed procurement and contracting for 8 prime contracts for Golomoti 20MW solar project, including 10MWh battery energy storage system
- Project manager
- Engineering lead for all JCM activities, including construction projects in Malawi, prospecting for wind and solar projects across sub-Saharan Africa, operating wind farms in Pakistan, regional grids in Haiti and technical due diligence of acquisitions.

General

- Highly proficient in computing, advanced in Microsoft excel, powerpoint and word.
- Extroverted and strong team player.
- Highly autonomous and take pride in quality of work delivery.

Other

- English (Fluent)
- Active sportsman including cricket, soccer, golf, cycling, tennis and trail running. Enjoy 'do-it-yourself' projects with electronics, construction and motoring



JOSEPH E. RODRIGUEZ

Mobile Phone (+1) 202-280-3978

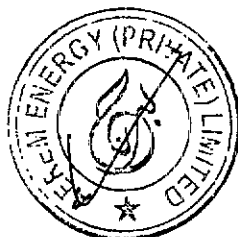
E-mail: jrodriguez@jcmpower.ca

EDUCATION

May 1999	COLUMBIA BUSINESS SCHOOL <i>MBA – Finance.</i>	New York, NY, USA
May 1993	THE JOHNS HOPKINS UNIVERSITY <i>Master in Civil Engineering</i>	Baltimore, Maryland, USA
May 1992	<i>BS in Civil Engineering</i>	
May 2012	HARVARD KENNEDY SCHOOL <i>Executive Training in Public Private Partnerships and Policy implementation For Infrastructure</i>	Boston, MA, USA

WORK HISTORY

11/2015 – Present	JCM POWER Vice President of Finance JCM Power is a Canadian based renewable energy developer that builds, owns and operates grid-tied solar and wind power plants across Africa, Latin America and Pakistan. I am responsible for raising equity, mezzanine and non-recourse debt financing for all of JCM's international projects.	Toronto, Canada
04/2012 – 10/2015	INTERNATIONAL FINANCE CORPORATION (World Bank) Principal Investment Officer - Infrastructure Responsible for origination and execution of debt and mezzanine investments (for IFC's own account as well as syndication) across Energy (generation and distribution) & Infrastructure projects in Sub-Saharan Africa, with specific country coverage of Kenya, Tanzania, Uganda, Rwanda, Nigeria and Mozambique.	Nairobi, Kenya
05/2010 – 03/2012	PERPETUAL ENERGY SYSTEMS ("PES") Chief Executive Officer of a private Solar Energy IPP developer Developed and implemented a growth strategy to increase the project pipeline of PES, a privately owned Independent Power Producer ("IPP") of commercial scale solar power plants in the USA and Canada. Responsible for all capital raising activities of the firm, including sponsor equity, tax equity and non-recourse project financing.	Los Angeles, CA, USA
04/2007 – 05/2010	AL RAJHI CAPITAL ("ARC") AL RAJHI CORPORATE & INVESTMENT BANK ("ARB") Managing Director and Head of Project and Leveraged Finance Member of the Management and Risk committees -Responsible, together with the CEO of ARC, for developing a full-fledged Investment Bank (+100 staff) providing Debt and Equity Capital Markets Solutions, Private Equity and Asset Management to corporate clients. - As Head of Project and Leveraged Finance, responsible for providing debt advisory and arranging services to sophisticated corporate clients in the areas of Project Finance, Acquisition Finance, Asset Finance, Structured Debt and Capital Markets. Received awards from Euromoney for 2010's Best Project Finance House and Best Project Finance Deal in the Middle East (Al Dur IWPP) as well as the 2010 award for Best Structured Finance Deal from IFN Journal for the Zain KSA (Telcom) Financing	Riyadh, Saudi Arabia



JOSEPH E. RODRIGUEZ

Mobile Phone (+1) 202-280-3978

E-mail: jrodriguez@jcmpower.ca

WORK HISTORY (continued)

-Received the Euromoney 2009 Excellence Award for Best Project Finance house in the Middle East

12/2005 – 04/2007

CITIGROUP CORPORATE & INVESTMENT BANK

South Africa

Director –Head of Corporate Finance Sub Saharan Africa Division

Responsible for a team of 8 bankers and for origination and execution of all structured debt products to the Division's Corporate Customers including Global Syndicated Loans, Bonds, Infrastructure & Energy Finance, Export Agency Finance, Credit Derivates and Asset Finance.

04/2004- 12/2005

CITIGROUP CORPORATE & INVESTMENT BANK

South Africa

Vice President – Head of Corporate Finance for East & West Africa and Non Presence African Countries

Managed a team of 4 bankers for a portfolio of 30 countries, with multiple cultures, languages, levels of industrial development as well as credit profiles.

Delivered highly structured debt products (local and international syndicated loans and bonds, Project Finance, Export Agency Finance and Capital Structuring) to Citigroup's Global Relationship clients, as well as Local Top Corporates, African Governments and Parastatal Entities.

09/2001- 04/2004

CITIGROUP CORPORATE & INVESTMENT BANK

South Africa

Vice President – Origination and Structuring of Cross Border as well as Local and Structured Debt Products for large South African Corporates including Project Finance as well as South African and International Loan Markets, Capital Markets, Derivatives and Export Agency Financing Products.

08/1999- 08/2001

CITIBANK, N.A, Global Emerging Markets Management Associate (GEMMA)

Completed the following assignments during the GEMMA program:

05/2000- 08/2001

Emerging Markets Corporate Finance – (CEEMEA).

London, UK

Origination and structuring of Structured Debt products for Eastern Europe and Sub-Saharan Africa. Extensive work with Export Agencies, Multilateral Agencies and Insurance Markets throughout Franco-phone Africa.

8/1999 – 4/2000

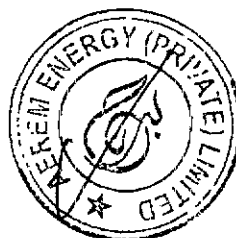
Global Transaction Services – Cash & Trade Management.

Taipei, Taiwan

Managed a team of 10 bankers and 4 external vendors in order to develop a web-based E-Banking initiation platform for all local and cross-border cash and trade transactions.

ADDITIONAL INFORMATION

Languages: Native oral & written English and Spanish. Basic French and Portuguese.



BIO-DATA

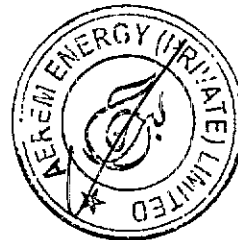
SAAD UZ ZAMAN

- Saad UZ Zaman is the founder and Chairman / CEO of Burj Capital with offices in UAE and Pakistan.
- Prior to establishing Burj Capital, Saad's work experience centered on banking and investments. He has held leading roles at global institutions like Citi, where he led Citi's Corporate Finance and Investment Banking. At Dubai Islamic Bank Group, he was responsible for international growth of the bank. Saad was also responsible for bank's investments and private equity platform which entailed management and turnaround of a USD 2 billion portfolio. This comprised of over 80 local and international investments in publicly listed equities, direct/strategic and joint venture stakes in industrial, financial services, land and incomegenerating real estate assets in UAE and internationally, as well as investments in special and general-purpose funds (e.g. aviation, shipping & power) managed by external managers. Through active management, and despite the unprecedented environment of the 2008 financial crisis, Saad was able to successfully manage key investments, helping DIB Group navigate the period.
- Saad started his career at ANZ Grindlays Bank in 1991. His achievement and career highlights include:

Dubai Islamic Bank Group, 2005 – 2010

Positions Held:

- CEO DIB Capital Limited, DFSA regulated entity
- Director on the Board of Dubai Islamic Bank Pakistan Limited
- CEO, Dubai Islamic Bank Pakistan Limited
- Director, Etisalat International Pakistan Limited (Strategic Shareholding in PTCL)
- Chairman, Millennium Finance Corporation, DFSA regulated Investment Advisory Company
- Director & Executive Committee member, Liquidity Management Center (LMC) Board of Directors
- Director & Executive Committee member, Bank of Khartoum (BOK) Board of Directors
- Head of International operations, Dubai Islamic Bank
- EVP and business manager; Treasury, Corporate Finance and Investment Bank
- Key Achievements:



- Established and ran DIB Pakistan, now a leading bank in the country with over 225 branches
- Established Emirates & Sudan Bank, at the time the largest capitalized bank in Sudan
- Established Bank of Khartoum, largest bank in Sudan, by way of acquisition of majority stake from the Government of Sudan and merged with Emirates & Sudan Bank
- Established and exited Millennium Finance Corporation that comprised DIB Group's investments
- Established DIB Capital, DIB Group's investment banking arm which comprised private equity and capital markets activities. Developed it into one of the leading investment banks in the region.
- Established Emirates REIT, the first REIT in UAE, now quoted on Nasdaq Dubai

Citigroup, 1994 - 2004

Appointments:

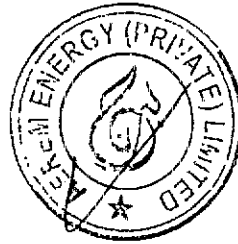
- Managing Director, Citi Islamic Investment Bank, Bahrain
- Head of Corporate Finance and Investment Banking, Middle East & Levant
- Head of Corporate Finance, Middle East
- Senior Securities Officer (SSO), Investment Banking
- Key Achievements:
 - Charged with and repositioned Citi Islamic Investment Bank for global growth in line with the growing Islamic banking sector
 - Positioned Middle East Corporate Finance & Investment Banking products to Citi's Global Corporate & Investment Banking practice into key relationships like Dubai Ports World, Dubai World, Emirates Airline, Family Offices etc
 - Established the Middle East Corporate Finance unit to increase bank's focus on the growing corporate finance market across the region
 - Completed over \$5bn in corporate finance deals in Middle East
 - Pakistan lead in London Club restructuring of Pakistan's commercial banking debt post 1997/98



ANZ Grindlays Bank, 1991 - 1993

- Relationship Manager, Corporate Branch, Karachi

- Management Assistant, ANZ Merchant Bank, London
- Education: Business & Finance, Bachelors in Commerce



Nabeel Malik

PROFESSIONAL PROFILE

Success driven and engaging executive/board member with a proven record of delivering exceptional results seeks to lead a forward thinking company, driving strategic growth and fostering innovation through building high performance teams. Recognized as one of the top 120 retail bankers globally by the Lafferty Group.

Tel : +92 331 842 9998

+1 (647) 768 3821

Email: nabeel61@gmail.com

WORK EXPERIENCE

SELF EMPLOYED INDEPENDENT CONSULTANT

Toronto, Canada | June 2023 – Present

- Advisor to Loop Financial Services, Karachi, Pakistan. Loop enables businesses to digitize financial operations for efficiency and profits,
- Advisor to Burj Capital, Dubai, UAE. Burj Capital is an investment firm engaged in renewable power development focussed on utility scale IPPs and Distributed Generation solutions for industrial and commercial customers
- Advisor to CombatIQ, London, UK. CombatIQ has a leading end-to-end solution that automates data extraction for individual sports. This cutting edge technology excels in generating realtime odds and micro-betting odds, as well as enhancing broadcasts with dynamic visualization
- Advisor to Caremiles, California, USA. Caremiles is on a mission to turn climate intention to action. A B2C app, EV CLUB, is designed to simplify and enhance the charging experience by offering a universal app that works across all charging networks. The aim is to make EV charging as hassle free as filling up a gas car
- Advisor to Apna Tax - a digital tax filing application in Pakistan.
- Advisor to BankT&D - I have been associated with BankT&D since 2013 as a consultant with breaks when I was working full time.

EXECUTIVE DIRECTOR and BUILDER

Din Global Private Limited , Singapore | March 2022 - May 2023

A fin-tech startup funded by Sequoia Capital (South East Asia); Kleiner Perkins and Nubank plus leading investors that applied for the recently introduced digital retail banking license in Pakistan. It also holds an NBFC license and aims to empower people to live with dignity through financial access and freedom. Global has registered offices in Karachi, Lahore, Islamabad and Singapore.

- One of three directors leading the creation of a strategy for individuals and SMEs; to recruiting and building a team and operationalizing the business
- Part of founding team that co-authored the SBP digital banking license application

EDUCATION

Yale School of Management

Masters in Public and Private

Management, New Haven,

Connecticut, USA

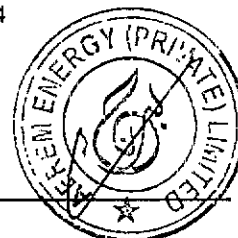
1989 - 1991

Princeton University

Bachelor of Arts, Princeton,

New Jersey, USA

1980 - 1984



SKILLS

PROFESSIONAL

Digital/Fin tech
Team Building
Strategic Planning
Problem Solving
Decision Making
Conflict Resolution
Risk Assessment
Credit Management
Fiscal Management
Financial Inclusion
Business transformation
Process reengineering
Marketing Managment

WORK EXPERIENCE CONTINUED

EXECUTIVE DIRECTOR

Silkbank, Karachi, Pakistan | January 2019 – February 2022

Acting CEO/President from September 2020 to December 2021

Silkbank is a medium sized bank serving SME, individual and wholesale clients across Pakistan with conventional and Islamic offerings

- Reduced the operating costs base by 15% within 12 months while growing low cost accounts
- Launched a full digital offering
- Led the formulation of a strategy to reduce the exposure to wholesale clients while building the SME and retail offer to improve profitability
- Worked with the board and the central bank to raise capital and restructure the balance sheet

CO-FOUNDER and PRESIDENT

Froog Inc, Toronto, Canada | January 2015 – February 2020

- A start-up financial engagement company that created closer relationships between users and their financial institutions by enriching financial data with behavioural psychology; by measuring anxiety levels, and by mapping financial ambitions. It sought to find answers for questions like (a) what motivates customers; (b) why they transact the way they do; and (c) what drives their decision making. It looked to start from where traditional financial management stops

FOUNDER and PRESIDENT

NIMR Consulting Inc., Toronto, Canada | January 2013 – March 2016

- Vice-Chairman, SimpleWatt Pakistan - a Distributed Generation company which helps companies and individuals manage their electricity costs with provision of green energy
- Director, Retail and Consumer Banking for BankT&D Consulting, UK.
- Re-structured a mid-sized bank in Pakistan as Program Director for the LoBue Group
- Collaborated with a South African PE fund on transforming a post office into a micro-finance bank
- Advisor on Africa acquisitions for SABRE Consulting, UAE
- Member of the advisory board of Ampion. Ampion.org is a catalyst for entrepreneurship and innovation in the emerging world starting with Africa (Volunteer)
- Led the establishment of the Toronto chapter of Change Management Institute (Volunteer)

COMMUNITY ENGAGEMENT

Board Member

LRBF fund raising for cataract surgery in Pakistan

2018 to date

Member

Donalda Club, Toronto

Member of the Alumni

Schools Committee for

Princeton in Toronto

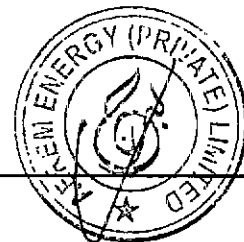
LANGUAGES

English - Native

Urdu - Native

Punjabi - Native

Spanish - Elementary



WORK EXPERIENCE CONTINUED

EXECUTIVE DIRECTOR, RETAIL BANKING DIVISION

First City Monument Bank, Plc, Lagos, Nigeria | January 2009 – December 2012

- Member of the board of directors and in charge of consumer, SME, private banking and micro finance subsidiary
- Directed the transformation of a traditional investment bank into creating the fastest growing division for the bank in line with strategy
- Grew operating PBT for the retail division exponentially (from N 0.1 billion to N 3.4 billion) by growing revenues; keeping expenses flat and from the sale of impaired assets to the Asset management Company of Nigeria (AMCON)
- Led the change management process for the distribution strategy; the customer management process; analytical capabilities; and by creating a strong underwriting and collections capability
- Integral part of management team and board decision to acquire Finbank for boosting retail capabilities even further
- Physical network increased to 280 outlets and over 3000 sales force
- Launched pilot for small depositors with a low cost to serve business model

HEAD OF INTERNATIONAL RETAIL

Mashreq, Dubai, UAE | November 2005 – December 2008

- Head of International Retail from May 2008 - December 2008
- Acting Head of Retail Division from May 2007 - January 2008
- Chief Marketing Officer from November 2005 - April 2008

CITI N.A, VARIOUS POSITIONS

Dubai, UAE | May 2002 – October 2005

- Marketing Director for Citigold Wealth Management for Europe, Middle East and Africa additional charge of Regional Marketing Director Turkey, Middle East and Africa from February 2004 to October 2005.
- Regional Consumer Bank Head for Gulf and Pakistan from May 2002 to January 2004

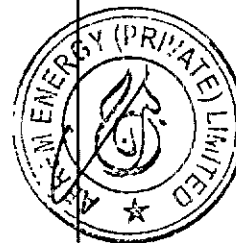
OTHER POSITIONS AND GEOGRAPHIES

1984 – May 2002

- ABN AMRO in Greece, Taiwan and Pakistan. General Manager, Consumer Bank between November 1995 and May 2002
- Citi, Pakistan, Sales and Financial Control between October 1991 to October 1995
- Aga Khan Rural Support Program (AKRSP), Gilgit Pakistan. 1984 to 1989

INTERESTS

Cricket
Soccer
Travel
Movies
Meditation



RANA UZAIR NASIM

Lahore, Pakistan | [Email Placeholder] | [Phone Placeholder] | [LinkedIn URL Placeholder]

PROFESSIONAL SUMMARY

Experienced energy executive with over a decade of leadership in renewable energy project development and execution across Pakistan. Proven track record of delivering solar and hydro IPPs, leading EPC negotiations, and commercial operations with local utilities. Passionate about innovative technologies in energy and agriculture.

EXPERIENCE

Chief Executive Officer

Gharo Solar Limited - Lahore, Pakistan

Jul 2016 - Present | 8 yrs 10 mos

- Spearheaded a 50 MWp solar project near Gharo, Sindh, featuring bifacial modules and single-axis trackers.
- Achieved successful commissioning with in-house EPC in December 2019.
- Electricity sold to K-Electric under long-term power purchase agreement.

Advisory Board Member

Jiye Kisan - Pakistan

Jul 2021 - Present | 3 yrs 10 mos

- Advising a pioneering startup transforming agri markets in Pakistan and beyond with technology-driven solutions.

Chief Executive Officer

Harappa Solar (Private) Limited - Pakistan

Sep 2014 - Present | 10 yrs 8 mos

- Led development of Pakistan's first single-axis tracking solar IPP (18 MWp) near Harappa, Punjab.
- Project achieved Commercial Operation Date (COD) in October 2017.

Chief Executive Officer

Kathai-II Hydro (Pvt.) Limited - Pakistan

Aug 2012 - Present | 12 yrs 9 mos

- Managing development of 8 MW high-head hydropower IPP in Azad Kashmir.
- Among the earliest such hydropower projects in the region, currently in EPC negotiation stage.

EDUCATION

Stanford University

Master of Science (MS), Management Science & Engineering



RANA UZAIR NASIM

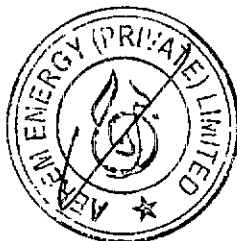
Lahore, Pakistan | [Email Placeholder] | [Phone Placeholder] | [LinkedIn URL Placeholder]

2006 - 2007

Stanford University

Bachelor of Arts (BA), Economics

2003 - 2007



Summary

I'm a result-oriented projects & contracts management specialist with more than 14 years of experience in developing, constructing, commissioning and Operation of Large-Scale Renewable Energy (Wind) generation and Substation projects. I've led turnkey EPC and ECC projects independently, overseeing their entire lifecycle from initiation to handover. These projects, worth over \$700 million and capacity of 450+ MW, were funded by esteemed DFIs including IFC, DEG, MCPP and CDC. I've adhered to NEC3 and FIDIC suit of contracts, utilised IFC performance standards for ensuring safe, timely, and cost-effective projects delivery.

Key Skills Summary

- Excellent and Effective Communication Skill;
- Proven track record in the successful delivery of large Transmission/Substation Infrastructure Project;
- Contractual Management (EPC/ECC) based on NEC3 and FIDIC;
- Hands on experience of financial management and budgeting;
- Demonstrated expertise in stake holder management whether they are Internal or external;
- Hands on Experience to forecast and control costs for projects and Events;
- Hands on experience to comply the health, safety and environment standard by following the CDM regulation and IFC performance standards;
- Lead multidisciplinary team to enhance team performance while managing complex projects;
- Instrumental at assessing potential risk and make strategies to effectively mitigate or eliminate the risk.

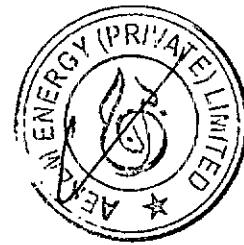
Work Experience

1. Din Energy Ltd.

50 MW Wind Power Project along with 132kV HV Substation, Jhimpir, Sindh, Pakistan

Transatlantic Energy Private Limited

50 MW Wind Power Project along with 132kV HV Substation, Jhimpir, Sindh, Pakistan



General Manager Projects – April 2019 to Present

- Report to the "Chairman" and "Board of Directors" of the Company;
- Managed the development and construction of a 50MW wind power project along with 132kV AIS Substation named *Din Energy Ltd.* Project achieved its commercial operation with Zero LTI and Zero TRIR;
- Executed tendering process of EPC/ECC proposal and its evaluation for Din Energy Ltd and;
- Budgeting and Forecasting project cost for tariff determination by regulators;
- Led the financial development of aforementioned project, the outcome was achieving key financing from lenders (IFC and Local Banks) of US\$52 million in a timely manner;
- Negotiated and executed the offshore and onshore EPC contracts worth \$58 million and O&M agreements worth \$12 million based on FIDIC Silver Book turnkey suit of contracts.
- Contractually administered the project through out the design and construction phase;
- Managed integrated Programme base on Primavera P6;
- Identification and mitigation of Risks and its reporting to leadership;
- Led a multidisciplinary team to manage the development and construction of the project;
- Supervised the complete transaction from pre-financial close till final disbursement/ COD. This resulted in compliance to the conditions precedents, legal & regulatory framework and achieving deliverables timely;
- Acting as single point of contact for sponsors, lenders, consultants & advisors, public sector stakeholders, etc.;
- Responsible for handing & taking-over of the plant from the EPC Contractors, warranty obligations, managing the BOP and WTG Maintenance FSA, E&S compliance in line with IFC performance standards;

Training

Green, Social and Sustainability Bonds Executive Training by IFC & International Capital Market Association (ICMA), Dubai, UAE

2. Artistic Energy (Pvt.) Ltd.

49.3 MW Wind Power Project along with 132kV HV Substation, Jhimpir, Sindh, Pakistan

Artistic Wind Power (Pvt.) Ltd.

50 MW Wind Power Project along with 132kV HV Substation, Jhimpir, Sindh, Pakistan

Project Manager – October 2015 to April 2019

- Report to the **“Group Chairman”** and **“CFO”** of the Company;
- Managed the development and construction of a 49.3MW wind power project along with 132kV AIS Substation named Artistic Energy (Pvt) Ltd. Project achieved its commercial operation 5 months ahead of RCOD with Zero LTI, Zero TRIR and Zero cost overruns with a multidisciplinary team of 8 professionals;
- Pre-Financial Closed development of Artistic Wind Power (Pvt.) Ltd;
- Executed tendering process of EPC/ECC, proposal and its evaluation for Artistic Energy (Pvt) Ltd and Artistic Wind Power (Pvt.) Ltd.;
- Contractually administered, NEC3 based contracts, the project throughout the design and construction phase;
- Negotiated the EPC/ECC, based on NEC3, contract worth **US\$90million**
- Budgeting and Forecasting project cost for tariff determination by regulators;
- Identification and mitigation of Risk and its reporting to leadership;
- Coordination with Regulators, Transmission System Operators, Power Purchaser;
- Responsible to implement CDM regulations effectively in capacity of client;
- Managed integrated Programme base on Primavera P6;
- Responsible to discuss and conclude Technical Due Diligence matter with Lender’s Technical Advisor;
- Negotiated and Finalized Energy Purchase Agreement with Power Purchaser;
- Part of Financial Agreements negotiations with Lenders and its Financial Advisor;
- Led a multidisciplinary team to manage the development and construction of the project;

Technical Training

Customer Training of GE 1.7 – 103, GE Shenyang, China.

3. China Three Gorges First Wind Farm Pakistan (Pvt.) Ltd.

49.5 MW Wind Power Project along with 132kV AIS Substation, Jhimpir, Sindh, Pakistan

Senior Engineer Projects – September 2012 to October 2015

- Selected by elite of experts to visit China for training on wind turbine technology;
- Ensured compliance of Energy Purchase Agreement and incorporate any shortcomings
- Contractual Management Based on NEC-3
- Coordinated with Regulators, Transmission System Operators, Power Purchaser
- Coordinated with EPC contractor, design consultant, WTG supplier etc.
- Development of the technical schedules of Energy Purchase Agreements;
- Design review of Electrical drawings & documents;
- Managed Programme base on MS Project;
- Technical bid evaluation & preparation of technical evaluation reports;
- Scheduling, planning & management of the electrical related assignments;
- Pre-commissioning and commissioning of GW77/1500 PMDD Wind Turbine Generators;
- Supervision of installation, testing and commissioning of 33kV & 132kV substation equipment;
- Play a leading role to achieve Reliability Run Test;
- Part of Successful Commercial Operation Date of the plant.

Technical Trainings

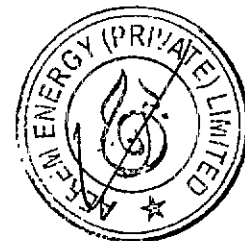
- Orientation of WTGs, GW 77/1500, Xinjiang GOLDWIND, Urumqi, China
- Introduction to Wind Parks, North China Electrical Power University, Beijing, China

4. Orient Energy System (Pvt.) Ltd.

Karkey Power Ship 232 MW Thermal Power Station along with 132kV AIS Substation, RPP

Asst. Electrical Engineer (Electrical Operations) - April 2011 to May 2012

- Managed routine operations of the Power Plant as an Shift Electrical Operations Engineer
- Lead a team of 11 members, including 6 EROs, 2 CROs, 2 Technicians & 1 Trainee Engineer
- Responsible for supervision of troubleshooting & rectification of electrical maintenance issues on operational side
- Ensured high reliability and availability of the electrical side of Power Plant



- Part of successful Certificate of Dispatch Test, dated April 9, 2011
- Part of successful Capacity Load Test, dated October 6, 2011

5. Tapal Energy (Pvt.) Ltd.

126 MW Thermal Power Stations along with 132kV AIS Substation, IPP
Trainee Electrical Engineer - March 2010 to March 2011

- Gained hands-on experience in power plant operations and maintenance.

EDUCATIONAL CAREER

1. Master of Business Administration (Executive) (2025)

Karachi School of Business & Leadership (KSBL) Karachi Pakistan

2. BS Electronics Engineering – 1st Division (2009)

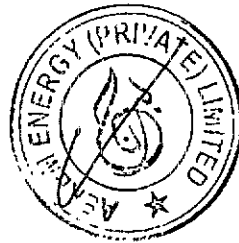
Sir Syed University of Engineering & Technology, Karachi

3. HSC Pre-Engineering (2005)

SSC Science (2003)

CERTIFICATIONS

1. IOSH – Managing Safely (2023)



Personal Information

Languages: English, Urdu

Activities: Regular Strength Training, Sprinting, Healthy Eating

Date of Birth: 04th August 1987

References: Furnished upon request

Contact

syedumarsaeed@gmail.com

www.linkedin.com/in/umar-saeed-fcca-55a94474 (LinkedIn)

Top Skills

Investment Strategies

Equity raise

Debt raise

Languages

Urdu

English

Pushto

Certifications

Excel Modeling Tips and Tricks

Two-Week-Too-Strong

Financial Modeling, Forecasting and Dashboard Reporting using Excel

CPD - Filing of Income Tax Return

Renewable Energy - Solar Financial Modeling Course

Umar Saeed, FCCA

Director Investments | Project Finance | Renewable Energy
Islāmābād, Pakistan

Summary

A Fellow ACCA Member (FCCA) with 8+ years experience in Power Sector, particularly Renewable Energy. Currently working for a Canadian Renewable Energy IPP, JCM Power, as a Financial Controller, managing the global FP&A and Asia Business Development activities.

Experience

JCM Power

7 years 7 months

Director Investments

January 2025 - Present (4 months)

Islamabad, Islāmābād, Pakistan

Controller

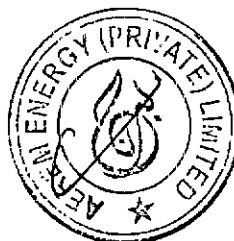
September 2021 - December 2024 (3 years 4 months)

Islāmābād, Pakistan

Manage JCM's global FP&A function which include the corporate valuation, group consolidated budgets, building and managing financial models for operating and pipeline projects, valuation for new opportunities, manage shareholders reporting, prepare Investment Committee and Board decks, etc.

Apart from FP&A, I also look after the Asia Business Development activities by working closely with the Regional Director. Some of my recent projects include co-leading the Competitive Bidding process for KE Renewable Energy Project Tenders 2024 of 640+ MWs and securing the largest and 1st ever utility scale project of 240 MWs, by being awarded the lowest bidder with Pakistan's record low tariff. Other than this, my recent projects include setting up C&I platform for JCM in Pakistan and Bangladesh, manage the due diligence and financial viability of new leads etc.

My previous role in JCM also provided me an opportunity to setup JCM's legal existence in Pakistan, by setting up JCM Power Pakistan Pakistan and getting registered with the regulatory authorities. Post the incorporation, manage the



bookkeeping, financial reporting, taxation, company secretarial duties and annual audits by Big4 auditors.

Manager Finance

January 2020 - August 2021 (1 year 8 months)

Karāchi, Sindh, Pakistan

Project Coordinator

October 2017 - December 2019 (2 years 3 months)

Karachi

Hawa Energy & Jhimpir Power

Controller

January 2023 - December 2024 (2 years)

Karāchi, Sindh, Pakistan



School of Hybrid Accountants

Co-Founder and Faculty Member

April 2018 - January 2019 (10 months)

Karāchi, Sindh, Pakistan

Co-founder of School of Hybrid Accountants and Faculty Member of courses:

- Introduction to Accounting
- Business Management
- Financial Reporting
- Corporate Reporting
- Basic and Advanced Excel Courses

Escribir College of Advanced Studies

Faculty Member - Financial & Corporate Reporting

April 2017 - April 2018 (1 year 1 month)

Karachi

Faculty Member for papers:

- Financial Reporting (F7)
- Strategic Business Reporting (SBR), formerly P2

K-Electric

Senior Accounts Officer

April 2016 - October 2017 (1 year 7 months)

Region 1, Distribution Finance

Pakistan International Airlines

Accounts Officer

March 2015 - April 2016 (1 year 2 months)
PIA HeadOffice, Karachi

Education

ACCA

Fellow Member (FCCA), Accounting and Finance · (2012 - 2016)

ACCA

Advance Diploma, Business and Finance · (2011 - 2012)

ACCA

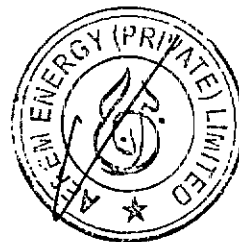
Certified Accounting Technician (CAT), Accounting and
Finance · (2010 - 2011)

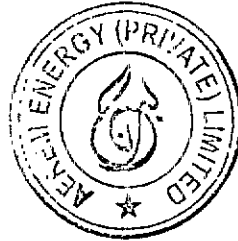
Bahria College

Intermediate, Engineering · (2007 - 2009)

Orchard Grammer School

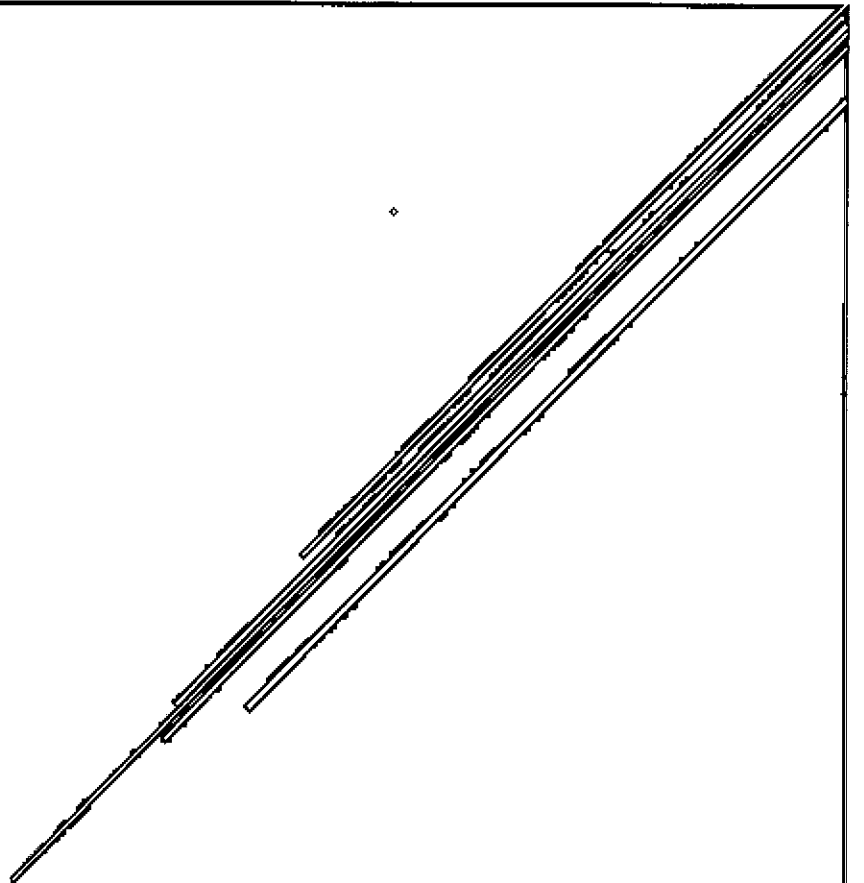
Matriculation, Computer Science · (2005 - 2007)





ANNEXURE – H

PROJECT TECHNICAL PROPOSAL



Site Neutral Hybrid Project at KE's Dhabeji Grid

**VOLUME II – TECHNICAL
PROPOSAL**

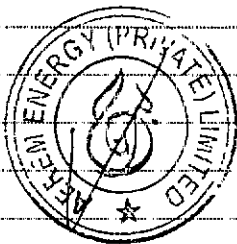
Document Number: HYBRID-JCM-VOL II

DOCUMENT CONTROL

Rev	Date	Description	Prepared By	Approved By
0	30 August 2024	For Tender	H Jagau	S Eglinton

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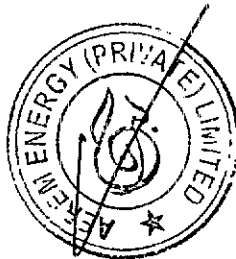
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1. MANDATORY CONDITIONS

All mandatory requirements are complied with as set forth in Exhibit 7.1 Technical Evaluation of the RfP and are summarised in the summary sheet provided in Annexure A as well in in the following Table

Table 1: Mandatory Conditions

No.	Mandatory Condition	RIP Clause	RIP Requirement	Provided in this Bid	Comply (Y/N)
1	Distance of the Project from Dhabeji Grid as per Section 20.1.3	20.1.3	< 50km	14.272 km	Yes
2	Capacity of the Project as per Section 20.1.4	20.1.4	200-400 MW (AC Peak)	236.6MW (AC Peak)	Yes
3	Site Availability/arrangement for the Project as per Section 20.1.5.	20.1.5	-	Comply	Yes
4	Hybrid Project Technology as per Section 20.1.6	20.1.6	> 59.15 MW (AC Peak)	61.6 MW (AC Peak)	Yes
5	Capacity Factor of the Project as per Section 20.1.7.	20.1.7	> 31%	33.7 %	Yes
6	Tier- 1 Solar Panels as per Section 20.2.	20.2	Tier 1	Tier 1	Yes
7	Type Tested (TC) WTGs as per Section 20.4	20.4	TC-25 yrs	TC-25 yrs	Yes
8	220 KV GIS on the Site where Interconnection Point(s) are proposed	20.5	220 kV GIS	Comply	Yes
9	Submission of Technical studies as per Section 20.1.9	20.1.9	Required	Provided	Yes
10	Inclusion of Reactive power compensation devices in the Bid as per Section 20.1.10 (a)	20.1.10 (a)	Required	Provided	Yes
11	Compliance to Grid Code requirement		Required	Comply	Yes



2. BACKGROUND

The consortium between JCM Power, Burj Capital and Gharo Solar ("JCM" or the "Bidder") have completed the technical proposal as per the requirements set out in Volume II of the RfP.

This document describes and highlights the key items of the technical proposal to assist K-Electric to adjudicate our bid efficiently.

The following sub-sections will address each of the requirements of Volume II and make further reference to the supporting documentation provided with the bid submission as required.

3. HYBRID PLANT, SIZING AND LAYOUT

The JCM site is located less than 15km from the Dhabeji Grid Station and is situated on a low-lying plateau and escarpment area, with excellent wind and solar resource as shown in the following figures.

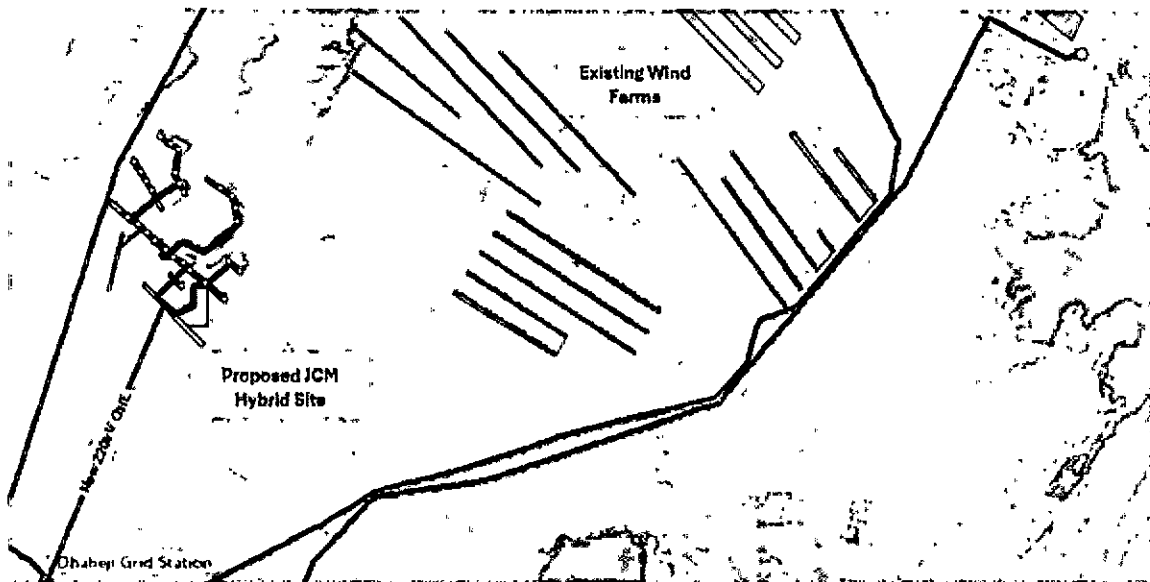
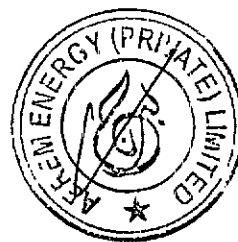


Figure 1: JCM site location relative to Dhabeji grid and other existing infrastructure

The distance from the Dhabeji Grid Station to the substation at the hybrid plat is 14.272 km, complying with the requirement of the RfP section 20.1.3.



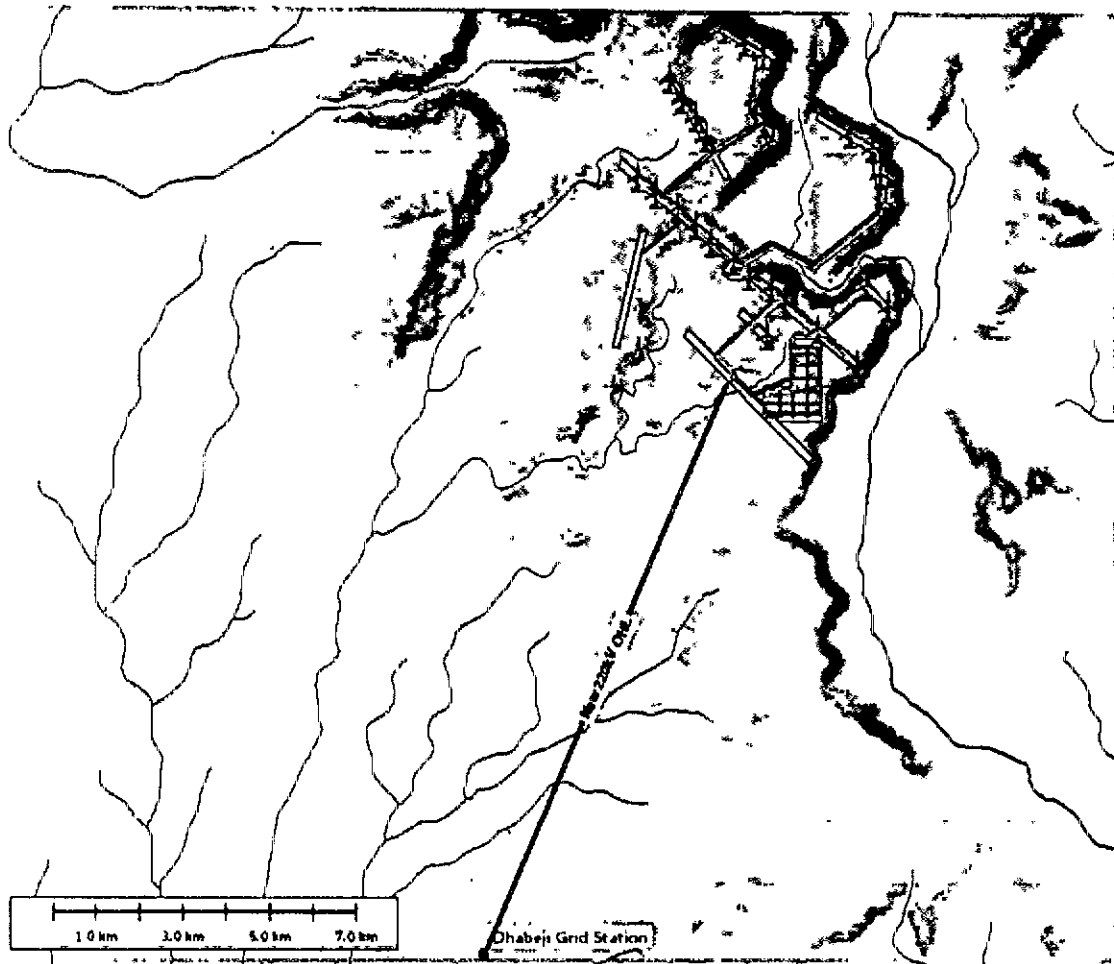


Figure 2: JCM site location relative to Dhabeji grid

Based on our detailed modelling to offer a competitive tariff, JCM has selected the following sizing for the hybrid facility:

Capacity	Wind Plant	Solar Plant	Total Complex
AC Peak	175 MW _{AC}	61.6 MW _{AC}	236.6 MW _{AC}
Contracted Capacity	175 MW _{AC}	94 MW _{P(DC)}	269 MW _P

The above values are in compliance with the requirements of section 20.1.4 and 20.16, i.e. Capacity (AC Peak) of plant between 200-240MW and min. 25% of Capacity (AC Peak) must be Solar.

The solar plant consists of seven PV blocks, each having an installed DC capacity of 13.4 MW and 8.8 MVA of inverter nameplate capacity. There are three 33kV collector feeders running to the 220/33 kV interconnection substation.

The wind plant consists of 28 x 6.25 MW wind turbines, which are collected by six 33 kV collector feeders running to the interconnection substation.

The following figures show the overall hybrid plant layout, as well as a more detailed view of the PV plant layout.

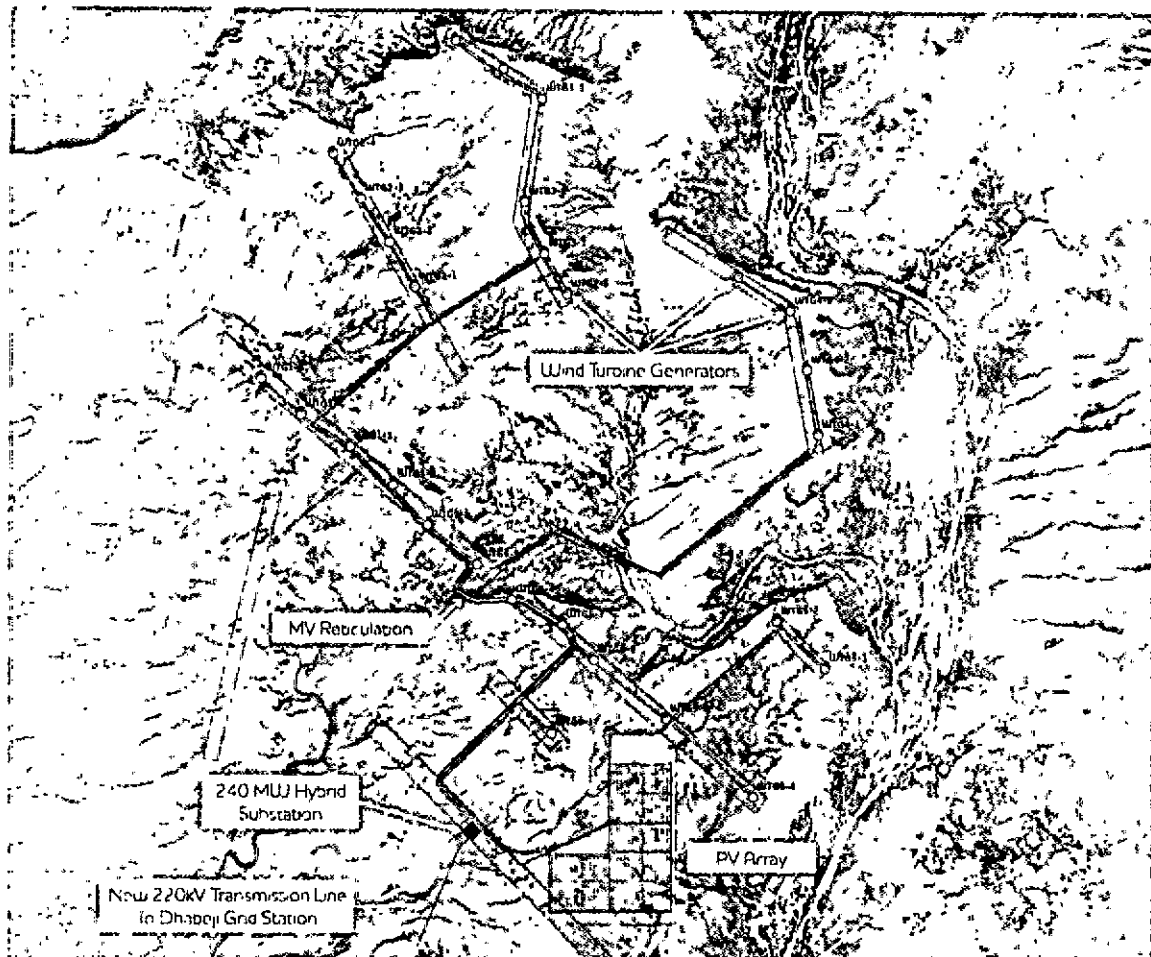
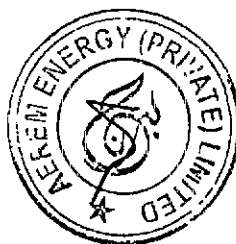


Figure 3: Hybrid Plant Layout (Wind and Solar PV Plant)



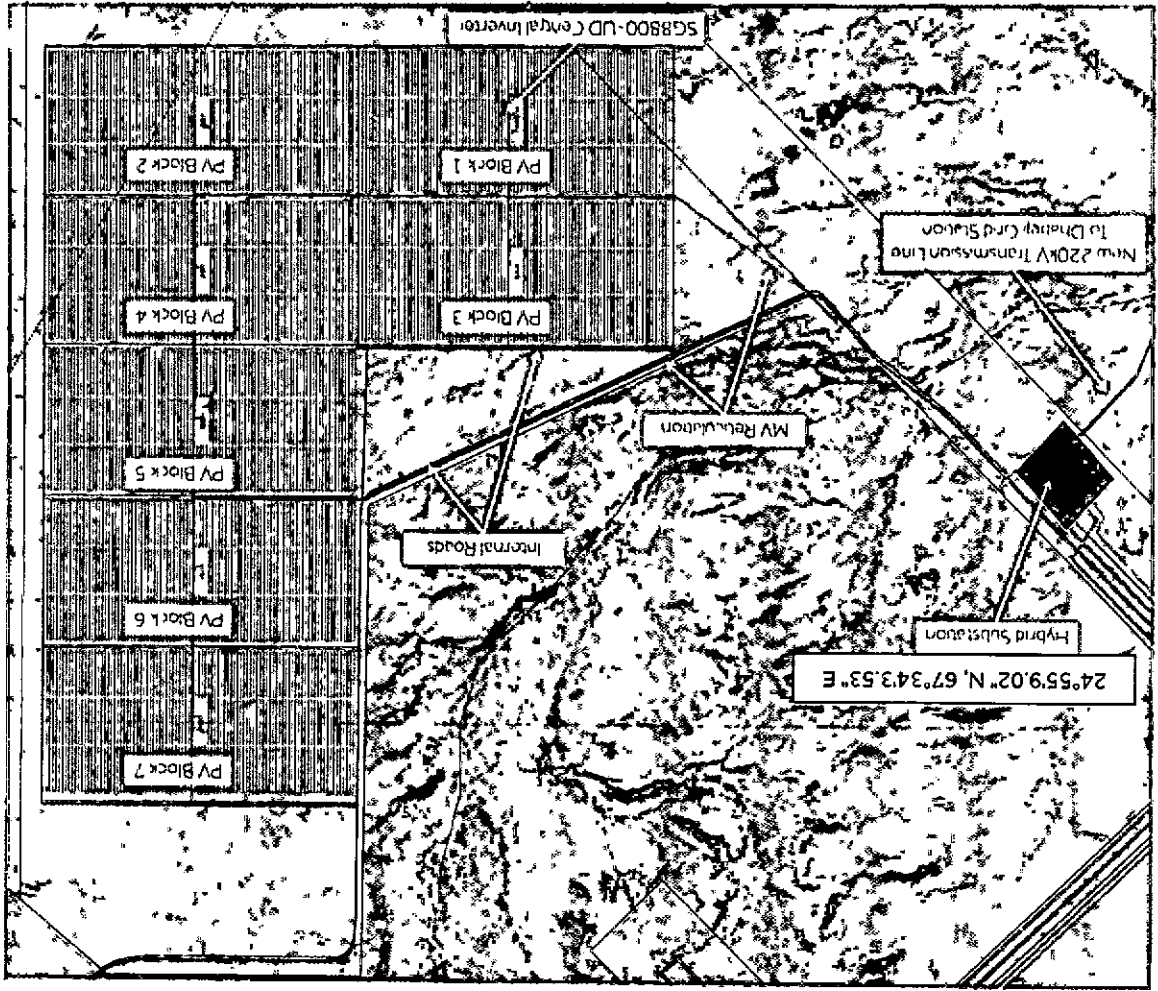


Figure 4: Solar PV Plant Layout



4. KEY EQUIPMENT

4.1 SOLAR PANEL

Our preferred solar module supplier is **JASOLAR**, who are a Tier 1 supplier as per the 2024 Q2 BNEF rating. We have opted for the n-type 620Wp bifacial module, which complies with the RfP requirements of minimum efficiency (17%), warranty terms (25 years) as well as compliance with all relevant standards and codes (IEC / ISO / NFPA).

We have listed Longi Solar as our alternative solar panel supplier, who also comply with all RfP requirements.

Solar panels will be mounted on single-axis tracking structures.

Refer to the supporting information provided along with the bid for details which show compliance with section 20.2 of the RfP.

4.2 POWER INVERTERS

Our preferred inverter supplier is **SUNGROW**, who are a reputable supplier for central inverters and leading the industry with the modular central inverter technology (1+X). We have opted for the 8.8 MVA turn-key central inverter station, which complies with the minimum efficiency requirements (such as 97%, THD of max 2.5% etc) as per the requirements, standard warranty terms (min 5 years, which is extendable), as well as compliance with all relevant standards and codes (IEC / EN / ISO / UL).

We have listed **Huawei** as our alternative power inverter supplier, who also comply with all RfP requirements and are a reputable supplier.

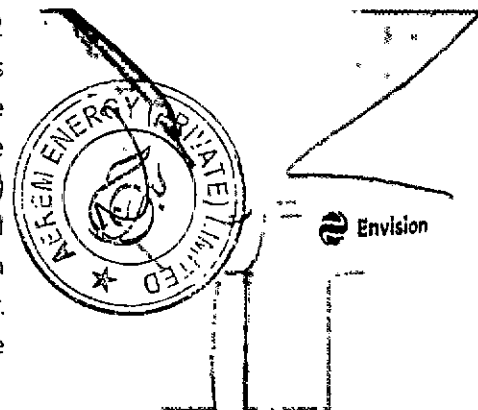
Refer to the supporting information provided along with the bid for details.

4.3 WIND TURBINE

Our preferred wind turbine supplier is **Envision**, who:

- are a reputable supplier, ranked 2nd according to the latest BNEF report
- have a global capacity of 6.2 GW since last 2 years, and
- have more than 5,000 wind turbines installed worldwide.

The turbine model we have selected is the EN 182 6.25 MW model, which Envision have confirmed as suitable for our site. Despite the RfP stating that type certification of 25 years is not available, we have been able to obtain type certification (IEC compliant) for the Envision WTG for 25-year design life and have therefore not provided any further certification from the EPC contractor, OEM or the Bidder. Should additional information be required this can be provided upon request.



The wind turbines which comply with the standard warranty terms (minimum 2 years), are able to produce power up to 45°C, and compliance with all relevant standards and codes (IEC / EN / ISO).

Refer to the supporting information provided along with the bid for details which show compliance with section 20.4 of the RfP.

We have listed the **Goldwind** GWH-182-6.2MW wind turbine model as our alternative supplier and can provide detailed technical compliance documentation upon request.

4.4 GIS

Our preferred GIS supplier is **XUJI**, who are a reputable manufacturer of 220 kV gas insulated switchgear (GIS). The GIS will be installed as per the drawing provided and meet the RfP requirements of double busbar single breaker scheme and is compliant with all relevant standards and codes (IEC / EN / ISO).

Refer to the supporting information provided along with the bid for details **which show compliance with section 20.5 of the RfP**.

4.5 POWER TRANSFORMER

Our preferred 220 kV power transformer supplier is **Sieyuan / Toshiba**, who are a reputable manufacturer of 220 kV power transformers, especially 240 MVA and upwards. The power transformer is compliant with all relevant standards and codes (IEC / EN / ISO), in particular but not limited to IEC 60076. The efficiency of the transformer is above 96% and warranty terms is minimum 2 years as per the requirements set out in the RfP.

All other outdoor switchyard equipment will also be supplied by Sieyuan and is compliant with all relevant standards and codes (IEC / EN / ISO).

Our hybrid power plant will have a single interconnection point.

Refer to the supporting information provided along with the bid for details.

4.6 CIVIL AND MOUNTING STRUCTURE

Our preferred PV tracker supplier is **HD Solar** with the alternative being Array Tech. The PV trackers comply with all requirements of the RfP, in particular being ICC and UL certified, have minimum product warranty of 10 years, designed to withstand the maximum wind speeds on site, and corrosion resistant to the prevailing site atmospheric and soil conditions. The PV plant will be designed to accommodate flood waters as per the flood risk assessment and the site selected for the PV plant is on flat topography.

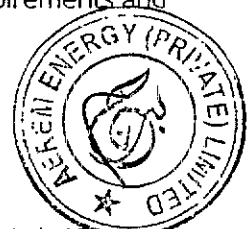
The foundations for the WTG are envisaged to be spread type footings and will be designed and constructed to comply with all relevant standards (IEC, DNV and Eurocodes).

Refer to the supporting information provided along with the bid for details.

4.7 BALANCE OF SYSTEM

The balance of system consists of the 33 kV cable network for the wind and solar, all grounding, lightning protection systems, etc. Our balance of system will comply with all requirements and standards set forth in the RfP.

Refer to the supporting information provided along with the bid for details.



4.8 REACTIVE POWER COMPENSATION

The PV inverters and WTGs are able to produce reactive power as per the supporting documentation provided. However, SVGs / Reactive power compensation devices have been considered in our bid proposal. Together, the hybrid power plant will ensure that the delivery of power at the interconnection grid substation of the hybrid plant will be in compliance with the Grid Code requirement. The final sizing of the reactive power devices will be determined and be substantiated by the grid interconnection study (refer to section 5.4 of this document).

We acknowledge that any change (if determined in the study) will be incorporated by us at our cost.

The above meets the requirements of the RfP as per section 20.2.10 (a) and mandatory conditions.

4.9 OTHER EQUIPMENT

All other smaller equipment will comply with all the requirements of the RfP.

Refer to the supporting information provided along with the bid for details.



5. TECHNICAL STUDIES

All technical studies as required by the RfP have been completed and provided with the bid, which show compliance with section 20.1.9 of the RfP.

5.1 GEOTECHNICAL AND TOPOGRAPHICAL

The geotechnical and topographical studies were completed on the project site and no adverse soil conditions were encountered, rather a homogeneous soil suitable for solar piling foundations and wind turbine spread footing foundations. The earth resistivity and soil corrosiveness are also low, posing little risk to using standard galvanised solar tracker pile foundations.

5.2 FLOOD RISK

The flood risk study for the project site was also completed and no concerns were encountered. One major stream has been identified, which is passing on the eastern side of the project site, which however is not crossing through the planned project site and therefore poses no risk to project equipment. There are numerous smaller streams crossing the project site, which will be managed with adequate stormwater management, such as installing culverts under the roads and berms where required.

5.3 ENERGY YIELD ESTIMATION

A detailed energy yield estimation report has been prepared for the respective wind and solar plants, and this has been summarised in the hybrid energy assessment.

These assessments, taking into account all the requirements set out in the RfP, notably:

- The wind assessment
 - Considers 25 months of data between 2022-2024 from the 93m high DIN Mast, located 15km from the site (raw data has been provided)
 - Considers historic ambient temperature data measured on site
 - Follows Measnet guidelines for site specific assessments
 - Additionally considers several other wind observations in the region including met masts, third party studies and purchased Vortex mesoscale data
- The solar assessment utilises both SolarGIS and SolCast datasets (widely regarded reputable datasets)
- Both studies done by reputable engineering consultants; Aurecon for the wind study and Zutari (formerly part of the Aurecon group) for the solar study

Detailed reports are provided with the bid, and the annual energy yield (AEP) and capacity factors of the hybrid plant have been summarised in the table below:

Table 2: Energy Yield for Hybrid Project

Source	P50	P90 (10 year)	P90 (1 year)
AEP Solar [GWh]	188.43	174.97	173.78
AEP Wind [GWh]	765.10	626.70	619.70
AEP Hybrid [GWh]	953.53	801.57	793.48
Capacity Factor Hybrid	40.5%	34.0%	33.7%

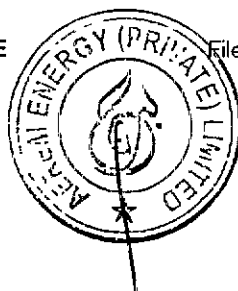
5.4 GRID INTERCONNECTION STUDY AND GRID CODE COMPLIANCE

A detailed grid interconnection study including load flow, short circuit, power quality, transient stability etc. will be completed by the Bidder as per requirements of Grid Code. After having been provided system data for the grid interconnection study by KE, the grid interconnection study will be available to KE within three months of being declared the Successful Bidder.

The grid interconnection study will also determine the size and type of reactive power devices required to meet grid code compliance.

Finally, the PV inverters and WTGs comply with the total harmonic distortion as set out in the RfP, ensuring that the hybrid plant will be grid code compliant.

The above meets the requirements of the RfP as per section 20.2.10 (a) and mandatory conditions.



ANNEX A SUMMARY SHEET OF HYBRID PROJECT

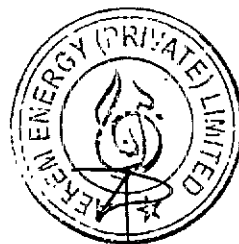




Sl. No.	Item	Value	Particulars (SUN / OEM)	Particulars (SUN / OEM)	Comments (SUN / OEM)
201	Basic Requirements				Compliance Letter Provided in Technical Proposal
201.1	Prequalification of Applicants				Previously pre-qualified Refer to section 20.1.1
201.2	Location of Grid Interconnection Substation	24° 55'02"N, 67° 34'35.53"E			Plant is within 50km from the Dhabay Grid station
201.3	Distance (from Dhabay Grid Station)	14.272 km			
201.4	Capacity AC Peak (Total / Wind / Solar)	2366 MW	175 MWAC	616 MWAC	Within 50km of Dhabay Grid station
201.5	Site Availability		175 MWAC	94 MWDC	Between min 200MWAC and max 240MWAC requirement
201.6	Project Technology	As per RFP requirement			Refer to section 20.1.5
201.7	Capacity Factor	40.5%, P50			25% min solar capacity achieved
201.8	Transmission/Interconnecting Arrangement	33.7% P90-1yr			Greater than 31.6 Capacity Factor, P90 (1-year)
201.9	Technical Studies	14.272 km			
(a)	Yield Assessment				
(b)	Geotechnical				
(c)	Flood Risk				
201.10	Other Studies				
(a)	Grid Interconnection Study	Compliant with Grid Code requirement			Comment letter provided under section 20.1.10 and 20.4
(b)	IEE				Comment letter provided under section 20.1.10
(c)	Consents				Comment letter provided under section 20.1.10
202	Solar Panel	JR solar 620Wp		Longi 630Wp	
203	Power Inverters	Sungrow		Huawei	
204	Wind Turbine (preferred model)	Emission (EN182-6-25MW)	XUJI	Goldwind (GUH182-6-2MW)	Bid is based on Emission EN182-6-25MW Alternative OEM is Goldwind
205	Gas Insulated Switchgear			Sieyuan	
206	Power Transformer and Switchyard Equipment	Sieyuan		TBEA	
207	SCADA, Tele-Communication and Protection	SCADA (INACCESS), Telecommunication & Protection (TBB)	SCADA (SIEMENS), Telecommunication & Protection (TBB)		
208	Metering System and Back-up Metering	ISKRA		Schneider ION	
209	Weather Station	Sungrow / Envision		Campbell Scientific / Goldwind	
2010	Civil/Mounting Structure		HD Solar	Array Tech	Compliance Letter Attached
	Wind	As per RFP requirement			Compliance Letter Attached
2011	Balance of System		MV Transformer (Sungrow) MV Switchgear (TBEA) RO Plant (HydroMech) Auxiliary Transformer (TBEA), DG(TBEA)	MV Transformer (Huawei) MV Switchgear (Sieyuan) RO Plant (ODM) Auxiliary Transformer (Sieyuan), DG(SDEC)	
2012	Safety & Security	As per KE Standard			Compliance Letter Provided in Technical Proposal
2013	Plant Monitoring System		PV INACCESS / WTG Emission	PV SIEMENS / WTG Goldwind	Refer to section 20.13
2014	Interconnection Requirements	As per KE Standard			Compliance Letter Provided in Technical Proposal
2015	Local Considerations	As per RFP requirement			Refer to section 20.15
2016	Local Industry	As per RFP requirement			Refer to section 20.16
2017	Construction/EPC Contractor	As per RFP requirement	Consortium between Power China Northwest and SinoHydro	CEEC China Energy International	Refer to section 20.17
2018	Design Experience and Capability	As per RFP requirement			Refer to section 20.18
2019	Operations and Maintenance	As per RFP requirement			Refer to section 20.19
2020	HSE	As per RFP requirement			Refer to section 20.20

ANNEXURE-J

BER SUBMITTED BY KE TO NEPRA

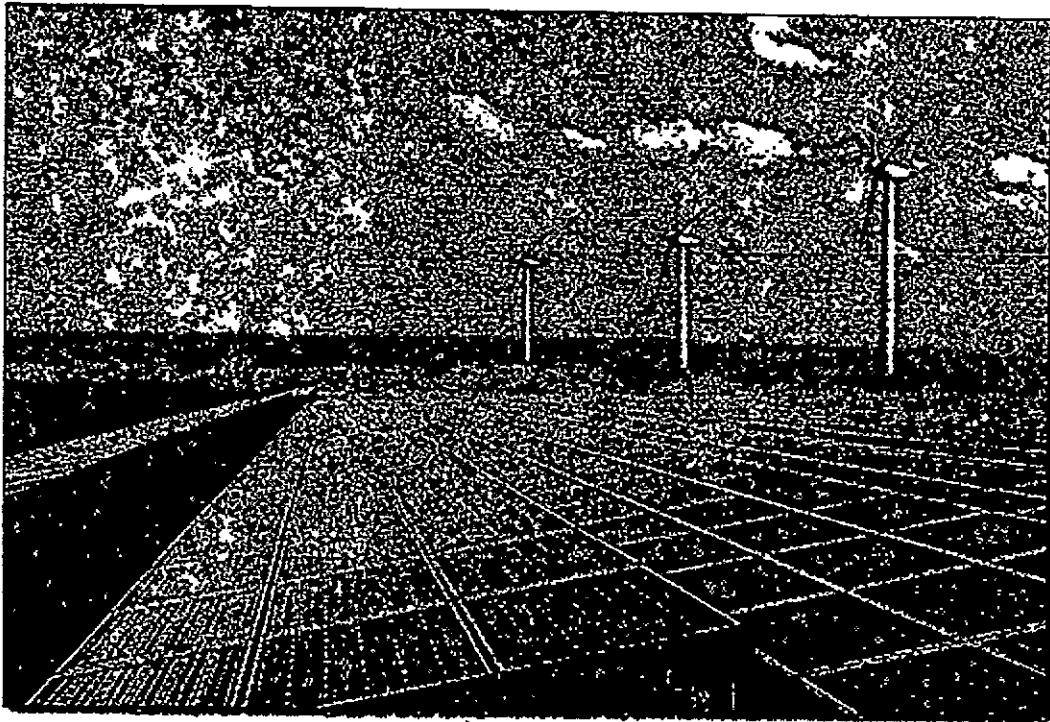




BID EVALUATION REPORT

**220 MW SITE NEUTRAL HYBRID PROJECT AT KE
DHABEJI GRID – SINDH – PAKISTAN
("PROJECT")**

**IN ACCORDANCE WITH NEPRA COMPETITIVE
BIDDING TARIFF REGULATIONS, 2017 ("NCBTR")**



OCTOBER 2024

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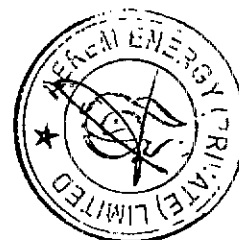




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4 KE's Prudency Check	13
5 Conclusion	14
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Executive Summary

Project Background

K-Electric Limited ("KE") initiated the process of bidding to induct 220MW Site Neutral Hybrid Project at KE's Dhabeji Grid in Sindh region under NCBTR. The Project will not only reduce generation costs but will also help KE in achieving its goal to include 30% Renewable capacity by 2030.

The Project is planned to be connected to KE Dhabeji grid through 220kV transmission line.

Open Competitive Bidding

KE conducted the initial prequalification process for the Project in 2023. Subsequently, the Request for Proposal ("RFP") for the Project was approved by NEPRA on March 15, 2024, under open competitive bidding without benchmark tariff ("NEPRA Determination"). In compliance with the NCBTR and NEPRA determination, KE invited reputable local and international companies/consortiums with proven power project experience and sound financial standing to submit their Bid Proposal for the Project by August 31, 2024 ("Bid Submission Deadline"). The Bid submission deadline was initially May 31, 2024, which was extended upon the requests of several parties and was also intimated to the Honorable Authority on May 09, 2024, vide letter Ref. No. BD/MZ/NEPRA-1065/2024-0905.

Power Evacuation arrangement

It is important to highlight that the successful evacuation of power from the Project relies on the timely completion of the associated transmission line. Accordingly, KE will be initiating the tendering process for the 220 kV double circuit transmission line which will be constructed from the Dhabeji grid station to the gantry of the Project for evacuation of power. Accordingly, KE will separately submit the Project cost of the transmission line upon receipt of bids, for inclusion in KE MYT Investment Plan for the Authority's approval.

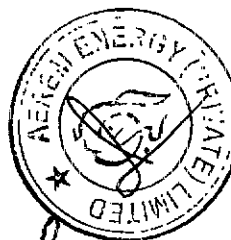
Submission of Bids and Evaluation of Technical Proposals

In response to KE Invitation, seven (07) Bidders participated in the open competitive bidding procedure and their technical bids for the Project were opened on September 02, 2024.

Following a comprehensive technical evaluation, it was determined that six (06) bidders successfully met the knock-out criteria and achieved the minimum technical score. However, one bidder did not meet the pre-qualification criteria and was therefore disqualified. The list of Technically qualified Bidders is as follows.

S. No.	Applicant / Lead Sponsor
1	Fauji Fertilizer Company Limited
2	Hub Power Holdings Limited
3	Hurricane 150MW (Pvt) Limited
4	JCM Power Corporation
5	Metro Group of Companies
6	Sapphire Textiles Mills Limited

Table 1: List of Technically qualified Bidders





Details of disqualified bidder are as follows:

S. No.	Lead Sponsor
1	Reshma Power Generation (Pvt.) Limited

Table 2: Disqualified bidder

Evaluation of Commercial Proposals

Subsequent to the technical evaluation, financial bids were opened for all the Technically qualified Bidders on September 24, 2024. The summary of tariff proposal submitted by these Bidders are as follows:

Lead Sponsor Name	Bid Tariff (PKR/kWh)	Evaluated Tariff including TCC (PKR/kWh)	Ranking
JCM Power Corporation	8.9189	9.7571	1
Hub Power Holdings Limited	9.8689	11.3689	2
Hurricane 150MW (Pvt) Limited	10.9610	11.9410	3
Sapphire Textiles Mills Limited	10.5000	11.9517	4
Fertilizer Company Limited	11.5000	12.4166	5
Metro Group of Companies	11.3151	12.8651	6

Table 3: Summary of Tariff Table

Prudency Check by KE

As directed under the NEPRA Determination, KE has conducted a comprehensive assessment of the successful bid, considering the prevailing macroeconomic and market conditions along with an assessment and analysis of displacement of expensive electricity in its system.

Based on the prudency check of Bid Tariff, KE has independently prepared an estimated Tariff number based on current market conditions and prices which works out to be in the range of Rs. 11.9930/kWh (USc. 4.1549/kWh) to Rs. 10.8630/kWh (USc. 3.7634/kWh). However, as evident from Table 3 above, the lowest Bidder – JCM Power Corporation has offered a tariff of Rs. 8.9189/kWh (USc. 3.0898/kWh) which is less than the estimated tariff worked out by KE.

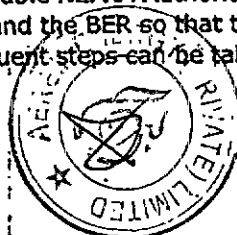
Additionally, KE has conducted analysis of displacement of expensive fuel due to offtake from the Project – further detailed in Section 4 of the Bid Evaluation Report ("BER"). Based on the analysis, the Project is expected to fetch annual savings in energy cost of PKR 7,050.3 million (total savings of PKR 176,259 million through the life of the Project) on account of displacement of expensive imported fuel-based generation. Moreover, the Project is also expected to realize annual forex savings of USD 39.45 million (total savings of USD 986.21 million through the life of the Project).

Results of Tariff Proposal

In accordance with the Technical and Financial evaluation criteria approved by NEPRA and as per the prudency check performed by KE, **JCM Power Corporation is declared as the Successful Bidder** for the Project by the Bid Evaluation Committee ("BEC").

Submission to NEPRA

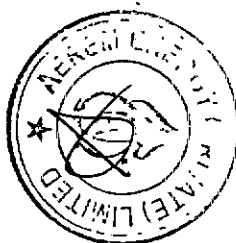
KE hereby requests the Honorable NEPRA Authority to grant its approval of the Competitive Bidding process and the BER so that the same can be communicated to the Successful Bidder and subsequent steps can be taken accordingly.





1 Project Background

- 1.1 K-Electric Limited ("KE") is a publicly listed utility company and the only vertically integrated power utility, engaged in the Generation, Transmission, Distribution and Supply of electricity in Pakistan. K-Electric has Distribution and Electric Power Supplier licenses for Karachi and its adjoining areas including Dhabeji and Gharo in Sindh and Hub, Uthal, Winder and Bela in Balochistan. The Company has around 3.7 million industrial, commercial, agriculture and residential consumers and is supplying electricity to over 20 million people.
- 1.2 The project will be connected to Dhabeji Grid Station via 220kV Transmission Line. KE is now initiating the tendering process for the 220 kV double circuit transmission line which will be constructed from the Dhabeji grid station to the gantry of the Project for evacuation of power and will separately submit the Project cost of the transmission line, upon completion of the tendering activities and receipt of bids, for the Authority's approval. The 220kV transmission system is planned to be energized three months before the Project's COD, subject to regulatory approvals.
- 1.3 KE conducted the initial prequalification process for the Projects in 2023. Subsequently, in accordance with the NEPRA Determination, the prequalification process was conducted again. Moreover, NEPRA had clarified that the existing prequalified parties were considered as prequalified.
- 1.4 The invitation to bid advertisement for the Project(s) was published on April 02, 2024, under major publications as follows:
 1. International newspapers: China Daily, Khaleej Times, New York Times and Financial Times
 2. Local newspapers: Daily Dawn, Business Recorder, Express Tribune and others
 3. Tendering websites: globaltenders.com and tendersinfo.com
- 1.5 The RFP document was also made available on the KE website. All Bidders/Applicants were required to register on SAP ARIBA software, for submission of soft copy of the bids. All correspondence, clarifications and amendments were uploaded on the Ariba Software and/or KE website.
- 1.6 In line with the RFP, KE formed the BEC (as detailed in Section 2 below) to oversee the Competitive Bidding process, evaluation of Bids and preparation of BER.
- 1.7 As required under NCBTR, KE appointed M/s OMS (Private) Limited ("OMS") as Independent Consultant ("IC") in the BEC.





2 Evaluation of Bids

2.1 Bid Evaluation Committee ("BEC")

In compliance with the NCBTR and the RFP, KE formed the BEC comprising of following five (5) members:

S. No.	Members
1	KE Business Development
2	KE Business Finance
3	KE Corporate Legal
4	KE Supply Chain
5	OMS (Private) Limited - Independent Member

Table 4: Bid Evaluation Committee Members

The BEC has assessed both the Technical Proposal, and the Financial/Tariff Proposal received, and subsequently conducted the bid evaluations in accordance with Exhibit 7 (Bid Evaluation Criteria) of the RFP. Moreover, OMS (Private) Limited, in its capacity as the Independent Member of the BEC, has been integral part of the bid evaluation process and has endorsed the technical and financial evaluation.

2.2 Power evacuation arrangements and Grid Interconnection Study

It is important to highlight that the successful evacuation of power from the Project relies on the timely completion of the associated transmission line. Accordingly, KE will be initiating the tendering process for the 220 kV double circuit transmission line which will be constructed from the Dhabeji grid station to the gantry of the Project for evacuation of power. Accordingly, KE will separately submit the Project cost of the transmission line upon receipt of bids, for inclusion in KE MYT Investment Plan for the Authority's approval.

Grid Interconnection Study will be conducted by the Successful Bidder and shall include load flow, short circuit, power quality, transient stability etc. as per requirements of the Grid Code. The successful bidder shall be responsible for obtaining approval of the Grid Interconnection Study from KE.

2.3 Bidding Process

2.3.1 Prequalification

A prequalification process was initially carried out by KE in 2023, however in the approval of the RFP, NEPRA directed KE to allow new parties to participate in the prequalification process who had not previously participated in the prequalification process, while the parties who had already been prequalified by KE were not required to go through the process again. The following parties were pre-qualified in the initial round of 2023.

S. No.	Lead Sponsor	Consortium member (if any)
1	Lucky Cement	





2	Engro Energy Limited	-
3	Hub Power Holdings Limited	-
4	Sapphire Textile Mills Limited	-
5	Sapphire Electric Company Limited	-
6	JCM Power Corporation	Burj Capital and Rana Nasim Ahmed
7	Danish Iqbal	Saad Iqbal and Natasha Iqbal
8	Master Textile Mills Limited	Liberty Mills Limited
9	Oursun Pakistan	Oursun Solar Power Limited and Orient Power Company
10	Atlas Power Limited	-
11	Hurricane 150 MW Pvt. Ltd.	-
12	Zahir Khan & Brothers	KALYON Insaat.
13	Sardar Muhammad Ashraf D. Baloch (SMABD)	Xingrong Construction Engineering (SMC-Private) Limited ("XCEL")

Table 5: List of Prequalified Bidders

Subsequently, new bidders submitted the prequalification documents along with their bidding documents. KE's Letter dated June 12, 2023, intimating the Prequalified parties to the Honorable NEPRA Authority is attached as Annexure A5.

2.3.2 Pre-bid clarifications

During the tendering process, several potential bidders submitted pre-bid clarifications to KE. In response, KE, in consultation with the Independent Consultant (OMS), addressed these clarifications. A consolidated document of pre-bid clarifications was subsequently prepared and circulated to all the Bidders by KE on August 27, 2024 (Refer Annexure A2). Also, KE Issued Corrigendum to the RFP (Refer Annexure A3) and shared the revised Energy Purchase Agreement with Bidders (Refer Annexure A4).

2.3.3 Bid submission

At the time of Bid Submission Deadline on August 31, 2024, a total number of seven (07) bids were received from the following Bidders:

Sr. No.	Bidder Name	Address	Single Entity/Consortium	Country
1	Fauji Fertilizer Company Limited (Lead Member) Oracle Energy Limited (Consortium Member) Fauji Foundation (Consortium Member)	156 The Mall, Rawalpindi 91 Shahrah-e-Iraq Block 5, Clifton Karachi Fauji Towers, 68 Tipu Road Chaklala, Rawalpindi	Consortium	Pakistan
2	Hub Power Holdings Limited	9th Floor, Ocean Tower Block-9, Main	Single Entity	Pakistan





Sr. No.	Bidder Name	Address	Single Entity/Consortium	Country
		Clifton Road, Karachi, Pakistan		
3	Hurricane 150MW (Pvt.) Limited	House No. 17, Street 4, F8/3, Islamabad	Single Entity	Pakistan
4	JCM Power Corporation (Lead Member) Burj Energy International Management Limited (Consortium Member) Rana Nasim Ahmed (Consortium Member)	15 Baycrest Drive, Barrie, ON, L4M 7C7, Canada 108 Liberty House, Dubai International Financial Center, Dubai, United Arab Emirates 76-B, Street 4, DHA Phase 5, Lahore	Consortium	Canada UAE Pakistan
5	Metro Group of Companies Mr. Danish Iqbal (Sponsor) Mr. Saad Iqbal (Sponsor) Ms. Natasha Iqbal (Sponsor)	2nd Floor, Al-Tijarah Centre, P.E.C.H.S., Main Shahrah-e-Faisal, Karachi	Consortium	Pakistan
6	Sapphire Textiles Mills Limited	7-A/K, Main Boulevard, Gulberg-II, Lahore	Single Entity	Pakistan
7	Reshma Power Generation (Pvt.) Limited (Lead Member) Gajander Bux Abbasi & Company (Consortium Member) MM Group (Consortium Member)	8th Floor, Aashiana Shopping Center, 78-D/I, Main Boulevard, Gulberg-II, Lahore	Consortium	Pakistan

Table 6: List of bids received

2.3.4 Evaluation of Prequalification Application upon bid submission

In accordance with the RFP, Consortiums led by Fauji Fertilizer Company Limited (FFC), and Reshma Power Generation (Pvt.) Limited submitted a new pre-qualification application for the Project.

After evaluation of the Legal, Technical and Commercial requirements submitted in compliance of the RFP, the following were the results of qualification process:

S. No.	Lead Sponsor	Status
1	Fauji Fertilizer Company Limited	Qualified





2	Reshma Power Generation (Pvt.) Limited	Disqualified

Table 7: Fresh Qualification Status

Reason of disqualification:

Consortium of Reshma Power Generation (Pvt.) Ltd has been disqualified as they did not fulfill the Prequalification criteria outlined in the RFP. On September 05, 2024, KE notified the bidder that they are failing to meet both the Technical and financial criteria for prequalification and other requirements of the RFP and requested them to submit additional/ missing information. However, the bidder failed to provide the requested information and was resultantly disqualified.

Consequently, on September 19, 2024, KE intimated the results of the technical evaluation to all parties.

2.3.5 Technical Evaluation Criteria:

Given below are the technical specifications relevant to the Project, non-compliance to which would have resulted in disqualification of the Bidder.

Knock-off Criteria:

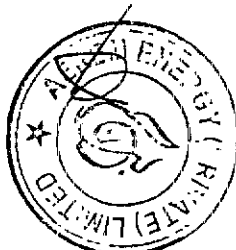
Sr. No.	Mandatory Conditions
1	Distance of the Project from Dhabejl Grid as Per Section 20.1.3
2	Capacity of the Project as per Section 20.1.4.
3	Site Availability/arrangement for the Project as per Section 20.1.5.
4	Hybrid Project Technology as per Section 20.1.6.
5	Capacity Factor of the Project as per Section 20.1.7.
6	Tier-1 Solar Panels as per Section 20.2.
7	Type Tested WIGs as per Section 20.4.
8	220 KV GIS on the Site where Interconnection Point(s) are proposed
9	Submission of Technical studies as per Section 20.1.9. (a) Yield Assessment (b) Geotechnical Investigation (c) Flood Risk
10	Inclusion of Reactive power compensation devices in the Bid as per Section 20.1.10 (a)
11	Compatibility of the Complex and equipment with technical standards of Grid Code (power factor, voltage variation, operating frequency range etc.), Distribution Code and other applicable document etc.

Table 8: Mandatory Conditions

Detailed Technical Scorecard is given in annexure A6, according to which, minimum criteria for qualification of bidder are 70 out of 100 marks after passing the knock-off criteria.

2.3.6 Technical Evaluation Summary

In view of the above, all 06 (six) prequalified parties submitting the technical bids have passed the technical evaluation and were declared as technically qualified.





Technical Evaluation Criteria	Fertilizer Company Limited	Hub Power Holdings Limited	Hurricane 150MW (Pvt) Limited	JCM Power Corporation	Metro Group of Companies	Sapphire Textiles Mills Limited
Compliant with Knock-off Criteria	Yes	Yes	Yes	Yes	Yes	Yes
Site Availability	Yes	Yes	Yes	Yes	Yes	Yes
Solar Panels	Yes	Yes	Yes	Yes	Yes	Yes
Power Inverters	Yes	Yes	Yes	Yes	Yes	Yes
Wind Turbines	Yes	Yes	Yes	Yes	Yes	Yes
Gas Insulated Switchgear (GIS), Power Transformers and other switchyard equipment, SCADA, Telecommunication and Protection Schemes, Back-up Metering System	Yes	Yes	Yes	Yes	Yes	Yes
Weather Station	Yes	Yes	Yes	Yes	Yes	Yes
Civil/Mounting Structure	Yes	Yes	Yes	Yes	Yes	Yes
Balance of System	Yes	Yes	Yes	Yes	Yes	Yes
Safety and Security	Yes	Yes	Yes	Yes	Yes	Yes
Plant Monitoring System as per RFP section 20.13	Yes	Yes	Yes	Yes	Yes	Yes
Corporate Social Responsibility /Ability to contribute towards local economy	Yes	Yes	Yes	Yes	Yes	Yes
EPC Contractor	Yes	Yes	Yes	Yes	Yes	Yes
Design Experience and Capability	Yes	Yes	Yes	Yes	Yes	Yes
HSE	Yes	Yes	Yes	Yes	Yes	Yes
O&M Methodology	Yes	Yes	Yes	Yes	Yes	Yes

Table 9: Technical Submission Summary Results (detailed technical scoring card in annexure A6)

Key: Yes = Compliant; No = Not Compliant

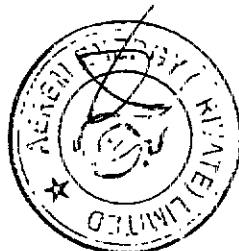
As per the RFP and general clarifications, any change in equipment proposed will be subject to KE's approval and with the fulfillment of criteria set out in the RFP.

2.3.7 Legal Submission:

The prequalified Bidders were required to submit the following information in their legal submission:

- Bid Submission Letter
- Confidentiality Agreement
- Form of Covenant
- Power of Attorney
- Affidavit
- Letter of Acceptance
- Form of Bid Bond

All the prequalified Bidders have submitted a compliant legal submission.



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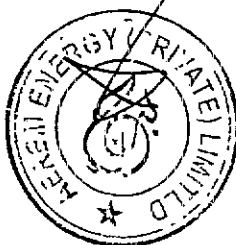
Lead Sponsor	Bid Submission Letter	Confidentiality Agreement	Form of Consent	Power of Attorney	Affidavit	Letter of Acceptance	Form of Bid Bond
Fauji Fertilizer Company Limited	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hub Power Holdings Limited	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hurricane 150MW (Pvt) Limited	Yes	Yes	Yes	Yes	Yes	Yes	Yes
JCM Power Corporation	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Metre Group of Companies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sapphire Textiles Mills Limited	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 10: Summary of Legal Documentation
Key: Yes = Compliant; No = Not Compliant

2.3.8 Grievance and Redressal Committee

From and after the announcement of the technically qualified Bidders, any Bidder feeling aggrieved by the evaluation outcome may lodge a written complaint before the Grievance Redressal Committee concerning its grievance not later than three (3) days after the announcement with adequate particulars of the complaint and attaching copies of any documents relevant to the complaint, via electronic mail to the following address: email address: project.grievance@ke.com.pk.

No grievance was received for the Project by KE from the disqualified bidder.



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¹ Applicant has submitted a cheque of the required amount in favor of KE as Payment Security for which KE obtained a clarification from the Bidder. Detailed correspondence is available on ARIBA portal.



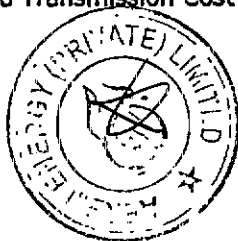
3 Evaluation of Bid Tariff

The financial bid opening took place on September 24, 2024. The Tariff Proposals of the technically qualified Bidders were opened in the presence of the representatives from KE, OMS and all technically qualified Bidders. The details of the Bid Tariffs submitted by each Bidder are summarized in the table below:

Lead Sponsor Name	Distance from Dhabeji Grid [km]	Bid Tariff [PKR/kWh]	TCC [PKR/kWh]	Evaluated Tariff [PKR/kWh]	Ranking
JCM Power Corporation	14.2720	8.9189	0.8382	9.7571	1
Hub Power Holdings Limited ²	36.3333	9.8689	1.5000	11.3689	2
Hurricane 150MW (Pvt) Limited ²	19.0000	10.9610	0.9800	11.9410	3
Sapphire Textiles Mills Limited	34.7248	10.5000	1.4517	11.9517	4
Fertilizer Company Limited	18.8880	11.5000	0.9166	12.4166	5
Metro Group of Companies	38.0000	11.3151	1.5500	12.8651	6

Table 11: Bid Tariff of technically qualified Bidders

As evident from above and based on the evaluation criteria as mentioned in Exhibit-7 of the RFP, the Bidder that has offered the lowest Evaluated Tariff is JCM Power Corporation, with an Evaluated Tariff of PKR 9.7571 (USc. 3.3802/kWh)³ – [Bid Tariff of PKR 8.9189/kWh and Transmission Cost Component of PKR 0.8382/kWh].



² The TCC calculated through the switchyard coordinates provided in the technical bid submission of HUBCO and Hurricane slightly differs from the ARIBA submission and is 1.5155 PKR/kWh and 1.0052 PKR/kWh respectively.
³ USD to PKR rate of Rs.288.65/USD have been used



4 KE's Prudency Check

As required by NEPRA in the RFP approval, KE has performed a prudency check on the successful bid based on the prevailing equipment cost, market conditions and funding costs. Moreover, analysis for displacement of expensive fuel have also been done as per IGCEP and PAP.

4.1 Prudency of Bid Tariff

KE has performed an analysis of the submitted tariffs based on its assessment of the prevailing EPC cost of the Project and the prevailing market conditions. The key assumptions and results of the above analysis are as follows:

Parameter	Assumptions
Exchange Rate	288.65/USD
SOFR + Spread	5.37% + 4.25%
Foreign Debt Tenor	15 years
KIBOR + Spread	21.28% + 2.25%
Local Debt Tenor	15 years
Capacity Factor	36.9%
Debt: Equity Ratio	80:20
Return on Equity	15% (USD Based)
IRR	13% (USD Based)
EPC Cost	USD 0.71 - 0.79 Mn/MW ⁵

Table 12: Assumptions

Bid Tariff upon KE independent assessment
RS 11.9930/kWh - RS 10.8630/kWh

Table 13: Estimated bid Tariff

4.2 Displacement Cost Analysis⁶

The induction of the Project in KE fleet is expected to bring savings in both national system and KE grid due to replacement of expensive generation in National Grid and KE fleet with renewable power from the Project. Based on KE estimate, the Project will bring following cost and forex savings:

Parameters	Annual savings	Project life savings
Energy Cost Savings - PKR	7,050.3 Mn	176,259 Mn
Forex Savings - USD	39.45 Mn	986.21 Mn

Table 4.2-1: Project Savings

The above savings are indicative only and have been computed based on certain assumptions including but not limited to the hourly demand profile, availability of supply from National Grid (assumed at 1,700 MW for the analysis), fuel prices, marginal cost of National Grid, technical constraints etc.

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⁴ The presented IRR does not consider variation in macroeconomic factors which may further reduce the IRR.

⁵ Considering the subjectivity of the EPC quotes, KE has also evaluated the prudency of the Successful Bid assuming a tentative reduction in the EPC price.

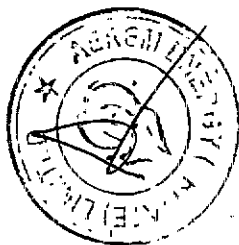
⁶ Savings due to displacement of imported fuel has been worked out using prevalent fuel cost considering horizon of 7 years, which have then been prorated over entire Project Life.





5 Conclusion

Based on the Technical and Financial evaluation conducted by the BEC, along with the prudency checks performed by KE as detailed in the report presented above, it is requested to the Honorable NEPRA Authority to approve the Bid Evaluation Report and declare **M/s JCM Power Corporation** (Refer Annexure A1 for Bid Details) as the Successful Bidder. This declaration is requested in accordance with the criteria set forth in the NCBTR and the NEPRA Determination.



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The Bid Evaluation Committee hereby approves the Bid Evaluation Report and declares **M/s JCM Power Corporation** as the Successful Bidder, subject to approval of NEPRA.

MUDASSIR ZUBERI
Head of Business Development
KE-ELECTRIC LIMITED

Head of Business Development – KE

MUNIR AHMAD FARAZ PASHA
Head of Business Finance
Head of Business Finance
KE-ELECTRIC LIMITED

Head of Business Finance – KE

SYED IRFAN ALI SHAH
Director & Head of Legal Affairs
KE-ELECTRIC LIMITED

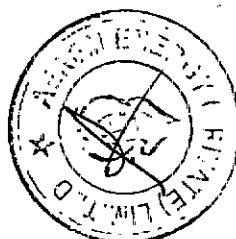
Head of Legal – KE

JUSTICE HASHAM
Head of Procurement
Supply Chain
KE-ELECTRIC LIMITED

Head of Procurement – KE



Independent Consultant – OMS (Private) Limited





ANNEXURES

A1 – Bid Details for JCM Power Corporation

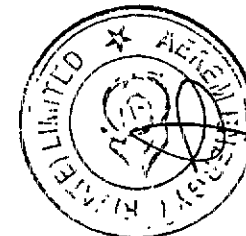
S. No.	Description	Specifications
1	Solar Panel	JA Solar 620Wp Longi 630Wp
2	Power Inverters	Sungrow, Huawei
3	Wind Turbine Generator (WTGs)	Envision (EN182.6.25MW) Goldwind (GWH182-6.2MW)
4	Gas Insulated Switchgear (GIS)	XUJI Sieyuan
5	Power Transformers and Switchyard Equipment	Sieyuan TBEA
6	SCADA, Tele-Communication and Protection Schemes	SCADA (INACCESS), Telecommunication & Protection (ABB)
7	Metering System and Back-up Metering System	ISKRA Schneider IQN
8	Weather Station	Sungrow / Envision Campbell Scientific / Goldwind
9	Balance of System	MV Transformer (Sungrow), MV Switchgear (TBEA), RO Plant (HydroMech), Auxiliary Transformer (TBEA), DG-s (TBEA)
10	Construction/EPC Contractor	Consortium between Power China Northwest and SinoHydro CEEC China Energy International
11	HSE	Compliance
12	CSR	Compliance



Consolidated Clarification Document of Site Neutral Hybrid Project at KE's Dhabeji Grid

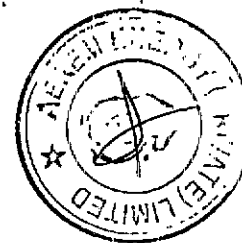
The responses are as shared with prospective bidders on the clarifications sought; changes (if any) in responses is issued as Amendment and Corrigendum on KE Website and on Ariba.

We have now concluded the clarification process of Site Neutral Hybrid Power Project bidding process.

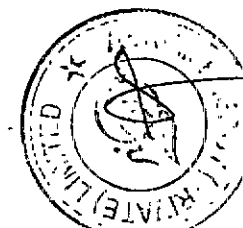


Commercial Clarification Responses

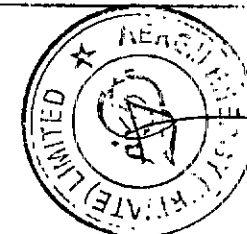
Sl. #	RFP/EPA Clause No.	RFP/EPA Statement	RFP/EPA Queries	KE Response
1	RFP I - Definitions - Instruction to Bidders	Bid Bond - An unconditional, irrevocable, on demand bank guarantee issued in favor of K-Electric Limited pursuant to Section 14.6 of this RFP, by at least an "AA" rated scheduled bank operating in Pakistan which is acceptable to K-Electric, valid for a period of at least twelve (12) months from the bid submission deadline in the format and language as provided in Exhibit 8.	The bid bond validity period of 12 months is quite aggressive and may not be acceptable to the lending bodies/banks. Request to re-consider reducing the bid bond validity to less than 6 months.	Please refer to Corrigendum issued by KE in this regard, Bid Bond Validity have been revised to 8 months.
2	RFP 3.14- Invitation to Bid	The Successful Bidder will be awarded the LOI as appended in Exhibit 11 of this RFP after NEPRA's approval of Bid Evaluation Report, for formation of SPV subject to submission of Performance Guarantee (PG).	As per NEPRA Decision in the matter of the RFP for 200 MW Hybrid Project at Dhabeji Grid, KEL is directed to communicate upfront, while floating the RFP, its desired level of equity participation percentage (a fixed number) with a maximum limit of 25%. For the sake clarity, please share if KE would not be part of the SPV anymore as no percentage has been specified.	KE will not have any shareholding in the Project.
3	RFP 14.3 Technical Proposal	It is mentioned "The technical proposal should comprise of the following..... (a)... (b)... (c)Pre-qualification fee...	The Pre-qualification fee would not be applicable for the already pre-qualified bidders. To avoid ambiguity at a later stage, the same should be specified next to this	Applicants who were already prequalified previously do not have to reapply.



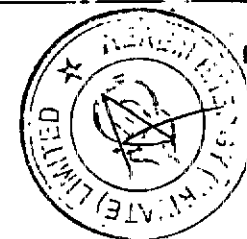
			requirement as mentioned on the requirement above (b).	
4	RFP Exhibit 2 Confidentiality Agreement	The Bidder must execute the Confidentiality Agreement on stamp paper and submit to K-Electric along with complete Application for Prequalification (if applicable)	For the sake of clarity, KE is requested to share the value of the stamp paper.	Region Sindh denomination of stamp paper PKR 1000. Region Punjab denomination of stamp paper PKR 500.
5	RFP Exhibit 5 - Affidavit	The Bidder must execute the Affidavit on stamp paper and submit to K-Electric along with complete Bid.	For the sake of clarity, KE is requested to share the value of the stamp paper.	Region Sindh denomination of stamp paper PKR 200. Region Punjab denomination of stamp paper PKR 300.
6	RFP Exhibit 6 - Letter of Acceptance by the Bidder	To be submitted on stamp paper.	For the sake of clarity, KE is requested to share the value of the stamp paper.	Region Sindh denomination of stamp paper PKR 200. Region Punjab denomination of stamp paper PKR 300.
7	EPA 1.1 Definitions	Services provided by the Seller through the Complex, other than the delivery of Net Delivered Energy, as provided in Schedule 5, which services shall be provided within the Technical Limits and according to the provisions of the Grid Code.	EPA schedules are not attached to this RFP. For the sake of clarity, KE is requested to share all EPA schedules.	NPMV Schedule have been already shared and the pass-through items have been covered in the RFP
8	EPA 9.3 Liquidated Damages	9.3 (a), (b), (c)	Clause 9.3 pertains to Liquidated Damages which focuses only on a breach of Seller duties and do not provide any circumstance entitling the Seller to claim Liquidated Damages. A clause should be added encapsulating the failure on part of the Purchaser to fulfil its obligations and the consequences thereof	Liquidated damages (LDs) for delays attributable to the Purchaser's Interconnection Facilities are detailed in Section 6 of EPA. Similarly, LDs for delays in Commissioning Tests are outlined in Section 8 of EPA.



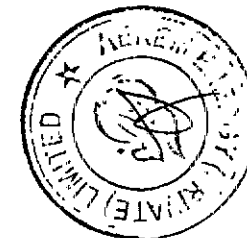
			entitling the Seller to claim Liquidated Damages.	
9	EPA 9.4 Billing	The first invoice for Energy Payment after the Commercial Operations Date may include the invoice for the Pre-COD Energy Payment under Section 8.7; and	Section 8.7 mentions Pre-COD Energy as free energy, please clarify what will be the mechanism for the Pre-COD Energy Payment ; as mentioned in section 9.4?	The invoice will document the Net Delivered Energy at a tariff rate of zero.
10			I am writing to inquire about the transferability of bidder registration within our industrial group companies, particularly concerning the formation of a Special Purpose Vehicle (SPV) at a later stage in the bidding process. As we prepare to participate in the Hybrid Project, we are keen to understand the process regarding bidder registration and the subsequent formation of the SPV. Our query pertains to whether the registration of a company within our industrial group, which is actively involved in renewable energy, can be transferred to the SPV formed by one or more companies within the same group. Could you kindly provide clarity on whether such transferability is permissible within the framework of the bidding process? Additionally, if there are any specific requirements or procedures we need to adhere to in this regard, we would greatly appreciate your guidance.	Please provide a detailed query regarding this point. Generally, SPV entity is a distinct legal entity responsible for fulfilling all regulatory and corporate requirements, including obtaining NEPRA licenses and tariff approvals, as stated in Exhibit 13 (Letter of Intent of the successful bidder). Generation licenses are typically non-transferable; however, this may vary depending on the terms and conditions of the license.



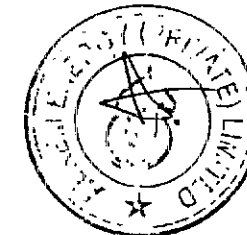
11	General		(a) RFP is silent on KE's equity ownership, which as per NEPRA determination for 200MW Hybrid Project has to be made part of the RFP including terms of the SPA. KE to confirm %age ownership including draft SPA. (b) There will be contingent commitments made to the lenders like "cost overrun" commitment, Debt Service Reserve commitment and some level of completion guarantees. These will have to be shared by all shareholders in their respective ratios (i.e. KE and Sponsors) in a form acceptable to the lenders (usually, cash reserve or SBLCs). Please confirm that the proportionate share of such commitments will be met by KE as shareholder. Failure to meet such commitment, will result in dilution of KE provided other sponsors funds it. Please confirm.	KE will not have any shareholding in the Project.
12	General		What would be denomination of stamp paper for following: Power of Attorney	Region Sindh denomination of stamp paper PKR 1000. Region Punjab denomination of stamp paper PKR 2000.
13	General		Please confirm that the lowest bidder tariff in its entirety will either be approved or rejected by NEPRA, and no changes can be made to the tariff conditions, including pass-through Please confirm this.	NEPRA reserves the right to reject a successful bid if deemed imprudent. Please refer to Clause 55 (ii) of NEPRA's approval on the RFP for further details. Pass-through items approved by NEPRA are outlined in Section 21.3 of the RFP document.



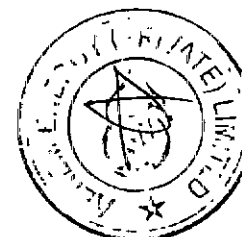
14	General		Escrow Agreement have to be in place as a condition to Financial close. Escrow mechanism/structure and draft of escrow agreement needs to be provided to the bidders.	Please refer Amended EPA
15	General		There are numerous instances where existing projects are unable to remit dividends to foreign shareholders or to get forex for meeting operational needs. How will the situation be different for these projects and is KE prepared to bear the cost, for similar delays?	Since KE is not participating as a shareholder, KE will not bear the cost. Furthermore, dividend repatriation is done with the approvals from the SBP; KE in its role as power purchaser or relevant Agent is not the relevant authority to provide such approvals. These will need to be taken care of by the SPV/Sponsors themselves.
16	Two Technologies and Completion Date		Since there are two different technologies which could have different time frames what would be rate at which the energy would be taken for one technology.	With respect to Pre-COD sales of energy for the solar portion (since it may be commissioned before the wind portion), please refer to Section 8.7 of the EPA that has been circulated. Additionally, please note that there will only be a single tariff applicable for the entire hybrid (wind/solar) facility post-COD.
17	Section 3.2 of RFP RFP Process		What document will the prequalified parties need to submit along with Exhibit 16? Will it be an acknowledgment email received from KE, or will KE issue a letter?	Parties that are already pre-qualified are exempt from submitting Exhibit 16, as explicitly clarified in the RFP documentation.
18	Section 3.15 & 20.17 of RFP EPC Agreements Construction/EPC Contractors		(a) The RFP document does not cater to scenario where successful bidder, instead of EPC contractor, will itself do the construction or combination thereof including equipment supply contract. (b) The Criteria mentioned for the EPC Contractor is very stringent and	(a) Under the site neutral hybrid project, Bidder is required to have an EPC Contractor who will be evaluated based on the criteria stipulated within the RFP. (b) Bidders must ensure compliance with the criteria specified in the RFP. It is encouraged to utilize the services of a renowned EPC



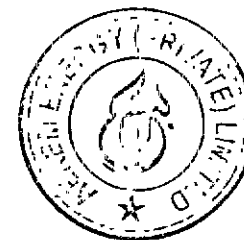
			no local EPC Contractor will qualify. This will only limit the available foreign companies who are prepared to work in Pakistan today thereby increasing the Bid price. (c) Point 3 and 4 excludes the foreign EPC Companies who are not already registered as per the requirement.	Contractor due to the first of its kind nature of this Project in the country. (c) According to Pakistani law, PEC registration is mandatory for any engineering work in the country before commencement of works.
19	Section 8 & 9 of RFP Communications and Bid Submission Requirements		(a) While the Bidders will be submitting both the Technical and Tariff Proposal on ARIBA also, how the confidentiality of the financial part of bid will be ensured on ARIBA? (b) What will be the procedure of opening of Financial Bids?	(a) It is mandatory to submit separate envelopes for the technical and tariff proposals through the ARIBA platform to ensure the confidentiality of the financial envelope. Intimation is sent to bidder when the financial document is accessed/ viewed. (b) This requirement is elaborated upon in the RFP document.
20	Section 6 of RFP Project milestones		If there is a delay in the project milestones that are beyond the reasonable control of bidder, will the dates mentioned in the milestones extend accordingly?	Any extensions due to unforeseen circumstances beyond the reasonable control of the Parties may be considered later.
21	Section 21 Indexation Mechanism		Kindly share the rationale of different indexation % ages for SOFR and KIBOR.	These percentages are determined by NEPRA in its approval of RFP.
22	Section 21.1 footnote Indexation Mechanism		In the footnote, it is mentioned that the first quarter will be partial based on COD, and then onwards it will be calendar quarters. However, the note needs to state that the last quarter will also be partial to get to end of the concession period.	The language is in accordance with the decision of the Authority.



23	Section 21.3 footnote Pass through items		The payment of interest to foreign lenders is liable to withholding tax deduction of 15%. Please confirm this would be treated as pass through as the same cannot be accounted for in bid tariff as SOFR is not known today? Also confirm that any change in withholding rate would also be a passthrough?	All pass-through items approved by NEPRA are listed in the RFP section 21.3, and no additional items will be permitted as passthrough.
24	Section 21.3 footnote Pass through items		The dividend withholding tax is not a pass through. However, if rate of withholding tax on dividend is increased from the current rate, then it should be treated as passthrough. Please confirm.	All pass-through items approved by NEPRA are listed in the RFP section 21.3, and no additional items will be permitted as passthrough
25	Section 21.3 footnote Pass through items		After 2022 no power project is exempt from income tax as per current income tax law (schedule II section 132), as per the RFP language this income tax will be full pass through. please confirm what process has to be followed to reclaim this.	All pass-through items approved by NEPRA are listed in the RFP section 21.3, and no additional items will be permitted as passthrough
26	Exhibit 2 Confidentiality Agreement		There is a requirement of submission of Confidentiality Agreement with bid. Please clarify signing date of the same by KE which has to be before bid submission?	The Bidder will submit the Confidentiality Agreement along with its Proposal. Upon receipt, it will be countersigned by KE.



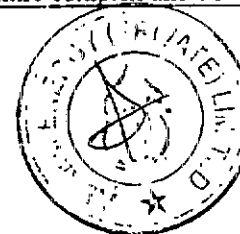
27	Section 20.1.7 of the RFP Capacity Factor- Minimum Capacity factor required is 31%		If Bidder achieves higher ACTUAL capacity factor during the Term of the EPA, the same rate will continue to apply on the excess generation, without any sharing with KE, since this is not a "cost plus tariff"? Please confirm.	The understanding is correct. KE will adhere to the mechanism outlined in the EPA.
28	General		Is it permissible to later change the proposed vendors in the bid provided the new vendors fulfil the necessary criteria?	KE does not encourage changes to the OEM for Major Equipment. However, in case of unforeseen circumstances, the bidder must seek approval from KE.
29			Please clarify whether the new hybrid project will be a must run project and dispatched mandatorily, or if it will be placed in the economic merit order.	Renewable plants will be considered as must-run plants.
30			As per the requirements for EPC contractors outlined in the RFP, none of the local EPC contractors qualify based on the criteria, leaving only one major foreign EPC contractor working in Pakistan. This situation may limit competitive bidding, as the developer with the closest land to the grid would likely qualify. Please confirm if the criteria for EPC contractors can be made more flexible.	Bidders must ensure compliance with the criteria specified in the RFP.
31			In the event of an increase in withholding tax rates (e.g., dividend withholding tax increased from 7.5% to 15% in the past), please clarify how K-Electric/regulators will compensate sponsors/developers.	All pass-through items approved by NEPRA are listed in the RFP section 21.3, and no additional items will be permitted as passthrough.



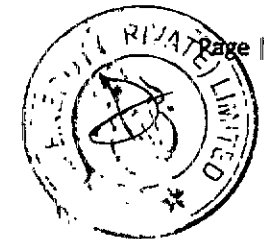
32			Please advise on the support K-Electric can offer to assist developer in securing State Bank of Pakistan (SBP) approval for foreign payments.	KE is unable to offer assistance in this matter.
33	Exhibit 17 - EPA Definitions	Change in Law and Change in Tax	Both Change in Law and Change in Tax provisions are applicable from the Agreement (EPA) data whereas they should be linked to the Bid Submission Date	Refer amended EPA.
34	Vol 2 (Project Technical Requirements) Section 20.17 EPC Contractor	EPC Contractor shall meet the below mentioned requirements:	The RFP specifies requirements for EPC Contractor, however, is the bidder allowed to opt for an unbundled EPC contract, and if yes, what would be the requirements in that case?	Unbundled EPC Contract is not allowed. Sole EPC contractor shall collectively guarantee the performance of the entire complex and should comply with requirements as stipulated in RFP section 20.17.
35	Exhibit 17 - EPA Definition SOFR	SOFR is defined as "The Secured Overnight Financing Rate, or SOFR is a backward-looking compounded rate based on the volume weighted median of overnight daily treasury repo transactions i.e., the cost of borrowing cash overnight collateralized by U.S. Treasury securities."	Current financing agreements for IPPs in Pakistan define SOFR as "the secured overnight financing rate administered by the Federal Reserve Bank of New York (or any other person which takes over the administration of that rate) published by the Federal Reserve Bank of New York (or any other person which takes over the publication of that rate);" It is requested that the same definition be adopted in this EPA as well.	The definition is in line with KE standard in its Agreements.
36	Exhibit 17 - EPA Section 9.3 Delay in COD LDs	EPA provides that in case of delay beyond RCOD, LDs will be charged at USD 4/KW per month.	We request to revise the rate to USD 2.5/KW per month as is provided in other NTDC/CPPA and KE contracts	The said proposal is not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP



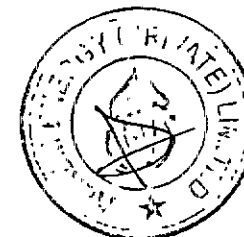
37	Exhibit 17 - EPA Section 9.8(a) Payment Security	The Purchaser shall secure the payments due to the Seller under this Agreement through KE's consumer collections by way of a waterfall arrangement, Escrow or any other method ("Payment Security").	The wording of this clause suggests that the mechanism is not finalized for now and will be done at a later stage. During the roundtable for investors, it was informed that payment security shall be through an escrow arrangement. Please confirm the nature / structure of payment security mechanism and provide details of the MCAs to be allocated for this project.	Please refer KE EPA & shared payment brief on Escrow for clarity in this regard.
38	Exhibit 17 - EPA Section 16.1(a)(ii) Seller EOD	The Seller's failure to achieve the Commercial Operations Date not earlier than one hundred eighty (180) Days after the Required Commercial Operations Date.	This has been 365 Days in the past EPAs where Construction Period of 15-18 months existed. It is suggested to make the same.	The said proposal is not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP
39	EPC Contractor Selection		(a) Can a bidder submit a bid with more than one shortlisted EPC contractor? (b) What is the process and potential implications if a bidder needs to change an EPC contractor after winning the bid? (c) Can the final EPC contract be split between different qualified contractors, for example, separate contracts for the wind and solar components of the project?	a) A bidder can consider more than one EPC but must ensure to submit the preferred EPC on which the technical evaluation needs to be conducted. Moreover, if the EPC is changed after being declared the successful bidder, it will require KE's consent, ensuring it meets the criteria stipulated in the RFP section 20.17. b) If, due to unforeseen reasons, the EPC needs to be changed, it will require KE's consent, ensuring it meets the criteria stipulated in the RFP section 20.17. Furthermore, the tariff number will remain the same, and no compensation will be provided to the successful bidder. c) There should be one EPC contractor which shall collectively guarantee the performance of the entire complex and adhere to the stipulated



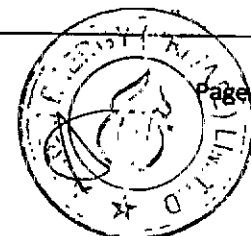
				requirements outlined in the Request for Proposal (RFP).
40	Payment Security		Could KE please elaborate on the payment security mechanism mentioned in Section 9.8 of the EPA? Specifically, what are the details of the "waterfall arrangement" or other methods being considered, and how will they ensure timely payment to the project developer?	Escrow brief and other responses to queries have been shared with bidders in this regard
41	One-Time Adjustment		Will any one-time adjustments made during the project term be carried forward and applied to the final tariff calculation at the end of the project? If so, can these adjustments be revised or readjusted later based on changing circumstances?	This will be in accordance with the tariff indexation as approved by the NEPRA in the RFP.
42	Surplus Energy Compensation		Will KE compensate the project developer for any surplus energy generated beyond the contracted capacity? If so, what would be the compensation mechanism and price?	Any surplus energy generated by the project due to better capacity factor (i.e. greater than 31%) will be compensated as per the EPA.
43	Debt Financing Mix		Are there any restrictions, preferences, or incentives regarding the mix of local and foreign debt financing for the project?	There is no restriction, preferences, or incentives regarding debt financing mix.
44	Pre-COD Power Generation		Given the different construction timelines for wind and solar components, will KE purchase power generate before the Commercial Operation Date (COD)	In reference to section 8.7 of EPA, Net Delivered Energy prior to the Commercial Operations Date shall be delivered to Purchaser free of cost at the Interconnection Point.



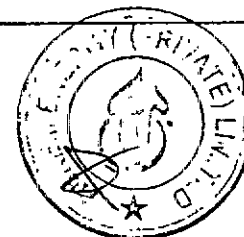
			of the entire hybrid plant? If yes, what would be the purchase price for this pre-COD energy?	
45	Termination Payment Security		In the event of contract termination due to Purchaser Events of Default (EOD) or Political Force Majeure Events (PFME), what security mechanisms are in place to ensure lenders and equity providers receive adequate compensation, considering the difficulty of finding an alternate buyer/PPA for such a large capacity project?	The security mechanism in place is already provided in the EPA
46	Payment Purchaser Default During Major		The EPA seems to limit the three-year revenue payment to specific EOD scenarios (clauses 16.2(f) and 16.2(h)). What remedies are available to project sponsors for other EODs, including payment defaults by KE?	Remedies available to the project due to payment default will be clarified in the EPA amendments.
47	Interest Rate and FX Indexation		(a) Regarding the tariff formula, please confirm whether interest rate indexation will continue throughout the entire project life, regardless of the debt amount, currency, and tenor, (b) For foreign currency loans other than USD, is there a mechanism for indexation of other currencies, such as Euro or CNY?	a) Indexations provided will be available throughout the entire project life in accordance with the mechanism approved by NEPRA in the RFP decision. These indexations will apply on the single tariff submitted by the bidder. b) Indexation mechanism will be applied strictly in accordance with NEPRA RFP decision, which does not include adjustment for any currencies other than USD.



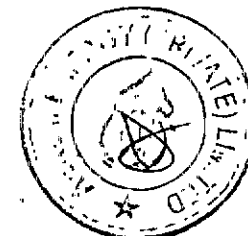
48	RFP - 20.1.8. Determination of wheeling/ transmission cost component ("TCC")	KE shall arrange infrastructure for power evacuation and provide an interconnection scheme. Indicative wheeling/transmission cost component ("TCC") for the construction of transmission line depending on the overall distance of the complex from Dhabeji Grid will be added to the Bid tariff for selection of lowest Bidder as per section 16 and 21.2(c)	1) Unclear how the TCC component of the Evaluated Tariff shall be calculated. While the RFP says that TCC shall depend on the overall distance of the complex from Dhabeji Grid, however the formula in section 21.2(c). specifies "Total length of TL in km" Is the distance to be calculated in a straight line or along the TL route? If it is along the TL route, how will bidders and KE determine length of TL given that we understand interconnection scheme and RoW for TL is unknown and to be provided by KE at a later stage. During KE's roundtable for investors, we were given the explanation that the distance will be calculated in a straight line from the Dhabeji Grid Station (as per coordinates given in the RFP) and the nearest endpoint of the Bidder's land. Please confirm this understanding.	
49	RFP - section 16. Determination of wheeling/ transmission cost component ("TCC")	TCC means the indicative transmission cost component depending on the overall distance of the complex from Dhabeji Grid as calculated in accordance with Section 21.2.		
50	RFP - section 21.2(c). Determination of wheeling/ transmission cost component ("TCC")	TCC for the construction of transmission line depending on the overall distance of the complex from Dhabeji Grid will be added to the Bid tariff for selection of lowest Bidder, based on the formula given below: TL cost component (cents/KWh) = $A + [B * (\text{Total length of TL in km} - 5)]$	2) The formula under 21.2 (c) states TL component in cents / kWh. We understand that this is actually in PKR but would appreciate a confirmation of the same. 3) Confirmation is also required on	1) The transmission tariff will be calculated from the Dhabeji Grid to the prospective project's interconnection point, with the straight-line distance serving as the determining factor as communicated in the roundtable for investors. Moreover, this determination of the transmission tariff is only for bid evaluation purpose. 2) Yes, understanding is correct TL component will be in in Rs. /kWh. 3) In case TL length is less than 5 km, based on the TCC formula in the RFP, effective transmission cost will be Rs. 0.56/kWh.



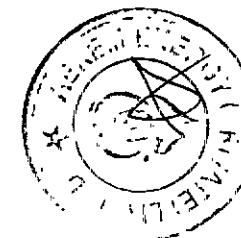
			our understanding that in case TL length is less than 5 km, based on the TCC formula in the RFP, effective transmission cost to be added to Bid Tariff shall be less than PKR 0.56 / kWh.	
51	RFP - 21.1., definition of Rev SOFR Base rate for foreign lending	Quarterly revised Term or Daily SOFR, as the case may be based on GOP policy decision on the transition from LIBOR to SOFR, as on the last day of the preceding quarter	We understand that the RFP provides flexibility to bidders to consider either Term and / or Daily SOFR as "base" rate (in line with lender's requirements) with the indexation mechanism to be available for both as applicable. Please confirm this understanding. Please also confirm that if the financing sets base rate as "Term SOFR", the same will be used for indexation, and incase financing is based on "Daily SOFR" (in arrears), the same methods will be used? is this the purpose of stating both SOFR application methods in the definition?	Term or Daily SOFR, is in accordance with the NEPRA decision No: NEPRA Advisor(CTBCM)/RFP-04/3115-21 in which it was stated that SOFR either Term or Daily will be based on GOP policy decision at the time of transition from LIBOR to SOFR, rather than individual discretion. However, we believe that this does not have any impact for bid submission since the reference SoFR for Bid preparation has been provided in the RFP decision.
52	EPA - Clause 9.8 (a) Payment Security	The Purchaser shall secure the payments due to the Seller under this Agreement through KE's consumer collections by way of a waterfall arrangement, Escrow or any other method ("Payment Security").	The wording of this clause suggests that the mechanism is not finalized for now and will be done at a later stage. During the roundtable for investors, it was informed that payment security shall be through an escrow arrangement. Please confirm the nature / structure of payment	Please refer amended KE EPA & shared brief on Escrow / other responses for clarity in this regard.



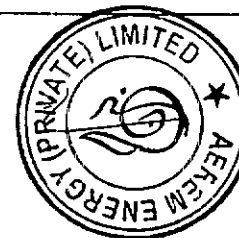
			security mechanism and provide details of the MCAs to be allocated for this project.	
53	EPA - Definitions Change in Law and Change in Tax		Both Change in Law and Change in Tax provisions are applicable from the Agreement (EPA) date whereas they should be linked to the Bid Submission Date	Please refer KE EPA amendment shared for clarity in this regard.
54	EPA - 16.2 (f) and Definition of Financial Closing Payment Security - Timeline	non-signing of Payment Security arrangement / agreement becomes a Purchaser Event of Default post [x] days of COD.	Under previous KE precedents, the Escrow Agreement execution is a pre-condition to Financial Close which is not the case in the current draft EPA and should be reconsidered by KE.	Please refer clarification on Escrow arrangement and Amended EPA shared by KE.
55	2.1 (a) EPA Effectiveness		A condition precedent for the effectiveness of the EPA is the prior approval of NEPRA to be provided by KE. We understand that the EPA has already been approved by NEPRA. Clarification is required from KE whether a further subsequent approval is needed.	EPA will be approved by NEPRA after conclusion of bidding process, and completion of other regulatory requirements.
56	6.5 (a) Purchaser Interconnection Facilities	The completion date for PIF shall be extended on Day for Day basis for any changes in the Scheduled Commercial Operation Date because of the occurrence of, inter alia: - any circumstances/events that are beyond the reasonable control and cause delay in construction or operations of Purchaser	Such risk is typically addressed through Force Majeure Event - which is already provided for in Section 6.5(a)(iii) of the EPA. The provision is also not in line with earlier precedents (both projects where KE is the purchaser, and where CPPA-G is the purchaser).	Please refer to the updated EPA.



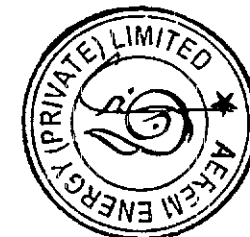
		Interconnection Facilities. (6.5 (a) (iv)).		
	6.5 (b)	In addition, if the Purchaser has not completed the Purchaser Interconnection Works by the date which is [●] Days following the date by which the Purchaser Interconnection Facilities were required to be completed in accordance with Section 6.5(a) as such date may be extended pursuant to Section 6.5(a)(i), (ii), (iii) and (iv), and such delay causes a delay in Commissioning of the Complex, as certified by the Engineer, then the Purchaser shall pay to the Seller monthly, in arrears, (and prorated for any portion of a Month) an amount equal to the Carrying Cost plus [●] % of the Energy Price on account of partial reimbursement for actual O&M and insurance costs multiplied by the Average Daily Energy for each Day during the period of such delay	Reference to section 6.5 (a) (v) needs to be added in the highlighted clause - KE to provide the information in []. (number of days and percentage of Energy Price to be paid as compensation).	
57	Purchaser Interconnection Facilities Delay Compensation			Please refer to the updated EPA.
58	Definition Annual Benchmark Energy		The formula for the Annual Benchmark Energy for a given Agreement Year does not seem to account for degradation impact of solar. It is unclear whether degradation is accounted for or not in the EPA as we have not been	As per the RFP requirements, the Bidder has been asked to submit a single bid tariff for the project, considering degradation as per the OEM specifications. It's important to note that no additional costs or allowances will be permitted for the bidder beyond what is specified in the RFP.



			provided the EPA schedules. Hence needs to be confirmed from KE	
59	Payment Security		In addition to the Payment Security related points noted at serial no. 5 and 7 above, the Payment Security is subject to procurement of all Consents under the EPA and the EPA not being terminated (due to default or FME) given that the Payment Security obligation triggers within a certain period of time of COD. The Payment Security (and related arrangements) should be unconditional and irrevocable (including, but not limited to, procurement of all upfront Consents). It is important to stress that the Payment Security should secure all payments under the EPA (and not only the Energy Payments) and should remain place until all payments have been made under the EPA (and not till the EPA is terminated).	Please refer KE EPA & shared payment brief / other responses on Escrow for clarity in this regard.
60	Section 15.6 PPFME / CLFME – Consequences		If a PPFME / CLFME has occurred and such delays construction or ability to operate the Complex, then: - in case of prior to COD (for Restoration Event), only Carrying Costs (i.e. IDC) are payable. Carrying Cost would be insufficient	Please refer Amended EPA



			since the project would incurring other administrative and insurance costs, and therefore, such compensations should include some percentage of tariff to recover insurance and O&M related costs. Furthermore, if the restoration continues for a certain period, then, the compensations should include principal payments under the Financing Document. - following COD (for both Restoration and Non-Restoration Event), amounts equal to Energy Price multiplied by the Average Daily Energy. However, this amount is discounted by a (x) % of Energy Price. Clarification should be sought as to the rationale and quantum of the discount (x %). Moreover, the above compensations are payable in case such amounts are allowed as pass-through under KE's own tariff. Accordingly, clarity may be sought from KE to confirm whether such amounts are currently a pass through under KE's own tariff. If not, would it be approaching NEPRA in this regard. we understand that clause 2.2 (e) says that if NEPRA does not permit KE to pass through any payments for the PE Compensation Period under its Determined Tariff, then the	

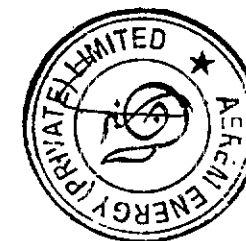


			Agreement Year shall be extended for such duration of the PE Compensation Period. In case NEPRA does not accord (or delays) its approval in relation to the such pass-through items, and we understand that it would be KE that would need to make such an application, it would be inappropriate to park that risk at the end of Seller.	
61	Purchaser Event of Default Consequences	In case of a Purchaser Event of Default other than a Purchaser Major Default which has not been cured, KE is entitled to an additional 365 days cure period. If it is not cured, then the Seller may suspend the EPA.	Typically, in case of purpose-built project, if there is a termination due to the off-taker's default, there is usually a buy-out obligation on part of the off taker. Given that this is squarely a default by KE, therefore, the buyout obligation (along with necessary compensation payments) should kick in.	The said proposal is not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under Exhibit 6 of the RFP
62	Arbitration	Any dispute not resolved by mediation or by an expert or has been referred to arbitration without reference to an expert shall be settled by arbitration under Arbitration Act 1940/LCIA rules. The seat and venue of arbitration shall be Karachi/London.	We suggest that it should expressly specify that arbitration should be under the LCIA rules and depending on (market standard) thresholds, it should be either Karachi or London.	Please refer Amended EPA

63	Escrow arrangement		How many MCAs does KE have, what percentage of KE collections goes into these MCAs, and how is it determined?	KE has 3 MCAs at the moment for lenders. Collections under these MCAs / Escrow accounts are based on predetermined customers cashflows / banks, however sufficiency of the cashflow for debt servicing is ensured. Further, sufficiency of cash flows for monthly payments under MCA for KE's tendered IPPs will be demonstrated to the Successful Bidder and its lenders. Approximately 35% of the total collections are deposited in the above-mentioned MCAs.
64	Escrow arrangement		Are MCA deposits and balances driven by a coverage ratio in KE's existing loan agreements? If yes, what is the coverage ratio?	MCA Deposits are based on collections of banks and retention is done every month to ensure the debt service requirement is satisfied. Once the collections are trapped in MCA's to meet the debt service requirement, the surplus cashflows are then released to KE for its own use. However, with respect to the Escrow mechanism for tendered IPPs, it is to be noted that KE has excess cash flows available under such MCAs which is over and above the lender requirements which shall be provided for payment to tendered IPPs.
65	Escrow arrangement		How many lenders have rights on these MCAs, and how will upcoming IPPs be assured their security won't be diluted by new MCAs during the EPA terms?	Security of tendered IPPs won't be diluted as sufficiency of cash flows for their payments will be demonstrated to the Successful Bidder while addition of any new parties to the MCA or any rerouting of cash flows / collection accounts will only take place in case excess cash flows over and above the IPP requirement are available. For this purpose, KE will ensure that a 20% additional cushion over cashflows is

				always available in MCA based on which, new IPPs / lenders will only be added subject to the availability of such cushion for tendered IPPs/Lenders.
66	Escrow arrangement		What happens once KE loans are paid off and MCA requirements fall away?	As provided in the EPA, Escrow will be provided for the Term of the EPA and any Escrow account / MCA will be provided for the EPA term. Further, it is to be noted that the repayments of KE's existing loans would not automatically dissolve the MCA mechanism because the tendered IPPs will be made party to the existing MCA agreement. Accordingly, the MCA will continue for tendered IPPs even if all loans covered under the MCA have been repaid in entirety.
67	Escrow arrangement		What is the payment priority and cash waterfall in these MCAs?	Payments to existing lenders and tendered IPPs will be made on pari passu basis.
68	Escrow arrangement		Generally, purchases and vendor payments are ranked above debt services in the cash waterfall. Why is KE proposing suppliers' payments through PSA, which is subordinated to debt service through MCA?	As explained in KE's brief on Escrow arrangement, this is not a cash waterfall arrangement similar to IPPs. Only payments to existing lenders and tendered IPPs will be made through this MCA and both payments will be considered on pari passu basis. Purchases and vendor payments are not made from MCA's and are rather paid from the operational cashflows from unencumbered accounts.
69	Escrow arrangement		If there is a default on the KE loan agreement, how does that affect the collection flow from MCAs to PSA?	This is a very unlikely scenario as KE already has substantial excess cashflows available in the MCA. Moreover, lenders' payments are likely to reduce in future due to debt repayment while collections will grow each year due to increase in consumers and inflationary trends.

70	Escrow arrangement		Is there a reason why KE cannot assign a batch of customer collections directly to PSA rather than making it subordinated to MCAs?	KE has already assigned certain collection accounts to MCA and sufficient cushion is available for future debt servicing and RE Project payments. Also, as explained above, payments to existing lenders and tendered IPPs will be released on pari passu basis.
71	Escrow arrangement		Do other existing IPPs get paid through the same MCA/PSA waterfall arrangement?	This arrangement has been proposed for tendered IPPs due to availability of cashflow cushion in the MCA. Few of the KE's existing IPPs have access to specific escrow accounts while others are paid directly from operational cashflows.
72	Escrow arrangement		Where do the tendered IPPs fit into the cash waterfall mechanisms compared to other IPPs, and how will payment priorities be determined?	As explained, proposed MCA will only be used for payments to existing lenders and tendered IPPs. Also, as explained above, payments to existing lenders and IPPs will be released on pari passu basis.
73	Escrow arrangement		Is it possible to have a separate PSA account for each IPP with allocated customers and an agreed buffer?	PSA is just an operational mechanism, and all payments will be managed through the collections under the MCA. Accordingly, we don't believe that having a separate or single MCA would have any effect on the provided security.



Technical Clarification Responses

S/N	RFP/EPA Clause No.	RFP/EPA Statement	RFP/EPA Queries	KE Response
1	RFP 3.7- Invitation to Bid	Grid interconnection and power evacuation study shall be conducted after bid evaluation for Successful Bidders at their expense, with KE's consent. However, basic requirements pertinent to this clause are mentioned in Section 20.1.10.(a) and 20.14. of this RFP.	Section 20.1.10(a) states that the SVGs/Reactive Power Compensation Devices are to be included in the bid, however, the Grid Interconnection Study would be performed post declaration of successful bidder by KE. It is crucial to understand that the equipment selection and sizing would be pertinent and incur significant costs. Without a Grid Interconnection Study, the parameters would not be defined accurately, and the study would require greater time than the allocated time for bid submission.	Now that the Grid Code 2023 is available which specifically caters for SWEs, therefore SVG and Reactive Power Compensation must comply with the it, specifically clause CC6.3.2 which states that: "A SWE shall manage reactive power control at the Connection Point to maintain the power factor within the range of 0.90 lagging to 0.95 leading over the full range of operation, according to dispatch instructions and/or voltage adjustment requirements within the above power factor range." Further, as mentioned in the RFP clause 20.1.10.(a), the grid interconnection study is the responsibility of the Bidder, considering the plant location as specified in the bid. Any modifications identified in the study must be incorporated by the Bidder, subject to KE's consent.
2	RFP 20.1.3. Distance	The Project shall preferably be on a single land parcel however, max 02 Interconnection Points can be proposed by the Bidder. The Capacity of the facility on the land parcel considered for Interconnection Point shall not be less than 50 MW.	In case of 2 land parcels, (i.e. one for solar and other for wind farm), with 2 interconnection points, how would the metering be carried out. Considering this to be a single project, would energy reading (metering) of both parcels be done separately or collectively? What would be the mechanism?	In the scenario involving two land parcels, separate energy readings (metering) will be conducted for each parcel at the interconnection points. The mechanism for energy readings can be decided at the time of EPA finalization.

3	RFP 20.1.4. Capacity	The Capacity shall not be less than 200 MW (AC peak) with a +20% allowance. There are no additional points for Bidders proposing Capacity within the allowable range of +20% above 200 MW (AC peak). For clarity, minimum 50 MW (AC peak) of Solar portion is mandatory however the installed capacity (in DC for Solar and AC for Wind) will be greater than 200 MW.	For the sake of clarity, KE is requested to confirm whether the AC capacity mentioned is the Net Electrical Output (NEO) or Gross Capacity?	The combined capacity of both solar and wind energy sources totals 200 MW (AC peak), representing the net delivered output at the point of Interconnection.
4	RFP 20.2 Solar Panel	Panels considered for the Project should be Tier-1 as determined by BNEF. Tier-2 or above shall be disqualified without any assessment.	BNEF Tier-1 is a varying assessment every year whereas a few of the top tier may not make it to the list every time. As such there should be a specific criterion to the BNEF Tier-1 list or OEMs specified as BNEF Tier-1 in the last 5 years, etc. There are other OEMs which are not specified in BNEF list however have proven performance record with considerable installed capacity (GW scale).	The bidder is required to adhere to the criteria outlined in section 20.2 of the RFP document. The OEM must be listed on the BNEF Tier-1 list at the time of bid submission.
5	RFP 20.4.1 Standards and Codes	The use of GB standards is strictly forbidden.	It is understood that the Chinese OEMs with EU/IEC and/or other international standards are acceptable for the project. KE to clarify.	All plant equipment must be designed and tested in accordance with IEC standards or equivalent (where applicable) as provided in the RFP.

6	RFP 21.2. Bid/Evaluated Tariff Assumptions c) Transmission/ Wheeling Cost Component		KE is requested to confirm that all losses post evacuation point are the responsibility of the off taker and not bidder.	The bidder will not be responsible for any losses incurred beyond the Interconnection point.
7	EPA Recital A.	Whereas, the Seller has proposed to the Purchaser that the Seller will design, engineer, construct, insure, Commission (as hereinafter defined), operate and maintain an approximately [●] MWP (Contract Capacity) hybrid electric generation facility (the "Complex", as hereinafter defined) to be located at the Site (as hereinafter defined) at [●], Pakistan on build, own, operate model basis.	For the sake of clarity please specify if the Contract Capacity (CC) is in MWp or MWac. Considering the hybrid nature of the project, the CC is expected to be MWac as the MWp capacity is generally considered for Solar Projects only.	The AC capacity for Hybrid Project referenced in the RFP ensures that a minimum of 200MW (AC Peak) must be maintained by every bidder to secure the transmission capacity, as the nominal capacity which is the nameplate capacity will vary based on the proportion of Wind and Solar PV opted by bidder. Additionally, variations due to the DC to AC ratio of inverters are accounted for. Since NEPRA has already approved EPAs where the Solar PV plant contract capacity was specified in MWp, we have maintained this format for the overall contract capacity to remain consistent with previous approvals of Authority. Therefore, nominal capacity of the plant is the sum of the nameplate capacity of the Wind in MW and the nameplate capacity of the PV array in MWp. The overall contract capacity is represented in MWp to indicate that the Solar PV nameplate capacity is considered in DC for capacity factor calculation, and contract capacity includes the Solar Part in DC (i.e. MWp). Furthermore, this contract capacity in MWp aligns with the discussions held with NEPRA.

8	EPA 1.1 Definitions – Net Delivered Energy	The net electrical energy expressed in kWh generated by the Complex and delivered at the Interconnection Point, as measured by the Metering System or the Back-Up Metering System (as the case may be).	Please clarify the calculation basis of Net Delivered Energy. Also confirm the allowable degradation during project Term.	The definition of Net Delivered Energy is clearly stated in section 1.1 of the EPA. Please specify what further clarity is required. Additionally, as per the requirements in section 21.1 of the RFP, the bidder is required to submit a single bid tariff for the project, considering degradation as per the OEM specifications. It's important to note that no additional costs or allowances will be permitted for the bidder beyond what is specified in the RFP.
9	EPA 7.2 (b) Installation of Metering System	Purchaser shall thereafter be responsible for the ownership and maintenance of the Meter and the Back-Up Meter provided that the Seller shall thereafter be responsible for the ownership and maintenance of the Allied Metering Equipment and the Allied Back-Up Metering Equipment.	What will be the mechanism to carry out the daily energy reading from energy meters under the ownership of the Purchaser? Please clarify.	The seller will have access to the metering room which will be on the plant premises.



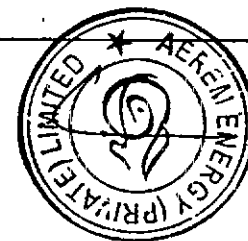
10	EPA 7.3(a) Reading Meters	Thereafter, the Purchaser and the Seller shall test the accuracy of each of the Metering System and the Back- Up Metering System at any time that the readings of Net Delivered Energy from the Metering System and the Back-Up Metering System differ by an amount greater than one-fifth of one percent (0.2%). In such eventuality, the Purchaser and the Seller together shall test the accuracy of the Metering System and recalibrate the Metering System, if necessary. The Purchaser shall provide the Seller no less than forty-eight (48) hours' notice of such	The percentage error is deviating from the Grid Code which is $\pm 0.5\%$. Please clarify if there is any ambiguity.	The variance between the Net Delivered Energy readings from the Metering System and the Back-Up Metering System must not exceed 0.2%. While adherence to the Grid Code is required, KE has outlined a more stringent criteria based on its extensive experience and in line with the standards set for its other IPPs' PPA/EPA agreements.
11	EPA 8.5 A Recalibration of the Hybrid Forecasting Model	The Seller shall procure and maintain at its own cost at least two (2) load banks-of capacity corresponding to the Arrays and each WTG.	For the sake of Bidders' clarity, KE is requested to define the load banks and its details.	A typical load bank is constructed from several resistors assembled onto racks. The design capacity of the load bank should be as such to undertake the dump load test of the plant.
12			How is nameplate capacity of the plant defined? AC output for both solar and wind? Does the developer have freedom to install the DC capacity limiting the AC output to 240 Mwac?	The maximum annual generation capacity will be determined by summing the maximum generation capacity of wind in MWac and the maximum generation capacity of solar in MWp (based on nominal installed DC capacity). The bidder has the flexibility to adjust the DC capacity, limiting the AC output to 240 MWac, while ensuring that at least 25% of the combined AC capacity is comprised of solar PV. This means that the minimum installed capacity of solar PV should be 50MWac, while maintaining a minimum combined capacity factor of 31%.



13			Apart from the minimum capacity factor of 31% and solar 50 MW (AC) is there any weightage for wind/solar ratio or maximum capacity factor in determining the winning bid.	There is no weightage for wind/solar ratio or maximum capacity factor.
14			Is it correct to assume that the construction of transmission lines from project (solar + wind hybrid power plant) to dhabeji grid station will be in scope of off taker. If this is the mechanism, then how we will define the transmission cost components which means how we will add cost of transmission per KM in tariff. [Internal Note: Transmission Cost Component ("TCC") is defined in RFP S.21.2.c. It will be added to the bid tariff to determine the winner]	The construction of the Transmission Line falls within the responsibility of KE scope. Additionally, it is important to note that the formula delineated in the RFP Section 21.2.c is designated to compute the indicative Total Cost Component (TCC) and shall solely serve the purpose of Bid Evaluation.
15	RFP - 20.4 WTG and OEM	WTG and OEM qualifying requirements: (i) be amongst top ten (10) ranking of WTG OEMs as per Bloomberg NEF (BNEF). (ii) have onshore global installed capacity of 10 GW since last 2 year. (iii) have 5,000 onshore global installed number of WTGs. (iv) have fleet size of 500 WTGs installed of the same model as offered in the Bid. Installation within the region is preferable.	What is the cut-off date for meeting the WTG and OEM qualifying requirements? Is it the Bid submission date?	Yes, understanding is correct. The OEM must fulfill criteria as stipulated in RFP section 20.4. at the time of bid submission.



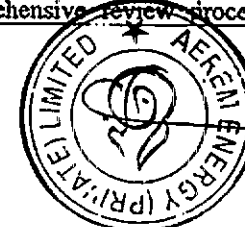
16	Section 20.1.4 & 20.1.6 of the RFP Capacity & project Technology		The minimum capacity for Solar is defined but there is no minimum requirement for Wind power. Kindly clarify if there is any minimum requirement for wind power capacity as long as 31% capacity factor is met.	There are no minimum capacity criteria for Wind Power. The Bidders are free to configure their facility as they wish as long as they meet the minimum criteria defined in the RFP including minimum 31% capacity factor and minimum solar installation of 50 MW (AC).
17	Section 20.2		In-case there are two separate sites, will the TCC be calculated based on a weighted average of the capacity installed at each site, or some other mechanism? If no such mechanism is provided for, the formula would give unfair advantage to bidders who have a single site.	Refer to Section 21.2 (c) of RFP. TCC will be calculated as the cumulative distance from the Dhabeji grid station, i.e., the length of the transmission line from Dhabeji grid covering both Interconnection Points.
18	Section 20.2		Some standards specified in the requirements are not supplied by the Original Equipment Manufacturer (OEM) but rather by the installer. How can this issue be dealt with especially if bidder is to do the construction itself?	The RFP specifies that all equipment and installation practices must comply with the relevant standards and regulations. Certain standards apply to OEMs, while others apply to EPC installations. It is the responsibility of the bidder to ensure that the required standards are met for the selected equipment.
19	Section 20.3.3 Power Inverters		The relevant IEEE standard (-----) for THD specifies a limit of 5%. Please provide the standard reference that specifies 2.5%.	According to the IEEE standard, IEEE 519, Total Harmonic Distortion (THD) should be less than 2.5% at the Interconnection Point.
20	Section 20.5 GIS		It has been mentioned that the bidder implements a redundant scheme for the interconnection, which includes a double bus bar with a single breaker scheme and n-1 Transformers. Is a similar n-1 scheme being employed at the KE end. Please confirm.	As specified in Section 20.5 of the Request for Proposal (RFP), the 220kV double circuit will be interconnected with the seller's facility. Each circuit will have the capacity to evacuate the maximum power if the other circuit trips.



21	Section 20.11.1 (k) Module Cable with temperature range -55 to +125 degree Centigrade is required		The upper limit is too high for outdoors and will severely limit the available supplier. The relevant IEC standards also support it.	KE has outlined more stringent criteria based on its extensive experience and in line with the standards. Bidders must ensure compliance with the criteria specified in the RFP.
22	Miscellaneous-Anti-theft module--fibre-system		There will be a minimum of 8 to 10 feet wall from ground level with PSI strength of a minimum of 3000. There will be a CCTV system in place capturing the whole site and monitored by a 24-hr surveillance team present on site. The anti-theft equipment seems unnecessary for every solar panel and will be a major cost add on with a security team on site.	Bidders must ensure compliance with the criteria specified in the RFP.
23			Please clarify whether the Transmission Tariff will be calculated from Dhabeji Grid to the potential project's interconnection point in a straight line or based on the actual transmission line route.	As outlined in RFP Section 21.2.c, titled "Transmission/Wheeling Cost Component", the transmission tariff will be calculated from the Dhabeji Grid to the prospective project's interconnection point, with the straight-line distance serving as the determining factor. Additionally, it is important to note that the formula delineated in RFP is designated to compute the indicative Total Cost Component (TOC) and shall solely serve the purpose of Bid Evaluation.
24	Vol 1 (Instructions to Bidders) Section 1 (Definitions - Capacity)	The nominal rated Capacity of the Complex which should not be less than 200 MW (AC peak)	Reading all these together, there are some mismatches on installed capacity of solar to be in AC or DC. KE is requested to clarify the following:	1. The AC capacity for Hybrid Project referenced in the RFP ensures that a minimum of 200MW (AC Peak) must be maintained by every bidder to secure the transmission capacity, as the nominal capacity which is the nameplate capacity will vary based on the proportion of Wind and Solar PV opted by
25	Vol 2 (Project Technical)	The Capacity shall not be less than 200 MW (AC Peak) with a +20%	1. How is the capacity and capacity	



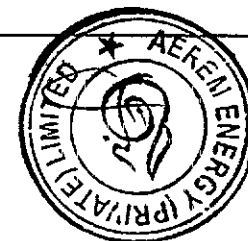
	Requirements) Section 20.1.4 (Capacity)	allowance. The minimum 50 MW (AC Peak) of Solar portion is mandatory, however, the installed capacity (in DC for Solar and AC for Wind) will be greater than 200 MW.	factor handled? This derives from how is this handled for solar (MW (AC) or MWp)? Accordingly, KE is requested to set the same philosophy in all relevant provisions the RFP and the EPA.	bidder. Additionally, variations due to the DC to AC ratio of inverters are accounted for.
26	Vol 1 (Instructions to Bidders) Section 1 (Definitions - Capacity Factor)	The ratio of annual Complex's Net Delivered Energy recorded by Metering System at the 220 kV side of the step-up trafo and the maximum annual generation capacity (in DC for Solar and in AC for Wind).	2. For wind, we understand that the capacity in MW (AC peak) will be the nameplate capacity of the offered WTGs. Please confirm.	Further, nominal capacity of the plant is the sum of the nameplate capacity of the WTGs in MW and the nameplate capacity of the PV modules in MWp. The overall contract capacity is represented in MWp to indicate that the Solar PV nameplate capacity is considered in DC for capacity factor calculation, and contract capacity includes the Solar Part in DC (i.e. MWp).
27	Exhibit 17 - EPA Definition Contract Capacity	The rated capacity of the Complex in MWp which the Seller commits to install and operate at the Site under this Agreement	3. For solar and if that is in MW (AC), please elaborate the mechanism or formula to determine the capacity in MW (AC peak). For example, is this sum of capacity of all inverters (AC peak) used in the design?	This contract capacity in MWp aligns with the discussions held with NEPRA.
28	Exhibit 17 - EPA Definition Annual Benchmark Energy	The calculation of ABE takes into account installed capacity of Wind in MW (AC) and installed capacity of Solar in MWp.	4. When calculating the Capacity Factor (see definition in RFP), we understand that "NDE recorded by the Metering System" means the calculated energy that the plant is expected to generate. It is suggested to clearly confirm this because linking this with Metering System creates an impression of a real time check during operations. It would be clear if RFP specifies a formula for calculation of CF.	2. The installed capacity of Wind is to be measured in MW (AC) and is the sum of the nameplate MW (AC) of all the WTGs. 3. The installed capacity of Solar is to be measured in DC as referred in Section 20.1.4 of RFP and is the sum of the nameplate capacity of all the Solar PV modules in DC. 4. The capacity factor is defined in the Request for Proposal (RFP) as follows: (Annual Complex Net Delivered Energy)/(Nameplate Capacity for Wind in AC + Nameplate Capacity for Solar PV in DC)
29	Vol 2 (Project Technical Requirements)	The Capacity Factor of the Complex shall be minimum 31%.	There are varying techniques and methods to carry out the assessments and results of two qualified	Evaluation of the correctness of the Capacity Factor (i.e. minimum 31%) will go through a comprehensive review process. This process



	Section 20.1.7 (Capacity Factor)		assessments can even vary from one another. There are different views on handling of wind data, there are different technical basis when assigning uncertainties, occasionally the uncertainties are driven through commercial risks than technical factors. All of this contributes towards the final Capacity Factor. Please elaborate how KE will evaluate the correctness of the Capacity Factor or is this only a spot check with a high-level review that the assessments have been professionally performed? For that matter and more precisely, the RFP does not specify the probability of exceedance level (P50, P75, P90) to be used or leave that open to Bidders to decide their own basis, this grants opportunity to the Bidders for coming up with their own Wind - Solar capacity mix while meeting the minimum solar threshold and also maintaining 31% overall CF. Variations in wind studies / solar studies due to different techniques or different uncertainties considered by different Bidders will create unnecessary mismatch. It is suggested to set some rules and boundaries on how to determine the Capacity Factor.	will include a high-level review to ensure that the assessments have been conducted professionally and according to industry standards. KE will look for consistency in the application of methodologies, sensitivity and transparency in the presentation of uncertainties and assumptions. The requirement of 31% complex capacity factor is minimum as per RFP. Hence the yield assessment report should demonstrate minimum 31% at P90.



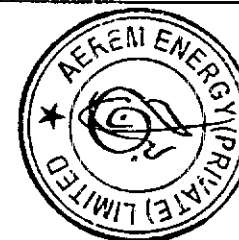
30	Exhibit 17 - EPA Section 5.1(d)	If the Actual Annual Energy in an Agreement Year falls below eighty-five percent (85%) of the Annual Benchmark Energy for such Agreement Year, ...	The calculation of ABE is silent if and how it takes the de-gradation into account KE is requested to clarify. In the absence of de-gradation, ABE fixed at 85% to be achieved will create an imbalance.	Bidder would take the impact of degradation in the Bid Tariff amount; No additional compensation is allowed during the project duration. Furthermore, it is the responsibility of the Seller to maintain 85% throughout the life of Project.
31	Vol 2 (Project Technical Requirements) Section 20.4.3 (WTG Performance)	Wind Turbine should produce power above the ambient temperature of 50 degrees Celsius.	While this is good to have WTGs operating in stringent conditions, several high-end WTGs still cut off at lower temperatures such as 45 degrees Celsius. It is suggested to keep this threshold at 45 degrees Celsius. The analysis of temperature data in Jhimpir and Gharo shows that the ambient temperature rarely crosses 45C.at the WTG hub height of approx. 100m.	Please refer the Corrigendum # 05 issued on KE website.
32	Exhibit 17 - EPA Section 6.5(a)		PIF is an essential item and the timeline (number of days prior to SCOD) should be provided for better understanding of the project time scheduling during construction phase.	The expected dates will be communicated to the successful bidder, and it will be in accordance with the COD of power plant.
33	Vol 2 (Project Technical Requirements) 20.1.10. Other Studies	The Successful Bidder shall perform a grid interconnection study including load flow, short circuit, power quality, transient stability etc. as per requirements of Grid Code.	According to KE's existing network, What's the applicable short circuit level range at 220kV Dhabeji Grid station?	The switchgears installed at Dhabeji 220kV are rated at 50kA for 3 seconds.
34	Vol 2 (Project Technical Requirements) Section 20.18 Design Consultant	Bidder shall engage and provide the information relating to the Design Consultant which shall comply with the below mentioned criteria:	As there is a requirement for a Design Consultant, confirmation is sought on whether the EPC contractor can be designated as the Design Consultant? Usually, there is no practice or a binding to appoint an	In this case the EPC Contractors itself, if being Design Consultant for own, shall have to meet the criteria outlined in Section 20.18. of the RFP.



			independent Design Consultant because the detailed engineering is undertaken by the EPC Contractors and the vendors.	
35			The RFP does not mention roads and lifting platforms. Please clarify scope, relevant requirements, and technical standards for roads and lifting platforms.	The bidder is required to comply with Section 20.10 of RFP, taking into consideration established industrial practices and the long-term O&M requirements. Moreover, roads and lifting platforms are part of EPC scope and should be covered during detailed engineering design.
36			The RFP says, "The Capacity shall not be less than 200 MW (AC peak) with a +20% allowance." Our understanding is that the maximum capacity can be 240MW, then why the project is named by 220MW?	220MWp is an indicative parameter used to establish a calculation basis for the minimum 31% capacity factor. Bidders are free to select superior plant configurations to achieve better outcomes while ensuring compliance with the RFP requirements. However, bidders must refer to Section 20.1.4 of the RFP for detailed requirements.
37			GB is forbidden for the whole project? Can it be used partly for civil design?	As per clause 20.4.1 of the RFP in the Wind Turbine section, "The use of GB standards is strictly forbidden." However, where standards are not specified in the RFP, the bidder may choose any appropriate standard, provided it complies with all necessary requirements regarding civil design as outlined in the RFP.
38			What is the local Seismic design code that the design team needs to consider for the project?	The bidder must refer to the Building Code of Pakistan 2007 for the design and guidelines of seismic values with stringent or peak values for the respective zone based on the detailed assessment of seismic zones, historical earthquake data, and geological studies. Moreover, bidders should refer to Section 20.4. of the RFP for design and construction details.



39			Is there any requirement for minimum Net Delivered Energy?	As per clause 20.1.7, "The Capacity factor of the complex shall be minimum 31%". The Bidder needs to relate the Net Delivered Energy with capacity factor, accordingly, maintaining the minimum Capacity factor of 31%.
40			Is there a mandatory requirement that a standby main transformer must be installed?	Bidders need to comply with Grid Code 2023, clause TPCS 4.1.1.(a), TPCS 4.1.1.(b) & TPCS 4.1.4., which states that "All transmission lines and transformers shall be loaded below their Contingency Ratings under contingency conditions (N-1)." Please refer to Table TPCS3 of Grid Code 2023 for further clarity.
41			Is it allowed to install 4 main transformers (50mva for each) while have one 50mva transformer installed as stand by?	Bidders have the flexibility to select any combination of transformer ratings that align with the requirements outlined in Grid Code 2023, including compliance with clause TPCS 4.1.1.(a), TPCS 4.1.1.(b), and TPCS 4.1.4.
42	Nameplate Capacity		How is the nameplate capacity of the hybrid plant defined? Is it the combined AC output of both solar and wind components, or the maximum DC capacity? Can the developer install a larger DC capacity than the rated AC output of 240 MWac?	The Contract Capacity as defined in the EPA and denoted in MWp, reflects the combined nameplate capacity of all wind turbine generators (WTGs) in AC and photovoltaic (PV) modules installed capacity in DC at the site as of the Commercial Operations Date. The bidder has the flexibility to adjust the DC capacity, limiting the AC output to 240 MWac, while ensuring that at least 25% of the combined AC capacity is comprised of solar PV, while maintaining a minimum combined capacity factor of 31%.
43	Capacity Factor and Technology Mix		In addition to the minimum capacity factor of 31% and the requirement for at least 50 MWac of solar, are there any specific weightage criteria or preferences for the wind/solar	There are no weightage criteria or preferences for the wind/solar ratio. It is up to the Bidder to decide on its own.



			ratio or maximum capacity factor in evaluating bids?	
44	Global Horizontal Irradiation (GHI)		Clarity needed on GHI data for the selected site.	Utilize long-term GHI data for the selected site (data set should be submitted).
45	Wind Resource Data and Site Assessment		Please clarify which two consecutive years data to be used for wind resource analysis.	Utilize minimum two consecutive years of wind resource data (raw data – data logger files should be submitted) from any period within the past ten years (CY14 and beyond).
46			Which criteria/ losses to be account for in calculation of site-specific wind speed to be determined?	Utilize the latest Measnet Guidelines (version 3, September 2022) for evaluating site-specific wind speed.
47	Capacity Factor		We understand that the minimum 31% Capacity Factor must be calculated on a P90 basis. Please confirm what return period the P90 should be calculated on (1 year, 10 year or 25 years)	The yield assessment report should satisfy the minimum capacity factor for 1st year.
48			We understand that the Capacity Factor should include all losses including availability (i.e. the energy in the numerator should be net of availability). Please confirm our understanding.	Capacity Factor should be net of all the losses and your understanding in this regard is correct.



Consolidated Clarification Document of Site Neutral Hybrid Project at KE's Dhabeji Grid

The responses are as shared with prospective bidders on the clarifications sought; changes (if any) in responses is issued as Amendment and Corrigendum on KE Website and on Ariba.

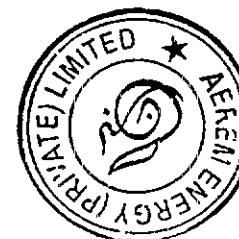
We have now concluded the clarification process of Site Neutral Hybrid Power Project bidding process.



General/ Commercial Clarification Responses on EPA/ RFP

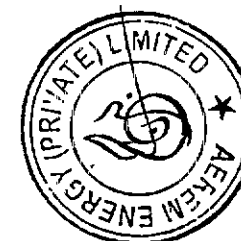
Sr.	RFP/EPA Section No.	Current Clause of the RFP/EPA	Proposed Clause of the Revised RFP/EPA	Comments/ Clarifications	KE Response
1.	NEPRA request for approval for RFP.			Could K.E provide NEPRA's approval in respect for the Request for Proposal.	NEPRA's approval on the RFP, decision No. NEPRA/Advisor (CTBCM)/RFP-07/2522-28, can be found on:
					<u>KE-200MW-SNHPP-RFP-NEPRA-15-03-2024</u>
2.	Definition of Lock in Period	N/A		Lock in Period is not defined.	As per Exhibit 16 of the RFP, Prequalification Document, Lock in Period is defined as: "Lock in Period" means the period commencing from the date of award of bid till 7th anniversary of Project COD or any other extended term as required by lenders or NEPRA.
3.	4.16 (of the	Subsequent to the formation	Subsequent to the formation of	Please remove this sub-	The RFP is

	RFP)	of SPV, the SPV will be required to, inter alia, (i) obtain Generation License/Concurrence and Tariff Approval from NEPRA (ii) enter into EPC contract for the design, construction and commissioning of the Complex (iii) enter into EPA with KE, and other necessary Project agreements, (iv) obtain any relevant regulatory and corporate approvals (v) arrange the necessary financing for the close (vi) construct and implement the Project to achieve COD within the time period allowed by NEPRA in the Tariff Approval, and (vii) upon commissioning, operate and maintain the Complex for the Term to provide the generated electricity to KE as per the terms and conditions of the EPA and Tariff Approval.	SPV, the SPV will be required to, inter alia, (i) obtain Generation License/Concurrence and Tariff Approval from NEPRA (ii) enter into EPC contract for the design, construction and commissioning of the Complex (iii) enter into EPA with KE, and other necessary Project agreements, (iv) obtain any relevant regulatory and corporate approvals (v) arrange the necessary financing for the Project(s) and achieve financial close (vi) construct and implement the Project to achieve COD within the time period <u>provided in the EPA</u> ~~allowed by NEPRA in the Tariff Approval~~, and (vii) upon commissioning, operate and maintain the Complex for the Term to provide the generated electricity to KE as per the terms and conditions of the EPA and Tariff Approval.	section since the timeline for completion of the Project is already provided in the EPA. Any subsequent change in the construction timeline would have an impact on the value of the Bid.	approved by NEPRA, and the construction period allowed is 18 months.

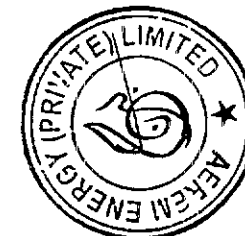


		The Successful Bidder shall be required to provide Performance Guarantee to the value equal to USD 5,000/MW for each Project. Such Performance Guarantee shall be issued by at least an "AA" rated scheduled bank operating in Pakistan, acceptable to KE or in case of foreign bank, having a correspondent bank in Pakistan. The Performance Guarantee shall be submitted prior to LOI issuance by KE with validity up to thirteen (13) months. The Performance Guarantee shall be as per the format attached as Exhibit 9.		Please confirm whether the Performance Guarantee would be the same as the Seller Letter of Credit. If not, then the Performance Guarantee should be returned upon submission of the Seller Letter of Credit.	As earlier clarified, both Seller LC and PG are separate document and PG will be returned upon submission of the Seller Letter of Credit.
4.	9.7 (of the RFP)			Furthermore, the Performance Guarantee should also be returned if: (a) NEPRA does not approve or delays the approval of the EPA; (b) NEPRA does not approve or delays the issuance of the Tariff Approval; (c) NEPRA does not approve the Bid in accordance with the NCBTR; (d) the Escrow Agreement is not executed in accordance with agreed terms; (e)	Since RFP has already been approved by NEPRA therefore no change can be made at this stage. Further, in case non-performance of its obligation by the Successful Bidder are due to Regulatory reasons KE may consider return of PG upon submission of documentary

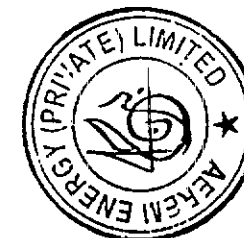
				NEPRA does not approve or delays to issue Generation License/Concurrence; and, (f) K.E otherwise abandons the bidding process contemplated under this RFP.	evidence to the satisfaction of KE.
5.	11.1 (3.) (of the RFP)	11.1 – Upon Selection of Successful Bidder: 3. KE will sign EPA with the SPV formed for each Project after approval by NEPRA.	11.1 – Upon Selection of Successful Bidder: 3. KE will sign EPA with the SPV formed for each Project after (i) approval by NEPRA of the EPA; (ii) issuance of Generation License/Concurrence; (iii) issuance of Tariff Approval for each Project by NEPRA; and, (iv) approval by NEPRA of the Bid in accordance with the NCBTR.	The proposed amendment is for preventing unnecessary delay in the construction of the Project after the signing of the EPA due to any delay in the procurement of the Generation License/Concurrence or approval by NEPRA of the EPA or the Tariff Approval.	The construction timeline will be governed under EPA therefore we understand such amendment is not required. However, the LOI already contains provision of the requested information.
6.	11.7 (of the RFP)	The SPV will be required to complete the regulatory process to obtain all relevant consents and approvals and achieve Financial Close in accordance with the timelines specified in the LOI. The SPV will be required to construct the Project consistent with the technical specifications, equipment details and design parameters that are consistent with the Technical Proposal of the Successful Bidder	The SPV will be required to complete the regulatory process to obtain all relevant consents and approvals and achieve Financial Close in accordance with the timelines specified in the LOI. The SPV will be required to construct the Project consistent with the technical specifications, equipment details and design parameters that are consistent with the Technical Proposal of the Successful Bidder		The consequences defined in the said clause pertains to delay in achieving required milestones of the LOI and such will remain unchanged because EPA will be signed at a later stage after fulfilling conditions under LOI.



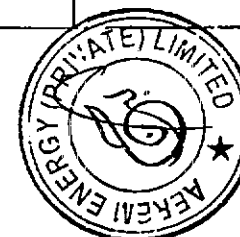
		received pursuant to this RFP and agreed with K-Electric in the EPA with the approval of NEPRA. Any variations to above that are determined to be material by K-Electric, shall result in revocation of the LOI by K- Electric and encashment of Performance Guarantee provided that K-Electric shall notify in writing to the Successful Bidder of such material deviations and allow ten (10) Business Days for rectification of such material deviations.	received pursuant to this RFP and agreed with K-Electric in the EPA with the approval of NEPRA. Any variations to above that are determined to be material by K- Electric, shall result in revocation of the LOI by K- Electric and encashment of Performance Guarantee provided that K-Electric shall notify in writing to the Successful Bidder of such material deviations and allow ten (10) Business Days for rectification of such material deviations.		
7.	15.15 (of the RFP)	Bidder shall provide the information relating to the Design Consultant along with the relevant details/experience as per below mentioned criteria: a) Proven design experience with projects of comparable sizes (Minimum 05 projects with at least 02 solar power projects of 50 MW capacity each designed by the Consultant). b) Applicable		Confirmation is required on whether the EPC Contractor (in case one is appointed) can be designated as the Design Consultant?	In such case the EPC contractor shall meet the criteria outlined in Section 20.18 of the RFP.



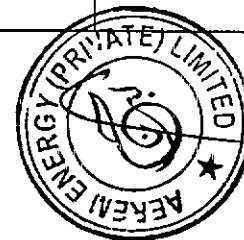
		experience of key design staff to be assigned to the Project (Each individual's role in the project to be specified). c) Minimum 50 MW projects with each project not less than 10 MW is interconnected with Grid in last 05 years. d) Well-defined row spacing to reduce inter-row shading and associated shading losses, layout to minimize cable runs and associated electrical losses, sufficient distance between rows to allow access for maintenance purposes etc. shall be evaluated under design criteria.			
8.	16.1.1 and 16.1.2, definition of Rev SOFR (of	16.1.1 (Indexation mechanism – SBP Financing) 16.1.2 (Indexation mechanism –		We understand that the RFP provides flexibility to bidders to consider either Term and / or Daily SOFR as base rate (in line with	Refer amended EPA



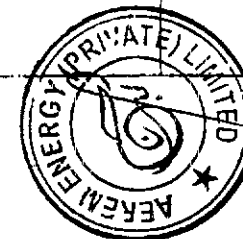
	the RFP)	Commercial Financing)		lender's requirements) with the indexation mechanism to be available for both as applicable. Please confirm this understanding. Please also confirm that if the financing sets base rate as "Term SOFR", the same will be used for indexation, and in case financing is based on	
		"Rev SOFR" – quarterly revised Term or Daily SOFR, as the case may be based on GOP policy decision on the transition from LIBOR to SOFR, as on the last day of the preceding quarter.		"Daily SOFR" (in arrears), the same methods will be used? Is this the purpose of stating both SOFR application methods in the definition?	
9.	16.3 (of the RFP)	Subject to the approval of NEPRA in Determined Tariff, following items shall be considered pass-through: (a) Duties and/or taxes, not being of refundable nature, relating to the construction period directly imposed on the Successful Bidder up to Commercial Operations Date, will be allowed at actual upon production of verifiable		We understand that the payments specified herein should be first paid and then subsequently applied to NEPRA for approval. Kindly reflect such understanding here.	RFP can't be amended at this stage; however, the said understanding is already covered under EPA.



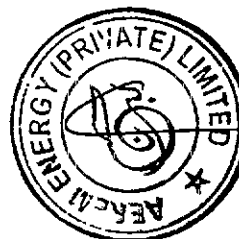
		documentary evidence to the satisfaction of the Authority. (b) In case the Successful Bidder is obligated to pay any tax on its income from generation of electricity from solar, or any duties, taxes or cess not being of refundable nature, are imposed on the Successful Bidder, the exact amount paid by the Successful Bidder on these accounts will be reimbursed by KE on production of original filing documents. In case of the above scenario, the Successful Bidder shall also submit to KE the details of any tax savings and KE shall deduct the amount of these savings from its payment to the Successful Bidder on			



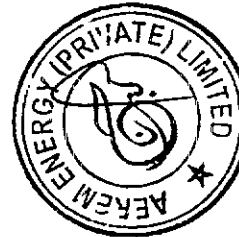
		accounts of taxation. The adjustment for duties and taxes will be restricted only to the extent of duties and taxes directly imposed on the Successful Bidder. No adjustment for duties and taxes imposed on third parties such as contractors, suppliers, consultants, etc., will be allowed.			
		(c) Payment into Worker's Profit Participation Fund and Worker's Welfare Fund. (d) Withholding tax on dividend will not be a pass-through item. (e) Alternative & Renewable Energy Policy, 2019 (ARE Policy 2019) states certain conditions, fulfillment of which can result in the exemption of duties on the import of			



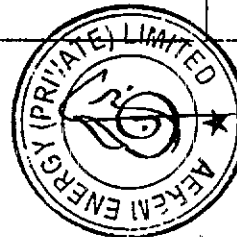
		items, being manufactured locally also. In case any Bidder proposes to import any plant, machinery or equipment that is also manufactured locally in accordance with the Customs General Order of the FBR, shall be reimbursed to the Successful Bidder subject to fulfillment of conditions as given in the ARE Policy 2019, for which certification shall be obtained by the Successful Bidder from AEDB. The Bidder is expected to have knowledge of applicable laws and regulations and shall not in any case hold KE accountable for information not provided under this document.			



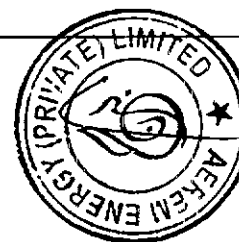
10.	Exhibit 13 – Form of Letter of Intent to Successful Bidder (of the RFP)	Recital C (ii) of the LoI says that the SPV shall be required to enter into EPC contract for the design, construction and commissioning of the Complex Clause 1.1 is reproduced below: For the purposes of this LOI, Successful Bidder and/or any of its sponsors and/or its affiliates together with any other individual or group or entity nominated by and duly accepted by KE, shall be the		The RFP does not specify any requirements/ prerequisites for EPC contractors based on which we understand that bidders are allowed to opt for an unbundled EPC structure. Please confirm this understanding along with clarification of the apparent mismatch of the above with the draft LoI.	Bidders must ensure compliance with the criteria specified in the RFP Section 20.17.



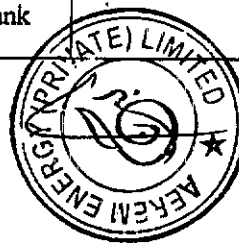
		Main Sponsor(s) of the Project. It is anticipated that KE will execute a mutually acceptable Energy Purchase Agreement with SPV for the term agreed under the Energy Purchase Agreement. For the purposes of this LOI irrespective of any other Sponsor being added to the Project in the future, SPV or its designated affiliate shall remain as the developer for the Project for all intents and purposes and in its dealings with KE. The equity shareholding of the Lead Member of the Successful Bidder's (in case Successful Bidder is a consortium/joint venture) shall be higher of minimum 20% or greater than the equity shareholding of other members of the consortium/joint venture and shall maintain such shareholding for the term of the loan; any change prior thereto shall require approval, of KE which shall not be unreasonably withheld.		In relation to Clause 1.1, please clarify if the Lead Member's equity needs to be higher than the combined equity of the other shareholders or their individual equity.	Please refer Section 5 of RFQ.



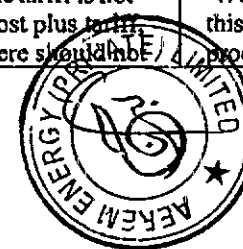
				EPA Schedules are not provided as part of the RFP. Please share these schedules as they are an integral part of the EPA and are required for a thorough commercial; / financial review of the EPA by Bidders.	NPMV Schedule have been already shared and the pass-through items have been covered in the RFP.
11.	Schedules of the EPA			Bidder will not be able to bid without knowing the exact requirements for insurance, Schedule 1 (pass through items), technical, NPMV protocol (Schedule 10 and 13) etc. Project specific requirements may be left blank in the Schedules to the EPA.	NPMV Schedule have been already shared and the pass-through items have been covered in the RFP.
12.	1.1 (of the EPA)	"Ambient Site Conditions" – The climatic conditions at the Site for generation of Net Delivered Energy or which have an impact on the electrical output and efficiency of the Complex, including, without limitation, solar irradiation, windspeed, temperature and rainfall, etc.	"Ambient Site Conditions" – The climatic conditions at the Site for generation of Net Delivered Energy or which have an impact on the electrical output and efficiency of the Complex, including, without limitation, solar irradiation, windspeed including the Cut In Wind		The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP



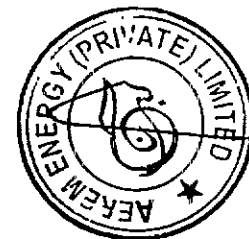
		as measured by the Meteorological Station provided for the purposes of calculating Adjusted Forecast Energy, the Ambient Site Conditions may be measured by the Forecasting Consultant without necessarily relying on the Meteorological Station.	<u>Speed and Cut Out Wind Speed</u> , temperature and rainfall, etc. as measured by the Meteorological Station provided for the purposes of calculating Adjusted Forecast Energy, the Ambient Site Conditions may be measured by the Forecasting Consultant without necessarily relying on the Meteorological Station.		
13.	1.1 (of the EPA)	"Carrying Costs" – Unless otherwise amended by NEPRA, the interest (or mark-up) limited to KIBOR plus [●] for Rupee based financing and SOFR/ plus [●] for Foreign Currency based financing, as applicable, as agreed under the Financing Documents, payable in or converted into Rupees accruing on the then-outstanding principal amount of the relevant portion of the debt under the Financing Documents related to the Complex; provided that if the Seller secures full or portion of the debt under any concessionary financing scheme, including one introduced by the State Bank of Pakistan, the Carrying	"Carrying Costs" – Unless otherwise amended by NEPRA, the interest (or mark-up) limited to KIBOR plus [●] for Rupee based financing and SOFR/ plus [●] for Foreign Currency based financing, as applicable, as agreed under the Financing Documents, payable in or converted into Rupees accruing on the then-outstanding principal amount of the relevant portion of the debt under the Financing Documents related to the Complex; provided that if the Seller secures full or portion of the debt under any concessionary financing scheme, including one introduced by the State Bank of Pakistan, the Carrying	Given the nature of tariff, we suggest that the Carrying Costs are linked with the actual payments under the Financing Documents.	Refer amended EPA.



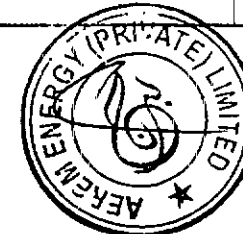
		Costs for such portion of the debt shall be calculated on the basis of the rate applicable to such concessionary financing availed by the Seller.	Costs for such portion of the debt shall be calculated on the basis of the rate applicable to such concessionary financing availed by the Seller.		
14.	1.1 (of the EPA)	N/A	<u>"Cut In Wind Speed" – The minimum wind speed at which the WTGs can operate and generate electrical power, as specified in Schedule 5.</u>		Schedule 5 will be shared with the successful bidder, where this will be defined.
15.	1.1 (of the EPA)	N/A	<u>"Cut Out Wind Speed" – The maximum wind speed below which the WTGs can safely operate and generate electrical power, as specified in Schedule 5.</u>		Schedule 5 will be shared with the successful bidder, where this will be defined.
16.	1.1 (of the EPA)	<u>"Escrow Agent" – The financial institution which enters into an Escrow Agreement with the Seller and the Purchaser.</u>	<u>"Escrow Agent" – The financial institution (acceptable to the Seller) which enters into an Escrow Agreement with the Seller and the Purchaser.</u>	The Escrow Agent should be acceptable to the Seller in line with the precedent KE EPA.	Escrow Agent is already finalized as Seller will be added to existing MCA
17.	1.1 (of the EPA)	<u>"Energy Price" – The Reference Tariff, as adjusted from time to time in accordance with the indexations permitted by NEPRA under the Tariff Determination.</u>	<u>"Energy Price" – The Reference Tariff, as adjusted from time to time in accordance with the indexations permitted by NEPRA under the Tariff Determination Schedule 1.</u>	The Energy Price should be linked with Schedule 1 in line with the precedent KE EPA.	We understand that such change makes no difference as both EPA and Tariff Determination are to be approved by NEPRA.
18.	1.1 (of the EPA)	<u>"Financing Documents" – Loan agreements, based on the term sheets related thereto,</u>	<u>"Financing Documents" – Loan agreements listed in Schedule 1 of the Direct</u>	Given that the tariff is not based on a cost plus tariff, therefore, there should not be	We understand this is a general procedural



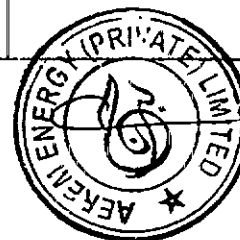
		provided to the Purchaser, and all related notes, indentures, security agreements, guarantees, documents under Islamic financing arrangements, agreements or other instruments providing security to the Lenders (including consents and acknowledgements of assignment and direct agreements in respect to documents assigned as security to the Lenders) and other documents entered into by the Seller in relation to the construction and permanent financing (including any refinancing) of the Complex (or any part thereof), as such agreement, instruments, guarantees and documents may be amended from time to time".	~~Agreement, based on the term sheets related thereto, provided to the Purchaser,~~ and all related notes, indentures, security agreements, guarantees, documents under Islamic financing arrangements, agreements or other instruments providing security to the Lenders (including consents and acknowledgements of assignment and direct agreements in respect to documents assigned as security to the Lenders) and other documents entered into by the Seller in relation to the construction and permanent financing (including any refinancing) of the Complex (or any part thereof), as such agreement, instruments, guarantees and documents may be amended from time to time".	be any requirement to submit term sheets in relation thereto. Therefore, in line with Precedent EPA, this can be linked with Schedule 1 of the Direct Agreement.	requirement and should not be an issue to the Bidder.
19.	1.1 (of the EPA)	"Generation License" – The license No. [●] dated [●], issued by NEPRA for generation and supply of electricity by the Seller from the Complex in accordance with the terms and conditions of such license as may be amended from time to time.	"Generation License" – The license/ <u>concurrence</u> No. [●] dated [●], issued by NEPRA for generation and supply of electricity by the Seller from the Complex in accordance with the terms and conditions of such license/ <u>concurrence</u> as may be amended from time		The Successful Bidder will form the SPV with management control. The SPV would be responsible for filing the Tariff



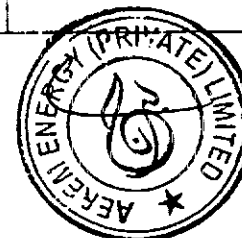
			to time.		Application with NEPRA and obtaining its concurrence on setting up the Generation Facility, with applicable fees.
20.	1.1 (of the EPA)	"SOFR" - The Secured Overnight Financing Rate, or SOFR is a backward-looking compounded rate based on the volume weighted median of overnight daily treasury repo transactions i.e., the cost of borrowing cash overnight collateralized by U.S. Treasury securities.	"SOFR" - the secured overnight Financing Rate administered by the Federal Reserve Bank of New York (or any other person which takes over the administration of that rate) published by the Federal Reserve Bank of New York (or any other person which takes over the publication of that rate);	The proposed amendment is the definition used in current financing agreements for IPPs in Pakistan. Hence, this definition should be adopted.	Refer Amended EPA
21.	2.1 (of the EPA)	(a) No provision of this Agreement shall become effective prior to the approval of this Agreement by NEPRA, a copy of which approval shall be provided by the Purchaser to the Seller. Subject to and in accordance with the terms of NEPRA's approval only the following Articles and Sections shall become effective: (i) Article I	(a) No provision of this Agreement shall become effective prior to the approval of this Agreement by NEPRA, a copy of which approval shall be provided by the Purchaser to the Seller. Subject to and in accordance with the terms of NEPRA's approval On the date of execution of this Agreement, only the following Articles and Sections shall	Please note that in terms of the RFP, the EPA is only signed following approval of NEPRA in accordance with Clause 11.1 (3.) which states: 'KE will sign EPA with the SPV formed for each Project after approval by NEPRA.'	We understand this is a general procedural requirement and should not be an issue to the Bidder



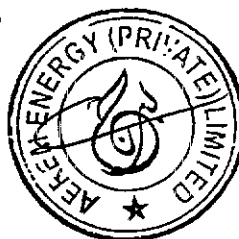
		(Definitions; Interpretation),	become effective:		
	(ii)	this Section 2.1,	(i) Article I (Definitions; Interpretation),		
	(iii)	Section 2.3,	(ii) this Section 2.1,		
	(iv)	Article XIII (Representations and Warranties) and	(iii) Section 2.3,		
	(v)	Article XIX (Miscellaneous Provisions).	(iv) Article XIII (Representations and Warranties) and		
	(b)	The Seller shall use its reasonable endeavors to cause the occurrence of Financial Closing by the [●], or such extended date as may be approved by NEPRA, which extension shall also be agreed to by the Purchaser.	(v) Article XIX (Miscellaneous Provisions).		
	(c)	The Seller shall deliver to the Purchaser, the Seller Letter of Credit in a form which is reasonably acceptable to the Purchaser on or before the Financial Closing Date.	(b) The Seller shall use its reasonable endeavors to cause the occurrence of Financial Closing by the [●], or such extended date as may be approved by NEPRA, which extension shall also be agreed to by the Purchaser.		
	(d)	The date on which notice	(c) The Seller shall deliver to the Purchaser, the Seller Letter of Credit in a form which is reasonably acceptable to the Purchaser on or before the		



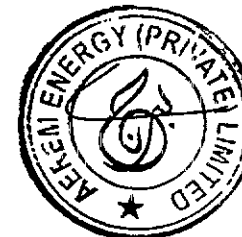
		from the Agent of the occurrence of Financial Closing is received by the Purchaser, this Agreement shall become effective in its entirety (the "Effective Date"). (e) If the Effective Date does not occur by [●], as such date may be extended in accordance with this Agreement, then the Purchaser may deliver written notice to the Seller terminating this Agreement, which termination shall be effective on the date of delivery of such notice. From the date of such termination, the Parties shall have no further rights against each other and shall be released from all further obligations under this Agreement, subject to any rights and obligations that may have accrued before the date of such termination.	Financial Closing Date. (d) The date on which notice from the Agent of the occurrence of Financial Closing is received by the Purchaser, this Agreement shall become effective in its entirety (the "Effective Date"). (e) Subject to Section 2.1 (f), If the Effective Date does not occur by [●], as such date may be extended in accordance with this Agreement, then the Purchaser may deliver written notice to the Seller terminating this Agreement, which termination shall be effective on the date of delivery of such notice. From the date of such termination, the Parties shall have no further rights against each other and shall be released from all further obligations under this Agreement, subject to any rights and obligations that may have accrued before the date of such termination.		



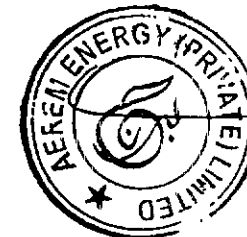
			(f) <u>If the Effective Date does not occur within the timeline provided in Section 2.2 (e) due to failure to enter into an Escrow Agreement in an agreed form, then the timeline given in Section 2.2 (e), shall be further extended by ninety (90) days.</u>		
22.	2.2 (b) (of the EPA)	If there occurs a PPFME or a CLFME that, in either case, requires the Purchaser to make payments to the Seller pursuant to Section 15.6(a)(iii) and 15.6(i), then, unless Section 2.2(e) applies, the Term at the end of the Agreement shall be extended for a period equal to the number of Days such PPFME or CLFME, as the case may be, was in effect. During such extended period; the Seller shall be paid [● %] of the Energy Price prevalent at the end of 25th Agreement Year, on account of O&M and insurance costs in respect of such period.		K.E to revert on the quantum of the Energy Price to be paid to the Seller. We understand that such blank relate to payment in relation to Operations and Maintenance, and insurances. We suggest that the approach in relation to its quantum should be clarified upfront. Furthermore, since no Return on Equity component was paid when compensation set out in Section 15.6 (a) (iii) and Section 15.6 (i) were paid, therefore, Return on Equity component should	Refer amended EPA



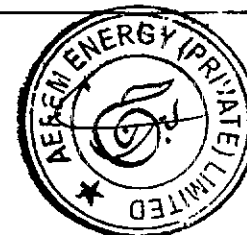
				be payable in this case as well.	
23.	Performance Guarantee (under the RFP) and Seller Letter of Credit – Section 2.7 of the EPA			KE to confirm whether Performance Guarantee and the Seller Letter of Credit are separate instruments. If so, then the Performance Guarantee should be returned as soon as the Seller Letter of Credit is submitted.	This is correct.
24.	2.9 (a) (of the EPA)	The Parties agree that the Contract Capacity is [●]MWP, being the nameplate capacity of all the WTGs (in MW) and PV modules (in MWp) (installed at the Site at Commercial Operations Date. In the event that PV Panels are added after Commercial Operations Date, at the Seller's cost, to address effect of yearly degradations, the same would not be added to calculate the Contract Capacity and necessary regulatory approvals shall be sought by the Seller.	The Parties agree that the Contract Capacity is [●]MWP, being the nameplate capacity of all the WTGs (in MW) and PV modules (in MWp) (installed at the Site at Commercial Operations Date. In the event that PV Panels are added after Commercial Operations Date, at the Seller's cost, to address effect of yearly degradations, the same would not be added to calculate the Contract Capacity and necessary regulatory approvals (if applicable) shall be sought by the Seller.		Refer amended EPA
25.	2.9 (b) (of the EPA)	The Seller may vary the installed capacity in MWp before the Commercial Operations Date for which the necessary consents needs to be obtained, provided that the	The Seller may vary the installed capacity in MWp before the Commercial Operations Date for which the necessary consents needs to be obtained (if applicable).	Please see the attached proposal in respect of this clause. Furthermore, the allowances that have been	The said proposals are not acceptable to KE. Applicant is requested to provide its



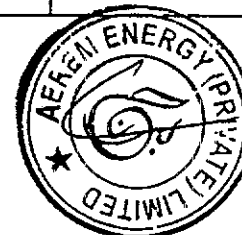
	maximum power to be evacuated in MWac shall remain consistent with the grid study approved by the Purchaser; and provided further that, if the reduction in the Contract Capacity requested by the Seller is less than or equal to five percent (5%) of the specified Contract Capacity, the Seller shall pay to the Purchaser in immediately available funds within five (5) Business Days after the notice to reduce the Contract Capacity, as liquidated damages for such reduction and not as a penalty, an amount equal to four hundred thousand Dollars (\$400,000) multiplied by the number of MW (prorated for any fraction thereof) of the reduction in the Contract Capacity. (i) from the date of payment of the amount of liquidated damages determined pursuant to Section 2.9(b), the Contract Capacity shall be reduced by the amount stated in such notice to the Purchaser; the Seller may deliver	provided that the maximum power to be evacuated in MWac shall remain consistent with the grid study approved by the Purchaser; and provided further that, if the reduction in the Contract Capacity requested by the Seller is ~~less than or equal to five percent (5%)~~ <u>greater than five percent (5%) and less than or equal to ten percent (10%)</u> of the specified Contract Capacity, the Seller shall pay to the Purchaser in immediately available funds within five (5) Business Days after the notice to reduce the Contract Capacity, as liquidated damages for such reduction <u>(not for all reductions but for reductions greater than five percent (5%))</u> and not as a penalty, an amount equal to ~~four hundred thousand Dollars (\$400,000)~~ <u>three hundred and fifty thousand Dollars (\$350,000)</u> multiplied by the number of MW (prorated for any fraction thereof) of the reduction after <u>five percent (5%)</u> in the Contract Capacity.	provided in respect of the Contract Capacity are market standard both in case of K.E Projects as well as CPPA-G Projects. It provides a certain relief (with obviously attached liquidated damages) within acceptable tolerances. Please note that restricting such tolerances would have an impact on EPC cost. It is also important to note that despite such tolerances, none of the projects (including, it appears, K.E Projects) have suffered substantive reductions in Contract Capacity. We would therefore request that this provision is aligned with market standard.	acceptance to the amended EPA as required under the RFP



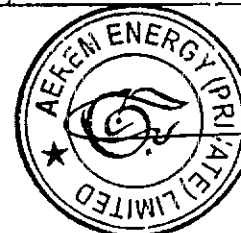
		additional notices of reduction of the Contract Capacity, provided that the aggregate reduction in Contract Capacity does not exceed five percent (5%) of the initial Contract Capacity specified in Section 2.9(a), and <u>provided, further</u>, that the amount of any liquidated damages payable pursuant to Section 2.9(b) for such further reduction shall be ~~without double-counting of~~, and shall exclude, any amounts already paid under Section 2.9(b) for previous reductions of the Contract Capacity.	(i) from the date of payment of the amount of liquidated damages determined pursuant to Section 2.9(b), the Contract Capacity shall be reduced by the amount stated in such notice to the Purchaser; (ii) the Seller may deliver additional notices of reduction of the Contract Capacity, provided that the aggregate reduction in Contract Capacity does not exceed ~~five percent (5%)~~ <u>ten percent (10%)</u> of the initial Contract Capacity specified in Section 2.9(a), and <u>provided, further</u>, that the amount of any liquidated damages payable pursuant to Section 2.9(b) for such further reduction shall be without double-counting of, and shall exclude, any amounts already paid under Section 2.9(b) for previous reductions of the Contract Capacity.		
26.	5.12 (a) (of the EPA)	If, after the Commercial Operations Date, without the prior written consent of the Purchaser, the Seller shall have ceased to operate the Complex for a period of seven	If, after the Commercial Operations Date, without the prior written consent of the Purchaser, the Seller shall have ceased to operate the Complex for a period of seven		Refer amended EPA



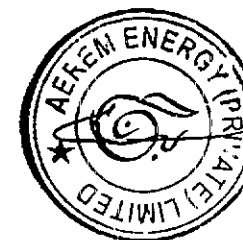
		(7) consecutive Days other than because of: (i) a Force Majeure Event, (ii) a Scheduled Outage or a Maintenance Outage, (iii) a Forced Outage or a Partial Forced Outage, (iv) a Non-Project Event, or (v) any act or omission of the Purchaser that effectively prevents the Seller or its Contractors from operating the Complex, then the Purchaser shall be entitled to (A) enter the Complex and operate it until the Seller demonstrates, to the reasonable satisfaction of the Purchaser, that the Seller can and will resume normal operation of the Complex or until the Lenders shall have exercised their rights in accordance with the Financing Documents,	(7) consecutive Days other than because of: (i) a Force Majeure Event, (ii) a Scheduled Outage or a Maintenance Outage, (iii) a Forced Outage or a Partial Forced Outage, (iv) a Non-Project Event, or (v) any act or omission of the Purchaser that effectively prevents the Seller or its Contractors from operating the Complex, then the Purchaser shall be entitled to (A) enter the Complex and operate it until the Seller demonstrates, to the reasonable satisfaction of the Purchaser, that the Seller can and will resume normal operation of the Complex or until the Lenders shall have exercised their rights in accordance with the Financing Documents,		



		including the EPA Direct Agreement, to enter the Complex and operate it, and (B) as soon as is reasonably practicable, send written notice of such entry to the Lender or the Agent (as defined in Section 16.5) in accordance with the procedure set forth in Section 16.5 and the EPA Direct Agreement.	including the EPA Direct Agreement, to enter the Complex and operate it, and (B) as soon as is reasonably practicable, send written notice of such entry to the Lender or the Agent (as defined in Section 16.5) in accordance with the procedure set forth in Section 16.5 and the EPA Direct Agreement.		
		During any period that the Purchaser operates the Complex pursuant to this Section 5.12, the Purchaser shall (i) operate the Complex within the Technical Limits and in accordance with Laws of Pakistan, Prudent Utility Practices and Prudent Electrical Practices, (ii) bear all costs of such operation, and (iii) pay to the Seller the aggregate of the Actual Principal Repayment Component and the Actual Interest Charges Component multiplied by the Average Daily Energy during such period (to the extent Ambient Site Conditions enabled such generation under the Hybrid Forecast Model); <u>provided, however, that the Seller shall</u>	During any period that the Purchaser operates the Complex pursuant to this Section 5.12, the Purchaser shall (i) operate the Complex within the Technical Limits and in accordance with Laws of Pakistan, Prudent Utility Practices and Prudent Electrical Practices, (ii) bear all costs of such operation, and (iii) pay to the Seller the aggregate of the Actual Principal Repayment Component and the Actual Interest Charges Component ~~multiplied by the Average Daily Energy~~ during such period (to the extent Ambient Site Conditions enabled such generation under the Hybrid Forecast Model); <u>provided, however, that the Seller shall</u>		



		not be entitled to any payment during such period to which it would not be entitled if the Complex had been operated by the Seller during such period.	not be entitled to any payment during such period to which it would not be entitled if the Complex had been operated by the Seller during such period.		
27.	6.5 (of the EPA)			Please note that this project has been specifically set up for the purposes of KE's requirements. In case of suspension, the Seller would be incurring significant costs to keep the project suspended – this would include operational costs, insurance costs as well as debt payments. How does KE propose to address such a risk? This would necessarily mean that there would be default under the financing documents for non- payment of debt payments, and a failure to pay insurance premium (which would result in an expiry of the insurance policies). Furthermore, in case there is termination due to a PPFME / CLFME, it appears that there are no compensations payable by	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP

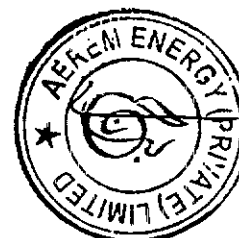


				KE in such case. From a bankability perspective, this would be a significant risk that would need to be addressed. In view of the above, to ensure bankability of the risk, it is important that the EPA reflects the market standard provisions relating to a buy-out obligations and payment of compensation payments.	
28.	6.5 (a) (of the EPA)	Within seven (7) Days of the Effective Date, the Seller shall give to the Purchaser written notice of the Scheduled Commercial Operations Date then anticipated by the Seller (which date shall not in any event be earlier than the earliest date on which the Commercial Operations Date may occur hereunder). Following receipt of such notice, the Purchaser shall commence the final design of the Purchaser Interconnection Facilities. Thereafter, the Purchaser shall provide to the Seller reports on the progress of the Purchaser Interconnection Works until their completion. The	Within seven (7) Days of the Effective Date, the Seller shall give to the Purchaser written notice of the Scheduled Commercial Operations Date then anticipated by the Seller (which date shall not in any event be earlier than the earliest date on which the Commercial Operations Date may occur hereunder). Following receipt of such notice, the Purchaser shall commence the final design of the Purchaser Interconnection Facilities. Thereafter, the Purchaser shall provide to the Seller reports on the progress of the Purchaser Interconnection Works until their completion. The	Please also note the provisions of Section 6.5 (a) (iv) which operates as an exception to Purchaser's obligations to provide Purchaser Interconnection Facilities by a certain specified date. Please note that in any contractual framework, the only exception to performance obligations is Force Majeure Events and therefore such would be reflected here. As K.E would be aware that this is a key obligation on part of the Purchaser. Please note that the consequences for the	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP

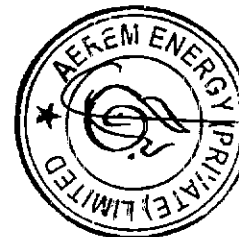
		Purchaser shall complete the Purchaser Interconnection Works so as to be able to accept Net Delivered Energy at the Interconnection Point to carry out the Commissioning Tests no later than [●] Days prior to the Scheduled Commercial Operations Date notified by the Seller to the Purchaser pursuant to this Section 6.5(a); <u>provided, however</u>, that such completion date shall be extended on a Day-for-Day basis for any changes in the Scheduled Commercial Operations Date, and to the extent necessary because of the occurrence of any of the following: (i) the Seller's failure to execute, in sufficient time for the Purchaser to complete the Purchaser Interconnection Facilities, such easements, rights-of-way, licenses and other documents, each in recordable	Purchaser shall complete the Purchaser Interconnection Works so as to be able to accept Net Delivered Energy at the Interconnection Point to carry out the Commissioning Tests no later than [●] Days prior to the Scheduled Commercial Operations Date notified by the Seller to the Purchaser pursuant to this Section 6.5(a); <u>provided, however</u>, that such completion date shall be extended on a Day-for-Day basis for any changes in the Scheduled Commercial Operations Date, and to the extent necessary because of the occurrence of any of the following: (i) the Seller's failure to execute, in sufficient time for the Purchaser to complete the Purchaser Interconnection Facilities, such easements, rights-of-way, licenses and other documents, each in recordable	Seller are severe since if the construction timelines are extended due to Section 6.5 (a) (iv), it is not entitled to any compensations under the EPA nor the Insurance Policies. Therefore, we suggest that Section 6.5 (a) (iv) is deleted.	



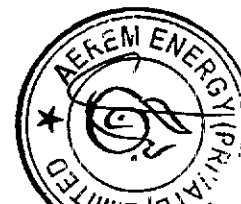
		form, as the Purchaser may reasonably require to record the deeds, easements, rights-of-way and licenses granted pursuant to Section 6.4;	form, as the Purchaser may reasonably require to record the deeds, easements, rights-of-way and licenses granted pursuant to Section 6.4;		
	(ii)	the Seller's failure to provide the Purchaser, on a timely basis, with any technical data relating to the Complex and available to the Seller but not included in Schedule 3, requested by the Purchaser and reasonably necessary for the Purchaser to undertake the design, construction, installation, commissioning, maintenance and operation of the	(ii)	the Seller's failure to provide the purchaser, on a timely basis, with any technical data relating to the Complex and available to the Seller but not included in Schedule 3, requested by the Purchaser and reasonably necessary for the Purchaser to undertake the design, construction, installation, commissioning, maintenance and operation of the	



		Purchaser Interconnection Facilities; (iii) a Force Majeure Event that materially and adversely affects the Purchaser's ability to perform its obligations in accordance with this Article VI; (iv) Any circumstances / events that are beyond Purchaser's reasonable control and cause delay in construction or operations of Purchaser Interconnection Facilities; (v) any other failure by the Seller to perform in accordance with this Agreement, including but not limited to the Seller's obligations	Purchaser Interconnection Facilities; (iii) a Force Majeure Event that materially and adversely affects the Purchaser's ability to perform its obligations in accordance with this Article VI; (iv) Any circumstances / events that are beyond Purchaser's reasonable control and cause delay in construction or operations of Purchaser Interconnection Facilities; (v) any other failure by the Seller to perform in accordance with this Agreement, including but not limited to the Seller's		



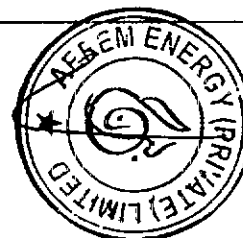
		assumed under Schedule 3, that materially and adversely affects the Purchaser's ability to perform its obligations in accordance with this Article VI; ~~provided, however,~~ that no extension shall be granted to the Purchaser to the extent that such failure or delay would nevertheless have been experienced by the Purchaser. If the Purchaser has not completed, commissioned and energized the Purchaser Interconnection Facilities, by the date required in Section 6.5(a), and such delay causes a delay in the Commissioning of the Complex, the Required Commercial Operations Date shall be extended Day-for-Day until the date on which the Purchaser Interconnection Works are completed, provided however, the Required Commercial Operations Date shall not be extended on account of any extension of the completion	obligations assumed under Schedule 3, that materially and adversely affects the Purchaser's ability to perform its obligations in accordance with this Article VI; ~~provided, however,~~ that no extension shall be granted to the Purchaser to the extent that such failure or delay would nevertheless have been experienced by the Purchaser. If the Purchaser has not completed, commissioned and energized the Purchaser Interconnection Facilities, by the date required in Section 6.5(a), and such delay causes a delay in the Commissioning of the Complex, the Required Commercial Operations Date shall be extended Day-for-Day until the date on which the Purchaser Interconnection Works are completed, provided however, the Required Commercial Operations Date shall not be extended on account of any		



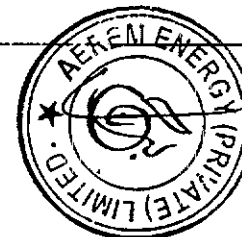
		date of the Purchaser Interconnection Works under Section 6.5(a)(i), (ii) and (iv).	extension of the completion date of the Purchaser Interconnection Works under Section 6.5(a)(i), (ii) and (iv).		
29.	6.5 (b) (of the EPA)	In addition, if the Purchaser has not completed the Purchaser Interconnection Works by the date which is [●] Days following the date by which the Purchaser Interconnection Facilities were required to be completed in accordance with Section 6.5(a) as such date may be extended pursuant to Section 6.5(a)(i), (ii), (iii) and (iv), and such delay causes a delay in Commissioning of the Complex, as certified by the Engineer, then the Purchaser shall pay to the Seller monthly, in arrears, (and prorated for any portion of a Month) an amount equal to the Carrying Cost plus [●%] of the Energy Price on account of partial reimbursement of actual O&M and insurance costs multiplied by the Average Daily Energy for each Day during the period of such delay.	In addition, if the Purchaser has not completed the Purchaser Interconnection Works by the date which is [●] Days following the date by which the Purchaser Interconnection Facilities were required to be completed in accordance with Section 6.5(a) as such date may be extended pursuant to Section 6.5(a)(i), (ii), (iii) and (iv), and such delay causes a delay in Commissioning of the Complex, as certified by the Engineer, then the Purchaser shall pay to the Seller monthly, in arrears, (and prorated for any portion of a Month) an amount equal to the Carrying Cost plus [●%] of the Energy Price on account of partial reimbursement of actual O&M and insurance costs multiplied by the Average Daily Energy for each Day during the period of such delay.	Please note that given the structure of the Tariff, there would not be any specific components as such.	Refer amended EPA
30.	6.5 (c) (of the EPA)	In addition to payment set out in Section 6.5(b) above for the period of such delay, if	In addition to payment set out in Section 6.5(b) above for the period of such delay, if	The adjustment with regards to debt servicing should not be subject to	Refer amended EPA



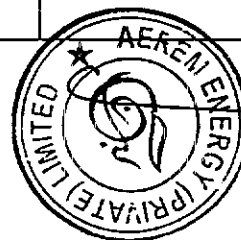
		the delay by the Purchaser in completing the Purchaser Interconnection Facilities continues beyond the [●] Day following the date of the issuance by the Engineer of the Certificate of Readiness for Synchronization and a simultaneous certificate by the Engineer that the delay caused by the Purchaser would likely cause the then-scheduled Commissioning Tests to be delayed, the Purchaser shall also be required to pay the principal sum of the debt when due pursuant to the repayment schedule as set out under the relevant Financing Document (as certified to the Purchaser by the Lender or Agent). Such payment of the principal sum of the debt by the Purchaser shall be made within [●] Days following receipt of an invoice therefor, but in no event earlier than the [●] day following the Scheduled Commercial Operations Date prevailing immediately prior to such delay which invoice shall be signed by the Lenders or the Agent, certifying the amount shown therein to be	the delay by the Purchaser in completing the Purchaser Interconnection Facilities continues beyond the [●] Day following the date of the issuance by the Engineer of the Certificate of Readiness for Synchronization and a simultaneous certificate by the Engineer that the delay caused by the Purchaser would likely cause the then-scheduled Commissioning Tests to be delayed, the Purchaser shall also be required to pay the principal sum of the debt when due pursuant to the repayment schedule as set out under the relevant Financing Document (as certified to the Purchaser by the Lender or Agent). Such payment of the principal sum of the debt by the Purchaser shall be made within [●] Days following receipt of an invoice therefor, but in no event earlier than the [●] day following the Scheduled Commercial Operations Date prevailing immediately prior to such delay which invoice shall be signed by the Lenders or the Agent, certifying the amount shown therein to be	KIBOR +[3%] since such additional spread has not been made available to compensation that are made to the Seller at a subsequent date.	



		correct and stating the due date for such payment of principal debt under the repayment schedule as set out under the relevant Financing Document (as certified to the Purchaser by the Lenders or Agent). Such payments shall continue until the earlier of (A) the end of the period equal to the period of delay or deferral of any Commissioning Test, or (B) completion of the first attempted Commissioning Tests (whether successfully completed or not), <u>provided</u> , that any payments made by the Purchaser pursuant to Section 6.5(c) on account of payments of principal sum of the debt shall be in the form of a loan from the Purchaser to the Seller in order to facilitate the Seller to meet its debt servicing obligations and the same shall be recovered, together with interest at KIBOR plus a spread of [3%] (on the monthly outstanding balance of such amounts) commencing on the date of such payments by the Purchaser and ending on the date of complete repayment	correct and stating the due date for such payment of principal debt under the repayment schedule as set out under the relevant Financing Document (as certified to the Purchaser by the Lenders or Agent). Such payments shall continue until the earlier of (A) the end of the period equal to the period of delay or deferral of any Commissioning Test, or (B) completion of the first attempted Commissioning Tests (whether successfully completed or not), <u>provided</u> , that any payments made by the Purchaser pursuant to Section 6.5(c) on account of payments of principal sum of the debt shall be in the form of a loan from the Purchaser to the Seller in order to facilitate the Seller to meet its debt servicing obligations and the same shall be recovered, together with interest at KIBOR plus a spread of [3%] (on the monthly outstanding balance of such amounts) commencing on the date of such payments by the Purchaser and ending on the date of complete repayment	



		thereof by the Seller, through successive deductions of [●%] of the Energy Price from the monthly Energy Payments until such amounts have been completely recovered. The Purchaser shall have no obligation to make the payments provided in this Section 6.5 if, and to the extent that, the delay in the Commissioning Tests would nevertheless have occurred regardless of the Purchaser's delay or deferral of such tests. If payments by the Purchaser under this Section 6.5 shall have commenced, or the obligation for such payments shall have accrued, the Complex shall be tested at the first available opportunity thereafter. Except as provided in this Section 6.5, Section 8.1, Section 15.6 and Section 16.2(h), the Seller shall be entitled to no other compensation or claim for damages under this Agreement as a result of delay in completion of the Purchaser Interconnection Facilities or deferral of the Commissioning Tests by the Purchaser, as the	thereof by the Seller, through successive deductions of [●%] of the Energy Price from the monthly Energy Payments until such amounts have been completely recovered. The Purchaser shall have no obligation to make the payments provided in this Section 6.5 if, and to the extent that, the delay in the Commissioning Tests would nevertheless have occurred regardless of the Purchaser's delay or deferral of such tests. If payments by the Purchaser under this Section 6.5 shall have commenced, or the obligation for such payments shall have accrued, the Complex shall be tested at the first available opportunity thereafter. Except as provided in this Section 6.5, Section 8.1, Section 15.6 and Section 16.2(h), the Seller shall be entitled to no other compensation or claim for damages under this Agreement as a result of delay in completion of the Purchaser Interconnection Facilities or deferral of the Commissioning Tests by the Purchaser, as the		



		case may be.	case may be.		
31.	6.6 (c) (of the EPA)	Subject to providing the Seller reasonable notice, the Purchaser may require the Seller to modify or expand the requirements for protective devices. Following the Purchaser's approval of the costs of such modification or expansion, the Seller shall perform such modification or expansion. Such work shall be completed within a reasonable time under the circumstances. If such request for a modification or expansion is sent by the Purchaser on or after the Construction Start Date and such request causes a delay in Commissioning the Complex, as certified by the Engineer, the Required Commercial Operations Date shall be extended Day-for- Day to account for such delay provided the Seller has submitted its final metering, control and protection single line diagram to the Purchaser no later than fifteen (15) Days after the Construction Start Date. The Purchaser shall be notified in advance of, and shall have the	Subject to providing the Seller reasonable notice, the Purchaser may require the Seller to modify or expand the requirements for protective devices. Following the Purchaser's approval of the costs of such modification or expansion, the Seller shall perform such modification or expansion. Such work shall be completed within a reasonable time under the circumstances. If such request for a modification or expansion is sent by the Purchaser on or after the Construction Start Date and such request causes a delay in Commissioning the Complex, as certified by the Engineer, the Required Commercial Operations Date shall be extended Day-for- Day to account for such delay provided the Seller has submitted its ~~final~~ <u>initial</u> metering, control and protection single line diagram to the Purchaser no later than ~~fifteen~~ <u>thirty (15 30)</u> Days after the Construction Start Date. The Purchaser shall be notified in advance of, and		Refer amended EPA



		right to observe, all work on the protective devices.	shall have the right to observe, all work on the protective devices.		
		If the Purchaser is unable to accommodate the schedule for any of the Commissioning Tests as provided by the Seller, the Purchaser will give the Seller notice within forty-eight (48) hours of its receipt of the final schedule for testing of its requirements regarding deferral or delay of any Commissioning Tests for the Complex and the Parties will mutually agree on a date for any deferral test or programme of tests; <u>provided</u> , subject to the requirements for notification to the Purchaser hereunder, in no event shall the Purchaser be permitted to delay or defer the Commissioning Tests beyond thirty (30) Days from the date on which the tests were finally scheduled, except for reasons of a Force Majeure Event experienced by the Purchaser. Notwithstanding the foregoing, the Purchaser shall have no liability to the Seller under this Section 8.1 and no claim of breach or default hereunder shall arise	If the Purchaser is unable to accommodate the schedule for any of the Commissioning Tests as provided by the Seller, the Purchaser will give the Seller notice within forty-eight (48) hours of its receipt of the final schedule for testing of its requirements regarding deferral or delay of any Commissioning Tests for the Complex and the Parties will mutually agree on a date for any deferral test or programme of tests; <u>provided</u> , subject to the requirements for notification to the Purchaser hereunder, in no event shall the Purchaser be permitted to delay or defer the Commissioning Tests beyond ~~thirty (30)~~ <u>fifteen (15)</u> Days from the date on which the tests were finally scheduled, except for reasons of a Force Majeure Event experienced by the Purchaser. Notwithstanding the foregoing, the Purchaser shall have no liability to the Seller under this Section 8.1 and no claim of breach or default		
32.	8.1 (b) (1) (of the EPA)			Given the competitive construction timeline provided in the EPA, we would suggest that the 30 days should be 15 days in line with Precedent EPA.	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP



		if, and to the extent that, any delay in or deferral of the programme of Commissioning Tests would nevertheless have occurred regardless of the Purchaser's delay or deferral of such tests.	hereunder shall arise if, and to the extent that, any delay in or deferral of the programme of Commissioning Tests would nevertheless have occurred regardless of the Purchaser's delay or deferral of such tests.		
33.	8.1 (b) (2) (of the EPA)	Should the Purchaser defer or delay any Commissioning Tests beyond thirty (30) Days from the date on which the tests were finally scheduled and such deferral or delay causes the Scheduled Commercial Operations Date of the Complex to be delayed or deferred, as certified by the Engineer, then from the Scheduled Commercial Operations Date prevailing immediately prior to such delay or deferral, the Purchaser shall pay to the Seller Monthly, in arrears, (and prorated for any portion of a Month) an amount equal to the Carrying Cost plus [●] % of the Energy Price on account of actual reimbursement of partial O&M and insurance costs multiplied by the Average Daily Energy for the number of Days of such delay. Such payments shall commence on the Scheduled Commercial	Should the Purchaser defer or delay any Commissioning Tests beyond ~~thirty (30)~~ <u>fifteen (15)</u> Days from the date on which the tests were finally scheduled and such deferral or delay causes the Scheduled Commercial Operations Date of the Complex to be delayed or deferred, as certified by the Engineer, then from the Scheduled Commercial Operations Date prevailing immediately prior to such delay or deferral, the Purchaser shall pay to the Seller Monthly, in arrears, (and prorated for any portion of a Month) an amount equal to the Carrying Cost plus [●] % of the Energy Price on account of actual reimbursement of partial O&M and insurance costs multiplied by the Average Daily Energy for the number	Given the competitive construction timeline provided in the EPA, we would suggest that the 30 days should be 15 days in line with Precedent EPA. Please provide us the missing information in the blanks. It would be important to highlight prior to Bid submission as how such blanks would operate given the structure of the tariff.	Refer amended EPA



		Operations Date prevailing immediately prior to such delay and shall continue until the completion of the first attempted Commissioning Tests (whether successfully completed or not); <u>provided, however,</u> that the payment of such amounts by the Purchaser and extension of the Required Commercial Operations Date shall be subject to issuance by the Engineer of Certificate of Readiness for Synchronization and a simultaneous certificate that the delay caused by the Purchaser has caused the then scheduled Commissioning Tests to be delayed.	of Days of such delay. Such payments shall commence on the Scheduled Commercial Operations Date prevailing immediately prior to such delay and shall continue until the completion of the first attempted Commissioning Tests (whether successfully completed or not); <u>provided, however,</u> that the payment of such amounts by the Purchaser and extension of the Required Commercial Operations Date shall be subject to issuance by the Engineer of Certificate of Readiness for Synchronization and a simultaneous certificate that the delay caused by the Purchaser has caused the then scheduled Commissioning Tests to be delayed.		
34.	8.1 (b) (3) (of the EPA)	In addition to the payment set out in Section 8.1(b)(2) above, if the delay or deferral of the commissioning Tests by the Purchaser continues beyond the [●] Day following the date of issuance by the Engineer of the two (2) certificates referred to in this Section, then the Purchaser shall also be required	In addition to the payment set out in Section 8.1(b)(2) above, if the delay or deferral of the Commissioning Tests by the Purchaser continues beyond the <u>ninetieth (90th)</u> Day following the date of issuance by the Engineer of the two (2) certificates referred to in this Section,		Refer amended EPA



	to pay the principal debt payments when due under the Financing Documents pursuant to the repayment schedule agreed between the Seller and the Lenders at Financial Closing, with a copy of such repayment schedule being furnished to the Purchaser attested by the Lenders or their Agent as to its accuracy ("Lender Debt Confirmation"). Such principal debt payment shall be due from the Purchaser no later than thirty (30) Days following receipt of an invoice therefor (together with the Lender Debt Confirmation) which invoice shall be signed by the Lenders or the Agent certifying the amount shown therein to be correct and stating the due date for such payment of principal debt under the repayment schedule. Such payments shall continue until the earlier of (i) the end of a period equal to the period of delay or deferral of any Commissioning test or Commissioning Tests; and (ii) the completion of the first attempted Commissioning Tests (whether successfully completed or not).	then the Purchaser shall also be required to pay the principal debt payments when due under the Financing Documents pursuant to the repayment schedule agreed between the Seller and the Lenders at Financial Closing, with a copy of such repayment schedule being furnished to the Purchaser attested by the Lenders or their Agent as to its accuracy ("Lender Debt Confirmation"). Such principal debt payment shall be due from the Purchaser no later than thirty (30) Days following receipt of an invoice therefor (together with the Lender Debt Confirmation) which invoice shall be signed by the Lenders or the Agent certifying the amount shown therein to be correct and stating the due date for such payment of principal debt under the repayment schedule. Such payments shall continue until the earlier of (i) the end of a period equal to the period of delay or deferral of any Commissioning test or Commissioning Tests; and (ii) the completion of the first attempted Commissioning Tests		



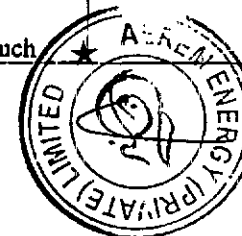
			(whether successfully completed or not).		
35.	8.1 (b) (5) (of the EPA)	Any payments made by the Purchaser pursuant to this Section 8.1(b) on account of principal debt payments under the Financing Documents shall be in the form of a loan from the Purchaser to the Seller in order to facilitate the Seller to meet its debt servicing obligations and the same shall be recovered by the Purchaser, together with interest at KIBOR plus a spread of three percent (3%) (on the monthly outstanding balance of such amounts), commencing on the Commercial Operations Date and ending on the date of complete repayment thereof by the Seller, through successive deductions of [●] % twenty percent of the Energy Price from the monthly Energy Payments until the aforesaid amounts have been completely recovered.	Any payments made by the Purchaser pursuant to this Section 8.1(b) on account of principal debt payments under the Financing Documents shall be in the form of a loan from the Purchaser to the Seller in order to facilitate the Seller to meet its debt servicing obligations and the same shall be recovered by the Purchaser, together with interest at KIBOR plus a spread of three percent (3%) (on the monthly outstanding balance of such amounts), commencing on the Commercial Operations Date and ending on the date of complete repayment thereof by the Seller, through successive deductions of [●] % twenty percent of the Energy Price from the monthly Energy Payments until the aforesaid amounts have been completely recovered.	The adjustment with regards to debt servicing should not be subject to KIBOR + [3%] since such additional spread has not been made available to compensation that are made to the Seller at a subsequent date.	Refer amended EPA
36.	9.3 (b) (of the EPA)	If the Seller is in breach of its obligation under Section 4.1(b) to achieve the Commercial Operations Date by the Required Commercial	If the Seller is in breach of its obligation under Section 4.1(b) to achieve the Commercial Operations Date by the Required Commercial	This exception to the applicability of the liquidated damages under Section 9.3 (b) should also include a Non-Project	The said proposals are not acceptable to KE. Applicant is requested to



	Operations Date (unless such breach is attributable to breach or default by the Purchaser of its obligations hereunder, the nonavailability of Ambient Site Conditions in accordance with Section 8.8, or a Force Majeure Event) then for each Month (prorated Daily) thereafter until the Commercial Operations Date is actually achieved, the Seller shall pay the Purchaser as liquidated damages an amount equal to four Dollars (\$4.00) per kW of the Contract Capacity for each Month (prorated Daily) thereafter until the Commercial Operations Date is actually achieved. The Parties acknowledge and agree that it would be difficult or impossible at the date of this Agreement to determine with absolute precision the amount of damages that would or might be incurred by the Purchaser as a result of the Seller's failure to perform those matters for which liquidated damages are provided under this Section 9.3.	Operations Date (unless such breach is attributable to breach or default by the Purchaser of its obligations hereunder, the nonavailability of Ambient Site Conditions in accordance with Section 8.8, a Force Majeure Event, <u>or a Non-Project Event</u>) then for each Month (prorated Daily) thereafter until the Commercial Operations Date is actually achieved, the Seller shall pay the Purchaser as liquidated damages an amount equal to ~~four Dollars (\$4.00)~~ <u>per kW two and half Dollars (\$2.50)</u> per kW of the Contract Capacity for each Month (prorated Daily) thereafter until the Commercial Operations Date is actually achieved. The Parties acknowledge and agree that it would be difficult or impossible at the date of this Agreement to determine with absolute precision the amount of damages that would or might be incurred by the Purchaser as a result of the Seller's failure to perform those matters for which liquidated damages are provided under this Section	Event. In terms of EPA, Non-Project Event is recognized as an exception to generation of electricity. Therefore, similarly, such should also be included here. Furthermore, the quantum of the delay liquidated damages should be adjusted in line with the K.E Precedent EPAs and other market precedent.	provide its acceptance to the amended EPA as required under the RFP



37.	9.4 (h) (of the EPA)	Notwithstanding anything to the contrary in this Agreement, if any amount paid by the Purchaser to the Seller under this Agreement, is subsequently disallowed by NEPRA under the Determined Tariff, the Purchaser shall have the right to recover the same from the Seller by way of set off or otherwise.	9.3. ~~Notwithstanding anything to the contrary in this Agreement, if any amount paid by the Purchaser to the Seller in terms of Section 15.6 (a) (iii) and 15.6 (i) under this Agreement, is subsequently disallowed by NEPRA under the Determined Tariff, the Purchaser shall promptly inform (but not later than three (3) Days of issuance of such determination by NEPRA) the Seller of the same. If the Seller does not file an appeal before the appellate tribunal established under the NEPRA Act, and/or a motion for leave for review, in accordance with the applicable law, the Purchaser shall have the right to recover the same from the Seller by way of set off or otherwise on a mutually agreed Schedule. The Purchaser shall provide to the Seller all information and documents as may be requested by the Seller as may be required by the Seller to file an appeal before the Appellate Tribunal established under the NEPRA Act and/or a motion for leave for review in~~	Please note that contractual payments which do not relate to the tariff itself should in any case be excluded from this clause. Such excluded payments would include payments in relation to delay in Purchaser Interconnection Facilities, delay in commissioning-tests, Delayed Payment Rate, payments in relation to indemnities or other payment in relation to the Contract. With regards to Energy Payments, Supplemental Tariffs and Pass- Through Items, such payments would be made pursuant to Schedule I which would be reflective of the tariff approval for the Project in any case. Therefore, such payments should be excluded. This clause should be restructured to the payments only under Section 15.6 (a) (iii) and Section 15.6 (i). We understand that such	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP

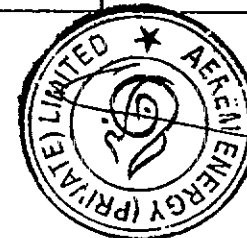


			<u>accordance with the applicable law.</u>	payments would be made upfront and then in case of disapproval, would be adjusted. Any such adjustment should be based on a reasonable schedule. Furthermore, the Agreement Year should be extended to allow the Seller to re-coup such disallowed payments.	
38.	9.5 (d) (of the EPA)	Late payments by either Party of amounts due and payable under this Agreement shall bear interest at a rate per annum equal to the Delayed Payment Rate, prorated Daily.	Late payments by either Party of amounts due and payable under this Agreement shall bear interest at a rate per annum equal to the Delayed Payment Rate, prorated Daily <u>provided however any interest on liquidated damages payable under Section 9.3(b) shall be calculated at SOFR instead of KIBOR plus the same applicable spread on Delayed Payment Rate.</u>	Please note that the Liquidated Damages are USD denominated, and therefore SOFR should be applicable. Please note that the same is in line with Precedent EPAs.	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP
39.	9.6 (a) (of the EPA)	At any time within three hundred and sixty (360) Days after receipt of an invoice, a Party may serve notice (an 'Invoice Dispute Notice') on the other Party that the amount of such invoice (or part thereof) is in dispute. Each	At any time within three hundred and sixty (360) Days after receipt of an invoice, a Party may serve notice (an 'Invoice Dispute Notice') on the other Party that the amount of such invoice (or part thereof) is in dispute. Each	In line with Precedent solar based K.E EPAs, this allowed a party to go straight to an Expert for determination. Given the prolonged timelines in case of arbitration, this a more efficient manner of	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the

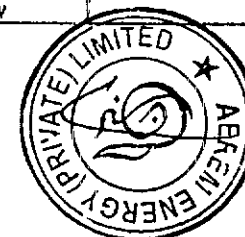


		Invoice Dispute Notice shall specify the invoice concerned and the amount in dispute, providing reasons as complete and detailed as reasonably possible. A Party shall be entitled to submit any Dispute relating to an invoice to dispute resolution in accordance with Article XVIII, so long as it has delivered an Invoice Dispute Notice to the other Party in accordance with Section 9.6(a).	Invoice Dispute Notice shall specify the invoice concerned and the amount in dispute, providing reasons as complete and detailed as reasonably possible. A Party shall be entitled to submit any Dispute relating to an invoice to dispute resolution in accordance with Article XVIII, so long as it has delivered an Invoice Dispute Notice to the other Party in accordance with Section 9.6(a). <u>A Party submitting an Invoice Dispute Notice may require such dispute to be immediately referred to an Expert for determination pursuant to Section 18.2.</u>	resolution of disputes.	RFP
40.	9.6 (c) (of the EPA)	Notwithstanding the determination of the Dispute by the Expert under Section 18.2, each Party shall be entitled to refer the Dispute to arbitration without being obligated to pay, repay or offset, as the case may be, prior to the Dispute being settled through arbitration if such Party has elected to refer the Dispute to arbitration.	~~Notwithstanding the determination of the Dispute by the Expert under Section 18.2, each Party shall be entitled to refer the Dispute to arbitration without being obligated to pay, repay or offset, as the case may be, prior to the Dispute being settled through arbitration if such Party has elected to refer the Dispute to arbitration.~~ <u>Following such resolution or determination by an Expert,</u>	We have suggested this provision in line with the K.E Solar IPPs – this goes a long way in creating efficiency in the overall payment structure and does not lead to either party being cash constrained.	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP

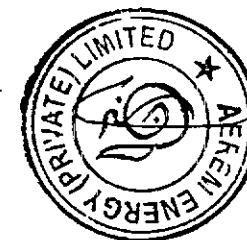
			<u>neither Party may refer a Dispute regarding such matter to arbitration under Section 18.3, unless and until it has paid all amounts resolved or determined to be payable in accordance with Section 9.6(b).</u>		
41.	9.8 (of the EPA)	(a) Within [●] Business Days prior to Financial Closing, the Purchaser undertakes to execute an Escrow Agreement which shall become effective sixty (60) Days after Commercial Operations Date. The Purchaser shall for the purposes of effecting payments under the Agreement, designate a collection account maintained with the Escrow Agent in accordance with the Escrow Agreement. The Escrow Agent shall transfer, in accordance with the Escrow Agreement, the payments due in accordance with Section 9.5, to the Seller that have fallen due and which have not been disputed by the Purchaser.	(a) Within [●] Business Days prior to Financial Closing, the Purchaser undertakes to execute an Escrow Agreement which shall become effective ~~sixty (60) Days after Commercial Operations Date~~ <u>on the Scheduled Commercial Operations Date</u> . The Purchaser shall for the purposes of effecting payments under the Agreement, designate a collection account maintained with the Escrow Agent in accordance with the Escrow Agreement. The Escrow Agent shall transfer, in accordance with the Escrow Agreement, the payments due in accordance with Section 9.5, to the Seller that have fallen due and which have not been disputed by the Purchaser.	Please note that the Escrow Agreement should become immediately effective given that there are certain very important payments prior to Commercial Operations Date.	Refer Amended EPA
		(b) The Escrow Account will remain in-place until all payment obligations of the	(b) The Escrow Account	Please note that such payments are not lump sum payment but compensations linked to regular tariff component and therefore should not unusually strain the Escrow Arrangement.	Payments covered under escrow are clearly defined in Amended EPA Section 9.8
				We understand that the arrangement relating to payment security would not only include an escrow arrangement, but also its linkages with the MCAs and the Collection Agreements. We would request KE to reflect such an	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP



	Purchaser to the Seller in relation to the Energy Payments (as approved by NEPRA in the Tariff Determination) under this Agreement, to the extent of any undisputed amounts, are paid or discharged in full, provided that; (i) All Consents under this Agreement are timely obtained as per the terms of this Agreement; (ii) The Agreement is not terminated due to a Force Majeure Event pursuant to Section 15; (iii) The Agreement is not terminated pursuant to Section 16. (c) In the event that the Seller fails to pay any undisputed invoice issued by the Purchaser in accordance with this Agreement (the "Purchaser Invoice"), the Purchaser shall have the right to set-off such undisputed amounts due and payable to it under the Purchaser Invoice against any amount due and	will remain in place until all payment obligations of the Purchaser to the Seller in relation to the Energy Payments (as approved by NEPRA in the Tariff Determination) under this Agreement, to the extent of any undisputed amounts, are paid or discharged in full, provided that; (i) All Consents under this Agreement are timely obtained as per the terms of this Agreement; (ii) The Agreement is not terminated due to a Force Majeure Event pursuant to Section 15; (iii) The Agreement is not terminated pursuant to Section 16. (c) In the event that the Seller fails to pay any undisputed invoice issued by the Purchaser in accordance with this Agreement (the "Purchaser Invoice"), the Purchaser shall have the right to set-off such undisputed amounts due and payable to it	understanding in Section 9.8(a). This should be reflected in the definition of Escrow Agreement as well. We are a bit unclear with regards to the reference to "as approved by NEPRA in the Tariff Determination". All energy payments would be made in accordance with Schedule 1 of the EPA and the Tariff Approval. We understand that prior to Financial Close, there would be an approval in relation to Energy Purchase Agreement, there is no need for a subsequent approval from NEPRA. Therefore, we suggest that the same be deleted. KE to clarify which Consents are contemplated here. This is a fundamental security for any bidder (and its lenders), therefore, a clarification in this regard would be appreciated. In any case, all such consents should be procured prior to the signing of the Escrow	All energy payments would be made in accordance with the Tariff Approval The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP Consents under the agreement will be the obligation of respective parties.



		payable by the Seller under the Escrow Agreement. (d) Notwithstanding the aforesaid, in the event the Purchaser is notified by the Escrow Agent that the Escrow Agreement may terminate prior to the termination of this Agreement, the Purchaser shall, prior to such termination of the Escrow Agreement, provide the Seller with an alternate escrow arrangement, on substantially similar terms to the Escrow Agreement.	under the Purchaser Invoice against any amount due and payable by the Seller under the Escrow Agreement. ~~(d) Notwithstanding the aforesaid, in the event the Purchaser is notified by the Escrow Agent that the Escrow Agreement may terminate prior to the termination of this Agreement, the Purchaser shall, prior to such termination of the Escrow Agreement, provide the Seller with an alternate escrow arrangement, on substantially similar terms to the Escrow Agreement.~~	Agreement. The Escrow Account should secure all payments under the Energy Purchase Agreement and not just Energy Payments. There are important payments such as Pass-Through Items, Supplementary Tariffs, Payments made under Section 15.6 upon occurrence of PPFME/CLFME which should be secured by the Escrow Account.	Payments covered under escrow are clearly defined in Amended EPA Section 9.8
				References to the Energy Purchase Agreement being terminated should be removed. The escrow arrangement should also be terminated once all amounts are settled. There may very well be the case of termination of the Energy Purchase Agreement but still amounts outstanding at KE's end.	This clause binds KE to replace the mechanism before termination and is for Seller's comfort.
				There should be advance timelines built in to allow for an appropriate novation to a third account bank, and the existing arrangement should only be terminated once the	Already covered in EPA



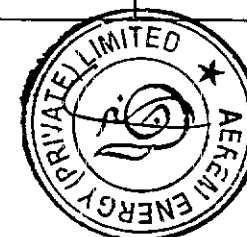
				substituted arrangement is in place.	
				K.E to also provide the MCA Agreements and confirm whether the Lenders have provided such consent.	Brief already shared; further clarifications also provided as part of General clarification
				Under Clause 15 of the EPA, if a natural Force Majeure Event e.g. a hurricane, delays KE in completing the Purchaser-Interconnection Works or subsequently damages KE's network, the EPA provides an extension of time e.g. to allow the Seller to reach COD. But there is no financial support (the protections for lenders' interest and principal in 6.5(b) and (c) do not apply in case of force majeure). The normal solution for a project company affected by a natural force majeure would be to obtain insurance cover which would include interim payments to cover principal and interest. But, in this case, the seller cannot insure against the risk because the network is not its insurable asset. We	
42.	15				The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP



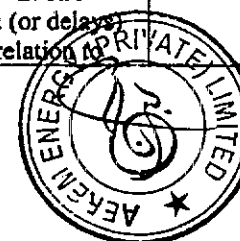
				request clarity on what approach will be taken in terms of insurance for delay from KE.	
43.	15.6 (a) (iii) (A) (of the EPA)	(iii): If there occurs a PPFME or a CLFME that prevents or delays the construction of the Complex or the ability of the Seller to operate the Complex or deliver Net Delivered Energy, the Purchaser shall within thirty (30) Days of the delivery by the Seller for an invoice therefor, pay to the Seller, for each Month (prorated for portion thereof) of the PB Compensation Period (as defined below) an amount equal to: (A) if the PPFME or the CLFME occurs prior to the Commercial Operations Date, the Carrying Cost or	if the PPFME or the CLFME occurs prior to the Commercial Operations Date, the carrying Cost plus [● %] of the <u>Energy Price multiplied by the Average Daily Energy for each Day during the period of such delay. In addition, in the event that a PPFME or a CLFME continues beyond ninety (90) days, then the Purchaser shall also be required to pay the principal sum of the debt when due pursuant to the repayment schedule as set out under the relevant Financing Document (as certified to the Purchaser by the Lender or Agent). Such payment of the principal sum of the debt by the Purchaser shall be due from the Purchaser on the earlier of thirty (30) Days following receipt of an invoice therefor or the due date for such payment under the repayment schedule (as certified to the Purchaser by the Lender or Agent), which invoice shall be signed by the</u>	KE to clarify whether such payments are already approved as part of its Determined Tariff. If not, would it seek such an approval prior to signing the Energy Purchase Agreement. If not, then, fundamentally, this regulatory risk would be undertaken by the Bidder. KE to clarify. The compensations are important to cover key risks for the Seller. This compensation regime is also something that the lenders would look for in such a Project and since, in any case, it is subject to NEPRA's approval, there would not be a risk on K.E's end. Please provide the missing information in the blanks.	Refer amended EPA



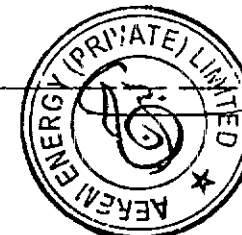
			<u>Lenders or the Agent, certifying the amount shown therein to be correct and stating the due date for such payment of principal debt under the repayment schedule as set out under the relevant Financing Document (as certified to the Purchaser by the Lenders or Agent), or</u>		
44.	15.6 (a) (iii) (B) (of the EPA)	(B) if the PPFME or the CLFME occurs after the Commercial Operations Date, the Energy Price multiplied by the Average Daily Energy for the number of Days the Seller was unable to operate the Complex or deliver the Net Delivered Energy less (i) the amount of Energy Payments paid to the Seller by the Purchaser pursuant to Section 15.5 and (ii) [●]% of the Energy Price for the energy not delivered under Section 15.5; further such payments shall be pass-through item in Determined Tariff by NEPRA.	(B) if the PPFME or the CLFME occurs after the Commercial Operations Date, the Energy Price multiplied by the Average Daily Energy for the number of Days the Seller was unable to operate the Complex or deliver the Net Delivered Energy less (i) the amount of Energy Payments paid to the Seller by the Purchaser pursuant to Section 15.5 and (ii) [●]% of the Energy Price for the energy not delivered under Section 15.5; <u>Provided however if (i) such payments are disallowed by NEPRA to be claimed by the Purchaser under its Determined Tariff, the Purchaser shall be entitled to set-off such paid amounts</u>	Please fill in the missing information in the blanks as we would need visibility on this, as such has been the case in the past EPAs. We understand that such payments would be made upfront, and then NEPRA approval would be sought. Please reflect such understanding. Furthermore, in case of (ii), once the approval by NEPRA is in place, then such amounts should be paid as well.	Refer Amended EPA



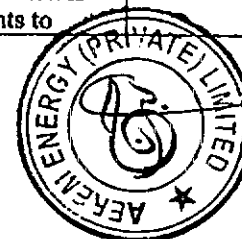
			<u>against any outstanding invoice issued by the Seller pursuant to Section 9.5 or otherwise recover the same from the Seller in accordance with a reasonably mutually agreed schedule; or (ii) the payment of the Energy Payments is permitted by NEPRA to be claimed by the Purchaser under its Determined Tariff the Purchaser shall pay the Seller withheld pursuant to Section 15.6(a)(iii)(B)(ii), following such approval.</u> ~~further such payments shall be pass-through item in Determined Tariff by NEPRA.~~		
45.	15.6 (i) (of the EPA)	If, following the Commercial Operations Date, there occurs a PPFME or a CLFME that, in either case, does not require the Seller to undertake a Restoration but nonetheless disables the Seller from operating the Complex and delivering Net Delivered Energy (a "Non-Restoration Event"), then the Purchaser shall pay to the Seller for each Month (or portion thereof) of the PE Compensation Period (as defined below), the	If, following the Commercial Operations Date, there occurs a PPFME or a CLFME that, in either case, does not require the Seller to undertake a Restoration but nonetheless disables the Seller from operating the Complex and delivering Net Delivered Energy (a "Non-Restoration Event"), then the Purchaser shall pay to the Seller for each Month (or portion thereof) of the PE Compensation Period (as defined below), the	It appears that the BPA states that such compensations are payable in case such amounts are a pass-through under KE's own tariff. In this regard, we would first request for KE to confirm whether such amounts are a pass through under KE's own tariff. If not, would it be approaching NEPRA in this regard. In case NEPRA does not accord (or delays its approval in relation to	Refer amended EPA



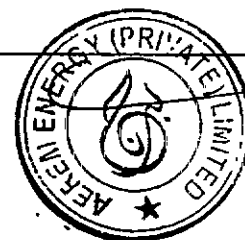
		Energy Price multiplied by the Average Daily Energy for the number of Days during such period less (i) payment on account of [●]%(%) of the prevailing Energy Price for the energy not delivered under Section 15.5 and (ii) the amount of any Energy Payments paid to the Seller by the Purchaser pursuant to Sections 9.1 and 15.5; provided however any such payment hereunder shall be pass-through item under the Determined Tariff by NEPRA. The term "PE Compensation Period" for purposes of this Section 15.6(i) only, shall have the same meaning as it bears in Section 15.6(a)(iv) except for the reference to the Restoration Period.	Energy Price multiplied by the Average Daily Energy for the number of Days during such period less (i) payment on account of [●]%(%) of the prevailing Energy Price for the energy not delivered under Section 15.5 and (ii) the amount of any Energy Payments paid to the Seller by the Purchaser pursuant to Sections 9.1 and 15.5; provided however any such payment hereunder shall be pass-through item under the Determined Tariff by NEPRA. The term "PE Compensation Period" for purposes of this Section 15.6(i) only, shall have the same meaning as it bears in Section 15.6(a)(iv) except for the reference to the Restoration Period. <u>Provided however if (i) such payments for the PE Compensation Period as above are disallowed by NEPRA to be claimed by the Purchaser under its Determined Tariff, the Purchaser shall be entitled to set-off such paid amounts</u>	the such pass-through items, and we understand that it would be KE that would need to make such an application, it would be inappropriate to park that risk at the end of Seller. Furthermore, if such payments are to be submitted to NEPRA for approval, then why is there a deduction from such compensations? Furthermore, we understand that payments would be first made by K.E, and then, in case disapproved by NEPRA, then there would be adjustment. Kindly reflect the same.	



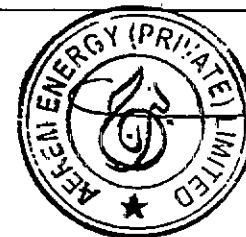
			against any outstanding invoice issued by the Seller pursuant to Section 9.5 or otherwise recover the same from the Seller in accordance with a reasonable mutually agreed schedule or (ii) the payment of the Energy Payment is permitted by NEPRA to be claimed by the Purchaser under its Consumer End Tariff the Purchaser shall pay to the Seller withheld pursuant to this section 15.6(i), following such approval.		
46.	15.6 (k)	Notwithstanding anything herein to the contrary, in the event of: (i) the occurrence of a PPFME and/or CLFME that has a material adverse effect on the Seller's ability to construct, commission or operate the Complex and such PPFME and/or CLFME continues for a period exceeding one hundred eighty (180) Days, or	Notwithstanding anything herein to the contrary, in the event of: (i) the occurrence of a PPFME and/or CLFME that has a material adverse effect on the Seller's ability to construct, commission or operate the Complex and such PPFME and/or CLFME continues for a period exceeding one hundred eighty (180) Days, or (ii) a series of such related PPFMEs and/or CLFME that continue	We would suggest that the right to opt for Suspension should be limited to the Seller since it would be best placed to undertake an assessment as to whether it would be able to continue with the Project without compensation. Otherwise, the Seller would be locked in for the FME Suspension Period being fully aware that it would be unable to address the consequences of the same. The other option is that if the Purchaser wants to	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP



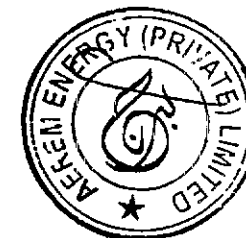
		(ii) a series of such related PPFMEs and/or CLFME that continue in the aggregate for a period that exceeds one hundred eighty (180) Days during any year, or	(iii) in the aggregate for a period that exceeds one hundred eighty (180) Days during any year, or a PPFME or a CLFME following which (A) the Parties agree or the Expert determines that a Restoration is not feasible or the Purchaser decides that the cost of Restoration is not acceptable or (B) the Parties agree that a Restoration is feasible and the Seller fails to secure financing for the Restoration or (C) the Parties disagree on the Report, or	continue with the Suspension option, then it should simple takeover the Project at an agreed price. Furthermore, the EPA should also contemplate the possibility that the Seller may continue with the EPA past 180 days without opting for termination or suspension.	
		(iii) a PPFME or a CLFME following which (A) the Parties agree or the Expert determines that a Restoration is not feasible or the Purchaser decides that the cost of Restoration is not acceptable or (B) the Parties agree that a Restoration is feasible and the Seller fails to secure financing for the Restoration or (C) the Parties	(iv) a CLFME following which the Complex does not operate for one hundred eighty (180) Days and during such period the Change in Law is not rescinded or modified in a way to permit or avoid the Restoration or allow the Complex to operate as before,		
			either Party the Seller may		



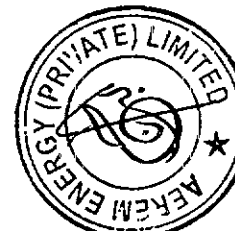
		disagree on the Report, or (iv) a CLFME following which the Complex does not operate for one hundred eighty (180) Days and during such period the Change in Law is not rescinded or modified in a way to permit or avoid the Restoration or allow the Complex to operate as before, either Party may elect to suspend the operation of this Agreement pursuant to Section 15.6A no later than three (3) Days: (i) prior to the expiry of one hundred and eighty (180) day period provided in Section 15.6(k)(i), (ii) and (iv) hereinabove; or (ii) following the fulfilment of the condition(s) provided in Section 15.6(k)(iii) hereinabove by delivering a written notice to the other Party	elect to suspend the operation of this Agreement pursuant to Section 15.6A ~~no later than three (3) Days at any time following:~~ (i) prior to <u>upon</u> the expiry of one hundred and eighty (180) day period provided in Section 15.6(k)(i), (ii) and (iv) hereinabove; or (ii) following the fulfilment of the condition(s) provided in Section 15.6(k)(iii) hereinabove by delivering a written notice to the other Party Purchaser (the "FME Suspension Notice"). If both the Parties fail to deliver the <u>Seller does not issue</u> the FME Suspension Notice ~~within the period set out herein~~, then <u>the Seller</u> either Party shall have the option to terminate this Agreement immediately by delivering a written notice of such termination to the other Party Purchaser. Notwithstanding the Parties' <u>Seller's</u> right to suspend or terminate this Agreement pursuant to this Article 15, no payments shall be due from the Purchaser to the Seller under Section 15.6 (a) (iii) or		



		(the "FME Suspension Notice"). If both the Parties fail to deliver the FME Suspension Notice within the period set out herein, then either Party shall have the option to terminate this Agreement immediately by delivering a written notice of such termination to the other Party. Notwithstanding the Parties' right to suspend or terminate this Agreement pursuant to this Article 15, no payments shall be due from the Purchaser to the Seller following the expiry of the one hundred and eighty (180) Days as provided in this Section 15.6(k) on account of a PPFME/CLFME.	15.6 (i) following the expiry of the one hundred and eighty (180) Days as provided in this Section 15.6(k) on account of a PPFME/CLFME.		
47.	15.6A (n) + 15.6A (o) (of the EPA)	(n) If either Party elects to suspend the operation of this Agreement by issuance of the FME Suspension Notice pursuant to section 15.6(k), such suspension shall take effect from the date of the FME Suspension Notice and continue until the earlier to occur of the following: (i) expiry of the period, as set out in the FME Suspension Notice; or (ii) the earlier withdrawal by either Party of	(a) (a) If either Party the Seller elects to suspend the operation of this Agreement by issuance of the FME Suspension Notice pursuant to section 15.6(k), such suspension shall take effect from the date of the FME Suspension Notice and continue until the earlier to occur of the following: (i) expiry of the period, as set out in the FME Suspension Notice; or (ii) the earlier	We would suggest the right to opt for suspension should be limited to the Seller since it would be best placed to undertake an assessment as to whether it would be able to continue with the Project without compensation. Otherwise, the Seller would be locked in for the FME Suspension Period being fully aware that it is	Refer Amended EPA



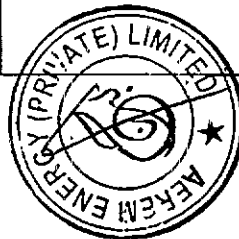
	the FME Suspension Notice in accordance with Section 15.6A(c) below; or (iii) the earlier cessation of the PPFME or CLFME, as the case may be (the "FME Suspension Period"). The Parties agree that the aggregate of the FME Suspension Period shall not exceed five (5) years during the Term (the "Total FME Suspension Period") and either Party may issue as many FME Suspension Notice(s) as it deems appropriate during the Term. For avoidance of doubt, following the expiry of the Total FME Suspension Period, either Party shall have the option to terminate this Agreement immediately by delivering written notice of such termination to the other Party. (e) During the FME Suspension Period, all obligations under the Agreement for both the Parties, including, inter alia, the Seller to supply energy and Purchaser's obligation to make any payments during the pendency of PPFME or	withdrawal by either Party the Seller of the FME Suspension Notice in accordance with Section 15.6A(c) below; or (iii) the earlier cessation of the PPFME or CLFME, as the case may be (the "FME Suspension Period"). The Parties agree that the aggregate of the FME Suspension Period shall not exceed five (5) years during the Term (the "Total FME Suspension Period") and either Party the Seller may issue as many FME Suspension Notice(s) as it deems appropriate during the Term. For avoidance of doubt, following the expiry of the Total FME Suspension Period, either Party shall have the option to terminate this Agreement immediately by delivering written notice of such termination to the other Party. (e) (b) During the FME Suspension Period, all obligations under the Agreement for both the Parties, including, inter alia, the Seller to supply energy and Purchaser's obligation to	unable to address the consequences of the same. The other option is that if the Purchaser wants to continue with the suspension option, then it can simply take-over the Project at an agreed price.	



		CLFME shall be suspended with immediate effect and shall remain suspended until the Seller withdraws the FME Suspension Notice.	~~make any payments during the pendency of PPFME or~~ CLFME shall be suspended with immediate effect and shall remain suspended until the Seller withdraws the FME Suspension Notice <u>provided, however, it is hereby clarified that this Section shall not apply in respect of any accrued obligation prior to such suspension.</u>		
48.	15.8 (d) (of the EPA)	The Seller shall (unless this Agreement has been terminated by the Purchaser pursuant to Sections 15.6(e), 15.8(a) or 15.9), be entitled to receive a Supplemental Tariff such that it will recover from the Purchaser, the costs actually incurred in effecting the Restoration, including, without limitation, weighted average cost of capital not exceeding KIBOR plus three percent (3%) determined at the time the Complex returns to operation or, if the Complex did not cease operation, at the time the Restoration is completed by the Seller but subject in all respect to the terms and conditions of NEPRA's approval under the			The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP

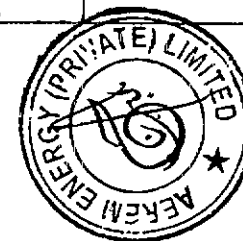


		Supplemental Tariff. The costs to be recovered by the Seller pursuant to this Section 15.8 and Section 15.9 shall be the costs that are actually incurred by the Seller to effect the Restoration to the extent those costs exceed any insurance proceeds; <u>provided, however</u>, that each such item of cost shall have been reasonable and appropriate for the Seller to effect such Restoration consistent with the standards for the original construction and the applicable Laws of Pakistan Prudent Utility Practices and low cost Restoration methods, as the case may be. The Seller shall deliver a schedule of such costs to the Purchaser, together with copies of the invoices, for review by the Purchaser. If the Purchaser contests any item of cost on the basis of the foregoing standards and the Purchaser and the Seller cannot agree, the issue of whether such item of cost should be recovered under this Agreement shall be referred to an Expert pursuant to Section 15.7(c) to render a decision based on the			



		foregoing standards.			
49.	15.10 (of the EPA)	Subject to the Parties entitlement to issue a FME Suspension Notice pursuant to Section 15.6(k), a Party shall exercise any right to terminate this Agreement under this Article XV by delivering a notice of termination to the other Party in accordance with Section 19.1. Any such notice from the Purchaser shall be executed by a duly authorized representative of the Purchaser. Such notice shall identify, if applicable, the PPFME or CLFME (as applicable) in reasonable detail and the basis for termination. Termination of this Agreement shall be effective at 17:00 hours on the thirtieth (30th) Day following the date of delivery of such notice.	Subject to the Parties <u>Seller's</u> entitlement to issue a FME Suspension Notice pursuant to Section 15.6(k), a Party shall exercise any right to terminate this Agreement under this Article XV by delivering a notice of termination to the other Party in accordance with Section 19.1. Any such notice from the Purchaser shall be executed by a duly authorized representative of the Purchaser. Such notice shall identify, if applicable, the PPFME or CLFME (as applicable) in reasonable detail and the basis for termination. Termination of this Agreement shall be effective at 17:00 hours on the <u>thirtieth</u> (30th) Day following the date of delivery of such notice.		The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP
50.	16.1 (a) (ii) (of the EPA)	(a) The Seller's failure: (ii) to achieve the Commercial Operations Date not earlier than one hundred eighty (180) Days after the Required Commercial Operations Date;	(a) The Seller's failure: (ii) to achieve the Commercial Operations Date not earlier than <u>one hundred eighty (180) three hundred sixty-five (365)</u> Days after the Required Commercial Operations Date;	The required COD is within 10 months + 180 days before it becomes a Seller Event of Default, we understand usually there is 365 days' buffer. We request KE to confirm whether past precedent will be followed and if not,	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the

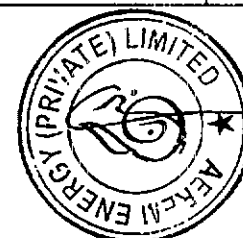
				the reasoning behind such a change.	RFP
51.	16.1 (m) (of the EPA)	Reduction of the Contract Capacity on the Commercial Operations Date by an amount which exceeds in aggregate five percent (5%) of the Contract Capacity specified in Section 2.9(a).	Reduction of the Contract Capacity on the Commercial Operations Date by an amount which exceeds in aggregate ~~five percent (5%)~~ <u>ten percent (10%)</u> of the Contract Capacity specified in Section 2.9(a).		The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP
52.	16.2 (b) (of the EPA)	The Purchaser's failure to pay any undisputed (or following the resolution of such dispute in favour of the Seller) amount due from it under the provisions of Section 9.4 of this Agreement by the Due and Payable Date for the relevant invoice or to make any other payment when required to be made under the Agreement, that, in each case, is not remedied within sixty (60) Days following the Seller's notice to the Purchaser stating that a payment default has occurred and is continuing, and describing such payment default in reasonable detail.	The Purchaser's failure to pay any undisputed (or following the resolution of such dispute in favour of the Seller) amount due from it under the provisions of Section 9.4 of this Agreement by the Due and Payable Date for the relevant invoice or to make any other payment when required to be made under the Agreement, that, in each case, is not remedied within ~~sixty (60) Days~~ <u>thirty (30) Days</u> following the Seller's notice to the Purchaser stating that a payment default has occurred and is continuing, and describing such payment default in reasonable detail.	Kindly note that failure to comply with payment obligations would have a key impact on the Project. Therefore, given the various risks highlighted, we suggest a time period of 30 days.	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP
53.	16.2 (f) (of the EPA)	The Purchaser fails to enter into the Escrow Agreement in accordance with Section 9.8(a); or the Escrow	The Purchaser fails to enter into the Escrow Agreement in accordance with Section 9.8(a); or the Escrow	In case of provision of an alternate Escrow arrangement, we suggest a time period of 7 days.	Refer Amended EPA



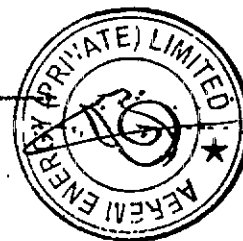
		Agreement is terminated prior to the expiry or termination of this Agreement, and the Purchaser fails to provide an alternate escrow arrangement in accordance with Section 9.8 within [●] Days of such termination or expiry or termination of the Escrow Agreement,	Agreement is terminated prior to the expiry or termination of this Agreement, and the Purchaser fails to provide an alternate escrow arrangement in accordance with Section 9.8 within [●] 7 Days of such termination or expiry or termination of the Escrow Agreement,		
54.	16.2 (g) (of the EPA)	Breach of any material term of the Escrow Agreement which is attributable to the Purchaser and such breach continues for a period of [●] consecutive Days.	Breach of any material term of the Escrow Agreement which is attributable to the Purchaser and such breach continues for a period of [●] <u>thirty (30)</u> consecutive Days.		Refer amended EPA
55.	16.2 (h) (of the EPA)	The failure by the Purchaser to complete and commission the Purchaser Interconnection Facilities within [●] Days following the Required Commercial Operations Date; provided any extension of RCOD shall only be pursuant to a Force Majeure Event and/or Section 6.5.	The failure by the Purchaser to complete and commission the Purchaser Interconnection Facilities within [●] <u>thirty (30)</u> Days following the Required Commercial Operations Date; provided any extension of RCOD shall only be pursuant to a Force Majeure Event and/or Section 6.5.		Refer amended EPA
56.	16.2 (j) (of the EPA)	N/A	<u>Any Change in Law rendering any material undertaking or obligation of the Purchaser under this Agreement or the Escrow Agreement unenforceable, invalid or void or making it unlawful for the Seller to receive payment or</u>		The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as



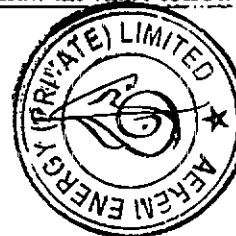
			<u>perform its obligations for more than one hundred and eighty (180) Days.</u>		required under the RFP
57.	16.3(b)(i)	(b) The following cure periods (each a "Cure Period") shall apply: (i) In the case of a Seller Event of Default arising under Section 16.1(c)(i) or a Purchaser Event of Default arising under Section 16.2(b) and (g), the Cure Period shall be sixty (60) Days;	(b) The following cure periods (each a "Cure Period") shall apply: (i) In the case of a Seller Event of Default arising under Section 16.1(c)(i) or a Purchaser Event of Default arising under Section 16.2(b) and (g), the Cure Period shall be ~~sixty (60)~~ <u>forty-five (45)</u> Days;	We suggest the cure period in line with the Precedent KE EPA.	Refer Amended EPA
58.	16.3A (b) (of the EPA)	If there is a Seller Event of Default as set out in Section 16.1(a)(iv), Section 16.1(e) or Section 16.1(i), which is not cured within the time period provided in Section 16.3 or there is a Seller Other Default which is not cured within the period provided in Section 16.3A(a), the Purchaser may elect to suspend the operation of this Agreement by delivering a written notice to the Seller (the "Purchaser Suspension Notice") but shall not be entitled to terminate this Agreement. If the Purchaser elects to suspend		During a suspension period, KE shall not be entitled to terminate the Escrow Agreement.	We understand no such termination clause is part of EPA currently. However, in case of suspension due to Seller EoD. The Payment security would become available after default is cured because KE cannot lock its cash streams if the Seller is on default.



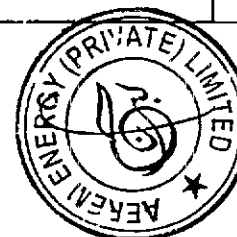
		the operation of this Agreement by issuance of the Purchaser Suspension Notice, such suspension shall take effect from the date of the Purchaser Suspension Notice and continue until the earlier to occur of the following: (i) fourteen (14) Days of the notice from the Seller to the Purchaser, that it has cured such default; or (ii) withdrawal by the Purchaser of the Purchaser Suspension Notice (the "Purchaser Suspension Period"). The Parties agree that the aggregate of the		Furthermore, during the suspension period, whilst the right to 'dip in' the Payment Security may be suspended, however, the obligation to maintain the Payment Security should continue as is.	



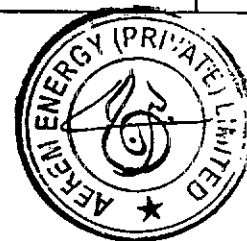
		Purchaser Suspension Period shall not exceed five (5) years during the Term (the "Purchaser Total Suspension Period") and the Purchaser may issue as many Purchaser Suspension Notice(s) as the circumstances permit during the Term.		Following termination, the Seller should have the option to provide energy to third parties, however, the framework for that should be, to the extent possible, upfront agreed.	Refer amended EPA.
59.	16.3A (c) (of the EPA)	During any Purchaser Suspension Period, all obligations under the Agreement for both the Parties, including, inter alia, the Purchaser's obligation to make any payments or provide the Payment Security and the Seller's obligation to supply and deliver energy and its entitlement to receive any payments or Payment Security shall be suspended with immediate effect and shall remain suspended until the end of the Purchaser Suspension	During any Purchaser Suspension Period, all obligations under the Agreement for both the Parties, ~~including, inter alia~~ <u>but excluding</u> , the Purchaser's obligation to make any <u>accrued payments prior to commencement of the Purchaser Suspension Period</u> or provide the Payment Security and the Seller's obligation to supply and deliver energy and its entitlement to receive any payments <u>(except as</u>	Please note that in case of a Purchaser Suspension Period, whilst we can understand that there may be a suspension in relation to a dip in right in the Escrow Account, however, given that the Energy Purchase Agreement contemplates a cure and termination of the Purchaser Suspension Period, from a payment security perspective, KE cannot have the right to withdraw the entire escrow	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP



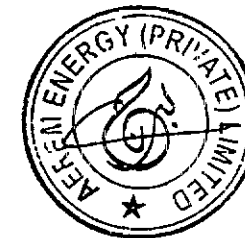
		Period.	<u>otherwise provided above) or Payment Security shall be suspended with immediate effect and shall remain suspended until the end of the Purchaser Suspension Period.</u>	arrangement.	
60.	16.3A (e) (of the EPA)	If the Purchaser elects not to suspend this Agreement pursuant to Section 16.3A(b), the Purchaser shall be required to pay only for the Net Delivered Energy supplied by the Seller in accordance with this Agreement provided that [●]% of the prevailing Energy Price shall not be payable until such time that the Seller Event of Default is cured.		Please provide the missing information in the blanks. It would be important to highlight prior to Bid submission as how such blanks would operate given the structure of the tariff.	Refer amended EPA
61.	16.3A (g) (of the EPA)	N/A	<u>If any Seller Event(s) of Default occurs following which the Purchaser elects to suspend the operation of this Agreement pursuant to Section 16.3A (b), then the Escrow Agreement shall stand suspended by the issuance of relevant instructions to the Escrow Agent by the Purchaser. If the Seller cures the Seller Event(s) of Default to the satisfaction of the Purchaser, the Purchaser shall within fourteen (14) Days of the</u>	Please see the proposed provision in relation to our comment with regards to Section 16.3A (c) above. The proposed provision is in line with Precedent K.E EPA.	KE understands since the suspension is not in place as the Seller has cured its default then Escrow will be available therefore such addition is not required.



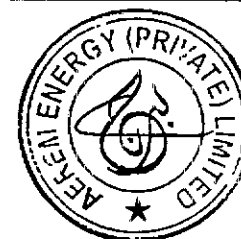
			<u>cessation of the relevant Seller Event of Default issue a notice to the Escrow Agent requesting a resumption of the Escrow Agreement.</u>		
62.	16.3B (a) (of the EPA)	If there is a Purchaser Event of Default as set out in Section 16.2(f) and 16.2(h) (the "Purchaser Major Default") and the same is not cured within the time period provided in Section 16.3, the Seller may cease the supply and delivery of the Net Delivered Energy by delivering a written notice to the Purchaser (the "Purchaser Major Default Notice"), but the Purchaser shall continue to be liable to pay and the Seller shall continue to be entitled to receive hundred percent (100%) of the Energy	If there is a Purchaser Event of Default as set out in Section <u>16.2 (a), 16.2 (b), 16.2 (c), 16.2(f), 16.2(g), and 16.2(h) and 16.2(i)</u> (the "Purchaser Major Default") and the same is not cured within the time period provided in Section 16.3, the Seller may <u>(i) elect to terminate the Agreement in accordance with Section 16.4 or (ii) cease the supply and delivery of the Net Delivered Energy by</u> delivering a written notice to the Purchaser (the "Purchaser Major Default Notice"), but the Purchaser	The Term shall be extended by such time period, however the tariff shall be limited to O&M and insurance component. Please note that if the EPA is terminated due to the Purchaser Event of Default, then the Seller shall not further rights to claim against KE. It would have been expected that Purchaser Major Default should include Purchase Event of Default relating to breach of payment security agreement as well as failure to make payment under the EPA.	Refer Amended EPA.



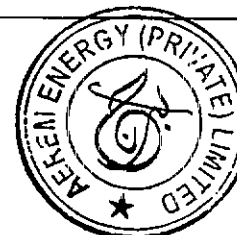
		Payment multiplied by the Average Daily Energy for each Day during the period of such suspension (the "Undisputed Payment Obligation"). If the Seller elects to stop the supply and delivery of the Net Delivered Energy from the date of the Purchaser Major Default Notice, the same shall continue until the earlier to occur of the following: (i) the date the Purchaser pays all due payments to the Seller under this Agreement; or (ii) the earlier withdrawal by the Seller of the Purchaser Major Default Notice (the "Purchaser Major Default Period"). The Parties agree that the aggregate of the Purchaser Major Default Period shall not exceed three (3) years during the Term ("Total Major Default Period") and the Seller may	shall continue to be liable to pay and the Seller shall continue to be entitled to receive hundred percent (100%) of the Energy ~~Payment Price~~ multiplied by the Average Daily Energy (as the Energy Payment) for each Day during the period of such suspension (the "Undisputed Payment Obligation"). If the Seller elects to stop the supply and delivery of the Net Delivered Energy from the date of the Purchaser Major Default Notice, the same shall continue until the earlier to occur of the following: (i) <u>three (3) days from</u> the date the Purchaser pays all due payments to the Seller under this Agreement; or (ii) the earlier withdrawal by the Seller of the Purchaser Major Default Notice (the "Purchaser Major Default Period"). The Parties agree	Typically, in case of purpose-built project, if there is a termination due to the off-taker's default, there is usually a buy-out obligation on part of the off taker. Given that this is squarely a default by KE, therefore, the buy-out obligation (along with necessary compensation payments) should kick in.	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP



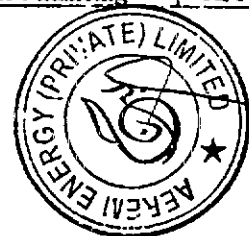
		issue as many Purchaser Major Default Notice(s) as the circumstances permit during the Term. Provided however in the event the Purchaser Major Default Period continues beyond the Total Major Default Period, either Party may terminate this Agreement pursuant to Section 16.4. The Agreement may only be terminated during the Purchaser Major Default Period by mutual consent by both the Parties.	that the aggregate of the Purchaser Major Default Period shall not exceed three (3) years during the Term ("Total Major Default Period") and the Seller may issue as many Purchaser Major Default Notice(s) as the circumstances permit during the Term. Provided however in the event the Purchaser Major Default Period continues beyond the Total Major Default Period, either Party may terminate this Agreement pursuant to Section 16.4. ~~The Agreement may only be terminated during the Purchaser Major Default Period by mutual consent by both the Parties.~~	In case of a Purchaser Event of Default, the Seller should have the option to walk away and terminate the EPA during the Purchaser Major Default Period especially where such period has commenced due to default relating to the Escrow Agreement.	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP
63.	16.3B (b) (of the EPA)	If the Purchaser has paid the Undisputed Payment Obligation, then the Term shall be extended for a period equal to the Purchaser Major Default Period and the Purchaser shall be entitled to	If the Purchaser has paid the Undisputed Payment Obligation, then the Term shall be extended for a period equal to the Purchaser Major Default Period and the Purchaser shall be entitled to	Furthermore, the extension of the Term is entirely due to the Purchaser Event of Default, therefore, in such a case, the Seller should be entitled to Return on Equity	Since ROE will already be part of Suspension payment in case of Purchaser Major BoD therefore no ROE



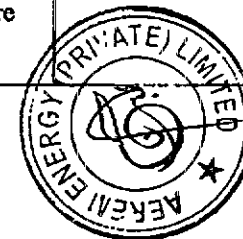
		receive an equivalent number of kWh, during such extended period, provided the Purchaser pays to the Seller the [•%] of the Energy Price on account of O&M and insurance costs, in accordance with the provisions of Schedule 1, for the Net Delivered Energy delivered by the Seller to the Purchaser. For avoidance of doubt, no additional payment shall be due and payable by the Purchaser for such Net Delivered Energy other than as provided in this Section 16.3B(b).	receive an equivalent number of kWh, during such extended period, provided the Purchaser pays to the Seller the [•%] of the Energy Price on account of O&M and insurance costs, in accordance with the provisions of Schedule 1, for the Net Delivered Energy delivered by the Seller to the Purchaser. For avoidance of doubt, no additional payment shall be due and payable by the Purchaser for such Net Delivered Energy other than as provided in this Section 16.3B(b).		in extension period.
64.	16.3B (c) (of the EPA)	If there is a Purchaser Event of Default other than the Purchaser Major Default and Purchaser Event of Default set out in Section 16.2(c) (the "Purchaser Other Default") and the same is not cured within the time period provided under this Agreement, the Seller shall deliver a written notice to the Purchaser within seven (7) Days of the expiry of the cure period as provided in Section 16.3, to cure such Purchaser Other Default by providing to the Purchaser a further period(s) not exceeding three	If there is a Purchaser Event of Default other than the Purchaser Major Default and Purchaser Event of Default set out in Section 16.2(c) (the "Purchaser Other Default") and the same is not cured within the time period provided under this Agreement, the Seller shall deliver a written notice to the Purchaser within seven (7) Days of the expiry of the cure period as provided in Section 16.3, to cure such Purchaser Other Default by providing to the Purchaser a further period(s) not exceeding three	The Seller should have the option to terminate the Agreement in such a case and not simply go for suspension of the Agreement.	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP



		hundred and sixty five (365) Days to cure the Purchaser Other Default ("Additional Cure Period"). Following the expiry of the Additional Cure Period the Seller may elect to suspend the operation of this Agreement ("Seller Other Suspension Notice").	hundred and sixty five (365) Days to cure the Purchaser Other Default ("Additional Cure Period"). Following the expiry of the Additional Cure Period the Seller may (i) elect to suspend the operation of this Agreement ("Seller Other Suspension Notice") or (ii) elect to terminate the Agreement in accordance with Section 16.4.		
65.	16.3B (f)	During any Seller Suspension Period, the Seller shall not be entitled to terminate this Agreement on account of the Purchaser Other Default; provided however in the event the Purchaser Other Default continues beyond the Seller Total Suspension Period, either Party may terminate this Agreement pursuant to Sections 16.4.	During any Seller Suspension Period, <u>only</u> the Seller shall not be entitled to terminate this Agreement on account of the Purchaser Other Default; provided however in the event the Purchaser Other Default continues beyond the Seller Total Suspension Period, either Party may terminate this Agreement pursuant to Sections 16.4.	As suggested above, please note that the Seller should have the right to terminate in case of a suspension scenario. Please also note that this is in line with the Precedent KE EPA.	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP
66.	16.3B (i)	N/A	<u>In the event the Seller terminate this Agreement in accordance with this Agreement due to a Purchase Event of Default, the Seller may elect to the transfer the Complex to the Purchaser and, in such an event, the Complex shall be transferred to the Purchaser and the Purchaser</u>	We suggest that the Compensation Payments should include the following: • The sum of: (i) All outstanding payments under the Financing	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP



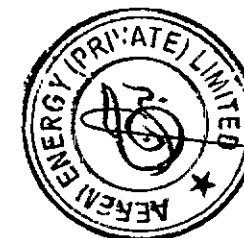
			<u>shall simultaneously pay the Compensation Amount. As soon as reasonably practicable and in any event not later than sixty (60) Days after the Termination Date, the Seller shall invoice to the Purchaser setting out the amounts payable by the Purchaser as Compensation Payments ("Termination Invoice"). The Termination Invoice would be accompanied by a certification of a reputable international accountancy firm operating in Pakistan, agreed by the Parties or appointed by the President of the Institute of Chartered Accountants of Pakistan, experienced in the methods of valuation of utility assets, verifying the calculation of all of the elements listed in the Termination Invoice in reasonable details, which calculation shall be used in the preparation of the Termination Invoice. The Purchaser shall pay to the Seller the amount shown in the Termination Invoice not later than thirty (30) days</u>	Documents including any winding-up costs, breakage costs, pre-payment penalties and charges, or similar charges or cost pass through by or payable to Lenders in accordance with the Finance Documents; (ii) The total amount outstanding under any loan agreements for capital improvements to, or Restoration of the Complex that are required as a result of Change in Law Force Majeure Event or Pakistan	



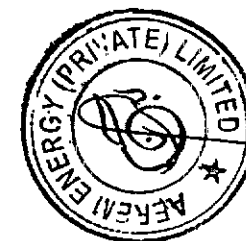
			<u>following the delivery of the Termination Invoice to the Purchaser ("Payment Date"). If any Tax is imposed on or withheld from payments from the Purchaser under this Section, then such payments to the Seller shall be increased by an amount such that the Seller shall receive same amount which it would had no such Tax been imposed or withheld. The Parties agree that the termination amount provided herein are the Seller's reasonable and pre-agreed genuine estimates of the actual losses that the Seller would incur as a result of termination of this Agreement, and do not constitute a penalty. Following payment of the amounts set out in the Termination Invoice, the Seller shall transfer to the Purchaser the Transferrable Assets.</u>	Political Force Majeure Event under the Energy Purchase Agreement; • The actual initial equity investment by the Seller to achieve Commercial Operations Date as reduced on a straight line basis from the Commercial Operations Date through the term of the EPA to 20% of value of such equity; • For a period, equal to the lesser of (i) four (4) years, and (ii) the remainder of the initial term of the EPA, an amount equal to: (A) Prior to the first anniversary of the Commercial Operations Date, a return based on 30% of the Energy Price assuming Average Daily	



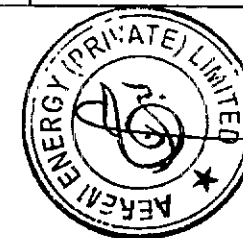
				Energy multiplied by the number of Days in such period or, (B) Following the first anniversary of the Commercial Operations Date, the Net Cash Flow for such period, as shown in audited financial statements of the Seller for the last completed financial year prior to the date of termination, discounted to its present value by applying a discount rate equal to 12%. The term Net Cash Flow shall mean the gross cash revenues of the Seller with respect to the operations of the Complex; Any additional equity amounts that are contributed by the	



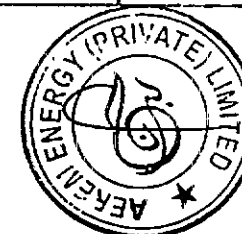
				shareholders of the Seller for any of the events described under Article 15 of the EPA plus any such other equity contributions, approved by either NEPRA or the Purchaser, as the case may be, in each case reduced on a straight line basis for each year following the date of such equity contribution to the end of the Term; • The summation of (i) any additional equity amounts, that are contributed by the shareholders of the Seller for any of the events that are described under Article XV of the Energy Purchase Agreement consequent upon the occurrence of a Force Majeure Event (as defined in the Energy Purchase Agreement) giving rise to the Restoration which led to termination of the	



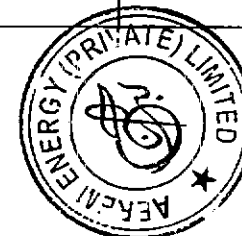
				Energy Purchase Agreement pursuant to Article XV thereof, reduced on a straight-line basis for each year following the date of such equity contribution to the end of the Term, <u>plus</u> (ii) original equity contributions, adjusted in the manner	
				described in item (b) here above, plus other equity contributions, prior to such Force Majeure Event and approved by the NEPRA or the Purchaser, as the case may be, reduced on a straight-line basis for each year following the date of such equity contribution to the end of the Term.	
67.	16.8 (c) (of the EPA)	Notwithstanding the foregoing or any other provision of this Agreement, the Parties agree that, in the event the Seller terminates this Agreement as a result of a Purchaser Event of Default under this Agreement, then upon termination of this Agreement, any claims by the	~~Notwithstanding the foregoing or any other provision of this Agreement,~~ The Parties agree that, in the event the Seller terminates this Agreement as a result of a Purchaser Event of Default under this Agreement, then upon termination of this	The Purchaser's obligation in case of a Purchaser Event of Default should not be limited if the Purchaser's Event of Default has been caused by its gross negligence or willful misconduct.	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP



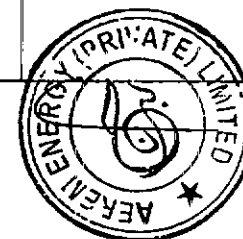
		Seller against or liability of the Purchaser under this Agreement (except as provided in Section 16.6) shall be fully extinguished and the Seller shall have no further claim or recourse against the Purchaser under this Agreement.	Agreement, any claims by the Seller against or liability of the Purchaser under this Agreement (except as provided in Section 16.6) shall be fully extinguished and the Seller shall have no further claim or recourse against the Purchaser under this Agreement, <u>provided, however, this provision shall not apply in case of gross negligence or willful default of the Purchaser.</u>		
68.	16.8 (d) (of the EPA)	N/A	<u>Notwithstanding the foregoing or any other provision of this Agreement, the Parties agree that, in the event the Purchaser terminates this Agreement as a result of a Seller Event of Default under this Agreement, then upon termination of this Agreement, any claims by the Purchaser against or liability of the Seller under this Agreement (except as provided in Section 16.6) shall be fully extinguished and the Purchaser shall have no further claim or recourse against the Seller under this Agreement.</u>	Similar protection that is available to the Purchaser should be available to the Seller as well in such a case.	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP



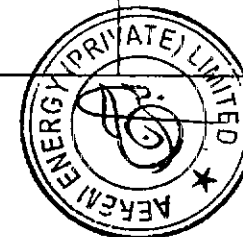
69.	16.8 (d) (of the EPA)			Typically, in case of purpose-built project, if there is a termination due to the off taker's default, there is usually a buy-out obligation on part of the off taker. Given that this is squarely a default by KE, therefore, the buy-out obligation (along with necessary compensation payments) should kick in.	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP.
70.	17.3 (of the EPA)	If this Agreement is terminated during the Term, the Seller may sell the Net Delivered Energy to any prospective purchaser in accordance with the Laws of Pakistan.	(a) If this Agreement is terminated or suspended during the Term, or the Agreement has otherwise expired, the Seller may shall have the right to sell the Net Delivered Energy to any prospective purchaser in accordance with the Laws of Pakistan. (b) The Purchaser hereby represents and warrants that: (i) the Seller shall be entitled to enter into the Use of System.	In case of termination, the Seller should have the right to sell Net Delivered Energy to third parties.	Refer Amended EPA



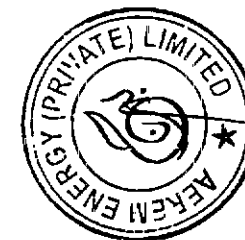
			<u>Agreement with the Purchaser and supply energy to consumers in accordance with the applicable law; and</u> <u>(ii) the Purchaser has provided to the Seller the Use of System Agreement proposed by NEPRA, as well as the comments proposed by the Purchaser in relation to the Use of System Agreement.</u> <u>(c) Upon termination or expiry or suspension of the Agreement, the Purchaser shall, within fifteen (15) days of request by the Seller, enter into the Use of System Agreement approved by NEPRA (and in case the NEPRA has not approved a Use of</u>		



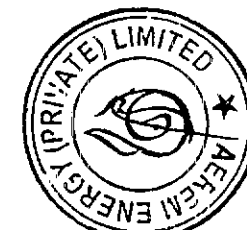
			<u>System Agreement based on the Purchaser's comments, then the Use of System Agreement proposed by NEPRA and provided to the Seller in terms of Section 17.3(b)(ii).</u>		
			<u>(d) The Purchaser should, on a best effort basis, provide all facilitation to the Seller for the Seller to be able to produce energy to its customers</u> <u>(e) Time is the essence of this Section 17.3 of this Agreement.</u>		
			<u>(f) In case of sale of Net Delivered Energy by the Seller to a bulk power consumer (as specified in the National Electric Power Regulation Authority Act, 1997), the Purchaser hereby acknowledges that it would be deemed to have received any</u>		



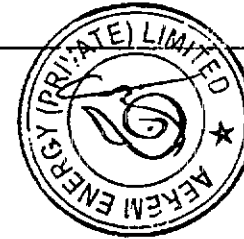
			<u>advance notice required to be received by it under the applicable law (including, but not limited to, Section 22 of the National Electric Power Regulation Authority Act, 1997), and Seller shall be entitled to sell energy to such bulk power consumer immediately following termination or expiry or suspension of the Agreement.</u> <u>(g) This Section 17.3 of this Agreement shall survive any termination or expiry or suspension of this Agreement.</u> <u>(h) Section 17.3 of this Agreement shall continue to be applicable notwithstanding any other provision of this Agreement.</u> <u>The Parties shall enter into a Use of Systems Agreement as</u>		



			a pre- condition to Financial Closing, which Use of System Agreement shall become automatically effective upon notice by the Seller.		
			Subject to Section 18.2(i) either Party may serve a written notice on the other Party within thirty (30) Days of the Expert's determination having been notified to it, stating its intention to refer the matter in Dispute to arbitration, provided that the notifying Party implements fully the determination of the Expert before commencing the procedure to refer the Dispute to arbitration and commences the procedure to refer the Dispute to arbitration within a further forty-five (45) Day period after serving such notice. Notwithstanding anything to the contrary expressed in this Article XVIII, either Party may require arbitration of a Dispute pursuant to Section 18.3 without reference to an Expert under this Section 18.2.		
71.	18.2 (o) (of the EPA)	Subject to Section 18.2(i) either Party may serve a written notice on the other Party within thirty (30) Days of the Expert's determination having been notified to it, stating its intention to refer the matter in Dispute to arbitration.		In line with Precedent K.E EPA, we suggest that if there has been an Expert determination, then, if a party is challenging the same through arbitration, then, in such a case, the amount determined by the Expert should be paid upfront.	The said proposals are not acceptable to KE. Applicant is requested to provide its acceptance to the amended EPA as required under the RFP.
72.	18.3 (a) (of the EPA)	Any Dispute that has not been resolved following the procedures set forth in Section 18.1 (Resolution by Parties)	Any Dispute that has not been resolved following the procedures set forth in Section 18.1 (Resolution by Parties)	Only a single forum should be applicable in case of Arbitration. Given that there would be	Refer amended EPA

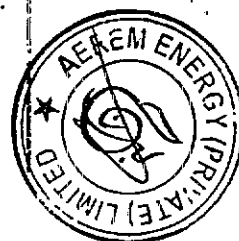


		and Section 18.2 (<i>Determination by Expert</i>), or has been required by a Party to be referred to arbitration without reference to an Expert, shall be settled by arbitration in accordance with the [Arbitration Act of 1940/rules of arbitration of the London Court of International Arbitration ("LCIA") as may be amended from time to time (the "Rules"). The arbitral tribunal shall comprise of one (1) arbitrator.	and Section 18.2 (<i>Determination by Expert</i>), or has been required by a Party to be referred to arbitration without reference to an Expert, shall be settled by arbitration in accordance with the [~~Arbitration Act of 1940/~~ rules of arbitration of the London Court of International Arbitration ("LCIA") as may be amended from time to time (the "Rules"). The arbitral tribunal shall comprise of one (1) arbitrator.	international Lenders in this case, we suggest it should be LCIA.	





A3 - Corrigendum to RFP





May 10, 2024

CORRIGENDUM No 1 : EXTENSION IN BID SUBMISSION DEADLINE
150 MW Solar Projects in Balochistan and 220 MW Site Neutral Hybrid Project at
Dhabeji ("Projects")

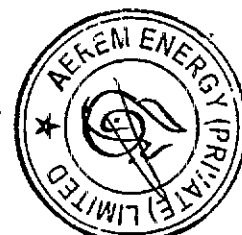
KE had invited bids/proposals from the investors for the development of the subject Projects through advertisement made on April 2, 2024.

This corrigendum is to notify that the deadline for submission of bids/proposals has been extended as follows:

S. No.	Project Name	Bid Submission Deadline (Original)	Bid Submission Deadline (Revised)
1	50 MW Solar Project at Winder and 100 MW Solar Project at Bela	20-May-2024	31-Jul-2024
2	220 MW Site Neutral Hybrid Project at Dhabeji	31-May-2024	31-Aug-2024

K-Electric Limited

39-B KE House Sunset Boulevard, DHA- Phase 2, Karachi, Pakistan





May 15, 2024

CORRIGENDUM No 2: AMMENDMENT IN SECTION 20.4
220 MW Site Neutral Hybrid Project at Dhabeji (Project)

KE had invited bids/proposals from the investors for the development of the subject project through advertisement made on April 2, 2024.

This corrigendum is issued to notify an amendment in Section 20.4 of the subject project RFP document. The change has been made to promote innovation and to give more flexibility to the prospective bidders.

The changes have been made in the following two clauses:

The earlier mentioned Clause (ii) stated that "The WTG and its OEM must have onshore global installed capacity of 10 GW since last 2 year.", has now been revised to ***"The WTG and its OEM must have an onshore global installed capacity of 5 GW, within the last 2 year."***

Furthermore, Clause (iv) stated earlier that "The WTG and its OEM must have fleet size of 500 WTGs installed of the same model as offered in the Bid. Installation within the region is preferable." ***has now been omitted from the knock-off criteria.***

The Updated Section 20.4 now reads as follows:

20.4. Wind Turbine

The specific model of WTG shall be "Type Certified" on latest IEC standards by an internationally accredited certification body acceptable to KE. The Bidder shall submit such a Type Certificate duly valid with the Bid. If the Type Certification is in process at the time of submission of the Bid, then a written commitment from the original equipment manufacturer shall be provided confirming that the Type Certificate shall be available before the Financial Close at the sole risk of the Bidder. By delivering the aforesaid written commitment, the Bidder is deemed to have undertaken that its Bid or the Project awarded to it will stand disqualified if the requisite Type Certificate is not available prior to Financial Close. However, subject to KE consent, the Bidder may also propose alternate WTG which complies with all the conditions as stipulated in this RFP without any impact on Tariff Approval.

Since Type Certificates for WTGs are not issued for a design life beyond 20 years, the Bidders will provide certificates from (1) the original equipment manufacturer of the WTG, (2) the EPC contractor, and (3) itself, certifying that the WTG and the plant will have a design life of 25 years from the Commercial Operations Date.

The WTG and its OEM must:

- (i) be amongst top ten (10) ranking of WTG OEMs as per Bloomberg NEF (BNEF).
- (ii) have an onshore global installed capacity of 5 GW, within the last 2 year.
- (iii) have 5,000 onshore global installed number of WTGs.





May 24, 2024

CORRIGENDUM (No. 3): EXTENSION IN DEADLINE FOR CLARIFICATION REQUESTS
150 MW Solar Projects in Balochistan and 220 MW Site Neutral Hybrid Project at Dhabeji
("Projects")

KE had invited bids/proposals from the investors for the development of the subject Projects through advertisement made on April 2, 2024.

This corrigendum is to notify that the deadline for submission of clarifications on the RFP Documents has been extended as per table below:

S. No.	Project Name	Clarification Submission Deadline (Original) ¹	Clarification Submission Deadline (Revised)	Bid Submission Deadline
1	50 MW Solar Project at Winder and 100 MW Solar Project at Bela	22-April-2024	20-June-2024	31-July-2024
2	220 MW Site Neutral Hybrid Project at Dhabeji	25-April-2024	05-July-2024	31-August-2024

¹Clarification dates as per RFP Section 8.4 of 50 MW Solar Project at Winder and 100 MW Solar Project at Bela and Section 9 of 220 MW Site Neutral Hybrid Project at Dhabeji

KE will timely be responding to clarifications received prior to the deadline and K-Electric will not have any obligation to respond to clarifications received after the clarification deadline.



K-Electric Limited

39-B KE House Sunset Boulevard, DHA- Phase 2, Karachi, Pakistan



June 14, 2024

CORRIGENDUM No. 4: AMENDMENT IN SECTION 1 (BID BOND), 14.9 & 15.
220 MW Site Neutral Hybrid Project at Dhabejl (Project)

KE had invited bids/proposals from the investors for the development of the subject project through advertisement made on April 2, 2024.

This corrigendum is to notify an amendment in RFP of subject project related to;

1. Section 1 Definition of Bid Bond & Exhibit 8 – Form of Bid Bond
2. Section 14.9. Bid Validity
3. Section 15. Bid Evaluation Committee

1. Amendment in Section 1

An unconditional, irrevocable, on demand bank guarantee issued in favor of K-Electric Limited pursuant to Section 14.6 of this RFP, by at least an "AA" rated scheduled bank operating in Pakistan which is acceptable to K-Electric, valid for a period of at least **twelve (12) months** from the bid submission deadline in the format and language as provided in Exhibit 8.

Has now been revised as:

*"An unconditional, irrevocable, on demand bank guarantee issued in favor of K-Electric Limited pursuant to Section 14.6 of this RFP, by at least an "AA" rated scheduled bank operating in Pakistan which is acceptable to K-Electric, valid for a period of at least **eight (08) months** from the bid submission deadline in the format and language as provided in Exhibit 8."*

2. Amendment in Section 14.9

The earlier mentioned section stated that "The Bidders shall provide the validity period of their bids for **twelve (12) months** from Bid submission deadline."

Has now been revised as:

*"The Bidders shall provide the validity period of their bids for **08 months** from Bid submission deadline."*

3. Amendment in Section 15

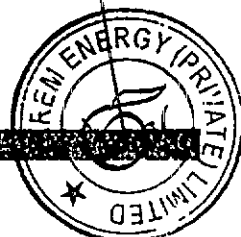
The earlier mentioned section stated as "The Bid Evaluation Committee would comprise of the following:

- a) One (1) independent consultant having expertise in competitive bidding and fulfilling the independence requirement of NCBTR 2017.
- b) Two (2) representatives from KE having Technical and Financial Expertise."

Has now been revised as:

"The Bid Evaluation Committee would comprise of the following:

- a) One (1) independent consultant having expertise in competitive bidding and fulfilling the independence requirement of NCBTR 2017.
- b) **Four (4)** representatives from KE having Technical, Commercial, and Financial Expertise."





June 27, 2024

CORRIGENDUM No. 5: AMENDMENT IN SECTION 20.4.3
220 MW Site Neutral Hybrid Project at Dhabeji (Project)

KE had invited bids/proposals from the investors for the development of the subject project through advertisement made on April 2, 2024.

This corrigendum is issued to notify an amendment in Section 20.4.3 of the subject project RFP document.

The earlier mentioned Section 20.4.3 stated that:

"Wind turbine and its associated system should be designed and selected such that it can produce power above the ambient temperature of 50 degree Celsius. The proposal shall include the OEM provided deration curve/table w.r.t the ambient temperature. The simulation which suggests the overall plant's Capacity Factor must include the historical ambient temperature of the Bidder's site/area."

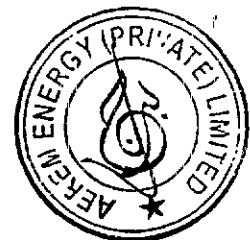
has now been revised to

"Wind turbine and its associated system should be designed and selected such that it can produce power above the ambient temperature of 45 degree Celsius. The proposal shall include the OEM provided deration curve/table w.r.t the ambient temperature. The simulation which suggests the overall plant's Capacity Factor must include the historical ambient temperature of the Bidder's site/area."

The Updated Section 20.4.3 now reads as follows:

20.4.3. Performance:

Wind turbine and its associated system should be designed and selected such that it can produce power above the ambient temperature of 45 degree Celsius. The proposal shall include the OEM provided deration curve/table w.r.t the ambient temperature. The simulation which suggests the overall plant's Capacity Factor must include the historical ambient temperature of the Bidder's site/area.





July 01, 2024

CORRIGENDUM No. 6: AMENDMENT IN SECTION 20.12.6.
220 MW Site Neutral Hybrid Project at Dhabeji (Project)

KE had invited bids/proposals from the investors for the development of the subject project through advertisement made on April 2, 2024.

This corrigendum is issued to notify an amendment in Section 20.12.6. Clause (f) of the subject project RFP document.

The earlier mentioned Section 20.12.6, Clause (f) stated that:

"Bidders must ensure adequate fencing & surveillance to ensure security of the Complex as per the Site condition/requirement, security systems installation, lighting, security cameras, microwave sensors for security purpose shall also be preferred. Anti-theft module fiber system proposition. Anti-theft module mounting bolts with the use of synthetic resin."

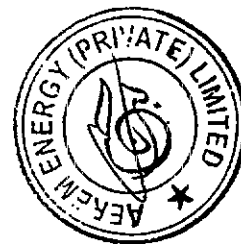
has now been revised to

"Bidders must ensure adequate fencing & surveillance to ensure security of the Complex as per the Site condition/requirement, security systems installation, lighting, security cameras, microwave sensors for security purpose shall also be preferred."

The Updated Section 20.12.6. Clause (f) now reads as follows:

20.12.6. Miscellaneous:

- f) Bidders must ensure adequate fencing & surveillance to ensure security of the Complex as per the Site condition/requirement, security systems installation, lighting, security cameras, microwave sensors for security purpose shall also be preferred.





August 27, 2024

CORRIGENDUM No. 7: AMENDMENT IN SECTION 21.3.
220 MW Site Neutral Hybrid Project at Dhahi (Project)

KE had invited bids/proposals from the investors for the development of the subject project through advertisement made on April 2, 2024.

This corrigendum is issued to notify an amendment in Section 21.3. of the subject project RFP document.

The earlier mentioned Section 21.3. clause 2 stated that:

"In case the Successful Bidder is obligated to pay any tax on its income from generation of electricity from solar, or any duties, taxes or cess not being of refundable nature, are imposed on the Successful Bidder, the exact amount paid by the Successful Bidder on these accounts will be reimbursed by KE on production of original filing documents."

has now been revised to

"In case the Successful Bidder is obligated to pay any tax on its income from generation of electricity from solar and wind, or any duties, taxes or cess not being of refundable nature, are imposed on the Successful Bidder, the exact amount paid by the Successful Bidder on these accounts will be reimbursed by KE on production of original filing documents."

The Updated Section 21.3. now reads as follows:

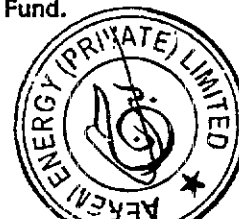
21.3. Pass-through Items:

Subject to the approval of NEPRA in Determined Tariff, following items shall be considered pass-through:

1. Duties and/or taxes, not being of refundable nature, relating to the construction period directly imposed on the Successful Bidder up to Commercial Operations Date, will be allowed at actual upon production of verifiable documentary evidence to the satisfaction of the Authority.
2. In case the Successful Bidder is obligated to pay any tax on its income from generation of electricity from solar and wind, or any duties, taxes or cess not being of refundable nature, are imposed on the Successful Bidder, the exact amount paid by the Successful Bidder on these accounts will be reimbursed by KE on production of original filing documents.

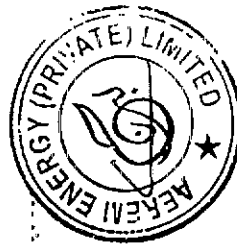
In case of the above scenario, the Successful Bidder shall also submit to KE the details of any tax savings and KE shall deduct the amount of these savings from its payment to the Successful Bidder on accounts of taxation. The adjustment for duties and taxes will be restricted only to the extent of duties and taxes directly imposed on the Successful Bidder. No adjustment for duties and taxes imposed on third parties such as contractors, suppliers, consultants, etc., will be allowed.

3. Payment into Worker's Profit Participation Fund and Worker's Welfare Fund.
4. Withholding tax on dividends will not be a pass-through item.



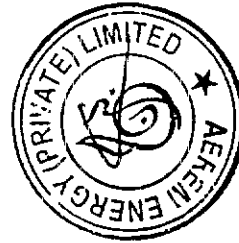


5. Alternative & Renewable Energy Policy, 2019 (ARE Policy 2019) states certain conditions, fulfillment of which can result in the exemption of duties on the import of items, being manufactured locally also. In case any Bidder proposes to import any plant, machinery or equipment that is also-manufactured locally in accordance with the Customs General Order of the FBR, shall be reimbursed to the Successful Bidder subject to fulfillment of conditions as given in the ARE Policy 2019, for which certification shall be obtained by the Successful Bidder from AEDB. The Bidder is expected to have knowledge of applicable laws and regulations and shall not in any case hold KE accountable for information not provided under this document.





A4 – Draft Energy Purchase Agreement





Reference No. BD/MZ/NEPRA-1083/2024-0903
Sept 03, 2024

The Registrar,
National Electric Power Regulatory Authority ("NEPRA"/ "Authority")
NEPRA Tower,
Attaturk Avenue (East),
G-5/1,
Islamabad

Subject: Competitive Auction for 220 MW Site Neutral Hybrid Project at Dhabeji (the "Project")

Dear Sir,

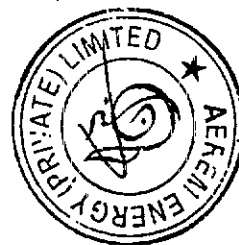
We write this in continuation to our letter having reference no. BD/MZ/NEPRA-1065/2024-0905 dated May 09, 2024.

In this regard, we would like to apprise NEPRA that based on comments received from the bidders, KE has revised the draft Energy Purchase Agreement ("EPA"). Accordingly, the final draft of EPA is enclosed in Annexure A for your consideration.

Sincerely,

Mudassir Zuberi
Head of Business Development

Enclosed: Annexure A – Energy Purchase Agreement



K-Electric Limited

39-B KE House Sunset Boulevard, DHA- Phase 2, Karachi, Pakistan



Reference No. BD/MZ/NEPRA 1031/2023-0612

June 12, 2023

Registrar,
National Electric Power Regulatory Authority ("NEPRA")
NEPRA Tower,
Attaturk Avenue (East)
G-5/1
Islamabad

Subject: KE Submission of the Request For Proposal ("RFP") Document for the Development of 200MW Site Neutral Hybrid Power Project ("Project") at Dhabeji Grid under NCBT Regulations, 2017

Dear Sir,

We write this with reference to our letter No. BD/MZ/NEPRA/291122/916 dated November 29, 2022 related to submission of the RFP for the Project.

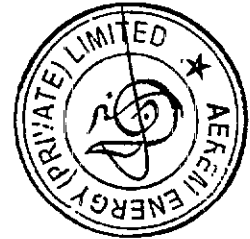
The pre-qualification process for the subject Project was conducted in accordance with the NCBT Regulations 2017 and is now complete. Sixteen (16) applicants participated in the process and were evaluated as per the criteria mentioned in the Pre-qualification document. The list of pre-qualified applicants is enclosed as Annexure A.

We look forward to the swift processing of the RFP by the Authority, so that the RFP can be shared with pre-qualified applicants to initiate the bidding process. Timely approval will enable the induction of the much-needed renewable energy into KE system by the planned date.

We remain available for any further clarification required in this regard.

Regards,

Mudassir Zuberi
Head of Business Development





Annexure-A (List of pre-qualified applicants)

S. No.	Name
1	Lucky Cement
2	Engro Energy Limited
3	Hub Power Holdings Limited
4	Sapphire Textile Mills Ltd.
5	Sapphire Electric Company Ltd.
6	JCM Power Corporation
7	Metro Power
8	Master Textile Mills
9	Oursun Pakistan Ltd.
10	Atlas Power Limited
11	Hurricane 150 MW Pvt. Ltd.
12	ZKB
13	SMABD





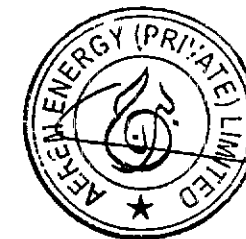
A6 – Technical Scoring Sheet

Sr. No.	Description	Marks	Bidder-1	Bidder-2	Bidder-3	Bidder-4	Bidder-5	Bidder-6
2a	Site Availability	10	9.75	9.75	9.75	9.75	9.75	9.75
2b	Solar Panels	5	4.5	4.5	4.5	4.5	4.5	5
2c	Power Inverters	12	12	12	12	12	12	12
2d	Wind Turbines	12	12	12	12	12	12	12
2e	Gas Insulated Switchgear (GIS), Power Transformers and other switchyard equipment, SCADA, Telecommunication and protection Schemes, Backup Meteorological System	6	5.5	5.5	5.5	5.5	5.5	5.5
2f	Weather Station	3	3	2.5	2.5	2.5	2.5	2.5
2g	Civil Monitoring Structure	8	6	6	6	8	7	6
2h	Balance of System	5	5	5	4.5	5	5	5
2i	Safety and Security	13	13	13	13	13	13	13
2j	Plant Monitoring System as per RFP section 20.13	6	4	4	4	4	5	6
3	Corporate Social Responsibility/Ability to contribute towards local economy	15	4.5	3.5	4.5	3.5	3.5	3
4	EPC Contractor	10	5	10	10	10	9	10
5	Design Experience and Capability	6	6	6	6	6	6	6
6	HSE	3	2	2	1.75	2	2	2
7	QA/QC Methodology	6	4.5	4.5	3	4.5	6	2
Total Marks		100	86.75	84.25	80	86.25	86.75	83.75

Bidder No.

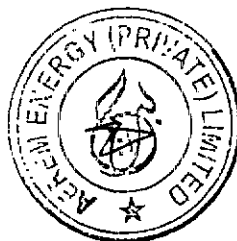
Name of Bidder

- Bidder 1 Fauji Fertilizer Company Limited (Lead Member) - Orade Energy Limited (Consortium Member) - Fauji Foundation (Consortium Member)
 Bidder 2 Hub Power Holdings Limited
 Bidder 3 Hurricane 150MW (Pvt) Limited
 Bidder 4 JCM Power Corporation (Lead Member) - Burj Energy International Management Limited (Consortium Member) - Rana Nasim Ahmed (Consortium Member)
 Bidder 5 Metro-Group of Companies - Mr. Danish Iqbal (Sponsor) - Mr. Saad Iqbal (Sponsor) - Ms. Natasha Iqbal (Sponsor)
 Bidder 6 Sapphire Textiles Mills Limited



ANNEXURE - K

BER APPROVAL





From: Mudassir Zuberi <mudassir.zuberi@ke.com.pk>
Sent on: Wednesday, April 16, 2025 1:27:11 PM
To: Muhammad Asad <masad@jcmppower.ca>; Muhammed Ali <mali@jcmppower.ca>
CC: Fahad Mazhar <fahad.mazhar@ke.com.pk>; Sameer Hasan, Syed <sameer.hasan@ke.com.pk>; Fahad Najmi <fahad.najmi@ke.com.pk>
Subject: FW: Bid Evaluation Report (BER) for 220 MW Site Neutral Hybrid Power Project at Dhabeji Grid Submitted by KEL

Dear JCM team,

Pis find below approval by NEPRA. As requested, Please share the tariff application for our review at the earliest so it may be submitted to NEPRA this week by JCM. Thanks

Regards,

Mudassir

From: Registrar <registrar@nepra.org.pk>
Sent: Wednesday, 16 April 2025 6:19 pm
To: Moonis Abdullah Alvi, Syed <moonis.alvi@ke.com.pk>; Sameer Hasan, Syed <sameer.hasan@ke.com.pk>
Cc: Chairman <chairman@nepra.org.pk>; Gul Hassan Bhutto <bhutto.gulhassan@nepra.org.pk>; Hassan Bhinder <hassan.bhinder@nepra.org.pk>; Saba Salf <sabasalf@nepra.org.pk>; Noor Saleem <noorsaleem@nepra.org.pk>; Ali Feroz Khan <alikhan@nepra.org.pk>; Syed Salman Rehman <salman@nepra.org.pk>
Subject: Bid Evaluation Report (BER) for 220 MW Site Neutral Hybrid Power Project at Dhabeji Grid Submitted by KEL

[External Sender registrar@nepra.org.pk]

It is informed that the Authority has approved the Bid Evaluation Report (BER) in the matter of 220 MWp Site Neutral Hybrid Power Project at Dhabeji Grid Station and the issuance of the formal decision will take some time.

In the interest of time and in view of bid validity period expiring on April 30, 2025, as informed by KEL, KEL is being informed to direct the lowest evaluated bidder to file tariff petition before NEPRA, as per the relevant provisions of NCBTR.

Wasim Anwar Bhinder,

Registrar, NEPRA

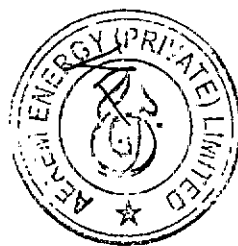
CONFIDENTIALITY NOTICE: The contents of this email and any attachments are intended solely for the addressee(s) and may contain confidential and/or privileged information and may be legally protected from disclosure. If you are not the intended recipient of this message or their agent, or if this message has been addressed to you in error, please immediately alert the sender by reply email and then delete this email and any attachments. If you are not the intended recipient, you are hereby notified that any use, dissemination, copying, or storage of this email or its attachments is strictly prohibited.

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ANNEXURE – L

O&M PLAN

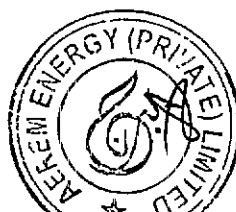




Site Neutral Hybrid Project at KE's Dhabeji Grid

OPERATIONS AND MAINTENANCE PLAN

Document Number: HYBRID-JCM-20.19



DOCUMENT CONTROL

Rev	Date	Description	Prepared By	Approved By
0	31 August 2024	Preliminary for Tender	J Dragt	H Jagau

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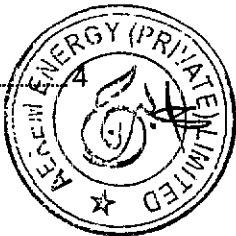
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1. BACKGROUND

JCM Power will construct a 200-240 MUW hybrid solar and wind facility as IPP near KE's Dhabeji Grid, Pakistan (the "Complex"). The Complex is designed with bi-facial PV modules and horizontal single axis tracking technology. High performance wind turbines will be used. The Complex is designed in accordance with the requirements set out in the RfP from KE for a 220MUW Site Neutral Hybrid Project.

2. OBJECTIVES:

JCM Power will take full responsibility for the Operations and Maintenance of the entire Complex.

1. The Complex shall be operated strictly in compliance with the Operating Procedures and OEM guidelines.
2. JCM shall follow good industrial practices and OEM instructions for all Preventive and unscheduled Corrective maintenance.
3. JCM shall ensure EHS monitoring and compliance at the Complex pursuant to Operational Environmental & Social Management System (the "ESMS")
4. Key Performance Indicators (KPI) are provided in section 8. We shall submit the monthly reports to substantiate that KPIs are being met.



3. KEY STAFF

3.1 ORGANOGRAMS

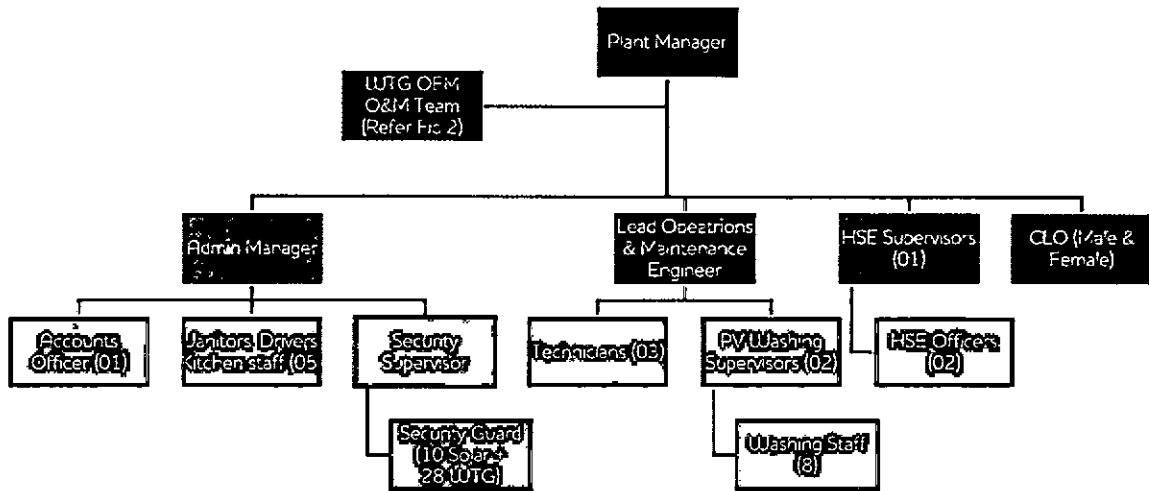


Figure 1: Organogram showing operations and maintenance personnel for PV and BOP

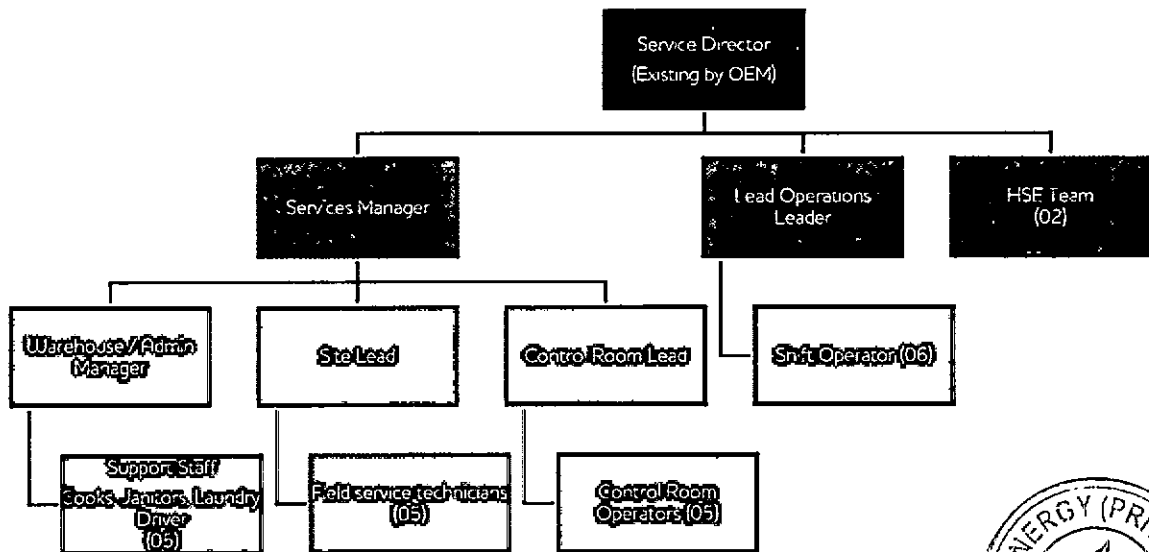
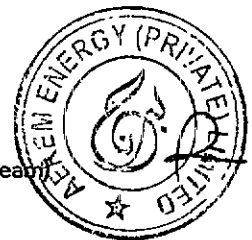


Figure 2: Organogram showing operations and maintenance personnel for WTGs (OEM team)

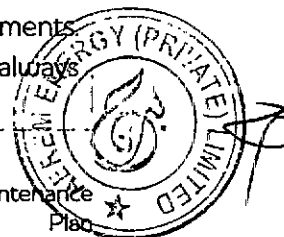


3.2 QUALIFICATIONS AND EXPERIENCE

The Key Personnel will be expected to meet the minimum criteria set out in the table below:

Table 1: Key Personnel Roles and Requirements

Role	Experience and Qualifications Required
Plant Manager	■ Bachelor's degree in engineering ■ 5 years experience in renewable energy, including hands-on experience in operation and maintenance of renewable energy plants ■ 3 years of management experience in an industrial or energy facility, including overseeing teams of engineers, technicians and support staff ■ Deep understanding of the operational requirements of hybrid power systems (wind, solar), including electrical systems, grid integration, and performance optimization. ■ Familiarity with industry standards, regulations, and safety protocols in renewable energy. ■ Understanding of SCADA Systems: Familiarity with supervisory control and data acquisition (SCADA) systems used for monitoring and controlling power generation. ■ Knowledge of Electrical Systems and Grid Connectivity: Ability to understand the electrical design, grid interconnection requirements, and performance optimization of renewable power plants. ■ Proficiency in Data Analysis: Ability to analyze plant performance data and make decisions to improve efficiency, availability, and reliability. ■ Preventive and Predictive Maintenance: Experience with maintenance strategies to minimize downtime and improve plant performance.
Admin Manager	■ Bachelor's Degree: A degree in business administration, management, finance, accounting, human resources, or a related field is required. ■ 5-7 years of experience in an administrative or managerial role, preferably within the energy sector, manufacturing, or other industrial environments. Experience in renewable energy is a plus but not always necessary.



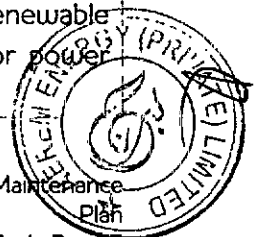
Lead Operation & Maintenance Engineer

- Experience managing administrative functions, such as office management, budgeting, procurement, human resources, and compliance with regulatory and legal requirements
- 3-5 years of experience in a supervisory or managerial role overseeing office staff, administrative personnel, or support staff.
- Experience in managing cross-functional teams and working with different departments, such as finance, operations, HR, and legal.

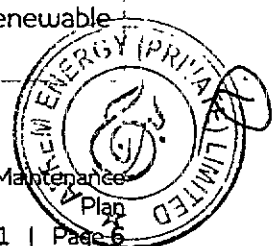
- Bachelor's Degree: A degree in mechanical engineering, electrical engineering, renewable energy engineering, or a closely related field is required
- 5-10 years of experience in renewable energy operations and maintenance, specifically in solar and wind power generation. Experience in hybrid systems, combining solar, wind, and energy storage, is preferred.
- Hands-on experience in operations, troubleshooting, and maintenance of solar and wind power plants.
- Experience in a senior or lead engineering role within an energy production facility. Experience in supervising teams of engineers and technicians is critical.
- Supervisory or leadership experience in maintenance teams, including experience in leading technicians and junior engineers.
- Experience managing operations and maintenance (O&M) teams, contractors, and field personnel.
- Project Management Experience: Involvement in the commissioning, construction, or significant upgrades of renewable energy plants can be beneficial.
- Experience in organizing and managing preventive and corrective maintenance programs and coordinating with other departments such as operations and safety.

HSE Supervisors

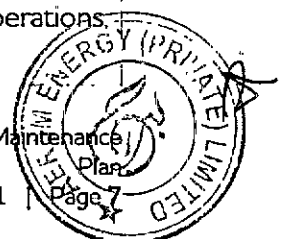
- A degree in occupational health and safety, environmental science, industrial safety, engineering, or a related field is required.
- 5-7 years of experience in health, safety, and environmental roles, particularly within the renewable energy sector, construction, heavy industry, or power generation.



	■ Experience working with hybrid systems (solar, wind, energy storage) is beneficial but not mandatory. General experience in industrial or energy-related HSE roles can be applicable. ■ 3-5 years of supervisory or managerial experience overseeing safety and environmental teams or personnel. ■ Experience leading safety audits, incident investigations, and compliance initiatives in a field or operational setting.
Community Liaison Officer	■ A degree in communication, public relations, community development, social sciences, environmental studies, or a related field is required. ■ 3-5 years of experience in community engagement, public relations, stakeholder management, or corporate social responsibility (CSR). Experience in renewable energy projects, infrastructure development, or environmental sectors is a plus. ■ Experience in the Energy Sector: Previous experience working in or liaising with communities around energy projects, particularly in renewable energy or large infrastructure projects, is preferred.
Security Manager	■ A degree or diploma in security management, criminal justice, law enforcement, business administration, or a related field is required ■ 5-10 years of experience in security management, preferably in an industrial, energy, or infrastructure setting. ■ Experience in the Energy Sector: Prior experience managing security for energy plants, renewable energy facilities, or large-scale infrastructure projects is highly preferred. ■ 3-5 years of supervisory or management experience leading security teams, including security officers, contractors, and external security services.
Service Manager (WTG)	■ Minimum 10-15 years of experience in the energy sector, with at least 5 years in wind energy. ■ Proven track record in managing large-scale O&M contracts for onshore wind farms. ■ Bachelor's or Master's degree in Engineering, Renewable Energy, or a related field.



	■ Certification in Project Management (e.g., PMP) is highly desirable. ■ Strong leadership skills with experience in managing multidisciplinary teams. ■ Extensive knowledge of regulatory requirements, HSE standards, and industry best practices.
Lead Operations Leader (WTG)	■ 5-10 years of experience in wind plant operations, with hands-on experience in O&M activities. ■ Experience in leading operations teams for multiple wind farm sites. ■ Bachelor's degree in Mechanical, Electrical, or Renewable Energy Engineering. ■ In-depth understanding of wind turbine technology and SCADA systems. ■ Strong problem-solving skills and experience in optimizing plant performance. ■ Familiarity with industry standards such as IEC and ISO.
Warehouse/Admin Manager (WTG)	■ 3-5 years of experience in warehouse management, preferably within the renewable energy sector. ■ Experience in managing inventory, spare parts, and logistics for wind turbines. ■ Degree in Supply Chain Management, Business Administration, or a related field. ■ Proficiency in ERP systems and inventory management software. ■ Strong organizational skills with experience in managing a team. ■ Knowledge of safety standards and compliance in warehouse operations.
Site Lead (WTG)	■ 5-10 years of on-site experience in wind energy or a related field, with at least 3 years in a supervisory role. ■ Hands-on experience in turbine maintenance, troubleshooting, and site operations. ■ Degree in Engineering, Renewable Energy, or equivalent experience. ■ Certification in HSE management and first aid. ■ Excellent leadership skills with the ability to manage on-site teams and subcontractors. ■ Strong understanding of site logistics, turbine operations, and maintenance procedures.



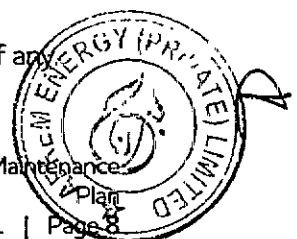
Control Room Lead (WTG)

- 3-5 years of experience in control room operations within the energy sector, preferably in wind energy.
- Experience in real-time monitoring and remote operations of wind turbines.
- Degree in Electrical Engineering, Control Systems, or a related field.
- Proficiency in SCADA systems and other control room technologies.
- Strong analytical skills with the ability to interpret data and respond to alarms.
- Experience in shift management and team coordination in a 24/7 operational environment.

4. OPERATIONAL ACTIVITIES

The Plant Manager shall be responsible for the technical and administrative functions of the Complex's operation and maintenance. To the extent practical, the operation of the Complex will be automated, supervised, and controlled by SCADA. The operational activities of plant team are summarized in the following:

1. Provide operational services including such number of personnel as specified in the Agreement in accordance with the Plant design and engineer's recommendations, the equipment manufacturer's recommendations and the Company's recommendations
2. Perform and record periodic operational checks and tests of equipment in accordance with original equipment manufacturers' recommendations, Applicable Law, Energy Purchase Agreement and the Company's recommendations.
3. Maintain operating logs, records and reports for operation of the plant in English language. These can be provided to the Purchaser upon request.
4. Operate the Complex as per the set operating procedures and in line with OEM instructions (Annex A).
5. Implementation and reporting pursuant to ESMS Plans, for EHS.
6. O&M budget reviews and recommendations
7. Critical spares identification and auditing of present inventory levels. Critical spares list can be found in Annex C
8. Technical assistance in obtaining or renewing relevant permits and consents.
9. Preparation and timely submission of monthly and daily progress reports.
10. Recommendations to optimize the operations which can reduce EHS risks, if any.
11. Any other items as required under the Contract.

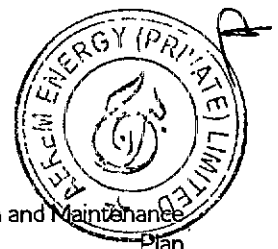


5. MAINTENANCE ACTIVITIES

The maintenance activities of plant team are summarized in the following:

1. Solar: Module cleaning (dry and wet), module connection integrity, junction boxes/combiners inspection, Thermographic detection of faults, Inverter servicing, mechanical integrity of mounting structure, vegetation control, Routine balance of plant servicing/inspection, cable connection tightening/replacement of blown fuses, Lightening damage repair, Mounting structure/Tracking system fault repair, optimized loss due to soiling, additional points for automated cleaning mechanism provision.
2. Wind: Complete semi- and annual maintenance activities as per the requirements of the OEM, complete daily, weekly, monthly checks, etc.
3. BoP and GIS substation: Complete semi- and annual maintenance activities as per the requirements of the OEM, complete daily, weekly, monthly checks, etc.
4. SCADA, plant monitoring, telecommunication: Rectifying of all SCADA, weather station, data logging faults and ensure plant monitoring system is running reliably, etc.
5. Undertake Schedule Outages, Maintenance Outages, routine maintenance services and provide technical supervision of any maintenance activity carried out by original equipment manufacturer.
6. Perform preventive maintenance when due pursuant to OEM guidelines as provided in Annexes. Tentative preventive maintenance schedule is given in Annexes A and B for solar and wind respectively.
7. Execute and handle unscheduled maintenance activities. All defects and faults shall be duly documented within the same day of occurrence in a reporting log.
8. A detailed report of the fault diagnosis including timing, details of occurrence, history, long term trends of the fault and the corrective procedures performed shall be included in the monthly and annual maintenance reports.

Providing support for any warranty claims from OEMs and take corrective measures to remove any defects and faults in the Complex.



6. EHS ACTIVITIES

We shall ensure the compliance with ESMS and shall recommend any changes, if required. The ESMS is briefly summarised below:

1. ESMS Manual
2. MP1 – Operation Environmental Management Plan (OEMP)
3. MP2 – Traffic Management Plan (TMP)
4. MP3 – Labour and Working Conditions Management Plan (LWCMMP)
5. MP4 – Waste Management Plan (WMP)
6. MP5 – Security Management Plan (SMP)
7. MP6 – Stakeholder Engagement Plan (SEP)
8. MP7 – Contractor and Supply Chain Management Plan (CSMP)
9. MP8 – Emergency Preparedness and Response Plan (EPRP)
10. MP9 – Occupational Health and Safety Management Plan (OHSMP)
11. MP10 – Corporate Social Responsibility Management Plan (CSRMP)
12. MP11 – Worker Accommodation Management Plan (WAMP)

Refer to section 20.20 of the document submission, providing JCM's EHS policies and plans.

In addition, pursuant to MP9 – Occupational Health and Safety Management Plan (the "OHSMP"), JCM will prepare a site specific EHS manual once we have been awarded preferred bidder.

7. WTG OPERATIONS AND MAINTENANCE

Operations and Maintenance of WTG's will be undertaken by the OEM as part of their Long-Term Full-Service Agreement (LTSA). A summary of the O&M services included by the OEM is given in Annex B.



8. KEY PERFORMANCE INDICATORS (KPI)

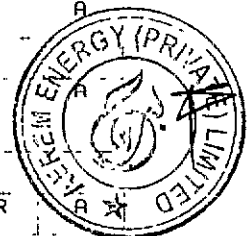
The KPIs shall be the following:

1. Annual Complex Availability for each Agreement Year shall be greater than the final agreed value (shown in the summary sheet). The final available value is a combination of the wind plant and solar plant, which is separately calculated for each.
 - a. For the WTG LTSA the time-based availability shall be greater than 98%.
 - b. For the solar plant the time-based availability shall be greater than 99%.
2. Annual Performance Ratio of the PV plant shall be greater than the final agreed value for the 1st Operating Year (shown in the summary sheet) which shall be reduced by 0.4% upon completion of subsequent Operating Year due to degradation of PV modules.
3. Soiling of the PV plant shall be monitored be below 2% by completing dry and wet cleaning cycles.
4. 0% Loss time accident regarding Occupational Health and Safety.
5. Other KPIs as included in relevant management plans.



ANNEX A SOLAR: MAINTENANCE SCHEDULE

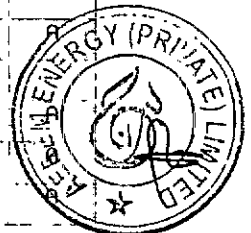
Solar Power Plant						
PREVENTIVE MAINTENANCE SCHEDULE (A=Annual, B=Bi-Annual, W=Weekly, M=Monthly, AR= As Required)						
Sr.No	Equipment/ Area	Activities	Inspection	Cleaning	Service	Testing
1	Single Axis 1P PV Tracker	Opti-Sky		W	AR	A
		Dust-IQ		W		A
		Sun Slew Drive/Central pile assembly and classic head assembly	A			A
		Check Electrical Connections for Tracker Boxes/Controller/Vermin Proofing	B			A
		PV Module (60w)	M			A
		Wind vane/Anemometer	W			A
		Torquing inspection	B			A
		Area Box	M			A
		Test system grounding continuity and Resistance (internal and main grid connections)	A			A
2	PV Modules	Use infrared camera to inspect for hot spots; bypass diode failure				A
		EL Testing				AR
		Test system grounding continuity and Resistance (internal and main grid connections)	A			
3	String Combiner Box and DC Wiring	Test system grounding continuity and Resistance (internal and main grid connections)				A
		Scan combiner boxes with Infrared camera to identify loose or broken connections				B
		Inspect cabling for signs of cracks, defects, pulling out of connections; overheating, arcing, short or open circuits and ground faults.	B			
		IV Curve Testing of string				A
		Vermin proofing and Re-torque all electrical connections in combiner box	B			
4	Inverter, Data Logger and PPC	Inspection of ventilation fan of inverter, air inlet and outlet points	M		B/AR	
		Inspection of Earthing connection of inverter	M			B
		AC/DC Cable Megger				A
		AC/DC SPDs	B			
		Test system grounding continuity and Resistance (internal and main grid connections)				
		Inverters Sealing/Cleaning		B		
5	Inverter Stations	Exercise operation of all protection devices in RMU and LV panels.			AR	
		Complete RMU including relay	D			A



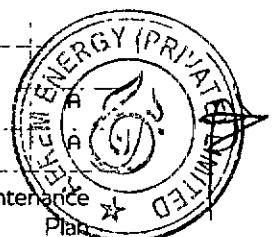
Solar Power Plant

PREVENTIVE MAINTENANCE SCHEDULE (A=Annual, B=Bi-Annual, W=Weekly, M=Monthly, AR= As Required)

		LT Panels Busbar insulation Resistance test (Megger test)				AR
		Vermine proofing and Re-torque all electrical connections.			B	
		Test system grounding continuity and Resistance (internal and main grid connections)				A
		Functional Test/ ACB Cleaning				A
6	Inverter Transformer	Thermography	AR			B
		All necessary electrical testing including DGA/ C&DF				A
		Insulation Resistance test (Megger test) / Winding Resistance Test/ TTR				A
		Oil Sample testing (BDV)				A
		Vermine proofing and Re-torque all electrical connections.			B	
		Test system grounding continuity and Resistance (internal and main grid connections)				A
7	Weather Station	Wind vane/ Rain gauge Equipment			B	
		Vermine proofing and Re-torque all electrical connections.			B	
		Test system grounding continuity and Resistance (internal and main grid connections)				A
8	33kV Switch gear	Complete switchgear		A	AR	
		Visual Inspection, check apparent condition, abnormal noise, rust, indication, earthing connection etc.	D		AR	
		Inspection and thermography of Switchgear and HT/Control Cables	W			B
		Insulation Resistance test (Megger test)				A
		Contact Resistance test/ Breaker Timing Test				A
		Vermine proofing and Re-torque all electrical connections.			B	
		Test system grounding continuity and Resistance (internal and main grid connections)				A
		Functional Testing + protection testing				A
9	Electrical Panel	Vermine proofing, Thermography and Re-torque all electrical connections	W		AR	B
		Test system grounding continuity and Resistance (internal and main grid connections)				A
		Functional Test				A
10	Battery Bank	220V & 48V Battery charger & Battery Bank	M		B	
		Functional Test				
11	Main Transformer	Inter Phases Mechanical Linkages/TTR	A			
		Insulation Resistance test (Megger test) / Winding Resistance Test				
		Capacitance and Dissipation Factor test				
		Transformer Oil Test DGA				



Solar Power Plant					
PREVENTIVE MAINTENANCE SCHEDULE (A=Annual, B=Bi-Annual, W=Weekly, M=Monthly, AR= As Required)					
		Transformer BDV Test			A
		Re-torque all electrical connections.			B
		Test system grounding continuity and Resistance (internal and main grid connections)			A
		Functional Test			A
12	Switch yard	Measurement of Earth Resistance			A
		CVT Electrical Testing			A
		Surge Arrestor and Counter		A	AR
		Structure Rusting and Torquing/Alignment	M		B
		Test system grounding continuity and Resistance (internal and main grid connections)			A
13	Metering CT PT	Vermin proofing and Re-torque all electrical connections / Thermography			B
		Test system grounding continuity and Resistance (internal and main grid connections)			A
14	Energy Meters	Test system grounding continuity and Resistance (internal and main grid connections)			A
15	GIS	Gas Leakage Test			A
		GIS Gauge calibration			A
		Testing and Commissioning/ Functional Test			A
		Vermin proofing and Re-torque all electrical connections.			B
		Functional Test			A
		Test system grounding continuity and Resistance (internal and main grid connections)			A
16	Earthing Transformer	Connection Tightening			A
		Earthing Transformer Testing			A
		Cleaning of transformer		A	
		Vermin proofing and Re-torque all electrical connections.			B
		Test system grounding continuity and Resistance (internal and main grid connections)			A
		NGR Resistance Test			A
		Functional Test			A
17	Diesel Genset	Vermin proofing and Re-torque all electrical connections.			B
		Cleaning of Radiator			B
		Test system grounding continuity and Resistance (internal and main grid connections)			A
18	Aux. Transformer	Vermin proofing and Re-torque all electrical connections.			B
		Functional test			A
		Insulation Resistance and Winding Resistance Testing			A



Solar Power Plant					
PREVENTIVE MAINTENANCE SCHEDULE (A=Annual, B=Bi-Annual, W=Weekly, M=Monthly, AR= As Required)					
19	33kV and 132kV Control & Protection Testing & Commissioning	Complete functional testing			A
		Vermine proofing and Re-torque all electrical connections.		B	
		Test system grounding continuity and Resistance (internal and main grid connections)			A
20	Fire Fighting System	N2 System		AR	A
		Fire Alarm System Test	B		A
		Functional Test			A
21	RO System	Membrane cleaning	B		
		Structure Rusting and Torquing/Alignment		B	
22	Lightning & Earthing	Physical Inspection.	B		
		Structure Rusting and Torquing/Alignment		B	
		Test system grounding continuity and Resistance (internal and main grid connections)			A
23	Overall Plant	Vermine proofing and Re-torque all electrical connections.		B	
24	UPS Panel	Functional Test			A
25	SCADA Panel	Performed connection tightness, Checkback indications and command verification at HMI.			A

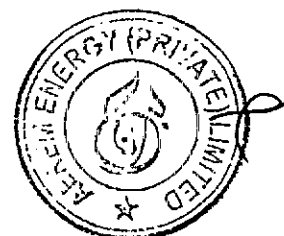


ANNEX B WTG: LONG TERM FULL-SERVICE AGREEMENT OF OEM

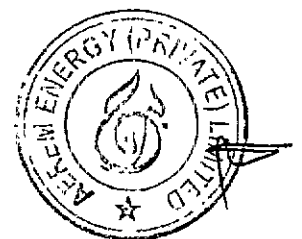
Category	Service Offering	WP O&M 0-2 Year	LT O&M 3-25 Year
Site Management	Working plan, monthly, yearly	✓	✓
	Warehouse management	✓	✓
	PPE	✓	✓
	communication device walkie-talkie	✓	✓
	HSE	✓	✓
	Office admin	✓	✓
	Vehicle	✓	✓
	Waste management (inside WF)	✓	✓
Reporting	Monthly performance reporting-routine	✓	✓
	Documentation	✓	✓
	Event report	✓	✓
	Monthly performance reporting-routine	✓	✓
Availability guarantee	Time-based availability	✓ 98%	✓ 98%
	Incentive	✓	✓
Preventive maintenance (Planned Maintenance)	Consumables	✓	✓
	Tools	✓	✓
	Manpower	✓	✓
	Supervision	N/A	N/A
Predictive maintenance	Condition monitoring & analysis	✓	✓
	Inspection	✓	✓
Corrective maintenance - Minor	Spare parts	✓	✓
	Tools	✓	✓
	Manpower	✓	✓



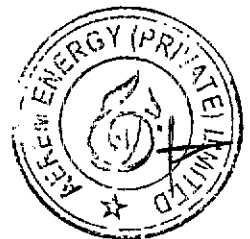
Category	Service Offering	WP O&M	LT O&M
		0-2 Year	3-25 Year
Corrective maintenance - Major	Supervision	N/A	N/A
	Components	√	√
	Special tools	√	√
	Tools	√	√
	Manpower	√	√
24/7 Remote monitoring & control	Supervision	N/A	N/A
	Crane	√	√
	24/7 Remote monitoring & control	√	√
24/7 Remote diagnosis & technical support	1st and 2nd line technical support	√	√
	Asset health & performance management	√	√
Monitoring and control software maintenance	2nd and 3rd line technical support	√	√
	Monitoring & control system updates	√	√



ANNEX C LIST OF SPARES FOR PV AND BOP



ANNEX D LIST OF SPARES FOR WTG





Private and Confidential
Without Prejudice

Reference No. BD/SQK/JCM/01/2024-1025
October 25, 2024

Mr. Muhammad Ali
Chief Executive Officer
JCM Power Corp
209(B), 2nd Floor, Park Towers, Block-5, Clifton,
Karachi.

Subject: Lowest Tariff Bid for Site Neutral Hybrid project Dhabeji (the "Project")

Dear Sir,

K-Electric (Private) Limited ("KE") is pleased to inform you that, following completion of its evaluation process, as outlined in the Project's Request for Proposal ("RFP"), consortium led by JCM Power Corporation ("JCM") has successfully cleared the technical evaluation and submitted the lowest bid tariff for the Project.

The Project is first of its kind Hybrid project in the country and it will play significant role towards KE's commitment for affordable and reliable power. This letter is confidential and being issued without prejudice for the sole purpose of initiating the preliminary requirements of JCM as per the RFP and should not be considered as notification of the successful bidder, which is subject to National Electricity Power Regulatory Authority's approval of KE's Bid Evaluation Report. Further, please note that KE does not accept any liability for any costs incurred or committed in the absence of a contract duly executed by KE.

We thank you for your time and effort in submitting the proposal and we will keep you informed of further developments in due course.

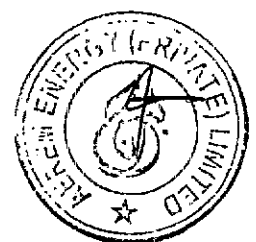
Shahab Qader Khan
Chief Strategy Officer



K-Electric Limited
39-B KE House Sunset Boulevard, DHA- Phase 2, Karachi, Pakistan

ANNEXURE - N

SUCCESSFUL BIDDER NOTIFICATION





Reference No.: BD/MZ/JCM-1559/2025-0425
April 25, 2025

Mr. Muhammad Ali
Chief Executive Officer
JCM Power Corp ("JCM")
209(B), 2nd Floor, Park Towers, Block-5, Clifton,
Karachi, Pakistan.

Subject: Declaration of Successful Bidder for Site Neutral Hybrid Project (the "Project")

Dear Sir,

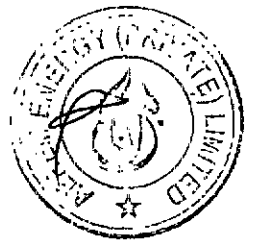
We write this in accordance with Request for Proposal ("the RFP") and in continuation to our letter having reference No. BD/SQX/JCM/01/2024-1025 dated October 25, 2024 (attached as Annexure 'A'), and the email received from the Registrar NEPRA dated April 16, 2025 (attached as Annexure 'B'), through which the NEPRA Authority has provided its approval on the Bid Evaluation Report ("BER"), which shall be subject to detailed decision of NEPRA.

Accordingly, KE, being the Relevant Agent, is pleased to notify JCM as the Successful Bidder for the Project in accordance with Section 12 of the NEPRA Competitive Bidding Tariff Regulations, 2017 ("NCBTR") and 16.1 of the RFP. Further, JCM is requested to file its tariff petition before NEPRA, prior to April 30, 2025, in accordance with the above mentioned approval of NEPRA Authority and shall also provide the Performance Guarantee amounting to USD 1,345,000 in favor of KE in accordance with Section 16.1 of the RFP.

We look forward to your earliest cooperation in this regard.

Sincerely,

Muhammad Aamir Ghaziani
Chief Financial Officer





Annexure 'A'



Private and Confidential
Without Prejudice

Reference No. BD/SQX/JCM/01/2024-1025
October 25, 2024

Mr. Muhammad Ali
Chief Executive Officer
JCM Power Corp
209(B), 2nd Floor, Park Towers, Block-5, Clifton,
Karachi.

Subject: Lowest Tariff Bid for Site Neutral Hybrid project Dhasbaji (the "Project")

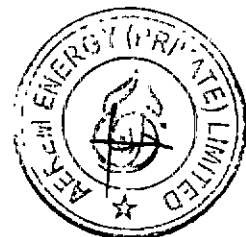
Dear Sir,

K-Electric (Private) Limited ("KE") is pleased to inform you that, following completion of its evaluation process, as outlined in the Project's Request for Proposal ("RFP"), consortium led by JCM Power Corporation ("JCM") has successfully cleared the technical evaluation and submitted the lowest bid tariff for the Project.

The Project is first of its kind Hybrid project in the country and it will play significant role towards KE's commitment for affordable and reliable power. This letter is confidential and being issued without prejudice for the sole purpose of initiating the preliminary requirements of JCM as per the RFP and should not be considered as notification of the successful bidder, which is subject to National Electricity Power Regulatory Authority's approval of KE's Bid Evaluation Report. Further, please note that KE does not accept any liability for any costs incurred or committed in the absence of a contract duly executed by KE.

We thank you for your time and effort in submitting the proposal and we will keep you informed of further developments in due course.


Shahab Qader Khan
Chief Strategy Officer





Annexure 'B'

Hamza Khalilullah

From: Hamza Khalilullah
Sent: Thursday, April 24, 2025 12:12 PM
To: Hamza Khalilullah
Subject: FW: Bid Evaluation Report (BER) for 220 MW Site Neutral Hybrid Power Project at Dhabaji Grid Submitted by KEL

Best Regards,
Hamza Khalilullah

From: Registrar <registrar@ncpra.org.pk>
Sent: Wednesday, 16 April 2025 6:19 pm
To: Moonis Abdullah Aini, Syed <moonis.aini@ke.com.pk>; Sameer Hasan, Syed <sameer.hasan@ke.com.pk>
Cc: Chairman <chairman@ncpra.org.pk>; Gul Hassan Bhutto <bhutto.gulhassan@ncpra.org.pk>; Hassan Bhinder <hassan.bhinder@ncpra.org.pk>; Saba Saif <sabasaif@ncpra.org.pk>; Noor Saleem <noorsaleem@ncpra.org.pk>; Ali Feroz Khan <afkhan@ncpra.org.pk>; Syed Salman Rehman <salman@ncpra.org.pk>
Subject: Bid Evaluation Report (BER) for 220 MW Site Neutral Hybrid Power Project at Dhabaji Grid Submitted by KEL

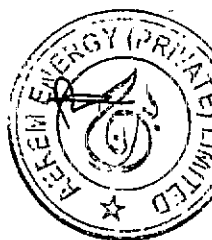
External Sender: registrar@ncpra.org.pk

It is informed that the Authority has approved the Bid Evaluation Report (BER) in the matter of 220 MWp Site Neutral Hybrid Power Project at Dhabaji Grid Station and the issuance of the formal decision will take some time.

In the interest of time and in view of bid validity period expiring on April 30, 2025, as informed by KEL, KEL is being informed to direct the lowest evaluated bidder to file tariff petition before NEPRA, as per the relevant provisions of NCBTR.

Wasim Anwar Bhinder,

Registrar, NEPRA



ANNEXURE -O

NOC FROM SINDH ENVIRONMENTAL PROTECTION AGENCY





SINDH ENVIRONMENTAL PROTECTION AGENCY GOVERNMENT OF SINDH

REGIONAL OFFICE HYDERABAD

Behind Board of Revenue Shahbaz Building Hyd.

Phone: 022-9201947

022-9201948

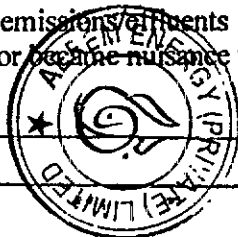
Dated: 06-03-2025

SUBJECT: DECISION ON INITIAL ENVIRONMENTAL EXAMINATION (IEE).

1. **Name & Address of :** M/s. Aeram Energy (Private) Limited,
Proponent House: F52/2, Clifton Block 6, Bath Island, Karachi.
2. **Description of Project :** The KE Site Neutral Hybrid Project (with Solar PV and Wind Turbine Generators) proposing a 270 MWp.
3. **Location of Project :** Gharo Wind Corridor, Sindh Pakistan.
4. **Date of Filing of IEE :** 24-02-2025.

1. After careful review of the Initial Environmental Examination (IEE) report regarding the installation of 270 MW (DC) Hybrid (Wind + Solar) Power Project at Gharo, District Thatta Sindh, the Sindh Environmental Protection Agency (SEPA) Government of Sindh, has decided to accord its approval subject to the following conditions:

- i. M/s. Aeram Energy (Private) Limited herein after referred as proponent shall comply National Environmental Quality Standard (NEQS)/ Sindh Environmental Quality Standard (SEQS) for wastewater, drinking water, air emissions and noise levels.
- ii. The mitigation measures provided in the IEE report and implementation of Environmental Management Plan (EMP) shall strictly be followed by the proponent to minimize or reduce the impacts on physical, biological, environmental and socio-economic resources. As for this, cost of EMP shall separate be allocated and be part of the tender document.
- iii. An undertaking shall be submitted by the proponent for compliance of SEP Act-2014 and all issues including the observations on noise, emissions, wastewater disposal, solid waste management, firefighting, safety and security, emergency response and contingency plan.
- iv. The proponent shall appoint Independent Monitoring Consultant (IMC) having expertise in carrying out Environmental monitoring. The IMC will monitor the implementation of the Environmental Management Plan, HSE Management System and commitments made in IEE report. Same will be submitted to SEPA on regular basis from the date of issuance of this approval.
- v. The proponent shall install pollution control mechanism for the control of air pollution, noise pollution and water pollution and efforts shall be made to minimize pollution at its sources as per industrial best practices and to comply with National and International Standard.
- vi. Discharging or dumping of any kind of waste material along roads is not allowed.
- vii. The impact on water, air, soil and noise shall be minimized by adopting adequate precautionary measures as stipulated in current national and international guidelines.
- viii. Solid waste generated from the project will be sent to designated disposal sites through Sindh EPA certified contractors. A comprehensive waste disposal plan would be developed to effectively manage all wastes.
- ix. The proponent shall prepare on-site & off-site emergency plans for fires-safety, spillage control, human accidents etc; as disaster risk management and emergency preparedness plan.
- x. A complete Occupational, Health, Safety and Environment (HSE) management system shall be developed, implemented and monitored for compliance as per national and international guidelines.
- xi. The proponent shall ensure that emissions/effluents from project activity do not pose an unacceptable risk to human health or become a nuisance to the neighborhood.



- xii. For all engineering designs, NFPA (National Fire Protection Authority) codes will be followed. Standard fire and smoke detection and protection devices shall be provided at all critical locations.
 - xiii. The proponent will seek all regulatory approvals required before the construction of the project.
 - xiv. In case of any emergency, loss damage, etc. the management of M/s. Aeram Energy (Private) Limited is bound to compensate the affected and make it good as original. Further, proponent shall be under obligation to compensate for any significant adverse short, medium, long term and irreversible impacts occurred due to project installation and commissioning.
 - xv. The proponent will maintain safe distances from communities, main transport network, water well, archaeological / cultural site / monument and any other sensitive infrastructure as per international guidelines during project execution.
 - xvi. The camp site must be established at considerable distance of 500 meters from communities, water resources and sensitive area.
 - xvii. The project activity will not be carried out within buffer zone of any protected area(s) designated under Sindh wildlife protection act.
 - xviii. Employment should be provided to the local people and assured for unskilled jobs. Skilled jobs shall be given to locals after providing them proper field training.
 - xix. The management of M/s. Aeram Energy (Private) Limited shall undertake extensive tree plantation in and around the area, for the improvement of aesthetic/ environmental conditions.
 - xx. The project shall be constructed in the prescribed time strictly as per schedule, which shall be submitted to this office at the start of construction activity.
 - xxi. That this IEE approval is only for construction phase. The proponent will approach this agency before commencing operation of the project under the provision of section 14(2) and 15 of Sindh Environmental Assessment Regulations, 2021.
 - xxii. That, 'no-hunting, no-trapping, no-harassment' policy shall be strictly enforced at the project.
 - xxiii. That, any nesting grounds of wildlife and birds shall be protected or be relocated.
 - xxiv. That, the proponent shall develop and submit the following plans to Sindh EPA within three (03) months from date of issuance of approval.
 - a) Community Health and Safety Plan
 - b) Corporate Social Responsibility (CSR) Plan
 - xxv. That, the proponent shall redress the objection/concerns of neighboring communities/ stakeholder on priority basis (if any at any stage). Proponent shall develop a Grievance Redress Mechanism (GRM) to ensure resolution of complaints from communities.
 - xxvi. That, an inventory shall be made for the old and mature trees located inside the proposed site to be cut down / relocated. In addition, the compensatory plantation shall be achieved if trees will need to be cut down. 5 trees shall be planted for each tree cutting.
2. All the environmental conditions of this approval shall be incorporated in the terms and conditions of Engineering, Procurement, Construction (EPC) & Operational & Maintenance (O & M) document of the project for commitment and compliance.
 3. This approval is applicable only for Initial Environmental Examination (IEE) and not applicable for Environmental Impact Assessment (EIA) requirements, if any, for your Project.
 4. The approval is accorded only for project activity described in the IEE report. Proponent must submit separate Environmental Assessment Report as required under regulation for any enhancement or change in the design or location of project.
 5. The proponent shall ensure facilitation to the SEPA officers/ official for the regular inspections to verify the compliance of the Section 11,12,13, 14, 17, 19 & 20 of SEP Act, 2014 Rules and Regulations framed there under and the conditions contained in this approval.
 6. The proponent shall be liable for compliance of section 14, 15 and 16 of Sindh EPA (Environmental Assessment) Regulations, 2021.
 7. All conflicting issues must be settled before commencing the project activities. The project proponent must submit an affidavit for commitment on compliance of the mitigation measures and the conditions laid down in this approval within two weeks from the date of issuance of this approval.



8. The Department reserves the right to stipulate additional conditions, if found necessary and the company/ project proponent in a time bound manner will have to implement those conditions.
9. This approval does not absolve the proponent of the duty to obtain any other approval or consent that may be required under any other law in force.
10. This approval is not valid for resolving any dispute or court matter, or seeking relief under any enquiry or investigation
11. The M/s. Aeram Energy (Private) Limited will comply with all directives of Honorable Court (if any). In case of any contravention or conflict with any of the plan / mitigation measures mentioned in the IEE with direction to the Honorable Court, the direction of court shall prevail.
12. This approval shall stand null and void, in case of failure to comply with set forth condition.
13. The approval is valid for initial **three (03) years**. The proponent shall obtain extension in validity period of decision under section (15) of Sindh Environmental Assessment Regulations, 2021.

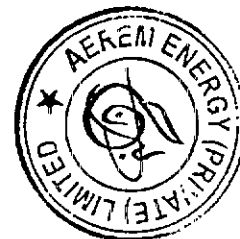
This issued with the approval of Director General, Sindh EPA.

Director General

C.C. to:

1. The P.S. to Director General, Sindh EPA, Karachi.
2. Office File.


Assistant Director (Tech)
for Director General



Project report

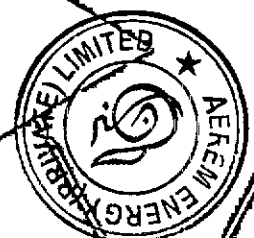
Pakistan KE Hybrid Project

Energy Yield Report

JCM Power

Submission date: 30 August 2024

Document number: HYBRID-JCM-EYA-0001
Revision: 0



Document control record

Document prepared by:

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Client		JCM				
Client contact		Shane Eglinton	Client reference			
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0	30-Aug-24	First issue	Thompho Ramahana	Craig Knowles		Craig Knowles
Current revision		0				

Approval			
Author signature		Approver signature	
Name	Thompho Ramahana	Name	Craig Knowles
Title	Renewables Engineer	Title	Technical Director

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1 Introduction

1.1 Site location and description

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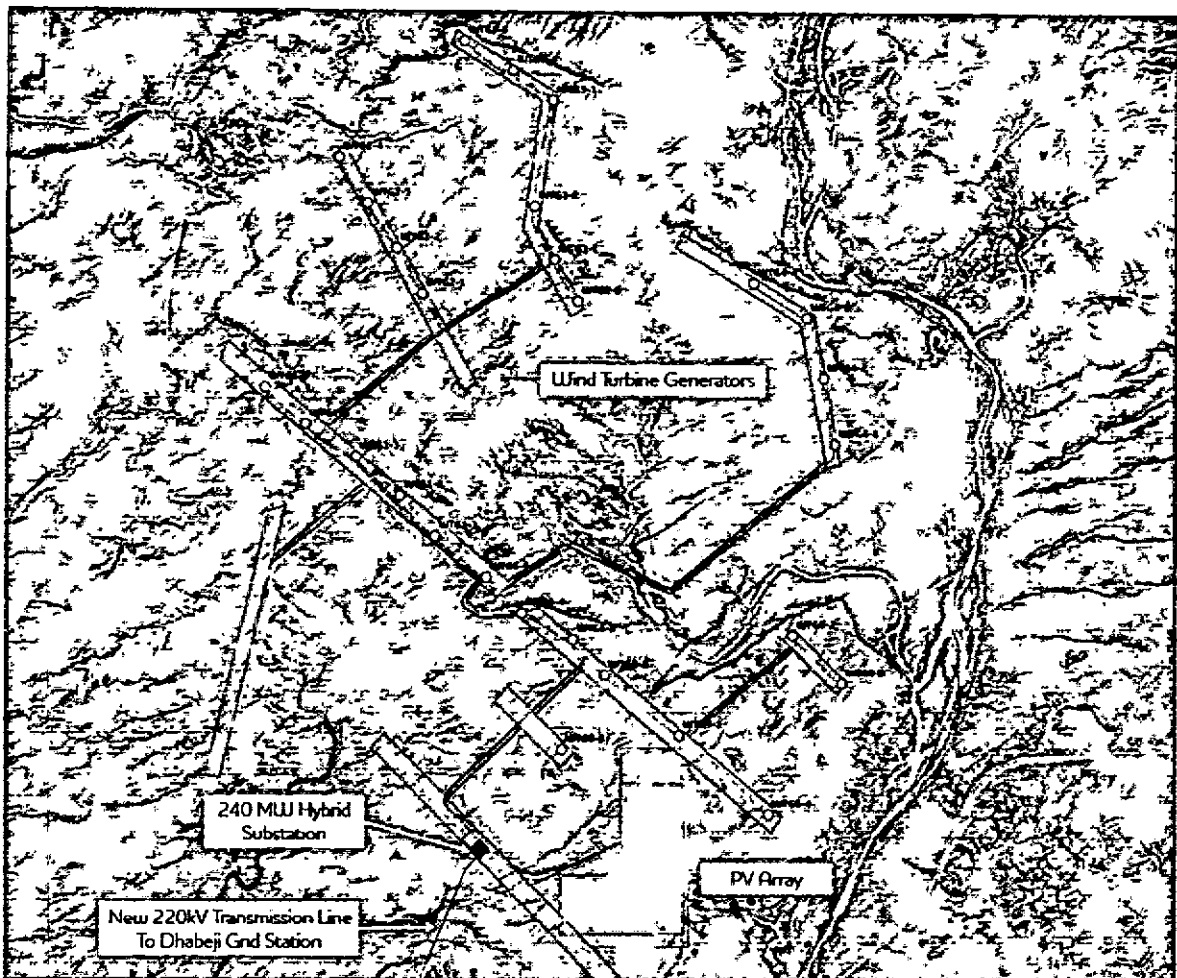


Figure 1 | Hybrid Facility Site Layout

There is notable other wind power infrastructure of around 1500MW in the region, as well as transmission infrastructure. Some of the existing and planned wind farms nearest to the site are shown in Figure 2 below.



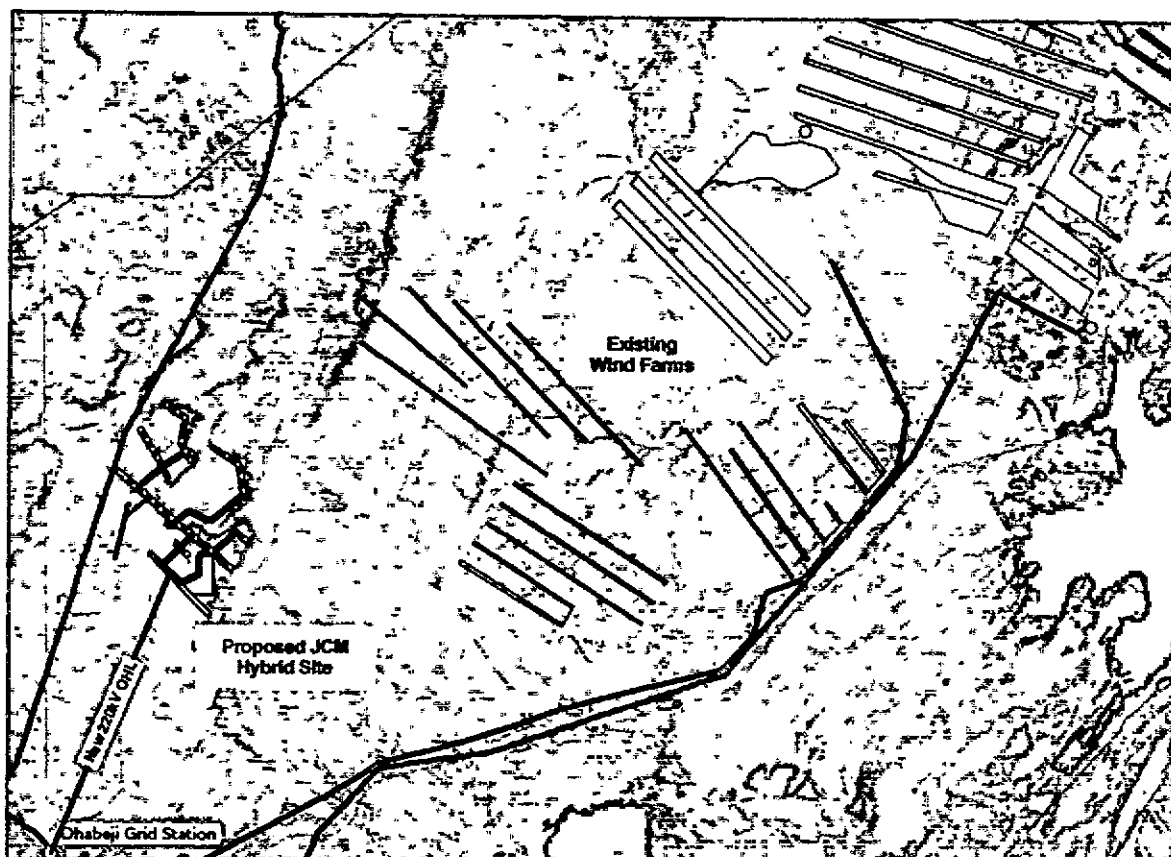


Figure 2 | Wind farms in area of proposed JCM Hybrid Site

The coordinates of an approximate centre-point for the proposed site are given in the table below.

	Latitude	Longitude
Site coordinates	24° 56' N	67° 34' E



2 Solar Resource Assessment

2.1 Key Design Parameters

The solar PV component of the hybrid power plant consisting of 94MWDC / 61.6MWAC has been designed and modelled, using the key design parameters given in the table below. A detailed solar resource assessment has been conducted by Zutari (South Africa), a well-regarded and highly experienced consultant with over 10 years' experience in design and modelling of large utility scale renewable energy powerplants in global markets.

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- Assessment of multiple reputable solar resource datasets, including SolarGIS and Solcast data which was procured specifically for this project, and readily available datasets including MeteroNorm and Nasa-SSE
- A detailed assessment of losses and net production
- Uncertainty and probabilities of exceedance

Table 1 | Solar PV design configuration

Item	Value	Details
PV modules	151,606 modules	620Wp JA Solar JAM72D42-620/LB (bifacial)
DC Capacity	94 MWp	
Trackers		Single-axis tracker, 6.5m pitch Tracker limit $\pm 55^\circ$, Azimuth 0° Horizontal N-S Axis, 1 module in Portrait (Optimum 1P tracker)
Inverters	7 x 8,800 kVA	Sungrow SG-8800-UD Central Inverter
Transformers	7 x 8,800 kVA	0.63/33kV SG-8800-UD
AC Capacity	61.6 MW	At 51°C

2.2 Energy Production

The best-estimate solar energy production, which includes availability losses, for year 1 is given in the table below.

Table 2 | Solar energy production forecast

	P50	P90 (10 year)	P90 (1 year)
Output at Connection Point, net AEP [GWh]	188.43	174.97	173.78
Capacity Factor	22.88%	21.25%	21.10%



3 Wind Resource Assessment

3.1 Key Design Parameters

The wind component of the hybrid power plant consisting of 28 x 6.25 MW WTGs has been designed and modelled, using the key design parameters given in the table below. A detailed wind resource assessment is included in Appendix 2 of this document.

Table 3 | Wind farm design configuration

Item	Value	Details
Turbine	28 x turbines	Envision EN-182/6.25
Rotor diameter	181	
Hub height	105m	
Total Rated Power	175 MW	28 x 6.25

3.2 Wind Resource and Energy Production

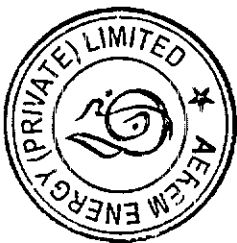
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- Considered 25 months of data from the 93m DIN mast between April 2022 and May 2024 (within the last 6 years)
- Assessed additional short-term data from the Shafi 120m mast and other known wind resource measurements in the region to serve as calibration and confirmation of predictions
- Considers historic measured ambient temperature to assess energy related matters including air density and equipment temperature derating, and
- Followed Measnet Guidelines

The wind resource and energy assessment has concluded the following for the preferred wind turbine model (Envision 182-6.25MW) at a 105m hub height.

Table 4 | Wind farm energy production forecast

	P50	P90 (10 year)	P90 (1 year)
Output at Connection Point (net AEP) [GWh]	765.1	626.7	619.7
Capacity Factor	49.9%	40.9%	40.4%



4 Hybrid Energy Assessment

The total energy yield from the combined Solar and Wind Hybrid Facility can be calculated by summing the total energy output from each component. The combination of the peak AC solar output and the peak wind output does not exceed the maximum export capacity of 240MW, and therefore no clipping of peak output will be necessary.

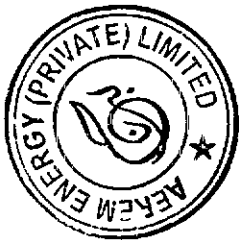
The best-estimate hybrid energy production for year 1 is given in the table below.

Table 5 | Hybrid energy production forecast

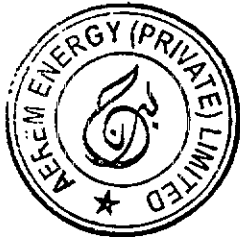
Source	P50	P90 (10 year)	P90 (1 year)
AEP Solar [GWh]	188.43	174.97	173.78
AEP Wind [GWh]	765.10	626.70	619.70
AEP Hybrid [GWh]	953.53	801.67	793.48
Capacity Factor Hybrid	40.5%	34.0%	33.7%

For reference, the Capacity Factor for the Hybrid is calculated as follows, in accordance with the RFP:

$$CF_{P90, facility} = \frac{AEP_{P90, wind} + AEP_{P90, solar}}{(Cap_{wind} + Cap_{solar}) \times 8760}$$



Appendix 1 – Solar PV EYA



In diversity there is beauty and there is strength.

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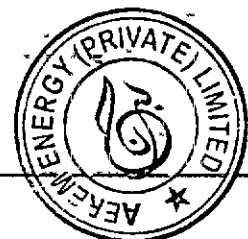
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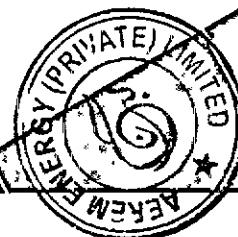
Pakistan KE Hybrid Project

Energy Yield Report

JCM Power

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Document number: HYBRID-JCM-EYA-0001
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Name	Thompho Ramahana	Name	Craig Knowles
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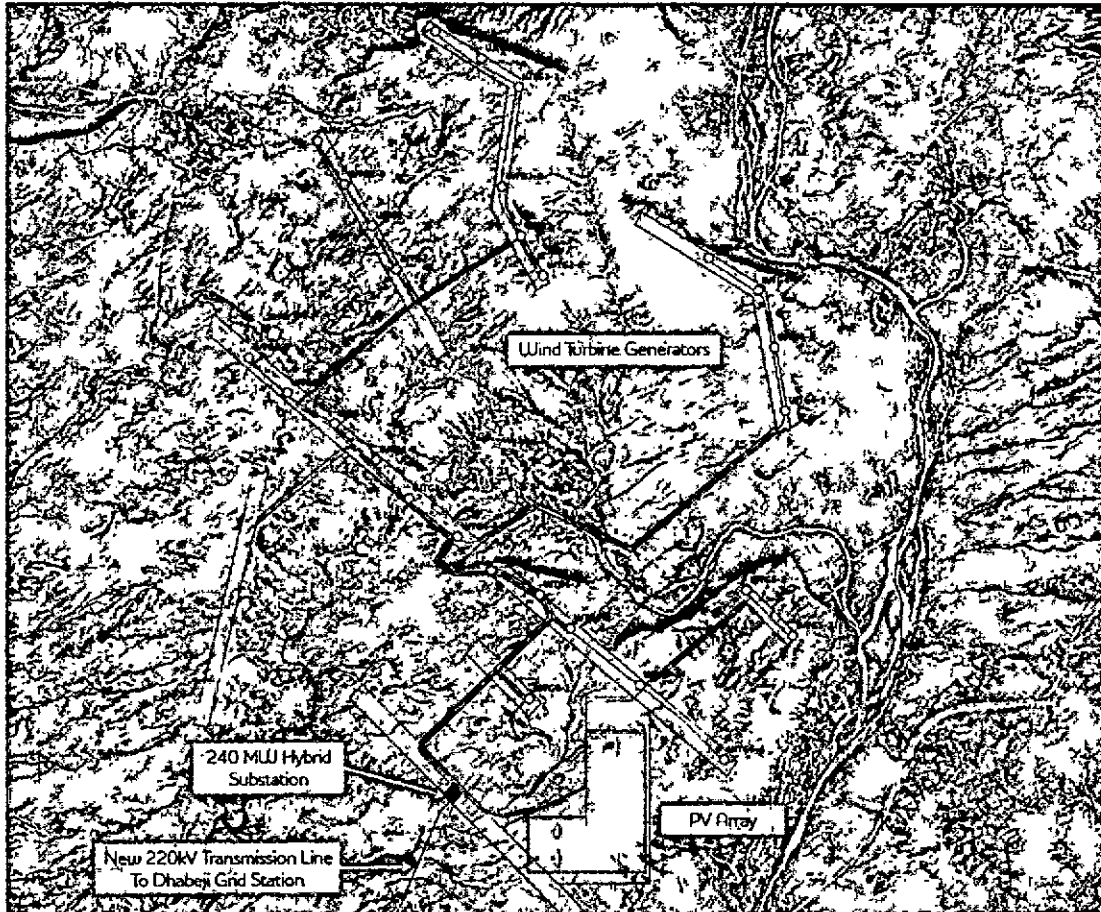


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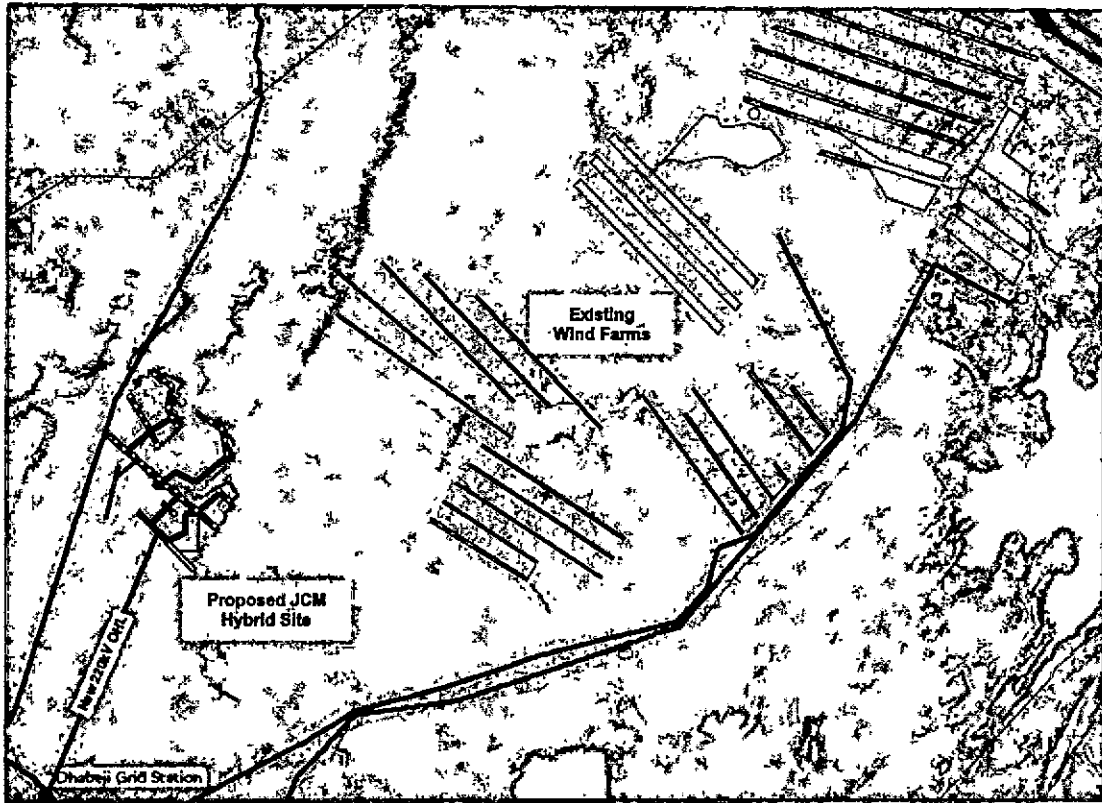
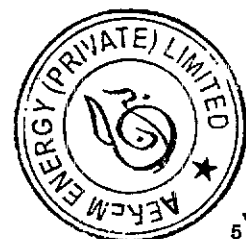


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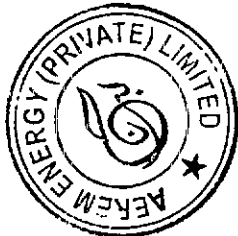
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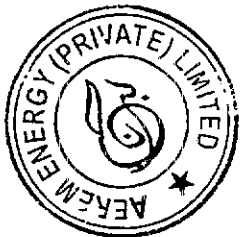
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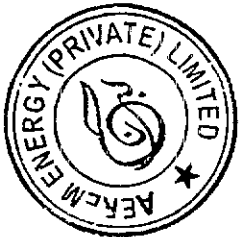
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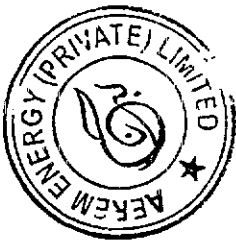
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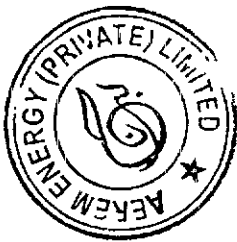
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Appendix 1 – Solar PV EYA



Appendix 2 – Wind Farm EYA



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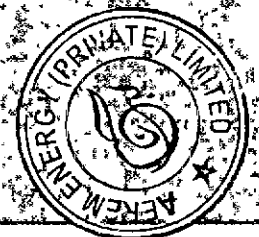
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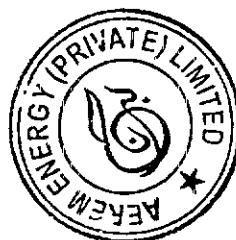
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JCM Power

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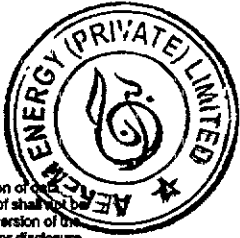
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Current revision		1				

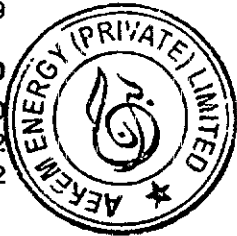
Approval			
Author signature		Approver signature	
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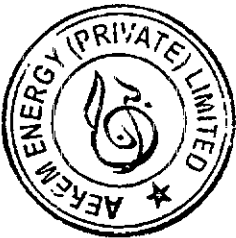


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Executive summary

JCM has appointed Zutari to conduct an assessment of the expected energy production for the proposed 61.6 MWac (94 MWp) Pakistan KE Hybrid solar photovoltaic (PV) facility currently under development. The plant design and configuration are described in Table 1.

Table 1 | Main components

Item	Quantity	Details
Location	-24.92 °S 67.58 °E	Pakistan
DC capacity	94 MWp	JA Solar JAM72D45-620/LB 620 Wp (bifacial)
Mounting configuration	SAT, 1-Portrait	Single-axis tracker (1P), 6.5 m pitch
AC capacity (nominal)	61.6 MWac	Assumed
Simulated power factor	1	Assumed PF = 1

The long-term solar resource has been assessed by Zutari from multiple satellite data sources in developing a consensus (or "best-estimate") for the GHI and ambient temperature. Zutari has determined the best-estimate GHI to be **2000.9 kWh/m²** (annual) and has modelled this using a weighted combination of the SolarGIS and Solcast datasets.

The performance of the solar energy facility has been modelled by Zutari using PVsyst (v7.4.8) which is established as an accurate tool for solar PV assessments, with a few losses calculated separately to improve accuracy. The majority of inputs and model settings have been determined from typical design details and indicative/likely equipment datasheets. Degradation is assessed in this report using an annual degradation rate of **0.4%** (the actual net reduction is initially less as the clipping loss reduces).

The forecast annual energy production (AEP) is shown in Table 2 below for year 1 including all losses (availability and degradation).

Table 2 | Net annual energy production (AEP) and P90 probabilities of exceedance, Year 1, PF 1 (including degradation and availability loss)

Probability of exceedance	Period [years]	AEP [MWh]	Capacity factor	Specific production* [MWh/MWdc]	Performance ratio
P50	-	188,425	22.88%	2,005	81.55%
P90	10	174,970	21.25%	1,861	75.72%

The probabilities of exceedance shown above are resulting from the assessed standard uncertainty of **5.51%** (from the energy production assessment) combined with annual output variability of **2.6%**



1 Introduction

1.1 Glossary

Some key terms that are used throughout this report are explained below. Other terms are explained where they are used.

Irradiance / insolation:

Irradiance generally refers to power (instantaneous or averaged over a period) with units of W/m^2 and Insolation refers to energy over a period, usually annual with units of kWh/m^2 . In this report, the term Irradiance is used interchangeably for either power or energy as determined by the units provided. Energy is for a standard year of 365 days unless stated otherwise.

- ▶ Albedo: irradiance reflected from the ground onto the plane of the array
- ▶ Diffuse irradiance: irradiance that is scattered and arrives from all over the sky dome
- ▶ Direct irradiance: irradiance that comes in a straight line from the sun
- ▶ Diffuse horizontal irradiance (DIF): diffuse component of irradiance, incident on a horizontal plane
- ▶ Direct horizontal irradiance (DHI): direct component of irradiance, incident on a horizontal plane (i.e., is the horizontal component of DNI)
- ▶ Direct normal irradiance (DNI): direct component of irradiance, incident on a plane that is normal (perpendicular) to the sun position
- ▶ Global horizontal irradiance (GHI): total (direct and diffuse) irradiance incident on a horizontal plane (equal to $DHI + DIF$)
- ▶ Plane of array irradiance or global tilted (or tracking) irradiance (GTI): total irradiance incident on the plane of array, i.e., the plane of the sensors or solar modules which may be at various tilt angles and orientations (made up of direct, diffuse and albedo)

Other:

- ▶ AC: alternating current i.e., 50 Hz mains power (at various voltages)
- ▶ BESS: battery energy storage system, which is currently under consideration by JCM (not assessed in this study however). Size TBC.
- ▶ Correlation: R^2 is the 'coefficient of determination', which is an indicator of quality of relationship (correlation) of two sets of data. In the case of a linear least-squares regression, the coefficient of determination corresponds to the square of the Pearson product-moment correlation coefficient (R).
- ▶ DC: direct current, i.e., the output from solar PV module
- ▶ LT: long-term
- ▶ MEC: Maximum Export Capacity
- ▶ MoMM: mean of monthly means
- ▶ MPP: maximum power point, the voltage and current combination that give the highest power from the solar module. The inverter adjusts its input resistance to ensure that the module strings operate at MPP.
- ▶ PPA: power purchase agreement
- ▶ Pyranometer: device to measure global irradiance (GHI or GTI)



- ▶ **Standard uncertainty:** the uncertainty expressed as the standard deviation of a normal distribution (all uncertainties in this report are standard uncertainties unless stated otherwise)
- ▶ **STC:** standard test conditions, 1,000 W/m², cell temperature of 25°C, spectrum corresponding to air mass of 1.5
- ▶ **TMY:** typical meteorological year, a year of data that represents the long-term average and distribution of data
- ▶ **VA (volt-ampere):** refers to the apparent power, which relates to heating effect or equipment ratings
- ▶ **W (watt):** refers to the active or useful power, which may be less than the apparent power if the power factor is below 1
- ▶ **Power units (e.g., W and MW)** for power ratings of equipment sometimes have a differentiator 'ac' or 'dc' to differentiate between module power rating (at STC, sometimes referred to as 'peak' although it is not the maximum power output of the module) and inverter / transformer power ratings.

Unit are SI – various references provide further details, including:

http://www.blpm.org/utills/common/pdf/si_summary_en.p

1.2 Site location and description

The proposed KE Hybrid solar PV plant is a 61.6 MWac / 94 MWdc project located in Pakistan as shown in the figure below.

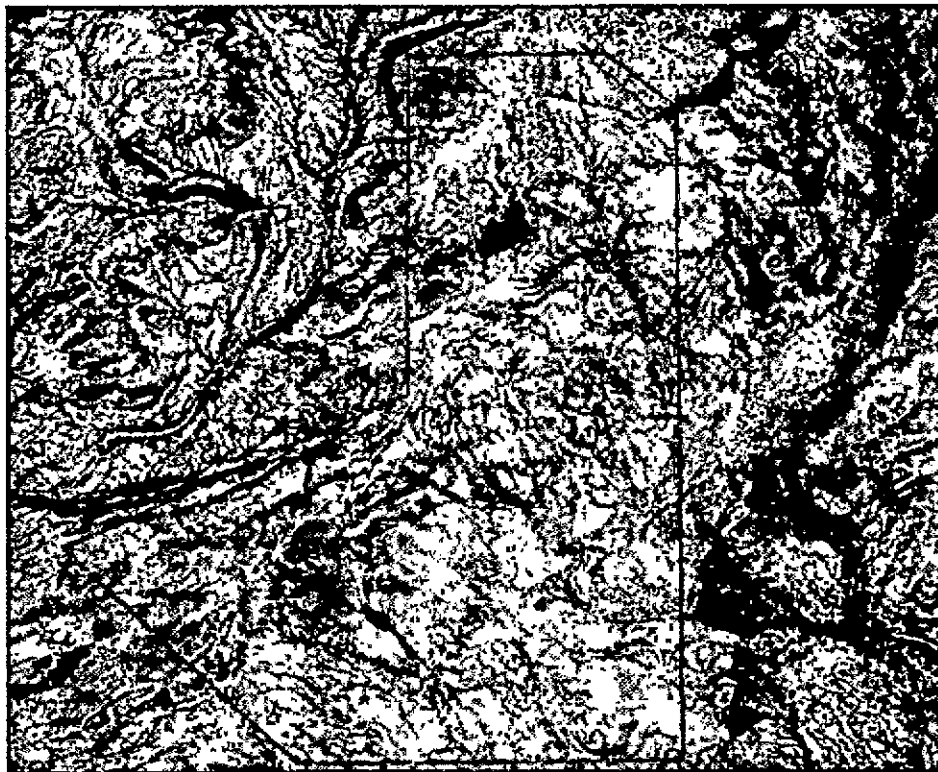
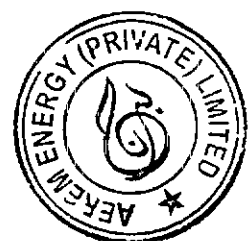


Figure 1 | PV plant site boundary as provided



2 Solar resource

The sections below describe the data sources and the process followed to check the available solar data and produce a long-term representative dataset.

2.1 Datasets

This section describes Zutari's analysis of long-term datasets and the process undertaken in obtaining the best-estimate long-term average (the 'consensus') and TMY dataset to represent this consensus. The best-estimate is determined using weighted averages of the data, with weighting according to the accuracy of each dataset. Then a dataset is chosen that is most representative of the best-estimate, with slight adjustment to match if required. The parameters considered in this process are GHI, diffuse fraction and air temperature, as these have the most effect on the energy production. Other parameters have a smaller effect, such as wind speed and spectral absorption (precipitable water).

2.1.1 Satellite data

The satellite data sources evaluated for use in this study are shown in Table 3. The data from MeteoNorm 7.2, MeteoNorm 8.0 and NASA-SSE have been obtained from PVSyst. The Solcast and PVGIS data was obtained from the respective web APIs, and the SolarGIS long-term dataset and SolarGIS TMY were purchased for the site.

Table 3 | Data sources

Source	Period	Data frequency	Annual GHI [kWh/m ²]	Annual Diffuse [kWh/m ²]	Average Temp [°C]
MeteoNorm 7.2	1954-1968	Monthly avg.	1850	876	26.7
MeteoNorm 8.1	1991-2005	Monthly avg.	1899	862	26.6
NASA-SSE	1983-2005	Monthly avg.	1989	607	25.9
PVGIS-TMY	2005-2014	Monthly avg.	2147	785	26.1
Solcast	2007-2020	Monthly avg.	1979	713	26.9
SolarGIS long-term	1994-2021	15 mins	2036	660	26.0
SolarGIS TMY	1994-2021	Hourly	2036	726	25.7

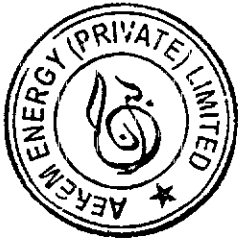
2.1.2 Site data

No site data was available for this assessment and therefore the solar resource evaluation was based purely on the satellite sources listed in the previous section.

2.1.3 Dataset selection

This section describes Zutari's analysis of the available datasets, and the process undertaken in obtaining the best-estimate long-term average GHI and temperature (the 'consensus') and TMY dataset to represent this consensus, including any adjustments made.

There is considerable variation in GHI between the various datasets for this location. The Meteonorm 7.2 dataset underpredicts GHI in the summer months, and PVGIS consistently overpredicts relative to the other datasets as shown in Figure 2.



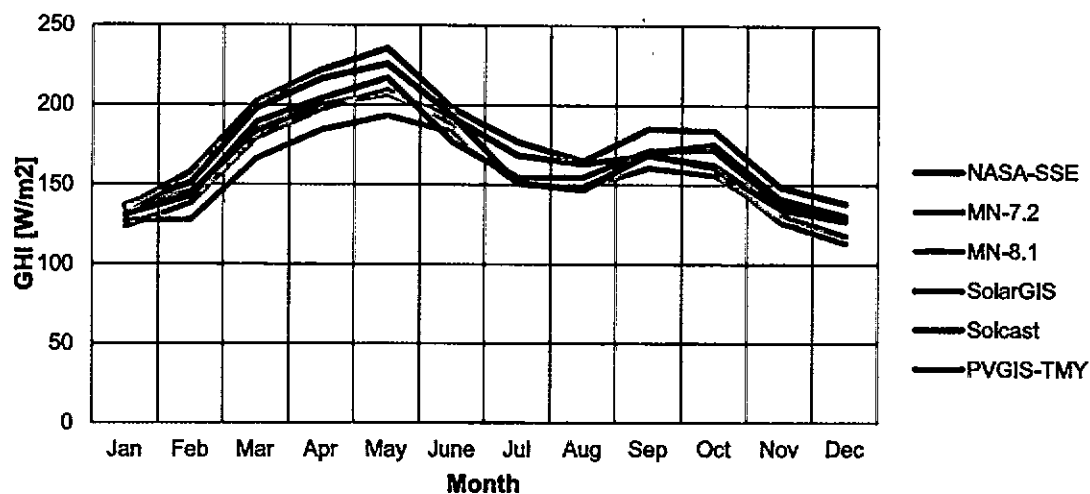


Figure 2 | Monthly averages (GHI) for the satellite datasets

The average ambient temperatures are generally similar between the datasets as shown in Figure 3.

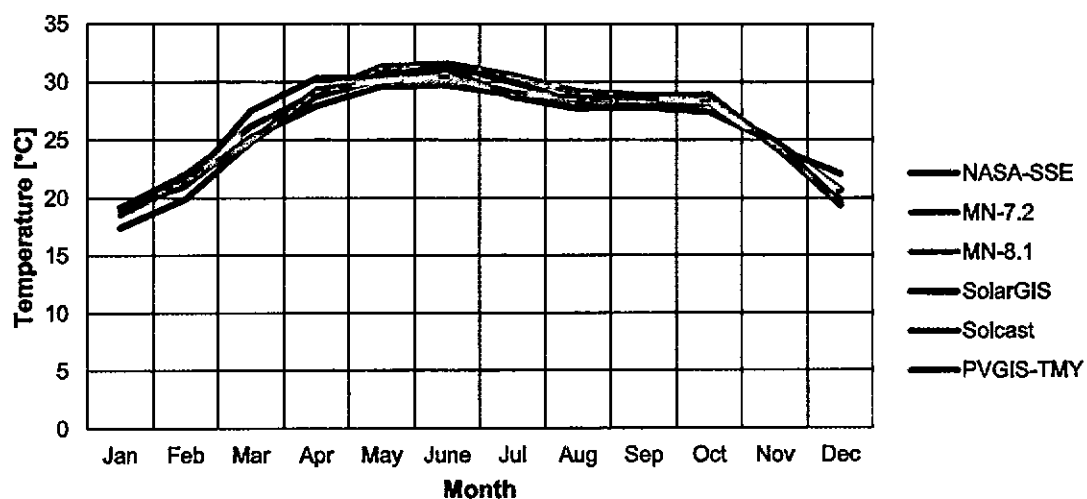
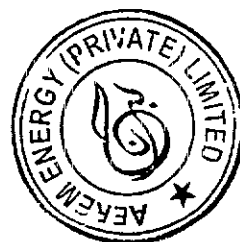


Figure 3 | Monthly averages (ambient temperature) for the satellite datasets

In order to determine the best-estimate, Zutari has weighted the datasets (equally for both irradiance and ambient temperature) based on our experience of their accuracy and consistency for the locations.

- Meteonorm 7.2 materially underpredicts the GHI during the summer months and has therefore been excluded with a weighting of 0 applied.
- The NASA-SSE, and Meteonorm 8.1 datasets are each weighted at 0.25 due to their lower spatial resolution and accuracy.
- The PVGIS dataset consistently overpredicts throughout the year and has therefore been excluded with a weighting of 0 applied.
- The SolarGIS dataset is considered to be of higher quality due to the quality checks and ground-based correlation which SolarGIS applies. SolarGIS has been weighted at 1.0 which has been split between the TMY and long-term data.



- Solcast data is generally considered to be of good quality, with similar data quality checks to those applied to SolarGIS and has been weighted at 0.5.

The resulting weighted average (or 'best-estimate') is provided in Table 4 below.

Table 4 | Determination of the consensus

Source	Weight (GHI)	Weight (air temp)	Annual GHI [kWh/m ²]	Average Temp [°C]
MeteoNorm 7.2	0	0	1850	26.7
MeteoNorm 8.1	0.25	0.25	1899	26.6
NASA-SSE	0.25	0.25	1989	25.9
PVGIS-TMY	0	0	2147	26.1
Solcast	0.5	0.5	1982	26.8
SolarGIS long-term	0.5	0.5	2036	26.0
SolarGIS TMY	0.5	0.5	2036	25.7
Weighted average (consensus)			1999.4	26.2

In order to determine a representative dataset to simulate the consensus above in PVsyst, the relative differences in GHI and ambient temperature for each source and the resultant effect on the AEP is evaluated in Table 5.

Table 5 | Deviation relative to the consensus in terms of GHI and ambient temperature (prior to adjustments)

Source	GHI	Air temp.	GHI and temp.
MeteoNorm 7.2	-7.47%	-0.18%	-7.63%
MeteoNorm 8.1	-5.00%	-0.15%	-5.14%
NASA-SSE	-0.53%	0.06%	-0.47%
PVGIS-TMY	7.37%	0.00%	7.37%
Solcast long-term	-0.88%	-0.21%	-1.08%
SolarGIS long-term	1.84%	0.03%	1.87%
SolarGIS TMY	1.82%	0.12%	1.95%

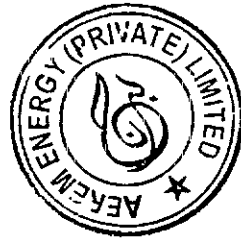
As mentioned above, there is considerable variation in GHI for this location, and although NASA-SSE's monthly averages are closest to the consensus, the dataset has a low spatial resolution. Zutari has therefore elected to use a weighted combination of the Solcast and SolarGIS datasets to model the best-estimate.

2.2 Modelling the best solar resource estimate

A full year of data that represents the long-term is required for modelling, referred to as a Typical Meteorological Year (TMY). As mentioned in the previous section, Zutari has simulated the best estimate solar resource using a combination of the SolarGIS and Solcast datasets.

The following steps were taken in modelling the facility:

1. Run PVsyst simulations of the solar facility using two datasets on either side of the best-estimate value (Solcast TMY and the SolarGIS TMY)



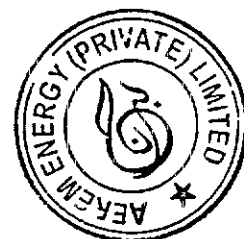
2. Weight the resulting simulation outputs using their respective deviations from the best-estimate in Table 5, e.g., Solcast TMY weighted at $1 / 1.08$, and the SolarGIS TMY at a weighting of $1 / 1.95$

The combined simulation most closely represents the best-estimate annual irradiance and air temperature of the available datasets as shown in Table 6.

Table 6 | Deviation relative to the 'best-estimate' in terms of GHI, DIF and ambient temperature of the combined simulation

Source	Weighting	GHI	Air Temp	All
Solcast TMY	$1 / 1.08 = 0.93$	-0.88%	-0.21%	-1.08%
SolarGIS TMY	$1 / 1.95 = 0.51$	1.82%	0.12%	1.95%
Combined dataset		0.08%	-0.10%	-0.01%

The sections that follow detail the combined simulation values which have been weighted in accordance with Table 6 above.



3 Energy production assessment

The performance of the solar energy facility has been modelled by Zutari using PVsyst version 7.4.8. Some losses (such as those related to availability) have been calculated separately by Zutari in order to improve accuracy and/or clarity of the calculated results.

3.1 Inputs

The input data and information available for the energy production assessment are the following:

- ▶ Irradiance and ambient air temperature
- ▶ Project design (module / string / diode / inverter / transformer setup, array dimensions and module orientation, and array tilt / orientation) as provided from the detailed design and procurement documentation
- ▶ Module, inverter and transformer datasheets and specifications
- ▶ Losses and adjustments based on modelling using suitable inputs or estimated from experience

3.2 Design and configuration

The project design and equipment are summarised in Table 7.

Table 7 | Plant design and configuration

Item	Value	Details
Location	Lat (-24.92°) Long (67.58°)	Pakistan
PV modules (quantity and nominal power)	151,606, 93.996 MWp	620Wp JA Solar JAM72D42-620/LB (bifacial) <i>Bifacial module</i>
Trackers	-	Single-axis tracker, 6.5m pitch
Tilt, orientation and configuration	-	Tracker limit $\pm 55^\circ$, Azimuth 0° Horizontal N-S Axis, 1 module in Portrait (Optimum 1P tracker)
Inverter station quantity and model	7	Sungrow SG8800UD
Maximum continuous rated capacity of inverter	10,560 kVA 8,800 kVA	At 23°C (Power Factor = 1) At 51°C (Power Factor = 1)
AC capacity (nominal)	61.6 MW	At 51°C (Power Factor = 1)
MV transformers (quantity and nominal power)	7 x 8.8 MVA (61.6 MVA)	0.63/33kV typical losses, SG-8800-UD
Grid (HV) connection transformer	240 MVA	As per client requirements for the complete hybrid site
Point of connection	240 MWac	As per client requirements for the complete hybrid site

The configuration of the PV array is as follows in Table 8. The string length is considered acceptable in terms of maximum open circuit voltage at minimum air temperature experienced at site.

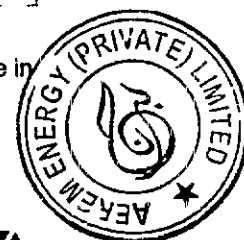


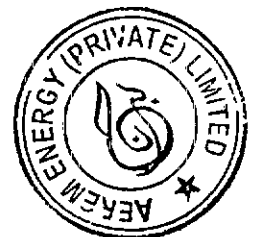
Table 8 | String configuration

Configuration	Value		Comment
Module STC power (DC)	620 Wp		Nominal
Modules per string	26		Modules in series
Strings per inverter (approximately)	833		Average for the site
Axis orientation, tilt	0°	0°	East of true north, above horizontal
Module height, width	2.465 m	1.134 m	From module datasheet
Module rows per array table	1		1P portrait orientation, 3 strings with 26 modules per string
Array pitch [m], GCR	6.5m	37.9 %	Array spacing, array area divided by ground area
Ground slope (N-S, E-W) as modelled	0°	0°	Average slope of ground, positive if rising from north to south or from east to west

3.3 Topography and slopes

The site topography has been defined based on the SRTM Worldwide Elevation Data (1-arc-second Resolution, SRTM Plus V3), and the resulting digital elevation model is shown in Figure 4 below.

The site is reasonably flat with slight slopes, ranging from 155 m above sea level in the South-West boundary of the site to around 165 m in the North-East (refer to Figure 4 below). Generally, the slopes are less than 4° but some isolated areas have slopes up to around 5° to 7°. It is expected however that the final layout will be optimised for the flat areas, and Zutari therefore considers the overall effect of terrain slopes to be negligible.



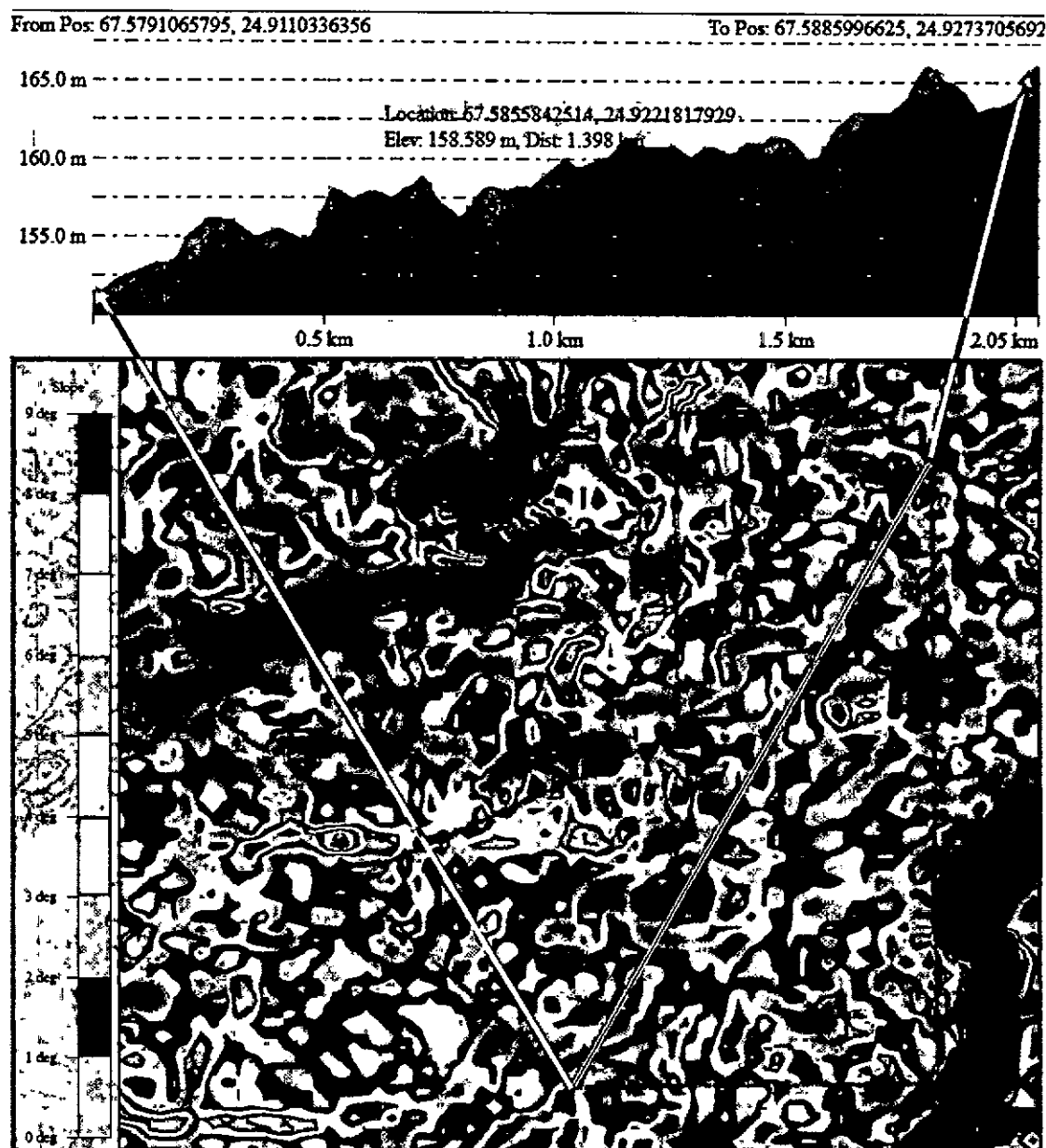


Figure 4 | Elevation map

3.4 Loss calculation and reporting

Each loss result in this report is given as an average over the full period (one year). The losses are displayed slightly differently than in other software such as PVsyst, being 'effective' after consideration of other losses. The losses at each time step are usually well correlated (or reverse-correlated) to the power and to each other, and so the individual losses cannot be simply combined. This also means that the reported size of the loss depends on the order in which it is assessed. The losses have been generally assessed in the order that they physically occur in the system.



3.4.1 Shading from horizon and objects

3.4.1.1 Overview

Zutari has considered a number of potential sources of far shading and near-shading of the PV array including the following, which are discussed below.

- Far shading due to terrain increasing the profile of the horizon
- Near shading from vegetation within the boundary and outside the fence line
- Near shading from objects near and within the site, including the overhead power lines (new and existing)

There were no major terrain features or structures that were identified that may cause significant near shading on the PV plant.

3.4.1.2 Terrain (far-shading)

The topography of the land surrounding the site is analysed using the SRTM Worldwide Elevation Data (1-arc-second Resolution, SRTM Plus V3). Shading on the array can also be caused by objects that are sufficiently far away such as steep slopes, hills, or mountains. For the PV site, the topography is mostly flat in the site. There were some undulating features around the site, Zutari does not expect this to cause a large amount of shading but a far shading assessment was also conducted as well by evaluating the horizon in 15° clockwise intervals beginning at north (10 km radius applied). All resulting far shading slopes are below 1.5° as such Zutari has not included the far shading in the PVsyst simulation.

Table 9| Northeast to southeast far shading slopes (horizon profile)

Azimuth (°)	15	30	45	60	75	90	105	120	135	150	165	180
Slope (°)	0.84	0.38	0.3	0.22	0	0	0	0	0	0	0	0

Table 10| Northwest to southwest far shading slopes (horizon profile)

Azimuth (°)	195	210	225	240	255	270	285	300	315	330	345	360
Slope (°)	0	0	0	0	0	0.06	0.36	0.64	0.95	0.82	1.49	1.49

3.4.1.3 Vegetation and objects within the boundary

No existing infrastructure was identified within the envelope as depicted in Figure 5. The vegetation is assumed to be cleared during construction for the facility, and then maintained during operations.

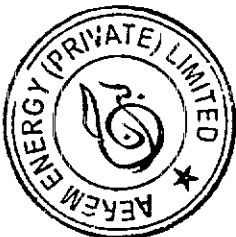




Figure 5 | Development envelope



3.4.2 Self-shading

3.4.2.1 General

The effect of self-shading is calculated using the geometry of the arrays. The location of the shadow of one array on the next is determined from the solar array geometry.

The loss of irradiance due to self-shading is calculated as the average reduction in irradiance across the entire array and is calculated separately for the direct and diffuse irradiance components. The sun position determines how much direct irradiance is lost from each array as a result of shading caused by the array in front. The diffuse irradiance is also reduced by self-shading in proportion to the area of sky blocked by the array in front and is calculated as an average over the height of the array since the shading varies with the position on the array.

There is an additional electrical loss as the result of the response of the modules and strings to the non-uniform irradiance that occurs during self-shading. Each module's power output is determined by the cell with least irradiance, and the whole string's power output is determined by the module with least irradiance (ignoring the small effects on voltage and MPP). If the modules of each string (i.e., modules connected in series) are mounted at the same height on the array (so that each has the same self-shading) then the output of the whole string is determined by the irradiance at the lowest point of the module.

3.4.2.2 Specific

The tracking system to be used is expected to incorporate backtracking (standard in industry), which ensures that there is no shading of the direct irradiance. The small amount of shading of diffuse irradiance is calculated, however PVsyst does not calculate the electrical shading loss for diffuse irradiance. Checks with the Zutari's model for other sites shows this electrical shading loss to be negligible even though the modules are mounted in portrait orientation which prevents the three bypass diodes in each module from reducing the electrical loss.

3.5 Module performance

3.5.1 Data file of module parameters

The client has provided the database file (*.pan) for the indicative PV module utilised for this evaluation. The key parameters have been confirmed to be reasonable by checking against the details in the associated module datasheet and with general expectations.

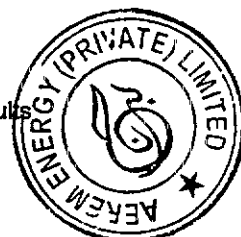
3.5.2 Bifacial gain

The PV modules to be installed on this project are bifacial, and therefore will receive an energy gain (relative to traditional PV modules) from irradiance on the rear-side of the PV module. Zutari has used PVSyst's Tracking plane, horizontal N-S axis report to simulate the bifacial behaviour of the PV modules.

The actual bifacial gain received will vary according to a number of factors, which are briefly discussed below.

Albedo and seasonality

Albedo is the measure of the reflectivity of the ground beneath the PV modules. Higher albedo results in a higher degree of sunlight reflectance, which would translate into the rear side of the module receiving more diffuse irradiance and hence an increased 'bifacial gain'. The actual albedo will naturally vary across the site and during the year as the vegetation changes with season.



There have not been any albedo measurements recorded for the site, and therefore Zutari has assumed an average albedo of 0.25.

Bifacial factor

The bifacial factor is the ratio of the power output between the rear and front sides of the module for the same irradiance. The modules are optimised for performance on the front side and so the bifacial factor is expected to be below 100%. The PV module datasheet for the JA Solar modules utilised in this study specifies a bifacial factor of 80% ($\pm 5\%$) which has been implemented in the .pan file and PVSyst simulation.

View factor

The reflectance of irradiance at each point on the ground is specific to its position on the ground and the position of the sun. These points will re-emit (reflect) a portion of this sunlight, characterised by the albedo factor, in all directions (assumed an isotropic distribution in PVSyst). A portion of this reflected irradiance will be intercepted by the rear side of the PV modules, and the remainder will be lost (sky). The 'view factor' is the fraction of this irradiance interception for each given point and is simulated by PVSyst for this project using a simplified 2D analysis ('unlimited trackers 2D model').

Mismatch (rear-side)

The mismatch effect is well known in traditional PV modules in which the small non-uniformities between the PV modules in a string in terms of current, irradiation received, soiling difference etc. and all modules in a string having to operate at the same current, results in a loss in energy. This effect occurs at the cell level for the rear side of bifacial modules due to irradiance variation on the rear-side (amongst other factors) and therefore an additional loss in terms of overall energy is calculated by PVSyst.

Zutari has assumed a nominal mismatch loss of 10% for the rear side of the bifacial system.

Pitch

The spacing between adjacent tracker rows (pitch), also characterised as the ground coverage ratio (GCR), affects the size of the area between PV modules which can reflect light. The larger the pitch (and smaller the GCR), the greater the reflectance of light to the rear-side of the modules and hence bifacial gain.

Zutari has utilised a GCR of 39.7% which translates into a pitch of 6.5 m as per the client's design. The final detailed design by the EPC contractor is expected to further optimise the pitch and GCR (which is a function of the final PV module dimensions).

Axis height

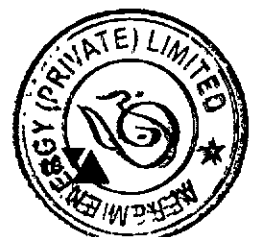
The PV modules are mounted on single-axis trackers which tilt the module between $-55^\circ/+55^\circ$ relative to the horizontal (Based on information provided by the client). Both the height of the array and the pitch influence the size of the effective area beneath and between the PV modules which enables the reflectance of sunlight to the rear-side of the modules. This reflectance (and hence bifacial gain) increases with array height.

Zutari has assumed an average axis height ('torque tube' height) of 1.5 m. The final selection of tracker manufacturer (and detailed design) will determine any adjustments required in this assumption.

Rear-side shading

The irradiation received by the rear side of the module is also subject to shading losses from the structure and any components installed along the torque tubes. The actual loss experienced will also vary depending on the position of the module within the string, the type of structure (and torque tube) as well as fastening method.

Zutari has utilised a typical structure shading factor of 5%.



3.5.3 Temperature

The performance of PV modules decreases with increasing temperature, and the loss can be determined from the cell temperature and the power-temperature coefficient. The cell temperature is calculated from the ambient air temperature, irradiance (heating effect), wind speed if available (cooling effect), and module insulation/thermal properties. Zutari has utilised a best-estimate value for U_c of $29 \text{ W/m}^2\text{°C}$ in the simulations.

While wind speed data is available in the SolarGIS TMY dataset, the ability to accurately transfer this to a wind speed experienced on site in amongst the modules is difficult and uncertain, and hence wind speed was not considered as part of the temperature model. The PVsyst method was used with settings that have no consideration of varying wind speed, i.e., $U_v = 0 \text{ W/m}^2\text{°C} / \text{m/s}$.

These temperature parameters are based on an assumed constant wind speed of 1.5 m/s throughout the solar farm at the height of the modules, which is a reasonable assumption for the site.

3.5.4 Spectral adjustment

The spectral adjustment due to the solar spectrum at different sun angles relative to the reference condition AM1.5 can be determined using the CEC/De Soto "Five Parameter" Module Model¹, using typical coefficients for mono-crystalline cells. This gives a small loss; however this only accounts for the spectrum change resulting from clear sky conditions, which causes red-shift (a shift in the spectrum towards red) at low sun angles. Some sources suggest that the presence of cloud may cause a blue-shift, and other sources suggest the spectral effect on mono-crystalline cells is negligible (balanced across the range of spectra occurring in practice). Therefore, Zutari considers that the best-estimate for the spectral adjustment is zero with a small uncertainty.

3.5.5 Irradiance effect on uncertainty

The module efficiency changes slightly with the irradiance level and the relationship of module efficiency to irradiance level is modelled by PVsyst as shown in Figure 6 below.



¹ "Improvement and Validation of a Model for Photovoltaic Array Performance", W. De Soto, Solar Energy Laboratory, University of Wisconsin – Madison, 2004

PV module: JA Solar, JAM72D42-620/LB

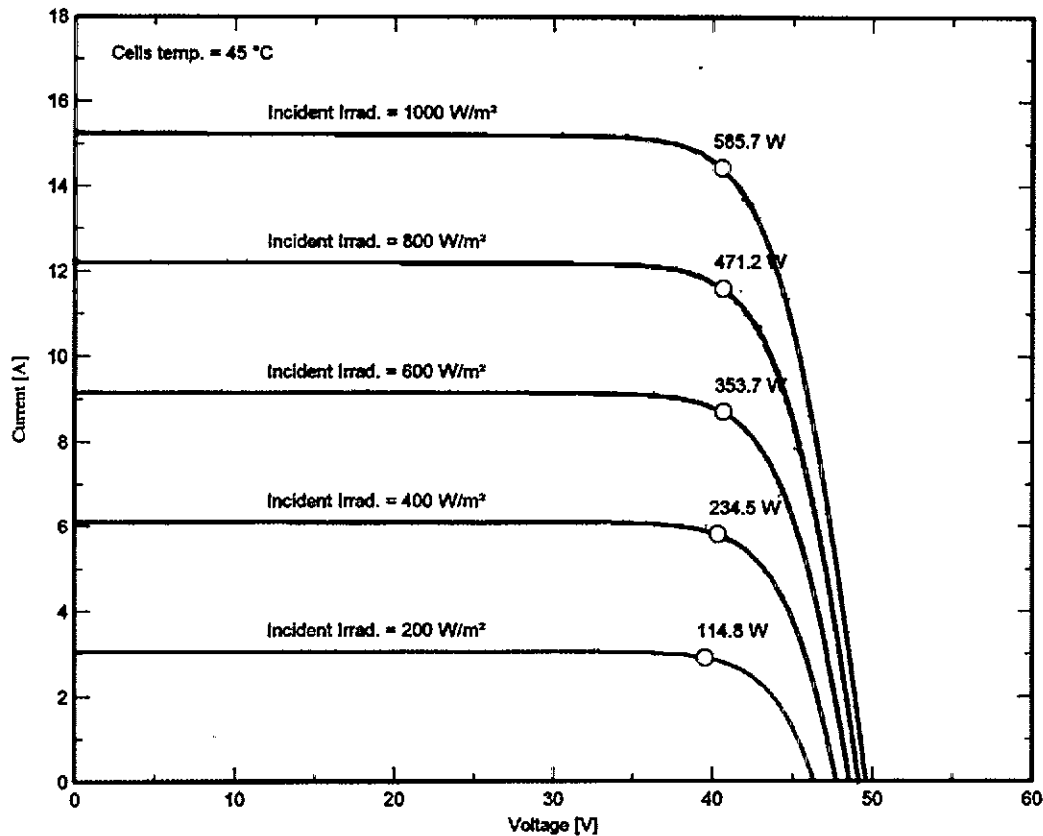


Figure 6 | PV module I/V/P response to irradiance (MPP power values labelled)

3.5.6 Power tolerance, mismatch, soiling, LID and PID losses

These losses are applied uniformly to the module output since their occurrence is not correlated to irradiance or other factors such as temperature. The soiling loss is an average and actual losses will vary by a few percent over a period of weeks and months, but this has only a minor effect on the calculation of downstream losses and can be ignored.

3.5.6.1 Power tolerance

The power tolerance adjustment indicates the average performance of modules supplied with a specified range of STC power, compared to the nominal power. The JA solar PV modules used in this study specify a positive power tolerance of 0/+5W according to the datasheet and therefore an average value of this tolerance band has therefore been used (0.4%). This is considered to be appropriate as the STC power of the modules is expected to be close to uniformly distributed within the tolerance band.

3.5.6.2 Soiling

At early-stage pre-construction assessments and in the absence of any monitoring campaign data (from a soiling station), soiling assumptions are generally based on experience from other similar solar PV facilities, regional data (e.g., wind direction/speed) and general industry practices. An important note is that soiling is a controllable loss – since the plant operator can adjust, increase and target the cleaning cycles. If a site is particularly dusty, the operator can employ a large team to move through



the plant and clean modules to minimize the losses. Seasonality will also play a significant factor in the dustiness on-site as the rainfall during the summer months will routinely clean the modules. In these months it is expected that the soiling loss will be small and the additional cost for largescale cleaning may not be warranted – however this is an iterative process which needs a dedicated soiling monitoring campaign during operations to manage. It should also be noted that the composition and size of the dust particles will differ in impact on a PV panel surface. Zutari has assumed an annual average loss of 3% as the site seems to be in a sandy and dusty area.

3.5.6.3 Mismatch

Mismatch accounts for the effect of modules with different performances being connected in series in strings, and therefore being forced to carry the same current. Mismatch also occurs when the strings are joined and forced to operate at the same voltage. The mismatch caused by different initial power ratings is expected to be small due to the small power tolerance and module sorting that will be done during construction. The loss includes voltage mismatch and variations in output caused by different cell temperatures of modules in different locations.

The 1% loss takes into account the following:

- ▶ Current variation after sorting; the sorting cannot be applied with complete accuracy due to flash test measurement error (some commentators say there is minimal improvement from sorting within a small power tolerance such as 1%)
- ▶ Differing amounts of LID, possibly +/-0.5% variation
- ▶ Differing temperatures on different parts of the module: this will have minimal effect since for a single row of modules there will be only small temperature variations; it will be a cell-level rather than string-level effect, and will occur mainly when tilted i.e., not all the time
- ▶ Mismatch due to the rear-side of bifacial modules is calculated separately in PVsyst and a nominal mismatch factor of 10% has been assumed (refer to section 3.5.2).

An additional 0.1% mismatch loss is applied for mismatch in strings due to voltage differences.

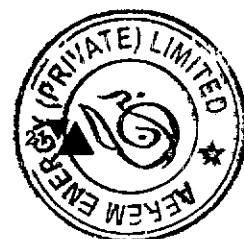
3.5.6.4 Light-induced degradation and potential-induced degradation

The light-induced degradation (LID) loss occurs gradually over about a week of exposure to sunlight, so it is not measured in the flash-tests used to determine the modules' rated power. In this assessment the LID loss is included in the initial conditions. In the absence of LID test reports for the PV modules, a typical loss of 0.6% (for good quality n-type PV modules) has been used as the best-estimate, with an uncertainty.

No potential-induced degradation (PID) loss is expected, as it is expected that the modules will be tested to be PID-free and that a guarantee will be provided.

3.5.7 Degradation

Zutari has applied a best-estimate system-level degradation rate of 0.4% with an uncertainty of 0.1%. The PV modules are considered to be of high quality and JA solar provides a 25-year degradation warranty on individual modules of 1.0% in the first year and 0.4% (of initial warranted power) per year thereafter. This means that modules that degrade at faster rates will be replaced, which reduces the spread and reduces the average degradation. The causes of system degradation are not particularly well understood in industry; however, one cause is the increasing mismatch caused by uneven degradation of modules, which is likely to be slightly reduced by the warranty. System degradation also covers other possible causes such as a slight reduction in inverter performance and increase in electrical joint resistances.



3.6 Electrical

3.6.1 Wiring and transformer (resistance / ohmic)

The electrical losses in the DC wiring, transformers and AC cables are calculated at each time step in proportion to the square of the current (ignoring small changes in AC voltage and power factor), using the no-load and full-load loss inputs specified in the table of electrical modelling inputs (Table 13).

The DC and AC electrical loss inputs have been determined using typical values for a project of this type and scale since no design for the facility has yet been conducted. It is expected that the EPC contractor will provide a design which broadly meets these assumptions.

Cables and reticulation:

- ▶ DC losses from modules to central inverters = **2%** (this includes losses associated with the string cables and DC subarray cables)
- ▶ LV AC losses from central inverter to MV transformer kiosk = **0.09%**
- ▶ MV cable losses = **0.5%**

Transformation:

- ▶ LV/MV PTK transformers = **0.10%** no load and **1.00%** full load
- ▶ MV/HV PTK transformers = **0.05%** no load and **0.50%** full load

These values are at rated (maximum) power for each item, and so they have been converted to the equivalent at STC power level, as a proportion of STC power, as used in PVsyst (this is a slightly higher power than the inverter and transformer rated output).

3.6.2 Inverters

The relationship of inverter efficiency to power level in the PVsyst inverter model and the maximum efficiency was confirmed to agree with the performance in the datasheet provided. The 'Euro' efficiency in the PVsyst model was given as 98.8%, however the datasheet indicates 98.7%. This discrepancy is reasonably small and is accounted for in the inverter uncertainty.

The inverter is expected to operate at MPP without significant loss. The PVsyst modelling shows that the module output is within the inverter operational limits (voltage, current and power ranges).

The inverter nominal rating varies with air temperature and is provided at 25°C and 50°C. The rating changes in a linear relation between these temperatures.

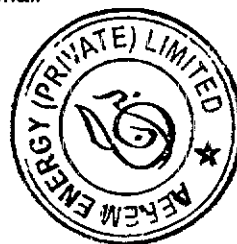
The calculated inverter clipping loss (limiting of power output to the inverter rating) is reasonably small even before gradual degradation reduces the output.

3.6.3 Point of connection and power factor

No grid limit has been applied in PVsyst, and Zutari has assumed a PF of 1.

3.6.4 Clipping loss

The calculation of inverter clipping, and curtailment (grid limit loss) has been done using hourly data since this is all that PVsyst can process. An hourly average smooths the power output and results in a lower calculated loss (inverter and grid curtailment) than occurs in reality. Zutari has previously tested this effect using 10 to 15 minutes data compared to half-hourly and hourly data for other projects and found small differences for 10 to 15 minutes data and slightly larger differences for 1 minute data.



Zutari has assessed the additional loss for this site using empirical methods derived from other similar sites:

- ▶ Empirical: applying an empirical estimation of additional loss based on the loss for hourly data (refer to Linked-In **"Solar PV clipping loss calculation"**²), which results in **1.70%** additional loss.

3.7 Other

3.7.1 Availability

Zutari has evaluated the plant availability based on the standard industry availability of 99%. The grid availability was also assumed to be 100%.

The total availability loss of **1.0%** is therefore comprised of:

- ▶ Plant availability loss = **1.0%**
- ▶ Grid availability loss = **0.0%**

3.7.2 Auxiliary electrical loads

Zutari has assumed a nominal auxiliary loss of **0.2%** (in energy terms) based on the assumption that electrical supply to the O&M building, guardhouse and any auxiliaries will be catered for.

3.7.3 Tracker stowing

The tracking control system is expected to provide protection against extreme wind loading by moving the trackers to the horizontal position when wind speeds exceed the tracker design limit. From Zutari's experience of wind speeds on similar sites and given the site location and perceived low-wind resource / exposure, it is considered that this high wind control strategy will rarely, if ever, be deployed, and there will be no significant impact on energy production.

3.8 Summary of inputs to model

The inputs and settings used in the energy production assessment are summarised in Table 11 to Table 13. The average values provided in Table 11 are for the whole period except where noted, i.e., temperature and irradiance include the night-time (zero) values.



² <https://www.linkedin.com/pulse/solar-pv-clipping-loss-calculation-simon-faulkner/>

Table 11 | Inputs to model: resources

Item	Value	Comment
Irradiance-weighted air temperature	30.02°C	Combined TMY
GHI [W/m ²]	2000.9	Combined TMY
Tilt modelling	Decomposition model: PVsyst Erbs. Transposition model: Perez, Albedo: 20%	

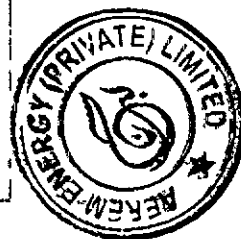
Table 12 | Inputs to model: PV modules

Item	Input	Comment
Spectral adjustment	-	See Section 3.5.4
Reflectance	-	Profile, see Appendix B
Irradiance (effect on efficiency)	-	PVsyst model, pan data file
Power temperature coefficient	-0.30%/°C	From specification and pan data file
Shading loss	-	Calculated according to defined shading scene. Refer to section 3.4.1
Self-shading loss – irradiance	-	Output is proportional to average irradiance on the array (shading varies with tilt, position and with direct/diffuse).
Self-shading loss – electrical	1 row	Output of string/row determined from irradiance at bottom of modules. Nil for direct irradiance due to back-tracking.
Mismatch loss	2.0%	Typical value, at MPP, see Section 3.5.6.3
String mismatch loss	0.1%	Typical value, at MPP, see Section 3.5.6.3
Module power tolerance loss	-0.40%	Performance (specified range) compared to nominal (negative indicates higher performance), see Section 0
Soiling loss	3%	Assumed annual average
LID loss	0.6%	Light-induced degradation, occurs immediately on exposure to sunlight, so included in initial conditions, see Section 3.5.6.4
PID loss	0.00%	Potential-Induced Degradation, modules expected to be "PID-free" and well-earthed to avoid PID loss
Degradation loss	0.40%	Typical annual value, constant proportion of initial power. Includes both modules and system degradation. Refer to Section 3.5.7



Table 13 | Inputs to model: electrical

Item	Input	Comment
Inverter efficiency loss	Model	Based on datasheet provided by Sungrow and parameters in PVsyst database
Inverter rated power (clipping)	10560 kW @ 23°C 8800 kW @ 51°C	
Inverter minimum input power	-	Covered in efficiency curve
Self-consumption (standby)	-	Supplied from AC output i.e., transformer/grid, applies after inverter clipping loss (from spec)
Self-consumption (no load)	-	From inverter datasheet
Self-consumption (rated power)	-	From inverter datasheet
Solar facility nominal power	61.6 MW	Using inverter nominal rated output (@ 40°C) at PF = 1
Solar Facility (maximum export capacity)	N/A	Grid limit at PF = 1
LV/MV transformer rated power	8800 kVA	As per PTS unit
DC cable loss (% of STC power)	2%	See section 3.6.1
Transformer loss, constant (proportion of STC power)	0.1%	As per section 3.6.1, however losses are converted to losses at STC power as a proportion of STC power.
Transformer loss, variable, at STC power (proportion of STC power)	1.00%	As per section 3.6.1, however losses are transformed from at AC rating to an STC equivalent
AC (cable) loss at STC power (proportion of STC power)	0.59%	See Section 3.6. These losses are added and converted to losses at STC power as a proportion of STC power.
MV/HV grid transformer loss	0.55%	See Section 3.6.
DC/AC ratio (STC, nominal)	1.526	Module nominal (STC) output, solar facility maximum output
Availability (loss)	1.0%	Based on the assumed availability
Auxiliary load	0.20 %	Refer to section 3.7.2
Metering (net of solar facility)	-	Net output derived from revenue meter



4 Energy production results

Results are given in terms of annual energy production (AEP) which is based on a standard year of 365 days or 8,760 hours. The AEP is an average that is expected to occur over a number of years, and if the period is not stated then it refers to the best-estimate, P50 or long-term average as relevant.

The performance ratio is also provided, which is the actual power or energy produced divided by the hypothetical power or energy that would be produced with the same irradiance if the PV modules operated ideally (i.e., at STC efficiency) under all conditions and without any other losses.

Note that the performance ratio values given in this report are based on the nominal installed capacity of the PV modules, and the actual STC rating of the modules is expected to be higher as discussed in section 3.5. This means that the PR is higher than might generally be expected. To make comparisons with other projects, the PR values may need to be adjusted to take account of the higher module rated power.

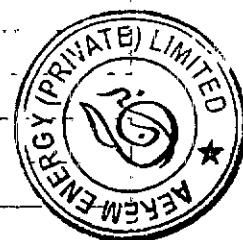
The capacity factor is the actual power produced (averaged over a period) divided by the nominal rated power. This is equivalent to the actual energy in a period divided by the energy that would be produced at nominal rated power.

4.1 Summary of losses and results

The main processing steps and losses are shown in Table 14. These are based on the weighted combination of the PVsyst results shown in appendix A, with the additional adjustments being noted in the table. These include the SolarGIS and Solcast results.

Table 14 | Processing steps and losses

Item	Energy Model	Comment
GHI [kWh/m²]	2000.9	
Increase due to tilt & orientation	22.85%	Modelled
GTI [kWh/m²]	2458.3	
Shading	0.00%	Calculated
Self-shading - irradiance	-2.03%	Calculated
IAM (reflectance)	-0.14%	Calculated based on module parameters
Spectral	0.00%	Assumed
Soiling	-3.00%	Assumed on annual average
Ground reflection on front-side	0.51%	Modelled
Effective irradiance [kWh/m²]	2345.8	
Collector area [m ²] - front	423786	Modelled
Ground area	1117488	Modelled
Global incident on ground [kWh/m ²]	1086.4	Modelled
Ground reflection loss	-75.00%	Modelled
View factor	-77.34%	Modelled
Sky diffuse rear side	20.95%	Modelled
Beam eff. Rear side	0.00%	Modelled
Shadings loss rear side	-5.00%	Assumed
Effective irradiance - rear [kWh/m²]	186.8	



Item	Energy Model	Comment
Bifaciality factor	80.00%	
Effective irradiance - total [kWh/m2]	2495.2	
Efficiency at STC	22.24%	Modelled
Array nom. (STC) energy [MWh]	235,265	
Irradiance (effect on efficiency)	0.34%	Modelled
Temperature	-6.55%	Glass-glass PV module
Self-shading - electrical	0.00%	Modelled
Module power tolerance	0.40%	Assumed 0/+5W tolerance
LID	-0.60%	Assumed
Mismatch (front-side)	-2.09%	Assumed
Mismatch (rear)	-0.60%	Modelled
Degradation	-0.20%	Average for first year
DC electrical	-1.61%	Provided at STC, typical design
Array output (MPP) [MWh]	210,393	
Inverter efficiency	-1.48%	Modelled
Inverter rated power (clipping)	-4.54%	Modelled
Inverter over nom. voltage	0.00%	Modelled
Inverter power threshold	0.00%	Modelled
Inverter night-consumption	-0.02%	Not incl. in inverter efficiency
Inverter output [MWh]	197,804	
AC electrical - inverter transformer	-1.03%	Assumed, typical values
HV transformer loss	-0.53%	Assumed
AC electrical - cable/transmission line	-0.37%	Assumed
Additional clipping - actual of hourly	-1.70%	Modelled
Auxiliary load	-0.20%	Modelled
Power output to grid [MWh]	190,329	
Availability	-1.00%	Modelled separately
Availability applied [MWh]	188,425	

4.2 Best-estimate energy production

The main results are shown for the first year, which includes LID as this normally occurs within the first few days of exposure, as well as the average over the year of the on-going long-term degradation, which is assumed to be linear.

Long-term degradation of the PV modules will happen gradually over the life of the project, but as the module output reduces the clipping losses (output capped to maximum inverter and grid power) will also reduce. Because of this interaction, the results are given separately for the first year and the reduction over time. Please note Table 15 displays the combined results.

Table 15 shows the best-estimate or P50 for year 1, which includes all losses listed in the sections above.



Table 15 | Best-estimate solar energy production, year 1 (P50)

Measuring point	Losses to measuring point	AEP [MWh]	Capacity factor based on DC Capacity (P50)	Performance ratio
Module input	No losses – ideal performance under site irradiance (GTI)	231,065	28.06%	100.00%
Module output	As above, plus losses from module response & DC wiring	210,393	25.55%	91.05%
Inverter output	As above, plus losses from inverter efficiency and self-load	197,804	24.02%	85.61%
Connection Point output	As above, plus losses in auxiliary load, transformers, AC cabling/transmission line	190,329	23.12%	82.37%
Connection point output (meter) (net AEP)	As above, plus availability loss	188,425	22.88%	81.55%

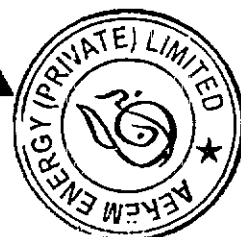
4.3 Degradation

The effect of degradation over time and the consequential change in clipping and other losses is shown in Table 16. The table also show the overall reduction in energy output, considering the interaction of all losses, from the initial condition i.e., before degradation. These are best-estimate or P50 values. The 'Reduction from initial' column gives the reduction in AEP for each year relative to that of the initial condition (i.e. Year 0). The 'Effective degradation' shows the net effect of degradation and changes to other losses, expressed as the value at the end of the year and as a proportion of the 'Year 0' energy.

Table 16 | Best-estimate (P50) energy production, project years (all losses)

Year	Net AEP [MWh]	Degradation loss ³	Combined clipping loss	Reduction from initial	Capacity Factor based on DC cap. (P50)	Capacity Factor based on DC cap. (P90)	Performance ratio	Effective degradation rate
1	188,425	0.20%	1.70%	0.00%	22.88%	21.25%	81.55%	-0.09%
2	188,022	0.60%	1.68%	0.21%	22.83%	21.20%	81.37%	-0.21%
3	187,614	1.00%	1.65%	0.43%	22.79%	21.16%	81.20%	-0.22%
4	187,199	1.40%	1.63%	0.65%	22.73%	21.11%	81.02%	-0.22%
5	186,779	1.80%	1.61%	0.87%	22.68%	21.06%	80.83%	-0.22%
6	186,351	2.20%	1.58%	1.10%	22.63%	21.02%	80.65%	-0.23%
7	185,917	2.60%	1.56%	1.33%	22.58%	20.97%	80.46%	-0.23%
8	185,474	3.00%	1.54%	1.57%	22.53%	20.92%	80.27%	-0.24%
9	185,023	3.40%	1.52%	1.81%	22.47%	20.87%	80.07%	-0.24%

³ Excludes LID as this is included in initial (year 0) result



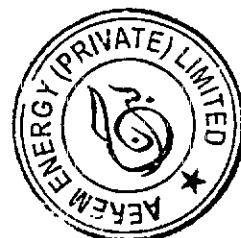
Year	Net AEP [MWh]	Degradation loss ³	Combined clipping loss	Reduction from initial	Capacity Factor based on DC cap. (P50)	Capacity Factor based on DC cap. (P90)	Performance ratio	Effective degradation rate
10	184,568	3.80%	1.50%	2.05%	22.42%	20.81%	79.88%	-0.25%
11	184,103	4.20%	1.48%	2.29%	22.36%	20.76%	79.68%	-0.25%
12	183,633	4.60%	1.46%	2.54%	22.30%	20.71%	79.47%	-0.26%
13	183,157	5.00%	1.44%	2.80%	22.24%	20.66%	79.27%	-0.26%
14	182,675	5.40%	1.42%	3.05%	22.19%	20.60%	79.06%	-0.26%
15	182,189	5.80%	1.40%	3.31%	22.13%	20.55%	78.85%	-0.27%
16	181,696	6.20%	1.38%	3.57%	22.07%	20.49%	78.63%	-0.27%
17	181,195	6.60%	1.36%	3.84%	22.01%	20.43%	78.42%	-0.28%
18	180,689	7.00%	1.34%	4.11%	21.94%	20.38%	78.20%	-0.28%
19	180,175	7.40%	1.32%	4.38%	21.88%	20.32%	77.98%	-0.28%
20	179,657	7.80%	1.29%	4.65%	21.82%	20.26%	77.75%	-0.29%

4.4 Seasonal and diurnal distribution

The distribution of monthly generation (based on the TMY which is similar to the long-term average pattern) at initial conditions and excluding availability loss is shown in Table 17.

Table 17 | Monthly generation for TMY (all losses)

Month	Average output [MWh]	Proportion of annual output
Jan	14,221	7.55%
Feb	15,090	8.01%
Mar	17,852	9.47%
Apr	17,994	9.55%
May	18,981	10.07%
Jun	16,123	8.56%
Jul	13,400	7.11%
Aug	13,634	7.24%
Sep	15,796	8.38%
Oct	17,029	9.04%
Nov	14,506	7.70%
Dec	13,800	7.32%
Year	188,426	100.00%



5 Uncertainty assessment

The uncertainty in the energy production has been assessed by assuming that all input uncertainties have a normal (Gaussian) distribution and are independent of each other, which allows the uncertainties to be combined together to give an overall uncertainty in the energy production. The mean of the normal distribution is the best-estimate (P50) value, and the uncertainty values are given as standard uncertainty, i.e., the standard deviation of the distribution of the uncertainty. The uncertainty distributions are assumed to be symmetrical. Independent uncertainties are combined as the square root of the sum of the squares.

The assumptions on the distribution of the uncertainty are reasonable as long as the uncertainty is assessed for downside risk and to moderate levels of probability, i.e., Zutari considers them to be valid for P50 to P95 results. Upside risk would need to be assessed differently since some input uncertainties may not be symmetrical. At higher levels of exceedance probability, such as P99 (extreme downside risk), the assumption that uncertainties have normal distributions may not be appropriate and so the result may be inaccurate. It is likely that some input uncertainties have a more rectangular or truncated distribution, and some may have other deviations from a normal distribution. Also, in many cases there is no adequate information on the shape of the input distribution at high exceedance probability levels. Upside risk would need to be assessed differently since some input uncertainties are not symmetrical.

The relationship between the uncertainty in an input parameter and the uncertainty in the result is described by the sensitivity factor. For example, if an input parameter has a sensitivity factor of 0.5 then a 10% change in the parameter will give a 5% change in the result. In the case of the irradiance, clipping losses may provide a partial offset and so the sensitivity factor may be slightly less than 1.

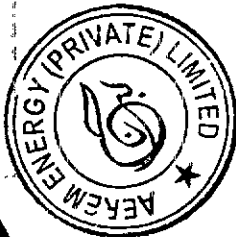
5.1 Uncertainty inputs

Table 18 gives the following values for each item of uncertainty:

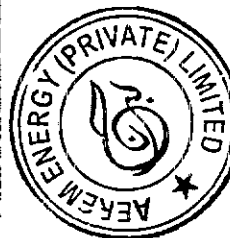
- ▶ Input uncertainty: uncertainty of input value, in relative terms except for temperature
- ▶ Sensitivity factor: ratio of change in output to change in input parameter
- ▶ Output uncertainty: resulting uncertainty in long-term net energy production

Table 18 | Uncertainty Inputs and results

Item	Input uncertainty	Sensitivity factor	Output uncertainty	Comment
Solar resource				
Representation of long-term	0.8%	1.50	1.2%	Combination of SolarGIS (~16-year dataset) and Solcast TMY simulation
Temperature [°C]	2	0.30%	0.6%	Modelled data. Includes possible incorrect relationship to irradiance.
Wind speed	50%	1.80%	0.9%	Wind speed assumed to be 1.5m/s in the model.
GHI measurement	2.5%	1.5	3.8%	Multiple modelled datasets that agree well
Distribution and correlation of hourly synthesised data	1.0%	1.5	1.5%	Modelled data (synthesised hourly) may not represent relationships and variations correctly



GTI meas/calc	3%	22.85%	0.7%	Uncertainty in conversion to tilted plane (confirmed by comparison to tilted measurements)
Configuration				
Array orientation [°]	1	0.10%	0.1%	Assume will be built accurately to design
Array tilt [°]	2	0.25%	0.5%	Assume will be built accurately to design
Ground slope [°]	100%	0.45%	0.5%	Effect of non-level ground. Uncertainty between measured and modelled / assumptions.
Effective irradiance on the rear side	50%	3.90%	1.9%	Uncertainty in terms of the modelling methodology and assumptions made - albedo, array height
Modules				
Cell temperature	3	0.30%	0.9%	Temperature model (no wind speed model)
Spectral adjustment	0.1%	1.5	0.2%	Half of loss for red-shift (blue-shift counteracts)
Reflectance loss	15%	0.60%	0.1%	Reflectance model, confirmed by comparison of methods
Irradiance effect on efficiency	25%	0.14%	0.0%	Irradiance/efficiency curve-fit and extrapolation
Temperature modelling	5%	6.55%	0.3%	Uncertainty in coefficient value and linearity
Shading loss	0.0%	0	0.0%	Modelled
Self-shading loss – irradiance	50%	2.03%	1.0%	Proportion of loss
Self-shading loss - electrical	50%	0.00%	0.0%	Proportion of loss
Mismatch loss	50%	2.09%	1.0%	Proportion of loss
Module power tolerance loss	25%	0.40%	0.1%	Proportion of loss
Soiling loss	50%	3.00%	1.5%	Proportion of loss
LID loss	50%	0.60%	0.3%	Proportion of loss
PID loss	50%	0.00%	0.0%	PID-free modules, covered by degradation warranty
Degradation loss (project life)	0.10%	10	1.0%	Loss at 10 years (representative of financial effect over project life)
DC wiring loss	10%	1.61%	0.2%	Proportion of loss
Inverter, transformer, grid				
MPP, limits	0.2%	1	0.2%	Nominal allowance for imperfect MPP tracking
Inverter efficiency loss	0.2%	1	0.2%	Nominal allowance for efficiency curve-fit and extrapolation



Inverter night consumption	10%	0.00%	0.0%	Proportion of loss
Transformer electrical loss	10%	1.03%	0.1%	Typical losses assumed
AC cable/transmission line electrical loss	20%	0.37%	0.1%	Proportion of loss
Grid transformer electrical loss	20%	0.53%	0.1%	Proportion of loss
Grid transmission line clipping loss	10%	0.00%	0.0%	Proportion of loss
Additional clipping - actual cf hourly	20%	1.70%	0.3%	
Availability (whole system)	20%	1.00%	0.2%	Proportion of loss
Auxiliary load	50%	0.20%	0.1%	Proportion of loss
Metering	0.30%	1	0.3%	Expect revenue meter Class 0.3
Total			5.51%	

5.2 Variability

The total variability of the energy production has been estimated as shown in Table 19. The inputs are added rather than combined as a root sum of squares since they are to some extent correlated to each other.

Table 19 | Variability

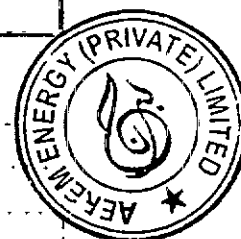
Item	Variability of input	Variability of energy
Resource (GHI) based on SolarGIS data		1.6%
Additional variability in GTI (typically higher than for GHI)		0.2%
Temperature	2	0.6%
Availability, soiling and maintenance (cleaning etc.)	20%	0.3%
Total		2.6%

5.3 Uncertainty results

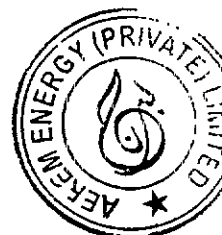
The uncertainty and inter-annual variability are combined to produce probability of exceedance figures shown in Table 20.

Table 20 | Probability of exceedance (best-estimate year 1 conditions)

Probability of exceedance	Period [years]	AEP [GWh]	Capacity factor based on DC cap.	Specific energy [MWh/MWdc]	Performance ratio
P50	-	188,425	22.88%	2,005	81.55%
	30	181,392	22.03%	1,930	78.50%
P75	10	181,344	22.02%	1,929	78.48%
	1	180,715	21.95%	1,923	78.21%
P80	30	179,650	21.82%	1,911	77.75%



Probability of exceedance	Period [years]	AEP [GWh]	Capacity factor based on DC cap.	Specific energy [MWh/MWdc]	Performance ratio
P90	10	179,589	21.81%	1,911	77.72%
	1	178,805	21.72%	1,902	77.38%
	30	175,062	21.26%	1,862	75.76%
	10	174,970	21.25%	1,861	75.72%
	1	173,776	21.10%	1,849	75.21%
P95	30	171,274	20.80%	1,822	74.12%
	10	171,155	20.79%	1,821	74.07%
	1	169,623	20.60%	1,805	73.41%



In diversity there is beauty and there is strength.

MAYA ANGELOU

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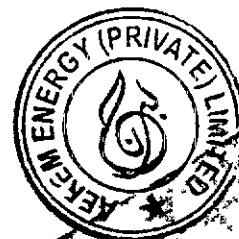
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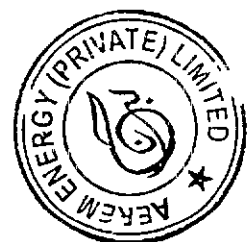
Preliminary Resource and Energy Assessment

JCM Power

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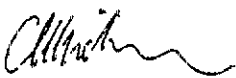
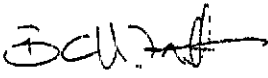
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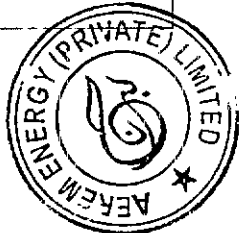
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Executive summary

JCM Power (the Client) is developing a proposed wind farm located approximately 50 km east of Karachi, Pakistan. The Client has engaged Aurecon New Zealand Ltd (Aurecon) to carry out a preliminary wind resource and energy assessment for the development. Two indicative turbine models have been considered in this assessment.

Wind data from the DIN mast, which is located 15 km from the site, covering a period of 25 months was validated and analysed by Aurecon. The mast is within an operational wind farm environment, and as such Aurecon has removed the wake effects of the wind farm on the mast data, through a calibration against other short-term datasets and observations from mesoscale datasets, and extrapolated the data to wind conditions at the proposed site.

The wind farm energy production was assessed using WAsP linear flow modelling to estimate the wind resource at each turbine location, calculating gross energy using the turbine power curve and site air density, then assessing wake and other losses. Ambient air temperature data measured by the DIN mast was also used to inform the air density and temperature de-rating impacts for the energy assessment. A preliminary uncertainty and variability assessment has also been performed.

Key results from the assessment are shown in Table 1 below.

Table 1 Key wind farm energy modelling results

Turbine model	EN-182/6.25	EN-182/6.25	GWH182-6.2
Rotor diameter [m]	181	181	183
Hub height [m]	105.0	110.0	110.0
Rated power [MW]	6.25	6.25	6.20
Turbine quantity	28	28	28
Total rated power [MW]	175.0	175.0	173.6
Mean wind speed [m/s]	8.3	8.4	8.4
Gross AEP [GWh]	880.4	888.7	880.0
- Wake loss	4.41%	4.37%	4.79%
Waked AEP [GWh]	841.5	849.9	837.9
- Other losses	9.09%	9.09%	8.63%
P50 net AEP [GWh]	765.1	772.6	765.6
P50 net capacity factor	49.9%	50.4%	50.3%
Uncertainty & variability (25-yr)	14.1%	13.9%	13.8%
P90 (10-yr) AEP [GWh]	626.7	634.5	630.1
P90 (1-yr) AEP [GWh]	619.7	627.4	623.1
P90 (10-yr) capacity factor	40.9%	41.4%	41.4%
P90 (1-yr) capacity factor	40.4%	40.9%	41.0%



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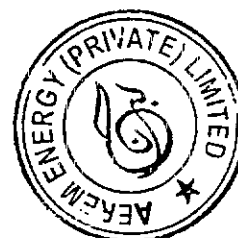
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1 Introduction

1.1 Aurecon credentials

Aurecon is a leading provider of technical advisory services, having advised on over 30 GW of renewable energy transactions in Australia, New Zealand, Africa, Asia and Europe. We have over 20 years extensive experience in renewable energy, executing various roles including designer, approvals support, due diligence provider, owner's engineer, and financiers' / independent certifier. Aurecon has a large portfolio of wind farm projects internationally, with an inhouse team of wind design and development specialists. Aurecon employs over 7,800 people across 11 countries in Asia and Australasia.

1.2 Project site

The proposed JCM wind farm site is located approximately 50 km east of Karachi in Sindh, Pakistan. There are multiple existing and proposed wind farms located to the east and northeast of the JCM site, with the closest wind farm being ~10 km from the site. There are approximately 840 turbines in total across these wind farms.

The site area mostly consists of dry flat land with sparse, short vegetation and some riverbeds and escarpments. The site is at an elevation of approximately 150 m to 270 m above sea level.

There is one 93 m high meteorological mast (DIN), located approximately 15 km from the proposed wind farm and encompassing 25 months of data, that has been primarily used for this preliminary energy yield assessment (EYA).

Figure 1-1 illustrates the site location and topography of the region, and also shows the mast location and proposed turbine locations for one layout option. The closest existing wind turbines are also visible in the east and northeast of the figures.

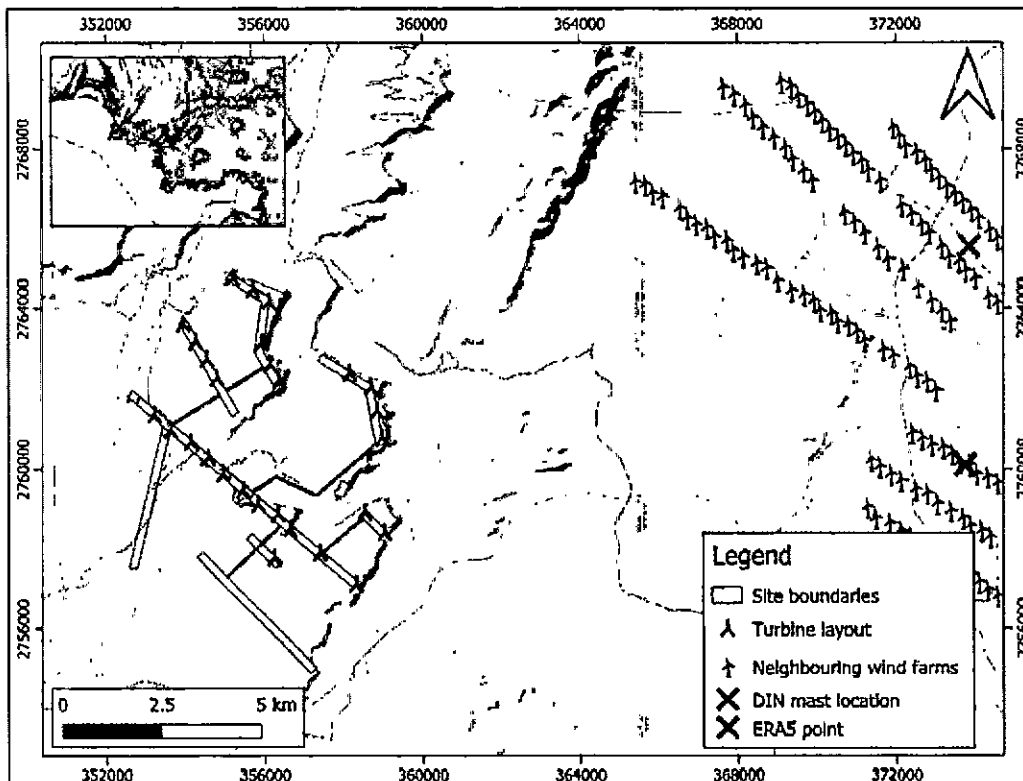
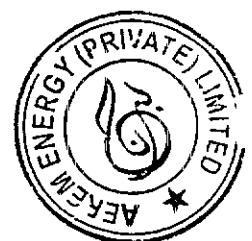


Figure 1-1 JCM wind farm site, turbine locations and wind data



2 Wind resource assessment

Aurecon performed a wind resource assessment using data from the Din Energy wind farm mast, 15 km from the proposed JCM wind farm, as no monitoring has been completed within the JCM site. The assessment presented here is considered preliminary, and a full assessment should be carried out with at least one year of measurements from a mast located within the JCM site.

The Din Energy mast is located within an existing wind farm, so the data most affected by the turbines in upwind directions has been filtered out of the dataset to provide an equivalent 'free-wind' speed. The wind data was further processed to remove invalid and inaccurate data, adjusted to long-term conditions using reanalysis modelled data, and then extrapolated to the proposed hub height.

The resulting dataset was scaled to the best-estimate wind speed at a location within the JCM site, and this "virtual mast" was used with the WAsP linear flow model and WindPRO software to determine the wind speed at the turbine locations. Energy production and wake losses were calculated by WindPRO, and other expected losses were evaluated based on industry experience.

Aurecon's assessment follows the Measnet procedure on Evaluation of Site-Specific Wind Conditions¹ to the extent possible within the limits of the available data. Aurecon's assessment is in line with best industry practice and has been developed over our 20 years of experience.

2.1 Wind data

Over two years of data from one wind monitoring mast ("DIN") was provided by the Client, and the analysis was further supported by a shorter dataset from another nearby met mast (Shafi), ERA5 reanalysis data and purchased Vortex mesoscale data.

2.1.1 Mast data

The DIN mast, which is the primary bid-compliant mast that was used for this assessment, is equipped with two anemometers at 93 m and one anemometer at 36 m, and two wind vanes, one at 89 m and one at 32 m. It also has temperature, humidity and pressure sensors at 10 m and a temperature sensor at 91 m. All height values are given above ground level (AGL)

There was no installation report accompanying the data provided, but the datafile included information on boom orientation and heights of each sensor. Aurecon has not been able to verify this information or the quality of the sensors or installation, however we understand it is utilised for the purposes of reference data under the Energy Purchase Agreement (EPA) for the DIN project and therefore should be installed in accordance with good industry practice.

The Client also provided 12 months of data from a 120 m met mast (Shafi) located 13 km southeast of the project site. While this dataset is shorter than the 24 months required by the KE RFP, the observations provided valuable insight in verifying the wind shear, turbulence intensity and wind direction parameters observed by the primary mast, and to confirm the wake-corrections applied to the DIN mast as discussed below.

2.1.2 Other reference data

ERA5 long-term reference data was used to produce a long-term extrapolation of the wind speed and direction data at hub height, and two Vortex MAST datasets were procured to confirm spatial wind observations.

A summary of the data sources is provided in below and the locations of the site data are shown in Figure 1-1 above (the ERA5 grid point used is approximately 15.5 km from the site).

¹ MEASNET Procedure: Evaluation of Site-Specific Wind Conditions, VERSION 3, Sept 2022, <https://www.measnet.com/wp-content/uploads/2022/09/Measnet-Evaluation-of-Site-Specific-Wind-Conditions-v3-1.pdf>

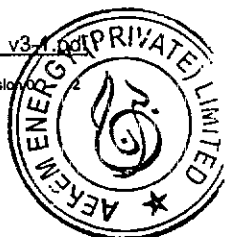


Table 2-1 Summary of data sources

Data source	Max measurement height (m)	Ground elevation (m)	Location (Lat/Long WGS84)	Location (UTM north-WGS84 Zone 42Q)	Valid data start	Valid data end	Period
DIN Mast	93	104	24.950903° 67.749228°	373,739m E 2,760,093m N	19/04/2022	31/05/2024	2.1 years
Shafi Mast	120	36	24.874451° 67.714240°	370,106m E 2,751,662m N	01/01/2017	31/12/2017	1.0 year
ERA5	100	120	25.000° 67.750°	373,856m E 2,765,529m N	01/01/2004	01/08/2024	20.6 years

Further to this wind data, the Client has also shared a number of independent third-party assessments for wind farms in the area performed for the Client, including for JCM's HAWA and JPL wind projects which are in the same wind corridor some 50 km northeast of the proposed site. These independent wind assessments have been used to support observations around climatic conditions including temperature, turbulence intensity, wind shear etc.

2.2 Data processing

The provided datafile included the scale and offset values to be applied to the raw data for each sensor, and Aurecon has assumed that the boom orientation corrections of the direction data (if required) are already accounted for in these values. Aurecon compared the wind direction to ERA5 data and other mesoscale models (Global Wind Atlas and procured Vortex data) and reviewed the other data channels to check the data appeared consistent and reasonable. Therefore, no further adjustments or calibrations were made during data processing.

The data was generally adequate, with several issues discussed below.

There is missing data for all data channels from 08/05/2022 to 31/06/2022. The direction data of the 89 m wind vane was erroneous for most of the dataset, from 01/07/2022 onwards. For the three weeks in which both direction sensors were functioning there was reasonable agreement between the 89 m and 32 m wind vane direction data, so the 32 m direction data has been used for the assessment.

The location of turbines relative to the mast was determined based on satellite imagery. The closest two turbines are approximately 120 m to the east and 170 m to the west-northwest. These turbines have a hub height of 93 m², meaning that the 93 m anemometers are affected by sheltering when the wind is coming from these directions. Turbine sheltering was flagged to a broad (70°) band of directions centred on 92° and 295°, based on the observed sheltering effects when comparing the 93m anemometers to the 36 m, which is below the rotor extent of the turbines (~57 m blade length²) and therefore relatively unaffected by turbine sheltering.

Sheltering was also observed when comparing the two 93 m anemometers at some of the edges of the turbine sheltering bands, ie one anemometer was reading significantly higher than the other. The reason for this sheltering is not known, but a further 10° band of turbine sheltering was applied between 250° - 260° and 47° - 57° to remove the effects.

Tower shading of the 93 m anemometers was observed around approximately 165° and 335°, which is offset from the nominal boom directions (170° and 350°) by 5-15°. The tower shading has been applied based on the observed patterns which resulted in a 30° band centred on 335° and 165°. Aurecon also notes that the anemometer labelled south was observed to be sheltered when the wind direction was from the south and vice versa for the northwards anemometer, meaning that the anemometers are likely mislabelled.

Data from the two 93 m anemometers was found to have discrepancies, with one sensor measuring consistently higher than the other in different directions. It was not possible to determine the more correct data in each case, and therefore the data from both sensors was averaged to create a combined 93 m wind speed data column.

² <https://www.power-technology.com/data-insights/power-plant-profile-gharo-jhimpir-wind-farm-din-energy-pakistan/>

The data recovery rate (DRR) of the combined 93 m wind speed data was 73.5%, significantly lower than the 36 m wind speed data DRR of 92.5% due to periods of turbine sheltering in which both 93 m sensors were flagged. Therefore, a synthetic 93 m dataset was generated by extrapolating from the 36 m dataset using the average shear (split by month and hour of day) observed between the 36 m and 93 m (combined) heights. The synthetic 93 m data was used to fill the gaps in the combined 93 m data.

2.3 Long-term extrapolation

The 2.1 years of site data was extrapolated to long-term using the ERA5³ long-term reference dataset. ERA5 has data available from 1991 to near-present, but only data from the year 2004 onwards was used because this is sufficient to establish the long-term mean and older data can be inconsistent over time due to changes in the sources of the data which feed the reanalysis models.

Aurecon extracted 20 years of wind speed, direction and temperature data from the nearest available grid point in the ERA5(T) (Rectangular Grid) dataset. Further details are provided in above.

The data periods of the DIN mast and ERA5 reference dataset are shown in Figure 2-1.

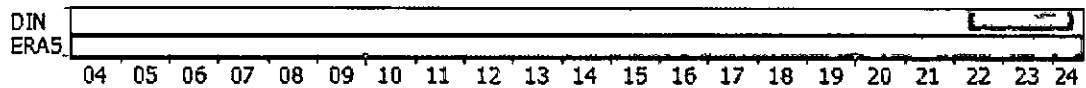


Figure 2-1 Site device data periods (2004 to 2024)

To extend the mast dataset, various correlation methods were trialled:

- LLS – Linear Least Squares (linear regression)
- TLS – Total Least Squares (linear symmetrical regression)
- VR – Variance Ratio (linear regression)
- MTS – Matrix Time Series (a matrix of wind speed ratios binned by wind speed)
- Split into time-of-day divisions and direction sectors

For hourly correlation, 24 time-of-day divisions and one direction sector had the highest R^2 for wind speed correlation. LLS algorithm had the highest R^2 by a slight margin and had the most realistic wind speed distribution.

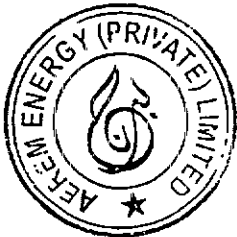
Different averaging periods of hourly, daily, 48 hourly, and monthly time steps were also tested. Correlation increases with longer averaging periods and is expected to result in the most accurate estimate of long-term wind speed, but hourly data was required for the time-varying energy calculation (see Section 3).

36 direction sectors were used for correlating direction as there was some non-linearity in the direction correlation. A cut-off wind speed of 4 m/s minimum was used for the direction correlation.

The correlation coefficients between the mast and the ERA5 datasets and resulting long-term average wind speeds for each averaging period are shown in Table 2-2 below.

Table 2-2 Correlation coefficients and long-term wind speeds for extending site dataset with reference data

Averaging period	Correlation coefficient (R^2)	Long-term average wind speed (93 m)
LLS		
Hourly	0.658	6.71 m/s
Daily	0.848	6.72 m/s
Monthly	0.862	6.74 m/s



While all correlations are above the minimum acceptable correlations following the Measnet guidelines ($R^2 \geq 0.64$), the monthly result has the highest R^2 and was used as the best-estimate. The long-term extrapolation

³ ERA5 is the fifth generation ECMWF atmospheric reanalysis of the global climate covering the period from January 1950 to present. ERA5 is produced by the Copernicus Climate Change Service (C3S) at ECMWF.

therefore resulted in a -4.0% scaling down from the measured data. The measured and long-term wind speeds for the mast are shown in Table 2-3. Aurecon notes that these wind speeds are lower than the true “free” wind speed at the mast, even after the data filtering discussed above. This is due to wake and blockage effects from the wind farm beyond the two closest turbines specifically targeted in the data processing; the mast is located within the fifth row of turbines in the predominant direction i.e. there are 4 rows of turbines having cumulative slowdown effects on the wind speed before it reaches the mast.

Table 2-3 Long-term extrapolation results with ERA5

Parameter	Value
Raw measurement period	2.1 years
Measured DIN mast wind speed (at 93 m)	7.02 m/s
Long-term extended wind speed (at 93 m)	6.74 m/s

2.4 Hub-height extrapolation

The DIN mast long-term extended data was extrapolated up to the proposed hub heights of 110 m and 105 m using a lookup table of shear exponents split by hour and month. The average measured shear exponent is 0.126 (wind speeds above 4 m/s at 93 m), with strong diurnal variation as shown in Figure 2-2 below.

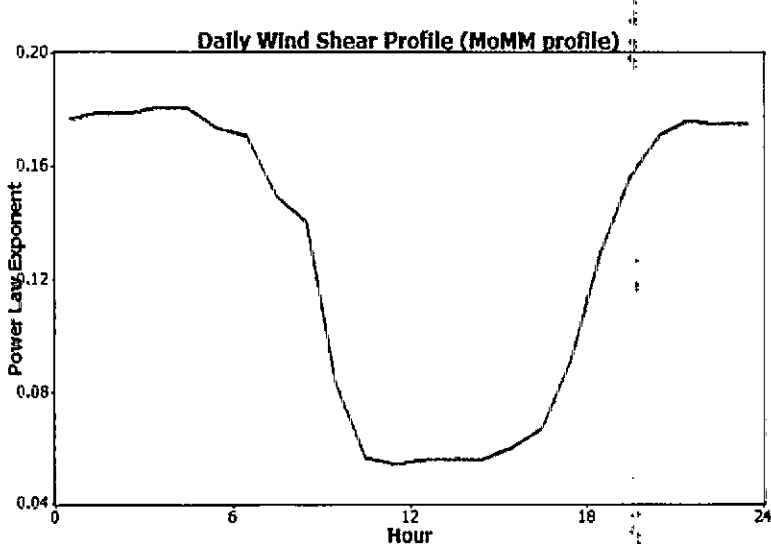
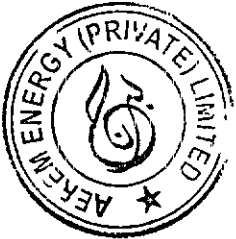


Figure 2-2 DIN mast shear exponent

However, Aurecon notes that the wind speeds recorded at 93 m will be lower than the “free” wind speed even after the data filtering performed due to wake and blockage effects, as discussed above. Therefore, Aurecon has estimated an uplift of the wind speed at 93 m and the wind shear exponent based on a combination of the observations from the Shafi mast data, which is in free-wind for the prevailing westerly wind, our experience and other confirmed observations in the region relative to mesoscale modelling observations including the Vortex data. Similarly, based on these other observations, we have increased the shear exponents used in the extrapolation to correct for free-wind. The resulting best-estimate average shear exponent is 0.16.

No variation of direction with height was observed, so the 32 m wind direction was used for the hub height dataset. Temperature was extrapolated from the measured temperature data at 91 m, using a constant gradient of -0.65°C per 100m.



2.5 Virtual mast

Using the long-term extrapolated DIN mast dataset as a basis, a synthesised mast dataset was created for the energy assessment at a virtual mast location⁴ in the JCM site. This location was selected as it is relatively central to the turbine layouts (see Figure 3-1 below), and in an area of flat ground in which the DIN mast data is most likely to be representative (i.e. away from the escarpments where wind speed up effects and turbulence are less predictable).

The DIN mast data was scaled to the best-estimate wind speed at the JCM site virtual mast location of 7.8m/s at 93 m, 7.9m/s at 105 m and 8.0m/s at 110 m. This estimate is based on a combination of Vortex FDC, Global Wind Atlas, and WASP linear flow modelling between the DIN mast, Shafi mast and JCM virtual mast locations.

The long-term hub height wind speed distribution for the virtual mast is shown in Figure 2-3 with the best-fit Weibull distributions also shown.

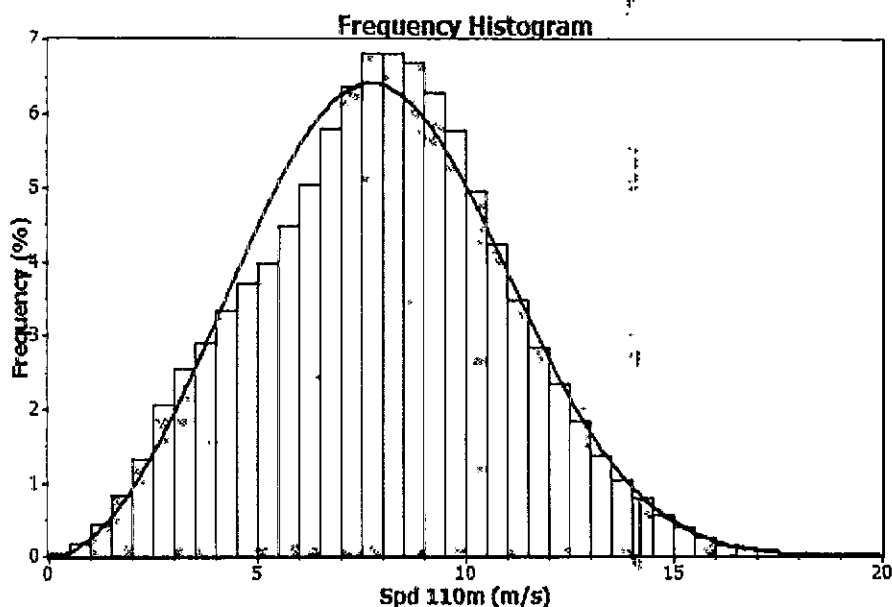
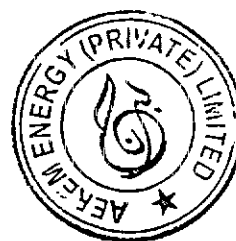


Figure 2-3 Wind speed distribution for JCM virtual mast

For the virtual mast, no adjustment was made to the long-term DIN mast direction as no significant change in direction is expected between the two locations based on mesoscale modelling and other observations in the area. The wind rose for the long-term virtual mast dataset is shown in Figure 2-4, binned by wind speed. Energy is generated mainly in the range 5–20 m/s. The site has a predominant wind direction of WSW, centred on about 242°, and minor secondary predominant wind direction of NNE (centred on about 20°).



⁴ Lat/long: 24.964568°, 67.554608°

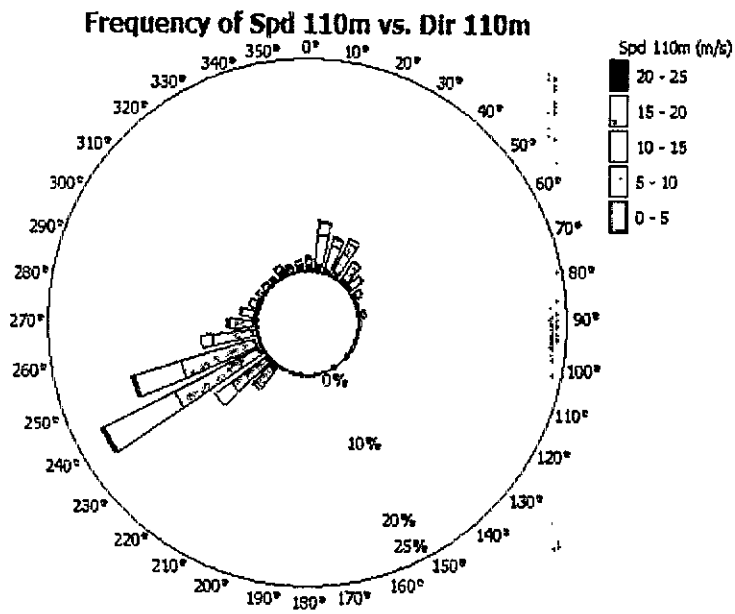
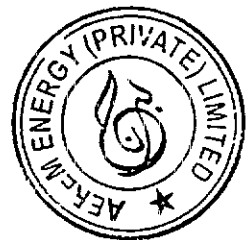


Figure 2-4 Wind rose for JCM virtual mast



3 Energy production

The wind farm annual energy production (AEP) has been assessed by performing flow modelling to determine the variation of wind resource across the site, power curve adjustment for air density, application of the wind resource to the power curve to give gross energy, assessment of wake loss, and application of a schedule of other losses to determine the net AEP. A time-varying calculation has been used with the long-term extended virtual mast dataset because this uses the actual wind speed distribution and is therefore more accurate than a wind statistic (Weibull distribution) calculation.

3.1 Inputs

3.1.1 Layout

Aurecon has used a layout developed by the Client with minor adjustments made by Aurecon, consisting of 22x 6.2-6.25MW turbines. The layout is shown in Figure 3-1 below, with distance ellipses of 8x2.5 rotor diameter (~182 m) in the predominant direction of 242°. The wind resource map at 110 m using the virtual mast is also shown. Coordinates are provided in Appendix A.

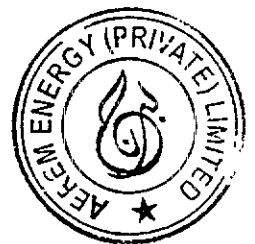
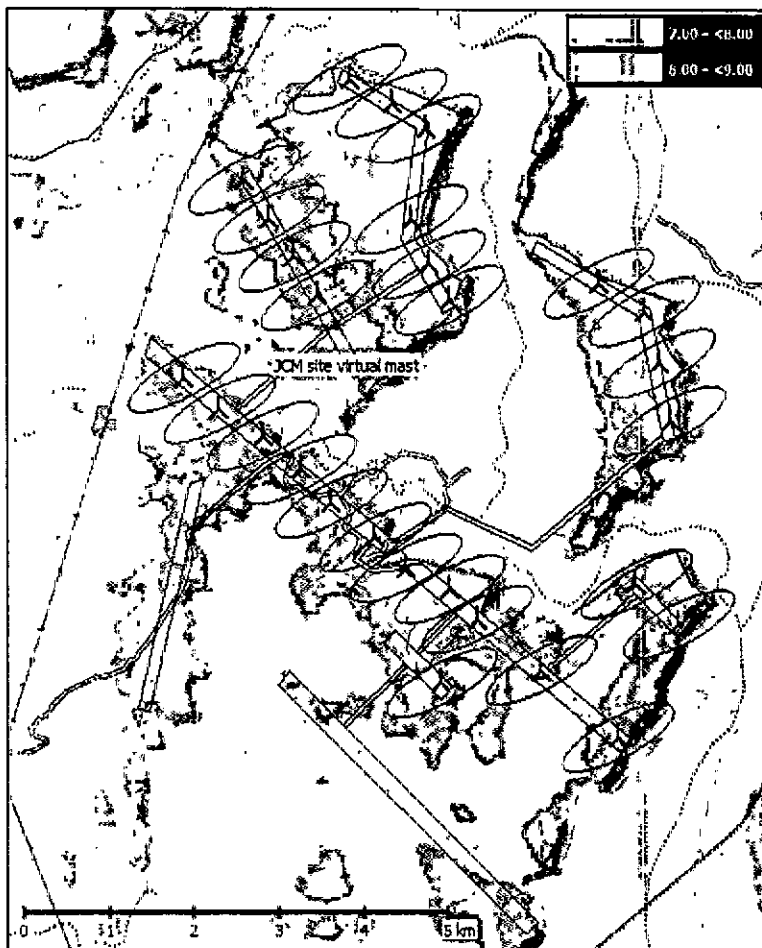


Figure 3-1 28x turbines layout with 110m resource map and 8x2.5 rotor diameter distance circles.

Existing turbines in the nearby wind farms were also included in order to model blockage effects (wind speed slowdown in front of a large array of turbines). The JCM site is upwind of all the other wind farms, but blockage will cause a minor decrease in wind speed before it reaches the site. The existing turbine locations were determined from satellite imagery, and the turbine models and hub heights were determined from online information (where possible) or otherwise estimated.

3.1.2 Turbine performance

There are two turbine options being considered: Envision EN182/6.25MW and Goldwind GWH182-6.2MW. The site-specific turbine power and thrust curves were obtained from the Client^{5,6}, provided for an air density of 1.225 kg/m³ as well as 1.150 kg/m³ (Envision) and 1.140 kg/m³ (Goldwind). The 1.15 and 1.14 kg/m³ curves were used as this is closer to the expected site hub height air density (see Section 3.1.3 below). The turbine power curves at standard 1.225 kg/m³ air density are shown in Figure 3-2 below.

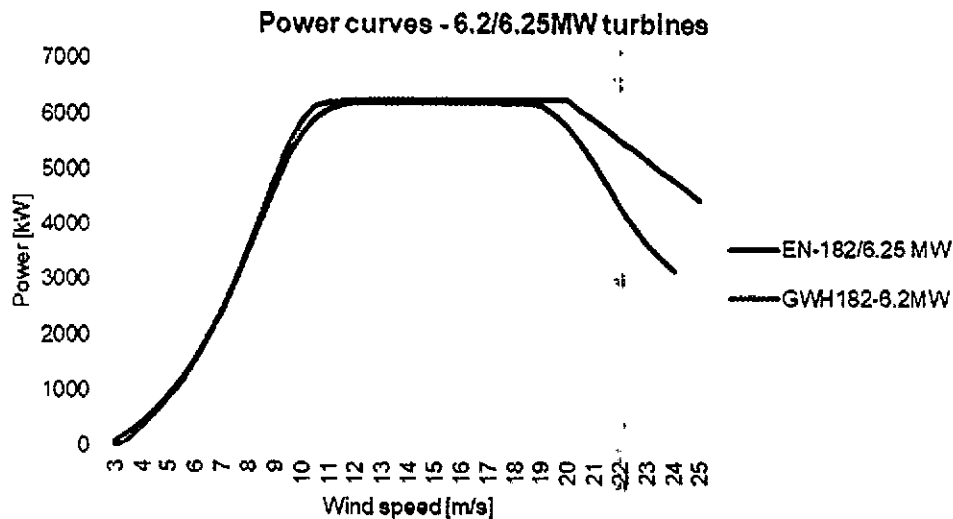


Figure 3-2 Turbine power curves

The turbines derate at high temperatures (above 42-42.5°C)^{7,8}, but hub height temperatures in the extended DIN mast / virtual mast data are not above 42°C and therefore no temperature derating is expected.

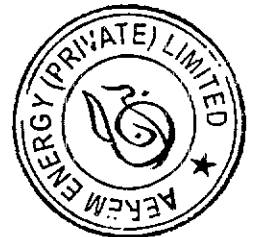
3.1.3 Air density

The power curve was adjusted to the average air density of each turbine hub height, with the average air density at hub height at turbine locations assessed to be approximately 1.14 kg/m³. The site air density was determined from the site elevation and the average air temperature measurements extrapolated to long-term.

3.2 Wind flow modelling

Flow modelling was performed from the virtual mast location with the WAsP linear flow model. Linear flow modelling is expected to be adequate for this preliminary assessment and this site as the terrain is generally flat.

Flow modelling was performed with 36 direction sectors to avoid the inaccuracies (particularly wake) that occur with fewer sectors.



⁵ 14_SSPPC-00602001_A Pakistan Project SSPPC for EN182-6.25.pdf

⁶ GWH-12SS.b0101_GWH182-6.2MW Site Specific Calculated Power Curve and Thrust Coefficient (Rated Power 6.2MW).pdf, GWH-08SS.0080_GWH182-6.2MW Power Curve and Thrust Coefficient.pdf

⁷ 6.2_PMD-0001737 A_Technical Spec for the Power Derating Characteristics of Envision EN182-6.25 WTG (1).pdf

⁸ GWH182-7.5MW Temperature Operation Curve Specification for Pakistan KE Project_A.pdf, Aurecon has assumed the 6.2MW turbine starts derating at the same temperature as the 7.5MW model.

10 m terrain contour maps for the surrounding area were downloaded from Copernicus DEM GLO-30⁹ online source. A roughness map was generated automatically in WindPRO from the CGLS-LC100 land cover database¹⁰. Most of the area was assigned a roughness class of:

- 0.9: Open farmland (smooth hills) with no clusters of trees and only scattered buildings
- 1.4: Farmland that is generally unobstructed with some small clusters of trees or bushes and some buildings
- 1.7: Farmland that is generally unobstructed with more clusters of trees or bushes and some buildings

This is consistent with what is known of the site and can be seen from satellite imagery, and is therefore expected to be sufficient for this preliminary assessment.

3.3 Gross energy

A time-varying calculation has been performed, which uses the long-term timeseries of wind speed, direction and temperature to calculate air density, energy generation and wake loss in each timestep. The timeseries result is then averaged to an annual result. The wind speed at each turbine location is calculated using WASP linear flow modelling as discussed above.

3.4 Wake loss

Wake losses were modelled in WindPRO using the N.O. Jensen PARK2 2018 model. Other wake models including Eddy Viscosity and WakeBlaster could be investigated in future. The PARK2 model is one of the industry-standard options and expected to be adequate for this preliminary assessment.

The Park2 model calculates the wake decay constant (WDC) from turbulence intensity (TI) by multiplying TI by a factor. The standard factor provided in the WindPRO software is 0.8 for wind farms with TI below 0.10. At the site the ambient turbulent intensity was assessed using the DIN mast, averaged over a wind speed range of 5-15 m/s. This corresponds to a value of 0.102 at 93 m (averaged between the two 93 m anemometers), however Aurecon notes that the turbulence will be artificially high due to wake effects from the mast being within a wind farm as previously discussed. Additionally, shear decreases as height increases and therefore the hub height turbulence will be lower than at 93 m, but the measured shear profile of TI will also be unreliable as the 36m TI is not significantly affected by the wind farm. Aurecon has therefore estimated a value of **0.087** for TI at 110m based on the observed 100 m and 120 m TI at the Shafi mast. The TI is not expected to be significantly different at 105 m and so only the 110 m value has been used in this assessment. The representative TI corresponds to IEC category C.

The wake losses are low due to the small number of the turbines and large spacing between them in the predominant direction. The wake across the wind farm is shown in Figure 3-3 below (the diameter of the circles is proportional to the wake loss).



⁹ The Copernicus Digital Elevation Model (DEM) is a DEM with global coverage released from the European Space Agency (ESA). It is available at 90m and 30m resolution; the 30m resolution data has been used

¹⁰ The CGLS-LC100 is a dynamic land cover map at 100m resolution and a part of the product portfolio for the Copernicus Global Land Service (CGLS). It has the target to deliver a yearly, global land cover map which primarily will be based on PROBA-V – and later to be merged and replaced by Sentinel-2 satellite sources. As of 2020, a dataset with near global coverage has been released with a 100m grid resolution. The map represents 2015 land cover and was derived from PROBA-V time series combined with local land cover training datasets as well as ancillary datasets.

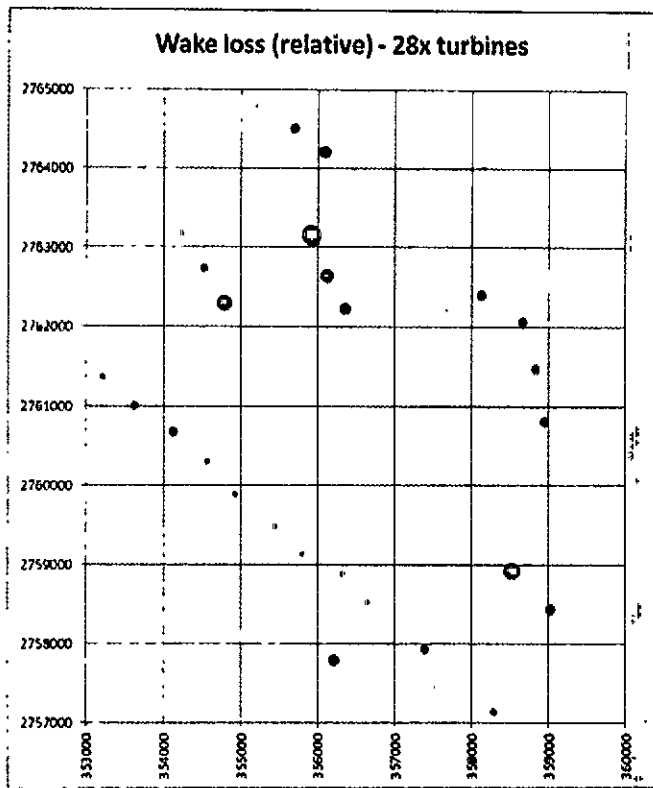


Figure 3-3 Wake loss map (UTM (north)-WGS84 Zone:42 coordinates)

3.5 Other losses

A schedule of losses was applied to the waked gross energy to calculate the net energy available at the point of connection to the local network.

Some losses will vary during the lifetime of the proposed wind farm but have been simplified to long-term averages. Other losses will vary from one turbine location to another but have been simplified to an average for the proposed wind farm. The losses are shown in Table 3-1. The availability losses are based on advice from the Client and the rest are based on Aurecon's industry experience. The Envision turbine scenarios have a slightly higher loss for turbine performance as the provided power curves are more aggressive than Goldwind in the "shoulder" of the curve i.e. just before reaching rated power, as shown in Figure 3-2 above. Aurecon considers that the Goldwind curves are more likely to be realistic and has applied a higher loss for the Envision turbines.

Table 3-1 Breakdown of losses (excl. wake)

Loss	Envision	Goldwind
Availability - total	2.64%	2.64%
Availability - turbines (technical/warranty)	2.00%	2.00%
Availability - turbines (owner/other)	0.60%	0.60%
Availability - electrical plant	0.05%	0.05%
Availability - grid	0.00%	0.00%
Turbine performance - total	3.46%	2.97%
Turbine performance - power curve under standard conditions	1.50%	1.00%
Turbine performance - power curve under site conditions	1.00%	1.00%
Turbine performance - high wind hysteresis	0.00%	0.00%
Turbine performance - general degradation & soiling	1.00%	1.00%
Turbine performance - icing	0.00%	0.00%
Environment - total	0.00%	0.00%
Environment - extreme weather shutdown	0.00%	0.00%



Loss	Envision	Goldwind
Environment - extreme temperature	0.00%	0.00%
Environment - site access and force majeure	0.00%	0.00%
Environment - change in surroundings	0.00%	0.00%
Electrical - total	3.28%	3.28%
Electrical - turbines to substation	2.50%	2.50%
Electrical - substation to grid metering point	0.50%	0.50%
Electrical - internal facility consumption	0.30%	0.30%
Total production losses (excluding wake)	9.09%	8.63%



4 Uncertainty and variability

The uncertainty has been evaluated for each step of the assessment of energy production. The uncertainty in the energy production has been assessed by assuming that all input uncertainties have a normal (Gaussian) distribution and are independent of each other, which allows the uncertainties to be combined together to give an overall uncertainty in the energy production. The mean of the normal distribution is the best-estimate (P50) value, and the uncertainty values are given as standard uncertainty, i.e. the standard deviation of the distribution of the uncertainty. The uncertainty distributions are assumed to be symmetrical. Independent uncertainties are combined as the square root of the sum of the squares.

The assumptions on the distribution of the uncertainties are reasonable if the uncertainty is assessed for downside risk and to moderate levels of probability, i.e. Aurecon Advisory considers them to be more appropriate for P50 to P95 results. At higher levels of exceedance probability, such as P99 (extreme downside risk), the assumption that input uncertainties have normal distributions may not be appropriate and so the result may be inaccurate.

The relationship between the uncertainty in an input parameter (which may be wind speed or another parameter) and the uncertainty in the energy production is described by the energy sensitivity factor. The energy sensitivity factor for wind speed is a value that can be calculated for each turbine location. It is inversely related to average wind speed and is also dependent on the distribution of wind speed and the turbine power curve. The energy sensitivity factor for each scenario is noted in. The energy sensitivity factors for inputs other than wind speed have also been determined, through calculations or estimates as appropriate.

The resulting uncertainties in energy production are shown in Table 4-1. Also shown are the probability of exceedance (P) results for various return periods, and the uncertainty in wind speed (input uncertainty).

Table 4-1 Uncertainty and variability breakdown.

Turbine model		EN102625	EN102625	GWH10262
Hub height [m]		105	110	110
SFW (Wind speed sensitivity factor)		1.46	1.44	1.43
	Wind speed	Energy	Energy	Energy
Wind speed measurement	3.0%	4.4%	4.4%	4.4%
Long-term prediction	4.1%	5.9%	5.9%	5.8%
Wind flow modelling	7.4%	10.8%	10.7%	10.6%
Total uncertainty of wind resource	9.0%	13.1%	13.0%	12.9%
Power curve	-	3.2%	3.2%	2.8%
Loss factors	-	3.5%	3.5%	3.5%
Other uncertainty considerations	-	1.4%	1.4%	1.4%
Total uncertainty of energy production		14.0%	13.9%	13.7%
Wind speed variability (1 year)	3.0%	4.4%	4.3%	4.3%
Resource and production variability (1 year)	-	2.0%	2.0%	2.0%
Total variability (25 year)	-	1.0%	1.0%	0.9%
Total variability (10 year)	-	1.5%	1.5%	1.5%
Total variability (1 year)	-	4.8%	4.8%	4.7%
Total uncertainty & variability (25 year)	-	14.1%	13.9%	13.8%
Total uncertainty & variability (10 year)	-	14.1%	14.0%	13.8%
Total uncertainty & variability (1 year)	-	14.8%	14.7%	14.5%

The higher power turbine options have higher wind speed sensitivity factors and therefore higher uncertainty due to reaching rated power at higher wind speeds. The Envision turbines have a higher power curve uncertainty due to proposing a more aggressive power curve (discussed in Section 3.5 above). The 105 m hub height Envision scenarios have higher wind speed sensitivity factors due to having a lower wind speed and therefore lower frequency of wind in the rated power section of the turbine power curve.

5 Results

Aurecon has summarised the key results and these are presented below in Table 5-1 and Table 5-2. Detailed results are shown in Appendix A.

Table 5-1 Key wind farm energy modelling results

Turbine model	EN-182/6.25	EN-182/6.25	GWH182-6.2
Rotor diameter [m]	181	181	183
Hub height [m]	105.0	110.0	110.0
Rated power [MW]	6.25	6.25	6.20
Turbine quantity	28	28	28
Total rated power [MW]	175.0	175.0	173.6
Mean wind speed [m/s]	8.3	8.4	8.4
Average air density [kg/m ³]	1.14	1.14	1.14
Gross AEP [GWh]	880.4	888.7	880.0
- Wake loss	4.41%	4.37%	4.79%
Waked AEP [GWh]	841.5	849.9	837.9
- Other losses	9.09%	9.09%	8.63%
P50 net AEP [GWh]	765.1	772.6	765.6
P50 net capacity factor	49.9%	50.4%	50.3%

Table 5-2 Uncertainty and probability of exceedance results

Turbine model	EN-182/6.25	EN-182/6.25	GWH182-6.2
Hub height [m]	105	110	110
P50 net AEP [GWh]	765.1	772.6	765.6
P50 net capacity factor	49.9%	50.4%	50.3%
Uncertainty	14.0%	13.9%	13.7%
Inter-annual variability	4.8%	4.8%	4.7%
Uncertainty & variability (25-year)	14.1%	13.9%	13.8%
P75 10 year AEP [GWh]	692.3	699.9	694.3
P90 25 year AEP [GWh]	627.2	634.9	630.6
P90 10 year AEP [GWh]	626.7	634.5	630.1
P90 1 year AEP [GWh]	619.7	627.4	623.1
P99 1 year AEP [GWh]	501.1	509.0	506.9
P90 (10 year) capacity factor	40.9%	41.4%	41.4%
P90 (1 year) capacity factor	40.4%	40.9%	41.0%



Appendix A - Detailed results

Table A-1 Detailed results – 110m hub height

Turbine number	Easting [m]	Northing [m]	Elevation [m]	Wind speed [m/s]	Envision EN192-6.25 = 110m HH		Goldwind GWH192-6.2	
					Wake Loss	Net AEP [MWh/a]	Wake Loss	Net AEP [MWh/a]
1	353212	2761370	216	8.19	3.1%	27,064	3.4%	26,858
2	353623	2761005	220	8.17	4.3%	26,615	4.8%	26,379
3	354130	2760682	210	8.17	4.5%	26,590	4.9%	26,348
4	354925	2759891	175	8.22	3.1%	27,175	3.4%	26,971
5	355443	2759490	180	8.2	2.8%	27,196	3.1%	26,997
6	355801	2759134	194	8.43	2.6%	28,385	2.8%	28,187
7	356316	2758881	215	8.6	2.8%	29,079	3.0%	28,869
8	356642	2758526	210	8.69	3.1%	29,372	3.3%	29,156
9	356206	2757791	193	8.32	5.2%	27,135	5.7%	26,866
10	357388	2757930	170	8.08	4.4%	26,189	4.8%	25,967
11	354573	2760297	190	8.16	3.5%	26,804	3.8%	26,591
12	358287	2757142	153	8.15	3.6%	26,813	3.9%	26,605
13	359023	2758440	161	8.14	5.1%	26,347	5.6%	26,102
14	358525	2758918	170	8.15	7.8%	25,609	8.6%	25,263
15	358945	2760811	199	8.64	4.8%	28,650	5.3%	28,365
16	358828	2761470	204	8.68	4.5%	28,902	4.9%	28,632
17	358654	2762067	190	8.42	4.6%	27,741	5.1%	27,481
18	358120	2762406	190	8.63	4.7%	28,599	5.1%	28,324
19	356352	2762227	250	8.84	5.3%	29,335	5.8%	29,030
20	356115	2762638	243	8.85	6.3%	28,974	7.0%	28,635
21	355912	2763160	250	8.68	8.9%	27,418	9.9%	26,996
22	356088	2764211	266	8.57	5.8%	28,044	6.3%	27,738
23	355690	2764510	260	8.68	4.6%	28,811	5.1%	28,525
24	355196	2764797	250	8.84	1.7%	30,344	1.9%	30,138
25	353944	2763639	235	8.15	1.1%	27,338	1.2%	27,186
26	354233	2763182	239	8.1	2.6%	26,699	2.9%	26,513
27	354526	2762746	230	8.05	4.0%	26,038	4.4%	25,816
28	354786	2762294	230	8.09	7.3%	25,381	8.0%	25,058
Total/Average				8.39	4.4%	772,646	4.8%	765,595

* UTM (north)-WGS84 Zone:42



Table A-2 Detailed results – Envision EN182-6.25, 105m hub height

Turbine number	Easting [m]	Northing [m]	Elevation [m]	Wind speed [m/s]	Wake loss	Net AEP [MWh/a]
1	353212	2761370	216	8.14	3.1%	26,769
2	353623	2761005	220	8.12	4.4%	26,300
3	354130	2760682	210	8.12	4.5%	26,286
4	354925	2759891	175	8.16	3.1%	26,887
5	355443	2759490	180	8.15	2.8%	26,896
6	355801	2759134	194	8.39	2.6%	28,140
7	356316	2758881	215	8.55	2.8%	28,837
8	356642	2758526	210	8.65	3.1%	29,184
9	356206	2757791	193	8.28	5.2%	26,867
10	357388	2757930	170	8.02	4.4%	25,868
11	354573	2760297	190	8.11	3.5%	26,501
12	358287	2757142	153	8.10	3.7%	26,502
13	359023	2758440	161	8.09	5.2%	26,048
14	358525	2758918	170	8.09	8.0%	25,282
15	358945	2760811	199	8.59	4.8%	28,422
16	358828	2761470	204	8.63	4.5%	28,667
17	358654	2762067	190	8.37	4.7%	27,471
18	358120	2762406	190	8.59	4.7%	28,410
19	356352	2762227	250	8.80	5.3%	29,144
20	356115	2762638	243	8.81	6.4%	28,757
21	355912	2763160	250	8.63	9.1%	27,164
22	356088	2764211	266	8.52	5.9%	27,765
23	355690	2764510	260	8.63	4.7%	28,563
24	355196	2764797	250	8.81	1.8%	30,169
25	353944	2763639	235	8.09	1.1%	27,029
26	354233	2763182	239	8.04	2.6%	26,379
27	354526	2762746	230	7.99	4.1%	25,706
28	354786	2762294	230	8.03	7.4%	25,046
Total/Average				8.34	4.4%	765,059

* UTM (north)-WGS84 Zone:42

Appendix B – WindPRO Results Reports

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aurecon



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Pakistan

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Calculated:
30/08/2024 8:42 am/4.0.424

PARK - Main Result

Calculation: 2024.08.21, 28x 180mRD Layout, CW edit rev2 - All WFs EN182/6.25MW, 105HH

Setup

AEP scaled to a full year based on number of samples
Scaling factor from 20.6 years to 1 year: 0.049

Calculation performed in UTM (north)-WGS84 Zone: 42
At the site centre the difference between grid north and true north is: -0.6°

Wake

Wake Model: N.O. Jensen (RISO/EMD) Park 2 2018

Wake decay constant

Terrain type: Wake decay constant
User defined: 0.065 Hub height independent

Blockage

Blockage Model: Self similar model (Forsting: 2017)

Gamma (?) Alpha (a) Beta (b) Lambda (?) Eta (?)
1.100 0.889 1.414 0.587 1.320

Note: When wake reductions are mentioned in this report, it also includes reduction from blockage.

Reference WTG: Envision EN-182/6.25 6250 181.1 101 hub: 105.0 m (TOT: 195.6 m) (271)

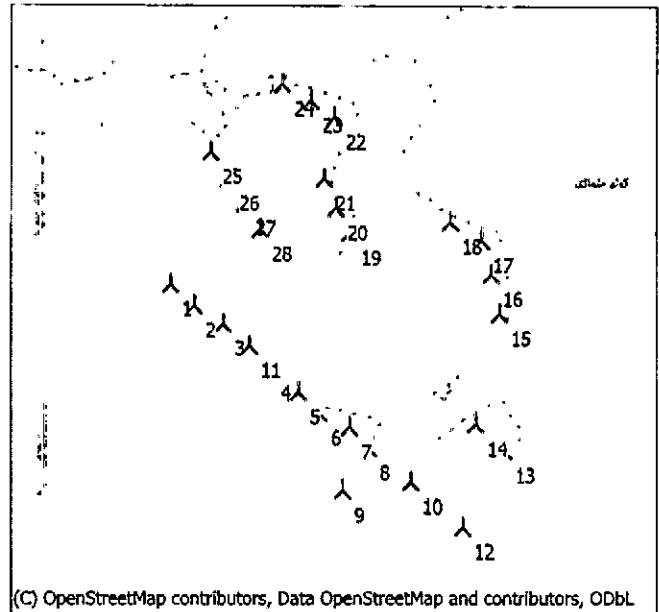
Scaler/wind data

Name: EMD Default Meso Scaler
Terrain scaling: Measured Data Scaling (Neutral stability / Raw flow)
Micro terrain flow model: WASP IZ2 from Site Data
Used period: 1/01/2004 5:00:00 am - 1/08/2024 4:00:00 am
Meteo object(s): JCM site virtual mast - DIN, 90.00m - E Synth
Displacement height: Omnidirectional from objects
WASP version: WASP 12 Version 12.08.0032

Power correction (All new WTGs)

Power curve correction (adjusted IEC method, improved to match turbine control)

	Min	Max	Avg	Corr.	Neg. corr.	Pos. corr.
				[%]	[%]	[%]
Air density						
JCM site virtual mast - DIN - 110.00 m	[°C]	8.4	41.3	26.5		
From air density settings	[hPa]	968.9	985.3	977.6		
Resulting air density	[kg/m³]	1.081	1.212	1.137		
Relative to 15°C at sea level	[%]	88.2	98.9	92.8	-0.6	-0.7



^ New WTG

Calculated Annual Energy for Wind Farm

WTG combination	Result PARK [MWh/y]	GROSS (no loss) Free WTGs [MWh/y]	Wake loss [%]	Specific results*)		Full load hours [Hours/year]	Wind speed	
				Capacity factor [%]	Mean WTG result [MWh/y]		free [m/s]	wake reduced [m/s]
Wind farm	841,530.9	880,383.9	4.4	54.9	30,054.7	4,809	8.3	8.1

*) Based on wake reduced results and any curtailments.

Calculated Annual Energy for each of 28 new WTGs with total 175.0 MW rated power

WTG type							Power curve		Annual Energy		Wind speed	
Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Creator	Name	Result [MWh/y]	Wake loss [%]	free [m/s]	reduced [m/s]	
1	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,444.2	3.1	8.14	8.00
2	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	28,929.3	4.4	8.12	7.92
3	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	28,913.0	4.5	8.12	7.91
4	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,574.7	3.1	8.16	8.00
5	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,584.9	2.8	8.15	8.00
6	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	30,952.5	2.6	8.39	8.24
7	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	31,719.1	2.8	8.55	8.40
8	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	32,101.6	3.1	8.65	8.48
9	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,552.3	5.2	8.28	8.02
10	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	28,453.6	4.4	8.02	7.82
11	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,150.3	3.5	8.11	7.93
12	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,151.3	3.7	8.10	7.93
13	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	28,652.1	5.2	8.09	7.86
14	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	27,808.6	8.0	8.09	7.75
15	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	31,263.3	4.8	8.59	8.34
16	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	31,532.5	4.5	8.63	8.39
17	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	30,216.8	4.7	8.37	8.14
18	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	31,250.1	4.7	8.59	8.36
19	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	32,056.6	5.3	8.80	8.50
20	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	31,631.0	6.4	8.81	8.45
21	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,879.3	9.1	8.63	8.17
22	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	30,540.5	5.9	8.52	8.23
23	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	31,418.1	4.7	8.63	8.38

To be continued on next page...

*) Included in wake losses is influence from 839 WTG(s) in the neighborhood, which has status as "Reference WTGs", see separate report to identify these.



Project:
Pakistan

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Calculated:
30/08/2024 8:42 am/4.0.424

PARK - Main Result

Calculation: 2024.08.21, 28x 180mRD Layout, CW edit rev2 - All WFs - EN182/6.25MW, 105HH

...continued from previous page

WTG type							Power curve		Annual Energy		Wind speed	
Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]		Creator	Name	Result [MWh/y]	Wake loss [%]	free [m/s]	reduced [m/s]
24	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	33,184.3	1.8	8.81	8.71
25	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,730.7	1.1	8.09	8.03
26	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,015.5	2.6	8.04	7.91
27	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	28,275.3	4.1	7.99	7.79
28	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	105.0	USER	SSPC - Pakistan, 1.15 kg/m3	27,549.3	7.4	8.03	7.69

Annual Energy result includes shown losses. Additional losses and uncertainty must be considered for an investment decision.

WTG siting

UTM (north)-WGS84 Zone: 42				Calculation period	
Easting	Northing	Z	Row data/Description	Start	End
		[m]			
1 New	353,212	2,761,370	216.4 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (271)	1/01/2004	1/08/2024
2 New	353,623	2,761,005	220.0 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (272)	1/01/2004	1/08/2024
3 New	354,130	2,760,682	210.0 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (273)	1/01/2004	1/08/2024
4 New	354,925	2,759,891	175.4 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (274)	1/01/2004	1/08/2024
5 New	355,443	2,759,490	180.0 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (275)	1/01/2004	1/08/2024
6 New	355,801	2,759,134	193.6 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (276)	1/01/2004	1/08/2024
7 New	356,316	2,758,881	215.2 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (277)	1/01/2004	1/08/2024
8 New	356,642	2,758,526	210.0 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (278)	1/01/2004	1/08/2024
9 New	356,206	2,757,791	192.6 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (279)	1/01/2004	1/08/2024
10 New	357,388	2,757,930	170.0 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (280)	1/01/2004	1/08/2024
11 New	354,573	2,760,297	190.0 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (281)	1/01/2004	1/08/2024
12 New	358,287	2,757,142	153.4 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (282)	1/01/2004	1/08/2024
13 New	359,023	2,758,440	161.4 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (283)	1/01/2004	1/08/2024
14 New	358,525	2,758,918	170.0 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (284)	1/01/2004	1/08/2024
15 New	358,945	2,760,811	199.3 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (285)	1/01/2004	1/08/2024
16 New	358,828	2,761,470	204.2 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (286)	1/01/2004	1/08/2024
17 New	358,654	2,762,067	190.0 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (287)	1/01/2004	1/08/2024
18 New	358,120	2,762,406	189.7 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (288)	1/01/2004	1/08/2024
19 New	356,352	2,762,227	250.0 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (289)	1/01/2004	1/08/2024
20 New	356,115	2,762,638	242.9 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (290)	1/01/2004	1/08/2024
21 New	355,912	2,763,160	250.0 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (291)	1/01/2004	1/08/2024
22 New	356,088	2,764,211	265.9 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (292)	1/01/2004	1/08/2024
23 New	355,690	2,764,510	260.0 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (293)	1/01/2004	1/08/2024
24 New	355,196	2,764,797	250.0 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (294)	1/01/2004	1/08/2024
25 New	353,944	2,763,639	235.3 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (295)	1/01/2004	1/08/2024
26 New	354,233	2,763,182	238.6 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (296)	1/01/2004	1/08/2024
27 New	354,526	2,762,746	230.0 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (297)	1/01/2004	1/08/2024
28 New	354,786	2,762,294	230.0 Envision EN-182/6.25 6250 181.1 !O! hub: 105.0 m (TOT: 195.6 m) (298)	1/01/2004	1/08/2024



Project:
Pakistan

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Calculated:
23/08/2024 10:28 am/4.0.424

PARK - Main Result

Calculation: 2024.08.21, 28x 180mRD Layout, CW edit rev 2 - All WFs - EN182/6.25MW

Setup

AEP scaled to a full year based on number of samples
Scaling factor from 20.6 years to 1 year: 0.049

Calculation performed in UTM (north)-WGS84 Zone: 42
At the site centre the difference between grid north and true north is: -0.6°

Wake

Wake Model: N.O. Jensen (RISO/EMD) Park 2 2018

Wake decay constant

Terrain type: Wake decay constant

User defined: 0.065 Hub height independent

Blockage

Blockage Model: Self similar model (Forsting: 2017)

Gamma (?) Alpha (a) Beta (b) Lambda (?) Eta (?)

1.100 0.889 1.414 0.587 1.320

Note: When wake reductions are mentioned in this report, it also includes reduction from blockage.

Reference WTG: Envision EN-182/6.25 6250 181.1 101 hub: 110.0 m (TOT: 200.6 m) (271)

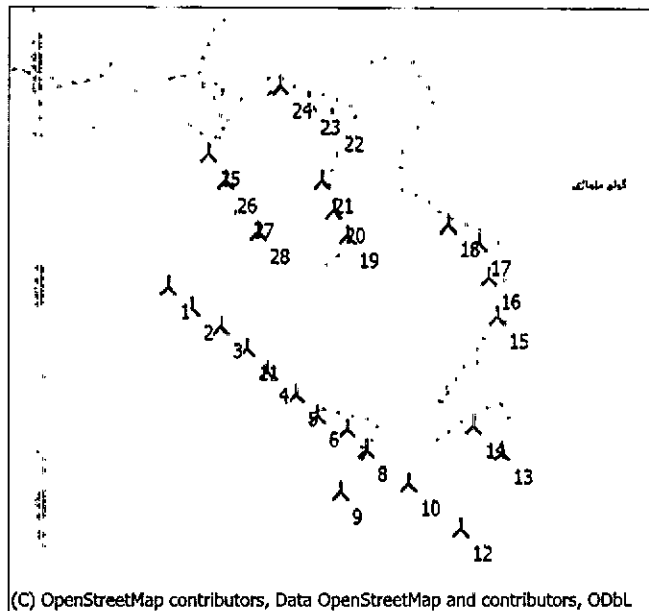
Scaler/wind data

Name: EMD Default Meso Scaler
Terrain scaling: Measured Data Scaling (Neutral stability / Raw flow)
Micro terrain flow model: WASP 182 from Site Data
Used period: 1/01/2004 5:00:00 am - 1/08/2024 4:00:00 am
Meteo object(s): JCM site virtual mast - DIN, 110.00m -
Displacement height: Omnidirectional from objects
WASP version: WASP 12 Version 12.08.0032

Power correction (All new WTGs)

Power curve correction (adjusted IEC method, improved to match turbine control)

	Min	Max	Avg	Corr. (%)	Neg. corr. (%)	Pos. corr. (%)
Air density						
JCM site virtual mast - DIN - 110.00 m	[°C]	8.4	41.3	26.5		
From air density settings	[hPa]	968.3	984.7	977.0		
Resulting air density	[kg/m³]	1.080	1.211	1.136		
Relative to 15°C at sea level	[%]	88.2	98.9	92.7	-0.7	-0.8 0.1



^ New WTG

Calculated Annual Energy for Wind Farm

WTG combination	Result [MWh/y]	GROSS (no loss) Free WTGs [MWh/y]	Wake loss [%]	Specific results(x)		Full load hours [Hours/year]	Wind speed	
				Capacity factor [%]	Mean WTG result [MWh/y]		free [m/s]	wake reduced [m/s]
Wind farm	849,876.6	888,682.3	4.4	55.4	30,352.7	4,856	8.4	8.2

* Based on wake reduced results and any curtailments.

Calculated Annual Energy for each of 28 new WTGs with total 175.0 MW rated power

WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Power curve		Annual Energy		Wind speed		
Valid	Manufact.	Type-generator				Creator	Name	Result [MWh/y]	Wake loss [%]	free [m/s]	reduced [m/s]	
1	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,768.9	3.1	8.19	8.05
2	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,275.5	4.3	8.17	7.97
3	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,247.6	4.5	8.17	7.97
4	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,891.8	3.1	8.22	8.05
5	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,914.1	2.8	8.20	8.05
6	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	31,222.6	2.6	8.43	8.29
7	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	31,985.3	2.8	8.60	8.45
8	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	32,308.4	3.1	8.69	8.52
9	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,847.0	5.2	8.32	8.07
10	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	28,807.0	4.4	8.08	7.88
11	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,482.9	3.5	8.16	7.99
12	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,493.4	3.6	8.15	7.99
13	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	28,980.6	5.1	8.14	7.91
14	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	28,168.3	7.8	8.15	7.80
15	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	31,514.0	4.8	8.64	8.38
16	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	31,791.4	4.5	8.68	8.43
17	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	30,513.4	4.6	8.42	8.19
18	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	31,457.9	4.7	8.63	8.39
19	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	32,266.9	5.3	8.84	8.54
20	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	31,869.9	6.3	8.85	8.49
21	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	30,158.8	8.9	8.68	8.21
22	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	30,847.5	5.8	8.57	8.28
23	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	31,690.3	4.6	8.68	8.43

To be continued on next page...

* Included in wake losses is influence from 839 WTG(s) in the neighborhood, which has status as "Reference WTGs", see separate report to identify these.



Project:
Pakistan

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Claire / claire.west@aurecongroup.com
Calculated:
23/08/2024 10:28 am/4.0.424

PARK - Main Result

Calculation: 2024.08.21, 28x 180mRD Layout, CW edit rev 2 - All WFs - EN182/6.25MW

...continued from previous page

WTG type							Power curve		Annual Energy		Wind speed	
Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Creator	Name	Result [MWh/y]	Wake loss [%]	free [m/s]	reduced [m/s]	
24	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	33,376.9	1.7	8.84	8.74
25	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	30,070.4	1.1	8.15	8.08
26	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	29,367.2	2.6	8.10	7.97
27	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	28,640.2	4.0	8.05	7.85
28	Yes	Envision	EN-182/6.25-6,250	6,250	181.1	110.0	USER	SSPC - Pakistan, 1.15 kg/m3	27,918.2	7.3	8.09	7.74

Annual Energy result includes shown losses. Additional losses and uncertainty must be considered for an investment decision.

WTG siting

UTM (north)-WGS84 Zone: 42

Easting Northing Z			Row data/Description		Calculation period	
					Start	End
1 New	353,212	2,761,370	216.4	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (271)	1/01/2004	1/08/2024
2 New	353,623	2,761,005	220.0	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (272)	1/01/2004	1/08/2024
3 New	354,130	2,760,682	210.0	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (273)	1/01/2004	1/08/2024
4 New	354,925	2,759,891	175.4	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (274)	1/01/2004	1/08/2024
5 New	355,443	2,759,490	180.0	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (275)	1/01/2004	1/08/2024
6 New	355,801	2,759,134	193.6	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (276)	1/01/2004	1/08/2024
7 New	356,316	2,758,881	215.2	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (277)	1/01/2004	1/08/2024
8 New	356,642	2,758,526	210.0	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (278)	1/01/2004	1/08/2024
9 New	356,206	2,757,791	192.6	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (279)	1/01/2004	1/08/2024
10 New	357,388	2,757,930	170.0	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (280)	1/01/2004	1/08/2024
11 New	354,573	2,760,297	190.0	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (281)	1/01/2004	1/08/2024
12 New	358,287	2,757,142	153.4	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (282)	1/01/2004	1/08/2024
13 New	359,023	2,758,440	161.4	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (283)	1/01/2004	1/08/2024
14 New	358,525	2,758,918	170.0	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (284)	1/01/2004	1/08/2024
15 New	358,945	2,760,811	199.3	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (285)	1/01/2004	1/08/2024
16 New	358,828	2,761,470	204.2	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (286)	1/01/2004	1/08/2024
17 New	358,654	2,762,067	190.0	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (287)	1/01/2004	1/08/2024
18 New	358,120	2,762,406	189.7	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (288)	1/01/2004	1/08/2024
19 New	356,352	2,762,227	250.0	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (289)	1/01/2004	1/08/2024
20 New	356,115	2,762,638	242.9	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (290)	1/01/2004	1/08/2024
21 New	355,912	2,763,160	250.0	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (291)	1/01/2004	1/08/2024
22 New	356,088	2,764,211	265.9	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (292)	1/01/2004	1/08/2024
23 New	355,690	2,764,510	260.0	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (293)	1/01/2004	1/08/2024
24 New	355,196	2,764,797	250.0	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (294)	1/01/2004	1/08/2024
25 New	353,944	2,763,639	235.3	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (295)	1/01/2004	1/08/2024
26 New	354,233	2,763,182	238.6	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (296)	1/01/2004	1/08/2024
27 New	354,526	2,762,746	230.0	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (297)	1/01/2004	1/08/2024
28 New	354,786	2,762,294	230.0	Envision EN-182/6.25 6250 181.1 !O! hub: 110.0 m (TOT: 200.6 m) (298)	1/01/2004	1/08/2024



Project:
Pakistan

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Chloe Nicholson / chloe.nicholson@aurecongroup.com
Calculated:
29/08/2024 2:07 pm/4.0.424

PARK - Main Result

Calculation: 2024.08.21, 28x 180mRD Layout, CW edit rev 2 - All WFs - GWH182-6.2MW, SSPC

Setup

AEP scaled to a full year based on number of samples
Scaling factor from 20.6 years to 1 year: 0.049

Calculation performed in UTM (north)-WGS84 Zone: 42
At the site centre the difference between grid north and true north is: -0.6°

Wake

Wake Model: N.O. Jensen (RISO/EMD) Park 2 2018
Wake decay constant
Terrain type: Wake decay constant
User defined: 0.065 Hub height Independent

Blockage

Blockage Model: Self similar model (Forsting: 2017)

Gamma (?) Alpha (a) Beta (B) Lambda (?) Eta (?)
1.100 0.889 1.414 0.587 1.320

Note: When wake reductions are mentioned in this report, it also includes reduction from blockage.

Reference WTG: Goldwind GWH182-6.2MW 6200 183.4 101 hub: 110.0 m (TOT: 201.7 m) (271)

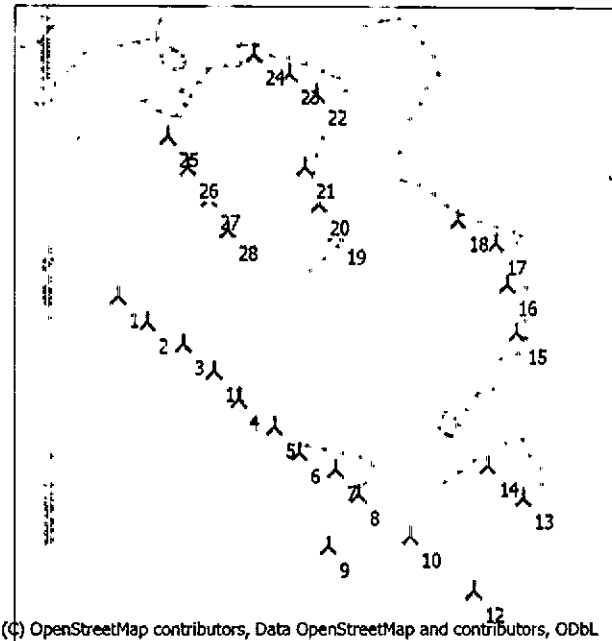
Scaler/wind data

Name: EMD Default Meso Scaler
Terrain scaling: Measured Data Scaling (Neutral stability / Raw flow)
Micro terrain flow model: WASP IBZ from Site Data
Used period: 1/01/2004 5:00:00 am - 1/08/2024 4:00:00 am
Meso object(s): JCM site virtual mast - DIN, 110.00m -
Displacement height: Omnidirectional from objects
WASP version: WASP 12 Version 12.08.0032

Power correction (All new WTGs)

Power curve correction (adjusted IEC method, improved to match turbine control)

	Min	Max	Avg	Corr.	Neg. corr.	Pos. corr.
				[%]	[%]	[%]
Air density						
JCM site virtual mast - DIN - 110.00 m	8.4	41.3	26.5			
From air density settings	968.3	984.7	977.0			
Resulting air density	1.080	1.211	1.136			
Relative to 15°C at sea level	88.2	98.9	92.7	-0.2	-0.4	0.2



Calculated Annual Energy for Wind Farm

WTG combination	Result		GROSS (no loss)	Wake loss	Specific results*)		Full load	Wind speed	
	PARK	Free WTGs			Capacity factor	Mean WTG result		free	wake reduced
	[MWh/y]	[MWh/y]		[%]	[%]	[MWh/y]	[Hours/year]	[m/s]	[m/s]
Wind farm	837,868.1	880,028.5		4.8	55.1	29,923.9	4,826	8.4	8.1

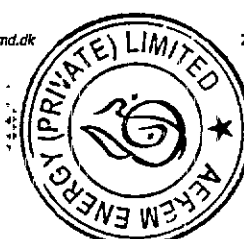
*) Based on wake reduced results and any curtailments.

Calculated Annual Energy for each of 28 new WTGs with total 173.6 MW rated power

WTG type	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Power curve Creator; Name	Annual Energy		Wind speed	
								Result	Wake loss	free	reduced
								[MWh/y]	[%]	[m/s]	[m/s]
1 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	29,393.7	3.4	8.19	8.03
2 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	28,869.5	4.8	8.17	7.95
3 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	28,835.3	4.9	8.17	7.94
4 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	29,517.0	3.4	8.22	8.03
5 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	29,545.2	3.1	8.20	8.03
6 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	30,847.6	2.8	8.43	8.27
7 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	31,593.8	3.0	8.60	8.42
8 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	31,908.0	3.3	8.69	8.49
9 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	29,402.0	5.7	8.32	8.04
10 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	28,418.0	4.8	8.08	7.85
11 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	29,101.2	3.8	8.16	7.96
12 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	29,116.9	3.9	8.15	7.97
13 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	28,566.1	5.6	8.14	7.89
14 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	27,648.1	8.6	8.15	7.75
15 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	31,043.1	5.3	8.64	8.34
16 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	31,334.9	4.9	8.68	8.40
17 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	30,075.6	5.1	8.42	8.16
18 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	30,997.3	5.1	8.63	8.36
19 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	31,770.0	5.8	8.84	8.49
20 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	31,337.7	7.0	8.85	8.44
21 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	29,544.8	9.9	8.68	8.15
22 Yes	Goldwind	GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	30,356.6	6.3	8.57	8.24

To be continued on next page...

*) Included in wake losses is influence from 839 WTG(s) in the neighborhood, which has status as "Reference WTGs", see separate report to identify these.



Project:
Pakistan

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Calculated:
29/08/2024 2:07 pm/4.0.424

PARK - Main Result

Calculation: 2024.08.21, 28x 180mRD Layout, CW edit rev 2 - All WFs - GWH182-6.2MW, SSPC

...continued from previous page

WTG type						Power curve		Annual Energy		Wind speed	
Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Creator	Name	Result	Wake loss	free	reduced
								[MWh/y]	[%]	[m/s]	[m/s]
23	Yes	Goldwind GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	31,218.3		5.1	8.68
24	Yes	Goldwind GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	32,983.4		1.9	8.84
25	Yes	Goldwind GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	29,752.0		1.2	8.15
26	Yes	Goldwind GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	29,015.7		2.9	8.10
27	Yes	Goldwind GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	28,253.3		4.4	8.05
28	Yes	Goldwind GWH182-6.2MW-6,200	6,200	183.4	110.0	USER	PC - Site specific, 1.14kgm3	27,423.0		8.0	8.09

Annual Energy result includes shown losses. Additional losses and uncertainty must be considered for an investment decision.

WTG siting

UTM (north)-WGS84 Zone: 42					Calculation period	
Eastings	Northing	Z	Row data/Description		Start	End
		[m]				
1	New	353,212	2,761,370	216.4 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (271)	1/01/2004	1/08/2024
2	New	353,623	2,761,005	220.0 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (272)	1/01/2004	1/08/2024
3	New	354,130	2,760,682	210.0 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (273)	1/01/2004	1/08/2024
4	New	354,925	2,759,891	175.4 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (274)	1/01/2004	1/08/2024
5	New	355,443	2,759,490	180.0 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (275)	1/01/2004	1/08/2024
6	New	355,801	2,759,134	193.6 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (276)	1/01/2004	1/08/2024
7	New	356,316	2,758,881	215.2 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (277)	1/01/2004	1/08/2024
8	New	356,642	2,758,526	210.0 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (278)	1/01/2004	1/08/2024
9	New	356,206	2,757,791	192.6 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (279)	1/01/2004	1/08/2024
10	New	357,388	2,757,930	170.0 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (280)	1/01/2004	1/08/2024
11	New	354,573	2,760,297	190.0 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (281)	1/01/2004	1/08/2024
12	New	358,287	2,757,142	153.4 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (282)	1/01/2004	1/08/2024
13	New	359,023	2,758,440	161.4 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (283)	1/01/2004	1/08/2024
14	New	358,525	2,758,918	170.0 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (284)	1/01/2004	1/08/2024
15	New	358,945	2,760,811	199.3 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (285)	1/01/2004	1/08/2024
16	New	358,828	2,761,470	204.2 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (286)	1/01/2004	1/08/2024
17	New	358,654	2,762,067	190.0 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (287)	1/01/2004	1/08/2024
18	New	358,120	2,762,406	189.7 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (288)	1/01/2004	1/08/2024
19	New	356,352	2,762,227	250.0 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (289)	1/01/2004	1/08/2024
20	New	356,115	2,762,638	242.9 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (290)	1/01/2004	1/08/2024
21	New	355,912	2,763,160	250.0 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (291)	1/01/2004	1/08/2024
22	New	356,088	2,764,211	265.9 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (292)	1/01/2004	1/08/2024
23	New	355,690	2,764,510	260.0 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (293)	1/01/2004	1/08/2024
24	New	355,196	2,764,797	250.0 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (294)	1/01/2004	1/08/2024
25	New	353,944	2,763,639	235.3 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (295)	1/01/2004	1/08/2024
26	New	354,233	2,763,182	238.6 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (296)	1/01/2004	1/08/2024
27	New	354,526	2,762,746	230.0 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (297)	1/01/2004	1/08/2024
28	New	354,786	2,762,294	230.0 Goldwind GWH182-6.2MW 6200 183.4 IO! hub: 110.0 m (TOT: 201.7 m) (298)	1/01/2004	1/08/2024



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Bringing ideas to life

PVsyst - Simulation report

Grid-Connected System

Project: Pakistan PV BEYA

Variant: 6.5m pitch variant

Trackers single array, with backtracking

System power: 94.00 MWp

Bakhshu Faqir - Pakistan

Author
Zutari Pty Ltd (South Africa)





Project: Pakistan PV BEYA

Variant: 6.5m pitch variant

PVsyst V7.4.8

VC0, Simulation date:
08/29/24 16:22
with V7.4.8

Zutari Pty Ltd (South Africa)

Project summary

Geographical Site

Bakhshu Faqir
Pakistan

Situation

Latitude 24.92 °N
Longitude 67.59 °E
Altitude 154 m
Time zone UTC+5

Project settings

Albedo 0.20

Weather data

KE Hybrid Aerem site
Solcast TMY

System summary

Grid-Connected System

Simulation for year no 1

Trackers single array, with backtracking

PV Field Orientation

Orientation

Tracking plane, horizontal N-S axis
Axis azimuth 0 °

Tracking algorithm

Astronomic calculation
Backtracking activated

Near Shadings

According to strings : Fast (table)
Electrical effect 100 %
Diffuse shading Automatic

System information

PV Array

Nb. of modules 151606 units
Pnom total 94,00 MWp

Inverters

Nb. of units 14 units
Pnom total 61.60 MWac
Pnom ratio 1.526

User's needs

Unlimited load (grid)

Results summary

Produced Energy 190281.51 MWh/year Specific production 2024 kWh/kWp/year Perf. Ratio PR 84.04 %

Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Near shading definition - Iso-shadings diagram	6
Main results	7
Loss diagram	8
Predef. graphs	9
Single-line diagram	10





Project: Pakistan PV BEYA

Variant: 6.5m pitch variant

Zutari Pty Ltd (South Africa)

PVsyst V7.4.8

VC0, Simulation date:
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with V7.4.8

General parameters

Grid-Connected System

PV Field Orientation

Orientation

Tracking plane, horizontal N-S axis

Axis azimuth 0 °

Trackers single array, with backtracking

Tracking algorithm

Astronomic calculation

Backtracking activated

Backtracking array

Nb. of trackers 195 units

Single array

Sizes

Tracker Spacing 6.50 m

Collector width 2.47 m

Ground Cov. Ratio (GCR) 37.9 %

Phi min / max. +/- 60.0 °

Backtracking strategy

Phi limits for BT +/- 67.6 °

Backtracking pitch 6.50 m

Backtracking width 2.47 m

Models used

Transposition Perez

Diffuse Imported

Circumsolar separate

Horizon

Free Horizon

Near Shadings

According to strings : Fast (table)

Electrical effect 100 %

Diffuse shading Automatic

User's needs

Unlimited load (grid)

Bifacial system

Model 2D Calculation
unlimited trackers

Bifacial model geometry

Tracker Spacing 6.50 m

Tracker width 2.47 m

GCR 37.9 %

Axis height above ground 1.50 m

Bifacial model definitions

Ground albedo 0.25

Bifaciality factor 80 %

Rear shading factor 5.0 %

Rear mismatch loss 10.0 %

Shed transparent fraction 0.0 %

PV Array Characteristics

PV module

Manufacturer JA Solar

Model JAM72D42-620/LB

(Custom parameters definition)

Unit Nom. Power 620 Wp

Number of PV modules 151606 units

Nominal (STC) 94.00 MWp

Modules 5831 string x 26 In series

At operating cond. (50°C)

Pmpp 87.41 MWp

U mpp 1038 V

I mpp 84193 A

Total PV power

Nominal (STC) 93996 kWp

Total 151606 modules

Module area 423786 m²

Inverter

Manufacturer Sungrow

Model SG4400UD

(Custom parameters definition)

Unit Nom. Power 4400 kWac

Number of inverters 14 units

Total power 61600 kWac

Operating voltage 895-1500 V

Max. power (=>22°C) 5060 kWac

Pnom ratio (DC:AC) 1.53

Power sharing within this inverter

Total inverter power

Total power 61600 kWac

Max. power 70840 kWac

Number of inverters 14 units

Pnom ratio 1.53





Project: Pakistan PV BEYA

Variant: 6.5m pitch variant

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Array losses

Array Soiling Losses

Loss Fraction 3.0 %

Thermal Loss factor

Module temperature according to irradiance

Uc (const) 29.0 W/m²K

Uv (wind) 0.0 W/m²K/m/s

DC wiring losses

Global array res. 0.27 mΩ

Loss Fraction 2.0 % at STC

LID - Light Induced Degradation

Loss Fraction 0.6 %

Module Quality Loss

Loss Fraction -0.4 %

Module mismatch losses

Loss Fraction 2.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.1 %

Module average degradation

Year no 1

Loss factor 0.4 %/year

Mismatch due to degradation

Imp RMS dispersion 0 %/year

Vmp RMS dispersion 0 %/year

IAM loss factor

Incidence effect (IAM): User defined profile

0°	50°	60°	65°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.994	0.966	0.915	0.745	0.000

System losses

Auxillaries loss

Proportional to Power 2.0 W/kW

0.0 kW from Power thresh.

AC wiring losses

Inv. output line up to MV transfo

Inverter voltage 630 Vac tri

Loss Fraction 0.09 % at STC

Inverter: SG4400UD

Wire section (14 Inv.) Copper 14 x 3 x 3000 mm²

Average wires length 9 m

MV line up to HV Transfo

MV Voltage 33 kV

Wires Copper 3 x 2000 mm²

Length 6310 m

Loss Fraction 0.50 % at STC

AC losses in transformers

MV transfo

Medium voltage 33 kV

Transformer parameters

Nominal power at STC 92.16 MVA

Iron Loss (24/24 Connexion) 92.16 kVA

Iron loss fraction 0.10 % at STC

Copper loss 921.57 kVA

Copper loss fraction 1.00 % at STC

Coils equivalent resistance 3 x 0.04 mΩ





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Project: Pakistan PV BEYA

Variant: 6.5m pitch variant

Zutari Pty Ltd (South Africa)

AC losses in transformers

HV transfo

Grid voltage 132 kV

Transformer from Datasheets

Nominal power 90000 kVA

Iron Loss (24/24 Connexion) 45.00 kVA

Iron loss fraction 0.05 % of PNom

Copper loss 450.00 kVA

Copper loss fraction 0.50 % at PNom

Coils equivalent resistance 3 x 60.50 mΩ





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with V7.4.8

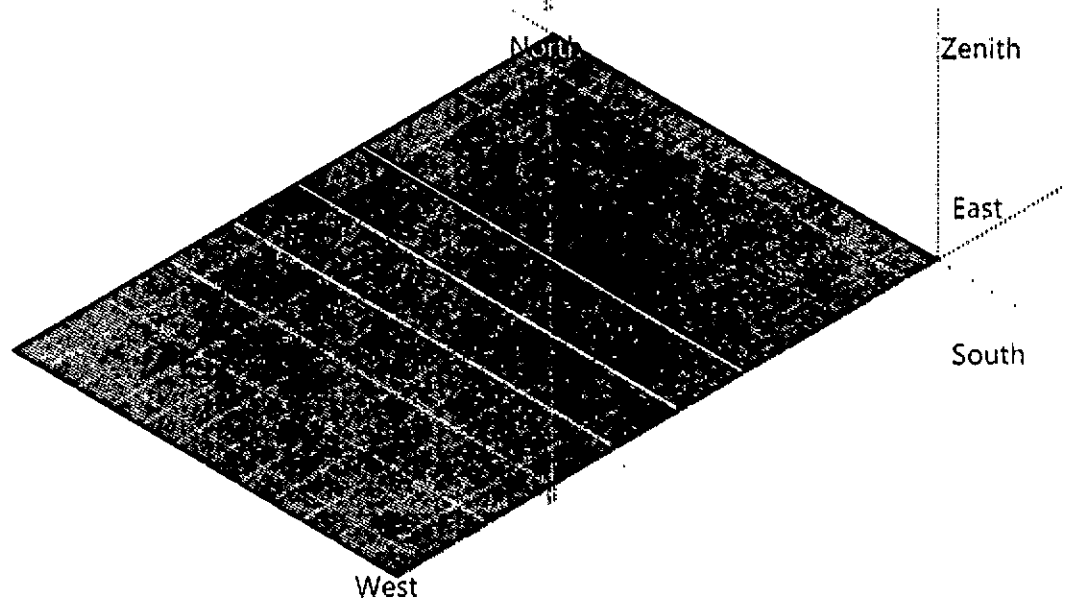
Project: Pakistan PV BEYA

Variant: 6.5m pitch variant

Zutari Pty Ltd (South Africa)

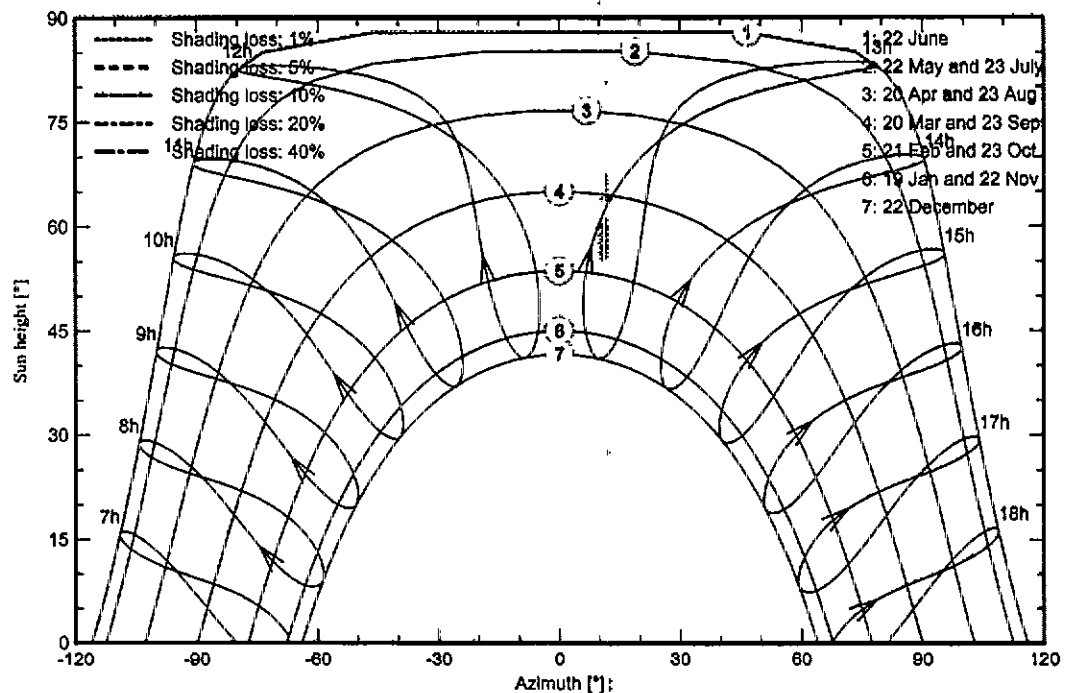
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1





Project: Pakistan PV BEYA

Variant: 6.5m pitch variant

PVsyst V7.4.8

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08/29/24 16:22
with V7.4.8

Zutari Pty Ltd (South Africa)

Main results

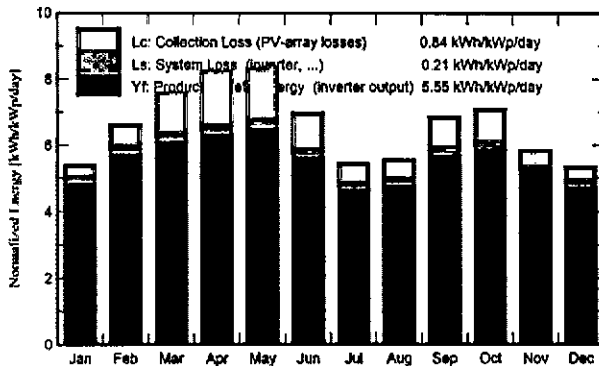
System Production

Produced Energy 190281.51 MWh/year

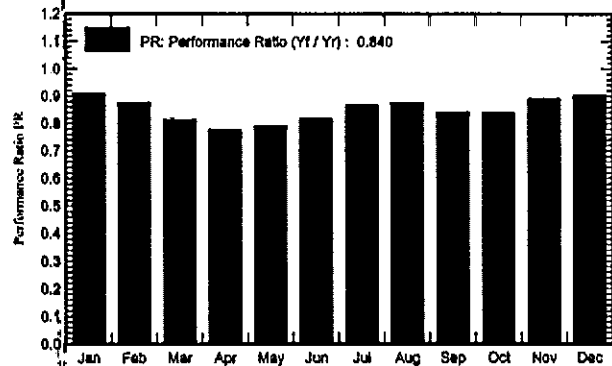
Specific production
Perf. Ratio PR

2024 kWh/kWp/year
84.04 %

Normalized productions (per installed kWp)



Performance Ratio PR



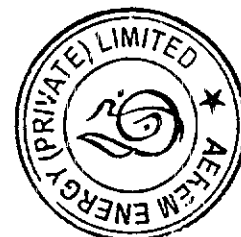
Balances and main results

	GlobHor kWh/m ²	DiffHor kWh/m ²	T_Amb °C	GlobInc kWh/m ²	GlobEff kWh/m ²	EArray MWh	E_Grid MWh	PR ratio
January	131.1	55.7	19.21	167.0	159.2	14763	14227	0.907
February	143.0	53.8	20.99	185.2	176.9	15787	15192	0.872
March	189.2	78.7	27.43	235.3	224.6	18644	17950	0.812
April	203.9	87.1	30.24	247.2	236.1	18695	18006	0.775
May	217.2	96.8	30.36	258.1	246.3	19808	19087	0.787
June	177.1	91.0	31.37	209.4	199.4	16621	16027	0.814
July	154.6	105.3	30.01	168.8	159.8	14207	13702	0.864
August	155.0	104.0	28.19	172.1	163.1	14605	14085	0.871
September	171.5	82.9	28.78	205.7	195.9	16799	16182	0.837
October	172.5	64.5	28.90	219.4	209.6	17888	17225	0.835
November	138.1	57.6	24.35	175.0	166.9	15171	14621	0.889
December	128.4	49.9	21.99	165.6	158.0	14498	13978	0.898
Year	1981.7	927.4	26.85	2408.7	2295.6	197486	190282	0.840

Legends

GlobHor Global horizontal irradiation
DiffHor Horizontal diffuse irradiation
T_Amb Ambient Temperature
GlobInc Global incident in coll. plane
GlobEff Effective Global, corr. for IAM and shadings

EArray Effective energy at the output of the array
E_Grid Energy injected into grid
PR Performance Ratio





Project: Pakistan PV BEYA

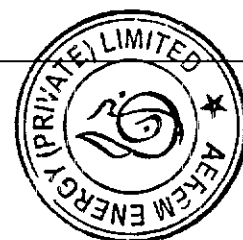
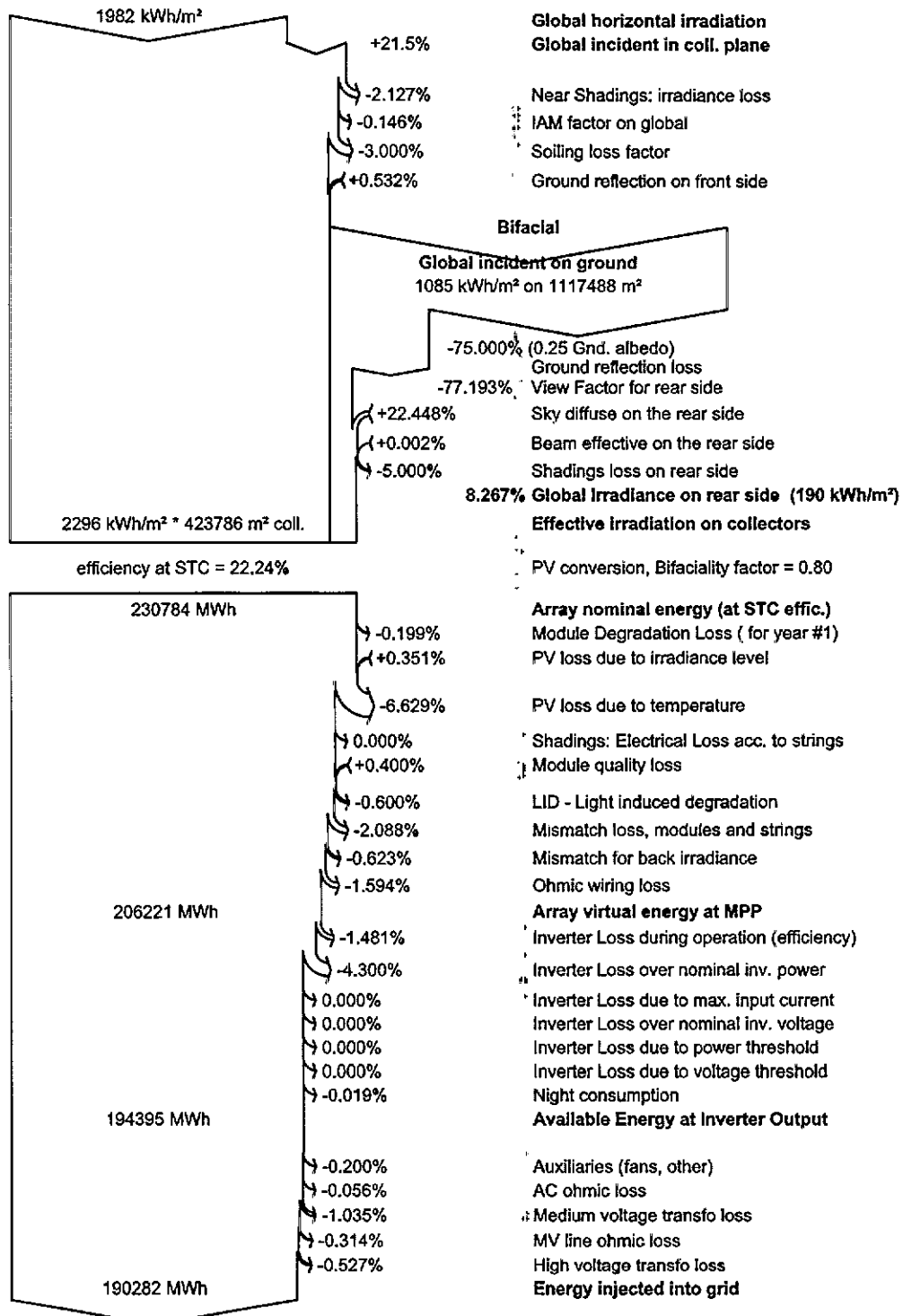
Variant: 6.5m pitch variant

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Loss diagram





Project: Pakistan PV BEYA

Variant: 6.5m pitch variant

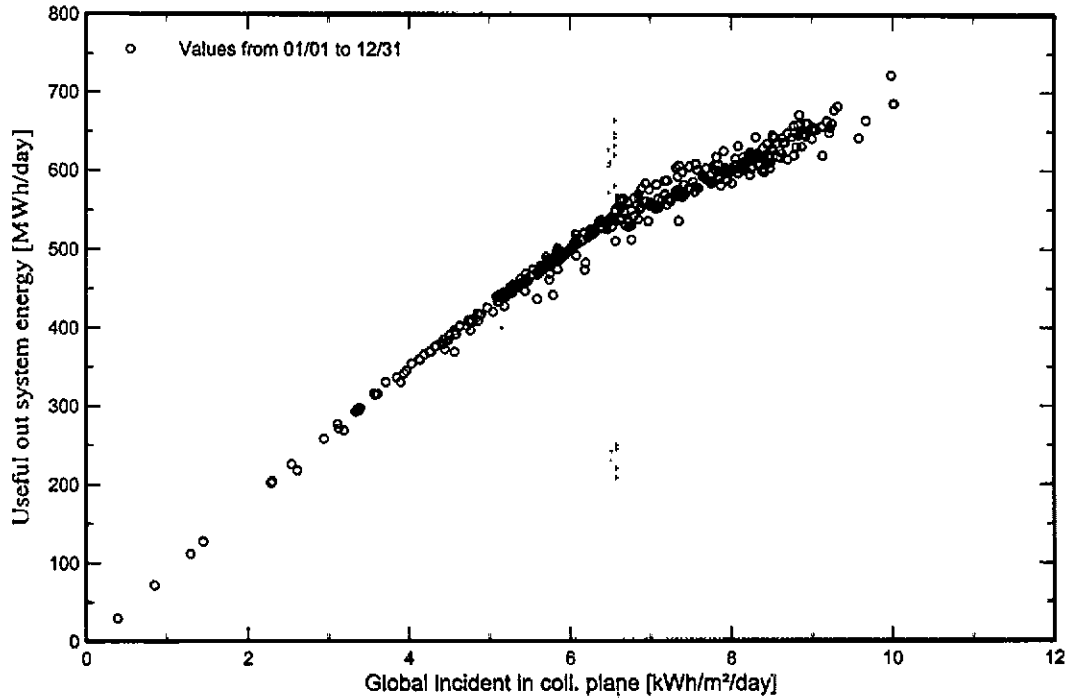
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VC0, Simulation date:
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with V7.4.8

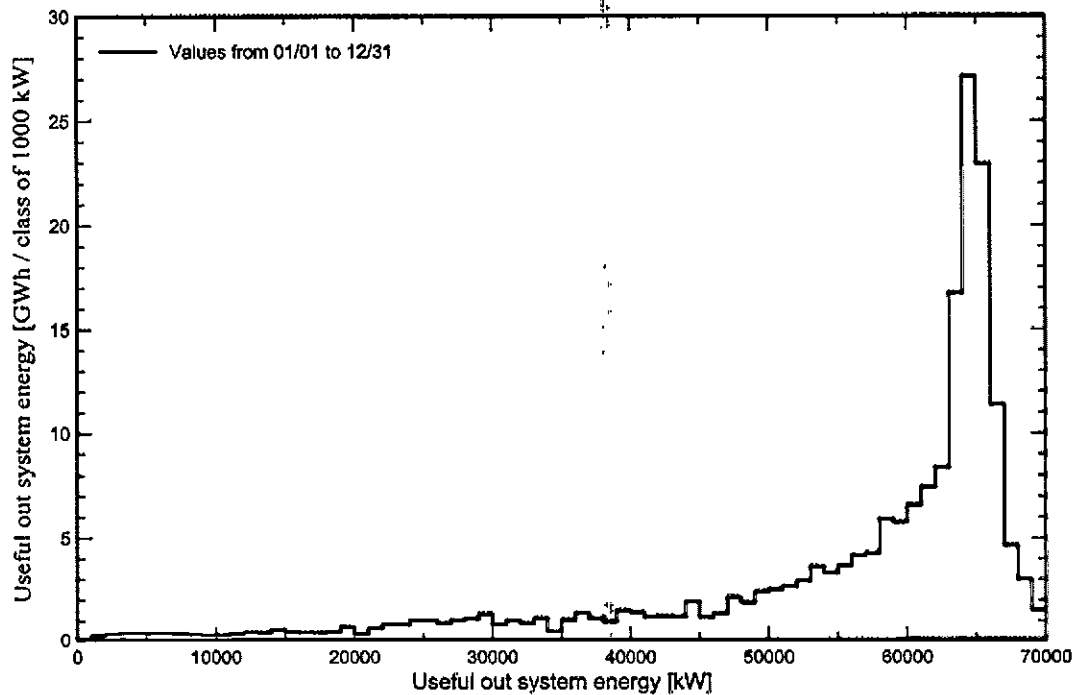
Zutari Pty Ltd (South Africa)

Predef. graphs

Daily Input/Output diagram



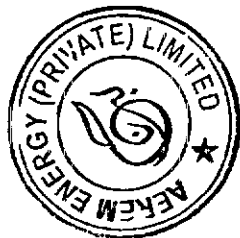
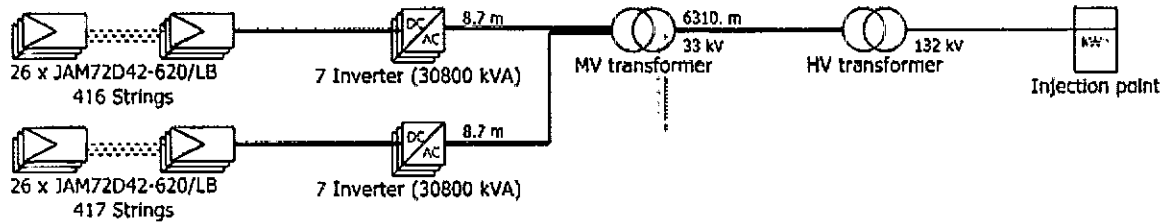
System Output Power Distribution





PVsyst V7.4.8
VC0, Simulation date:
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with V7.4.8

Single-line diagram



PV module	JAM72D42-620/LB
Inverter	SG4400UD
String	26 x JAM72D42-620/LB

Pakistan PV BEYA

Zutari Pty Ltd (South Africa)

VC0 : 6.5m pitch variant

08/29/24

PVsyst - Simulation report

Grid-Connected System

Project: Pakistan PV BEYA

Variant: 6.5m pitch variant

Trackers single array, with backtracking

System power: 94.00 MWp

Bakhshu Faqir - Pakistan

Author

Zutari Pty Ltd (South Africa)



**PVsyst V7.4.8**

VC0, Simulation date:
08/29/24 16:17
with V7.4.8

Project: Pakistan PV BEYA

Variant: 6.5m pitch Variant

Zutari Pty Ltd (South Africa)

Project summary**Geographical Site**

Bakhshu Faqir
Pakistan

Situation

Latitude 24.92 °N
Longitude 67.59 °E
Altitude 154 m
Time zone UTC+5

Project settings

Albedo 0.20

Weather data

Bakhshu Faqir
Custom file - Imported

System summary**Grid-Connected System**

Simulation for year no 1

Trackers single array, with backtracking**PV Field Orientation**

Orientation
Tracking plane, horizontal N-S axis
Axis azimuth 0 °

Tracking algorithm
Astronomic calculation
Backtracking activated

Near Shadings

According to strings : Fast (table)
Electrical effect 100 %
Diffuse shading Automatic

System information**PV Array**

Nb. of modules 151606 units
Pnom total 94.00 MWp

Inverters

Nb. of units 14 units
Pnom total 61.60 MWac
Pnom ratio 1.526

User's needs

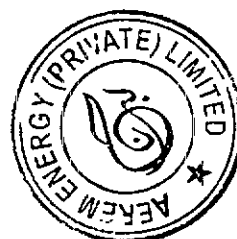
Unlimited load (grid)

Results summary

Produced Energy 199642.10 MWh/year Specific production 2124 kWh/kWp/year Perf. Ratio PR 83.29 %

Table of contents

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General parameters, PV Array Characteristics, System losses	3
Near shading definition - Iso-shadings diagram	6
Main results	7
Loss diagram	8
Predef. graphs	9
Single-line diagram	10





Project: Pakistan PV BEYA

Variant: 6.5m pitch variant

Zutari Pty Ltd (South Africa)

PVsyst V7.4.8

VC0, Simulation date:
08/29/24 16:17
with V7.4.8

General parameters

Grid-Connected System

PV Field Orientation

Orientation

Tracking plane, horizontal N-S axis

Axis azimuth 0 °

Trackers single array, with backtracking

Tracking algorithm

Astronomic calculation

Backtracking activated

Backtracking array

Nb. of trackers 195 units

Single array

Sizes

Tracker Spacing 6.50 m

Collector width 2.47 m

Ground Cov. Ratio (GCR) 37.9 %

Phi min / max. +/- 60.0 °

Backtracking strategy

Phi limits for BT +/- 67.6 °

Backtracking pitch 6.50 m

Backtracking width 2.47 m

Models used

Transposition Perez

Diffuse Perez, Meteonorm

Circumsolar separate

Horizon

Free Horizon

Near Shadings

According to strings : Fast (table)

Electrical effect 100 %

Diffuse shading Automatic

User's needs

Unlimited load (grid)

Bifacial system

Model

2D Calculation

unlimited trackers

Bifacial model geometry

Tracker Spacing 6.50 m

Tracker width 2.47 m

GCR 37.9 %

Axis height above ground 1.50 m

Bifacial model definitions

Ground albedo 0.25

Bifaciality factor 80 %

Rear shading factor 5.0 %

Rear mismatch loss 10.0 %

Shed transparent fraction 0.0 %

PV Array Characteristics

PV module

Manufacturer

JA Solar

Model

JAM72D42-620/LB

(Custom parameters definition)

Unit Nom. Power 620 Wp

Number of PV modules 151606 units

Nominal (STC) 94.00 MWp

Modules 5831 string x 26 In series

At operating cond. (50°C)

Pmpp 87.41 MWp

U mpp 1038 V

I mpp 84193 A

Total PV power

Nominal (STC) 93996 kWp

Total 151606 modules

Module area 423786 m²

Inverter

Manufacturer

Sungrow

Model

SG4400UD

(Custom parameters definition)

Unit Nom. Power 4400 kWac

Number of inverters 14 units

Total power 61600 kWac

Operating voltage 895-1500 V

Max. power (=>22°C) 5060 kWac

Pnom ratio (DC:AC) 1.53

Power sharing within this inverter

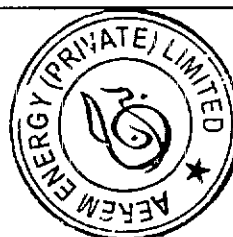
Total inverter power

Total power 61600 kWac

Max. power 70840 kWac

Number of inverters 14 units

Pnom ratio 1.53





PVsyst V7.4.8

VC0, Simulation date:
08/29/24 16:17
with V7.4.8

Project: Pakistan PV BEYA

Variant: 6.5m pitch variant

Zutari Pty Ltd (South Africa)

Array losses

Array Soiling Losses

Loss Fraction 3.0 %

Thermal Loss factor

Module temperature according to irradiance

Uc (const) 29.0 W/m²K

Uv (wind) 0.0 W/m²K/m/s

DC wiring losses

Global array res. 0.27 mΩ

Loss Fraction 2.0 % at STC

LID - Light Induced Degradation

Loss Fraction 0.6 %

Module Quality Loss

Loss Fraction 0.4 %

Module mismatch losses

Loss Fraction 2.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.1 %

Module average degradation

Year no 1

Loss factor 0.4 %/year

Mismatch due to degradation

Imp RMS dispersion 0 %/year

Vmp RMS dispersion 0 %/year

IAM loss factor

Incidence effect (IAM): User defined profile

0°	50°	60°	65°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.994	0.966	0.915	0.745	0.000

System losses

Auxillaries loss

Proportional to Power 2.0 W/kW

0.0 kW from Power thresh.

AC wiring losses

Inv. output line up to MV transfo

Inverter voltage 630 Vac tri

Loss Fraction 0.09 % at STC

Inverter: SG4400UD

Wire section (14 Inv.) Copper 14 x 3 x 3000 mm²

Average wires length 9 m

MV line up to HV Transfo

MV Voltage 33 kV

Wires Copper 3 x 2000 mm²

Length 6310 m

Loss Fraction 0.50 % at STC

AC losses in transformers

MV transfo

Medium voltage 33 kV

Transformer parameters

Nominal power at STC 92.16 MVA

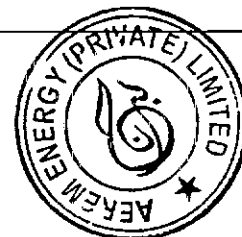
Iron Loss (24/24 Connexion) 92.16 kVA

Iron loss fraction 0.10 % at STC

Copper loss 921.57 kVA

Copper loss fraction 1.00 % at STC

Coils equivalent resistance 3 x 0.04 mΩ





PVsyst V7.4.8

VC0, Simulation date:
08/29/24 16:17
with V7.4.8

Project: Pakistan PV BEYA

Variant: 6.5m pitch variant

Zutari Pty Ltd (South Africa)

AC losses in transformers

HV transfo

Grid voltage 132 kV

Transformer from Datasheets

Nominal power 90000 kVA

Iron Loss (24/24 Connexion) 45.00 kVA

Iron loss fraction 0.05 % of PNom

Copper loss 450.00 kVA

Copper loss fraction 0.50 % at PNom

Coils equivalent resistance 3 x 60.50 mΩ





PVsyst V7.4.8

VC0, Simulation date:
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with V7.4.8

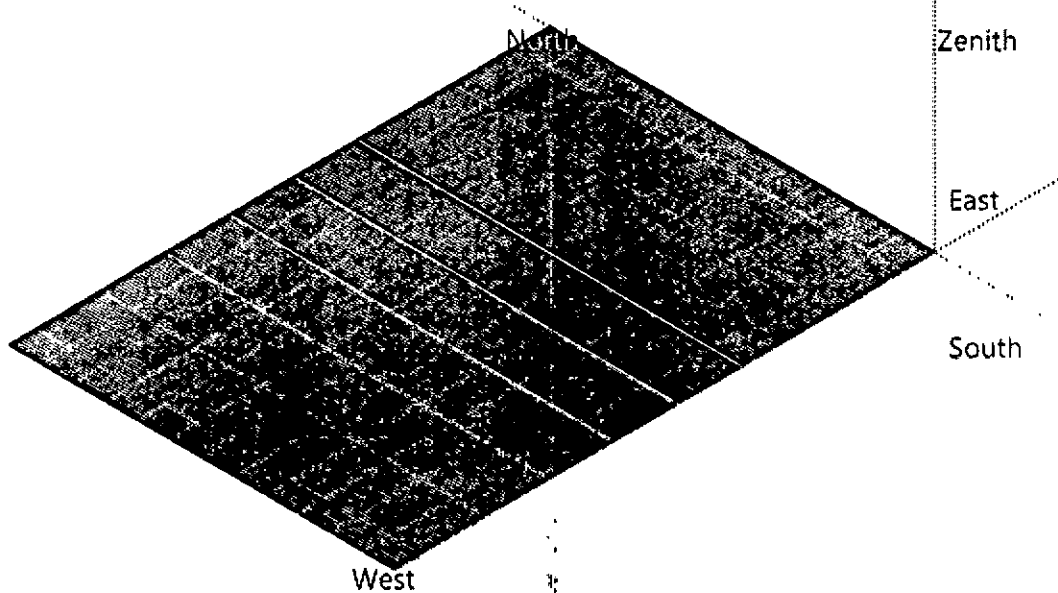
Project: Pakistan PV BEYA

Variant: 6.5m pitch variant

Zutari Pty Ltd (South Africa)

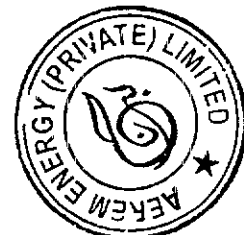
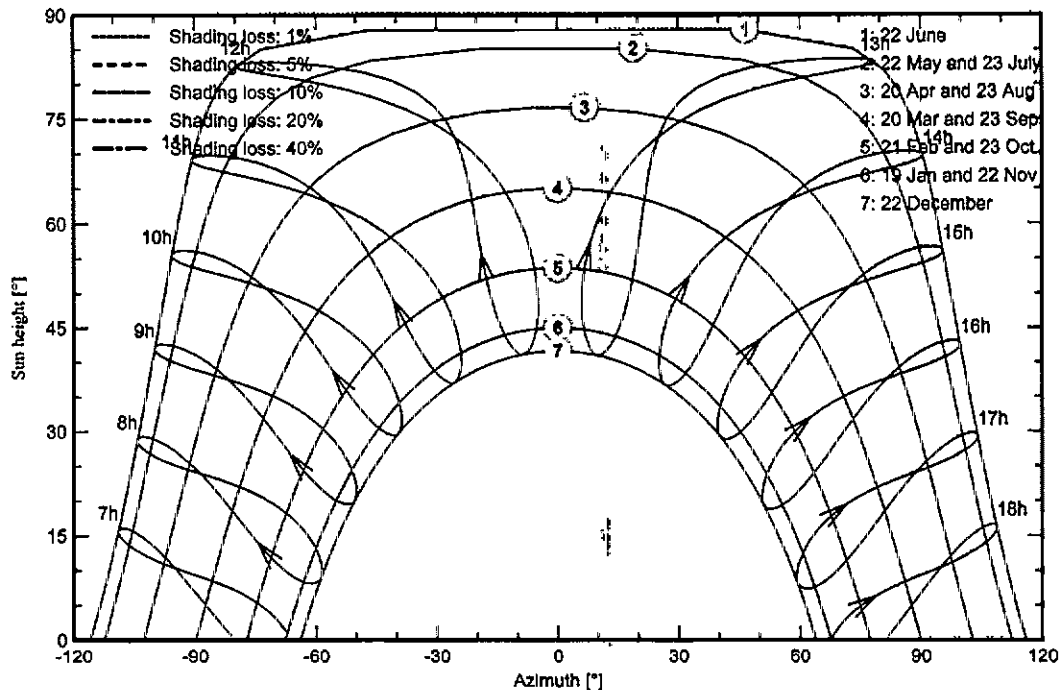
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1





Project: Pakistan PV BEYA

Variant: 6.5m pitch variant

PVsyst V7.4.8

VC0, Simulation date:
08/29/24 16:17
with V7.4.8

Zutari Pty Ltd (South Africa)

Main results

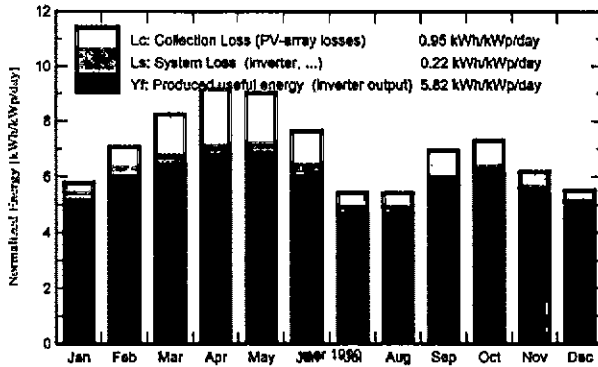
System Production

Produced Energy 199642.10 MWh/year

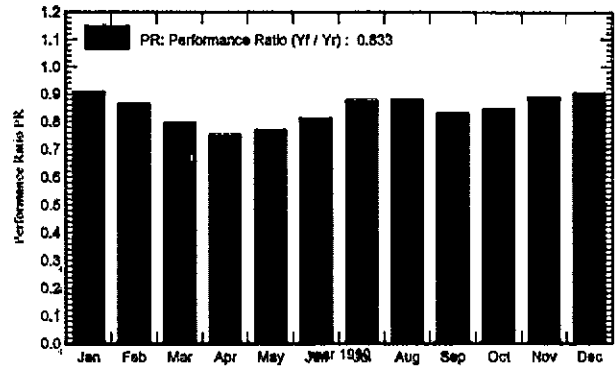
Specific production
Perf. Ratio PR

2124 kWh/kWp/year
83.29 %

Normalized productions (per installed kWp)



Performance Ratio PR



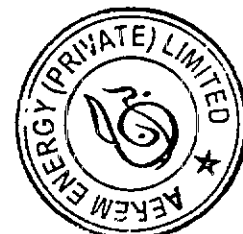
Balances and main results

	GlobHor kWh/m ²	DiffHor kWh/m ²	T_Amb °C	GlobInc kWh/m ²	GlobEff kWh/m ²	EArray MWh	E_Grid MWh	PR ratio
Jan. 90	136.9	41.19	17.45	179.9	172.0	15899	15310	0.905
Feb. 90	151.1	42.34	19.88	198.2	189.6	16708	16074	0.863
Mar. 90	197.8	53.93	24.76	255.8	244.9	19801	19055	0.793
Apr. 90	216.3	58.10	28.67	274.9	263.4	20101	19364	0.749
May 90	225.5	70.43	30.22	280.1	268.1	21018	20257	0.769
June 90	193.3	81.07	31.07	230.2	219.7	18195	17542	0.811
July 90	151.0	89.02	28.66	169.0	160.5	14405	13891	0.874
Aug. 90	147.0	86.30	27.69	168.3	159.9	14389	13873	0.877
Sep. 90	170.2	67.83	27.80	209.1	199.6	16941	16320	0.830
Oct. 90	175.1	51.80	27.45	227.2	217.3	18685	17991	0.842
Nov. 90	141.3	43.83	24.81	185.7	177.5	16004	15421	0.884
Dec. 90	130.4	39.79	19.63	171.5	163.9	15095	14546	0.903
Year	2035.7	725.62	25.70	2549.9	2436.3	207242	199642	0.833

Legends

GlobHor Global horizontal irradiation
DiffHor Horizontal diffuse irradiation
T_Amb Ambient Temperature
GlobInc Global incident in coll. plane
GlobEff Effective Global, corr. for IAM and shadings

EArray Effective energy at the output of the array
E_Grid Energy injected into grid
PR Performance Ratio





Project: Pakistan PV BEYA

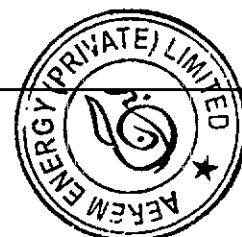
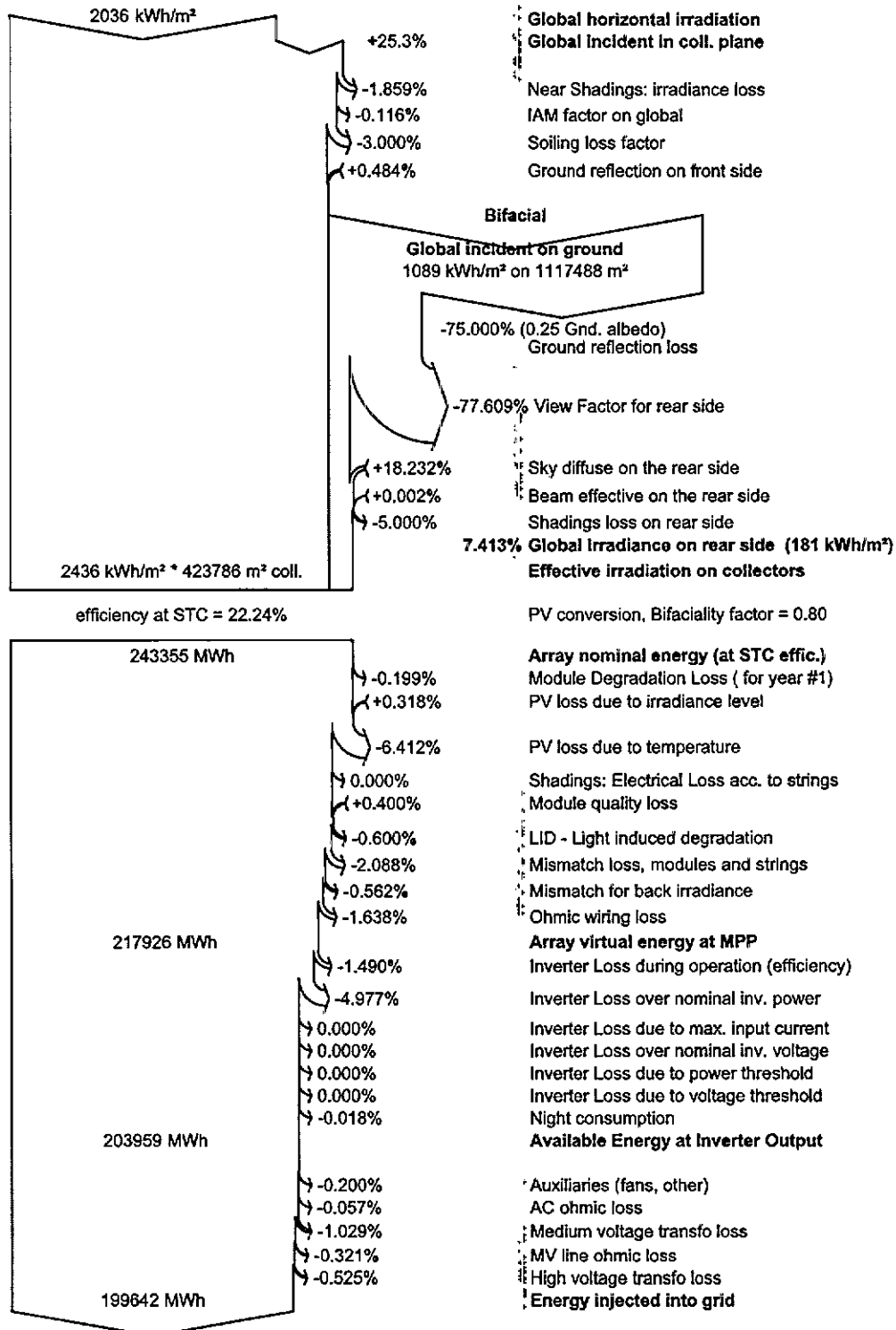
Variant: 6.5m pitch variant

Zutari Pty Ltd (South Africa)

PVsyst V7.4.8

VC0, Simulation date:
08/29/24 16:17
with V7.4.8

Loss diagram





PVsyst V7.4.8

VC0, Simulation date:
08/29/24 16:17
with V7.4.8

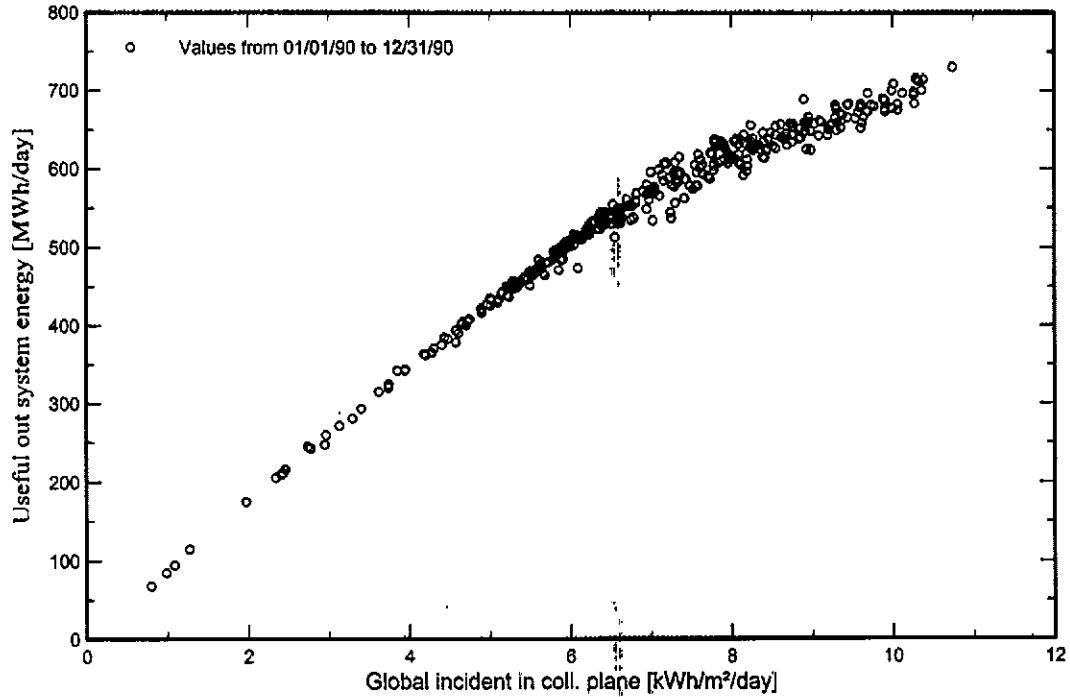
Project: Pakistan PV BEYA

Variant: 6.5m pitch variant

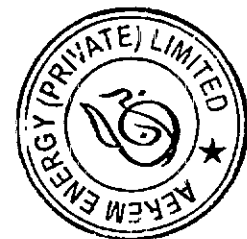
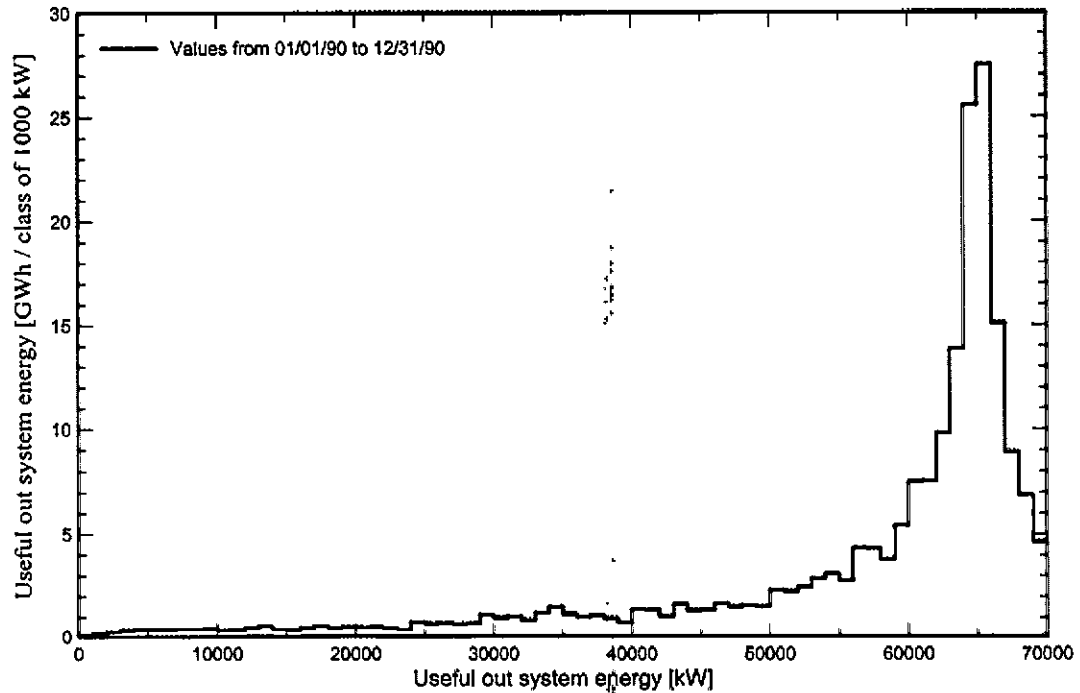
Zutari Pty Ltd (South Africa)

Predef. graphs

Daily Input/Output diagram



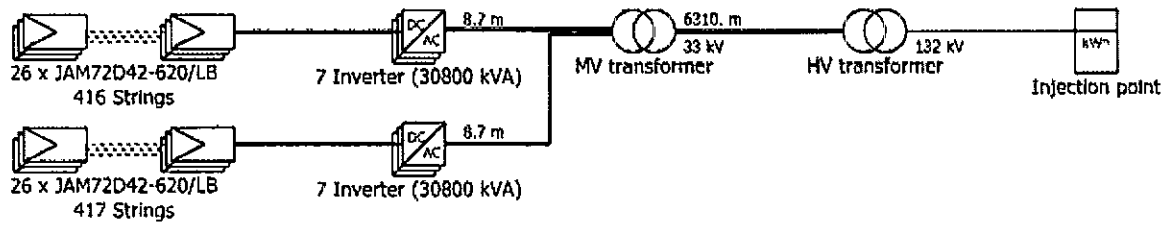
System Output Power Distribution





PVsyst V7.4.8
VC0, Simulation date:
08/29/24 16:17
with V7.4.8

Single-line diagram

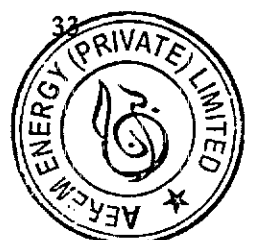


PV module	JAM72D42-620/LB
Inverter	SG4400UD
String	26 x JAM72D42-620/LB

	Pakistan PV BEYA	Zutari Pty Ltd (South Africa)
	VC0 ; 6.5m pitch variant	08/29/24

ANNEXURE - I

PROJECT FEASIBILITY STUDY



SOIL TESTING SERVICES

Geotechnical Engineers and Testing Laboratory

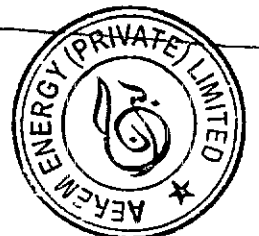
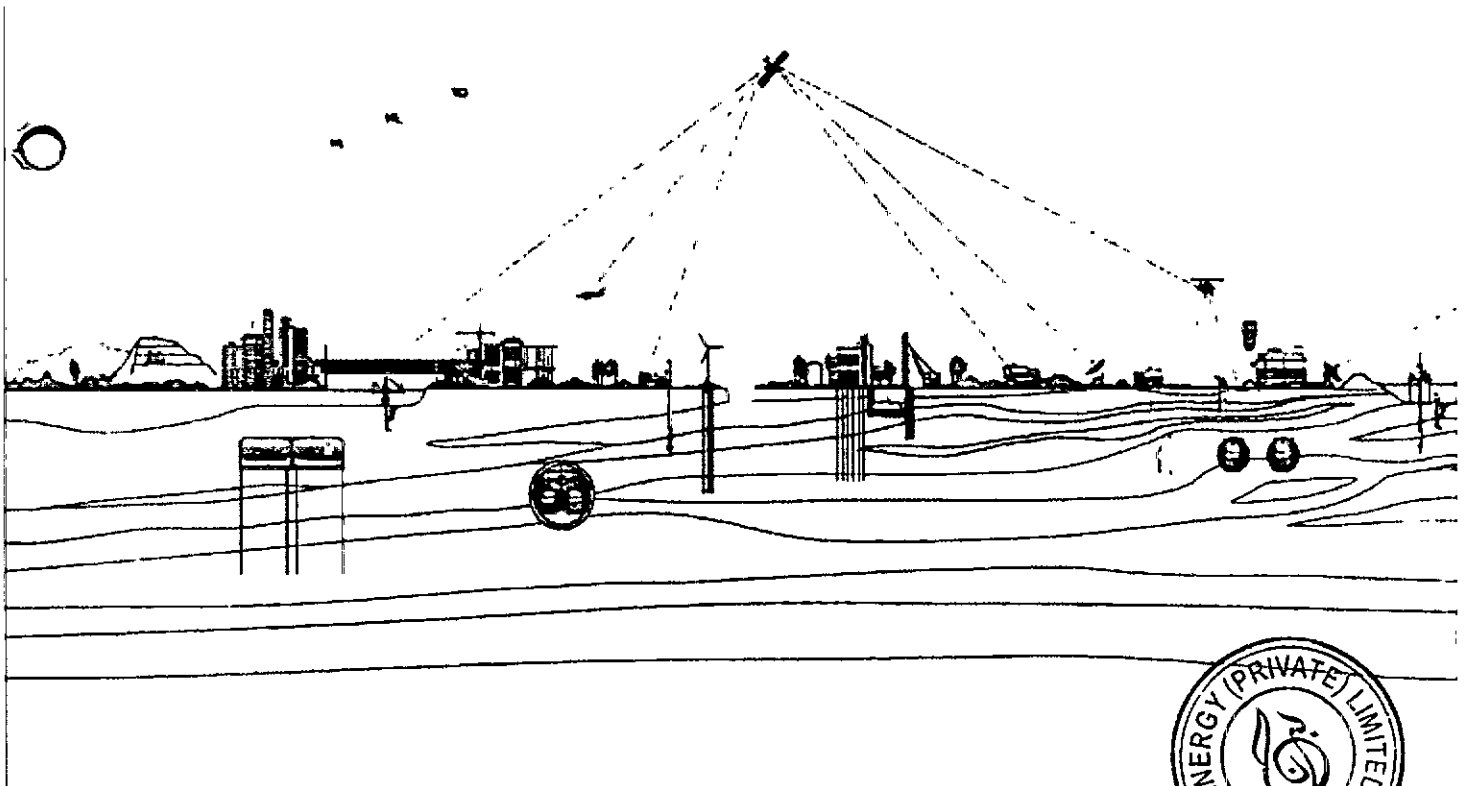


Report No. S-24-1131

HYDROLOGICAL STUDY REPORT FOR PROPOSED HYBRID RENEWABLE PROJECT NEAR GOTH DHORI JHOKHIO, DISTRICT THATTA, SINDH

(REV. 2.0, DATED: AUGUST 27, 2024)

CLIENT: **BURJ**
Capital





SOIL TESTING SERVICES

GEOTECHNICAL ENGINEERS

&

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www.sts.com.pk

SOIL TESTING SERVICES 	Hydrological Study Report		Revision	
			#	Date
	Report No.: Vol I		02	27/08/2024

**PROJECT: Hydrological Study for Proposed Hybrid Renewable Project Near Goth Dhorl
Jokhio, District Thatta, Sindh**

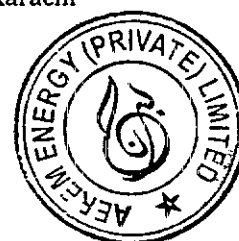
	NAME	SIGNATURE	DATE
PREPARED BY: (Project Engineer)	Safi Ul Hasan		
REVIEWED BY: (Project Manager)	Abdur Rehman		
APPROVED BY: (General Manager)	Naveed Anwer		

ISSUE/REVISION INDEX

Issue Code	Revision					Revision Details
	No.	By	Rev'd.	App.	Date	
RD	00	SUH	AR	NA	05/08/2024	
RD	01	SUH	AR	NA	21/08/2024	Project shifted to a new area
RD	02	SUH	AR	NA	27/08/2024	Figure-1 & recommendations updated

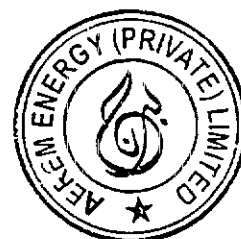
Issue Codes: RC = Released for Construction, RD = Released for Design, RF = Released for Fabrication, RI = Released for Information, RP = Released for Purchase, RPA = Released for Permit Application, RQ = Released for Quotation, RR = Released for Review and Comments.

SOIL TESTING SERVICES



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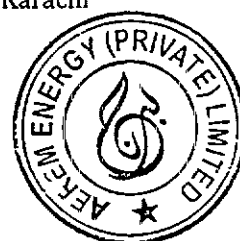


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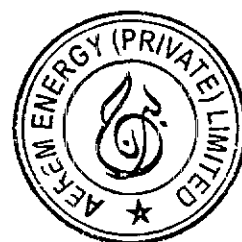
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ABBREVIATIONS

3D	Three Dimension
CN	Curve Number
DEM	Digital Elevation Model
ESRI	Environmental System Research Institute
HEC RAS	Hydrologic Engineering Center River Analysis System
GIS	Geographical Information System
ID	Identity
IDF	Intensity Duration Frequency
MW	Megawatt
RP	Return Period
S	Stream
SB	Sub basin
SCS	Soil Conservation Service
SRO	Surface Runoff
SRTM	Shuttle Radar Topography Mission
STS	Soil Testing Services
TAMU	Texas A&M University
T _c	Time of Concentration
USACE	United States Army Corps of Engineers



1. INTRODUCTION

Hydrological Study report for the Proposed Hybrid Renewable Project near Goth Dhori Jokhio, District Thatta, Sindh is underway. *M/s. Burj Capital* chartered *M/s. Soil Testing Services* as geotechnical consultants for carrying out geotechnical investigation, topographic survey and hydrological study.

This report is for hydrological study of the project site.



2. THE SITE

The project site is located in Goth Dhor Jekhio, approximately 12.0 kilometers northwest of Haleji Lake and around 10.0 kilometers west of Jungshahi, a small town in District Thatta. The nearby landmarks include Jamia Masjid Goth Abdul Hakeem Jekhio and Indus Wind Power Project.

The topography of the terrain is not plain with significant changes in elevation observed across the site at places. Bushes and different types of wild plants were also found across the site.

Figure 1 shows the satellite image of the site and neighbourhood.

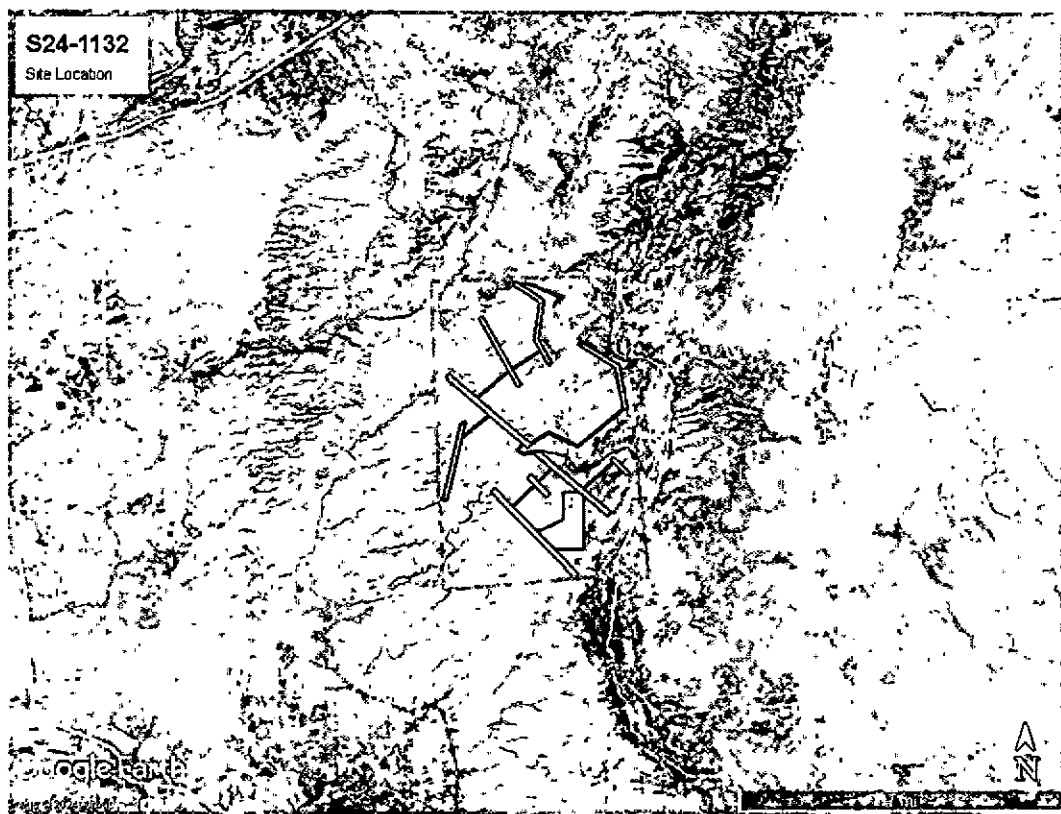
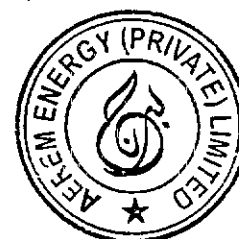


Figure 1: Satellite image of the site

Table 1 presents the coordinates of project site boundary.

Table 1: Site boundary coordinates

S. No.	Easting	Northing	Latitude	Longitude
	m	m	°	°
1	352259.42	2764916.68	24.992511	67.536101
2	358670.30	2765085.32	24.994648	67.599592
3	359735.26	2755074.49	24.904363	67.611157
4	352649.89	2754507.81	24.898574	67.541072



3. OBJECTIVES

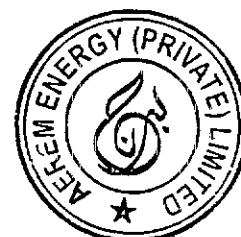
The objectives of this hydrological study are:

- To delineate the watershed of which the study area is a part.
- Identification of major stream and estimation of peak flow for flood conditions.

3.1 LIMITATIONS

This study has following limitations.

- Precipitation dataset has been taken from a remote sensing station for satellite data. It may differ from the rainfall observed at nearest PMD weather station.
- A DEM of 30m resolution has been used. This means that the change in features within 30m x 30m cell has been averaged.
- The return period has been taken as 25 years, calculated using Gumbel's Extreme Values Type I Distribution, applied on available dataset of 18 years (1997 – 2014). The rainfall intensity of single day (25 year RP) have been estimated as 118.07mm.



4. METHODOLOGY

To accomplish the objectives of the study, the methodology adopted is as follows:

- 1. Acquisition of topographic, soil, and meteorological data.
- 2. DEM generation, watershed delineation and stream networks identification using ArcGIS.
- 3. Precipitation data analysis for 1997 – 2014 (18 years) for maximum daily precipitation and annual precipitation trends.
- 4. Generation of intensity-duration-frequency (IDF) curves.
- 5. Mapping of land use data for identification of curve number.
- 6. Estimation of volume flow rate using Soil Conservation Service (SCS) Curve Number for each stream (catchment).

4.1 DATASET

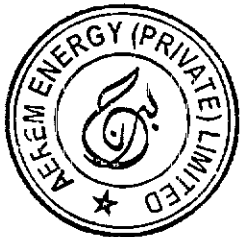
There are number of necessary data require for a comprehensive hydrologic assessment. These data include the basic input parameters of a watershed and the boundary conditions of the several water cycle components.

The success of hydrologic simulations depends on the complete fulfillment of these data requirements. The required information has been sourced from globally available satellite data and field surveys. For modelling of any watershed, following input data are required:

- Digital Elevation Model (DEM)
- Land use & Land cover
- Soil type
- Meteorological data (Precipitation)

Table 2: Datasets and their sources

S. No.	Description	Sources	Coordinates
1	Digital Elevation Model	Topography - Project area SRTM – for surrounding	Transient, 2015
2	Land cover	MODIS Land Cover – Type 1	Transient, 2022
3	Soil Type	STS (Soil Investigation)	-

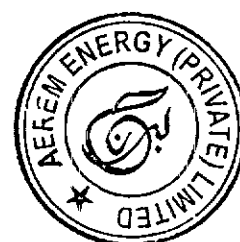


S. No.	Description	Sources	Coordinates
4	Met Data (1997-2014)	Global Weather Data (TAMU)	Lat: 67.5, Long: 24.51

4.2 HYDROLOGICAL MODELLING

Hydrological modelling is the mathematical conceptualization of complex and spatially distributed watershed processes such as rainfall, runoff, soil moisture flow, overland flow, and ground water flow. This simulation is done by the computers by solving the equations that governs these physical processes (Ajami, et al, 2008) based on land cover maps, topography, meteorological parameters, and soil types. It is an accepted and recognized approach for the assessment of water quantity and quality. It simulates and forecasts the watershed response in order to study impact of precipitation variations, land-use, anthropogenic factors, and climatic changes on river hydrology and surface water.

ArcGIS has been used as the key Geographic Information System (GIS) based computer program for analysis of the hydrologic patterns.



5. MODELLING AND CALCULATIONS

5.1 MODELLING

ArcGIS is a GIS for working with maps and geographic information maintained by Environmental System Research Institute (ESRI). It is used for creating and using maps, compiling geographic data, analysing mapped information, sharing and discovering geographic information, using maps and geographic information in a range of applications, and managing geographic information in a database.

The system provides an infrastructure for making maps and geographic information available throughout an organization, across a community, and openly on the Web. (Courtesy: Wikipedia)

5.1.1 DIGITAL ELEVATION MODEL CREATION

Digital Elevation Model is a type of GIS layer which represent three dimensions of terrain or topographic surface. It shows terrain slopes and profiles within selected points. A DEM can be represented as a raster or as a vector-based triangular irregular network. The DEM in Global Mapper is used to delineate the watershed and sub watersheds, and to generate the stream networks and drainage patterns of the terrain surface. Several sub-basin parameters are calculated using DEM such as; slope gradient, slope length of the terrain, and the stream network characteristics; such as channel slope, longest reaches, length, and width of the stream. Grid size is the main parameter which affects the accuracy of DEM.

Decreasing grid size will increase accuracy. Besides that, various resolutions of DEM are available which are built using remote sensing technique, for example, DEM of 30m resolution, and DEM of 90m resolution. The DEM for our watershed has developed with topographic data for the study area, whereas SRTM data for surrounding was considered for watershed delineation and analysis.

DEM as shown in *Figure 2* below is generated with the help of ARCGIS considering the topography of the area, it covers a large area around the area of interest, to help identify all the relevant basins.



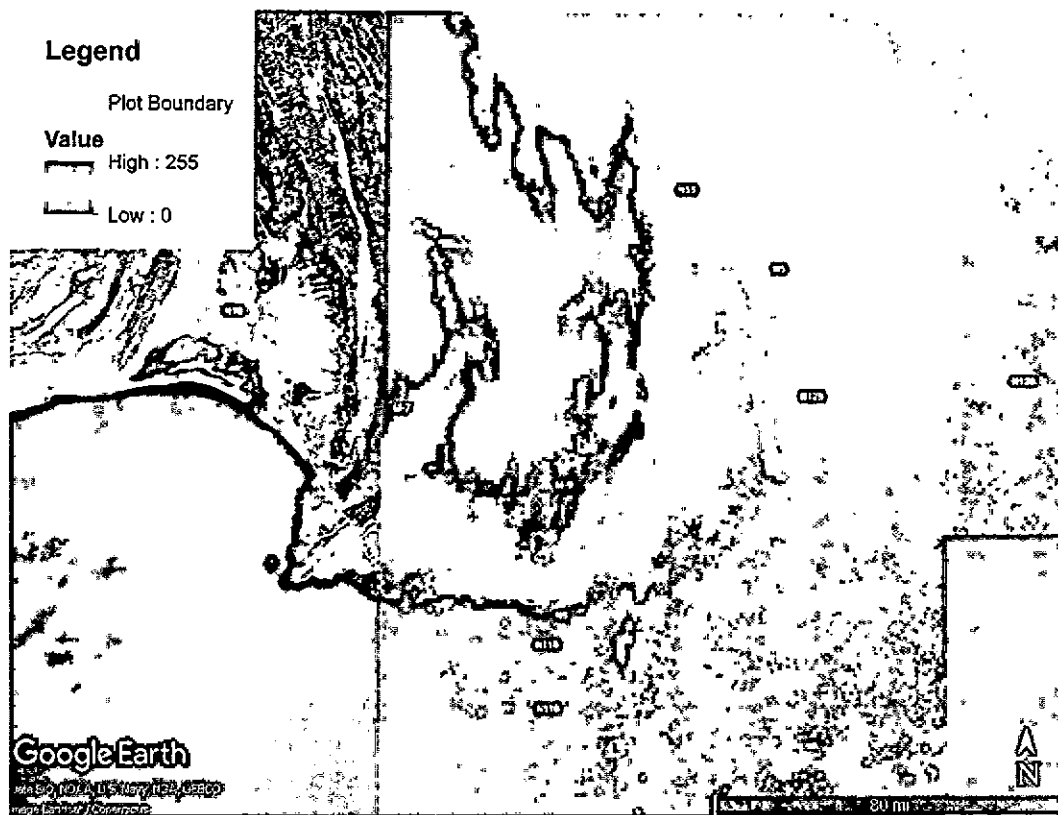
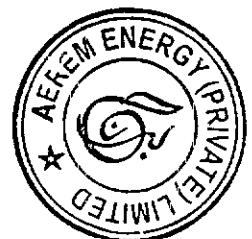


Figure 2: Elevation changes in the DEM

5.1.2 FILLING SINKS

This is done to create a depression less DEM. The grid created earlier contains cells with different elevation and when a cell is surrounded by cells with higher elevation, water will trap in that particular cell and will not flow (Merwade, 2011). It is crucial to fill the sinks because the network should be that of the continuation of flow path of each cell that will finally flow to the edge of the grid and when this fails, the trapped cell may drain into each other causing endless processing loop. *Figure 3* is intended to depict the purpose of this filling sinks step.



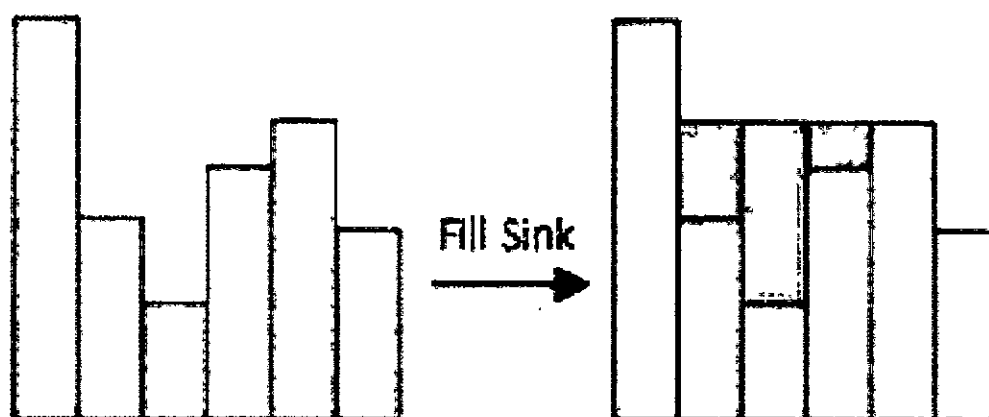


Figure 3: Filling in sinks

5.1.3 FLOW DIRECTION

Flow direction is needed to determine where the landscape will drain by implying coded cells representing the direction of the flow. Note that the coding numbers do not have any absolute, relative, or ratio meaning, they are just used as numeric place holders for nominal direction data values (since grid values are always numeric) as stated in the Surface Hydrology Modeling (2010).

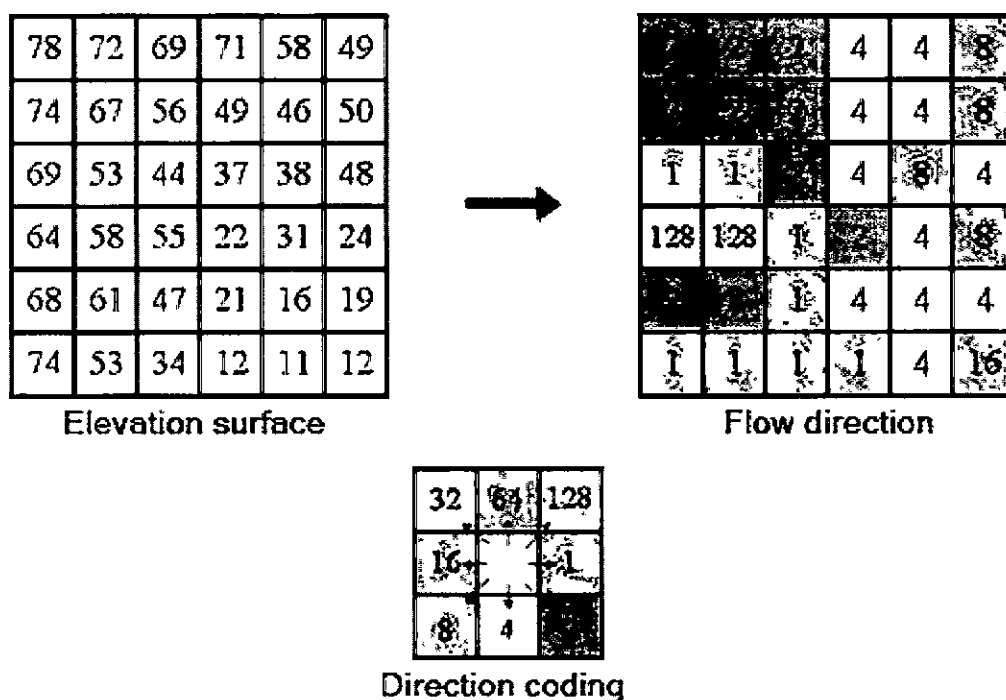


Figure 4: The coding of direction flow

5.1.4 IDENTIFICATION OF BASINS

Basin tool is used to identify the basins that flow to each outlet point. The purpose of this step to identify the basins that can influence our study area and basins present in the neighbourhood. *Figure 5* shows the basins relevant to the study area.

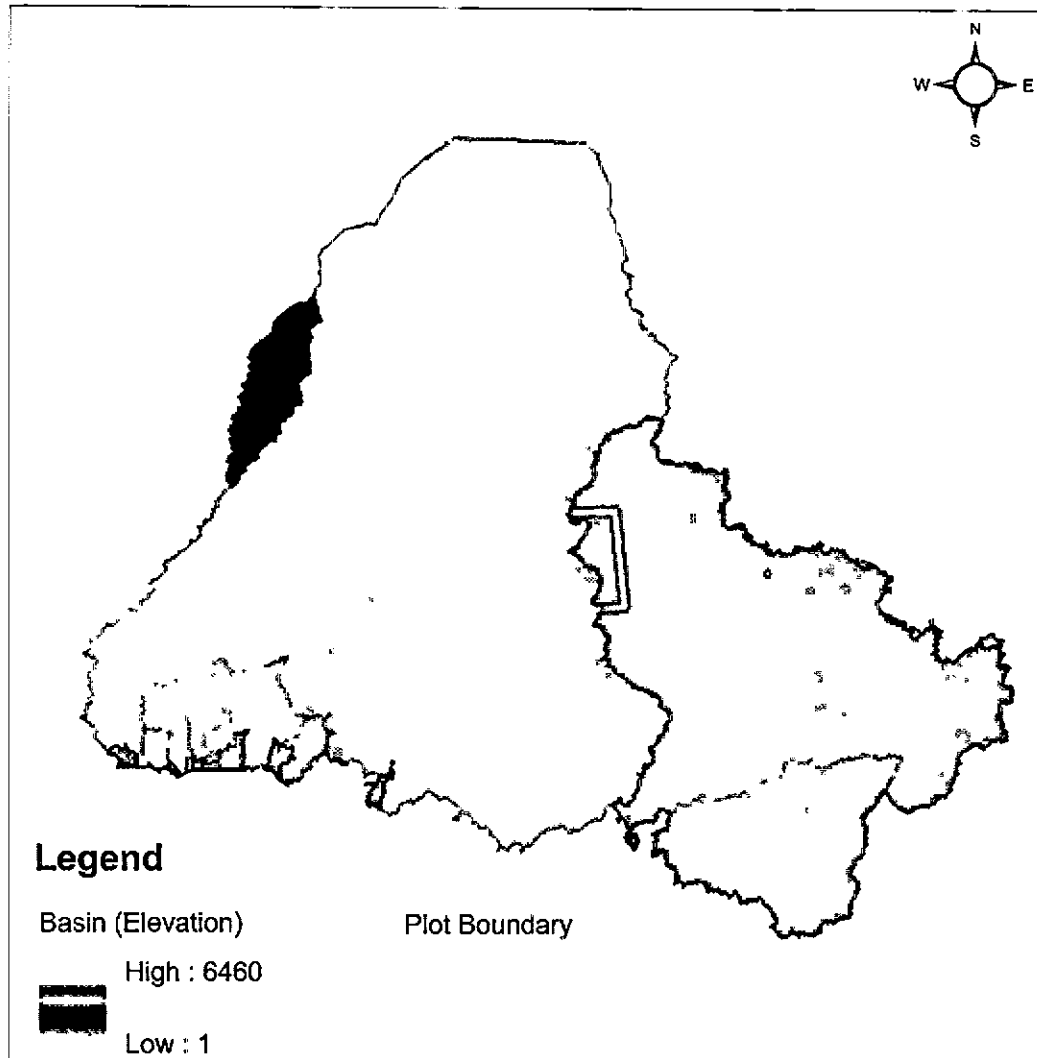


Figure 5: Illustrates the basins in which the site is located, along with the neighbouring basins

5.1.5 STREAM NETWORK

Stream networks are an important component of a hydrological system and provide a physical foundation for hydrological processes, storage and conveyance of water, aquatic habitats and human water demands. A DEM based stream network of the area was generated which is shown in *Figure 6* in order to proceed for watershed delineation. Stream network around the plot is shown in *Figure 7*.



Figure 6: Streams network in the region



Figure 7: Streams network around the plot



5.1.6 WATERSHED DELINEATION

The DEM made from topographic survey data, and satellite data for surrounding was processed in ArcGIS. A DEM based stream network of the area was generated which is shown in figure 8 in order to proceed for watershed delineation.

A single point (outlet of stream at site downstream) was provided as input. Based on DEM, it traced the stream back and delineated the watershed, presenting the catchment areas from which our site receives SRO. *Figure 8* shows a map of watershed in which the proposed study area is located. The watershed boundary and its sub catchments have also been marked.

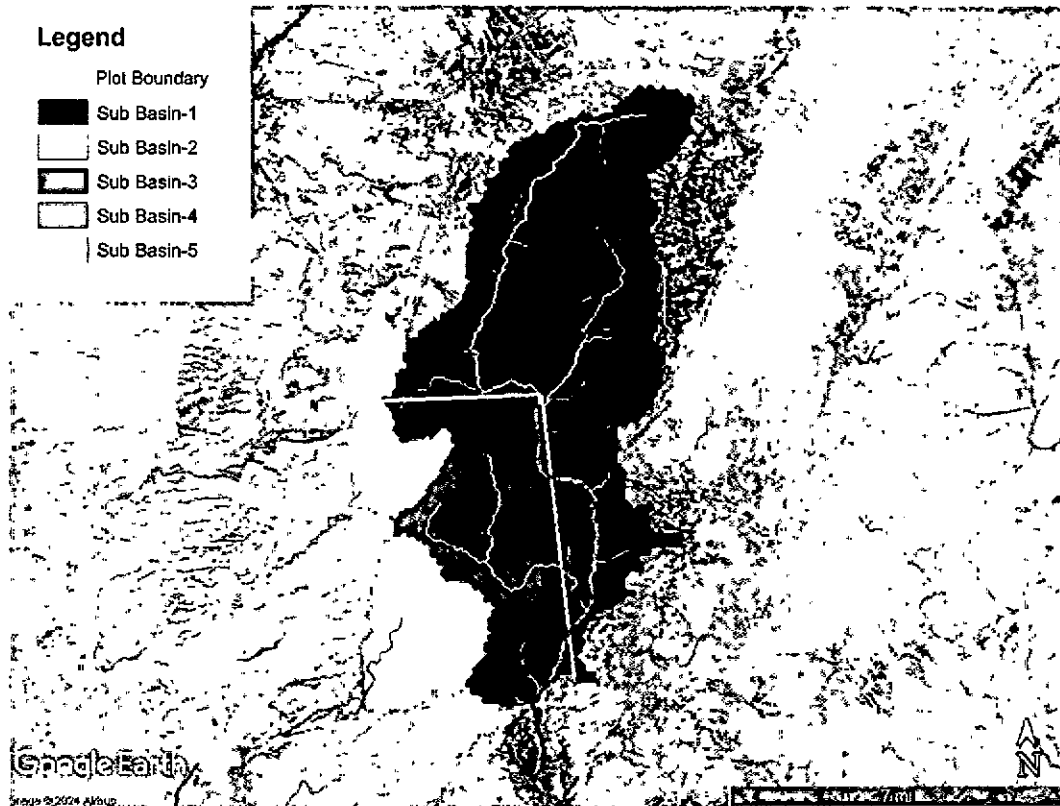


Figure 8: Study area with sub-basins and drainage pattern



5.1.7 LAND COVER MAPPING

As SCS curve number method is used for the estimation of unit peak flow & discharge hence, it was significant to choose the appropriate curve number. Curve number is dependent upon the land cover type. In order to acquire the land cover for the study area, MODIS land cover type is used which is global land classification that is produced annually. For each year there are five land cover schemes, developed by different research groups. Data is distributed by USGS at 500m resolution in standard.

The land use map prepared for the watershed of study area is shown below in *Figure 9*.



Figure 9: Land use map for the study area

5.2 CALCULATIONS

5.2.1 DAILY RAINFALL ANALYSIS

The maximum single day precipitation has been observed to be 136.23mm on August 11, 2011. Maximum Single day precipitation for each year during 1997 – 2014 has been used to generate Intensity Duration Frequency (IDF) Curve for the study area. The chart 3 shows the daily precipitation trend over the study duration of 18 years.



Chart 3: Daily precipitation for the study area

5.2.2 SCS CN METHOD

Soil conservation service (SCS) method is an experimentally derived method to determine rainfall excess using information about soils, vegetative cover, hydrologic condition and antecedent moisture conditions. The curve number is based on the areas hydrologic soil group, landuse, treatment and hydrologic condition. The two former being of greatest importance. The general equation for the SCS curve number method is as follows:

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S} \quad (1)$$

Q = Runoff (in)

P = Rainfall (in)

S = Potential Maximum Retention
after Runoff Begins

I_a = Initial Abstractions



$$I_a = 0.2S \quad (2)$$

$$Q = \frac{(P - 0.2S)^2}{(P + 0.8S)} \quad (3)$$

$$S = \frac{1000}{CN} - 10 \quad (4)$$

5.2.3 RAINFALL FREQUENCY (RETURN PERIOD) ANALYSIS & HYDROLOGICAL MODELLING

For the analysis of peak discharge in a watershed rainfall frequency analysis is required. Return period analysis for the study area was conducted on the processed precipitation data.

Maximum annual One day rainfall data at the Remote Sensing Weather Station is considered for 18 years (1997-2014) which has been used for the Rainfall frequency analysis. Used values of maximum annual one day rainfalls are shown in *Chart 4*.

The *chart 4* depicts that the highest and lowest Rainfall years were 2011 and 2000 with 136.23mm and 4.29mm maximum annual one day rainfall depth values, respectively. The mean value of maximum annual one day rainfall is 40.2mm with a standard deviation of 38.1mm. Rainfalls corresponding to 2, 5, 10, 15, 20, 25, 30, 50, and 100 year return period were computed using Gumbel's Extreme Value Type I Distribution. Microsoft Excel was used to carry out the Rainfall frequency analysis.

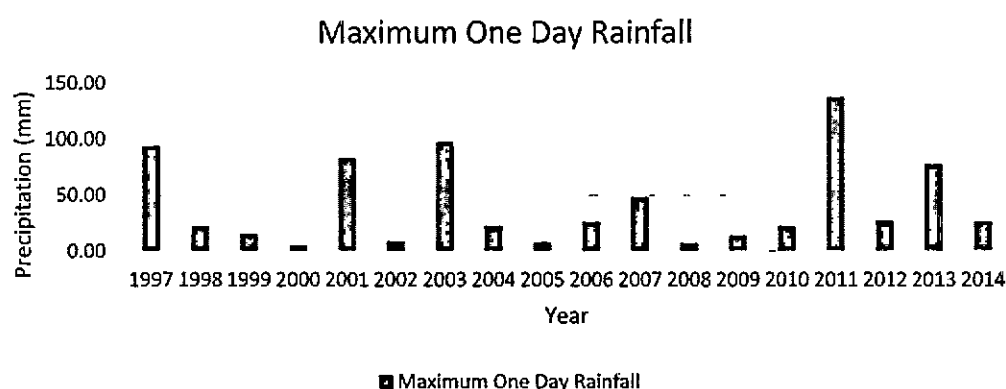
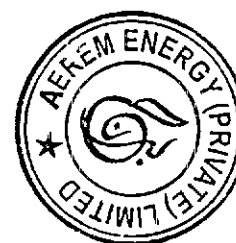


Chart 4: One day maximum rainfall (1997-2014)



5.2.4 STREAM THROUGH THE SITE

The study area is traversed by multiple streams, generated by the ArcSWAT model based on the digital elevation model as depicted by *Figure 10 & 11*. This main stream represented by dark blue, represents the principal source of flooding within the study area, which encompasses a catchment area of approximately 102.13 square kilometres. The major stream flows for 14.28 kilometres before entering the plot from the northern boundary. It then exits along the eastern boundary, travels parallel to it, and re-enters the plot near the southeastern corner. From there, it flows across the plot and exits through the southern boundary. It is important to note that the main stream does not pass through any of the proposed strips, marked by black in *Figure 10 & 11*. Multiple smaller streams also flow through the study area which shall be considered in the design phase.

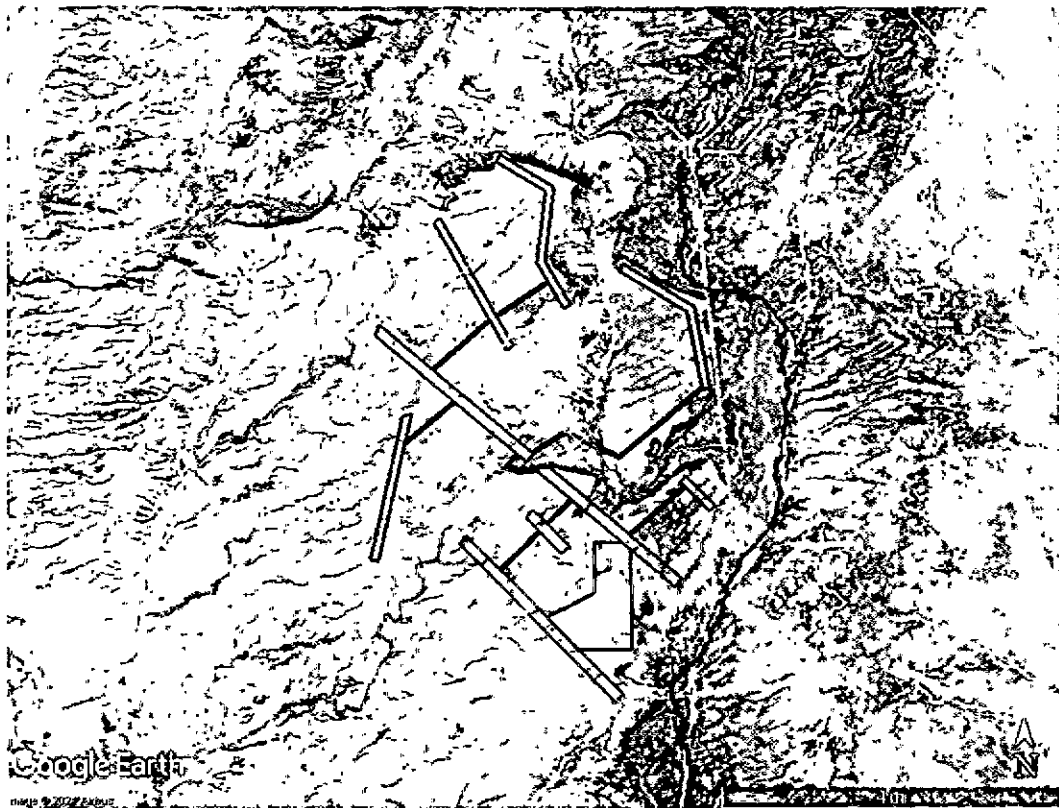
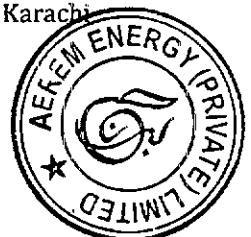


Figure 10: Streams passing through the study area



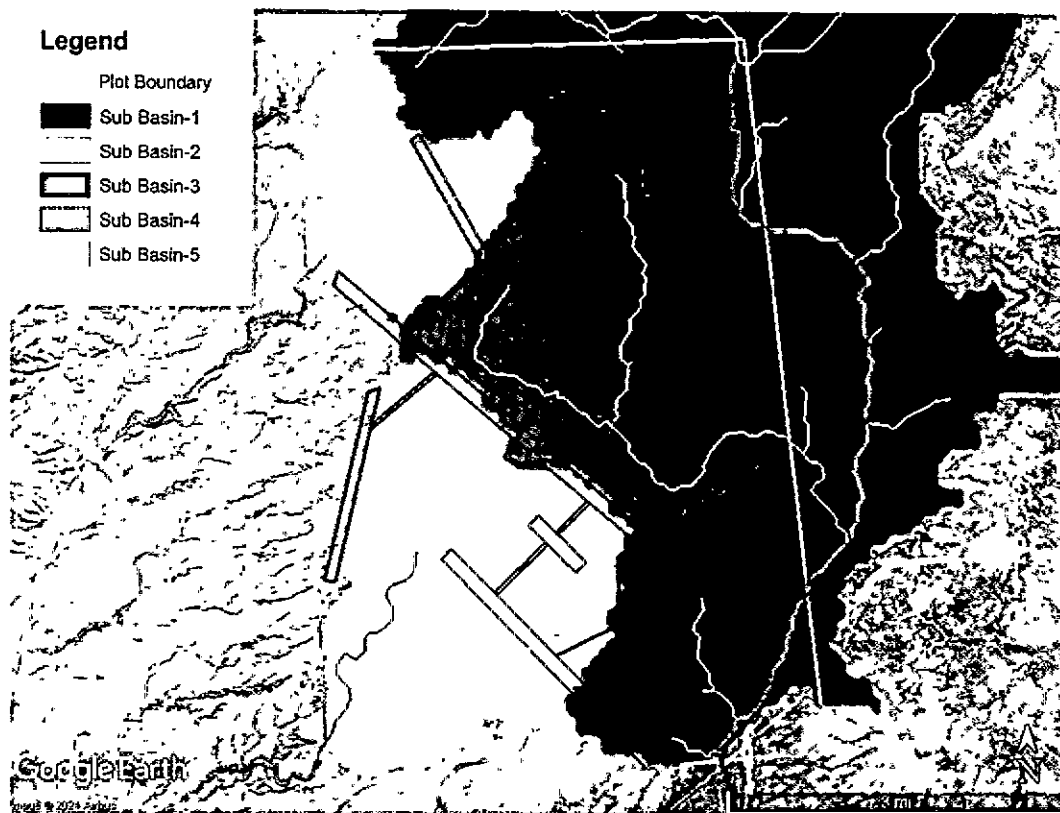


Figure 11: Streams passing through the study area – Watersheds superimposed

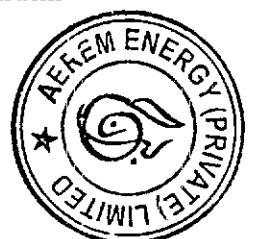
5.2.5 ANALYSIS AND RESULTS

For the analysis of peak discharge in a watershed, rainfall frequency analysis is required. One day maximum rainfall for 18 years was processed for generation of intensity duration frequency (IDF) curves. Chart 4 presents the one-day maximum rainfall trend for the study duration. Following the analysis using Gumbel's Extreme Values Type I Distributions, the value of rainfall intensity has been selected for 25-year return period.

Parameters for use in SCS CN Method are:

- SCS CN
- Length of stream
- Slope
- Rainfall (25 year return period)
- Catchment Area

These were then input to the SCS CN equation for estimation of Time of Concentration (T_c), Runoff depth, unit peak flow and discharge (flow rate). Flows out of the important

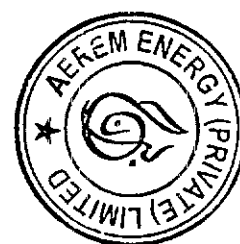


streams corresponding to the 25-year return period as estimated by the SCS CN Method. Table 5 presents the parameters and surface runoff for several catchments within the watershed.

Table 5: Inputs and Outputs

Catchment ID	Area (km ²)	Curve Number (CN)	Stream ID	Length (mile)	Slope (ft/mile)	Rainfall (mm)	Estimated Discharge (m ³ /s)
SB-1	102.13	91	S-1	17.14	172.25	118.07	50.31
SB-2	17.68	91	S-2	3.62	178.10	118.07	13.58
SB-3	19.18	91	S-3	4.87	345.38	118.07	16.28
SB-4	8.55	91	S-4	2.16	305.64	118.07	8.75
SB-5	6.06	91	S-5	2.02	105.93	118.07	4.74
Cumulative Discharge							80.17

The maximum observed flow at the watershed outlet is 50.31 cubic meters per second. A primary concern is SB-1, which contributes 63% of the discharge to the study area through a main stream. In comparison, SB-2, SB-3, SB-4 & SB-5 contribute 17%, 20%, 11% and 6% of the discharge, respectively. The combined discharge from these sources totals 80.17 m³/s. On the basis of these results, recommendations are presented in the section 6 of this report.



6. CONCLUSIONS AND RECOMMENDATIONS

Based on the field surveys, analysis of data, and computer modelling, following may be concluded.

1. The project site is part of very large watershed and receives surface runoff from huge catchment area of 153.60 sq.km hence, it is recommended to consider the total discharge i.e. 80.17 cumecs for being on safer side.

(Recommendation: To consider total discharge for safer side)

2. The major stream flows for 14.28 kilometres before entering the plot from the northern boundary. It then exits along the eastern boundary, travels parallel to it, and re-enters the plot near the southeastern corner. From there, it flows across the plot and exits through the southern boundary. It is important to note that the main stream does not pass through any of the proposed strips Multiple smaller streams also flow through the study area which shall be considered in the design phase.

(Conclusion: Water will flow through the site and eventually drain into the Indus River, which traverses approximately 35 Kilometres in southeast direction).

3. The volume flow rates have been presented in table 5 for mentioned return period and rainfall intensity. Adequate drainage facility must be provided to cater the flow during a flood event to ensure structural stability and safety.
(Recommendation: Adequate drainage facility is required for this site to cater the flow during flood conditions)

4. Any engineering interventions, regarding design of hydraulic structures; culverts, drains, should be in accordance with the presented flow rate and SRO depth, as per considered return period and flood magnitude. Designer to justify the adequacy of design with respect to presented recommendations.
(Recommendation: All hydraulic structures must be designed as per the provided flow rate and SRO depth)

5. Construction in the drainage pattern should be avoided to maximum extent. In case, it is desired to make development in near surroundings of the stream, adequate channels/conduits must be designed and constructed to ensure no effect on SRO.

(Recommendation: It is recommended to avoid the construction in path of water streams)



6. The proposed land use to be planned based on the drainage pattern of the site. High impact development in the areas near streams and steep slope should be avoided.

(Recommendation: Steep slopes are usually the way of water hence, it is recommended to avoid development near steep slopes)





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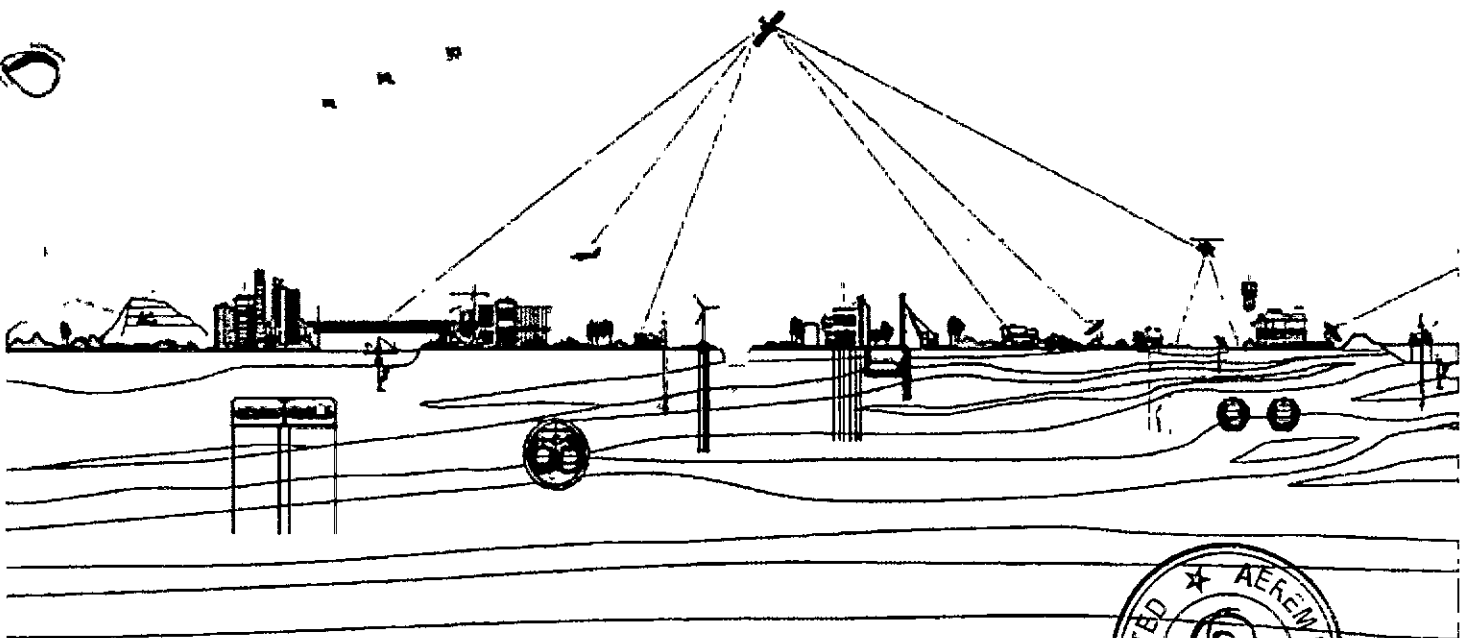


Report No. S-24-1131

TOPOGRAPHIC SURVEY REPORT FOR PROPOSED HYBRID RENEWABLE PROJECT NEAR GOTH DHORI JHOKHIO, DISTRICT THATTA, SINDH

(REV. 1.0, DATED: AUGUST 26, 2024)

CLIENT: **BURJ**
Capital





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SOIL TESTING SERVICES 	Topographic Survey Report		Revision	
			#	Date
	Report No.: Vol I		1.0	26/08/2024

PROJECT: Topographic Survey for Proposed Hybrid Renewable Project near Goth Dhorj Jhokhio, District Thatta, Sindh is underway

	NAME	SIGNATURE	DATE
PREPARED BY: (Project Engineer)	Safi Ul Hasan		
REVIEWED BY: (Project Manager)	Abdur Rehman		
APPROVED BY: (General Manager)	Naveed Anwer		

ISSUE/REVISION INDEX

Issue Code	Revision					Revision Details
	No.	By	Rev'd.	App.	Date	
RD	00	SUH	AR	NA	25/07/2024	
RD	1.0	SUH	AR	NA	26/08/2024	Revised area covered.

Issue Codes: RC = Released for Construction, RD = Released for Design, RF = Released for Fabrication, RI = Released for Information, RP = Released for Purchase, RPA = Released for Permit Application, RQ = Released for Quotation, RR = Released for Review and Comments.

SOIL TESTING SERVICES



Soil Testing Services, Karachi

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1. INTRODUCTION

Planning for Proposed Hybrid Renewable Project near Goth Dhor Jhokhio, District Thatta, Sindh is underway. In order to carry out the topographic survey of the area, *M/s. Soil Testing Services (STS)* were entrusted by *M/s. Burj Capital* to perform the confirmatory.

The fieldwork was carried out in July - August, 2024. Throughout the duration of the fieldwork, the survey team was accompanied by an authorized representative from *M/s. Burj Capital* who ensured seamless coordination with the project's requirements.



2. SCOPE OF WORK

The scope of work is given in the table below:

- Identification of major level deviations in the plot such as hills, severe depressions, water drains etc. and reporting of spot levels of area within the general area of the plot at a grid of 25 meters. The levels on the road or track along the site to be also taken.
- Topographic survey drawing of the entire plot shall be prepared marking all features therein. "Key Plan" should also be marked to facilitate identification and location of the Plot.
- Highest water level for the area (during Monsoon) is also to be reported (if any).
- The survey is to be carried out with respect to existing local Bench Mark (BM) or UTM system.



3. THE SITE

The project site is located in Goth Dhori Jokhio, approximately 12.0 kilometers northwest of Haleji Lake and around 10.0 kilometers west of Jungshahi, a small town in District Thatta. The nearby landmarks include Jamia Masjid Goth Abdul Hakeem Jokhio and Indus Wind Power Project.

The topography of the terrain is not plain with significant changes in elevation observed across the site at places. Bushes and different types of wild plants were also found across the site.



Figure 1: Google image of the neighborhood area (Courtesy: Google Earth)

Table 1 presents the coordinates of project site boundary.

Table 1: Site boundary coordinates

S. N.	Easting m	Northing m	Latitude	Longitude
1	352259.42	2764916.68	24.992511	67.536101
2	358670.30	2765085.32	24.994648	67.599592
3	359735.26	2755074.49	24.904363	67.611157
4	352649.89	2754507.81	24.898574	67.541072

4. TOPOGRAPHY AND PHYSIOGRAPHICAL FEATURES

The mountainous relief follows the general axial trend of structures, and they are:

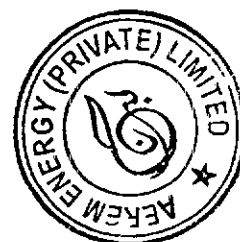
- The foot hills of western Sindh which have gentle structure and are of low relief.
- The Nagan range of mountain front, steeply folded, intensively faulted and of high relief.
- Zarghun and Khuzdar knots folded complex.
- Central Mekran, a region of parallel valleys and ridges.

Except for the hills of Khairpur, Indus plain is devoid of major relief and is essentially a broad and shallow basin bordered on the east by the low hills of Peninsular, India and on the west by the ranges of Baluchistan and western Sindh.

The central part is build up with floodplain material of the Indus River, which is post Tertiary alluvium, cut by river channels. The land slope is less than 1/5,300 or 1 ft. per mile. The western part of basin is a piedmont plain that slopes gently up to the mountains. The eastern part of the basin is largely covered with sand of the great "Thar" desert.

The erosional physiography is typical of arid and semi arid terrains, as seen by abrupt boundary between steep rocky mountains and the wide alluvial valley. The Indus river flows on a very flat plain (own-made plain more than 1,100 km long with one-foot per-mile slope, broken by a group of pre-cambrian hills and low isolated limestone hills at Sukkar, Hyderabad and Karachi).

Figures 2&3 illustrate the elevation profile of the plot in 2D and 3D, respectively, highlighting regions of maximum and minimum elevations. The data reveals that the general elevation of the plot decreases as we progress towards the south-western part of the plot. The highest elevation, approximately 255 meters, is found in the northern part of the plot, while the lowest elevation drops up to 84 meters in the south-eastern zone of the plot.



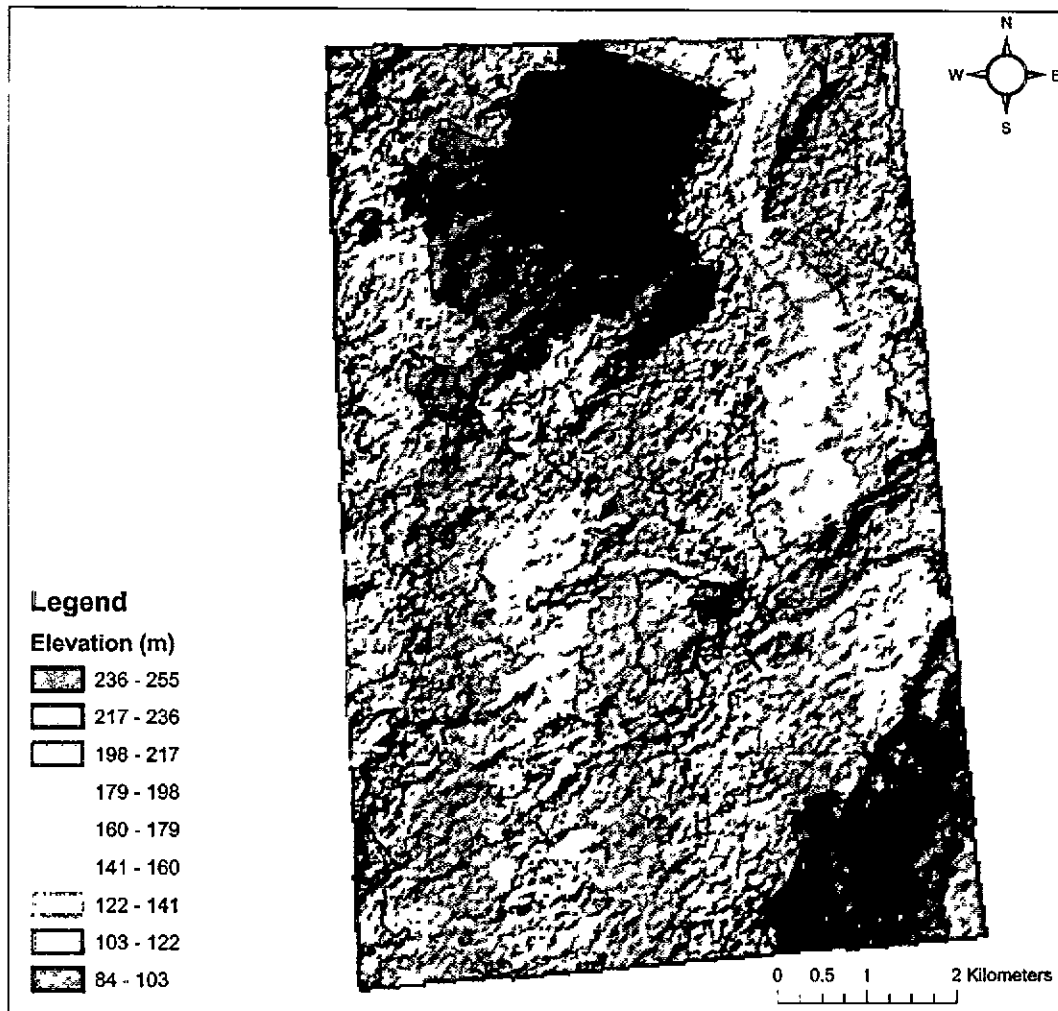


Figure 2: Elevations (2D)

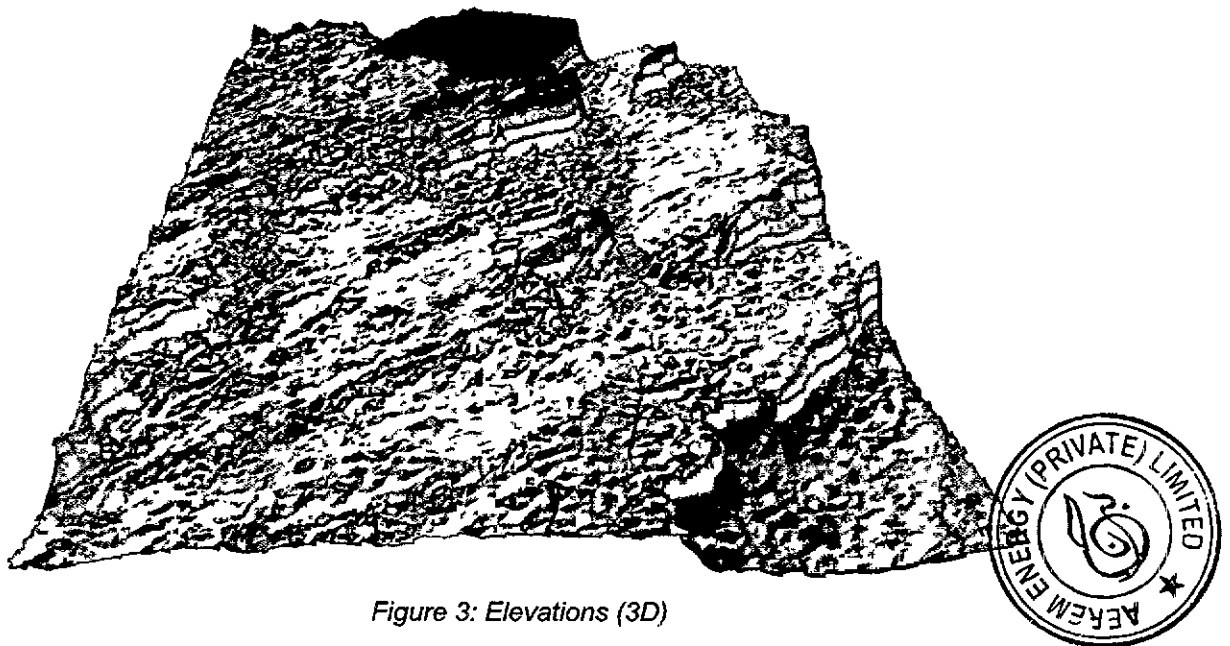


Figure 3: Elevations (3D)

Figure 4 provides detailed information about the slopes across the plot. Blue lines indicate regions with steeper slopes, while yellow areas denote regions with gentler slopes. The plot shows a maximum slope change of approximately 36%, alongside several areas where the slope is virtually level (0%). Notably, multiple regions exhibit significant slope changes, with the most pronounced steep gradients along the eastern part of the plot.

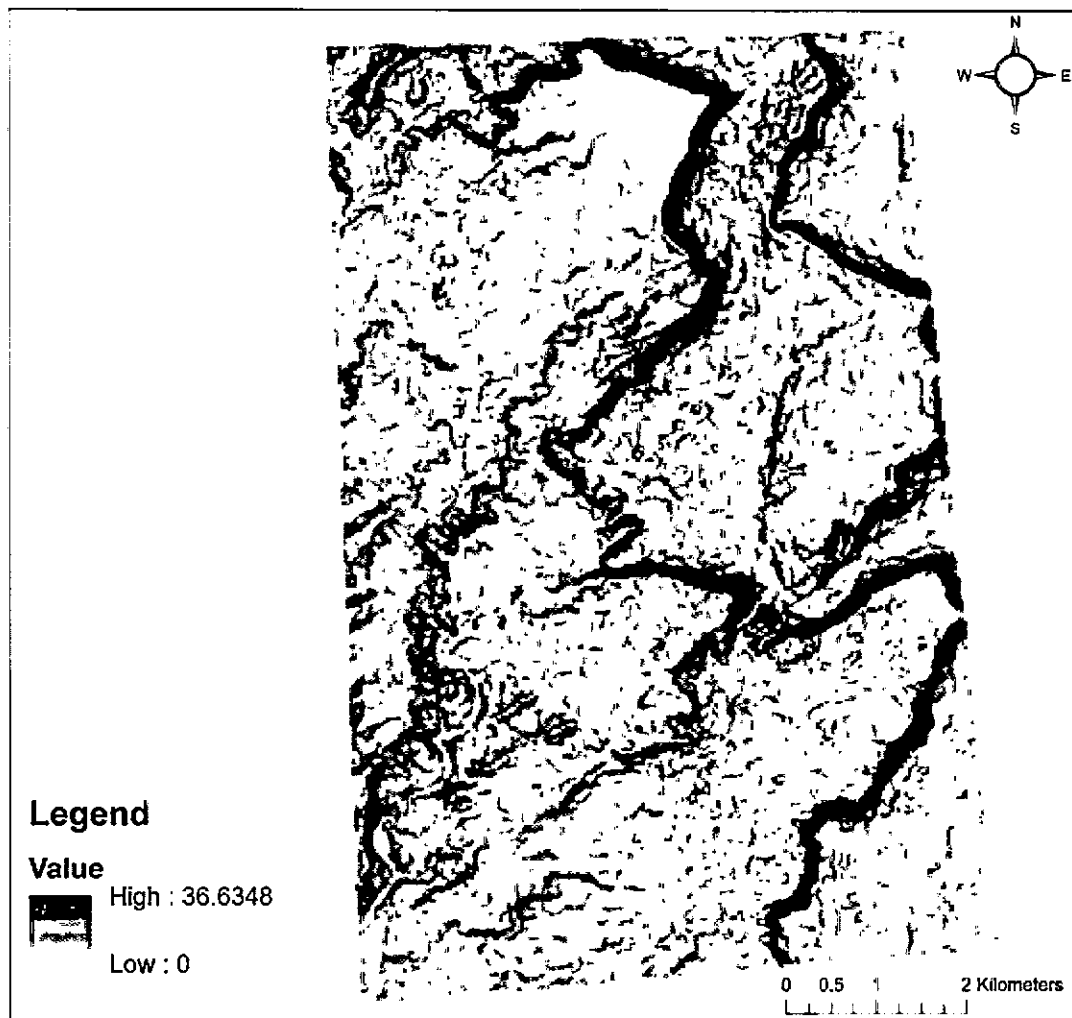
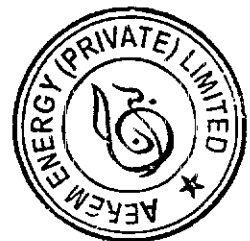


Figure 4: Slopes at the plot



Aspect is the orientation of slope, measured clockwise in degrees from 0 to 360, where 0 is north-facing, 90 is east-facing, 180 is south-facing, and 270 is west-facing. The Aspect identifies the direction the downhill slope faces. Details about the aspect at the plot are presented in *Figure 5*.

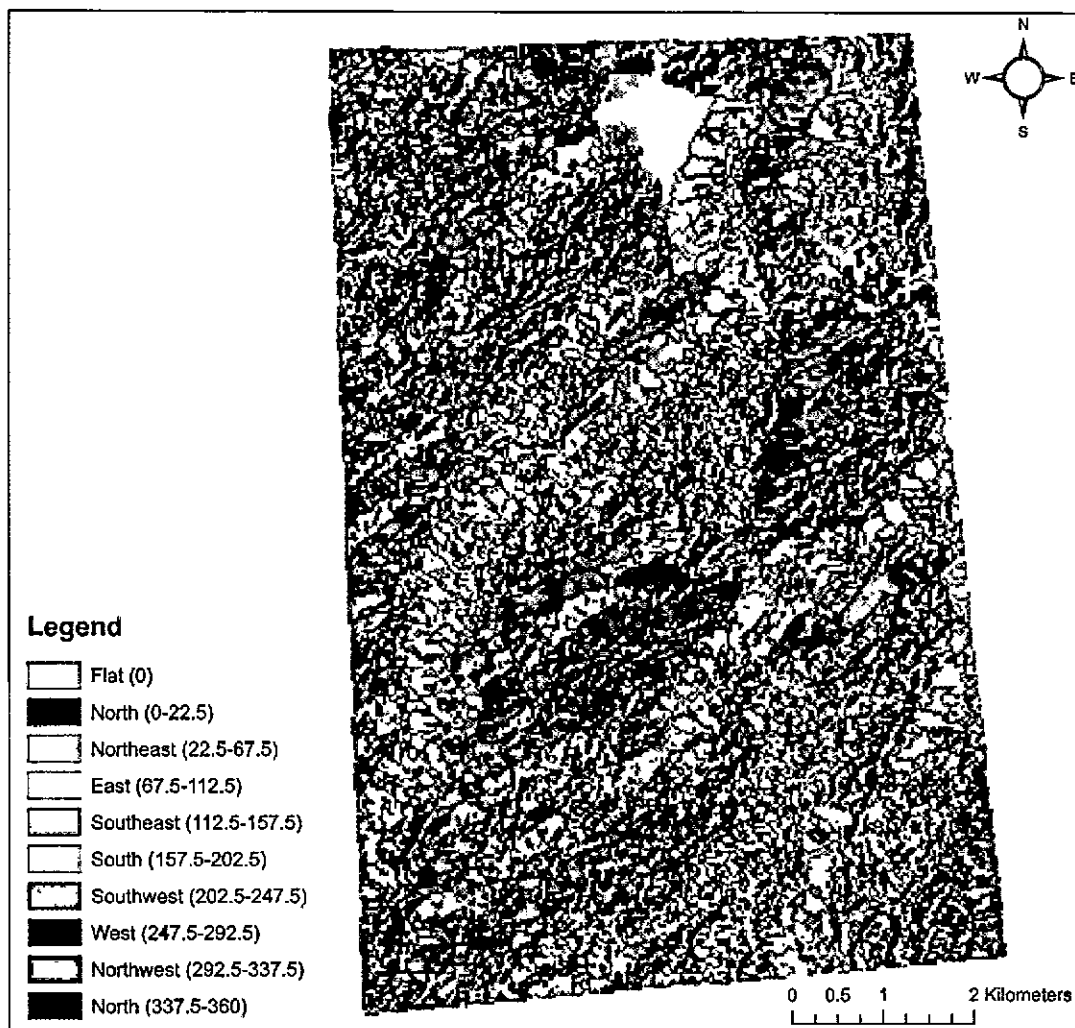


Figure 5: Aspect of slopes at the plot

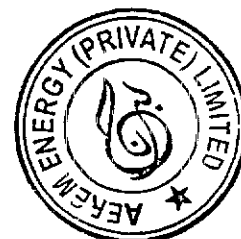


Figure 6 gives the 3D perspective of the slope, aspect and the elevations at the plot.

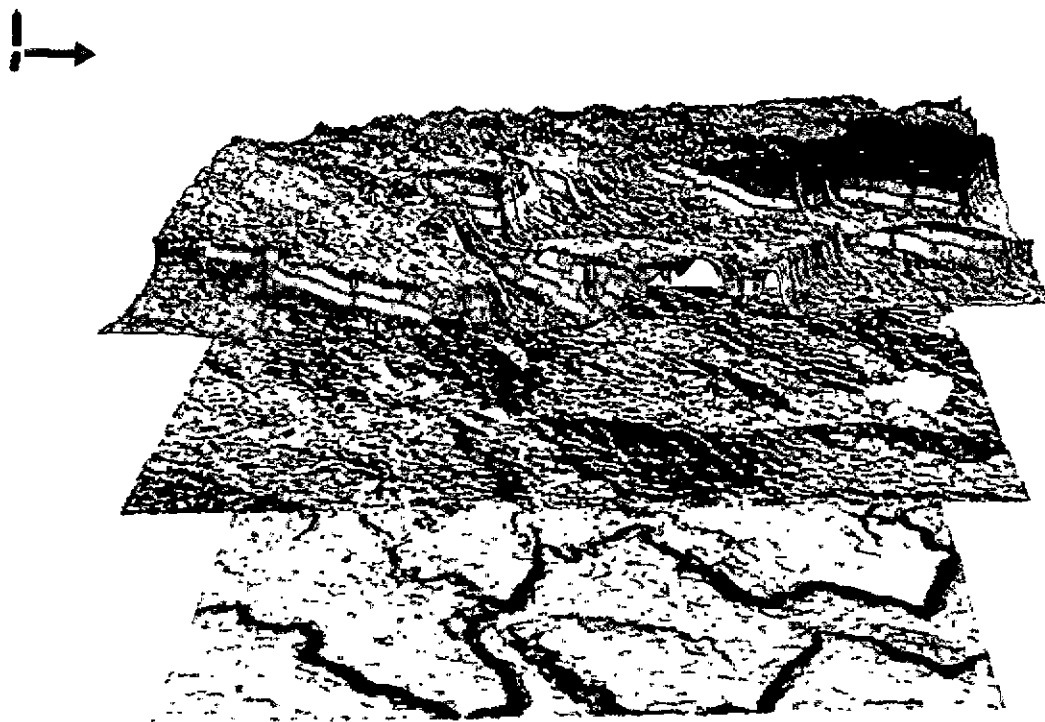
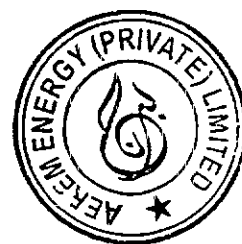


Figure 6: 3D perspective of elevations, slope and aspect of the plot



5. EQUIPMENT

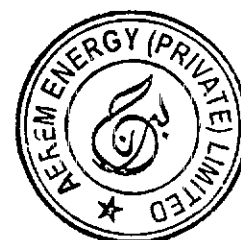
Survey instruments employed for this project included the GPS S9 Stonix and Sokkia 630RK total station instruments. The survey results were accurately computed and are presented in accordance with the WGS84 (Satellite) Everest 1830 coordinate reference system, specifically within Zone 42, which pertains to the Pakistani geodetic framework. It is pertinent to mention that the mapping outputs have been plotted using both global and local grid systems, thereby providing a comprehensive representation of the surveyed area.

6. BENCH MARK ESTABLISHMENT

To enhance the accuracy of the survey, four (04) local benchmarks were established. These benchmarks were strategically positioned within the survey area to provide additional reference points for triangulation and verification. *Table 1* gives details of benchmarks.

Table 1: Benchmark details

Benchmark	Easting	Northing	Level (m)
BM-01	352259.42	2764916.68	225.150
BM-02	358670.30	2765085.32	178.050
BM-03	359735.26	2755074.49	101.127
BM-04	352649.89	2754507.81	72.438



7. SURVEY EXECUTION METHODOLOGY

7.1. CONTROL SURVEY

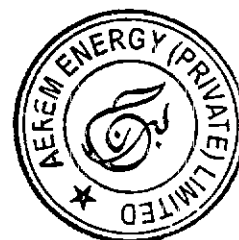
Four (04) control stations (Bench Marks) were established using the baseline "Static" and "RTK" methods. The first control station served as the base, while the other stations acted as the rover.

Upon completing the control network, we applied a Least Squares Adjustment to the coordinates and elevations. Once the network adjustment was finalized, all resulting coordinates and elevations were fixed for the duration of the project and any future work.

All control station coordinates are presented in Universal Transverse Mercator (UTM) coordinates, with reference to Zone 42 projection on EGM 2008 and Satellite (WGS84) datum.

7.2. TOPOGRAPHICAL SURVEY

A new control station was occupied by one GPS receiver as a reference, while other GPS receivers were used as rovers employing Stonix S9 GPS RTK techniques. This method is more efficient and accurate than the closed traverse technique. Subsequently, surveyors began a detailed topographic survey of the area. Permanent structures within the survey area, such as buildings, roads, walls, fences, existing plant limits, trees, field boundaries, invert levels, and edges of seasonal drains/NALAH, were surveyed. A grid of approximately 25 x 25 meters was used to observe levels and changes in slope.



8. DATA PROCESSING

8.1. OVERVIEW

The GPS static baseline data was processed using Spectrum software, Version 4.22. All survey data was sent to our office in Karachi for final processing. Once received, the raw GPS data was computed using Stonix post-processing software, and a quality control check was performed on each data set to ensure it met the required specifications.

After reducing the raw GPS and total station observations and converting the data into 3D CSV format, the raw drawing files were handed over to CAD operators for further processing. Individual jobs were merged, and all data editing was performed to present the data at the correct scales, symbology, and level structures. When sufficient data was available, digital terrain models, in the form of a triangulated irregular network (TIN), were generated using all surveyed spot heights and correctly defined break lines and boundaries.

Finally, the files were converted into DWG format for use with AutoCAD software.

8.2. MAPPING GPS / TOTAL STATION DATA PROCESSING

Preliminary processing was carried out using Stonix GPS processing software. The resultant coordinates and field codes were then loaded into Spectrum and Civil3D software for further processing to complete the check mapping. All drawings were produced using AutoCAD software.

Since the topographic mapping will be used for future engineering design purposes, it was compiled with the global grid, and contour lines were shown at 1.0-meter intervals. Topographic drawings have been attached in the appendices.



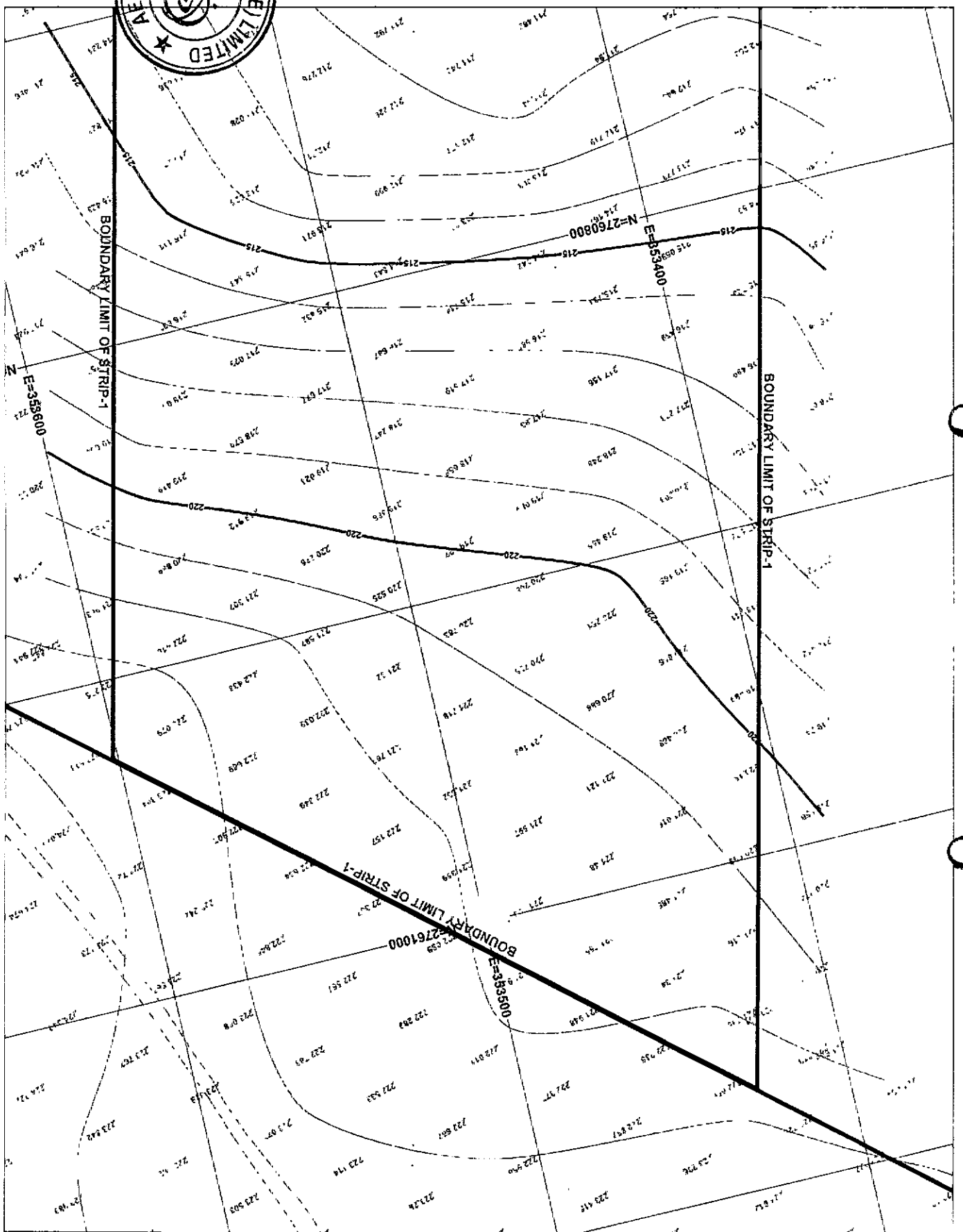
9. STATISTICS

Total area of the plot is 69,409,164.06 m² (17,151 acres). Table 2 gives details of each strip.

Table 2: Details of area, highest and lowest elevation of each strip

Strip No.	Area		Highest Elevation	Lowest Elevation
	m ²	acre	m	m
Strip-01	716,852	177.13	223.08	177.61
Strip-02	1,489,445	368.04	224.98	156.32
Strip-03	212,284	52.46	203.86	173.68
Strip-04	826,926	204.33	185.67	122.24
Strip-05	1,896,514	468.64	177.57	139.43
Strip-06	114,315	201.22	172.83	159.80
Strip-07	452,320	142.34	208.75	175.80
Strip-08	510,876	228.40	270.80	235.30
Strip-09	399,650	228.40	204.20	243.25



[illegible]

LEGEND	
PAVED FLOT	①
GRAVEL AND E	②
STILLWATER POOL	③
LEAFY FOLIAGE	④
SPOT LEVEL	⑤
UNBUILT FLOT	⑥
ADDITIONAL	⑦
PAVED	⑧
PAVED	⑨
STILLWATER POOL	⑩
THREE	⑪
PAVED	⑫
PAVED	⑬
PAVED	⑭
PAVED	⑮
PAVED	⑯
PAVED	⑰
PAVED	⑱
PAVED	⑲
PAVED	⑳
PAVED	㉑
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PAVED	㊼
PAVED	㊽
PAVED	㊾
PAVED	㊿

UFT



Notes:

1. All elevations are in meters
2. Contour interval is 1 meter
3. Shaded areas are 1:1

DRAWING NO: STS-08
SCALE: 1:1000
DATE: 13-07-2024
DRAWN: KAMRAN
CHECKED: KHANZADA
APPROVED:

Reference Station: 7507 AREA
Elevation: 100
Description: 100m x 100m
Dashed: 100m x 100m
Contour: 100m x 100m

BENCHMARKS LIST			
STATION	EASTING	NORTHING	LEVEL
1	210000	210000	100.00
2	210000	210000	100.00
3	210000	210000	100.00
4	210000	210000	100.00

LEGEND	
BENCH MARK	○
UNIMPROVED PLOT	□
ELECTRIC POLE	⊙
TELEPHONE POLE	⊙
WATER TOWER	⊙
SPOT LEVEL	○
VEGETATION	○
ROAD	—
RAILROAD	—
SIGN BOARD	⊙
TREE	⊙
WATER	—
WELL	⊙

STS

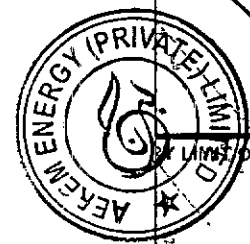
STATIONING: 0+00 TO 0+100

BOUNDARY LIMIT OF STRIP-1

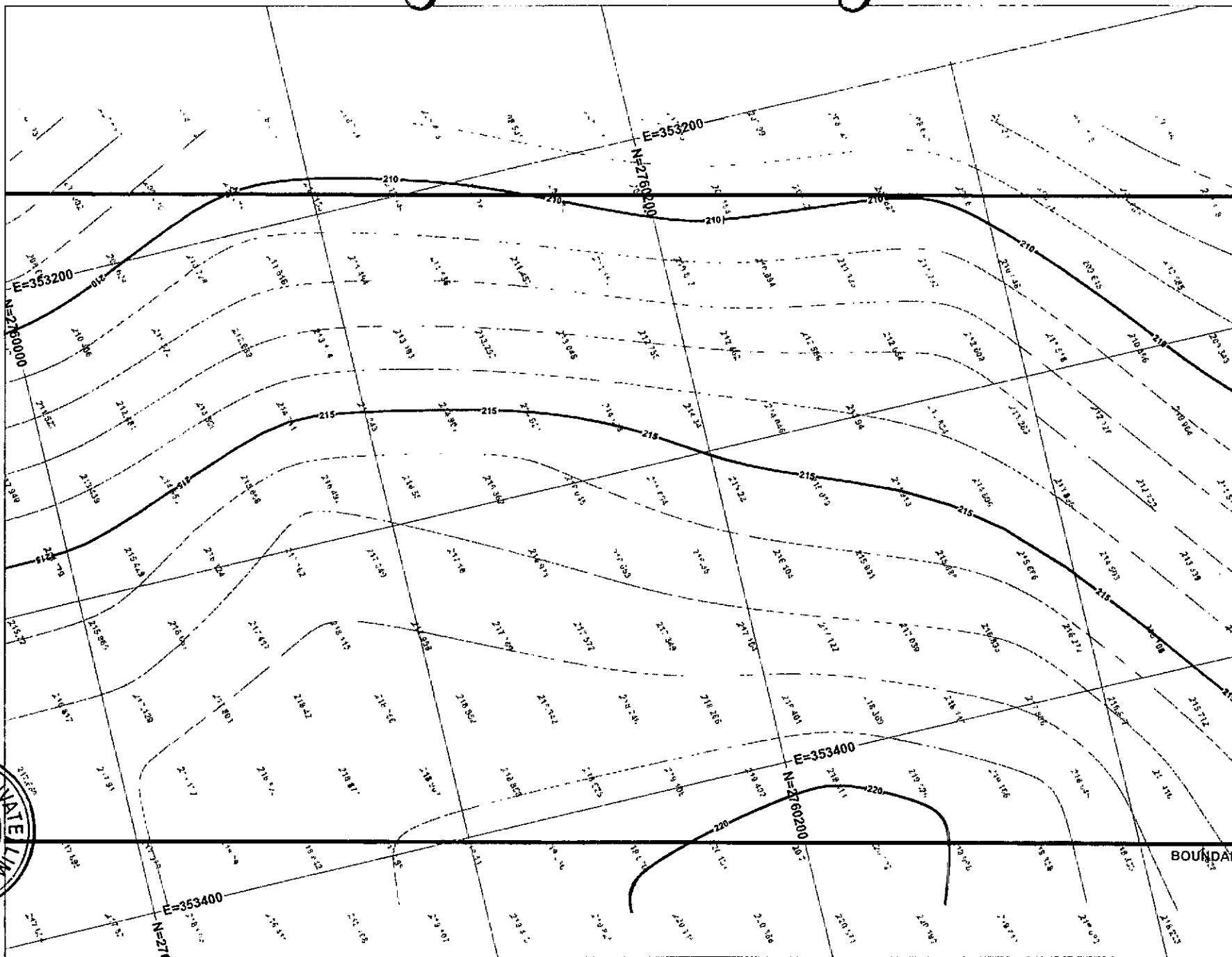
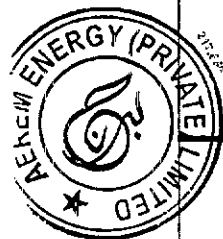
E=353400

E=353300

E=353500



BOUNDARY LIMIT OF STRIP-1



DATE

PROJECT



Note

1. All dimensions are in meters
2. Contour interval 100 ft
3. Spot level, 100 ft

DRAWING NO.	STS-02
SCALE	1" = 100'
DATE	13-07-2024
DRAWN	KAMRAN
CHECKED	KHANZADA
APPROVED	

PROPOSED ROAD	ROUTE AREA
SECTION	100' x 300'
CURVE	100' x 300'
AREA	100' x 300'

B.M.	EASTING	NORTHING	LEVEL
B.M.1	2760000	3532000	211.15
B.M.2	2760000	3532000	211.15
B.M.3	2760000	3532000	211.15
B.M.4	2760000	3532000	211.15

LEGEND	
PROPOSED ROAD	---
ELECTRIC POLE	⊙
TELEPHONE POLE	⊙
LIGHT POLE	⊙
SPOT LEVEL	•
PROPOSED LEVEL	94.04
WATER	~
WELL	⊕
WATER TOWER	⊕
WATER PUMP	⊕
WATER TANK	⊕
WATER PIPE	---



STB



Spalte:

1. alle 10.000 € zu 10 %
- 1.000 € zu 10 %
- 9.000 € zu 10 %

DRAWING NO	STS-07
SCALE	1= 1000
DATE	13-07-2024
DRAWN	KAMRAN
CHECKED	KHANZADA
APPROVER	

Rate of DM	2.07 AREA
Proportion	1.72
Dist. in	1.72
100	1.72

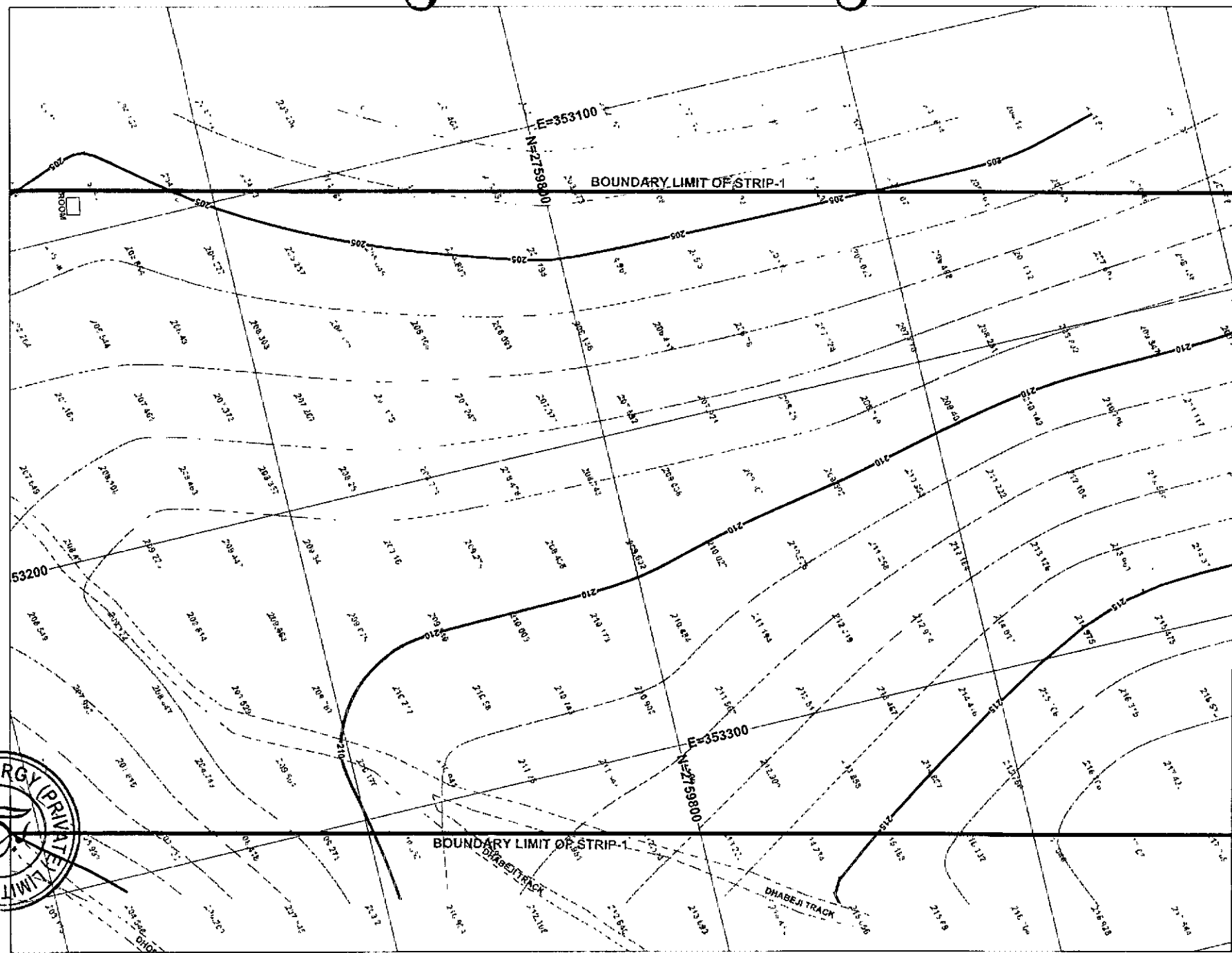
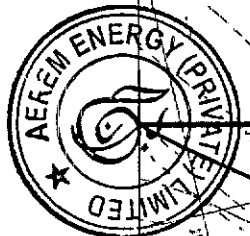
BENCHMARKS LIST				
SYS	FAST	HTP	HTP	VEL
B-1	19284743	2780484	832	22 140
B-2	194407150	278171	1584	12 028
B-3	191718147	274748125		21 167
B-4	183181540	276948174		2438

LEGEND

SEARCH MAP	
TELESCOPE PLANT	
FLY TRAP	
TELEPHONE POLE	
LIGHT POLE	
WOT LEVEL	
(IN) FIFT LEVEL	99 340
LAMP(S)	
RACK	
PAN	
SUN CARE	
REL	
STUD	
VER. M. T. T.	98.948
HYDRANT	



... it ... 87136 ... 111111





CLIENT

SHEET NO.



Notes

1. All dimensions are in meters
2. Contour interval 1 meter
3. Sheet scale 1:5000

DRAWING NO.	ST-4-08
SCALE	1:5000
DATE	13-07-2024
DRAWN	KAMRAN
CHECKED	K. ANZADA
APPROVED	

Reference Data	1507 AREA
Projection	U.T.M.
Datum	WGS84
Zone	42N
Area	177 ACRES

BENCHMARKS LIST			
S.NO	EASTING	NORTHING	LEVEL
BM1	258740	270914	2.240
BM2	258740	270914	2.240
BM3	258740	270914	2.240
BM4	258740	270914	2.240

LEGEND	
BENCH MARK	⊙
DRAINAGE POINT	⊙
ELECTRIC POLE	⊙
TELEPHONE POLE	⊙
WATER TOWER	⊙
SPOT LEVEL	⊙
NEVERT LEVEL	⊙
WATER TOWER	⊙
TRACK	—
PIVOT	⊙
SIGN BOARD	⊙
TREE	⊙
WATER	⊙
WATER TOWER	⊙
WATER TOWER	⊙



ST-4-08

BOUNDARY LIMIT OF STRIP-1

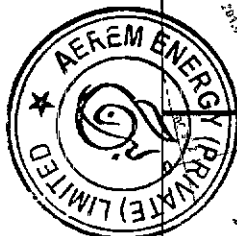
BOUNDARY LIMIT OF STRIP-1

E=353200

E=353000

N=2759400

N=2759600





Notes:
1. All measurements in meters
2. All bearings in degrees
3. All distances in meters

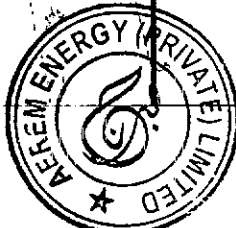
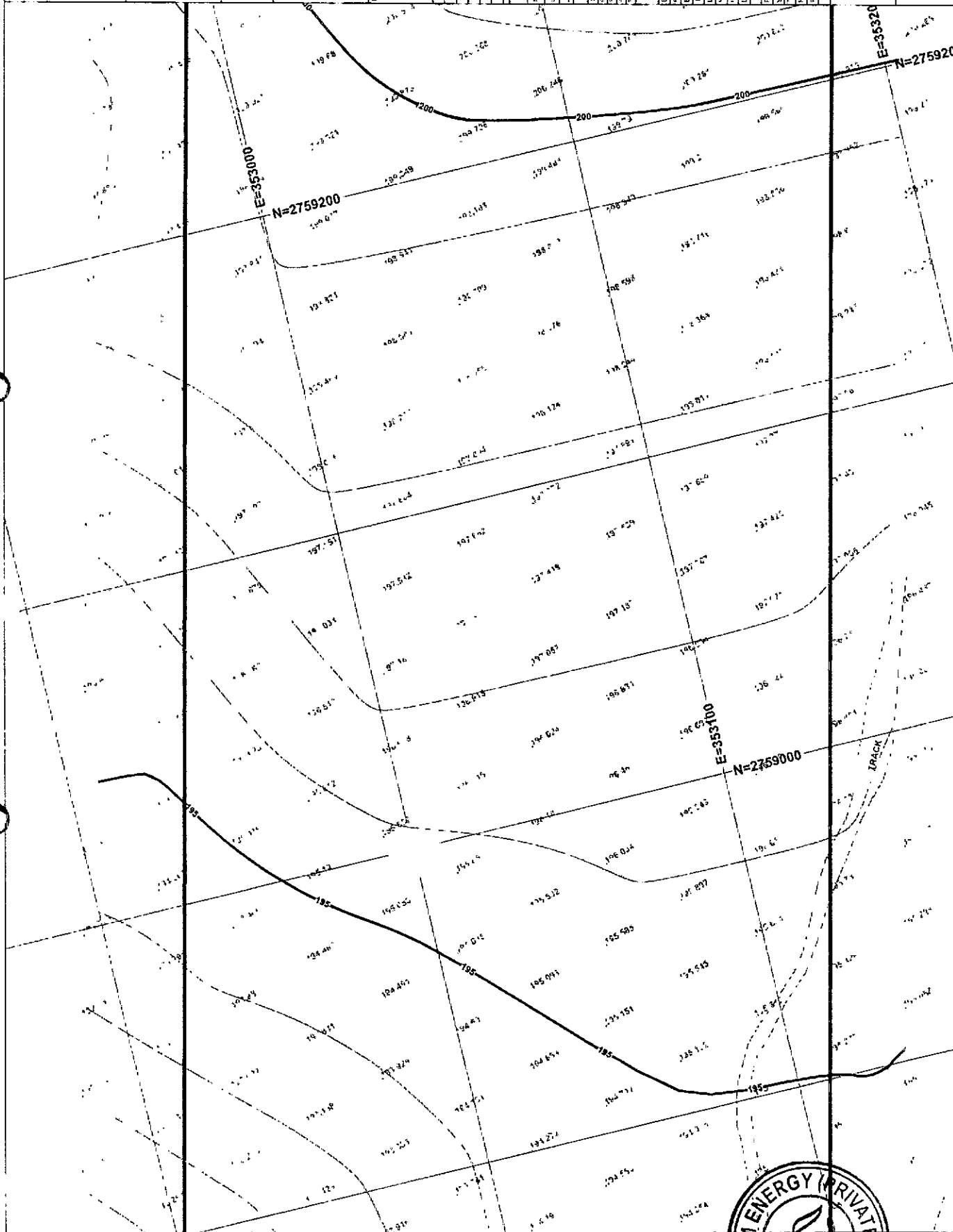
DRAWING NO. S.5.505
SCALE 1:1000
DATE 24-7-2024
DRAWN BY NAMRAN
CHK. BY K. ANZADA
APPROVED

UNIT 444A
SIGNED BY
DATE
BY
DATE

BENCH MARKS LIST
NO. 1
EASTING
NORTHING
ELEVATION
DATE

LEGEND
SYMBOLS
DESCRIPTION
SYMBOLS
DESCRIPTION

SYMBOLS
DESCRIPTION
SYMBOLS
DESCRIPTION





Note

- 1. All dimensions are in meters
- 2. Dashed line is not to be used
- 3. Survey is not to be used

DRAWING NO.	ST5-04
SCALE	1" = 1000'
DATE	13-07-2024
DRAWN	KAMRAN
CHECKED	KHANZADA
APPROVED	

Plot area	Plot area
PROJECTION	UTM
UNIT	1" = 1000'
COORDINATE	UTM
GRID	UTM

BENCHMARK LIST			
BM	MARK	COORDINATE	LEVEL
BM-1	STATION 1	1000000	1000000
BM-2	STATION 2	1000000	1000000
BM-3	STATION 3	1000000	1000000
BM-4	STATION 4	1000000	1000000

LEGEND	
BENCH MARK	⊕
PROPOSED PLOT	⊕
ELECTRIC POLE	⊕
11KV PUMP HOUSE	⊕
LIGHT POLE	⊕
WATER LEVEL	⊕
INVERT LEVEL	⊕
ROAD	⊕
TRAIL	⊕
SHED	⊕
WELL	⊕
WELL	⊕
WELL	⊕

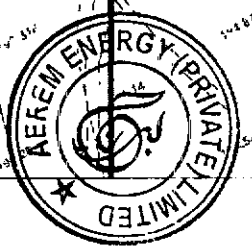
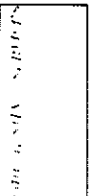
ST5

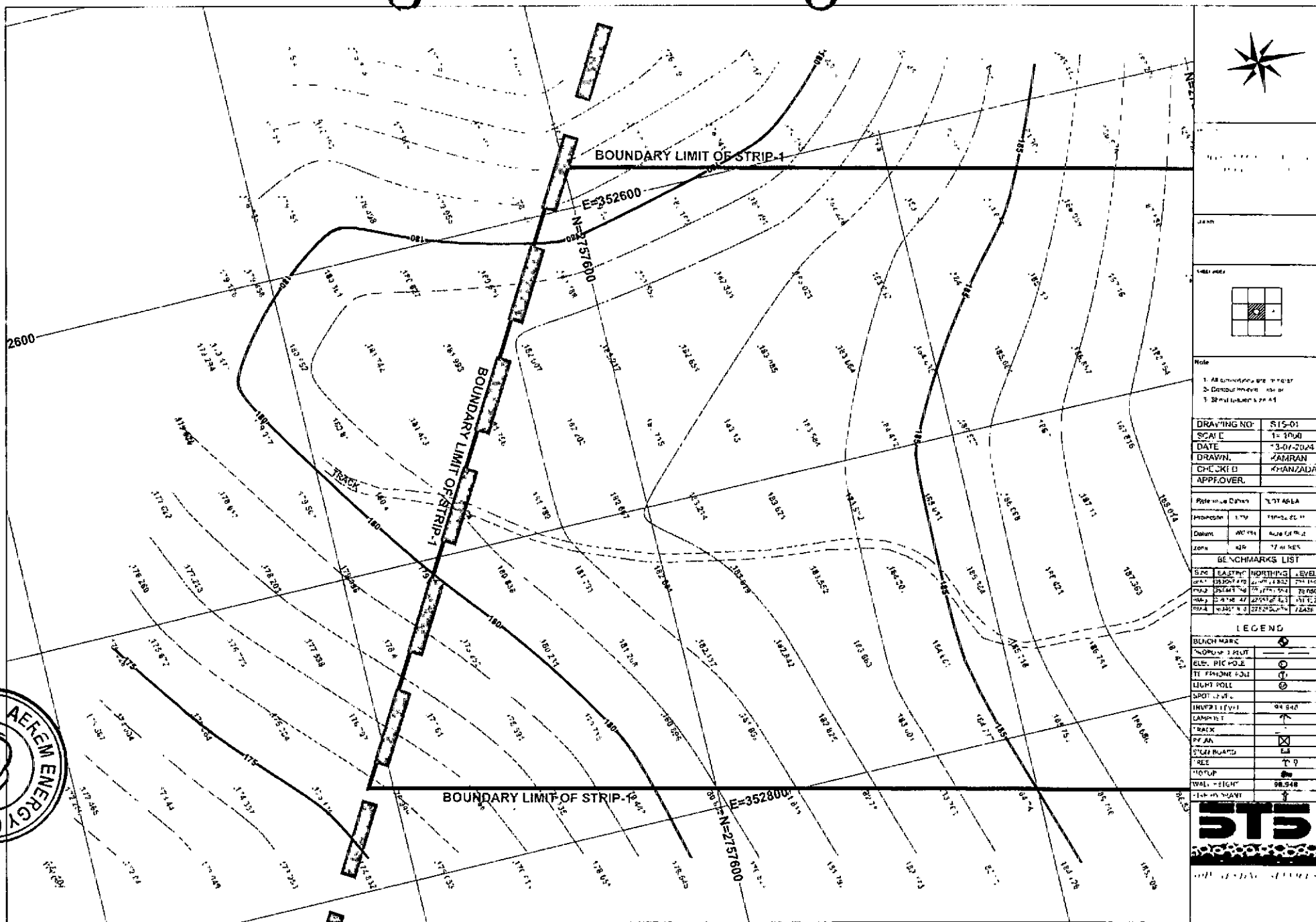
STATION 1

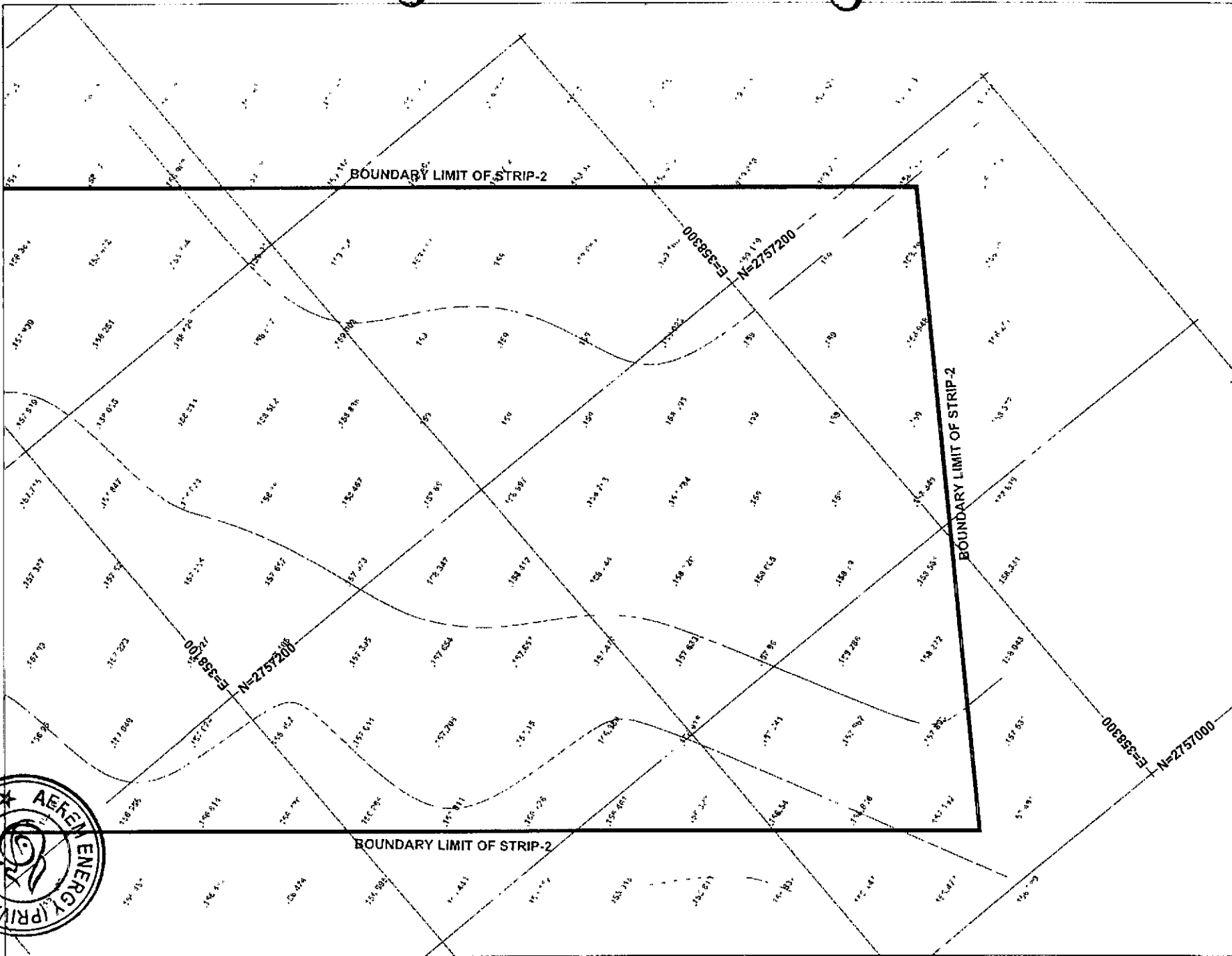
BOUNDARY LIMIT OF STRIP-1

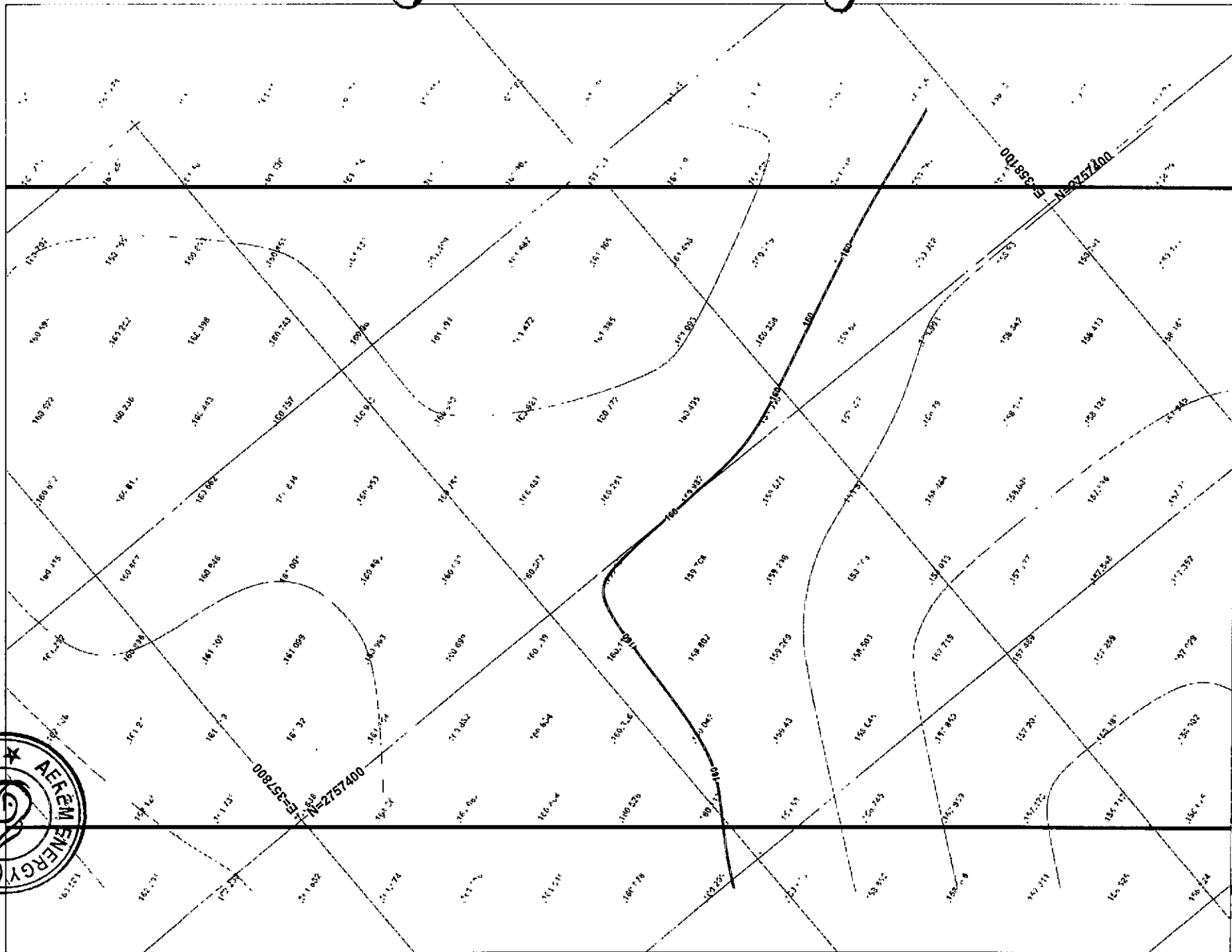
BOUNDARY LIMIT OF STRIP-1











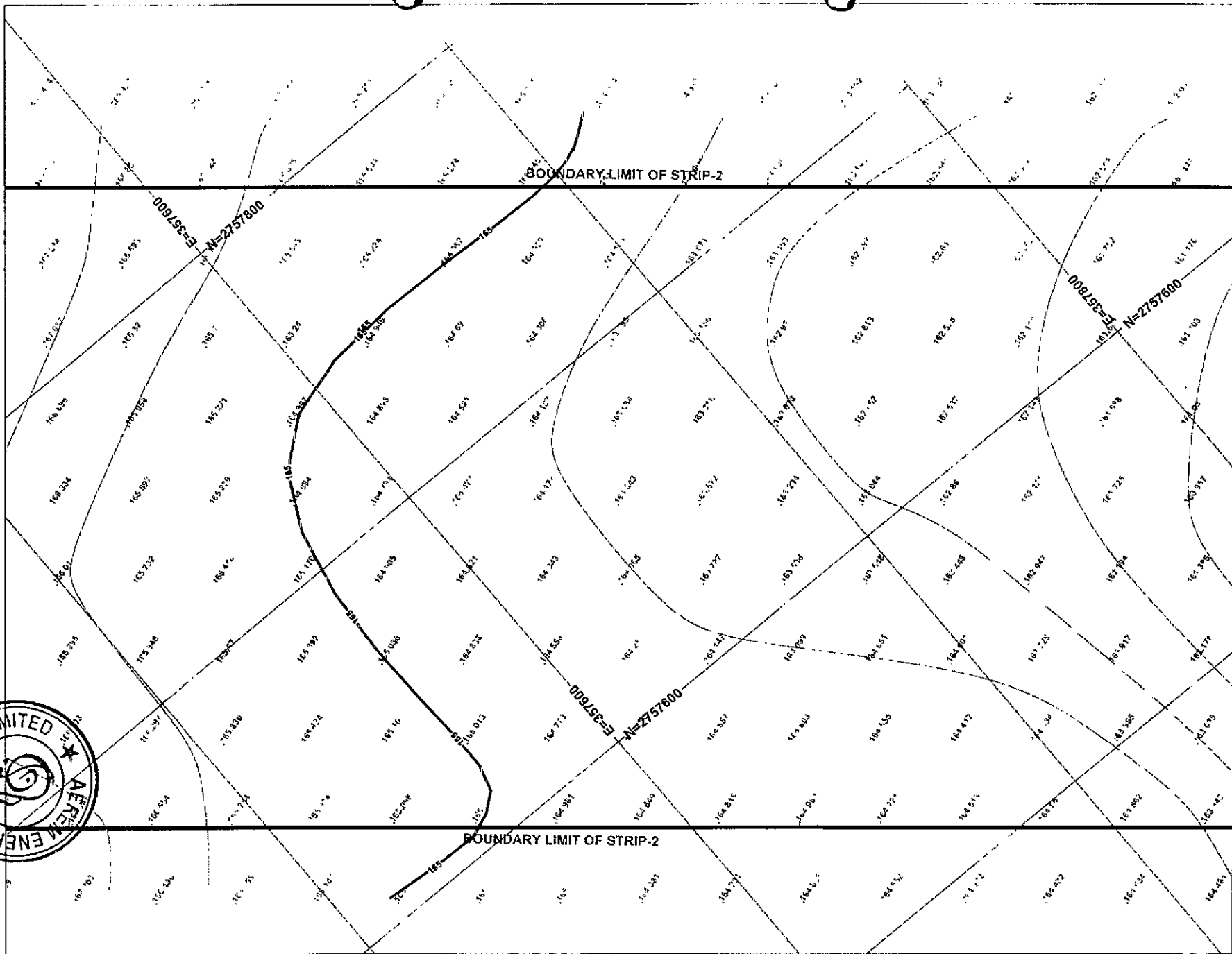
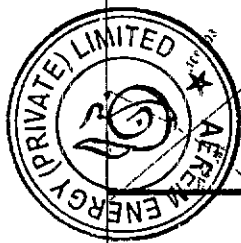
DRAWING NO.	STS-19
SCALE	1:1000
DATE	13-07-2024
DRAWN	AMHAN
CHECKED	KHANZADA
APPROVED	

PROJECT NAME	PLANT AREA
LOCATION	W/SH AREA OF CHD
DATE	13-07-2024

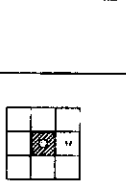
BENCHMARK LIST	
BM	STATION
BM	STATION
BM	STATION
BM	STATION

LEGEND	
PROPOSED PLOT	
ELECTRICITY P	
TELEPHONE POLE	
LG T-01	
NOT LEVEL	
W/SH LEVEL	
LANEWAY	
TRACK	
PZ AN	
SUBI BOARD	
TREE	
POLE	
W/SH T-01	
TRE 4" W/SH	





PROJECT
1. All dimensions are in feet
2. Original Survey is correct
3. Sheet is correct as per



Note
1. All dimensions are in feet
2. Original Survey is correct
3. Sheet is correct as per

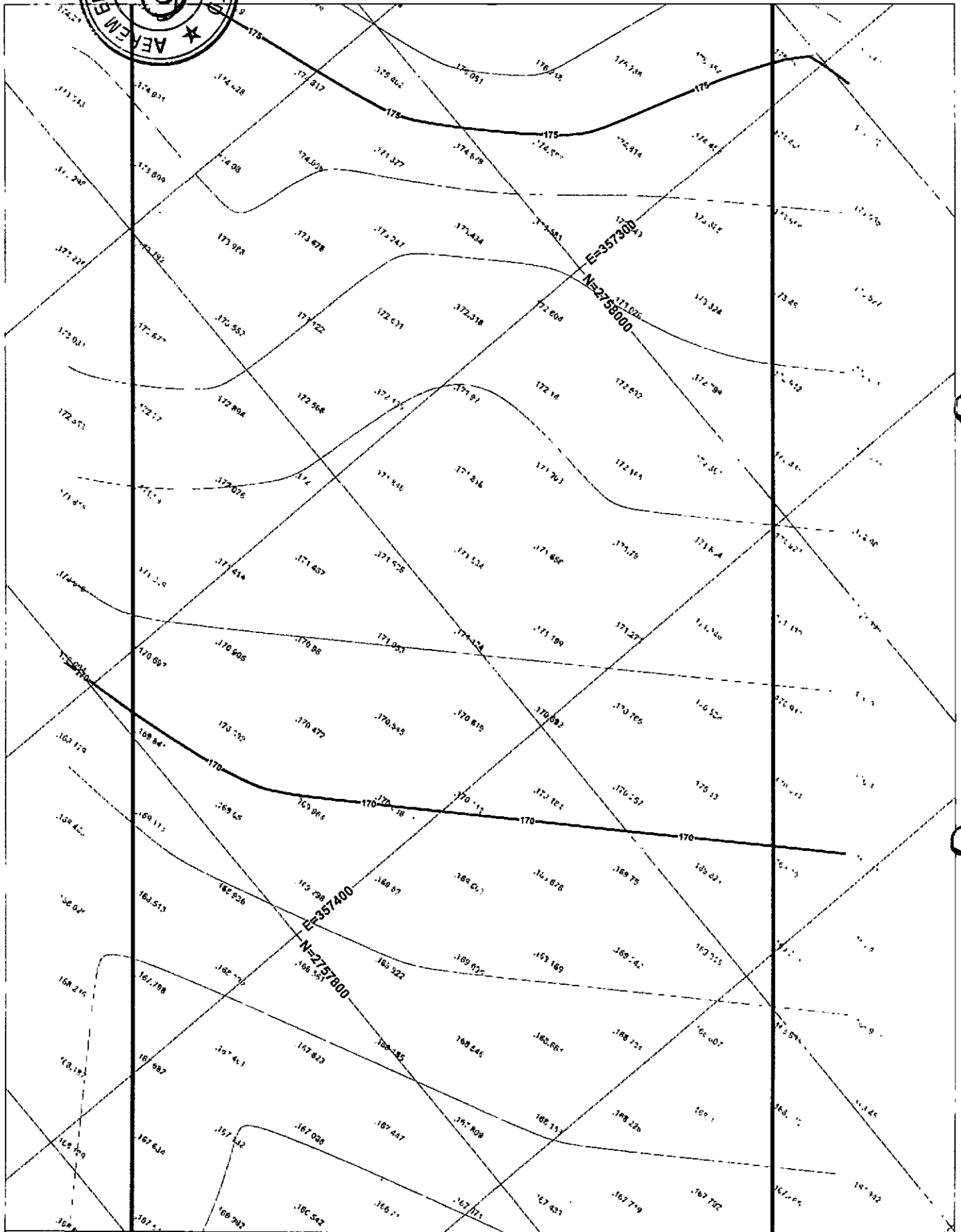
DRAWING NO	STS-18
SCALE	1" = 10' 0"
DATE	13-07-2024
DRAWN	KAMRAN
CHECKED	KHANZADA
APPROVER	

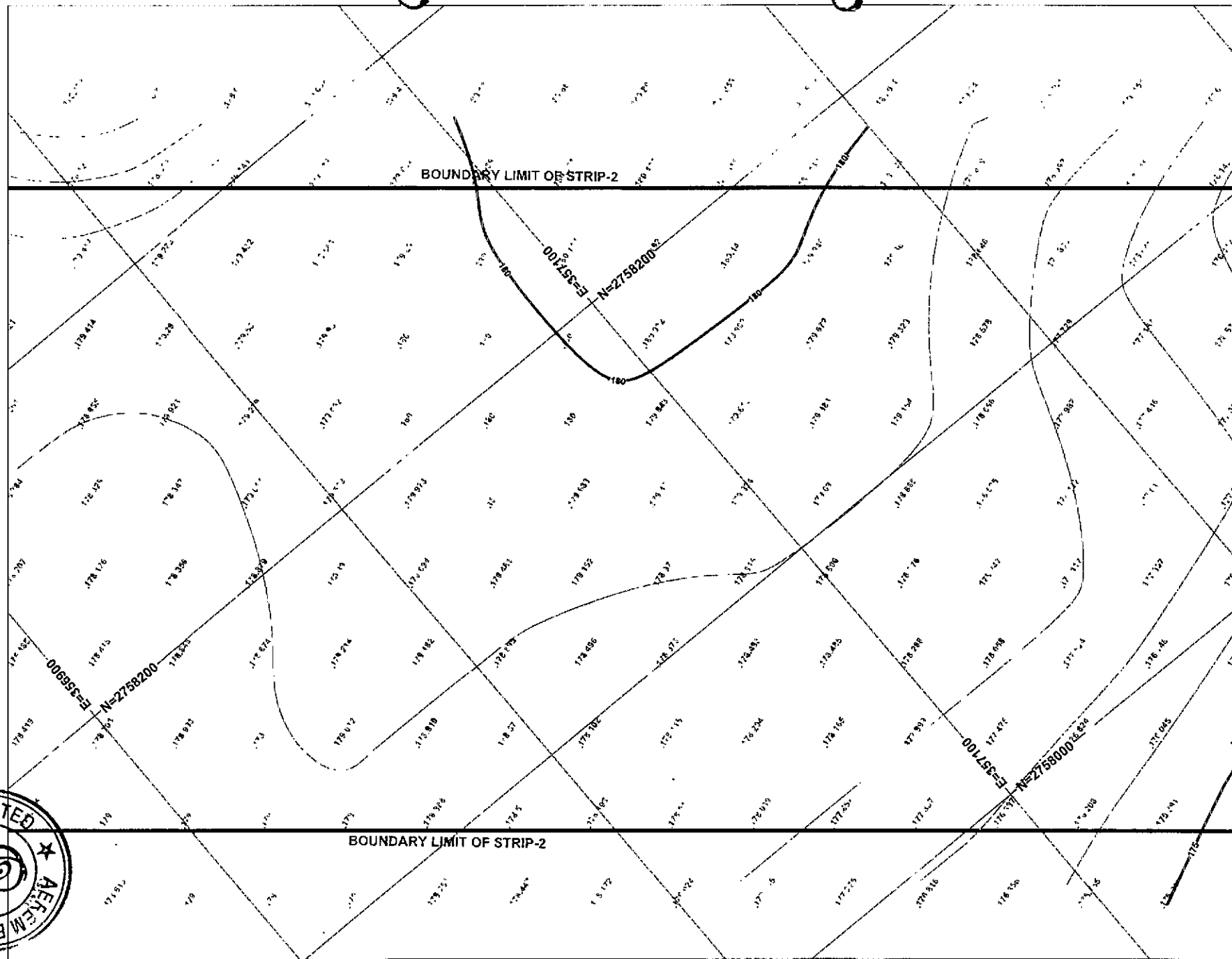
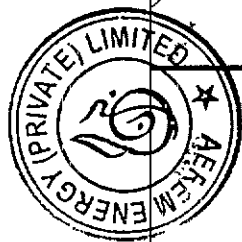
Reference Station	1107 AREA
Proposed	1107
Original	1107
Scale	1" = 10' 0"

STATION	BENCH MARK	LEVEL
1107	1107	1107
1108	1108	1108
1109	1109	1109
1110	1110	1110

LEGEND	
PROPOSED PLOT	
ELECTRIC POLE	
TELEPHONE POLE	
LIGHT POLE	
WATER LEVEL	
INVERT LEVEL	
LANDFILL	
TRUCK	
WATER	
STATION MARK	
TREE	
WATER	
WATER	
WATER	

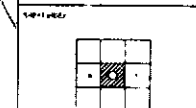


[illegible]



Scale
1:1000

Sheet



Mark
1. All measurements are in meter
2. Contour interval is 1 meter
3. Spot height is in meter

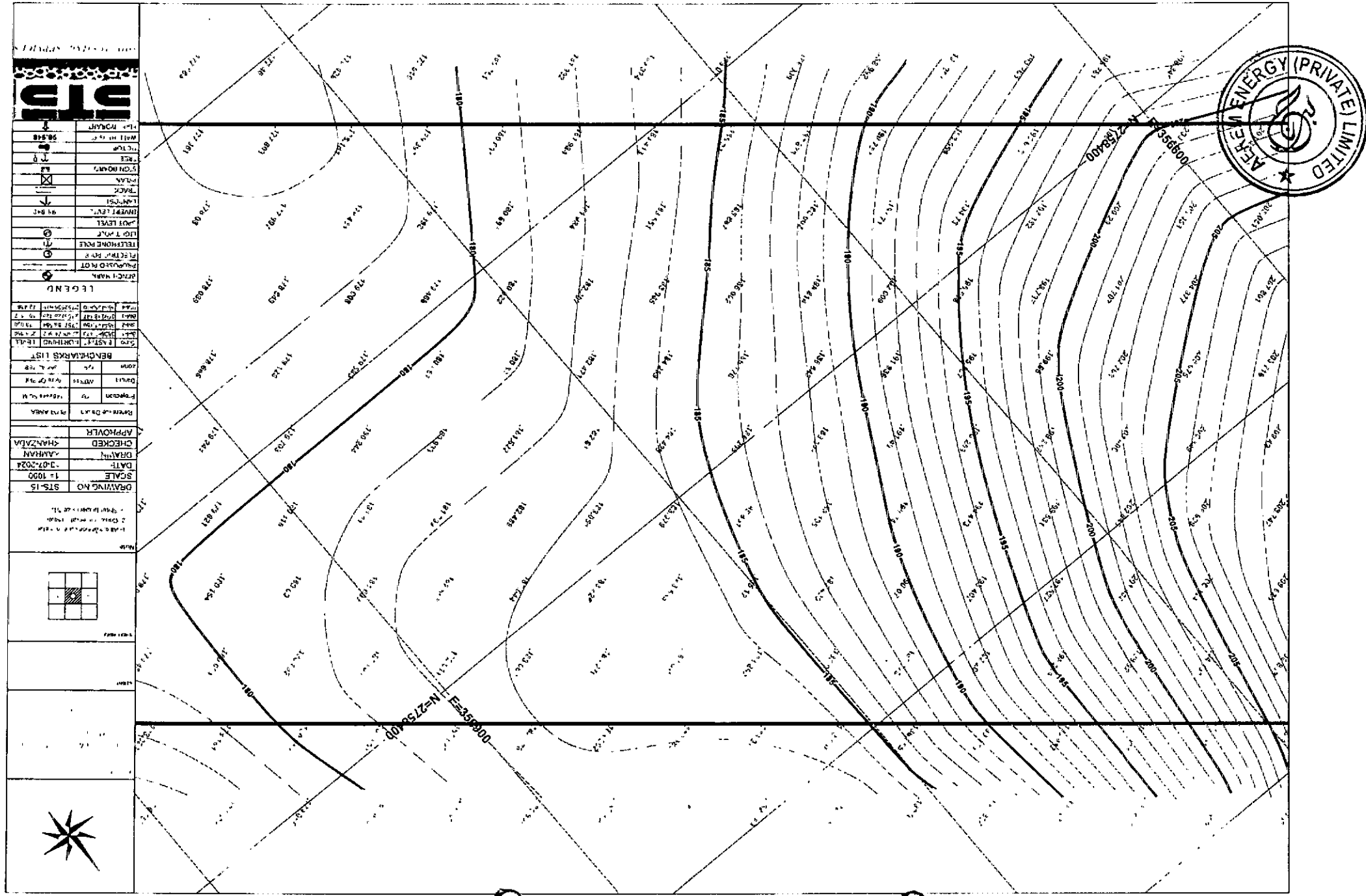
DRAWING NO.	STS 18
SCALE	1:1000
DATE	13-07-2024
DRAWN	KAMRAN
CHECKED	KHANZADA
APPROVED	

Project & Detail	Plot Area
Location	1000000000
Drawn	1000000000
Scale	1:1000

BENCHMARKS LIST			
Sl. No.	EASTING	NORTHING	Height
1	1000000000	1000000000	1000000000
2	1000000000	1000000000	1000000000
3	1000000000	1000000000	1000000000
4	1000000000	1000000000	1000000000

LEGEND	
BOUNDARY LIMIT OF STRIP-2	
ELECTRIC POLE	
TELEPHONE POLE	
WATER POLE	
SPOT LEVEL	
INVERT LEVEL	
LANDMARK	
ROAD	
FIELD	
SETTING	
TRAIL	
WATER	
WALL	
REMARKS	

STS





Note:

- 1. All responses are relative
- 2. Consider individual action
- 3. Showing ones self as

DRAWING NO.	ST-12
SCALE	1" = 100'
DATE	12-07-2002
DRAWN	KAMRAN
CHECKED	KHANZAD
APPROVED	

Parameters & Units		NOT AREA
Wavelength	nm	749-845 nm
Diameter	mm	4.0-5.0 mm
...	...	...

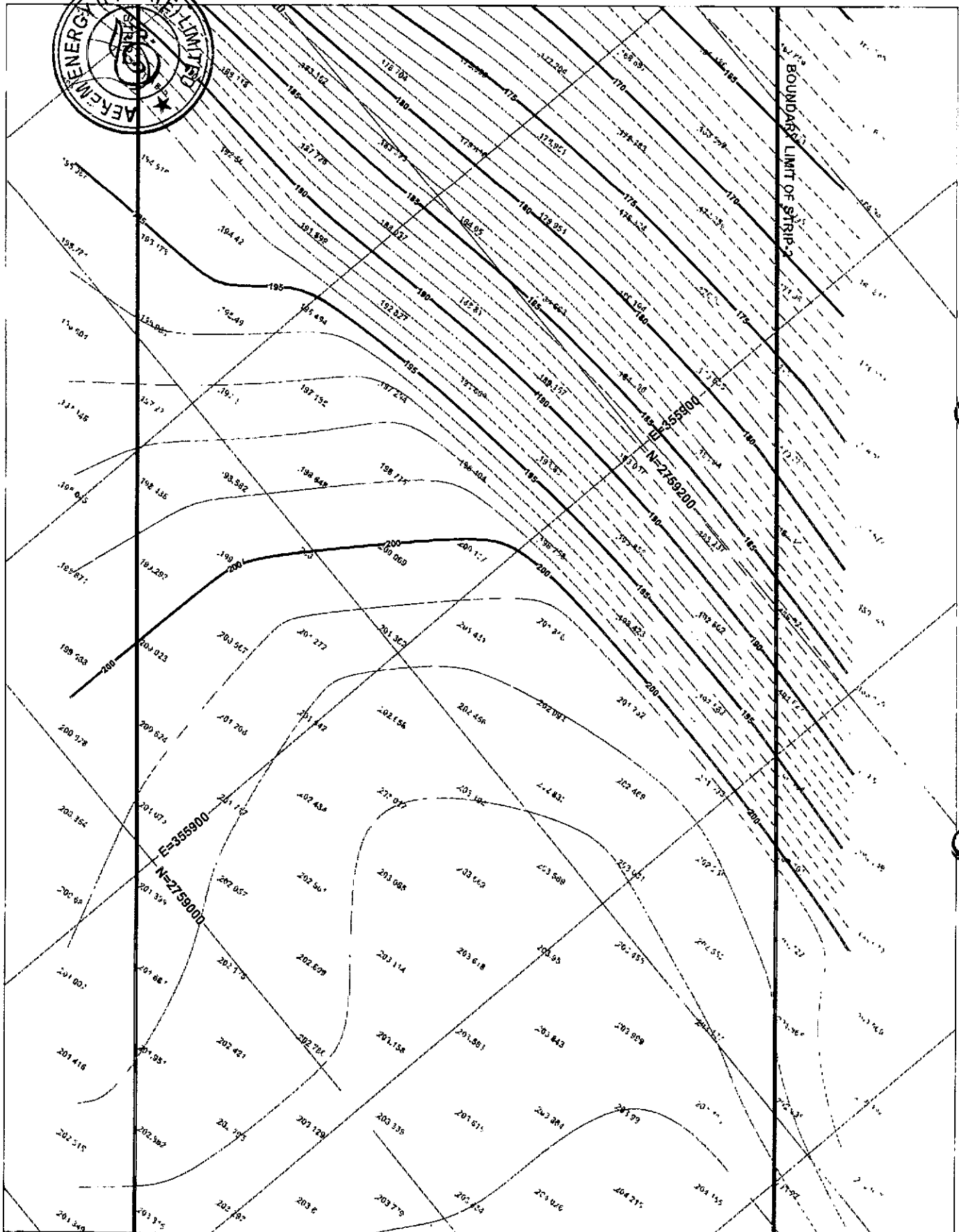
BENCHMARK LIST

DATE	ASTORIA	MOBILE	LEVEE
1951	15,000	1,000	2,000
1952	14,000	1,000	2,000
1953	13,000	1,000	2,000
1954	12,000	1,000	2,000

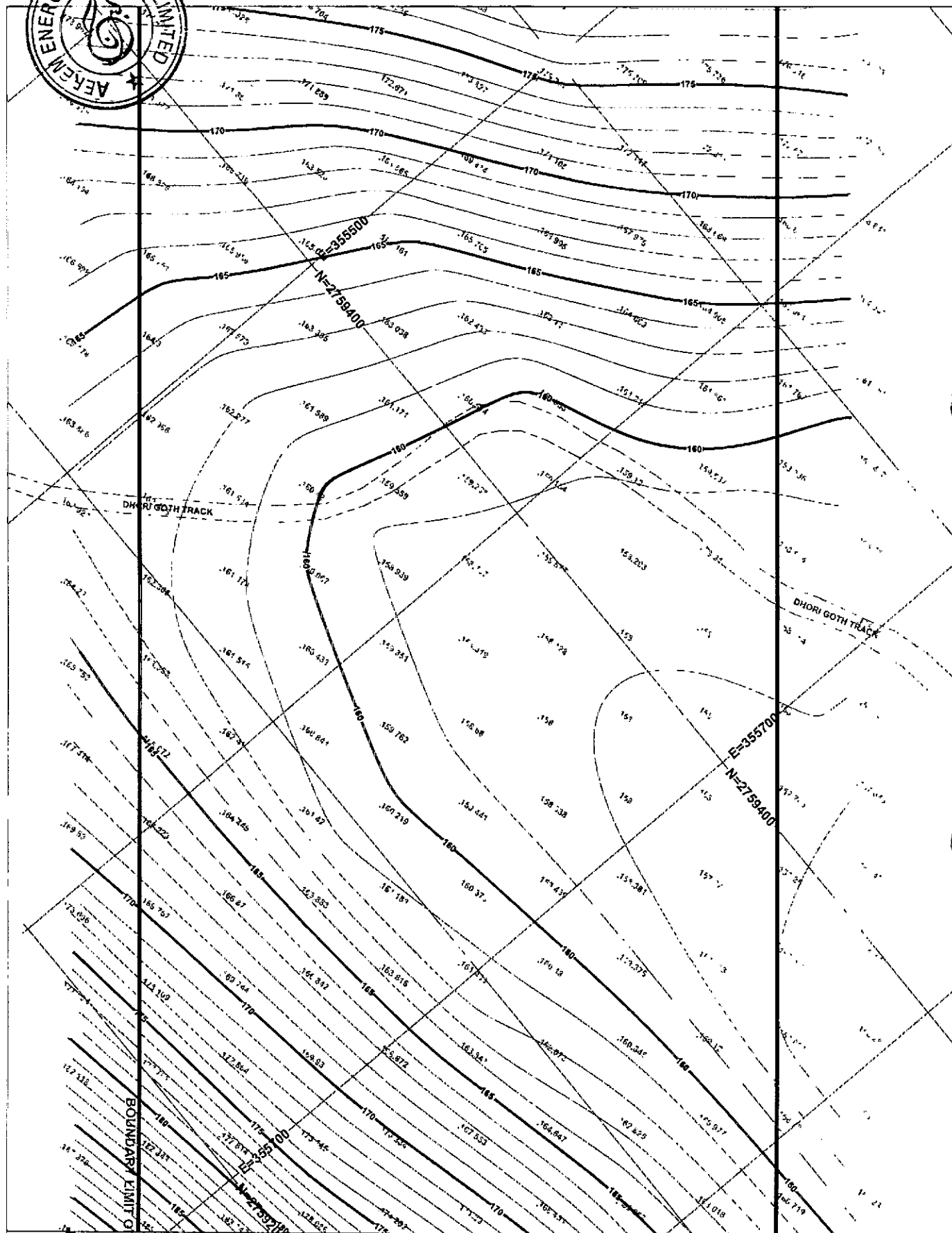
LEGEND

BOND MARK	
PHOTOGRAPH POINT	
ELECTRIC POLE	
TELEPHONE POLE	
LIGHT POLE	
SPD LEVEL	
INVERT LEVEL	99.840
ANCHOR	
WALL	
FLANK	
SIGN BOARD	
TREE	
MANHOLE	
WALL POINT	98.940
END OF ROAD	

STS



DRAWING NO.		SIS-12	
SCALE		1"=1000'	
DATE		12-22-2024	
DRAWN BY		KARINAE	
CHECKED BY		KARINAE	
APPROVER		KARINAE	
PROJECT NO.		24-001	
PROJECT NAME		PORT JONES	
PROJECT LOCATION		1414444444	
DESIGN NO.		1414444444	
DATE		12-22-2024	
BY		KARINAE	
CHECKED BY		KARINAE	
APPROVER		KARINAE	



NAME _____

1-800-847-7272

1000000

SCALE	1:1

ПРАВЫ	КА

APPROVAL: R

Petermann Druck

Process	1974	1975

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

BENCHMARK: 1

日 4	05067 070	2-27, 1, 10, 11

3M-1	250245-48	25 JAN 68 RAD

LEGEND

STRECH MARK

ELECTRIC HO	②

UNIVERSITY	⑤

LEVEL	ON

TRACY	

5' CH ROAD 8.2

[illegible]

THE M. GRANT

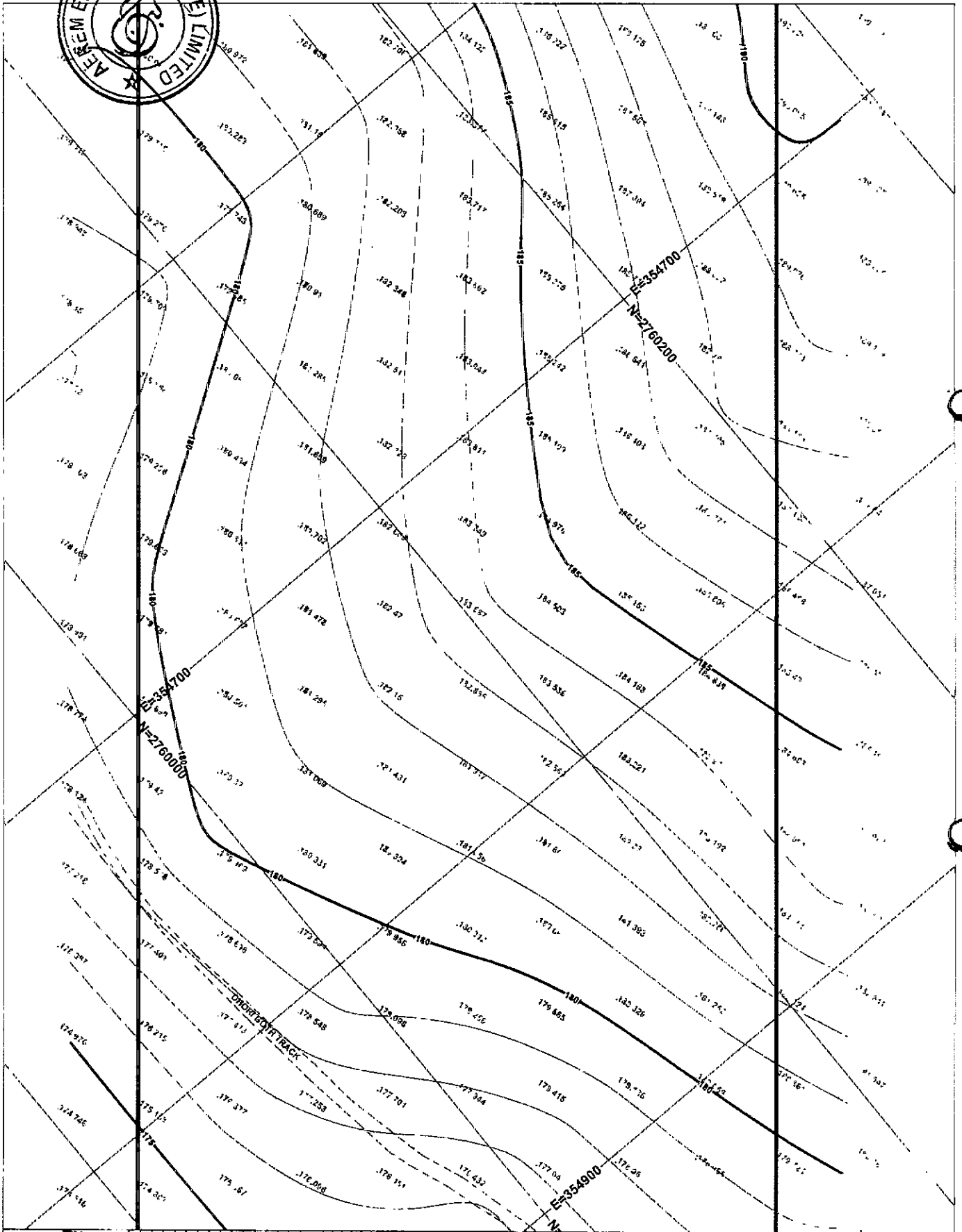
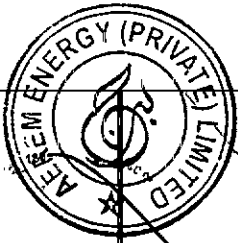
11

10

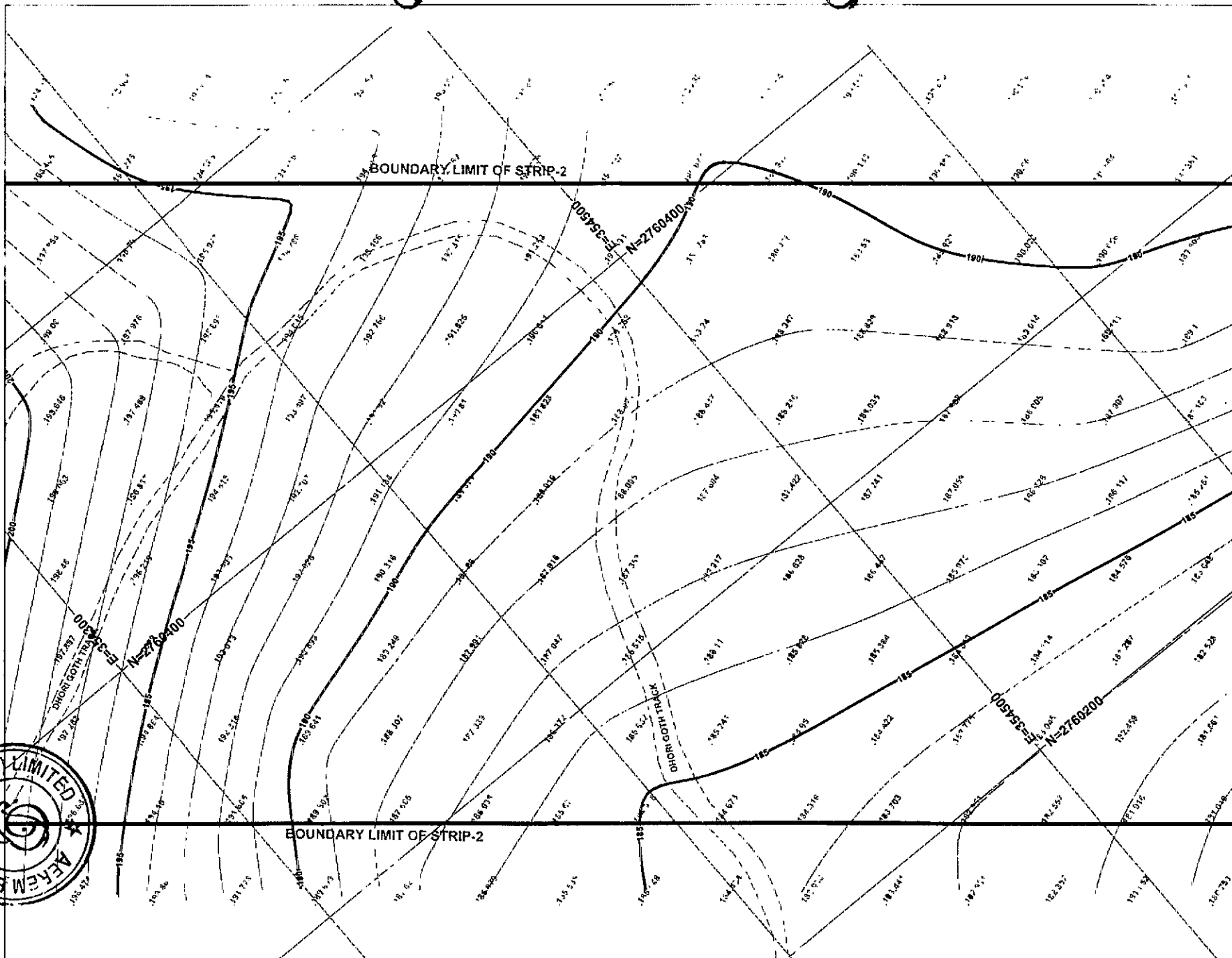
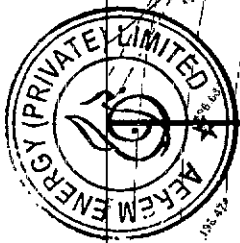
2017年11月

1938-39 1000

1



LEGEND 1. PROPOSED TRACK 2. EXISTING TRACK 3. EXISTING ROAD 4. EXISTING RAIL 5. EXISTING CANAL 6. EXISTING DRAIN 7. EXISTING FENCE 8. EXISTING WALL 9. EXISTING TOWER 10. EXISTING LIGHT 11. EXISTING SIGN 12. EXISTING MARKER 13. EXISTING MONUMENT 14. EXISTING STRUCTURE 15. EXISTING PLANT 16. EXISTING EQUIPMENT 17. EXISTING MATERIAL 18. EXISTING TOOL 19. EXISTING UTENSIL 20. EXISTING VEHICLE 21. EXISTING ANIMAL 22. EXISTING PERSON 23. EXISTING GROUP 24. EXISTING ORGANIZATION 25. EXISTING INSTITUTION 26. EXISTING RELIGIOUS BUILDING 27. EXISTING EDUCATIONAL BUILDING 28. EXISTING GOVERNMENT BUILDING 29. EXISTING COMMERCIAL BUILDING 30. EXISTING RESIDENTIAL BUILDING 31. EXISTING INDUSTRIAL BUILDING 32. EXISTING AGRICULTURAL BUILDING 33. EXISTING HEALTHCARE BUILDING 34. EXISTING RECREATION BUILDING 35. EXISTING CULTURAL BUILDING 36. EXISTING HISTORICAL BUILDING 37. EXISTING MONUMENTAL BUILDING 38. EXISTING MEMORIAL BUILDING 39. EXISTING MUSEUM BUILDING 40. EXISTING LIBRARY BUILDING 41. EXISTING ARCHIVE BUILDING 42. EXISTING RECORDS BUILDING 43. EXISTING DATA BUILDING 44. EXISTING INFORMATION BUILDING 45. EXISTING KNOWLEDGE BUILDING 46. EXISTING WISDOM BUILDING 47. EXISTING TRUTH BUILDING 48. EXISTING JUSTICE BUILDING 49. EXISTING FAITH BUILDING 50. EXISTING HOPE BUILDING 51. EXISTING LOVE BUILDING 52. EXISTING KINDNESS BUILDING 53. EXISTING PATIENCE BUILDING 54. EXISTING MERCY BUILDING 55. EXISTING GRACE BUILDING 56. EXISTING GLORY BUILDING 57. EXISTING HONOR BUILDING 58. EXISTING RESPECT BUILDING 59. EXISTING ADMIRATION BUILDING 60. EXISTING APPRECIATION BUILDING 61. EXISTING GRATITUDE BUILDING 62. EXISTING THANKS BUILDING 63. EXISTING PRAISE BUILDING 64. EXISTING WORSHIP BUILDING 65. EXISTING DEVOTION BUILDING 66. EXISTING DEDICATION BUILDING 67. EXISTING COMMITMENT BUILDING 68. EXISTING PROMISE BUILDING 69. EXISTING OATH BUILDING 70. EXISTING VOW BUILDING 71. EXISTING AGREEMENT BUILDING 72. EXISTING CONTRACT BUILDING 73. EXISTING TREATY BUILDING 74. EXISTING PACT BUILDING 75. EXISTING COVENANT BUILDING 76. EXISTING ALLIANCE BUILDING 77. EXISTING PARTNERSHIP BUILDING 78. EXISTING JOINT BUILDING 79. EXISTING COLLABORATION BUILDING 80. EXISTING COOPERATION BUILDING 81. EXISTING ASSISTANCE BUILDING 82. EXISTING SUPPORT BUILDING 83. EXISTING HELP BUILDING 84. EXISTING AID BUILDING 85. EXISTING RELIEF BUILDING 86. EXISTING RESCUE BUILDING 87. EXISTING SALVAGE BUILDING 88. EXISTING RECOVERY BUILDING 89. EXISTING RESTORATION BUILDING 90. EXISTING REPAIR BUILDING 91. EXISTING REBUILD BUILDING 92. EXISTING RECONSTRUCTION BUILDING 93. EXISTING RENOVATION BUILDING 94. EXISTING REFURBISH BUILDING 95. EXISTING REFRESH BUILDING 96. EXISTING REVitalize BUILDING 97. EXISTING REVIVE BUILDING 98. EXISTING REGENERATE BUILDING 99. EXISTING REFORM BUILDING 100. EXISTING REPAIR BUILDING			
GENERAL INFORMATION DRAWING NO: 115-01 SCALE: 1:1000 DATE: 13-01-2024 DRAWN BY: KANBAN CHECKED BY: KANBAN APPROVED BY: KANBAN			





Scale: 1:1000

1. All measurements are in meters
2. Contour interval 5 meters
3. Spot level up to 100

DRAWING NO	STS-07
SCALE	1:1000
DATE	13-07-2024
DRAWN	KAMRAN
CHECKED	KHANZADA
APPROVED	

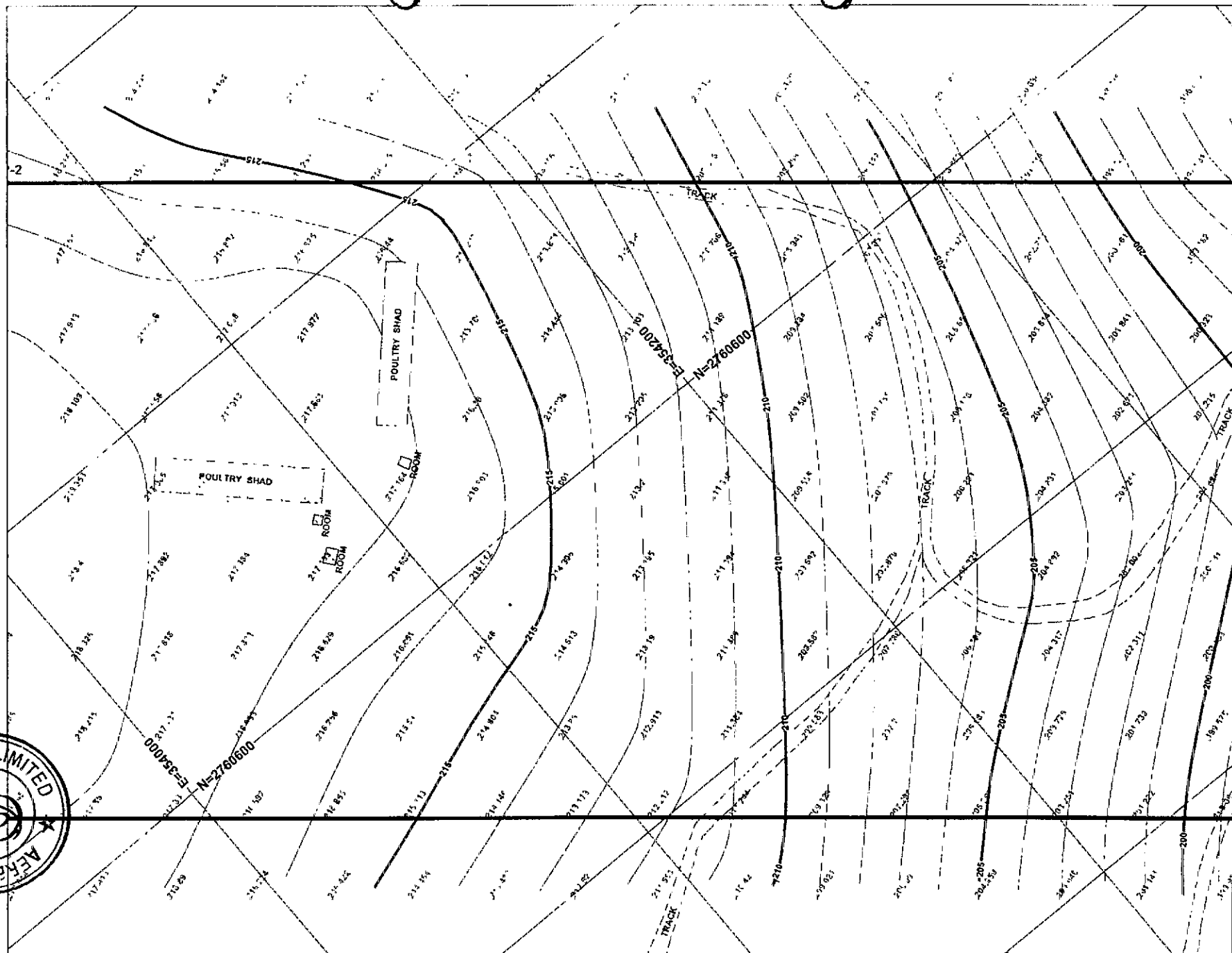
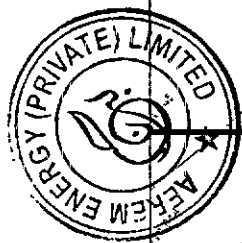
Project Name	STS-07 AREA
Utility	148KV/110KV
Diagram	PROPOSED LINE OF PROPOSED
Scale	1:1000

BENCHMARKS LIST			
BM	FACTING	NORTHING	EASTING
BM1	100.00	100.00	100.00
BM2	100.00	100.00	100.00
BM3	100.00	100.00	100.00
BM4	100.00	100.00	100.00

LEGEND	
PROPOSED LINE	---
ELECTRIC POLE	⊙
TELEPHONE POLE	⊙
LIGHT POLE	⊙
SPOT LEVEL	100.00
BOUNDARY LIMIT	---
ROAD	---
RAIL	---
SIGN BOARD	---
WATER	---
WALL HEIGHT	---

STS

STATIONARY SUPPLIES



Note.

- 1. All dimensions are in meters.
- 2. Contour interval is 10 meters.
- 3. Spot heights are in meters.

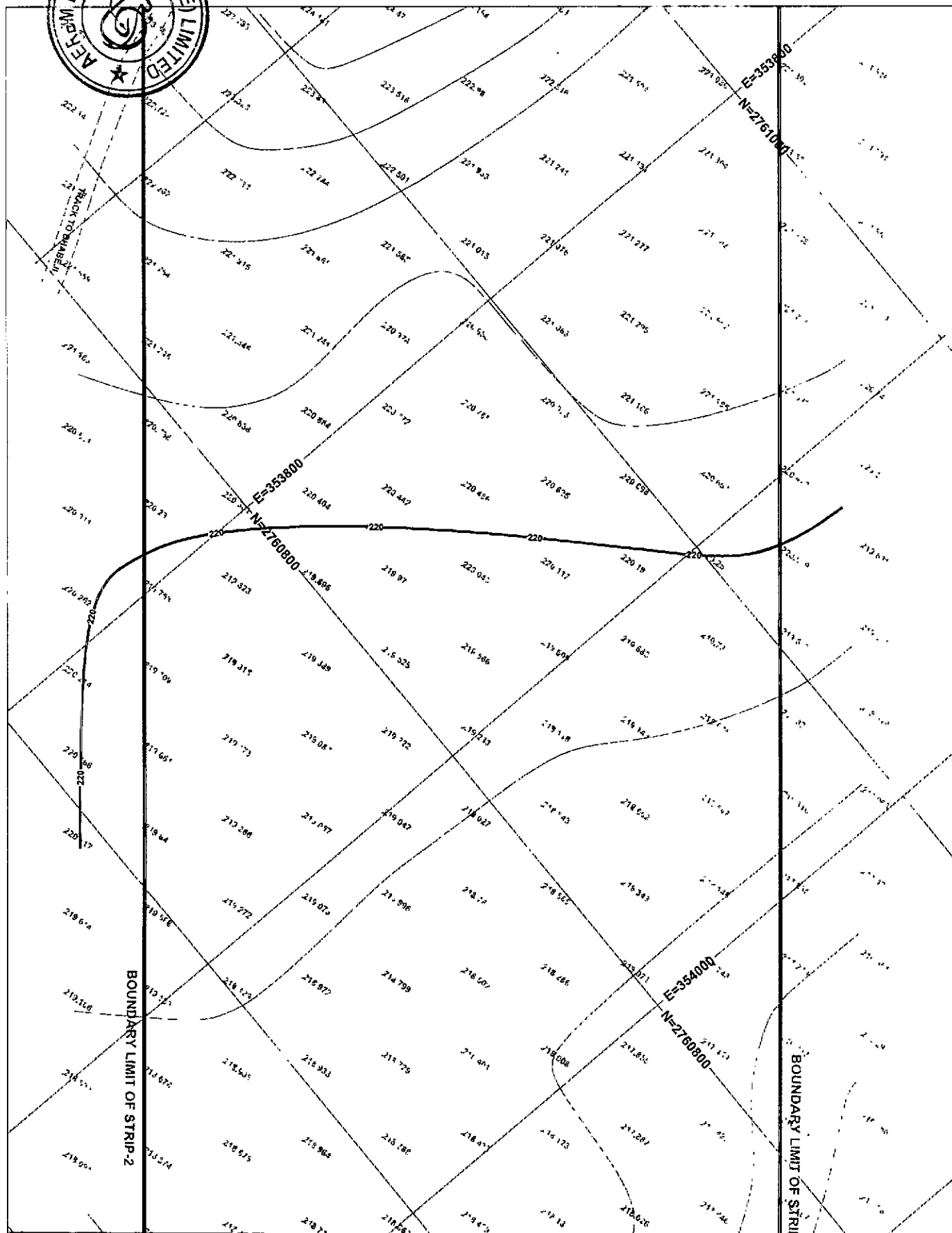
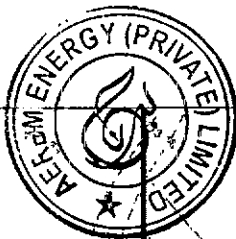
DRAWING NO	STS-08
SCALE	1"=10.00'
DATE	23-07-2024
DRAWN	KAMRAN
CHECKED	KHANZADA
APPROVER	

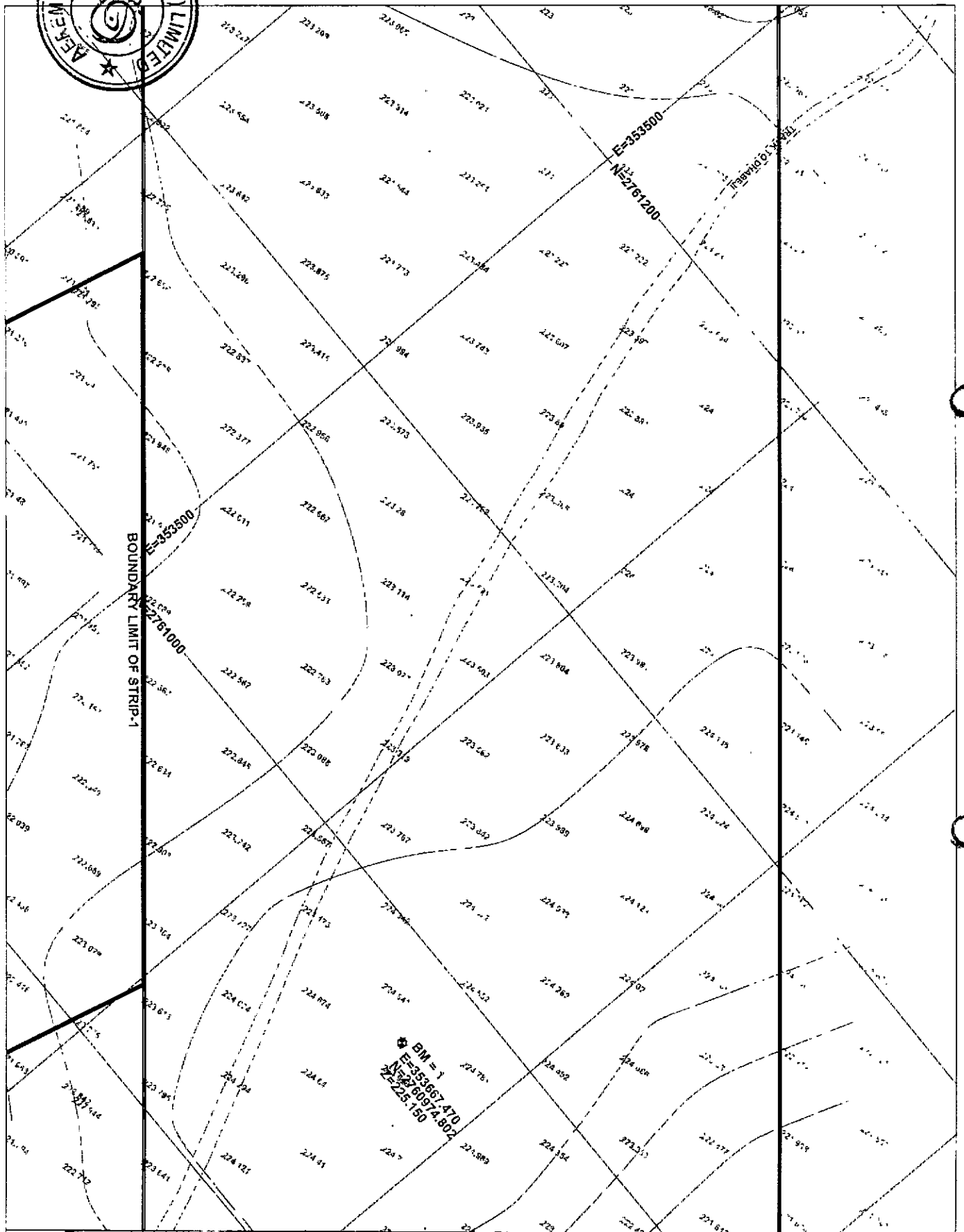
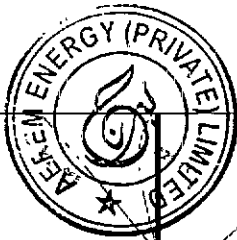
Reference Station	PIRATANA
Instrument	1"=10.00'
System	NGM
Scale	1:100,000

BENCHMARKS LIST			
BM	FAIRPLAY	10.00	10.00
BM	FAIRPLAY	10.00	10.00
BM	FAIRPLAY	10.00	10.00
BM	FAIRPLAY	10.00	10.00
BM	FAIRPLAY	10.00	10.00

LEGEND	
POULTRY SHAD ROOM	
ELECTRIC POLE	
TELEPHONE POLE	
WATER TOWER	
SPD LEVEL	
IN-TRT LEVEL	
CAMPPOST	
TRACK	
WATER	
WATER BOARD	
TOPE	
WATER	
WATER	
WATER	







STS
SOUTH TAMIL NADU
SURVEYING
SPECIALISTS

LEGEND	
	BOUNDARY MARK
	SPOT HEIGHT
	CONTOUR LINE
	WATER BODY
	ROAD
	FENCING
	BOUNDARY LINE
	SURVEY STATION
	BENCH MARK
	SPOT HEIGHT
	CONTOUR LINE
	WATER BODY
	ROAD
	FENCING
	BOUNDARY LINE
	SURVEY STATION
	BENCH MARK

BENCH MARK LIST	
BM 1	E=353667.470 N=2760974.802 2225.150

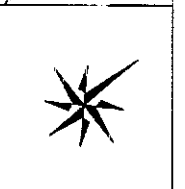
DRAWING NO.	
STS-01	1-1000
DATE	
13-07-2024	
DRAWN	
RAJAN	
CHECKED	
ANAND	
APPROVED	

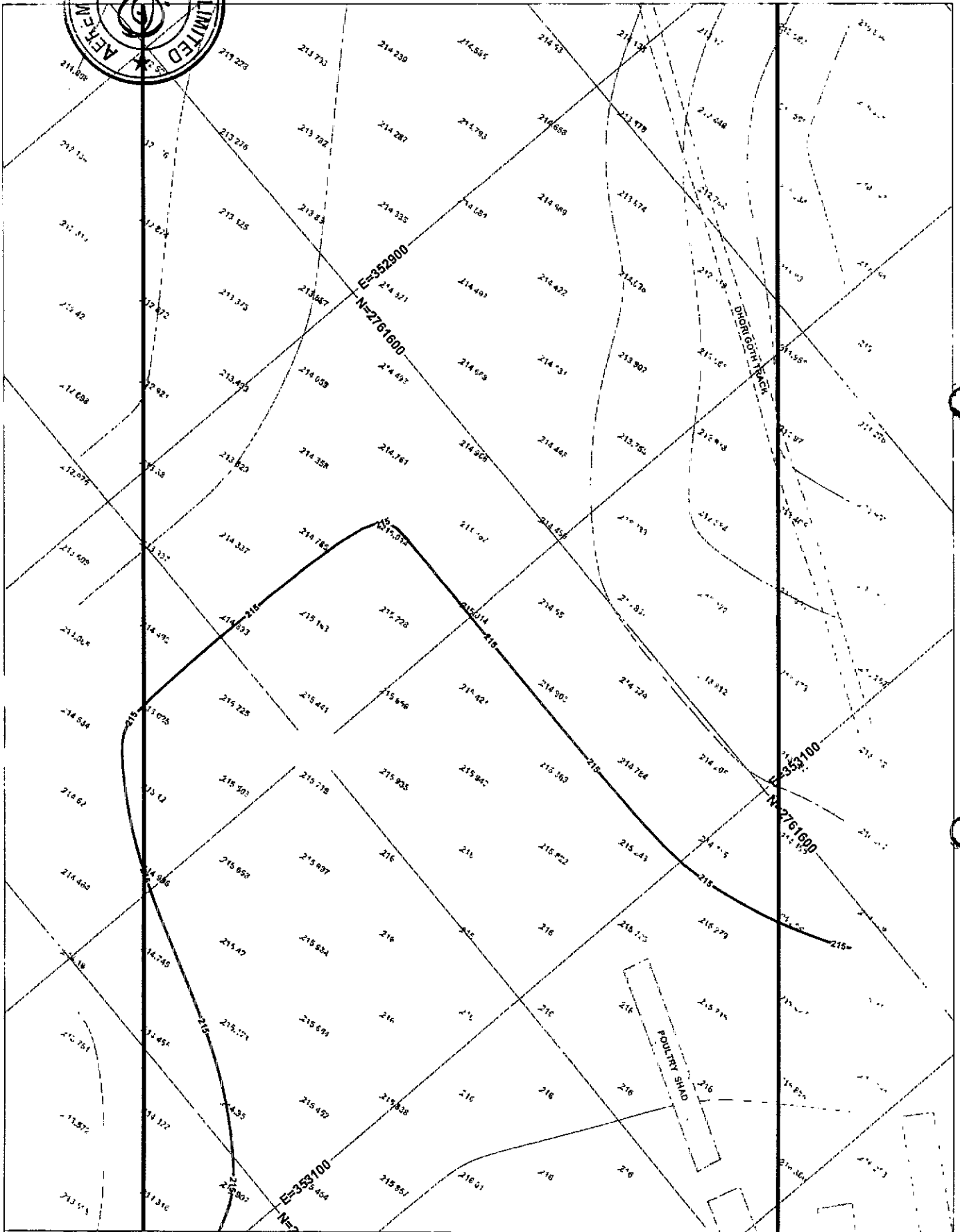
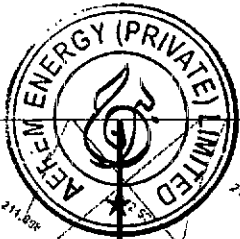
BENCH MARK LIST	
BM 1	E=353667.470 N=2760974.802 2225.150

BENCH MARK LIST	
BM 1	E=353667.470 N=2760974.802 2225.150

BENCH MARK LIST	
BM 1	E=353667.470 N=2760974.802 2225.150

BENCH MARK LIST	
BM 1	E=353667.470 N=2760974.802 2225.150



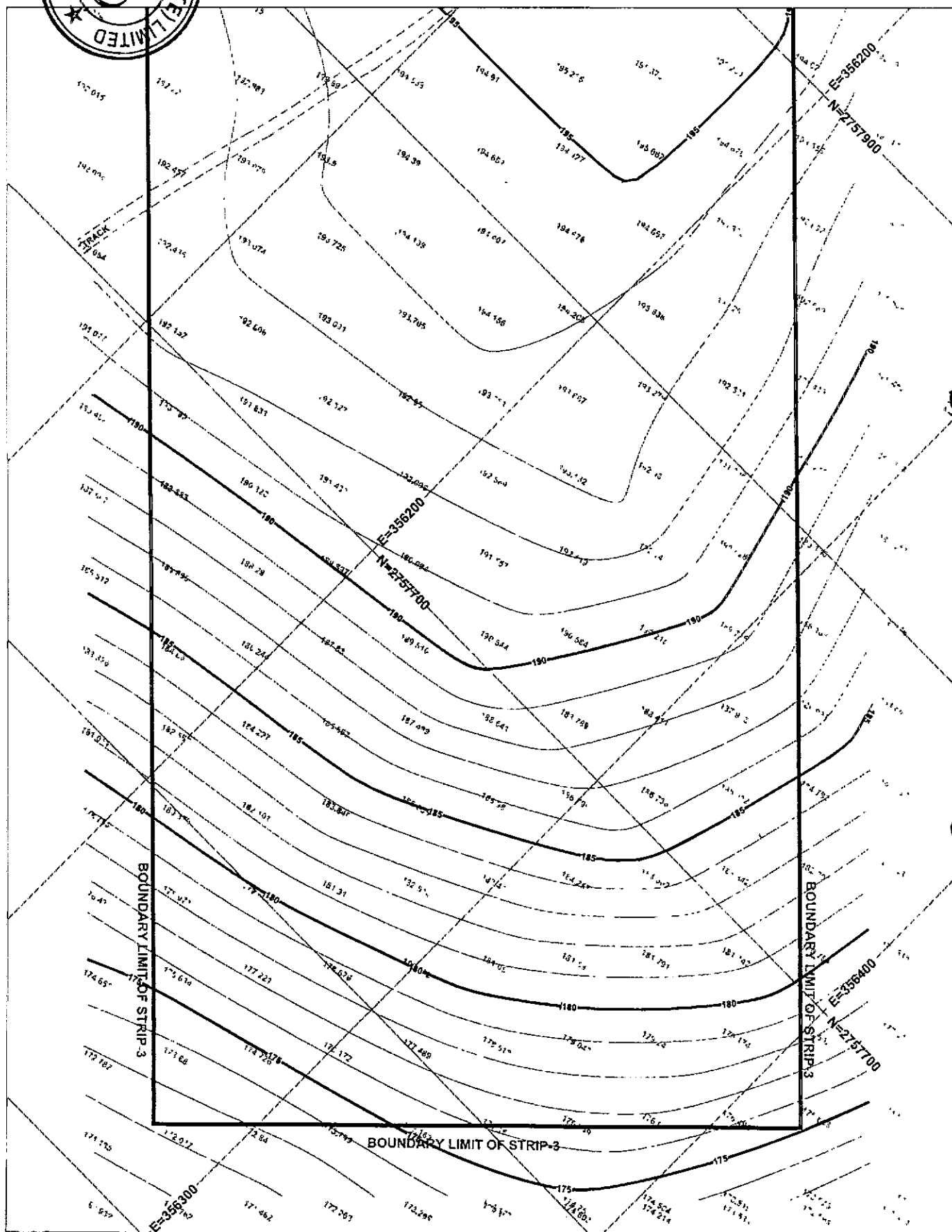


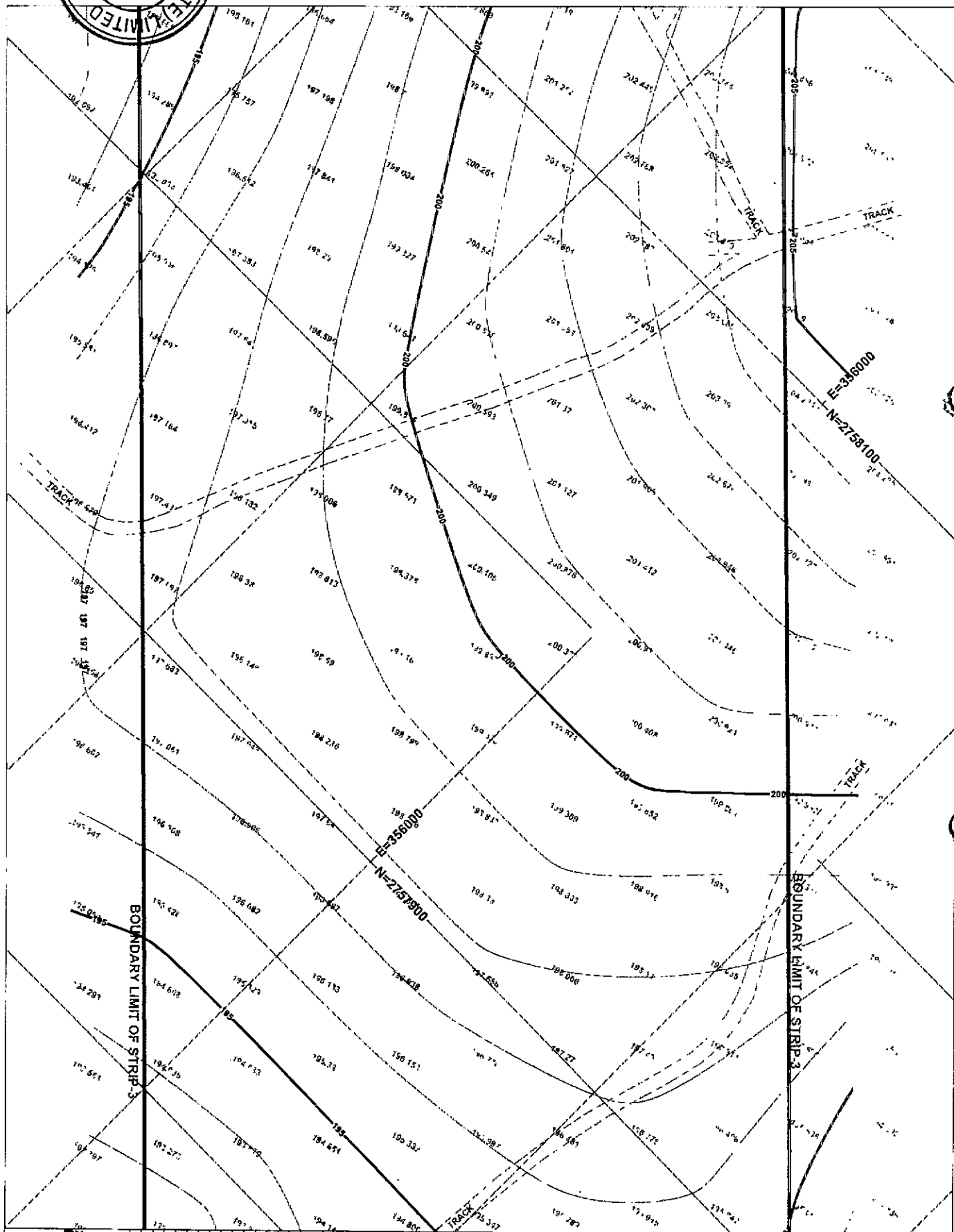
1. All dimensions are in meters
2. Contour interval is 1 meter
3. Spot heights are in meters

DRAWING NO.	S/S 02
SCALE	1" = 100'
DATE	13-01-2024
DRAWN	PAIRMAN
CHECKED	KUNAZADA
APPROVED	

Project Name	As per client
Location	As per client
Drawn	As per client
Checked	As per client
Approved	As per client

LEGEND	
BRIDGE MARK	As per client
ELECTRIC POLE	As per client
TELEPHONE POLE	As per client
WATER TOWER	As per client
WATER TANK	As per client
WATER PUMP	As per client
WATER TREATMENT PLANT	As per client
WATER DISTRIBUTION NETWORK	As per client
WATER SUPPLY LINE	As per client
WATER TREATMENT PLANT	As per client
WATER DISTRIBUTION NETWORK	As per client
WATER SUPPLY LINE	As per client

[illegible]

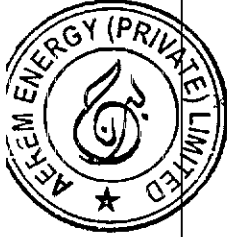


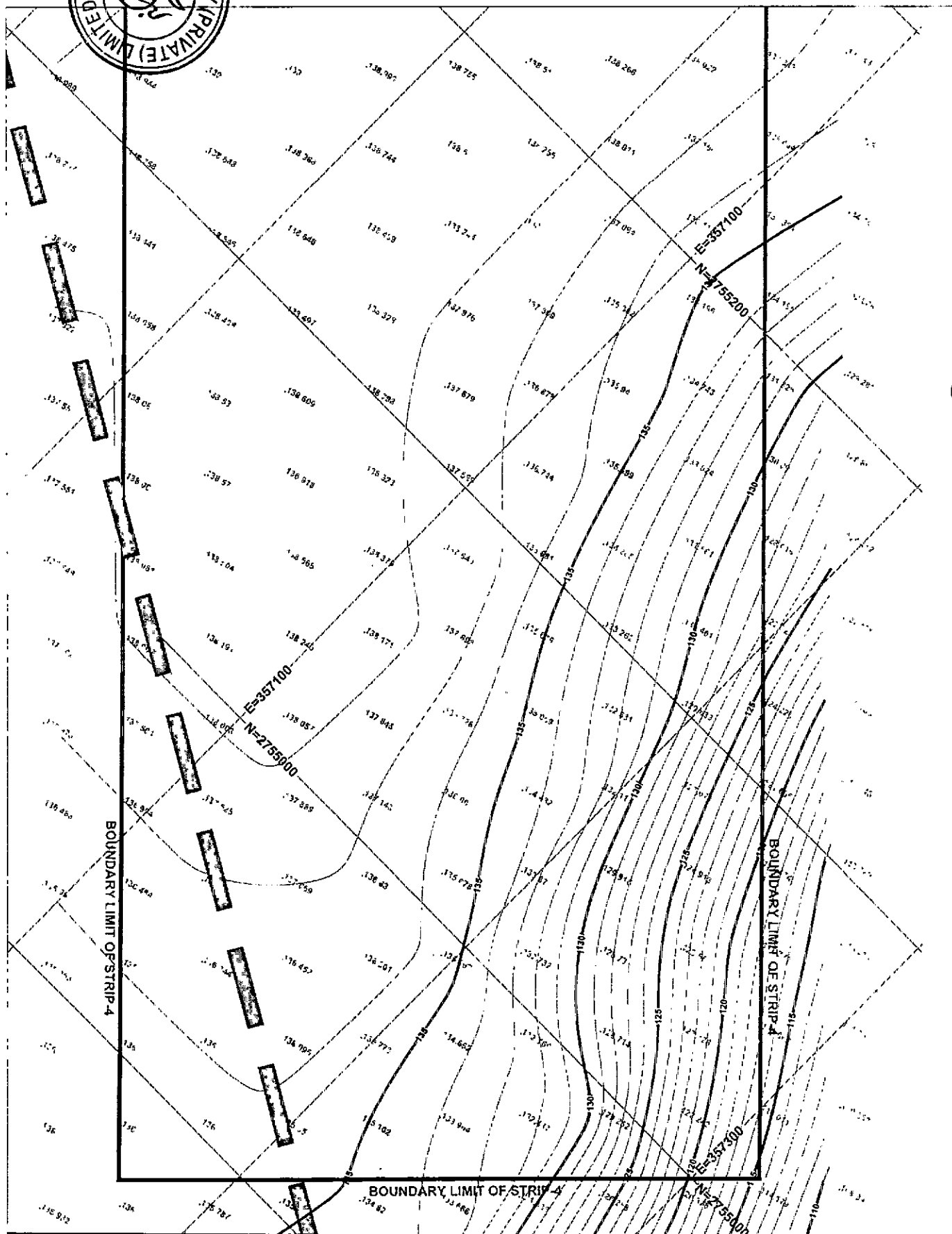
DRAWING NO.	S/S-02
SCALE	1=1000
DATE	13-07-2024
DRAWN	KAMRAN
CHECKED	KHANZADA
APPROVER	

NAME	DATE	TIME	LOCATION	REMARKS
1. J. J.	10/10/78	10:00	1000	1000
2. J. J.	10/10/78	10:00	1000	1000
3. J. J.	10/10/78	10:00	1000	1000
4. J. J.	10/10/78	10:00	1000	1000
5. J. J.	10/10/78	10:00	1000	1000
6. J. J.	10/10/78	10:00	1000	1000
7. J. J.	10/10/78	10:00	1000	1000
8. J. J.	10/10/78	10:00	1000	1000
9. J. J.	10/10/78	10:00	1000	1000
10. J. J.	10/10/78	10:00	1000	1000

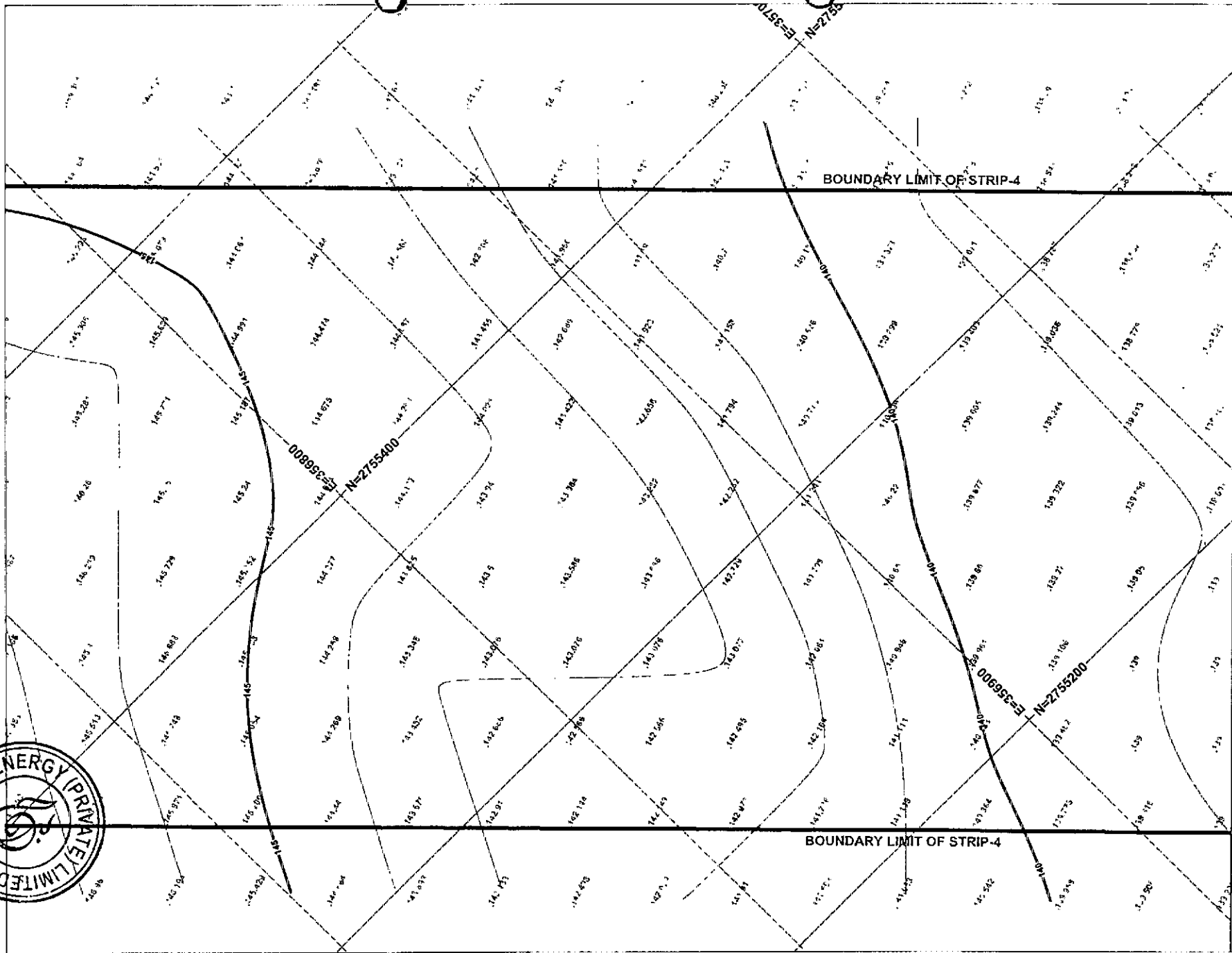
LEGEND	
BRUSH MARK	②
SCORCHED HUT	③
HAIR, PIT-OLE	④
WIND ROSE	⑤
SHORT LEVEL	⑥
WINDY PLACE	⑦
WINDY PLACE	⑧
BRACK	⑨
FLAME	⑩
WINDY PLACE	⑪
WINDY PLACE	⑫
WINDY PLACE	⑬
WINDY PLACE	⑭
WINDY PLACE	⑮
WINDY PLACE	⑯
WINDY PLACE	⑰
WINDY PLACE	⑱
WINDY PLACE	⑲
WINDY PLACE	⑳
WINDY PLACE	㉑
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WINDY PLACE	㊿

ST





DRAWING NO		SIS-11
SCALE		1:1000
DATE		13.07.2024
CHECKED		PAVANAN
DRAWING		KHAWAZADA
APP. OVER		
Rev. # & Desc		1/01 MFLA
Preparation	1/01	Rev. # & Desc
Customer	MOSAI	1/01 MFLA
Author	4/01	1/01 MFLA
BE ON CHAIRMAN'S LIST Rev. # & Desc		
1/01	1/01	1/01
2/01	2/01	2/01
3/01	3/01	3/01
4/01	4/01	4/01
5/01	5/01	5/01
6/01	6/01	6/01
7/01	7/01	7/01
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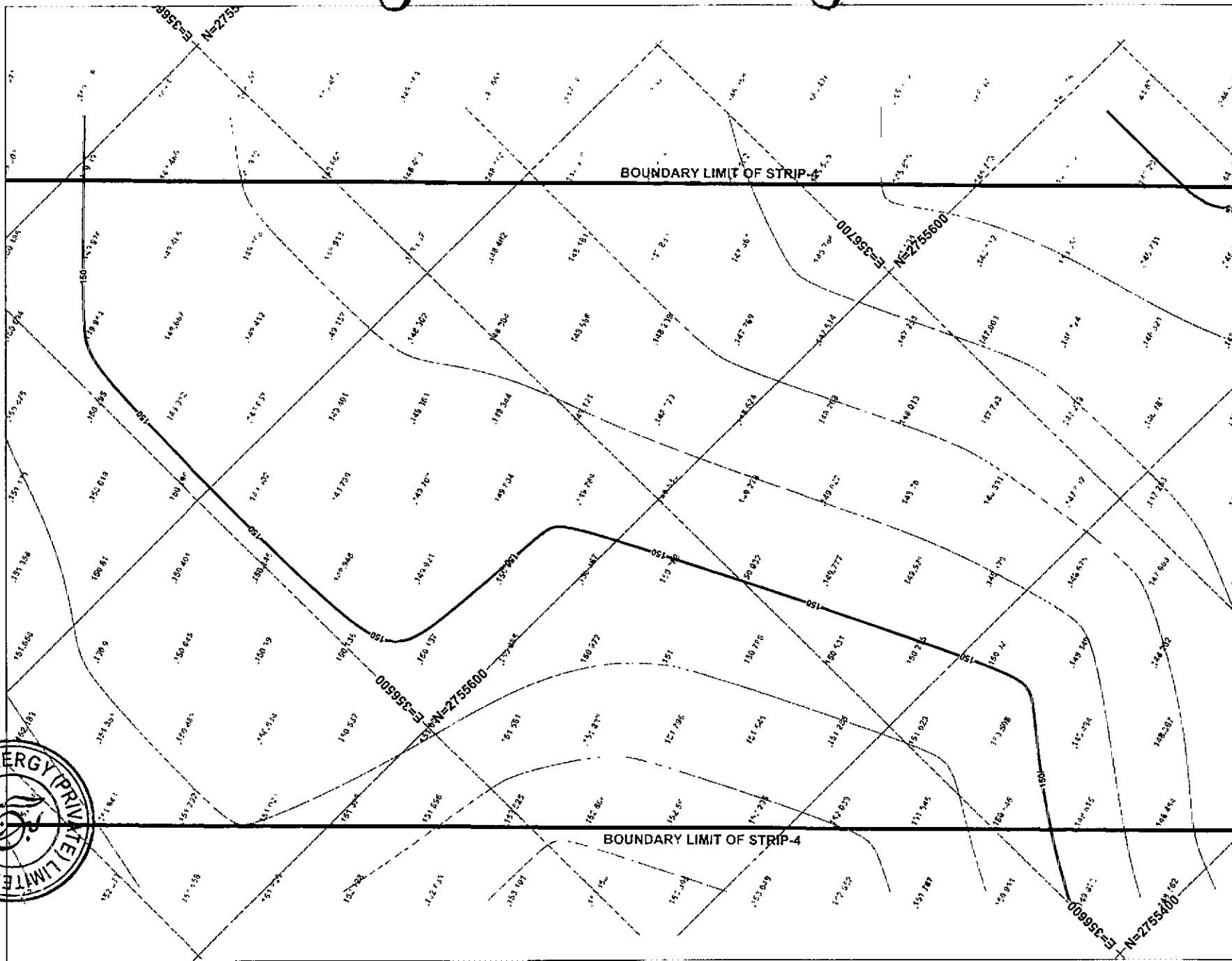


1. All $\mathbb{R}$ -vector spaces are $\mathbb{Q}$ -vector spaces.
2. $\mathbb{Q}$ -vector spaces are $\mathbb{Z}$ -modules.
3. $\mathbb{Z}$ -modules are $\mathbb{Z}$ -vector spaces.

Page 11 of 20		Page 11 of 20
Page 11 of 20	Page 11 of 20	Page 11 of 20
Page 11 of 20	Page 11 of 20	Page 11 of 20
Page 11 of 20	Page 11 of 20	Page 11 of 20

LEGEND	
BENCH MARK	
INDUSTRIAL PLOT	
ELECTRIC GO E	
TELEPHONE POLE	
LIGHT POLE	
SHOT LEVEL	
INVERT LEVEL	95.545
AMMUNITION	
TRUCK	
WAGON	
SURVEYOR'S	
"PFE"	
BRIDGE	
WATER TIGHT	98.545
DEMOGRAPH	

כד



- Notes:
1. All dimensions given in mm
 2. Contour interval 1 meter
 3. Sheet covers 100 A1

DRAWING NO.	SIS-09
SCALE	1:1000
DATE	13-07-2024
DRAWN	KAMRAN
CHECKED	KHANZADA
APPROVER	

Reference Datum		LIST A/LA
Intersection	E 118	206426.50 M
Datum	W 541	4128.27 541
2006	425	2 4 27 117

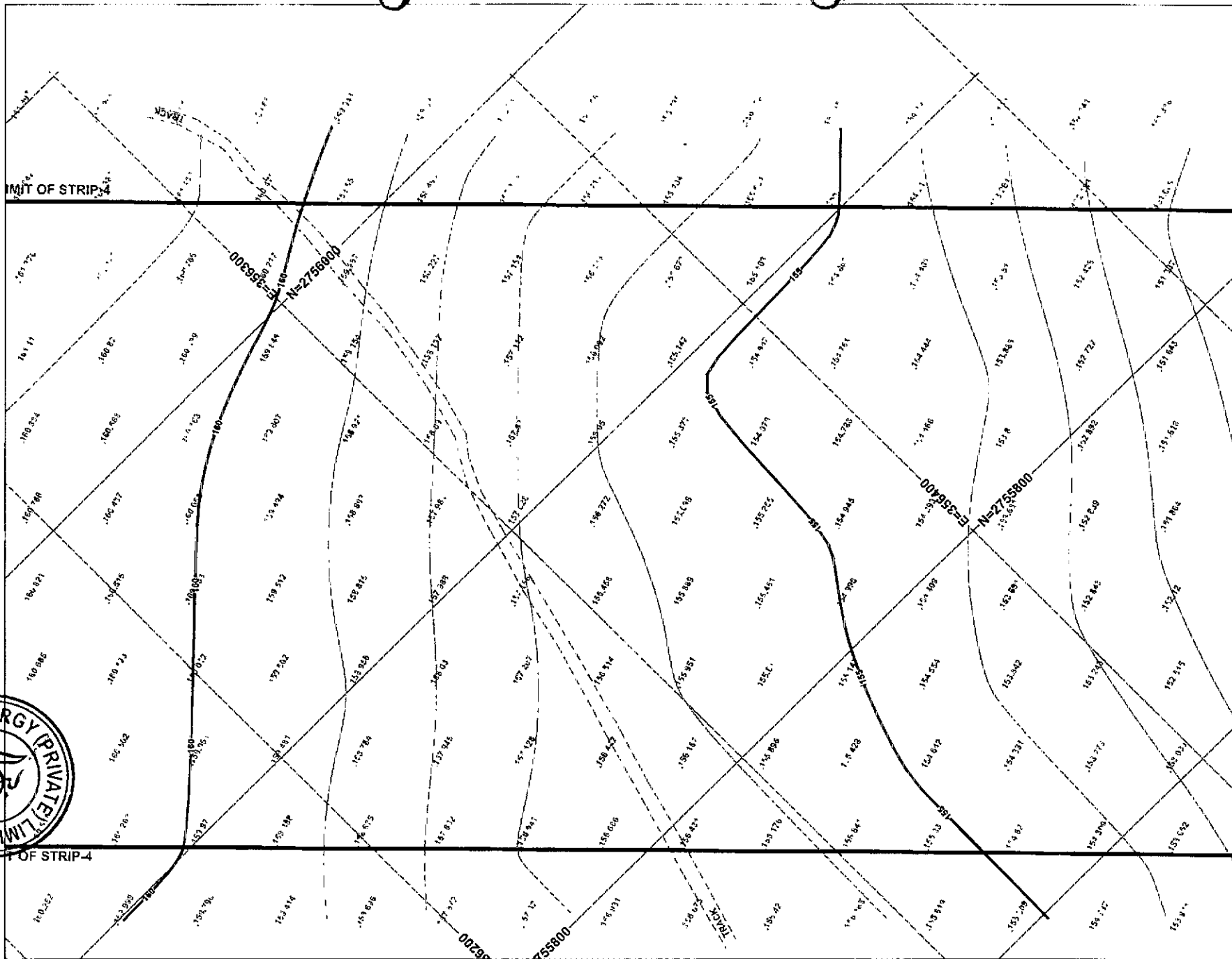
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LEGEND

SEARCH MARK	
PERMANENT IDENT	—
ELECTRIC POLE	⊙
TELEPHONE POLE	⊙
LIGHT POLE	⊙
SPOT LEVEL	
PROPERTY	98.941
LANDMARK	↑
TRACK	—
POLE	⊗
SIGN BOARD	⊗
TREE	↑
POST	⊗
WALL	98.948
LINE	↑

STB

PHILIPINE AIRLINES



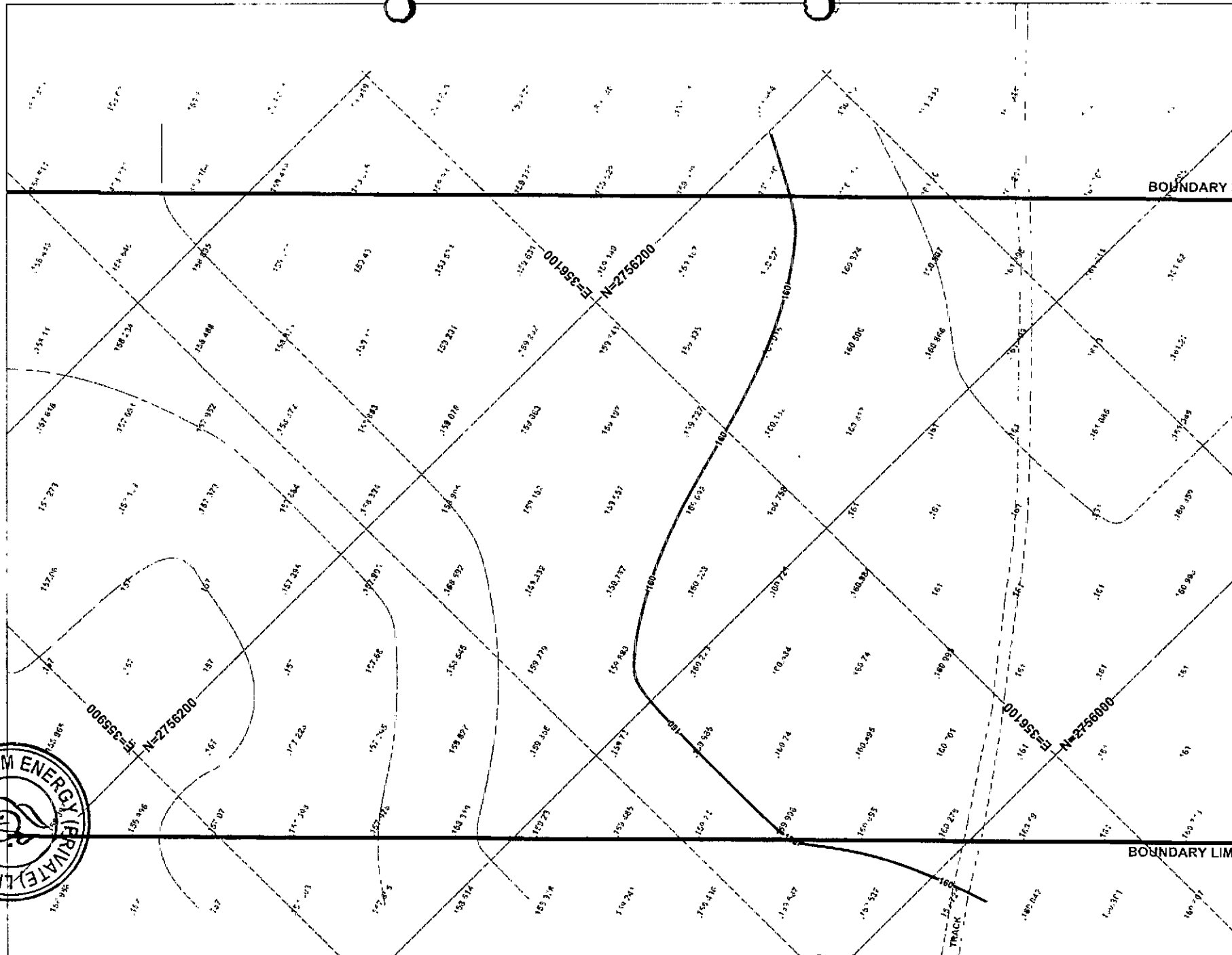
LEGEND

PROPOSED LOT	
ELECTRIC POLE	
TELEPHONE POLE	
WATER TOWER	
SPOT LEVEL	
INTERSECTION	
WATER	
ROAD	
RAILWAY	
WATER TOWER	
WATER TOWER	
WATER TOWER	

BENCHMARK LIST

STATION	MARK	HEIGHT	LEVEL
BM 1	1	100.00	100.00
BM 2	2	100.00	100.00
BM 3	3	100.00	100.00
BM 4	4	100.00	100.00

DRAWING NO: S15-02
SCALE: 1:1000
DATE: 13-07-2024
DRAWN: KAMRAN
CHECKED: KAMRAN
APPROVED: KAMRAN



BOUNDARY LINE



- Notes:
1. All drawings are in metric units.
 2. Contour interval is 1 meter.
 3. Shaded squares are water.

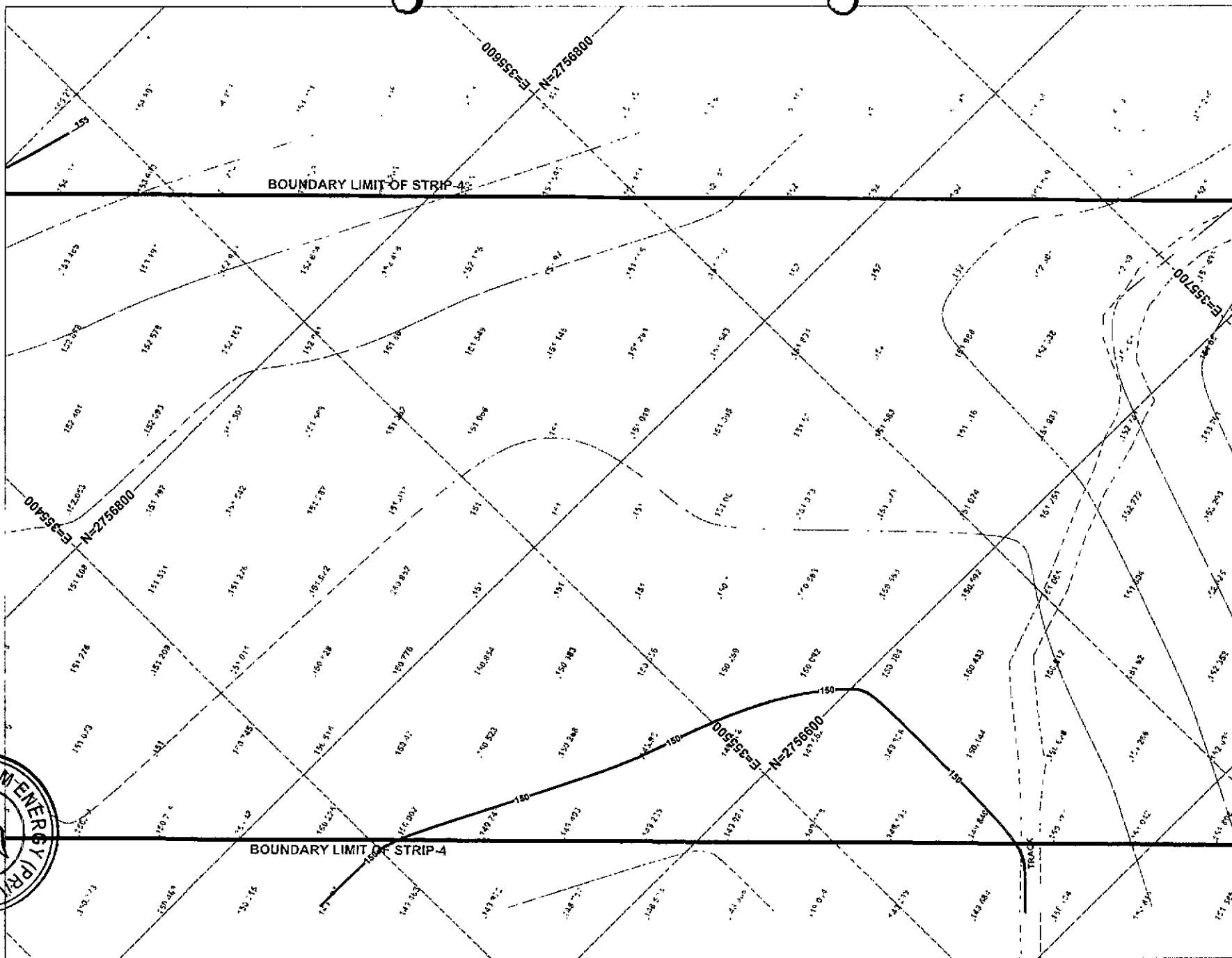
DRAWING NO.	STS-01
SCALE	1:1000
DATE	15.07.2024
DRAWN	KAMRAN
CHECKED	KHANZADA
APPROVED	

Author's Name	Plot Area
Project	1.75
Dist.	WG and
Zone	ACR

BENCHMARKS LIST	
BM 1	EASTING 1000000.000
BM 2	NORTHING 2000000.000
BM 3	EASTING 1000000.000
BM 4	NORTHING 2000000.000

LEGEND	
BENCH MARK	⊕
PROPOSED PLOT	—
ELECTRIC POLE	⊙
TELEPHONE POLE	⊙
LIGHT POLE	⊙
5.0' LEVEL	—
HAVER LEVEL	—
LAMPPOST	—
TRACK	—
WATER	—
WATER BOAT	—
WATER	—
WATER	—
WATER	—
WATER	—





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LARRY

14. 

Note:

1. All 3 numbers are in order
2. Number of odd $\geq$ even
3. The 1 comes last

| | |
|-------------|------------|
| DRAWING NO: | STS-06 |
| SCALE | 1= 1000 |
| DATE | 13-07-2024 |
| DRAWN | KAMRAN |
| CHECKED | KHANZADA |
| APPROVER | |

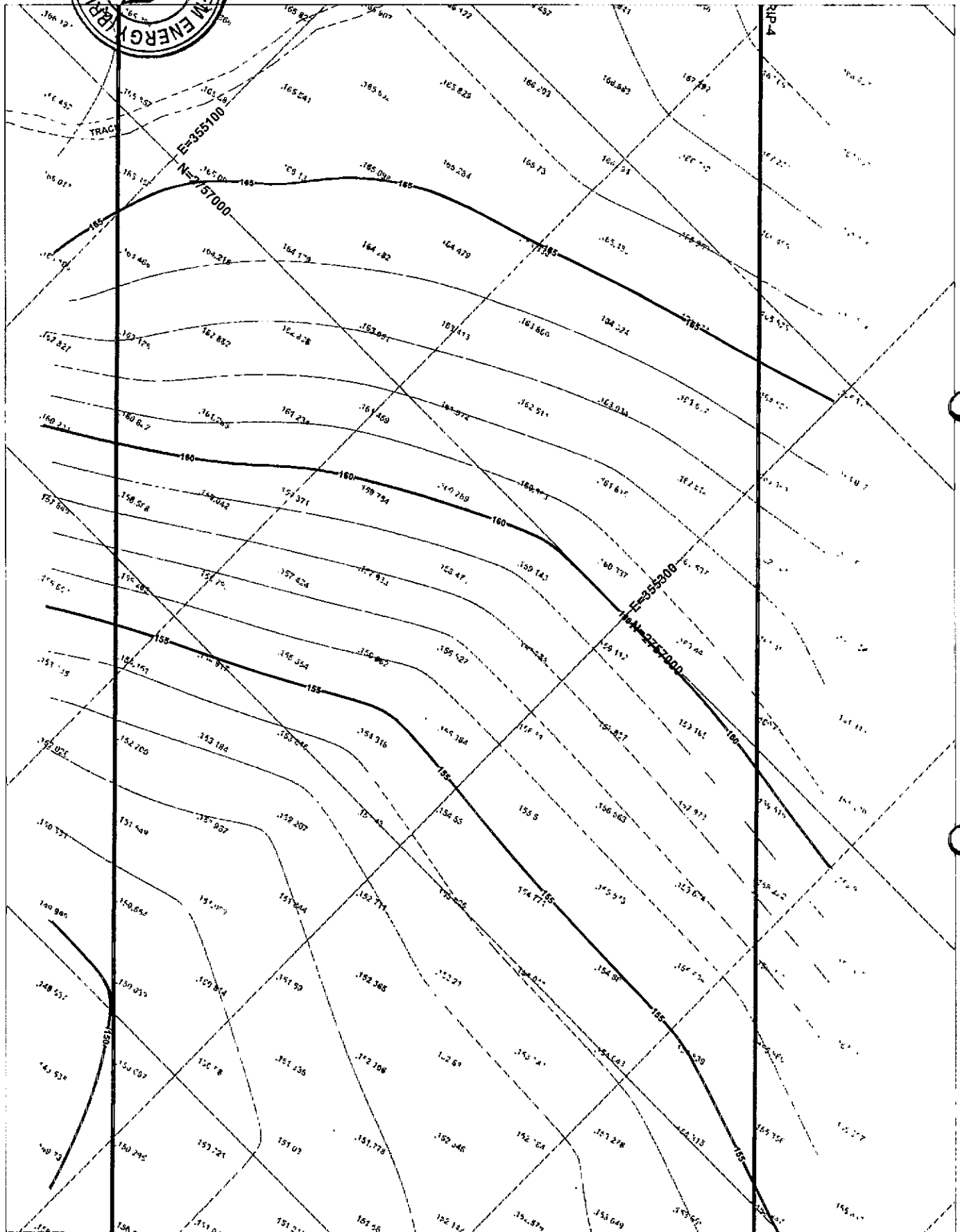
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|-----------------|--------|-------------|
| 1/1/1970 | 1/1/73 | 50428 sq ft |
| 1/1/73 | 1/1/75 | 42807 sq ft |
| 1/1/75 | 1/1/77 | 42807 sq ft |

| Id No | FASTING | POSTPRANDIAL | LEVEL |
|-------|--------------|--------------|--------------|
| 1 | 34.7 ± 0.47% | 21.0 ± 0.47% | 2 ± 1% |
| 2 | 14.1 ± 0.47% | 27.7 ± 0.47% | 17.0 ± 0.47% |
| 3 | 33.0 ± 0.47% | 27.4 ± 0.47% | 17.0 ± 0.47% |
| 4 | 14.1 ± 0.47% | 27.7 ± 0.47% | 17.0 ± 0.47% |

| LEGEND | |
|----------------|--|
| SPRINK MARK | |
| UNPAVED PLOT | |
| ELECTRIC CABLE | |
| TELEPHONE POLE | |
| WATER POLE | |
| SPOT LEVEL | |
| WATER LEVEL | |
| LAUNCHING | |
| TRAC | |
| PI AN | |
| STING PLANT | |
| TREE | |
| WATER | |
| WELL | |
| 2-6 HYDRANT | |

ST3

[illegible]



1. Drawn by: [Signature]
2. Checked by: [Signature]
3. Date: 10/10/2024

DRAWING NO.: S15-04
SCALE: 1:1000
DATE: 13.07.2024
DRAWN BY: [Signature]
CHK'D BY: [Signature]
APPROVER: [Signature]

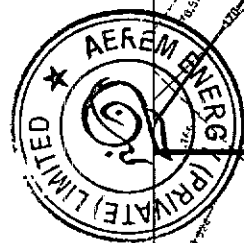
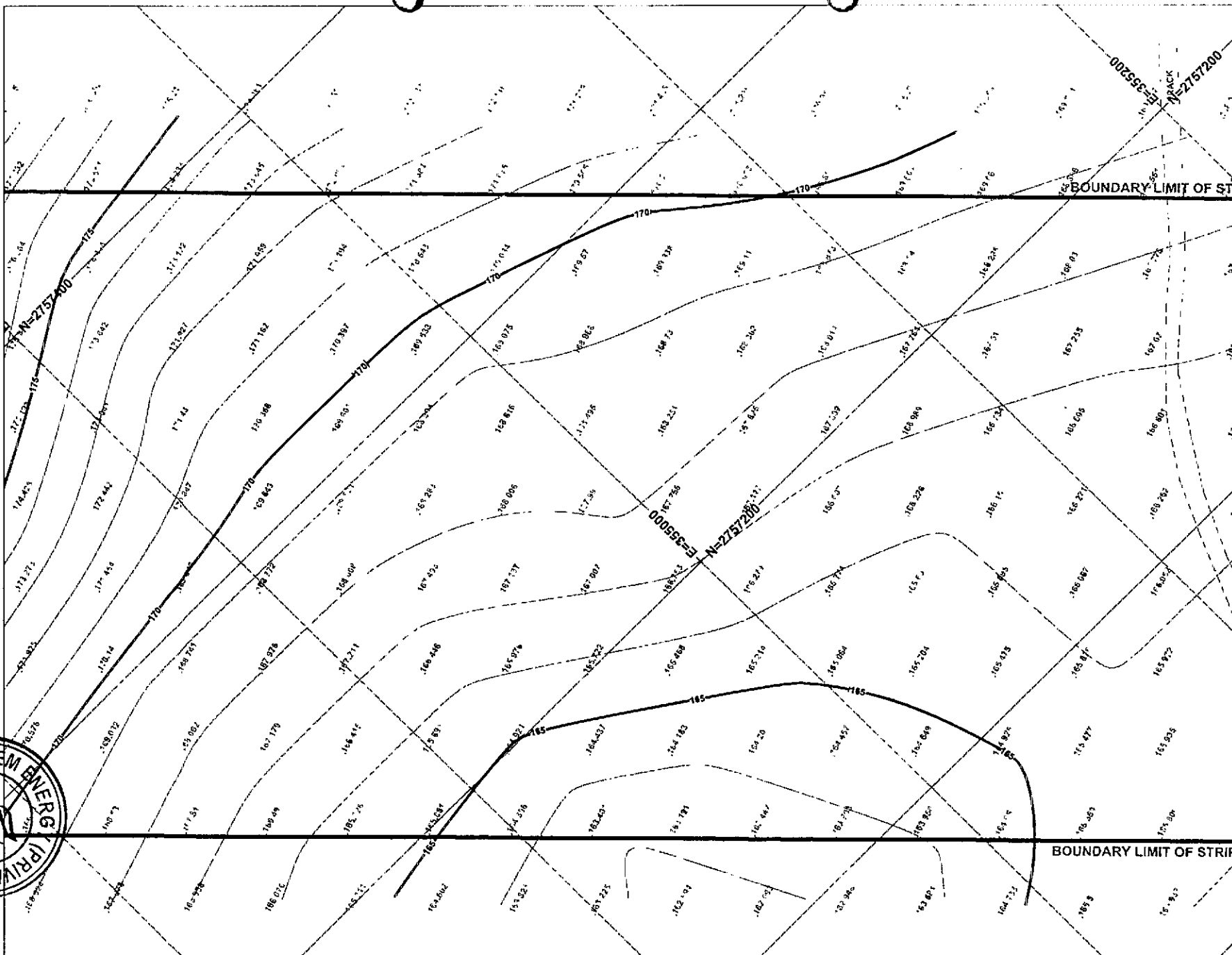
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Location: [Blank]
Drawing: [Blank]

BENCHMARKS LIST

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| 2 | BM2 | 1000000.00 | 1000000.00 |
| 3 | BM3 | 1000000.00 | 1000000.00 |
| 4 | BM4 | 1000000.00 | 1000000.00 |
| 5 | BM5 | 1000000.00 | 1000000.00 |
| 6 | BM6 | 1000000.00 | 1000000.00 |
| 7 | BM7 | 1000000.00 | 1000000.00 |
| 8 | BM8 | 1000000.00 | 1000000.00 |
| 9 | BM9 | 1000000.00 | 1000000.00 |
| 10 | BM10 | 1000000.00 | 1000000.00 |
| 11 | BM11 | 1000000.00 | 1000000.00 |
| 12 | BM12 | 1000000.00 | 1000000.00 |
| 13 | BM13 | 1000000.00 | 1000000.00 |
| 14 | BM14 | 1000000.00 | 1000000.00 |
| 15 | BM15 | 1000000.00 | 1000000.00 |
| 16 | BM16 | 1000000.00 | 1000000.00 |
| 17 | BM17 | 1000000.00 | 1000000.00 |
| 18 | BM18 | 1000000.00 | 1000000.00 |
| 19 | BM19 | 1000000.00 | 1000000.00 |
| 20 | BM20 | 1000000.00 | 1000000.00 |
| 21 | BM21 | 1000000.00 | 1000000.00 |
| 22 | BM22 | 1000000.00 | 1000000.00 |
| 23 | BM23 | 1000000.00 | 1000000.00 |
| 24 | BM24 | 1000000.00 | 1000000.00 |
| 25 | BM25 | 1000000.00 | 1000000.00 |
| 26 | BM26 | 1000000.00 | 1000000.00 |
| 27 | BM27 | 1000000.00 | 1000000.00 |
| 28 | BM28 | 1000000.00 | 1000000.00 |
| 29 | BM29 | 1000000.00 | 1000000.00 |
| 30 | BM30 | 1000000.00 | 1000000.00 |
| 31 | BM31 | 1000000.00 | 1000000.00 |
| 32 | BM32 | 1000000.00 | 1000000.00 |
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| 35 | BM35 | 1000000.00 | 1000000.00 |
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| 42 | BM42 | 1000000.00 | 1000000.00 |
| 43 | BM43 | 1000000.00 | 1000000.00 |
| 44 | BM44 | 1000000.00 | 1000000.00 |
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| 46 | BM46 | 1000000.00 | 1000000.00 |
| 47 | BM47 | 1000000.00 | 1000000.00 |
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| 61 | BM61 | 1000000.00 | 1000000.00 |
| 62 | BM62 | 1000000.00 | 1000000.00 |
| 63 | BM63 | 1000000.00 | 1000000.00 |
| 64 | BM64 | 1000000.00 | 1000000.00 |
| 65 | BM65 | 1000000.00 | 1000000.00 |
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| 67 | BM67 | 1000000.00 | 1000000.00 |
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| 89 | BM89 | 1000000.00 | 1000000.00 |
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| 94 | BM94 | 1000000.00 | 1000000.00 |
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| 97 | BM97 | 1000000.00 | 1000000.00 |
| 98 | BM98 | 1000000.00 | 1000000.00 |
| 99 | BM99 | 1000000.00 | 1000000.00 |
| 100 | BM100 | 1000000.00 | 1000000.00 |

LEGEND

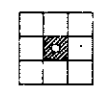
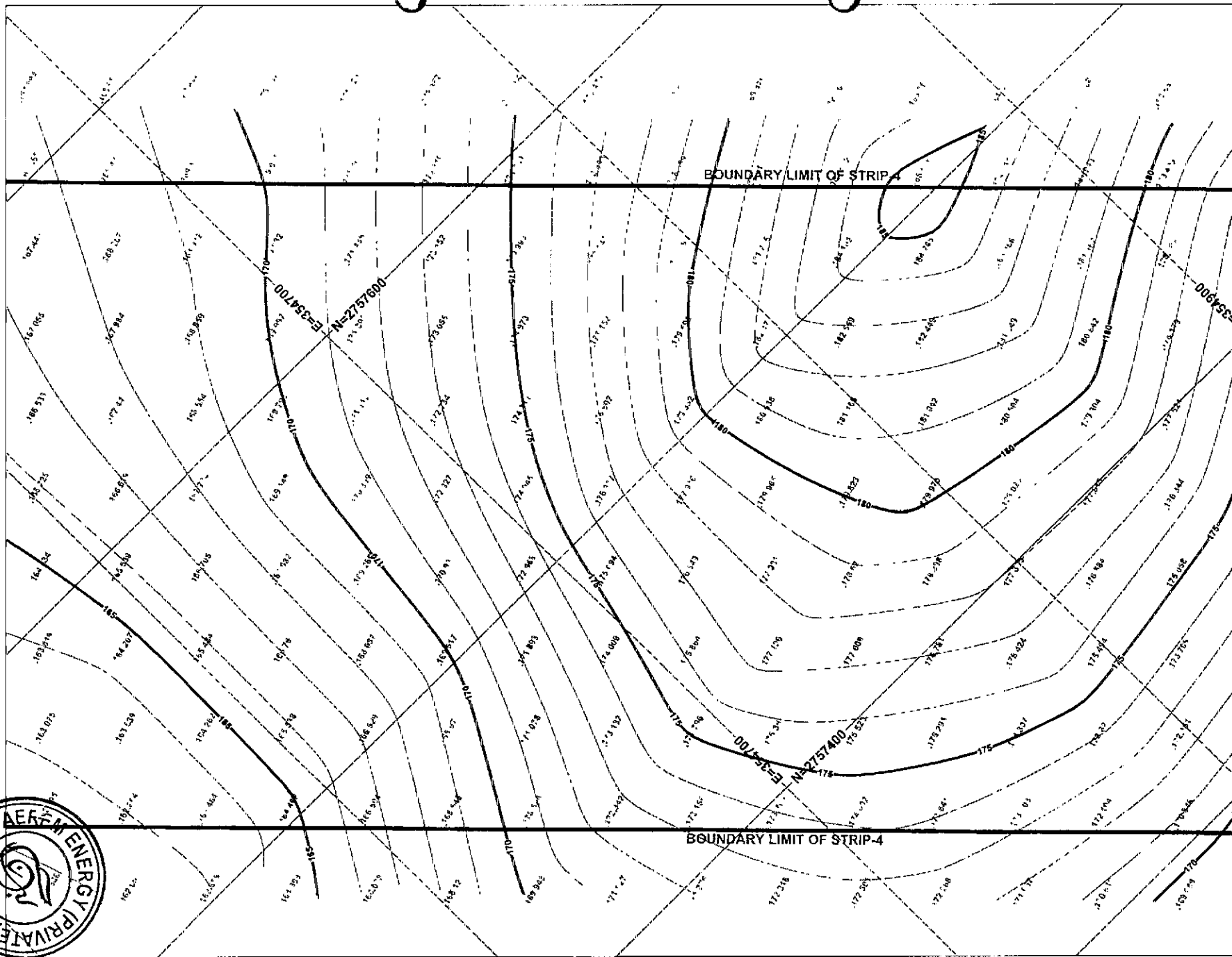
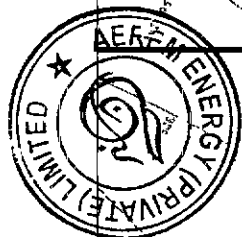
| Symbol | Description |
|--------|----------------------|
| ⊙ | Benchmark |
| ⊙ | Leveling point |
| ⊙ | Survey point |
| ⊙ | Control point |
| ⊙ | Station point |
| ⊙ | Intersection point |
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BOUNDARY LIMIT OF STRIP

STB

$$(iii) \quad 0 \leq f(\lambda) \leq 1, \quad \lambda \in \mathbb{R}^n, \quad \lambda \neq 0.$$



Note.

- 1. All spot heights are in meter
- 2. Contour interval 1 meter
- 3. Spot heights in m

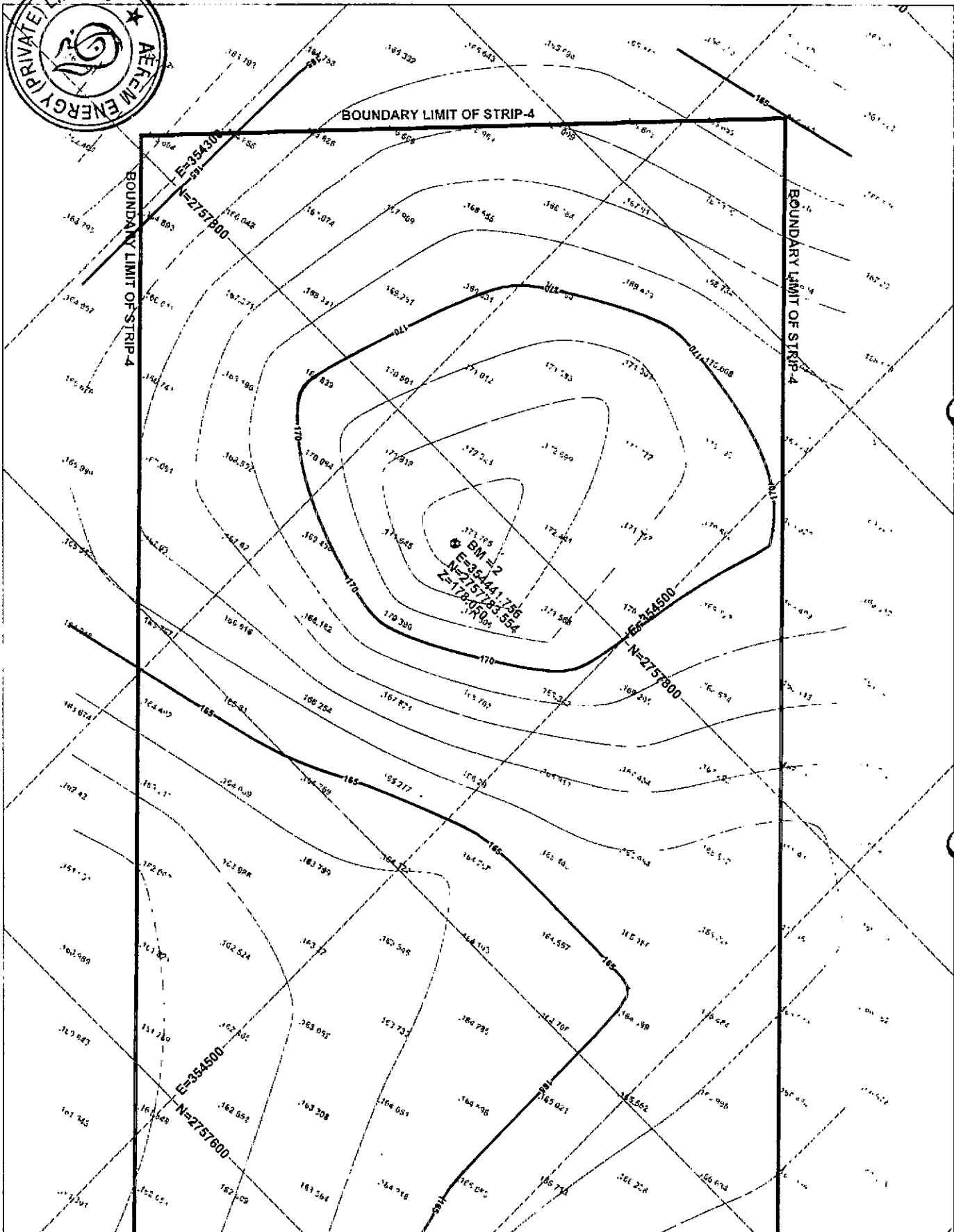
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| CHKD | KHANZADA |
| APPROVED | |

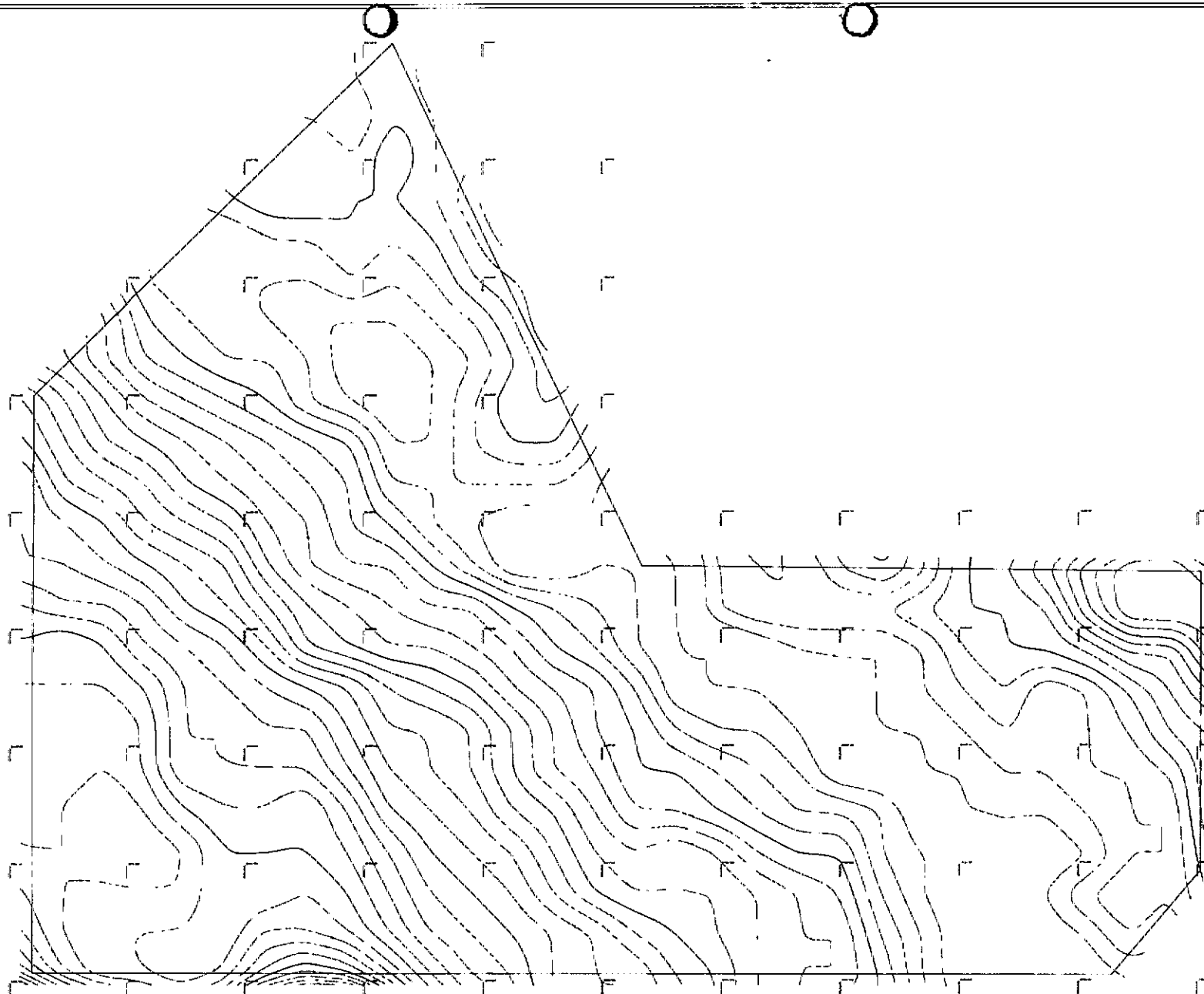
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| Projection | UTM |
| Units | Meters |
| Zone | 48Q |

| BENCHMARK LIST | | | |
|----------------|---------|----------|---------|
| NO | EASTING | NORTHING | LEVEL |
| 1 | 178 100 | 178 100 | 178 100 |
| 2 | 178 100 | 178 100 | 178 100 |
| 3 | 178 100 | 178 100 | 178 100 |
| 4 | 178 100 | 178 100 | 178 100 |

| LEGEND | |
|----------------|---|
| BENCHMARK | ⊕ |
| PROPOSED PLOT | □ |
| ELECTRIC POLE | ⊙ |
| TELEPHONE POLE | ⊙ |
| LIGHT POLE | ⊙ |
| SPOT LEVEL | • |
| INVERT LEVEL | ▽ |
| CANAL | — |
| ROAD | — |
| BOUNDARY | — |
| SEE | — |
| WELL | ⊕ |
| WELL RIG | ⊕ |
| WELL RIG | ⊕ |



[illegible]



PROJECT NO. 1000
 PROJECT NAME
 PROJECT LOCATION

CLIENT
 ADDRESS

DATE
 DRAWN BY
 CHECKED BY
 APPROVED BY

Notes
 1. All dimensions in meters
 2. Contour interval 1 meter
 3. Sheet Upper and All

| | |
|-------------|------------|
| DRAWING NO. | STS 01 |
| SCALE | 1:1000 |
| DATE | 23-08-2024 |
| DRAWN | KAMRAN |
| CHECKED | SHAN/AJIA |
| APPROVED | |

| Reference Station | Spot Area |
|-------------------|-------------|
| PL Station | JTM 1:40000 |
| Quota | ACQ. 54 |
| Flow | 1.5 |

BENCHMARKS LIST

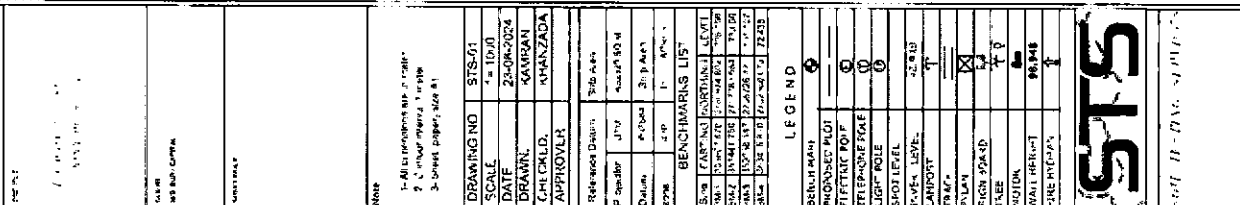
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| BM 2 | 1000000 | 1000000 | 1000000 |
| BM 3 | 1000000 | 1000000 | 1000000 |

LEGEND

| | |
|----------------|---|
| PLANT MARK | ① |
| PROPOSED PLOT | ② |
| ELECTRIC POLE | ③ |
| TELEPHONE POLE | ④ |
| LIGHT POLE | ⑤ |
| SPOT LEVEL | ⑥ |
| INVERT LEVEL | ⑦ |
| LANDPOST | ⑧ |
| TRACE | ⑨ |
| WYLLAY | ⑩ |
| SIGN BOARD | ⑪ |
| TRAIL | ⑫ |
| TRUCK | ⑬ |
| WALL 4" HIGH | ⑭ |
| FIRE HYDRANT | ⑮ |

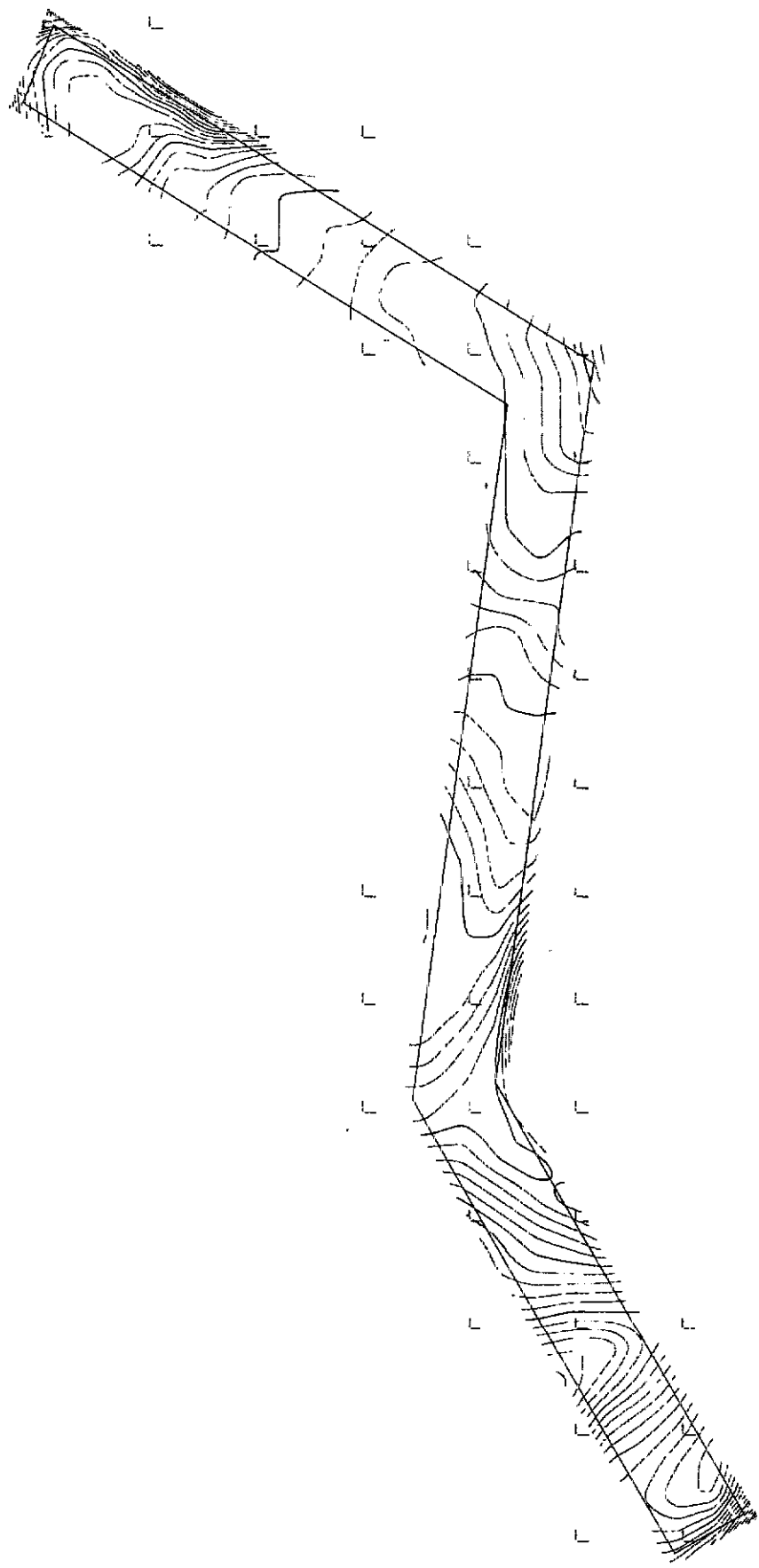
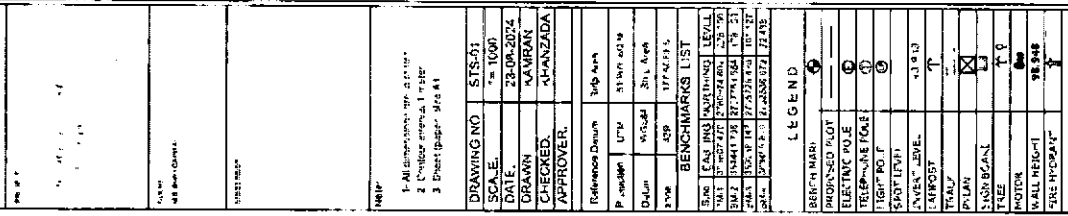
STS

STANDARD SPECIFICATIONS



ST

11-11-11



| SEARCH NAME | PHON/SEC | PGT |
|----------------|----------|-----|
| ELECTRIC POLE | ① | ① |
| TELEPHONE POLE | ② | ② |
| LIGHT POLE | ③ | ③ |
| SPOT LIGHT | ④ | ④ |
| INVERTER LEVE | ⑤ | ⑤ |
| AMF057 | ⑥ | ⑥ |
| TRAIL | ⑦ | ⑦ |
| PLAN | ⑧ | ⑧ |
| SUBSIGNAL | ⑨ | ⑨ |
| TRAIL | ⑩ | ⑩ |
| MOTOR | ⑪ | ⑪ |
| WALL MOUNTED | ⑫ | ⑫ |
| TRAILHEAD | ⑬ | ⑬ |

ST5

—

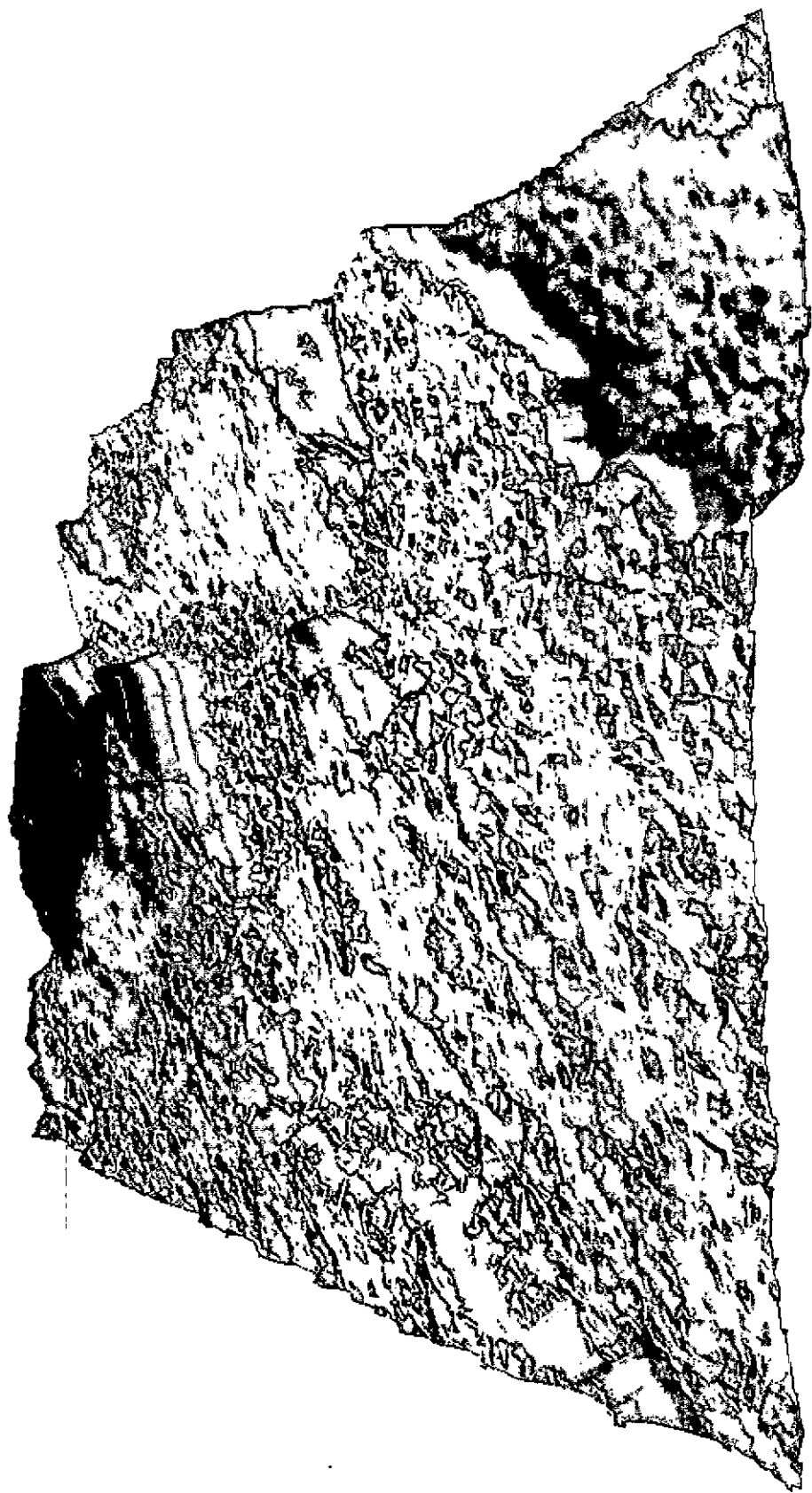


APPENDIX-I

3D PERSPECTIVE OF THE PLOT









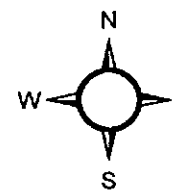
Legend

Value



High : 36.6348

Low : 0

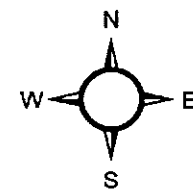


0 0.5 1 2 Kilometers

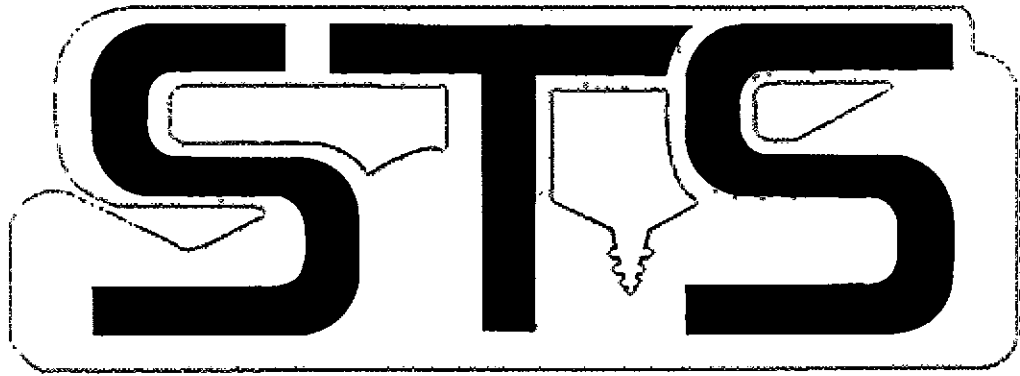


Legend

-  Flat (0)
-  North (0-22.5)
-  Northeast (22.5-67.5)
-  East (67.5-112.5)
-  Southeast (112.5-157.5)
-  South (157.5-202.5)
-  Southwest (202.5-247.5)
-  West (247.5-292.5)
-  Northwest (292.5-337.5)
-  North (337.5-360)



0 0.5 1 2 Kilometers



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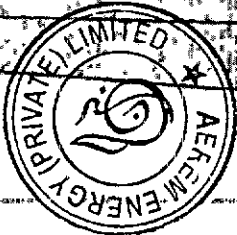
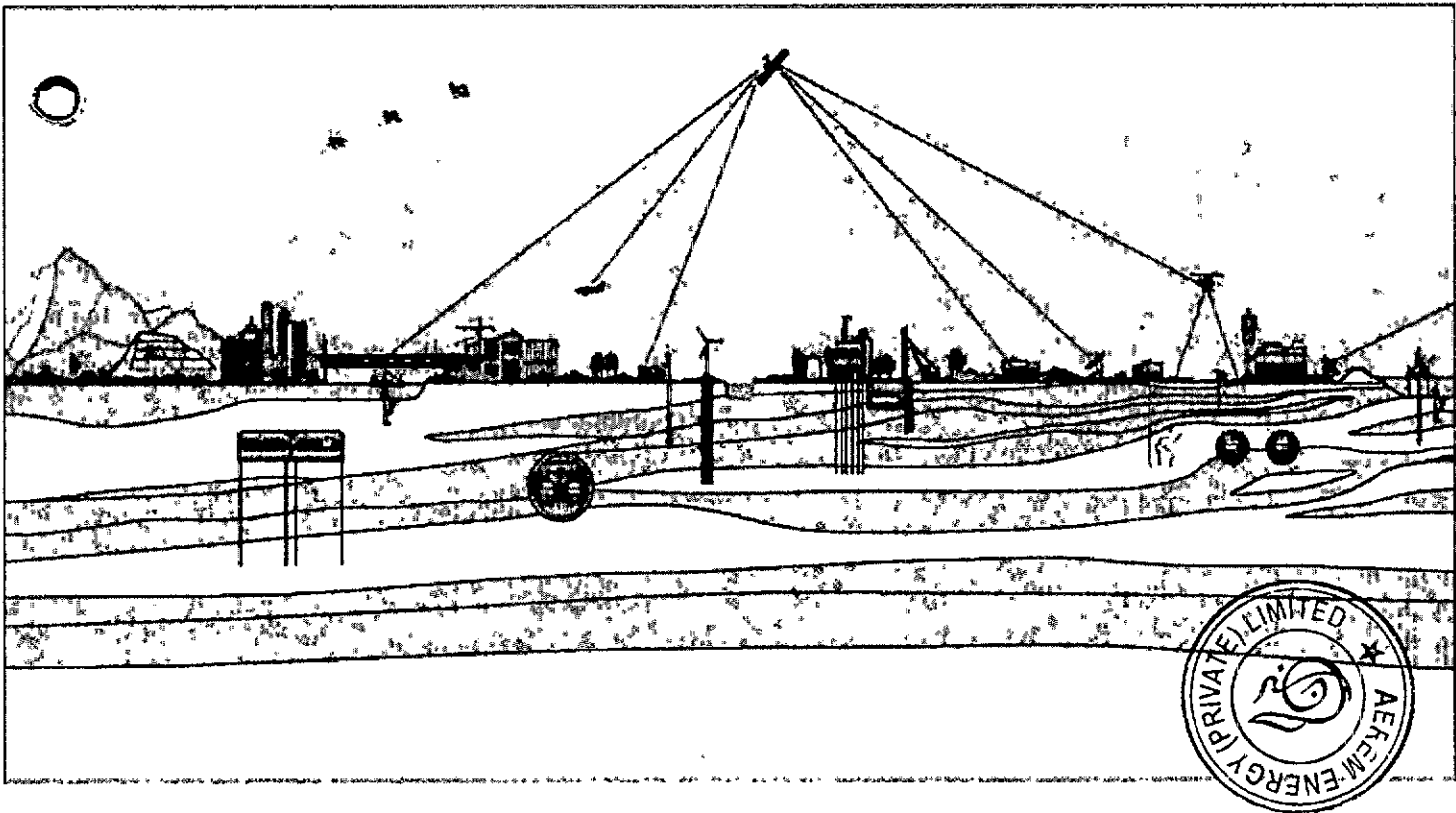


Report No. S-24-1131

GEOTECHNICAL INVESTIGATION REPORT FOR PROPOSED HYBRID RENEWABLE PROJECT NEAR GOTH DHORI JHOKHIO, DISTRICT THATTA, SINDH

(REV. 2.0, DATED: AUGUST 28, 2024)

CLIENT:





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| | | | | |
|---|-----------------------------------|--|----------|------------|
| <div>SOIL TESTING SERVICES</div> <div></div> | Geotechnical Investigation Report | | Revision | |
| | | | # | Date |
| | Report No.:
Vol II | | 2.0 | 28/08/2024 |

PROJECT: Geotechnical Investigation Report for Proposed Hybrid Renewable Project near
Goth Dhori Jhokhio, District Thatta, Sindh

| | NAME | SIGNATURE | DATE |
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(General Manager) | Naveed Anwer | | |

ISSUE/REVISION INDEX

| Issue Code | Revision | | | | | Revision Details |
|------------|----------|----|--------|------|------------|-------------------------|
| | No. | By | Rev'd. | App. | Date | |
| RD | 00 | IA | AR | NA | 25/07/2024 | |
| RD | 01 | IA | AR | NA | 23/08/2024 | New study area covered. |
| RD | 02 | IA | AR | NA | 28/08/2024 | Comments incorporated. |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Issue Codes: RC = Released for Construction, RD = Released for Design, RF = Released for Fabrication, RI = Released for Information, RP = Released for Purchase, RPA = Released for Permit Application, RQ = Released for Quotation, RR = Released for Review and Comments.

SOIL TESTING SERVICES



EXECUTIVE SUMMARY

Geotechnical Investigation for Proposed Hybrid Renewable Project near Goth Dhori Jhokhio, District Thatta, Sindh was carried out in order to determine geotechnical parameters of subsurface deposits. Scope of field work included drilling of fifty five (55) boreholes; five (05) up to the depth of 30.0 meters and fifty (50) up to the depth of 5.0 meters below the existing ground level. Out of the fifty five (55) boreholes drilled, thirty one (31) were within the project development area. Additionally, within the same area, three (03) test pits were excavated, and two (02) electrical resistivity tests were conducted. Soil and rock samples were collected during field investigation. Laboratory testing of these samples has been carried out in the Soil Testing Services laboratory, Karachi.

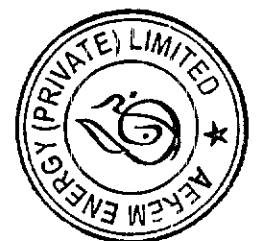
The deposition of the area mainly consists of '*very dense, fine grained, silty, sand*' and '*very weak to weak, highly weathered and fractured, limestone*'. Groundwater table was not encountered up to the maximum explored depth of 30.0 meters below the existing ground level in the boreholes drilled at site, at the time of this investigation.

Keeping these conditions under consideration:

- Allowable bearing pressures for circular raft foundations have been provided at a depth of 2.5 - 3.0 meters below the existing ground level for WTGs.
- Allowable bearing pressures for pad foundations have been provided at a depth of 1.0 - 2.0 meters below the existing ground level for Solar Panels foundations.
- Allowable pile capacities are documented for various diameters and lengths of piles intended for WTGs.
- Allowable pile capacities are documented for various diameters and lengths of piles intended for Solar Panels foundations.
- Electrical resistivity survey was performed at two locations within the extended area to confirm the rock type and formation.
- Three test pits were also excavated at three locations within the extended area to confirm the rock type and formation.
- Earth pressure parameters have been provided for earth retaining structures.
- Seismic soil profile has been taken as '*Sc*' for the foundations in accordance with PBC-21.

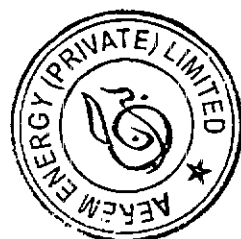


The exposure of underground concrete to aggressive chemicals is found to be '*negligible*' for sulphates and chlorides which have influenced the selection of cement for underground concreting and it is recommended to use *Ordinary Portland Cement (OPC)* for all underground concrete works.

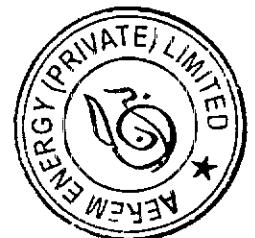


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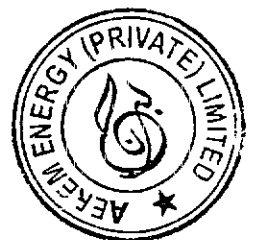


1. INTRODUCTION

Planning for Proposed Hybrid Renewable Project near Goth Dhor Jhokhio, District Thatta, Sindh is underway. In order to confirm the geotechnical parameters of the subsurface deposits, *M/s. Soil Testing Services (STS)* were entrusted by *M/s. Burj Capital* to perform the confirmatory geotechnical investigation at the project site.

Scope of field work included drilling of fifty five (55) boreholes; five (05) up to the depth of 30.0 meters and fifty (50) up to the depth of 5.0 meters below the existing ground level. Out of the fifty five (55) boreholes drilled, thirty one (31) were within the project development area. Additionally, within the same area, three (03) test pits were excavated, and two (02) electrical resistivity tests were conducted. Elevation of the drilling platform at each borehole location was noted with respect to the mean sea level and is mentioned in borehole logs attached in Appendix B. Standard penetration tests were carried out at regular intervals in the boreholes along with the collection of soil samples via split spoon sampler. Boreholes in rock were advanced through continuous coring. Rock core samples were extracted with the help of double tube core barrels. The samples retrieved from the field work were tested in the laboratory and this report is prepared from the information obtained from the field and laboratory tests.

The report consists of five chapters with *Chapter 2* describing the site's existing condition, *Chapter 3* discusses briefly geology and climate of the area, *Chapter 4* discusses the subsurface deposits in detail, *Chapter 5* includes the recommendations for foundation design, and *Chapter 6* contains a summary of conclusions regarding the ground conditions, with respect to geotechnical engineering for this project.



2. THE SITE

The project site is located in Goth Dhorj Jokhio, approximately 12.0 kilometers northwest of Haleji Lake and around 10.0 kilometers west of Jungshahi, a small town in District Thatta. The nearby landmarks include Jamia Masjid Goth Abdul Hakeem Jokhio and Indus Wind Power Project.

The topography of the terrain is not plain with significant changes in elevation observed across the site at places. Bushes and different types of wild plants were also found across the site.

Figure 1 shows the google image of the site.

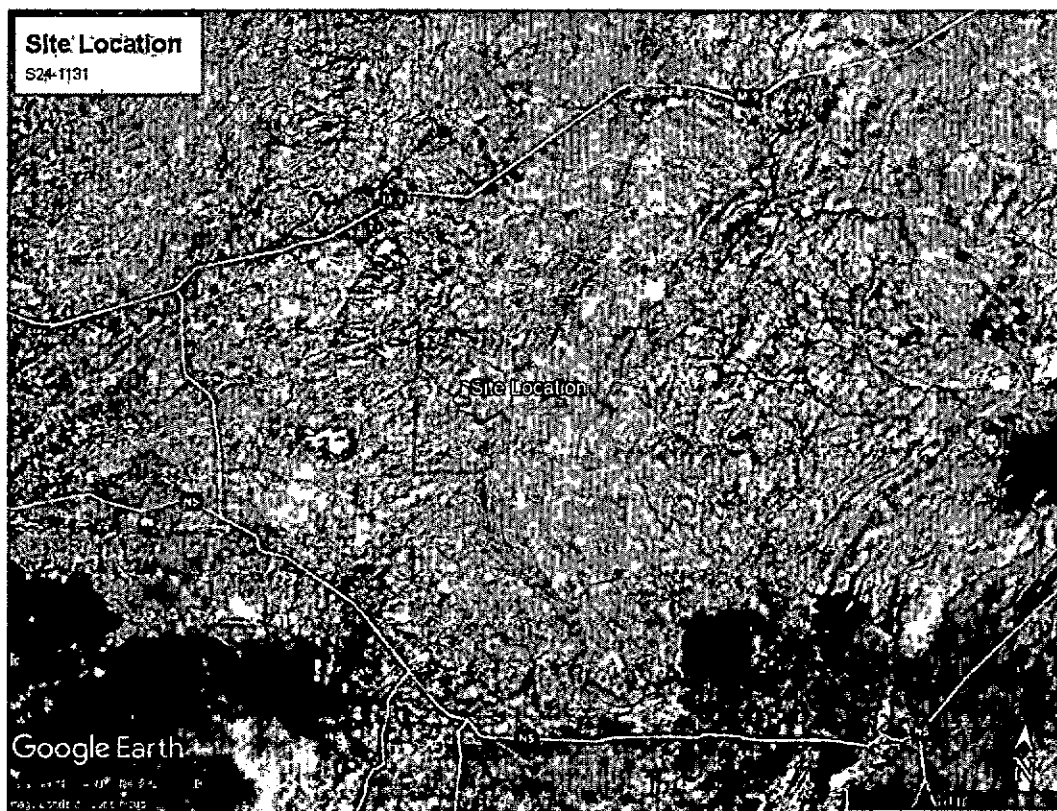
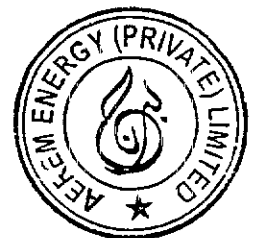


Figure 1: Google image of the the Neighbourhood area (Courtesy: Google Earth)



3. CLIMATOLOGY & GENERAL GEOLOGY OF THE AREA

3.1 CLIMATE

There is an excess of evaporation over precipitation at the site, so the climate here is 'Desert'. Virtually there is no rainfall during the year in the study area. The average annual temperature of the site area is observed 26.8 C and the average annual rainfall is estimated at 210 mm. Summer season is arid, sweltering & windy and winters are short, comfortable and dry.

3.2 GENERAL GEOLOGY OF THE AREA

3.2.1 TOPOGRAPHY AND PHYSIOGRAPHICAL FEATURES

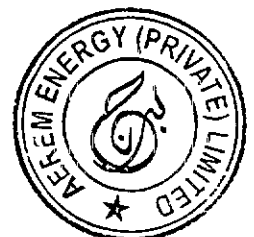
The mountainous relief follows the general axial trend of structures, and they are:

- The foot hills of western Sindh which have gentle structure and are of low relief.
- The Nagan range of mountain front, steeply folded, intensively faulted and of high relief.
- Zarghun and Khuzdar knots folded complex.
- Central Mekran, a region of parallel valleys and ridges.

Except for the hills of Khairpur, Indus plain is devoid of major relief and is essentially a broad and shallow basin bordered on the east by the low hills of Peninsular, India and on the west by the ranges of Baluchistan and western Sindh.

The central part is build up with floodplain material of the Indus River, which is post Tertiary alluvium, cut by river channels. The land slope is less than 1/5,300 or 1 ft. per mile. The western part of basin is a piedmont plain that slopes gently up to the mountains. The eastern part of the basin is largely covered with sand of the great "Thar" desert.

The erosional physiography is typical of arid and semi arid terrains, as seen by abrupt boundary between steep rocky mountains and the wide alluvial valley. The Indus river flows on a very flat plain (own-made plain more than 1,100 km long with one-foot per-mile slope, broken by a group of pre-cambrian hills and low isolated limestone hills at Sukkar, Hyderabad and Karachi).

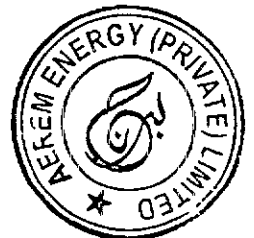


3.2.2 STRATIGRAPHIC SUCCESSION

A generalized stratigraphic succession of the area is summarized in table 1 as follows:

Table 1: Stratigraphic Succession of the area

| Period | Epoch/Age | Formations |
|----------|------------|--|
| Holocene | Recent | Loose alluvial, wind born deposits. |
| | Sub recent | Cemented coarse gravels conglomerates and sandy gravels. |
| Tertiary | Pliocene | Manchar formations in Sindh and Karachi area. Sand stone, shale and conglomerate |
| | Miocene | Gaj formations in Western Sindh and Karachi area. Lime stone, sandstone and shale. |
| | Oligocene | Nari formations in Western Sindh. Sand stone and limestone. |



4. GROUND CONDITIONS

The subsurface deposits up to the explored depth consist of the following units:

- Sand
- Limestone

Following sub-sections describe the strength characteristics of the geological unit and the groundwater conditions. Soils are classified as per Unified Soil Classification System (USCS) and rocks are classified as per BS-5930.

4.1 SAND

Deposits of *fine grained, silty* sand were encountered in one (01) of the boreholes drilled at site. State of compactness according to SPT 'N' counts has been determined to be 'very dense'. The grain size analysis has been carried out of samples collected from these deposits. Unified Classification System (UCS) classifies these deposits as 'SM'. Table 2 summarizes the details of these deposits.

Table 2: Deposits of Sand

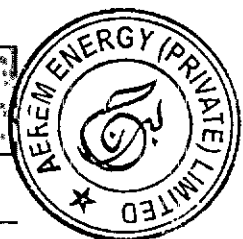
| Borehole No. | Depth
(meters) |
|--------------|-------------------|
| BH-07 | 0.0 – 1.2 |

4.2 LIMESTONE

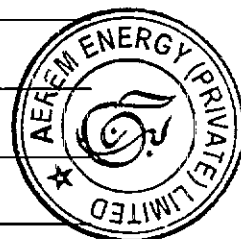
Deposits of *highly weathered and fractured*, limestone were encountered in all the boreholes drilled at the site. Disturbed and undisturbed rock core samples were collected from these deposits which were tested for moisture content, density and unconfined compression test. According to BS 5930, these deposits are classified as 'very weak to weak' rock. Table 3 summarizes the details of these deposits.

Table 3: Deposits of Limestone

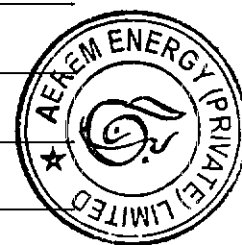
| Borehole No. | Depth
(meters) |
|--------------|-------------------|
| BH-01 | 0.0 – 5.0 |
| BH-02 | 0.0 – 5.0 |



| Borehole No. | Depth
(meters) |
|--------------|-------------------|
| BH-03 | 0.0 – 5.0 |
| BH-04 | 0.0 – 5.0 |
| BH-05 | 0.0 – 5.0 |
| BH-06 | 0.0 – 5.0 |
| BH-07 | 1.2 – 5.0 |
| BH-08 | 0.0 – 30.0 |
| BH-09 | 0.0 – 5.0 |
| BH-10 | 0.0 – 5.0 |
| BH-11 | 0.0 – 5.0 |
| BH-12 | 0.0 – 5.0 |
| BH-13 | 0.0 – 5.0 |
| BH-14 | 0.0 – 5.0 |
| BH-15 | 0.0 – 5.0 |
| BH-16 | 0.0 – 30.0 |
| BH-17 | 0.0 – 5.0 |
| BH-18 | 0.0 – 5.0 |
| BH-19 | 0.0 – 5.0 |
| BH-20 | 0.0 – 5.0 |
| BH-21 | 0.0 – 5.0 |
| BH-22 | 0.0 – 5.0 |
| BH-23 | 0.0 – 5.0 |
| BH-24 | 0.0 – 5.0 |



| Borehole No. | Depth
(meters) |
|--------------|-------------------|
| BH-25 | 0.0 – 30.0 |
| BH-26 | 0.0 – 5.0 |
| BH-27 | 0.0 – 5.0 |
| BH-28 | 0.0 – 5.0 |
| BH-29 | 0.0 – 5.0 |
| BH-30 | 0.0 – 5.0 |
| BH-31 | 0.0 – 5.0 |
| BH-32 | 0.0 – 5.0 |
| BH-33 | 0.0 – 5.0 |
| BH-34 | 0.0 – 5.0 |
| BH-35 | 0.0 – 5.0 |
| BH-36 | 0.0 – 5.0 |
| BH-37 | 0.0 – 30.0 |
| BH-38 | 0.0 – 5.0 |
| BH-39 | 0.0 – 5.0 |
| BH-40 | 0.0 – 5.0 |
| BH-41 | 0.0 – 5.0 |
| BH-42 | 0.0 – 5.0 |
| BH-43 | 0.0 – 5.0 |
| BH-44 | 0.0 – 5.0 |
| BH-45 | 0.0 – 5.0 |
| BH-46 | 0.0 – 5.0 |



| Borehole No. | Depth
(meters) |
|--------------|-------------------|
| BH-47 | 0.0 – 5.0 |
| BH-48 | 0.0 – 5.0 |
| BH-49 | 0.0 – 5.0 |
| BH-50 | 0.0 – 5.0 |
| BH-51 | 0.0 – 5.0 |
| BH-52 | 0.0 – 30.0 |
| BH-53 | 0.0 – 5.0 |
| BH-54 | 0.0 – 5.0 |
| BH-55 | 0.0 – 5.0 |

4.3 GROUNDWATER CONDITIONS

Groundwater table was not encountered up to the maximum encountered depth of 30.0 meters below the existing ground level in the boreholes drilled at site, at the time of this investigation.



5. ENGINEERING DESIGN CONSIDERATIONS

Foundation type for a structure depends on the expected loads taken by the foundation and the type of soil underlying it. The characteristics of subsurface soil deposits have been discussed in the previous section. As per the information provided by the client, following structures are proposed at the project site:

Table 4: Details of proposed structures and foundations

| Structure | Soil Profile Reference | Proposed Foundation Type |
|---------------------------|------------------------|--------------------------|
| Solar Panel's Foundations | Soil Profile 1 | Pad Foundation |
| | | Deep Foundation |
| WTGS Foundations | | |
| Circular Raft Foundation | | |
| | | Deep Foundation |

Keeping in view the subsoil conditions prevailing at the site and the loads expected to be transferred to the foundations and as per the project specifications, recommendations for both shallow foundation and deep foundation (bored cast in-situ pile foundation) are provided. Following sections discusses recommendations for shallow and deep foundations, in detail.

5.1 DESIGN PARAMETERS

The design soil parameters are based on grain size, material type, SPT N-values, field and laboratory testing data. Our recommended design soil parameters used in our analysis are presented below.

Table 5: Engineering Design Parameters

| Layer Depth below EGL (m) | | Layer Thickness (m) | Design SPT-N | Material Type | Cohesion, C _v (KPa) | Angle of Internal friction (φ) (degree) | Unit Weight co-related with SPT N (kN/m ³) | Modulus of Elasticity E (kN/m ²) |
|---------------------------|--------|---------------------|--------------|---------------|--------------------------------|---|--|--|
| Top | Bottom | | | | | | | |
| 0.0 | 5.0 | 5.0 | - | Limestone | 180 | 40 | 21.0 | 150,000 |
| 5.0 | 30.0 | 25.0 | - | Limestone | 200 | 42 | 21.0 | 200,000 |



NOTE:

- The values of **internal angle of friction (Φ)** for soil and rock are taken as under:
 - Values are taken as presented in Chapter 2 of Book "Rock Slope Stability Analysis by G.P. Giani".
- The values of **cohesion (c)** are taken as under:
- Values are taken as presented in Chapter 11 of Book "Handbook of Geotechnical Investigation & Design Tables by Burt Look.
- The values of **Elastic Modulus (E)** are taken as under:
 - Values are taken as presented in Chapter 11 of Book "Handbook of Geotechnical Investigation & Design Tables by Burt Look.

5.2 DESIGN CRITERIA FOR SHALLOW FOUNDATIONS

A suitable shallow foundation for any structure must satisfy two basic independent criteria with respect to the underlying foundation soils. First, the foundation must have an adequate factor of safety against exceeding the bearing capacity of the foundation soils. Second the vertical movements of the foundation due to settlement or swelling of the foundation soils must be within tolerable limits for the structure.

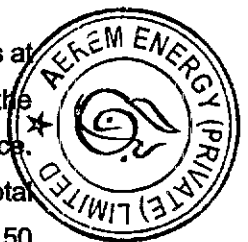
Dynamically loaded foundations, such as those supporting vibrating machinery, must satisfy additional criteria as follows:

- vibrations transmitted to the foundation soils must not cause excessive settlement of the structures or its surroundings;
- vibrations of the dynamically loaded structure, and its surroundings, must not interfere with planned operations and adjacent structures.

The foundation bearing pressures should be limited so that settlements do not exceed tolerable limits for the structures.

5.3 ALLOWABLE BEARING PRESSURES FOR SHALLOW FOUNDATION

The allowable bearing pressure for shallow foundation supported on natural soils/rocks at the site will be limited either by the settlement tolerance of individual structures, or by the bearing capacity of the soil, depending on the foundation width and depth of influence. Typically, for shallow raft footings, the bearing pressure should be limited so that the total foundation settlement does not exceed 50 mm, with differential settlements of about 50



percent of the total settlement, or so that the bearing capacity is not exceeded, whichever is the lower of the two values.

The ratio of differential to total settlements for raft foundations on sand is typically half that of an isolated/pad footing (Terzaghi, Peck and Mesri, 1996). Consequently, the amount of settlement that a raft foundation can tolerate is twice that of an isolated foundation, usually 50 mm. However, the actual settlement tolerance of various structures should be defined by the structural engineer.

We estimated the allowable bearing pressures for pad and raft foundations as the lower of the two values calculated based on settlement and shear criteria. Table 6 gives the allowable bearing pressures for circular raft foundations at depth of 2.5 – 3.0 meters from existing ground level and Table 7 gives the allowable bearing pressures for pad foundations at the depth range of 1.0 to 2.0 meters.

Table 6: Allowable Bearing Pressures for WTGs foundations

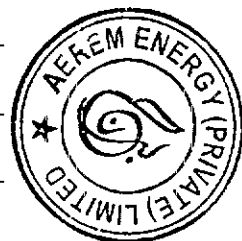
| Foundation Type | Foundation Diameter (meter) | Minimum Embedment below EGL (meter) | Raft Foundation (kPa / tsf) |
|-----------------|-----------------------------|-------------------------------------|-----------------------------|
| Circular | 18.0 | 2.5 – 3.0 | 500.0** / 5.0** |

*Diameter of raft foundation is assumed as 18.0 meters to calculate bearing capacities.

* Bearing capacities of circular footings at WTGs have been restricted to 500 kPa due to practical considerations.

Table 7: Allowable Bearing Pressures for Solar Panel Foundations

| Minimum Embedment below EGL (meter) | Foundation Dimensions (meter × meter) | Pad Foundation (kPa / tsf) |
|-------------------------------------|---------------------------------------|----------------------------|
| 1.0 | 1.0 × 1.0 | 250.0* / 2.50* |
| | 1.5 × 1.5 | 330.0* / 3.30* |
| | 2.0 × 2.0 | 400.0* / 4.00* |
| 1.5 | 1.0 × 1.0 | 400.0* / 4.00* |
| | 1.5 × 1.5 | 400.0* / 4.00* |



| Minimum Embedment
below EGL
(meter) | Foundation
Dimensions
(meter × meter) | Pad Foundation
(kPa / tsf) |
|---|---|-------------------------------|
| 1.5 | 2.0 × 2.0 | 400.0* / 4.00* |
| | 1.0 × 1.0 | 400.0* / 4.00* |
| 2.0 | 1.5 × 1.5 | 400.0* / 4.00* |
| | 2.0 × 2.0 | 400.0* / 4.00* |

* Bearing capacities of pad footings for solar panels footings have been restricted to 400 kPa due to practical considerations.

Proper drainage shall be provided to avoid infiltration of water into the foundation soil. It should be ensured that the foundation is not placed on the fill material. The settlement of pad and raft foundations due to net allowable pressure has been estimated to be within the allowable limit of 25mm (1-inches) and 50mm (2-inches), respectively.

Cohesive material shall not be used for backfilling purposes. Check for tension must be carried out before finalising the dimensions of the footing in order to ensure adequate safety against uplift forces. Due to the horizontal seismic forces, and wind forces, uplift can occur at one end of the foundation. This uplift can be balanced by increasing the dimensions of the foundation and the weight of the soil above the foundation. The angle of internal friction for limestone and other type of rocks can be taken as 40 - 42 degrees.

5.4 MODULUS OF SUBGRADE REACTION

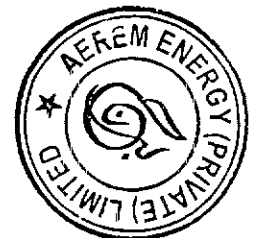
The modulus of subgrade reaction, k_s , may be required to design raft foundations. The modulus principally depends on the soil stiffness, raft foundation stiffness and foundation size.

We recommend computing the modulus of subgrade reaction values for raft foundations at the site using the allowable bearing pressures that could be obtained from the bearing pressures presented in this report and the following equation:

$$k_s = \frac{1}{A} (SF) q_a$$

where:

k_s = Modulus of subgrade reaction, kN/m²/m;



- SF = Factor of safety;
 q_a = Allowable bearing pressure, kPa; and
 A = Allowable settlement, mm.

The above equation assumes that the rafts will tend towards flexible rather than rigid behaviour. For perfectly rigid rafts the modulus values obtained from the above equation should be doubled.

Mat foundations will behave as:

Perfectly rigid if $h/B > 1/5$

Perfectly flexible if $h/B < 1/55$

where:

- h = thickness of raft foundation; and
 B = width of raft foundation

Table 8: Modulus of subgrade reaction based on allowable bearing pressure (WTGs)

| Minimum Embedment
below EGL
(m) | Foundation Diameter
(meter) | Modulus of subgrade
reaction
(MN/m ² / tcf) |
|---------------------------------------|--------------------------------|--|
| 2.5 - 3.0 | 18.0 | 29.53 / 88.58 |

Table 9: Modulus of subgrade reaction based on allowable bearing pressure
(Solar Panel Foundations)

| Minimum Embedment
below EGL
(m) | Foundation
Dimensions
(meter × meter) | Modulus of subgrade
reaction
(MN/m ² / tcf) |
|---------------------------------------|---|--|
| 1.0 | 1.0 × 1.0 | 29.53 / 88.58 |
| | 1.5 × 1.5 | 38.98 / 116.93 |
| | 2.0 × 2.0 | 47.24 / 141.73 |
| 1.5 | 1.0 × 1.0 | 47.24 / 141.73 |
| | 1.5 × 1.5 | 47.24 / 141.73 |
| | 2.0 × 2.0 | 47.24 / 141.73 |



| Minimum Embedment
below EGL
(m) | Foundation
Dimensions
(meter × meter) | Modulus of subgrade
reaction
(MN/m ³ / tcf) |
|---------------------------------------|---|--|
| 2.0 | 1.0 × 1.0 | 47.24 / 141.73 |
| | 1.5 × 1.5 | 47.24 / 141.73 |
| | 2.0 × 2.0 | 47.24 / 141.73 |

5.5 DEEP FOUNDATIONS - ALLOWABLE PILE CAPACITIES

The ultimate compressive capacity, Q , for a given bored concrete pile penetration is taken as the sum of the skin friction on the pile wall, Q_s , and the end bearing on the pile tip, Q_p , so that:

$$Q = Q_s + Q_p = \Sigma f A_s + q A_p$$

Where A_s and A_p represent, respectively, the embedded surface and pile end area; f and q represent, respectively, the unit skin friction and unit end bearing. When computing ultimate tensile capacity, the end bearing term in the above equation is neglected. Therefore, the value of the ultimate tensile capacity is the same value as the ultimate compression capacity due to skin friction Q_s .

The design parameters for calculating pile capacities have been derived from shear strength determination, through in-situ field tests and laboratory tests of collected soil samples. Table 10 provides pile capacities for wind turbine generators (WTGs) with diameters of 600mm, 760mm, and 900mm. For solar panels, please refer to Table 11, which lists pile capacities for diameters of 150mm, 200mm, 250, 300mm, 350mm and 400mm.

Table 10: Allowable Pile Capacities Wind Turbine Generators (WTGs)

| Diameter
(mm) | Length of Pile
Below Existing
Ground Level
(meters) | Tension
(kN) | Compression
(kN) |
|------------------|--|-----------------|---------------------|
| 600 | 10.0 | 3064 | 3630 |
| | 15.0 | 4596 | 5162 |



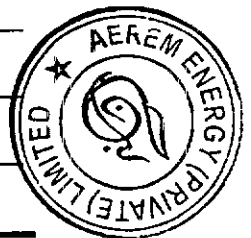
| Diameter
(mm) | Length of Pile
Below Existing
Ground Level
(meters) | Tension
(kN) | Compression
(kN) |
|------------------|--|-----------------|---------------------|
| 600 | 20.0 | 6129 | 6694 |
| | 10.0 | 3881 | 4789 |
| | 15.0 | 5822 | 6730 |
| | 20.0 | 7763 | 8670 |
| 760 | 10.0 | 4596 | 5869 |
| | 15.0 | 6895 | 8167 |
| | 20.0 | 9193 | 10465 |
| | | | |

Table 11: Allowable Pile Capacities for Solar Panels

| Diameter
(mm) | Length of Pile
Below Existing
Ground Level
(meters) | Tension
(kN) | Compression
(kN) |
|------------------|--|-----------------|---------------------|
| 150 | 1.5 | 115 | 150 |
| | 2.0 | 153 | 189 |
| | 2.5 | 192 | 227 |
| | 3.0 | 230 | 265 |
| | 3.5 | 268 | 303 |
| | 4.0 | 306 | 342 |
| | | | |
| 200 | 1.5 | 153 | 216 |
| | 2.0 | 204 | 267 |
| | 2.5 | 255 | 318 |
| | 3.0 | 306 | 369 |



| Diameter
(mm) | Length of Pile
Below Existing
Ground Level
(meters) | Tension
(kN) | Compression
(kN) |
|------------------|--|-----------------|---------------------|
| 200 | 3.5 | 358 | 420 |
| | 4.0 | 409 | 471 |
| 250 | 1.5 | 192 | 290 |
| | 2.0 | 255 | 354 |
| | 2.5 | 319 | 417 |
| | 3.0 | 383 | 481 |
| | 3.5 | 447 | 545 |
| | 4.0 | 511 | 609 |
| | 1.5 | 230 | 371 |
| 300 | 2.0 | 306 | 448 |
| | 2.5 | 383 | 524 |
| | 3.0 | 460 | 601 |
| | 3.5 | 536 | 678 |
| | 4.0 | 613 | 754 |
| | 1.5 | 268 | 461 |
| 350 | 2.0 | 358 | 550 |
| | 2.5 | 447 | 639 |
| | 3.0 | 536 | 729 |
| | 3.5 | 626 | 818 |
| | 4.0 | 715 | 907 |
| | 1.5 | 306 | 558 |
| 400 | 1.5 | 306 | 558 |



| Diameter
(mm) | Length of Pile
Below Existing
Ground Level
(meters) | Tension
(kN) | Compression
(kN) |
|------------------|--|-----------------|---------------------|
| 400 | 2.0 | 409 | 660 |
| | 2.5 | 511 | 762 |
| | 3.0 | 613 | 864 |
| | 3.5 | 715 | 966 |
| | 4.0 | 817 | 1069 |

The design approach followed is based on FOS and as per this design approach, the settlement criteria of "Net settlement not to exceed 1% of the pile diameter at working load and Total penetration of the base not to exceed 10% of the pile diameter at test load" shall be fulfilled.

5.6 RECOMMENDED DRILLING METHOD AND CONFIRMATORY TESTING

The recommended drilling method for the construction of bored cast in-situ piles is straight rotary. Tentative pile capacity values given in *Tables 10 & 11* have been computed by static formulae which suffer from limitations. As such capacity values shall be verified by full scale load tests under the guidance of geotechnical engineer. Pile capacity shall be suitably adjusted if warranted by results of load tests. This report will be valid only if requirement of pile load tests is fulfilled.

The test pile should be loaded to 2.0 to 2.5 times the Specified Working Load (SWL) and the working pile should be loaded to 1.5 times the Specified Working Load (SWL). The calculations for allowable pile capacities for Wind Turbine Generators and Solar Panel Project, bored cast in-situ piles are presented in appendix E of this report.

5.7 PILE CONSTRUCTION

Allowable pile capacities have been derived from combination of end bearing and skin friction components. It is, therefore, essential to adopt the following construction methodology to satisfy following requirements:



1. Excessive disturbance to sub-surface along shaft and pile tip shall be avoided during the course of drilling.
2. The bottom of pile shall be cleaned of all loose materials which may accumulate during the course of drilling.

Pile concreting shall be undertaken only when above conditions are fulfilled. It is understood that subsurface materials will be carefully examined during piling and it shall be ensured that all piles are placed in proper stratum. This exercise will serve as safeguard against variations in quality and level of occurrence of dense stratum.

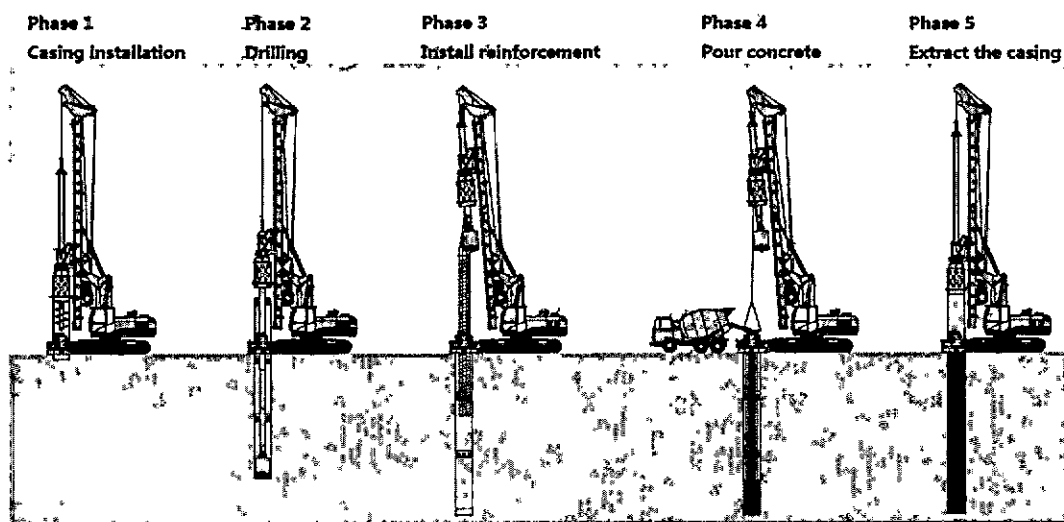


Figure 2: Construction of cast in situ piles by straight rotary

5.8 EARTH RETAINING STRUCTURE

All measures shall be taken to provide safety to adjacent structures. Properly designed earth retaining structure must be constructed prior to deep excavation.

Earth pressure parameters required for the design of structure to retain the excavation are given in Table 12.

Table 12: Earth pressure parameters

| Strata | ϕ
(Undisturbed) | K_a
(Coefficient of
active earth
pressure) | K_p
(Coefficient of
passive earth
pressure) |
|-----------|-------------------------|---|--|
| Limestone | 40° | 0.217 | 4.600 |



5.9 SEISMIC GROUND MOTION PARAMETERS (BCP – 2021)

5.9.1 SITE CLASS

Chapter 16 of BCP – 2021 defines the site class definition in accordance with Chapter 20 ASCE-7 to be used for determining site coefficients. Based on the field data obtained from sub-soil exploration, the soil class will be taken as “S_c”.

5.9.2 SHORT PERIOD SPECTRAL RESPONSE ACCELERATION (S_s)

Chapter 16 of BCP – 2021, Section 1613.2.1 deals with the mapped values for 0.2-seconds spectral acceleration corresponding to Maximum Considered Earthquake (MCE) defined as the ground motion level with 2% probability of exceedance in 50 years (2745 years return period). The S_s for project site will be taken as 0.7191.

5.9.3 LONG PERIOD SPECTRAL RESPONSE ACCELERATION (S_1)

Chapter 16 of BCP – 2021, Section 1613.2.1 deals with the mapped values for 1-second spectral acceleration corresponding to Maximum Considered Earthquake (MCE) defined as the ground motion level with 2% probability of exceedance in 50 years (2745 years return period). The S_1 for project site will be taken as 0.1839.

5.10 TYPE OF CEMENT

Tests on collected soil and rock samples obtained from the boreholes indicate ‘negligible’ exposure to sulphate and chloride. Under these conditions it is recommended to use *Ordinary Portland Cement (OPC)* for all underground concrete works.

5.11 ADDITIONAL TESTING

Two (02) electrical resistivity survey were conducted up to the depth of 20.0 meters and three test pits were excavated up to the depth of 1.5meters to confirm the continuity of geological strata in the area.

5.11.1 ELECTRICAL RESISTIVITY TEST

5.11.1.1 INTRODUCTION

Electrical resistivity tests were performed in accordance with ASTM G57-20. Electrical resistivity tests require inserting four probes into the test area. The probes are installed in a straight line spaced according to the type of configuration to be used during the testing. Two (02) electrical resistivity tests were conducted at different locations.



5.11.1.2 EQUIPMENT USED

For electrical resistivity tests, *Digital Ground Resistance & Soil Resistivity Tester Model # 6472* (by Chauvin Arnoux, Inc. d.b.a. AEMC Instruments) was used. The Model 6472 measures from 0.01 to 99.99kΩ.

5.11.1.3 WORKING PRINCIPLE

Following configuration was used to perform the tests at the site.

- **Wenner Configuration**

The probes are installed in a straight line and equally spaced. The probes establish an electrical contact with the earth. The meter injects current through the ground via the tester and the outer two probes. The current flowing through the earth (a resistive material) develops a voltage / potential difference. This voltage drop resulting from the current flow is then measured between the two inner probes.

The meter then knows the amount of current that is flowing through the earth and the voltage drop across the two center probes. With this information the meter uses ohms law ($R=V/I$) to calculate and display the resistance in ohms. The product of the measured resistance and geometric factor is known as apparent resistivity.

The calculated soil resistivity is the average of the soil resistivity from the surface to a depth equivalent to the probe spacing. For example, a probe spacing of 10 meters between each probe will provide the average soil resistivity between the surface and a depth of 10 meters.

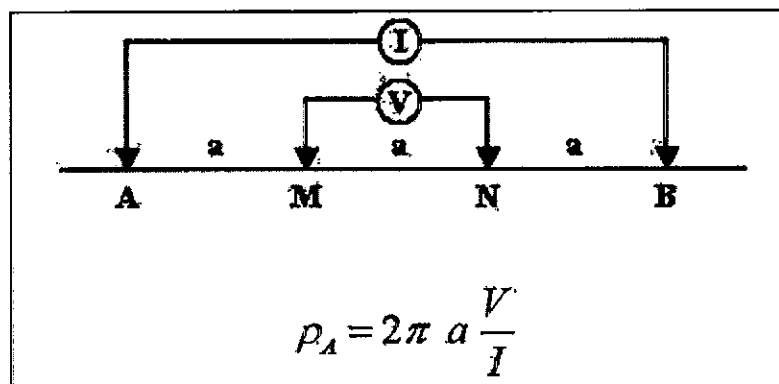


Figure 3: Schematic diagram of Wenner Array



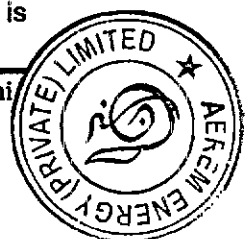
5.11.1.4 ELECTRICAL PROPERTIES OF GROUND

All materials, including soil and rock, have an intrinsic property, resistivity that governs the relation between the current density and the gradient of the electrical potential. Variations in the resistivity of earth materials either vertically or laterally, produce variations in the relations between the applied current and the potential distribution as measured on the surface or thereby reveal something about the composition, extent and physical properties of the subsurface materials. The various electrical geophysical techniques distinguish materials through whatever contrast exists in their electrical properties. Materials that differ geologically, such as described in a lithologic log from a drill hole, may or may not differ electrically and, therefore, may or may not be distinguished by an electrical resistivity survey. Properties that affect the resistivity of a soil or rock include porosity, water content, composition (clay mineral and metal content), salinity of the pore water, and grain size distribution.

Table 13: Typical electrical resistivity's of earth materials

| Material | Resistivity (Ωm) |
|--------------------|----------------------------|
| Clay | 1-20 |
| Sand, wet to moist | 20-200 |
| Shale | 1-500 |
| Porous limestone | 100-1,000 |
| Dense limestone | 1,000-1,000,000 |
| Metamorphic rocks | 50-1,000,000 |
| Igneous rocks | 100-1,000,000 |

Table 13 shows some typical ranges of resistivity values for manmade materials and natural minerals and rocks, similar to numerous tables found in the literature (van Blaricon 1980; Telford et al. 1976; Keller and Frischknecht 1966). The ranges of values shown are those commonly encountered but do not represent extreme values. It may be inferred from the values listed that the user would expect to find in a typical resistivity survey. Low resistivities for the soil layers, with underlying bedrock producing higher resistivities. Usually, this will be the case, but the particular conditions of a site may change the resistivity relationships. For example, coarse sand or gravel, if it is



dry, may have a resistivity like that of igneous rocks, whereas a layer of weathered rock may be more conductive than the soil overlying it. In any attempt to interpret resistivities in terms of soil types or lithology, consideration should be given to the various factors that affect resistivity.

Table 14: Resistivity versus Corrosivity of Soil

| Corrosivity | Resistivity (Ω-m) |
|-------------------------|-------------------|
| Very Corrosive | Below 5 |
| Corrosive | 5 - 10 |
| Moderately Corrosive | 10-20 |
| Mildly Corrosive | 20-100 |
| Generally Not Corrosive | > 100 |

5.11.1.5 SOIL RESISTIVITY INTERPRETATION OF THE SITE

Two (02) soil resistivity tests were conducted at different locations at the site. The underground environment can be categorized as *mildly corrosive to Generally Not corrosive*. The detailed values for resistivity are appended in appendix E of the report.

Table 15: Corrosivity at various depths in test lines

| Test Line | Depth Range (m) | Corrosivity | Test Location |
|-----------|-----------------|-------------------------|---------------------------------|
| ERS 01 | 0.0 – 20.0 | Generally Not Corrosive | 357285.00m N
2761687.00m E |
| ERS 02 | 0.0 – 20.0 | Generally Not Corrosive | 355604.00 m N
2761345.00 m E |

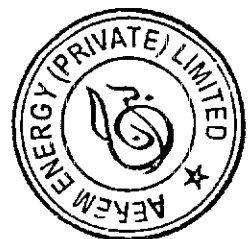




Figure 4: Electrical Resistivity in progress



Figure 5: Electrical Resistivity in progress



5.11.2 DISCUSSION ON TEST PITS AND EARTH WORK TESTS

Three (03) test pits were excavated at site up to the maximum 1.0 meter depth at three different locations in the extended area. The strata encountered in the test pits were mainly highly weathered and fractured, limestone. Groundwater was not encountered in any of the test pits at a depth of 1.0 meter below existing site grade. The detail of test pits is presented below:

Table 16: Summary of test pits

| Test Pit No. | Test Depth (m) | Rock Type | Test Location |
|--------------|----------------|-----------|---------------------------------|
| TP-01 | 1.0 | Limestone | 358222.00 m N
2762321.00 m E |
| TP-02 | 1.0 | Limestone | 355952.00 m N
2763830.00 m E |
| TP-03 | 1.0 | Limestone | 354379.00 m N
2762932.00 m E |



6. CONCLUSIONS

Geotechnical Investigation for Proposed Hybrid Renewable Project near Goth Dhori Jhokhio, District Thatta, Sindh was carried out in order to determine geotechnical parameters of subsurface deposits. Scope of field work included drilling of fifty five (55) boreholes; five (05) up to the depth of 30.0 meters and fifty (50) up to the depth of 5.0 meters below the existing ground level. Out of the fifty five (55) boreholes drilled, thirty one (31) were within the project development area. Additionally, within the same area, three (03) test pits were excavated, and two (02) electrical resistivity tests were conducted. Soil and rock samples were collected during the field investigation. Laboratory testing on these samples has been carried out in the lab and includes determination of index properties through grain size analysis, density, moisture content and unconfined compression test etc. Chemical characteristics of soil have also been assessed through determination of sulphate content, chloride content and pH.

Keeping in view, the results from field, and laboratory tests and the expected loads being transferred to the founding stratum, recommendations for both shallow foundation and deep foundation are provided. Exposure to chloride and sulphate salts is '*negligible*' for collected soil and rock samples, therefore, *Ordinary Portland Cement (OPC)* may be used for all underground concreting works.

None of the executed boreholes has shown any evidence of underground cavities up to the maximum depth of 30 m.

